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Wagga Wagga Local Environmental Study: Sewerage Services

Final Report

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Executive Summary

This study examines the suitability of various potential development areas in the Wagga Wagga Local Government Area, with respect to the provision of sewerage services. The study is intended to form an input into Wagga Wagga's new Local Environmental Plan.

The study assesses the suitability with respect to serviceability, capital works requirements and makes recommendations regarding the study areas. The study extensively relies on the document *City of Wagga Wagga Development Servicing Plan for Sewerage* prepared in 2006.

The findings are summarised in the following table:

Study area	Potential development	Downstream infrastructure cost ($/ET[1])	Findings
Residential development study areas			
Estella West (eastern portions)	Residential	$3,500-$3,900	Good serviceability. Holding costs will be minimised if the areas are developed concurrently.
Boorooma East	Residential	$3,900	The area falling in the "Boorooma B" catchment can be developed concurrently with Boorooma West (already zoned). Some areas are only serviceable with low-pressure sewerage and therefore are more suitable to rural residential development.
Lloyd (eastern catchments)	Residential	$3,900	Capable of being serviced using existing downstream infrastructure in the short term, however will require an additional pumping station in later years.
Estella West (Gobbagombalin northern and western portions)	Residential	$4,000-$5,400	Less suitable than eastern portions. These portions should be retained for development in the longer term.
Lloyd (western catchments)	Residential	$5,800	High cost of development due to a new pumping station and long rising main.
Bomen Industrial Area catchments			
Bomen (Central)	Industrial	$4,800	Good serviceability, suitable for development in the short term
Bomen (Western)	Industrial	Average $5,700	Preferred option once land in central catchment is exhausted. Infrastructure should be sized for dry industrial development.

[1] Dollars per equivalent tenement. An equivalent tenement represents the volume of sewage discharged by a typical house.

Study area	Potential development	Downstream infrastructure cost ($/ET[1])	Findings
Bomen (Eastern)	Industrial	Average $7,400	Very large potential catchment. May be useful for wet industrial development with trade wastewater pumped directly to the Bomen Industrial Sewage Treatment Facility.
Bomen (Southern)	Industrial	$7,400	Limited catchment area, requires a dedicated pump station. This is the least suitable Bomen catchment.
East Wagga Industrial Area catchments			
Hammond Ave North	Industrial	$3,400	Some limitations on serviceability, some lots may require low-pressure sewerage connections.
Edison Rd	Industrial	$4,800	Requires re-routing of a rising main. Low-pressure sewerage reticulation will be the most cost-effective option.
Copland St South	Industrial	$4,700-$6,000	Poor serviceability due to terrain, will need low-pressure sewerage to control costs.
Others			
Moorong St	Mixed use	$2,700	Difficult to service due to drains passing through the site and overloaded infrastructure. Low-pressure sewerage would reduce these impacts.

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1. Introduction

In late 2006 Wagga Wagga City Council resolved to prepare a draft Local Environmental Plan for the Local Government Area. The Plan is supported by a number of studies that evaluate areas that may be suitable for future development.

The studies consider the following areas:

- Lloyd (residential development)
- Boorooma, east of the ridgeline (residential development)
- Estella, west of the ridgeline (residential development)
- Bomen (industrial development)
- The vicinity of Edison Road, East Wagga Wagga (industrial development)
- The southern side of Copland Street, near Marshalls Creek (industrial development)
- The northern side of Hammond Avenue near Kooringal Road (industrial development)
- Moorong Street, north of Edward Street, Flowerdale (mixed use development)

1.1 Purpose of Report

This report reviews the suitability of the identified potential development areas with respect to the following, regarding the provision of sewerage services:

1. The suitability of the land with respect to the provision of sewerage services;
2. Identification of any capital works required to service the development area, and the costs of providing those works, taking into account the differing sizes of the development area; and
3. Development of best practice principles to guide the development of the LEP and DCP.

1.2 Background

Sewerage services within the local government area are provided by Wagga Wagga City Council.

Sewerage services are provided to all urban centres in the LGA, as well as a number of villages. Council requires that all new residential development in these centres to connect to the sewerage service. Some rural residential developments also are required to connect to a sewerage service as some local soils are unsuitable for septic disposal.

Properties are serviced using conventional sewerage in residential areas and low-pressure sewerage systems in rural residential areas. Sewage is treated in one of six sewage treatment plants. Effluent from these plants is used locally for irrigation of parks, tree lots or agricultural purposes, or discharged to the Murrumbidgee River, where it is available for water users downstream. Recently Council has entered into a contract to upgrade and operate the three major sewage treatment plants in the local government area.

New assets are funded through a combination of annual user charges, developer contributions under section 64 of the Local Government Act and directly by developers.

1.3 Study approach

This report heavily relies on the *Development Servicing Plan for Sewerage* adopted by Wagga Wagga City Council in 2007. This plan identifies future capital works required to service anticipated development over the next 30 years.

The merits of the various catchments within the study areas have been evaluated in terms of serviceability, risk and the cost of development. For the purposes of this study, the raw capital cost per equivalent tenement has been used as the primary means for assessing the suitability of each catchment. These values are based on those determined for the Development Servicing Plan, adjusted to consider downstream infrastructure required to service each of the sub-catchments.

The potential load generated from industrial catchments has been estimated using a rate of 2 equivalent tenements per gross hectare (inclusive of zero loading land such as roads and drainage easements). For comparison the East Wagga Industrial Area has a load generation rate of 1.8 ET per gross hectare.

1.4 Disclaimer

This document has been prepared for a particular purpose, using information made available by the client in accordance with the client's instructions. Users of this document should note the assumptions and approximations used. Any use of the document outside of the stated purpose is at the user's risk.

2. Suitability review – potential residential areas

2.1 Lloyd

The Lloyd area is characterised by well graded land which is well suited to conventional sewerage systems. Areas proposed for rural residential housing may be more economically serviced using pressure sewerage technology.

The sewerage network immediately downstream of Lloyd has limited spare capacity available, meaning that significant infrastructure upgrades are required to avoid downstream assets becoming overloaded.

2.1.1 Servicing approach

A potential servicing approach is shown in **Figure 1** of **Appendix A**.

The study area has been divided into two main catchments, divided by a rise intersecting Red Hill Road near Dalman Parkway.

