

## Culvert Fishway Planning and Design Guidelines

### Part I – Design Drawings for Fishway Projects



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James Cook University  
School of Engineering and Physical Sciences

**April 2010 – VER2.0**

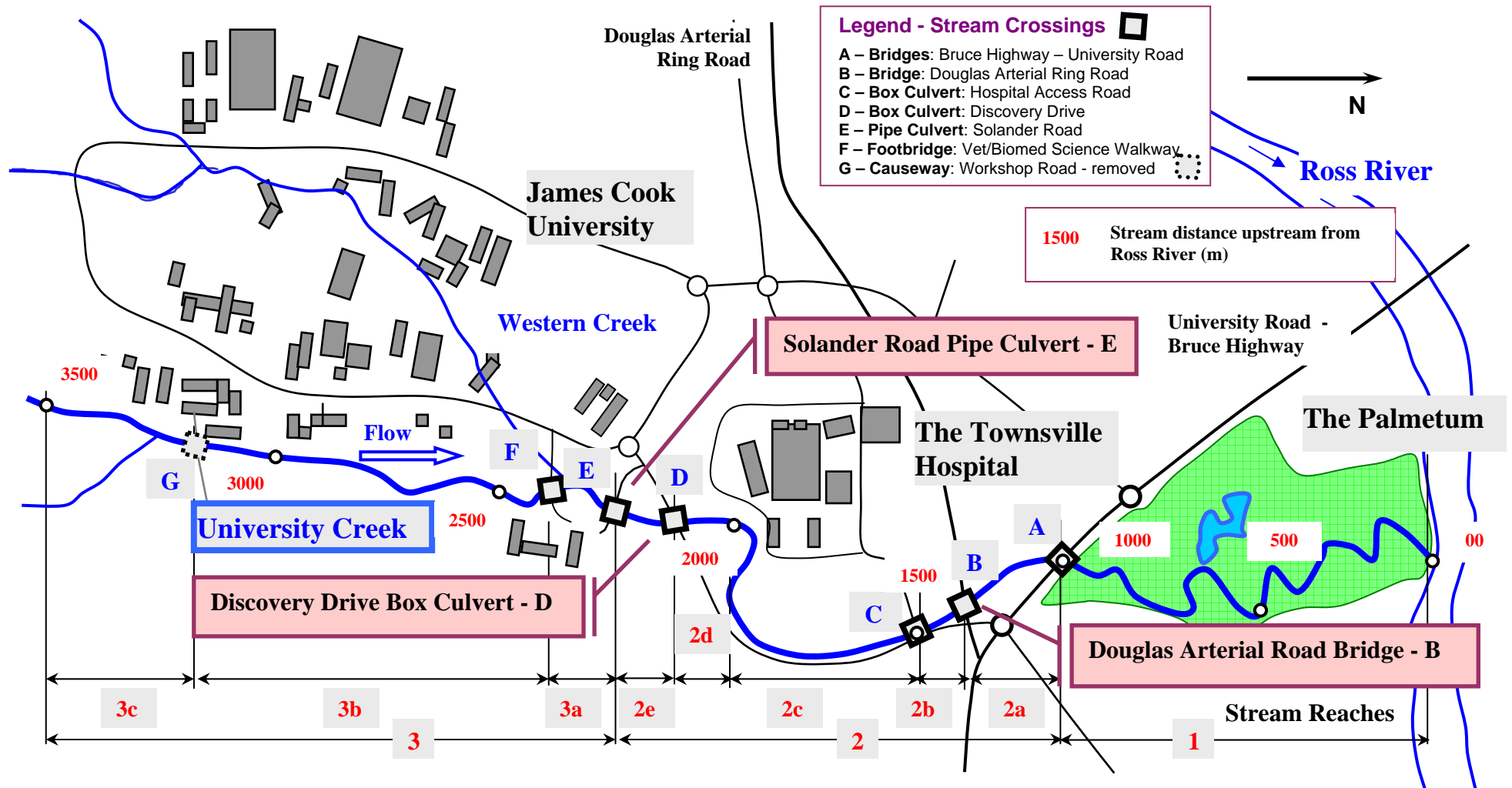
**James Cook University School of Engineering and Physical Sciences  
Culvert Fishway Planning and Design Guidelines  
Part I – Design Drawings for Fishway Projects**

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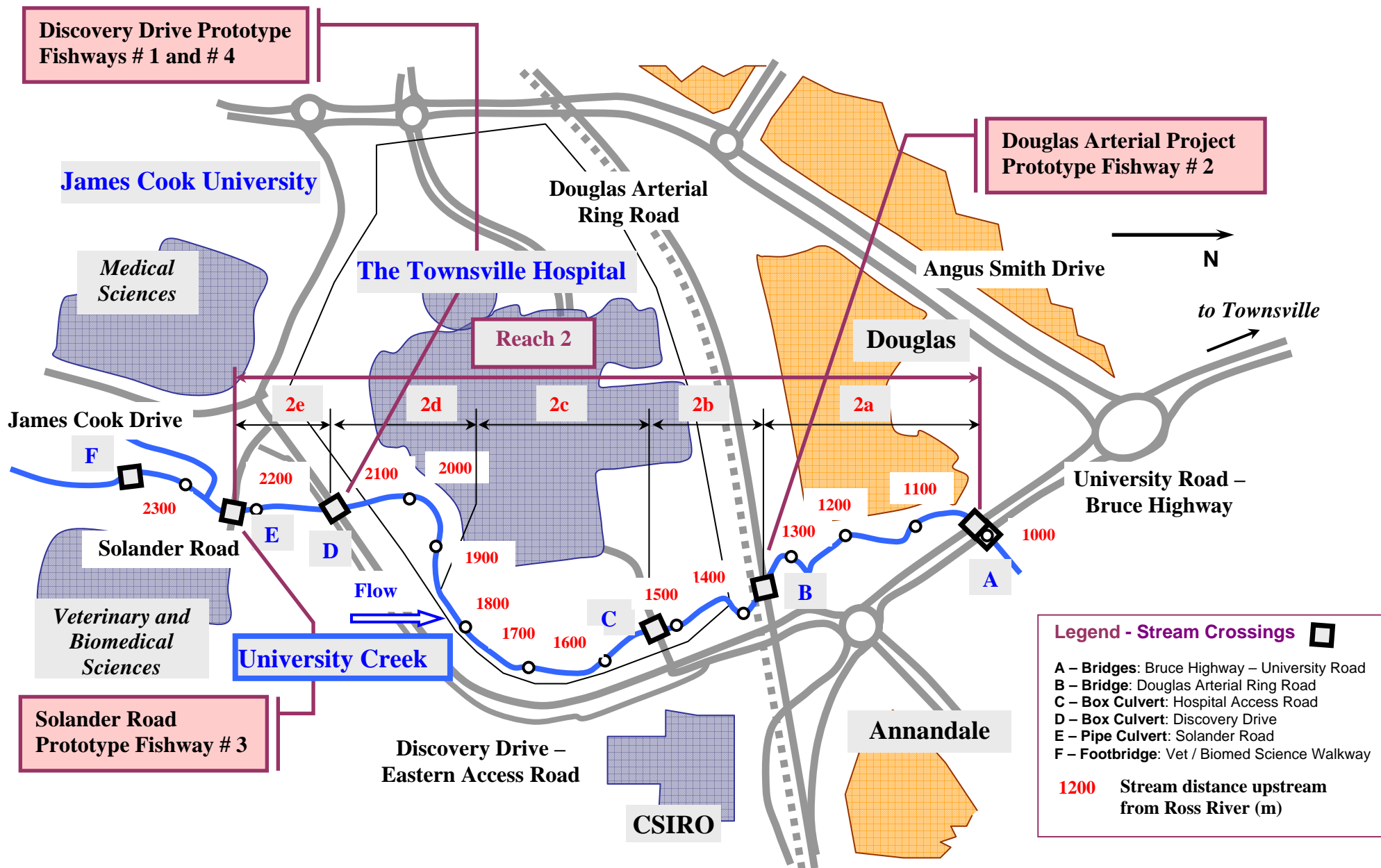
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## APPENDIX I1 – UNIVERSITY CREEK PROTOTYPE CULVERT FISHWAYS

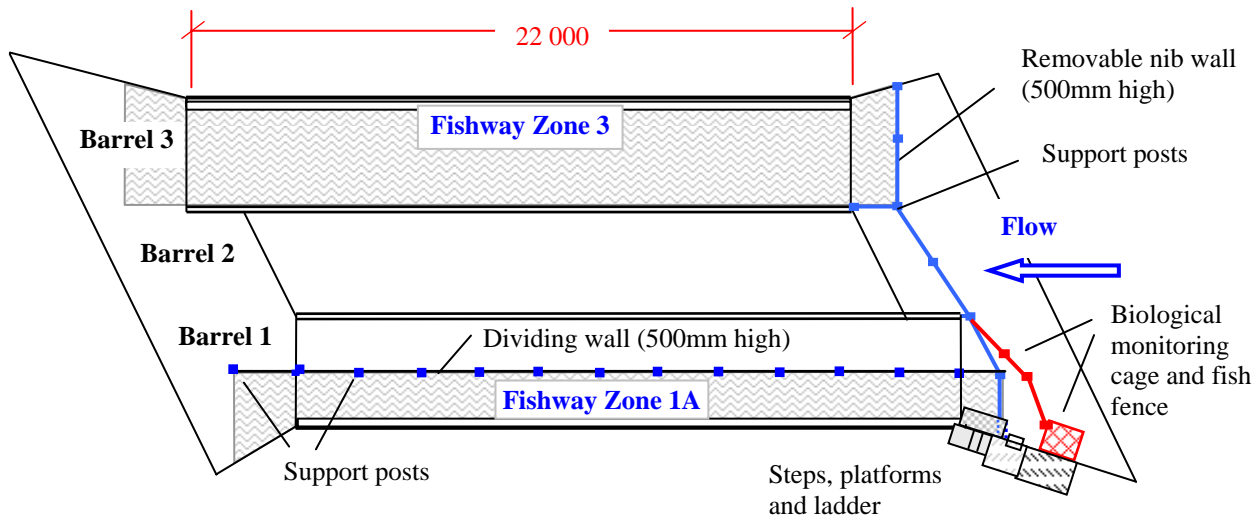
Drawing	Title
<b>University Creek Reaches, Crossings and Prototype Fishways</b>	
	University Creek Prototype Fishways – Creek Reaches and Crossings
	University Creek Prototype Fishways – Reach 2 Crossings and Fishways
<b>Discovery Drive Prototype Fishway # 1 and Prototype Fishway # 4</b>	
	University Creek Discovery Drive box culvert fishways – General arrangement
	Discovery Drive box culvert – Prototype Fishway # 1 – Offset Baffle fishway
	Discovery Drive box culvert – Prototype Fishway # 4 – Corner “EL” Baffle fishway
<b>Douglas Arterial Project Prototype Fishway # 2</b>	
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	Douglas Arterial Project diversion drain and rock ramps – General arrangement
	Douglas Arterial Project bridge crossing – Elevation
	Douglas Arterial Project – Prototype Fishway # 2 – Rock ramp layout
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<b>Solander Road Prototype Fishway # 3</b>	
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	Solander Road pipe culvert – Prototype Fishway # 3 – Long section
	Solander Road pipe culvert – Prototype Fishway # 3 – Rock ramp detail
	Solander Road pipe culvert – Prototype Fishway # 3 – Pipe and apron fishways
	Solander Road pipe culvert – Prototype Fishway # 3 – Offset Baffle fishway
	Solander Road pipe culvert – Prototype Fishway # 3 – Corner “Quad” Baffle fishway
<b>Notes</b>	<p>These are prototype facilities in which the baffle fishway devices are constructed of light duty materials to suit adaptation and performance evaluation, and which include provisions for monitoring and access that will not normally be incorporated into field installations of culvert fishway facilities</p> <p>These drawings have been prepared specifically for use on the University Creek prototype fishways. They are not standard drawings and the designs are not necessarily applicable to other locations. Users should make their own site-specific evaluation and design arrangements and should seek specialist input on fish passage design as required.</p>



University Creek Prototype Fishways – Creek Reaches and Crossings

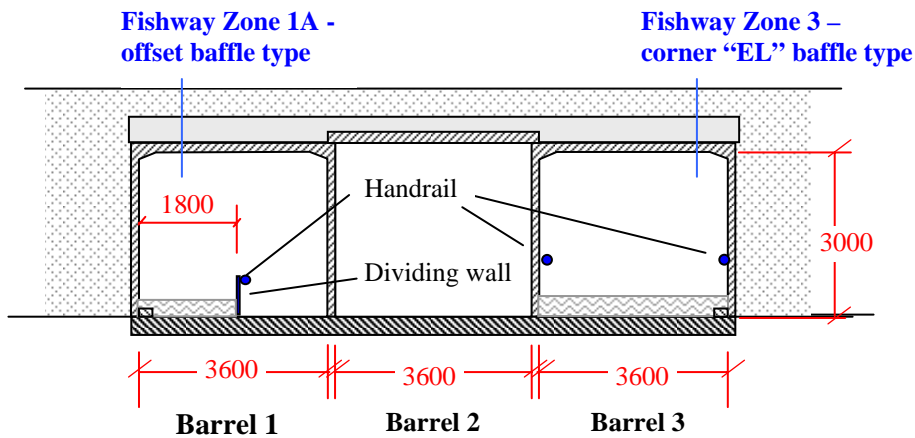


**University Creek Prototype Fishways – Reach 2 Crossings and Fishways**

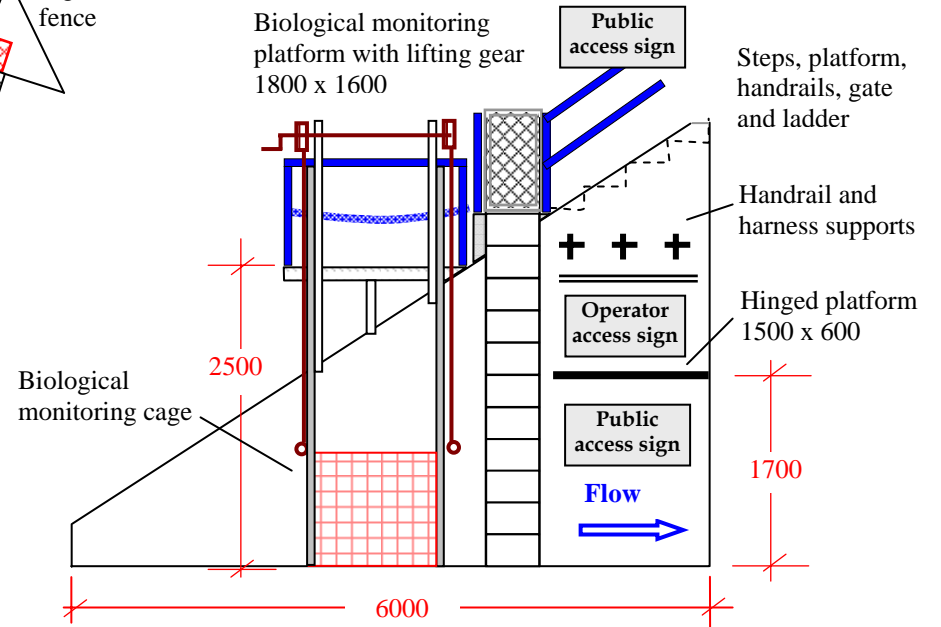


**Culvert Plan View**

This is a prototype facility in which the baffle fishway devices are constructed of light duty materials to suit adaptation and performance evaluation, and which includes provisions for monitoring and access that will not normally be incorporated into field installations of culvert fishway facilities



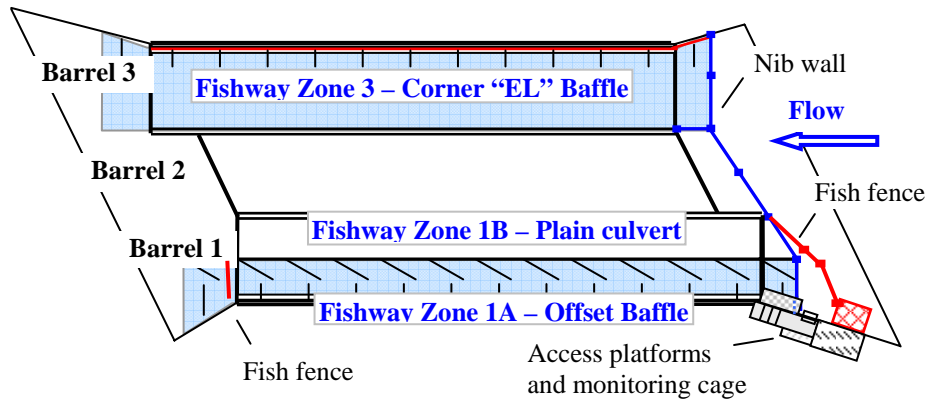
**Culvert Section**



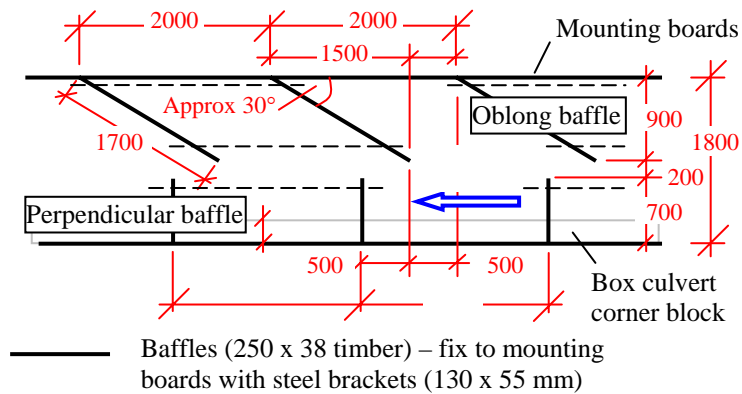
**Wingwall Elevation**

**University Creek Discovery Drive Box Culvert Fishways – General Arrangement Plan, Section and Elevation**

## University Creek Discovery Drive Culvert Fishway –

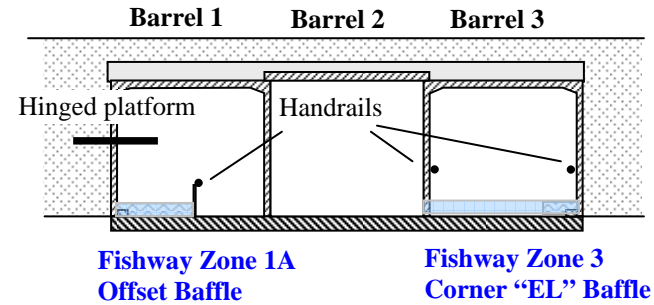


**Culvert Plan showing Fishway Zones and Monitoring Facilities**

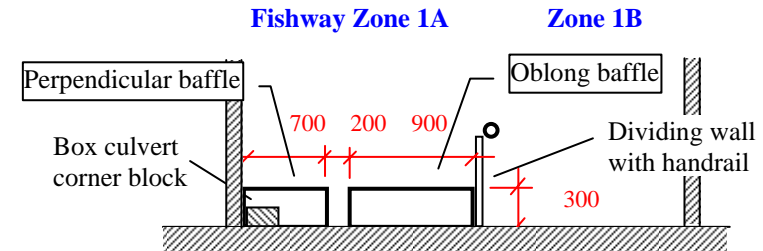


**Offset Baffle Detail**

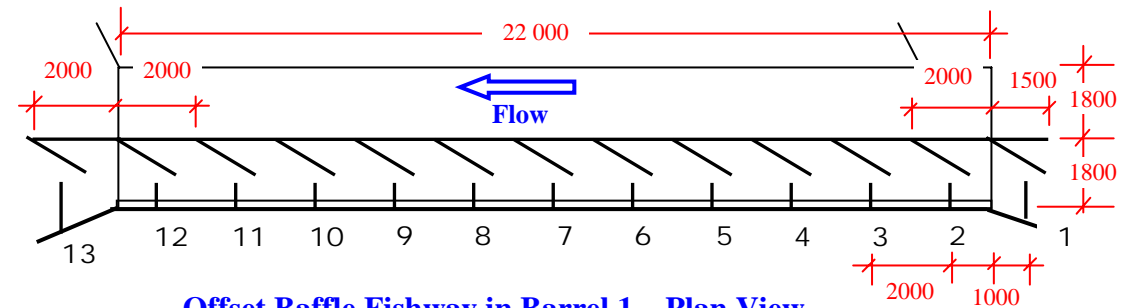
This is a prototype facility in which the baffle fishway devices are constructed of light duty materials to suit adaptation and performance evaluation, and which includes provisions for monitoring and access that will not normally be incorporated into field installations of culvert fishway facilities



