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Reef Catchments Limited NRM

Carmila Creek Fish Barrier Remediation – Gauging Weir Fishway:

Monitoring Report for operational works permit 2501-44071 SDA

May 2026

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Contents

Background

Reef Catchments Limited (RCL) Natural Resource Management (NRM) are undertaking fish passage improvement work within the Mackay, Whitsunday and Isaac regions. This work includes multiple sites which require varying degrees of remediation to restore adequate connectivity. Carmila Creek Gauging weir (Figure 1) is used to capture stream flow data for water resource management. The gauging station is also used by the Bureau of Meteorology as a hydrological reference station. This station provides well-maintained river gauges of long, high quality streamflow records to estimate trends in long-term and seasonal water availability from climate variability and change.

The arrangement of the weir (Figure 2) and its position within the catchment posed an impediment to fish movement within the catchment. Carmila Creek Gauging weir ranked 8th out of 9738 potential fish barriers within the region and was the highest ranked barrier within the catchment (Power et al 2021). RCL consulted with the Department of Local Government, Water and Volunteers (DLGWV) and gained support for undertaking fish passage remediation work on the weir. DLGWV advised the weir forms critical infrastructure and any remediation options must retain the function of the gauging weir.

Catchment Solutions was engaged by RCL to develop and implement a suitable remediation option for the site which restored fish passage and maintained the operational requirements of the weir. The fishway developed included a novel trapezoidal ramp low flow channel with nursery steps and graded scour protection across the remaining stream width. The fishway was progressed through the detailed design phase and was approved under operational works permit 2501-44071 SDA. Construction was completed in 2025. Monitoring conditions were placed on the operational works permit to demonstrate that the constructed fishway functions as designed.

This report details the methods and results of the monitoring and provides a summary of how the fishway performs in providing fish passage at this location.

Figure 1. Location of Carmila Creek Gauging weir prior to the fishway construction.

Figure 2. Carmila Gauging Weir prior to the fishway construction.

Figure 3. Overview of Carmila Gauging Weir fishway after completion prior to its first flow (left) and with the low flow trapezoidal ramp engage during a low flow (right).

Methods

Barrier Trapping

Barrier trapping was conducted pre- and post-construction. Pre-construction trapping was conducted in May 2025 (Figure 4) and post-construction trapping was conducted in March 2026 (Figure 5). Flow during pre-construction trapping was low with discharge at the weir confined to the existing V-notch spillway. Flow during the post construction trapping was moderate and some flow was passing over the graded scour protection on the northern bank. Trap setting was confined to the V-notch spillway during the pre-construction trapping. For the post-construction trapping, the trap was set in the low flow channel as well as the northern bank scour protection. On both occasions traps were only set at the top of the structure to capture fish which successfully ascended. Trapping focused on upstream movement of fish as small headloss barriers like Carmila Gauging Weir pose no impediment to downstream movement. Traps were set and checked multiple times per day to minimise stress and the potential of predation of fish within the traps.

Trapping of the V-notch spillway and low-flow channel of the fishway utilised purpose-built traps. Traps were constructed from 10 mm round bar with shade cloth (4.0 mm mesh size) covering the frame. Shade cloth wing walls prevented fish from swimming around the traps on either side, whilst sandbags and star pickets were used to secure the traps and wing walls in place. The trap consisted of a single cone entrance, with dimensions of 1.4 m x 1.0 m x 1.1 m. Trapping of the graded scour protection utilised a double-winged fyke net. The Fyke net had a 1.2 m hoop entrance and a mesh size of 4.0 mm. Sandbags and star pickets were used to secure the fyke net in place.

All fish captured during a trap sets were identified to species level, counted, and measured to the nearest millimetre (fork length of forked-tail species, total length for all other species). If large numbers of a species were captured during a single set, a random subset of 25 fish were measured, with the remaining fish counted and contributing only to abundance data. After processing, all fish were released upstream of the weir.

Figure 4. Trapping Carmila Gauging Weir prior to construction of the fishway.

Figure 5. Trapping of the low-flow channel and scour protection of the northern bank scour protection.

Stream Flow and Fishway Velocities

Water velocity data was collected from nursery steps and resting pools using a Global Water flow meter (GWFP111). Nursery step measurements were taken by placing the flow meter in the centre of each step, then averaging the velocity over a 20 second period. The average velocities for each step were recorded. Pool measurements were recorded from left, right and centre sections of each pool. Within each section of the pool measurements were recorded from the water column and the bottom of the pool. For water column measurements the flow meter was positioned at six-tenths the depth of the pool. Bottom velocity measurements were recorded with the flow meter positioned on the floor of the pool.

Electrofishing

Electrofishing was conducted at several sites upstream and downstream of the gauging weir prior to and after the construction of the fishway (Figure 6). The electrofishing provided complementary data to identify the fish species within Carmila Creek and provide an indication of changes in habitat utilisation upstream of the gauging weir.

Electrofishing was conducted from the 3.7 m vessel (Electrolyte) operating a Smith-Root 2.5 GPP electrofisher unit, equipped with a single boom arm, 6 dropper anode array and hull cathode. Settings were adjusted based on electrical conductivity of the water on site to maximise the effectiveness of electrofishing operations. A master and single dip-netter were employed during all sampling activities on Electrolyte.

Sampling was conducted at various depths and encompassed all types of instream habitats within the waterbody. The electrofishing methodology used was a combination of power on, power off for the duration of the sampling effort. The sampling effort consisted of a series of 300 second 'shots' where the boat was maneuvered in and out from the shoreline as well as parallel to the shore in deeper water. The effective electric field of this unit was approximately 3 m radius (centred on the anode) to a depth of 3 m. Fish positively identified during operations but not captured were also recorded and contributed abundance and assemblage data in this report.