Lloyd East will be serviced using a developer provided trunk main parallel to Red Hill Rd, draining towards Glenfield Rd, where it connects into the existing trunk sewer network. The anticipated load from this catchment will lead to overloading problems in the Pearson Street area, including overloading the existing pumping station, SPS7 Flowerdale. This overloading problem will need to be addressed by constructing an interceptor pump station to store and ultimately divert peak loads from the lower catchment. Once these measures have been implemented, the value of downstream infrastructure is approximately $3,900 per equivalent tenement, excluding the developer provided main.

Lloyd West generally will be serviced using a developer provided trunk main parallel to Red Hill Rd, draining towards the Great Sothern Railway. A new pumping station would need to be provided that pumps the wastewater to the Narrung Street Sewage Treatment Works. Once these measures have been implemented, the value of downstream infrastructure is approximately $5,800 per equivalent tenement, excluding the developer provided trunk main.

2.1.2 Recommendations

Lloyd East and Lloyd West may be developed in parallel (if considered appropriate) as the catchments discharge to different parts of the sewerage system.

2.1.2.1 Asset funding

The following works should be considered as part of future Development Servicing Plans as they benefit multiple developments:

- Glenfield West pumping station (services Glenfield and Lloyd West) and associated rising mains
- Glenfield East pumping station (services Lloyd East and adjacent suburbs) and associated rising mains

Developers should be required to directly fund the trunk mains identified above as this will encourage development in an economic manner.

2.2 Boorooma East

The Boorooma East area consists of undulating and relatively steep terrain. Some rock is present which will make conventional sewer more costly than for most development areas in Wagga Wagga.

2.2.1 Servicing approach

A potential servicing approach is shown in **Figure 2** of **Appendix A**.

The study area spans two sewage drainage catchments:

- **Boorooma B** covers the western half of the study area. This area will be serviced using a new pump station adjacent to the Olympic Highway, discharging into the Northern Rising Main nearby[2]. As Boorooma West develops an alignment needs to be finalised and reserved to connect the development area to the sewerage system. This catchment has a downstream infrastructure cost in the order of $3,900 per equivalent tenement.
- **Boorooma C** covers the eastern half of the study area. This area will be serviced using a pump station adjacent to the Olympic Highway, discharging into the Northern Rising Main nearby. This catchment has a downstream infrastructure cost in the order of $3,900 per equivalent tenement.

A triangular section immediately south of the knoll cannot be serviced by either of the above catchments. This area would most likely require servicing using pressure sewerage technology. Given the rocky ground conditions in this area, pressure sewerage almost certainly would be more cost-effective than conventional sewerage. Pressure sewerage could either discharge to the surrounding gravity reticulation, or immediately downstream of the new pump station.

2.2.2 Recommendations

There is merit in developing Boorooma B portion of the study area in at the same time as the western part of Boorooma. This will maximise cost-effectiveness as the sewerage systems can be integrated. The design of the network will need to consider future extensions to Hillgrove and Glenora. This will need to be facilitated by the provision of additional mains capacity, or setting aside a suitable easement to allow a new sewer to be constructed at a later date.

The Boorooma C part of the study area could be developed at a later stage.

Areas not falling under the above catchment areas will require servicing using pressure sewerage technology and therefore may be more suitable for rural residential development.

[2] This new pump station also will service the portion of Boorooma West already zoned for residential development.

2.2.2.1 Asset funding

The following assets should be funded from future Development Servicing Plans:

- A new sewage pumping station near the Olympic Highway to service Boorooma B, as well as land currently zoned for residential development, and the future suburbs of Hillgrove and Glenora outside of the study area.
- A new sewage pumping station near the Olympic Highway to service Boorooma C.
- Linkages from the new pumping stations to the northern rising main.

All other assets required should be fully funded by developers to encourage economic development. This will require coordination between landowners, particularly for the Boorooma B catchment.

2.3 Estella West

The Estella West Study Area has been divided into five primary catchments as follows:

Catchment	Description
Estella B	Area bounded by the north-west to south-east ridgeline, the north-south ridgeline and Colin Knott Dr
Estella C	Area between north-south ridgeline and Pine Gully Road
Gobbagombalin A	Area west of Pine Gully Rd serviceable from Colin Knott Dr
Gobbagombalin B	Area north of Estella Rd
Gobbagombalin C	Residual part of study area west of Gobbagombalin A and south of Gobbagombalin B

2.3.1 Servicing approach

A potential servicing approach is shown in **Figure 2** of **Appendix A**.

- Estella C, Estella D and Gobbagombalin A can be served using a new pump station located in the vicinity of Colin Knott Drive and Old Narrandera Road, discharging to the main northern rising main. Gobbagombalin A would be connected via a 300mm trunk main designed to serve the catchment down to 198 metres AHD. The value of downstream infrastructure utilised by these sub-catchments is in the range $3,500 to $3,900 per equivalent tenement.
- Gobbagombalin B would be served using a dedicated pump station adjacent to Old Narrandera Road, discharging to the main northern rising main. The value of downstream infrastructure utilised by this catchment is in the in the order of $5,100 per equivalent tenement.
- Gobbagombalin C would be served using a dedicated pump station in the north-western corner of the catchment. This pump station would pump to a rising main running along Estella Road to Boorooma Street, and discharge into the catchment of SPS9 Boorooma. The value of downstream infrastructure utilised by this catchment is in the in the order of $4,000 per equivalent tenement.

Within these catchment boundaries, grades are generally favourable and should permit a high degree of flexibility in layout. There could be some restrictions Gobbagombalin C near Old Narrandera Road as there is a slight fall away from the proposed pump station.

2.3.2 Summary

Catchment	Sub-catchment	Est Cost ($/ET)
Estella Pump Station	Estella B	$3,500
	Estella C	$3,700
	Gobbagombalin A	$3,900
Gobbagombalin North	Gobbagombalin B	$5,100
Gobbagombalin West	Gobbagombalin C	$4,000

2.3.3 Recommendations

It is recommended that the first stage of Gobbagombalin be rezoned at the same time as the latter stages of Estella, as the areas utilise the same pump station. This will promote a rapid take-up of the pump station capacity, which minimises the investment risk and holding costs associated with constructing this asset.

