



Appendix G

Cross Drainage Assessment



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Table A2 Cross Drainage Schedule (refer to Stormwater Layout Plans in Appendix A)

Crossing Name & Location	Catchment Area (ha) ^a	Size	Crossing Type	Proposed works	Total Length (under motorway) (m)	Parallel to channel flow (Y/N)	Peak Discharge - TP108 Method (m ³ /s)		Peak Discharge - Flood Model ^b (m ³ /s)		Upstream flood level 100 year ARI ^c (mRL)	Freeboard to Road Edge Line (mm)	Comment
							Q10	Q100	Q10	Q100			
CU-NEW-01 Oteha Valley Road	6.3	1500 mm Ø	Grated manhole to headwall	New culvert	167	N	1.3	2.4	1.3	3.4 (includes wetland discharge)	26.99	2010	Headwater level includes discharges from both proposed Oteha Valley East and West Wetlands (1m ³ /s in Q100)
CU-EX-02 SH1 – CH12420	2.9	825 mm Ø	Grated manhole to pipe network	Extend upstream	190 (ex) + 39 (ext)	Y (natural channel)	0.8	1.3	0.49	0.79	45.18	8120	
CU-EX-03 SH1 – CH12760	1.5	750 mm Ø	Grated manhole to headwall	Extend upstream	77 (ex) + 11 (ext)	Y (natural channel)	0.4	0.7	0.57	0.94	65.27	1390	
CU-EX-04 SH1 – CH12890	1.6	825 mm Ø	Pipe network to headwall	Retain / repair	76	N	0.4	0.7	0.83	1.38	66.43	4990	Inverts from Alpurt A1 as-built information
CU-EX-05 SH1 – CH13350	2.1	825 mm Ø	Headwall to headwall	Relocate upstream headwall, extend downstream	62 (ex) + 6 (ext)	Y (natural channel)	0.6	0.9	0.3	0.6	65.66	2540	
CU-EX-06 SH1 – CH13970	143	3000 mm Ø	Pipe network to headwall	Retain / repair	140	Y (Oteha Stream)	28.0	47.1	15.5	36.0	30.60	9400	Survey confirmed pipe (AC GIS shows box culvert)
CU-EX-07 SH1 – CH14330	105	2400 mm Ø	Pipe network to pipe network	Retain / repair	103	Y (natural channel)	21.8	36.0	18.0	19.0	28.01	5549	
CU-EX-08 SH1 – CH14420	4.3	1350 mm Ø	Pipe network to pipe network	Retain / repair	133	N	1.2	1.9	1.2	2.2	29.00	7050	Additional inlet at upstream for cut-off drain flows
CU-EX-09 SH1 – CH14650	4.7	1200 mm Ø	Pipe network to pipe network	New connection at upstream	60 (ex) + 15 (ext)	N	1.3	2.1	1.2	2.1	40.79	1310	Additional inlet at upstream for cut-off drain flows
CU-EX-10 SH1 – CH15000	215	1200 mm Ø	Pipe network to headwall	Extend and new connection at upstream	473 (ex) + 59 (ext)	Y (concrete channel)	35.3	58.7	5.2	5.4	33.43	6650	Flow is throttled upstream of culvert.
CU-EX-11 SH1 – CH15280	74	1800 mm Ø	Headwall to pipe network	New connection to relocated bell-mouth structure at downstream	132 (ex) + 10 (ext)	Y (natural channel with concrete base)	14.9	24.6	2.1	2.3	39.32	2130	Significant overflows into Watercare Pond 1 prior to culvert.
CU-EX-12 SH1 – CH15470	13	1500 mm Ø	Pipe network to headwall	Extend upstream and downstream	121 (ex) + 124 (ext)	Y (natural channel)	3.5	5.6	2.4	5.7	40.79	6840	Splitter weir at downstream to direct WQ flows to ARC Refuse Wet Pond. Flows larger than WQV bypass the ARC Refuse Wet Pond
CU-EX-13	74	1350 mm Ø	Pipe network to headwall	Abandon (replaced with 2 new culverts)	61	N	8.2	13.8	4.9	5.9 (10.5 total)	49.65	-280	Does not meet requirements. Abandon and replace



