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Sewer Options Investigation Report



CONSULTING ENGINEERS

CIVIL • STRUCTURAL • BUILDING DESIGN • PLANNING

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1. Executive summary

The capacity of the existing sewer system within the precinct identified in Figure 1 below was investigated to determine if there was sufficient capacity for potential future subdivision of the included properties, and further to this the capacity of the system to support further development within a wider precinct area was also investigated. The capacity of the sewer system to support the subdivision of 2 Gregadoo Road into four allotments was also examined. It was determined that the existing system can support the proposed subdivision of 2 Gregadoo Road, with sufficient capacity available to support further development within the identified precinct to a theoretical maximum of 224 additional tenements, subject to Council approval.



Figure 1. Precinct area including 2 Gregadoo Road

It is noted that the sewer main from Olearia Place to the east in Gregadoo Road does not meet the minimum number of tenements required. Additional tenements would be advantageous to the proper functioning of this 90mm main. Refer to Table 2 in the report for analysis.

2. Introduction

This report has been prepared to investigate the sewer capacity within the Lake Albert area and whether the system has the ability to support a subdivision of 2 Gregadoo Road, currently one allotment with a total area of 2.03Ha, into four allotments, and potential further development of the wider precinct. The report will determine:

- the existing sewer system capacity servicing the area;
- the ability of sewer system to service the proposed development;
- if there is capacity within the sewer system for further development within the precinct above that proposed for 2 Gregadoo Road; and

- options available to facilitate servicing of the proposal.

3. Existing system capacity

In this section, sewer capacity of two lines within the proposed E-one system are evaluated. Pressure sewer 50mm PE main line in Blackbutt Road has a maximum capacity of 18 Equivalent Tenements (ET) with no minimum value. The current number of tenements discharging their sewer into this line is 10 to which three ETs will be added after subdivision development of 2 Gregadoo Road (i.e. future loading of 13 ETs with development) as can be counted in Figure 2 below.



Figure 2. Tenements connected to the sewer main lines

As it can be realised, both sewer loadings before and after the subdivision development is within the minimum and maximum range of the pressure sewer 50mm PE main line (i.e. 0-18 ETs).

A portion of the sewer 90mm PE main line between Mitchell Road and Blackbutt Road is critically underloaded in the sense that it receives less sewer amount than its designed minimum capacity. Minimum and maximum number of tenements for this sewer main is 19 and 240 tenements, respectively. There is a total of 13 tenements that discharge to sewer 90mm PE main between Mitchell Road and Blackbutt Road currently. This number increases to 16 ETs after the proposed subdivision development. The current line loading obviously does not reach its upper threshold, however, it is under the minimum value 19 ETs, both before and after the subdivision development. The rest of the sewer 90mm PE main line between Blackbutt Road to Olearia Place

receives enough amount of sewer (41 ETs before and 44 ETs after development), therefore its loading falls within the range of minimum to maximum design capacity. Due to its high capacity, the pipe allows for future expansion in the precinct identified in the below figure.



Figure 3. Future expansions

A summary of this discussion is presented in Table 1 below.

Table 1. E-one system lines capacity

Sewer line	section	Time of development	Sewer line loading	Min design capacity	Max design capacity	Falls in min-max range?
pressure sewer 50mm PE	Along Blackbutt Rd	Before	10	0	18	Yes
		After	13	0	18	Yes
pressure sewer 90mm PE	Mitchell Rd to Blackbutt Rd	Before	13	19	240	No
		After	16	19	240	No
pressure sewer 90mm PE	Blackbutt Rd to Olearia Pl	Before	41	19	240	Yes
		After	44	19	240	Yes

4. Serviceability of proposed development

As discussed under Section 3 above, there is sufficient capacity within the existing E-one system to service the proposed subdivision of 2 Gregadoo Road.

5. Scope for further development in the area

As discussed previously in Section 3, a portion of the sewer 90mm PE main line between Mitchell Road and Blackbutt Road is critically underloaded in the sense that it receives less sewer amount than its designed minimum capacity. Minimum and maximum number of tenements for this sewer main is 19 and 240 tenements, respectively. As depicted previously in Figure 2, this would therefore allow for further development as outlined, with a theoretical maximum of 224 additional tenements, subject to Council approval. Any additional subdivision within this area would need to install mains to service the development and discharge to the existing main in Gregadoo Road.