The northern and western parts of Gobbagombalin are less favourable due to the need for dedicated pump stations and long rising mains, driving up the servicing costs of these developments. These areas should be retained for the rezoning in the medium to long term.

2.3.3.1 Asset funding

The following assets should be funded from future Development Servicing Plans:

- A new sewage pumping station at the southern end of Estella Catchment C near the intersection of Colin Knott Dr and Old Narrandera Rd.
- The linkage from the new pumping station to the northern rising main.
- A trunk main parallel to Old Narrandera Rd from Pine Gully Rd to the new sewage pumping station.

The assets listed above serve multiple development areas. All other assets required should be fully funded by developers to encourage orderly development.

3. Suitability review- potential industrial areas

3.1 Bomen

3.1.1 Servicing approach

A potential servicing approach is shown in **Figure 3** of **Appendix A**.

The existing sewerage network services an abattoir and meat cannery as well as various 'dry' industries. The Wagga Livestock Marketing Centre occasionally discharges to sewer on an opportunity basis to manage excess wastewater.

The catchment is served by the Bomen Industrial Sewage Treatment Facility (BISTF)[3]. This facility partially treats industrial sewage before further treatment at the Narrung Street Sewage Treatment Works. The BISTF has a processing capacity of 4.5 megalitres per day[4] and is readily expandable to 6 megalitres per day. The BISTF has been designed to allow higher strength industrial wastes to be pre-treated locally to capture the benefits of pre-treatment and waste mixing at the same site.

The presence of the BISTF has a significant influence on the servicing approach for Bomen. The benefits of the BISTF are best realised if new 'wet' industry[5] pumps liquid trade wastes directly to the plant for pre-treatment and controlled mixing with other industrial streams.

The sewerage layout for the development area needs to have the following characteristics:

- Gravity sewers need be sized for 'dry'[6] industrial development. This will reduce the initial development cost and reduce the likelihood of operational problems due to underloading.
- Sewerage easements need to be large enough to allow the laying of additional pumped lines at a later stage.

3.1.1.1 Catchments

The study area has been broken into four major catchments:

- The **central** catchment consists of the area to the east of the Great Southern Railway in the vicinity of the Riverina Investments and the BOC properties, which is capable of draining by gravity to the Bomen Industrial Sewage Treatment Facility.
- The **western** catchments are bounded by the Wagga Wagga Livestock Marketing Centre, the Olympic Highway, the Great Southern Railway and Trahairs Road. This catchment will require a new sewage pumping station in the south-western corner of

[3] The Bomen Industrial Sewage Treatment Facility, as with other major treatment plants in Wagga Wagga, is operated by a contractor on behalf of Wagga Wagga City Council.
[4] Based on a high nitrogen/high carbon influent stream and effluent discharge at domestic strength
[5] 'Wet' industries include food processors and other industries where raw materials need to be cleaned, leading to significantly higher water consumption and wastewater generation, compared to other industry.
[6] Most industrial premises only require wastewater services for employee facilities and low volume activities such as cleaning parts. These areas have a lower sewer loading per hectare than residential areas. Guideline design values are available from sources such as NSW Water Directorate (2005) *Section 64 Determinations of Equivalent Tenements Guidelines.*

the catchment. Further sub-catchments could be provided north to Mary Gilmore Road if necessary.

- The **eastern** catchments service the study area east of the Great Southern Railway north of the East Bomen Reservoir. These areas will require a new sewage pumping station in the south-western corner of the catchment.
- The **southern** catchment services a small area in the vicinity of Bavin Road. This catchment will require a new sewage pumping station in the south-eastern corner of the catchment.

All catchments are well graded for sewerage services, meaning that sewerage servicing will not represent a significant limitation when considering lot density and layout.

3.1.2 Catchment suitability

3.1.2.1 Central catchment (BC01)

Catchment BC01 is the most cost-effective development area in the short term, as the only infrastructure required consists of relatively minor mains extensions. This catchment therefore also represents a relatively low investment risk as the assets can easily be constructed in pace with development. The primary asset for the catchment is a 225 mm diameter main running along Byrnes Road, from Bomen Road level crossing north to the crest of the hill. There is sufficient capacity within this main to service the total anticipated load of 270 equivalent tenements.

Development within this catchment utilises downstream infrastructure valued at $4,800 per equivalent tenement.

3.1.2.2 Western catchment (BW11 to BW13)

Catchments BW11 to BW13 require a pump station to be constructed near the south-western corner of catchment BW11, which would pump wastewater to the BISTF inlet works. Consequently the development of these areas represents a higher investment risk than for catchment BC01, however once BW11 to 13 have been developed, the servicing cost of BW11 is comparable to that of BC01.

Once services have been provided for BW11, development can progress north to sub catchments BW12 and BW13 by providing a 225mm trunk main running approximately parallel to the Olympic Highway. This main could extend to Mary Gilmore Road if required for future development; however some capacity augmentation would be necessary. There also is potential to connect the rural residential locality of Brucedale to this main.

Sub-catchment BW11 has an anticipated load of 100 equivalent tenements at full development. Sub-catchments BW12 and BW13 have anticipated loads of 500 and 230 equivalent tenements respectively.

Development within this catchment utilises downstream infrastructure (including a new pump station and rising main), valued at $4,900 per equivalent tenement. Servicing costs increase to $5,500 for sub-catchment BW12 and $6,300 for BW13.

3.1.2.3 Eastern catchment (BE20, BE21, BE30)

The eastern catchments require a pump station to be constructed at the south-eastern corner of sub-catchment BE20. This pump station could initially pump to a 225mm main servicing sub-catchment BE20; however at full development load the rising main would need to be extended to the inlet works of the BISTF. The long rising main required means that these sub-catchments typically have a higher servicing costs than for the equivalent stages in the central and western catchments.

Development would be most cost-effective if it were to proceed along East Bomen Road in a westward direction from the pump station towards Byrnes Road, using a 225mm trunk main. Following the development of BE20 and BE30, the very large sub-catchment BE21 can be serviced from the pump station via a 300mm trunk main in the longer term.

Sub-catchment BE20 has an anticipated load of 350 equivalent tenements at full development. Sub-catchments BE30 and BE21 have anticipated loads of 330 and 900 equivalent tenements respectively.