Crossing Name & Location	Catchment Area (ha) ^{*a}	Size	Crossing Type	Proposed works	Total Length (under motorway) (m)	Parallel to channel flow (Y/N)	Peak Discharge - TP108 Method (m ³ /s)		Peak Discharge - Flood Model ^{*b} (m ³ /s)		Upstream flood level 100 year ARI ^{*c} (mRL)	Freeboard to Road Edge Line (mm)	Comment
							Q10	Q100	Q10	Q100			
SH18 – Caribbean Drive										including overflows)			with CU-NEW-13A and CU-NEW-13B
<u>CU-NEW-13A</u> SH18 – Caribbean Drive	74	1350 mm Ø	Pipe network to headwall	New culvert	204	Y (concrete channel)	8.2	13.8	5.9	6.8	48.76	960	Note culverts combine into an 1800 Ø.
<u>CU-NEW-13B</u> SH18 – Caribbean Drive		1350 mm Ø	Grated manhole to pipe network	New culvert	47	Y (concrete channel)	(Combined flow for CU-NEW-13A and 13B. Same as CU-EX-13)	(Combined flow for CU-NEW-13A and 13B. Same as CU-EX-13)	0.1	4.6	48.76	960	
<u>CU-EX-14</u> SH18 – Alexandra Stream	119	2400 mm Ø	Headwall to headwall	Retain / repair	70	Y (Alexandra Stream)	23.4	38.7	16.5	18.4	33.75	2690	Pedestrian underpass culvert.
<u>CU-EX-14-SUP</u>		3400 mm Ø	Headwall to headwall	Extend upstream	47 (1.9)	Y (Alexandra Stream)	(Combined flow for CU-EX-14 and CU-EX-14-SUP)	(Combined flow for CU-EX-14 and CU-EX-14-SUP)	1.8	14.7	33.75	2690	
<u>CU-EX-15</u> SH18 – Unsworth Drive	4.4	600 mm Ø	Pipe network to pipe network	Retain / repair	40	N	1.2	2.0	0.7	1.1	35.91	400	Post-dev results shown. Culvert undersized - existing culvert overtops road. Works around this area eliminate road overtopping (cut-off drains at both US and DS sides direct flows to Alexandra Stream).
<u>CU-EX-16</u> SH18 – Bluebird Reserve	28	1650 mm Ø	Pipe network to pipe network	Retain / repair	80	Y (natural channel)	6.5	11.0	1.9	7.5	37.67	4360	Significant storage in the catchment.

*Note: ^a Total upstream catchment (including upstream culverts contributing area)
^b AC, 2013 & NSCC, 2009
^c Most conservative level (flood model vs. HY8 results)

Table A3 Preliminary Blockage Assessment - Cross Drainage Schedule (refer to Stormwater Layout Plans in Appendix A)

Crossing Name & Location	Catchment Area (ha) ^{*a}	Size	Crossing Type	Proposed works	Blockage Assessment Required	Blockage Assessment					
						Catchment Characteristics (Debris Type, Availability & Transportability)	Secondary overflow path	Debris management required (Y/N)	Blockage mechanism	Culvert inlet type	Debris management type
<u>CU-NEW-01</u> Oteha Valley Road	6.3	1500 mm Ø	Grated manhole to headwall	New culvert	Y	Direct catchment is a grassed cut-off slope. Debris type grass cuttings. However will receive flood flows from Spencer Creek in extreme events, which has significant vegetation available.	Overflow Oteha Valley Road to north, or ramp so west to wetland, or Alexandra Stream to east. Existing overflow path.	Y	Inlet blockage	Scruffy dome	Oversize inlet / Secondary inlet



