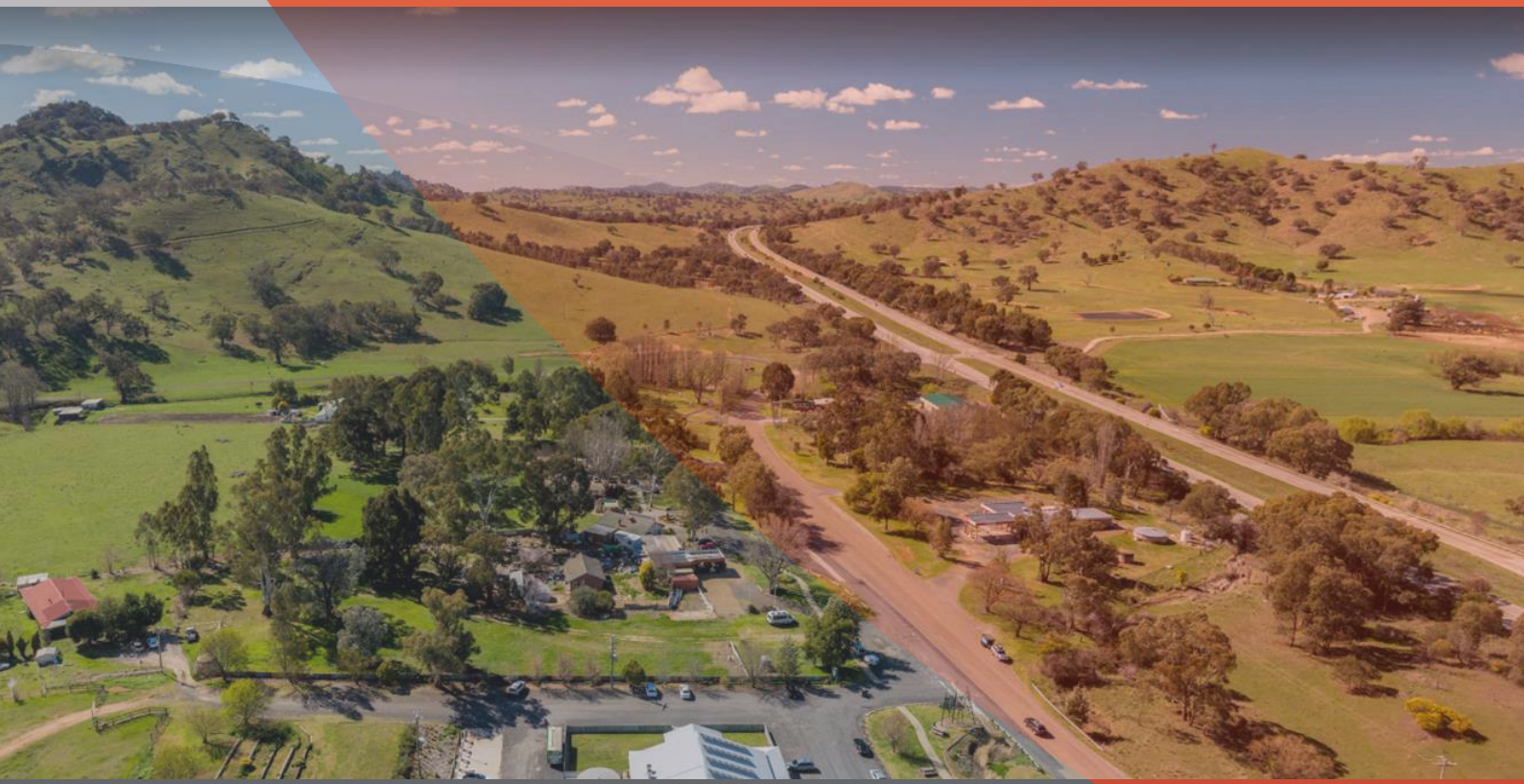


CIVIL AND DRAINAGE INFRASTRUCTURE REPORT

DOG ON THE TUCKERBOX DEVELOPMENT
AUGUST 2023

PREPARED FOR THE PRICE GROUP PTY LTD

This report has been prepared by the office of Spiire
445 Townsend Street PO Box 3400 **Albury NSW** 2640

Issue Date	Rev No	Authors	Checked	Approved
21/08/2023	0	T. Staats	B. Mugridge	B. Mugridge

Spiire Job Number: 310970

Citation: Spiire 2023, CIVIL AND DRAINAGE INFRASTRUCTURE REPORT for THE PRICE GROUP PTY LTD. Authors T. Staats Spiire Australia Pty Ltd. Project Number 310970

Front Cover: Aerial Image of site source: Google Streetview 2023

File Name: \\spiire.com.au\albdata\Data\31\310970\Civil\G01 003 310970 CIVIL AND DRAINAGE INFRASTRUCTURE REPORT.docx

TABLE OF CONTENTS

1. INTRODUCTION

Spiire has been engaged by The Price Group to develop a Civil and Drainage Infrastructure Report to highlight the Civil Infrastructure proposed for the development and analyse the capture, conveyance and treatment of stormwater flows for the Dog on the Tuckerbox Development located in North Gundagai.

1.1 REPORT PURPOSE AND SCOPE

The overall purpose of this document is to provide a strategy and framework with respect to civil infrastructure and drainage to inform the future development. To provide this, the specific scope of this assessment is to:

- Understand the existing site and proposed conditions,
- Undertake a hydrological assessment to represent the site catchment and flows,
- Determine pre-development minor and major drainage flow paths and runoff
- Provide commentary around the capacity for stormwater to flow through the site given the existing conditions and proposed development.
- Assess impacts to downstream catchments and provide commentary and recommendations based on findings.

1.2 SITE DESCRIPTION

1.2.1 LOCATION

The Dog on the Tuckerbox site is located on Annie Pyers Drive a quick turn off the Hume Freeway 7km north of Gundagai, 510km north of Melbourne, 369km south of Sydney, positioned next to other roadside offerings such as Olivers and Shell Coles Express.

Figure 1 – Site Aerial image from Google Streetview 2023

1.2.2 EXISTING CONDITIONS

The 2.76-hectare existing site contains mainly grassy undeveloped land with established trees, with some hardstand areas through the centre of the site where the Dog on the Tuckerbox and shops are currently located. The terrain generally slopes to the north-east, with site runoff collecting into road table drains along Annie Pyers Drive and ultimately outfalls into Five Mile Creek upstream of the existing road culvert.

Figure 2 – Subject Site from Google Maps 2023

1.3 PROPOSED DEVELOPMENT

The land proposed to be developed includes the existing Dog on the Tuckerbox Australian historical monument. The existing site will be developed into a premium roadside rest stop located on the Melbourne to Sydney Hume Freeway hosting a range of high-end facilities as can be seen in Figure 4, which is also referenced in Appendix B.

Civil infrastructure includes seven (7) Bus parking bays accessed from Annie Pyers Drive, as well as new carpark with drainage including 140 total car-spaces, 26 of which are designated disabled access car-spaces. The dimensions and layout can be referenced in the Architectural drawing set as below in figure 3, including details and location of speed humps and pedestrian crossings.

