East Biloela Sewerage Planning

Background

The existing trunk sewerage infrastructure is not sufficient for the anticipated residential growth each side of the Dawson Highway on the northeast of Biloela. Augmentation had been planned around a new pump station and rising main to be constructed for the 220 lot Lehwood Gardens development.

The sewerage catchment under consideration and the proposed augmentation is shown in Appendix A

However the developers of Lehwood Gardens are considering altering their development to larger lots without sewerage, and may defer it altogether. From the water and sewerage perspective it is preferable that the Lehwood Gardens development be sewered because

1. The existing trunk system will need to be augmented anyway, and if there are fewer connections then economy of scale is reduced and the cost per allotment will be higher.

2. On-site wastewater systems in Lehwood Gardens would increase the risk of contamination of groundwater supplies. The existing town bores are more than a kilometre from the development but there are closer private bores.

This report considers an alternative method of transporting sewage from east Biloela to the wastewater treatment plant with a view to:

1. providing a system that is more economical for Lehwood Gardens,

2. identifying the works required to service the balance of east Biloela independently of Lehwood Gardens if necessary, and

3. providing a basis for cost sharing for construction of the new external works.

Loading

The various sub-catchments that make up the sewerage catchment are depicted in Appendix B. The number after the identifying letter is the number of lots, or equivalent dwellings (EDs) in the sub-catchment.

The loading in the subject area is summarised in the following table:

Ref	Description	EDs
Pump Station 9 (Baptist) Catchment		
B	Brigalow Lakes existing	140
E	Panorama Heights	209
C	Brigalow Lakes stg 5-8	94
F	Highland Reserve	194
H	Howards' future	130
J	Existing rural res	100
Pump Station 7 (Dawson) Catchment		
A	PS7 (Ward Cres)	161
D	Howards' development	23
K	Clarke Drive	40
L	PS5 (Lawrence St)	150
Northern Catchment		
G	Lehwood Gardens	220
Total		**1,461**

Item L in the table is an optional item. This existing pump station can be decommissioned and the flow allowed to gravitate to pump station 7 if the intervening development proceeds. It is always desirable to minimise the number of pump stations in a sewerage scheme, and this would also free up capacity in the system to the southeast which may be of benefit in the future.

Design Flow

Different authorities use different sewage flow parameters, typically:

Average Dry Weather Flow (ADWF) = 200 L/d/EP to 250 L/d/EP
Peak Wet Weather Flow (PWWF) = 5 x ADWF
Banana Shire's Contributions Policy adopts PWWF = 1,080 L/d/EP
which is equivalent to ADWF = 216 L/d/EP

This is towards the lower end of the normal range, which is reasonable for the East Biloela catchments because the infrastructure is (or will be) new and infiltration/inflow should be relatively low.

From Council's Contributions Policy, residential load = 3.5 EP/lot (EP/ED)
Therefore PWWF = (3.5x1,080)/(24x3,600) = 0.04375 L/s/ED

This is the design flow rate in a gravity system. The discharge rate from a pump station will generally be higher than this because the pump must at least match the inflow rate but is rarely an exact match. The flow increase at a pump station can be minimised using VFDs and programming to match the discharge rate to the inflow rate. If sufficient storage volume is available, it is even possible to attenuate the flow peaks. However such storage must be in addition to the emergency breakdown storage.

Emergency storage equivalent to 4 hours flow at ADWF rate is required at pump stations to cater for the worst likely power failure without overflow.
The volume of storage required = 216 x (4 / 24) X 3.5 L/ED = 126 L/ED.

Augmentation Costs

The trunk infrastructure components are illustrated in Appendix C. The cost of the various augmentation components is listed below. Note that these can be staged because the existing components have varying amounts of surplus capacity.

1. Valley View Drive

This 225mm gravity main may not have capacity for the ultimate load. The upper sections appear to be on a grade of 1:100 or steeper, in which case they will have adequate hydraulic capacity. The bottom 1 or 2 legs may be laid at minimum grade in which they will ultimately require augmentation.

