Dr Adrian Meredith

Summary of CPW evidence

Environment Canterbury
Your regional council

Scope of Summary points

- **Waimakariri River Flow and Water Quality**
  - Comment on: habitat modelling, water quality issues, fine sediment issues, algal issues, river discharges – sluicing, bywashes, industrial (SFF), and ultimately flow regimes.
  - Applicability to Rakaia River situation also
- **River Intake Screening**
  - Comment on screening requirements, management plan approach, other recent consents (HDIS, RDR, NTPL), alternative approaches – RDR.
- **Reservoir Issues**
  - Water Quality Management
  - Case study Opuha
  - Mudfish issues

Waimakariri River Flow and Water Quality

- **Habitat modelling**
  - Confusing array of modelled outcomes
  - HSI, WUA, depth, velocity, width
    - 1. do not consider qualitative aspects

    (assume everything remains the same –no degradation of habitat quality (sediment or algae))
    - 2. assumes uniform habitat quality across river
  - Produces an array of simple species and community outcome curves
    - Useful starting point
    - But need ‘common sense’ truthing
  - Assumes habitat is limiting (Burrell evidence)

Waimakariri River Flow and Water Quality

- Clear requirement for flows
- 2
- 3
- 4

Waimakariri River Flow and Water Quality

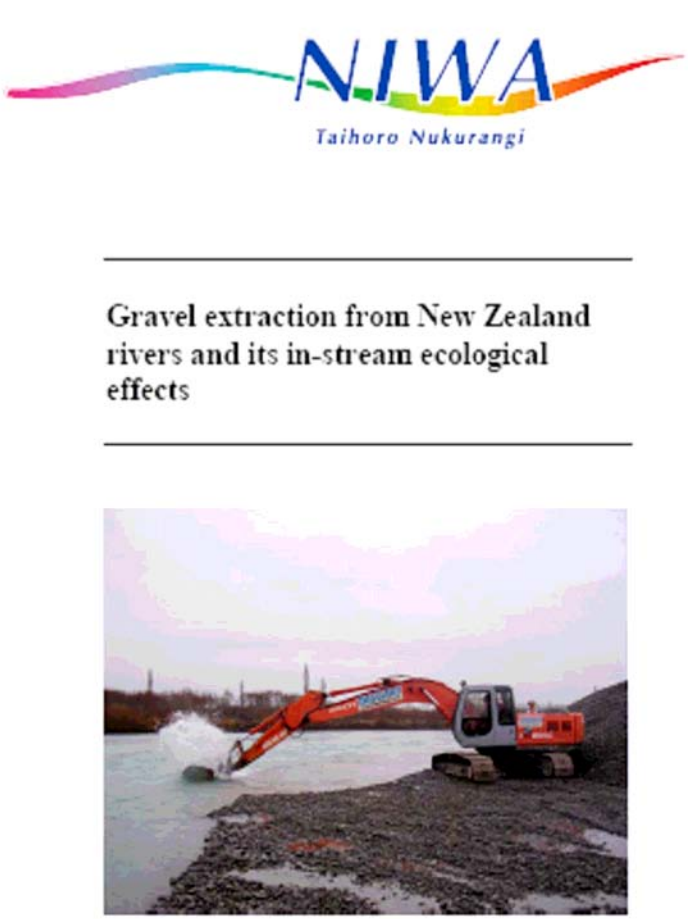
- Water Quality issues
  - water quality (in the strict sense) will not be directly affected by abstraction alone, remaining issues:
    - Clarity issues
    - Sedimentation
    - Algal growth
    - Bywashes,
    - Sediment sluicing
    - Industrial discharges

- These issues are either ignored or over simplified in assessments, and may not be an adequate representation of likely outcomes

Waimakariri River Flow and Water Quality

- Clarity Issues
  - Considerable discussion of changing water clarity down the river by Dr Hayes, and others based on NIWA national network data
  - All fail to identify in-river gravel abstraction in Wrights cut as a potential confounding factor
  - Studied by NIWA 2003
  - Studied by FH 2005

Waimakariri River Flow and Water Quality



Fulton Hogan

Investigation on the Effect of Gravel Extraction on the Clarity and Fishability of the Waimakariri River.

