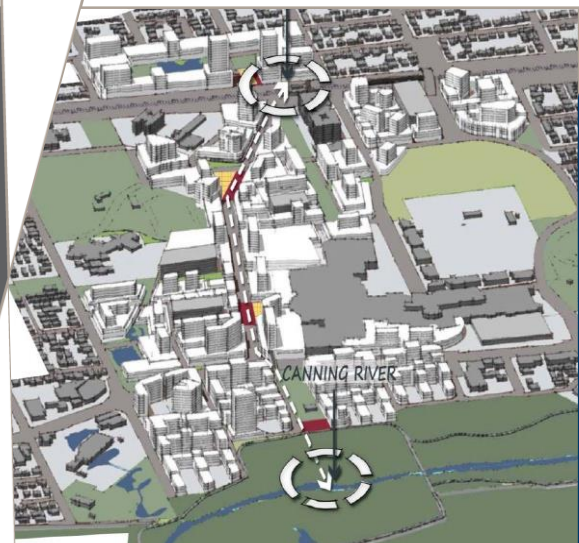


Canning City Centre Servicing Report

Canning City Centre

Prepared for
City of Canning

16 December 2016



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Executive Summary

The Canning City Centre Structure Plan provides a framework for the redevelopment of the Canning City Centre area into a “major growth area by 2031” for a major transit orientated development location.

Through close liaison with the City of Canning and relevant service providers, Cardno has researched and reported on the current capacity of the infrastructure and services within the Canning City Centre area. Cardno has also provided detailed findings and recommendations regarding the future infrastructure and servicing requirements that are needed to accommodate the redevelopment of the centre as proposed by the Canning City Centre Structure Plan.

In summary, Cardno’s assessment of the Canning City Centre in terms of required infrastructure for the CCC Structure Plan area is as follows:

- The Canning City Centre Structure Plan area faces a shortage in wastewater and gas infrastructure to service the proposed increase in residential and commercial activity.
- Upgrades other than the required major infrastructure upgrades as outlined in this report infrastructure will be rolled out in response to new development within the centre.
- It is recommended that a working group between the City of Canning and Water Corporation is set up in order to help plan and coordinate precinct development and staging with any Water Corporation trunk infrastructure capital works.
- The City of Canning could implement a minimum Green Star, NABERS or Waterwise accreditation requirement for any new developments within the Canning City Centre. Minimum energy conservation requirements can help reduce peak electricity demand, reduce water demand, increase load diversity and reduce greenhouse gas emissions. These measures may delay to onset of the medium-long term infrastructure requirements.
- National Broadband Network (NBN) has rolled their infrastructure across the entire city centre precinct.

In conclusion, based on advice received by Cardno from the relevant service authorities, there should be no reason from a servicing point of view that the Canning City Centre Structure Plan could not be implemented with the proposed infrastructure upgrades outlined in this report.

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1 Background

1.1 Introduction

Cardno was engaged to assist the City of Canning (CoC) in preparing an Infrastructure and Servicing Plan for the Canning City Centre (CCC) Structure Plan 2013. The subsequent plan was revised in May 2016 and Cardno have been requested to review the draft Activity Centre Plan May and report their findings.

The scope of works includes:

- Review of draft Canning Activity Centre Plan May 2016;
- Review of previous studies and reports;
- Provide analysis of existing services infrastructure;
- Identification of future service demands;
- Liaison and engagement of services providers;
- Infrastructure cost estimates;
- Production of an equitable developer contribution scheme;
- Presentations to key stakeholders, and
- Development of reports.

Cardno assessed the infrastructure and costs to inform the City on decisions around the long-term provision of electrical energy, natural gas, potable water and sewage disposal, along with high-speed data /telecommunications for the City Centre.

Cardno also provided an effective developer/infrastructure provider contribution scheme using industry recognized methodology that has been developed through fair and objective analysis.

The findings and advice presented in this report is based on Cardno's observations, experience from similar projects and responses from various service providers and stakeholders.



Figure 1-1 Canning City Centre Area (Not to Scale) (Image Source: Activity Centre Plan Area - CCC Activity Plan (Draft) May 2016)

Figure 1-1 shows the Canning City Centre Activity Plan Area. The Activity Plan has been divided into precincts as shown in Figure 1-2.

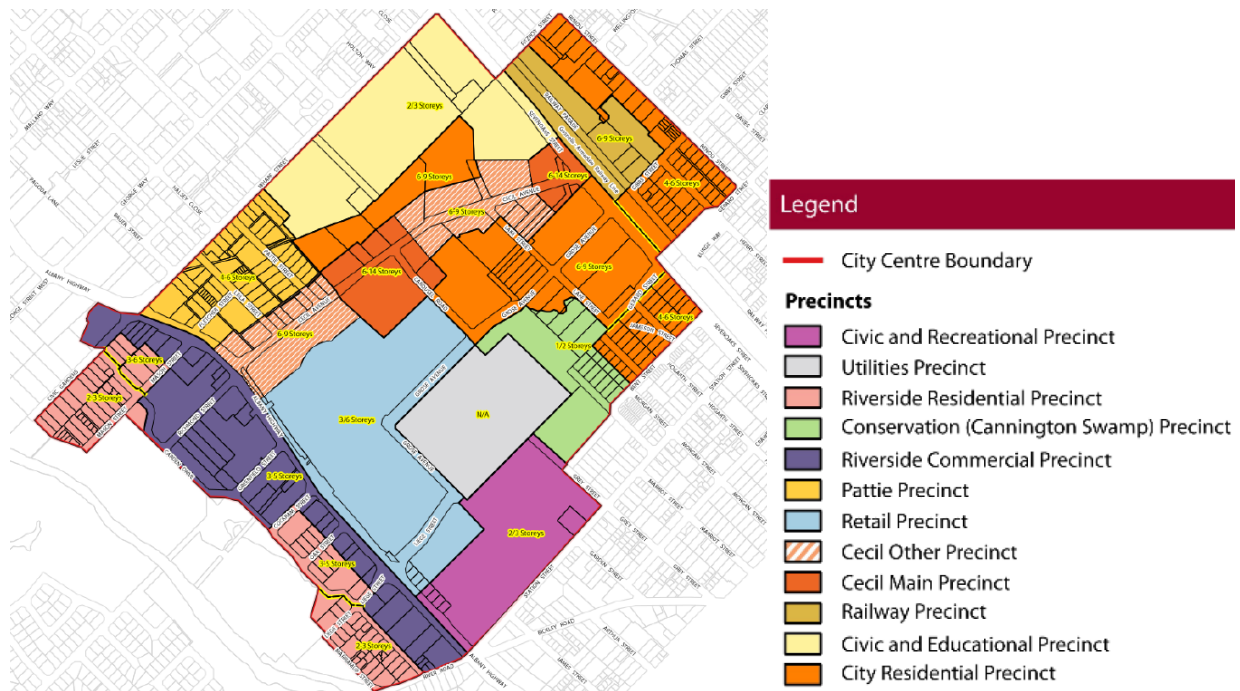


Figure 1-2 Canning City Centre Precincts

Details of the precinct areas are shown in Table 1-1.

Table 1-1 Canning City Activity Centre Areas and Use

Precinct	Area (ha)	Proposed Zoning R Code	Minimum Density (min dwellings per gross Ha)
Cecil Avenue Main	7.98	R-AC0	120
Cecil Avenue Other	12.8	R-AC0	120
Railway	7.26	R-AC0	100
City Residential	38.17	R-AC0	80
Pattie Street	10.80	R-AC0	100
Retail	26.88	N/A	N/A
Riverside Residential	13.98	R-AC0	60
Riverside Commercial	22.69	N/A	N/A
Civic and Educational	21.30	N/A	N/A
Civic and Recreational	14.12	R-AC0	60
Utilities	11.86	N/A	N/A
Conservation	8.20	N/A	N/A

2 Study Area

2.1 Location

The Canning City Centre (CCC) is located 10km southeast of the Perth Central Business District and is within the City of Canning local government area. The CCC is approximately 196 hectares and encompassed by the blue boundary line shown in Figure 2-1.

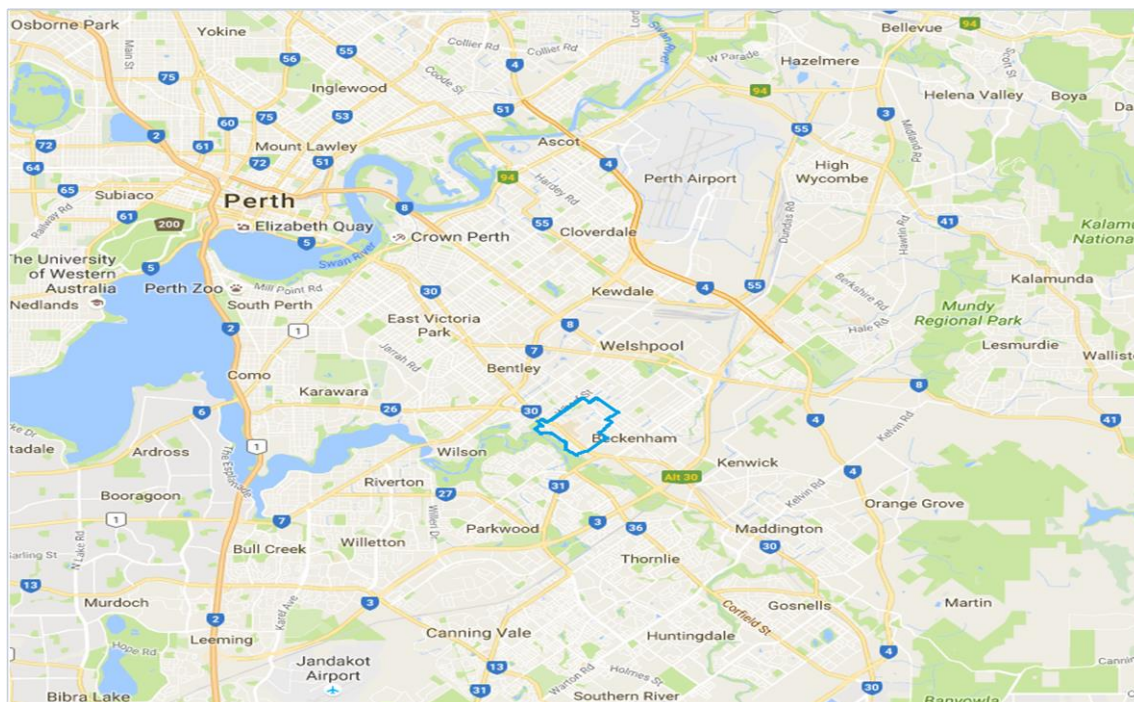


Figure 2-1 Study Area Location (Image source: www.nearmap.com 07/11/2016)

The following figures form part of the regulatory provisions of the CCC Activity Centre Plan.

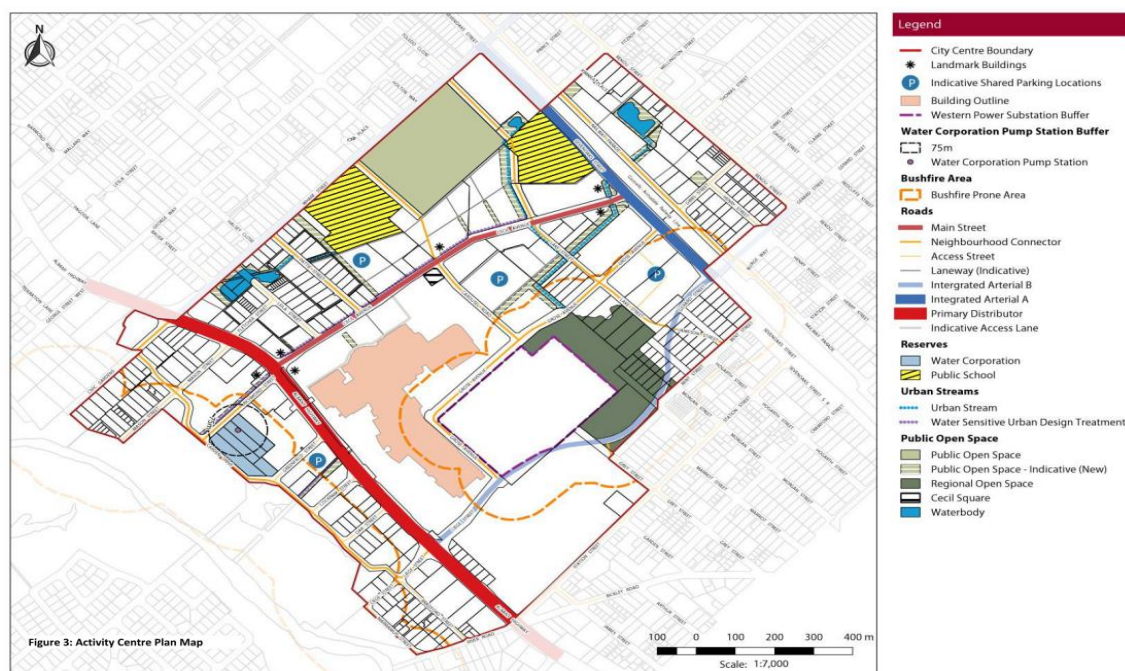


Figure 2-2 Study Area Development Plot Ratios (Image Source: Figure 3, Activity Centre Plan Area - CCC Activity Plan (Draft) May 2016)

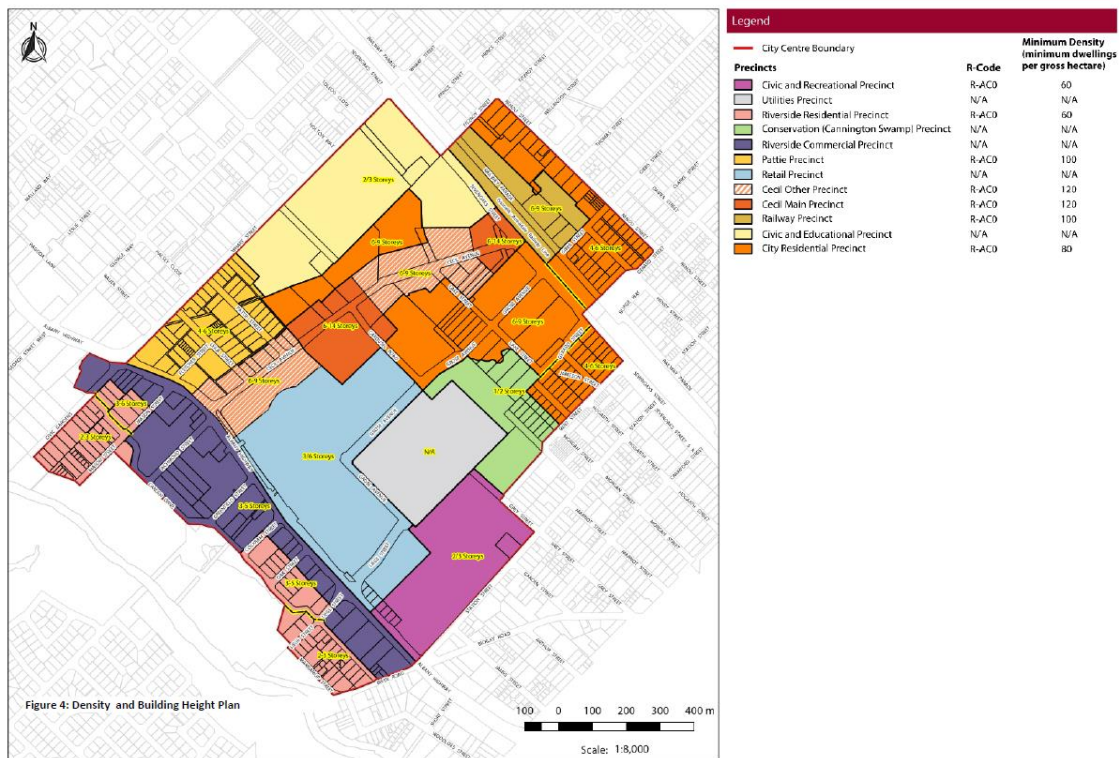


Figure 2-3 Density and Height Building plan (Image Source: Figure 4, Activity Centre Plan Area - CCC Activity Plan (Draft) May 2016)

2.2 Proposed Development Precincts

2.2.1 Cecil Avenue Main Precinct

The precinct will consist predominately of residential buildings, car parks, office/commercial, mixed developments, retirement village and commercial use developments. This diversity of activity will rebalance the centre as it evolves into a mature city centre.