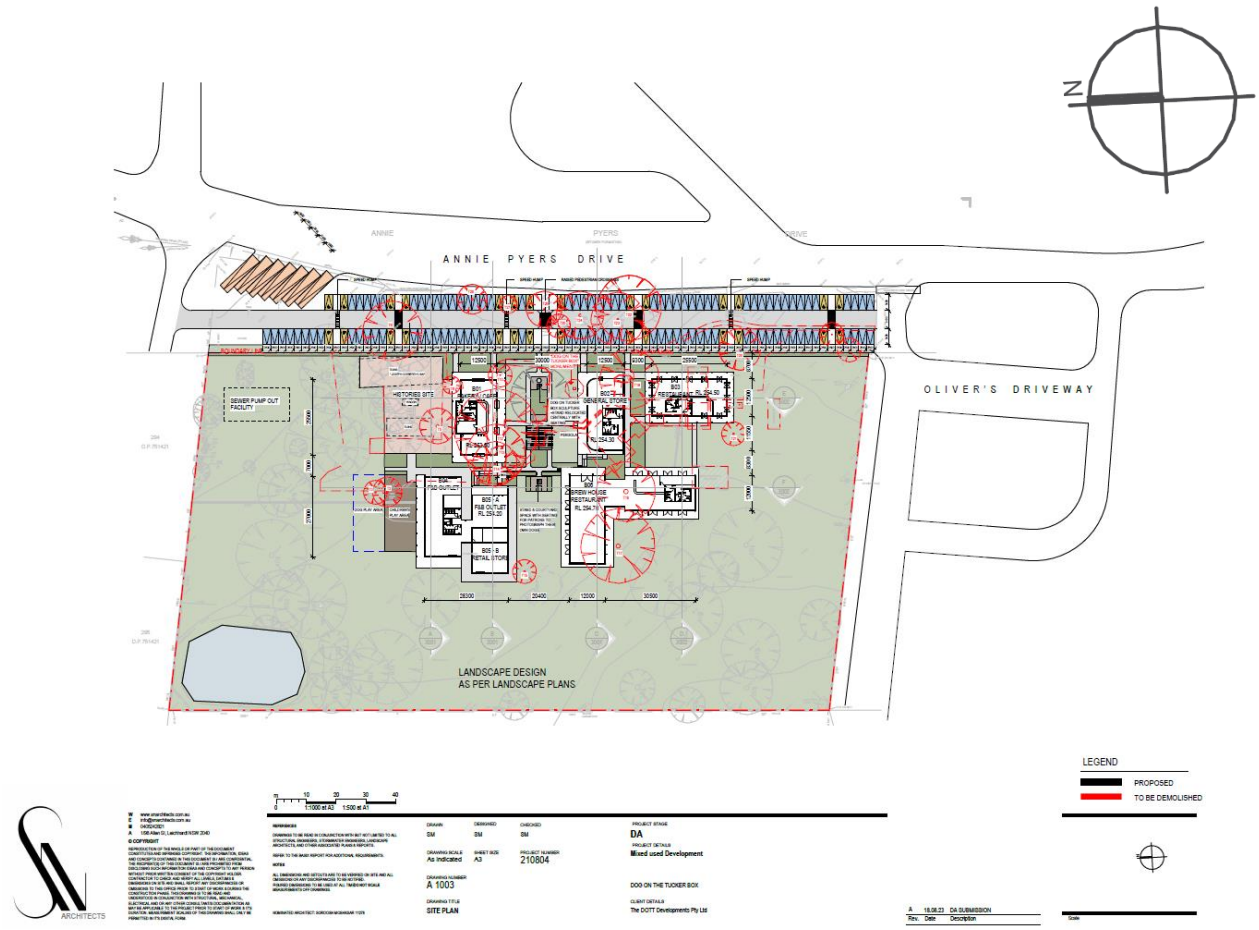


Figure 3 – Development Plan REV A 18/08/2023 (SN Architects)

2. HYDROLOGICAL ANALYSIS

2.1 OBJECTIVES AND APPROACH

This section of the report will analyse the proposed development site's pre- and post-developed minor & major storm flows and compare the scale of this to the greater receiving waters catchment area (Five Mile Creek).

The objectives of the hydrological analysis are to:

- Estimate peak flows for the minor and major storm events for the subject site.
- Quantify the increase in stormwater runoff generated by the proposed development.

2.1.1 DESIGN CRITERIA

- Minor flows are considered as those up to the 10% AEP (Average Exceedance Probability) storm event. These flows are typically conveyed via the underground drainage network.
- Major flows are considered to be the 1% AEP storm event. Major flows are collected and conveyed via the road network, spilling into the designated receiving drainage infrastructure.
- The Development site piped flows will be assessed for the 10% AEP storm event as it is classed as a commercial development, however Annie Pyers Drive will be subject to a design storm event of 20% AEP as this is a Council road catchment.

For the purposes of this report, major and minor flows were estimated using the Rational Method for Estimation, with Australian Rainfall & Runoff 2019 rainfall data. (See Appendix D).

2.2 CATCHMENT ANALYSIS

This section of the report will analyse the proposed development site's pre- and post-developed minor & major storm flows and compare the scale of this to the greater receiving catchment area (Five Mile Creek) and make commentary around the stormwater quality and detention proposed for the site, as shown below in Figure 5.

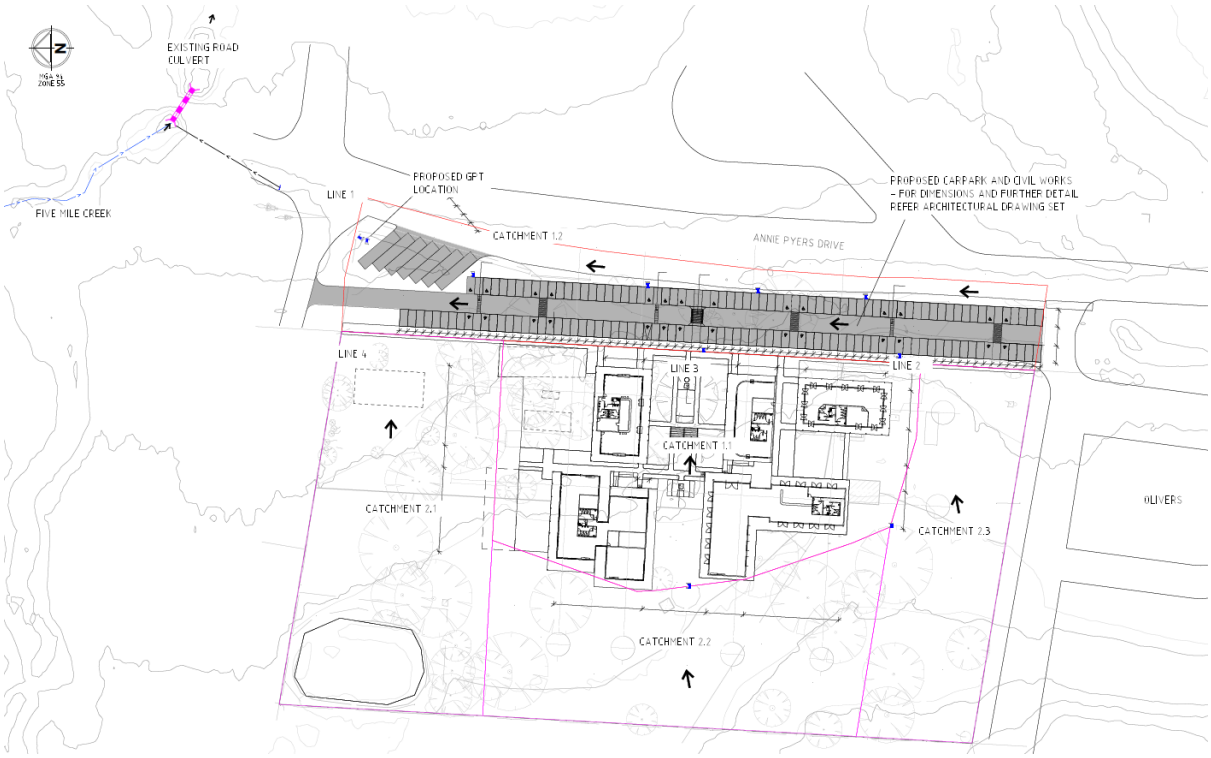


Figure 4 – Proposed Development Catchment plan (Spiire)

MINOR STORM EVENT

The minor storm event analysis based on the site catchments is outlined in below in Table 1 & 2.

Table 1: Pre-developed Catchments (Minor)

Catchment	Area (Ha)	Ave. Fraction Impervious	Tc (mins)	10% AEP flow (L/s)
Development	2.76	0.29	9.4	233
Carpark (20% AEP)	0.6	0.75	8.8	91
Total	3.36	-	-	324

Table 2: Post-developed Catchments (Minor)

Catchment	Area (Ha)	Ave. Fraction Impervious	Tc (mins)	10% AEP flow (L/s)
Development	2.76	0.39	8.6	336
Carpark (20% AEP)	0.6	0.85	8.2	103
Total	3.36	-	-	439

2.2.1 MAJOR STORM EVENT

The major storm event analysis based on the site catchments is outlined in below in Table 3 & 4.

Table 3: Pre-developed Catchments (Major)

Catchment	Area (Ha)	Ave. Fraction Impervious	Tc (mins)	10% AEP flow (L/s)
Development	2.76	0.29	10.5	493
Carpark (20% AEP)	0.6	0.75	9.8	204
Total	3.36	-	-	698

Table 4: Post-developed Catchments (Major)

Catchment	Area (Ha)	Ave. Fraction Impervious	Tc (mins)	10% AEP flow (L/s)
Development	2.76	0.39	10.5	579
Carpark (20% AEP)	0.6	0.85	9.8	225
Total	3.36	-	-	804

2.2.2 FIVE MILE CREEK EXTERNAL CATCHMENT ANALYSIS

To determine the flows generated by the Five Mile Creek external catchment, the Regional Flood Frequency Estimation Model (4th Edition AR&R) was used to validate the rational calculations.

