

# River Engineering

## Asset Condition Summary

**June 2022**



## 1. Introduction

Asset condition is a measure of the physical state of the asset and is visually assessed by staff on an annual basis. Environment Canterbury has several methods to monitor the condition of the rating districts assets. This information is critical to the overall life cycle management of the assets, with regards to maintaining the asset at minimum cost, whilst maintaining the required level of service, forecast renewal requirements and prioritising works. The assets are inspected depending on the asset type and the importance of the asset.

Condition information is currently available for some of Environment Canterbury's river and drainage scheme assets, but not all. For very localised schemes, the asset management compliance report is sufficient to summarise the condition of assets, these are completed on a yearly basis.

The asset types that have had a documented condition assessment include:

- Stopbanks
- River berms (includes assessment of the relative erosion protection value of trees, groynes and rockwork)
- River fairways (not included in asset valuations but a critical part of scheme capacity)
- Drains

Condition assessments are typically on a 1-5 scale, where 1 means excellent condition, 3 may be adequate or with minor deficiencies and 5 is very poor condition, or not fit for purpose.

Culverts and other structures tend to be inspected frequently and have generally also had some condition assessment but the documentation for these assessments is ad hoc and not easily summarised.

## 2. River Scheme stopbank condition assessments

There are two main types of documented stopbank condition assessment.

1. Localised defect condition assessment: These are programmed to be assessed in a systematic way, but the assessments can also be added to frequently as issues arise (ad hoc and post-flood event).
2. Reach defect condition assessment/standard assessment: The localised defect assessments feed in to a "standard" assessment of sections of stopbank typically 2-5km long. These assessments are more generalised and on a longer cycle. These generalised assessments can form part of stopbank risk assessments, which assess the likelihood and consequences of failure of a stopbank, but are not reported on here.

### 2.1 Localised stopbank assessments

For most schemes, only moderate and significant localised defects are recorded (3's, 4's and 5's).

The Stopbank reach condition score is based on how the most significant defects can influence the likelihood of failure during a design flood event.

Some schemes have a more detailed localised defect record, including very minor defects

(1's and 2's), which in general do not influence the score for a length of stopbank.

Table 1: Localised defect condition assessment scoring example

Score	Severity	Examples
<b>1</b> (Excellent)	Localised, barely noticeable	Woody/shrubby weeds, Rabbit scratchings, Good tie-in with a well-constructed groyne, track, or structure
<b>2</b>	Noticeable	Locally steep batters at culverts, Minor stock damage
<b>3</b> (Acceptable)	Evident, a cause for concern	Rabbit hole, Tree growing on bank, Crack traceable part way through bank or 1x top width along bank, Poor tie-in with moderately vulnerable groyne, track or structure adjacent to the bank, Evidence of seepage adjacent to a structure through the bank, Poor grass growth, Well-worn bike/4WD track
<b>4</b>	Significant	Significant stock damage, Insufficient topsoil for grass to grow, Excessive shading, Bike/4WD track that has gouged a path and reduced level of top of stopbank.
<b>5</b> (Vulnerable)	Extensive, major weak point in structure	Stopbank toe undercut >0.5m, Extensive rabbit network, Large, shallow-rooting tree, Vulnerable tie-in with eroding groyne or track, Poor tie-in with a structure through the bank, Significant level deficiency

## 2.2 Summary of condition assessments of Ecan stopbanks 2020-2022

A “standard” stopbank (and floodwall) condition assessment has been undertaken for several schemes, with a “reach” or section of bank assigned a score according to the weakest link in that bank.