Mark Broughton

February 2005

Waimakariri River Flow and Water Quality

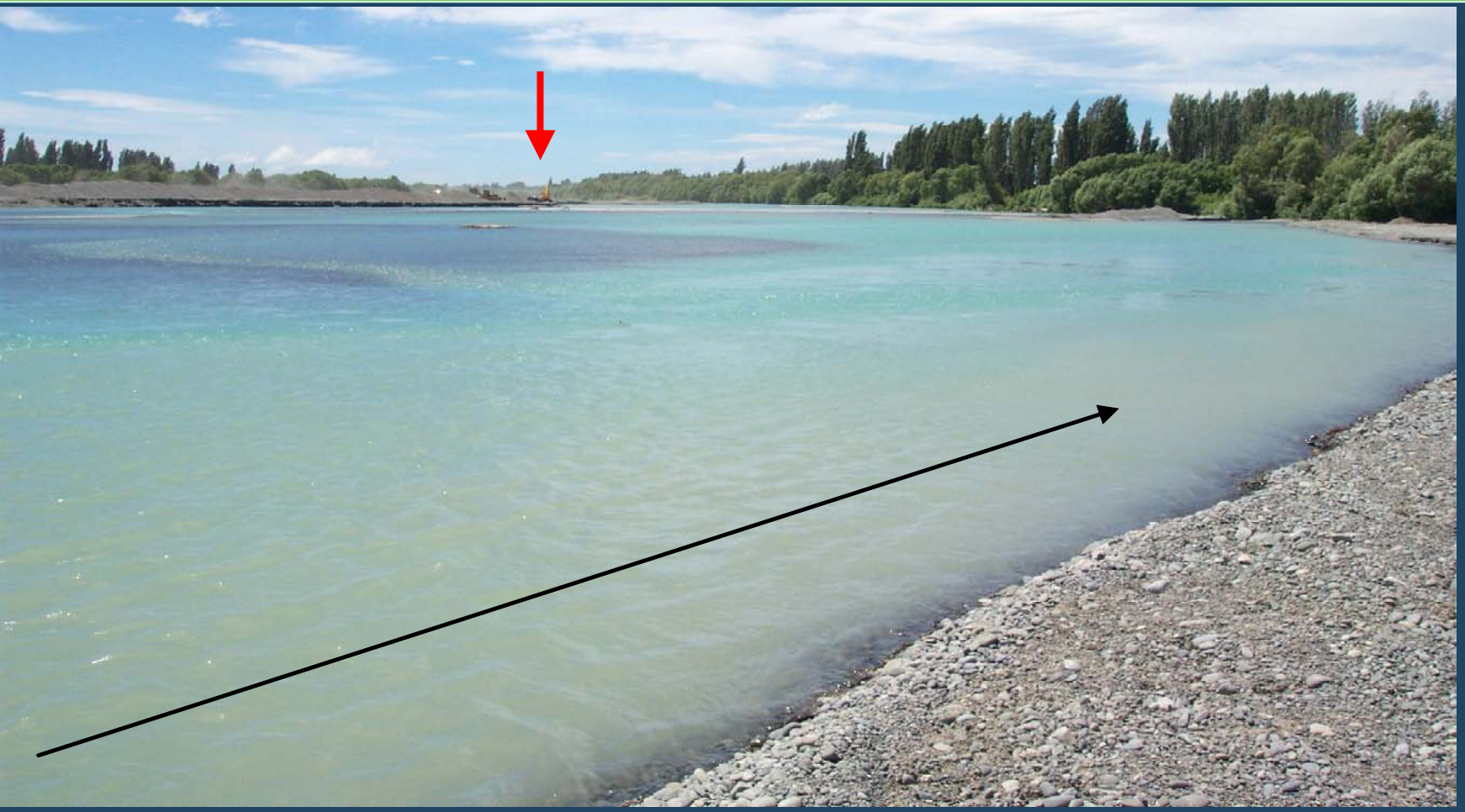


Figure 6. Brown Sediment Plume propagating downstream of extraction point.

From FH 2005: Showing effect of abstracter, note further abstraction downstream.

