
0
25
50
metres
Y (49.8m)
X (3.5m)
W (8.4m)
V (4.9m)
U (3.7m)
Z (1.6m)
T (1.8m)
S (4m)
19
20
21
22
23
24
26
27
Key
Boat Ramp (disused)
Culvert
Drain
Drain (disused)
Jetty
Pylon
Mangrove gap distance (A-Z in Appendix 2)
Ecotone Ecological Consultants Pty Ltd
Figure 6c. Point Source Disturbance Locations
Mangrove and Stream Bank Assessment, Pitt St, Taree
May 2008


0
25
50
metres
25
27
Y
(49.8m)
Z
(31.6m)
Key
Boat Ramp (disused)
Culvert
Drain
Drain (disused)
Jetty
Pylon
Mangrove gap distance (A-Z in Appendix 2)
Ecotone Ecological Consultants Pty Ltd
Figure 6d. Point Source Disturbance Locations
Mangrove and Stream Bank Assessment, Pitt St, Taree
May 2008

3.2 Bank Stability and Erosion Potential

Figures 7a to 7d provide a visual representation of the overall state of bank stability in linear sections along the Manning River and the unnamed tributary. Details of the bank condition along each section are included in **Appendix 4**.

The areas exhibiting the worst bank condition occur towards the western end of the study area (Figure 7a) where the bank was highest and where a rope swing was present. Use of the swing and regular human access has denuded the bank of most ground vegetation and initiated severe erosion, resulting in exposure of tree roots and compromising the stability of trees along this section of the bank. Because of the steepness of the bank, mangroves were relatively sparse in this area.

Other areas of poor bank stability occurred in more limited areas along the shoreline, and were usually related to access by horses, often combined with wave action due to passing power boats along the main river. Poor stability also occurred where a section of mangroves had died.

The most stable sections of bank occurred mainly at the eastern end along the Manning River, plus stretches in the central area where mangroves were dense and the bank was heavily vegetated. The sections of bank where the bank height was lower and less steep were also generally more stable. One section directly behind the concrete plant had been artificially stabilised by the pouring of large quantities of concrete on and at the base of the bank. This section had a higher stability rating for this reason plus the high level of plant cover. Many parts of the unnamed tributary also had a high stability rating where vegetation cover was high and access by horses too difficult.

It should be noted that sections with the best bank stability also frequently had the highest weed infiltration. Therefore, whilst the weeds assisted in maintaining bank stability, the ecological condition of these sections with regards floristic composition was poor.