6. Alternative Sewer servicing options

Three sewer system alternatives are suggested including:

- Option 1: connection to an existing gravity sewer discharge point
- Option 2: combined gravity and pressurised sewer lines
- Option 3: E-one system

These options are shown in the appendix in Figure 4 and Figure 5. The project boundary is shown by a yellow rectangle in Figure 4, and the closest gravity sewer discharge point to the project is hatched by orange colour lines starting at the corner of Gregadoo Road and Main Street. Option 2 is shown on the left hand side of Figure 5, in which a sewer gravity line is installed on the western side of lots and ended at a proposed pump station which pumps the gathered sewer to a pressure sewer 90mm PE main line underneath Gregadoo Road. Furthermore, Figure 5 depicts E-one system in which each lot is directly connected to the pressure sewer 50mm PE main line underneath Blackbutt Road through a proposed E-one connection point.

6.1. Comparison of sewer discharge options

In this section, all available sewer options are assessed in terms of cost of installation, cost of maintenance, line capacity, and asset management.

6.1.1. Connection to an existing gravity sewer discharge point (option 1)

From financial point of view, option 1 is generally the most economic, since there is no significant maintenance cost for pump stations as it would fall under council maintenance program. However, in case existing gravity discharge outlet is not within a reasonable distance (below 500m) to the project site, substantial installation cost is incurred to build a connection line. As it can be seen in Figure 4, the closest gravity main line is located over 1.4 km away from the edge of the subdivision boundary. This means in addition to significant installation cost, building a connection line might not be possible because of existing residential houses and other municipal elements in the way. Therefore, option 1 is eliminated and not progressed any further due to excessive installation costs and implementation difficulties.

6.1.2. Combined gravity and pressurised sewer lines (option 2)

As it can be seen in Figure 5, supply and installation of a new pump station and a new gravity line is needed in option 2. This makes this option an expensive one in terms of cost of installation. However, cost of maintenance is minimum since the residents are charged

no annual maintenance fee. There is only a small pump station that needs maintenance which is undertaken by Wagga Wagga City Council.

In terms of line capacity, sewer spurs of lots are initially connected to a 150mm gravity line, and then to a sewer pump in option 2 as shown in Figure 55. Taking the relatively big size of this sewer line, it can be argued that a sufficient capacity is provided in option 2 with little to no possibility of sewer overloading.

Apart from cost and line capacity, there is another criterion to consider when making decision on selecting a sewer system; ease of asset management. Option 2 consists of a proposed rather short gravity line along with a small pump station which Wagga Wagga City Council may not support as they would have to maintain a small pump station. This makes option 2 unattractive for Wagga Wagga City Council in terms of asset management.

6.1.3. E-one system (option 3)

Option 3 is an economic plan in which only four E-one connection points are needed to be installed to carry lots sewer to the pressure PE line. Considering less equipment involved, lower installation cost is expected in E-one system as compared to option 2. Nevertheless, an annual maintenance fee is applied by Wagga Wagga City Council in the case of deciding to proceed with E-one system since the facilities are required to be provided with maintenance services. Therefore, although installation cost in option 3 is lower, maintenance cost is higher than option 2, for future landowners.

According to Figure 5, outcoming sewer of each lot first connects to lower size 50 mm pressure PE main and only then to the same 90 mm PE main in Gregadoo Road. Although this might be sufficient for four lots involved in the proposed subdivision, option 2 still provides a better service in terms of line capacity. This might be highlighted more in particular in future when additional tenements are constructed in the vicinity with a possible need to use this sewer line that will add into its current sewer loading.

From asset management perspective, option 3 (E-one system) is a desirable system. The reason is that the surrounding subdivisions in Gregadoo Road are all set up with E-one system, so deciding on installing E-one system for this proposed subdivision results in an integrated sewer system asset which functions in more coherent way with the rest of sewer network and is easier to repair, maintain, and manage.

Summary of the discussion on the performance of sewer options against the decision making criteria is presented in Table 2 below.

