Greater Heretaunga and Ahuriri Land and Water Management Collaborative Stakeholder (TANK) Group

TANK

Meeting 31:
17 August 2017

HAWKE'S BAY
REGIONAL COUNCIL

Karakia

Karakia

Ko te tumanako

Kia pai tenei rā

Kia tutuki i ngā wawata

Kia tau te rangimarie

I runga i a tatou katoa

Mauriora kia tatou katoa

Āmine

Water is a taonga

This guides our work together.

Engagement etiquette

- Be an active and respectful participant / listener
- Share air time – have your say and allow others to have theirs
- One conversation at a time
- Ensure your important points are captured
- Please let us know if you need to leave the meeting early

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Ground rules for observers

- RPC members are active observers by right (as per ToR)
- Pre-approval for other observers to attend should be sought from Robyn Wynne-Lewis (prior to the day of the meeting)
- TANK members are responsible for introducing observers and should remain together at break out sessions
- Observer's speaking rights are at the discretion of the facilitator and the observer should defer to the TANK member whenever possible.

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Agenda

9:00am Notices, meeting record

9:15am Lowland Streams and groundwater depletion

- Flow requirements to support aquatic habitat (Thomas Wilding)
- GW modelling summary (Pawel Rakowski)
- Flow regime management decisions by TANK (MAB)

10.45am Surface water takes from lowland streams

- Summary of current situation (Rob Waldron)
- Options for management – TANK decision (MAB)

11.15am Impact of GW takes on Ngaruroro River flows

- Review model information (Pawel)
- Options and TANK decision (MAB)

12:30pm LUNCH

1.30pm Managing groundwater levels

- GW levels- review trend information from Meeting # 30 (Pawel)
- Options and TANK decision (MAB)

3:00pm COFFEE BREAK

3:15pm Farmer Reference Group Report back

3.45pm WCO process submission

4:00pm **CLOSE MEETING**

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Meeting Record – TANK Group 30

- Matters arising
- Action points

Action points

		Person	Status
30.1	HBRC to come back to the TANK Group with suggested replacement for James Palmer as default spokesperson.		
30.2	Monique Benson to make contact with the Water Augmentation Working Group members and schedule first meeting.		
30.3	HBRC to email the joint process statement to TANK members with a deadline to reply.		Completed

Overview of today

What we're going to cover
Decisions that need to be made

What we are going to cover;

1. Management of the effects of stream depleting groundwater takes on;

    - Lowland stream flows

    - The Ngaruroro River flows

2. Management of direct surface water takes from lowland streams

3. Groundwater levels

What decisions need to be made;

1. Your desired flow management targets for lowland streams
    - Specified flows to protect aquatic ecosystem values
2. Whether flow augmentation will be used to manage g/w depletion effects on the specified flows
    - A decision to further develop flow augmentation option
3. The management of surface water takes (lowland streams)
    - Flow triggers for restriction of takes
4. The management of Ngaruroro R flows (effect of g/w takes)
    - Longer term strategy to mitigate the effect by water storage and release
5. Management of groundwater levels
    - Allocation limit in relation to current equilibrium

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Decision Making Context

Stream Depletion modelling

Lowland Streams & Ngaruroro R

Surface water flow management

Ngaruroro R and Tutaekuri R flow management regime (still to come)

- Effects of g/w abstraction
- Role of stream flow augmentation
- Affected streams/rivers identified
- Groundwater level trends

- **Allocation limits**
  - Stream depleting groundwater takes
  - Surface water abstractions
- **Flow regulation regimes**
  - Augmentation requirements
  - Take restrictions

Groundwater sustainability

Security of supply for abstraction

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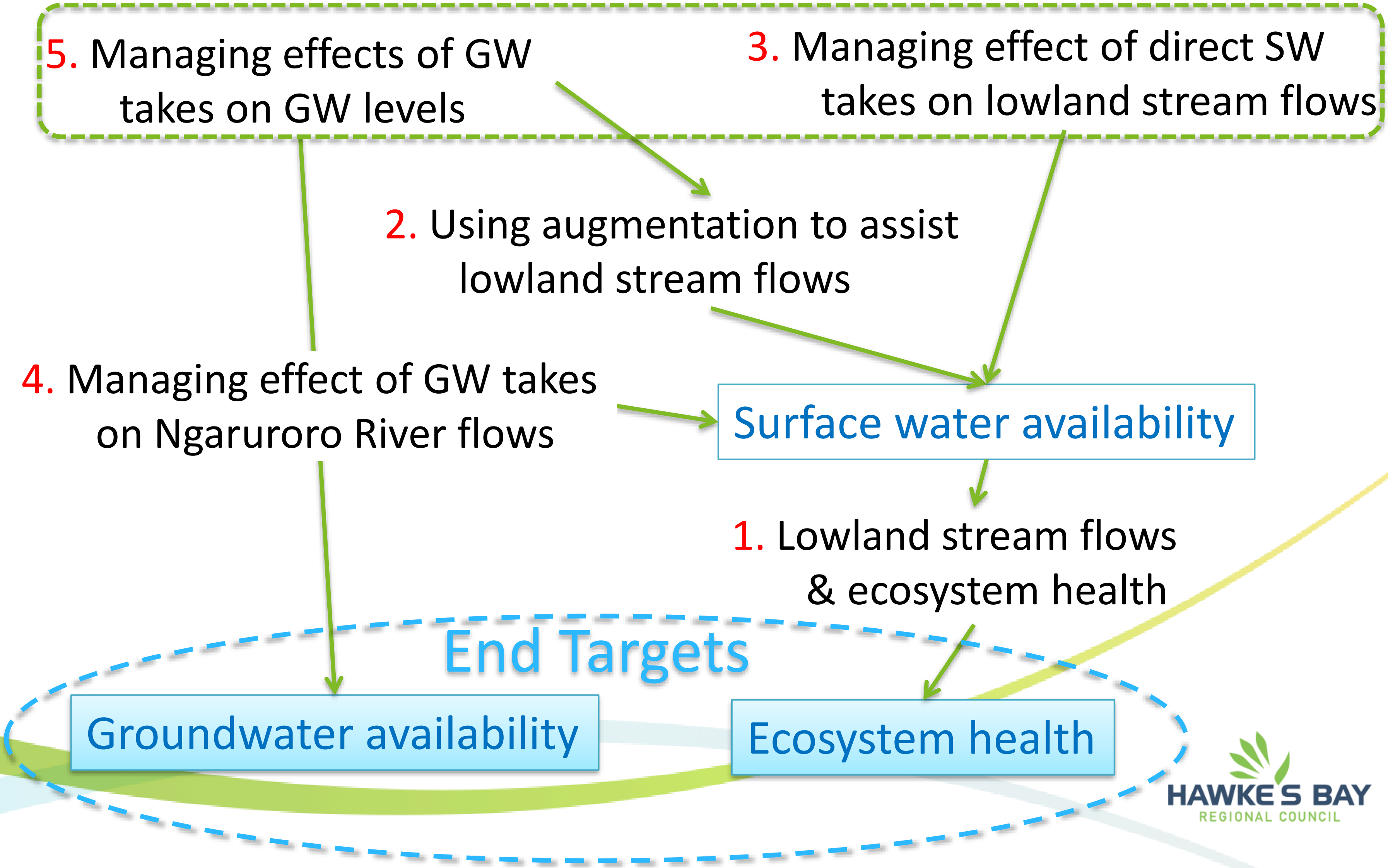
The Challenges for This Meeting



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Challenge 1 –Managing flows in lowland streams

Issue: There is a cumulative impact on flows in lowland streams from GW takes but we need to understand the requirements for flow regimes before we can manage the effects of those takes by a flow augmentation scheme.

Objective:
To agree on the flows in lowland streams that will meet the needs of ecosystem health, mauri and other instream values.

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Flow thresholds to protect fish in lowland streams

Thomas Wilding

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Effects of water use - summary

- Many streams already fall below 40% for oxygen in dry years
- Further increases in water use would further reduce stream flows and oxygen levels
- Some streams are already falling below the lowest standards (e.g. 0.04 m/s in Awanui)

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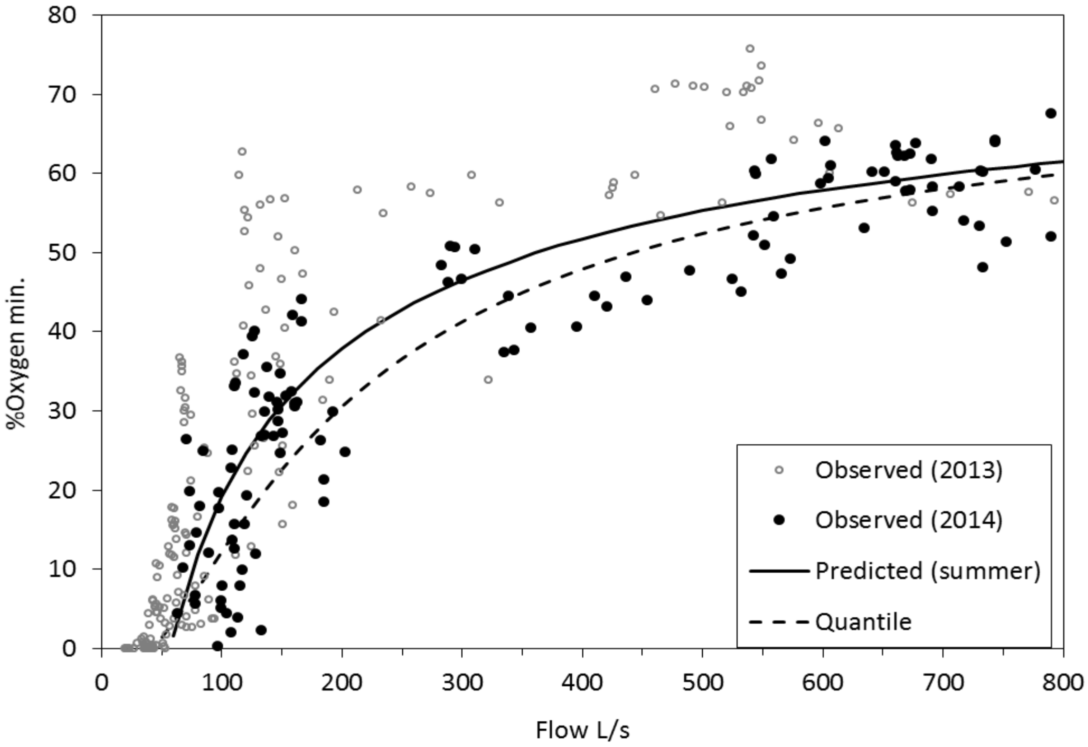
Methods (Recap)

Less flow => less Oxygen

Seasonal plant growth changes the oxygen-flow response



Awanui Stream – comparing model predictions (black line) to observed oxygen (training circles; validation dots)

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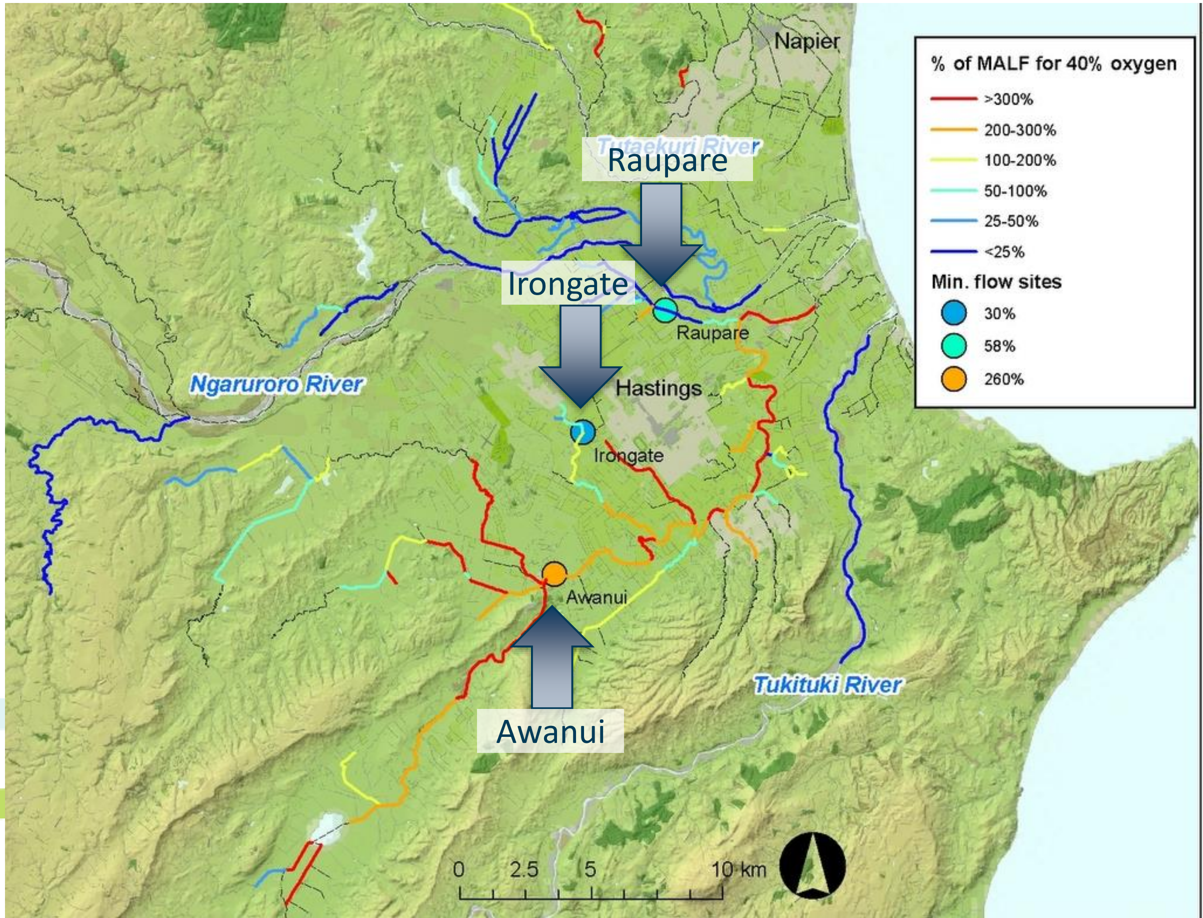
Oxygen-flow models

- SEFA oxygen model for detailed modelling at 3 sites
- Froude model for predicting which streams have oxygen problems



Oxygen triggers for low-gradient streams

Custom limits for low-gradient streams, as an alternative to NPS

Oxygen attribute	60%	40%	(velocity 0.04 m/s)
Indicator	invertebrate MCI	Health of adult native fish	Fish survival / aquatic plant health

