

27 Dec 24

286 Sydney Rd Balgowlah

Submission to Transport for NSW

Section 1 - Driveway – Proposed new driveway for 286 Sydney Rd Balgowlah

Section 2 - Storm water drainage – Proposed discharge to Sydney Rd gutter

References (all attached in sequence)

- A. TfNSW letter dated 4 October 2024 Reference: SYD24-01653
- B. Email from Richard Weber to 'development.sydney@transport.nsw.gov.au' 9 Dec 24

Reference A outlines the need for design drawings to be sent to TfNSW for approval of the proposed driveway at 286 Sydney Rd Balgowlah. Reference A also requests inclusion of changes in the stormwater drainage system . . . (see extract from Ref A below).

4. Detailed design plans and hydraulic calculations of any changes to the stormwater drainage system are to be submitted to TfNSW for approval, prior to the commencement of any works. Please send all documentation to development.sydney@transport.nsw.gov.au.

This report should be read in conjunction with Driveway Drawings C8 and C9 and Stormwater Management Design Drawings SW01 and SW02

Section 1 – Driveway

The proposed new Driveway/Layback/Cross over at 286 Sydney Rd is shown on attached drawings

- C8 Rev A Driveway Plan and Sections
- C9 Rev A Driveway Details

In the absence of standard TfNSW driveway drawings (except perhaps for standard RMS drawings), the dimensions and details shown on Dwg C8 and C9 are based on Northern Beaches Council standard drawings and AS2890.1 2004.

It is understood that Northern Beaches Council will deal with the approval of the internal driveway details, and approval of the street tree removal, whilst TfNSW will deal with the approval of the proposed driveway and cross over between the kerb and the property boundary.

It should be noted that the Sydney Rd pavement at this address was constructed out to the back of the kerb without a (typical) separate kerb and gutter block. The kerb has been constructed on top of the pavement. As a consequence, the proposal includes dowelling the back half of the new layback to the edge of the Sydney Rd pavement slab.

TfNSW approval of the Driveway/Layback/Crossover would be appreciated.

Queries should be directed to the author at rweber@bigpond.net.au or 0400 77 00 68.

Section 2 – Proposed Stormwater Discharge to Sydney Rd

Background

1. A stormwater drainage easement available since 1913, to drain the property at 286 Sydney Rd, (and 10 other Boyle St properties) has recently been made unavailable to 286 Sydney Rd. An alternative drainage arrangement is required for a proposed residential building.
2. A revised design is based on
Discharge of roof water to the Sydney Rd gutter via 2 x 5000 litre storage tanks and charged pipework with a periodic evacuation pit.
Discharge of non roof (ground surface and paving) run off to a detention basin, discharge control pit and orifice . . . to a spreader. . . .
3. The revised design requires approval from TfNSW to discharge stormwater runoff to the Sydney Rd gutter. In summary, this report provides an analysis and justification for discharging stormwater from 251 m² of roof to the Sydney Rd Kerb, as per the attached design drawings SW01 and SW02.
The proposed discharge method would be the same as is the typical case elsewhere on both sides of Sydney Rd. (See example below on the north side of Sydney Rd. (i.e. 2 rectangular hollow section outlets to the gutter))