Table 5: External Catchment RFFE

Catchment	Area (Ha)	Dist to nearest gauged catchment (km)	1% AEP flow (m^3/s)	10% AEP flow (m^3/s)
EXT-1 (Five Mile Creek)	962	12.7	32.6	12.3

It was found that the Five Mile Creek catchment was suitable for estimation using this method (RFFE) by ensuring there were no limitations listed on the website applicable to this site.

Table 6: External Catchment Rational Calculations

Catchment	Area (Ha)	Flow length (km)	Tc (Mins)	1% AEP flow (m^3/s)	10% AEP flow (m^3/s)
EXT-1 (Five Mile Creek)	962	4.95	80	32.643	12.378

For the rational calculation, catchment analysis was performed as can be seen in Appendix C.

Due to the high-correlation for the Five Mile Creek catchment to other gauged catchments referenced in the RFFE for size, shape and location, the RFFE major and minor flows were deemed appropriate for this analysis.

Figure 5 – Five Mile Creek Catchment area

2.3 DEVELOPMENT SITE FLOWS COMPARED TO GREATER CATCHMENT

The current site on which the development is proposed is currently untreated and has no stormwater retardation prior to release into the receiving catchment. The development increases the Fraction Impervious by only 10% due to the demolition and then construction of new buildings on the site – shortening the Time of Concentration by less than 1 minute in the minor storm event.

The increase of storm peak flows from the development site as estimated above, contribute to the overall catchment as shown below in table 7.

Table 7: External Catchment Rational Calculations

Catchment	Area (Ha)	Fraction Impervious	1% AEP flow (m^3/s)	10% AEP flow (m^3/s)
Five Mile Creek (Pre-development)	962	0.100	32.643	12.378
Five Mile Creek (Post-development)	962	0.1006	32.701	12.400
Increase (%)	-	**0.006**	**0.18% (58L/s)**	**0.18% (22L/s)**

It can be seen that the development contributes just a 0.18% increase in peak flows in a major and minor storm event of the total Five Mile Creek Catchment, 58 L/s and 22 L/s respectively.

3. HYDRAULIC ANALYSIS

The hydraulic analysis objectives for the subject site are to:

- Determine the nominal pipe sizing based on typical site grades.
- Determine the capacity for 'Gap' flows to be safely conveyed via the road network – checked in accordance with MWC floodway criteria.

3.1 MINOR DRAINAGE NETWORK

Manning's Pipe Capacity calculations have been conducted to assess the capacity of the proposed drainage network as shown in figure 4.

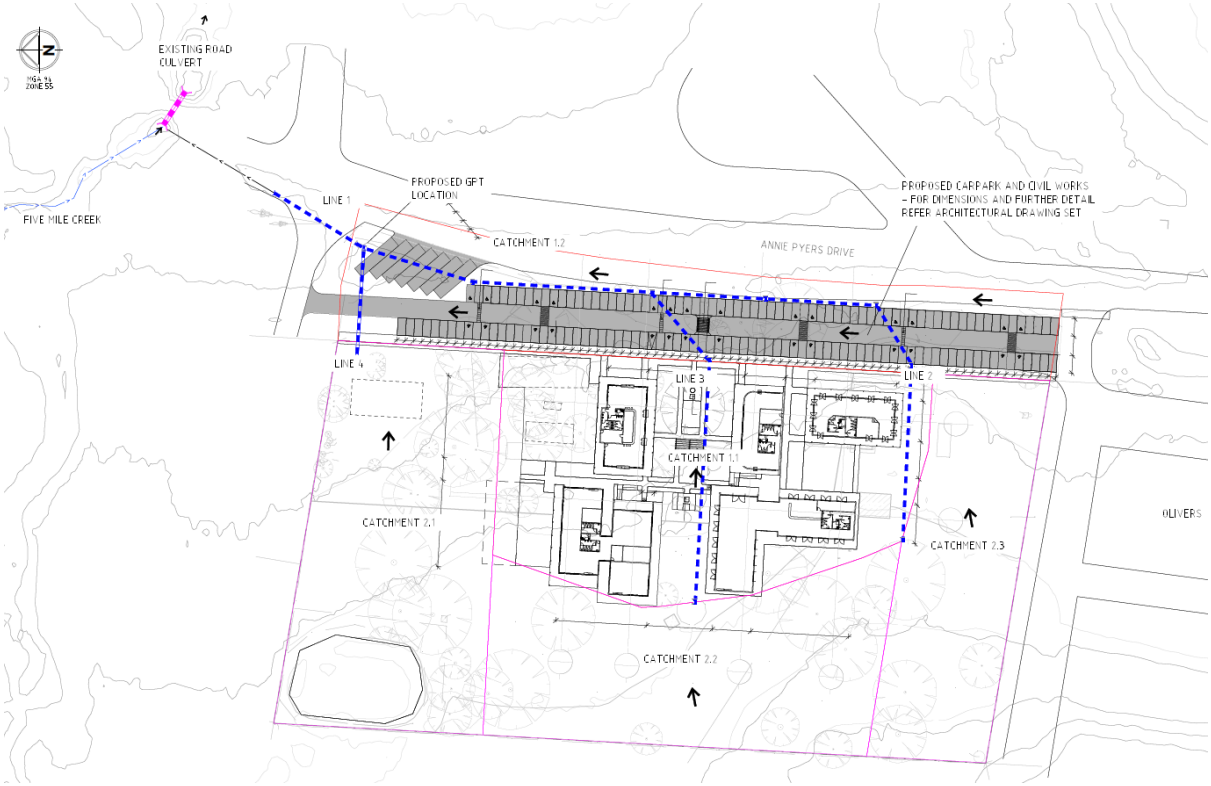


Figure 4. Development's indicative drainage layout (Spiire, 2023)

A summary of the indicated pipe capacity is provided in Table 8.

Table 8: Pipe Capacity

Line	Pipe Diameter (mm)	Slope (%)	$Q_{capacity}$ (m^3/s)	Pipe Velocity (m/s)	$Q_{10\%}$ (L/s)	Capacity
1	DN600	0.6	476	1.7	439	OK
2	DN300	0.9	92	1.3	46	OK
3	DN375	1.8	235	2.1	199	OK
4	DN300	2.0	137	1.9	66	OK

Refer to Appendix D for the Rational Calculations.

3.2 MAJOR DRAINAGE NETWORK

In a major storm event, the pipe network will convey the calculated capacity identified in section 3.1, and the remaining flow (gap flow) from the major storm event will be expected to be conveyed via a 5m wide channel in the road reserve, 300mm deep with a longitudinal grade of 0.6% - the Convey Sections shown in Appendix F.

Table 9: Major storm event gap flow calculation

Pipe	$Q_{1\%}$ (L/s)	Pipe $Q_{capacity}$ (L/s)	Gap Flows (L/s)
1	804	476	328

Table 10: Channel capacity flow check

Channel	Grade	$Q_{capacity}$ (L/s)	Velocity (m/s)
1	1 in 167	540	0.72

Table 11: System capacity flow check

Combined Pipe & Channel	Capacity Q_{Total} (L/s)	$Q_{1\%}$ (L/s)	Surplus capacity (L/s)
1	1016	804	212

As shown above, the pipe and channel have sufficient capacity for the developments estimated flows.

The channel capacity was analysed using Melbourne Water's floodway criteria, as such a Mannings 'n' of 0.030 was used for the channel section, representative of a "well maintained grassed floodway in easements possibly containing sparse tree plantings on the verges, in urban areas" (Melbourne Water, 2017), achieving a Vav.dav of 0.11 m^2/s and dav of 0.15m, both lower than the "recommended safety limits for continuously grading streets: Vav.dav <= 0.35 m2/s, and dav <= 0.30m" (Melbourne Water, 2017).

4. STORMWATER QUALITY AND DETENTION

This section of the report will analyse the requirements for the stormwater quality and detention proposed for the site and make commentary around the effects to downstream catchments.