**Culvert Section showing Fishway Zones**

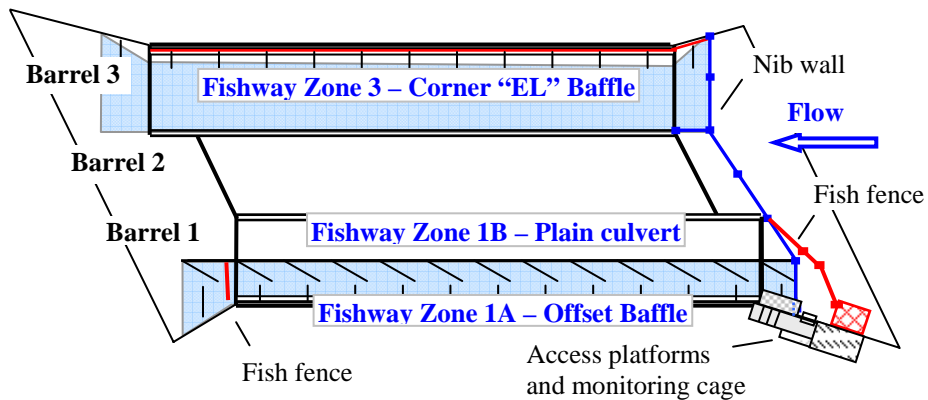


**Offset Baffle Fishway – Barrel 1 looking downstream**

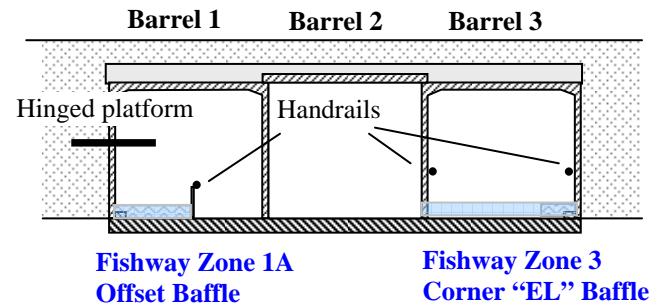


**Offset Baffle Fishway in Barrel 1 – Plan View**

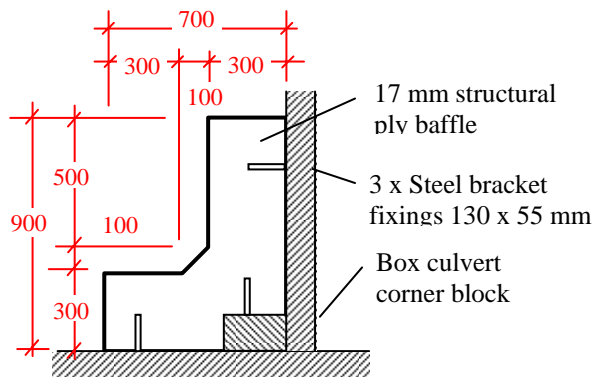
**Discovery Drive box culvert – Prototype Fishway # 1 – Offset Baffle configuration**



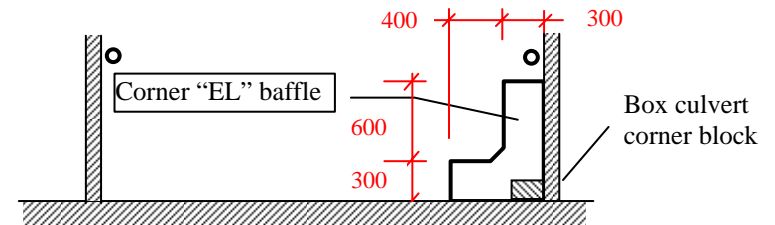
**Culvert Plan showing Fishway Zones and Monitoring Facilities**



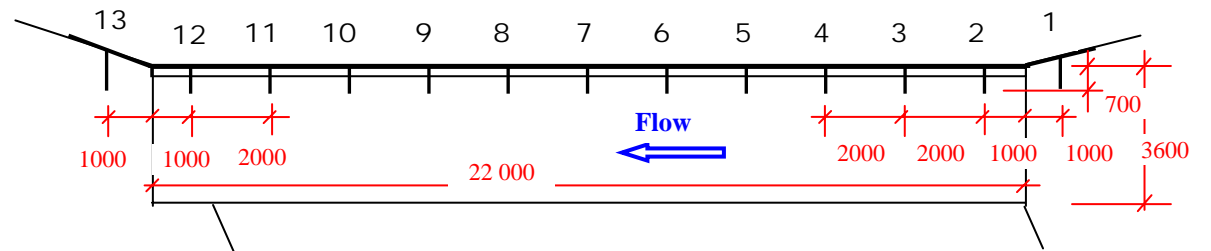
**Culvert Section showing Fishway Zones**



**Corner "EL" Baffle Detail**



**Corner Baffle Fishway - Barrel 3 looking downstream**

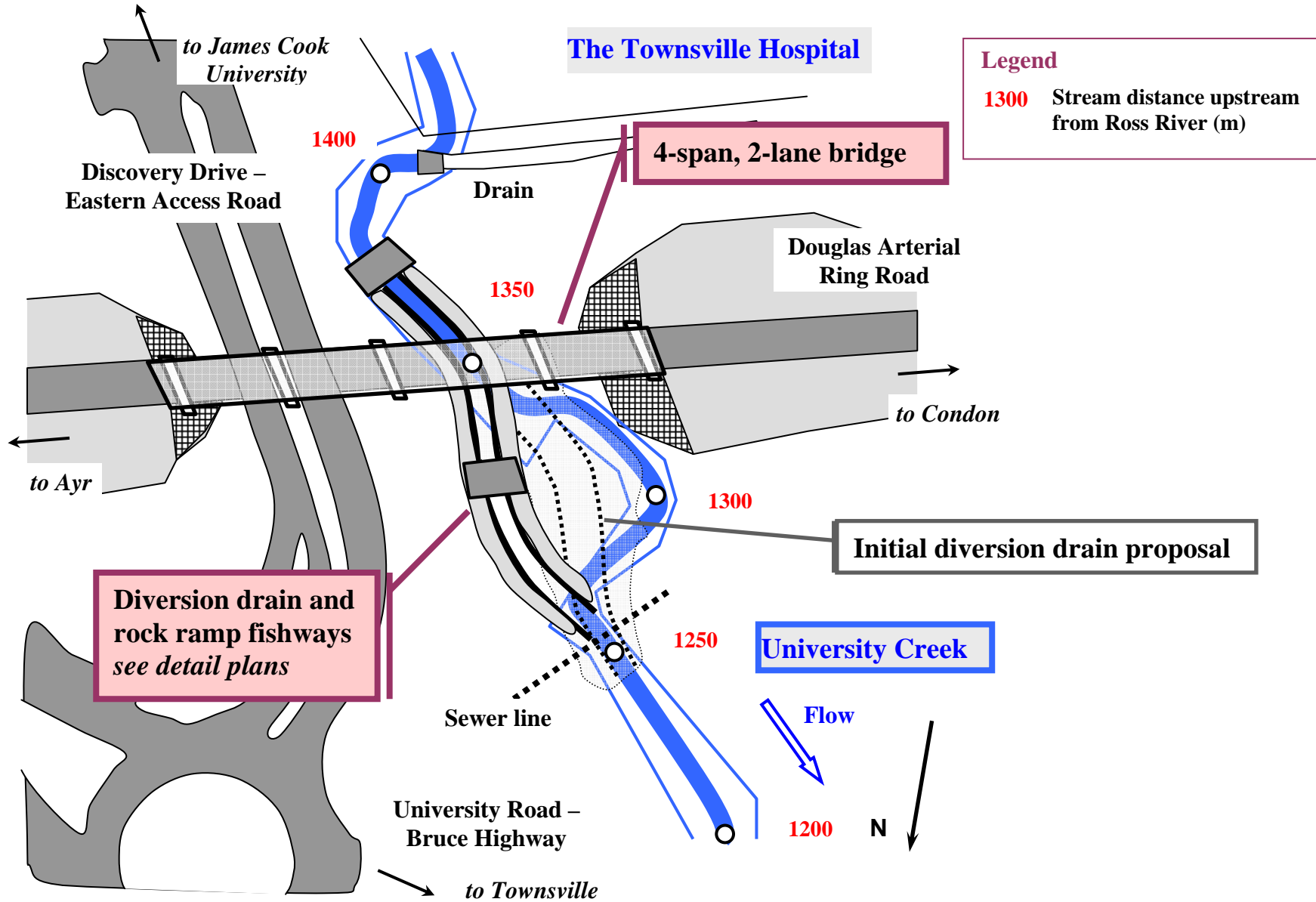


**Corner "EL" Baffle Fishway in Barrel 3 - Plan**

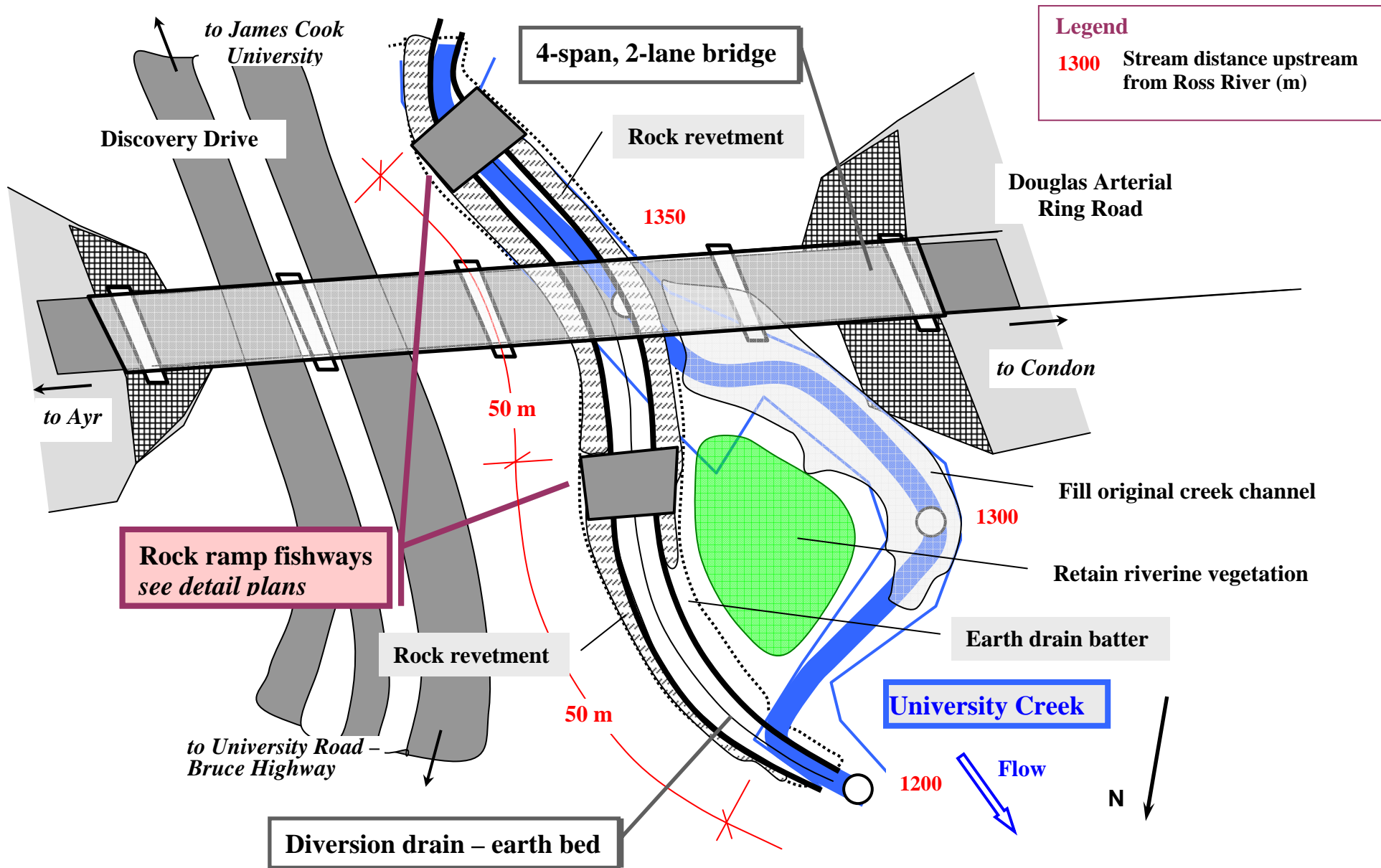
This is a prototype facility in which the baffle fishway devices are constructed of light duty materials to suit adaptation and performance evaluation, and which includes provisions for monitoring and access that will not normally be incorporated into field installations of culvert fishway facilities