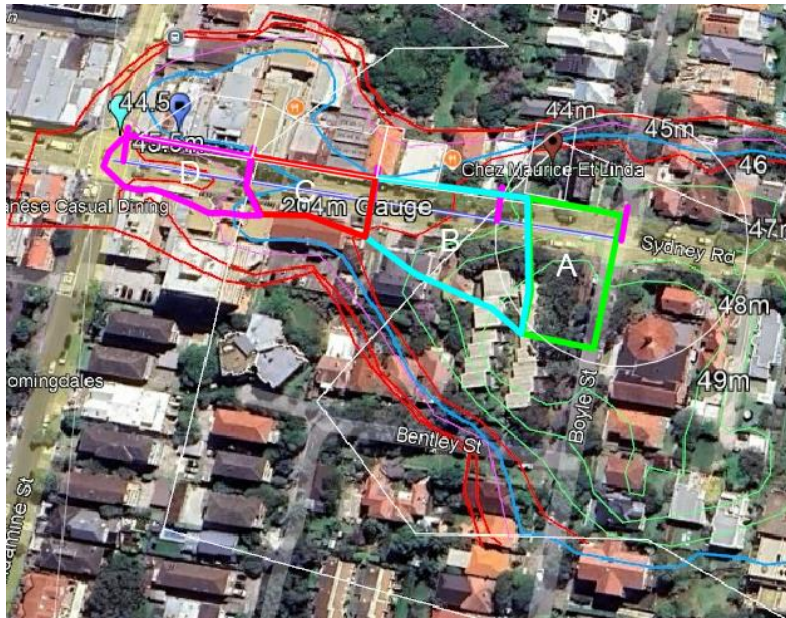
Hydraulic / Hydrological Assessment

4. In order to assess the impact of a new stormwater discharge to Sydney Rd from 286 Sydney Rd, the following process was followed . . .
 - a. An engineering survey of the catchment that includes the Sydney Rd gutter in front of 286 Sydney Rd was carried out. Observations were done on Sun 15 Dec 24 when traffic was acceptable to take road centre shots. Observations included
 - i. Boundary shots on the north side of Sydney Rd between Boyle St and Condamine St
 - ii. Gutter shots on the north side of Sydney Rd between Boyle St and Condamine St
 - iii. Road centre shots on Sydney Rd between Boyle St and Condamine St
 - b. A BOM IFD table (Bureau of Meteorology Intensity Frequency-Duration table) was generated for Balgowlah
 - c. Rainfall data (based on Aust Rainfall and Runoff (ARR) 2016 storm temporal patterns) was generated for a range of Tc values and perhaps 2 significant AEP values (eg. 5% AEP and 1% AEP) Note: Tc = Time of Concentration AEP = Average Exceedance Probability . . A 5% AEP storm was formerly referred to as a 20year Storm. A 1% AEP storm was formerly referred to as a 100year Storm
 - d. Catchment areas were specified and determined from mapping routines.
 - e. The survey observations were reduced and various open channel cross sectional areas, available to flow, were measured from the engineering survey .. The cross sectional areas are
 - i. the flow area below the top of kerb or
 - ii. the flow area below the level of the road centre or
 - iii. the flow area below the typical property boundary level
 - f. Worst case actual flow areas were determined on the basis of inflow for a range of storms and flow velocities. The maximum actual flow cross sectional area of interest in this assessment, is of course at the western end of the part of Sydney Road between Boyle St and Condamine Street. . . . before flow turns north into Condamine St to a more steeply sloping gutter. The actual storm flow areas determined were . . .
 - i. As exists
 - ii. With the addition of roof run off from 286 Sydney Rd

The Results

Basic parameters and measurements

- Sydney Rd width 12.8m including 2 traffic lanes and 1 parking lane on each side
- Gutter to Boundary width – North side – 3.6m
- Boyle St centre line (Chainage 0) to Condamine St centre Line – Distance 204m
- Location of High point in Gutter and road centre and boundary Chainage 15 just east of 286 Sydney Rd.
- Distance from high point to Condamine East side gutter – 177m
- General gutter flow on north side of Sydney Rd – from high point at chainage 15 to corner of Condamine and Sydney Rd then all to the north along Condamine.
- Assumed Coefficient of runoff C = 0.6. Factors include shallow flows over rough concrete, surface on nature strip, cars parked on street. A Mannings n value of 0.025, would apply to the road and gutter surface.
- Change from set back residential buildings to shop fronts – Chainage 72 (all shop front buildings discharge stormwater to Sydney Rd)
- Number of stormwater outlets in kerb
 - on northern side of Sydney Rd – 26 - rectangular (2) – 90mm circular (24)
 - on southern side of Sydney Rd – 14 along with uncontrolled discharge without pipes



The survey shots were taken on Sun 15 Dec 24.

