

ROCKHAMPTON REGIONAL COUNCIL  
These plans are approved subject to the current  
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Development Permit No. D/571-2013  
Dated 25-08-2014



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1	5.11.2012	DESIGN DEVELOPMENT ISSUE		THE ROCKHAMPTON GRAMMAR SCHOOL 5 YEAR DEVELOPMENT PLAN	1	Level 1, 220 Quay St. Rockhampton PO Box 1479 Rockhampton Q 4700 www.thomsonadsett.com	These drawings and designs and the copyright thereof are the property of Thomson Adsett (Regional) Pty Ltd and must not be used, retained or copied without the written permission of Thomson Adsett (Regional) Pty Ltd. A.B.N. 78 105 314 663. Trading as ThomsonAdsett.	05.12.2013	1:500	SMP			project no.	sheet no.	revision
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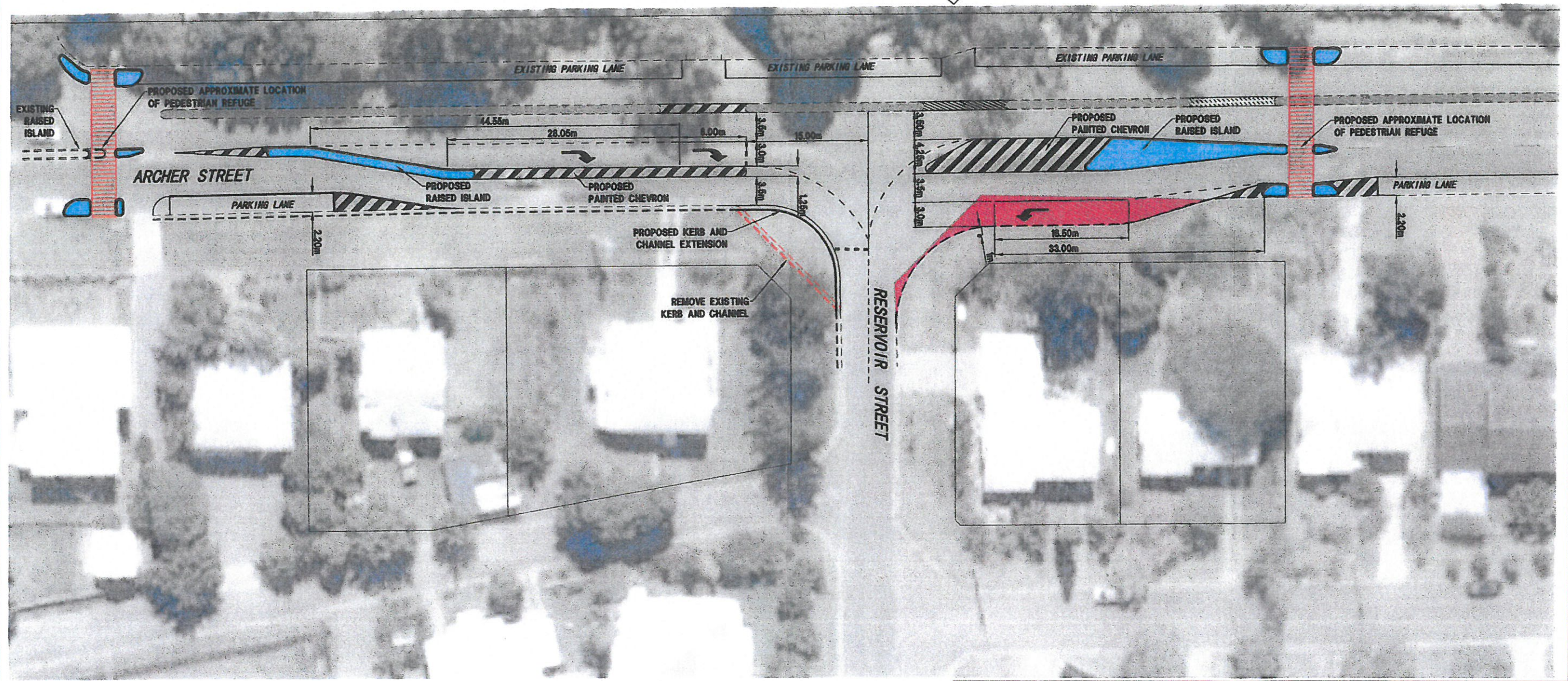


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Date 18/8/14  
For and On Behalf of BROWN Consulting (QLD) Pty Ltd  
RPB 2412

ROCKHAMPTON  
GRAMMAR SCHOOL

PALMER  
ANNEXE

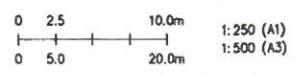
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**LEGEND:**

KERB	EXISTING	PROPOSED
PAVEMENT MARKING	---	---
NEW PAVEMENT WORKS		■
CONCRETE MEDIAN	---	---
CONCRETE MEDIAN TO BE REMOVED	---	---