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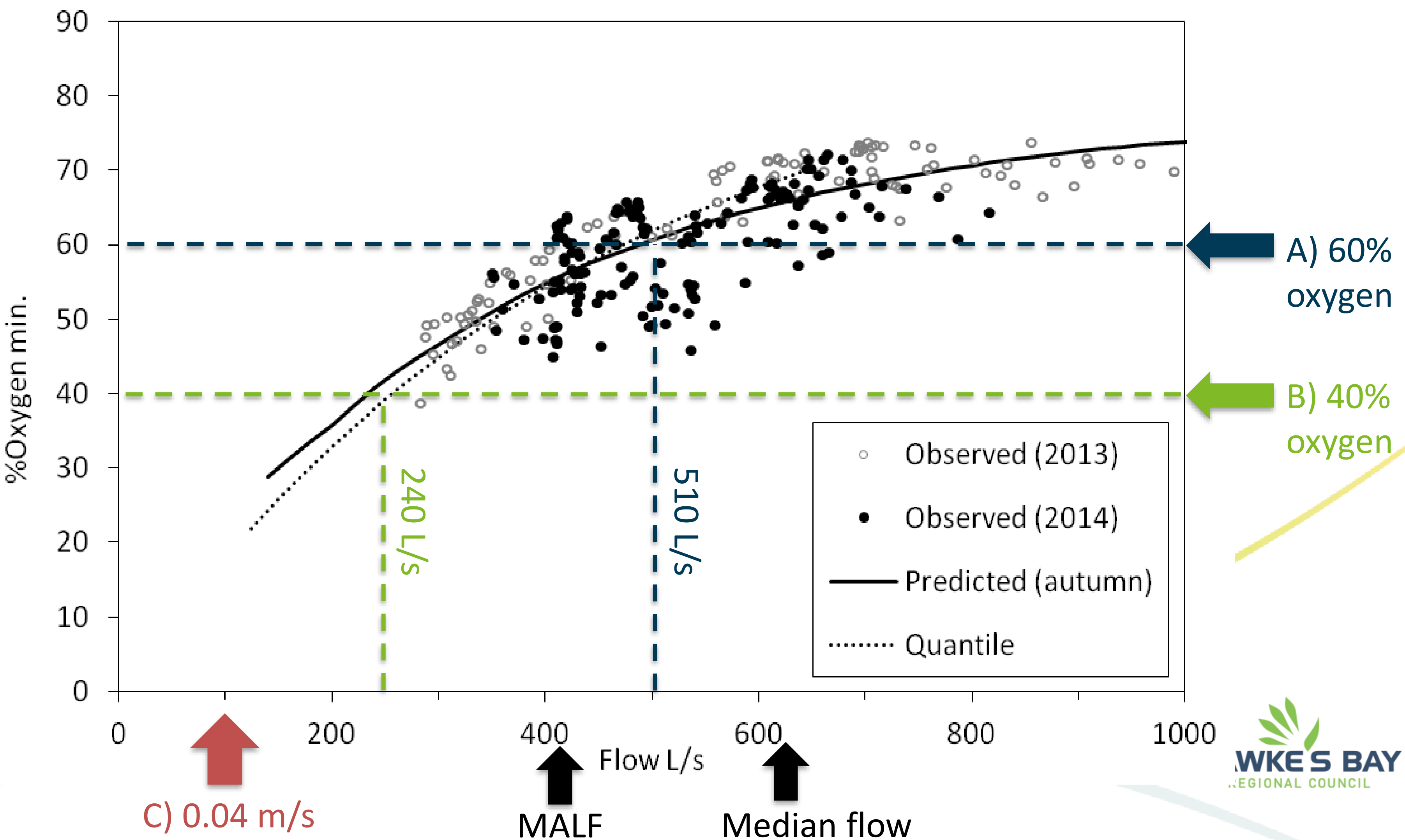
Results

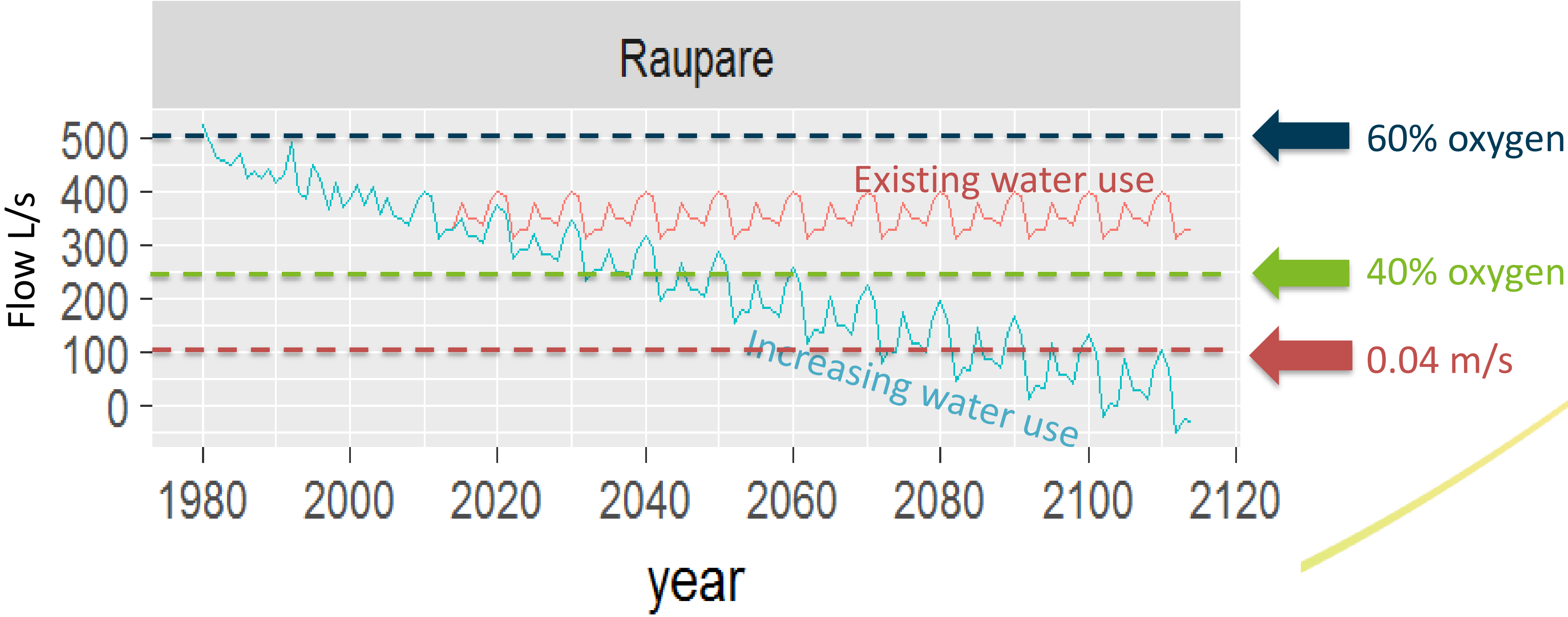
Raupare – oxygen vs. flow

40% oxygen is an achievable trigger flow



Rauparе

- oxygen predicted to drop below 40% oxygen if water use increases



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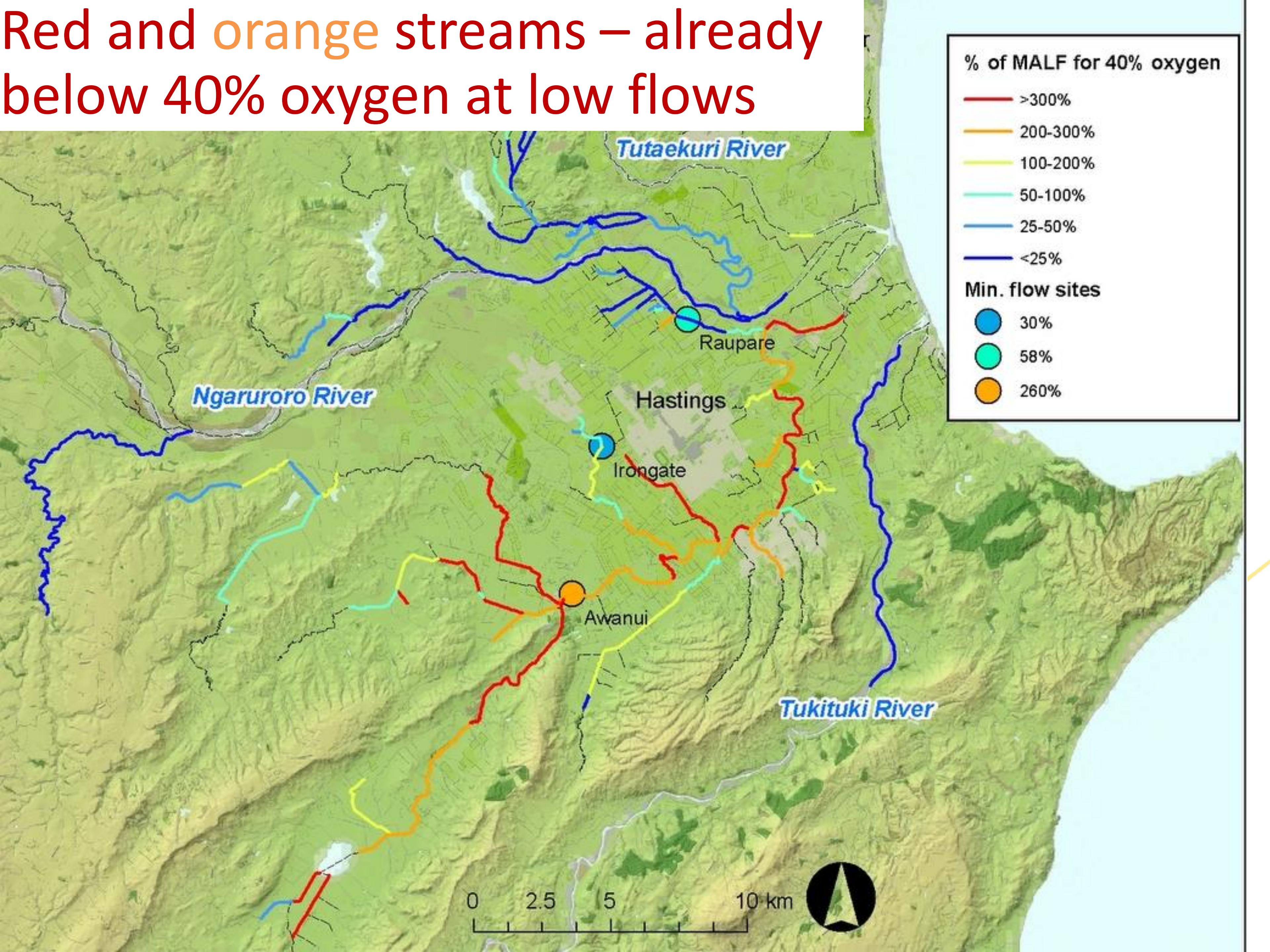
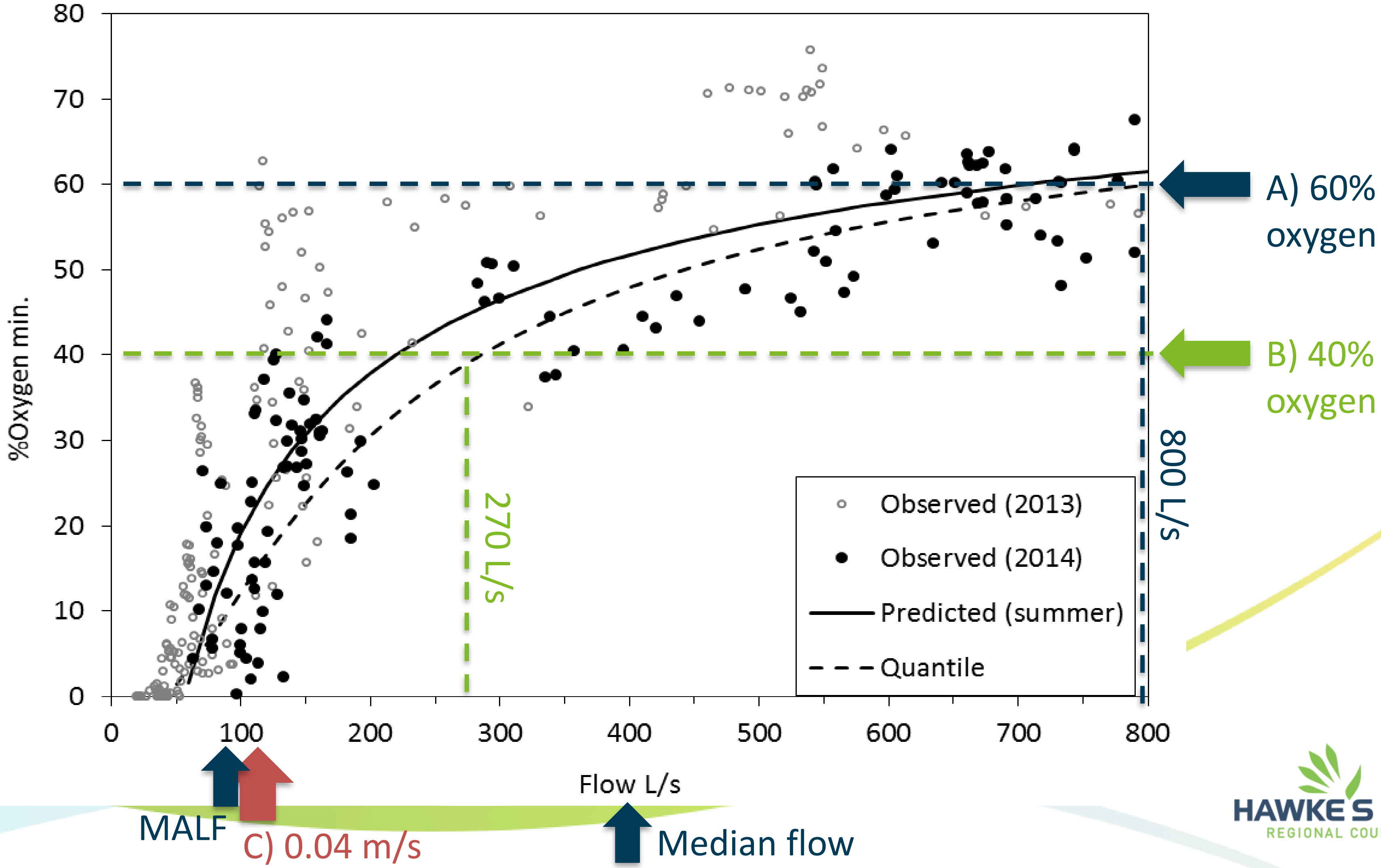
Red and orange streams – already below 40% oxygen at low flows



Awanui – often drops below all oxygen triggers



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Flow triggers for lowland streams

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Proposed trigger flows for each site

Stream	Proposed trigger flow	Rationale
Raupare	300	Multi-scenario exceed 40%
Irongate	100	40% oxygen upper reach, velocity trigger lower reach
Karamu	1000	Exceeds 30% oxygen
Karewarewa	45	Velocity trigger
Mangateretere	60	40% oxygen
Louisa	22	Velocity trigger
Awanui	110	Velocity trigger
Tutaekuri-Waimate	1200	Existing minimum flow

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Summary

- Raupare
  - already using enough water to effect stream invertebrates
  - increased water use could impact native fish
- Awanui
  - Already below the lowest limits in dry years
- Other lowland streams
  - Many below 40% oxygen under existing water-use

Reference Tables

Flow estimates to achieve oxygen levels

Site	60% oxygen	40% oxygen	0.04 m/s	Confidence	MALF L/s (existing)	Existing Min. flow L/s
Irongate Riverslea Rd	1300	370	92	low	170	160
Louisa Te Aute Rd	340	77	22	moderate	36	30
Tutaekuri-Waimate Goods	1800	540	140	moderate	1860	1200
Raupare Ormond Rd	510	240	100	high	402	300
Mangateretere Napier Rd	350	60	17	moderate	48	100
Awanui flume	800	270	110	high	90	120
Karewarewa Pakipaki	640	170	45	moderate	25	75
Karamu floodgates	4900	1600	380	low	970	1100

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Alternatives - higher trigger flows

Stream	Proposed trigger flow	Alternative higher triggers
Raupare	300	300 (multi-scenario support)
Irongate	100	160 (existing min. flow)
Karamu	1000	1100 (existing min. flow)
Karewarewa	45	75 (existing min. flow)
Mangateretere	60	100 (existing min. flow)
Louisa	22	30 (existing min. flow)
Awanui	110	120 (existing min. flow)
Tutaekuri-Waimate	1200	1200 (existing min. flow)

…..Managing flows in lowland streams

General observations:
The higher the flow to be maintained the higher pumping costs associated with a flow augmentation scheme.