		19/12/2024:07		Dialer or Free Beds	Grad ent	BS	IS	FS	rise(+) fall(-)	RL							Dialer - Staff Building	RL
1			BM in kerb 286 Sydney Rd	15		1.325				45.548								
2			Bndry	15		0.821		0.454	0.394	45.557								
3			Gutter	15		1.759		-0.893	-0.415	45.415								
4			Centre	15		1.088		0.558	0.325	286 Syd Rd Side Bndry	15							
5			Bndry	25		0.365		0.635	0.388									
6			Gutter	25		1.258		-0.285	-0.415									
7			Centre	25		1.198		0.514	0.735									
8			Bndry	45		2.857		-0.327	-0.488	286 Syd Rd West Side B	45.888							
9			Gutter	45		2.315		-0.258	-0.558									
10			Centre	45		2.885		0.238	0.788									
11			Change "Res Driveway	52.6		0.415		2.545	-0.468	45.528								
12			Bndry	72.1		1.333		-0.745	-0.377									
13			Gutter	72.1		1.582		-0.224	-0.358									
14	Road C&	72.1	Fu	92.5		1.532		-0.518	-0.249	SHOPS	64.249							
15	Outlet	90.7		92.5		1.578		-0.295	-0.687	SHOPS	92.5							
			Centre	92.5		1.733		0.195	0.282	SHOPS	92.5							
			CP	98.5		1.178		1.768	-0.893	SHOPS	98.5							
			Bndry	114		1.515		-0.145	-0.824	SHOPS	64.824							
			Gutter	114		1.683		-0.234	-0.738	SHOPS	114							
			Centre	114		1.425		0.583	0.515	SHOPS	114							
			Bndry	135		1.555		-0.148	-0.779	SHOPS	63.779							
			Gutter	135		1.876		-0.518	-0.453	SHOPS	135							
			Centre	135				0.576	0.535	SHOPS	135							
			Bndry	145		1.742		-0.812	-0.627	SHOPS	63.627							
			CP	145		1.512		1.738	-0.881	SHOPS	145							
			Bndry	148		1.312		0.388	0.541	SHOPS	63.541							
			Gutter	148		1.431		0.518	0.518	SHOPS	148							
			Centre	148		1.492		0.192	0.418	SHOPS	148							
			Bndry	158.2		1.312		0.853	0.487	SHOPS	63.487							
			Gutter	158.2		1.744		-0.388	-0.187	SHOPS	158.2							
			Centre	158.2		1.585		0.241	0.348	SHOPS	158.2							
			Bndry	172		1.542		-0.857	-0.511	SHOPS	63.511							
			Gutter	172		1.986		-0.304	-0.247	SHOPS	172							
			Centre	172		1.638		0.268	0.215	SHOPS	172							
			Bndry	184		1.721		-0.893	-0.152	SHOPS	63.152							
			Gutter	184		2.883		-0.282	-0.458	SHOPS	184							
			Centre	184		1.744		0.237	0.387	SHOPS	184							
			cp	192		1.557		1.791	-0.828	SHOPS	192							
			Gutter	192		1.62		0.253	0.274	SHOPS	192							
			Centre	192		1.41		0.218	0.185	SHOPS	192							
			Gutter (Cushioning SH)	197		1.827		-0.417	-0.585	SHOPS	197							

