Redland
CITY COUNCIL

Water Supply Master Plan for the Weinam Creek PDA

Redland Bay, Qld

Redland City Council
ABN 86 058 929 428
Bloomfield & Middle Streets Cleveland Q 4163
PO Box 21 Cleveland Q 4163 Australia
Telephone: (07) 3829 8999 Facsimile: (07) 3829 8765 Email: redland@redland.qld.gov.au

WRITER TO COMPLETE TABLE BELOW FOR VERSION CONTROL PURPOSES

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EXECUTIVE SUMMARY

The Weinam Creek Priority Development Area (PDA) is located in Redland Bay, on the Moreton Bay foreshore, within the Redland City Council (RCC) Local Government Area (LGA). The Economic Development Queensland (EDQ) Weinam Creek PDA Development Scheme has proposed a mixed-use master plan, majority of which will be high density residential apartment living, with buildings up to 7 storeys in height. The ultimate population density for the development scheme has been estimated at 3,000 Equivalent Population (EP) by Redland Investment Corporation (RIC).

EDQ's Weinam Creek PDA planning density (3,000 EP) far exceeds that of RCC's Local Government Infrastructure Plan (LGIP) ultimate planning demands (approximately 1,096 EP). A detailed water supply planning study was therefore undertaken to determine the impact that the additional loading will have on the existing network, and to identify infrastructure upgrades necessary to achieve RCC's minimum design standards.

The analysis identified that there is insufficient capacity for the existing water supply network to service the additional loading of the Weinam Creek PDA, and the increase in fire flow requirement (i.e. 15 L/s to 30 L/s) to service commercial land-use and buildings in excess of 3 storeys. Detailed hydraulic modelling identified two potential service strategy options to service the local network within RCC's minimum design standards, up to the 2041 planning horizon. Details are as follows.

Service Strategy Option	Proposed Infrastructure	$ / Unit Rate	Capital Cost ($)	Purpose
Option 1 - Split Serpentine Creek DMA with a new meter point located from the DN750 along Cleveland Bay Road	1,570 m of DN375	$1,535 / m	2.4M	Meet SF min. pressure and maintain pressure management
	905 m of DN300	$658 / m	0.6M	
	780 m of DN225	$522 / m	0.4M	
	770 m of DN200	$466 / m	0.4M	
	PRV/Meter assembly	$100k / unit	0.1M	
	200 m of DN200	$466 / m	0.1M	Meet FF min. pressure
	1,250 m of DN150	$394 / m	0.5M	
		TOTAL	**4.5M**	
Option 2 - Split Serpentine Creek DMA with a new meter point located from the DN600 along Giles Road	1,135 m of DN375	$1,535 / m	1.7M	Meet SF min. pressure and maintain pressure management
	830 m of DN300	$658 / m	0.5M	
	420 m of DN250	$553 / m	0.2M	
	640 m of DN200	$466 / m	0.3M	
	260 m of DN150	$394 / m	0.1M	
	PRV/Meter assembly	$100k / unit	0.1M	
	200 m of DN200	$466 / m	0.1M	Meet FF min. pressure
	1,250 m of DN150	$394 / m	0.5M	
		TOTAL	**3.6M**	

The hydraulic analysis of the two service options identified similar network pressures, with a minimum standard flow and fire flow pressure of 30-34 m and 12 m, respectively, at the 2041 planning horizon.

It is recommended that Option 2 is selected as the preferred service strategy for the following reasons.

- Improved security of supply for the downstream area.
- Less construction issues as pipe alignment is predominantly within non-urban areas and less involvement with State Government controlled roads.
- Caters for demand in the network up to the 2041 planning horizon.
- Lowest capital cost estimated.

1 INTRODUCTION

The Weinam Creek Priority Development Area (PDA) is located in Redland Bay, on the Moreton Bay foreshore, within the Redland City Council (RCC) Local Government Area (LGA). The total area of the PDA is estimated at 42 Hectares and is bounded by Weinam Street to the west, Moreton Bay to the east, Peel Street to the north, and Moores Road to the south.

The Economic Development Queensland (EDQ) Weinam Creek PDA Development Scheme has proposed a mixed-use master plan, majority of which will be high density residential apartment living, with buildings up to 7 storeys in height. The ultimate population density for the development scheme has been estimated at 3,000 Equivalent Population (EP). Refer to Appendix 1 for an overview of the PDA.

EDQ's Weinam Creek PDA planning density (3,000 EP) far exceeds that of RCC's Local Government Infrastructure Plan (LGIP) ultimate planning demands (approximately 1,096 EP). Therefore, the PDA will likely have a significant impact on the capacity of the existing water supply network, triggering the need for a review on the water supply infrastructure master plan for the relevant catchment.

1.1 Purpose

The purpose of this report is to quantify the impact of EDQ's Weinam Creek PDA planning demands on RCC's existing water supply network, and associated trunk infrastructure master planning. This information will form part of the revised headworks charges for approved Development Applications (DA), within the Weinam Creek PDA.

The hydraulic modelling was completed up to the 2041 planning horizon, to align with the Redland City Plan (2018) strategic framework. The 2016 Netserv Plan (and associated Water Supply Master Plan) were completed to a 2036 planning horizon to ensure compliance with minimum 20-year planning criteria required under the South-East Queensland Water (Distribution and Retail Restructuring) Act 2009.

1.2 Background

The Weinam Creek PDA is supplied by the Heinemann Road tank set, with a total combined storage of approximately 60 ML and Bottom Water Level (BWL) of RL 77.3 m AHD. The majority of the PDA is located within the Serpentine Creek District Metered Area (DMA), serviced by an existing PRV with a setting of approximately 60 m residual pressure, and ground level of RL 12.5 m AHD. The north-west area of the PDA is located within the Boundary Street DMA, with an existing fixed PRV setting of approximately 42 m residual pressure, and ground level of RL 9.7 m AHD.

The PDA is directly serviced by a trunk system of DN200, DN225 and DN300 trunk system downstream of each PRV. Refer to Appendix 2 for an overview of the existing water supply network.

RCC's current LGIP only considers augmentations and demand projections up to 2036, which identified 6 pipe upgrades to service fire flow deficiencies, with no upgrades required to service standard flow. The only LGIP upgrades that would directly impact the Weinam Creek PDA, would be the DN150 cross-connection between Auster Street and Moores Road, and DN150 cross-connection between Banana Street and the Weinam Creek boat ramp.

1.3 Relevant Reports

- The '*Redland Water Water Supply Master Plan*' (Oct 2016) report presents information on augmentations to support RCC's LGIP for water supply.
- The '*SEQ Water Supply and Sewerage Design and Construction Code (SEQ WS&S D&C Code)*' (Jul, 2013) report presents RCC latest design standards.

2 METHODOLOGY

2.1 Design Standards

The design standards of the "*South East Queensland Water Supply and Sewerage Design and Construction Code*" (2013) were utilised for the assessment. A summary of the most relevant requirements are as follows.