There is an optimal amount of water that can be pumped from groundwater to augment stream flows before there are further adverse flow effects

The recommended flows will help maintain oxygen levels and protect aquatic ecosystem needs.

Higher flows may provide for other values, but there is no other information to help determine what flows might be required for other values.

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Recommendations for lowland stream flow

Proposed trigger flows for each site

Stream	Proposed trigger flow	Rationale
Raupare	300	Multi-scenario exceed 40%
Irongate	100	40% oxygen upper reach, velocity trigger lower reach
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Louisa	22	Velocity trigger
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Tutaekuri-Waimate	1200	Existing minimum flow

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Break out question – Challenge 1

1. Do you agree/disagree with the proposed flows to trigger the flow augmentation management response for the lowland streams?

2. If not, what option do you prefer and what further information can you provide?

Challenge 2 – Managing flows in lowland streams

Issue: There is a cumulative impact on flows in lowland streams from stream-depleting GW takes but neither;

- restricting individual takes nor
- restricting takes in specified areas/zones

is likely to be cost effective for achieving recovery of flows to desired levels in a timely manner.

Options:

1. Restricting groundwater takes on the basis of;
    - Location; area or zone of effect
    - Level of impact of individual take
2. Reducing overall allocation and use
3. GW - stream flow augmentation scheme

More information on option 2 is being presented later today

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Challenge 2 – Managing flows in lowland streams

Proposal:
To develop Option 3 further as a preferred management scenario and report on costs and implementation.

Implementation;
Through a rule (resulting in consent conditions) that all GW takes contribute to flow augmentation for lowland streams. This would require:

- Extent of contribution to be based on degree of impact on stream depletion (formula under development as presented at TANK#27)
- Timeframes to be specified in the Plan
- Further development of stream augmentation scheme details, initially by Water Augmentation Working Group and Council staff

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Combined Stream Augmentation Modelling

By Pawel Rakowski
2017-08-17

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Presentation outline:

1. Re-cap on previous work
2. Summary of findings
3. Augmented streams and augmentation locations
4. Observed flows simulations

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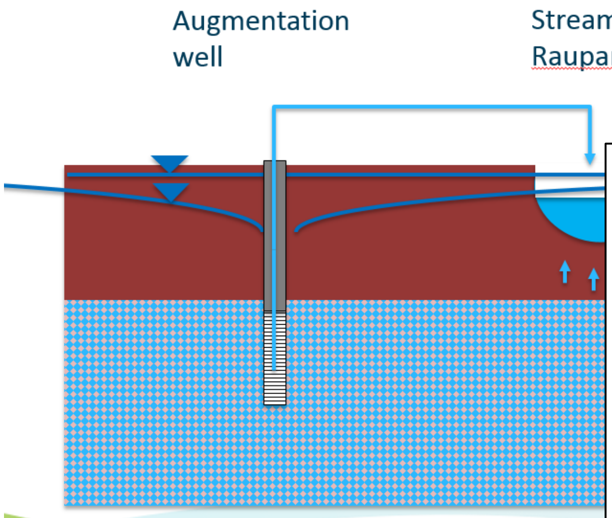
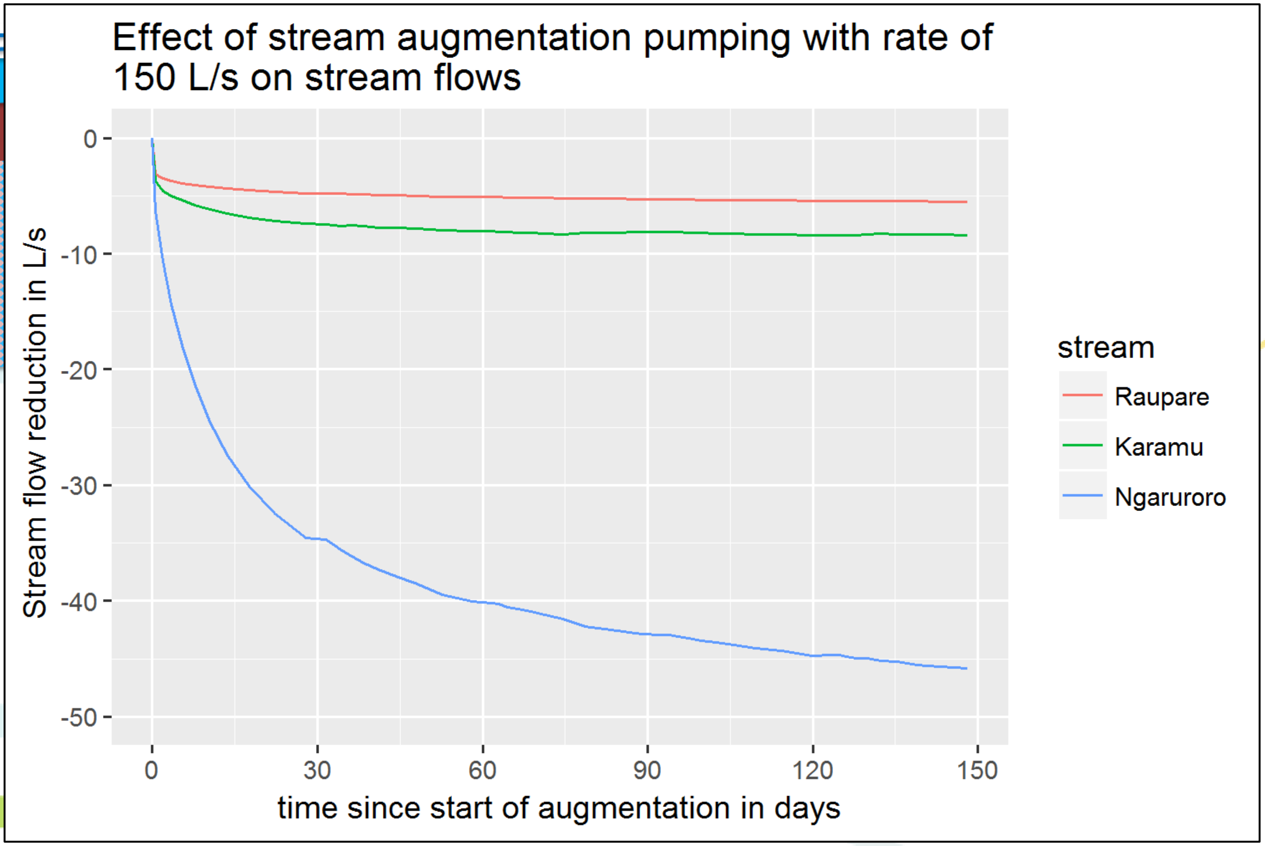
Re –cap on previous work

Stream augmentation

- Pumping groundwater to the streams during dry periods

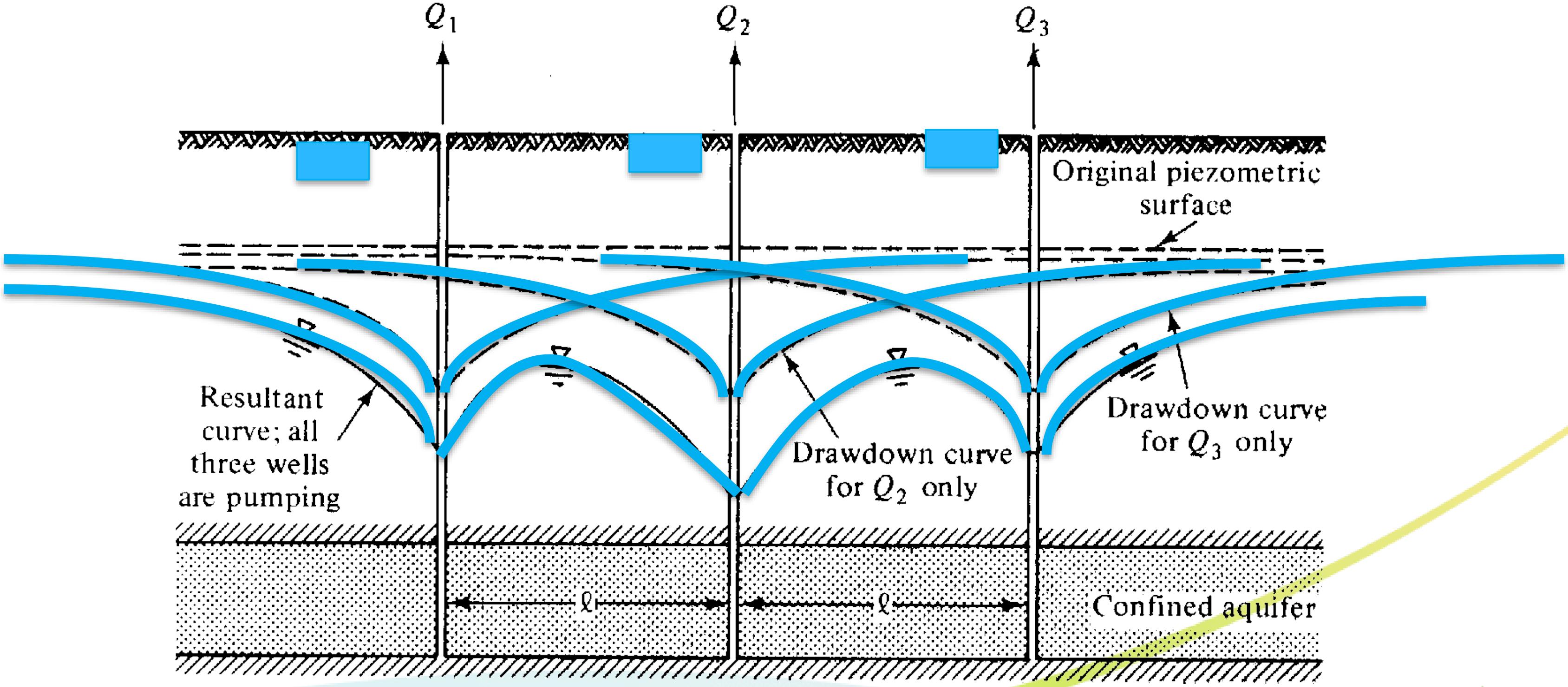




Combined Stream Augmentation

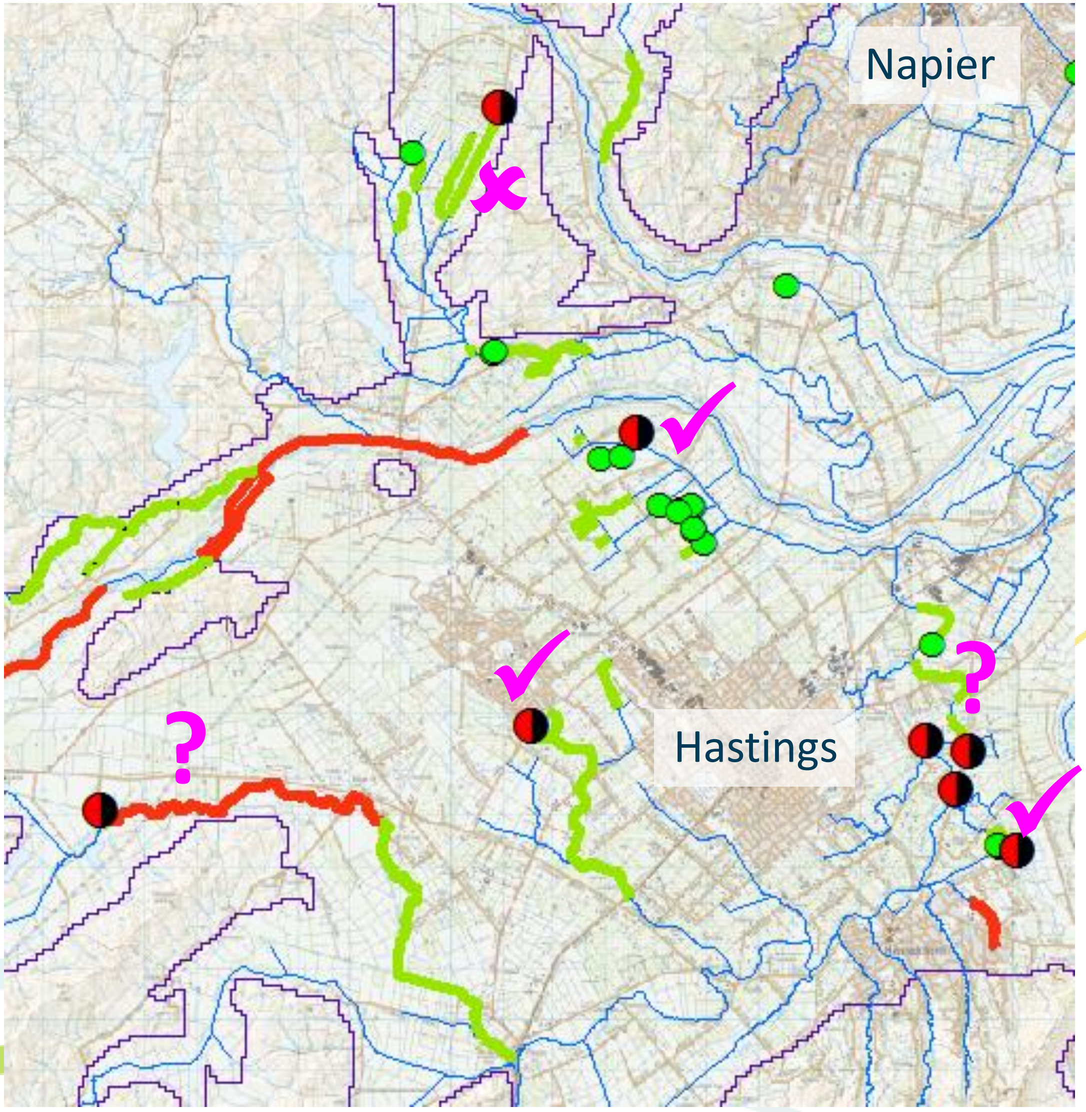
Objectives:

- To investigate effects of augmenting several streams at the same time
- Establish if this is feasible in principle



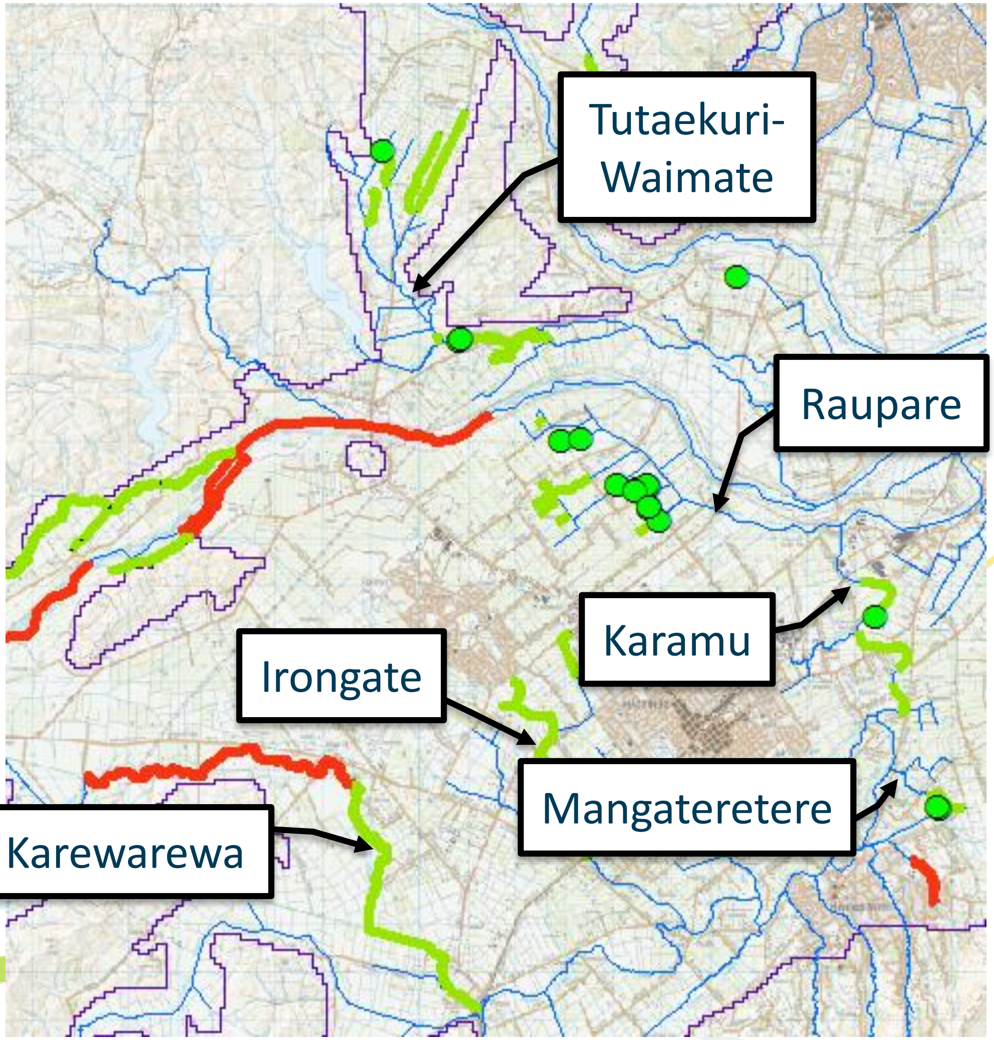
Summary of findings of combined augmentation investigation:

1. **Mangateretere, Irongate, Raupare** can be augmented without large effect on groundwater
2. **Karamu** could be augmented, but required volumes may be large
3. **Karewarewa** augmentation may be impossible
4. **Tutaekuri-Waimate** is unlikely to require augmentation

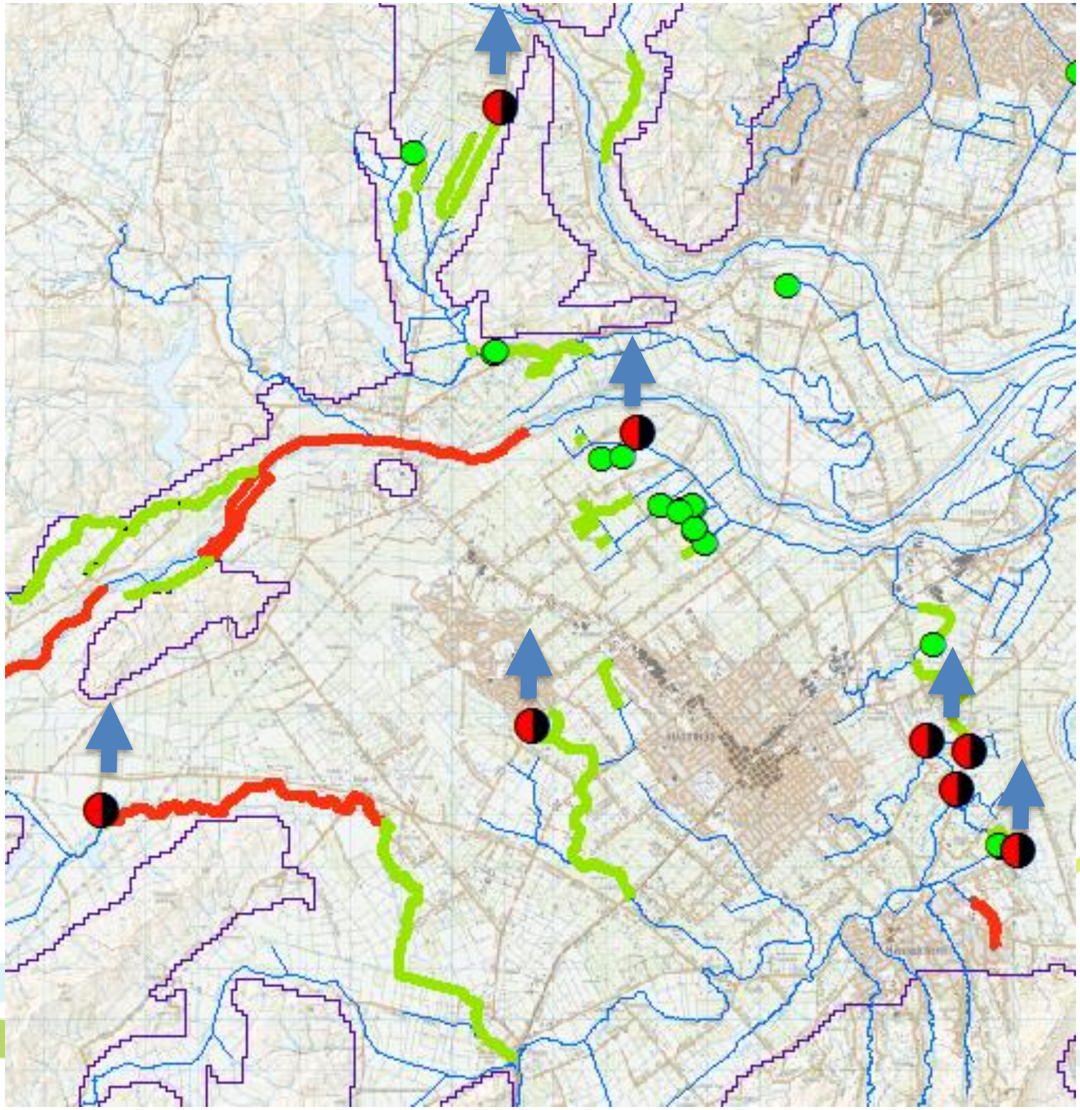


Streams considered in the analysis

- Raupare
- Irongate
- Karamu
- Mangateretere
- Karewarewa
- Tutaekuri - Waimate



Possible location of augmentation takes



Methodology

2012-2013 stream flows

- Use **actual flow record** and **new target flow** (based on t.Wilding's work) to calculate augmentation rate and duration per stream
- Augmentation will have a negative effect on augmented stream and other streams
- Overlay this augmentation effect on actual flow record
- Calculate groundwater level effect

Calculation Augmentation Flows

stream	recommended augmenation	worst conservative case scenario
Karamu	1000	1100
Raupare	300	300
Mangateretere	61	100
Karewarewa	45	75
Tutaekuri-Waimate	1200	1200
Irongate	100	160

Maximum Augmentation flows in L/s

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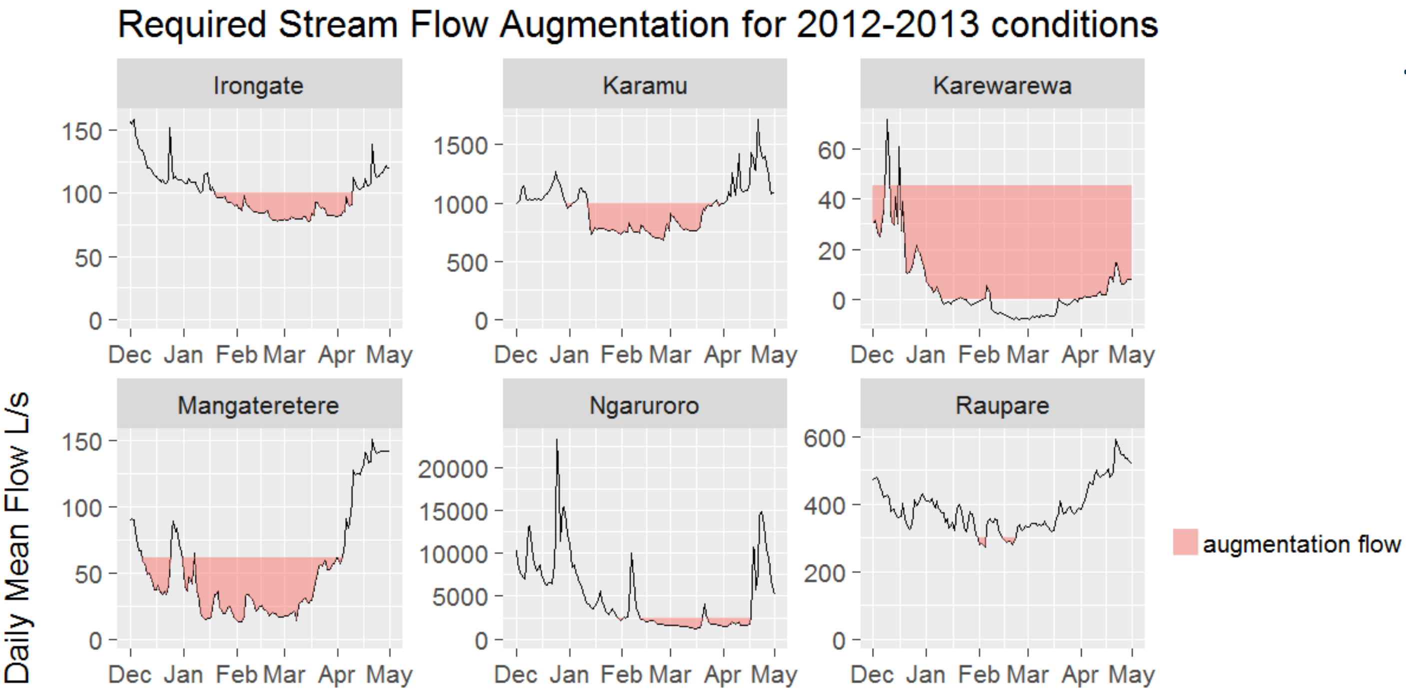
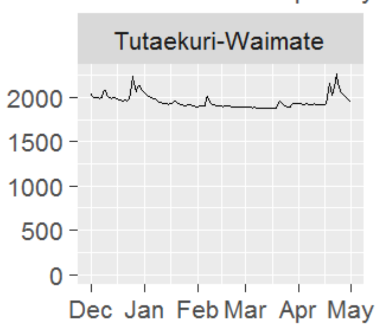
2012-2013 Data-based Augmentation Flows recommended augmentation flows