**INTERSECTION OF ARCHER STREET  
AND RESERVOIR STREET  
R12310 - PEDESTRIAN CROSSINGS AND  
INTERSECTION CONCEPT PLAN**

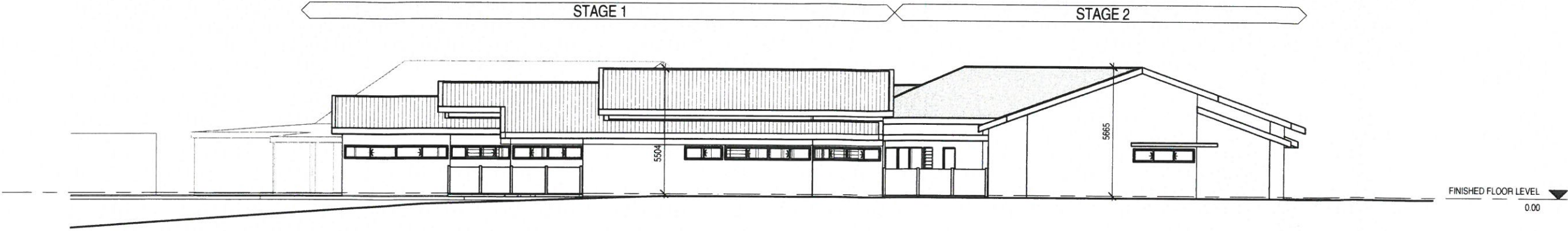


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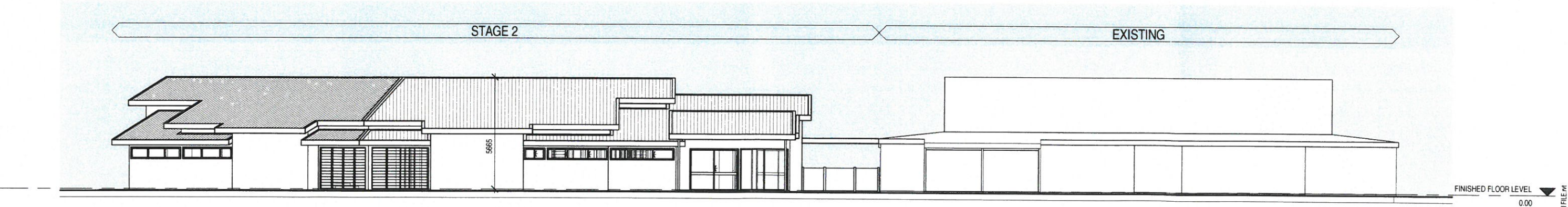
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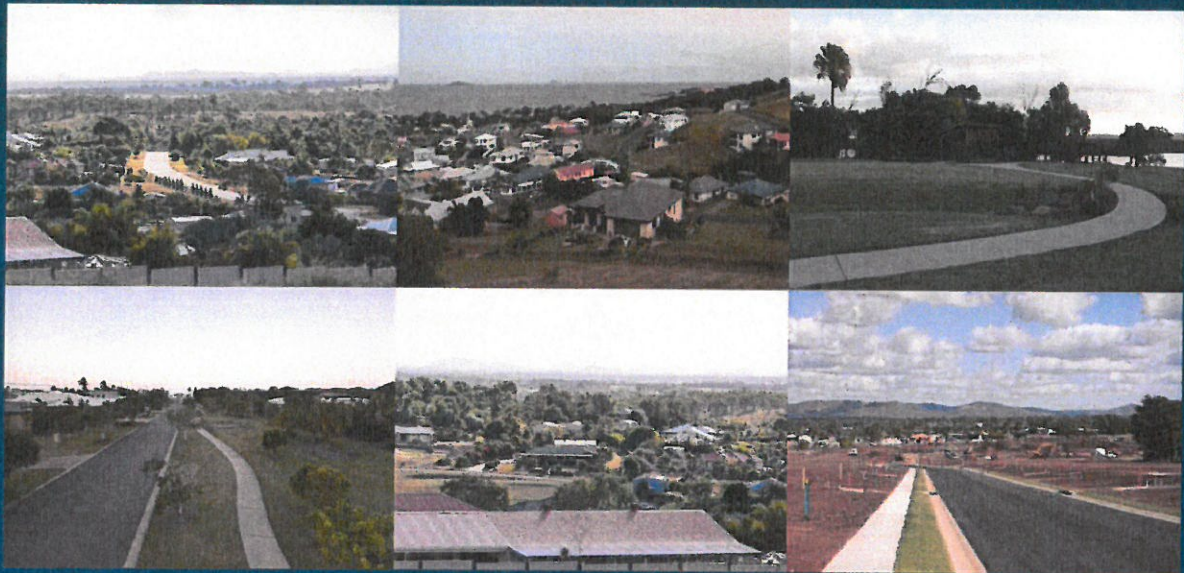
NORTH-WEST ELEVATION



SOUTH ELEVATION

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# Infrastructure Report

ROCKHAMPTON REGIONAL COUNCIL

These plans are approved subject to the current  
conditions of approval associated with  
Development Permit No. D/571-2013

Dated 25-05-2014

## Expansion of the Early Learning Centre Rockhampton Grammar School

December 2013

R12310

Prepared for Rockhampton Grammar School as  
part of a Material Change of Use Application

Urban Development - Rockhampton



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2013

### DOCUMENT CONTROL

#### Infrastructure Report

Issue	Date	Issue Details	Author	Checked	Approved
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## Table of Contents

<b>1. Introduction .....</b>	<b>1</b>
1.1 Site Location .....	1
1.2 Background Information .....	2
1.3 Equivalent Persons per Phase .....	2
2.1 Proposed Site Water Demands .....	3
<b>3. Sewerage Strategy.....</b>	<b>4</b>
3.1 Proposed Site Sewer Discharge .....	4
<b>4. Stormwater Management.....</b>	<b>5</b>
4.1 Existing System .....	5
4.2 Proposed System .....	6

### Tables

Table 1: Existing Early Learning Centre.....	2
Table 2: Stage 1: Early Learning Centre .....	2
Table 3: Stage 2: Early Learning Centre .....	3
Table 4: Stage 1 Net Demand .....	3
Table 5: Stage 2 Net Demand .....	4
Table 6: Phase 1 Net Demand.....	5
Table 7: Phase 2 Net Demand.....	5

### Figures

Figure 1: Aerial photograph indicating development site. ....	1
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### APPENDICES

Appendix A	Site Plan
Appendix B	Existing Sewer and Water Plan
Appendix C	Stormwater Calculations
Appendix D	Stormwater Management Plan



## 1. Introduction

*Brown Consulting (QLD) Pty Ltd* has prepared the following report to address civil engineering issues to support the Material Change of Use Application for the proposed expansion of the Early Learning Centre - Rockhampton Grammar School on Lot 9 CP908779.

This report will provide engineering recommendations in relation to the sewerage services, water supply, and stormwater management to the development.