**Discovery Drive box culvert - Prototype Fishway # 4 - Corner "EL" Baffle configuration**

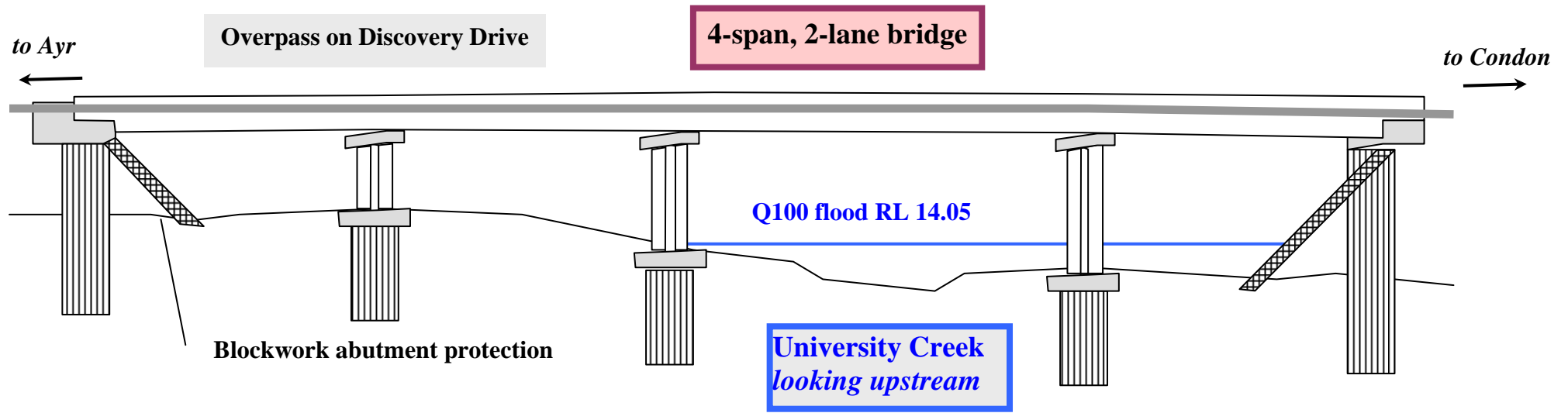




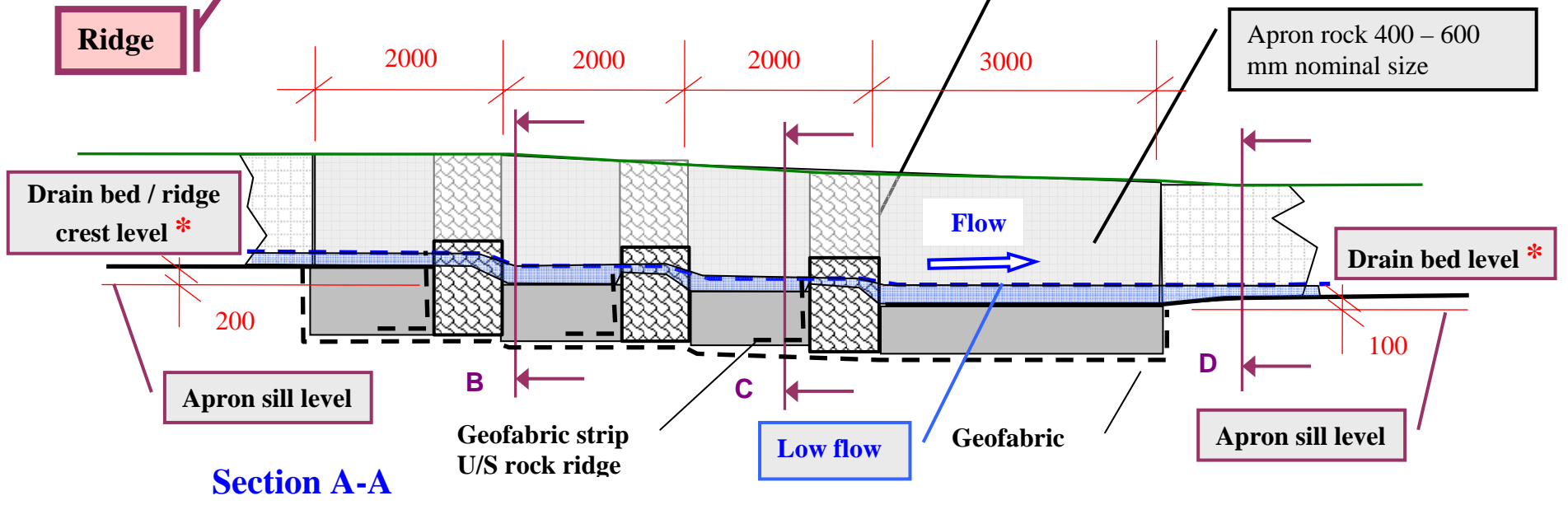
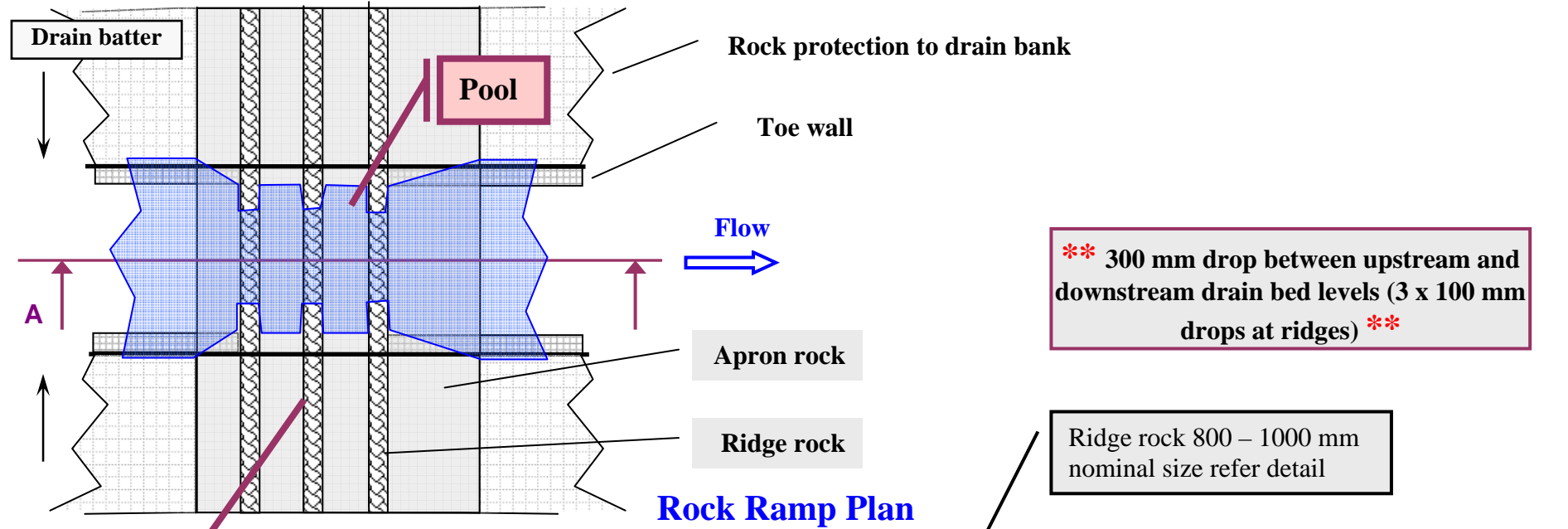
**University Creek Douglas Arterial Project Crossing – Layout Plan**



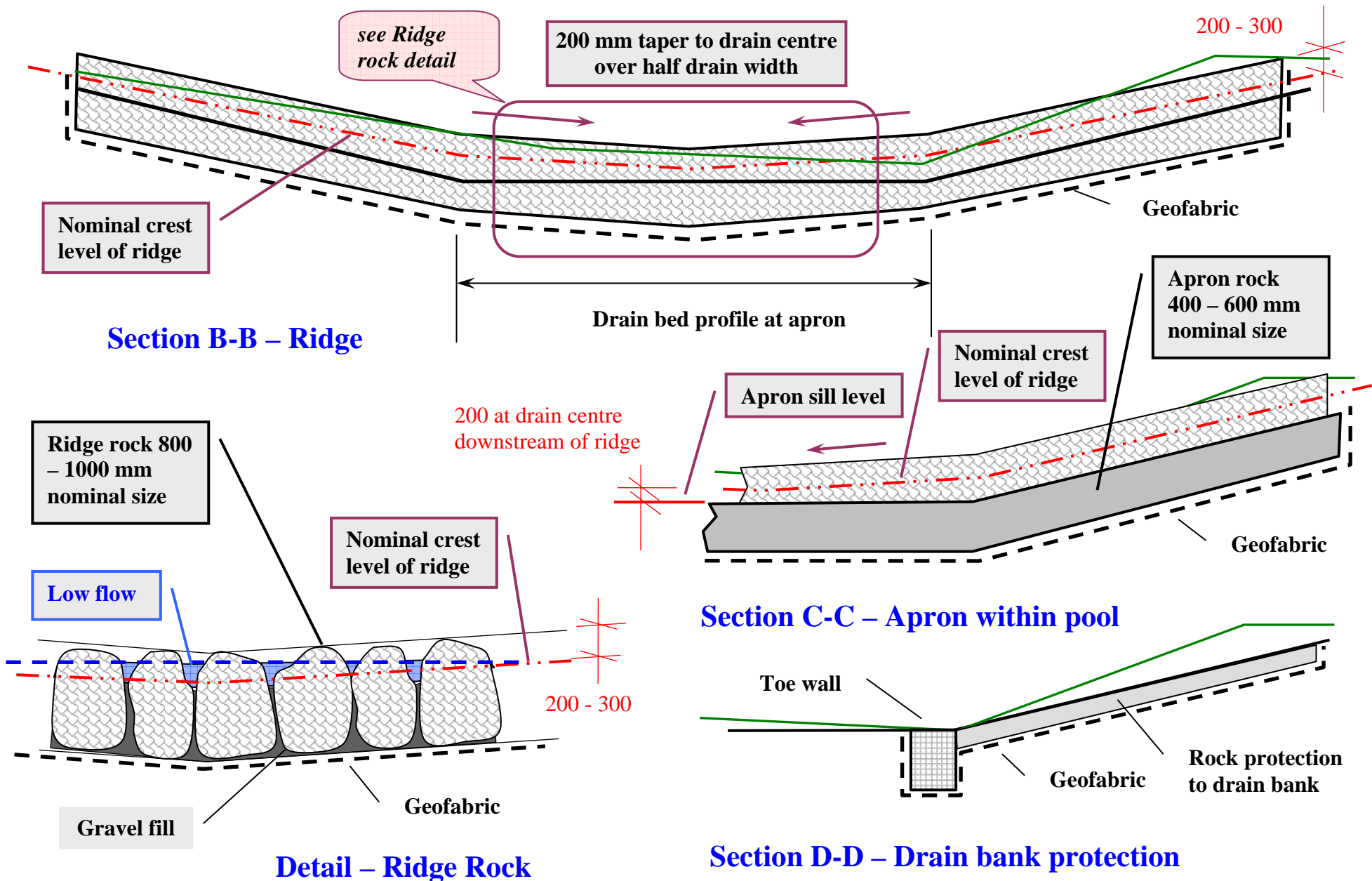
**Douglas Arterial Project Diversion Drain and Rock Ramp Fishways – General Arrangement**



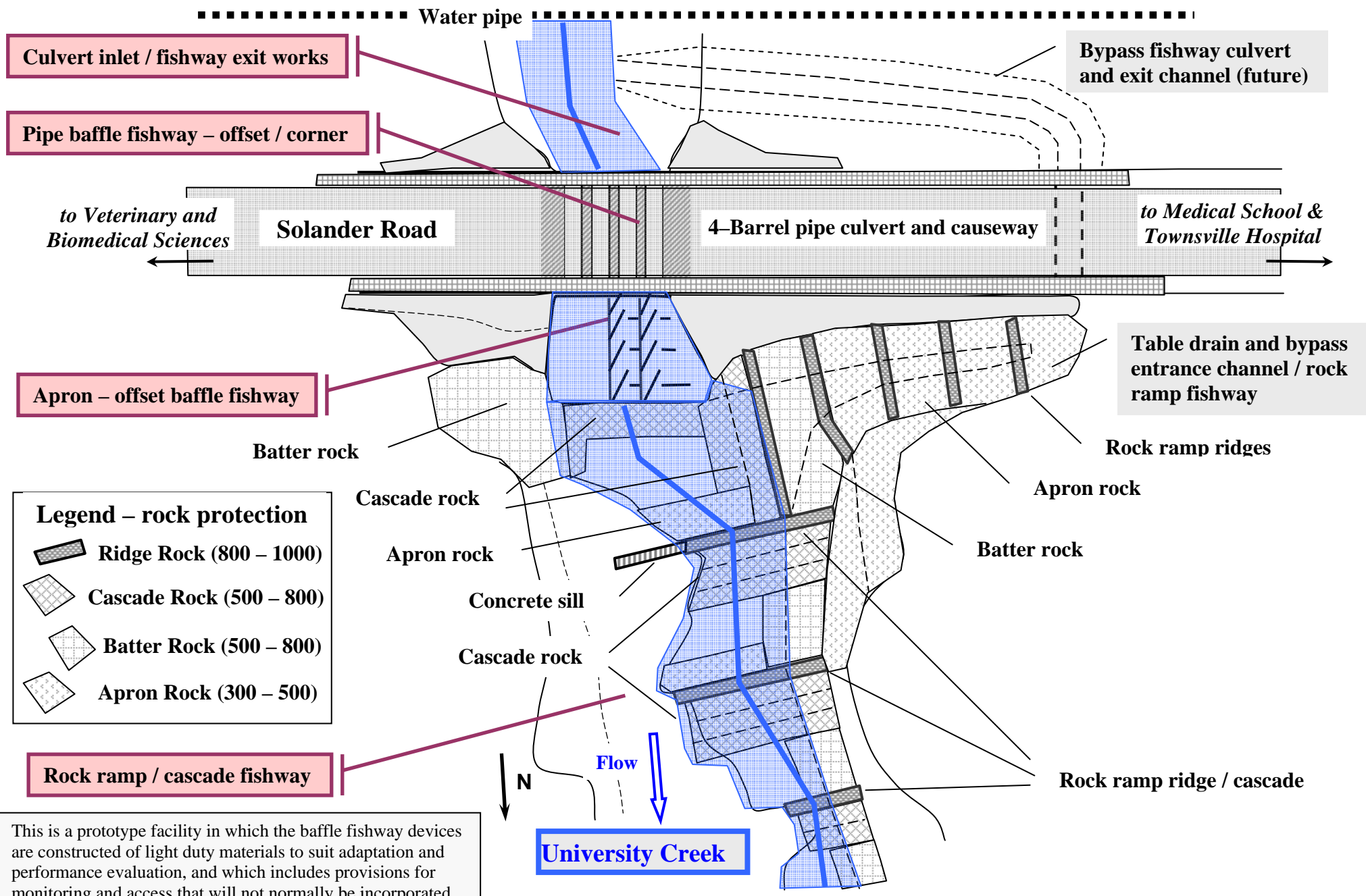
**University Creek Douglas Arterial Project Bridge Crossing – Elevation**



**University Creek Douglas Arterial Project Rock Ramp Layout**



**University Creek Douglas Arterial Project Rock Ramp Details**



Culvert inlet / fishway exit works

Pipe baffle fishway – offset / corner

Bypass fishway culvert and exit channel (future)

to Veterinary and Biomedical Sciences

Solander Road

4-Barrel pipe culvert and causeway

to Medical School & Townsville Hospital





Apron – offset baffle fishway

Table drain and bypass entrance channel / rock ramp fishway

Batter rock

Rock ramp ridges

**Legend – rock protection**

-  Ridge Rock (800 – 1000)
-  Cascade Rock (500 – 800)
-  Batter Rock (500 – 800)
-  Apron Rock (300 – 500)

Cascade rock

Apron rock

Apron rock

Batter rock

Concrete sill

Cascade rock

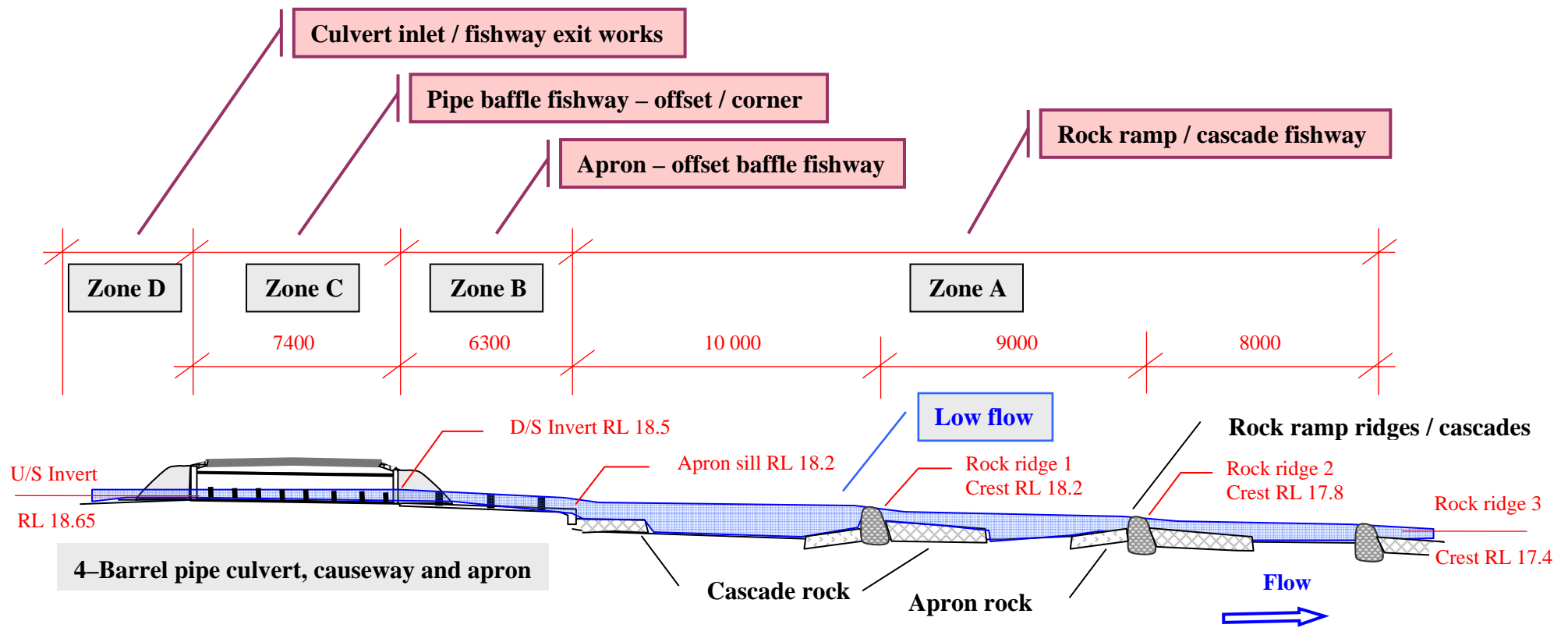
Rock ramp / cascade fishway

Rock ramp ridge / cascade

This is a prototype facility in which the baffle fishway devices are constructed of light duty materials to suit adaptation and performance evaluation, and which includes provisions for monitoring and access that will not normally be incorporated into field installations of culvert fishway facilities

University Creek

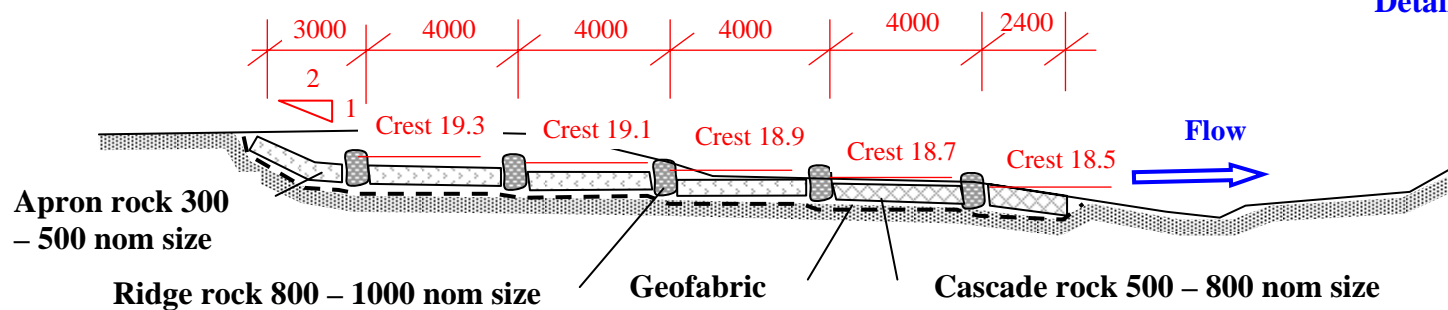
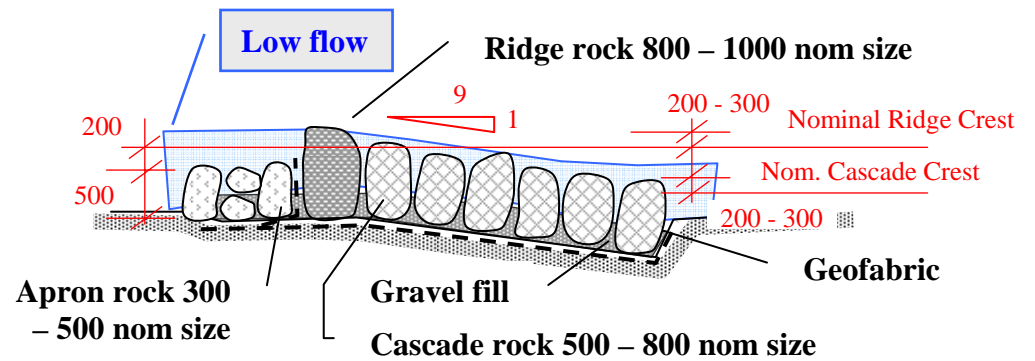
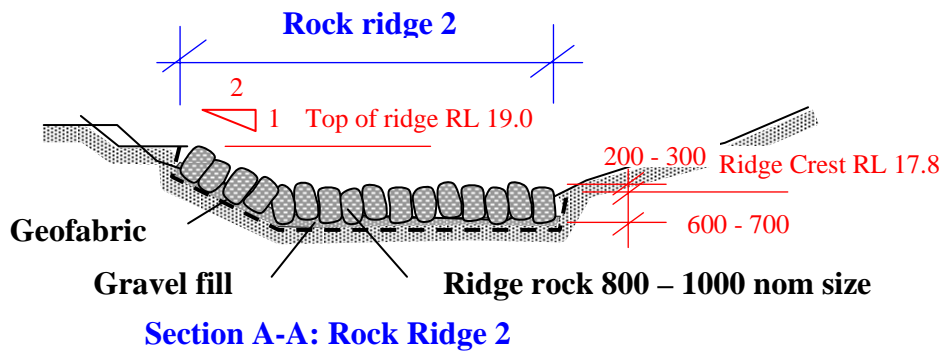
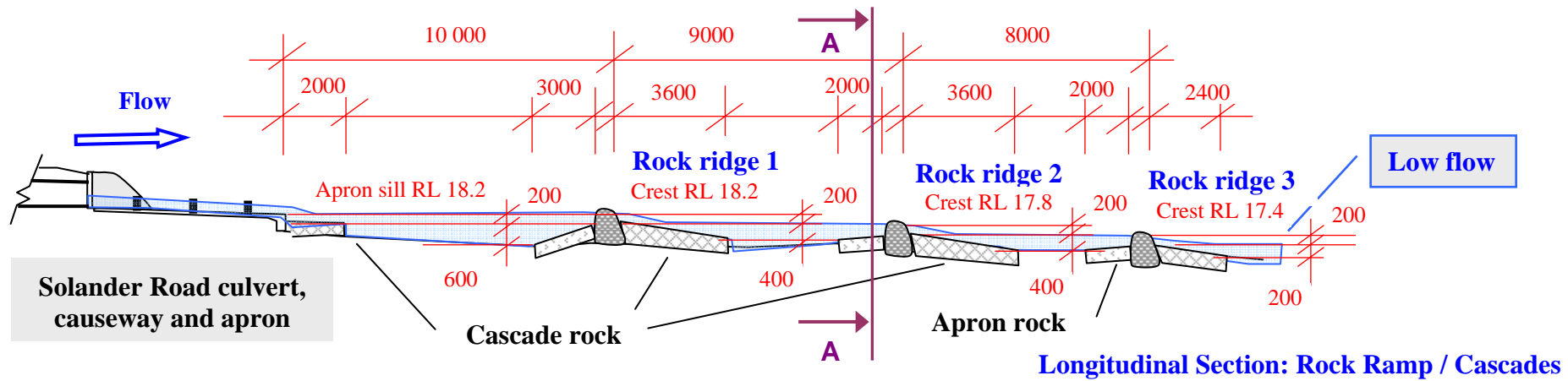
University Creek Solander Road pipe culvert – Prototype Fishway # 3 - Plan