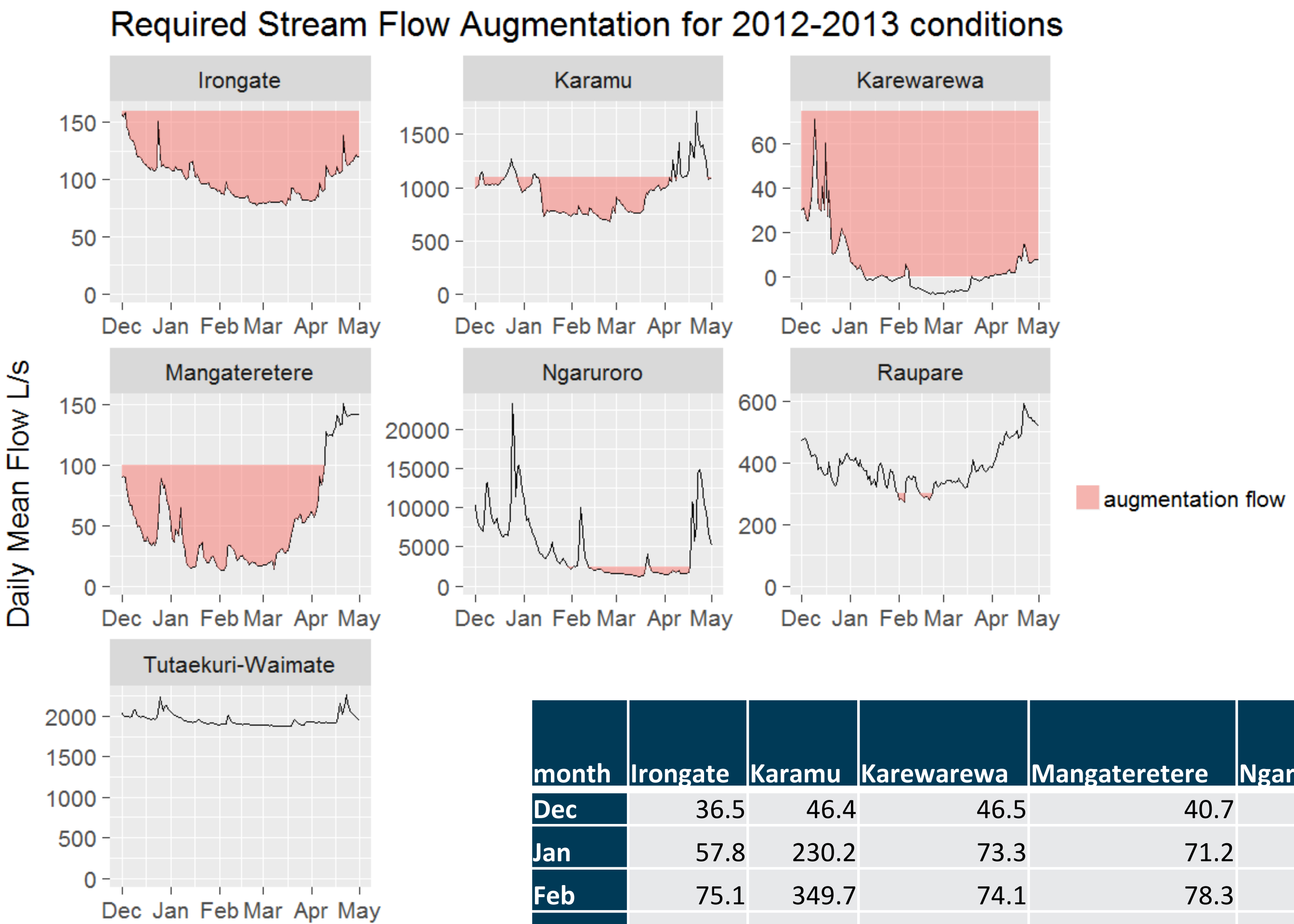




Total annual augmentation:
2.4 Mm^3/yr
(**3 %** of total current pumping 76 Mm^3/yr)

month	Irongate	Karamu	Karewarewa	Mangateretere	Ngaruroro	Raupare	Tutaekuri-Waimate
Dec	0.0	1.9	18.4	9.6	0.0	0.0	0.0
Jan	2.3	147.2	43.3	32.3	8.3	0.0	0.0
Feb	15.1	249.7	44.1	39.3	270.6	6.1	0.0
Mar	17.4	126.0	45.0	23.9	767.7	0.0	0.0
Apr	3.8	0.0	40.0	0.2	361.9	0.0	0.0
May	0.0	0.0	37.0	0.0	0.0	0.0	0.0

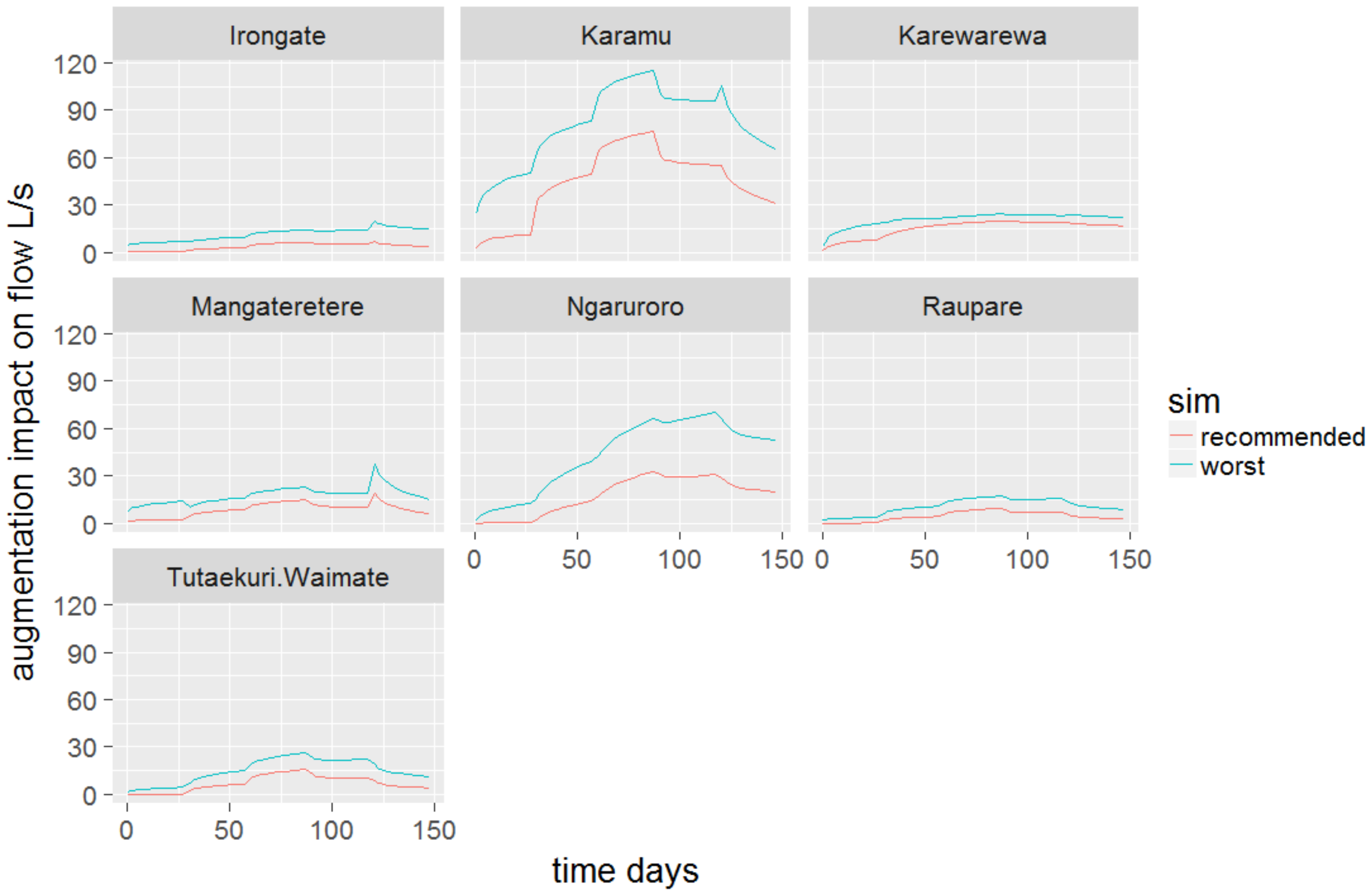
2012-2013 Data-based Augmentation Flows recommended augmentation flows



Total annual augmentation: **4.8**Mm^3/yr (**6 %** of total current pumping 76 Mm^3/yr)

month	Irongate	Karamu	Karewarewa	Mangateretere	Ngaruroro	Raupare	Tutaekuri-Waimate
Dec	36.5	46.4	46.5	40.7	0.0	0.0	0.0
Jan	57.8	230.2	73.3	71.2	8.3	0.0	0.0
Feb	75.1	349.7	74.1	78.3	270.6	6.1	0.0
Mar	77.4	224.7	75.0	62.9	767.7	0.0	0.0
Apr	55.1	12.6	70.0	7.4	361.9	0.0	0.0
May	39.7	3.6	67.0	0.0	0.0	0.0	0.0

Augmentation effect on flow



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Modelled maximum impact on augmentation on flow spring flow

	recommended scenario	worst case scenario
Irongate	6.5	19.4
Karamu	76.7	115.5
Karewarewa	19.6	24.1
Mangateretere	18.6	37.3
Ngaruroro	32.9	70.1
Raupare	9.3	17.4

Calculated impacts in L/s

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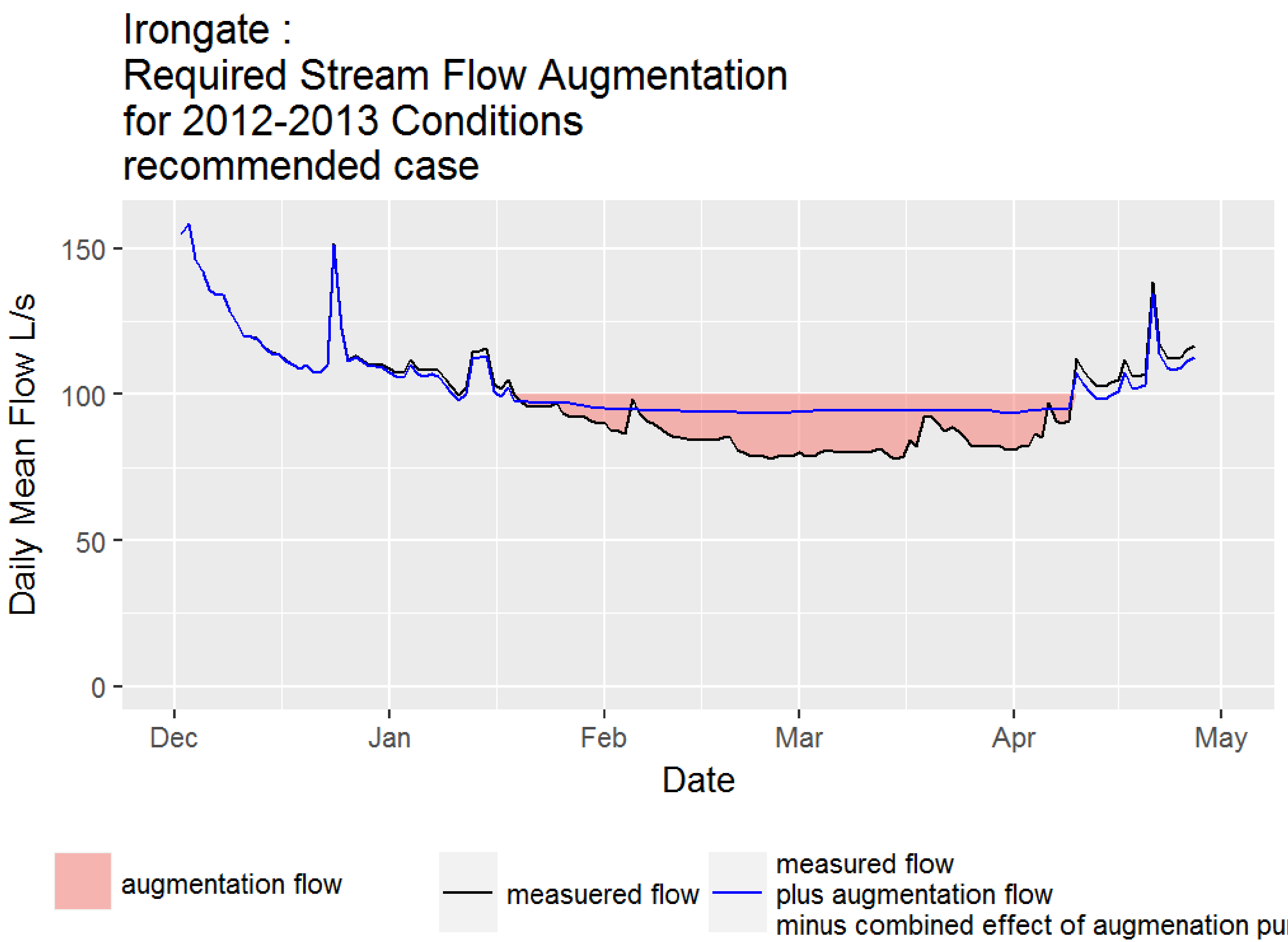
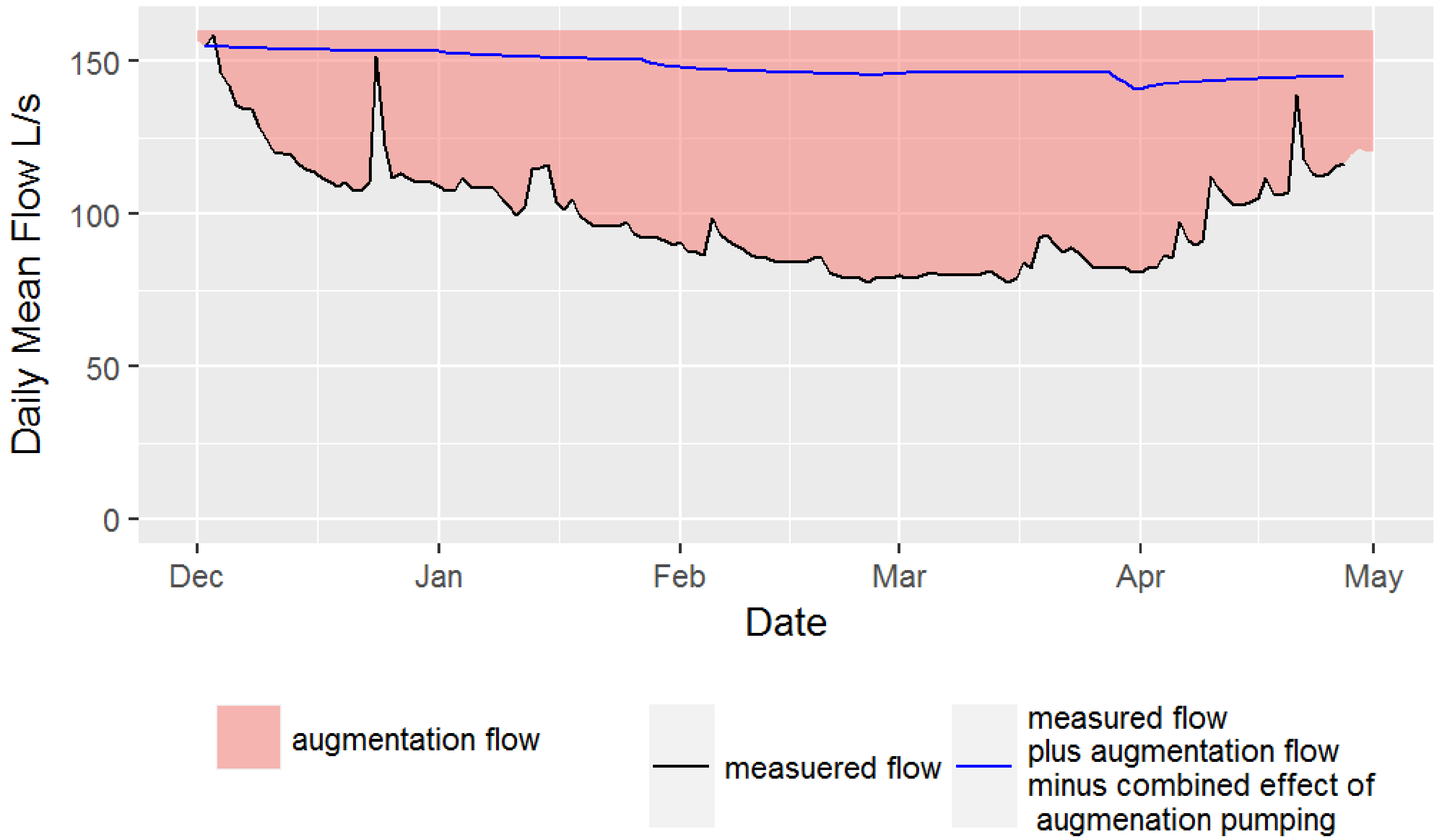
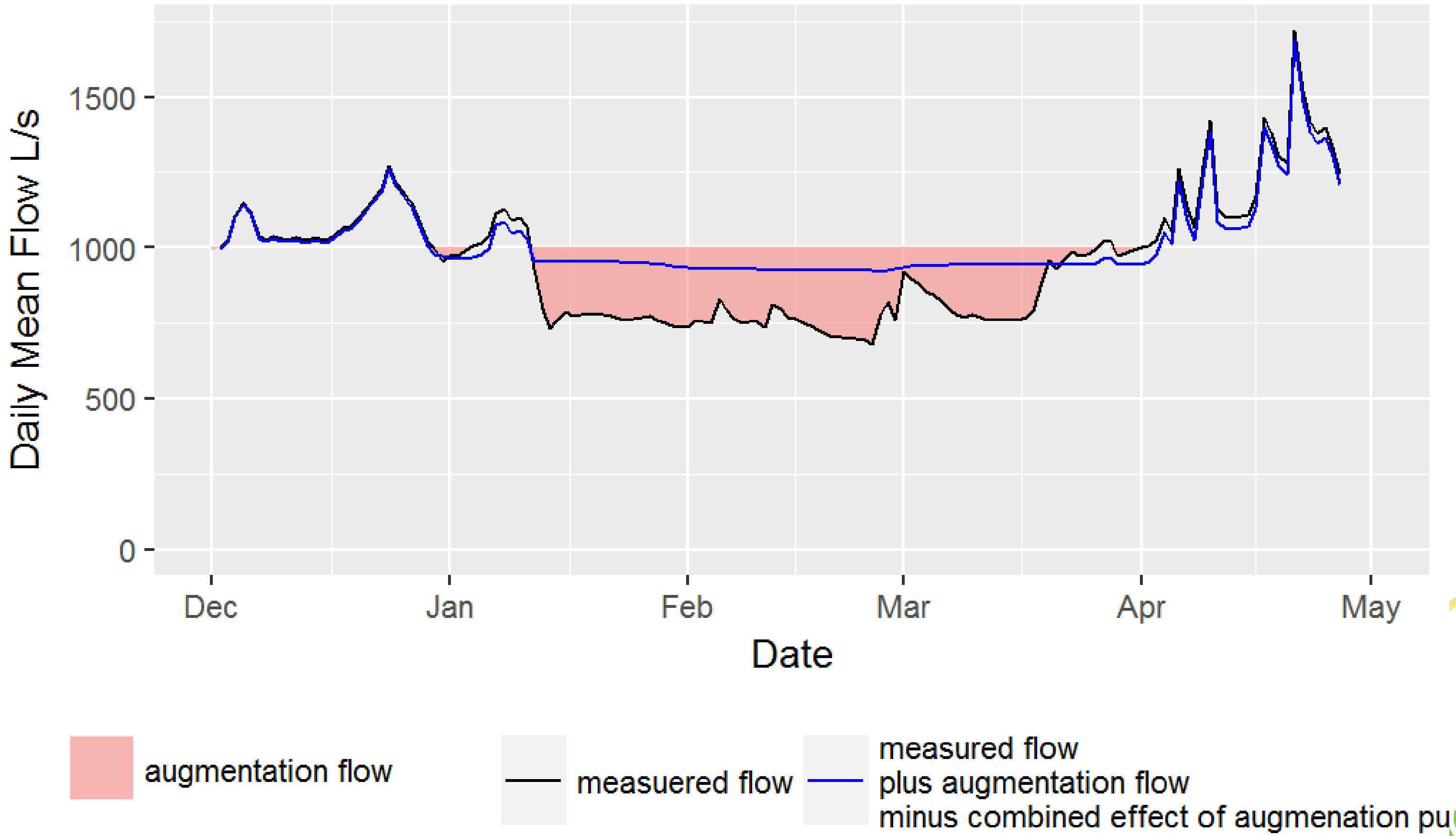