### 1.1 Site Location

The Early Learning Centre (proposed and existing) is located on the south east of Archer Street at the end of Reservoir Street. The facility location is shown in Figure 1.



Figure 1: Aerial photograph indicating development site.

The Early Learning Centre is in the western corner of the development site.



## 1.2 Background Information

The existing facility has a maximum operational capacity of 63 students and 17 staff; it is open 51 weeks per year. The proposed facility expansion will unfold in two stages. The first Stage will increase the number of students to 97 with 22 staff. The second and final Stage would increase the student body to 141 with 26 staff. A preliminary site plan showing the buildings with their respective staging is shown in Appendix A.

According to the Capricorn Municipal Development Guidelines (CMDG) the design equivalent persons (EP) for an educational institution is 0.2 EP per person. This factor will be used for all water and sewer calculations within this report, where all students and staff will be considered 0.2 EP each.

The following EP values will be used:

- » Existing Facility: (63 students + 17 Staff) x 0.2 EP per Person = 16 EP
- » Stage 1: (97 students + 22 Staff) x 0.2 EP per Person = 23.8 EP
- » Stage 2: (141 students + 26 Staff) x 0.2 EP per Person = 33.4 EP

The location and size of existing sewer and water infrastructure are shown in Appendix B. This plan was obtained from Rockhampton Regional Council (RRC) and illustrates the as constructed sewer and water infrastructure that services the development.

## 1.3 Equivalent Persons per Phase

The tables below show the EP breakdown for the current facility as well as each progressive phase.

Table 1: Existing Early Learning Centre

Use	# of People	Rate	Loading EP/Day
1. Total Students	63	0.2 EP/Person	12.6
2. Total Staff	17	0.2 EP/Person	3.4
<b>Total EP/Day</b>			<b>16</b>

Table 2: Stage 1: Early Learning Centre

Use	# of People	Rate	Loading EP/Day
1. Total Students	97	0.2 EP/Person	19.4
2. Total Staff	22	0.2 EP/Person	4.4
<b>Total EP/Day</b>			<b>23.8</b>



Table 3: Stage 2: Early Learning Centre

Use	# of People	Rate	Loading EP/Day
1. Total Students	141	0.2 EP/Person	28.2
2. Total Staff	26	0.2 EP/Person	5.2
<b>Total EP/Day</b>			<b>33.4</b>

## 2. Water Reticulation

Reticulated water supply is currently provided to the site through a metered connection at the north west corner property boundary fronting Reservoir Street. An estimate of the site water demand has been calculated in accordance with the CMDG and is tabulated below.

### 2.1 Proposed Site Water Demands

The site contains other 'uses' such as a small kitchen/dining area, basic recreation facilities and laundries, it is considered that the water demand from these uses would be equivalent to or less than the allowance for provided for each EP in a typical domestic use situation.

Table 4: Stage 1 Net Demand

Use	Size	Rate	ADWF
Existing Facility	16 EP	1000 L/E/Day	16000 L/Day
Stage 1	23.8 EP	1000 L/EP/Day	23800 L/Day
Net Difference ADWF	7.8 EP		7800L/Day
<b>Net Difference (L/S) Post Stage 1</b>			<b>0.090 L/Sec.</b>

As compared to existing facility in 2013.



Table 5: Stage 2 Net Demand

Use	Size	Rate	ADWF
Existing Facility	16 EP	1000 L/E/Day	16000 L/Day
Stage 2 (Including Stage 1)	33.4 EP	1000 L/EP/Day	33400 L/Day
Net Difference ADWF	17.4 EP		17400 L/Day
<b>Net Difference (L/S) Post Stage 1 &amp; 2</b>			<b>0.201 L/Sec.</b>

As compared to existing facility in 2013.

Reticulated water supply is currently provided to the site through a metered connection at the north west corner property boundary fronting Reservoir Street.

If required, Rockhampton Regional Council may be engaged to carry out a network analysis to determine what impacts this development is expected to have on the surrounding reticulated water supply network.

### 3. Sewerage Strategy

The facility's sewerage is currently discharged through a 150Ø sewer main on the north western property boundary between lot 5 and 3. This is shown in Appendix 1.

An estimate of the sewage discharge has been calculated in accordance with the CMDG and is tabulated below.

#### 3.1 Proposed Site Sewer Discharge

Similar to the water strategy, the sewer loading for the site has been calculated in accordance with the Capricorn Municipal Development Guidelines (CMDG) for Water Supply & Sewerage and has been calculated as 30.2 EP of the final phase. Although the facility contains other 'uses' such as the kitchen/dining area, basic recreation facilities and laundries, it is considered that the sewage loading from these uses would be equivalent to or less than the allowance for these uses included for each EP in a typical domestic situation.



Table 6: Phase 1 Net Demand

Use	Size	Rate	ADWF
Existing Facility	16 EP	250 L/E/Day	4000 L/Day
Stage 1	23.8 EP	250 L/EP/Day	5950 L/Day
Net Difference ADWF	7.8 EP		1950 L/Day
<b>Net Difference (L/S)</b>			<b>0.023 L/Sec.</b>

Table 7: Phase 2 Net Demand

Use	Size	Rate	ADWF
Existing Facility	16 EP	250 L/E/Day	4000 L/Day
Stage 2	33.4 EP	250 L/EP/Day	8350 L/Day
Net Difference ADWF	17.4EP		4350 L/Day
<b>Net Difference (L/S)</b>			<b>0.050 L/Sec.</b>

If required, Rockhampton Regional Council may be requested to supply a quotation to carry out a network analysis to determine the impact this development has on the surrounding reticulated sewer network.

## 4. Stormwater Management

The objective of this management plan is to demonstrate that the proposed stormwater management strategy for rain events up to and including a 1 in 5 year average return interval (ARI), to a 1 in 100 year ARI for the proposed development, will not result in any deterioration of the flood immunity to any of the surrounding buildings or infrastructure.