4.1.1 DESIGN CRITERIA

- Stormwater treatment targets to be addressed are as outlined in the *Urban Stormwater: Best Practice Environmental Management Guidelines* (CSIRO 1999):
  - Total suspended Solids – 80%
  - Total Phosphorus – 45%
  - Total Nitrogen - 45%
  - Gross Pollutants - 70%

4.2 STORMWATER QUALITY

To ensure the design criteria are met for the proposed site post-development, the system will include the following stormwater quality products;

- Gross Pollutant Trap: Atlan Vortceptor SVO.096, vortex style GPT with non-binding screen sized for the Q-3 Month flows, high flow bypass 96L/s.
- Pit filters: Atlan Stormsack - 6 x located in drainage pits with 200micron mesh, high flow bypass 15L/s each.

4.2.1 MUSIC MODELLING

The proposed system achieved the following reduction targets in the table below:

Table 12: System capacity flow check

Item	Target reduction %	Actual reduction %	Check
Total Suspended Solids (kg/yr)	80	88.3	OK
Total Phosphorus (kg/yr)	45	49.6	OK
Total Nitrogen (kg/yr)	45	45	OK
Gross Pollutants (kg/yr)	70	100	OK

Refer Appendix E for MUSIC modelling outputs.

4.3 DETENTION

As described above in section 2.3, the development is already discharging untreated and undetained flows into the receiving catchment.

It can be seen that the development contributes just a 0.18% increase in peak flows in a major and minor storm event of the total Five Mile Creek Catchment, 58 L/s and 22 L/s respectively.

The estimated Tc of the development is 10.5 minutes, where-as peak flow from the Five Mile Creek external catchment is estimated at 80 minutes. These minor fractions of the overall flows contributed by the development, paired with the large difference in time between the peak flows occurring provides the justification to exclude detention from the subject development.

5. LIMITATIONS

Limitations exist with respect to the above report, with the following to be considered:

- A Staging plan is to be finalised to enable a strategy for temporary works, as such the catchments have potential to change, but the general concept will be adopted, and,
- Cultural heritage, fauna and flora, and geotechnical information was not available.
- Existing pipe capacity outside of subject site not available, conservative assumptions are in place to mitigate.

SUMMARY AND RECOMMENDATIONS

This report was carried out for The Price Group Pty Ltd to demonstrate that the proposed development is viable when considering hydraulic & hydrological, stormwater quality and detention to the relevant authority requirements.

The development site conditions were assessed including pre- and post-development catchment flows in minor and major storm events, with the current Dog on the Tuckerbox site stormwater runoff being untreated and undetained.

As estimated, the development changes on site will see an increase to the fraction impervious by only 10%, as there will be removal and construction of new buildings and landscaping.

While proposing to install appropriate stormwater quality assets to meet the minimum reduction targets identified and discharging into a catchment 350 times greater in size, the development will contribute just a 0.18% increase to peak flows in the major and minor storm events.

The estimated Tc of the development is 10.5 minutes, and peak flow from the Five Mile Creek external catchment is estimated at 80 minutes.

It was concluded that due to the large time between peak flow's occurring from the large external and small development catchments, and the minor fraction of an increase in peak flows as a result of the development, excluding site detention is unlikely to cause damage, or negatively impact downstream catchments, property or the environmental and therefore provides the justification to exclude stormwater detention from the subject development.

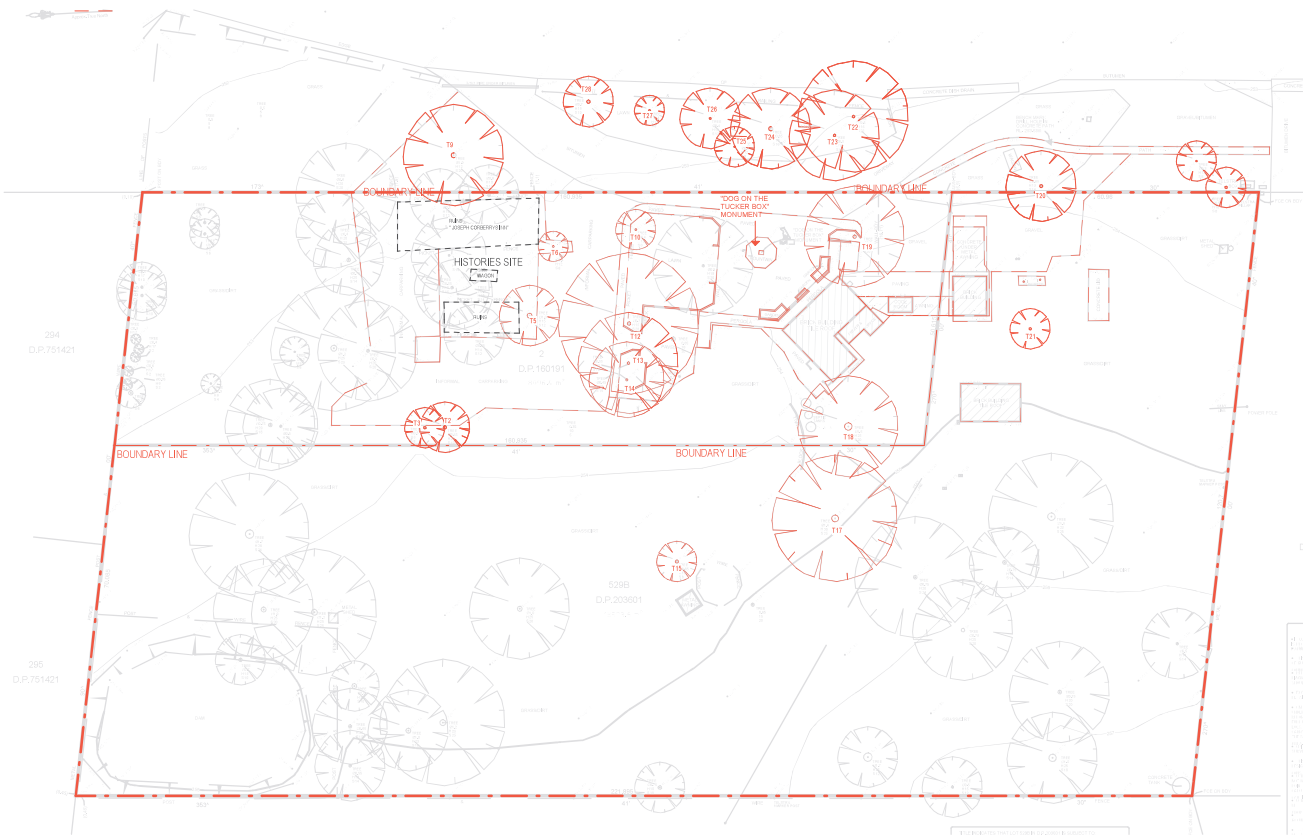
6. REFERENCES

1. CSIRO 1999, *Urban Stormwater: Best Practice Environmental Management Guidelines*, published electronically 2006 by CSIRO PUBLISHING, viewed 4/08/2023, <https://www.publish.csiro.au/ebook/chapter/SA0601261>
2. RFFE 2023, *Regional Flood Frequency Estimation Model*, Release Version of the Regional Flood Frequency Estimation Model for the 4th edition of Australian Rainfall and Runoff, viewed 24-August-2023, <https://rffe.arr-software.org>
3. Melbourne Water 2017, *Floodway safety criteria*, viewed online 25 August 2023, <https://www.melbournewater.com.au/building-and-works/developer-guides-and-resources/standards-and-specifications/floodway-safety>