Irongate :
Required Stream Flow Augmentation
for 2012-2013 Conditions
recommended case
Daily Mean Flow L/s
150
100
50
0
Dec
Jan
Feb
Mar
Apr
May
Date
augmentation flow
measuered flow
measured flow
plus augmentation flow
minus combined effect of augmenation pur

Irongate :
Required Stream Flow Augmentation
for 2012-2013 Conditions
worst case



Karamu :
Required Stream Flow Augmentation
for 2012-2013 Conditions
recommended case



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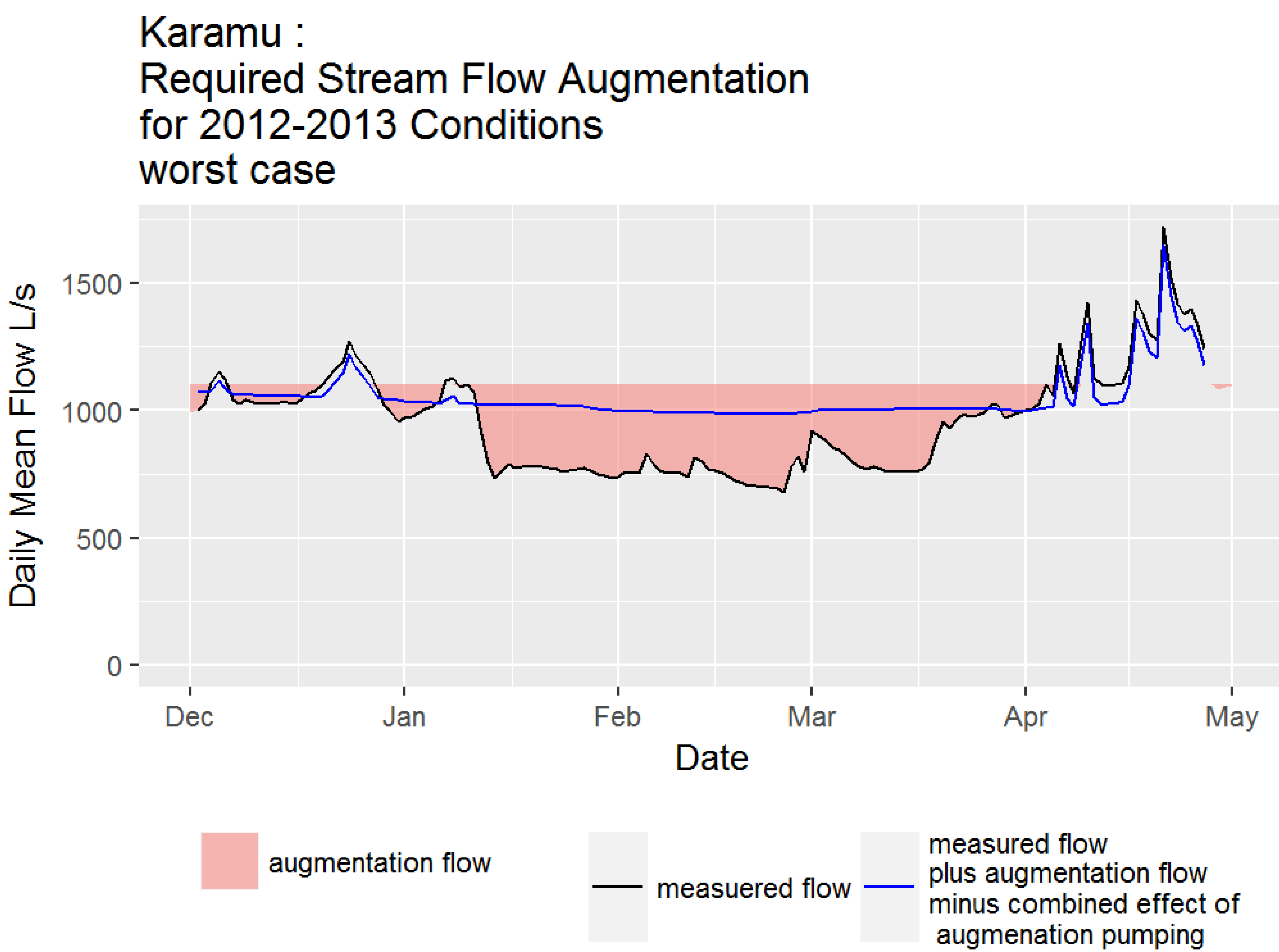
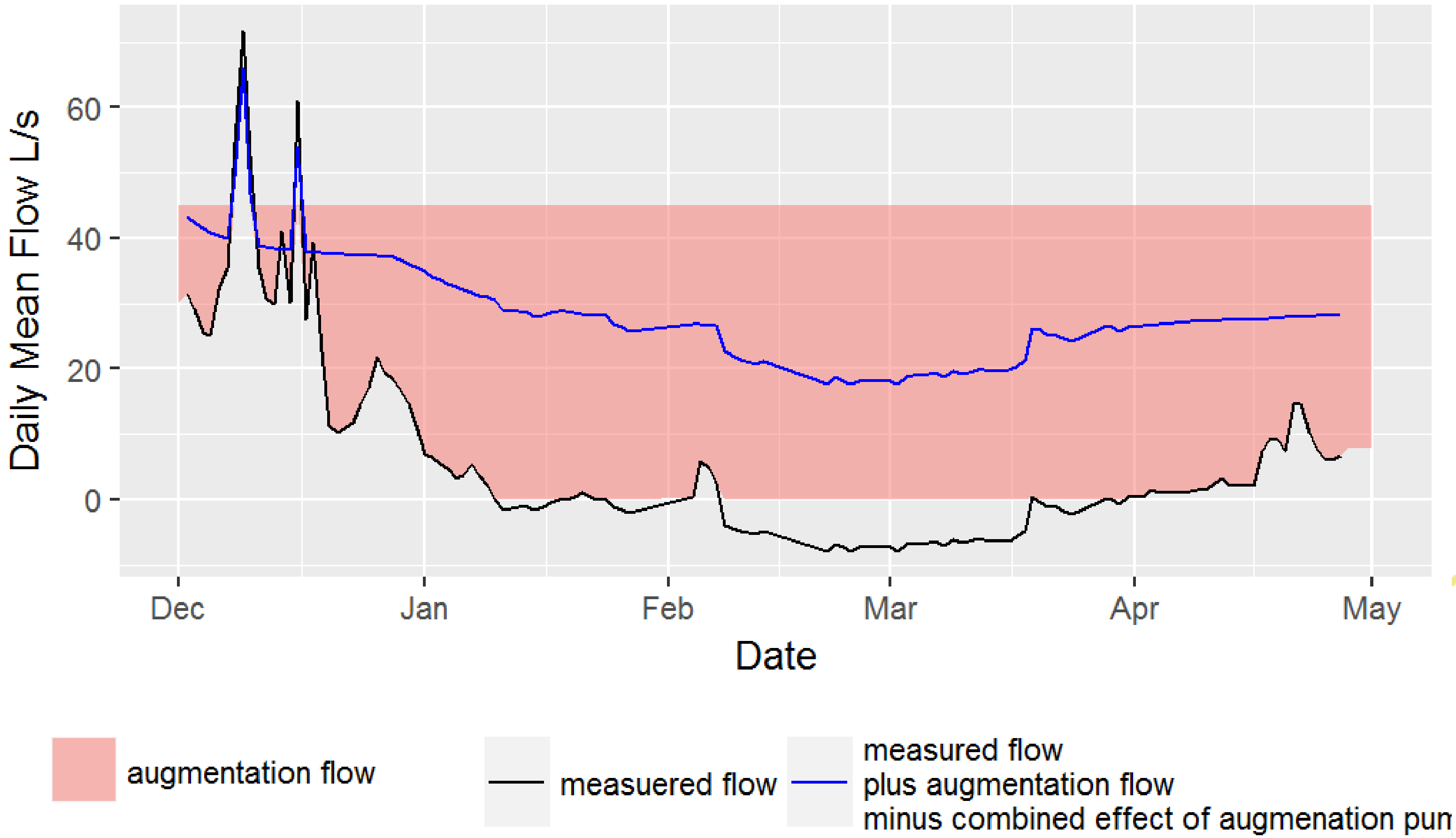


Karamu :
Required Stream Flow Augmentation
for 2012-2013 Conditions
worst case
Daily Mean Flow L/s
1500
1000
500
0
Dec
Jan
Feb
Mar
Apr
May
Date
augmentation flow
measuered flow
measured flow
plus augmentation flow
minus combined effect of
augmenation pumping

Karewarewa :
Required Stream Flow Augmentation for 2012-2013 Conditions recommended case