### 4.1 Existing System

The existing 1.5ha allotments currently consists of 4 major buildings with some sealed areas for parking and driveway access. Sites catchments are split by a natural ridge running through from East to West, with the Southern catchments generating flow directly into the Southern neighbouring property (Lot381 LN801355). Catchment B encompasses the entire Northern section of the property, currently discharging all flow to Quarry Street kerb and channel.



Development sites existing stormwater catchment flow rate are calculated to be:

Existing Site Pre Development			
Catchment Area	Point of Discharge	Minor Q5	Major Q100
Catchment A	Lot 381 LN801355	147l/s	333l/s
Catchment B	Quarry Street	136l/s	306l/s

Refer to detailed calculations contained with Appendix C.

## 4.2 Proposed System

The proposed development involves the construction of two additional buildings and added parking area. See table below for post development flow rates.

Post Development Site Catchment			
Catchment Area	Point of Discharge	Minor Q5	Major Q100
Catchment A1	Lot 381 LN801355	122l/s	276l/s
Catchment A2	Quarry Street	33l/s	74l/s
Catchment B	Quarry Street	140l/s	316l/s
Proposed Site Discharge Unmitigated			
Total Site Discharge	Quarry Street	173l/s	390l/s
Increase over existing catchment		27.3%	27.3%
Total Site Discharge	Lot 381 LN801355	122l/s	276l/s
Increase over existing catchment		-17.0%	-17.0%

The information provided in the table above indicates that the southern catchment flow rate has been reduced thus improving the existing catchment. This will create a no worsening effect on the neighbouring properties. As shown on our Stormwater Management Plan Appendix D, all storms greater than a Q20 stormwater will overflow the system and discharge to Catchment A1, therefore continuing to maintain a no worsening effect on the neighbouring property. It is proposed to divert A2 stormwater to Quarry Street and reinstate flow rates to pre development levels.

The proposed development catchment (B & A2) would increase the stormwater flow rate being released to the legal point of discharge (Quarry Street – kerb and channel). To mitigate this increase in stormwater runoff the development proposes to detain stormwater by using a detention tank in northern corner of catchment B adjacent to Quarry Street.

The detained stormwater will be released slowly from the site by a reduced size stormwater pipe, therefore throttling outflow from the detention devices to match the pre development flow rate



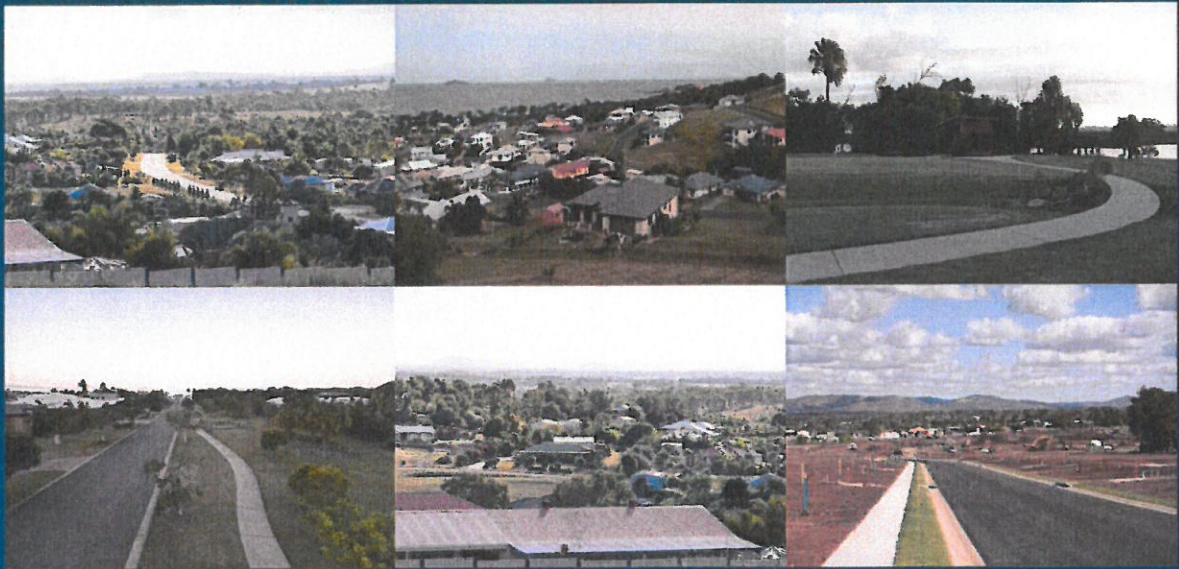


To limit the stormwater runoff from the site to pre development conditions, it is recommended that a total of 30,500 litres of detention is provided onsite. This detention volume of 30,500 litres includes a safety factor of 1.1.

Detention volume has been calculated using a method in QUDM by generating a hydrograph for the peak storm event for pre and post development stages.

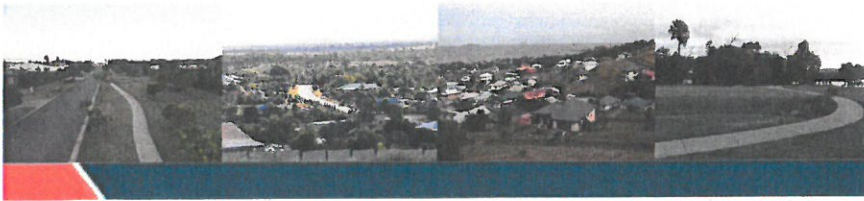
The post develop sites total catchment flow to Quarry Street will be throttled back to ensure the new discharge will maintain a no worsening effect on the local network. The post development flow will be piped to Quarry Street at a peak rate of 82l/s thus demonstrating a less than pre development flow. Refer Appendix C and D for stormwater calculations and Stormwater Management Plan.





