



SUPPORTING DATA

- B.1 Aerial Photography
- B.2 ALS Survey Data
- B.3 Stream Photography
- B.4 Structure Survey & Photography
- B.5 June 1991 Rainfall Hyetographs
- B.6 June 1991 Albion Park Stage Record
- B.7 June 1991 Princes Highway Stage Record
- B.8 Albion Park(Sunnybank) Rating Curve
- B.9 Princes Highway Rating Curve
- B.10 June 1991 Flood Photography
- B.11 June 1991 Recorded Flood Levels

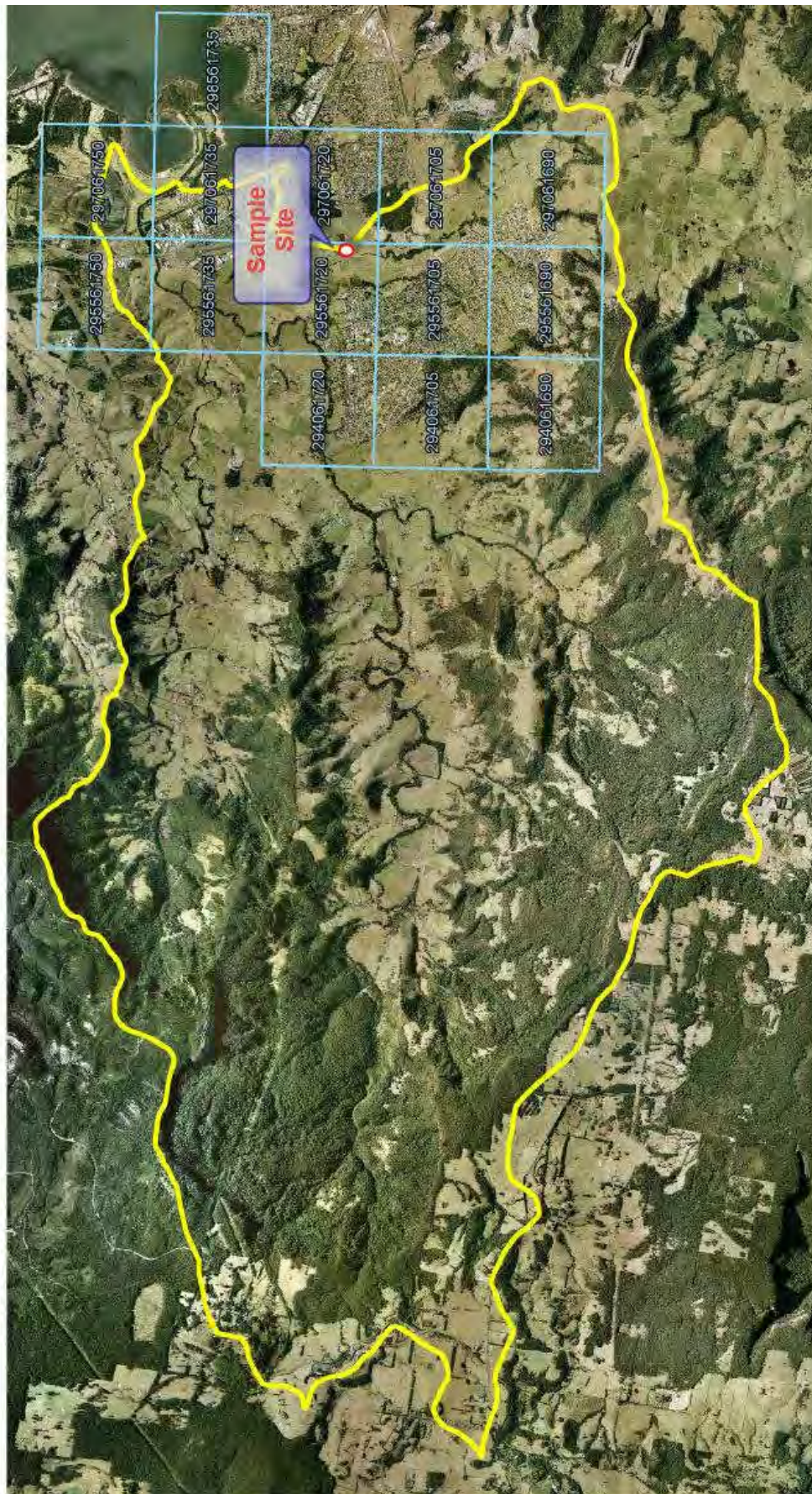
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APPENDIX B



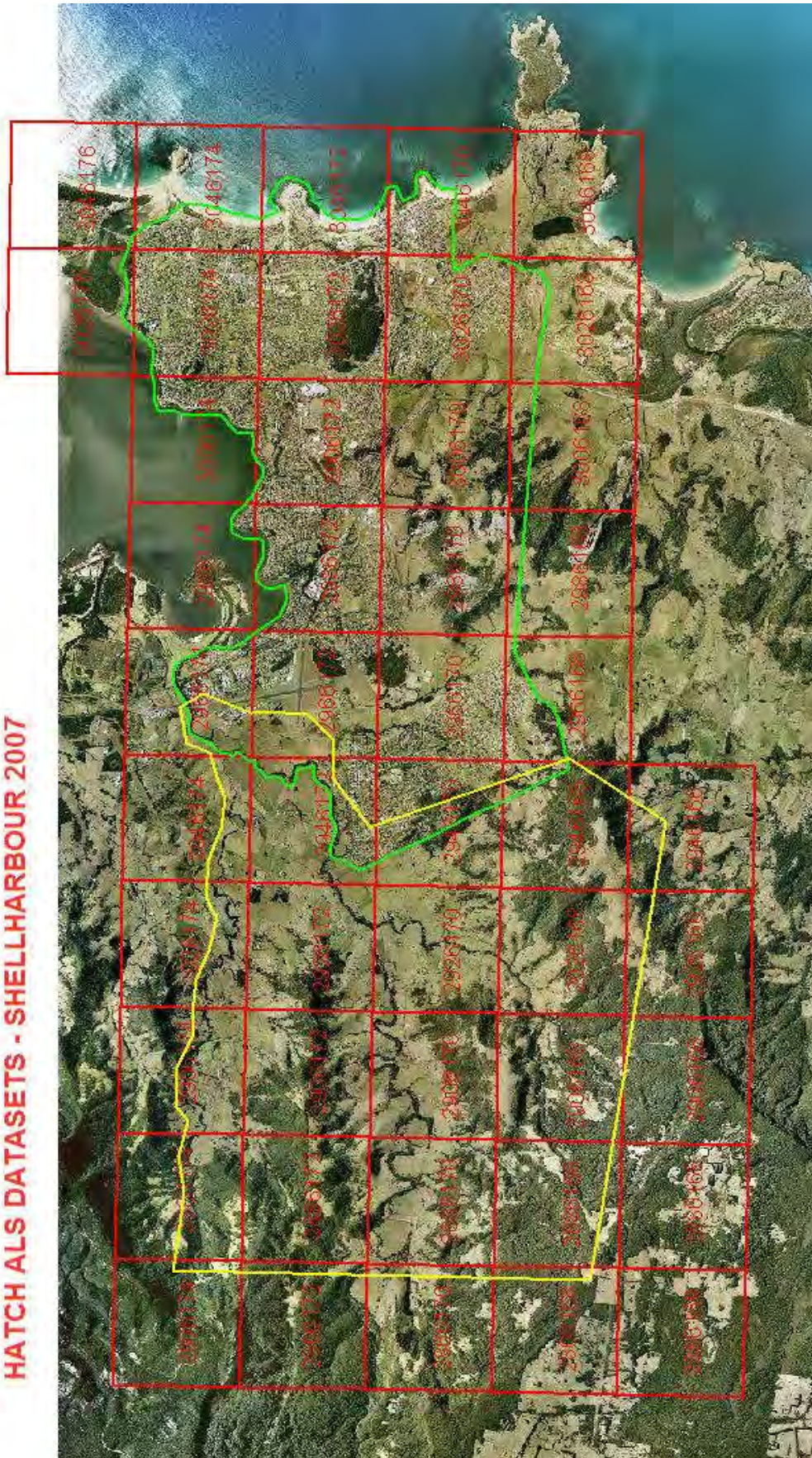
APPENDIX B1.1. AERIAL PHOTOGRAPHY – COVERAGE



APPENDIX B1.2. AERIAL PHOTOGRAPHY - SAMPLE



HATCH ALS DATASETS - SHELLHARBOUR 2007



APPENDIX B2. ALS SURVEY DATA



Macquarie Rivulet D/S Illawarra Rail Bridge (Feb 2007)



Macquarie Rivulet D/S Princes Highway Road Bridge (Feb 2007)

APPENDIX B3. STREAM PHOTOGRAPHY



Frazers Creek D/S Illawarra Highway (Feb 2007)



Town Creek D/S Illawarra Highway (Feb 2007)

APPENDIX B3. STREAM PHOTOGRAPHY (ctd)



Frazers Creek West D/S Tongarra Rd (Feb 2007)



Frazers Creek Central D/S Tongarra Rd (Feb 2007)

APPENDIX B3. STREAM PHOTOGRAPHY (ctd)



Frazers Creek East D/S Tongarra Rd (Feb 2007)