Table 2-1. SEQ WS&S D&C Code provisions relevant to the analysis

Provision	Specification
ET to EP conversion factor	2.7
Maximum pipe velocity	2.5 m/s
Maximum head loss	5 m head/km for <=DN150 3 m head/km >=DN200
Minimum service pressure	22 m at the property boundary
Maximum service pressure	55 m
Minimum fire flow network pressure and background demand	12 m at 2/3 peak hour demand (res.) 12 m at peak hour demand (com./ind.)
Fire flow	15 L/s (res. <= 3 storeys) 30 L/s (res. > 3 storeys) 30 L/s (com./ind.)

2.2 Hydraulic Modelling

The methodology adopted for the Weinam Creek PDA water supply master plan study is as follows.

1. RCC's latest Mike Urban LGIP water supply hydraulic model (IDM_Rev17) was adopted for the hydraulic analysis. For the post-development scenario, existing LGIP planning demands were removed and EDQ's Weinam Creek PDA planning demands (3,000 EP total) were allocated to the closest model node, on a lot by lot basis.
2. For the 2041 planning horizon, a detailed 1 x Maximum Day (MD) standard flow analysis was undertaken on the local pipe reticulation servicing the PDA, and DMA network, for both pre- and post-development scenarios. The assessment of the pre-development scenario was undertaken to merely identify the impact that the Weinam PDA demands has on RCC's existing LGIP.
3. A number of service strategy options were investigated for standard flow deficiencies triggered by the Weinam Creek PDA. This included network improvements such as pipe size upgrades, pipe cross-connections, DMA boundary changes, increase to PRV settings, operational changes etc.

   Note: An assessment on the capacity of the water supply tanks (Heinemann Road LLZ) was not undertaken, as the additional loading (3,000 EP) was considered a minor impact to the existing storage capacity, approximately 60 ML.
4. For the pre-development scenario, the Serpentine Creek DMA pipe network was allocated a 15 L/s @ 2/3 Peak Hour demand fire flow. This is due to RCC's existing LGIP based on a low density residential land-use, with buildings < = 3 storeys.
5. For the post-development scenario, Residential (15 L/s) and commercial (30 L/s) fire flow allocation was applied to the local pipe network servicing the PDA, as per the following.

   a. Pipework along Auster Street, Esplanade and Moores Road: 15 L/s @ 2/3 Peak Hour demand, due to the EDQ development zoning of high density residential @ 3 storeys or less.
   b. Pipework along the foreshore from Meissner Street to Weinam Street: 30 L/s @ Peak Hour demand, due to the mixed-use zoning including commercial use.
   c. All remaining pipework: 30 L/s @ 2/3 Peak Hour demand, due to high density residential above 3 storeys in height.

   Note: Tank MOL was not considered for both the standard flow and fire flow assessments, as the DMA PRV's operate as a "Break of Head".

6. In combination with the solutions identified for standard flow, a number of service strategy options were investigated for fire flow deficiencies triggered by the Weinam Creek PDA. This included network improvements such as pipe size upgrades, pipe cross-connections, PRV setting increases, DMA boundary changes etc.
7. To determine the most economical option, a capital cost assessment was undertaken on each service strategy.
8. Modelling results were verified and findings reported.

3 RESULTS

3.1 Standard Flow

As per the methodology described in Section 2.2 of this report, a detailed standard flow network analysis was undertaken on the 2041 planning horizon, pre- and post-development of the Weinam Creek PDA. The post-development analysis identified significant standard flow minimum pressure failures at elevated areas of the Serpentine Creek DMA, with approximately 185 nodes unable to meet the 22m residual pressure requirement. A summary of results is presented below in Table 3-1 and Appendix 3.

Table 3-1. Standard flow modelling results, pre- and post-development

Provision	2041 (Pre-develop. Demands)	2041 (Post-develop. - Weinam Creek PDA)
Weinam Creek PDA min. pressure (m)	43.7	29.2
Serpentine Creek DMA min. pressure (m)	16.9	9.4
No. of total min. pressure failures	30	185

Note 1: RCC's hydraulic model is showing pre-existing standard flow failures at the 2041 planning horizon, as RCC's latest LGIP was based on an ultimate planning horizon of 2036. The pre-development pressure failures can be resolved via a 5 m increase in the PRV setting for the Serpentine Creek DMA. This is however not considered a viable long-term option for aging network assets also subject to additional growth.

Note 2: The above results are with the existing Serpentine Creek DMA PRV setting @ 61 m residual pressure.

The pressure deficiencies demonstrated in Table 3-1 above were predominantly due to a cumulative head loss, through the existing DN375, DN300 and DN225 trunk system, from the increase in peak hour demand (25 L/s). Refer to Figures 3-1 and 3-2 below for the trunk HGL pre- and post-development of the Weinam Creek PDA, at the 2041 planning horizon.

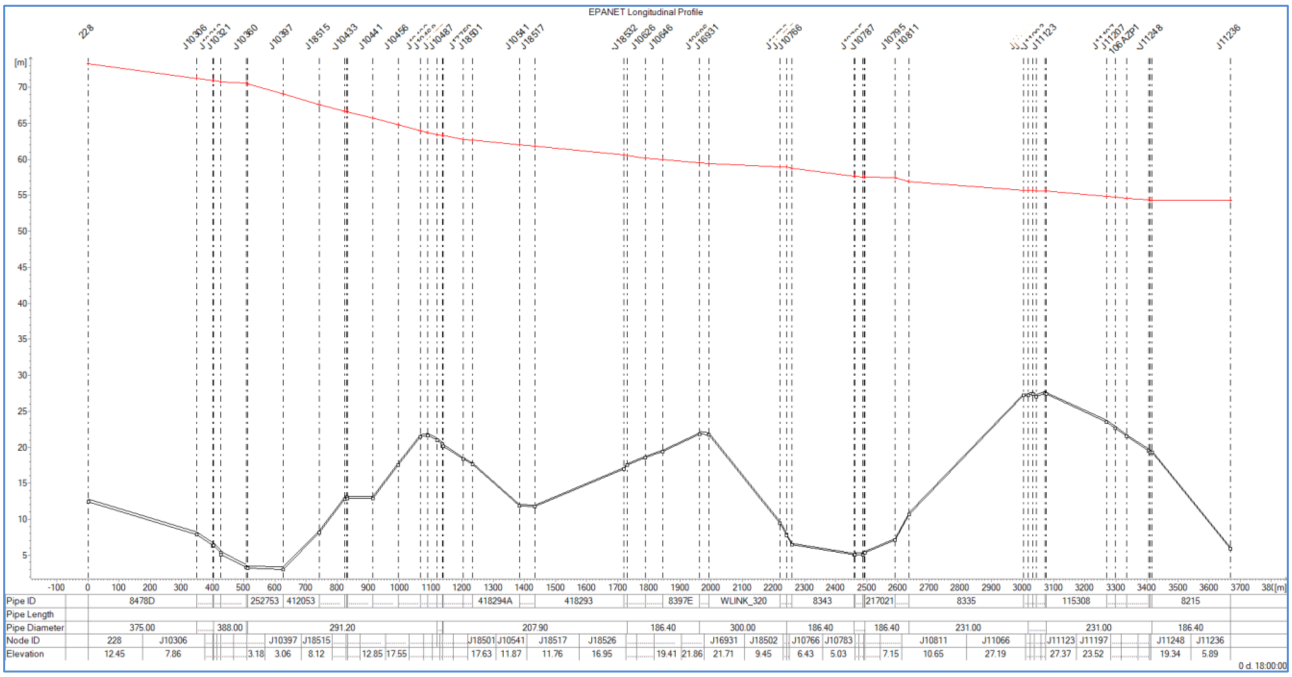

Figure 3-1. Peak demand HGL along Serpentine Creek DMA trunk system, pre-develop. Weinam Creek PDA