Development within this catchment utilises downstream infrastructure (including a new pump station and rising main), valued at $5,800 per equivalent tenement. Servicing costs increase to $7,000 for sub-catchment BE30 and $8,300 for BE21.

3.1.2.4 Southern catchment (BS40)

The southern catchment requires a pump station to be constructed in the vicinity of Bavin Road. This pump station would require a rising main to transfer wastewater north over the hill, connecting with line K1250/2. This line will need to be increased to a 225mm capacity to meet full development. The relatively small size of the catchment combined with the need for a pump station leads the highest servicing cost for a first stage development.

Sub-catchment BS40 has an anticipated load of 130 equivalent tenements at full development. Development within this catchment would utilise downstream infrastructure (including a new pump station, rising main and increased gravity main capacity), valued at $7,400 per equivalent tenement.

Wagga Wagga City Council will also bear the costs of operating and replacing the pump station. As this pump station would benefit a relatively small number of users these costs would represent a disproportionate burden on the community compared to other options.

3.1.3 Pressure sewerage servicing option

Pressure sewerage technology replaces the conventional method of providing graded pipework to each property with an on-site pump and pressurised sewer reticulation. The technology is considered particularly useful for very low density development, difficult terrain and areas with high groundwater. Pressure sewerage systems are not subject to infiltration and inhibit stormwater inflows, reducing operating problems associated with wet weather flows. However as each property needs to be provided with its own pump, the technology is not cost effective at higher lot densities. In some circumstances systems can also be affected by septicity.

As all catchments are well graded, the benefits of providing pressure sewerage reticulation instead of conventional sewerage are marginal. Pressure sewerage may be more cost effective if lot densities are low, or the rate of industrial development is highly variable. Systems could be designed with and exclusive pressure mains network, or potentially could be a hybrid arrangement with local networks discharging into a gravity trunk main.

3.1.4 Summary

Catchment	Sub-catchment	Full Load (ET)	Est Cost ($/ET)
Central	BC01	270	$4,800
Western	BW11	100	$4,900
	BW12	500	$5,500
	BW13	230	$6,300
	Overall Western[7]	*810*	*$5,700*
Eastern	BE20	350	$5,800
	BE30	330	$7,000
	BE21	900	$8,300
	Overall Eastern[8]	*1570*	*$7,400*
Southern	BS40	130	$7,400

3.1.5 Recommendations

The central and western catchments offer cost-effective servicing solutions for dry industry. The eastern catchment offers a very large developable area, which may prove useful in the long term. The southern catchment represents a high cost option which offers limited future development capability.

From a sewer servicing perspective, preference should be given to development in the central catchment as the low risk/low cost option. Once this catchment approaches capacity, the western catchment should be developed for dry industry, with land progressively being rezoned from the southernmost extent northwards. If development in the western catchment is given priority, it is unlikely that the eastern catchment will be required for dry industry for many years.

Given this, this area could be instead be retained for 'wet' industrial development, given that these industries often need larger blocks and larger environmental buffers. The high wastewater loads from these industries make it cost-effective for each development to pump directly to the BISTF.

3.1.5.1 Funding of assets

It is recommended that the preferred dry industry location be included within future sewerage Development Servicing Plans. This plan should fund the provision of the new sewage pumping stations and rising mains identified by the study. Developers should be required to provide upstream assets inclusive of trunk mains as this will promote orderly development and reduce the risk of the community cross-subsidising industrial development.

[7] Values do not total due to rounding
[8] Values do not total due to rounding

Wet industrial development should be required to pump wastewater to the BISTF facility using developer provided assets. Some assets may be shared with other developments where this is shown to be beneficial to the system. This approach will again assist orderly development, yet it will also provide industry with a degree of flexibility in locating the facility.

3.2 Edison Rd

3.2.1 Servicing approach

A potential servicing approach is shown in **Figure 4** of **Appendix A**.

The Edison Road industrial area is serviced by a small pump station (SPS26 Kyeamba) which was constructed in the early 1980s. Wastewater is pumped via a number of pump stations to the Kooringal Sewage Treatment Works. The study area contains a 225mm gravity main, which services a small number of industrial premises. A carrier main also is provided to the south of the development area, which joins the study area to Forest Hill. This carrier main is out of service and is unlikely to be useful in the future.

While the pump station currently has a very small load, in the future the pump station will service a 200 lot rural residential development which is being provided with a pressure sewerage system. This development takes the pump station to its full capacity.

Under the current configuration, the value of downstream infrastructure is $7,900 per equivalent tenement. The current configuration is relatively inefficient in that wastewater is pumped several times over a circuitous route, taking up system capacity and increasing operating costs. This can be remedied by constructing a new rising main directly west, to junction with the rising main linking SPS15 Hammond Ave to the Kooringal Sewage Treatment Works. Under this arrangement the cost of downstream infrastructure reduces to $4,800 per equivalent tenement under a conventionally sewered approach.

The study area has a very flat terrain, with possibly a slight fall towards the pump station. The small size of the study area means that the full study area should be capable of service using conventional sewerage reticulation, although depending on the layout, some sewers may be over four metres deep. The anticipated load at full development is 40-50 equivalent tenements.

3.2.2 Pressure sewerage servicing option

This study area is well suited to servicing using pressure sewerage. The key benefit of pressure sewerage servicing in this area is the ability to connect premises directly to the rising main from SPS26 Kyeamba, slightly reducing the risk of pump station overflows and potentially avoiding or deferring a pump station upgrade. As pumps only need to be installed when a lot is developed, the investment risk is lower than for a development provided with conventional sewerage.

The small size of the study area means septicity problems are unlikely.

3.2.3 Recommendation

It is recommended that, should the area be considered suitable for development, detailed design consider the pressure sewerage option with effluent injected directly into the rising main.

3.2.3.1 Funding of assets

If the area is considered suitable for industrial development, the new rising main and the existing pump station should be included within future Development Servicing Plans. Within the plan the pump station should be sized and valued assuming the study area is serviced by pressure sewerage as outlined above. If the development is instead to be provided with conventional sewerage reticulation, the developer should be required to fund a further pump station upgrade.

3.3 Copland St South

3.3.1 Servicing approach

A potential servicing approach is shown in **Figure 4** of **Appendix A**.