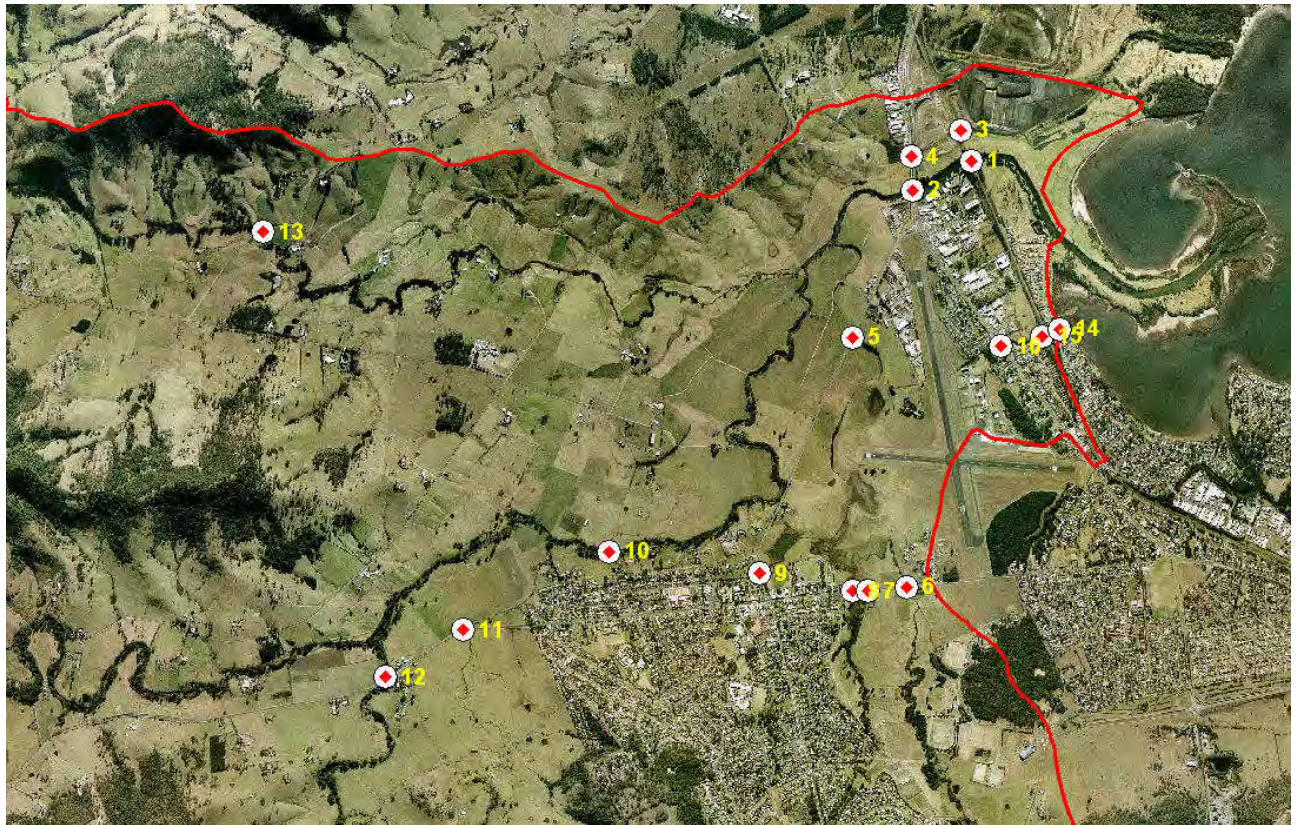


Albion Creek D/S Princes Highway (Feb 2007)



Albion Creek D/S Shearwater Drive (Feb 2007)

APPENDIX B3. STREAM PHOTOGRAPHY



ID	Location			Structure	Dimensions	U/S Inv (m)	D/S Inv (m)	L (m)	'n'
14	Albion Creek @ Shearwater Dr			Single Bebo Arch	1 * 10mW * 3mH	0.5	0.5	20	0.01 2
15	Albion Creek @ Illawarra Rail			Multi Barrel Pipe Culvert	5 * 2.6m Dia Rail over at RL 5.1m AHD	-0.35	-0.35	30	0.01 2
16	Albion Creek @ Princes Hway			Multi Cell Box Culvert	<1.5m diag(not inc)				
1	Macquarie Riv @ Illawarra Rail			Multi Span Conc Bridge	17 * 7.6m Spans RL 4.54m Obvert RL 5.64m Top of rail	Vble	Vble	6	- 0.03 0
2	Macquarie	Rivulet	@	Twin Multi Span Conc Bridge	5 * 22m Spans RL 6.35 Obvert RL 8.07 Top of Kerb	Vble	Vble	25	- 0.03 0
3	Wollongurry	Creek	@	Multi Cell Box Culvert	2 * 2.7mW * 2.7mH RL5.8 Top of Rail	0.91	0.81	28	0.01 2
4	Wollongurry	Creek	@	Multi Barrel Pipe Culvert	3 * 1.75m Dia Road over at RL8.5	1.83	1.41	81	0.01 2



5	Frazers Creek @ Illawarra Hway	Multi Barrel Pipe Culvert	4 * 1.05m Dia Road over at RL 2.85	1.4	1.4	15	0.01 2
8	Frazers Creek @ Tongarra(west)	Multi Cell Box Culvert	4 * 2.5mW * 1.55mH Road over at RL 6.58	4.54	4.64	16	0.01 2
7	Frazers Creek @ Tongarra(central)	Single Cell Box Culvert	1 * 2.4mW * 1.25mH Road over at RL 6.58	4.75	4.68	16	0.01 2
6	Frazers Creek @ Tongarra(east)	Single Span Conc Bridge	8.1m Span RL 9.17m Obvert Road over at RL10.13	Vble	Vble	16	0.03 0
9	Town Creek @ Illawarra Hway	Multi barrel Pipe Culvert	3 * 0.9m Dia Road over at RL 6.0	4.5	4.5	15	0.01 2
11	Cooback Creek @Illawarra Hway	Multi Cell Box Culvert	4* 2.4W * 1.2H Road over at RL 14.85	13.0 0	13.0 0	20	0.01 2
12	Yellowrock Creek @Illawarra Highway	Multi Span Conc Bridge	6.5/10.0/5.2m spans Road over at RL17.00	12.5	12.5	16	0.05 0
10	Macquarie Rivulet @Calderwood Rd (Mansons Bridge)	Multi Span Steel/Con c Bridge	6 * 7m spans Road over at RL 10.6	5.0	5.0	16	0.05 0
13	Marshall Mt Creek @ Marshall Mt Rd	2 Span Conc Bridge	2 * 9m spans Road over at RL 18.00	16.0	16.0	16	0.05 0

SUMMARY OF STRUCTURES INCORPORATED INTO HYDRAULIC MODEL

APPENDIX B4. STRUCTURE SURVEY



Original Illawarra Rail Bridge over Macquarie Rivulet circa 1908



Present Illawarra Rail Bridge over Macquarie Rivulet

APPENDIX B4. STRUCTURE PHOTOGRAPHY



Early Princes Highway Road Bridge over Macquarie Rivulet circa 1950



Present Macquarie Rivulet Road Bridge over Macquarie Rivulet

APPENDIX B4. STRUCTURE PHOTOGRAPHY (ctd)



Weir in Macquarie Rivulet near Meadow View



Illawarra Highway Road Culvert @ Frazers Ck



Illawarra Highway Culvert @ Town Creek



Tongarra Rd Culvert @ Frazers Ck (West)

APPENDIX B4. STRUCTURE PHOTOGRAPHY (ctd)



Tongarra Rd Culvert @ Frazers Ck (Central)



Tongarra Rd Bridge @ Frazers Ck (East)

APPENDIX B4. STRUCTURE PHOTOGRAPHY (ctd)



Albion Ck Culvert @ Princes Highway



Albion Ck Culvert @ Illawarra Rail

APPENDIX B4. STRUCTURE PHOTOGRAPHY (ctd)



Albion Ck Culvert @ Shearwater Dr

APPENDIX B4. STRUCTURE PHOTOGRAPHY (ctd)

Delfin
Lend Lease

Hydraulic Structures

CALDERWOOD
URBAN DEVELOPMENT PROJECT

Legend

- Site Boundary
- Hydraulic Structures (Rienoe Consulting)
 - Inspection Completed or Not Required
 - Visual Inspection Required
- Watercourse (LPMA)
- Cadastre (LPMA)