At sites not accessible with the boat, backpack electrofishing was used to collect fish community data. The backpack unit utilised was a Smith-Root Model-LR24 Backpack Electrofisher operating a 300-500 volt pulsed-DC current and a standard pulse setting (1ms). An operator and single dip-netter were employed during all backpacking operations. Sampling effort was the same used for boat mounted operations and was limited to a wading depth of 1.2 m.

All fish captured during electrofishing operations were identified to species level, counted, and measured to the nearest millimetre (fork length of forked-tail species, total length for all other species). If large numbers of a species were captured during a single set, a random subset of 25 fish were measured, with the remaining fish counted and contributing only to abundance data. After processing, all fish were released at the location of capture.

Water Quality Parameters

Water quality parameters including temperature, pH, dissolved oxygen, and electrical conductivity were measured using a YSI – Pro Quattro multiprobe during fishway monitoring.

The water quality sampling method involved placing the probe into the water at a depth of 0.1 m. After readings had stabilised, values were recorded for each of the water quality parameters. For the barrier trapping operations water quality measurements were recorded from the headwater and tail water pools at commencement of each trap set. During electrofishing operations water quality measurements were recorded from the lower, middle and upper reach of the site.

The parameters recorded included:

- pH
- Dissolved Oxygen (mg/L & % saturation)
- Electrical Conductivity (µs/cm)
- Temperature (°C)

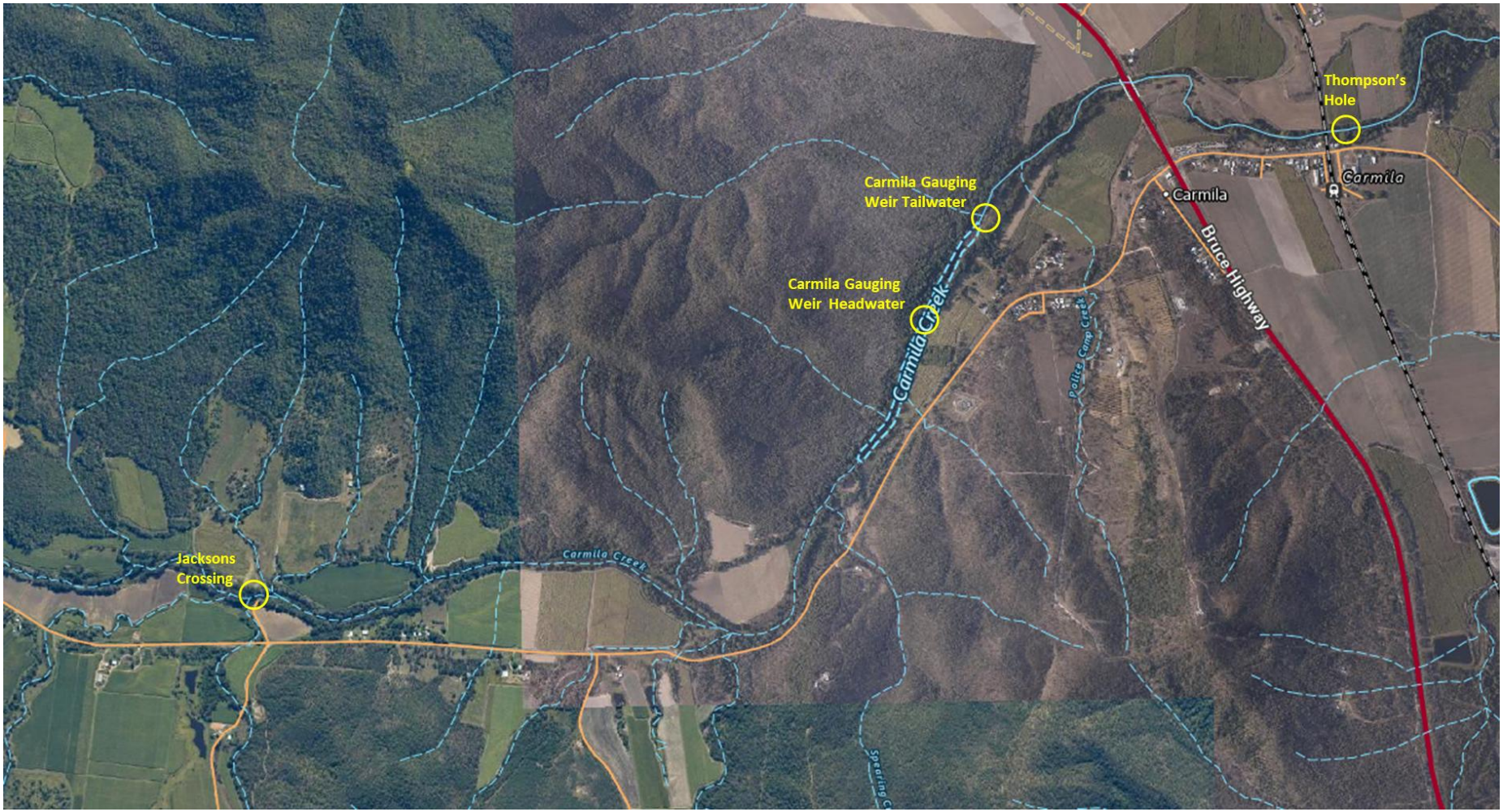

Figure 6. Electrofishing locations within Carmila Creek.

Results

Barrier Trapping

Sampling Effort

Pre-construction trapping was conducted from 05th – 07th May 2025. Total sampling effort was 48.5 h with trap sets varying between 5.8 h and 18.5 h. Post-construction trapping of the low-flow channel occurred from 17th – 20th of March 2026. Total sampling effort was 67.3 h with trap sets varying between 4.6 h and 17.6 h. Post-construction trapping of the northern bank scour protection occurred concurrently to the low-flow channel trapping. Total sampling effort was 72.3 h with trap sets varying between 4.0 h and 17.5 h.