The Copland Street South area is relatively remote from existing sewerage services. The closest existing sewerage services are in Reidell Street, some 250 metres from the northernmost part of the study area. The sewers in the Reidell Street area are too shallow to reach the majority of the study area. The study area is to the east of the Equex centre which has been provided with some conventional and pressure sewerage services. A small area at the eastern end of the study area potentially could connect to sewers near Blaxland Rd.

Under a conventional sewerage scenario the study area would require a new sewage pumping station, located on the southern boundary of the study area. This pump station would transfer wastewater to the rising main from SPS15 Hammond Ave, near the intersection of Kooringal Road and the Tumbarumba Railway. In the future, this pumping station potentially also could service adjacent development areas.

The study area is quite flat. Some reticulation would need to be over four metres deep to be able to reach the pumping station, leading to quite high servicing costs, and restricting lot layout.

The anticipated load under full development would be in the order of 100 equivalent tenements. Under a conventional sewerage scenario, the value of downstream infrastructure required, inclusive of a new sewage pumping station and rising main, would be in the order of $6,000 per equivalent tenement.

3.3.2 Pressure sewerage servicing option

Under a pressure sewerage arrangement, the need for a dedicated sewage pumping station and deep reticulation mains would be avoided. As pumps only need to be installed when a lot is developed, the investment risk is lower than for a development provided with conventional sewerage. The eliminated pumping station reduces downstream infrastructure costs by

$1,300 per equivalent tenement. Given the high cost of deep sewers, it is likely that pressure sewerage will prove to be a more cost effective option.

3.3.3 Recommendation

This site is difficult to service using conventional sewerage technology due to flat terrain and limited opportunities to connect with existing infrastructure. If the area is considered suitable for industrial development, servicing using pressure sewerage technology is preferred to control development cost and investment risk, and maximise flexibility in lot layout.

3.3.3.1 Funding of assets

If the area is considered suitable for industrial development, the new rising main should be included within future Development Servicing Plans. If the development is provided with conventional sewerage reticulation, the developers should be required to fund the construction of a sewage pumping station to Council's specification.

3.4 Hammond Ave North

3.4.1 Servicing approach

The Hammond Avenue North area is currently served by mains along Hammond Avenue and Tarcoola Road. The eastern part of the study area is serviced by a reticulation main running along Tarcoola Rd, draining to SPS27 Tarcoola. The westernmost lot is serviced by a main running along Hammond Avenue. Some lots in the study area do not have a sewerage connection.

Some service could be provided to Lot 2 DP 542294 and Lot 2 DP 738461, although the shallow depth of the main may limit the reach of sanitary drainage within the lots. Further subdivision may require servicing using pressure sewer, with wastewater injected into the SPS27 rising main. The portion of Lot 1 DP 152987 within the study area is partially serviceable by conventional sewer; however the easternmost portion would require a pumped arrangement.

Lots served by SPS27 utilise downstream infrastructure valued at $3,400 per equivalent tenement.

3.4.2 Funding of assets

The study area does not require any new major sewerage assets. Any mains extensions or pressure sewerage connections should be fully funded by the developer.

4. Suitability review- potential mixed use areas

4.1 Moorong St

A potential servicing approach is shown in **Figure 5** of **Appendix A**.

The Mooring Street study area is a triangular shaped piece of land bounded by the Sturt Highway, Olympic Highway and a levee bank. The area has a number of drains that would make the provision of conventional sewerage difficult. The land slopes slightly towards the centre of the area, and drains to the west. The drain extending from Spring Street probably would isolate the northern tip of the study area. The western tip of the study area has a number of drains and is assumed that this area will not require a sewerage service.

4.1.1 Servicing approach

The study area has been divided into two catchments, divided by the drain extending from Spring Street.

The main study area could potentially carry 100 equivalent tenements. The constrained northern part of the study area possibly could carry 5-10 equivalent tenements under a medium density development scenario.

The majority of the site would be best served via a connection to the Ashmont Carrier running along the southern side of the Sturt Highway. However this carrier discharges into a major overloaded pump station (SPS7 Flowerdale). The constrained nature of the site makes it difficult to upgrade this station, however the potential contribution of this area is quite small compared to its existing load. The development of this study area may lead to the earlier implementation of load diversion works required for development in Lloyd.

Internal reticulation could be constrained to some extent given the need to connect to the Ashmont Carrier.

Downstream infrastructure has been valued at $2,700 per equivalent tenement.

4.1.2 Pressure sewerage servicing option

This study area is well suited to servicing using pressure sewerage. The key benefit of pressure sewerage servicing in this area is the ability to connect premises directly to the rising main from SPS7 Flowerdale, avoiding the overloaded pump station upstream. This approach also avoids the potential layout problems associated with the drains in the study area. As pumps only need to be installed when a lot is developed, the investment risk is lower than for a development provided with conventional sewerage.

The small size of the study area means septicity problems are unlikely.

4.1.3 Recommendation

If the area is considered suitable for development, the difficult terrain and infrastructure capacity restrictions make it best serviced using pressure sewerage technology.

4.1.3.1 Funding of assets

The study area does not require any new major sewerage assets. Any mains extensions or pressure sewerage connections should be fully funded by the developer.

5. References

NSW Water Directorate (2005) *Section 64 Determinations of Equivalent Tenements Guidelines.*

John Wilson and Partners (2006) *City of Wagga Wagga Development Servicing Plan for Sewerage*, accessed at http://www.wagga.nsw.gov.au/resources/documents/Development_Servicing_Plan_-_Sewerage.pdf