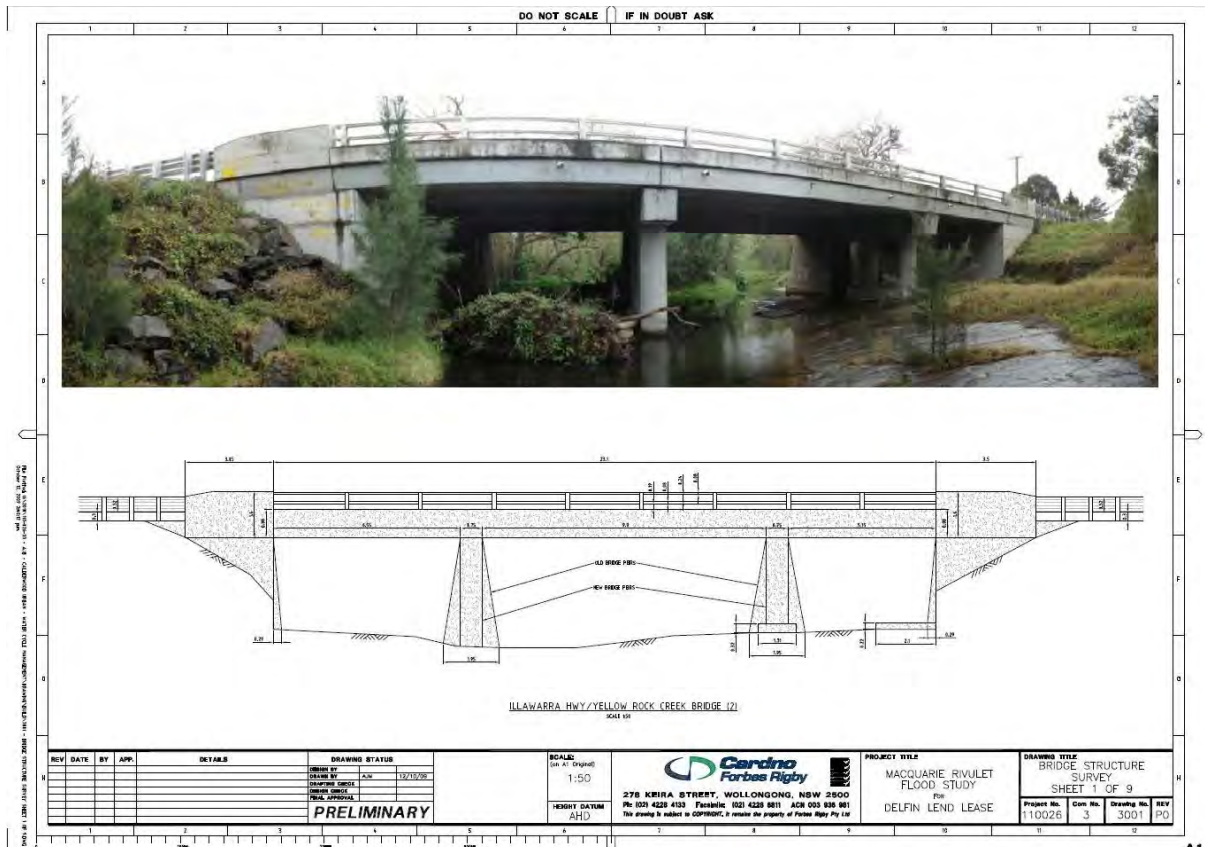
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0 250 500 1,000 1,500
Metres

Map Produced by: Cairns (Geography)
Date: 18 February 2015
Coordinate System: Zone 58 UTM/AGDA 54
GIS MAP REF: 110226-01_20050_hydraulic_structures.mxd 54

STRUCTURE SURVEY 2009 - LOCATION PLAN

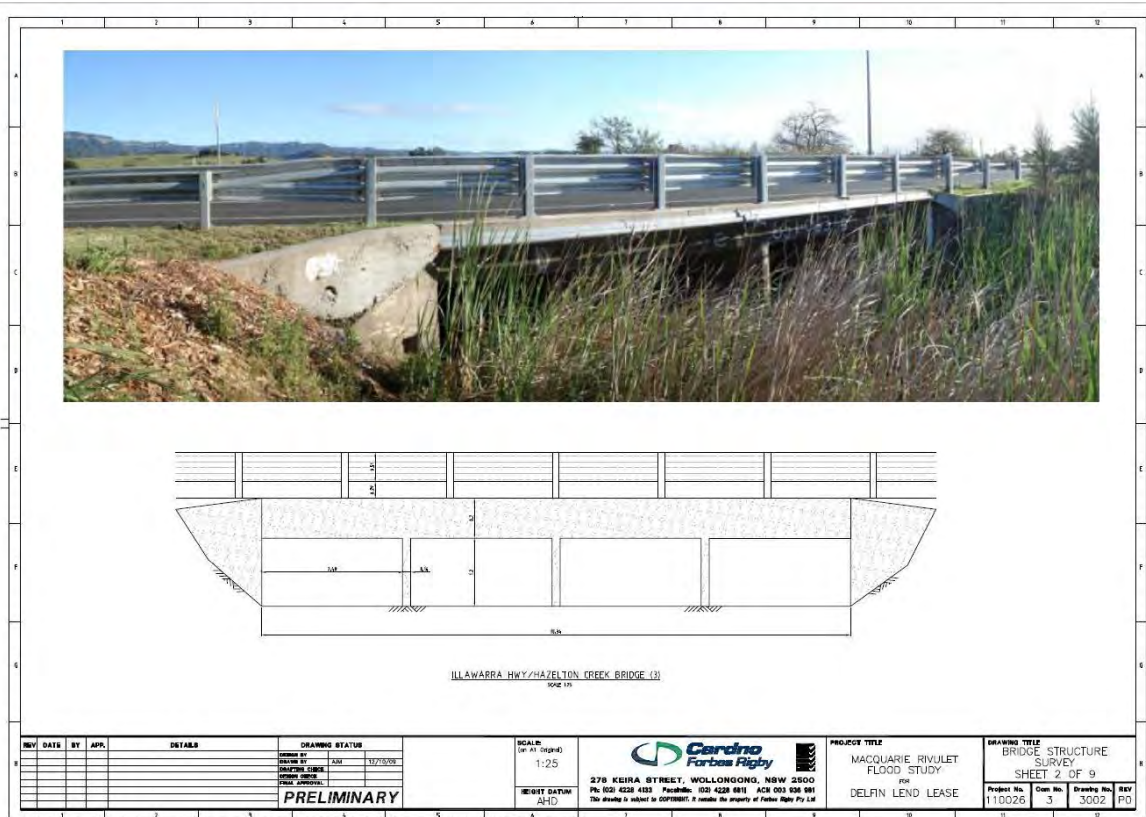
APPENDIX B4. STRUCTURE PHOTOGRAPHY (ctd)



BRIDGE OVER YELLOW ROCK CK – ILLAWARRA HWAY



MANSONS BRIDGE – CALDERWOOD RD

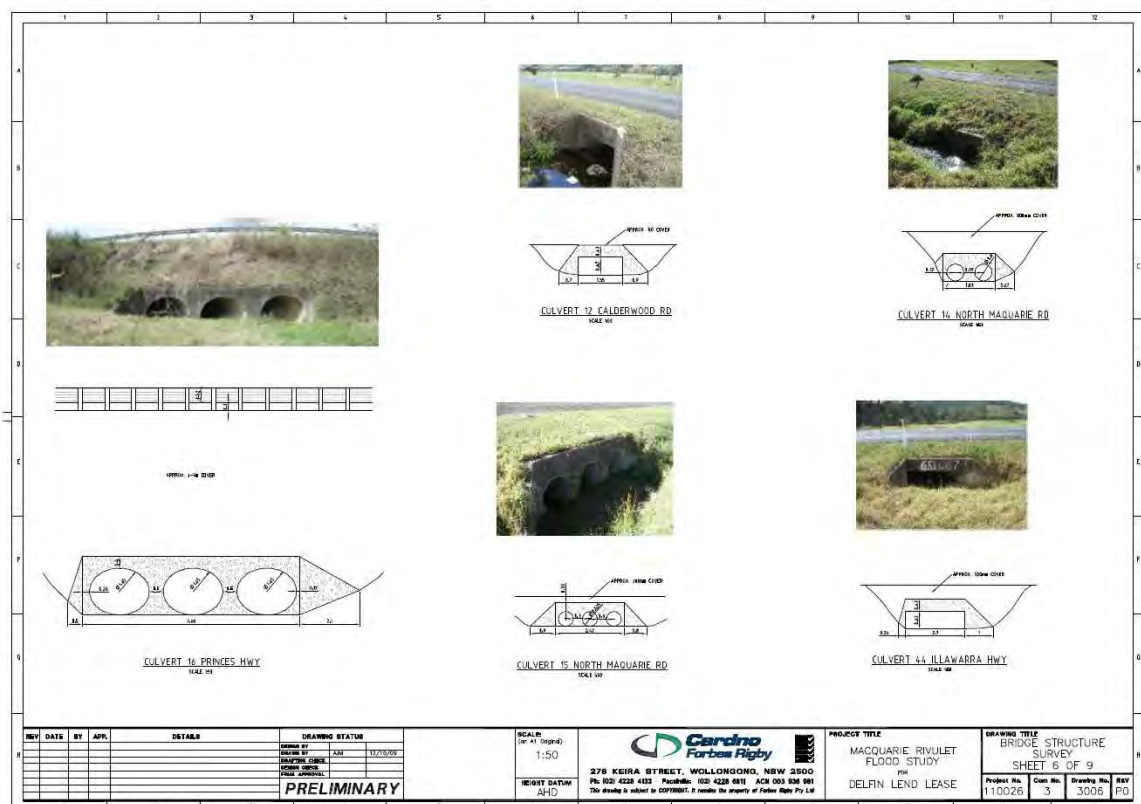
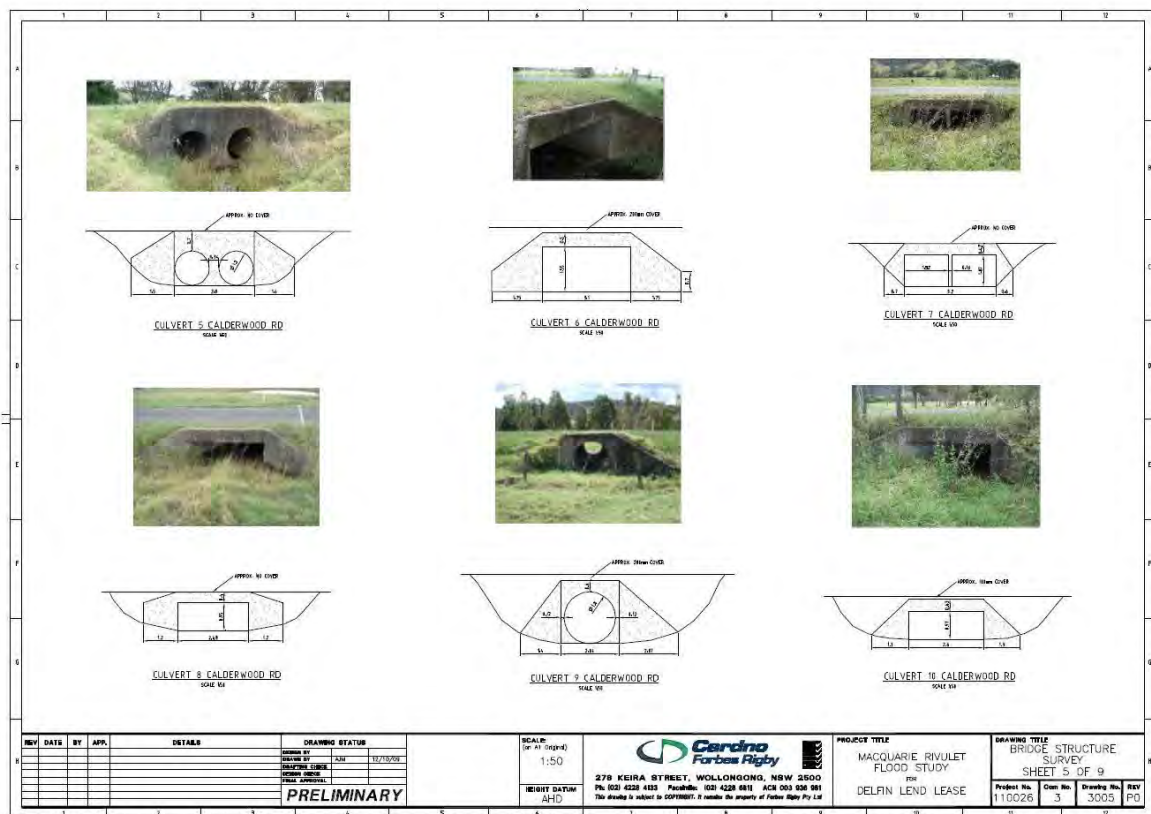