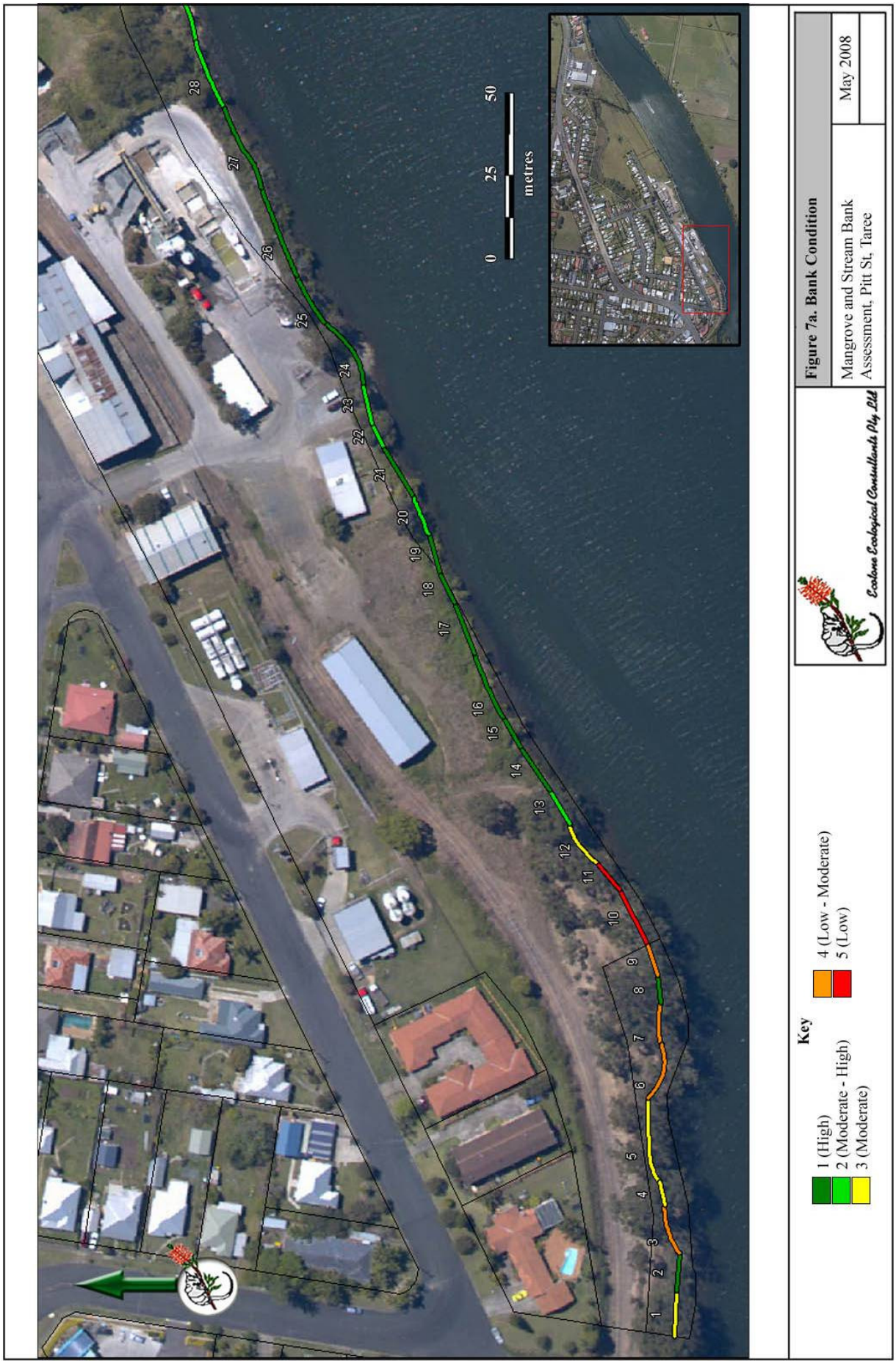
The main areas of occurrence of individual bank condition indicators is summarised as follows:

Erosion: This occurred at greatest intensity at the western end of the river (sections 3, 9, 10 and 11). Other major areas of erosion also occurred along short stretches in the unnamed tributary, due to access by horses (sections 68, 76-78, 80 and 84).

Slumping: This was relatively minor throughout the study area, and only appeared to occur west of the tributary mouth where the bank was lower and less rocky (e.g., sections 62 and 64 where mangroves had died).

Overhangs: These occurred sporadically along the length of the bank, but were never very deep or wide.

Aggradation: Minor areas of aggradation in the form of deposition of fine sand and silt (but not gravel or stones) occurred in the central part of the river bank (from section 35 east) and along the tributary banks where horses have destabilised short sections.


0
25
50
metres
Key
1 (High)
2 (Moderate - High)
3 (Moderate)
4 (Low - Moderate)
5 (Low)
Ecotone Ecological Consultants Pty Ltd
Figure 7a. Bank Condition
Mangrove and Stream Bank Assessment, Pitt St, Taree
May 2008


44
43
42
41
40
39
38
37
36
35
34
33
32
31
30
29
8
0
25
50
metres
Key
1 (High)
2 (Moderate - High)
3 (Moderate)
4 (Low - Moderate)
5 (Low)
Figure 7b. Bank Condition
Mangrove and Stream Bank Assessment, Pitt St, Taree
May 2008
Ecotone Ecological Consultants Pty Ltd


0
25
50
metres
Key
1 (High)
2 (Moderate - High)
3 (Moderate)
4 (Low - Moderate)
5 (Low)
Figure 7c. Bank Condition
Mangrove and Stream Bank Assessment, Pitt St, Taree
May 2008
Ecotone Ecological Consultants Pty Ltd