Allow 155m of 225 sewer + 2 manholes	$65,000

2. Pump Station 9

This pump station has some reserve capacity at the moment but will need to be upgraded to cater for the ultimate load. The well has a net capacity of 10 m^3, sufficient for ultimate pump operation but not for emergency storage.

Allow for pump and switchboard upgrade	$130,000
Emergency storage, 110 m3	$110,000

3. PS9 Pressure Main

This 150mm diameter pressure main will need to be duplicated to handle the ultimate flows.

465m of 150mm pressure main	$101,000

4. Pump Station 7

In due course the pumps and switchboard in this pump station will need to be upgraded to cater for the increased load. Emergency storage will also need to be upgraded.

Allow for pump and switchboard upgrade	$130,000
Emergency storage, 110 m3	$47,000

5. PS7 Pressure Main

This pressure main, together with the section of 225mm gravity main into which it discharges, will be the first sewage transport component to need augmenting. The most efficient augmentation appears to be a more direct pressure main route to connect to the 300mm gravity main at the corner of State Farm Road and Prairie Street.

840m of 225mm pressure main including bore under highway	$359,000

6. State Farm Road Gravity Main

This main has limited capacity but will be bypassed by the new main proposed in item number 5. Therefore no work is required on this main.

7. Civic Centre Gravity Main

This main is 300mm diameter. It appears to be laid at minimum grade (1:420) which provides a capacity of 990 EDs and so it will need to be duplicated for the ultimate load.

446m of 300mm gravity sewer and 6 manholes $236,000

8. Murchison Street Gravity Main

This main is constructed with substantial grade, which will provide adequate capacity for the ultimate flows.

9. Railway Gravity Main

This main is laid in flat terrain and understood to be laid at minimum grade. Hence its capacity is 990 EDs and it will need to be duplicated to carry the ultimate flows.

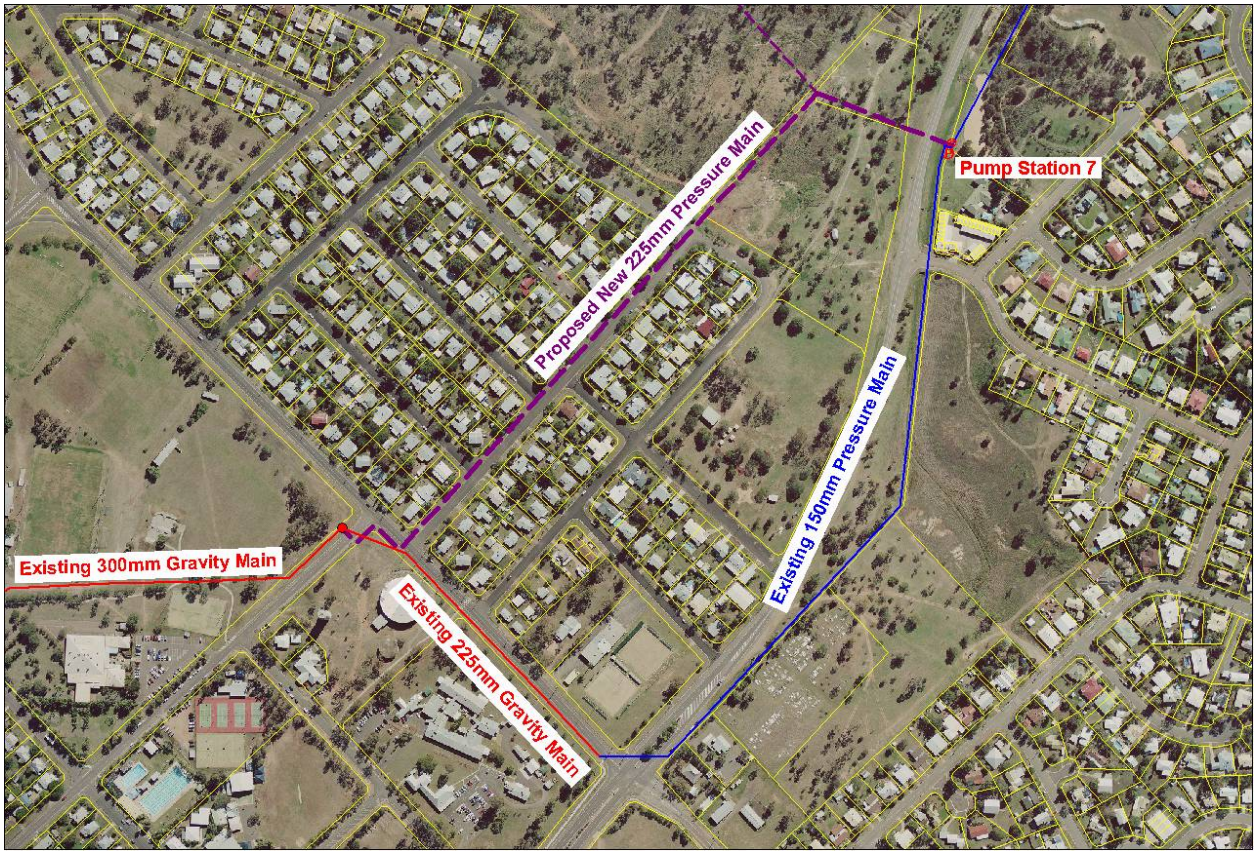
328m of 300mm gravity sewer and 8 manholes $199,000