Waimakariri River Flow and Water Quality

Figure 9: Waimakariri River looking upstream towards the SH1 Bridges, 9 June 2003. The stockpiled gravel would be removed if flooding was predicted. Note the disturbance due to recreational four-wheel-drive vehicles.

Waimakariri River Flow and Water Quality

Consented abstracters within 2km of SH1 bridge in 2005

(From FH 2005)

7.6 Total present gravel extraction volumes allocated by Environment Canterbury on the Waimakariri River

Consent Number	Consent holder	Permitted Extraction Volume (m^3) per annum
CRC 000851	March Construction Limited	**100,000**
CRC 002132	Laurie Kiesanowski Truck Hire Limited	2,000
CRC 010089	K B Quarries Limited	25,000
CRC 012192	Mr Barry Henry Grant Foster	50,000
CRC 030898	Dormer Construction Limited & Blakely Construction	20,000
CRC 031157	Mr Peter John Clifford Thorn	2,000
CRC 962059	Christchurch Ready Mix Concrete Limited	80,000 SITE A 70,000 SITE B
CRC 960369	Brooklands Properties 2000 Limited	250,000 TOTAL and limit of 100,000 downstream of highway bridge
CRC 040170	Living Earth Limited	20,000
CRC 962266	Mr Paul Clifton Stemmer	30,000
CRC 970642	Taggart Earthmoving Limited	40,000
CRC 972307	**Fulton Hogan Canterbury**	**200,000**

Total: 895,000 m^3/annum

Waimakariri River Flow and Water Quality

- In-river gravel abstraction is an extensive and ongoing influence in lower Waimak
- It renders NIWA NRWQN data of limited use for clarity comparison
- It is an ‘effect’ on the lower river whose effects will be exacerbated by low flow regime
- It has not been considered

Waimakariri River Flow and Water Quality

- **Sedimentation**
  - Evidence of Dr Mabin (for CPW) and Mr Duncan (for ECan) is that sedimentation not a big issue quantitatively.
  - But, may be significant in a qualitative sense.

  - Often see increasing layer of fine silt across the river bed in low flow recessions. This will affect:
    - Algal communities: Cyanobacterial algal mats rather than filamentous
    - Macroinvertebrates: Chironomids rather than mayflies (see Burrell evidence)

    "Silt tolerant communities" – poor for fish, birds, recreation etc.

  - Effect will be exacerbated by accentuated flow recessions by major abstractions:
    - 80 cumec wq transcribed into 40 cumec flow = accentuated rate of fine sediment settlement more often
  - More often get silted bed of poor ecological quality, if not protected against by 'caps'

Waimakariri River Flow and Water Quality

- **Algal issues**
  - Evidence presented by CPW and submitters describe ‘risk’ of nuisance *filamentous algal growths* in river
  - But: we seldom see filamentous growth in main channels of Waimak R – sometimes see nuisance b/g MAT growth (NIWA NRWQN data)
  - Cyanobacteria mat growth is very different issue to filamentous growth
    - Very silt tolerant - motile
    - Potentially toxic and odorous
    - Tainting of fish flesh and aquatic life
  - Most complaints in lower river (below gravel abstractors), but does occur at gorge and below
  - Primarily due to fine sediment siltation and very stable flows – less due to nutrient issues.

River Intake Screening

Data from NIWA National River Water Quality Network

Site	Date formatted	Fila colour	Mat colour	F1	F2	F3	F4	F5	F6	F7	F8	F9	F10	M1	M2	M3	M4	M5	M6	M7	M8	M9	M10
				Filamentous										Mats									
SITE CH3 = WAIMAKARKIRI @ GORGE																							
CH3	25-Jan-89			-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CH3	22-Feb-89			-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CH3	30-Mar-89			-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CH3	27-Apr-89	G		10	5	5	0	0	0	0	0	0	0	10	10	10	10	5	5	5	5	5	5
CH3	24-May-89			10	5	5	5	0	0	0	0	0	0	10	10	10	10	10	5	5	5	5	5
CH3	21-Jun-89			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
CH3	19-Jul-89			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
CH3	24-Aug-89		GRY	0	0	0	0	0	0	0	0	0	0	10	20	20	20	20	0	0	0	0	0
CH3	21-Sep-89		B	0	0	0	0	0	0	0	0	0	0	90	80	20	10	0	0	0	0	0	0
CH3	25-Oct-89			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
CH3	22-Nov-89			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
CH3	20-Dec-89			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
CH3	24-Jan-90			0	0	-	-	-	-	-	-	-	-	0	0	-	-	-	-	-	-	-	-
CH3	21-Feb-90	G	B	10	10	0	0	0	0	0	0	0	0	100	100	100	100	80	60	0	0	0	0
CH3	21-Mar-90			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
CH3	19-Apr-90			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
CH3	23-May-90			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Black