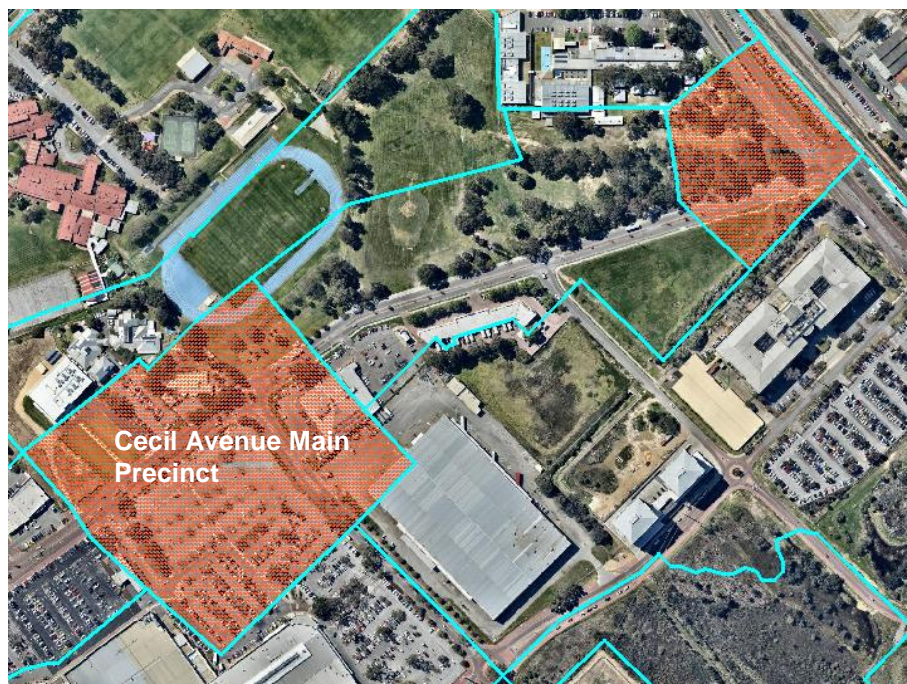


Figure 2-4 Cecil Avenue Main Precinct Aerial (Image source: www.nearmap.com 07/11/2016)

Under the CCC Activity Plan, the Cecil Avenue Main will be re-zoned with a high-density code that allows for a variety of residential development within activity centres. Table 2-1 shows the proposed changes to zoning, plot ratios and minimum/maximum story height in the Cecil Avenue Main Precinct.

Table 2-1 **Cecil Avenue Main Precinct Zoning**

Cecil Avenue Main Precinct				
Current Planning Scheme ¹ (Zoning)	Area (ha)	Proposed Structure Plan (Zoning)	Proposed Structure Plan (Minimum Plot Ratio)	Proposed Structure Plan (Minimum/Maximum Stories)
City Centre	7.98	R-AC0	2:1	6/14 stories

2.2.2 Cecil Avenue Other Precinct

The precinct will consist predominately of residential buildings, car parks, office/commercial, mixed developments, retirement village and occasional use developments. Cecil Avenue (other) is currently comprised of commercial lots. Refer aerial close-up below in Figure 2-5.

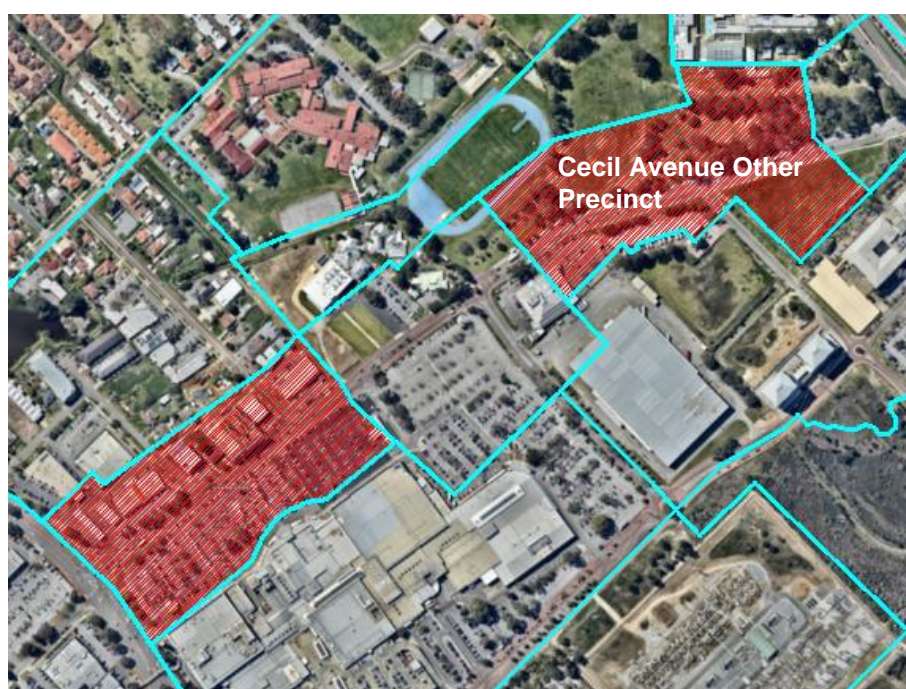


Figure 2-5 **Cecil Avenue Other Precinct Aerial** (Image source: www.nearmap.com 07/11/2016)

Under the CCC Activity Plan, the Cecil Street Other will be re-zoned with a high-density code that allows for a variety of residential development within activity centers.

Table 2-2 shows the proposed changes to zoning, plot ratios and minimum/maximum story height in the Cecil Avenue Other.

Table 2-2 **Cecil Avenue Other Precinct Zoning**

Cecil Avenue Other Precinct				
Current Planning Scheme ¹ (Zoning)	Area (ha)	Proposed Structure Plan (Zoning)	Proposed Structure Plan (Minimum Plot Ratio)	Proposed Structure Plan (Minimum/Maximum Stories)
City Centre	12.8	R-AC0	2:1	6/9 stories

¹ Town Planning Scheme 40

2.2.3 Pattie Precinct

Pattie Street Precinct will be mixed use with ground and upper floor retail, office or residential uses. Ground floor activation will be required and landscaped frontages incorporated into the design of the buildings to add to the amenity and character of the Precinct.

Pattie Street Precinct is currently comprised of commercial and residential lots. Refer aerial close-up below in Figure 2-6.

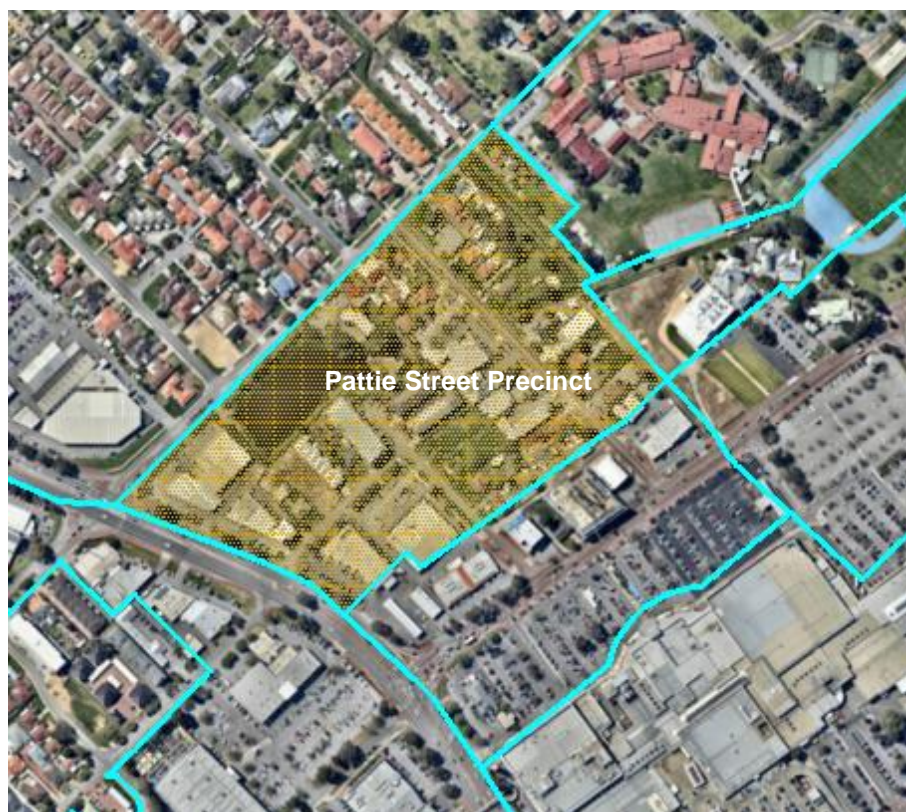


Figure 2-6 *Pattie Precinct Aerial (Image source: www.nearmap.com 07/11/2016)*

Under the CCC Activity Plan the Pattie Precinct will be re-zoned as R-AC0 which is a high residential density code that allows for a variety of residential development within activity centers.

Table 2-3 shows the proposed changes to zoning, plot ratios and minimum/maximum story height in the Pattie Precinct Development Area.

Table 2-3 *Pattie Precinct Zoning*

Current Planning Scheme ² (Zoning)	Area (ha)	Pattie Precinct		
		Proposed Structure Plan (Zoning)	Proposed Structure Plan (Minimum Plot Ratio)	Proposed Structure Plan (Minimum/Maximum Stories)
City Centre	10.80	R-AC0	1:1	4/6 stories

² Town Planning Scheme 40

2.2.4 Retail Precinct

The Retail Precinct will be characterised by the large format buildings of Carousel Shopping Centre and associated parking structures. Refer Figure 2-7 below for an aerial image.



Figure 2-7 Retail Precinct Aerial (Image source: www.nearmap.com 07/11/2016)

The Retail Precinct has a commercial land use with the focus of commercial activity being the Carousel Shopping Centre, which is owned by Westfield. Apart from the Carousel Shopping Centre, a large portion of the site is devoted to associated car parks. Furthermore, Bunnings have constructed a new 6.8ha (approx.) development within the retail precinct. Under the CCC Activity Plan, the Retail Precinct will not be rezoned. Table 2.4 shows the proposed changes to zoning, plot ratios and minimum/maximum story height in the Retail Precinct.

Table 2-4 Retail Precinct Zoning

Current Planning Scheme ³ (Zoning)	Area (ha)	Retail Precinct		
		Proposed Structure Plan (Zoning)	Proposed Structure Plan (Minimum Plot Ratio)	Proposed Structure Plan (Minimum/Maximum Stories)
City Centre	26.88	-	1:1	3/6 stories

³ Town Planning Scheme 40

2.2.5 **Railway Precinct**

The Railway Precinct is currently comprised of residential, public and mixed business land uses. Refer Figure 2-8 below for an aerial close-up.

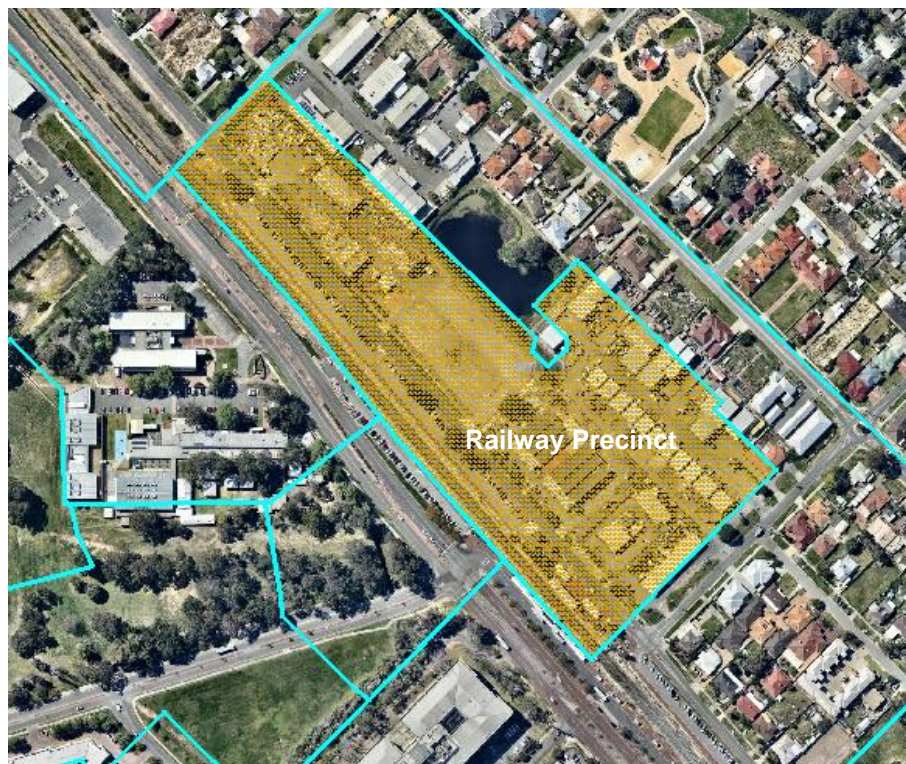


Figure 2-8 Railway Precinct Aerial (Image source: www.nearmap.com 07/11/2016)

Under the CCC Activity Plan the Railway Precinct will be re-zoned as R-AC0 (Residential Activity Centre) which is a high density code that allows for a variety of residential development within activity centers.

Table 2-5 shows the proposed changes to zoning, plot ratios and minimum/maximum story height in the Retail precinct.

Table 2-5 Railway Precinct Zoning

Railway Precinct				
Current Planning Scheme ⁴ (Zoning)	Area (ha)	Proposed Structure Plan (Zoning)	Proposed Structure Plan (Minimum Plot Ratio)	Proposed Structure Plan (Minimum/Maximum Stories)
City Centre	7.26	R-AC0	1:1	6/9 stories

⁴ Town Planning Scheme 40

2.2.6 City Residential Precinct

The City Residential precinct currently comprises of residential, civic buildings, recreational land use associated with a school and vacant lots. A small area is designated Public Open Space. Refer aerial close-up below in Figure 2-9.



Figure 2-9 City Residential Precinct Aerial (Image source: www.nearmap.com 07/11/2016)

Under the CCC Structure Plan the City Residential Precinct will be re-zoned as R-AC0 which is a high residential density code that allows for a variety of residential development within activity centres.

Table 2-6 shows the proposed changes to zoning, plot ratios and minimum/maximum story height in the City Residential Precinct.

Table 2-6 City Residential Precinct Zoning

Current Planning Scheme ⁵ (Zoning)	Area (ha)	City Residential		
		Proposed Structure Plan (Zoning)	Proposed Structure Plan (Minimum Plot Ratio)	Proposed Structure Plan (Minimum/Maximum Stories)
City Centre	38.17	R-AC0	1:1	4/9 stories

⁵ Town Planning Scheme 40

2.2.7 **Riverside Commercial Precinct**

The Riverside Commercial Precinct currently comprises of bulky goods and commercial land use. Refer Figure 2-10 below for an aerial image.

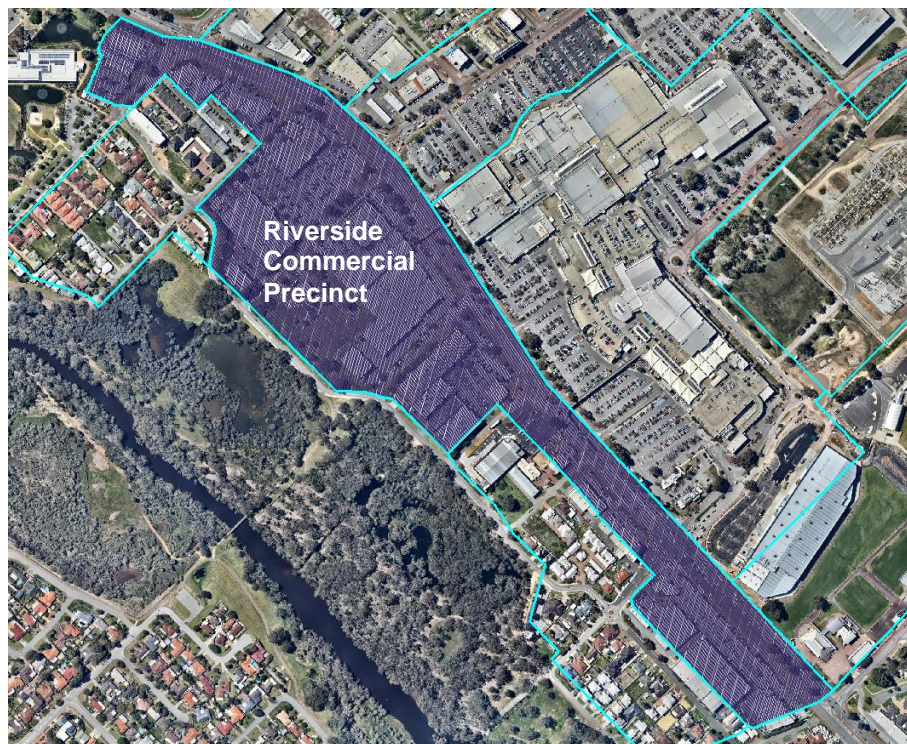


Figure 2-10 Riverside Commercial Precinct Aerial (Image source: www.nearmap.com 07/11/2016)

Under the CCC Structure Plan, the Riverside Commercial Precinct will not be rezoned. Table 2-7 shows the proposed changes to plot ratios and minimum/maximum story height in the Riverside Commercial Precinct.