Flow Conditions

Flow conditions during the trapping period varied between pre- and post-construction. During pre-construction trapping the flow was consistent with low flow conditions for this stream. Slight peaks were recorded during the sampling period (Figure 7), however this is likely the result of the trap installation reducing flow through the site and causing the headwater to rise. The slight rise in headwater is interpreted as a stream flow rise. Excluding this anomaly, the discharge progressively reduced from 0.011 m^3/s to 0.010 m^3/s over the trapping period.

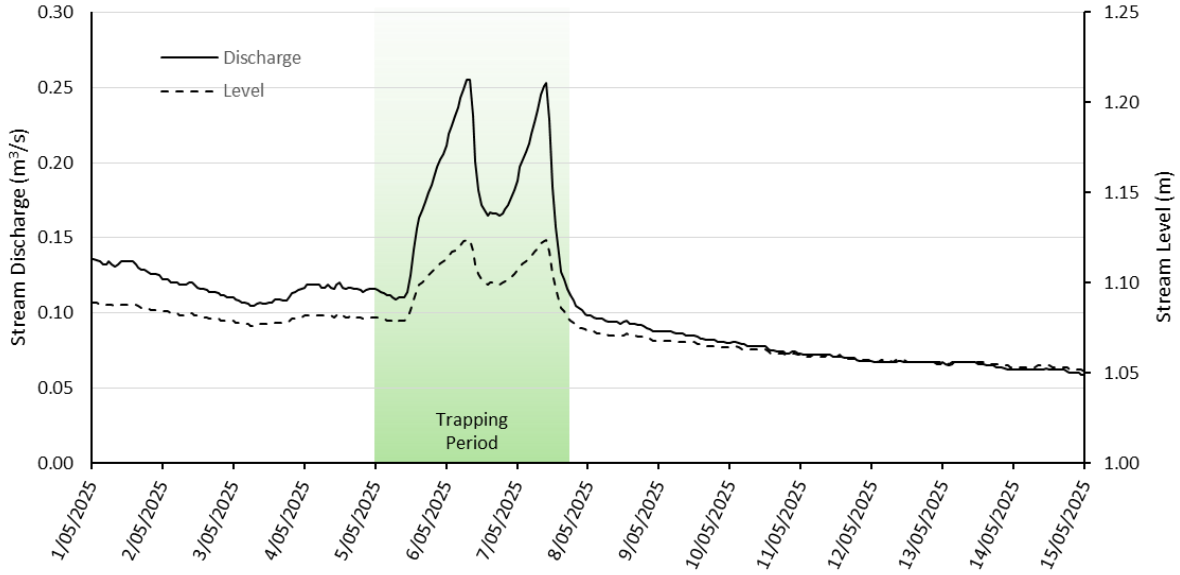

Figure 7. Stream flows recorded from Carmila Gauging Weir, during pre-construction trapping (gauge # 126003A).

Stream flow during the post-construction trapping was consistent with moderate flow conditions for this stream. Similar flow variation anomalies (Figure 8) were observed during the trapping due to the traps artificially raising the headwater height. Excluding these anomalies, the discharge progressively reduced from 1.70 m^3/s to 1.3 m^3/s over the trapping period.

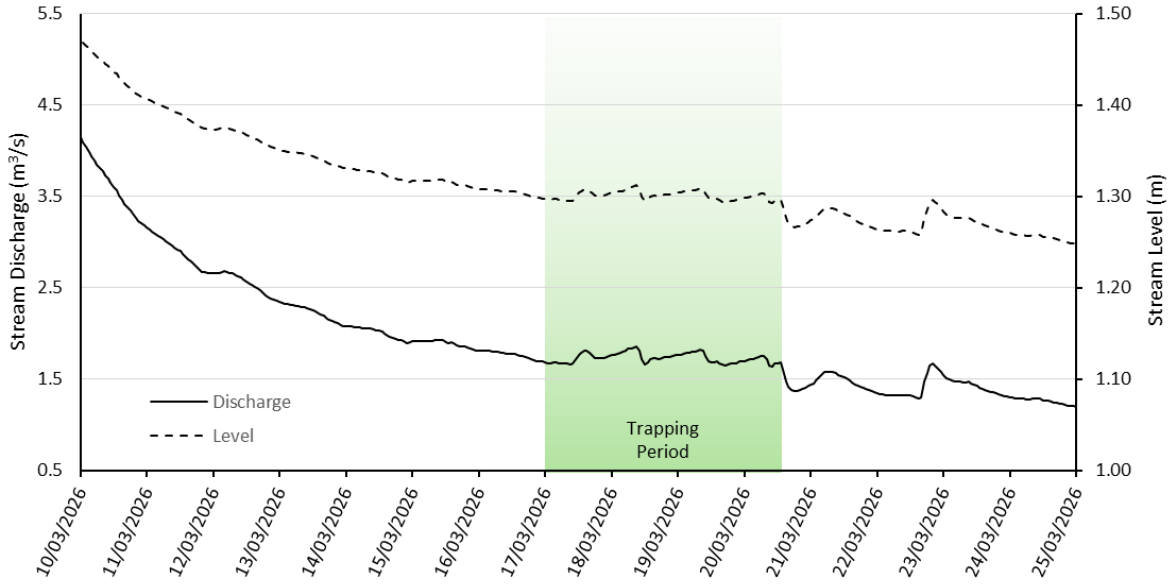

Figure 8. Stream flows recorded from Carmila Gauging Weir, during post-construction trapping (gauge # 126003A).