0
25
50
metres
67
66
65
64
63
62
61
60
82
83
84
85
86
87
88
89
81
80
79
78
77
76
75
74
Key
1 (High)
2 (Moderate - High)
3 (Moderate)
4 (Low - Moderate)
5 (Low)
Ecotone Ecological Consultants Pty Ltd
Figure 7d. Bank Condition
Mangrove and Stream Bank Assessment, Pitt St, Taree
May 2008

3.3 Assessment of Potential Impacts on Water Quality

The Concept Masterplan is very basic and lacks a key but it appears to include facilities such as marinas, a swimming pool, roads and building construction. Construction would require considerable excavation and dredging along the foreshore.

The water quality of the Manning River and its tributary within the study area will have to be protected both during construction of the facilities and once they are operational.

Best practice sediment and erosion control measures will need to be put in place during construction in order to contain runoff and treat runoff from land based construction and where the bank is to be excavated along the Manning River, the construction area will need to be completely isolated from the river water to avoid water pollution.

The water quality of any discharges from the Swimming Pool will need to be managed and sewage pump out facilities will be required at the marinas for moored boats. If any boat maintenance facilities are proposed at the marinas, additional water pollution protection measures will be required for those facilities.

The proposed arrangement of the marinas appears to avoid the potential for areas of water stagnation or scouring, but a full fluvial flow analysis should be carried out under the full range of river conditions to ensure that eddies are not created in these areas.

It is assumed that on-site stormwater management would be a requirement for the buildings and that only clean water would be discharged into the river.

The runoff from roads should similarly be treated prior to discharge to the river and gross pollutant traps are likely to be required.

Any discharge points to the river or the tributary should be below low water mark or via dissipaters in order to prevent bank erosion.

Further comment on the Concept Masterplan cannot be provided until further details are available.

4.0 DISCUSSION AND CONCLUSIONS

Overall, the current concept plan retains approximately 36% of the length of the shoreline along the Manning River in an unmodified condition. The remainder of the waterfront (approximately 64% of its length) would be removed and modified for the construction of marinas, wharves, moorings and a swimming pool. Most of the mangroves and riparian vegetation along the unnamed tributary would be retained under the current plan, apart from removal of a section towards the upper tidal limit and limit of mangroves for the construction of a road.

In terms of impacts on the mangroves, the current concept plan removes some of the areas of highest mangrove quality and abundance, particularly the placement of the large marina at the eastern end of the river shoreline.

Note that 'mangrove density' (Figures 4a to 4d) turned out to be a poor indicator of the 'quality' of a mangrove stand. This is because the areas where mangroves were present as large trees with wide canopies were also the areas where the density of mangrove trunks were the lowest due the large area occupied by the stands. In contrast, the areas of narrow mangrove stands often had the highest densities because the trees were much smaller with narrower canopies, and many more trunks occurred at higher density. The areas of highest density and narrower stands often coincided with the areas where the bank was steepest. A better indication of the quality and abundance of each stand of mangroves is given by the occupied area (Figure 3) and the ecological quality (Figure 5). On this basis, the stands of mangroves of highest conservation value occurred at the eastern end of the study area along the river, and along the unnamed tributary.

The current concept plan does not necessarily preserve the areas of best bank stability. For example, the proposed marina at the eastern end would remove most of the area with best bank stability (sections 58 to 67) with a few short areas of higher instability in between. The western part of the proposal would remove areas of alternating good and poor bank stability.

5.0 RECOMMENDATIONS

If possible, consider the following modifications to the concept plan:

- Shift the currently planned eastern marina further west, to west of the mouth of the unnamed tributary. This would avoid the highest quality area of mangroves and the best bank stability. Since this would link with the other central marina area along the shoreline, this would lessen the fragmentation of mangroves into smaller patches.
- Shift the central road a little further to the north at the eastern end, so that it crosses the unnamed tributary approximately at the existing small bridge, upstream from where the mangroves end. This would retain more mangroves.
- Wherever possible, minimise the length of waterfront occupied by marinas, berths, swimming pools and other structures, particularly in the areas identified as supporting higher quality patches of mangroves or of better bank stability.