Table 2-7 Riverside Commercial Precinct Zoning

Riverside Commercial Precinct				
Current Planning Scheme ⁶ (Zoning)	Area (ha)	Proposed Structure Plan (Zoning)	Proposed Structure Plan (Minimum Plot Ratio)	Proposed Structure Plan (Minimum/Maximum Stories)
City Centre	22.69	-	1:1	3/6 stories

⁶ Town Planning Scheme 40

2.2.8 Riverside Residential Precinct

The Riverside Residential Precinct currently comprises of bulky goods and light residential development. Refer Figure 2-11 below for an aerial image.

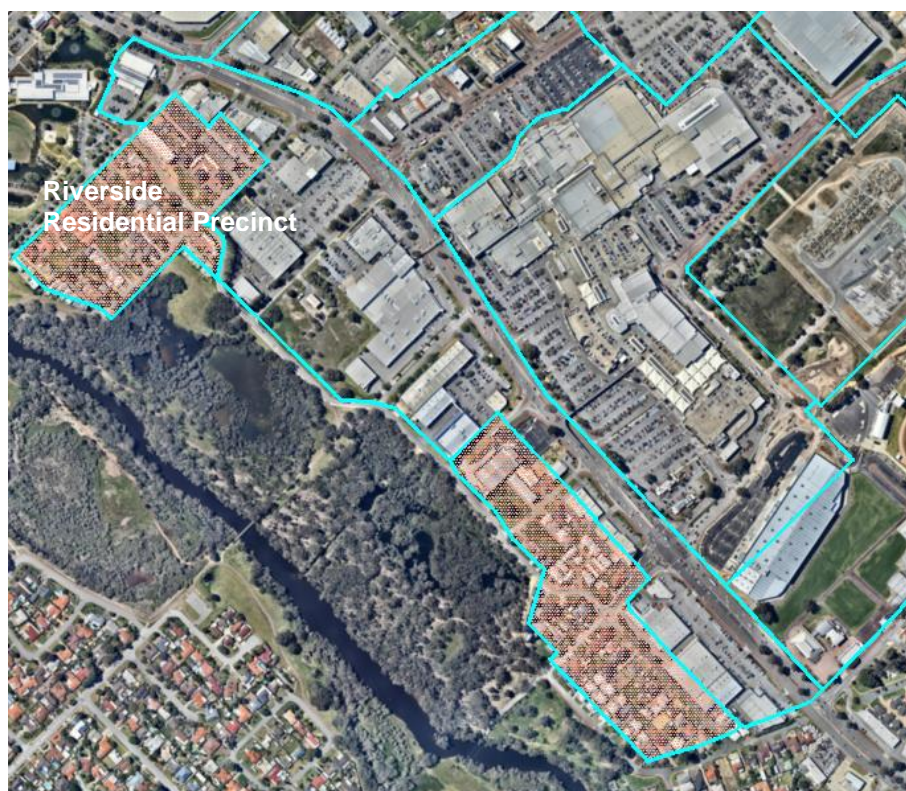


Figure 2-11 Riverside Residential Precinct Aerial (Image source: www.nearmap.com 07/11/2016)

Under the CCC Structure Plan, the Riverside Residential Precinct will be re-zoned as a high residential density code that allows for a variety of residential development within activity centres. Table 2-8 shows the proposed changes to zoning, plot ratios and minimum/maximum story height in the Riverside Residential Precinct.

Table 2-8 Riverside Residential Precinct Zoning

Riverside Residential Precinct				
Current Planning Scheme ⁷ (Zoning)	Area (ha)	Proposed Structure Plan (Zoning)	Proposed Structure Plan (Minimum Plot Ratio)	Proposed Structure Plan (Minimum/Maximum stories)
City Centre	13.98	R-AC0	0:6:1	2/6 stories

⁷ Town Planning Scheme 40

2.2.9 **Conservation Precinct**

The Conservation Precinct contains a Threatened Ecological Community as identified by the Department of Environment and Conservation. The area is mapped as a Conservation Category Wetland. Refer to Figure 2-12 below for an aerial image.



Figure 2-12 Conservation Precinct Aerial (Image source: www.nearmap.com 07/11/2016)

Under the CCC Activity Plan the Conservation Precinct will not be re-zoned. Table 2-9 shows the proposed minimum/maximum story height in the Conservation Precinct.

Table 2-9 Conservation Precinct Zoning

Current Planning Scheme ⁸ (Zoning)	Area (ha)	Conservation Precinct		
		Proposed Structure Plan (Zoning)	Proposed Structure Plan (Minimum Plot Ratio)	Proposed Structure Plan (Minimum/Maximum stories)
City Centre Deferred	8.20	-	-	1/2 stories

⁸ Town Planning Scheme 40

2.2.10 **Civic and Educational Precinct**

The Civic and Educational Precinct comprises of residential land, civic land use and recreational use associated with Coker Park. The area also comprises of two colleges and the Canning Leisure Centre. Refer Figure 2-13 below for an aerial close-up.



Figure 2-13 Civic and Educational Precinct Aerial (Image source: www.nearmap.com 07/11/2016)

Under the CCC Activity Plan the Civic and Educational Precinct will be re-zoned as R-AC0 which is a high residential density code that allows for a variety of residential development within activity centers. Table 2-10 shows the proposed changes to zoning, plot ratios and minimum/maximum story height in the Civic and Educational Precinct.

Table 2-10 Civic and Educational Precinct Zoning

Civic and Educational Precinct				
Current Planning Scheme ⁹ (Zoning)	Area (ha)	Proposed Structure Plan (Zoning)	Proposed Structure Plan (Minimum Plot Ratio)	Proposed Structure Plan (Minimum/Maximum stories)
City Centre	21.30	R-AC0	-	2/3 stories

⁹ Town Planning Scheme 40

2.2.11 **Civic and Recreational Precinct**

The Civic and Recreational Precinct comprises primarily of the Greyhounds WA Cannington site. Refer Figure 2-14 below for an aerial close-up.



Figure 2-14 Civic and Recreational Precinct Aerial (Image source: www.nearmap.com 07/11/2016)

Under the CCC Activity Plan the Civic and Recreational Precinct is to be re-zoned as R-AC0 that will be developed into commercial, educational and public uses. Table 2-11 shows the proposed changes to zoning, plot ratios and minimum/maximum stories in the Civic and Recreational Precinct.

Table 2-11 Civic and Educational Precinct Zoning

Civic and Recreational Precinct				
Current Planning Scheme ¹⁰ (Zoning)	Area (ha)	Proposed Structure Plan (Zoning)	Proposed Structure Plan (Minimum Plot Ratio)	Proposed Structure Plan (Minimum/Maximum stories)
City Centre	21.30	R-AC0	0:6:1	2/3 stories

¹⁰ Town Planning Scheme 40

2.2.12 Utilities Precinct

The Utilities Development Area is currently comprised of the Cannington Terminal substation owned by Western Power. Refer Figure 2-15 below for an aerial image.

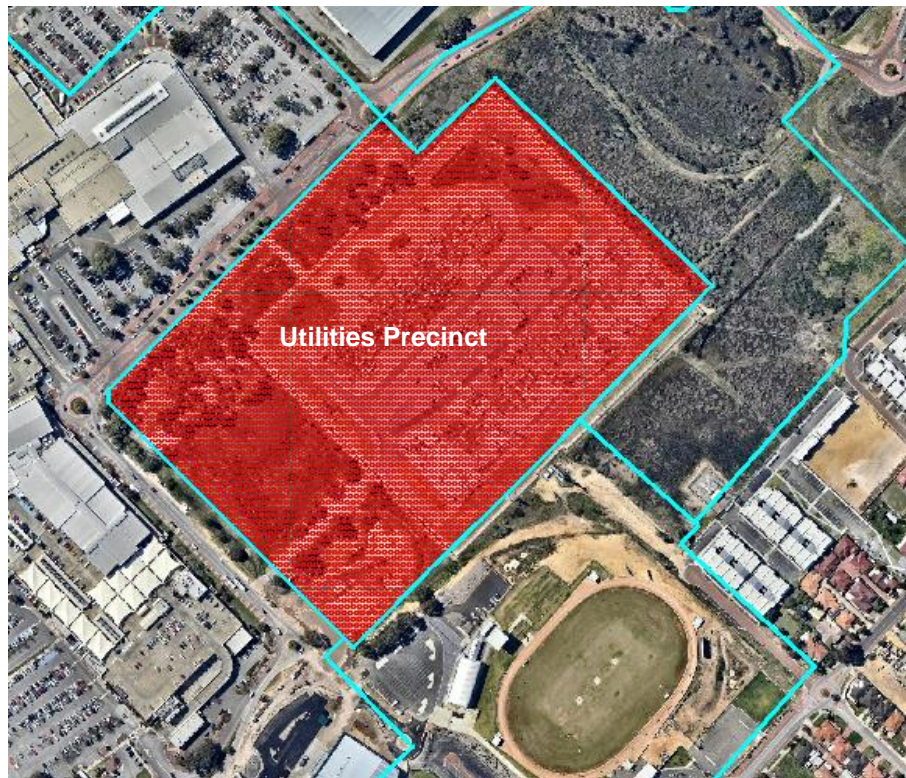


Figure 2-15 Utilities Precinct Aerial (Image source: www.nearmap.com 07/11/2016)

Under the CCC Structure Plan the Cannington Terminal will remain as a Western Power substation.

Table 2-12 Utilities Precinct Zoning

Western Power Substation Development Area				
Current Planning Scheme ¹¹ (Zoning)	Area (ha)	Proposed Structure Plan (Zoning)	Proposed Structure Plan (Minimum Plot Ratio)	Proposed Structure Plan (Minimum/Maximum Stories)
City Centre Deferred	11.86	-	-	-

¹¹ Town Planning Scheme 40

3 Services

3.1 Wastewater

The Water Corporation of Western Australia is the state authority regulating the distribution, storage and disposal infrastructure for wastewater in the area.

3.1.1 Current Infrastructure

Refer drawings in Appendix A for existing sewer infrastructure.

3.1.1.1 ***Cecil Avenue Main Precinct***

The Cecil Avenue Main Precinct is split into two main areas, Cecil South and Cecil North. Cecil North's wastewater flows initially to the Lake Street PS6 before being re-directed to the 1800mm arterial line running north to south through the city centre to the Richmond Street PS3. Cecil South flows directly to the Richmond Street PS3 via a series of 150mm property connections linking to a 1050mm main trunk.

3.1.1.2 ***Cecil Avenue Other Precinct***

Cecil Avenue Other Precinct is well serviced by wastewater infrastructure. The north portion of the precinct's wastewater flows directly to the Lake Street PS6 initially and then pumped to a discharge chamber at the intersection of Pattie Street and Cecil Avenue. The discharge chamber flows to the Richmond Street PS3. The southern portion of the precinct is serviced by a collection of 150mm and 225mm sewer lines that generally flow south to the Richmond Street PS3.

3.1.1.3 ***Railway Precinct***

The Railway Precinct's wastewater infrastructure generally flows east to west via a 150mm/225mm main line running along Renou Street. This line links into the 1800mm arterial line running north to south through the city centre to the Richmond Street PS3. The surrounding streets in the precinct are serviced by a series of 150mm lines running to each property.

3.1.1.4 ***City Residential Precinct***

The City Residential Precinct is well serviced by wastewater infrastructure. The internal area of the precinct is serviced by an internal private pumping station that is then pumped to a discharge chamber at the intersection of Pattie Street and Cecil Av. The discharge chamber flows to the Richmond Street PS3.

The northern parts of the precinct generally flow from east to west via a 150mm/225mm main line running along Renou Street. This line links into the 1800mm arterial line running north to south through the city centre to the Richmond Street PS3.

3.1.1.5 ***Pattie Precinct***

The wastewater for the area generally flows from east to west through a series of 150mm and 225mm gravity sewer pipes that link into the main arterial 1050mm line along Fleming Avenue and finally to the Richmond Street PS3.

3.1.1.6 ***Retail Precinct.***

The Retail Precinct which encompasses the Westfield Carousel Shopping Centre is immediately serviced via the private pumping station #12678 located at the west end of Carousel road and Private pumping station #12707 located at the east end of Carousel road. Both pumping stations discharge to a chamber at the intersection of Pattie Street and Cecil Av. The discharge chamber flows to the Richmond Street PS3.

3.1.1.7 ***Riverside Residential Precinct***

Riverside residential is split into two main wastewater areas, Riverside Residential East and Riverside Residential West. Both areas sit either side of the Richmond Street PS3. Sewer from the east area flows west to Richmond St PS3 and conversely sewer from the west area of the precinct flows east to the Richmond

Street PS3. The properties and adjoining streets within both areas are serviced through a network of 150mm lines feeding an 1800mm arterial main line that links the areas to Richmond Street PS3.

3.1.1.8 **Riverside Commercial Precinct**

Riverside Commercial is split into two main wastewater areas, Riverside Commercial East and Riverside Commercial West. Both areas sit either side of the Richmond Street PS3. Sewer from the east area flows west to Richmond St PS3 and conversely sewer from the west area of the precinct flows east to the PS3. The properties and adjoining streets within both areas are serviced through a network of 150mm lines feeding an 1800mm arterial main line that links the areas to Richmond Street PS3.

3.1.1.9 **Civic and Educational Precinct**

The majority of the Civic and Educational Precinct wastewater flows via a 150mm main line to the south network at Pattie Street that links into the main arterial 1050mm line along Fleming Avenue and finally to the Lake Street PS6. The Sevenoaks School is locally serviced via a private pumping station #11406. The PS discharges to a line running along Renou Street linking into the 1800mm arterial line running north to south through the city centre to the Richmond Street PS3. The surrounding streets in the precinct are serviced by a series of 150mm lines running to each property.

3.1.1.10 **Utilities Precinct**

This precinct has little wastewater infrastructure. Any sewer requirements for the area is directed to the 1800mm arterial line running north to south through the city centre to the Richmond Street.

3.1.1.11 **Conservation Precinct**

The Conservation Precinct generally flows from east to west via a 150mm/225mm main line running along Lake Street and linking into the 1800mm arterial line running north to south through the city centre to the Richmond Street PS3.

3.1.2 **Future Demand**

The following table outlines the anticipated wastewater additional flow for the proposed development in the Cannington City Centre precincts. It can be seen the total additional flow for the development is approximately 68 L/s.

Table 3-1 **Wastewater for Activity Centre Plan (Draft) May 2016**

Precinct	Area (ha)	Proposed Density	Proposed Development Dwellings	Pre-development Flow (L/s)	Post development Flow (L/s)	Additional Flow (L/s)	Stage 1 Pumping Station
Cecil Avenue Main	7.98	120	958	1.7	8.3	6.6	Richmond St
City Residential	38.17	80	3054	9.7	33.4	23.7	Lake St / Carousel Private PS 1 and 2
Pattie Street	10.80	100	1080	2.3	11.2	8.9	Richmond St
Cecil Avenue Other	12.80	120	1536	2.7	13.3	10.6	Lake St / Richmond St
Retail	26.88	N/A	N/A	5.6	5.6	0.0	Carousel Private PS 1 and 2
Riverside Residential	13.98	60	839	2.9	9.2	6.3	Richmond St
Riverside Commercial	22.69	N/A	N/A	4.8	4.8	0.0	Richmond St
Civic and Educational	21.30	N/A	N/A	4.5	4.5	0.0	Lake St / Sevenoaks

Precinct	Area (ha)	Proposed Density	Proposed Development Dwellings	Pre-development Flow (L/s)	Post development Flow (L/s)	Additional Flow (L/s)	Stage 1 Pumping Station
							St Private PS
Railway	7.26	100	726	1.5	7.5	6.0	Richmond St
Civic and Recreational	14.12	60	847.2	3.0	9.3	6.3	Richmond St
Utilities	11.86	N/A	N/A	0.0	0.0	0.0	Richmond St
Conservation	8.20	N/A	N/A	0.0	0.0	0.0	Richmond St
Sub-Total				39	107	68	

3.1.3 Service Capacity

It should be noted the entire Canning City Centre's wastewater ends up at the Richmond Street PS3. The additional 68 L/s is to be compared to the current and long-term capacities of the pumping station. As per the table below it can be seen that the Richmond Street PS 3 is adequately sized for the proposed development precincts however, it is likely Lake Street PS 6 will have a shortfall and need upgrading.