**Longitudinal Section: Culvert and Fishways**

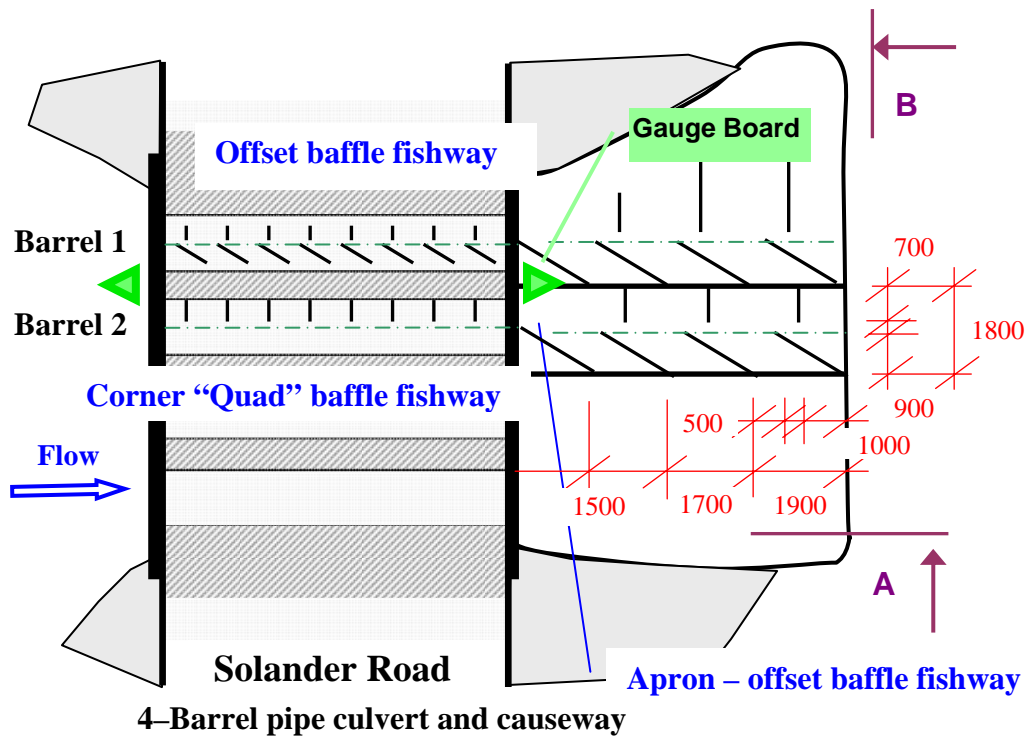
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**University Creek Solander Road pipe culvert – Prototype Fishway # 3 – Long section**

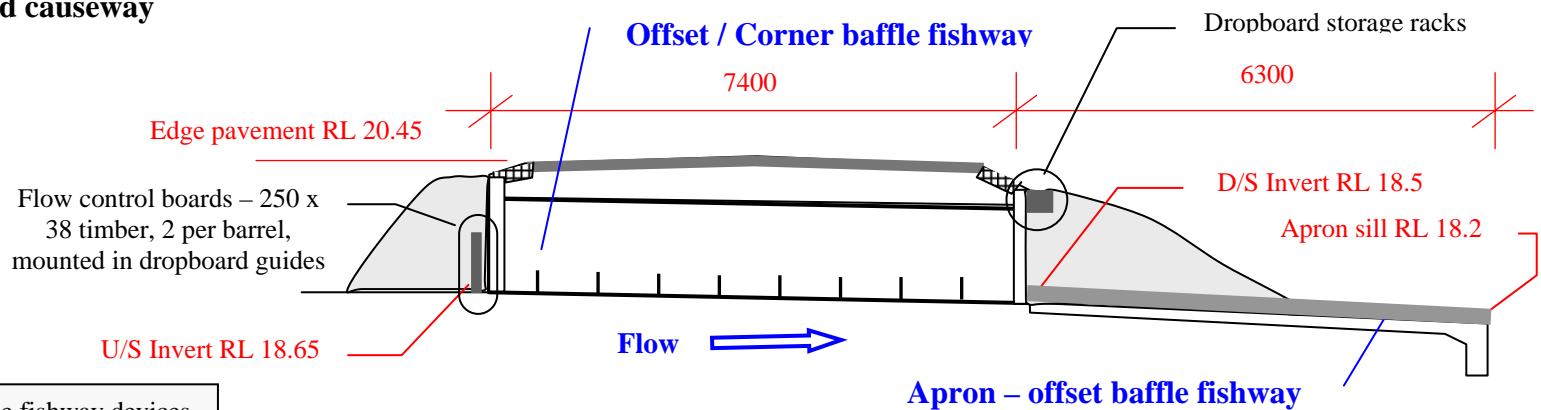
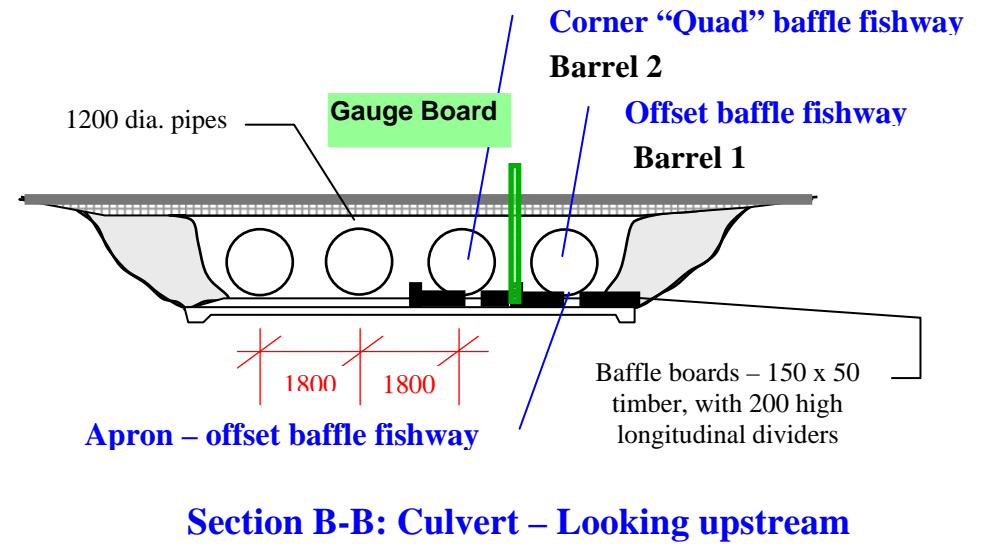


**Solander Road pipe culvert - Prototype Fishway # 3 - Rock ramp detail**





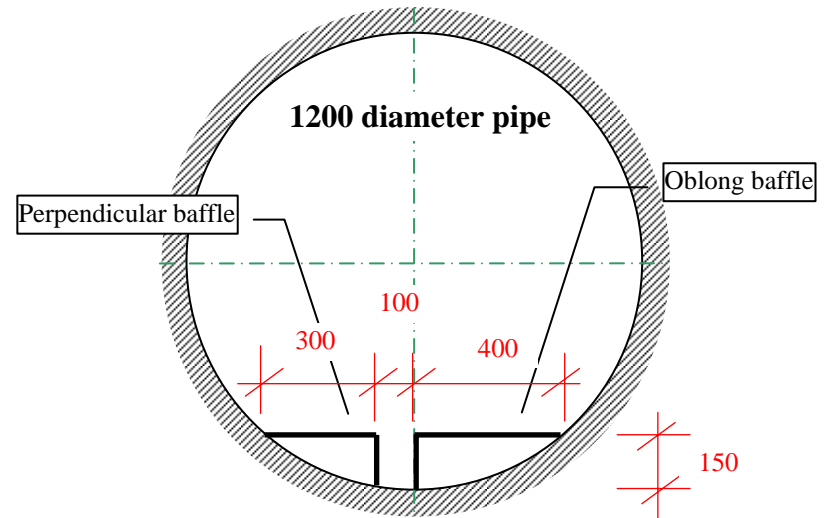
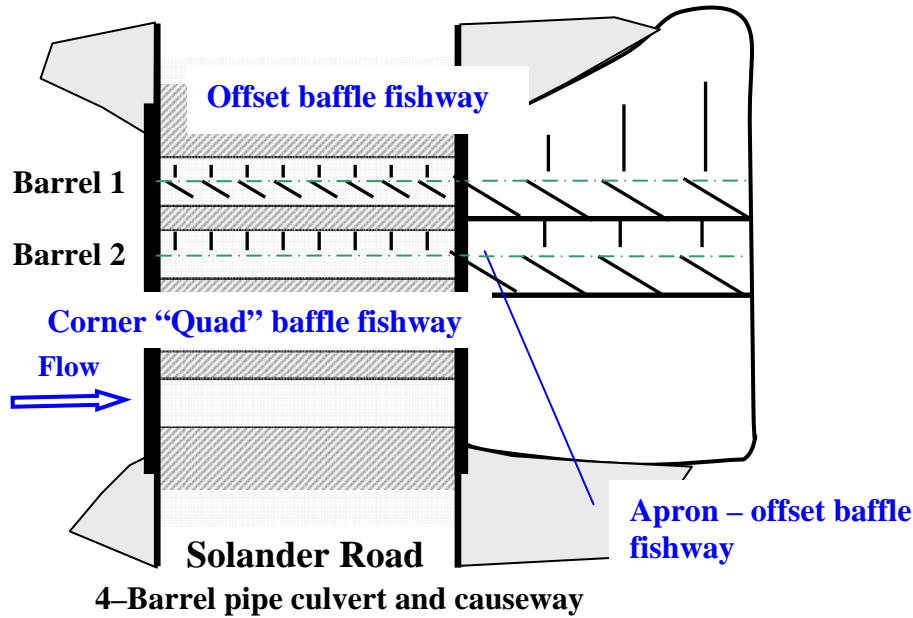
**Culvert Plan View**



**Section A-A: Culvert and apron**

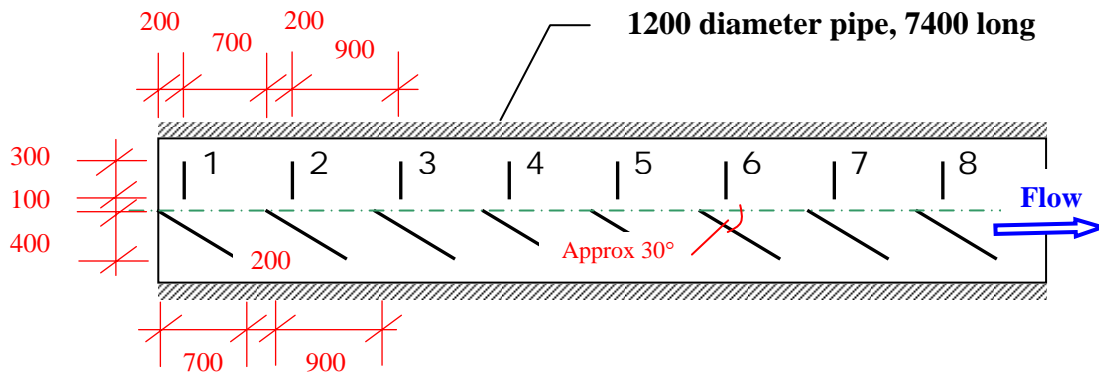
**Solander Road pipe culvert - Prototype Fishway # 3 - Pipe and apron fishways**

This is a prototype facility in which the baffle fishway devices are constructed of light duty materials to suit adaptation and performance evaluation, and which includes provisions for monitoring and access that will not normally be incorporated into field installations of culvert fishway facilities

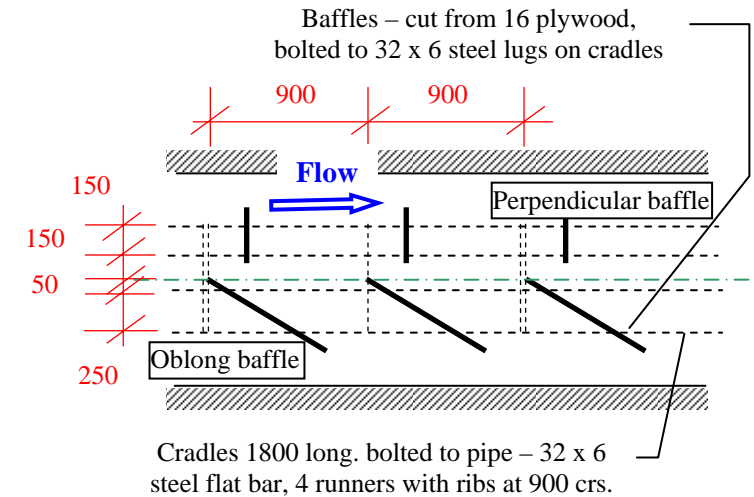


Offset Baffle Fishway - Barrel 1 looking downstream

Culvert Plan showing Fishways in Barrels and Apron



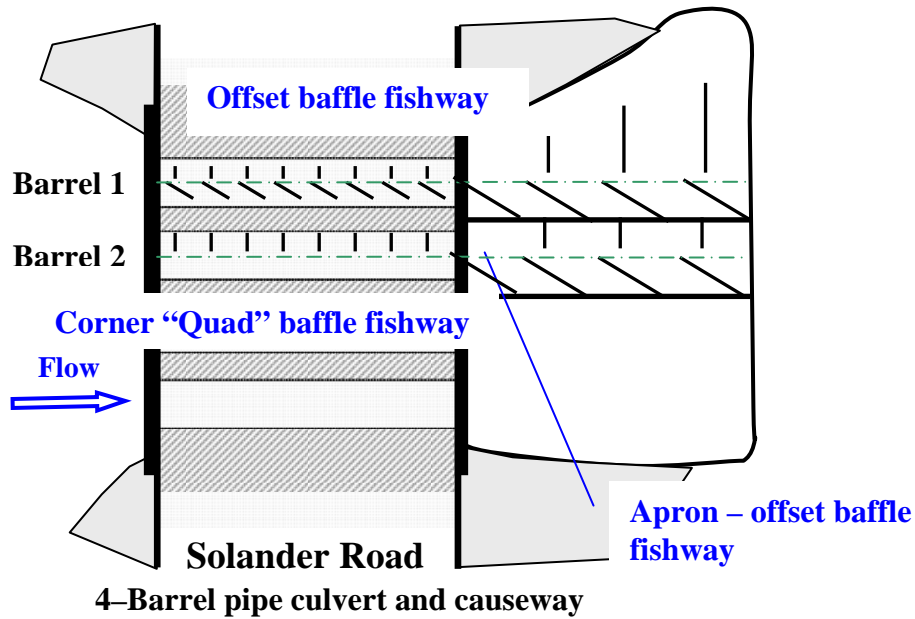
Offset Baffle Fishway in Barrel 1 - Plan View



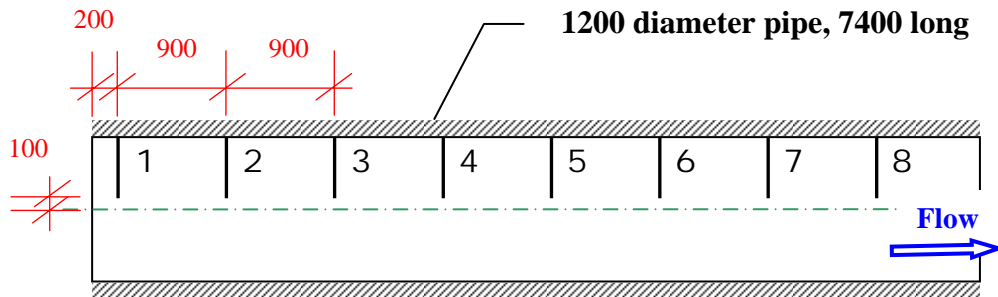
Offset Baffle - Fixing Detail

This is a prototype facility in which the baffle fishway devices are constructed of light duty materials to suit adaptation and performance evaluation, and which includes provisions for monitoring and access that will not normally be incorporated into field installations of culvert fishway facilities