Appendix A: Servicing Strategy Figures

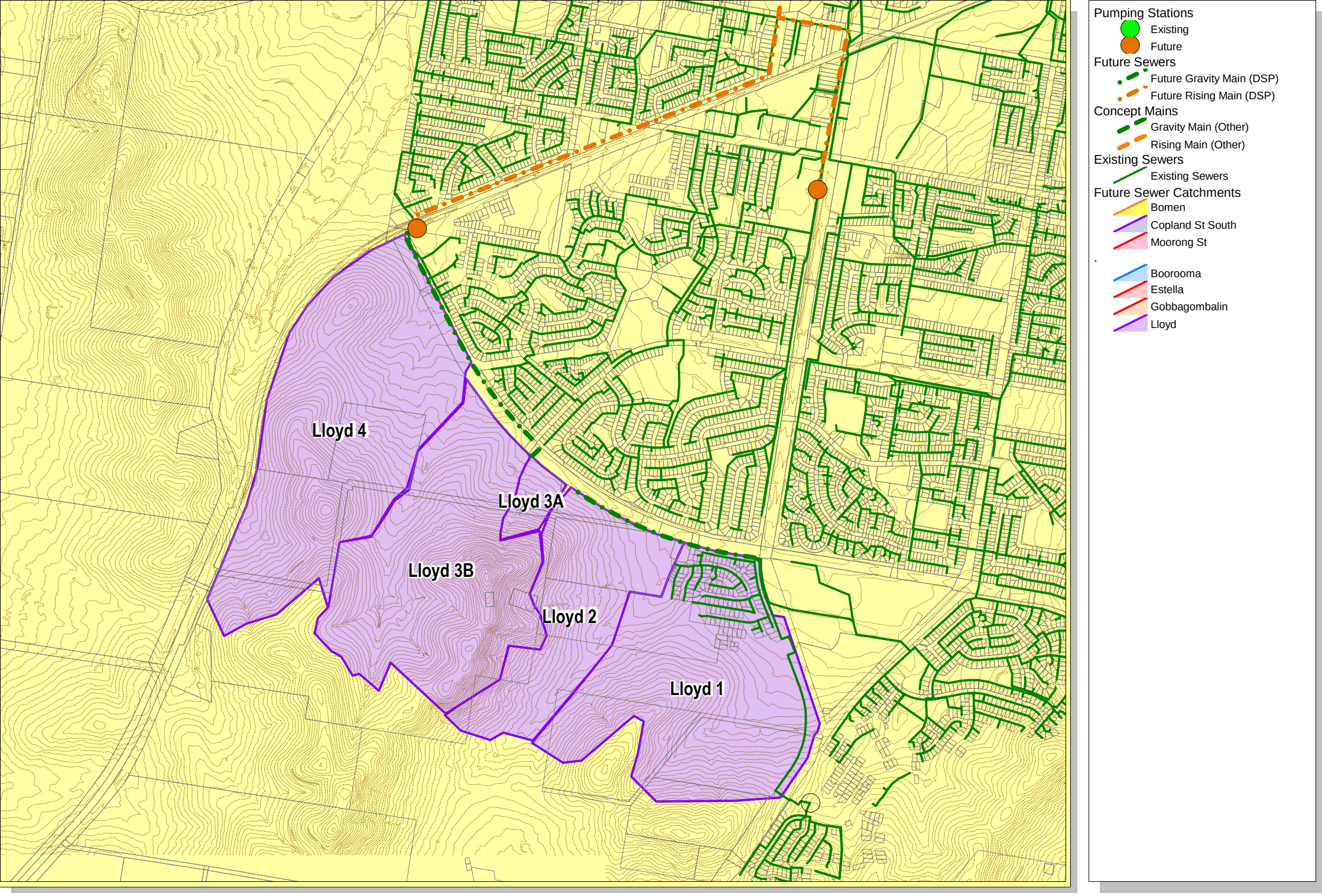

Figure 1- Lloyd Sewerage Servicing 1:19340

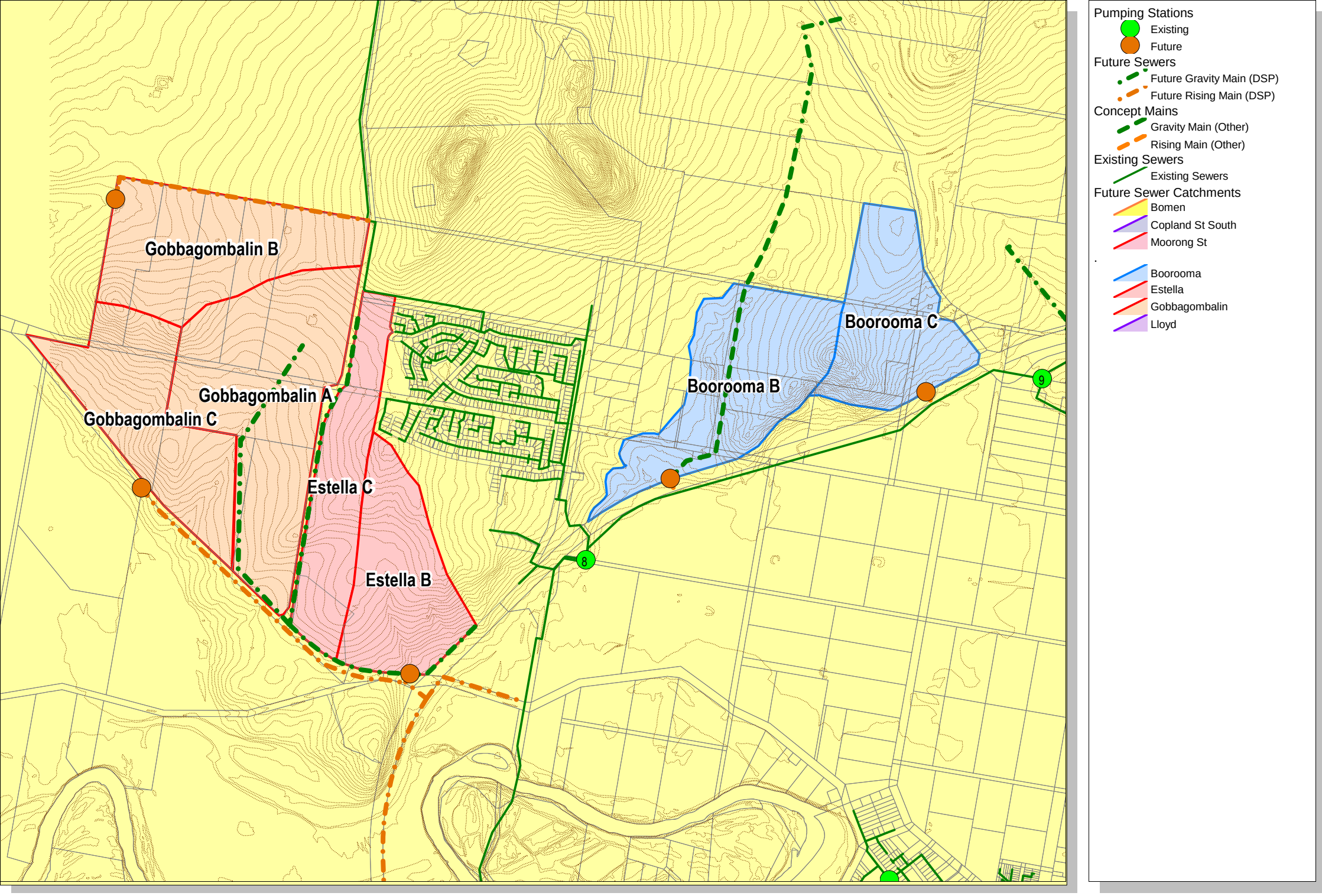