BRIDGE OVER HAZELTON CK – ILLAWARRA HWAY



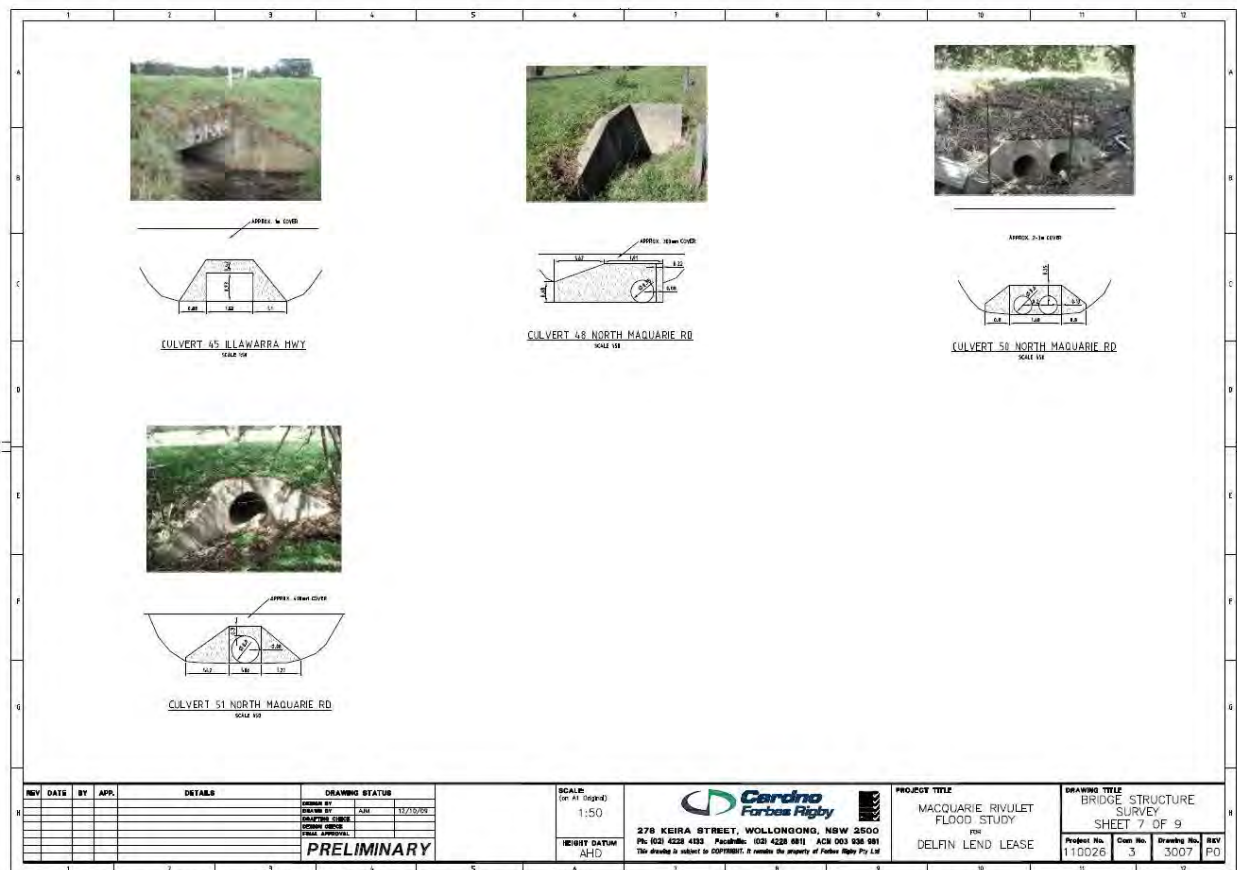
BRIDGE OVER MARSHALL MT CK – MARSHALL MT RD

APPENDIX B4. STRUCTURE PHOTOGRAPHY (ctd)