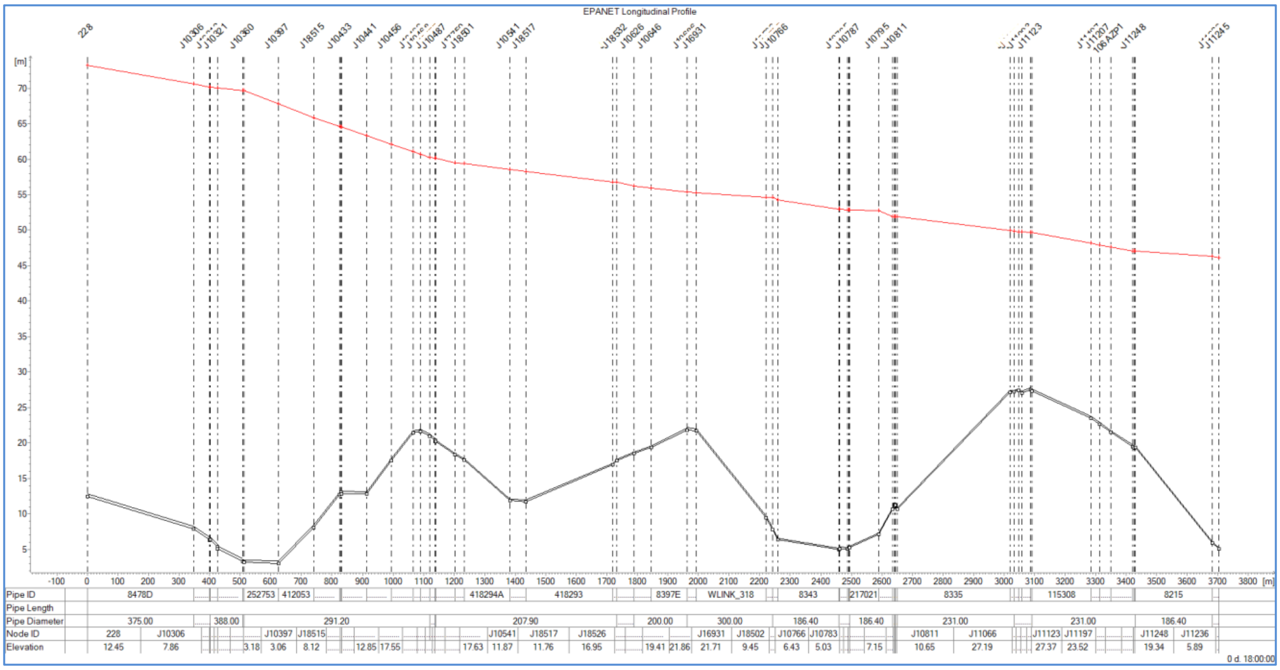

Figure 3-2. Peak demand HGL along Serpentine Creek DMA trunk system, post-develop. Weinam Creek PDA

As demonstrated in the figures above, the head loss over the length of the trunk system is cumulative and not the result of an isolated capacity deficiency. A wider network service strategy was therefore required to resolve the overall pressure deficiencies that were triggered by the Weinam Creek PDA. Refer to Section 3.3 for relevant service strategy options in order to achieve RCC's minimum design standards, up to the 2041 planning horizon.

3.2 Fire Flow

As per the methodology described in Section 2.2 of this report, a detailed fire flow network analysis was undertaken on the 2041 planning horizon, pre- and post-development of the Weinam Creek PDA. The post-development analysis identified significant fire flow minimum pressure failures within the reticulation network directly servicing the Weinam Creek PDA, and additional failures within the external network. A summary of results is presented below in Table 3-2 and Appendix 4.

Table 3-2. Fire flow modelling results, pre- and post-development

Provision	2041 (Pre-develop. Demands)	2041 (Post-develop. - Weinam Creek PDA)
Weinam Creek PDA min. pressure (m)	32.8	-53.2
Serpentine Creek DMA min. pressure (m)	-9.7	-53.2
No. of total min. pressure failures	41	90

Note 1: RCC's hydraulic model is showing pre-existing fire flow failures at the 2041 planning horizon, as RCC's latest LGIP is based on an ultimate planning horizon at 2036.

Note 2: The above results are with the existing Serpentine Creek DMA PRV setting @ 61 m residual pressure.

Note 3: 30 L/s @ peak hour demand was applied to pipework along Banana Street and The Esplanade, 30 L/s @ 2/3 peak hour demand was applied to pipework along Outridge Street, Weinam Street and Hamilton Street. All remaining pipework applied 15 L/s @ 2/3 peak hour.

The pressure deficiencies demonstrated in Table 3-2 were predominantly due to insufficient pipe sizes, to meet the increase in peak hour demand (25 L/s) from the Weinam Creek PDA, and escalation of fire flow requirements for commercial land-use and residential buildings in excess of 3 storeys, i.e. an increase from 15 L/s to 30 L/s for all allotments north of Weinam Creek. Significant pipe upgrades were therefore required to resolve these issues. Refer to Section 3.3 for relevant service strategy options, to achieve RCC's minimum design standards, up to the 2041 planning horizon.

3.3 Service Strategy Options

The following service strategy options were developed to resolve the identified standard flow and fire flow deficiencies triggered by the Weinam Creek PDA. The fire flow upgrades were identical for both options, as these were localised issues unrelated to the service strategies developed for standard flow requirements.

- Option 1 – Split Serpentine Creek DMA with a new meter point located from the DN750 along Cleveland Bay Road. Refer to Appendix 5 for further details.
- Option 2 – Split Serpentine Creek DMA with a new meter point located from the DN600 along Giles Road. Refer to Appendix 6 for further details.

In order to complete a comparison of both options, a capital cost estimation was undertaken for the proposed infrastructure works. The impact to the cost savings associated with the Serpentine Creek DMA pressure management scheme (e.g. leakage and pipe bursts) was not considered, as each option would provide identical zone boundaries and additional pressure reduction, estimated at 5 m for 46.6 km of pipe. General operational and maintenance costs were also excluded from the assessment as both options would have a negligible difference. A summary of the capital cost estimate is as follows.