In general:

- Following removal of horses and stock from the site, eroded areas along sections of the bank that will be retained should be stabilised and revegetated. A weed management plan should be prepared for weedy sections of the bank that will be retained. The plan should aim to progressively control weeds and promote native plant regeneration without creating bare soil and initiating further erosion.

Reference

Department of Natural Resources and Water, 2007. *Queensland Community Waterway Monitoring Manual*. Queensland Government, Brisbane.

6.0 APPENDICES

Appendix 1. Mangrove Stands Data Table

Shape ID	No. River Mangroves	No. Grey Mangroves	Canopy Density (%)	Av. Canopy Ht	Max. Canopy Ht	Ecological Condition*	Disturbance	Sig. Species or Features	Habitat Value	Area (m^2)	Stems per m^2	Notes
1	14	2	30	1	2	Good	None	None	Foraging/roosting birds; juvenile fish	15.09	0.07	
2	1	1	70	1	1	Moderate	Weeds	None	Foraging/roosting birds; juvenile fish	8.63	0.93	
3	54	9	70	1	1	Good	Bank erosion	None	Foraging/roosting birds; juvenile fish	229.87	0.52	
4	1	0	70	1	1	Good	Bank erosion	None	Foraging/roosting birds; juvenile fish	1.32	0.76	
5	100	20	50	2	8	Good	Weeds	None	Foraging/roosting birds; juvenile fish	80.49	0.78	Ballon vine in some sections of canopy; concrete block at E end
6	0	1	40	6	6	Good	Weeds	*Eucalyptus nicholii* above bank	Foraging/roosting birds; juvenile fish	4.48	0.45	Balloon vine in canopy
7	7	1	50	1	2	Good	None	None	Foraging/roosting birds; juvenile fish	16.14	0.99	
8	1	0	60	1	1	Good	None	None	Foraging/roosting birds; juvenile fish	1.34	0.75	
9	2	0	60	1	2	Good	None	Many small stems (river mangroves)	Foraging/roosting birds; juvenile fish	4.46	0.45	
10	4	10	20	1	6	Good	None	Many small stems (river mangroves)	Foraging/roosting birds; juvenile fish	112.54	0.12	
11	5	1	5	2	6	Good	None	mangroves very sparse along this strip	Foraging/roosting birds; juvenile fish	48.71	0.12	
12	14	5	70	2	7	Good	Rubbish	Many small stems (river mangroves)	Foraging/roosting birds; juvenile fish	162.19	0.12	Plastic bags, plastic bottles
13	16	4	80	2	5	Good	Weeds	Many small stems (river mangroves)	Foraging/roosting birds; juvenile fish	134.81	0.15	Balloon vine over canopy