Table 3-2 **Sewer Capacity of Activity Centre Servicing Pumping Stations**

Pumping Station	Additional Flow (L/s)	P.S Current Design Sewer Flow (L/s)	Long Term P.S. Capacity (L/s)	Future Capacity / [Shortfall] (L/s)
Richmond Street PS3	68	1182	3231	1981
Lake Street PS6	21	6	8	[19]

3.1.4 Required Infrastructure

The Water Corporation provided initial advice to Cardno. In their advice, they offered the following key points:

- Redevelopment works may be subjected to headwork's charges on works within the precincts.
- Minor reticulation works, typically pipework less than 300mm diameter, are to be funded by the developer.
- Water Corporation will upgrade the headwork's, pipe equal to or greater than 300mm diameter and pump stations, as and when required.
- Wastewater reticulation planning will be done after Structure Plan and rezoning is confirmed.

Cardno engaged the Water Corporation again in November 2016 to request more current investigations, they offered the following points:

- Further investigations are recommended to check if private pump station #1406 at the Sevenoaks Senior College is still operational.
- It is likely that the Lake Street Pumping Station 6 may exceed capacity due to the re-development.
- The Private Pump Station along Carousel Road will require grading out to gravity sewer to cater for the re-development.
- The Lake Street Pumping Station will be overloaded due to the re-development and will require upgrading.
- Incorrect Pump Station Data was previously supplied by the Water Corporation, the Richmond Street. Pumping Station 3 capacity is 520L/s according to October 2015 Data.

The Lake Street PS6 provides a level of service to the following precincts:

- City Residential;
- Cecil Avenue (other); and
- Civic and Educational.

As highlighted in previous section the Lake Street Pumping Station 6 has a shortfall of 19 litres per second in the case of the full planned development. This will require the upgrade of the pumping station to a type 40. A type 40 pumping station consists of two pump-sets located in a common wet-well constructed from 225mm internal diameter precast concrete pipes.

The DN100 pressure main that discharges to a gravity sewer on Bent Street will require a dedicated easement through the development area or be re-aligned.

The two private pumping stations servicing lots 104 and 102 will need to be phased out and replaced with pump stations under Water Corporation asset management and control. The flow will need to be routed to the proposed type 40 pumping station servicing the catchment area. The location of the type 40 pumping station is yet to be determined but the final location will require the secession of a reserve for its placement adjacent to a road reserve which will be in a suitable position to service all contributing lots.

It is proposed to discharge from the pump station to an 1800 millimetre diameter RCP on Liege Street.

No major infrastructure upgrades besides the above pump upgrade are envisaged to be required to convey the wastewater to the Canning Main PS 3 from the precincts. Although minor works may be required in altering the sewer reticulation network to service new precinct areas as development takes place.

3.2 Water

Water Corporation Western Australia is the state authority regulating the distribution infrastructure for water reticulation in the area. Assessing Water Corporation's GIS planning layer reveals that there are no planned or scheduled works for water service infrastructure within the Canning City Centre area.

3.2.1 Current Infrastructure

Refer drawings in Appendix A for existing water infrastructure.

3.2.1.1 *Cecil Avenue Main Precinct*

The 1062mm steel Canning Main trunk running along Sevenoaks Street currently services the Cecil Avenue Main Precinct. Branching off the main is a 205mm water service pipe running along the east side of Cecil Avenue and locally servicing the properties and areas fronting Cecil Avenue. Servicing the west side of Cecil Avenue is a 100mm water main coming off Albany Highway.

3.2.1.2 *Cecil Avenue Other Precinct*

The 1062mm steel Canning Main trunk running along Sevenoaks Street currently services the Cecil Avenue Other Precinct. Branching off the main is a 205mm water service pipe running along the east side of Cecil Avenue and locally servicing the properties and areas fronting Cecil Avenue. Servicing the west side of Cecil Avenue is a 100mm water main coming off Albany Highway.

3.2.1.3 *Railway Precinct*

The 1062mm steel Canning Main trunk running along Sevenoaks Street currently services the Railway precinct. Branching off the main is a 150mm water service heading down Gibbs Street and servicing the local area. Two fire services come off the local service, one service off Gibbs Street and one off Sevenoaks Street to provide service to the railway station.

3.2.1.4 *City Residential Precinct*

The 1062mm steel Canning Main trunk running along Sevenoaks Street currently services the City Residential precinct. The north side of the City Residential area is service via a 150mm water service branching off the

Canning Main and heading down Gibbs Street to service the local area. The south side of the prescient is serviced via a 150mm water line branching off the 200mm Cecil Avenue east side main.

3.2.1.5 **Pattie Precinct**

A 100mm water service runs along the north side of Pattie Street linking from the Cecil Avenue's 100mm to the 125m water service on Wharf Street. The adjacent and surrounding lots on Pattie Street are serviced via this water line.

3.2.1.6 **Retail Precinct**

The Retail Precinct area is serviced off a 100mm water line running along Grose Street that branches off the 150mm main running along the north side of Albany Highway.

3.2.1.7 **Riverside Residential Precinct**

Water to the eastern part of Riverside Residential Precinct is supplied via two 100mm services; one running along Carden Drive and one along Mason Street. These water lines service the surrounding and fronting lots. A 100mm line off the Albany Highway 600mm main runs down Liege Street and provides service to the east side of the Riverside Residential area.

3.2.1.8 **Riverside Commercial Precinct**

The 600mm Albany Highway main runs along the south side of Albany Highway and provides multiple water 100/150mm water services and fire services to the Riverside Commercial district.

3.2.1.9 **Civic and Educational Precinct**

The 1062mm steel Canning Main trunk running along Sevenoaks Street currently services the Civic and Educational area precinct. Branching off the main is a 100mm that runs south along Wharf Street and locally services the Civic and Educational area.

3.2.1.10 **Utilities Precinct**

A 100mm fire service branches off the 100mm water line running along Grose Avenue to provide service to the Utilities Prescient.

3.2.1.11 **Conservation Precinct**

A 100mm fire service and a 100mm domestic service (DOMS) branch off the 100mm water line running along Station Street at the James Street intersection to provide service to the Conservation Prescient.

3.2.2 **Future Demand**

Table 3-3 **Projected Probable Simultaneous Demand (Water)**

Precinct	Area (ha)	R Code	Proposed Density	Proposed Development Dwellings	Existing Flow (L/s)	Post development Flow (L/s)
Cecil Avenue Main	7.98	R-AC0	120	958	-	42.8
City Residential	38.17	R-AC0	80	3054	-	116.8
Pattie Street	10.80	R-AC0	100	1080	-	47.4
Cecil Avenue Other	12.80	R-AC0	120	1536	-	63.9
Retail	26.88	N/A	N/A	N/A	11.0	11.0
Riverside Residential	13.98	R-AC0	60	839	-	38.4
Riverside Commercial	22.69	N/A	N/A	N/A	9.3	9.3

Civic and Educational	21.30	N/A	N/A	N/A	8.7	8.7
Railway	7.26	R-AC0	100	726	-	34.1
Civic and Recreational	14.12	R-AC0	60	848	-	38.7
Utilities	11.86	N/A	N/A	N/A	4.8	4.8
Conservation	8.20	N/A	N/A	N/A	3.4	3.4
Sub-Total					-	419

The table above describes the projected simultaneous demand for the Canning City Centre. The total demand is calculated by estimating the potential total dwelling per precinct based on the R-codes and Table 3.2 – probable simultaneous demand for multiple dwellings from AS3500.1 - plumbing and drainage part 1.

3.2.3 Service Capacity

The Canning City Centre is located in the Supply Scheme area. It is difficult to ascertain exactly what capacity the current infrastructure network has without full water network modelling carried out by Water Corporation. However, Water Corporation does not foresee any issues with servicing the proposed scheme with potable water at the time of this report.

3.2.4 Required Infrastructure

Exact water infrastructure upgrades will be determined when Water Corporation carries out full water network modelling. Water Corporation has advised that water reticulation planning and modelling will be done after Structure Plan and rezoning is confirmed, effectively at development application phase. The Water Corporation provided initial advice to Cardno and in their advice; they offered the following key points.

- Water Corporation will upgrade the headwork's, pipe equal to or greater than 300mm diameter and pump stations, as and when required. However, headwork's charges will be charged to the developer. Minor reticulation works, typically pipework less than 300mm diameter, are to be funded directly by the developer.
- All temporary works associated with any development within the Canning City Centre is to be funded directly by the developer.
- Redevelopment areas within the Canning City Centre need to integrate water efficiency technology and design approaches into the area and buildings in line with Water Corporation's 'Water Forever 2009' document. This will require a local water management strategy that includes local scale water balancing and identifying water efficiency measures such as; rainwater reuse, appropriate fittings, irrigation smart systems, planting and soil types and drainage collection and reuse.
- Water Corporation advises that a Development Area Plan be commissioned to support development in the Canning City Centre and submitted to Water Corporation once the Structure Plan has been finalised. This should include a plan identifying the proposed development, densities and likely staging and timeframe. Accompanying this should be a water management strategy outlining how water efficiencies are to be met along with engineering plans detailing proposed works and estimates. The water efficiency targets are to be determined by the City of Canning in consultation with Water Corporation. Water Corporation runs a Waterwise Development Program that enables developments that have applied water efficient principles to be recognised and endorsed by Water Corporation.
- Water Corp recommends a consolidated approach to the requesting and programming of works to minimise disruptions and maximise cost efficiencies. Water Corporation recommends any reticulation reinforcement or new work should be managed by the City of Canning due to the fractured land ownership within the area. It is recommended that a working group between the City of Canning and Water Corporation is set up in order to help plan and coordinate precinct development and staging with any Water Corporation trunk infrastructure capital works.

- Identification of required infrastructure upgrades requires detailed water modelling and more specific demand inputs. Water reticulation planning will be done after Structure Plan and rezoning is confirmed.

3.3 Gas

Cardno consulted ATCO Gas to gain network infrastructure information in November 2016 for the Canning City Centre based on the anticipated demand increases provided in Table 1-1.

3.3.1 Current Infrastructure

Refer drawings in Appendix A for existing gas infrastructure.

3.3.1.1 *Cecil Avenue Main Precinct*

A 150mm Medium Pressure line runs along Sevenoaks Street. A 155mm line branches off Sevenoaks and runs down Grose Avenue to Lake Street to service Cecil Avenue and frontage/adjacent properties.

3.3.1.2 *Cecil Avenue Other Precinct*

150mm Medium Pressure line runs along Sevenoaks Street. A 155mm line branches off Sevenoaks and runs down Grose Avenue to Lake Street to service Cecil Avenue and frontage/adjacent properties.

3.3.1.3 *Railway Precinct*

An 80mm Medium/Low Pressure line runs along Railway Parade to service the north side of Railway parade and subsequently the Railway precinct.

3.3.1.4 *City Residential*

To service the north of City Residential precinct an 80mm Medium/Low Pressure line runs along Gibbs Street. To service the South part a 155mm line branches off Sevenoaks and runs down Grose Avenue.

3.3.1.5 *Pattie Precinct*

Pattie Street is serviced by an 80mm uPVC Medium Pressure gas line running from Albany Highway to Sevenoaks. This line services all properties fronting Pattie Street.

3.3.1.6 *Retail Precinct*

Grose Avenue is the main arterial supply for gas to the Precinct area, an 155mm uPVC Medium Pressure line runs through the area and provides service to the east side of the precinct.

3.3.1.7 *Riverside Residential Precinct*

Gas service to the eastern part of Riverside Residential Precinct is supplied an 80mm services running along down George Street West. A 50mm Medium Pressure line off the Albany highway 155mm main runs down Liege Street and provides service to the east side of the Riverside Residential area.

3.3.1.8 *Riverside Commercial Precinct*

Riverside Commercial Precinct is serviced off the Albany Highway 155mm Main Medium Pressure gas line. Multiple gas connections branch off the main and service the commercial properties to the south of Albany Highway.

3.3.1.9 *Civic and Educational Precinct*

An 80mm Medium/Low pressure line branches off Albany highway up Wharf Street to service the local area.

3.3.1.10 *Utilities Precinct*

Grose Avenue is the main arterial supply for gas to the Precinct area via a 155mm uPVC Medium Pressure, line. No gas connection currently services the utilities area.

3.3.1.11 Conservation Precinct

No gas connection currently services the conservation area.

3.3.2 Required Infrastructure

ATCO Gas confirmed on the 12th December 2016 that Cecil Avenue Main Precinct requires 260m mains extension. The reinforcement for the entire development is illustrated in Table 3-4 below.

Table 3-4 **Projected Gas Infrastructure Requirements**

Precinct	Area (ha)	Estimated Dwellings	Estimated gas load SCMH	supply	Headwork's	Reinforcement
Cecil Avenue (main)	7.98	958	325.72	MP	260m X 110PE, MP mains extension	MPR in Gerard St to MLP network
Cecil Avenue (other)	12.8	1536	522.24	MP		
Railway	7.26	726	246.84	MLP		
City Residential	38.17	3054	1038.36	MP, MLP		
Pattie Street	10.8	1080	367.2	MP		1.4km x 110PE, MP in Wharf ST& Albany HWY 60m x 63PE, MP mains ext. in Pattie ST 105m x 63PE, MP mains ext. in Leila ST
Retail	26.88	N/A	N/A			
Riverside Residential	13.98	839	285.26	MP		110m x 110PE, MP mains ext. across Nicholson Rd
Riverside Commercial	22.69	N/A	N/A			110m x 110PE, MP mains ext. across Nicholson Rd
Civic and Educational	21.3	1278	434.52	MP		1.4km x 110PE, MP in Wharf ST& Albany HWY 50m x 100ST main ext. (Railway crossing) and a HPR on Wharf St
Civic and Recreational	14.12	N/A	N/A			110m x 110PE, MP mains ext. in Bickley Rd and a HPR
Utilities	11.86	N/A	N/A			
Conservation	8.2	N/A	N/A			

3.4 Power

Western Power owns and operates all electrical supply network assets within the development area and therefore all new electrical supply equipment and cables will need to be installed in accordance with Western Power, WAER (West Australian Electrical Requirements), AS3000 specifications and standards.

3.4.1 Current Infrastructure

The existing power infrastructure surrounding the development site includes a 22kV network, fed from the Welshpool Zone Substation, approximately 2.6 km north/north east of the proposed development site.

Two feeders presently supply the Centre with a third coming close and feeding the East Cannington area to the north of the railway line.

The present loading of these three feeders is unknown. Therefore, it is not feasible to determine if there is any spare capacity. There are sections of HV & LV Underground Network in Cecil Ave. However, three HV feeders that feed in to this are mostly aerial lines back to Welshpool Substation. This will place load constraints on the available power that can be delivered to this precinct.

Refer drawings in Appendix A for existing power infrastructure.

3.4.2 Service Capacity

It is difficult to ascertain exactly what capacity the current infrastructure network without full power network modelling carried out by Western Power.

3.4.3 Required Infrastructure

3.4.3.1 **Cecil Avenue Main Precinct**

The land use for this precinct predominantly retail, commercial at ground level, and residential and/or office above.

Based on the current power network configuration and feeder loads, there is a possibility that the existing network could supply the estimated power demand of 1.59MVA without reinforcement, other than the probable Western Power requirement to underground the aerials in Cecil Avenue in front of the site. Subsequent stages of the development will likely trigger the requirement for an additional feeder.

A new 22 kV underground feeder would be required from the Welshpool substation that is 2.6km away at its shortest path. This new feeder would need to be interconnected to other feeders along the way to enable supply of backup power.

The Western Power desktop study in the JDSI report has noted that there are currently no spare circuit breakers in the Welshpool Zone Substation. A double cable termination could be required for this new feeder. Additional equipment may be required at the Welshpool Zone Substation to facilitate connection of the new dedicated feeder. This new feeder from Welshpool substation would be a 400mm² Al XLPE 22kV underground cable.

Table 3-5 **Cecil Avenue Main Precinct Probable Power Demand**

Area ha	Formula = 200Kva/HA	Total Demand kVA
7.98	200 * 7.98	1596

Maximum power requirement for the development has been calculated using a load value of 200 kVA/hectare. As stipulated in section 5.3.2.5 of Western Powers Underground Distribution Schemes Manual.

Based on proposed precinct boundaries and R-Codes it is proposed to develop 958 dwellings within the precinct.