Table 3-3. Summary of the capital cost estimate for each service option

Service Strategy Option	Proposed Infrastructure	$ / Unit Rate	Capital Cost ($)	Purpose
Option 1	1,570 m of DN375	$1,535 / m	2.4M	Meet SF min. pressure and maintain pressure management
	905 m of DN300	$658 / m	0.6M	
	780 m of DN225	$522 / m	0.4M	
	770 m of DN200	$466 / m	0.4M	
	PRV/Meter assembly	$100k / unit	0.1M	
	200 m of DN200	$466 / m	0.1M	Meet FF min. pressure
	1,250 m of DN150	$394 / m	0.5M	
		TOTAL	**4.5M**	
Option 2	1,135 m of DN375	$1,535 / m	1.7M	Meet SF min. pressure and maintain pressure management
	830 m of DN300	$658 / m	0.5M	
	420 m of DN250	$553 / m	0.2M	
	640 m of DN200	$466 / m	0.3M	
	260 m of DN150	$394 / m	0.1M	
	PRV/Meter assembly	$100k / unit	0.1M	
	200 m of DN200	$466 / m	0.1M	Meet FF min. pressure
	1,250 m of DN150	$394 / m	0.5M	
		TOTAL	**3.6M**	

Note 1: Unit capital costs sourced from 2016 Cardno rates and indexed 3% per annum (compounded), for 3 years.

Note 2: Assumed soft rock urban adjustment factor (1.16) for all pipework.

Note 3: Rates include valves/hydrants/services and 20% overheads. No contingency adjustments have been applied.

Note 4: For both options, approximately 465 m of the proposed DN150 fire flow upgrades are existing LGIP augmentations, i.e. cross connection between Auster St and Moores Rd, and cross-connection of Banana Street and Weinam Creek boat ramp.

Table 3-3 demonstrates that Option 2 should have a $0.9M (approximately) lower capital cost to that of Option 1. This is predominantly due to a lower pipe length and size to that of Option 2.

For information purposes only, a cost saving estimate was undertaken on the additional 4-5 m of pressure reduction that both service options can achieve. These savings are associated with leakage, pipe/connection bursts and asset life extension for approximately 46.6 km of pipe work, with the “splitting” of the Serpentine Creek DMA. These savings were based on the below assumptions.

- Current industry understanding for 150mm AC mains is every 10 metre reduction in Average Zone Night Pressure (AZNP) will increase the asset life by 2.3 years (source: WSAA / Allan Lambert).
- According to the WSAA Stage 3 LAPMET software, it is acceptable to assume that a 10% reduction in pressure provides a 10% reduction in leakage.
- The pipe burst saving estimate was calculated by comparing pre- and post- pressure reduction burst rates, as per RCC’s Maximo database, per metre of pressure reduction, for DMAs 202, 203, 204 and 205. This resulted in a 0.0059 burst saving, per metre of pressure reduction, per month. Service burst data was not available so was assumed at 50% of the burst rate and replacement cost to that of pipes. This was deemed acceptable as City of Gold Coast’s (CoGC) PLMP monitored a service burst saving rate approximately 50% lower to that of pipe bursts.

Hydraulic modelling identified the following maximum static pressure reduction achievable for both service options.

- 28.8 m on 38.4 km of pipe for the Western Zone
- 33.0 m on 46.6 km of pipe for the Eastern Zone.

Based on the previously discussed assumptions re unit costs related to pressure reduction, this resulted in the following additional 50 year NPV cost saving estimation.

- **Asset life extension** - $375k over 50 year total replacement program for 46.6 km of pipe, based on 1 year asset life extension. Adopted DN100 pipe replacement cost of $403 per metre, with an adjustment rate of 1.16 for Urban Soft Rock. Pipe replacement cost sourced from Cardno 2016 unit rates, compounded to 2019 (3 years) at 3% index, and 25% contingency.
- **Leakage** - $256k over 50 year time period, based on total combined zone leakage of 2.7 L/s (source: Redland Water 106 Serpentine Creek DMA Report, 2009) and 3.1% of additional pressure reduction for 55% (46.6 km of pipe) of the existing DMA. Adopted Retail Price of $3.536 per kL. Based on Bulk Water price of $2.935 per kL, this saving is reduced to $212k.
- **Pipe/service bursts** - $80k over 50 year time period, based on 0.006 pipe burst saving / m pressure reduction / month. A repair cost of $3,000 per pipe burst and $1,500 per service burst was adopted.

The above discussion shows that Options 1 and 2 is estimated to offset $700k in operational costs, for a 50-year time period, associated with the additional 5 m pressure reduction on 46.6 km of the pipe network.

3.4 Timing of Construction

A subsequent hydraulic analysis was undertaken to estimate timing of the identified pipe upgrades. Details are as follows.

Standard Flow

- With the ultimate Weinam PDA demands (3,000 EP) applied at the 2018 MD scenario, the Serpentine Creek DMA marginally passed the peak hour min. pressure standard (22 m).
- With the ultimate Weinam PDA demands (3,000 EP) applied at the 2031 MD scenario, the network failed (by approx. 5 m) and required all proposed standard flow upgrades to resolve.

Therefore, the standard flow upgrades will likely be triggered prior to the 2031 planning horizon. With the PDA at ultimate development, any significant growth within the Serpentine Creek DMA would likely result in standard flow pressures to falling below the minimum standard. It is therefore recommended that all standard flow upgrades are completed prior to 2030, assuming the PDA reaches ultimate development prior to this time and there is no significant population growth within the DMA.

Fire Flow

- With the existing LGIP demands applied at the 2018 MD scenario, the following upgrades were required to meet the increase in fire flow requirements, i.e. 15 L/s to 30 L/s.
  - DN150 cross connection between Banana St and Weinam Creek Boat Ramp.
  - DN150 upgrade for the existing DN100 that extends from Weinam St into the Jetty car park (east of Redland Bay Fishing Club).
- With the ultimate Weinam PDA demands (3,000 EP) applied at the 2018 MD scenario, all identified fire flow upgrades were required to meet the increase in fire flow (30 L/s) and ultimate PDA demand (3,000 EP).

Therefore, the extensive fire flow upgrades were triggered by both the increase to 30 L/s and the additional PDA demand. First stages of development (above 3 stories or commercial land-use) should install the two DN150 upgrades identified above (i.e. Banana St and Jetty car park). Modelling indicates that the remaining fire flow upgrades will be required at approximately 20% loading of the PDA (approx. 600 EP).

In summary, all standard flow upgrades are required prior to ultimate development of the PDA (3,000 EP), and all fire flow upgrades are required prior to the PDA reaching a density of 600 EP.

3.5 Non-financial Considerations

The key ‘non-financial’ considerations that should be factored into strategy selection are displayed in the tables below.

Table 3-4. 'Non-financial' advantages for each service strategy option

Option	Option Advantage	Comment
Option 1	Operations	High level of operational flexibility and redundancy
	Pressure management	Allows an additional 4-5m of pressure reduction for 46.6 km of network
	Network Capacity	Significantly improves network capacity, with a peak hour min. pressure of 34 m at the 2041 planning horizon
Option 2	Operations	Highest level of operational flexibility and redundancy
	Pressure management	Allows an additional 4-5m of pressure reduction for 46.6 km of network
	Network Capacity	Significantly improves network capacity, with a peak hour min. pressure of 30 m at the 2041 planning horizon

Table 3-5. 'Non-financial' disadvantages for each service strategy option

Option	Option Disadvantage	Comment
Option 1	Implementation	Significant pipe works required, including a long pipe alignment along Main Roads
	Operations	Requires some pipe lengths to be "dead-end" with the DMA boundary changes. This may result in water quality issues
Option 2	Implementation	Significant pipe works required
	Operations	Requires some pipe lengths to be "dead-end" with the DMA boundary changes. This may result in water quality issues

3.6 Recommended Service Option

Option 2 has been identified as the preferred option, due to the following reasons.