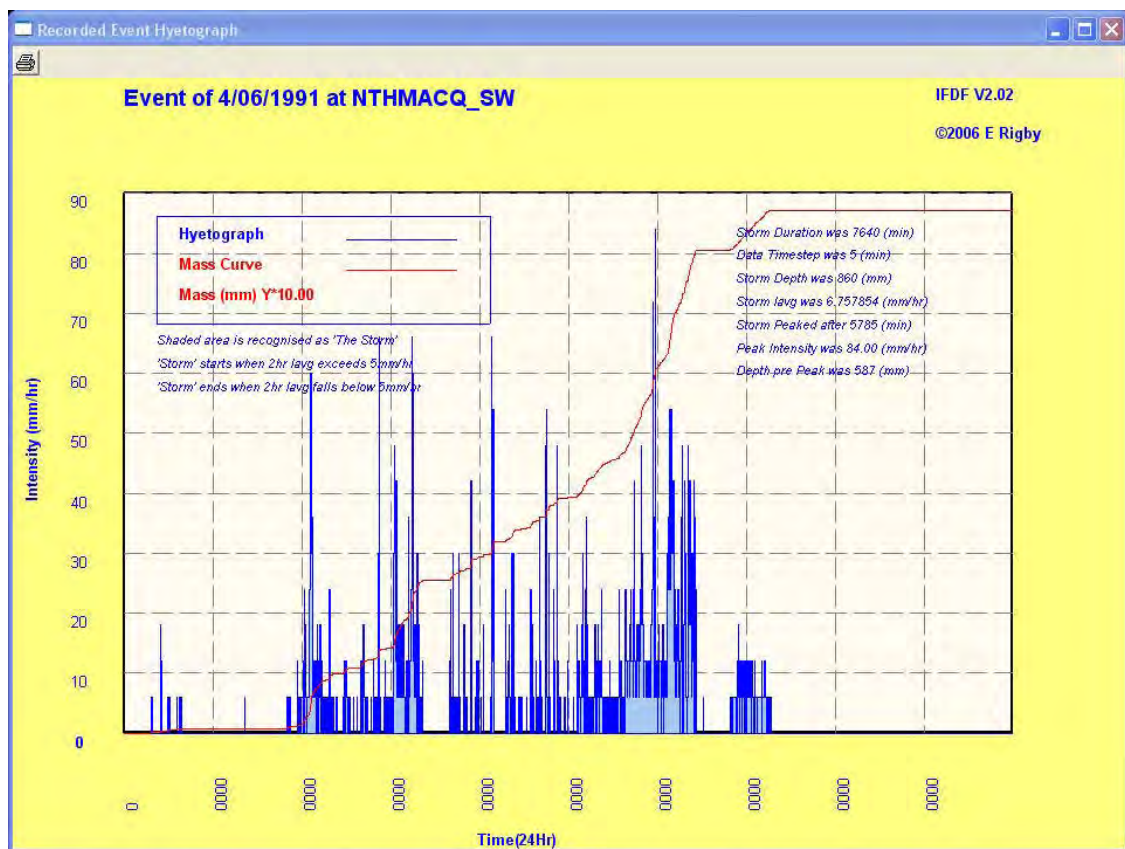
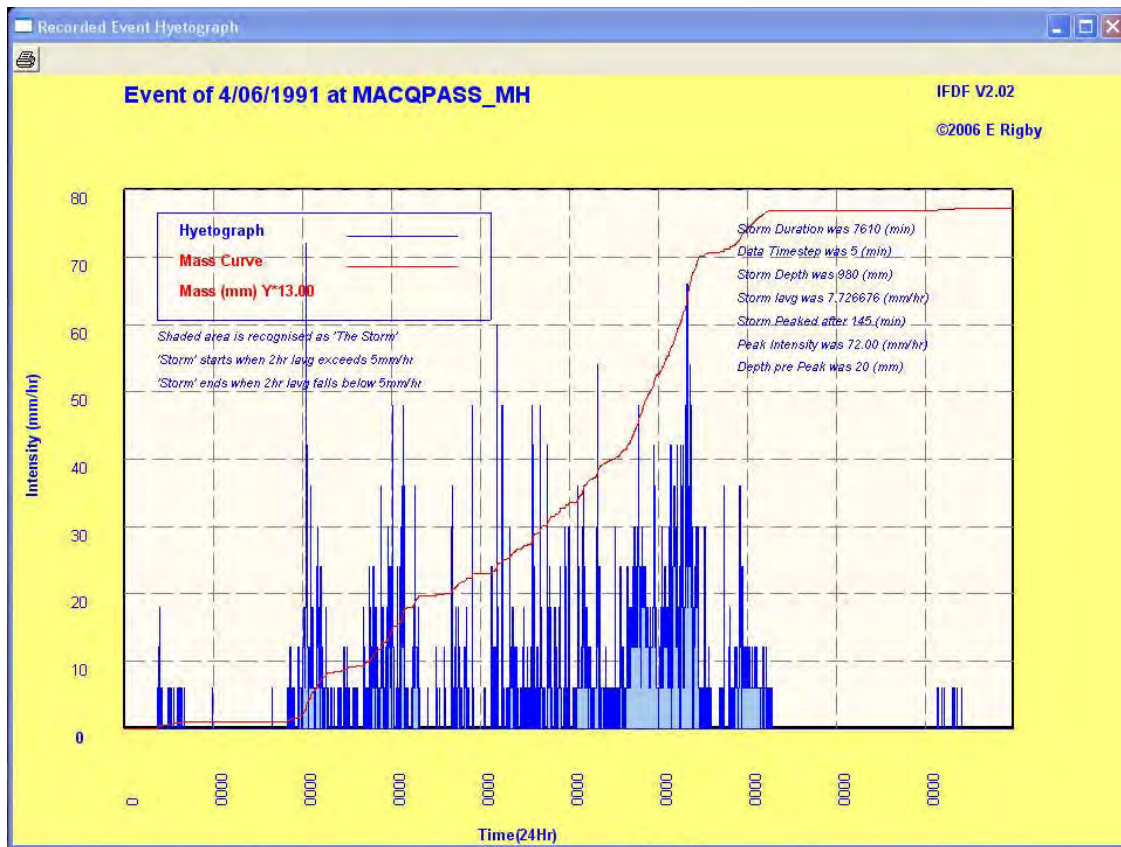
CULVERTS IN OR NEAR TO SITE

APPENDIX B4. STRUCTURE PHOTOGRAPHY (ctd)

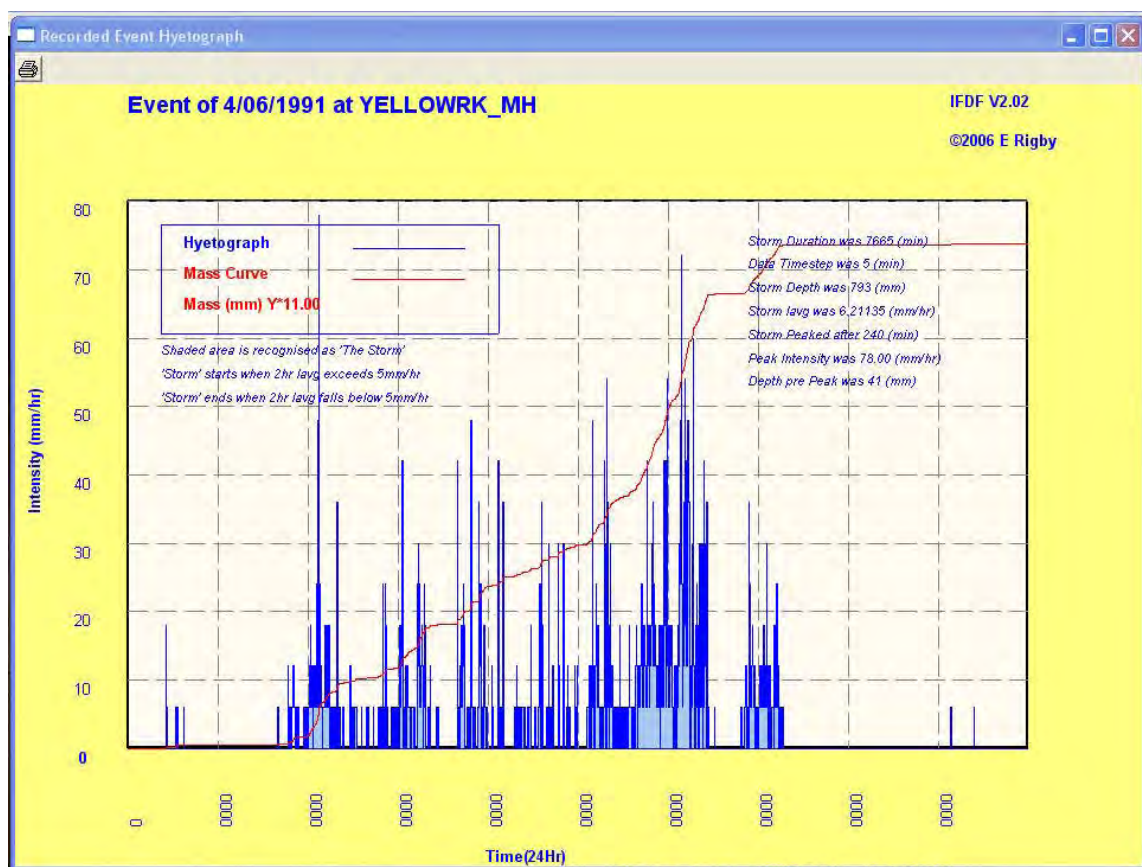
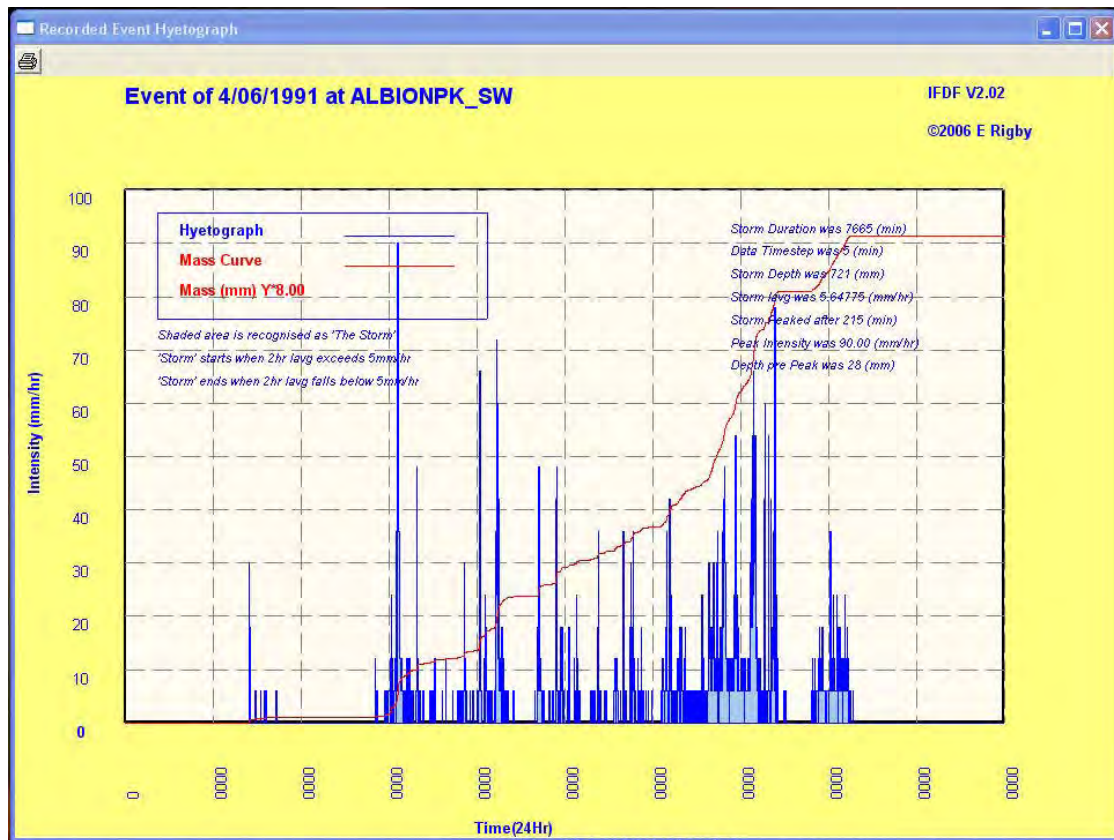