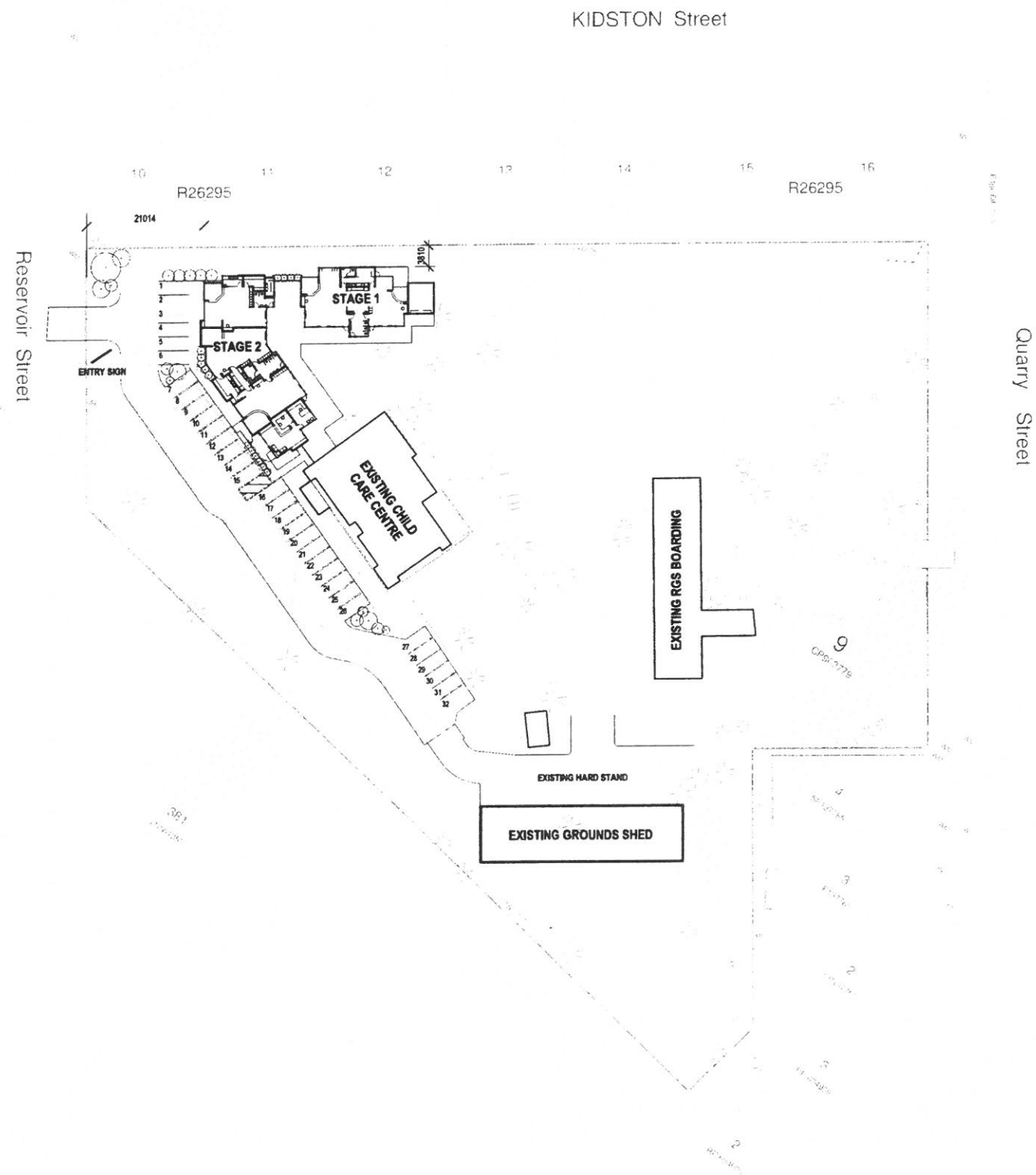
## Appendices





## Appendix A      Site Plan





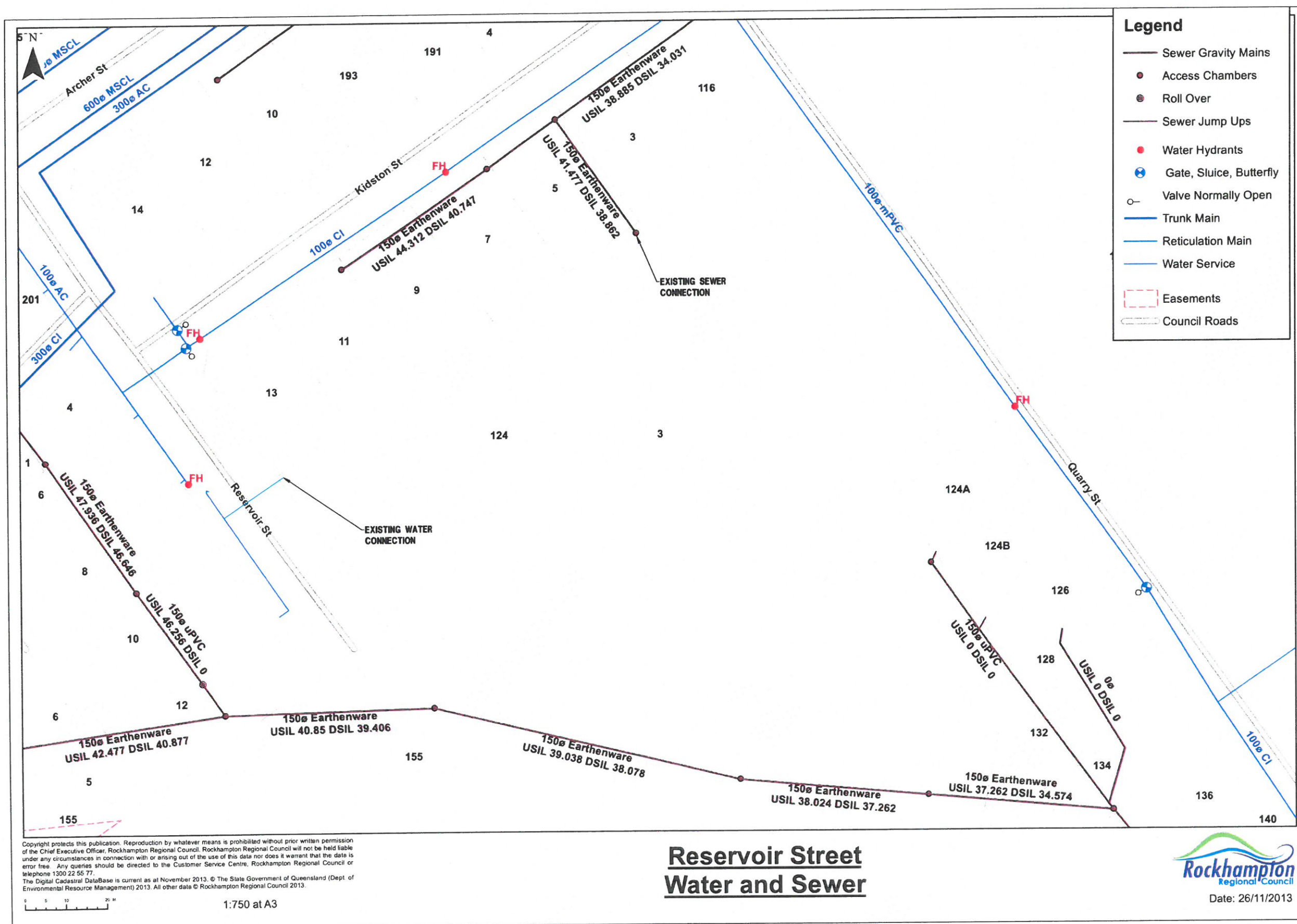
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2	26.06.2013	ISSUED FOR MCU.													