APPENDIX A – EXISTING CONDITIONS & DEMOLITION PLANS

DEMOLITION NOTES

- CAP OFF EXISTING PLUMBING AND ELECTRICAL WORKS AS NECESSARY BY CERTIFIED TRADESPERSON.
- MODIFIED BRICKWORK TO BE TOOTHED INTO EXISTING WHERE APPLICABLE AND CAVITY TO REMAIN CONTINUOUS AT ALL TIMES.
- EXISTING MATERIALS TO BE REUSED TO OWNERS DETAIL.
- MATERIALS REMOVED FROM SITE MUST BE DISPOSED OF AS PER COUNCIL REGULATIONS.
- INVESTIGATION SHOULD BE UNDERTAKEN BEFORE ALL WORKS THAT REQUIRES EXCAVATION.
-ALLOW TO CAREFULLY DEMOLISH/REMOVE/SALVAGE THE ITEMS SHOWN ON DRAWINGS IN ACCORDANCE WITH BUILDING CODES AND AUSTRALIAN STANDARDS AND AS REQUIRED FOR THE COMPLETION OF THE CONTRACT WORKS.
-ALLOW TO EXCAVATE ALL TRENCHES REQUIRED FOR NEW/RELOCATED UTILITY SERVICES (ELECTRICITY, WATER, GAS, SEWER, ETC
-ALLOW FOR ANY OTHER DEMOLITION AND EXCAVATION AS REQUIRED FOR THIS COMPLETION OF THE WORKS.
- CHECK THE STABILITY OR OTHERWISE OF STRUCTURES IN THE VICINITY OF THE DEMOLITION WORK. TAKE PRECAUTIONS TO PREVENT DAMAGE TO SUCH STRUCTURES.
- IF EXCAVATION IS REQUIRED BELOW THE LINE OF INFLUENCE OF AN EXISTING FOOTING, USE METHODS THAT MAINTAIN THE SUPPORT OF THE FOOTING AND ENSURE THAT THE STRUCTURE AND FINISHES SUPPORTED BY THE FOOTING ARE NOT DAMAGED.
- ARRANGE FOR DISCONNECTION, CUTTING, SEALING OFF, DIVERTING ETC. OF EXISTING SERVICES AS REQUIRED BY THE CONTRACT.
-PREVENT DAMAGE OR INTERFERENCE TO EXISTING SERVICES ABOVE AND BELOW GROUND. IMMEDIATELY RECTIFY ANY DAMAGE OR INTERFERENCE OF THESE SERVICES AND PROVIDE TEMPORARY SERVICES WHILST REPAIRS ARE BEING CARRIED OUT.
-SEEK APPROVAL FROM COUNCIL FOR REMOVING TREES (IF NOT EXEMPT)



1 DEMOLITION PLANS

1 : 1000

LEGEND

PROPOSED

TO BE DEMOLISHED

ARCHITECTS

W www.snarchitects.com.au
E info@snarchitects.com.au
M 0405242821
A 1/68 Allen St, Leichhardt NSW 2040

m 0 10 20 30 40

1:1000 at A3 1:500 at A1

REFERENCES

DRAWINGS TO BE READ IN CONJUNCTION WITH BUT NOT LIMITED TO ALL STRUCTURAL ENGINEERS, STORMWATER ENGINEERS, LANDSCAPE ARCHITECTS, AND OTHER ASSOCIATED PLANS & REPORTS ,.

REFER TO THE BASIX REPORT FOR ADDITIONAL REQUIREMENTS.

NOTES

ALL DIMENSIONS AND SETOUTS ARE TO BE VERIFIED ON SITE AND ALL OMISSIONS OR ANY DISCREPANCIES TO BE NOTIFIED. FIGURED DIMENSIONS TO BE USED AT ALL TIMES DO NOT SCALE MEASUREMENTS OFF DRAWINGS.

NOMINATED ARCHITECT: SOROOSH MOSHKSAR 11278

DRAWN	DESIGNED	CHECKED
SM	SM	SM

DRAWING SCALE	SHEET SIZE	PROJECT NUMBER
As indicated	A3	210804

DRAWING NUMBER
A 1104

DRAWING TITLE
DEMOLITION PLANS

PROJECT STAGE
DA

PROJECT DETAILS
Mixed used Development

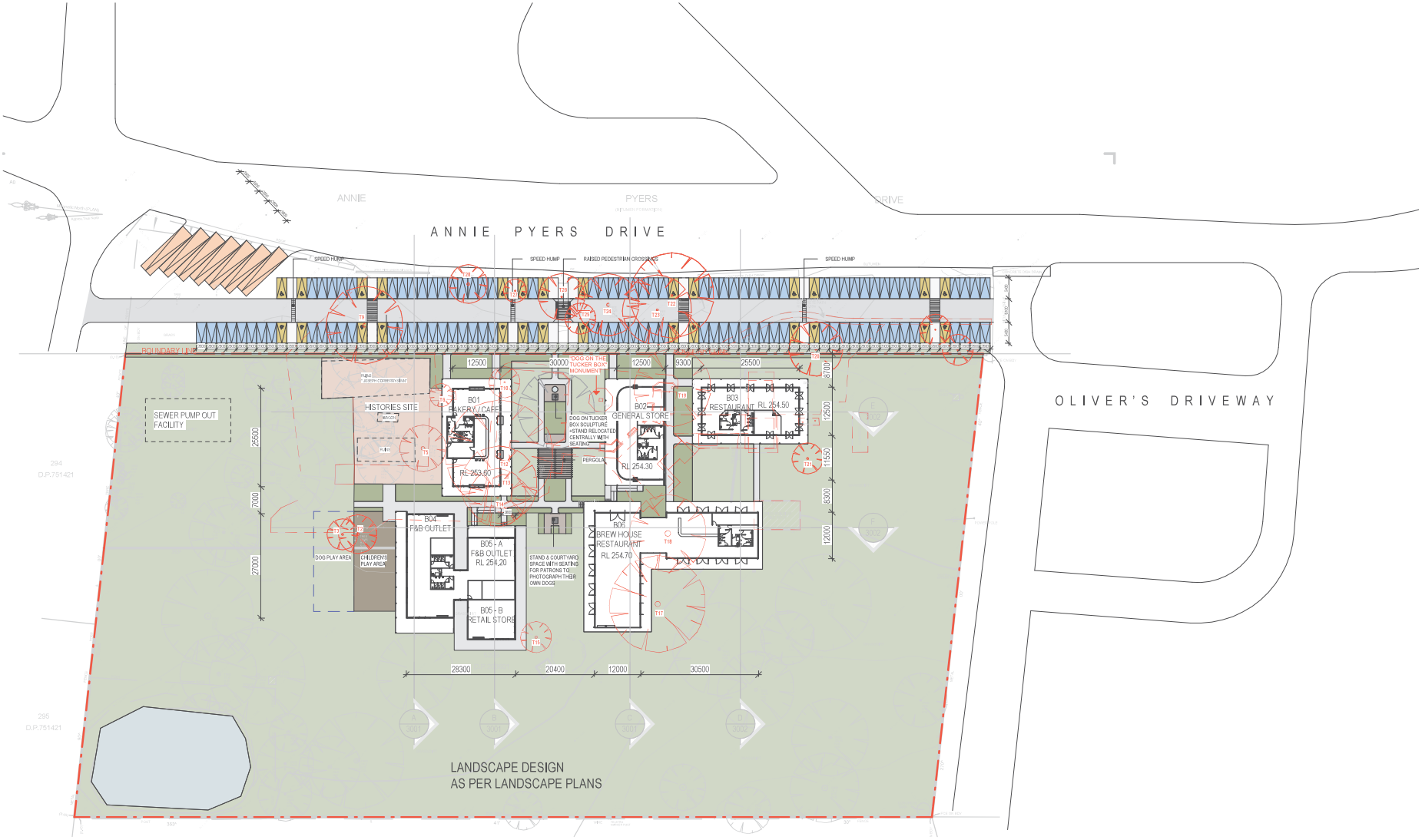
DOG ON THE TUCKER BOX

CLIENT DETAILS
The DOTT Developments Pty Ltd

Rev.	Date	Description
A	18.08.23	DA SUBMISSION

Scale

APPENDIX B – PROPOSED DEVELOPMENT



LEGEND

PROPOSED

TO BE DEMOLISHED

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1:1000 at A3 1:500 at A1

W www.snarchitects.com.au
E info@snarchitects.com.au
M 0405242821
A 1/68 Allen St, Leichhardt NSW 2040

REFERENCES

DRAWINGS TO BE READ IN CONJUNCTION WITH BUT NOT LIMITED TO ALL STRUCTURAL ENGINEERS, STORMWATER ENGINEERS, LANDSCAPE ARCHITECTS, AND OTHER ASSOCIATED PLANS & REPORTS.,

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NOMINATED ARCHITECT: SOROOSH MOSHKSAR 11278