10. Dual 450mmTrunk Gravity Mains

Assuming these are laid at minimum grade of 1:730, these mains have a capacity of 4,460 EDs – or a connected population of around 15,000 so they are adequate for the order of development under consideration.

These costs have been calculated on the basis of the discharge from the 220 lots in Lehwood Gardens entering the system via their own 150mm pressure main to the proposed new Pump Station 7 pressure main at the northern end of Prairie Street, as shown on the next page. This is the optimum long term arrangement, but there is an opportunity to stage this work, using the current spare capacity in Pump Station 7. Lehwood Gardens could construct the short length of 225mm pressure main to connect their main to Pump Station 7 and this could operate until that system reaches capacity. The rest of the 225mm pressure main along Prairie would then need to be constructed. This could be a condition of future stages of Lehwood Gardens.

This would have the advantage of improving the developer's cash flow and making sewerage more attractive – with the resultant improved protection of groundwater resources


Proposed New 225mm Pressure Main
Pump Station 7
Existing 150mm Pressure Main
Existing 300mm Gravity Main
Existing 225mm Gravity Main

Distribution of Costs

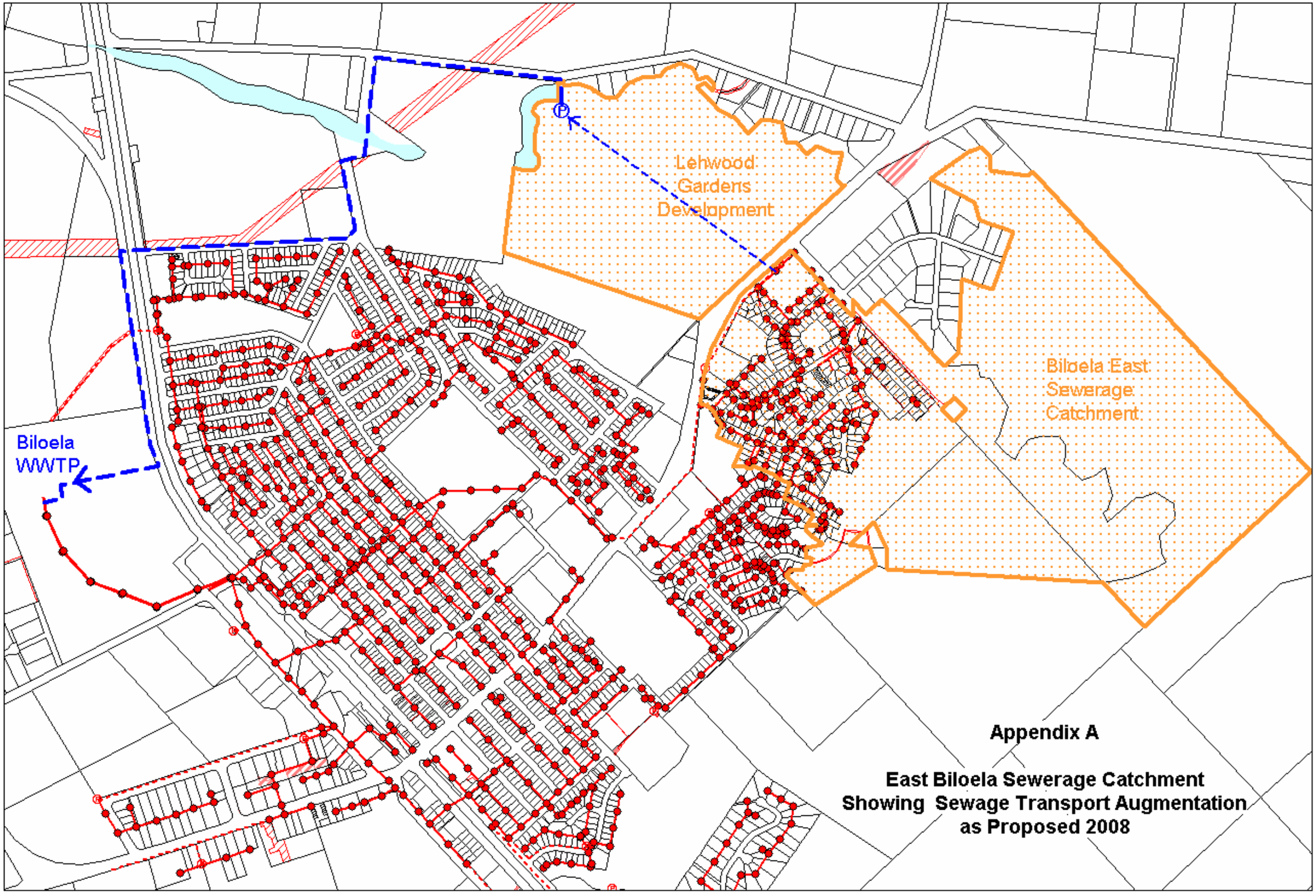