Water Quality

Between the trapping periods there was variation in temperature and dissolved oxygen measurements (Table 1). The variations were typical of regional streams within central Queensland. Conductivity and pH remained relatively consistent between the trapping periods (Table 1).

Within each trapping period variations within parameters were relatively low (Table 1). Dissolved oxygen concentrations during the pre-construction trapping period had the greatest relative variation, ranging between 38.9 - 87.0% saturation. While notable, these variations were not outside the typical values for regional streams.

Table 1. Parameter ranges for water quality measurements recorded over the pre and post-construction trapping periods.

Time of WQ reading	Temperature °C	DO mg/L	DO %sat	EC µS/cm	pH
Pre-construction (May 25)	22.6 - 23.5	3.37 - 7.25	38.9 - 87.0	262 - 268	7.39 - 7.69
Post-construction (Mar 26)	25.7 - 27.9	7.08 - 8.48	87.1 - 107.0	246 - 257	7.12 - 7.38

Fishway Velocities

Measured velocities across the ridges of trapezoidal fishway ranged from 0.5 m/s towards the outer steps, to 1.5 m/s across the centre of the ridge (Figure 11). The depth of flow passing over the outer steps (steps 28-32) was insufficient to take velocity measurements. A trend line was fitted to the plotted data which produced a strong relationship (R^2=0.8004) between velocity and depth passing over the step. This provides a strong indication the velocities are further reduced towards the outer steps of the ridge. Velocities within the resting pools also varied.

Pool velocities were lower along the left and right sides of the pools, than the centre portion of the fishway. (Figure 9). Average velocities on the left and right sides were <0.2 m/s at both the bottom and water column locations. Velocities recorded from the centre bottom averaged to 0.41 m/s and 0.78 m/s in the water column. Variation in velocities within the centre portion of the fishway was also greater than the left and right sides (Figure 9).

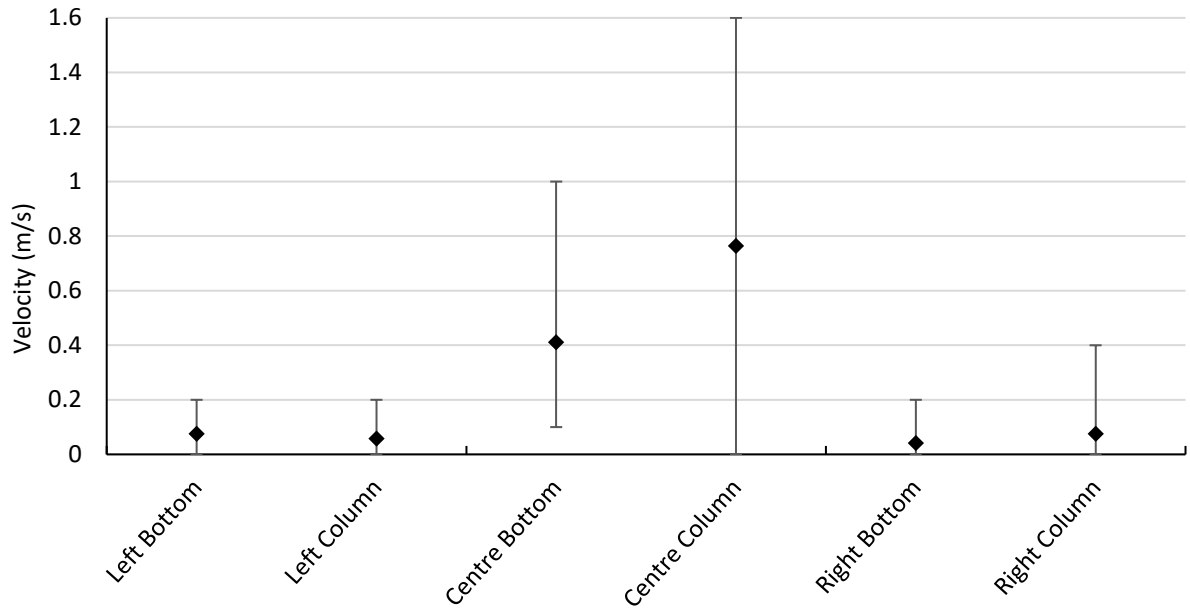

Figure 9. Pool velocities measured from the water column and bottom. Locations were the left, centre and right side of the pool in relation to the direction of flow.

Figure 10. Examples of trap captures from the low-flow channel of the fishway.