- Improved security of supply for the downstream network, due to the proposed DN375 trunk line from the existing DN600 along Giles Road.
- Less construction issues as pipe alignment is predominantly within non-urban areas and less involvement with State Government controlled roads.
- Caters for demand within the network (30 m @ peak hour) up to the 2041 planning horizon.
- Lowest capital cost estimated.

Modelling results with the implementation of this service option, are as follows.

Table 3-6. Standard flow peak hour modelling results for recommended service strategy option

Provision	2041 (Post-develop. Weinam PDA)
Weinam Creek PDA min. pressure (m)	51.5
Serpentine Creek DMA min. pressure (m)	30.0
No. of min. pressure failures	0

Table 3-7. Fire flow modelling results for recommended service strategy option

Provision	2041 (Post-develop. Weinam PDA)
Weinam Creek PDA min. pressure (m)	17.6
Serpentine Creek DMA min. pressure (m)	12.0
No. of min. pressure failures	0

4 CONCLUSION

The Weinam Creek Priority Development Area (PDA) is located in Redland Bay, on the Moreton Bay foreshore, within the Redland City Council (RCC) Local Government Area (LGA). The Economic Development Queensland (EDQ) Weinam Creek PDA Development Scheme has proposed a mixed-use master plan, majority of which will be high density residential apartment living, with buildings up to 7 storeys in height. The ultimate population density for the development scheme has been estimated at 3,000 Equivalent Population (EP).

EDQ's Weinam Creek PDA planning density (3,000 EP) far exceeds that of RCC's Local Government Infrastructure Plan (LGIP) ultimate planning demands (approximately 1,096 EP). A detailed water supply planning study was therefore undertaken to determine the impact that the additional loading will have on the existing network, and to identify infrastructure upgrades necessary to achieve RCC's minimum design standards.

The analysis identified that there is insufficient capacity for the existing water supply network to service the additional loading of the Weinam Creek PDA, and the increase in fire flow requirement (i.e. 15 L/s to 30 L/s) to service commercial land-use and buildings in excess of 3 storeys. Two service strategy options were therefore developed to service the local network within RCC's minimum design standards, up to the 2041 planning horizon. Details are as follows.

Table 4-1. Summary of the capital cost estimate for each service option

Service Strategy Option	Proposed Infrastructure	$ / Unit Rate	Capital Cost ($)	Purpose
Option 1 - Split Serpentine Creek DMA with a new meter point located from the DN750 along Cleveland Bay Road	1,570 m of DN375	$1,535 / m	2.4M	Meet SF min. pressure and maintain pressure management
	905 m of DN300	$658 / m	0.6M	
	780 m of DN225	$522 / m	0.4M	
	770 m of DN200	$466 / m	0.4M	
	PRV/Meter assembly	$100k / unit	0.1M	
	200 m of DN200	$466 / m	0.1M	Meet FF min. pressure
	1,250 m of DN150	$394 / m	0.5M	
		TOTAL	**4.5M**	
Option 2 - Split Serpentine Creek DMA with a new meter point located from the DN600 along Giles Road	1,135 m of DN375	$1,535 / m	1.7M	Meet SF min. pressure and maintain pressure management
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	200 m of DN200	$466 / m	0.1M	Meet FF min. pressure
	1,250 m of DN150	$394 / m	0.5M	
		TOTAL	**3.6M**	

It is recommended that Option 2 is selected as the preferred service strategy for the following reasons.

- Improved security of supply for the downstream network.
- Less construction issues as pipe alignment is predominantly within non-urban areas and less involvement with State Government controlled roads.
- Caters for demands in the network up to the 2041 planning horizon.
- Lowest capital cost estimated.

It is also recommended that RCC completes the following.

- Undertake discussions with RCC's IC Unit regarding the implementation of the preferred strategy including apportionment of headworks charges to this area.

5 APPENDICES

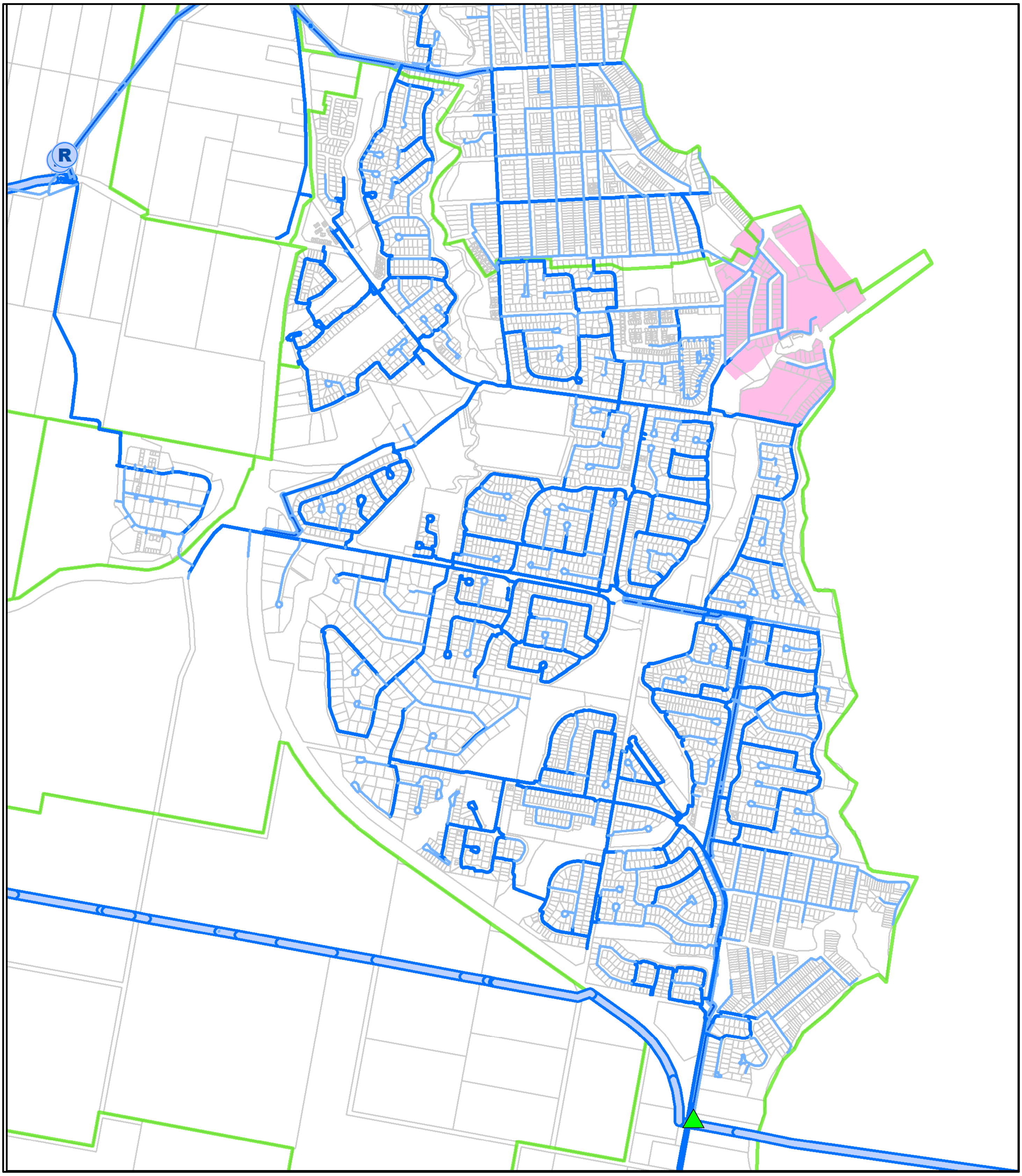
Appendix 1. Weinam Creek PDA Master Plan