Reoccurring incidences in both spring and autumn

Mats – 15 incidences in record,

Filamentous - 2 incidences in record

Waimakariri River Flow and Water Quality

Algal mats in Waimakariri River on tidally exposed islands below SH1

(30 March 2007)

Frequently the subject of publicity and complaints by:

Whitebaiters: Aug – Nov

Fishermen: Jan – Mar

Particularly 2005, 2007

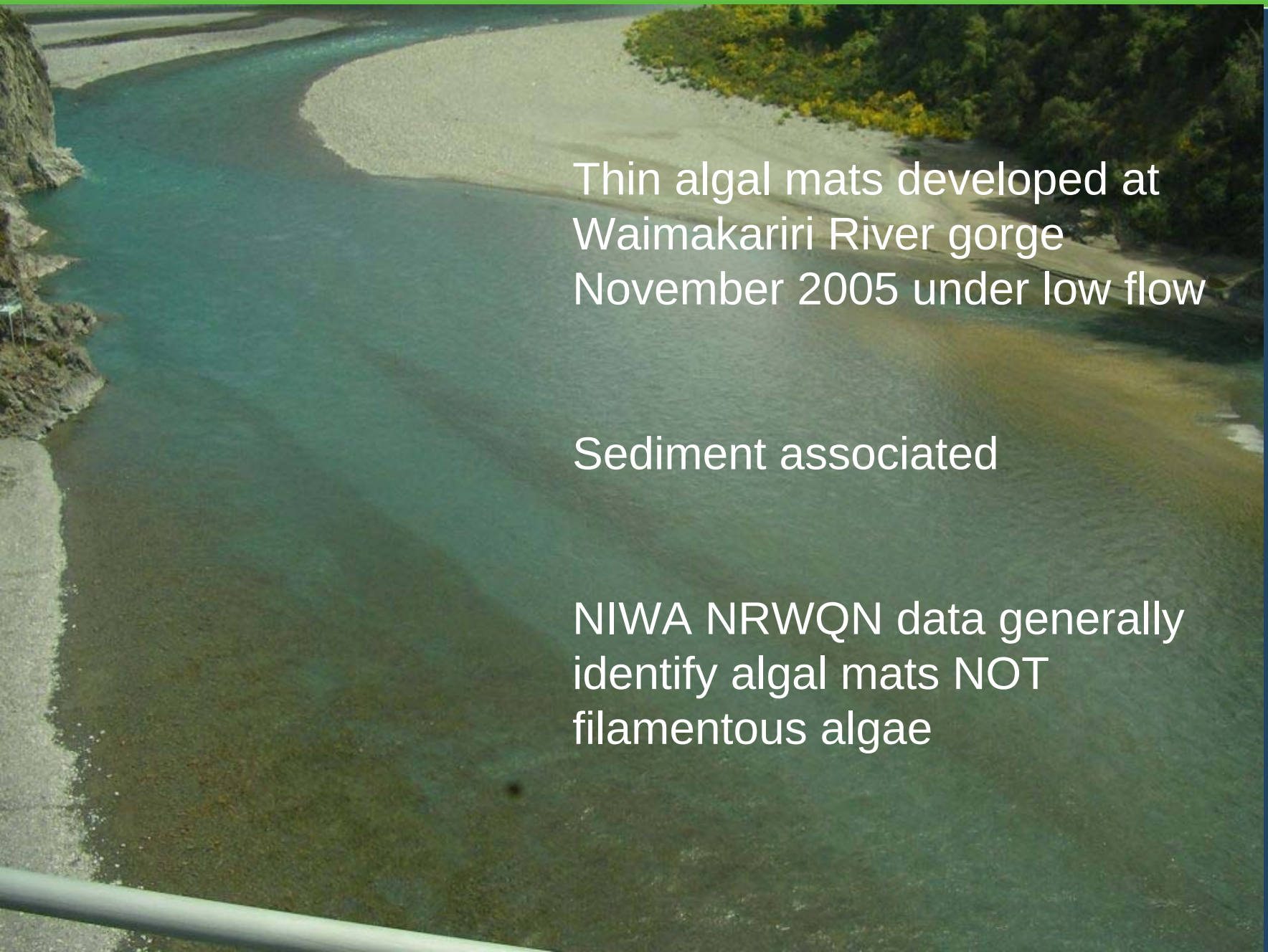
Waimakariri River Flow and Water Quality