CULVERTS IN OR NEAR TO SITE (ctd)

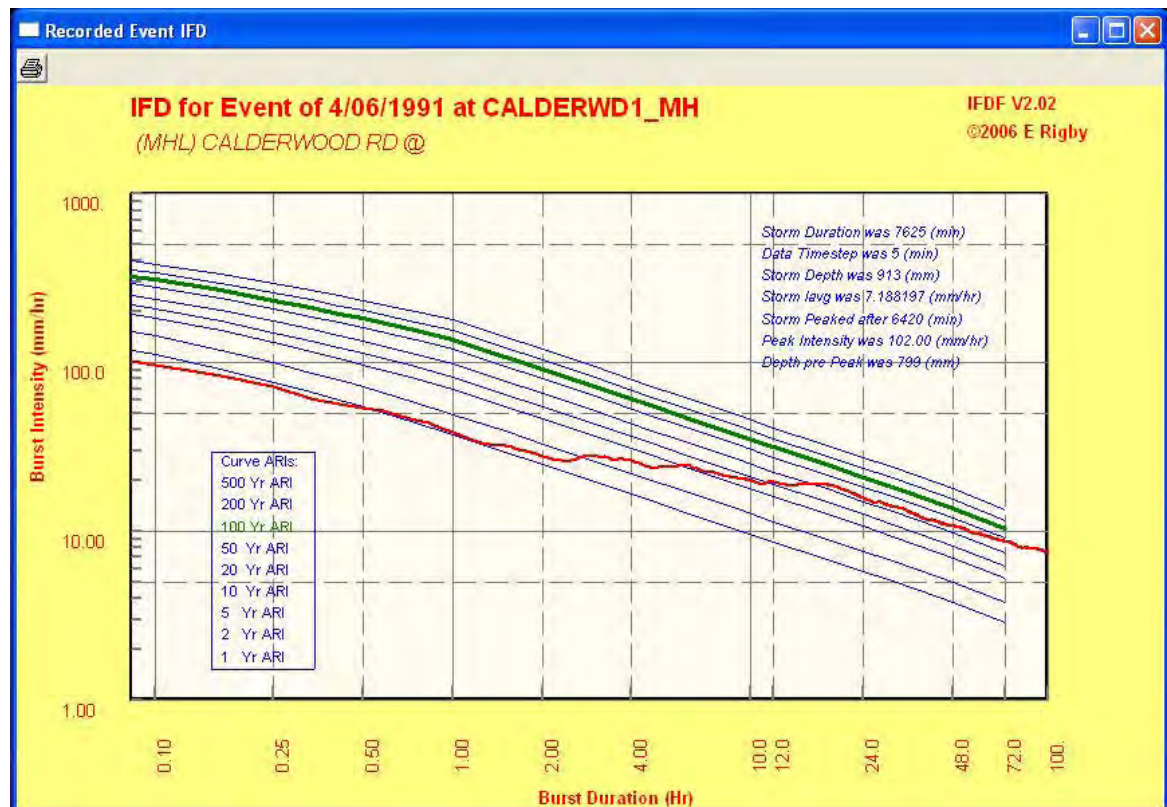
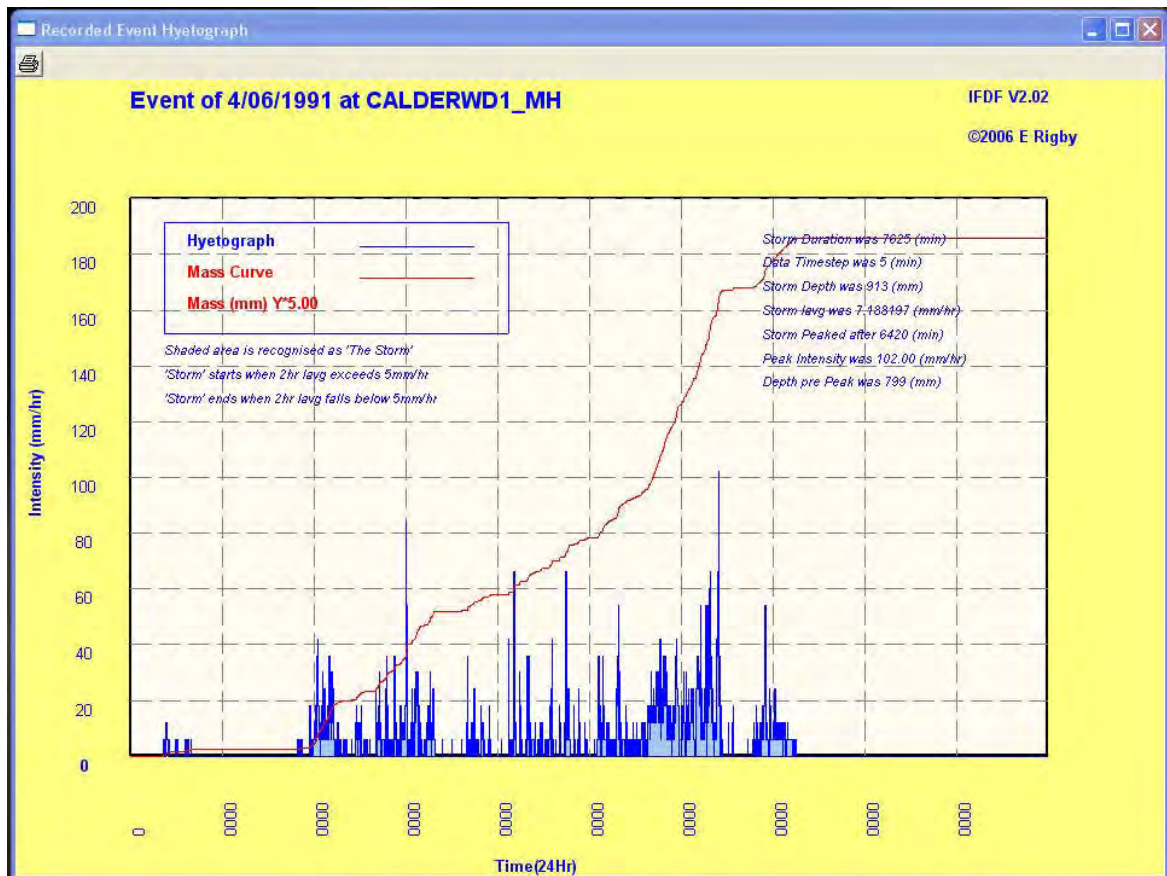
APPENDIX B4. STRUCTURE PHOTOGRAPHY (ctd)