DRAWN	DESIGNED	CHECKED
SM	SM	SM

DRAWING SCALE: As indicated

SHEET SIZE: A3

PROJECT NUMBER: 210804

DRAWING NUMBER: A 1003

DRAWING TITLE: SITE PLAN

PROJECT STAGE: DA

PROJECT DETAILS: Mixed used Development

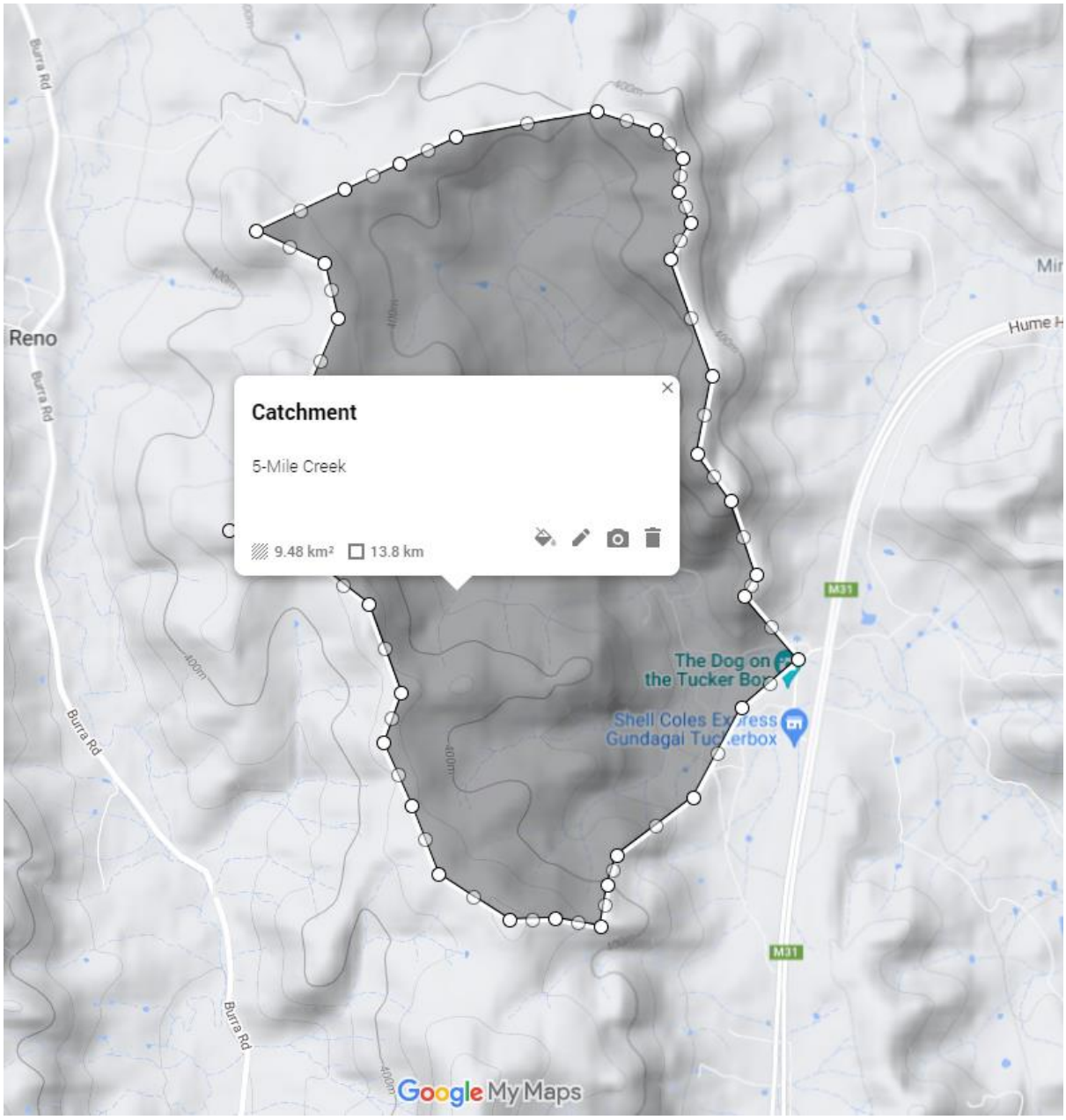
DOG ON THE TUCKER BOX

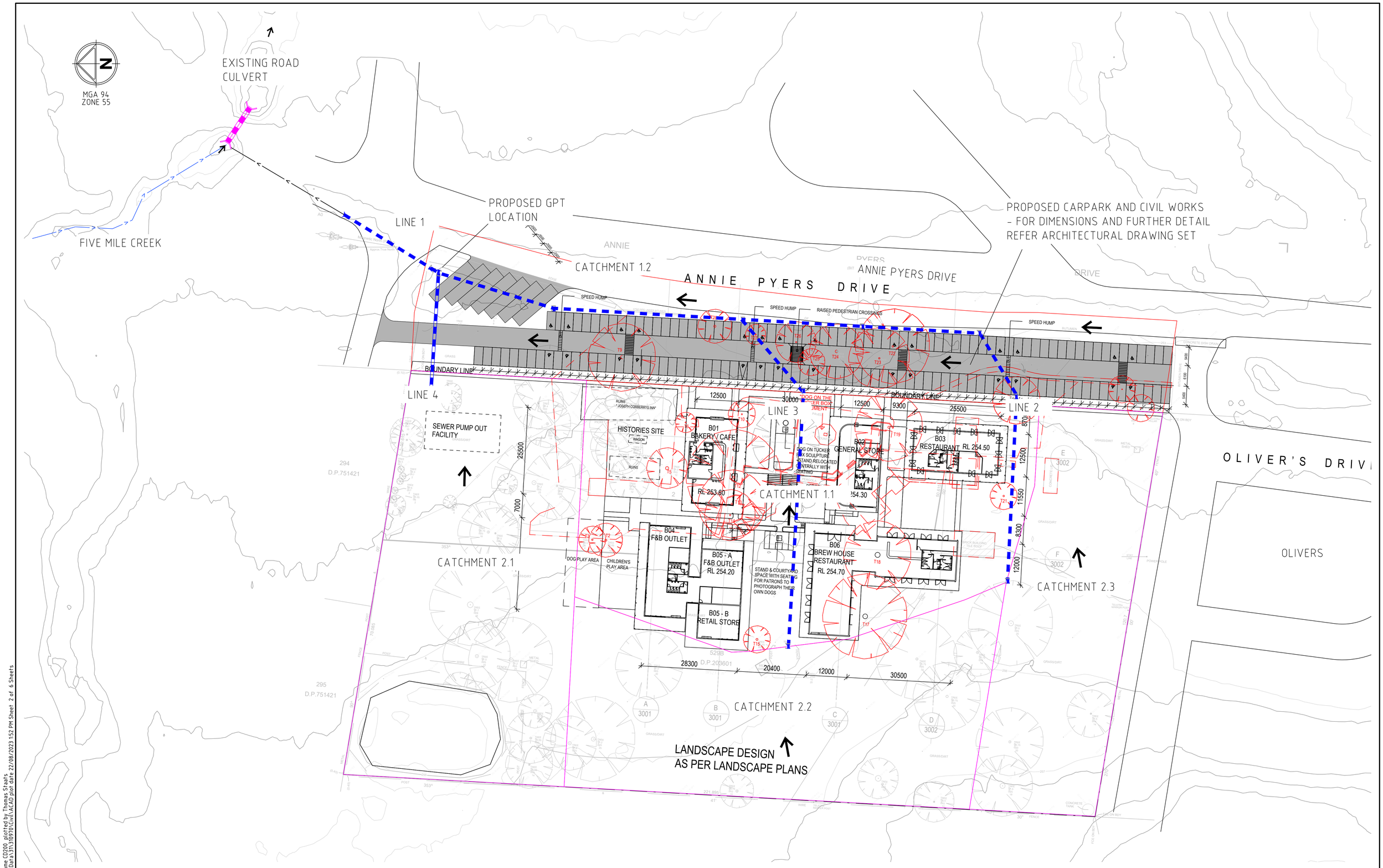
CLIENT DETAILS: The DOTT Developments Pty Ltd

Rev.	Date	Description
A	18.08.23	DA SUBMISSION

Scale

APPENDIX C – CATCHMENT PLANS (EXTERNAL AND DEVELOPMENT)





Rev	Amendments	Approved	Date
C	UPDATED ARCHITECTURAL PLANS	BM	22/08/23
B	UPDATED MASTERPLAN	BM	17/08/23
A	FOR INFORMATION ONLY	BM	11/08/23

Scale H 1:500 SCALE @ A1 (0 5 10 15 20 25)

CATCHMENT 1.2 = CAR PARK
CATCHMENT 1.1, 2.1-2.3 = DEVELOPMENT

LEGEND
DEMOLISH/REMOVE
PROPOSED
OVERLAND FLOW ARROWS

dlcs ISO 9001 certified ISO 45001 certified ISO 14001 certified
System Certified

spiire
445 TOWNSEND STREET ALBURY
NSW 2640 AUSTRALIA T 61 2 6051 1300
spiire.com.au ABN 55 050 029 635