Table 2: Asset Condition as of June 2022

		Number of reaches in each category					
		1	2	3	4	5	Not assessed
<b>Kaikoura Rivers 34km</b>	Kowhai River		6	6	3		10
	Mt Fyffe streams		5	7	1		7
<b>Ashley River Scheme 35km</b>		1	13				
<b>Waimakariri - Eyre - Cust Scheme 145km</b>	Waimakariri River	10	10				3
	Eyre, Cam, Cust, other	1	2	4	1		15

Table 2: Asset Condition as of June 2022, continued

		1	2	3	4	5	Not assessed
Dry Creek 1km	Dry Creek	1		1			
Ashburton Rivers Control Scheme 77km	Ashburton Main Stem			3			6
	Ashburton North Branch		4	3	2	1	6
	Ashburton South Branch		1		1		
Lower Hinds River Control Scheme 20km	Lower Hinds River				1		4
Upper Hinds Catchment Control Scheme 2km	South Branch Hinds River				1		
Orari - Waihi - Temuka Rivers 128km	Orari River and tributaries	3	2			1	11
	Waihi River	1	3	2	1		8
	Temuka River		2	1			3
	Opihi River left bank d/s Temuka and Milford			2			1
Opihi Catchment Control Scheme 72km	Opihi River		3				13
Seadown Drainage 9km			1				1
Lower Pareora River 28km	Pareora River			4	1		1
Waihao Wainono Rivers and Drainage 62km	Waihao River			5			
	Waihao Arm			1	2		
Total		17	52	39	14	2	89
	12 schemes representing 612km of stopbanks	14% of those assessed	42%	31%	11%	2%	42% of all stopbanks in these schemes

The condition of the Selwyn River stopbanks (22.5km) were documented in 2017 but the assessment was superseded by the May 2021 floods when a post-flood inspection was undertaken, including one significant stopbank breach. The stopbank scores were not reassessed but the most significant repairs have since been completed.

The following stopbanked schemes have not had recent condition assessments:

Table 3 Stopbanks yet to be assessed

River/ scheme	Length to be assessed (km)	Priority
Lyndon	0.80	Medium
Waiau Township	0.33	Low (new build)
Sefton	5	Medium
Washdyke Creek	4.6	Medium
Penticotico	3	Medium
Rangitata River	3.6	Low (recently rebuilt)
Waiau Spotswood	2.3	Low (informal banks)
Total	19.63 km not assessed	

In addition, 550m of stopbank on the Upper Chatterton and Hanmer West scheme built by developers have not been formally adopted by the scheme and have not been assessed.

## 2.2 Fairway and berm condition assessments:

Fairway and berm condition assessments were undertaken for a number of rivers in 2020 and 2021. The assessments were based largely on aerial photography from around 2017 and were supplemented in places by more recent Google and satellite images. The desired fairway widths and ideal and minimum buffer widths are assessed before scoring.

Table 4 shows the scoring examples for each condition score given.

Table 4: Scoring examples

Score	Condition description	Fairway examples	Berm buffer examples
1	Ideal, excellent, highly resilient	Within design channel alignment and bed levels, little vegetation	Wide berm, healthy, uniform density, height, and root mass
2	Good	Minor bed or bank erosion, few woody weeds within design channel	Minor bank erosion, rubbish
3	Adequate, fit for purpose, moderate	Moderate bed erosion, debris or vegetation restriction, mainly within design channel alignment	Good berm width, minor disease or insect damage, some weed infestation

4	Poor	Parts need realignment, significant erosion or bed build-up or vegetation restriction	Berm somewhat vulnerable, significant silt build-up
5	Inadequate, very poor	Well outside of design channel alignment, large areas of debris or vegetation obstructions	Very narrow berm, major bank erosion, significant weed infestation

Table 5 shows the overall scoring for the rivers assessed in 2020 and 2021.

Table 5: Fairway and berm condition assessments by river

### Percentage of fairway and berm in each category

River or scheme	1	2	3	4	5
Kowhai River 11.5km	43%	19%	25%	9%	5%
Ashley River 22km	34%	28%	26%	13%	0%
Hanmer West-Chatterton River 2km	7%	10%	39%	36%	9%
North Kowai River (part) 1.5km	2%	11%	37%	23%	26%
Kowai River (incl South Branch) 6km	6%	13%	44%	32%	4%
North Rakaia 27km	23%	34%	29%	11%	3%
Lower Rakaia River 42km	16%	13%	28%	26%	17%
Ashburton Rivers 157km	42%	25%	22%	9%	2%
Lower Hinds River 26.5km	1%	25%	44%	28%	2%
Upper Hinds River 48km	11%	18%	47%	13%	11%
Orari - Waihi - Temuka Rivers 51.5km	13%	27%	39%	13%	8%
Opihi River 110.5km	23%	25%	27%	18%	7%
Pareora River 19.5km	4%	15%	47%	24%	9%
Lower Waitaki River (fairway only) 59.5km	12%	39%	33%	16%	0%
Average (584.5km)	17%	22%	35%	19%	7%

A fairway and berm assessment will be programmed for those rivers where it is appropriate (as shown in table 6 below). For some of the smaller rivers, an overall condition will be worked out rather than individual fairway and berm assessments.