## **Appendix B      Existing Sewer and Water Plan**









## Appendix C      Stormwater Calculations



**Catchment A - (Pre-development)**

$t_c = (107n(L^{0.333})/(S^{0.2}))$   
 mins  
 9.67  
 5  
 Total 15  
 ...5mins off roof

n = 0.045  
 L = 27 m  
 S = 7.4 %  
 Average Grassed (n = 0.045) Refer Fig 4.07  
 RL 44.5  
 RL 46.5

**Rainfall Intensity Table**

Return period	1	2	5	10	20	50	100
15	68	89	115	131	153	183	206

Total Catchment Area 7460 m<sup>2</sup>  
Area of Impervious 1284 m<sup>2</sup>

$Q = F \cdot C \cdot I \cdot A$

	F factor	C co eff	I mm/hr	A ha	Q m <sup>3</sup> /sec	Fy factor
Q2	0.00278	0.553	89.00	0.746	0.102	0.85
Q5- Minor	0.00278	0.618	115.00	0.746	0.147	0.95
Q10	0.00278	0.650	131.00	0.746	0.176	1.00
Q20	0.00278	0.683	153.00	0.746	0.216	1.05
Q50	0.00278	0.748	183.00	0.746	0.283	1.15
Q100 - Major	0.00278	0.780	206.00	0.746	0.333	1.20

C10 value 0.65  
fi value 0.17

**Catchment A1 - (Post development)**

$t_c = (107n(L^{0.333})/S^{0.2})$   
 mins  
 15.00  
 0.00  
 Total 15  
 Use same Time of Concentration as pre development

Total Catchment Area 5590 m<sup>2</sup>  
Area of Impervious 2164 m<sup>2</sup>

**Rainfall Intensity Table**

Return period	1	2	5	10	20	50	100
15	68	89	115	131	153	183	206

$Q = F \cdot C \cdot I \cdot A$

	F factor	C co eff	I mm/hr	A ha	Q m <sup>3</sup> /sec	Fy factor
Q2	0.00278	0.612	89.00	0.559	0.085	0.85
Q5- Minor	0.00278	0.684	115.00	0.559	0.122	0.95
Q10	0.00278	0.720	131.00	0.559	0.146	1.00
Q20	0.00278	0.756	153.00	0.559	0.180	1.05
Q50	0.00278	0.828	183.00	0.559	0.235	1.15
Q100 - Major	0.00278	0.864	206.00	0.559	0.276	1.20

C10 value 0.72  
fi value 0.39

**Runoff**

	Pre Development	Post Development	Increase
Q5 - Minor	0.147	0.122	-17.00%
Q100 - Major	0.333	0.276	-17.00%



**Catchment B**

$t_c = (107n(L^{0.333})/(S^{0.2}))$   
 mins  
 14.33  
 5.00  
 Total 19  
 +5mins off roof

$n = 0.045$  Average Grassed ( $n = 0.045$ ) Refer Fig 4.07  
 $L = 95$  m  
 $S = 8.4$  %  
 RL 38.5  
 RL 46.5

**Rainfall Intensity Table**

Return period	1	2	5	10	20	50	100
19	62	80	103	118	137	163	184

Total Catchment Area 7680 m<sup>2</sup>  
Area of Impervious 1395 m<sup>2</sup>

$Q = F \cdot C \cdot I \cdot A$

	F	C	I	A	Q	Fy
	factor	co eff	mm/hr	ha	m <sup>3</sup> /sec	factor
Q2	0.00278	0.553	80.00	0.768	0.094	0.85
Q5 - Minor	0.00278	0.618	103.00	0.768	0.136	0.95
Q10	0.00278	0.650	118.00	0.768	0.164	1.00
Q20	0.00278	0.683	137.00	0.768	0.199	1.05
Q50	0.00278	0.748	163.00	0.768	0.260	1.15
Q100 - Major	0.00278	0.780	184.00	0.768	0.306	1.20
C10 value			0.65			
Ii value			0.18			

**Catchment B - (Post Development)**

$t_c = (107n(L^{0.333})/(S^{0.2}))$   
 mins  
 14.33  
 5.00  
 Total 19  
 +5mins off roof

$n = 0.045$  Average Grassed ( $n = 0.045$ ) Refer Fig 4.07  
 $L = 95$  m  
 $S = 8.4$  %  
 RL 38.5  
 RL 46.5