w e i n a m   c r e e k

master plan

Ref. No. 133693 Date : March 2019 Scale 1 : 1500@A1

Appendix 2. Existing water supply network



Legend

Water Mains - Operating Diameter

- 20 - 100 mm
- 101 - 250 mm
- 251 - 500 mm
- 501 - 900 mm

- Serpentine Creek PRV
- Distribution Maintenance Areas
- Current Land
- Weinam Creek PDA

D1	24/07/2019	JM	MI	MI
Issue	Date	By	Chkd	Appd

Redland City Council
Redland Water
PO Box 21
Cleveland QLD 4163

Job Title **Weinam Creek PDA**

Drawing Title **Existing water supply network**

Scale at A3 **1:406,300** Drawing Status **Draft V1**

Coordinate System **GDA 1994 MGA Zone 56**

Date of Print **24/07/2019** Drawing No **001**

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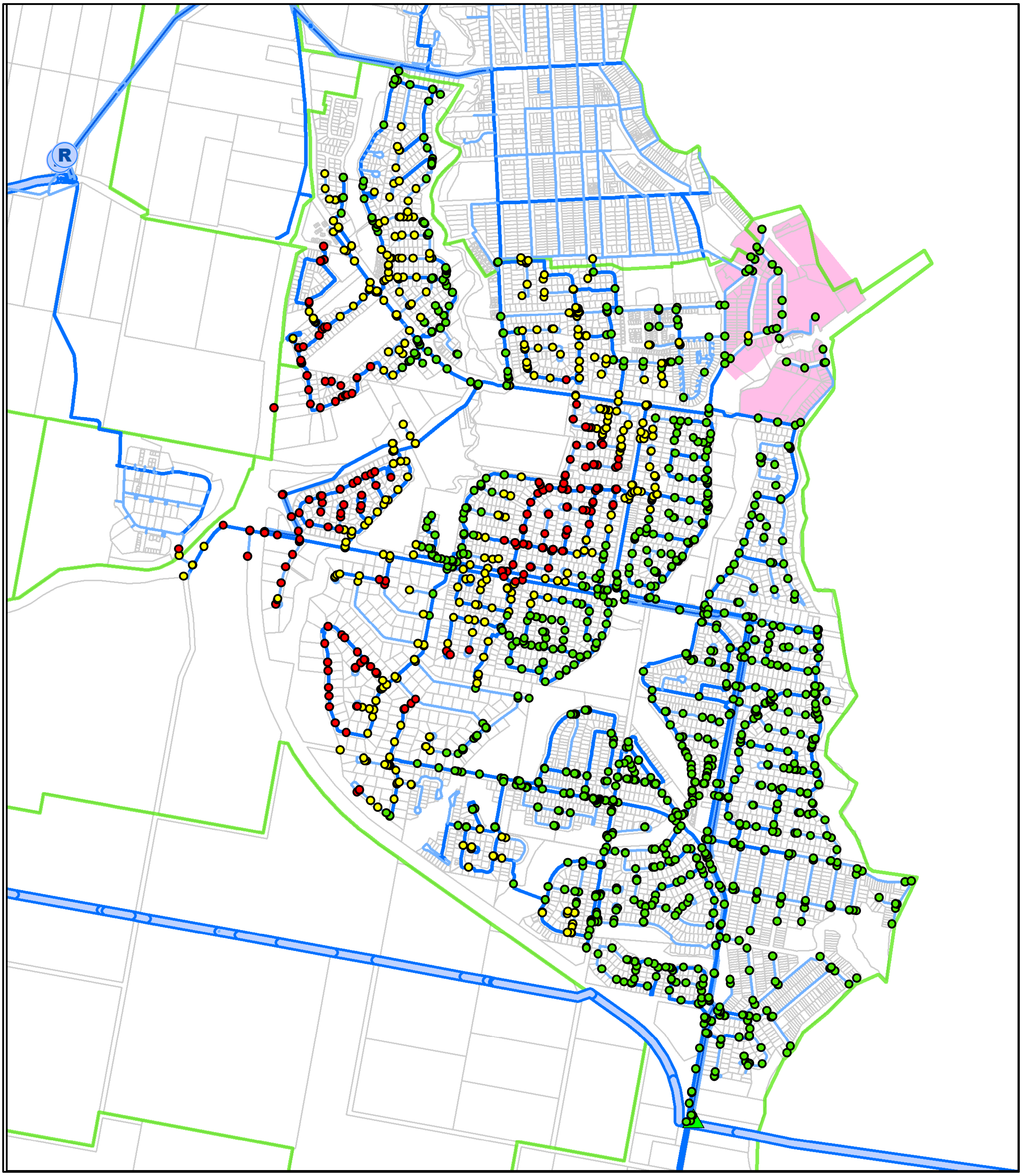
Appendix 3. Standard flow modelling results (peak hour) post-develop. Weinam PDA



Legend

Standard Flow Results

- <22 m
- 22 to 30 m
- >30 m

Water Mains - Operating Diameter

- 20 - 100 mm
- 101 - 250 mm
- 251 - 500 mm
- 501 - 900 mm

- Serpentine Creek PRV
- Distribution Maintenance Areas
- Current Land
- Weinam Creek PDA