3.4.3.2 **Cecil Avenue Other Precinct**

Cecil Avenue Other Precinct will enable a variety of ground floor uses to be accommodated with upper floor residential, commercial and office uses. This precinct allows for residential on the ground floor but is also flexible enough to accommodate activated uses as Cecil Avenue transitions to a main street. The precinct will allow for the development of up to 1536 dwellings that is based on proposed precinct boundaries and R-Codes.

Planned re-zoning enables developments to be constructed up to a maximum of 9 stories. Utilising existing precinct boundaries, the estimated power demand is 2.56MVA as shown in Table 3-5.

Table 3-6 **Cecil Avenue Other Precinct Probable Power Demand**

Area ha	Formula = 200Kva/HA	Total Demand kVA
12.80	200 * 12.80	2560

3.4.3.3 Pattie Precinct

Pattie Street Precinct will be mixed use with ground and upper floor retail, office or residential uses. The precinct will allow for the development of up to 1080 dwellings that is based on proposed precinct boundaries and R-Codes. Based on these values the probable load for the precinct is 2.16MVA as shown in table 3.6.

Table 3-7 **Pattie Precinct Probable Power Demand**

Area ha	Formula = 200Kva/HA	Total Demand kVA
10.80	200 * 10.80	2160

There are existing transformers in Pattie Street and Carousel Road. These transformers feed power to Pattie Street and to the Westfield Shopping Centre.

3.4.3.4 Retail Precinct

It is envisaged that the shopping centre will expand north towards Cecil Avenue. Future load increase is unknown. However, power would likely be supplied from the Westfield supply point in Cecil Avenue. Bunnings have recently developed in this area and they have an expectant loading of approximately 1MVA.

3.4.3.5 Railway Precinct

It will be a predominantly residential precinct with the intent of providing a range of housing, designed for people who choose to live in a lively urban environment close to amenity and transport. Buildings fronting Railway Parade will form a continuous 12m (4 storeys) high frontage with taller elements set back. The precinct will allow for the development of up to 726 dwellings that is based on proposed precinct boundaries and R-Codes. The existing power requirements for the areas is approximately 0.5MVA, the estimated load for the precinct is 1.45MVA as shown below in table 3.7.

Table 3-8 **Railway Precinct Probable Power Demand**

Area ha	Formula = 200Kva/HA	Total Demand kVA
7.26	200 * 7.26	1452

Therefore, one MVA of additional capacity will be required. This will need to be verified by Western Power once an application has been made to Western Power with the known load.

3.4.3.6 City Residential Precinct

This is a predominantly a residential precinct that will provide a range of housing designed for people who choose to live in a lively urban environment close to amenity and transport. This precinct is focussed on high density and high quality residential development. Ground floor uses may include residential, retail or office. However, this will be at the discretion of the landowner. The precinct will allow for the development of up to 3054 dwellings based on proposed precinct boundaries and R-Code.

The estimated load for the precinct is 7.63 MVA as shown below in table 3.8.

Table 3-9 **City Residential Precinct Probable Power Demand**

Area ha	Formula = 200Kva/HA	Total Demand kVA
38.17	200 * 38.17	7634

3.4.3.7 Riverside Commercial Precinct

This precinct will continue to function as a highway commercial environment with vehicle based trading and showroom type buildings. Office accommodation will be provided on upper floors of this precinct to take advantage of the access and public transport opportunities provided by Albany Highway. Over time, transitions from single-storey large format showroom type buildings to mixed-use multistorey development. All lots facing the Albany Highway already have underground power. Based on current precinct boundaries, the estimated load for the precinct is 4.53 MVA as shown below in table 3.9.

Table 3-10 **Riverside Commercial Precinct Probable Power Demand**

Area ha	Formula = 200Kva/HA	Total Demand kVA
22.69	200 * 22.69	4538

3.4.3.8 Riverside Residential Precinct

This precinct will be a predominantly residential development with variations to build form to ensure optimal, compatible and desirable development. Buildings will be of varying heights and step down toward the river parklands. The precinct will allow for the development of up to 839 dwellings that is based on proposed precinct boundaries and R-Code.

Based on current precinct boundaries, the estimated load for the precinct is 2.79 MVA as shown below in table 3.10.

Table 3-11 **Riverside Residential Precinct Probable Power Demand**

Area ha	Formula = 200Kva/HA	Total Demand kVA
13.98	200 * 13.98	2796

Based on current understanding of Western power infrastructure it is likely that an extra two MVA is required to service the area. Albany Highway frontages have underground high and low voltage power. Richmond St has aerial high voltage power whilst Mason St and Civic Gardens have a mixture of aerial and underground low voltage power. The Cannington Pump Station in Richmond Street has its own sole use transformer.

This advice is based on assumptions that will need to be verified by Western Power once an application has been made with the known load and the makeup of the load between residential and commercial.

3.4.3.9 Conservation Precinct

The precinct is to be retained as a conservation area and is not suitable for any additional uses. No significant power demand.

3.4.3.10 Civic and Educational Precinct

The precinct will predominantly consist of Civic, Community, Health, Recreation and Educational uses with the exception of a small parcel of land to the northeast of the precinct, which is considered suitable for mixed-use development. Most of this load is existing so no significant extra power requirement.

The estimated load for the precinct is 4.26 MVA as shown below in table 3.11.

Table 3-12 **Civic and Educational Precinct Probable Power Demand**

Area ha	Formula = 200Kva/HA	Total Demand kVA
21.30	200 * 21.30	4260

3.4.3.11 Civic and Recreational Precinct

The permitted uses for this precinct will be civic and recreational in nature with residential, office and commercial use supported at the discretion of Council. The final configuration of uses and their location, however, is subject to an approved Local Development Plan by the Local Authority. The precinct will allow for the development of up to 847 dwellings that is based on proposed precinct boundaries and R-Code.

The estimated load for the precinct is 2.82 MVA as shown below in table 3.12.

Table 3-13 **Civic and Recreational Precinct Probable Power Demand**

Area ha	Formula = 200Kva/HA	Total Demand kVA
14.12	200 * 14.12	2824

3.4.3.12 Utilities Precinct

Largely consists of the Western Power substation and this is not likely to change in the short to medium term. The transmission power lines emanating from the substation place considerable constraints on the middle of the Canning City Centre.

There are no distribution lines from this substation so no capacity available to supply any of the Canning City Centre developments. Western Power has no plans to install step down transformers at this stage. To underground all the existing 132kV – 66kV Transmission lines would be prohibitively expensive. This likely would need Federal Government Funding under a Scheme such as the Better Cities Programme.

3.5 Communications

3.5.1 Current Infrastructure

The Canning City Centre is well serviced by telecommunications infrastructure with optical fibre running in or adjacent to all precincts. This infrastructure is owned by various telecommunications providers including Telstra, Optus and others.

Refer to Appendix A for a detailed plan of the fibre optic cable locations.

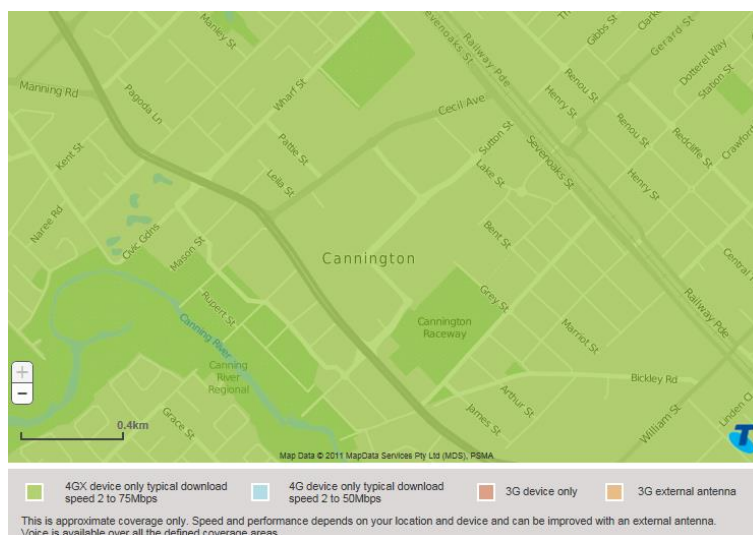


Figure 3-1 Telstra Mobile Network Coverage (Image source: www.telstra.com.au/coverage-networks/our-coverage accessed on 16th November 2016)

Mobile network coverage in the area is well serviced with 4G covering the entire Canning City Centre Area under the Telstra network; other network providers may vary.

The National Broadband Network (NBN) has service availability in the area. Should any road upgrade or re-alignment be carried out within the City Centre area, NBN Co. should be advised of the works being carried out.

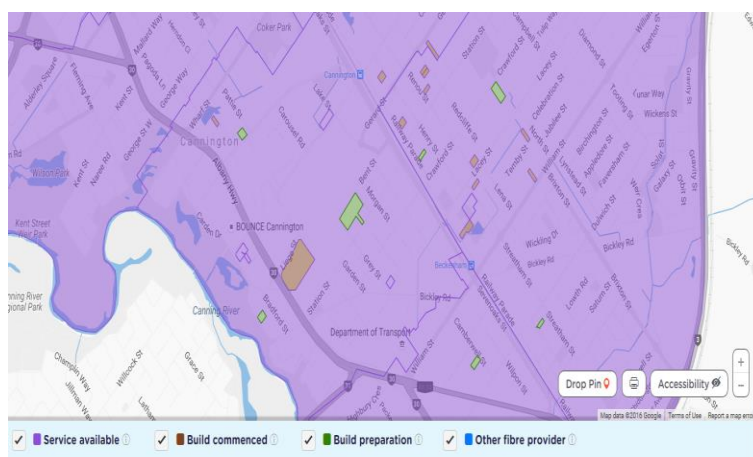


Figure 3-2 NBN Rollout Plan (Image source: www.nbnco.com.au/connect-home-or-business/check-your-address accessed on 16th November 2016)

3.5.2 Service Capacity

Advancement in fibre optic technology is currently outpacing service demand for data. For the near future, it is not likely that demand for data will exceed the current technological limitation of optical fibre. Current demand far exceeds the provision of fibre optic physical infrastructure; the NBN seeks to resolve this issue and is currently being implemented across the nation.

3.5.3 Future Demand

The Australian Bureau of Statistics (ABS) reports the average fixed-line end-user broadband usage has increased by 46 per cent in the past year. The figures show Australians' average broadband downloads grew from 36.0 GB per month in June 2013 to 51.7 GB per month in June 2014. This trend is likely to continue into the near future with no sign of the demand for data abating.

3.5.4 Required Infrastructure

3.5.4.1 Telstra

Should a developer wish to register a development with Telstra smart communities; this must be done twelve weeks prior to construction.

The infrastructure within a development will be installed by the developer. Telstra can be engaged to install infrastructure within a development at the developer's expense.

Telstra's commercial pit and pipe service will generally not be offered in developments where NBN Co has confirmed agreement to install NBN Co fibre within a development stage.

3.5.4.2 NBN

In line with the new Telecommunications Infrastructure in New Developments policy, NBN is required to recover part of the cost of deploying network infrastructure by applying a deployment contribution charge. These deployment charges only apply to developers and builders.

- A charge of \$400 per premises in multi dwelling units (MDUs).
- A charge of \$600 per premises within a single dwelling unit (SDU).

A backhaul contribution charge may also apply to the development, NBN will clarify this requirement when the developer submits his application.

4 Infrastructure Impact

The purpose of this section is to highlight possible means and methods the City of Canning can employ in order to reduce the impact of development on existing infrastructure. The aim of implementing these suggestions is to future-proof the Canning City Centre to provide a long-term cost savings to the City, ratepayers, consumers and local business. Listed below are a number of programs and ratings agencies that provide either complimentary or alternative methods of reducing development's impact on infrastructure, the environment, global warming and/or productivity.

The suggestions provided are an opinion only, based entirely on Cardno's own experience and research. No modelling has been undertaken to determine the economic impact of the enactment of these conditions on development.

4.1 NABERS

NABERS can be used to rate the environmental performance of an existing office building or tenancy, focussing on one or all of the following – energy, water, waste and indoor environment.

The City of Canning can assert a development condition that requires the attainment of a minimum star rating from NABERS. Rating go up to six stars for the performance of energy, water, waste and indoor environment.

Buildings need 12 months of energy or water use data in the form of utility bills to obtain rating, so new buildings will need to wait until they have been in operation for a full year before they can be rated.

4.2 Waterwise

4.2.1 Waterwise Offices

This program provides an alternative to the NABERS Water Rating and provides a guide to water efficiency benchmark for businesses. Key benefits are:

- WA performance indicators to measure water use against others in your industry
- Annual recognition by Water Corporation, Property Council of Australia and City of Perth as a leader in efficient water use
- Access to the Waterwise Business logo
- Potential for improved sustainability ratings and reduced operational costs through improved efficiency and water savings
- Access to tools, such as data loggers, resources and networks that support and enable improvements in water use
- Competitive edge when promoting your business as a sustainable place to work.

The City of Canning could implement a development condition on any commercial offices with a net lettable area greater than 5,000 m².

4.2.2 Waterwise Council

The City of Canning is in the process of attaining endorsement as a Waterwise council.

Becoming a Waterwise Council will provide the following benefits:

- A better understanding of council water use.
- Potential water and financial savings through improved efficiency.
- Free specialist Waterwise training courses for appropriate council staff.
- Access to Waterwise materials on water efficiency and conservation.
- Access to the Waterwise branding to promote the council as a sustainable water manager.

The City of Canning should endeavour to attain Waterwise endorsement to set a precedent for developers in enforcing Waterwise as a condition for development.

4.3 Green Star

Green Star is a certification attained for the performance of a building that meets specific sustainability criteria. The City of Canning can stipulate as a development condition the attainment of a green star rating in Design & As-Built, Interiors or Communities. This will ensure a green star performance rating of a minimum of 4 Stars.

4.3.1 Benefits

The economic benefit of attaining green star certification is spread from the developer all the way through to the community.

4.3.1.1 *Developer*

A development with Green Star certification sees higher returns on investment and attracts more tenants. The [Building Better Returns](#) report (2011) found that Green Star-rated buildings deliver a 12% 'green premium' in value and a 5% premium in rent, when compared to non-rated buildings.¹²

4.3.1.2 *Council*

[The Value of Green Star: A decade of environmental benefits](#) (2013) finds that Green Star buildings use 66% less electricity and 51% less water than the average Australian building. Because Green Star buildings deliver higher levels of energy and water efficiency, they are cheaper to operate.¹³

4.3.1.3 *Business and Labour*

[The University of San Diego's Burnham-Moores Centre for Real Estate \(2009\)](#) has found that green buildings reduce sick leave by 45%, and absenteeism dropping by almost three days per worker per year.¹⁴

4.4 Transport

4.4.1 Bike Sharing System

The Canning City Centre could benefit by introducing a bike share program that has seen great success in Melbourne and overseas. It would prove to be a landmark move by the City of Canning by being the first urban centre in Western Australia to introduce the program. A Bike Share Station will be beneficial to three-quarters of the target demographic as outlined in section 2.1.14 of the Canning City Centre Structure Plan. A bike share system could be implemented in conjunction with Curtin University. Stations in Canning City Centre and Curtin University would have a travel time of only 15 mins that is well within the cycling catchment for an all-day activity. The following benefits will result from the introduction of a bike share program:

4.4.1.1 *User cost savings*

Studies on previous bike share programs have shown a net saving to users that result in an increase in savings or disposable income for the users. This disposable income is most likely to be spent in the local economy.

4.4.1.2 *Increased access*

Increased access to the proposed jobs that the City of Canning Structure Plan seeks to create. This will attract the target demographic and increase the catchment for bicycle commuting.

¹² http://www.api.org.au/assets/media_library/000/000/219/original.pdf?1315793106

¹³

https://www.gbca.org.au/uploads/194/34754/The_Value_of_Green_Star_A_Decade_of_Environmental_Benefits.pdf

¹⁴ <https://www.gbca.org.au/green-star/why-use-green-star/work-in-a-green-building/35604.htm>

4.4.1.3 Congestion reduction

In general, bike share members borrow bikes as a replacement for walking or taking public transportation. A bike share program will also take cars off the roads that will increase the life and condition of the already strained road network.

4.4.1.4 Emissions reduction

Depending on the number of kilometres travelled by users, a reduction in CO2 emission is likely.

4.4.1.5 Improved public health

Health benefits are a large side effect of city bike share programs.

4.4.2 Electric Vehicles (EVs)

The City of Canning should encourage to use and ownership of electric motor vehicles by introducing EV charge points.

4.4.2.1 Electric Vehicle Charge Points

Figure 4-1 below the current location of existing EV charge points in the Perth metropolitan area. The figure highlights the lack of an EV charge point in the Canning City Centre.