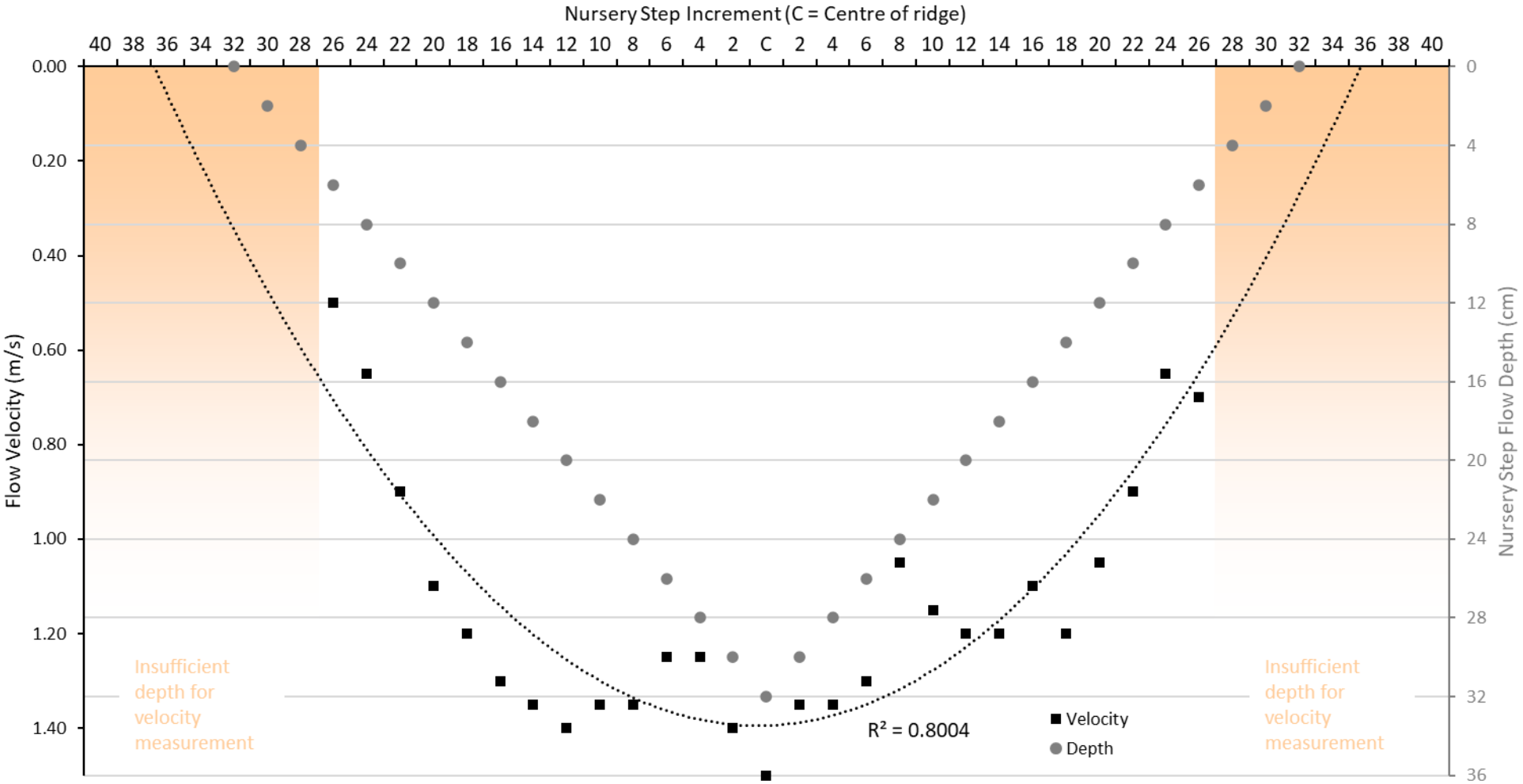

Figure 11. Flow depth and velocity over the trapezoidal ridge within the low flow channel of the fishway. Trend line provides an inference for velocities over stems with insufficient depth to take measurements.

Fish Movements

Pre-construction sampling recorded a single species (empire gudgeon) in trap sets at a catch rate of 1.49 fish/day.

Eleven species were captured during post-construction trapping operations, comprising all native species. Empire gudgeon were the most prevalent species representing 49.4% of the catch. Catch rates of empire gudgeon were notably higher through the scour protection (175.75 fish/day) compared to the low-flow channel (12.86 fish/day). Fly-specked hardyhead were the next most abundant species representing 39.2% of the catch. Catch rates of fly-specked hardyhead were also greater coming over the scour protection (124.92 fish/day) than through the low-flow channel (26.07 fish/day). The remaining species were captured in lower abundance (Table 2). Sea mullet were recorded moving through the low-flow channel and over the scour protection. Barramundi, tarpon, midgley's carp gudgeon and eastern rainbowfish were only recorded moving through the low-flow channel, while pacific blue-eye, spotted scat and mouth almighty were only recorded moving over the scour protection. Examples of trap set captures are provided in Figure 10.

Table 2. Catch summary for Carmila Gauging Weir during pre- and post-construction barrier trapping. Catch effort (CPUE) represented as fish/day.

	Common Name	Species	Pre-con low-flow		Post-con low-flow		Post-con scour protection	
			Catch	CPUE	Catch	CPUE	Catch	CPUE
Diadromous	*Anguilla reinhardtii*	Long-finned eel					11	3.65
	Hypseleotris compressa	Empire gudgeon	3	1.49	36	12.86	529	175.75
	Lates calcarifer	Barramundi			3	1.07		
	Megalops cyprinoides	Tarpon			2	0.71	3	1.00
	Mugil cephalus	Sea mullet			15	5.36	4	1.33
	Pseudomugil signifer	Pacific blue-eye					8	2.66
	Scatophagus argus	Spotted scat					1	0.33
Potamodromous	*Craterocephalus stercusmuscarum*	Fly-specked hardyhead			73	26.07	376	124.92
	Glossamia aprion	Mouth almighty					3	1.00
	Hypseleotris species 1	Midgley's carp gudgeon			1	0.36	30	9.97
	Melanotaenia splendida splendida	Eastern rainbowfish			29	10.36	20	6.64
		Total	**3**	**1.49**	**159**	**56.79**	**985**	**327.24**

The fish captured were a mixture of small and large bodied species. (Table 3). The smallest was a 24 mm eastern rainbowfish and the largest was an 850 mm long-finned eel. While small fish were recorded moving through the low-flow channel, most fish under <50 mm were recorded moving over the scour protection. This is illustrated through the length frequency distribution plots for the two most prevalent species captured (empire gudgeon and fly-specked hardyhead). Figure 12 and Figure 13 show similar size distributions for these species captured from the low-flow channel and scour protection. However, the number of individuals recorded moving over the scour protection was far greater. Apart from long-finned eels, larger fish appeared to prefer passing the weir through the low-flow channel.