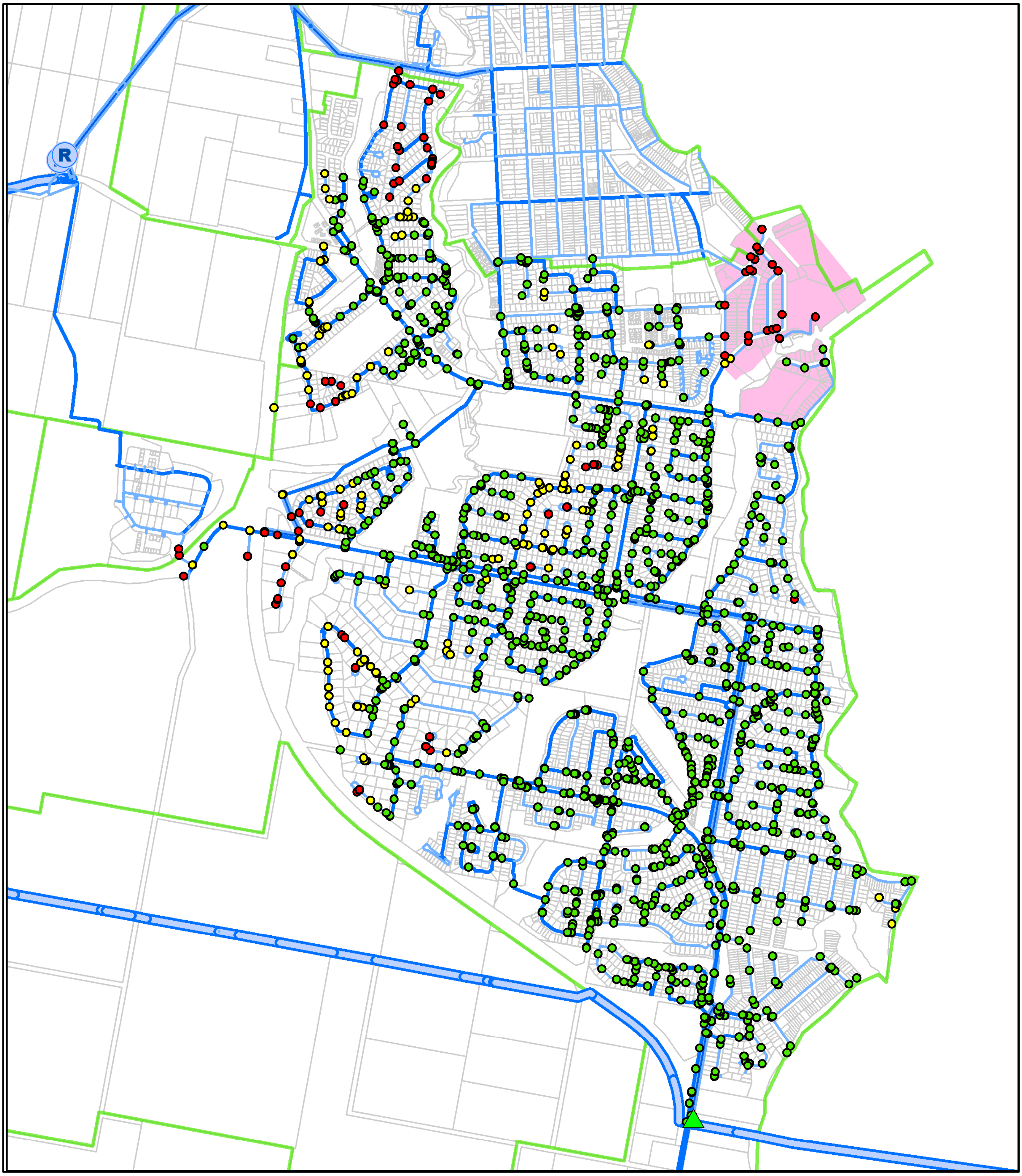
D1	27/08/2019	JM	MI	MI
Issue	Date	By	Chkd	Appd

Redland CITY COUNCIL
Redland Water
PO Box 21
Cleveland QLD 4163

Job Title **Weinam Creek PDA**
Drawing Title **Standard flow modelling results**
Scale at A3 **1:406,300** Drawing Status **Draft V1**
Coordinate System **GDA 1994 MGA Zone 56**
Date of Print **27/08/2019** Drawing No **001**

G:\RedlandWater&Waste\Data\TechSup\Planning\Water\02_Planning\002_Land Use Planning Advice\Weinam Creek PDA\GIS\Appendix 3.mxd

Appendix 4. Fire flow modelling results post-develop. Weinam PDA



Legend

Fire Flow Results

- < 12 m
- 12 to 20 m
- > 20 m

Water Mains - Operating Diameter

- 20 - 100 mm
- 101 - 250 mm
- 251 - 500 mm
- 501 - 900 mm

Serpentine Creek PRV

Distribution Maintenance Areas

Current Land

Weinam Creek PDA

D1	27/08/2019	JM	MI	MI
Issue	Date	By	Chkd	Appd

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PO Box 21
Cleveland QLD 4163

Job Title **Weinam Creek PDA**

Drawing Title **Fire flow modelling results**

Scale at A3 **1:406,300** Drawing Status **Draft V1**

Coordinate System **GDA 1994 MGA Zone 56**

Date of Print **27/08/2019** Drawing No **001**

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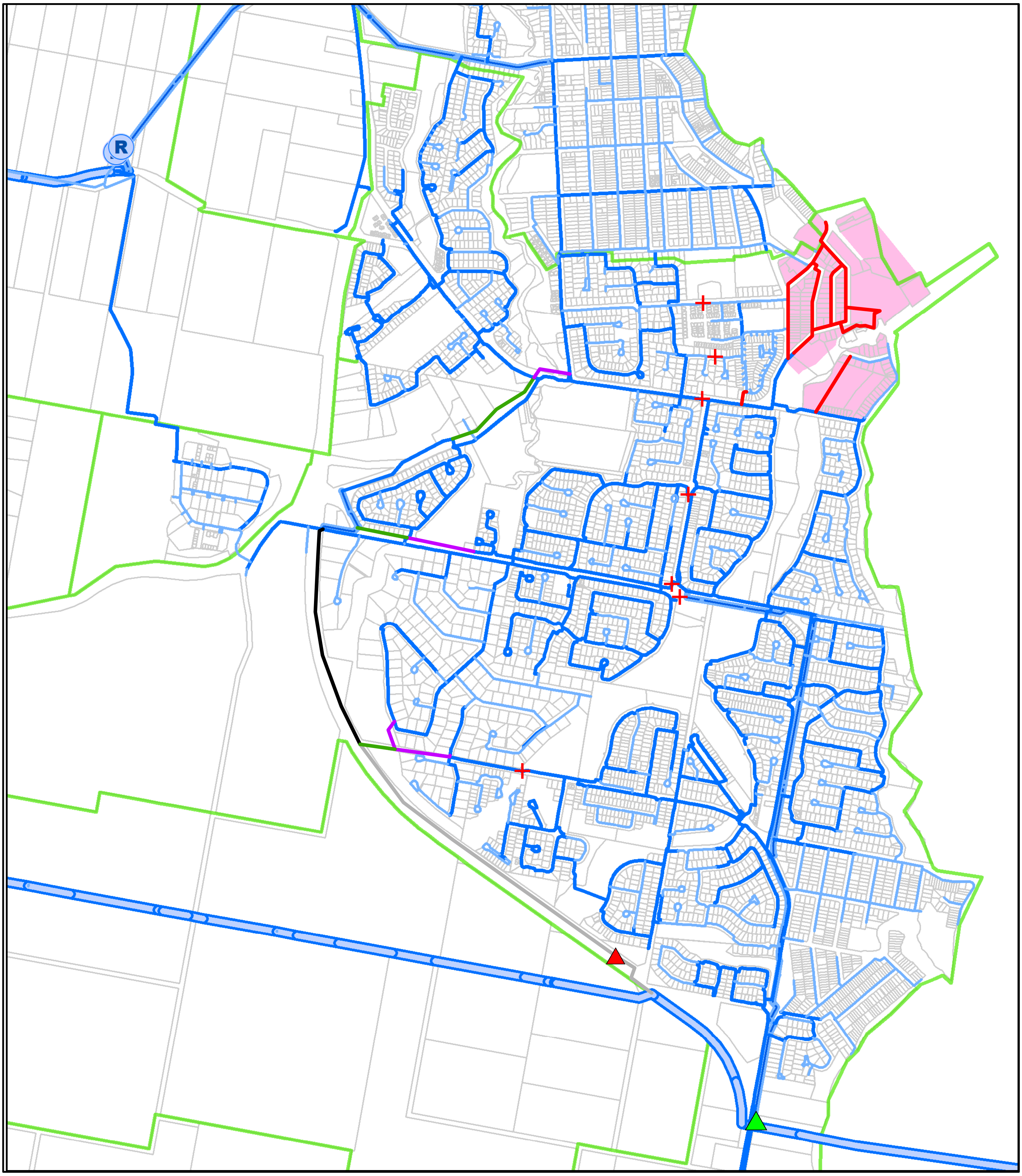
Appendix 5. Option 1 service strategy