The various development sites use different amounts of the trunk infrastructure. The following table shows the augmentation costs distributed to the sites that use them.

	Component	Existing Size	Capacity (ED)		Loading (ED)			Augmentation Cost
			Desirable	Maximum	Existing	Existing + Pending	Existing + Pending + Potential	
1	**Valley View Drive** gravity main	398m, 225mm	450	550	140	640	870	**Part A** 65,000
2	**Pump Station 9** well capacity pumps emergency storage		410	640				130,000 110,000
3	**Pump Station 9** pressure main	465m, 150mm	410	720				101,000
							Total Part A	**406,000**
4	**Pump Station 7** well capacity pumps emergency storage		510	1,000	300	860	1240 including Pump Station 5	**Part B** 130,000 47,000
5	**Pump Station 7** pressure main	760m, 150mm	510	510				359,000
6	**State Farm Road** gravity main	348m, 225mm	450	550				
							Total Part B	**536,000**
7	**Civic Centre** gravity main	446m, 300mm	910	990	300	1080 including Lehwood Gardens	1460	**Part C** 236,000
8	**Murchison Street** gravity main	572m, 300mm	910	2,520				
9	**Railway** gravity main	328m, 300mm	910	990				199,000
10	**Dual 450mm trunk** gravity mains	878m, 2x450mm		4,460				
							Total Part C	**435,000**

	Total cost	Lots	Cost/Lot
Part A cost/lot	406,000	730	556
Part B cost/lot	536,000	940	570
Part C cost/lot	435,000	1160	375