Shape ID	No. River Mangroves	No. Grey Mangroves	Canopy Density (%)	Av. Canopy Ht	Max. Canopy Ht	Ecological Condition*	Disturbance	Sig. Species or Features	Habitat Value	Area (m^2)	Stems per m^2	Notes
14	14	2	65	2	7	Good	Rubbish	Many small stems (river mangroves)	Foraging/roosting birds; juvenile fish	123.43	0.13	Small amount of rubbish
15	8	3	80	2	5	Good	Rubbish	Many small stems (river mangroves)	Foraging/roosting birds; juvenile fish	34.71	0.32	Small amount of rubbish
16	29	11	60	3	13	Good	Drain	Many small stems (river mangroves)	Foraging/roosting birds; juvenile fish	293.05	0.14	Open drain from top of bank
17	61	22	50	4	10	Moderate	Rubbish	Many small stems (river mangroves)	Foraging/roosting birds; juvenile fish	691.97	0.12	Some dieback of grey mangroves
18	2	2	30	4	8	Moderate	Rubbish	some sections with regenerating river mangroves	Foraging/roosting birds; juvenile fish	29.63	0.13	Some dieback of grey mangroves; small amount of rubbish
19	27	29	40	6	10	Moderate	Rubbish	very few juvenile grey mangroves	Foraging/roosting birds; juvenile fish	577.86	0.10	Obvious dieback of grey mangroves; Small amount of rubbish
20	64	59	40	5	12	Moderate	None	juvenile river mangroves but no young grey mangroves	Foraging/roosting birds; juvenile fish	973.24	0.13	Grey mangrove dieback; Small amount of rubbish
21	2	3	30	4	6	Moderate	Weeds; unstable bank	unstable bank	Foraging/roosting birds; juvenile fish	65.35	0.08	No dieback, but weedy - lantana, balloon vine; dead fish; mangrove fallen over where bank has colla
22	7	4	20	6	10	Moderate	Weeds	many small birds using lantana & balloon vine	Foraging/roosting birds; juvenile fish	122.99	0.09	No dieback, but weedy - lantana, balloon vine
23	27	1	50	8	12	Good	None	None	Foraging/roosting birds; juvenile fish	234.32	0.12	
24	6	3	50	4	6	Moderate	Undercut bank	Undercut bank	Foraging/roosting birds; juvenile fish	147.48	0.06	Whole bank undercut under mangrove roots

Shape ID	No. River Mangroves	No. Grey Mangroves	Canopy Density (%)	Av. Canopy Ht	Max. Canopy Ht	Ecological Condition*	Disturbance	Sig. Species or Features	Habitat Value	Area (m^2)	Stems per m^2	Notes
25	200	40	50	5	15	Good	Rubbish	v. few juv. greys - clumps of juv. rivers	Hollows for bats; Foraging/roosting birds; juvenile fish	807.52	0.20	Small amount of rubbish
26	17	44	35	6	9	Good	Weeds	no juv greys, scattered clumps juv rivers	Foraging/roosting birds; juvenile fish	465.31	0.13	Many weeds - balloon vine, lantana, grasses, etc.
27	34	59	25	6	14	Good	Weeds	few juvs, mostly tall greys; some clumps juv rivers	Foraging/roosting birds; juvenile fish	1070.20	0.09	

Notes:
* Based on general tree health within the stand - no stands were observed to be in low condition during the field survey.

Appendix 2. Mangrove Gap Distances Data Table

ID	DISTANCE (m)
A	7.5
B	5.1
C	3.6
D	65.5
E	7.3
F	8.9
G	20.1
H	7.5
I	9.0
J	7.0
K	21.2
L	22.4
M	9.6
N	20.3
O	11.0
P	6.7
Q	8.0
R	1.2
S	4.0
T	1.8
U	3.7
V	4.9
W	8.4
X	3.5
Y	49.8
Z	1.6

Appendix 3. Point Source Disturbance Data Table

ID	TYPE	Easting (GDA94)	Northing (GDA94)	NOTES
1	Drain (disused)	450513	6469804	Appears disused
2	Drain	450521	6469803	Outlet
3	Boat ramp (disused)	450675	6469850	Disused
4	Drain	450808	6469912	Open drain from top of bank
5	Jetty	450936	6469981	Jetty juts out approximately 10m from edge of water
6	Pylon	451027	6470011	
7	Jetty (disused)	451037	6470020	Disused
8	Jetty	451069	6470030	
9	Drain	451070	6470026	PVC pipe runs along jetty and discharges above water about 10m from bank
10	Drain (disused)	451065	6470036	Old metal pipe (25cm diam) under water (appears disused)
11	Drain (disused)	451069	6470036	Old concrete pipe (30cm diam) runs along shore and into water (appears disused)
12	Pylon	451082	6470029	End of jetties & pilons
13	Drain	451075	6470042	Open drain from top of bank
14	Boat ramp (disused)	451647	6470392	Disused
15	Culvert	451472	6470391	Pipe culvert under bridge