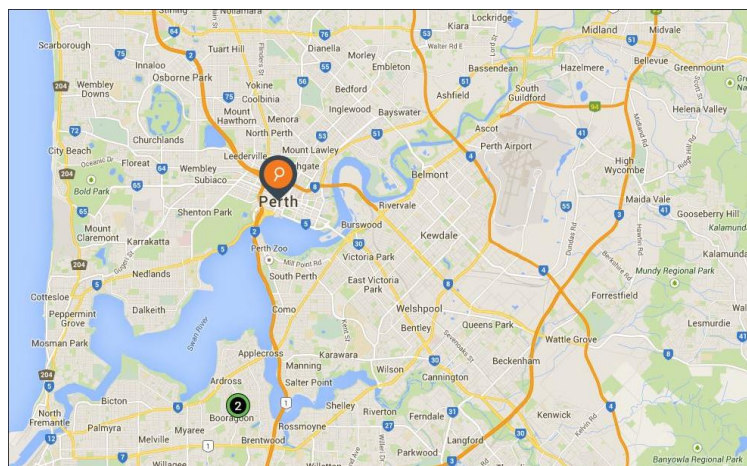


Figure 4-1 Charge point Locations (Image source: www.chargepoint.net.au/charge_point accessed on 22nd April 2015)

4.4.2.2 Benefits

4.4.2.2.1 Increased Productivity

EVs recharge while the owner/user works or rests. This improves productivity as it frees the user from expending time and energy at the pump.

4.4.2.2.2 Reduced Air Pollutants

EVs release almost zero air pollutants when they are driven providing a cleaner and more enjoyable environment.

4.4.2.2.3 Reduced Noise Pollution

EVs make no noise when stationary and low levels of noise when operating.

4.5 Broadband

4.5.1 Introduction

This section identifies the benefit of providing a fast and efficient broadband connection to homes and businesses within the Canning City Centre. Benefits include increased productivity and a decrease on the impact to existing infrastructure.

There are three main direct economic benefits being¹⁵:

- conducting existing online activities faster
- new applications and products
- new business models and productivity

4.5.2 Applications and Products

4.5.2.1 *Tele-health*

Tele-health is a future application of widely available high-speed broadband internet. Tele-health has the potential to lead to cost savings in the health and aged care sector.

There are four main components to tele-health:

- Real time tele-health involves live consultations in a variety of specialities. It provides the opportunity for medical professionals to consult with patient remotely.
- Store and Forward tele-health is the transmission of medical data — such as echocardiograms, photographs of skin lesions, blood glucose levels and x-rays — for remote diagnosis.
- Tele-homecare is the transmission of medical data for disease and injury management and prevention.
- Tele-education is the transmission of medical information, either for the training of health professionals or to assist members of the public to self-manage their health.

The benefits arising from tele-health are timesaving, improved quality of service and reduced latency.

4.5.2.2 *Smart Grid Technology*

A broadband enabled Canning City Centre will increase accessibility of building for the use of Western Power smart meters. A smart meter measures the amount of electricity used every 30 minutes and conveys this data back to Western Power. Real time monitoring allows for the adjustment of flows throughout the network which results in a reduction in transmission losses.

It also relays data to the homeowner-allowing real time monitoring of electricity usage. IBM reports that a US smart grid project led to a 15% decline in peak load.²⁴

4.5.3 Business Models

4.5.3.1 *Telecommuting*

The provision of fast reliable broadband internet will see an increase in telecommuting and encourage home entrepreneurship and business. The NBN will see a decentralisation of the overall economy with barriers to market entry reducing and distance conferencing becoming much easier and efficient. Working from home will increase with a reduction in lost hours due to sick or carer's leave. It will also decrease impact on transport network.

¹⁵ Economic change in Queensland: The role of the NBN - Department of Employment, Economic Development and Innovation – pg 15, 24

5 Upgrades, Implementation and Funding

5.1 Upgrades

5.1.1 Water & Wastewater

5.1.1.1 Water

Exact water infrastructure upgrades will be determined when full water network modelling is carried out by Water Corporation. Water reticulation planning and modelling will be done after Structure Plan and rezoning is confirmed, effectively at development application phase.

5.1.1.2 Wastewater

Accurate costing requires detailed Sewer Pumping Station Design and Pressure Main sizing which is outside the scope of this document. Costs provided are approximate in nature. Major required infrastructure costed:

- DN200 SPM 740m
- Type 40 PS
- 90m 150mm diameter sewer

5.1.2 Gas

Major required infrastructure costed:

- 260m X 110PE, Medium Pressure mains extension
- 1.4km X 110PE, Medium Pressure in Wharf Street & Albany Highway
- 50m X 100 ST main extension (Railway crossing) and a High Pressure Reducer on Wharf Street
- 105mX 63PE, Medium Pressure mains extension in Leila Street
- 60m X 63PE, Medium Pressure mains extension. in Pattie Street
- 110m X 110PE, Medium Pressure mains extension in Bickley Rd and a High Pressure Reducer
- 110m X 110PE, Medium Pressure mains extension across Nicholson Road
- New Medium Pressure Reducer in Gerard Street to Medium-Low Pressure network

5.1.3 Power

The ultimate theoretical additional power requirement for the entire Cannington City Centre, based on Western Power's ADMD calculator, is 28 MVA. This is based on an opinion of probable load calculation is envisaged to be taken up over several years.

This ultimate horizon load could require three to four new 22 kV feeders and possibly including a new zone substation transformer.

There are already three zone substation transformers at Welshpool substation, which is the maximum number for this size zone substation.

The Bentley Zone Substation is 4 km to the west and may have some spare capacity. The uptake of the load will determine the timing of any required upgrades to the Distribution and Transmission Networks.

The ultimate load requirement of Canning City Centre will have a significant impact on Western Power's network planning, and consultation will be required from an early date to avoid any constraints caused by the Transmission Network and the delivery of the power through the Distribution Network.

In reality, with modern efficient building design and economies of scale, the ultimate design load is likely to be less than the theoretical calculations. If loads were added in incremental blocks of less than 1MVA Western Power would consider this as normal load growth and carry out system reinforcement as required.

The application for power would fit in to the current policies of the “Distribution Low Voltage Connection Headwork’s Scheme”

Under this policy and along with the contestable load policy there could be a small contribution required from the applicant, as Western Power would consider the revenue offset if the development is solely commercial. If the development is all residential and a block load Western Power may consider the revenue offset. If not, the developer would pay for the required network extension, switchgear and transformers; resulting in the capacity being made available.

If the loads were a load that would cause a network constraint, say over 2 MVA in size, Western Power would work out a solution in order to deliver the required power in the time frame that the applicant is requiring. If the applicant is not able to fund the cost to remove the network constraint to allow Western Power to supply the power, then the applicant has two options:

- Wait until Western Power has the capacity available. This could be a 2 to 5-year time frame, if not longer; or
- Wait for other applicants to apply for power and then pool the cost between other applicants.

Western Power cannot reserve network capacity; therefore, it is recommended the Developer lodge a formal application with the utility provider for each individual lot once development intent is confirmed. This should be well in advance of the date the power is required on site. It could be a 12-month application process within Western Power depending on current power demands or other applications with Western Power. Any network upgrading will need to be considered by Western Power along with other upgrade projects within the Cannington area.

In all likelihood, the additional power to service this area will come from the Bentley zone substation that is located on McKay Street, Bentley. Western Power would most likely install 2 by 400 High Voltage (HV) cables from this zone substation to the Canning City Centre. The funding of the new HV feeder cables is discussed in Section 3.4 of this report.

5.1.4 Telecommunications

Upgrades to the telecommunications network are ongoing and continually changing to meet consumer demand and advancing technologies. As a result, it is difficult to determine the exact required infrastructure upgrade at this time.

5.2 Funding

5.2.1 Water and Wastewater

- Trunk Infrastructure upgrades (i.e. 300mm diameter or larger or Pumping Stations) are to be funded by Water Corporation.
- Internal reticulation up to 300m in diameter is to be funded by the developer.

5.2.2 Gas

ATCO Gas policy in essence is that reinforcement due to ongoing natural growth of an area (e.g. infill) is generally funded by ATCO Gas Australia as part of the operation of the network. Where an individual developer is completing a larger development (e.g. Greenfield subdivisions), then the upgrades would typically be funded by that developer.

5.2.3 Power

The upgrade requirements as outlined in section 3.4 could be funding in the following ways:

- Funded by Western Power over a period of years as a part installation of the feeder cables as the overhead network requires reinforcement. This would be as the applications equal or less than 1MVA are received by Western Power. Capacity would be gradually taken up by each applicant thus triggering the need for Western Power to carry out some system augmentation to the HV network to free up HV capacity. This could be funded under the normal natural load growth.

- A combination of funding by Western Power and the applicant. This is based on loads being of a critical size that restricts Western Power HV network, thus requiring specific network upgrading that does not fall under the normal natural load growth.

5.2.4 Telecommunications

Reinforcement due to ongoing natural growth is typically funded by telecommunications companies as part competition to gain customer base in the area.

A developer seeking a smart community (Telstra) in new developments of 100 premises or more, developers will meet the cost of installing fibre-optic ready pit and pipe infrastructure and transfer the ownership of such infrastructure to NBN Co. in exchange for the provision of fibre within that pit and pipe network.

5.3 Staging

As no service provider has pre-planned infrastructure upgrades, no restrictions on staging are apparent.

5.3.1 Water and Wastewater

Development of Canning City Centre Activity Plan Area will trigger required infrastructure upgrades as outlined in section 5.1.1 of this report.

Alignment of required infrastructure should take into consideration widening of Cecil Avenue and Lake Street.

5.3.2 Gas

Development of the Canning City Centre Activity Plan Area will trigger required infrastructure upgrades as outlined in section 5.1.2 of this report.

5.4 Recommendations

5.4.1 Water and Wastewater

Water Corp recommends a consolidated approach to the requesting and programming of works to minimise disruptions and maximise cost efficiencies. Water Corporation recommends any reticulation reinforcement or new work should be managed by the City of Canning due to the fractured land ownership within the area. It is recommended that a working group between the City of Canning and Water Corporation is set up in order to help plan and coordinate precinct development and staging with any Water Corporation trunk infrastructure capital works.

Alignment of required infrastructure should take into consideration widening of Cecil Avenue and Lake Street.

5.4.2 Power

The City of Canning could implement a minimum green star rating requirement for any new developments within the Canning City Centre. Minimum energy conservation requirements can help reduce peak electricity demand, increase load diversity and reduce greenhouse gas emissions. These measures may delay to onset of the medium-long term infrastructure requirements.

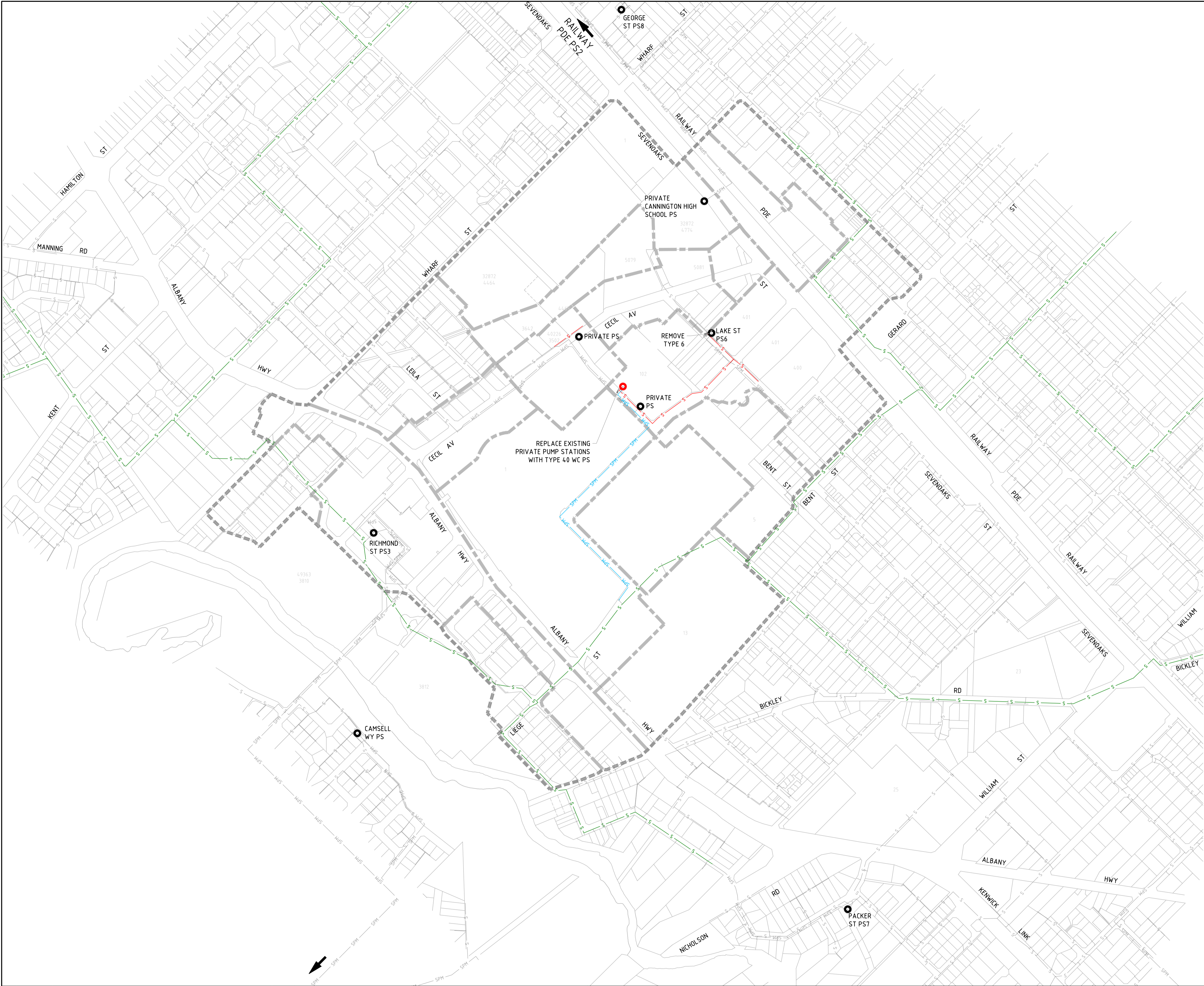
In summary, until there is a firm application in to Western Power for additional load Western Power will not proceed to determine what augmentation work is required on the 22kV Distribution Network. Western Power will not carry out any feasibility reports on hypothetical loads.

6 Conclusion

The CCC is well serviced by current infrastructure although significant upgrades to accommodate the increase in residential and commercial activity will be required. The widening of the Civil Avenue and Lake Street road reserves will require significant service relocation and will have staging implication for carrying out infrastructure upgrades.

APPENDIX A EXISTING SERVICES LOCATION

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DATE PLOTTED: 07 December, 2016 - 4:05pm



LEGEND

SITE BOUNDARY

PRECINCT BOUNDARY

PROPOSED SEWER

PROPOSED SEWERAGE PRESSURE MAIN

PROPOSED SEWERAGE PUMPING STATION

EXISTING SEWER

EXISTING SEWER TRUCK MAIN (DIA300+)

EXISTING SEWERAGE PRESSURE MAIN

EXISTING SEWERAGE PUMPING STATION

- SERVICES NOTES:
1.

SERVICE LINES ARE APPROXIMATE ONLY AND ARE SHOWN DIAGRAMMATICALLY. CONTACT THE RELEVANT AUTHORITY OR DIAL 1100.
2.

REFERENCE IS TO BE MADE TO TELSTRA DUTY OF CARE STATEMENT WHICH IS PROVIDED WITH DB4YD TELSTRA PLAN ENQUIRIES.
3.

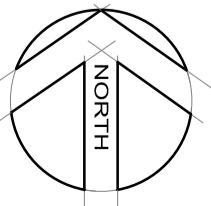
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4.

REFERENCE IS TO BE MADE TO ATCO GAS DUTY OF CARE STATEMENT WHICH IS PROVIDED WITH DB4YD ATCO GAS PLAN ENQUIRIES.