Fig 2. Screen shot of survey

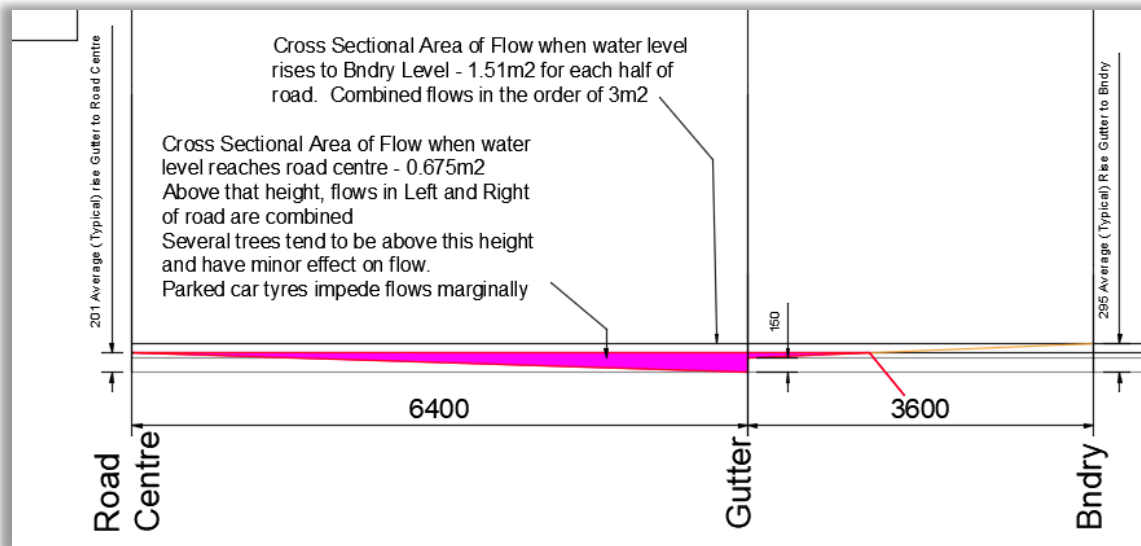


Fig 3. Typical cross section of the gutter channel on the north side of Sydney Rd

Catchments discharging to the Sydney Rd north gutter

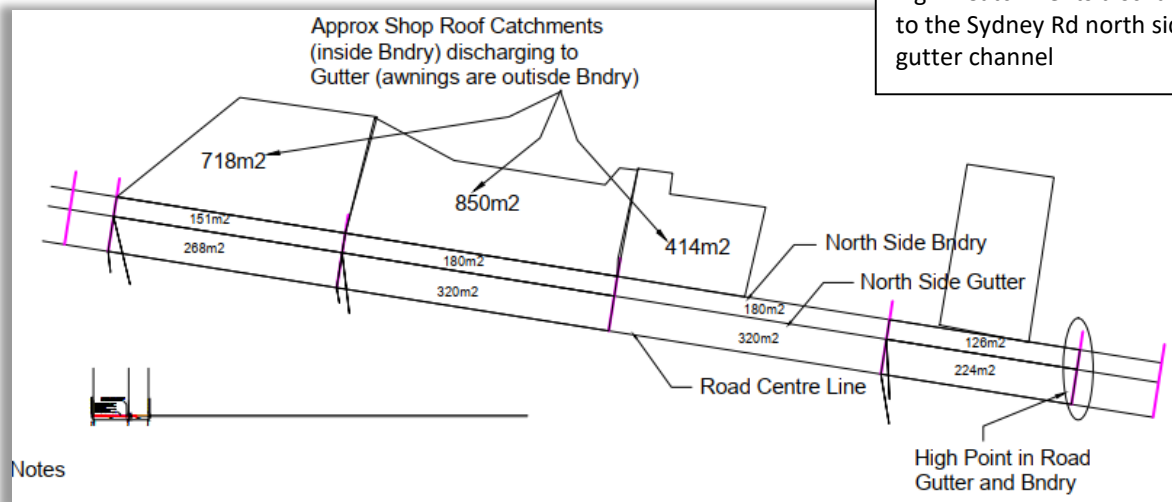


Fig 4. Catchments discharging to the Sydney Rd north side gutter channel

Location

Label: Balgowlah

Latitude: -33.795 [Nearest grid cell: 33.7875 (S)]

Longitude: 151.267 [Nearest grid cell: 151.2625 (E)]



IFD Design Rainfall Depth (mm)

Issued: 15 December 2024

Rainfall depth for Durations, Exceedance per Year (EY), and Annual Exceedance Probabilities (AEP).