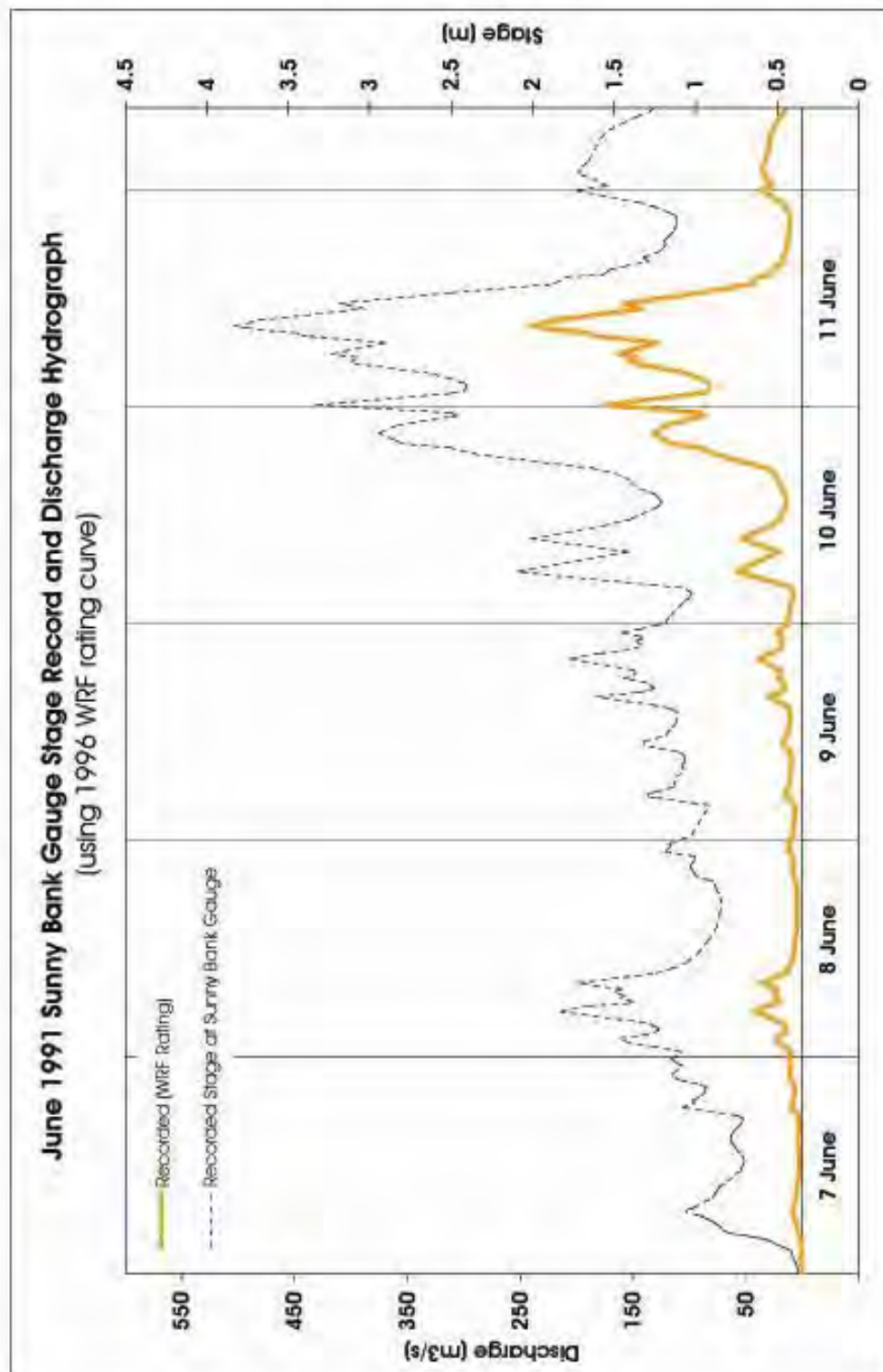
APPENDIX B5. JUNE 1991 HYETOGRAPHS



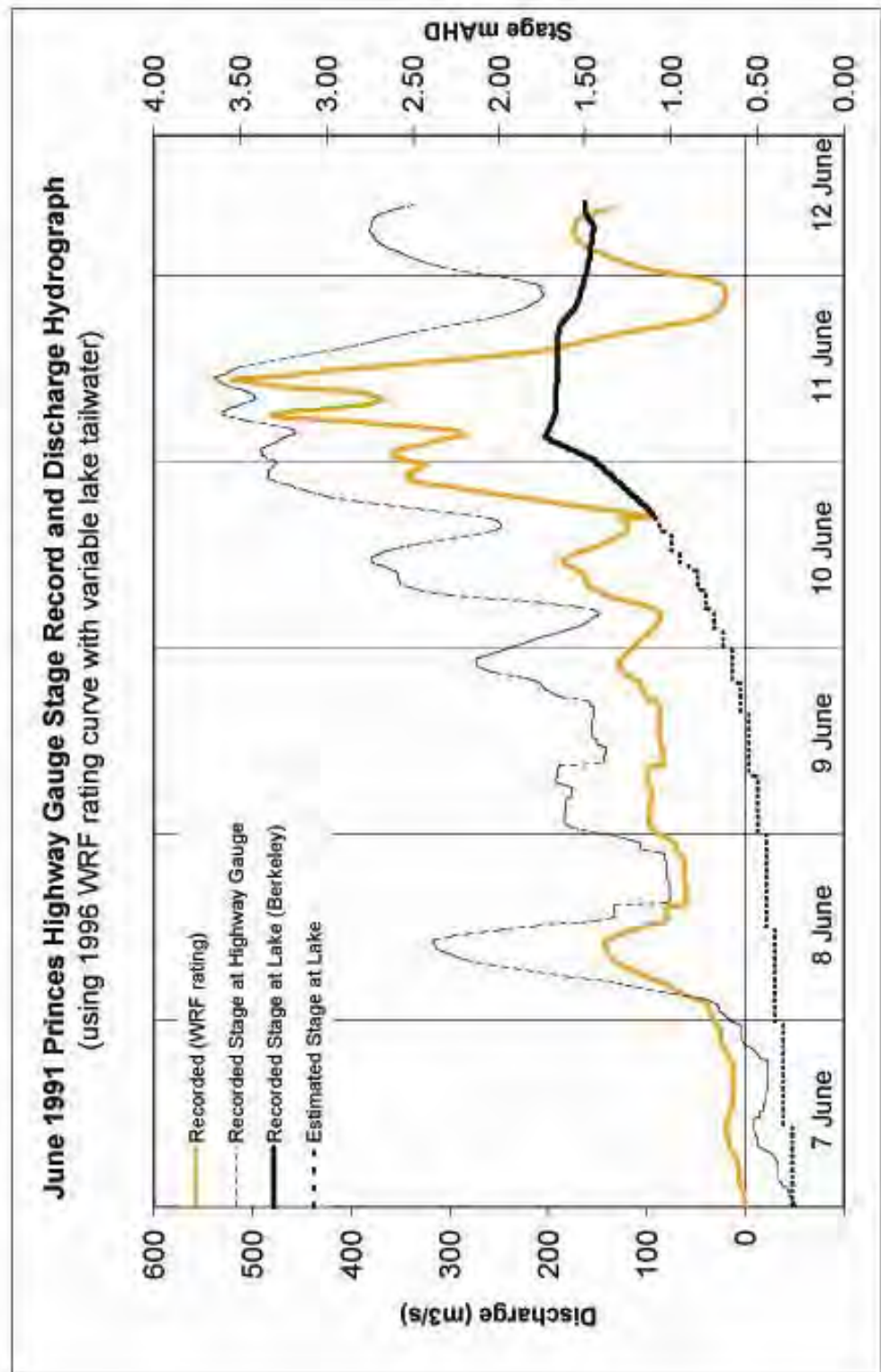
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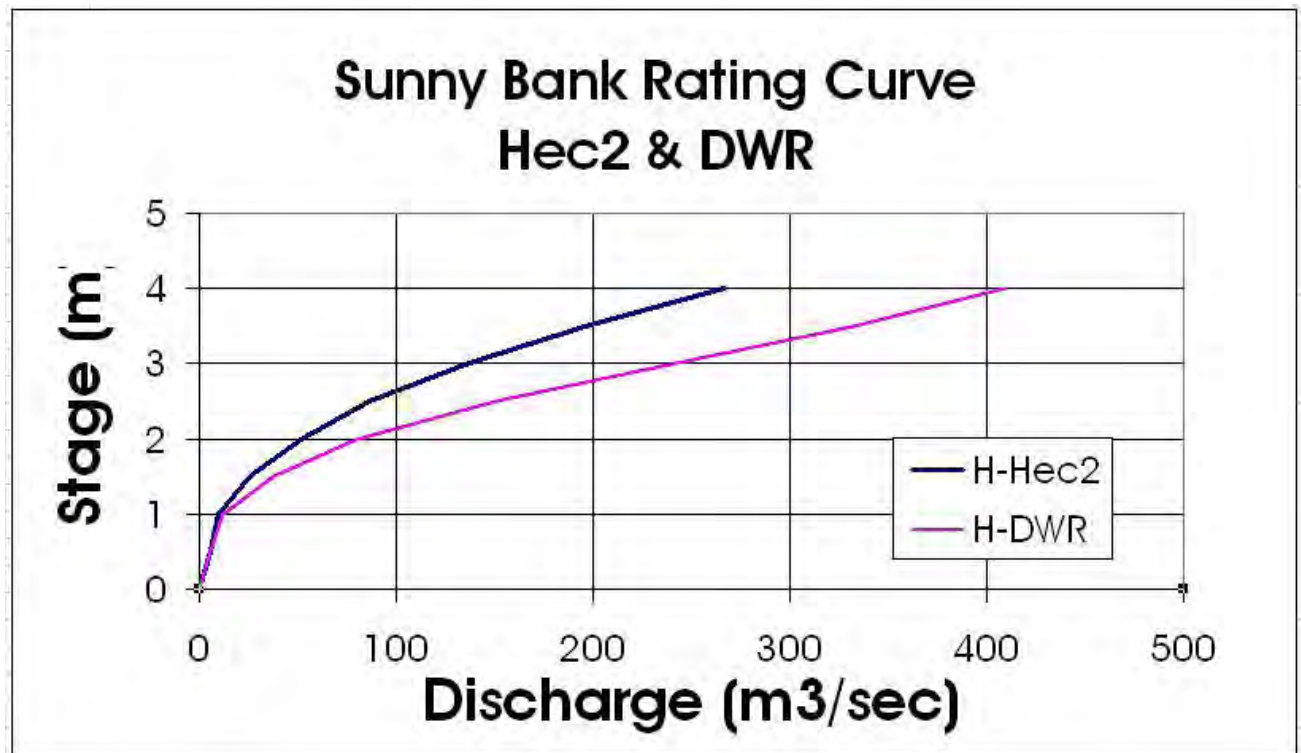
APPENDIX B5. JUNE 1991 HYETOGRAPHS (ctd)