Table 3. Size ranges of fish captured during the Carmila Gauging Weir pre and post-construction trapping operations. Sizes are reported in millimetres (mm).

	Common Name	Species	Pre-con low-flow	Post-con low-flow	Post-con scour protection
Diadromous	*Anguilla reinhardtii*	Long-finned eel			400-850
	Hypseleotris compressa	Empire gudgeon	43-54	26-63	20-63
	Lates calcarifer	Barramundi		241-471	
	Megalops cyprinoides	Tarpon		269-315	171-185
	Mugil cephalus	Sea mullet		265-445	230-375
	Pseudomugil signifer	Pacific blue-eye			24-33
	Scatophagus argus	Spotted scat			58
Potamodromous	*Craterocephalus stercusmuscarum*	Fly-specked hardyhead		25-73	21-82
	Glossamia aprion	Mouth almighty			32-94
	Hypseleotris species 1	Midgley's carp gudgeon		26	21-43
	Melanotaenia splendida splendida	Eastern rainbowfish		24-65	29-54

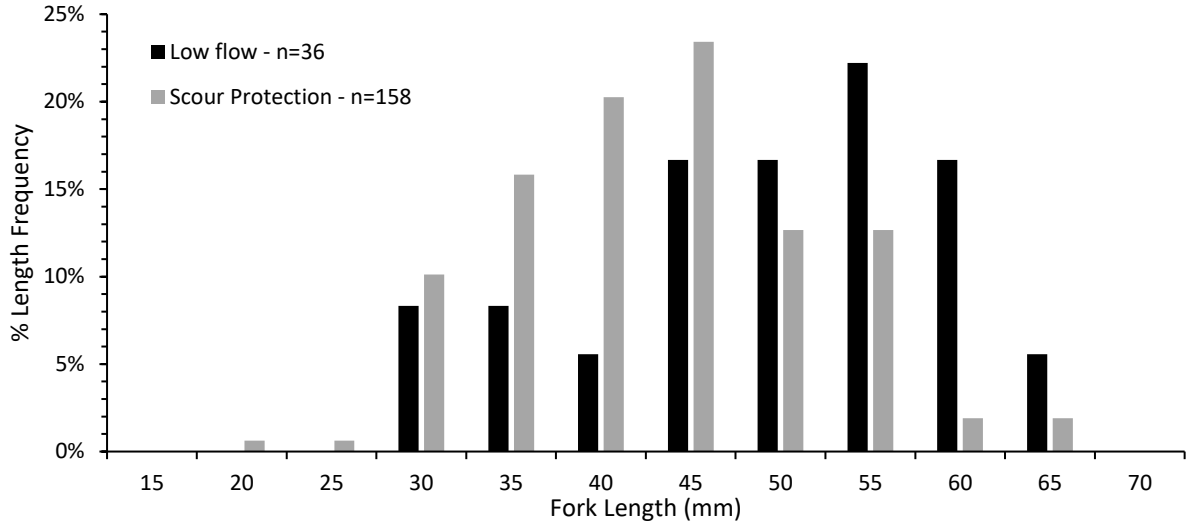

Figure 12. Percent frequency length distribution for empire gudgeon recorded moving through the low-flow channel and over the scour protection during post construction trapping operations.

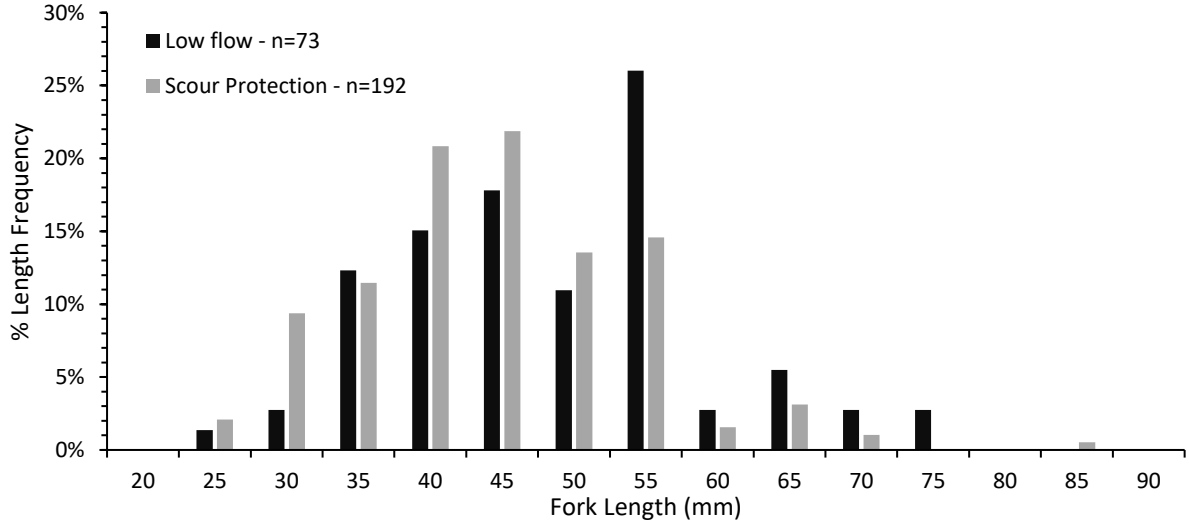

Figure 13. Percent frequency length distribution for fly-specked hardyhead recorded moving through the low-flow channel and over the scour protection during post construction trapping operations.

Electrofishing

Water Quality

Water quality readings at each of sites were typical of the conditions of the region and characteristic of the habitat types. Parameter measurements for all sites were within tolerances for native fish community species and followed the general trends expected to be observed (Table 4). The only notable observation was that DO was below 50% saturation at all sites except the Carmila Weir Tailwater pool during pre-construction electrofishing operations. The Carmila Weir Tailwater pool was 83.3% saturation. Post-construction DO measurements were above 75% saturation.