Table 2. Comparison of sewer options

Sewer options	Installation cost	Maintenance cost	Line capacity	Asset management
Option 1: connection to a gravity main line (Eliminated)	N/A	N/A	N/A	N/A
Option 2: combined gravity and pressurised sewer lines	✗	✓	✓	✗
Option 3: E-one system	✓	✗	✓	✓

7. The recommended servicing option

In the previous section, three suggested sewer alternatives were discussed and analysed through cost, capacity, and asset management criteria. Although there is not a sewer system which is superior in all criteria perspective, a more suitable option for the project can still be selected. After abovementioned assessments, option 3 (E-one system) is put forward as the recommended sewer system option. The main reason for this recommendation is the higher degree of integration to the existing sewer system already installed in the surrounding subdivisions which provides a more efficient asset management for Wagga Wagga City Council in long term. An E-one system will ensure future repair and replacement is more manageable and would, overall, be a superior sewer servicing choice from a public infrastructure economic viewpoint.

8. Conclusion

The existing sewer system/main in Gregadoo Road within the precinct has capacity to theoretically support up to an additional 224 tenements and is currently under the minimum number of tenements. Development within this area should be encouraged to enable the main to reach the minimum required tenements. The sideline in Blackbutt Road has the capacity to support an additional six tenements before duplication of the sideline is required. In summary there is capacity within the existing sewer system to support the proposed development of 2 Gregadoo Road and further development within the overall precinct.

Three options have been reviewed for servicing the development and precinct with the recommendation being to retain the existing E1 sewer system.

References

Wagga Wagga City Council website, <https://maps.wagga.nsw.gov.au/>

NSW Spatial Services. (n.d.). SIX Maps. Retrieved from SIX Maps: <https://maps.six.nsw.gov.au/>

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9. Appendix

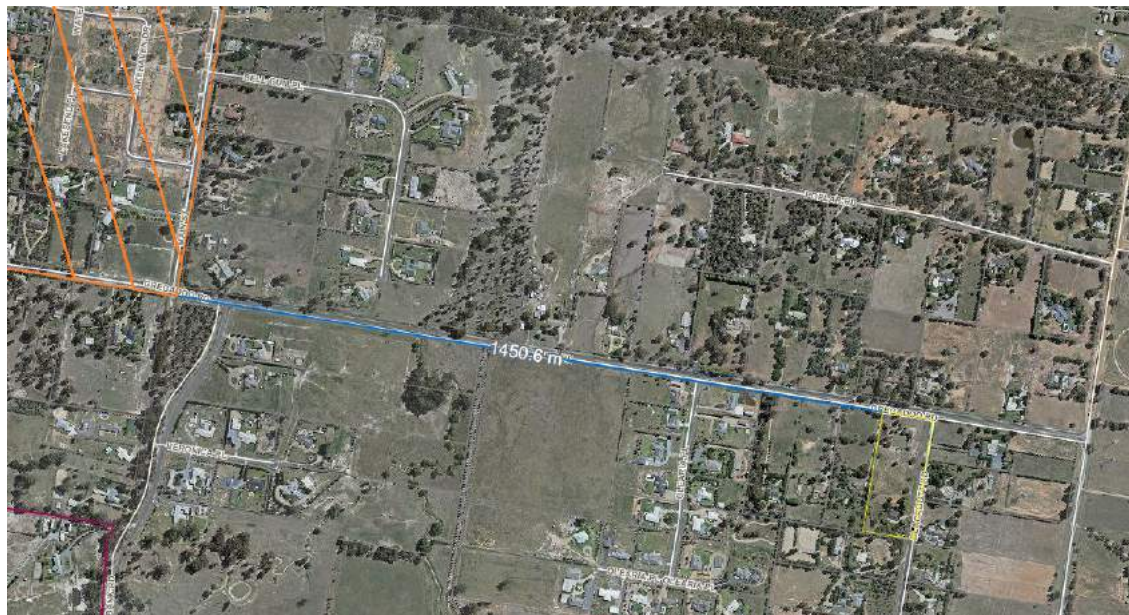


Figure 4. Gravity main line (option 1)



Concept gravity sewer main plan

Concept E-ONE main plan

Figure 5. Sewer options 2 and 3