[FAQ for New ARR probability terminology](#)

Table

Chart

Unit: mm

Duration	Annual Exceedance Probability (AEP)						
	63.2%	50%#	20%*	10%	5%	2%	1%
1 min	2.51	2.80	3.75	4.41	5.07	5.96	6.66
2 min	4.22	4.67	6.10	7.09	8.07	9.43	10.5
3 min	5.82	6.46	8.49	9.90	11.3	13.2	14.8
4 min	7.27	8.09	10.7	12.5	14.3	16.8	18.7
5 min	8.57	9.56	12.7	14.9	17.1	20.1	22.4
10 min	13.5	15.1	20.3	24.0	27.6	32.5	36.3
15 min	16.9	18.9	25.5	30.0	34.6	40.7	45.5
20 min	19.4	21.8	29.3	34.5	39.7	46.7	52.2
25 min	21.5	24.0	32.2	38.0	43.7	51.3	57.3
30 min	23.2	25.9	34.7	40.8	46.9	55.1	61.5
45 min	27.1	30.3	40.3	47.2	54.1	63.6	71.0
50 min	28.2	31.4	41.7	48.9	56.1	65.8	73.5
4.5 hour	50.9	56.3	73.8	86.5	99.6	118	132
9 hour	66.2	73.3	97.4	115	134	159	180
18 hour	86.8	97.1	132	157	184	221	250
30 hour	106	119	164	197	231	278	315
36 hour	113	127	176	212	249	300	340

Note:

Fig 5. IFD Table for Balgowlah

Extracts from ARR Balgowlah data

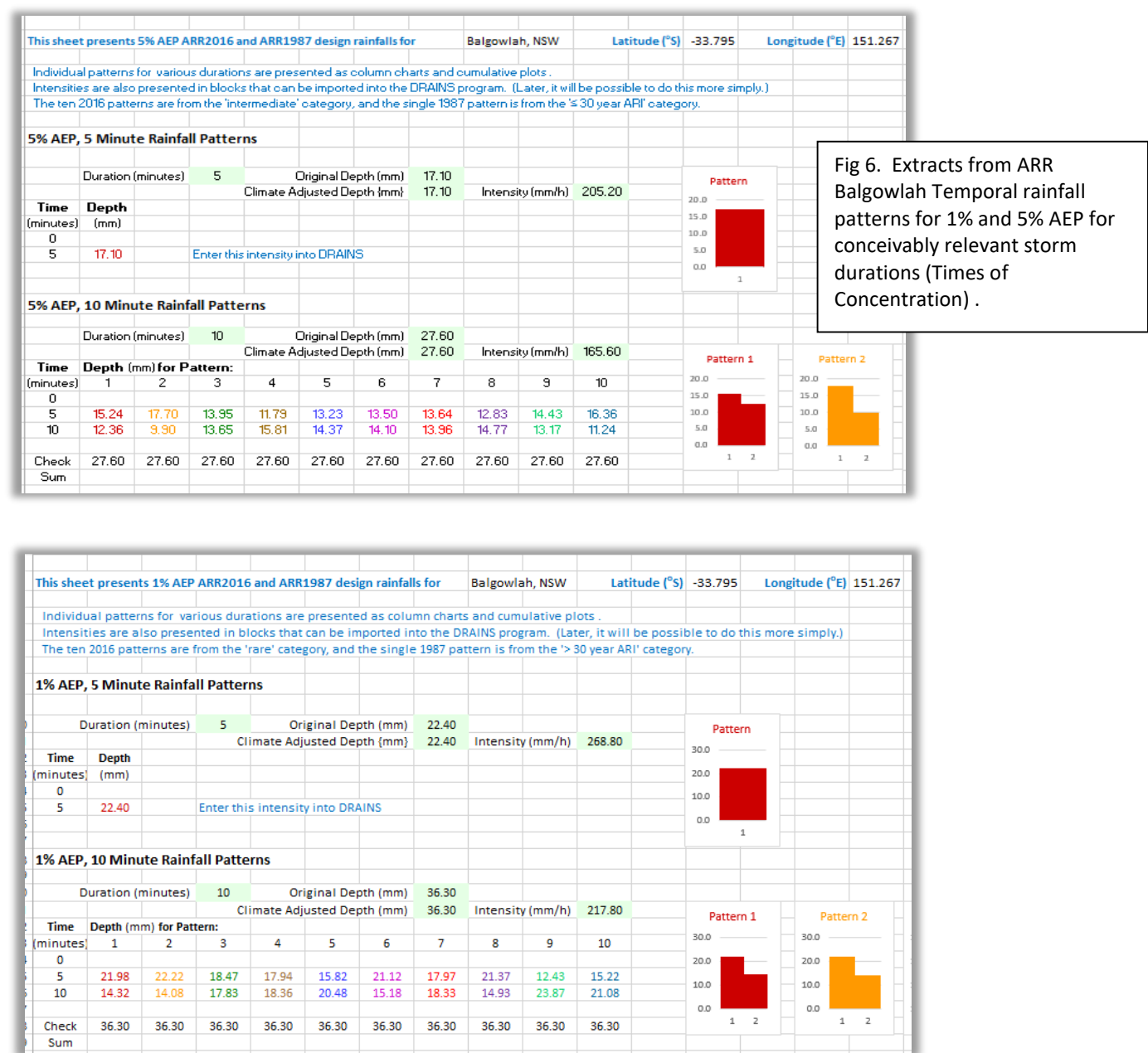


Fig 6. Extracts from ARR Balgowlah Temporal rainfall patterns for 1% and 5% AEP for conceivably relevant storm durations (Times of Concentration) .

ARR Rain Rates (l mm/hr)		
	5 Min	10 Min
AEP 5%	205	165
AEP 1%	268	217

Fig 7. Summary of ARR Rainfall rates for 2 durations and 2 storm frequencies

Gutter Capacity (cumeecs) for a range of flow velocities			
		Area Flow below Road Centre RL (m ²)	Q flow Capacity for sample velocities
Assume V (m/sec)	Equivalent Tc (mins) for 177m channel		Q (cumeecs)
1	3	0.675	0.675
0.6	5	0.675	0.405
0.3	10	0.675	0.2025

Fig 8. Gutter Flow Area (m²) available and Gutter Flow Capacity (m³/sec) applicable for a range of 3 relevant velocities

Fig 9. Sample (Typical) analysis for 10min duration storm, showing capacity of gutter channel against concentrated storm flows in gutter channel. Note 0.3m/sec flow velocity is consistent with 10 minute Time of concentration over a catchment length of 177 metres. A similar spreadsheet for a time of concentration of 5 minutes can be provided on request – but Fig 10. below shows the summary results for both 5 minute and 10 minute durations.

To (and therefore I) – both equate to **10 minutes duration ARR storm**

Note: 177m and 5 minute To equates to V= 0.6m/sec – highly unlikely

5% AEP Storm without runoff from 286 Sydney Rd

Run Off from Catchments									
	Road	Nat Strip	North Of Endry		C	AEPI%	I (mm/hr)	A (ha)	2.78 Q (l/sec) Run off Q cumecs
A	224	126	0	350	0.6	165	0.04	9.63	0.0036
B	320	180	414	314	0.6	165	0.03	25.16	0.0252
C	320	180	850	1350	0.6	165	0.14	37.15	0.0372
D	268	151	718	1137	0.6	165	0.11	31.29	0.0313
Total							0.38	103.24	0.1032

Gutter Capacity compared
with Calculated Flow
at V= 0.3m/sec

196%

5% AEP Storm with runoff from 286 Sydney Rd

Run Off from Catchments									
	Road	Nat Strip	North Of Endry		C	AEPI%	I (mm/hr)	A (ha)	2.78 Q (l/sec) Run off Q cumecs
A	224	126	251	601	0.6	165	0.06	16.54	0.0165
B	320	180	414	314	0.6	165	0.03	25.16	0.0252
C	320	180	850	1350	0.6	165	0.14	37.15	0.0372
D	268	151	718	1137	0.6	165	0.11	31.29	0.0313
Total							0.40	110.14	0.1101