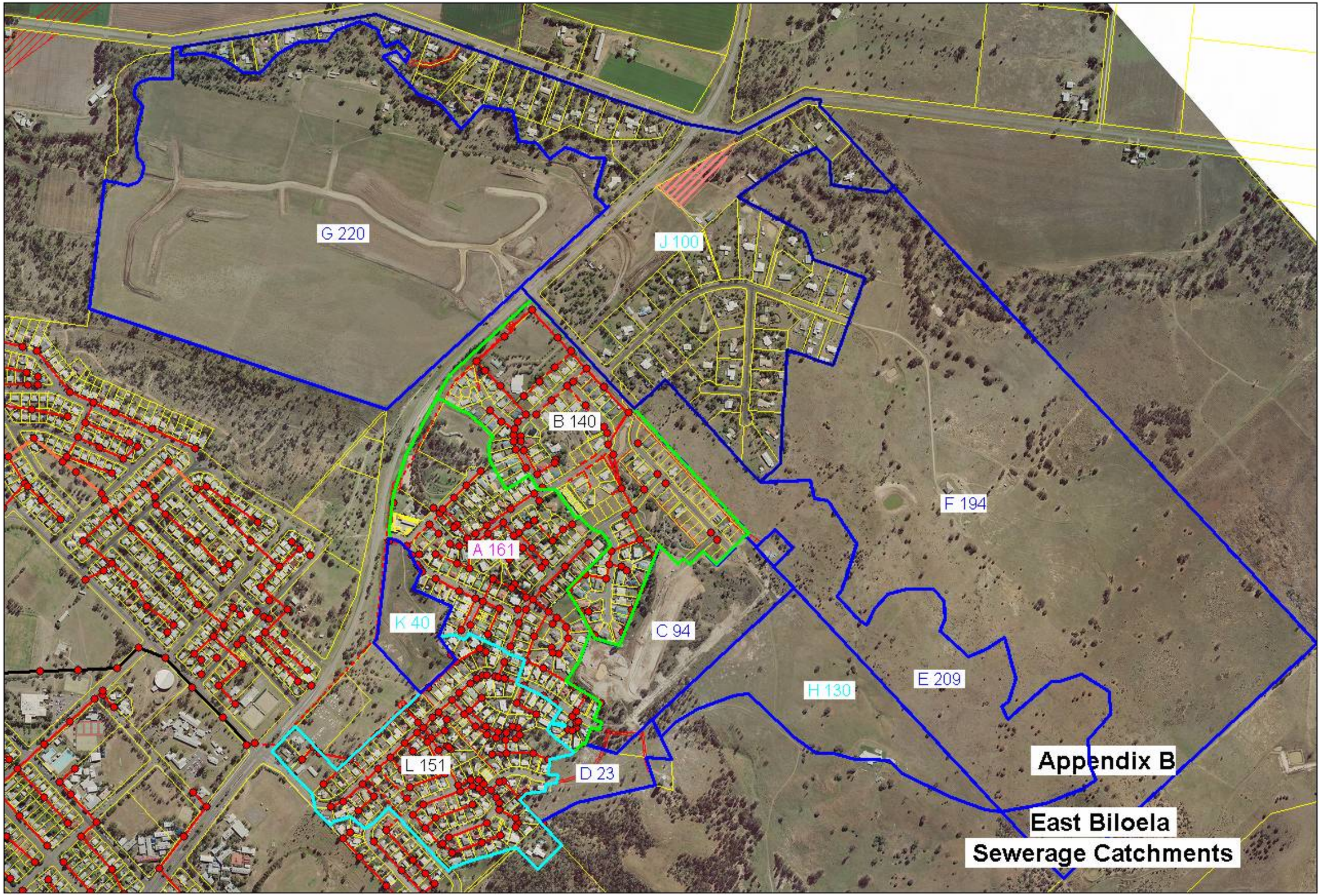
A developer in the Valley View Drive area, for example, would be required to pay Part A plus Part B plus Part C. Developers in other locations would similarly pay for the parts that they use.