Designed T.STAATS
Checked B.MUGRIDGE
Authorised B.MUGRIDGE
Date 11-08-2023

DOG ON THE TUCKERBOX DEVELOPMENT CIVIL AND DRAINAGE STRATEGY

DRAINAGE LAYOUT AND CONCEPT CIVIL PLAN - SHEET 1

COOTAMUNDRA-GUNDAGAI REGIONAL COUNCIL
THE PRICE GROUP

PRELIMINARY

Drg No 310970CD200 Rev C

file name 310970CD200.dwg layout name CD200 plotted by Thomas Staats
file location \\spiire.com.au\albdata\Data\31\310970\Civil\ACAD plot date 22/08/2023 1:52 PM Sheet 2 of 6 Sheets

APPENDIX D – RATIONAL ESTIMATION CALCULATIONS

Project Name:	310970 Dog on the Tuckerbox Development
Date:	4 August 2023
Designed:	T.S
Checked:	B.M

The below FI numbers have been selected as per the Useful Charts (ARR16) Tab, in their respective ranges suitable to the site. Road Runoff representative of Draft developed site

Road Runoff f =	0.85	
Developed Area Runoff f = B1Z	0.9	* High surface area runoff
Open Space Runoff f = RUZ	0.2	* Includes some existing hard-stand

	AREA (Ha)				Fraction	Weighted Runoff	Weighted Runoff
Catchment	Road Reserve	Developed	Open Space	TOTAL	Impervious (f)	$C_{1\%}$	$C_{10\%}$
Ex. STG 1.1 - Development		0.37	0.57	0.94	0.48	0.625	0.521
Ex. STG 1.2 - Carpark AEP 20%	0.60			0.60	**0.75**	0.863	**0.683**
Ex. STG 2.1 - Development			0.72	0.72	0.20	0.386	0.322
Ex. STG 2.2 - Development			0.62	0.62	0.20	0.386	0.322
Ex. STG 2.3 - Development			0.48	0.48	0.20	0.386	0.322
STG 1.1 - Development		0.74	0.20	0.94	0.75	0.864	0.720
STG 1.2 - Carpark AEP 20%	0.60			0.60	0.85	0.950	**0.752**
STG 2.1 - Development			0.72	0.72	0.20	0.386	0.322
STG 2.2 - Development			0.62	0.62	0.20	0.386	0.322
STG 2.3 - Development			0.48	0.48	0.20	0.386	0.322
Ext. Catchment 5-Mile Pre			962.00	962.00	0.1000	0.300	0.250
Ext. Catchment 5-Mile Post		0.74	961.26	962.00	0.1006	0.300	0.250
Total Pre		0.37	2.39	2.76	0.29	0.468	0.390
Total Post		0.74	2.02	2.76	0.39	0.549	0.458
Total Pre		0.37	2.39	2.76	0.29	0.468	0.370
Total Post		0.74	2.02	2.76	0.39	0.549	0.435

Project:	**Dog on the Tuckerbox Development**	**Designed:**	T.S
Reference No:	**310970**	**Checked:**	B.M

Annual Exceedance Probability (%)

AEP Coefficients	63.20%	50%	20%	10%	5%	2%	1%
C0	0.49419266	0.6060346	0.90516192	1.0762441	1.2258421	1.4031587	1.5264224
C1	0.61284125	0.6189464	0.63995421	0.65451509	0.66854644	0.6928193	0.71393746
C2	0.24105278	0.2312068	0.2042625	0.18888673	0.17563072	0.15202379	0.13164458
C3	-0.1360652	-0.1305699	-0.11804535	-0.11239811	-0.1083891	-0.10073154	-0.094223887
C4	0.02615487	0.0248123	0.022165503	0.021267202	0.02084312	0.01984534	0.01902636
C5	-0.0021989	-0.0020532	-0.00179838	-0.00173861	-0.0017361	-0.001692343	-0.001660362
C6	6.80E-05	6.22E-05	5.31E-05	5.19E-05	5.31E-05	5.32E-05	5.35E-05

AEP to ARI Conversion

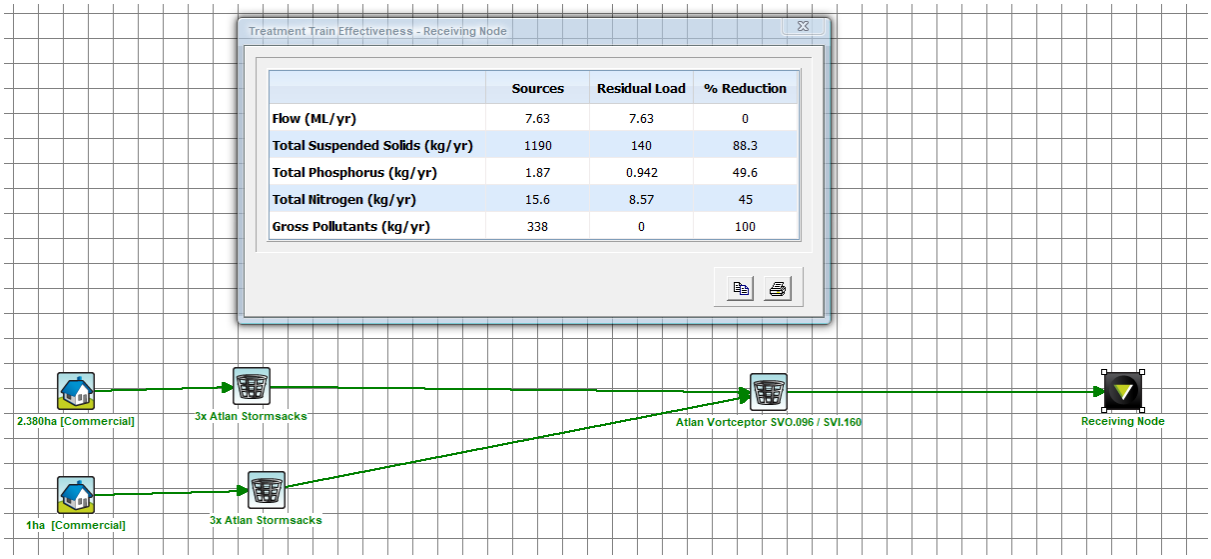
AEP %	ARI
63.20%	1
50%	1.44
20%	4.48
10%	10
5%	20
2%	50
1%	100