Solander Road pipe culvert - Prototype Fishway # 3 - Offset baffle fishway

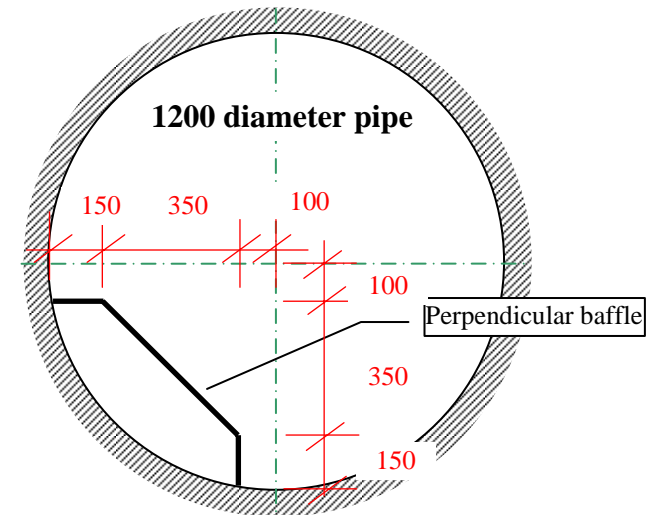


Culvert Plan showing Fishways in Barrels and on Apron

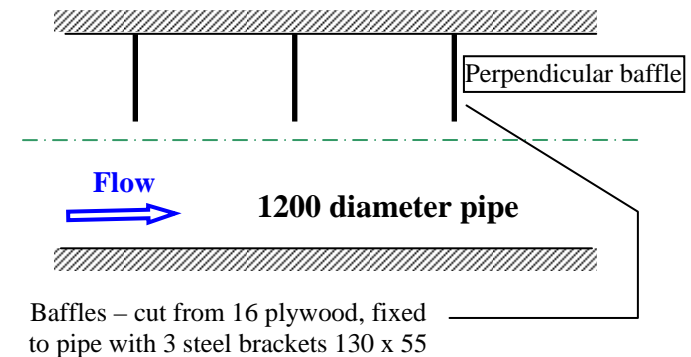


Corner "Quad" Baffle Fishway in Barrel 2 - Plan View

This is a prototype facility in which the baffle fishway devices are constructed of light duty materials to suit adaptation and performance evaluation, and which includes provisions for monitoring and access that will not normally be incorporated into field installations of culvert fishway facilities



Corner "Quad" Baffle Fishway - Barrel 2 looking downstream

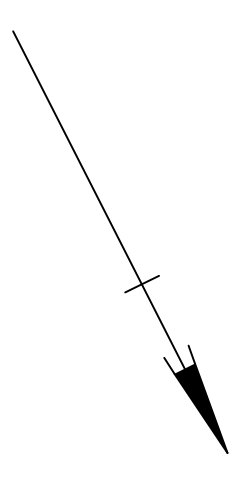
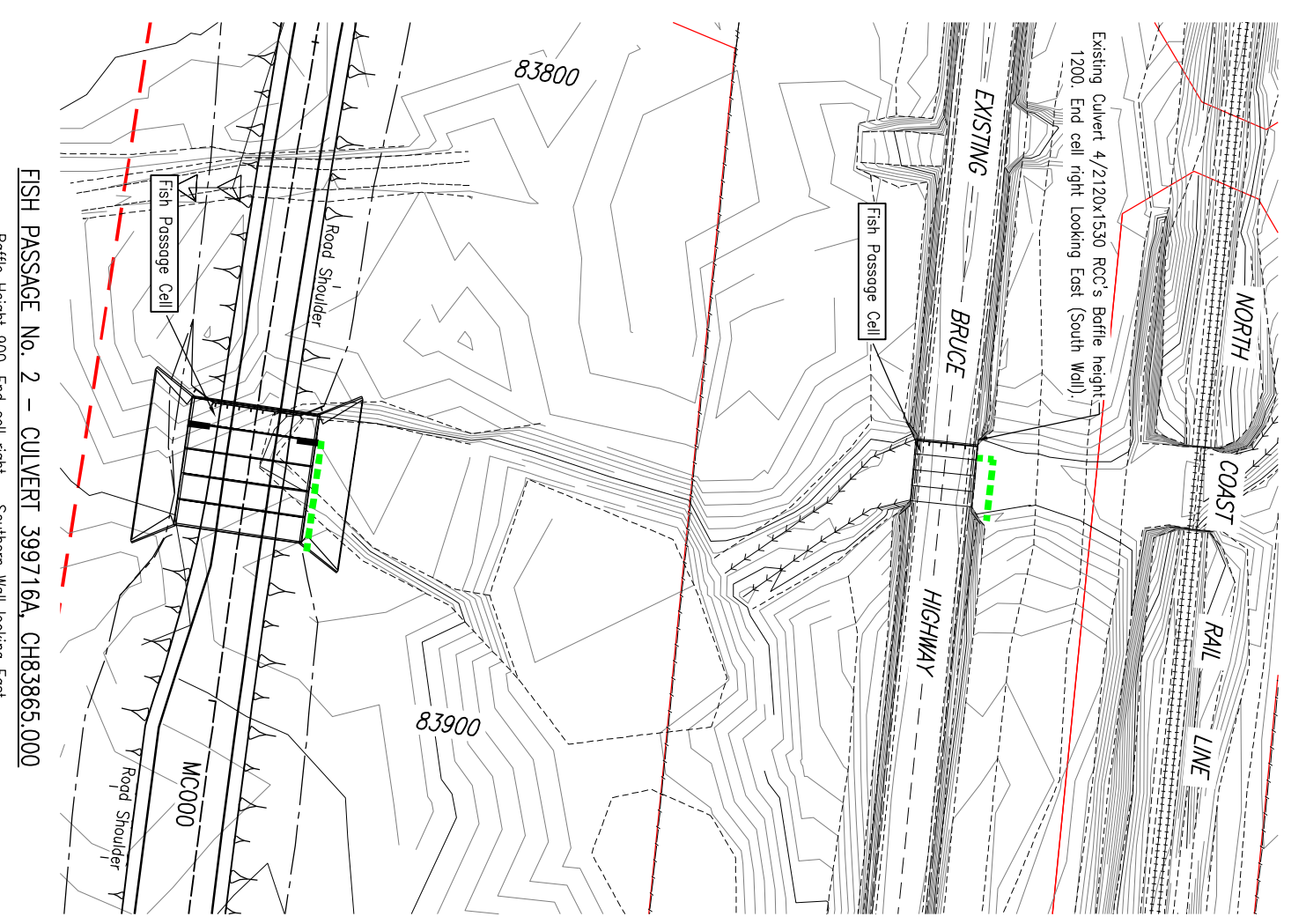
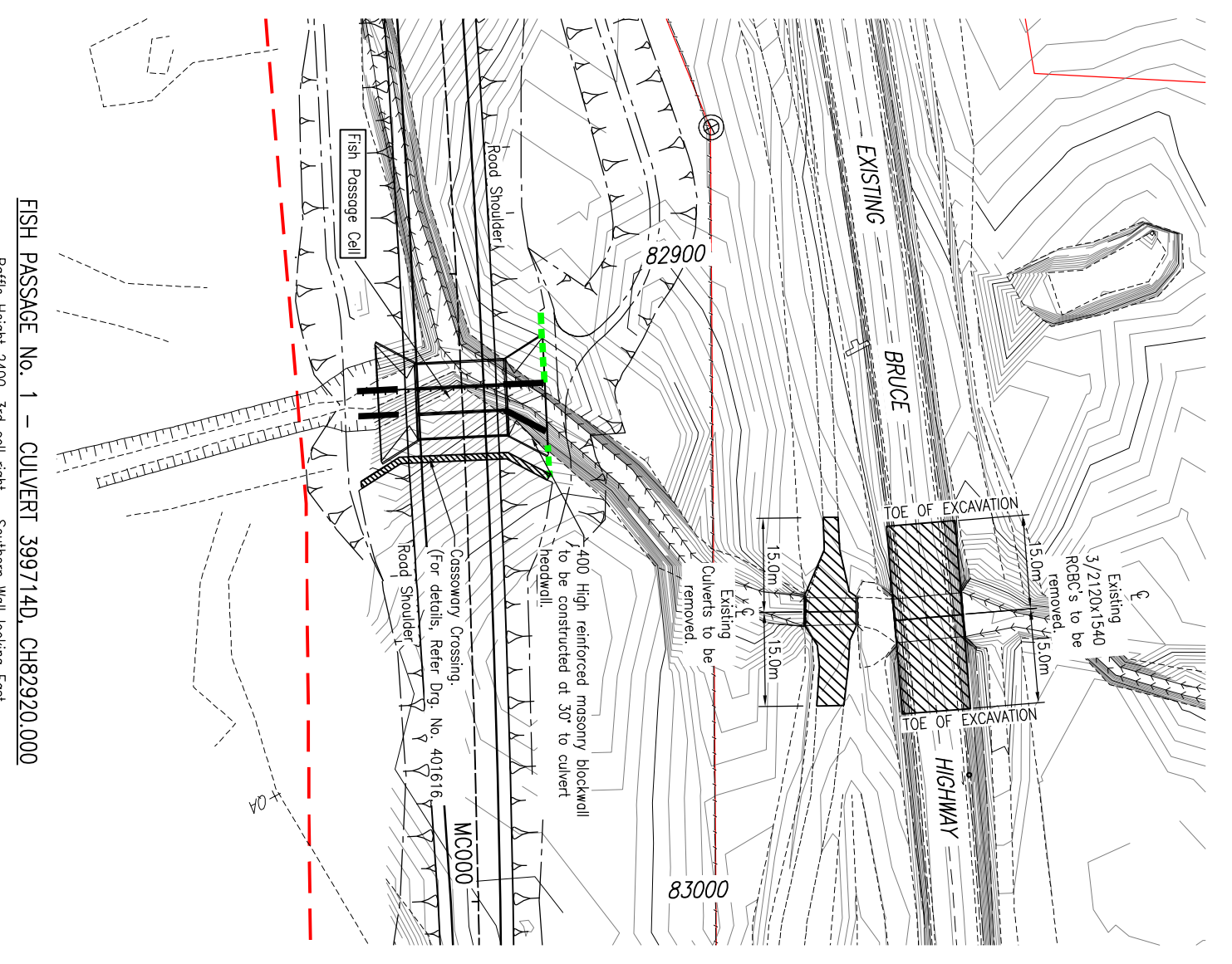


Corner "Quad" Baffle - Fixing Detail

Solander Road pipe culvert - Prototype Fishway # 3 - Corner "Quad" baffle fishway

## APPENDIX 12 – BRUCE HIGHWAY CORDUROY CREEK TO TULLY BOX CULVERT AND PIPE CULVERT BAFFLE FISHWAYS: MAUNSELL DRAWINGS

Drawing	Title
<b>Drainage and fish passage configuration at culvert crossings</b>	
Dwg No 401610C	Fish passage plans Culverts 399714D and 399716A
Dwg No 401611B	Fish passage plans Culverts 399716C and 399717D
Dwg No 399596E	Drainage cross sections Chge 80 010 – 94 376
Dwg No 399597E	Drainage cross sections Chge 80 010 – 94 376
Dwg No 399598E	Drainage cross sections Chge 80 010 – 94 376
Dwg No 399599D	Drainage cross sections Chge 80 010 – 94 376
<b>Culvert fishway details</b>	
Dwg No 401615C	Fish passage details (Control line MC000 and Existing Bruce Highway)
Dwg No 401612C	Fish passage Baffle locations
Dwg No 401613B	Fish passage works Baffle plate details Sheet 1 of 2
Dwg No 401614C	Fish passage works Baffle plate details Sheet 2 of 2
<b>Notes</b>	<p>These design drawings, prepared by Maunsell, incorporate culvert fishway designs developed by James Cook University School of Engineering on the basis of fish passage planning and design studies <i>Bruce Highway Corduroy Creek to Tully High School Provisions for fish passage – Preliminary Design Assessment Tasks 1B and 2</i> (Kapitzke 2007) and <i>Bruce Highway Corduroy Creek to Tully High School Provisions for fish passage Landholder access crossing at 82 920</i> (Kapitzke 2008)</p> <p>These drawings have been prepared for the Tully Alliance specifically for use on the Bruce Highway Corduroy Creek to Tully High School project. They are not standard drawings and the designs are not necessarily applicable to other locations. Users should make their own site-specific evaluation and design arrangements and should seek specialist input on fish passage design as required.</p>



**NOTES:**

- Refer Drg. No. 401616 for Cassowary crossing details.
- Refer Drg. No. 401612 for Fish Passage Installation/Location Details.
- Refer Drg. No's. 401613 - 401615 for Fish Passage Baffle Plate Details.

**LEGEND:**

- 2m x 500 x 500 Rock Gabions.
- 400 High Reinforced Masonry Block wall.
- Fish Passage Barriers.
- Cassowary Crossing.
- Existing Culverts and embankment to be removed 15.0 metres each side of existing culvert centreline. Cut batters to be no steeper than 1V:4H. Excavated area to be grassed and rock protection placed where directed by the Quality Officer.
- Resumption Boundary
- Cadastral Boundary

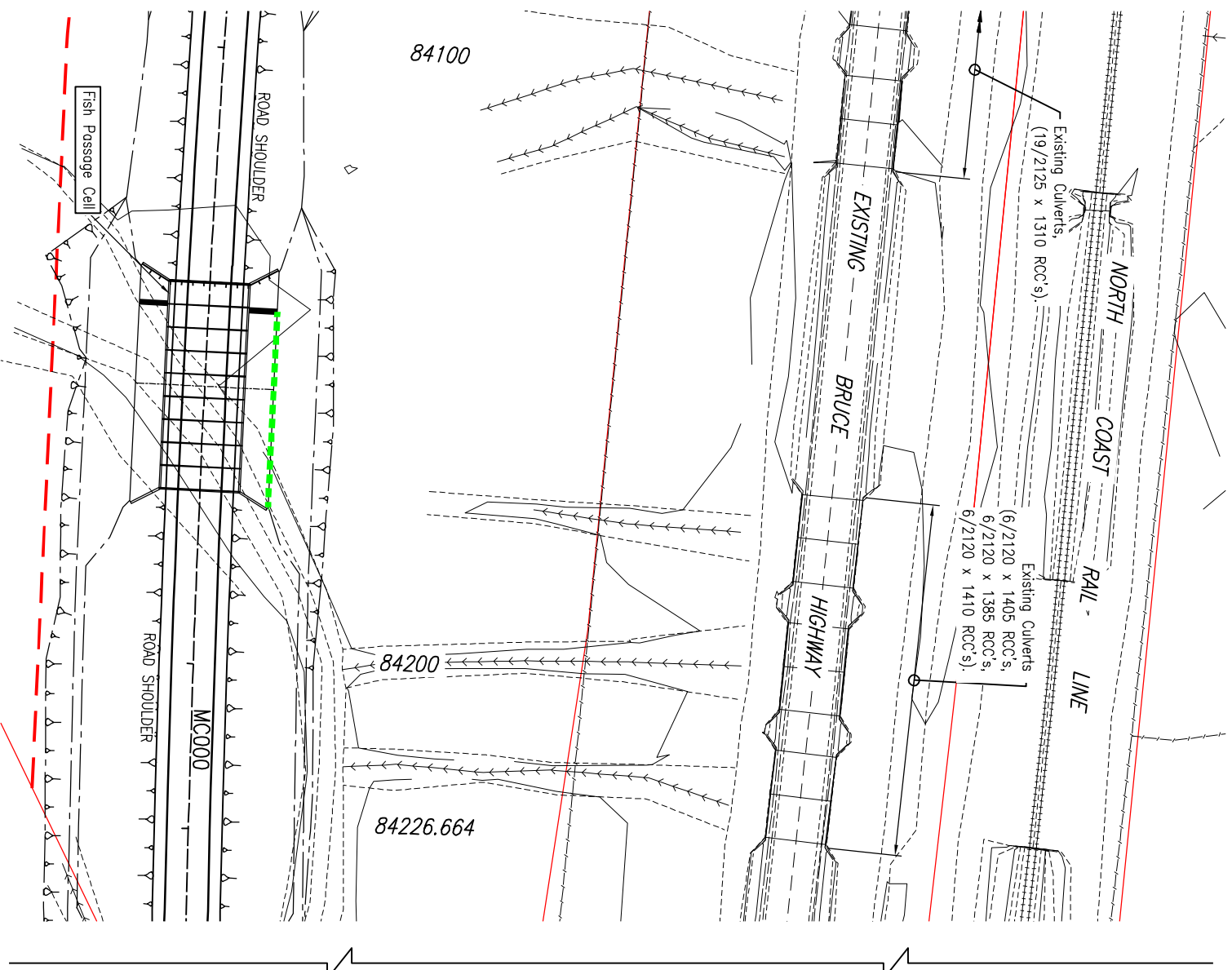
**FISH PASSAGE No. 1 – CULVERT 399714D, CH82920.000**  
 Baffle Height 2400, 3rd cell right – Southern Wall looking East.  
 (5/3600x3000 RCBC's)

**FISH PASSAGE No. 2 – CULVERT 399716A, CH83865.000**  
 Baffle Height 900, End cell right – Southern Wall looking East.  
 (3/3600x1200 RCBC's + 2/3600 RCSS)

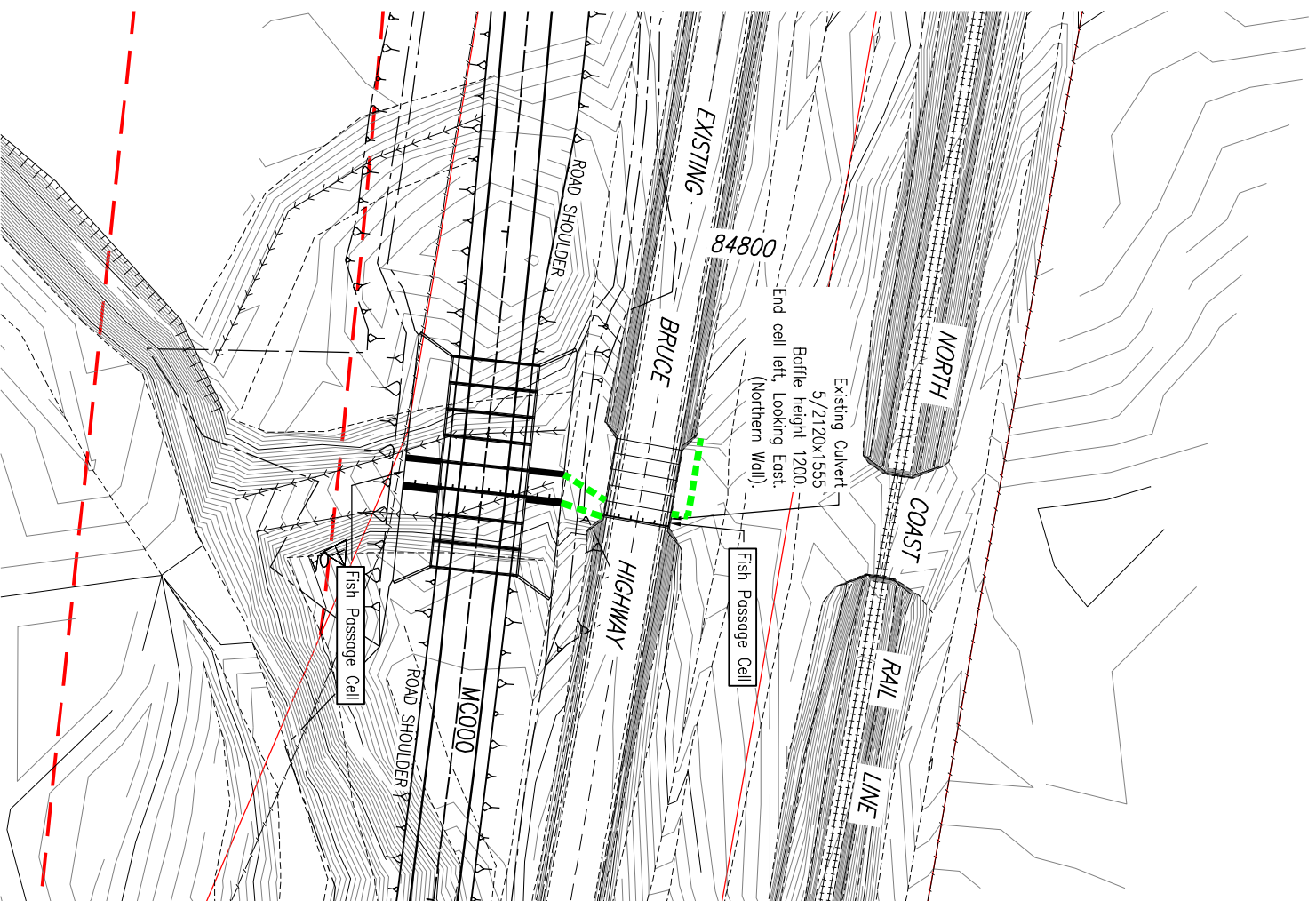
These drawings have been prepared for the Tully Alliance specifically for use on the Bruce Highway Corridor Creek to Tully High School. They are not standard drawings and the designs are not necessarily applicable to other locations.