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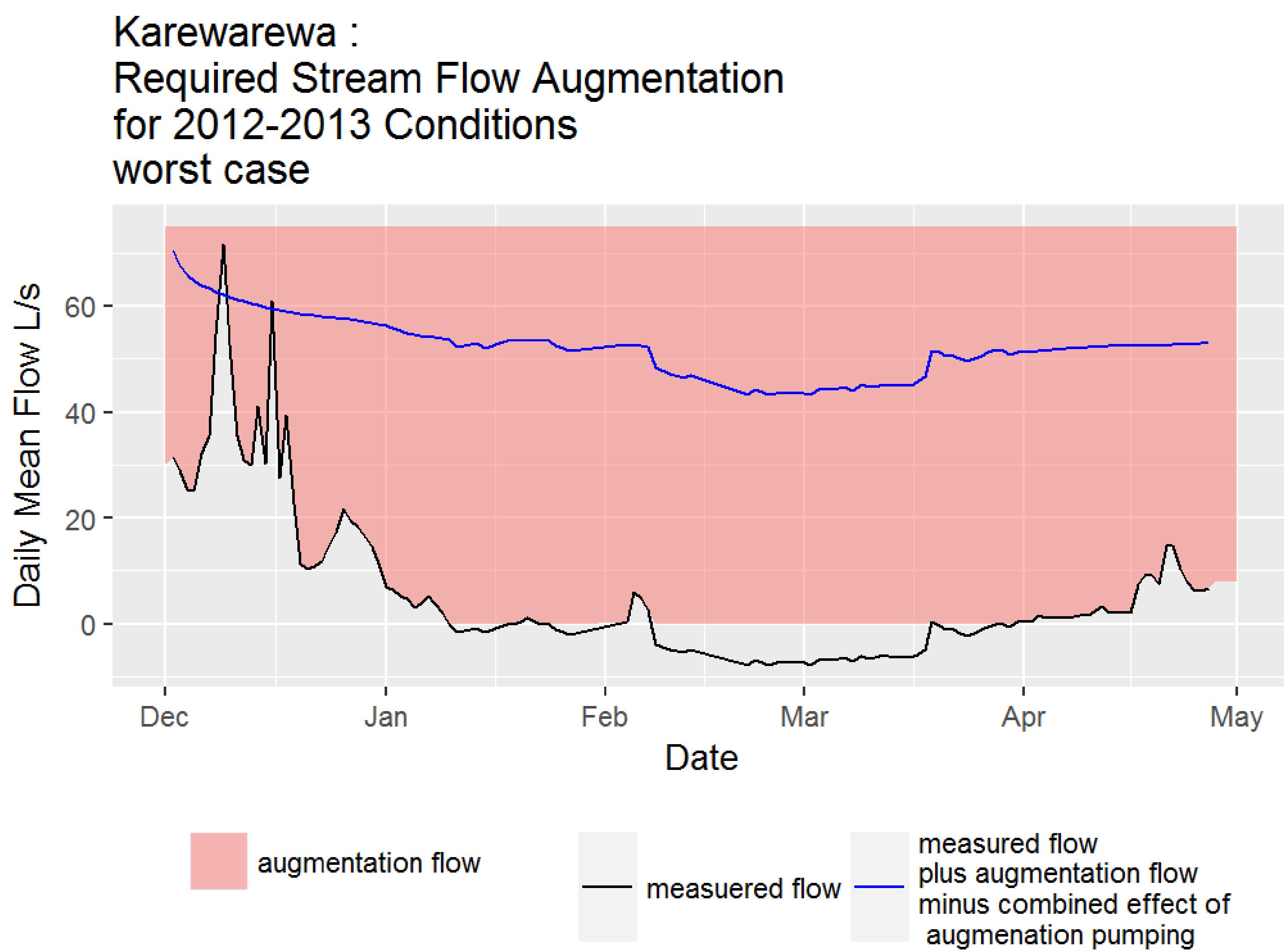

Karewarewa :
Required Stream Flow Augmentation
for 2012-2013 Conditions
worst case
Daily Mean Flow L/s
60
40
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Dec
Jan
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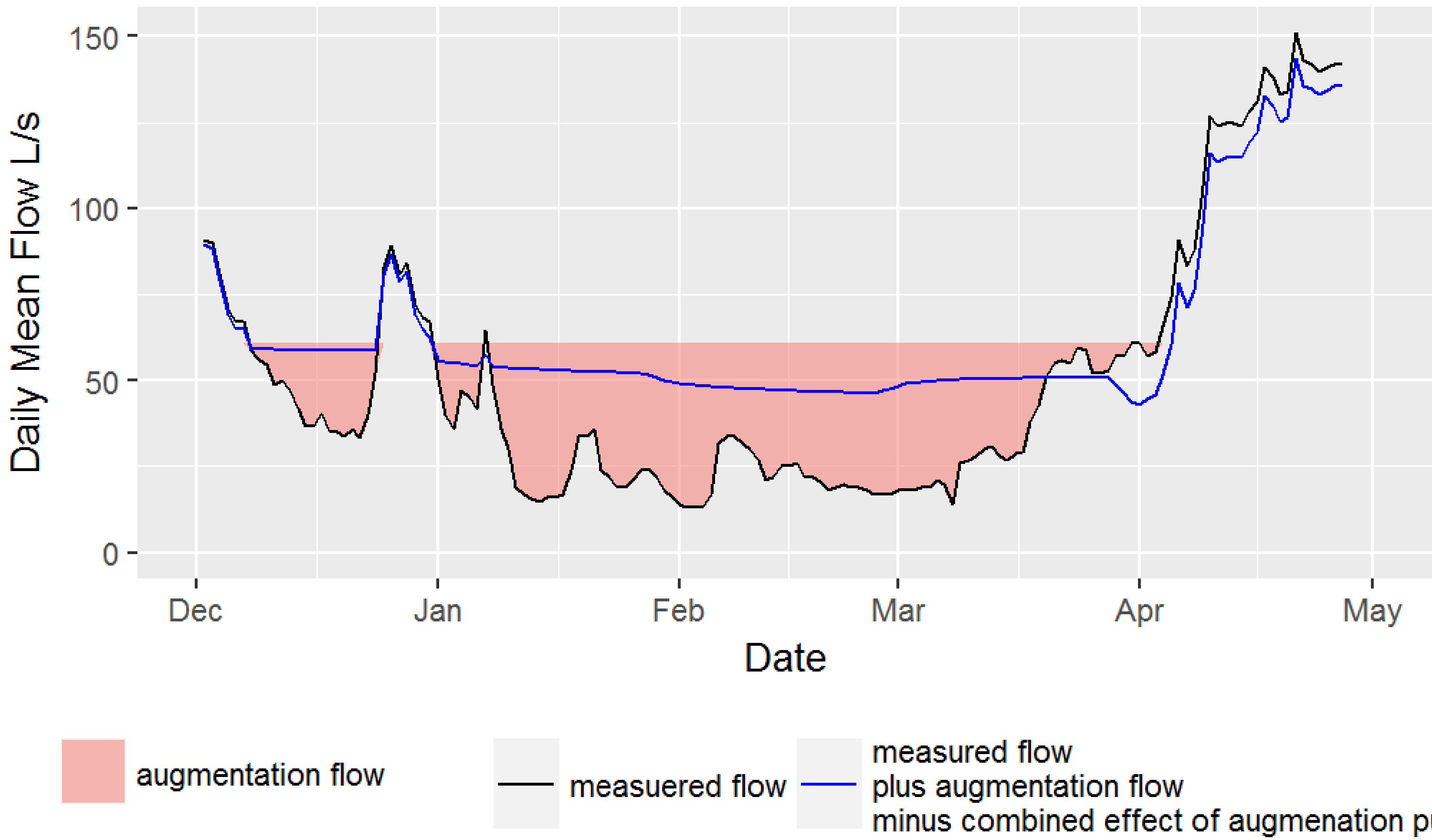
Mar
Apr
May
Date
augmentation flow
measuered flow
measured flow
plus augmentation flow
minus combined effect of
augmenation pumping

Mangateretere :
Required Stream Flow Augmentation
for 2012-2013 Conditions
recommended case



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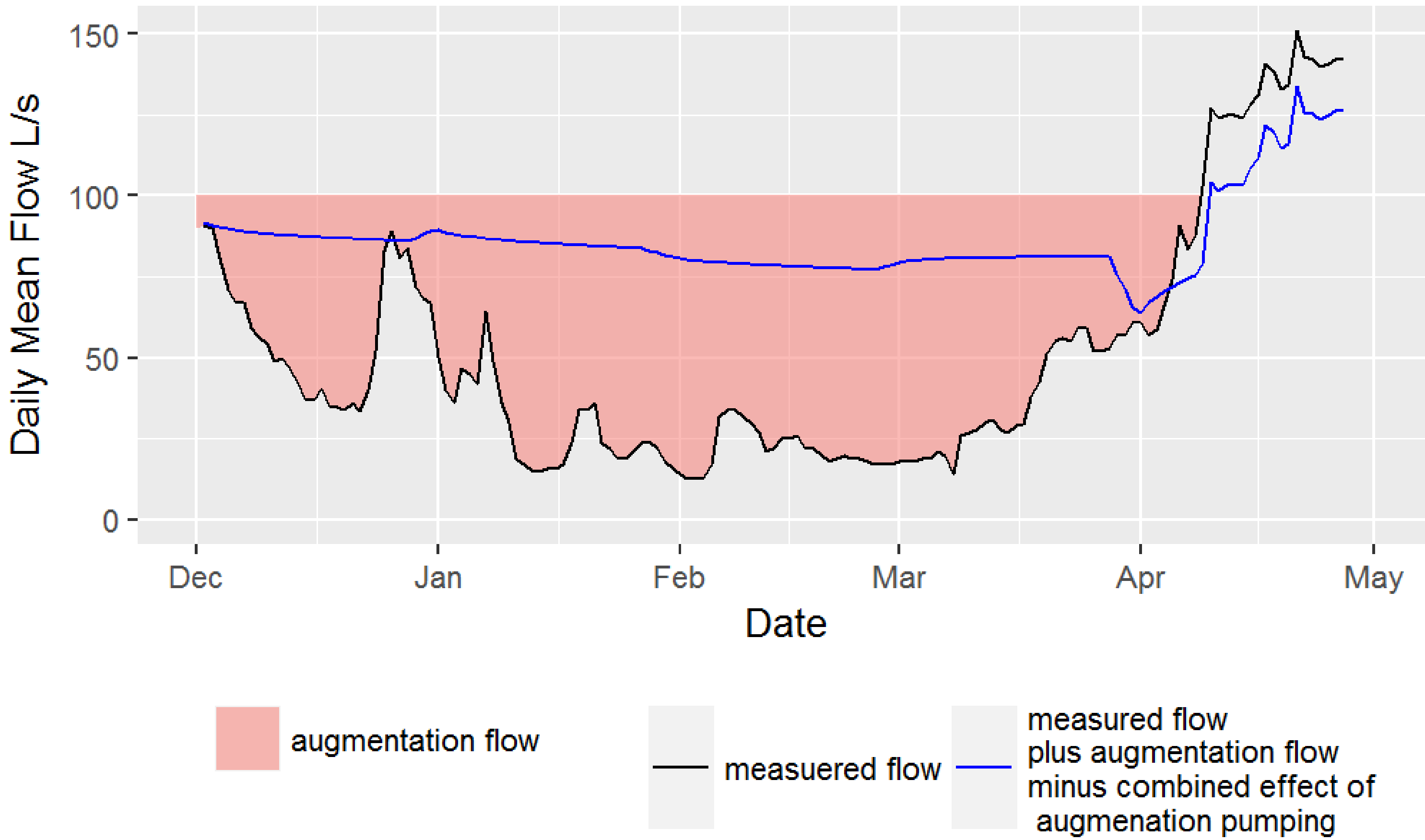
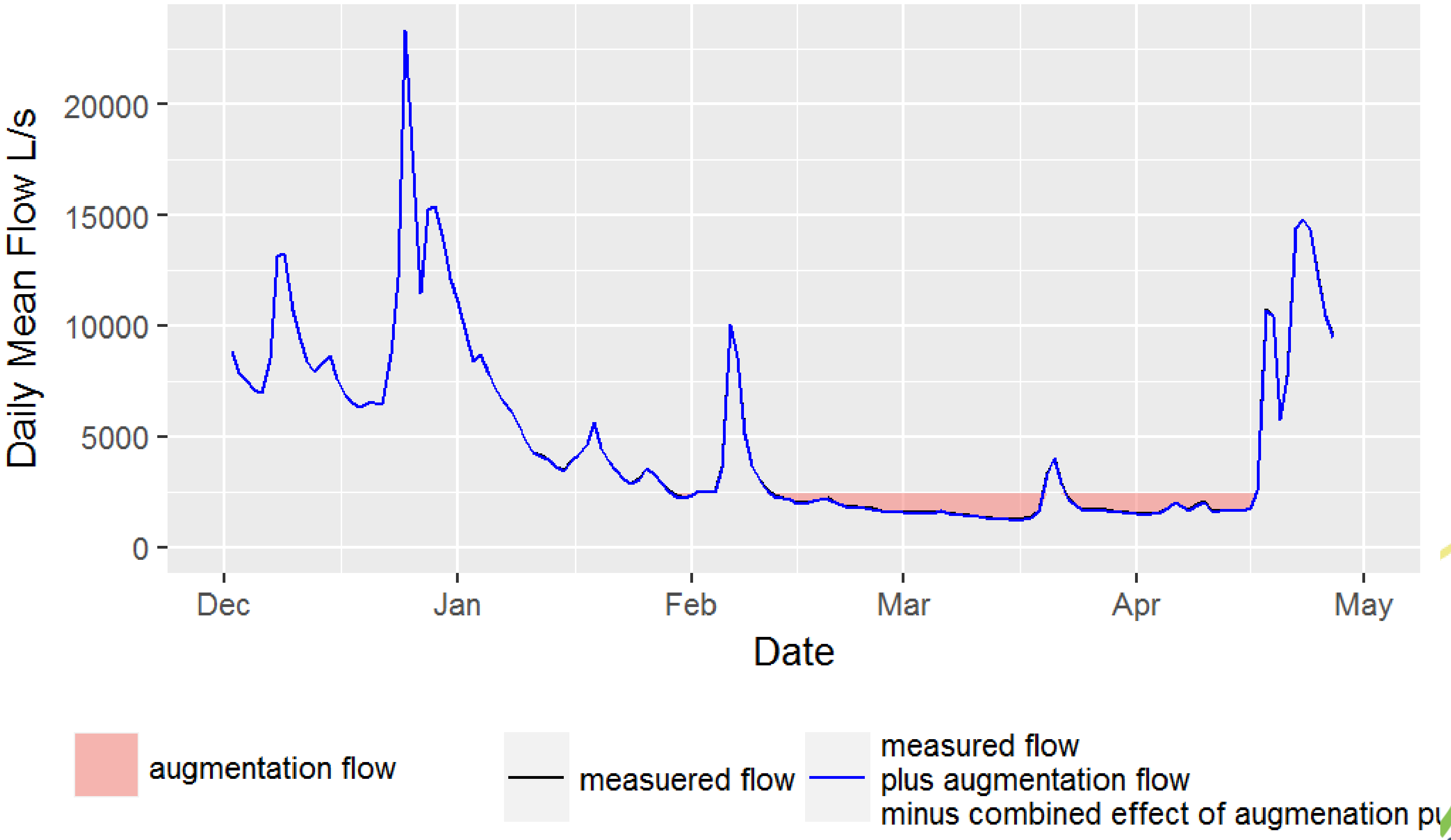
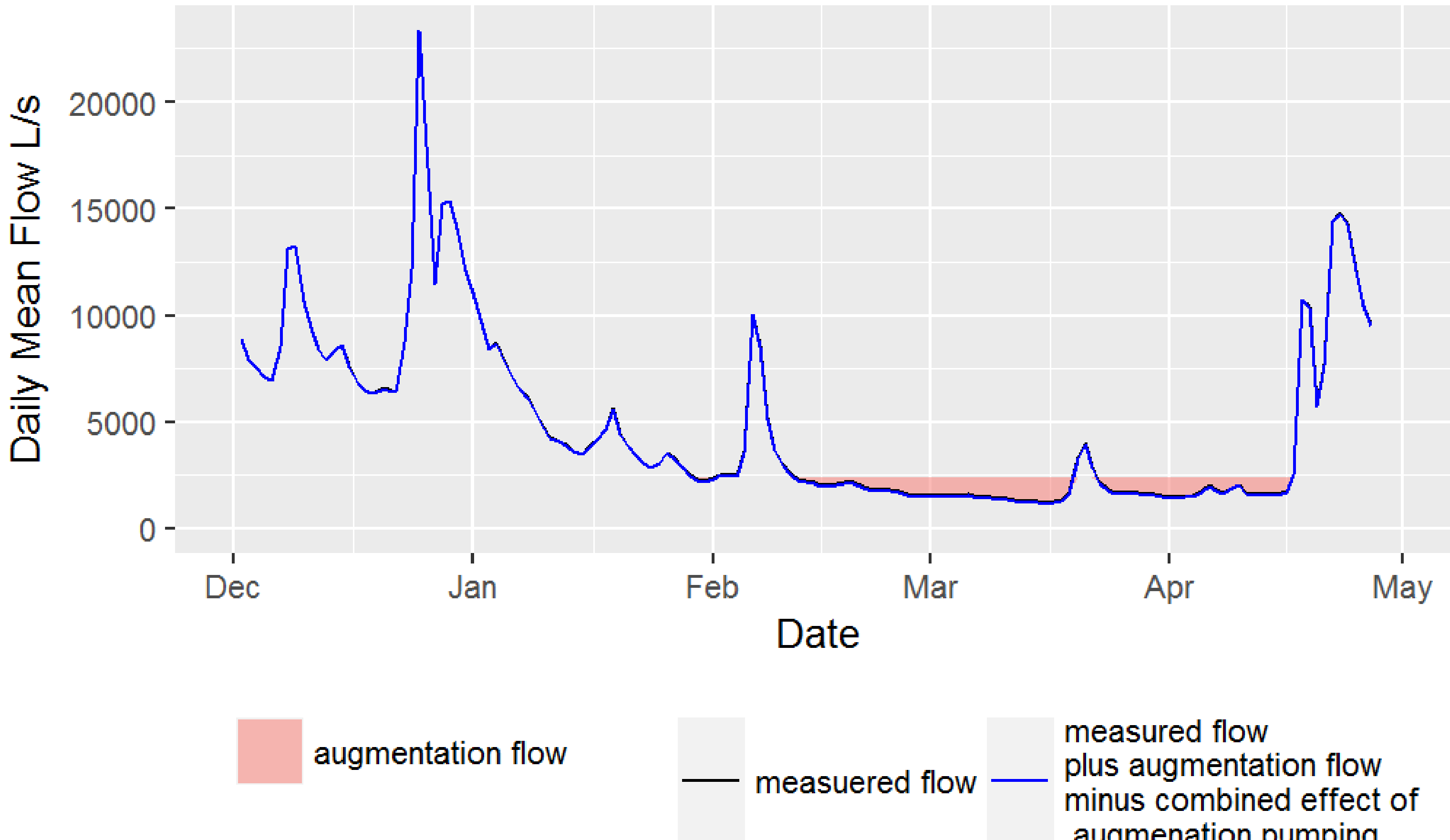
Mangateretere : Required Stream Flow Augmentation for 2012-2013 Conditions worst case