Table 6: Rivers left to have fairway and berm assessments completed

River	Priority	Length to be assessed (km)
Waimakariri, Eyre, Cust	High	105
Lower Waitaki (berms)	Med-high	56
Selwyn	Med	74
Kaiapoi	Med	8
Kowhai, Waimangarara, Lukes	Med	35
Waiau	Med	45
Pahau	Med	14
Waihao	Med	9
Conway	Low	9
Mason	Low	7
Percival	Low	11
North Kowai	Low	10
Twizel	Low	6
Omarama	Low	6
Penticotico	Low	4
Otaio	Low	46
Lower Hurunui (fairway only)	Low	15
Dry Creek	Low	1
Total		461

### 3 Drain and watercourse condition assessments

#### 3.1 Kaikoura Drainage scheme

In 2020, e2 Environmental was engaged to carry out a condition assessment of the Kaikoura Drainage scheme as part of the Kaikoura schemes review. Overall, the assessment covered channels, structures, planting, erosion and deposition, and fish passage. The current objectives of the scheme relate to the drainage function only and not the other aspects assessed, such as adequacy of riparian planting. The scheme was given an overall rating of moderate. This is reflective of the overall scheme serving rural catchment with and designed primarily to provide drainage function with relatively low levels of service on much of the scheme.

The following table details the percentages of assets (by length) and their associated rating.

Table 7: Percentage of channels for each rating in each part of the assessment

	<b>1 Very Good</b>	<b>2 Good</b>	<b>3 Moderate</b>	<b>4 Poor</b>	<b>5 Very Poor</b>
<b>Drainage Channel</b>	1%	14%	30%	51%	4%
<b>Bridge/ Culvert</b>	8%	35%	32%	26%	0%
<b>Riparian planting</b>	2%	9%	19%	43%	26%
<b>Scour/ erosion</b>	73%	9%	9%	8%	0%
<b>Deposition</b>	80%	10%	8%	0%	2%
<b>Erosion protection</b>	0%	6%	85%	9%	0%
<b>Fish passage</b>	19%	71%	6%	3%	1%
<b>Overall rating</b>	1%	8%	58%	33%	0%

Other drainage schemes have not had a documented condition assessment, though there is frequent monitoring for obstructions, which informs the day-to-day work priorities.

## 4 Culverts, floodgates, floodwalls and other structures

Culverts with flapgates and floodgate structures are inspected frequently for blockages, in particular when there are heavy rain warnings relevant to each catchment.

About 50% of the culverts had a CCTV inspection several years ago, which informed the works programme for remediation. All are due for reinspection.

All of the culverts and floodgate structures were included in an evaluation of fish passage and included in a prioritisation programme for fish passage upgrades, which is underway.

Environment Canterbury manages 5 floodwalls of various sizes and types, which have been subject to their own inspections on an ad hoc basis. In general, they are in good or adequate condition.

The Waihao Box has not had a specific recent condition assessment but had a significant upgrade of the nose section in 2013.