Revisions		Issued By	Date	Microfilmed	Associated Job Nos	Survey Data		Scales	
						Horiz. Datum	MGA 94 Zone 55	0 5 10 15 20m HORIZONTAL	
						Azimuth Datum	MGA 94 Zone 55		
						Height Datum	PM49752 = 9.087 AHD		
C Fish Passage Updated			9/10/08		Auxiliary Drg Nos	Survey Books	MR 84562		
B Issued for Construction		MRP	20/12/07		Refer drawing indexes on drgs.		MR 84563		
A Original Issue A3					399510 - 399512				
<p><b>CARDWELL SHIRE</b></p> <p><b>BRUCE HIGHWAY (INGHAM – INNISFAIL)</b></p> <p><b>C7L CHGE</b></p> <p>Reference Points: 80010.414 – 94376.059</p> <p>Preceding RP: 10N/12, Dist. to start of job (km): 5.545, From start to end of job: 14.36, Following RP: 10N/19, 4.3</p> <p>Through Choinage from Intersection Townsville Rd/Lomercost St Ingham (10N/70N/614)</p>									
				Drawing N/S Checked DAP		Design J/C Verified W/PW		Design Review MRP Date: M/PT/INGREW	
				For scheme submitted status refer Drg. No. 399510 (01-01 of 03)		For scheme approval status refer Drg. No. 399510 (01-01 of 03)			
		Job No.		30/10N/81		Contract No.		AC-09-006	
		Drawing No.		401610		Series Number		WD-06 of 17	
				MRR-Detail (08/06)					

CAD FILES: Cadd ref: J:\TullyProject\Tully\_60018841\Cad\20\_Detail\Cad\60018841-MD-06.dwg  
 Last modified: 29 Jan 08 - 8:54  
 Dimensions shown in millimetres except where shown otherwise



**FISH PASSAGE No. 3 – CULVERT 399716C, CH84155.000**  
 Baffle Height 1500, End cell Right – Southern Wall Looking East.  
 (5/3600x1800 RCBC's + 4/3600 RCC's)



**FISH PASSAGE No. 4 – CULVERT 399717D, CH84835.000**  
 Baffle Height 1500, 4th cell Right – Northern Wall, Looking East.  
 (8/3600x2400 RCBC's)

- NOTES:**
- Refer Drg. No. 401612 for Fish Passage Installation/Location Details.
  - Refer Drg. No's. 401613 – 401615 for Fish Passage Baffle Plate Details.

- LEGEND:**
- 2m x 500 x 500 Rock Gabions.
  - 400 High Reinforced Masonry Block wall.
  - Fish Passage Baffles.
  - Resumption Boundary
  - Cadastral Boundary

These drawings have been prepared for the Tully Alliance specifically for use on the Bruce Highway Corduroy Creek to Tully High School. They are not standard drawings and the designs are not necessarily applicable to other locations.

Revisions	Issued By	Date	Microfited	Associated Job Nos	Survey Data	Scales
					Horiz. Datum MGA 94 Zone 55	0 5 10 15 20m HORIZONTAL
					Azimuth Datum MGA 94 Zone 55	
					Height Datum PM49752 = 9.087 AHD	
B	Issued for Construction	MRP	20/12/07	Refer drawing indexes on drgs. 399510 - 399512	MR 84562 MR 84563	
A	Original Issue	AJ3				

CARDWELL SHIRE		Reference Points	
<b>BRUCE HIGHWAY (INGHAM – INNISFAIL)</b>		80010.414 – 94376.039	
Preceding RP	Dist. to start of job (km)	From start to end of job	Following RP
10N/12	5.545	14.36	10N/19
Through Choinage from Intersection Townsville Rd/Lomercost St Ingham (10N/10N/614)		4.3	

FISH PASSAGE PLANS		Design Review		For scheme approval	
<b>CULVERTS 399716C &amp; 399717D</b>		Design JC	Design Review	For scheme approval status refer Drg. No. 399510 (01-01 of 03)	For scheme approval status refer Drg. No. 399510 (01-01 of 03)
Drawing N/S	Checked DAP	Verified W/PW	Date: M.PETTINGREW		

Queenstand Government		Department of Main Roads	
Job No.	30/10N/81	Contract No.	AC-09-006
Drawing No.	401611	Series Number	MD-07 of 17
MRR - Detail (08/06)			

Culvert No.	Change	Drainage Structure	Wingwalls		EndWalls / Wingwalls		Concrete Bases		Aprons		Cut Off Walls (m <sup>3</sup> )	Excavation (m <sup>3</sup> )		Fill / Backfill			No. Fines Conc. Block	Reo. Bar Mass (kg)	OLM = Overlay Material FBM = Fill / Backfill / Side Material BHM = Bedding / Haunch Material BSP = Bedding Steel Pipes Remarks						
			Skew	W1 Lengths (m)	W2 Lengths (m)	(U) Conc. (m <sup>3</sup> )	(R) Conc. (m <sup>3</sup> )	Reinforcing (m <sup>2</sup> )	Conc. (m <sup>3</sup> )	N16 (m)		N12 (m)	Nibs (m)	Rock Area (m <sup>2</sup> )	Wire Matt. Area (m <sup>2</sup> )	Thick (mm)				Conc. (m <sup>3</sup> )	Reinforcing (m <sup>2</sup> )	Conc. (m <sup>3</sup> )	Mass (m <sup>3</sup> )	Culv. (m <sup>3</sup> )	Ends (m <sup>3</sup> )
399714D	82920.000 (MC000)	5/3600x3000 RCBC'S	0	7.2	7.2	2309	2308	104.6	104.6	89.2	3336	3330	0.845 (83)	2315	2316	2313	2314	3.5	591.5	70.4	280.4	24.9	24	8840	Culvert 12 (Hydrology Number) (Design Package 1)
399714E	82922.000 (MC000)	2/1350 RCP	0	3.0	3.0	2.9	6.2	22.2	SL1018									0.8	6.4	0.2	16.7	9.9	8	45	Culvert 13 (Hydrology Number) (Design Package 1)
399715A	83050.000 (MC000)	3/3600x1500 RCBC'S	0	3.8	3.8		12.6	33.9	SL1018	42.0	1550	1540	0.845 (65)					2.0	155.5	27.0	91.5	11.7	12	4049	Culvert 13 (Hydrology Number) (Design Package 1)
399715B	83170.000 (MC000)	5/3600x2100 RCBC'S	0	5.1	5.1		20.8	57.2	SL1218	69.3	2582	2558	0.845 (65)					3.2	98.8	28.7	184.9	19.2	16	6720	Culvert 14 (Hydrology Number) (Design Package 1)
399715C	83335.000 (MC000)	10/3600x1500 RCBC'S	0	3.8	3.8		16.0	33.9	SL1018	137.4	5164	5116	0.845 (65)					5.7	503.4	18.2	209.0	37.8	12	13207	Culvert15 (Hydrology Number) (Design Package 1)
Total Quantities				2.9	96.7		337.9	12632	12544	894 / SL62	252 / SL82	894 / SL62	117.5	893.7	SL62	15.2	1356	144	766	104	72	32861	Fabric quantities one net only No allowances made for laps etc.		

**399715 C** DATUM RL 5.0  
DRG. No. 399533 - FINAL DESIGN  
10/3600x1500 RCBC (13.200m) CH 83335.000 (MC000)

**399715 B** DATUM RL 5.0  
DRG. No. 399533 - FINAL DESIGN  
5/3600x2100 RCBC (13.200m) CH 83170.000 (MC000)

**399715 A** DATUM RL 5.0  
DRG. No. 399533 - FINAL DESIGN  
3/3600x1500 RCBC (13.200m) CH 83050.000 (MC000)

**399714 D** DATUM RL 3.0  
DRG. No. 399532 - FINAL DESIGN  
5/3600x3000 RCBC (16.800m) CH 82920.000 (MC000)  
2/1350 DIA RCP (6.100m) CH 82922.000 (MC000)  
(FISH PASSAGE AND CASSOWARY CROSSING)

1. Refer also Standard Drawing Nos 1303, 1304, 1316, 1317, 1320 & 1359.
2. All drainage cross section chonages are control line chonages unless specified otherwise.
3. All aprons to be constructed with cutoff walls including precast ends.
4. Type H2 support condition to apply unless specified otherwise.
5. Refer Erosion and Sediment Control Drawings for Protective Treatments beyond culvert Endwalls and Aprons.
6. All box culvert unit dimensions may vary from design information. Dimensions of base slabs to be confirmed by the constructor on site prior to the commencement of setout.
7. For Extended Headwall Detail - Refer Drawing 399593.
8. Base slab joints: -  
(i) For base slabs < 40.0m in length and/or with contraction joints to be constructed in accordance with Main Roads Standard Drawing 1317  
(ii) For base slabs > 40.0m in length and/or with expansion joints to be constructed in accordance with Drawing 399593

These drawings have been prepared for the Tully Alliance specifically for use on the Bruce Highway Corduroy Creek to Tully High School. They are not standard drawings and the designs are not necessarily applicable to other locations.

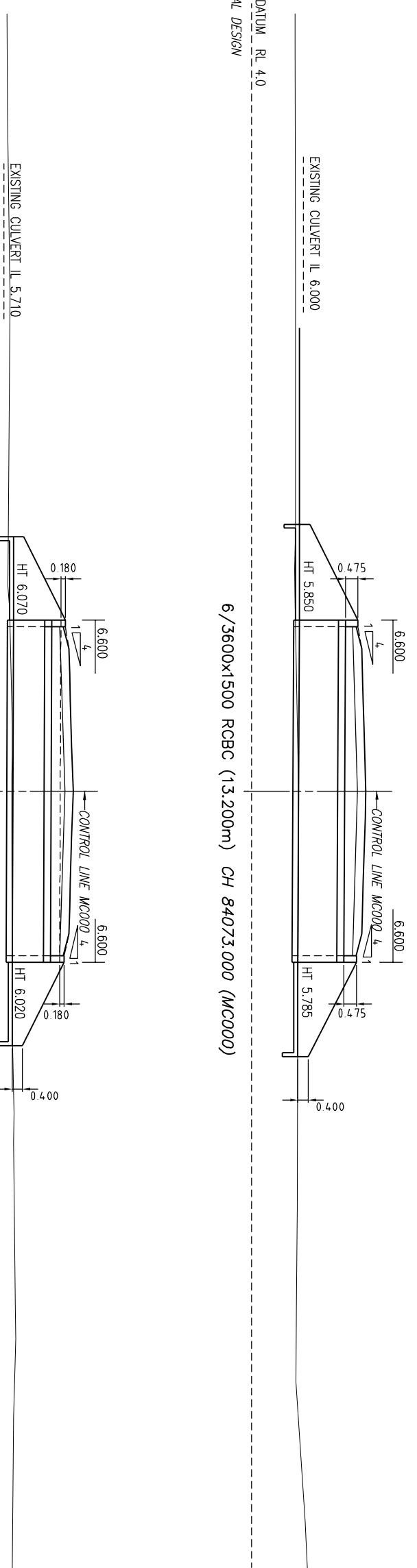
Revisions	Issued By	Date	Microfited	Associated Job Nos	Horiz. Datum	Survey Data	Survey Date	Scales	Cardwell Shire	Drainage Cross Sections	Job No.	Contract No.	Drawing No.	Series Number
E	Issued for Construction	MRP	20/12/07		Datum	MGA 94 Zone 55			<b>BRUCE HIGHWAY (INGHAM - INNISFAIL)</b>	Drawing JAE	30/10N/81	AC-09-006	399596	E
D	Culverts Amended	MRP	27/08/07	Auxiliary Drg Nos	Azimuth Datum	MGA 94 Zone 55		0 1 2 3 4m	<b>CARDWELL SHIRE</b>	Design JAE				
C	General Amendments	MRP	13/08/07	Refer drawing indexes on drgs. 399510 - 399512	Height Datum	PM49752 = 9.087 AHD			<b>DRAINAGE CROSS SECTIONS</b>	Design Review MRP				
B	Blwks Package 1 Amended	MRP	5/07/07			MR 84562				Design Review MRP				
A	Original Issue A3					MR 84563				Design Review MRP				

**Queenstand Government**  
Department of Main Roads

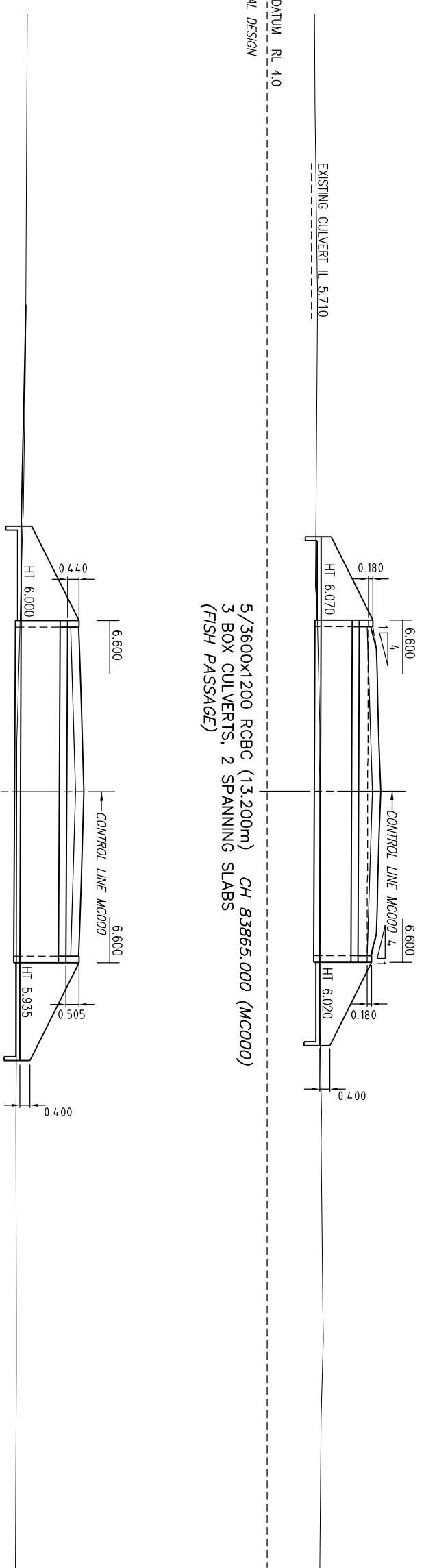
Job No. 30/10N/81  
Contract No. AC-09-006  
Drawing No. 399596  
Series Number DD-XS-04 of 19

Culvert	Drainage Structure	Wingwalls		EndWalls / Wingwalls		Concrete Bases		Aprons		Excavation (m <sup>3</sup> )	Fill / Backfill	No. Fines Bar	Reo. Mass (kg)	Remarks			
		Skew	Walls	Conc.	Reinforcing	Reinforced	Mass	Off	Culv.						Inlet	OLM	FBM
399715D 83500.000 (MC000)	10/3600x1500 RCBC'S	0	4.2	4.2 (NEST)	17.6	34.8	SL1018	137.4	5164	5116	0.845 (65)				12	13226	Culvert 16 (Hydrology Number) (Design Package 1)
399716A 83865.000 (MC000)	5/3600x1200 SLBC (3/3600x1200 RCBC + 2/3600 RCSS)	0	4	3.7	3.7	34.8	SL1018	67.4	2490	2480	0.845 (130)				12	6507	Culvert 17 (Hydrology Number) (Design Package 1)
399716B 84073.000 (MC000)	6/3600x1500 RCBC'S	0	4.3	4.3	17.5	36.8	SL1018	82.9	3100	3080	0.845 (65)				12	8018	Culvert 18 (Hydrology Number) (Design Package 2)
Total Quantities			4	4.3	4.3	36.8	SL1018	287.7	10754	10676	(260)				36	27751	Fabric quantities are net only No allowances made for laps etc.
Total Fabric					49.8	105	SL1018	627	SL62								