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Rev	Date	Description	Drawn	Appr
B	07.11.2016	AMENDED SITE & PRECINCT BOUNDARY	JYY	SH
A	13.03.2015	INITIAL ISSUE	JYY	PH



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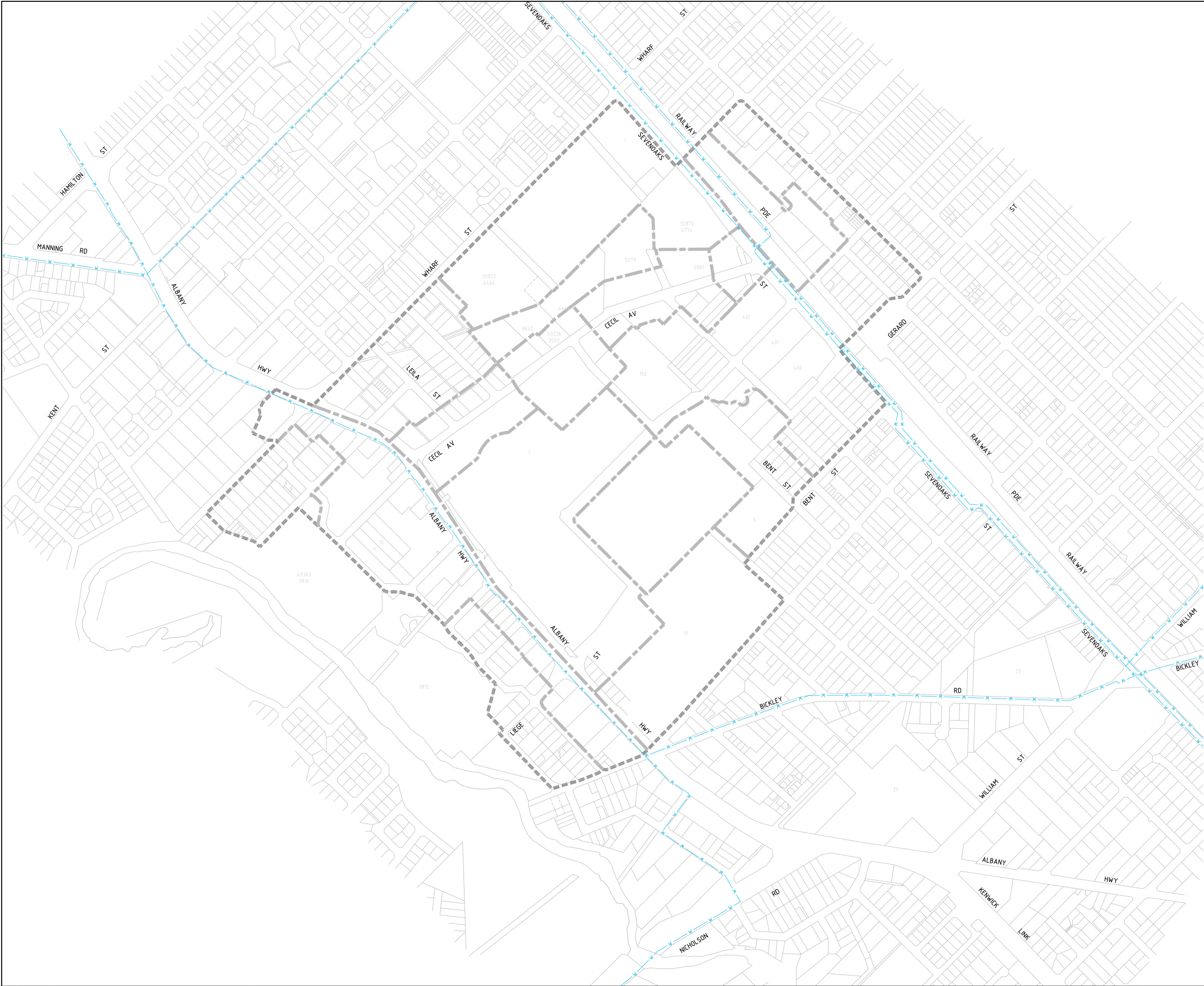
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Designed	PH	Date	25.03.2015
Checked	PH	Date	25.03.2015
Reviewed	SH	Date	26.11.16
Approved	SH	Date	26.11.16

Client	CITY OF CANNING
Project	CANNING CITY CENTRE INFRASTRUCTURE ASSESSMENT
Title	SEWER MASTER PLAN

Status	NOT FOR CONSTRUCTION			
Date	13.03.2015	Datum	A.H.D	Scale
Scale	1:5000	Size	A1	Revision
Drawing Number	E15002-001-CI-D-SK6			B

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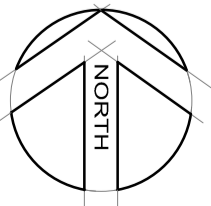
PRECINCT BOUNDARY

EXISTING WATER TRUCK MAIN (DIA300+)

- SERVICES NOTES:
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B 07.11.2016		AMENDED SITE & PRECINCT BOUNDARY	JYY	SH
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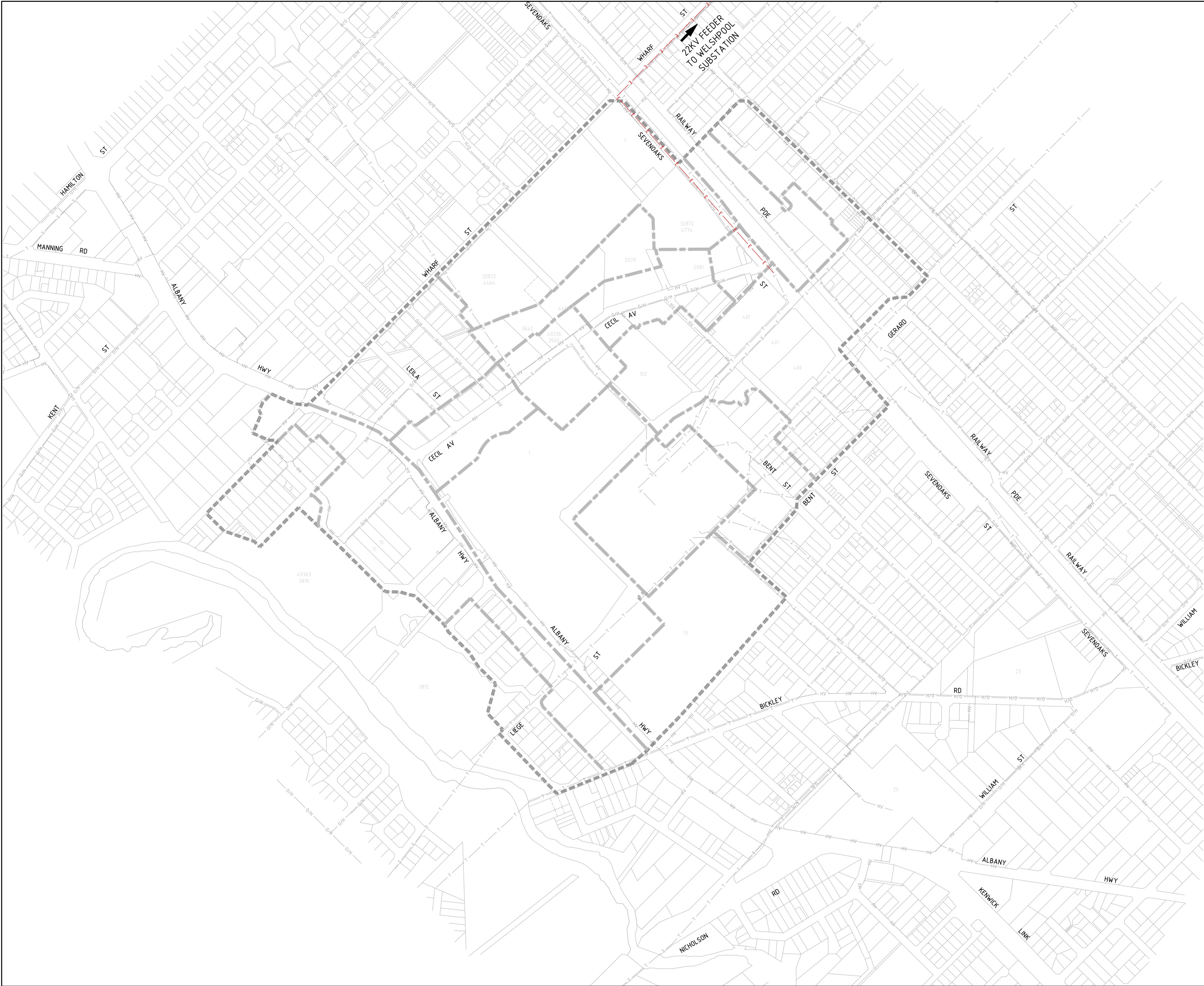
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Reviewed	SH	Date	26.11.2016
Approved	SH	Date	26.11.2016

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Project	CANNING CITY CENTRE INFRASTRUCTURE ASSESSMENT		
Title	WATERMASTER PLAN		

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LEGEND

SITE BOUNDARY

PRECINCT BOUNDARY

PROPOSED ELECTRIC UNDERGROUND
(HIGH VOLTAGE)

EXISTING ELECTRIC OVERHEAD
(HIGH VOLTAGE)

EXISTING ELECTRIC OVERHEAD
(TRANSMISSION)

EXISTING ELECTRIC UNDERGROUND
(HIGH VOLTAGE)

- SERVICES NOTES:
1.

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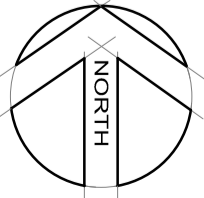
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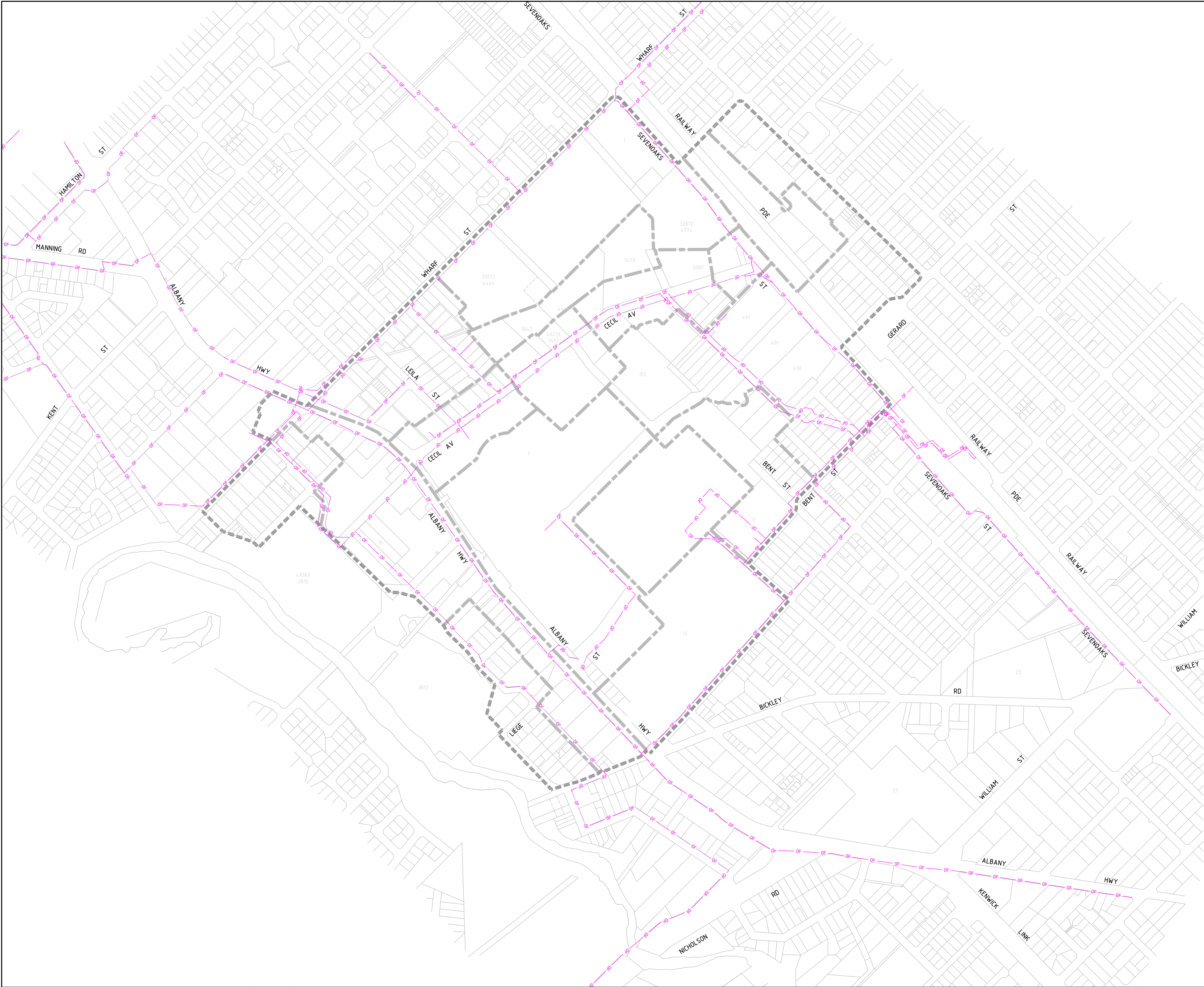
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Reviewed	SH	Date	26.11.2016
Approved	SH	Date	26.11.2016

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Project		CANNING CITY CENTRE INFRASTRUCTURE ASSESSMENT			
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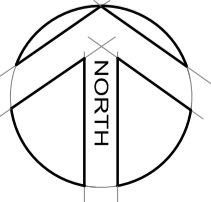
OF

EXISTING COMMS (OPTICAL FIBRE)

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- SERVICE LINES ARE APPROXIMATE ONLY AND ARE SHOWN DIAGRAMMATICALLY. CONTACT THE RELEVANT AUTHORITY OR DIAL 1100.
 - REFERENCE IS TO BE MADE TO TELSTRA DUTY OF CARE STATEMENT WHICH IS PROVIDED WITH DB4YD TELSTRA PLAN ENQUIRIES.
 - REFERENCE IS TO BE MADE TO WESTERN POWER SAFETY GUIDELINES AND INFORMATION PROVIDED WITH DB4YD PLAN ENQUIRIES.
 - REFERENCE IS TO BE MADE TO ATCO GAS DUTY OF CARE STATEMENT WHICH IS PROVIDED WITH DB4YD ATCO GAS PLAN ENQUIRIES.



B 07.11.2016 AMENDED SITE & PRECINCT BOUNDARY JYY SH	
A 13.03.2015 INITIAL ISSUE JYY PH	
Rev	Date Description Drawn Appr



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Shaping the Future

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Drawn	JYY	Date	13.03.2015
Designed	PH	Date	25.03.2015
Checked	PH	Date	25.03.2015
Reviewed	SH	Date	26.11.2016
Approved	SH	Date	26.11.2016

CITY OF CANNING

CANNING CITY CENTRE
INFRASTRUCTURE ASSESSMENT

COMMS MASTER PLAN

NOT FOR CONSTRUCTION

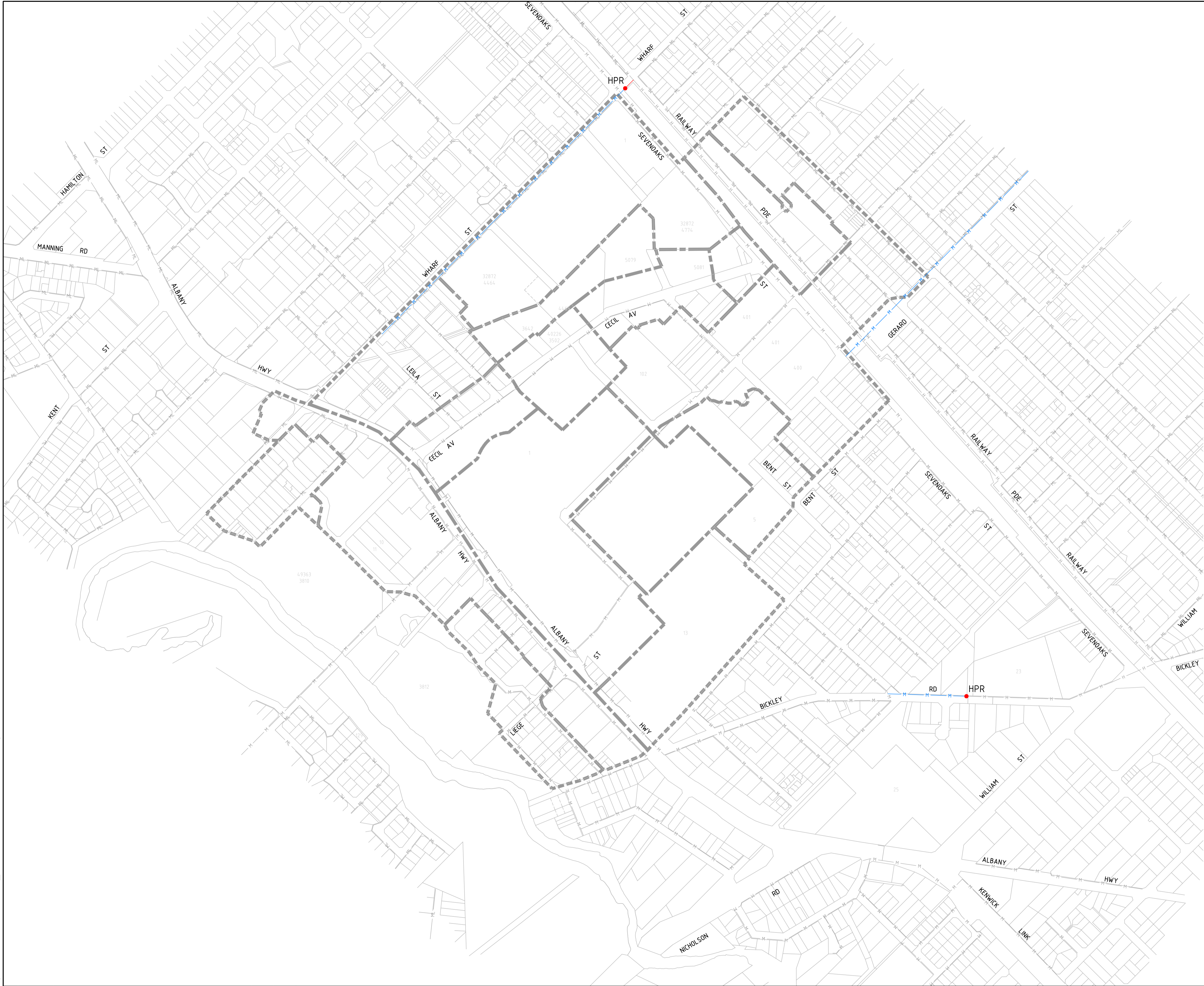
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Drawing Number	E15002-001-CI-D-SK9	Revision	B
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ON A1 ORIGINAL