Crossing Name & Location	Catchment Area (ha) ^a	Size	Crossing Type	Proposed works	Blockage Assessment Required	Blockage Assessment					
						Catchment Characteristics (Debris Type, Availability & Transportability)	Secondary overflow path	Debris management required (Y/N)	Blockage mechanism	Culvert inlet type	Debris management type
CU-EX-02 SH1 – CH12420	2.9	825 mm Ø	Grated manhole to pipe network	Extend upstream	Y	Small catchment residential medium development. Grassed area. Debris type urban + grass cuttings.	Flow north parallel to SH1 into cut-off drain to CU-NEW-01 inlet (low risk).	N	-	-	-
CU-EX-03 SH1 – CH12760	1.5	750 mm Ø	Grated manhole to headwall	Extend upstream	Y	Small catchment residential medium development. Debris type urban.	None. Would pond then flow north up SH1.	Y	Inlet blockage	Scruffy dome	Oversize inlet / Secondary inlet
CU-EX-04 SH1 – CH12890	1.6	825 mm Ø	Pipe network to headwall	Retain / repair	N (upstream pipe network)	-	-	-	-	-	-
CU-EX-05 SH1 – CH13350	2.1	825 mm Ø	Headwall to headwall	Relocate upstream headwall, extend downstream	Y	Catchment is small cut slope adjacent to highway - grassed. Debris type likely to be litter/grass cuttings.	South towards Greville wetland, parallel to SH1. Low risk.	N	-	-	-
CU-EX-06 SH1 – CH13970	143	3000 mm Ø	Pipe network to headwall	Retain / repair	N (upstream pipe network)	-	-	-	-	-	-
CU-EX-07 SH1 – CH14330	105	2400 mm Ø	Pipe network to pipe network	Retain / repair	N (upstream pipe network)	-	-	-	-	-	-
CU-EX-08 SH1 – CH14420	4.3	1350 mm Ø	Pipe network to pipe network	Retain / repair	N (upstream pipe network)	-	-	-	-	-	-
CU-EX-09 SH1 – CH14650	4.7	1200 mm Ø	Pipe network to pipe network	New connection at upstream	N (upstream pipe network)	-	-	-	-	-	-
CU-EX-10 SH1 – CH15000	215	1200 mm Ø	Pipe network to headwall	Extend and new connection at upstream	N (upstream pipe network)	-	-	-	-	-	-
CU-EX-11 SH1 – CH15280	74	1800 mm Ø	Headwall to pipe network	New connection to relocated bell-mouth structure at downstream	Y	Direct catchment is cut-off channel around Watercare ponds - low vegetation availability in immediate catchment. Upstream pipe network from urban residential/industrial.	Overtop bund into Watercare Pond. Low risk.	N	-	-	-
CU-EX-12 SH1 – CH15470	13	1500 mm Ø	Pipe network to headwall	Extend upstream and downstream	N (upstream pipe network)	-	-	-	-	-	-
CU-EX-13 SH18 – Caribbean Drive	74	1350 mm Ø	Pipe network to headwall	Abandon (replaced with 2 new culverts)	N (to be abandoned)	-	-	-	-	-	-
CU-NEW-13A SH18 – Caribbean Drive	74	1350 mm Ø	Pipe network to headwall	New culvert	N (upstream pipe network)	-	-	-	-	-	-
CU-NEW-13B		1350 mm Ø	Grated manhole to pipe network	New culvert	Y	Urban residential. Flow received is from overland flow in extreme	Overtop UHH, pond and flood kindergarten (as per	Y	Inlet blockage	Scruffy dome	Oversize inlet / Secondary inlet



Crossing Name & Location	Catchment Area (ha) ^a	Size	Crossing Type	Proposed works	Blockage Assessment Required	Blockage Assessment					
						Catchment Characteristics (Debris Type, Availability & Transportability)	Secondary overflow path	Debris management required (Y/N)	Blockage mechanism	Culvert inlet type	Debris management type
SH18 – Caribbean Drive						events. Individual catchment itself is small. Debris type urban. Limited vegetation availability in catchment.	existing conditions - advice from AC). High risk.				
<u>CU-EX-14</u> SH18 – Alexandra Stream	119	2400 mm Ø	Headwall to headwall	Retain / repair	N (no works)	-	-	-	-	-	-
<u>CU-EX-14-SUP</u>		3400 mm Ø	Headwall to headwall	Extend upstream	N (no works)	-	-	-	-	-	-
<u>CU-EX-15</u> SH18 – Unsworth Drive	4.4	600 mm Ø	Pipe network to pipe network	Retain / repair	N (upstream pipe network)	-	-	-	-	-	-
<u>CU-EX-16</u> SH18 – Bluebird Reserve	28	1650 mm Ø	Pipe network to pipe network	Retain / repair	N (upstream pipe network)	-	-	-	-	-	-

*Note: ^a Total upstream catchment (including upstream culverts contributing area)