Table 8 Summary of types of assessment by scheme

				Scheme type				Condition Assessment			
	Area	River/Tributary	Design flood size (cumecs)	Flood protection	Erosion protection	Fairway clearance	Drainage	"stopbank condition assesment "	"Fair way and berm assesment "	"length assesed to be assesed"	"asset management compliance report"
Comprehensive River Schemes	North	Waimakariri Eyre Cust	4730	x	x	x	x	✓	TBC	144	
	South	Opihi CCS	3460	x	x	x	x	✓	✓		
		Orari-Waihi-Temuka	1200/150/720	x	x	x	x	✓	✓		
	North	Ashley	2400 (3000)	x	x	x		✓	✓		
		Kaikoura Rivers + Drainage		x	x	x	x	✓	✓		
	Central	Ashburton River	1350/850/550	x	x	x		✓	✓		
		Selwyn River	560	x	x	x		TBC	TBC	74	
	South	Rangitata River	1500	x	x	x		TBC	TBC	3.6	
		Pareora	500	x	x	x	x	✓	✓		
		Waihao Wainono Combined	975	x	x	x	x	✓	TBC	9	
	Central	Upper Hinds	164	x	x	x		✓	✓		
		Lower Hinds	164	x	x	x		✓	?		
Localised River Schemes with urban benefit and/or stopbanks	North	Waiau Town Area	N/A (MAF 1020)	x	x	x		TBC	TBC	45	
		Hanmer West- chatterton River	-120	x	x	x	x	N/A	✓		
		Sefton Ashley	N/A	inf			x		N/A		✓
		Kowai Leithfield	Not defined	x	x	x		N/A	✓		
	Central	Rakaia Double Hill	Not defined	x	x	x		N/A	N/A		✓
		Dry Creek	Not defined	x	x	x		✓	TBC	1.3	
		Washdyke Creek	280	x	x	x		TBC	TBC	4.6	✓
	South	Seadown Drain	coastal overtopping	x			x	✓	?	8.8	
		Saltwater Creek	85	x		x		?	TBC	3.37	
		Penticotico	52	x	x	x		TBC	?	3	✓
		Twizel River	113/255	x	x	x		N/A	N/A		✓
Large Schemes with no flood protection	South	Lower Waitaki River	N/A (MAF 1200)		x	x		N/A	✓		
	Central	Lower Rakaia	N/A (MAF 2500)		x	x		N/A	✓		

Table 8 Summary of types of assessment by scheme, continued

Localised River Schemes - Erosion protection only	North	Conway River			x	x			TBC	9	
		Waiau Rotheram			x	x		TBC		0.33	
		Lyndon			x	x		TBC		0.8	
		Lower Flats Waiau			x	x			TBC	0.3	
		Waiau Bourne	N/A (MAF 1020)		x	x		N/A	TBC	3.5	
		Waiau Spotswood	N/A (MAF 1020)		x	x		TBC	TBC	6.5	
		School Creek				x		N/A	N/A		
		Upper Pahau			x	x		N/A	TBC	4	
		Lower Pahau			x	x		N/A	TBC	10	
		Lower Hurunui				x		N/A	TBC	25	
		Kowai North Branch			x	x		N/A	✓		
		Sefton Town				x		TBC	N/A	5	
	Central	Little River Wairewa				x					
		North Rakaia	MAF 2500		x	x		N/A	✓		
		Cleardale			x	x		N/A	N/A		✓
		Mt Harding Creek			x	x		N/A	N/A		✓
		Staveley S.W Channel				x		N/A	N/A		✓
	South	Upper Waitaki Rivers				x		N/A	N/A		✓
		Taitarakihi Stream				x		N/A	N/A		✓
		Otaio River			x	x		N/A	TBC	46	✓
		Esk Valley			x	x		N/A	N/A		✓
		Makikihi River			x	x		N/A	N/A		✓
		Omarama Stream		inf	x	x		N/A	N/A		✓
Large Drainage Schemes	Central	Ashburton Hinds					x	N/A	N/A	N/A	✓
		Halswell River Drainage		inf			x	N/A	N/A	N/A	✓
		Te Waihora/Lake Ellesmere					x	N/A	N/A	N/A	✓
Small Drainage Schemes	Central	Prices Valley					x	N/A	N/A	N/A	✓
		Greenstreet Creek					x	N/A	N/A	N/A	✓
		Buttericks Rd Drain					x	N/A	N/A	N/A	✓
		Chertsey Rd Drain					x	N/A	N/A	N/A	✓
	South	Kapua Drain					x	N/A	N/A	N/A	✓
		Seadown Road Drain					x	N/A	N/A	N/A	✓

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