Appendix 4. Bank Condition Data Table

Line ID	Bank Feature	Bank Ht (m)	Bank Slope (degrees)	Bank Overall Condition (1-5)*	Point Source Disturbance	Weed Infiltration (0-5)#	Notes
1	Overhang (0.5mx2m); Erosion (soil)	4	80	3	Drain (asbestos)	3	
2	Rocky; Erosion	4	60	1	Drain	3	
3	Rocky; Severe Erosion; Overhang to 1m deep	5	60	4	None	1	
4	Rocky; Moderate Erosion	6	70	3	None	1	
5	Rocky; Moderate Erosion; Overhang (0.5mx3m)	5	80	3	None	1	
6	Overhang (0.8m deep); Severe Erosion	6	70	4	Rope swing	1	
7	Severe Erosion	4	80	4	None	0	
8	None	4	45	1	None	2	
9	Severe Erosion; Overhang (1mx3m) (eroded under tree roots)	4	50	4	None	0	
10	Severe Erosion; Overhang (0.5mx8m) (eroded under tree roots)	4	80	5	None	0	
11	Severe Erosion; Overhang (0.5mx8m) (eroded under tree roots) (cont. from 10)	3	45	5	None	1	
12	Erosion	3	50	3	Minor rubbish	1	lantana
13	Very Minor Erosion	3	60	2	None	1	
14	No erosion or degradatation	2	30	1	None	2	
15	No erosion or degradatation	3	45	1	Concrete blocks	4	
16	No erosion or degradatation	4	45	1	None	5	
17	No erosion or degradatation	3	45	1	Concrete blocks	5	
18	No erosion or degradatation	3	50	1	Big log	5	
19	No erosion or degradatation	3	45	1	Large concrete block	5	
20	Minor Erosion	2	60	2	Concrete blocks	5	
21	No erosion or degradatation	3	30	1	None	5	
22	Minor Erosion	3	45	2	Concreted bank	4	
23	Minor Erosion; Small Overhang (0.3mx1m)	3	70	2	Concrete blocks & concreted bank	4	
24	No erosion or degradatation	2	30	1	Concreted bed	4	
25	No erosion or degradatation	3	40	1	Open drain from concrete plant	4	
26	No erosion or degradatation	3	45	1	Concreted	5	

Line ID	Bank Feature	Bank Ht (m)	Bank Slope (degrees)	Bank Overall Condition (1-5)*	Point Source Disturbance	Weed Infiltration (0-5)#	Notes
27	No erosion or degradatation	3	45	1	Concrete at base	5	
28	Very Minor Erosion	2	70	2	Concreted bed	5	
29	Minor Erosion; Overhang (Concrete breaking up)	2	25	2	Concreted bed	5	
30	Minor Erosion; Degradation	3	30	3	Jetty (juts out 10m into water); concreted bed	5	directly behind fish coop
31	No erosion or degradatation	3	30	1	None	5	
32	No erosion or degradatation	5	60	1	None (no concrete)	5	
33	No erosion or degradatation	2	25	1	Small amount of rubbish	5	
34	No erosion or degradatation	4	30	1	some concrete rubble&rubbish; start jetty structur	5	jetty
35	No erosion; minor aggradation	2	85	2	pvc pipe along jetty (discharges 10m from bank)	5	bank concreted under & adjacent jetty; metal pipe under water; concrete pipe along shore into water
36	No erosion or degradatation	4	45	1	some rubbish & old tyres	5	many oyster shells
37	Moderate Overhang (1mx8m); Degradation	3	50	3	None	4	
38	Overhang (0.3mx15m)	3	30	3	Some rubbish (a few plastic bags)	4	
39	Overhang at water level (0.3mx5m)	3	30	2	Some rubbish	4	
40	Minor Erosion	2	20	2	Minor rubbish	5	
41	Very Minor Erosion	2	15	2	Minor rubbish	5	
42	Overhang (0.5mx4m); Minor Erosion, Minor Slumping	2	90	4	Minor rubbish	4	
43	Some Erosion of bank (undercutting mangroves)	2	25	2	Minor rubbish	5	
44	Some Erosion of bank; Deposition of fine sand	2	90	3	Minor rubbish	5	
45	Minor erosion	2	80	2	None	5	
46	Overhang (cutting under mangrove base 0.2mx2m); Erosion/minor slumping of bank; aggredation of fines	2	80	4	Minor rubbish	5	
47	Minor erosion	2	80	2	None	5	
48	Overhang (0.5mx2m); Moderate Slumping; Aggradation of fine sand	2	80	4	None	5	
49	Minor Overhang	2	30	2	None	5	
50	Bank washed away - mangroves fallen over	2	20	3	None	5	