Sampling Effort

Electrofishing was completed at four locations during the pre-construction monitoring (Figure 6). This included two sites downstream of the weir (Thompson's Hole and Carmila Weir Tailwater) and two sites upstream of the weir (Carmila Weir Pool and Jacksons Crossing). Post-construction electrofishing operations limited to Thompson's Hole and Carmila Weir Pool.

During post-construction operations the counter on the electrofishing control box failed which prevented the power-on time being recorded. Without a measure of power-on time it was not possible to report abundance as a catch per unit effort. Total abundance is reported for both pre and post-construction electrofishing operations (Table 5).

Fish Captures

A total of 17 species were recorded from Carmila Creek, comprising 8 diadromous species and 9 potamodromous species (Table 4. Water quality measurements taken during electrofishing operations in Carmila Creek.

	Site	Date/time	Temp (c)	DO (mg/L)	DO (%)	EC (us/cm)	pH
Pre-construction	Thompsons Hole	6/05/2025 13:45	23.4	3.72	43.8	281	7.39
	Carmilla Weir Pool	5/05/2025 12:30	23.5	3.91	45.8	268	7.49
	Carmilla Weir Tailwater	7/05/2025 11:00	23.1	7.25	83.3	265	7.53
	Jacksons Crossing	6/05/2025 11:30	22.7	3.78	43.2	281	7.27
Post-construction	Thompsons Hole	21/04/2026 11:15	24.0	6.21	75.5	174	6.66
	Carmilla Weir Pool	21/04/2026 14:30	24.7	7.72	90.6	294	7.27

Table 5). A single pest fish species was recorded (mosquito fish). The most abundant species at all sites was empire gudgeon, followed by eastern rainbowfish and fly-specked hardyhead. Captures represented both juvenile and adult fish (Table 6).

Species compositions downstream and upstream of the weir were similar during pre- and post-construction electrofishing operations. The exceptions were bullrout, one-gilled eel and purple-spot gudgeon which were only captured downstream of the weir, while pacific blue-eye and spangled perch were only captured upstream of the weir. All these species were captured in low abundance (Table 5). Barramundi was absent from captures during pre-construction electrofishing operations at Carmila Weir Pool. Post-construction operations captured 17 individuals ranging in size from 223 to 564 mm.

Table 4. Water quality measurements taken during electrofishing operations in Carmila Creek.

	Site	Date/time	Temp (c)	DO (mg/L)	DO (%)	EC (us/cm)	pH
Pre-construction	Thompsons Hole	6/05/2025 13:45	23.4	3.72	43.8	281	7.39
	Carmilla Weir Pool	5/05/2025 12:30	23.5	3.91	45.8	268	7.49
	Carmilla Weir Tailwater	7/05/2025 11:00	23.1	7.25	83.3	265	7.53
	Jacksons Crossing	6/05/2025 11:30	22.7	3.78	43.2	281	7.27
Post-construction	Thompsons Hole	21/04/2026 11:15	24.0	6.21	75.5	174	6.66
	Carmilla Weir Pool	21/04/2026 14:30	24.7	7.72	90.6	294	7.27

Table 5. Total abundance of fish species recorded during pre- and post-construction electrofishing operations in Carmila Creek.

	Common name	Species	Downstream of Weir				Upstream of Weir			
			Thompson's Hole		Carmilla Weir Tailwater		Carmilla Weir Pool		Jacksons Crossing	
			Pre-con	Post-con	Pre-con	Post-con	Pre-con	Post-con	Pre-con	Post-con
Diadromous	Long-finned eel	*Anguilla reinhardtii*	56	45	56	Not sampled	14	26	34	Not sampled
	Empire gudgeon	*Hypseleotris compressa*	406	526	608		104	253	260	
	Barramundi	*Lates calcarifer*	3	14	2			17		
	Tarpon	*Megalops cyprinoides*	16	4			9	3	4	
	Sea mullet	*Mugil cephalus*	11				6	13	3	
	Bullrout	*Notesthes robusta*	1							
	One-gilled eel	*Ophisternon bengalense*		3						
	Pacific blue-eye	*Pseudomugil signifer*						1	3	
Potamodromous	Flyspecked hardyhead	*Craterocephalus stercusmuscarum*	130	85	427		69	182	103	
	Mouth almighty	*Glossamia aprion*	1	1	4		20	9	7	
	Midgley's carp gudgeon	*Hypseleotris species 1*	4	11			5	1	13	
	Spangled perch	*Leiopotherapon unicolor*					1		1	
	Eastern rainbowfish	*Melanotaenia splendida splendida*	206	299	209		75	677	132	
	Purple-spot gudgeon	*Mogurnda adspersa*		1						
	Bony bream	*Nematalosa erebi*					7	9		
	Hyrtl's catfish	*Neosilurus hyrtlii*		2	1			3	1	
	Mosquito fish*	*Gambusia holbrooki*		3						

* Denotes pest fish species

Table 6. Size ranges of fish species recorded during pre- and post-construction electrofishing operations in Carmila Creek.