Figure 2- Boorooma East and Estella West Sewerage Servicing 1:19340

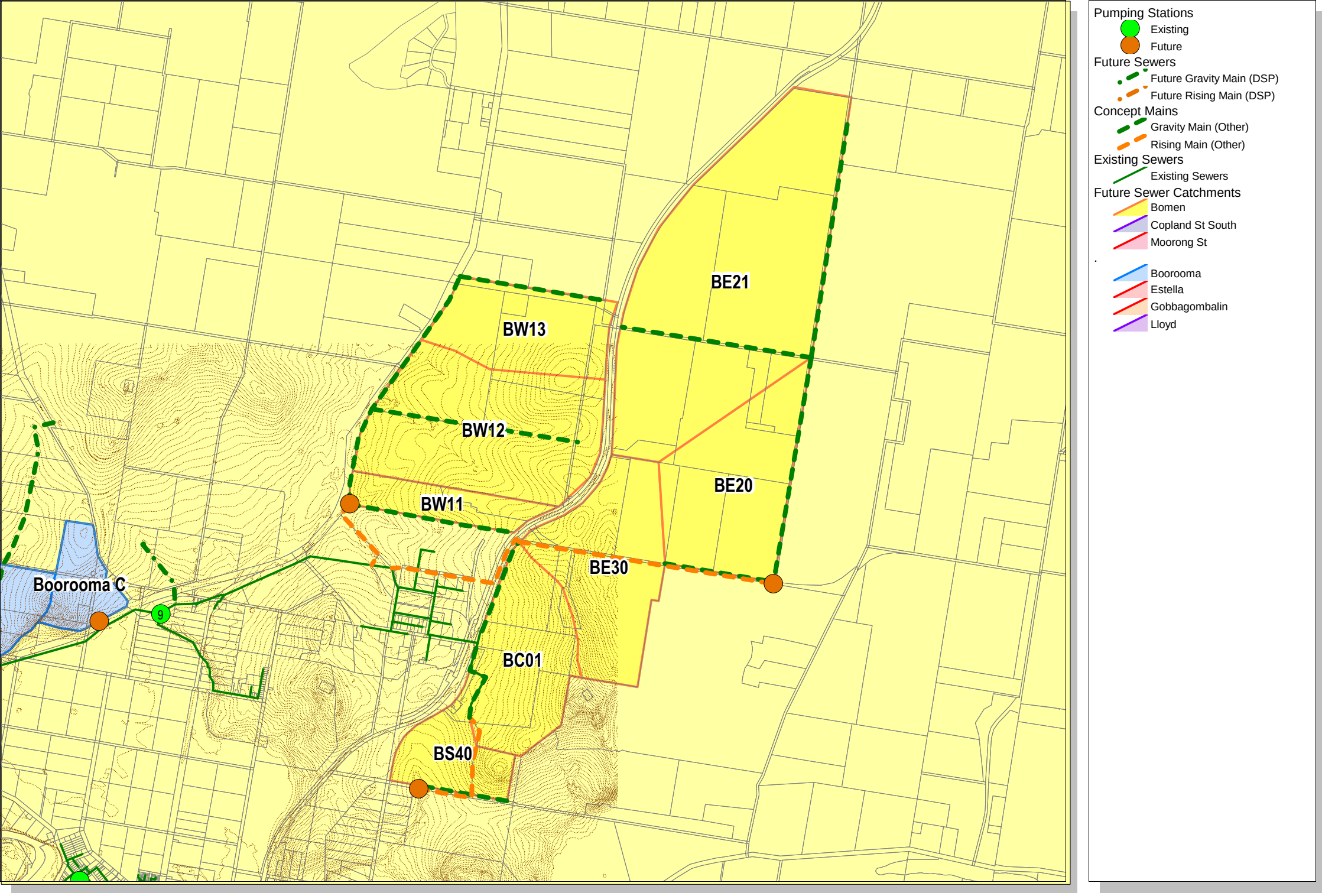

Figure 3- Bomen Sewerage Servicing 1:40842

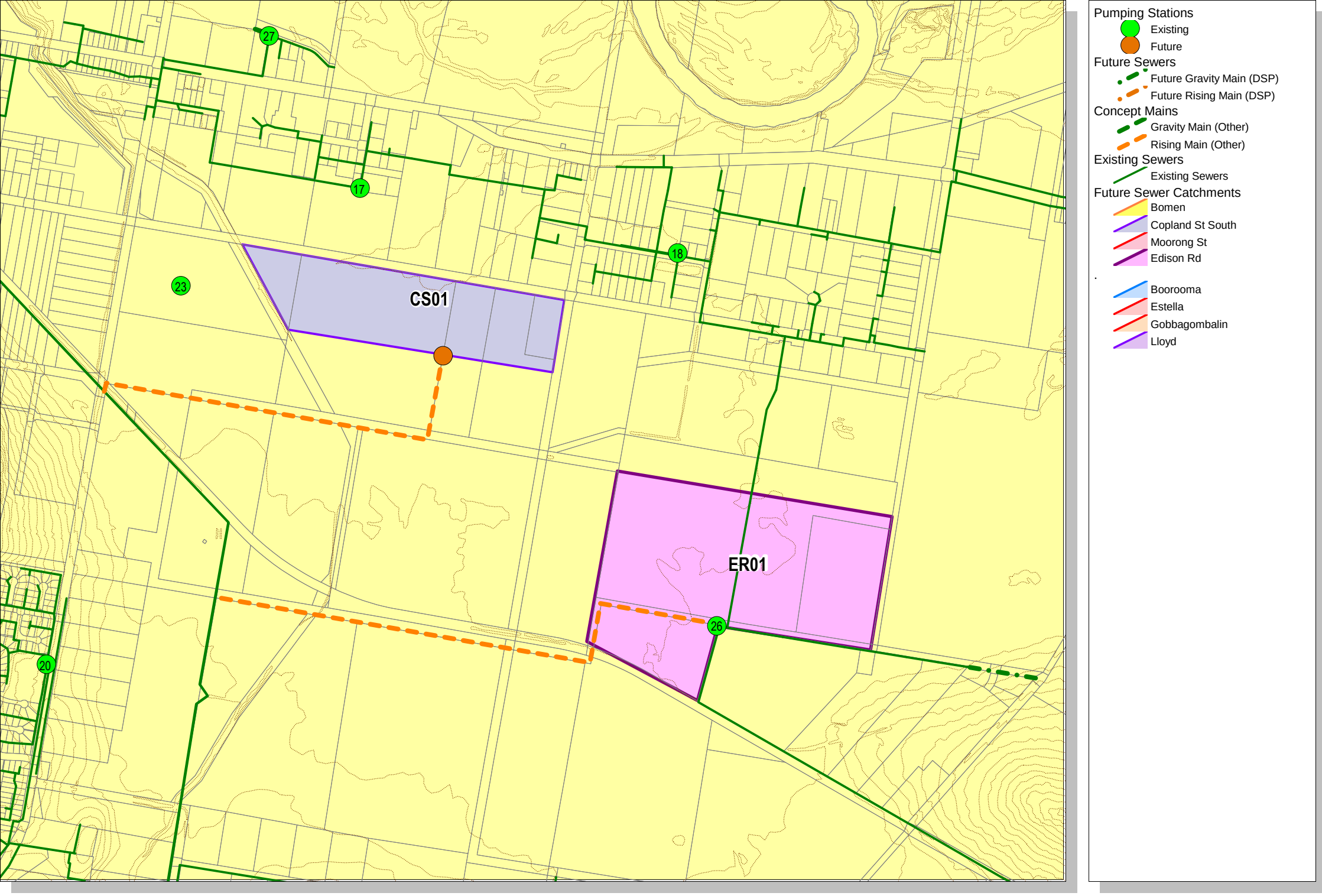