1% AEP URBAN ARI Drainage Calculations

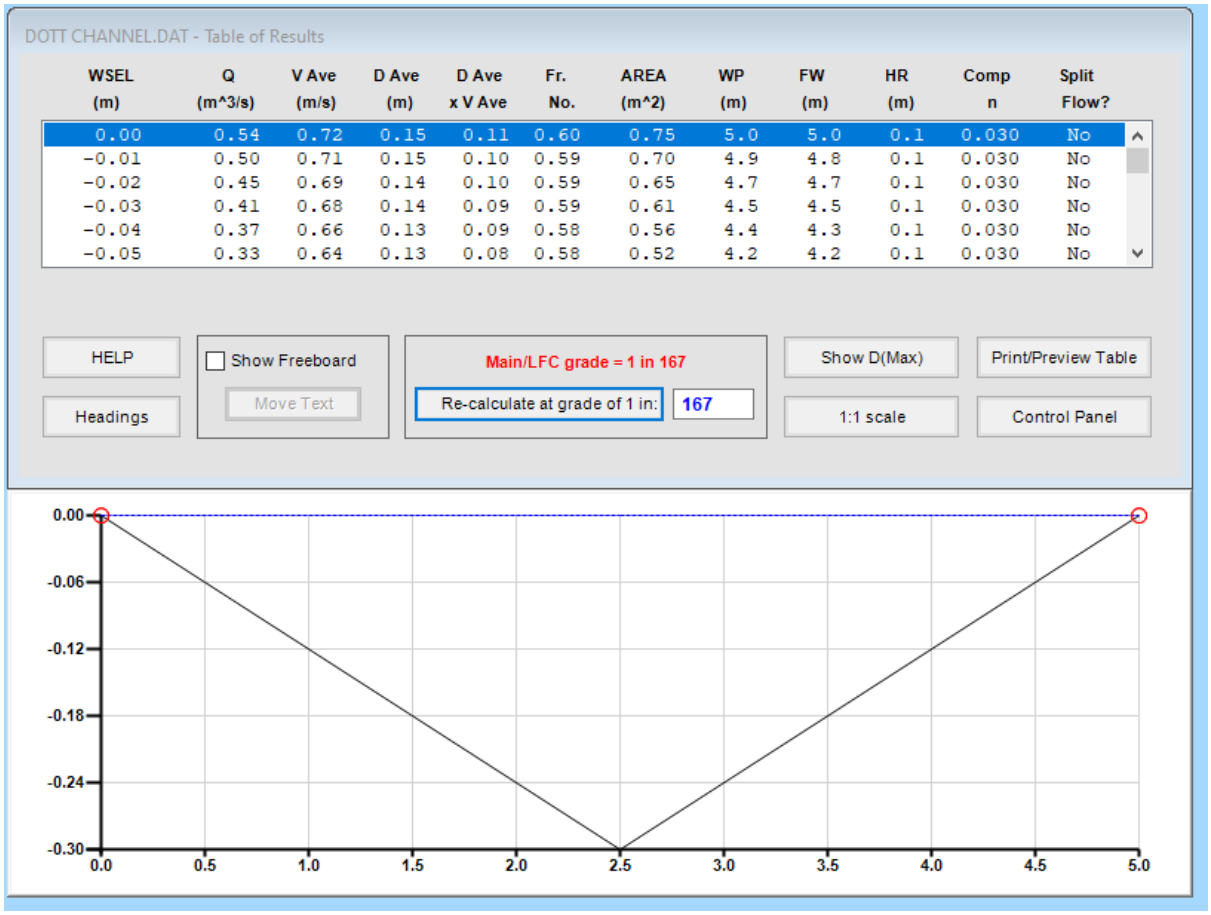
DEVELOPED CATCHMENT

Catchment (As per plan: Runoff Coefficients)	Area (ha)	∑A (ha)	C 1%	C 10%	Ae 1% (ha)	∑Ae 1% (ha)	Ae 10% (ha)	∑Ae 10% (ha)	Flow Length (m)	Velocity 1% (m/s)	Velocity 10% (m/s)	Tc 1% (mins)	Tc 10% (mins)	Int 1% (mm/hr)	Int 10% (mm/hr)	Q 1% m3/s	Qpipe m3/s	Qgap m3/s	Comments
Ex. STG 1.1 - Development	0.94	0.94	0.63	0.52	0.59	0.59	0.49	0.49	130	0.8	1	7.71	7.17	157.42	103.10	0.257	0.140	0.117	
Ex. STG 1.2 - Carpark AEP 20%	0.6	0.6	0.86	**0.68**	0.52	0.52	**0.41**	**0.41**	230	0.8	**1**	9.79	**8.83**	141.85	**79.90**	0.204	**0.091**	0.113	AEP 20%
Ex. STG 2.1 - Development	0.72	0.72	0.39	0.32	0.28	0.28	0.23	0.23	130	0.8	1	7.71	7.17	157.42	103.10	0.122	0.066	0.055	
Ex. STG 2.2 - Development	0.62	0.62	0.39	0.32	0.24	0.24	0.20	0.20	100	0.8	1	7.08	6.67	162.88	105.92	0.108	0.059	0.050	
Ex. STG 2.3 - Development	0.48	0.48	0.39	0.32	0.19	0.19	0.15	0.15	80	0.8	1	6.67	6.33	166.78	107.90	0.086	0.046	0.040	
																0.777	0.403		Total Site Pre-dev flow
STG 1.1 - Development	0.94	0.94	0.86	0.72	0.81	0.81	0.68	0.68	130	0.8	1.2	7.71	6.81	157.42	105.12	0.355	0.198	0.158	
STG 1.2 - Carpark AEP 20%	0.6	0.6	0.95	**0.75**	0.57	0.57	**0.45**	**0.45**	230	0.8	**1.2**	9.79	**8.19**	141.85	**82.42**	0.225	**0.103**	0.121	AEP 20%
STG 2.1 - Development	0.72	0.72	0.39	0.32	0.28	0.28	0.23	0.23	130	0.8	1.2	7.71	6.81	157.42	105.12	0.122	0.068	0.054	
STG 2.2 - Development	0.62	0.62	0.39	0.32	0.24	0.24	0.20	0.20	100	0.8	1.2	7.08	6.39	162.88	107.57	0.108	0.060	0.049	
STG 2.3 - Development	0.48	0.48	0.39	0.32	0.19	0.19	0.15	0.15	80	0.8	1.2	6.67	6.11	166.78	109.27	0.086	0.047	0.039	
																0.671	0.372		Total Site Post-dev flow
Ext. Catchment 5-Mile Pre	962	962	0.30	0.25	288.34	288.34	240.29	240.29	4950	1.15	0.7	76.74	122.86	40.75	18.54	32.643	12.378		Five Mile Creek Flows
Ext. Catchment 5-Mile Post	962	962	0.30	0.25	288.86	288.86	240.71	240.71	4950	1.15	0.7	76.74	122.86	40.75	18.54	32.701	12.400		Five Mile Creek Flows
Total Pre	2.76	2.76	0.47	0.39	1.29	1.29	1.08	1.08	262	0.8	1	10.46	9.37	137.58	77.92	0.493	0.233	0.261	Total Pre-dev flow
Total Post	2.76	2.76	0.55	0.46	1.52	1.52	1.26	1.26	262	0.8	1.2	10.46	8.64	137.58	95.67	0.579	0.336	0.244	Total Post-dev flow

APPENDIX E – MUSIC MODEL OUTPUTS

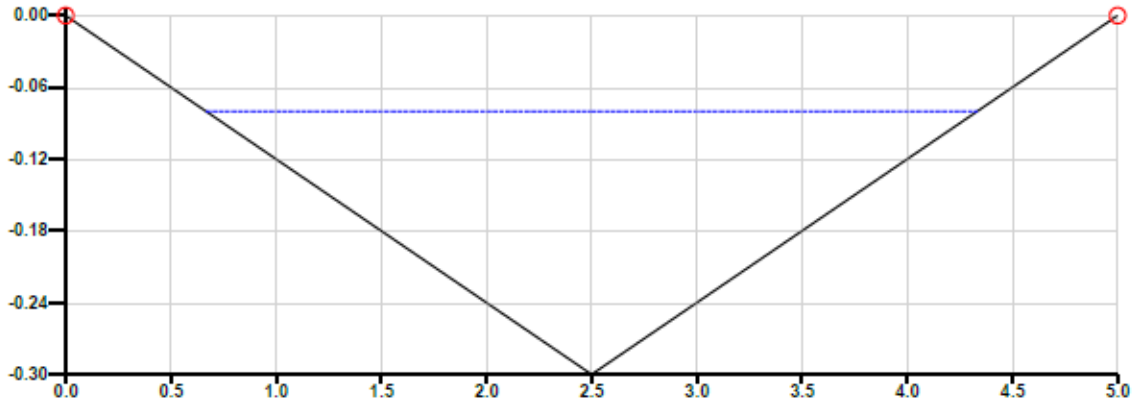


APPENDIX F – PC CONVEY SECTIONS



PROJECT: DOTT
Comment
Print-out date: 08/08/2023 - Time: 10:48
Data File: C:\Users\Thomas.Staats\Documents\DOTT Channel.dat

1. CROSS-SECTION:



2. DISCHARGE INFORMATION:

100 year (1%) storm event

Total discharge = 0.328 cumecs

There is no pipe discharge
Overland / Channel / Watercourse discharge = 0.328 cumecs

3. RESULTS: Water surface elevation = -0.080m

High Flow Channel grade = 1 in 167, Main Channel / Low Flow Channel grade = 1 in 167.

	LEFT OVERBANK	MAIN CHANNEL	RIGHT OVERBANK	TOTAL CROSS-SECTION
Discharge (cumecs):	0.00	0.36	0.00	0.36
D(Max) = Max. Depth (m):	0.00	0.22	0.00	0.22
D(Ave) = Ave. Depth (m):	0.00	0.11	0.00	0.11
V = Ave. Velocity (m/s):	0.00	0.88	0.00	0.88
D(Max) x V (cumecs/m):	0.00	0.19	0.00	0.19
D(Ave) x V (cumecs/m):	0.00	0.10	0.00	0.10
Froude Number:	0.00	0.85	0.00	0.85
Area (m^2):	0.00	0.40	0.00	0.40
Wetted Perimeter (m):	0.00	3.69	0.00	3.69
Flow Width (m):	0.00	3.67	0.00	3.67
Hydraulic Radius (m):	0.00	0.11	0.00	0.11
Composite Manning's n:	0.000	0.020	0.000	0.020
Split Flow?	-	-	-	No

4. CROSS-SECTION DATA:

	LEFT HAND POINT		RIGHT HAND POINT		
SEGMENT NO.	CHAINAGE (m)	R.L. (m)	CHAINAGE (m)	R.L. (m)	MANNING'S N
1	0.000	0.000	2.500	-0.300	0.020
2	2.500	-0.300	5.000	0.000	0.020