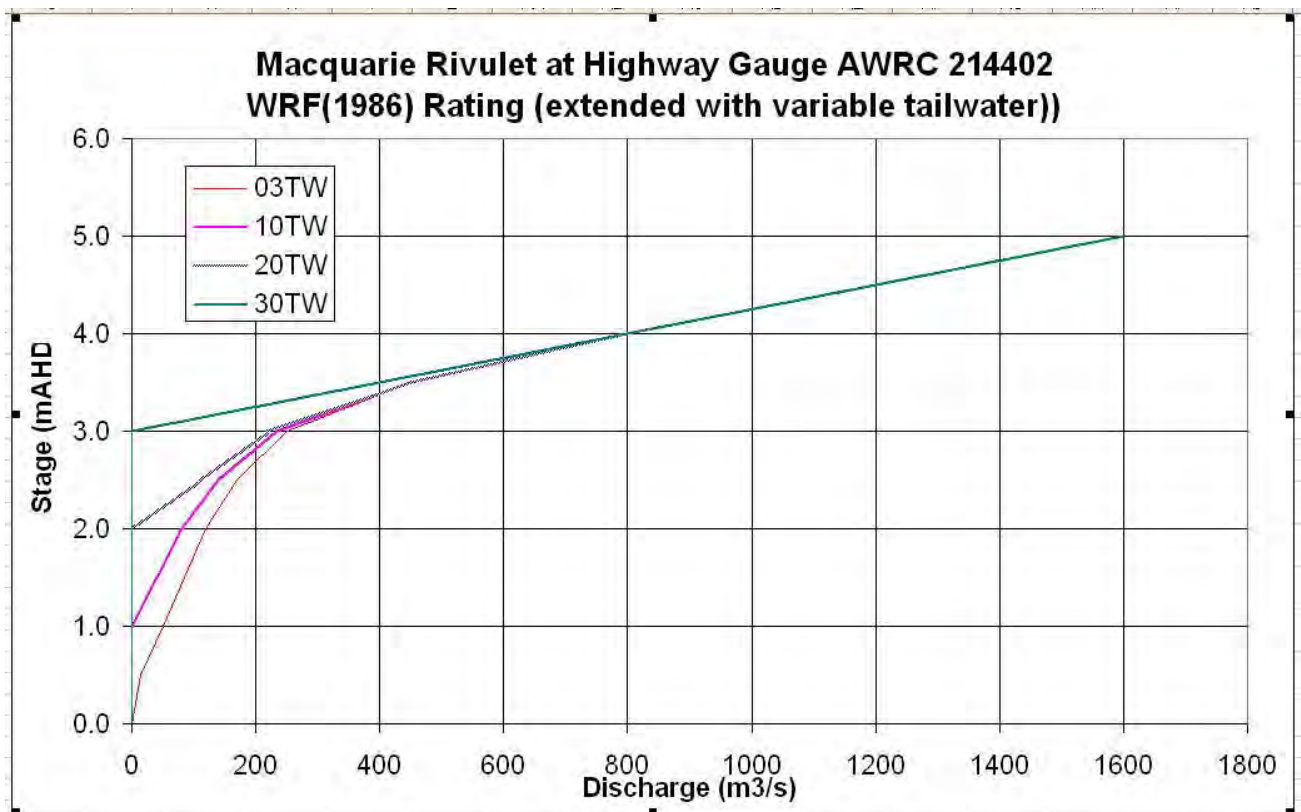
APPENDIX B6. JUNE 1991 ALBION PARK (SUNNYBANK) STAGE RECORD



APPENDIX B7. JUNE 1991 PRINCES HIGHWAY STAGE RECORD



APPENDIX B8. ALBION PARK (SUNNYBANK) RATING CURVE



APPENDIX B9. PRINCES HIGHWAY RATING CURVE



1..US RAIL BRIDGE (Note afflux above central spans



2..US RAIL BRIDGE (Note afflux above central spans

APPENDIX B 10. JUNE 1991 FLOOD PHOTOGRAPHY (E Rigby)



3..Floodplain DS Rail Bridge

APPENDIX B10. JUNE 1991 FLOOD PHOTOGRAPHY (E Rigby) (ctd)



4.. Between Rail and Highway Bridges From North Bank

APPENDIX B10. JUNE 1991 FLOOD PHOTOGRAPHY (E Rigby) (ctd)



5.. US Princes Highway Bridge From South Bank



Illawarra Highway at Green Meadows



Rail Bridge - Accumulated Debris After Event From DS South Bank



Rail Bridge - Accumulated Debris After Event From US South Bank

APPENDIX B10. JUNE 1991 FLOOD PHOTOGRAPHY (E Rigby) (ctd)



RECORDED FLOOD LEVELS (DECC)

The Department of Natural Resources (now DECC) operates a continuous stage recorder (CSR) immediately downstream of the Princes Highway road bridge. Tables A.-1 and A-2 provide a summary of the data recorded during the June 1991 flood event.(refer also stage hydrograph plot in Appendix B7)

Table A-1: Recorded Peak Flood Level at Princes Highway CSR

STATION	PEAK LEVEL	TIME OF PEAK	
	(m AHD)	(Hour)	(Date)
Macquarie Rivulet at Princes Highway	3.65	1045	11.6.91

Several Maximum Height Recorders are also maintained by the Department in this catchment. Peak flood levels registered at these gauges are tabulated below.

Table A -.2: Recorded Peak Flood Levels at MHIs

CREEK	LOCATION	RL (m AHD)
Macquarie Rivulet	Princes Highway – D/S	3.600
	Foot of Macquarie Pass – D/S	66.460
	Illawarra Highway at Tongarra Creek – D/S	53.630
	Illawarra Highway at Yellow Rock Creek – D/S	17.610
	“Cricklewood” at Marshall Mt Creek	43.030
	“Riversdale” at Marshall Mt Creek	8.470

Several flood debris marks were surveyed after the event by both the DNR and Shellharbour City Council providing comprehensive flood level information for the Macquarie Rivulet catchment. Table A-3 details these surveyed flood levels.

Table A -3: Recorded Peak Flood Levels From All Sources

NO.	LOCATION	RL (m AHD)
1	CSR Peak Reading – R/B D/S Princes Highway Bridge	3.610
2	Debris line – R/B U/S Princes Highway Bridge	3.645
3	Debris line – R/B U/S Illawarra Highway floodway	3.560
4	Debris line – R/B U/S Illawarra Highway floodway	3.560
5	Debris in tree – R/B U/S near Illawarra Highway	8.320
6	Debris in fence – R/B End of Hamilton Road	9.870
7	Debris in fence – R/B U/S Calderwood Road Bridge	11.410
8	Debris in fence – R/B western fence on farm U/S Calderwood Road	11.490
9	Debris line – L/B D/S Illawarra Highway at Yellow Rock Creek Bridge	17.280
10	Debris line – L/B U/S Illawarra Highway at Yellow Rock Creek Bridge	17.580
11	Debris in tree – D/S R/B Nth Macquarie Road floodway	26.580
12	Debris in fence – L/B D/S Tongarra Road cul on Central Frazers Creek	6.390



13	Debris in fence – L/B U/S Tongarra Road cul on Central Frazers Creek	6.570
14	Debris line – L/B D/S Tongarra Road Bridge on East Frazers Creek	7.865
15	Debris line – L/B U/S Tongarra Road Bridge on East Frazers Creek	8.715
16	Debris line – L/B U/S Illawarra Highway cul near Taylors Road	6.075
17	Debris line – L/B 100 m U/S Illawarra Highway cul near Taylors Road	6.220
18	Debris in tree – L/B D/S Cascading Basin on West Frazers Creek	9.750
19	Debris line – R/B U/S Cascading Basin on West Frazers Creek	10.100
20	Debris in tree – R/B 150 m D/S Terry Street cul on West Frazers Creek	10.860
21	Debris line – L/B D/S Terry St cul on West Frazers Creek	12.970
22	Debris line – L/B U/S Terry St cul on West Frazers Creek	13.800
23	Debris line – R/B D/S Simpson Pde cul on West Frazers Creek	22.550
24	Debris in fence – R/B U/S Simpson Pde on West Frazers Creek	24.210
25	Debris in tree – L/B at end of Frazers Cres on Central Frazers Creek	8.620
26	Debris in tree – L/B 50 m D/S of causeway to Polo Club on Centl Frazers Ck	13.830
27	Debris in fence – L/B U/S footbridge end of Hughes Drv on Centl Frazers Ck	14.090
28	Debris line – L/B D/S Retarding Basin at end of Smith Ave	16.300
29	Debris line – L/B D/S Terry St cul on Central Frazers Creek	24.600
30	Debris in tree – L/B northern end of Polo Field on East Frazers Creek	12.845
31	Debris in tree – L/B in Polo Field on East Frazer Creek	13.790
32	Debris in tree – L/B D/S footpath at end of Hughes Dr on East Frazers Ck	16.480
33	Debris line – R/B D/S Marshall Mt Road culv	18.150
34	Debris in fence – R/B D/S Marshall Mt Road	18.490
35	Debris line – R/B U/S Marshall Mt Road culv	19.010
36	MHI Recording - L/B D/S Illawarra Highway at foot of Macquarie Pass	66.460
37	MHI Recording - R/B D/S Illawarra Highway at Tongarra Creek	53.630
38	MHI Recording - R/B at "Cricklewood" on Marshall Mt Creek	43.030
39	MHI Recording - R/B at "Riversdale" on Marshall Mt Creek	8.470
40	Debris line - R/B D/S of Highway at gauge	3.570
41	Debris line - R/B 150m D/S of Highway	3.440
42	Debris line - R/B 250m D/S of Highway	3.400
43	Debris line - R/B U/S of Railway	3.000
44	Debris in fence - R/B D/S of Railway	3.040
45	U/S Princes Highway	3.725
46	100m U/S Princes Highway	4.140
47	U/S Princes Highway on Albion Creek	2.870
48	D/S Railway on Albion Creek	1.900
49	Pedestrian Bridge near Pollock Crescent	12.360
50	Taylor Rd 150m west of Illawarra Hway	6.100
51	R/B U/S culvert on Central Frazers Ck	6.530
52	L/B Central Frazers Ck 150m U/S of Tongarra Rd	7.080
53	L/B West Frazers Ck U/S of Terry St	13.820
54	West Frazers Creek near end of Propane St	16.560
55	West Frazers Creek U/S Simpsons Pde	23.985
56	Direct Observation by owner - Macriv R/B rear of Meadow View dairy	4.690

APPENDIX B11. JUNE 1991 RECORDED FLOOD LEVELS