**Rainfall Intensity Table**

Return period	1	2	5	10	20	50	100
19	62	80	103	118	137	163	184

Total Catchment Area 7680 m<sup>2</sup>  
Area of Impervious 1968 m<sup>2</sup>

$Q = F \cdot C \cdot I \cdot A$

	F	C	I	A	Q	Fy
	factor	co eff	mm/hr	ha	m <sup>3</sup> /sec	factor
Q2	0.00278	0.570	80.00	0.768	0.097	0.85
Q5 - Minor	0.00278	0.637	103.00	0.768	0.140	0.95
Q10	0.00278	0.670	118.00	0.768	0.169	1.00
Q20	0.00278	0.704	137.00	0.768	0.206	1.05
Q50	0.00278	0.771	163.00	0.768	0.268	1.15
Q100 - Major	0.00278	0.804	184.00	0.768	0.316	1.20
C10 value			0.67			
Ii value			0.26			

**Catchment A2 - (Post-development)**

$t_c = (107n(L^{0.333})/(S^{0.2}))$   
 mins  
 19.00  
 0.00  
 Total 19  
 Use same Time of Concentration as pre development

**Rainfall Intensity Table**

Return period	1	2	5	10	20	50	100
19	62	80	103	118	137	163	184

Total Catchment Area 1560 m<sup>2</sup>  
Area of Impervious 878 m<sup>2</sup>

$Q = F \cdot C \cdot I \cdot A$

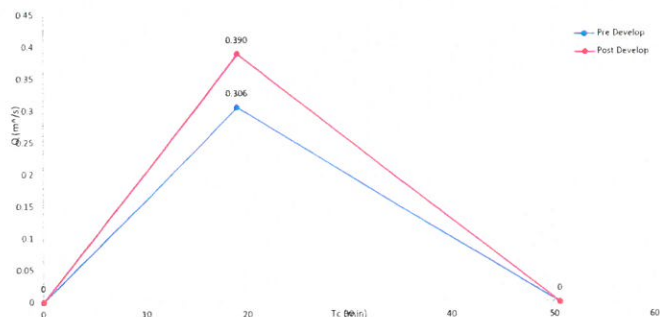
	F	C	I	A	Q	Fy
	factor	co eff	mm/hr	ha	m <sup>3</sup> /sec	factor
Q2	0.00278	0.553	80.00	0.186	0.022	0.85
Q5 - Minor	0.00278	0.618	103.00	0.186	0.033	0.95
Q10	0.00278	0.650	118.00	0.186	0.040	1.00
Q20	0.00278	0.683	137.00	0.186	0.048	1.05
Q50	0.00278	0.748	163.00	0.186	0.063	1.15
Q100 - Major	0.00278	0.780	184.00	0.186	0.074	1.20
C10 value			0.74			
Ii value			0.47			

**Runoff - Post Development**

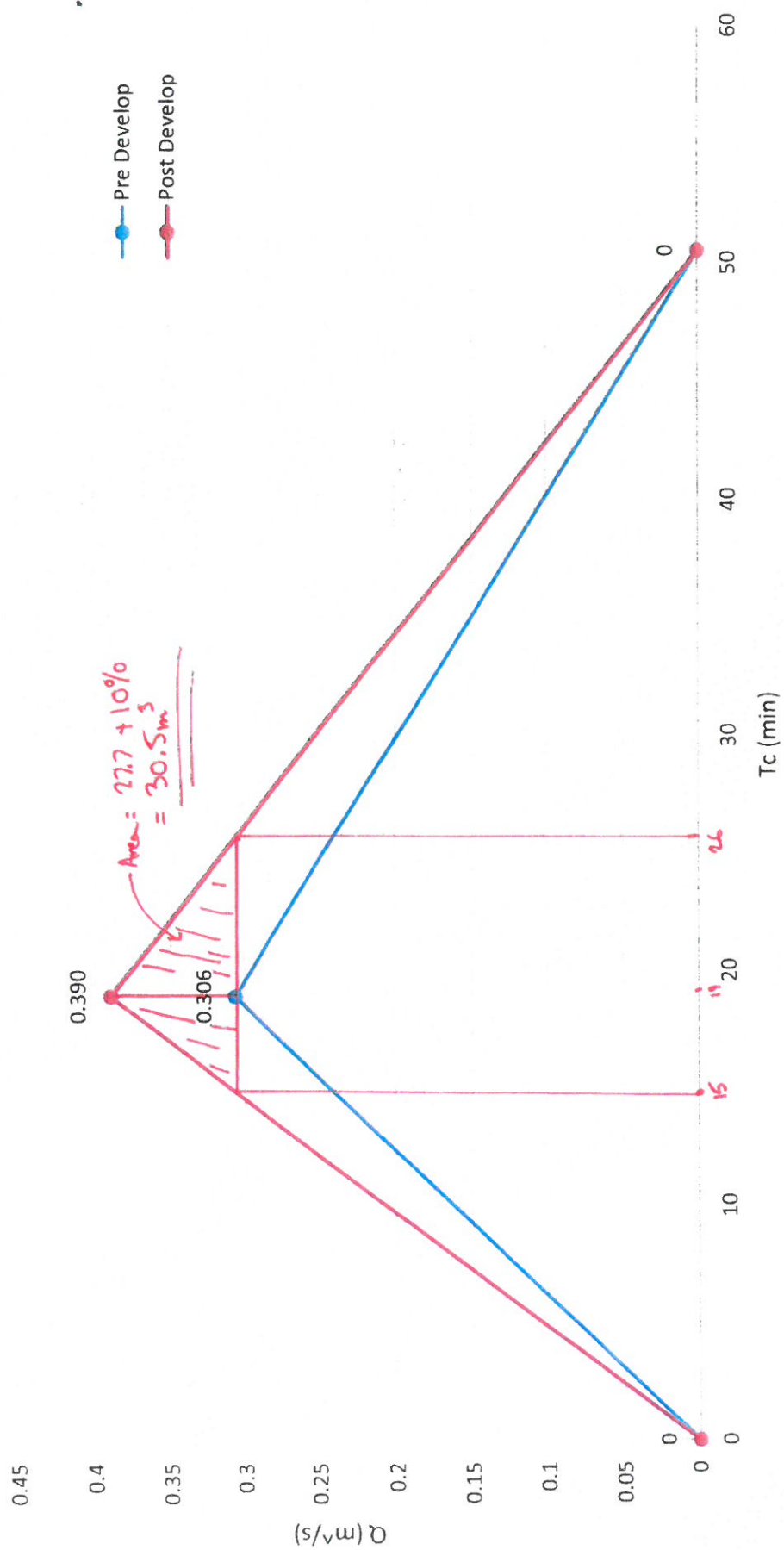
	Catchment B	Catchment A2	Total Post Development	Increase
Q5 - Minor	0.140	0.033	0.173	27.30%
Q100 - Major	0.316	0.074	0.390	27.30%