Figure 4- Edison Rd and Copland St South Sewerage Servicing 1:13184

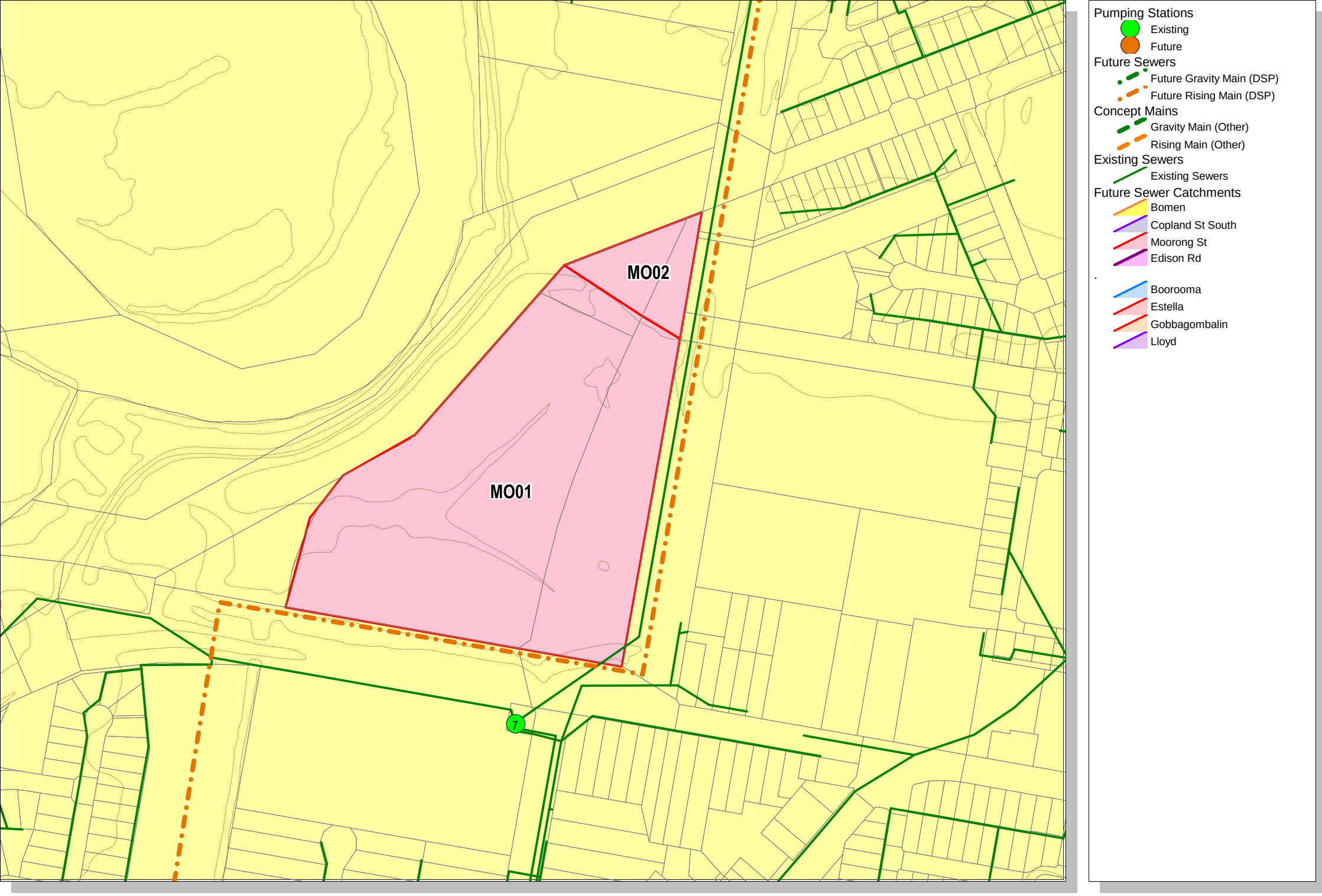

Figure 5- Moorong St Sewerage Servicing 1:4849