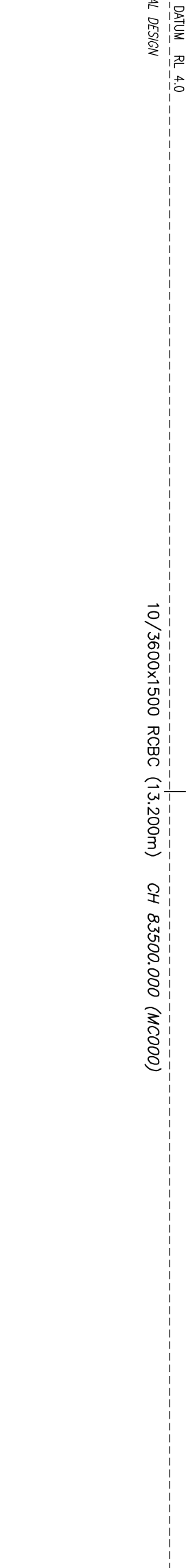
**399716 B** DATUM RL 4.0  
 DRG. No. 399534 - FINAL DESIGN  
 6/3600x1500 RCBC (13.200m) CH 84073.000 (MC000)



**399716 A** DATUM RL 4.0  
 DRG. No. 399534 - FINAL DESIGN  
 5/3600x1200 RCBC (13.200m) CH 83865.000 (MC000)  
 3 BOX CULVERTS, 2 SPANNING SLABS (FISH PASSAGE)



**399715 D** DATUM RL 4.0  
 DRG. No. 399533 - FINAL DESIGN  
 10/3600x1500 RCBC (13.200m) CH 83500.000 (MC000)



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1. Refer also Standard Drawing Nos 1303, 1304, 1316, 1317, 1320 & 1359.
2. All drainage cross section choinages are control line choinages unless specified otherwise.
3. All aprons to be constructed with cutoff walls including precast ends.
4. Type H2 support condition to apply unless specified otherwise.
- material between overlay/backfill and subgrade included in embankment quantities.
5. Refer Erosion and Sediment Control Drawings for Protective Treatments beyond culvert Endwalls and Aprons.
6. All box culvert unit dimensions may vary from design information. Dimensions of base slabs to be confirmed by the constructor on site prior to the commencement of setout.
7. For Extended Headwall Detail - Refer Drawing 399593.
8. Base slab joints :-  
 (i) For base slabs < 40.0m in length and/or width contraction joints to be constructed in accordance with Main Roads Standard Drawing 1317  
 (ii) For base slabs > 40.0m in length and/or width expansion joints to be constructed in accordance with Drawing 399593

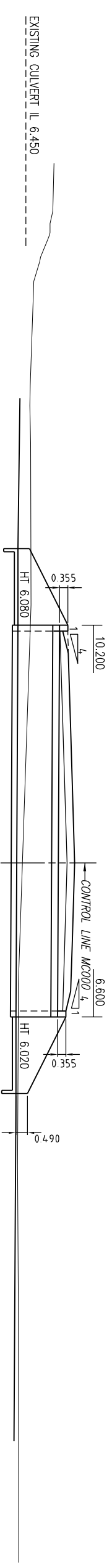
Revisions	Issued By	Date	Microfilied	Associated Job Nos	Horiz. Datum	Survey Data	Scales	CARDWELL SHIRE				DRAINAGE CROSS SECTIONS				Job No.	Contract No.	Drawing No.	Series Number
E	Wingwalls Amended	6/03/08			MGA 94 Zone 55		0 1 2 3 4m	BRUCE HIGHWAY (INGHAM - INNISFAIL)				Drawing JAE Checked RUS				30/10N/81	AC-09-006	399597	E
D	Issued for Construction	20/12/07			MGA 94 Zone 55			CITL CHGE				Design JAE Verified MRP							
C	Culverts Amended	27/08/07			PM49752 = 9.087 AHD			Reference Points				Design Review MRP							
B	General Amendments	13/08/07			MR 84562			Dist. to start of job (km)				Design Review MRP							
A	Original Issue A3				MR 84563			From start to end of job				Design Review MRP							



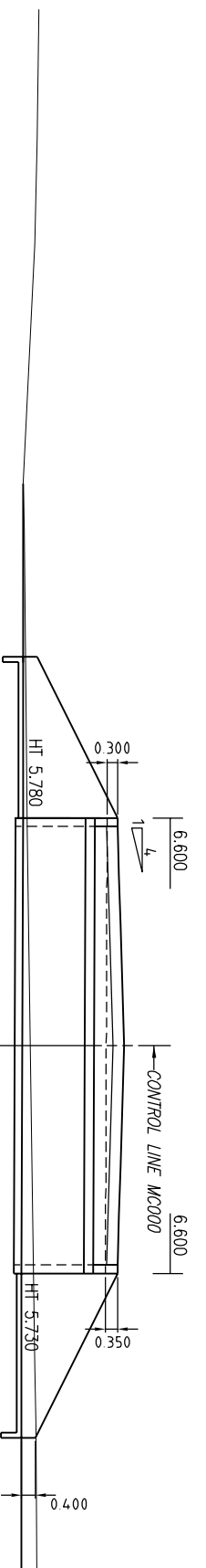
Queenland Government  
 Department of Main Roads  
 Job No. 30/10N/81  
 Contract No. AC-09-006  
 Drawing No. 399597  
 Series Number DD-XS-05 of 19



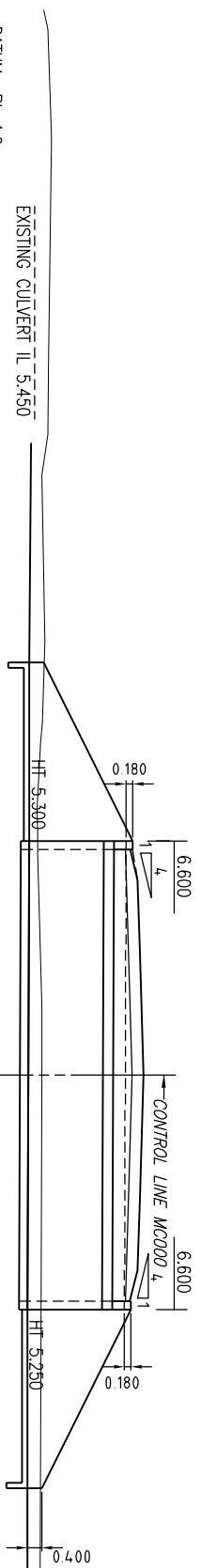
No.	Culvert Change	Drainage Structure	Wingwalls		Endwalls / Wingwalls		Concrete Bases			Aprons			Cut Off	Excavation (m <sup>3</sup> )			Fill / Backfill			No. Fines Conc. Block	Reo. Bar Mass (kg)	Remarks						
			Skew	Lengths	Reinforcing	Conc.	N16	N12	Nibs	Area	Wire Matl.	Reinforced		Mass	Walls	Culv.	Ends	Inlet Outlet	OLM				FBM	BHM	BSP			
399716C	84155.000 (MC000)	9/3600x1800 SLBC (5/3600x1800 RCBC + 4/3600 RCSS)	0	5.1	5.1	2308	24.8	56.4	SL1218	119.5	4462	4438	0.845 (130)	2315	2316	2313	45.6	341.9	SL62	2314	5.1	306.7	45.2	225.4	32.7	16	11583	Culvert 19 (Hydrology Number) (Design Package 2)
399717A	84270.000 (MC000)	9/3600x2100 SLBC (5/3600x2100 RCBC + 4/3600 RCSS)	0	5.8	5.8	29.1	70.1	SL1218	119.5	4462	4438	0.845 (130)	2315	2316	2313	45.6	341.9	SL62	2314	5.1	306.7	45.2	225.4	32.7	20	11613	Culvert 20 (Hydrology Number) (Design Package 2)	
399717B	84565.000 (MC000)	9/3600x1800 SLBC (5/3600x1800 RCBC + 4/3600 RCSS)	0	5.4	5.4	28.6	59.4	SL1218	119.5	4462	4438	0.845 (130)	2315	2316	2313	45.6	341.9	SL62	2314	5.1	306.7	45.2	225.4	32.7	16	11623	Culvert 21 (Hydrology Number) (Design Package 2)	
399717C	84740.000 (MC000)	8/3600x1500 RCBC'S	0	4	3.8	3.8	17.5	35.6	SL1018	139.7	5258	5230	0.845 (83)	498.2	18644	18544	31.1	241.5	SL62	234.3	4.6	319.7	37.3	234.3	38.9	12	13417	Culvert 22 (Hydrology Number) (Design Package 2)
Total Quantities			0	4	3.8	3.8	100	35.6	SL1018	139.7	5258	5230	0.845 (83)	498.2	18644	18544	31.1	241.5	SL62	234.3	4.6	319.7	37.3	234.3	38.9	12	13417	Culvert 22 (Hydrology Number) (Design Package 2)
Total Fabric				186	36	36	36	36	SL1018	221	1307	1307	SL62	173.9	1307.5	SL62	173.9	1307.5	SL62	173.9	20.0	1092	115	935	137	64	48236	Fabric quantities are net only No allowances made for laps etc.



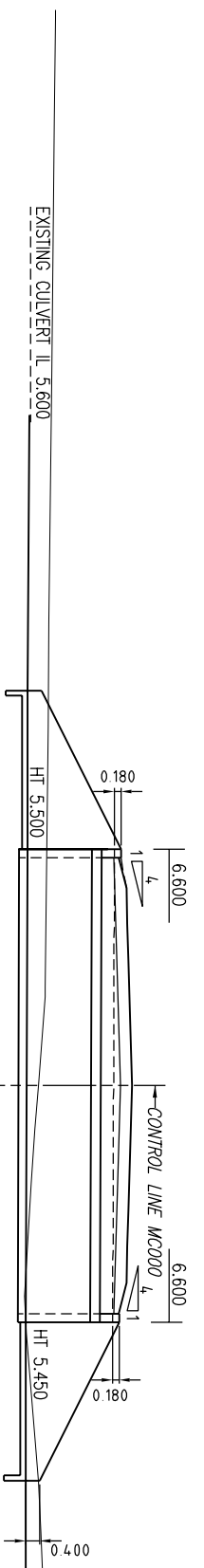
**399717 C** DATUM RL 4.0  
 DRG. No. 399535 - FINAL DESIGN  
 8/3600x1500 RCBC (16.800m) CH 84740.000 (MC000)



**399717 B** DATUM RL 4.0  
 DRG. No. 399535 - FINAL DESIGN  
 9/3600x1800 RCBC (13.200m) CH 84565.000 (MC000)  
 5 BOX CULVERTS, 4 SPANNING SLABS



**399717 A** DATUM RL 4.0  
 DRG. No. 399535 - FINAL DESIGN  
 9/3600x2100 RCBC (13.200m) CH 84270.000 (MC000)  
 5 BOX CULVERTS, 4 SPANNING SLABS



**399716 C** DATUM RL 4.0  
 DRG. No. 399534 - FINAL DESIGN  
 9/3600x1800 RCBC (13.200m) CH 84155.000 (MC000)  
 5 BOX CULVERTS, 4 SPANNING SLABS (FISH PASSAGE)

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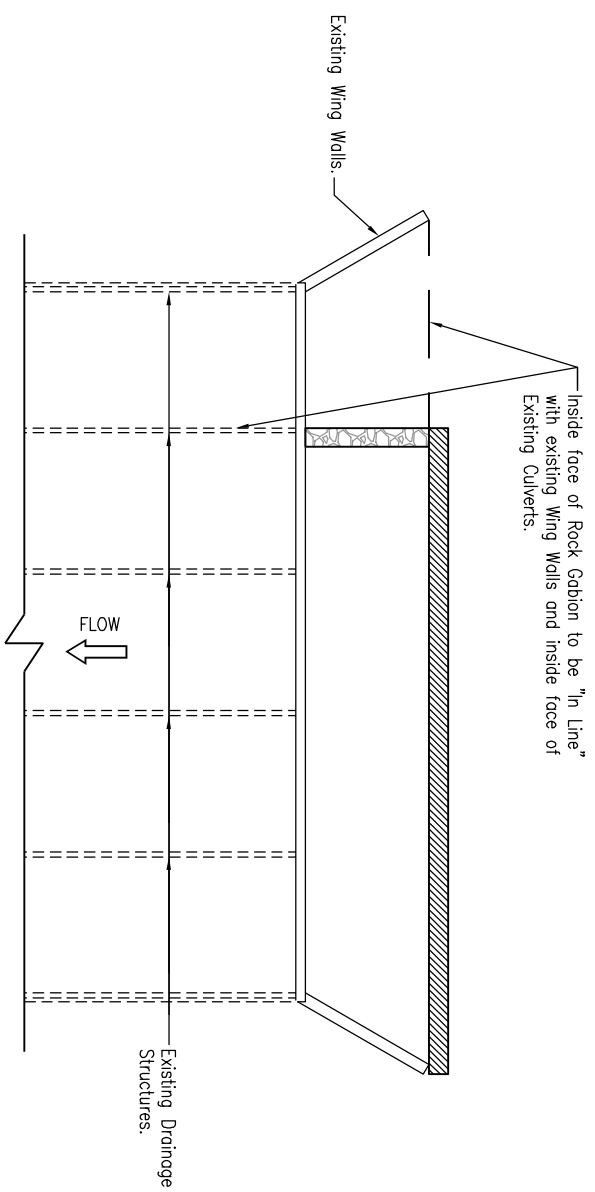
1. Refer also Standard Drawing Nos 1303, 1304, 1316, 1317, 1320 & 1359.
2. All drainage cross section changes are control line changes unless specified otherwise.
3. All aprons to be constructed with cutoff walls including precast ends.
4. Type H2 support condition to apply unless specified otherwise.
- material between overlay/backfill and subgrade included in embankment quantities.
5. Refer Erosion and Sediment Control Drawings for Protective Treatments beyond culvert Endwalls and Aprons.
6. All box culvert unit dimensions may vary from design information. Dimensions of base slabs to be confirmed by the constructor on site prior to the commencement of setout.
7. For Extended Headwall Detail - Refer Drawing 399593.
8. Base slab joints: -  
 (i) For base slabs < 40.0m in length and/or width contraction joints to be constructed in accordance with Main Roads Standard Drawing 1317  
 (ii) For base slabs > 40.0m in length and/or width expansion joints to be constructed in accordance with Drawing 399593

Revisions	Issued By	Date	Microfited	Associated Job Nos	Horiz. Datum	Survey Data	Scales	CARDWELL SHIRE				DRAINAGE CROSS SECTIONS				Job No.	Contract No.	Drawing No.	Series Number
E	Wingwalls Amended	6/03/08			Datum	MGA 94 Zone 55	0 1 2 3 4m	BRUCE HIGHWAY (INGHAM - INNISFAIL)				CUL CHGE				30/10N/81	AC-09-006	399598	E
D	Issued for Construction	20/12/07			Datum	MGA 94 Zone 55		80010.414 (=79826.036) - 94376.059				Preceding RP							
C	Culverts Amended	27/08/07			Datum	MGA 94 Zone 55		Reference Points				Following RP							
B	General Amendments	13/08/07			Datum	MGA 94 Zone 55		From start to end of job				From end to following RP							
A	Original Issue A3				Datum	MGA 94 Zone 55		From start to end of job				From end to following RP							

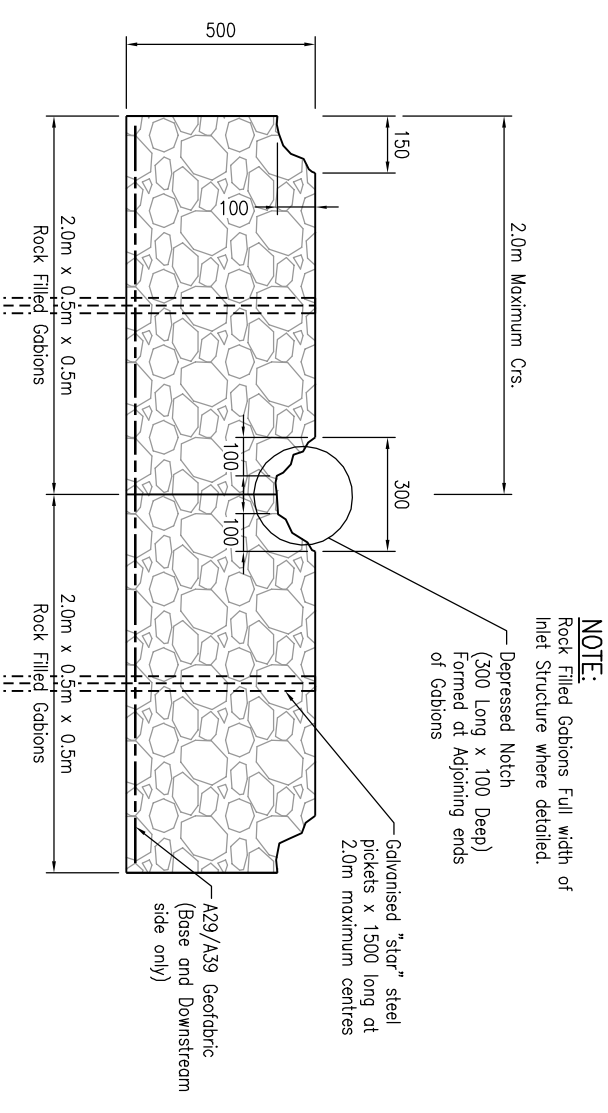
**Queenstand Government**  
 Department of Main Roads

Job No. 30/10N/81  
 Contract No. AC-09-006  
 Drawing No. 399598  
 Series Number DD-XS-06 of 19

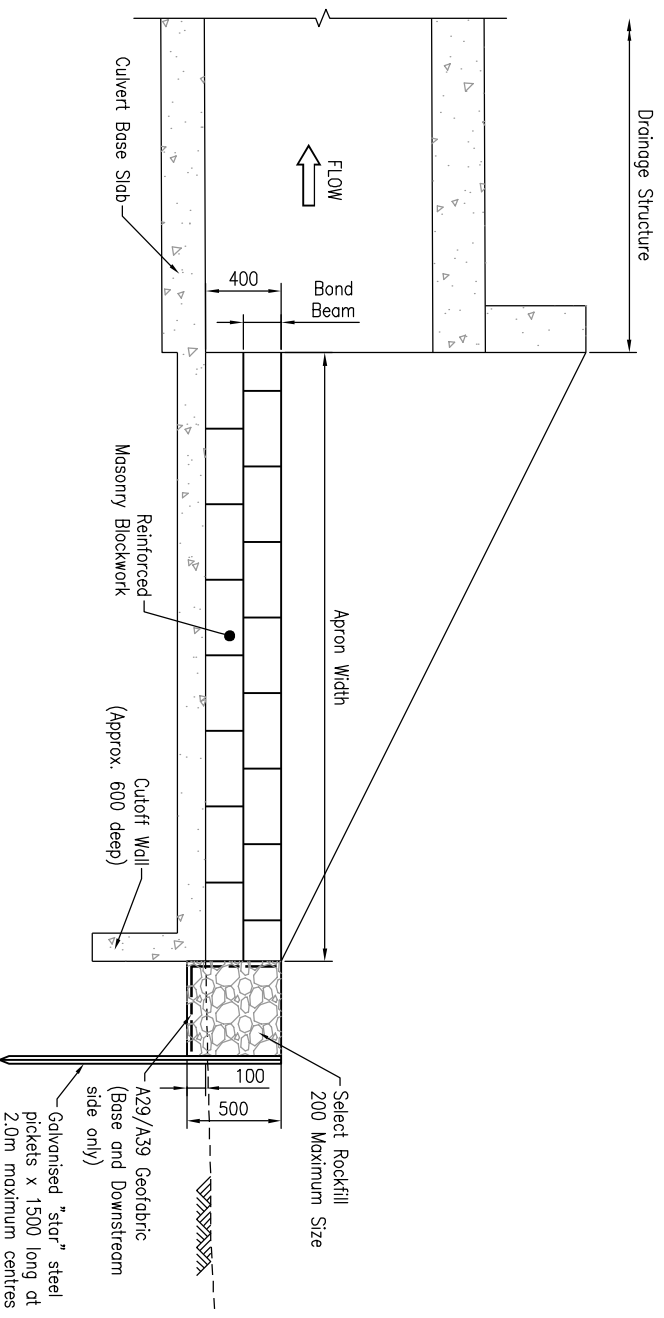




PLAN  
GABION TREATMENT FOR EXISTING  
CULVERTS WITHOUT APRONS.