Refer to Hydrograph calculations for detention volumes.

Preliminary Sizing using Hydrograph Method			
	t <sub>c</sub> (min)	Pre Q100 (m <sup>3</sup> /s)	Post Q100 (m <sup>3</sup> /s)
t <sub>c</sub> (min) initial	0	0	0
t <sub>c</sub> (min) design	19	0.306	0.390
t <sub>c</sub> (min) 2.66 x design	51	0	0
Storage Required (m <sup>3</sup> /s)	27.7		
plus 10% (m <sup>3</sup> /s)	30.5		



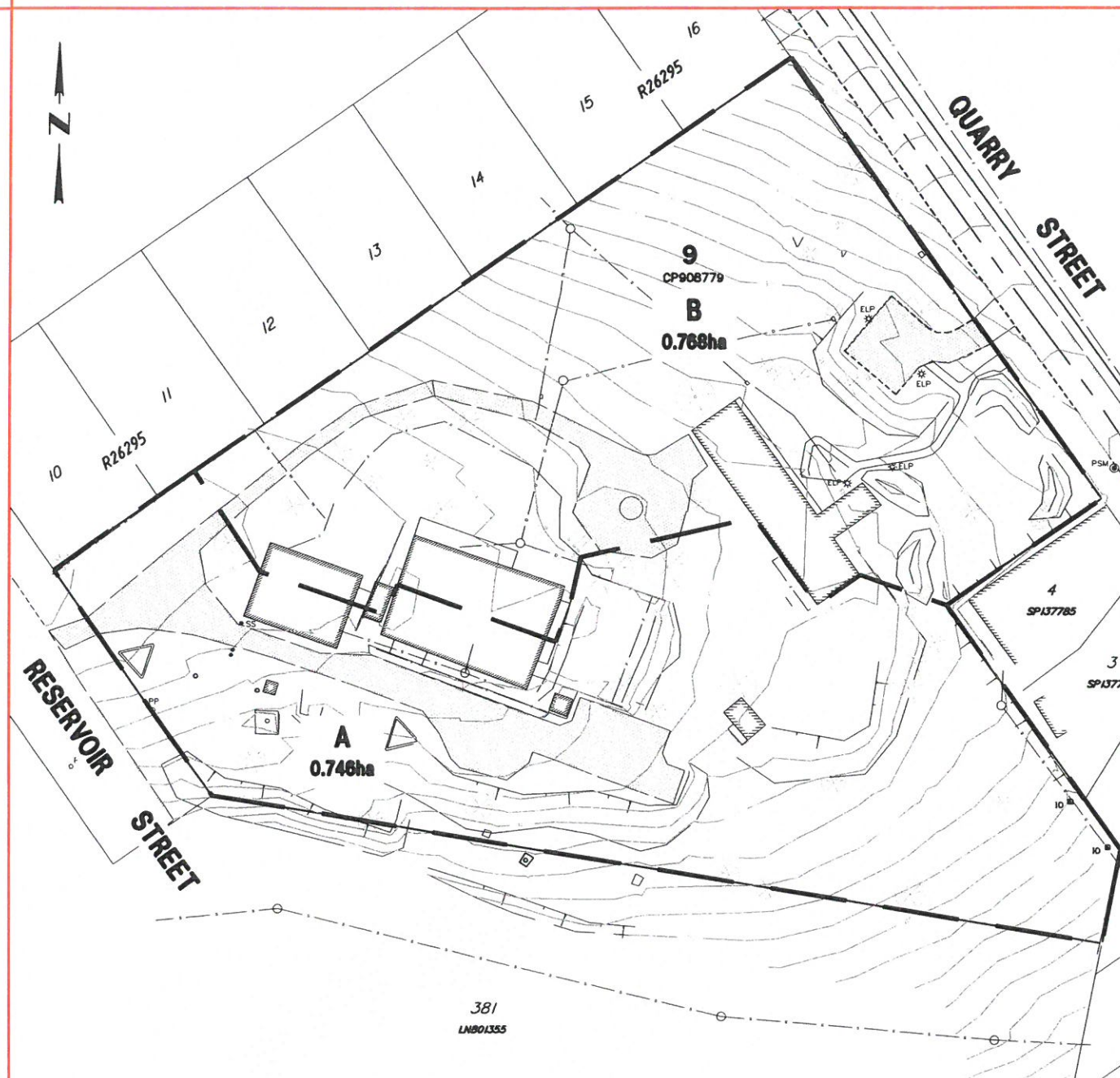






## Appendix D      Stormwater Management Plan





PRE-DEVELOPMENT CATCHMENTS  
Scale 1:100



POST-DEVELOPMENT CATCHMENTS  
Scale 1:100

#### LEGEND

- Proposed Works
- Proposed Building
- Existing Building
- Existing Contours
- Post-Dev. Catchment Boundary
- Pre-Dev. Catchment Boundary
- Proposed Stormwater Drainage Pipe

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## ROCKHAMPTON GRAMMAR SCHOOL STORMWATER MANAGEMENT PLAN PROPOSED GROUNDS EARLY LEARNING CENTRE R12310- SK01