- SH1 Sedimentation and algal mat issues are influenced by :
  - Tidal nature (low velocity)
  - Gravel abstracters (sediment)
  - SFF discharges? (nutrients)

- Not necessarily flow issues alone,
- But serve to illustrate the nature of the issues that can develop throughout the river, and that can be exacerbated in the lower river in particular, by extended low flow regimes:

“qualitative effects”

Waimakariri River Flow and Water Quality



Thin algal mats developed at Waimakariri River gorge November 2005 under low flow

Sediment associated

NIWA NRWQN data generally identify algal mats NOT filamentous algae

River Intake Screening

Data from NIWA National River Water Quality Network

Site	Date formatted	Fila colour	Mat colour	F1	F2	F3	F4	F5	F6	F7	F8	F9	F10	M1	M2	M3	M4	M5	M6	M7	M8	M9	M10
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CH3	21-Jun-89			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
CH3	19-Jul-89			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
CH3	24-Aug-89		GRY	0	0	0	0	0	0	0	0	0	0	10	20	20	20	20	0	0	0	0	0
CH3	21-Sep-89		B	0	0	0	0	0	0	0	0	0	0	90	80	20	10	0	0	0	0	0	0
CH3	25-Oct-89			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
CH3	22-Nov-89			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
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Waimakariri River Flow and Water Quality

- Algal Issues
  - Issues are NOT with filamentous algae
  - Issues are with algal mats
    - Not as modelled
    - Not range of effects predicted

Waimakariri River Flow and Water Quality

- Sediment sluicing and bywashes
  - Can't just view as "dilution"
  - Effects viewed in terms of qualitative issues
  - Sedimentation, algal mats
  - Not expedient to allow unregulated discharges
  - RDR to Rangitata – only discharge on floods - steeper, swifter river

Waimakariri River Flow and Water Quality

- **Industrial discharges – Silver Fern Farms**
  - ‘End of pipe’ consent controls
  - Assumes dilution and flushing
  - Not limited by WRRP min flow level
  - But: Widespread complaints:
    - Algal growths
    - Scums and films
    - Odour and discolouration
  - All implicated in SFF discharge effects but NOT due to current non-compliance
  - Will be an issue for any future reconsent (2010?)
  - Suite of issues will be exacerbated by flatlining or extending of low flow period.

  - Effects of CPW on SFF ‘effects’ could be reduced ensuring frequency of freshes and minimising duration of low flow periods

Waimakariri River Flow and Water Quality

- Range of Qualitative effects need to be considered to ensure acceptable outcomes
  - Not simplistic habitat modelling alone
  - Management of qualitative effects are probably more important
  - concern more visible effects

Waimakariri River Flow and Water Quality

- **Flow regimes required?**
  - Concur that WRRP regime inadequate
  - Require mechanisms that:
    - maintain freshes,
    - Reduce extent of accrual period
    - Prevent flat lining
  - Agree with Mr Duncan that a ‘gap’ between A and B block is expedient to achieve flow range of bird and recreational values (at least 17 cumecs)
  - Need to protect freshes (CPW mitigation)
    - Agree with Mr Duncan 100-130 cumec threshold
    - But also agree with Dr Hayes that an effective fresh has to have a duration element to effectively flush sediment, mats, etc. (12-24 hours despite reaching the 100-130 cumec threshold)
  - These would achieve mitigation of the quantitative (flow) and qualitative (habitat quality) requirements