**NOTE:**  
Rock Filled Gabions Full width of Inlet Structure where detailed.



ELEVATION – CULVERTS WITH CONCRETE APRONS.

MATERIAL LIST – FISH PASSAGE BAFFLES

CULVERT CHAINAGE	BAFFLE TYPE 1.	BAFFLE TYPE 2.	BAFFLE TYPE 3.	BAFFLE TYPE 4.	BAFFLE TYPE 5.	BAFFLE TYPE 6.
82920	-	10	-	10	6	-
NEW CULVERT EAST OF CH.82920	-	-	-	-	-	14
83865	10	-	-	-	2	-
EXISTING CULVERT WEST OF CH.83865	-	-	6	-	-	-
84135	2	8	2	-	-	-
84835	-	8	-	-	4	-
EXISTING CULVERT WEST OF CH.84835	-	-	6	-	-	-
TOTALS	12	26	14	10	12	14

**MASONRY NOTES**

- Masonry and masonry work shall conform to A.S. 3700 – SAA Masonry code.
- Characteristic compressive strength of masonry units shall be as follows:
- Concrete masonry units.
- Concrete masonry walls shall be reinforced with N16 vertical bars at 1000 CRS, U.N.O.
- Single bond beams shall be reinforced with 2/N12 (extend 150 minimum past face of opening U.N.O.).
- Bond beam reinforcement shall be continuous.
- Provide W188 W2 ties at 600 CRS. To longitudinal reinforcement in all masonry bond beams U.N.O.
- Mortar classification shall be M4 in accordance with A.S. 3700.
- All cores shall be concrete core filled, strength grade S20.
- Maximum slump core fill concrete = 225.
- Minimum grout cover to reinforcement shall be 20 U.N.O.
- Masonry cores shall be concrete filled where masonry anchors are required.
- Wall ties shall be heavy duty galvanised steel in accordance with A.S. 2699. spacing shall be as follows:
- Generally – CRS: horizontally & vertically.

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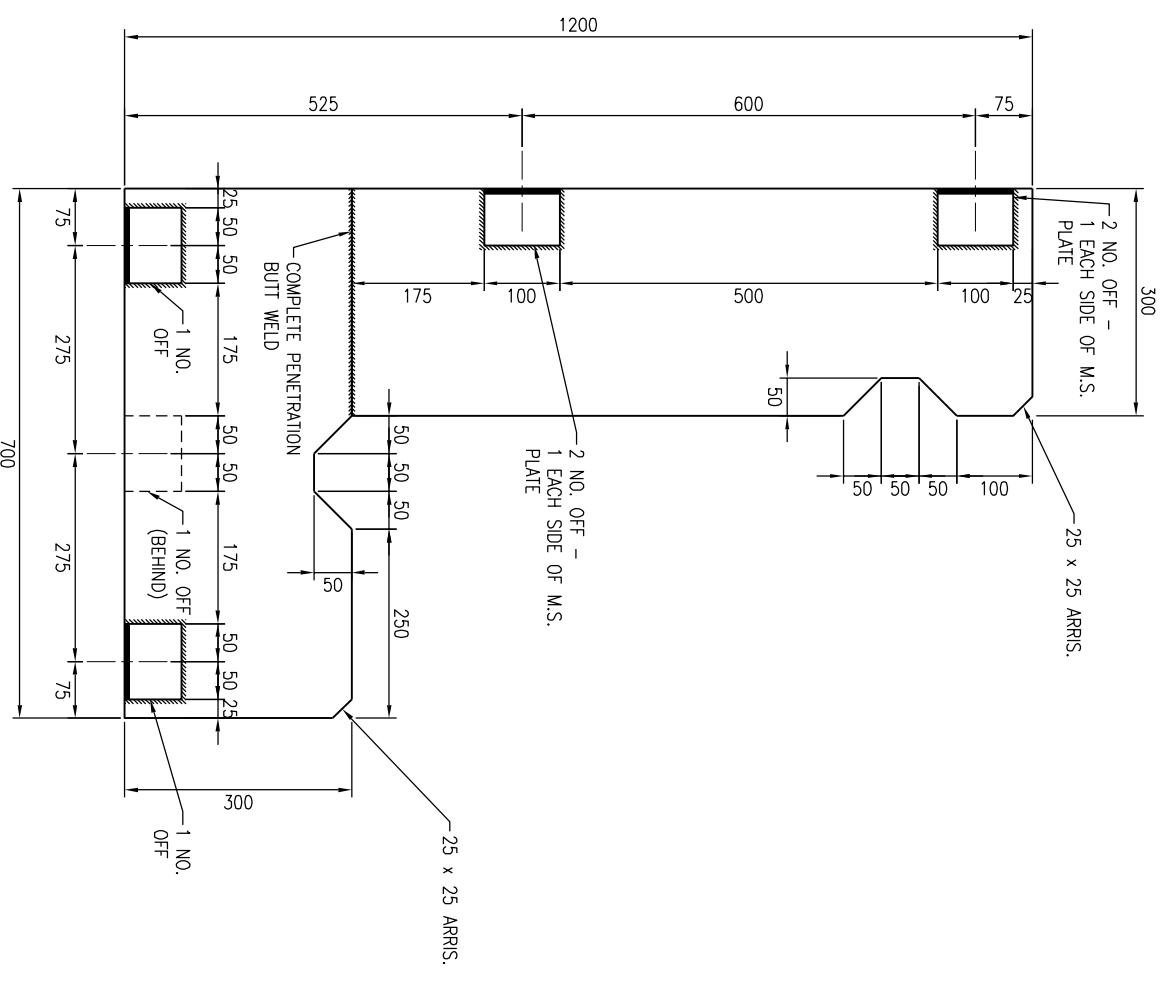
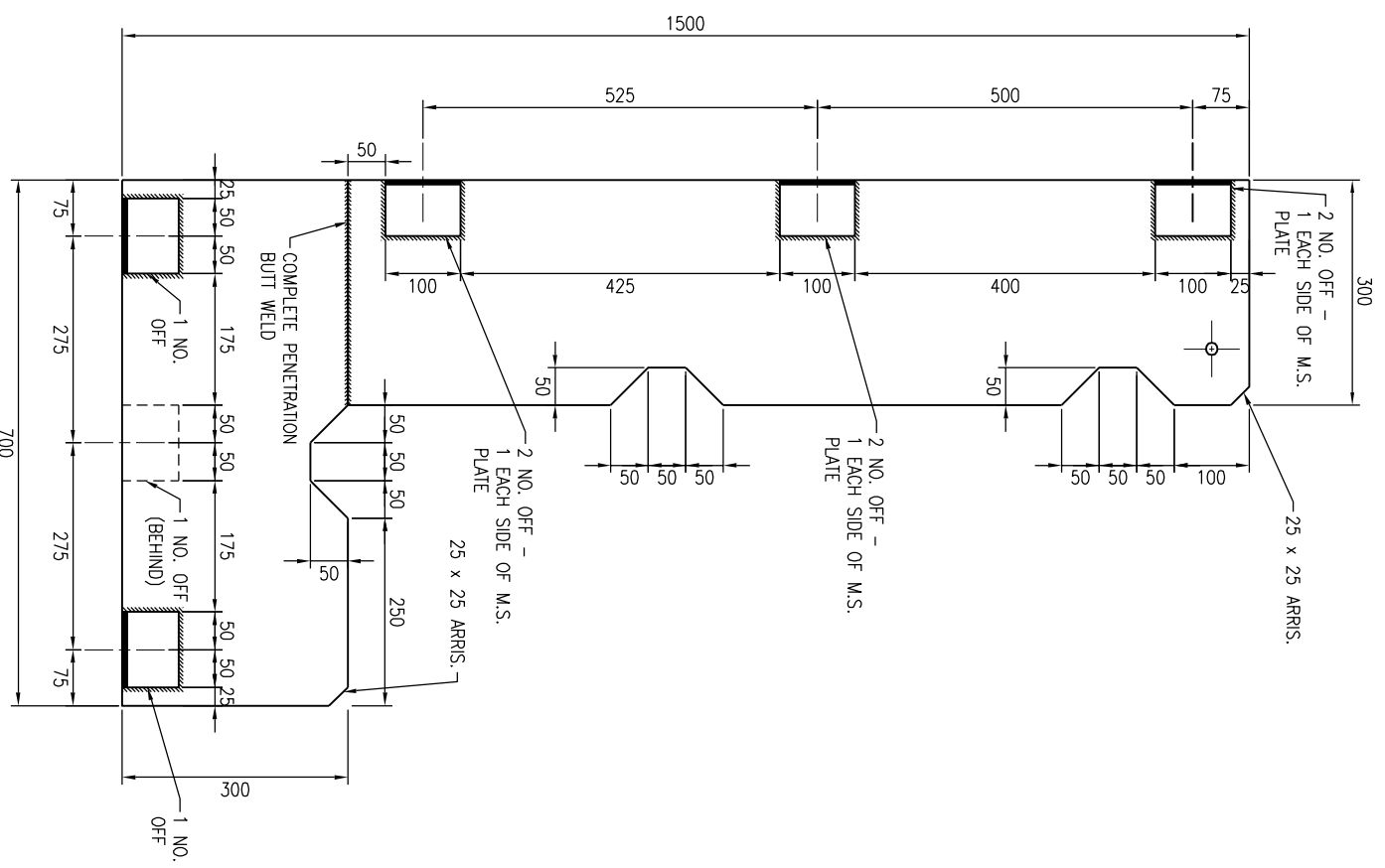
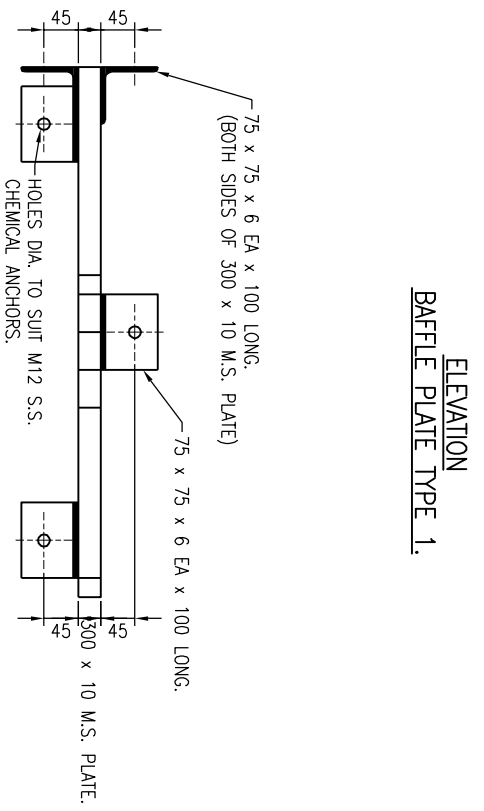
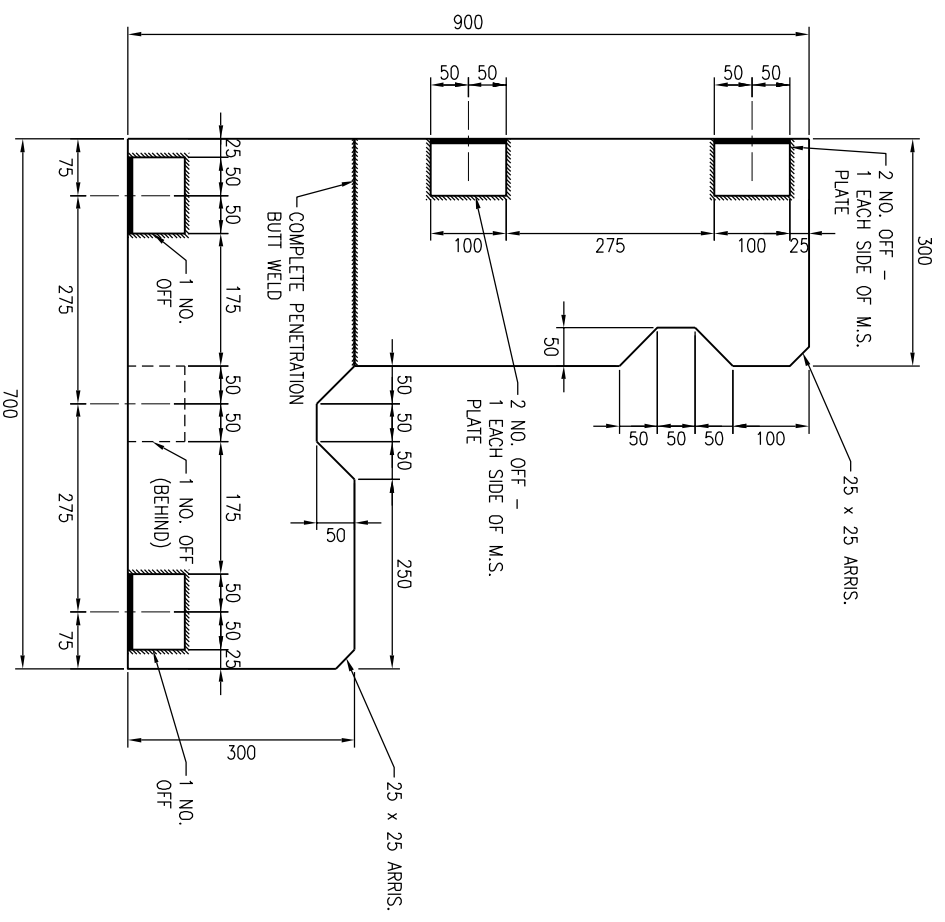
Revisions	Issued By	Date	Microfied	Associated Job Nos	Horiz. Datum	Survey Data	Scales
					MGA 94 Zone 55	MGA 94 Zone 55	N.T.S.
				Auxiliary Drg Nos	Azimuth Datum	MGA 94 Zone 55	
C		9/10/08		Refer drawing indexes on drgs. 399510 - 399512	Height Datum	PM49752 = 9.087 AHD	
B		20/12/07		MRP	Survey Books	MR 84562 MR 84563	
A				Original Issue A3			

CARDWELL SHIRE			
<b>BRUCE HIGHWAY (INGHAM – INNISFALL)</b>			
80010.414 – 94376.059			
<b>CTL CHGE</b>	Preceding RP	Dist. to start of job (km)	Reference Points From start to end of job
	10N/12	5.545	14.36
			From end to Following RP
			4.3
			10N/19
			Through Choinage from Intersection Townsville Rd/Lomercost St Ingham (10N/10N/614)

FISH PASSAGE DETAILS (CONTROL LINE MC000 AND EXISTING BRUCE HIGHWAY)			
Drawing Checked	Design Verified	Design Review	For scheme approval status refer Drg. No. 399510 (01-01 of 03)
NIS	JC	MRP	
DAP	WPW	M.PETTINGREW	

Queenstand Government Department of Main Roads	
Job No.	30/10N/81
Contract No.	AC-09-006
Drawing No.	401615
Series Number	MD-11 of 17
	MRR Detail (08/06)





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- STEELWORK NOTES**
- All steelwork shall conform to A.S. 4100, steel structures.
  - Steel grades: 300 U.O.N.
  - Plates – 250.
  - Fabrication shall be carried out by welders who are qualified in accordance with the requirements of A.S./NZS 1554.1.
  - All welds shall be category S.P. as specified in A.S. 1554, U.O.N.
  - Electrodes shall be E48XX/W50X.
  - All steelwork shall be blast cleaned to class 2<sub>1/2</sub> as specified in A.S. 1627.4.
  - Shop drawings, if required, shall be submitted before commencement of fabrication.
  - All angles to be 75 x 75 x 6 x 100 long U.O.N.
  - All fixings to be M12 S.S. chemical anchor embedded 100. ramsef/chemset injection 801. Epoxy.
  - All baffle plates shall be hot dipped galvanised and passivated in 0.2% sodium dichromate solution.

Revisions		Issued By	Date	Microfilied	Associated Job Nos	Survey Data		Scales		Project Information		Drawing Details		Approval		Client Information		
						Horiz. Datum	MGA 94 Zone 55	N.T.S		BRUCE HIGHWAY (INGHAM – INNISFAIL)		Drawing	Design	Design	Job No.	Contract No.	Queenstand Government Department of Main Roads	
						Azimuth Datum	MGA 94 Zone 55			CARDWELL SHIRE		N/S	JC	MRP	30/10N/81	AC-09-006		
						Height Datum	PM449752 = 9.087 AHD			FISH PASSAGE WORKS		Checked	Verified	MRP	401613	401613		
						Refer drawing indexes on drgs.	MR 84562			BAFFLE PLATE DETAILS		DAP	WPW	MRP	MD-09	MD-09		
						399510	MR 84563			SHEET 1 OF 2				MRP	MD-09	MD-09		
						399512	MR 84563			Through Choinage from Intersection Townsville Rd/Lomercost St Ingham (10N/70N/614)				MRP	MD-09	MD-09		
A		Original Issue	A3											MRP	MD-09	MD-09		
B		Issued for Construction	MRP	20/12/07										MRP	MD-09	MD-09		
C		Original Issue	A3											MRP	MD-09	MD-09		