Legend

Water Mains - Operating Diameter

- 20 - 100 mm
- 101 - 250 mm
- 251 - 500 mm
- 501 - 900 mm

Proposed Option 1 (mm)

- 200
- 225
- 300
- 375

Proposed FF (mm)

- 150

- Proposed Closed Valves
- Proposed Option 1 PRV
- Serpentine Creek PRV
- Distribution Maintenance Areas
- Current Land
- Weinam Creek PDA

Issue	Date	By	Chkd	Appd
D1	5/11/2019	JM	MI	MI

Redland City Council
Redland Water
PO Box 21
Cleveland QLD 4163

Job Title **Weinam Creek PDA**
Drawing Title **Option 1 Pipe Upgrades**
Scale at A3 **1:406,300** Drawing Status **Draft V1**
Coordinate System **GDA 1994 MGA Zone 56**
Date of Print **5/11/2019** Drawing No **001**

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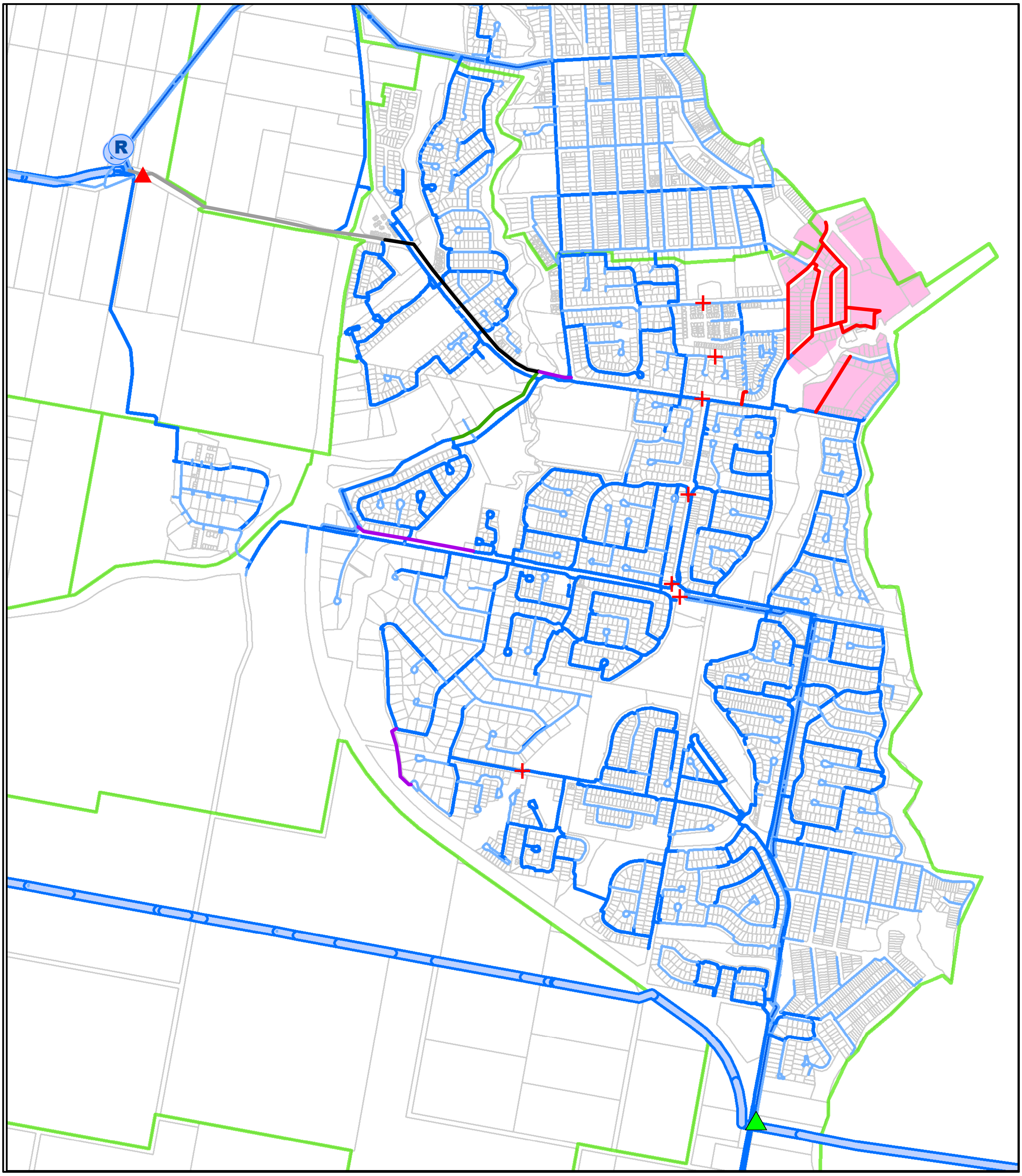
Appendix 6. Option 2 service strategy



Legend

Water Mains - Operating Diameter

- 20 - 100 mm
- 101 - 250 mm
- 251 - 500 mm
- 501 - 900 mm

Proposed Option 2 (mm)

- 200
- 250
- 300
- 375

Proposed FF (mm)

- 150

- Proposed Closed Valves
- Proposed Option 2 PRV
- Serpentine Creek PRV
- Distribution Maintenance Areas
- Current Land
- Weinam Creek PDA

D1	5/11/2019	JM	MI	MI
Issue	Date	By	Chkd	Appd

Redland City Council
Redland Water
PO Box 21
Cleveland QLD 4163

Job Title **Weinam Creek PDA**

Drawing Title **Option 2 Pipe Upgrades**

Scale at A3 **1:406,300** Drawing Status **Draft V1**

Coordinate System **GDA 1994 MGA Zone 56**

Date of Print **5/11/2019** Drawing No **001**

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