Gutter Capacity compared
with Calculated Flow
at V= 0.3m/sec

184%

1% AEP Storm without runoff from 286 Sydney Rd

Run Off from Catchments									
	Road	Nat Strip	North Of Endry		C	AEPI%	I (mm/hr)	A (ha)	2.78 Q (l/sec) Run off Q cumecs
A	224	126	0	350	0.6	217	0.04	12.67	0.0127
B	320	180	414	314	0.6	217	0.03	33.08	0.0331
C	320	180	850	1350	0.6	217	0.14	48.86	0.0489
D	268	151	718	1137	0.6	217	0.11	41.15	0.0412
Total							0.38	135.77	0.1358

with Calculated Flow
at V= 0.3m/sec

143%

1% AEP Storm with runoff from 286 Sydney Rd

Run Off from Catchments									
	Road	Nat Strip	North Of Endry		C	AEPI%	I (mm/hr)	A (ha)	2.78 Q (l/sec) Run off Q cumecs
A	224	126	251	601	0.6	217	0.06	21.75	0.0218
B	320	180	414	314	0.6	217	0.03	33.08	0.0331
C	320	180	850	1350	0.6	217	0.14	48.86	0.0489
D	268	151	718	1137	0.6	217	0.11	41.15	0.0412
Total							0.40	144.85	0.1449

Gutter Capacity compared
with Calculated Flow
at V= 0.3m/sec

140%

Gutter Capacity compared
with Calculated Flow - 10
minute ARR Storm
at V= 0.3m/sec

Storm

5%AEP	Excluding 286 Sydney Rd	196%
	Including 286 Sydney Rd	184%
1%AEP	Excluding 286 Sydney Rd	143%
	Including 286 Sydney Rd	140%

Summary results

		Gutter Capacity compared with Calculated Flow - 10 minute ARR Storm
Storm		at V= 0.3m/sec
5%AEP	Excluding 286 Sydney Rd	196%
	Including 286 Sydney Rd	184%
1%AEP	Excluding 286 Sydney Rd	149%
	Including 286 Sydney Rd	140%

		Gutter Capacity compared with Calculated Flow - 5 minute ARR Storm
Storm		at V= 0.6m/sec
5%AEP	Excluding 286 Sydney Rd	316%
	Including 286 Sydney Rd	296%
1%AEP	Excluding 286 Sydney Rd	242%
	Including 286 Sydney Rd	226%

Fig 10. Summary Results for 10min duration storm, and 5 minute duration storm showing capacity of gutter channel against storm flows in gutter channel. Note flow velocities are consistent with Times of concentration for the 177m channel length.

After including the runoff from the Roof Area of 286 Sydney Rd, on the basis of

- 5%AEP storm and 1%AEP storms
- ARR 5minute duration and 10 minute duration rainfall rates (1 mm/hr)
- Times of concentration and flow velocities commensurate with storm durations
- Assumed catchment surface characteristics
- A Gutter Capacity cross section measured below the road centre (less than would be the case for the gutter capacity below the typical boundary level)

... the gutter capacity exceeds the flow volume by at least 140%. (i.e. a worst case 140% for a 1%AEP storm of 10 minute duration)

Conclusion

It is considered that the foregoing hydraulic/hydrological analysis, provides sufficient evidence that the additional inflows from the roof runoff from the proposed building at 286 Sydney Rd have no meaningful consequence in terms of storm flows in the Sydney Rd north side gutter channel between Boyle St and Condamine St.

It is assumed that readers of the foregoing report will be aware of the predictive nature, and the 'inexactness', of open channel hydraulic / hydrological engineering.

Proposed location of discharge pipes

Attached drawings show the location of proposed 200x100 x 6mm Galvanised Rectangular Hollow Section (RHS) pipes discharging to Sydney Rd. Those drawings are

SW01 Rev F Stormwater Drainage Management

SW02 Rev E(1) SW Schematic



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Separate Attached drawings:

SW01 Rev F Stormwater Drainage Management

SW02 Rev E(1) SW Schematic

C8 Rev A Driveway Plan and Sections

C9 Rev A Driveway Details