	Common name	Species	Downstream of Weir				Upstream of Weir			
			Thompson's Hole		Carmilla Weir Tailwater		Carmilla Weir Pool		Jacksons Crossing	
			Pre-con	Post-con	Pre-con	Post-con	Pre-con	Post-con	Pre-con	Post-con
Diadromous	Long-finned eel	*Anguilla reinhardtii*			200	Not Sampled			120	Not Sampled
	Empire gudgeon	*Hypseleotris compressa*	22-82	29-61	25-58		27-83	39-67	30-63	
	Barramundi	*Lates calcarifer*	270	206-311	264-268			223-564		
	Tarpon	*Megalops cyprinoides*	200-379	288-344			298-332	335	247-331	
	Sea mullet	*Mugil cephalus*	307-382	3			329-331	342-357	398	
	Bullrout	*Notesthes robusta*	284							
	Pacific blue-eye	*Pseudomugil signifer*						19	25-35	
Potamodromous	Flyspecked hardyhead	*Craterocephalus stercusmuscarum*	20-63	16-57	19-59		12-70	19-59	40-85	
	Mouth almighty	*Glossamia aprion*	103	49	61-115		16-142	51-81	87-137	
	Midgley's carp gudgeon	*Hypseleotris species 1*	26-32	21-34			17-33	23-24	25-35	
	Spangled perch	*Leiopotherapon unicolor*					154		165	
	Eastern rainbowfish	*Melanotaenia splendida splendida*	29-110	29-104	19-86		13-82	20-109	27-100	
	Purple-spot gudgeon	*Mogurnda adspersa*		63						
	Bony bream	*Nematalosa erebi*					360	317		
	Hyrtl's catfish	*Neosilurus hyrtlii*		280-365	265		268	312	137	
	Mosquito fish*	*Gambusia holbrooki*	21	25						

Discussion

Remediation measures at Carmila Gauging Weir were successful in restoring fish passage in Carmila Creek with several species, size classes and life-stages of fish successfully passing upstream of the fishway. Significantly, the fishway was successful at passing juvenile and small-bodied fish species which possess the weakest swimming abilities. Successful passage of several fish species, including 7 diadromous and 4 potodromous, were observed above the weir post-construction. The largest individuals recorded moving through the fishway were adult long-finned eels (850 mm) with individuals as small as 24 mm successfully ascending. This contrasts with limited fish passage recorded during the pre-construction trapping operations.

A notable observation was the capture of barramundi passing through the fishway and upstream of the fishway during electrofishing operations. Barramundi were not captured in the Carmila Weir Pool during pre-construction operations. Over time, greater utilisation of upstream habitats by barramundi and other diadromous fish (e.g. sea mullet, tarpon, scat etc.) is anticipated.

Successful passage of several fish species through the low-flow channel, including the diadromous *Hypseleotris compressa* (Empire gudgeon) in small size classes (26-63mm) demonstrates adequate passage is occurring. However, under the post-construction trapping, high numbers of small fish (<50 mm) were captured passing over the graded scour protection (*cf.* low-flow channel), including several species which were not recorded passing through the low-flow channel. Passage conditions within the low-flow channel are anticipated to be adequate for small fish as low velocity zones will be provided over the nursery steps.

The greater abundance and species richness recorded over the scour protection is likely driven by a combination of fish behavioural preferences and hydraulic conditions. Small-bodied fish typically migrate upstream along channel margins, where velocities are lower and predation risk is reduced. As these fish encounter the weir, they are more likely to intercept flow paths along the bank. At Carmila weir, this means more fish are likely to pass over the scour protection rather than moving toward the centre of the channel where the low-flow channel is located. This a function of pathway accessibility and the likelihood of encounter, rather than an indication that the low-flow channel is unsuitable for passage.

While the low-flow channel provides a controlled and predictable passage route, particularly for larger-bodied fish and low flow conditions, it is not expected to represent the primary passage pathway for small-bodied species under moderate flow conditions. Hydraulic modelling of the fishway design predicted increased velocities through the centre of the channel with lower velocity zones along the margins of the channel, as flow increased. This was consistent with Hydraulic conditions observed within the low-flow channel during moderate flows in post-construction monitoring.

The scour protection was constructed from a well graded mix of rocks (100 mm – 1200 mm). The roughness elements within the scour protection generate localized low-velocity zones and boundary layers that can be exploited by small-bodied fish (<50 mm), allowing passage under conditions that may exceed their sustained swimming capacity within more uniform flow environments (i.e. low-flow channel). This interpretation is supported by the disproportionately high abundance of small-bodied fish recorded over the scour protection relative to the low-flow channel, as well as the occurrence of several species exclusively using this pathway. This provides a good indication that the scour protection will provide passage during elevated flows prior to the weir drowning-out.

Of note, there was some deposition of gravel and cobble in the pools of the low-flow channel which resulted in some shallowing of the pools (Figure 14). The deposition of material in the bottom of the low-flow channel is to be expected in an alluvial system like Carmila Creek. This material is likely to vary in depth over time as it becomes resuspended. However, at the current level of deposition, it is not likely having a significant impact on the operation of the fishway.

Figure 14. Sediment deposits within pools of the low flow channel at Carmila Gauging Weir fishway.

Alert and Action

The Carmila Gauging Weir fishway on the Carmila Creek was monitored by fish passage specialists – Catchment Solutions. The fishway was found to be functioning as designed, passing high numbers of fish during moderate flow conditions. Species diversity recorded in fishway captures were similar to community structure recorded throughout the creek during electrofishing operations. High numbers of small bodied and juvenile fish were recorded moving over the graded scour protection under the prevailing flow conditions. This highlights the importance of providing additional roughness outside of the low-flow channel, particularly on wide streams where it is impractical to extend ridges and pools across the entire stream channel.

Sediment deposition within the fishway should be monitored in accordance with the maintenance schedule. Where deposition levels are such that it prevents low flows from passing down the low-flow channel (i.e. it by passes the fishway or spills out part the way down) it should be removed and reprofiled on the bank immediately downstream.

References

Power, T., Moore, M., Fries, J. & Rossiter, C. (2021) *2021 Fish Barrier Prioritisation – Mackay Whitsunday Region*. Report prepared by Catchment Solutions for Reef Catchments Limited.

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