Line ID	Bank Feature	Bank Ht (m)	Bank Slope (degrees)	Bank Overall Condition (1-5)*	Point Source Disturbance	Weed Infiltration (0-5)#	Notes
51	No erosion or degradatation	2	40	1	None	4	
52	Minor aggradation	2	45	2	None	5	
53	No erosion or degradatation	2	20	1	None	5	
54	Very Minor Overhang	1	10	2	None	3	
55	Major aggradation ('beach' 2mx12m); Overhang (0.75mx2m)	2	45	3	None	4	
56	No erosion or degradatation	2	40	1	None	4	
57	Aggradation (sand - 10m long); Overhang (0.5mx2m)	2	70	3	None	5	
58	No erosion or degradatation	2	40	1	None	5	
59	Sticks & timber washed up - No erosion or degradatation	2	30	1	None	4	
60	Erosion; Slumping; Aggradation (10m wide)	1	90	4	None	4	
61	No erosion or degradatation	1	20	1	None	4	
62	Erosion & slumping	1	45	3	None	4	
63	Little 'spit' - no erosion, but slumping & erosion either side of this point	1	20	1	None	3	
64	Erosion & slumping	1	45	3	None	4	
65	No erosion or degradatation	1	5	1	None	3	
66	No erosion or degradatation	1	20	2	Concrete (old boat ramp)	4	
67	No erosion or degradatation	2	20	1	None	3	
68	Erosion	2	75	3	Bare soil - bare bank	3	
69	Very Minor Erosion	2	35	2	None	4	
70	Minor Erosion due to cattle	2	35	2	None	3	
71	Very Minor Erosion (cattle track)	2	60	1	None	4	
72	No erosion or degradatation	2	45	1	None	5	
73	Very Minor Erosion	2	45	2	None	5	
74	Minor Erosion; Widespread bare soil	2	40	3	Dumped cattle iron	3	
75	No erosion or degradatation	2	60	1	None	4	
76	Moderate erosion; Minor aggradation	2	40	4	None	1	
77	Moderate erosion and aggradation	2	70	4	Horses - side branch of ck to west	3	
78	Moderate erosion & aggradation; bare soil	2	45	3	Horses, animal burrow on bank	3	
79	Very minor bare soil	2	30	2	Horses	2	

Line ID	Bank Feature	Bank Ht (m)	Bank Slope (degrees)	Bank Overall Condition (1-5)*	Point Source Disturbance	Weed Infiltration (0-5)#	Notes
80	Severe erosion	2	30	4	Horses	2	
81	Very minor erosion	2	30	2	Pipe under bridge at northern end; horses	5	
82	No erosion or degradatation	3	40	1	Corrugated iron, fence, etc.	5	
83	No erosion or degradatation	2	60	1	None	5	
84	Moderate erosion	2	80	3	None	3	
85	Minor bare soil	2	60	2	None	3	
86	Minor basal erosion	2	60	2	None	5	
87	Minor basal erosion	3	60	2	Minor rubbish in stream	5	soil loamy
88	Minor Erosion; bare soil	3	60	3	None	2	
89	Minor basal erosion	2	50	2	None	5	
90	Minor basal erosion	2	45	2	None	5	
91	No erosion or degradatation	2	50	1	None	5	
92	Moderate basal erosion	2	60	2	None	2	
93	Minor basal erosion	3	70	2	None	4	
94	Very Minor Erosion at base	3	45	2	None	3	
95	No erosion or degradatation	2	60	1	None	4	

Notes:
* where 1 = best condition and 5 = worst condition
# where 0 = no weeds present and 5 = only weeds present