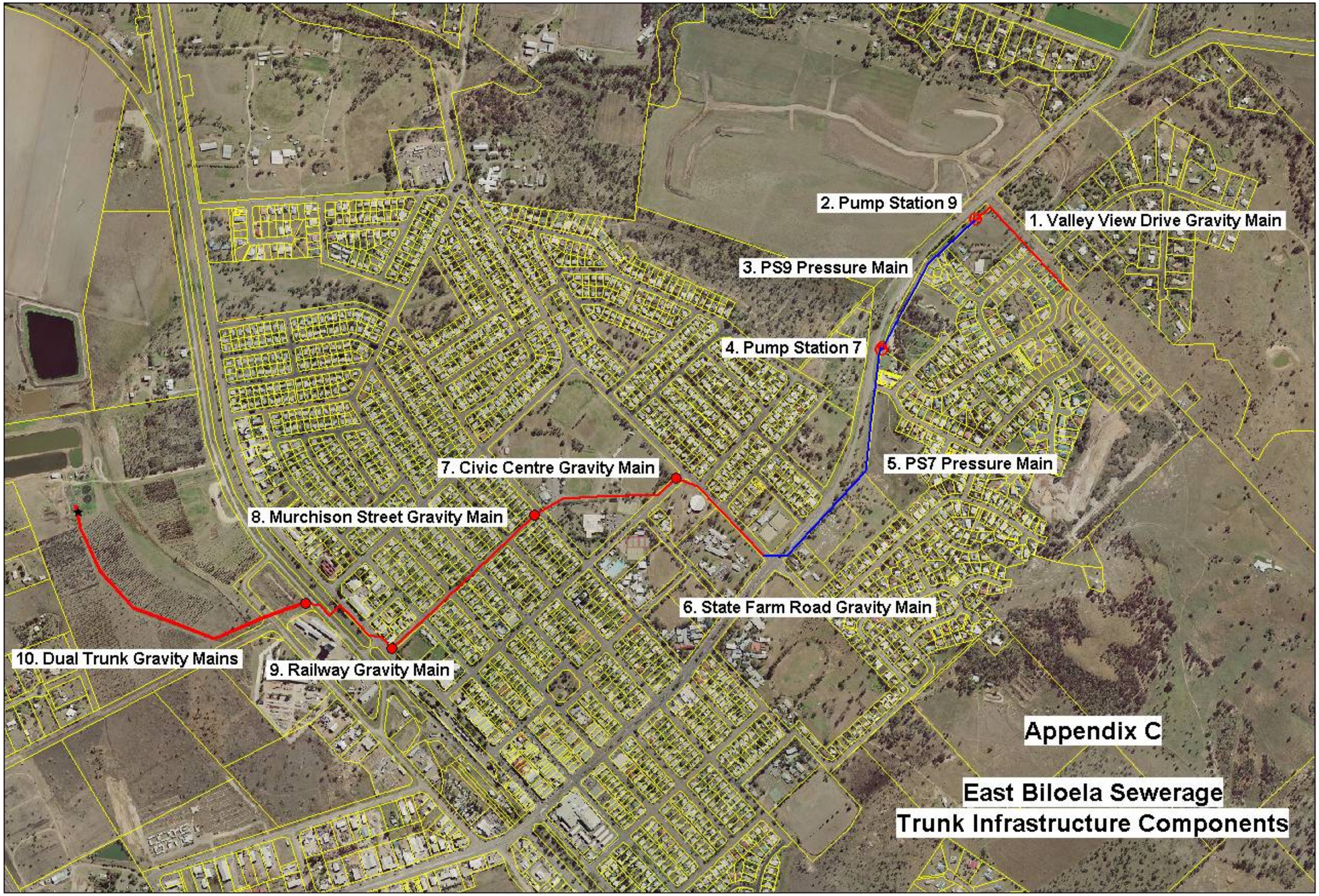
Council should condition developments that utilise the trunk sewerage infrastructure such that Council does not have to outlay funds for the development infrastructure. This could mean that one or more of the early developers pays more than their calculated share of the cost and the balance is recovered via an Infrastructure Agreement or is offset against Headworks Contributions.



Appendix A

East Biloela Sewerage Catchment
Showing Sewage Transport Augmentation
as Proposed 2008


G 220
J 100
B 140
A 161
K 40
C 94
F 194
E 209
H 130
L 151
D 23
Appendix B
East Biloela
Sewerage Catchments


2. Pump Station 9
1. Valley View Drive Gravity Main
3. PS9 Pressure Main
4. Pump Station 7
5. PS7 Pressure Main
7. Civic Centre Gravity Main
8. Murchison Street Gravity Main
6. State Farm Road Gravity Main
10. Dual Trunk Gravity Mains
9. Railway Gravity Main
Appendix C
East Biloela Sewerage
Trunk Infrastructure Components