Reservoir Issues

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Reservoir Issues

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Reservoir Issues

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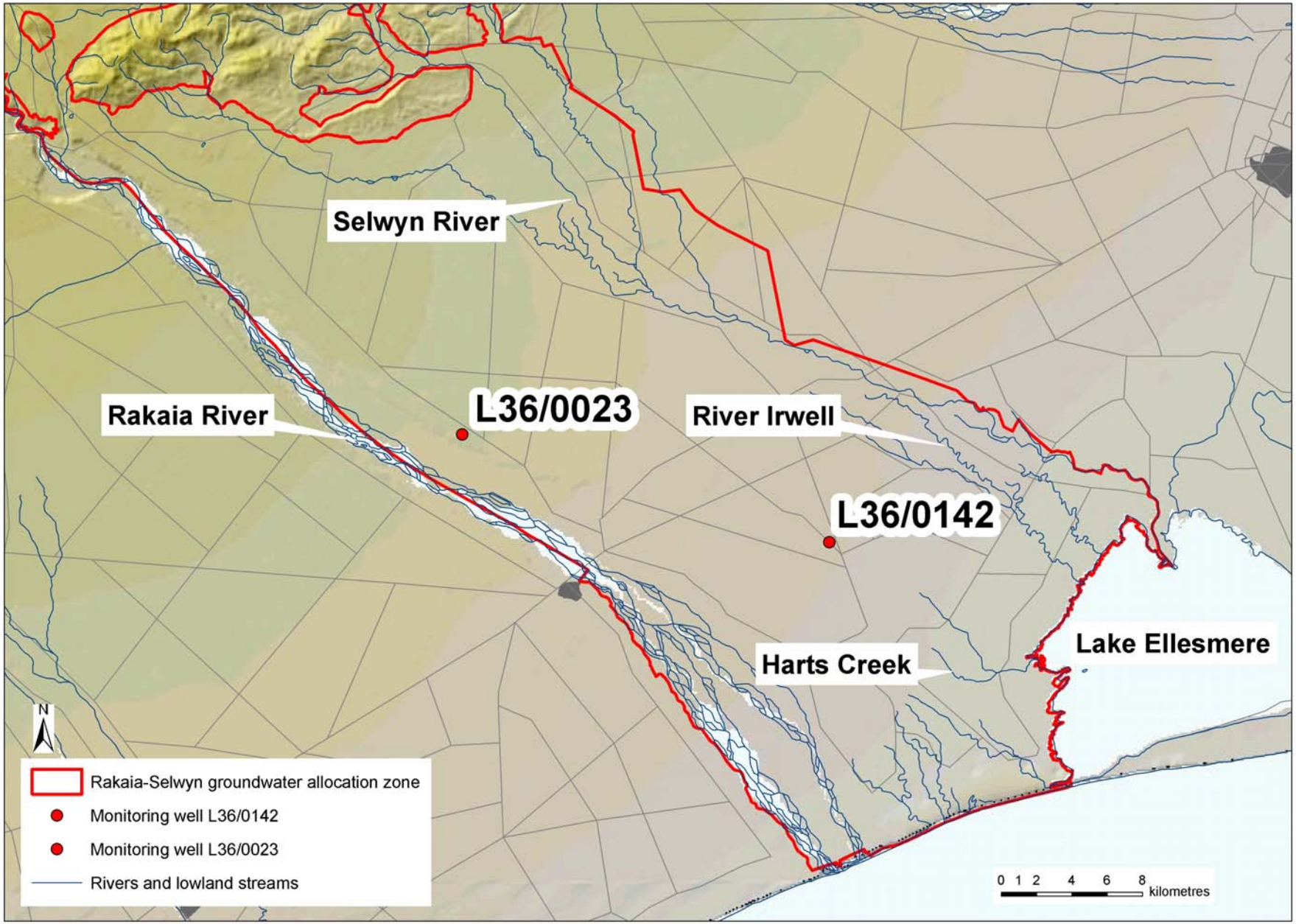

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