DATE PLOTTED: 07 December, 2016 - 4:10pm

XREF's: E:\024-001-CI-D-0A
CAD FILE: L:\PROJECTS\NE5002 - City Centre Infrastructure Assess\5_Technical\Civil\CAD\E15002-001-CI-D-SK10.dwg



LEGEND

SITE BOUNDARY

PRECINCT BOUNDARY

M

PROPOSED GAS (MEDIUM-LOW PRESSURE)

H

PROPOSED GAS (HIGH PRESSURE)

HPR

PROPOSED HIGH PRESSURE REDUCER

ML

EXISTING GAS (MEDIUM-LOW PRESSURE)

M

EXISTING GAS (MEDIUM PRESSURE)

H

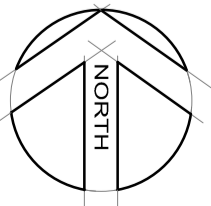
EXISTING GAS (HIGH PRESSURE)

SERVICES NOTES:

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B		07.11.2016	AMENDED SITE & PRECINCT BOUNDARY	JYY	SH
A		13.03.2015	INITIAL ISSUE	JYY	PH
Rev	Date	Description		Drawn	Appr



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Drawn	JYY	13.03.2015
Designed	PH	25.03.2015
Checked	PH	25.03.2015
Reviewed	SH	26.11.2016
Approved	SH	26.11.2016

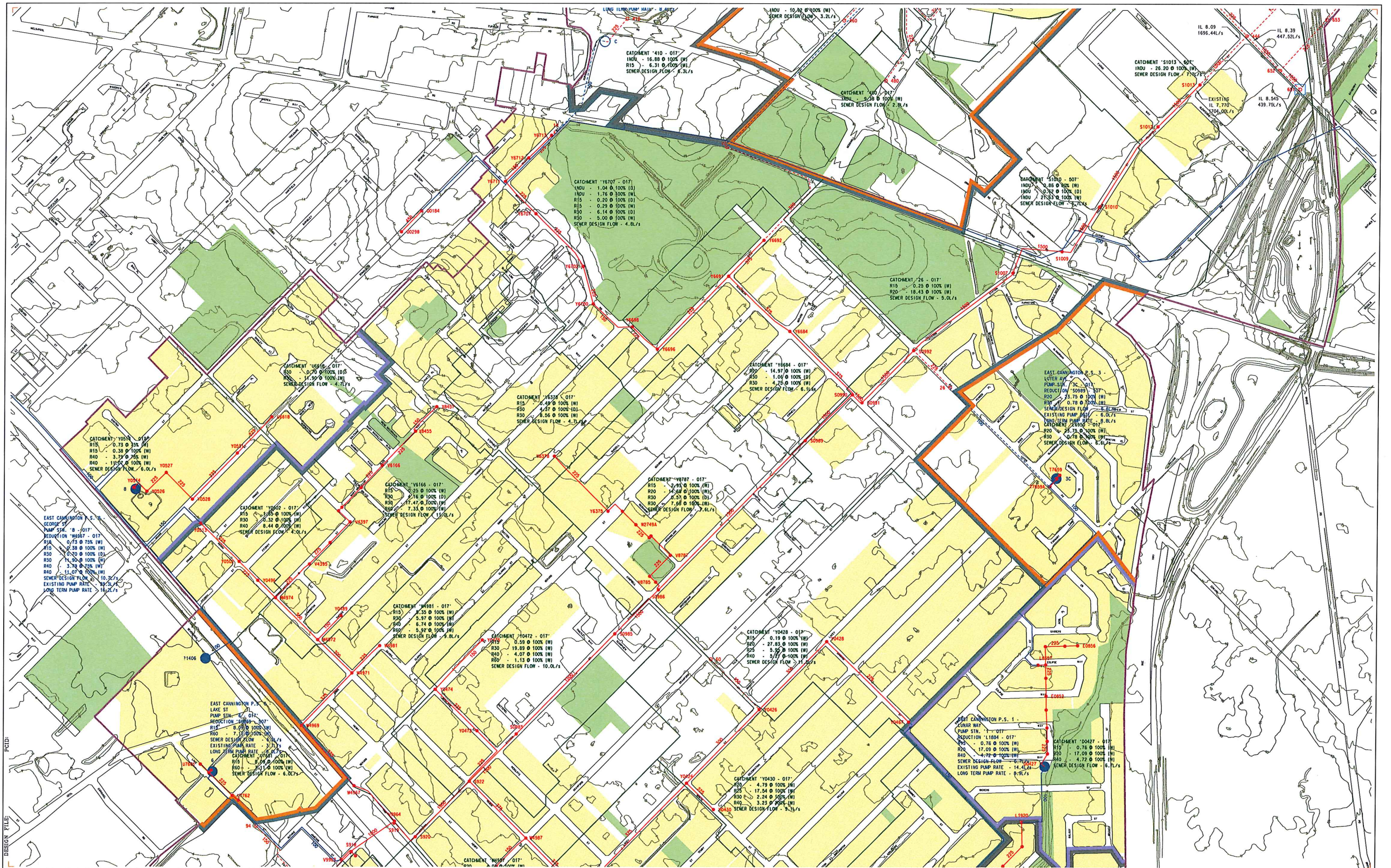
Client	CITY OF CANNING		
Project	CANNING CITY CENTRE INFRASTRUCTURE ASSESSMENT		
Title	GAS MASTER PLAN		

NOT FOR CONSTRUCTION			
Date	13.03.2015	Datum	A.H.D
Scale	1:5000	Size	A1
Drawing Number	E15002-001-CI-D-SK10		Revision
		B	

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1:5000 0 50m 100 150 200 250 300 350 400 450 500

APPENDIX B WATER CORPORATION PLANNING INFORMATION



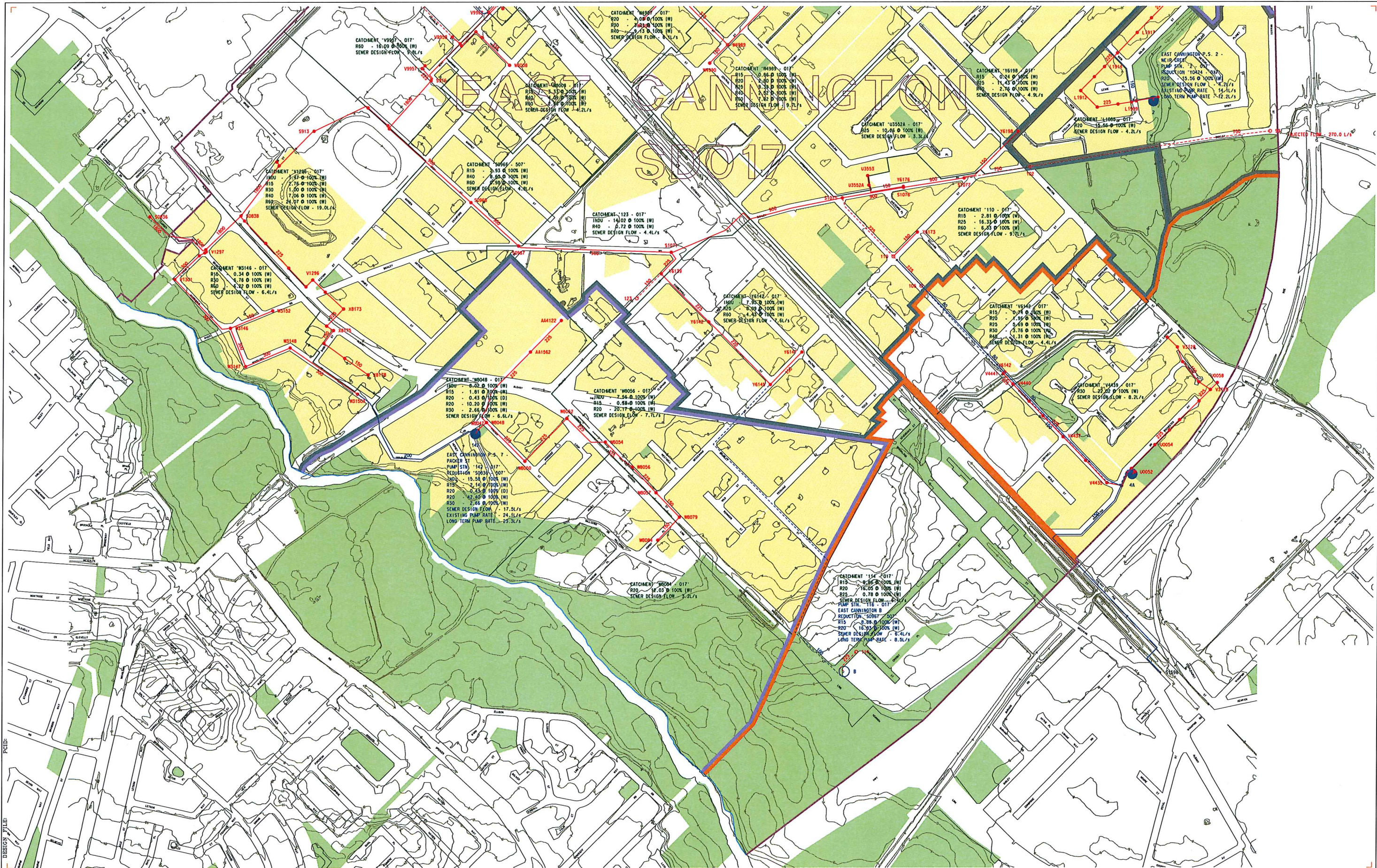
LEGEND		NOTATION	
	EXISTING PUMPING STATION		PARKS AND PUBLIC OPEN SPACE
	EXISTING PRESSURE MAIN		EXISTING SEWERED AREAS
	EXISTING GRAVITY SEWER		SEWERED BY PRIVATE PS
	PROPOSED PUMPING STATION		NODE CATCHMENT
	PROPOSED PRESSURE MAIN		PS AND SEWER CATCHMENTS
	PROPOSED GRAVITY SEWER		SEWER DISTRICT CATCHMENT
			WWTP CATCHMENT

SHEET INDEX		NOTATION	
	1		SEWER DISTRICT NUMBER
	2		CATCHMENT CODE
	3		CROSS AREA
			CODE TOWING
			LAND DEVELOPMENT
			WET CONDITIONS
			DRY CONDITIONS
			SEWER DESIGN FLOW

WATER CORPORATION

ISSUED WITH THE AUTHORITY OF THE MANAGER
INFRASTRUCTURE PLANNING BRANCH
600 NEWCASTLE STREET, LEEDERVILLE 6007
WESTERN AUSTRALIA.
TELEPHONE (08) 9420 2420, FAX (08) 9420 3179

WASTEWATER SCHEME PLANNING SERIES			
EAST CANNINGTON - SD017			
CONCEPTUAL PLANNING			
LONG TERM SCHEME: SHEET 2 OF 3			
PLANNING BY N. KOUNITIS	COMPILED BY G. HAYWARD	ACCEPTED BY	
SCALE 1:5000	VERSION 5 JULY 1996	FILE NO.	A1



THE INFORMATION ON THIS PLAN IS BASED ON THE BEST DATA AVAILABLE AT DATE OF PRINTING AND IS SUBJECT TO ONGOING REVIEW AND AMENDMENT. NO RESPONSIBILITY IS ACCEPTED BY THE WATER CORPORATION FOR ACCURACY OF DATA SUPPLIED BY EXTERNAL AGENCIES.

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LEGEND

● EXISTING PUMPING STATION	■ PARKS AND PUBLIC OPEN SPACE
— EXISTING PRESSURE MAIN	■ EXISTING SEWERED AREAS
— EXISTING GRAVITY SEWER	— NODE CATCHMENT
○ PROPOSED PUMPING STATION	■ PS AND SEWER CATCHMENTS
— PROPOSED PRESSURE MAIN	— SEWER DISTRICT CATCHMENT
— PROPOSED GRAVITY SEWER	— WWTP CATCHMENT

NOTATION

SEWER DISTRICT NUMBER
CATCHMENT NODE
CATCHMENT '7001 - 121'
R15 - 108.4 0.75% (W)

CROSS AREA THAT
IS CODE ZONING
X OF LAND DEVELOPMENT
(1) - WET CONDITIONS
(2) - DRY CONDITIONS

SEWER DESIGN FLOW - 1.5 x AVERAGE DAILY FLOW RATE

SHEET INDEX

1
2
3

WATER CORPORATION

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WASTEWATER SCHEME PLANNING SERIES

EAST CANNINGTON - SD017

CONCEPTUAL PLANNING

LONG TERM SCHEME: SHEET 3 OF 3

PLANNING BY N. KOUNITIS	COMPILED BY G. HAYWARD	ACCEPTED BY
SCALE 1:5000	VERSION 5 JULY 1996	FILE NO.

A1

APPENDIX C OPINION OF COST ESTIMATE

Canning City Centre Structure Plan					
Opinion of Cost					
Item	Description	Qty	Unit	Rate	Amount
1	Sewer Infrastructure				
1.1	DN200 Sewer Pressure Main	740	m	\$210.00	\$155,400.00
1.2	Type 40 Pumping Station	1	Item	\$1,123,300.00	\$1,123,300.00
1.3	150mm dia PVC sewer	90	m	\$150.00	\$13,500.00
Sub-Total					\$1,292,200.00
2	Gas Infrastructure				
2.1	DN200 Steel main (bored)	50	m	\$1,120.00	\$56,000.00
2.2	High Pressure Reducer	2	no.	\$136,000.00	\$272,000.00
2.3	DN160 PE main	885	m	\$300.00	\$265,500.00
2.4	DN110 PE main	940	m	\$220.00	\$206,800.00
Sub-Total					\$800,300.00
3	Electricity				
3.1	Undergrounding Power				
3.1.1	Carousel to Sevenoaks St	1	Item	\$366,500.00	\$366,500.00
3.2	Switching Station and Transformers				
3.2.1	Site A	1	Item	\$430,000.00	\$430,000.00
3.2.2	Site B	1	Item	\$250,000.00	\$250,000.00
3.2.3	Site C	1	Item	\$250,000.00	\$250,000.00
3.3	22 kV Feeder	1	Item	\$1,200,000.00	\$1,200,000.00
Sub-Total					\$2,496,500.00
Contingency (20%)					\$917,800.00
GST					\$341,430.00
Total					\$5,848,230.00

Exclusions:

- 1 This is an opinion of cost based only on previous experience of similar developments. Based on the detail provided in the concept plan, the estimate is in its nature an Order of Magnitude.
- 2 The contingency allowance made above is a suggested figure for budgeting purposes only. The client should assess its own contingency provisions based on its financing strategy and risk profile.
- 3 Fees and charges exclude Project Management, detailed engineering/landscape design fees and engineering certification fees.