Ngaruroro :
Required Stream Flow Augmentation for 2012-2013 Conditions recommended case



Ngaruroro :
Required Stream Flow Augmentation
for 2012-2013 Conditions
worst case



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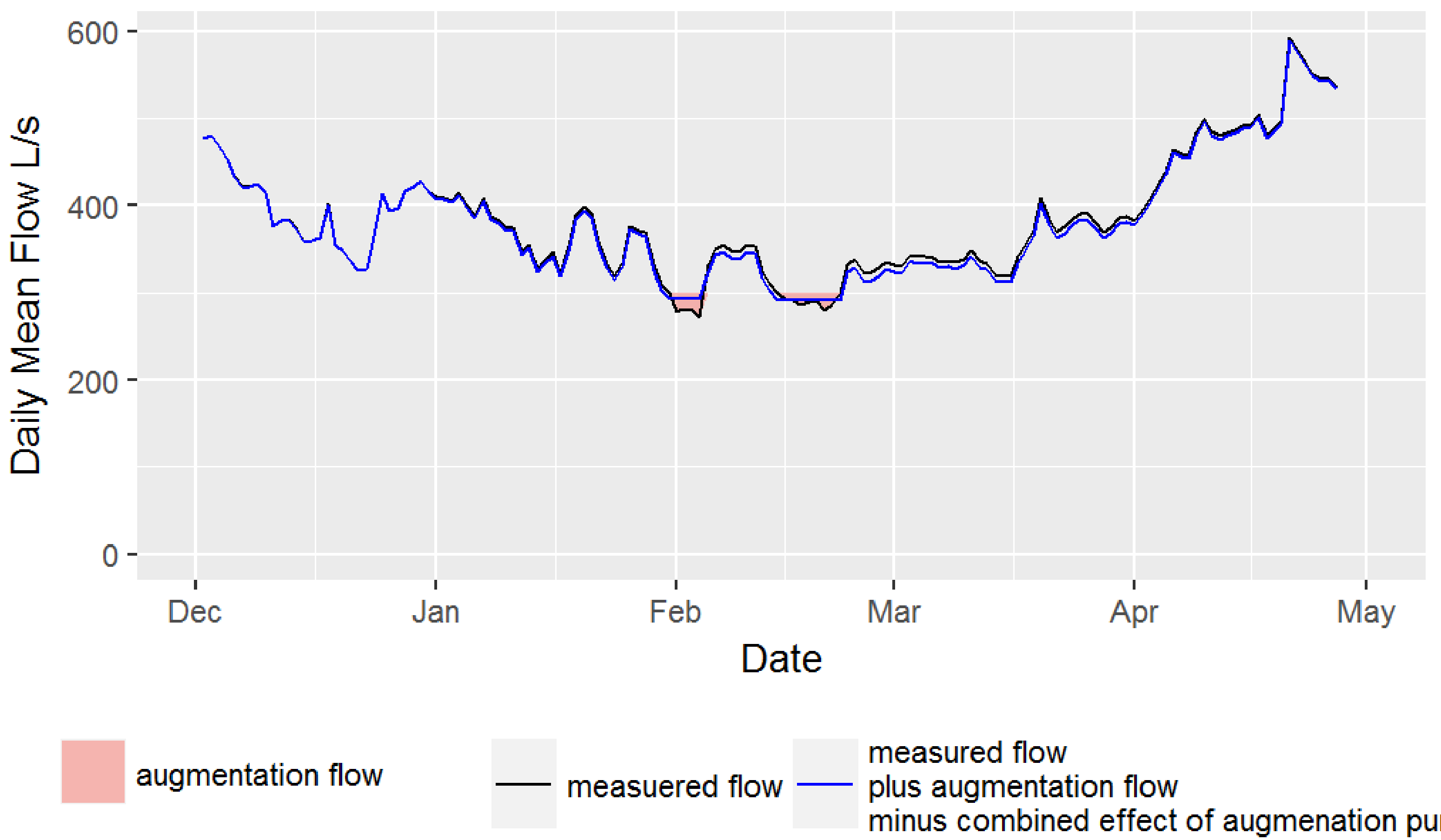
Raupare :
Required Stream Flow Augmentation
for 2012-2013 Conditions
recommended case



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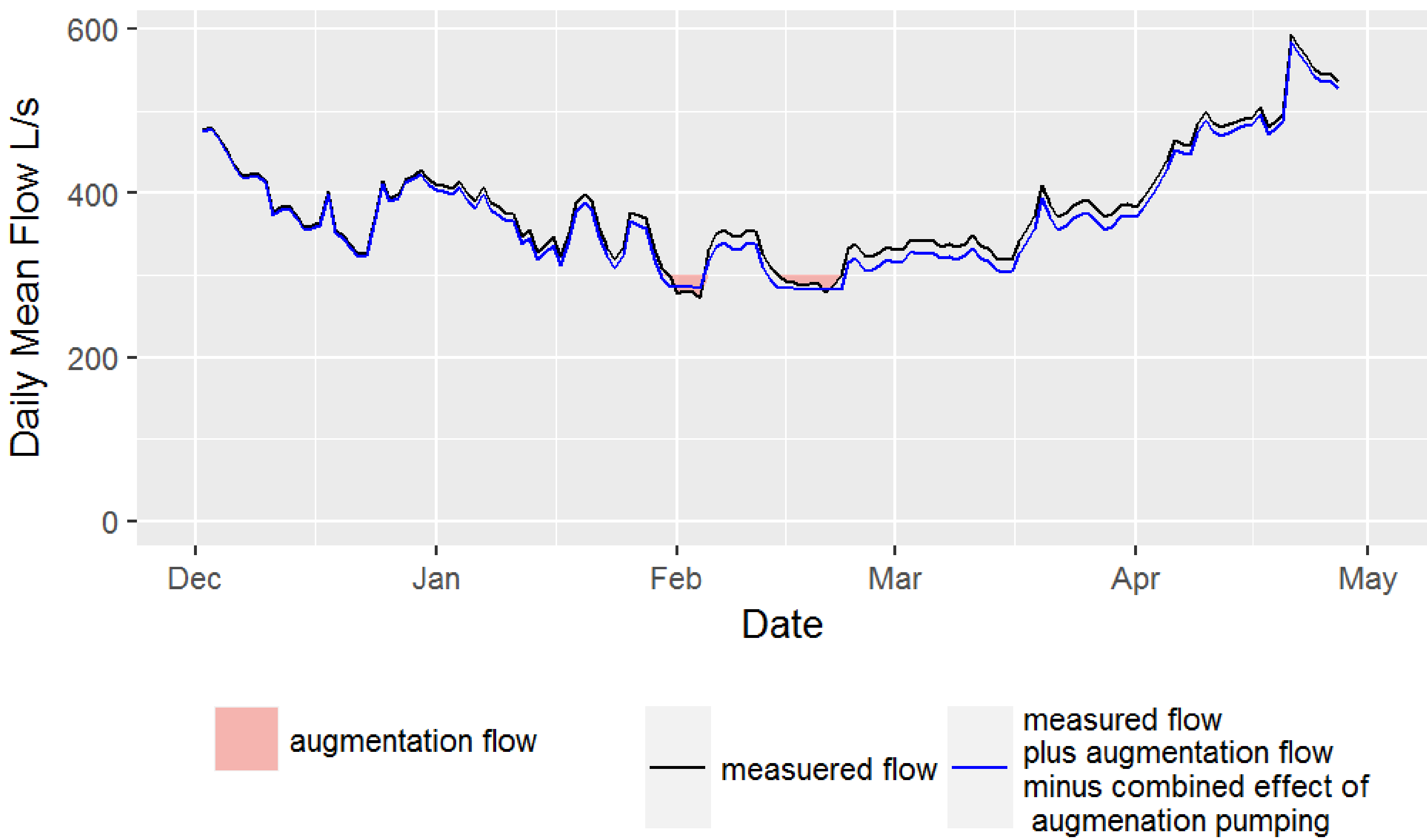
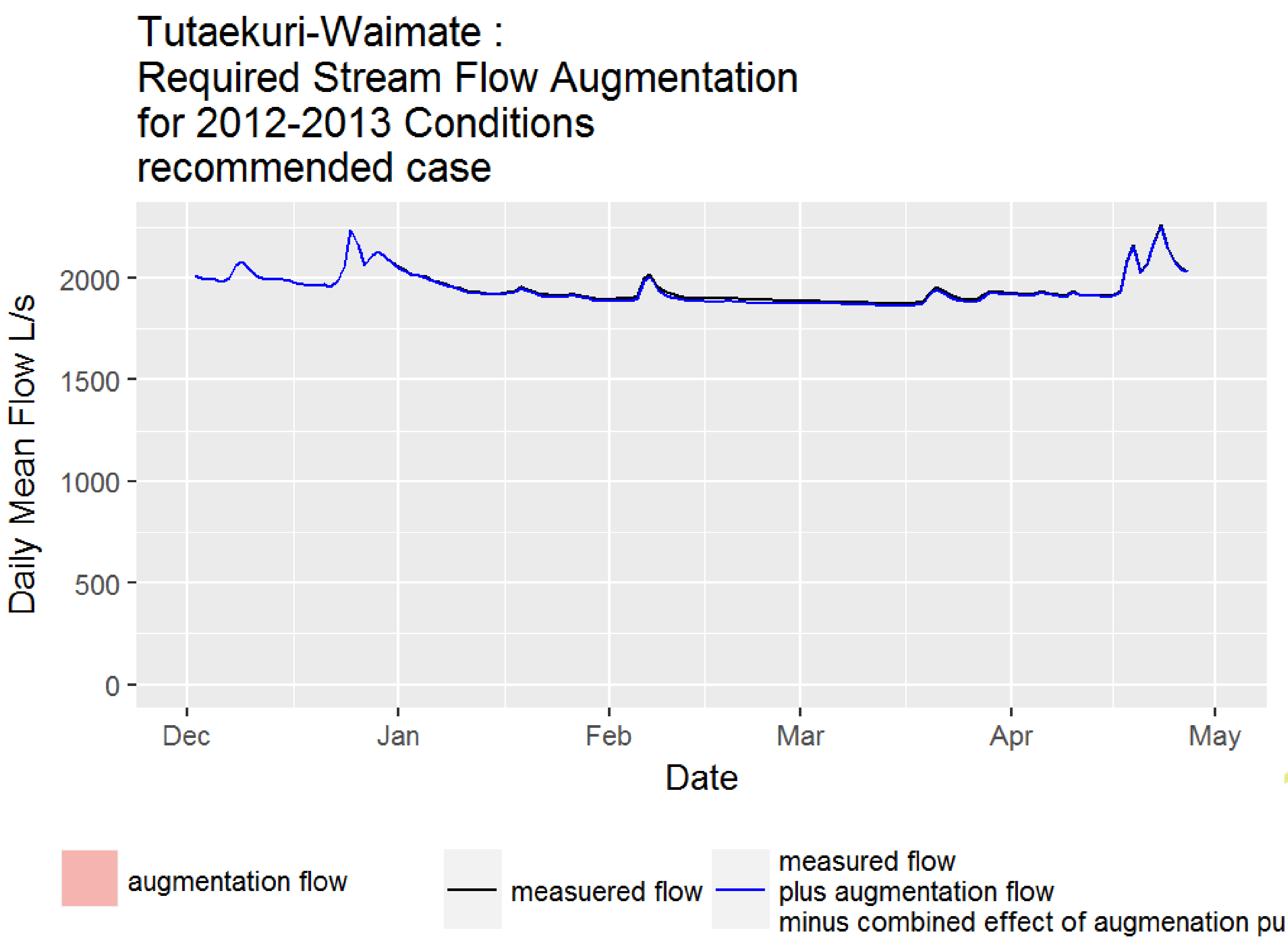
Raupare :
Required Stream Flow Augmentation
for 2012-2013 Conditions
worst case




Tutaekuri-Waimate :
Required Stream Flow Augmentation
for 2012-2013 Conditions
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Daily Mean Flow L/s
2000
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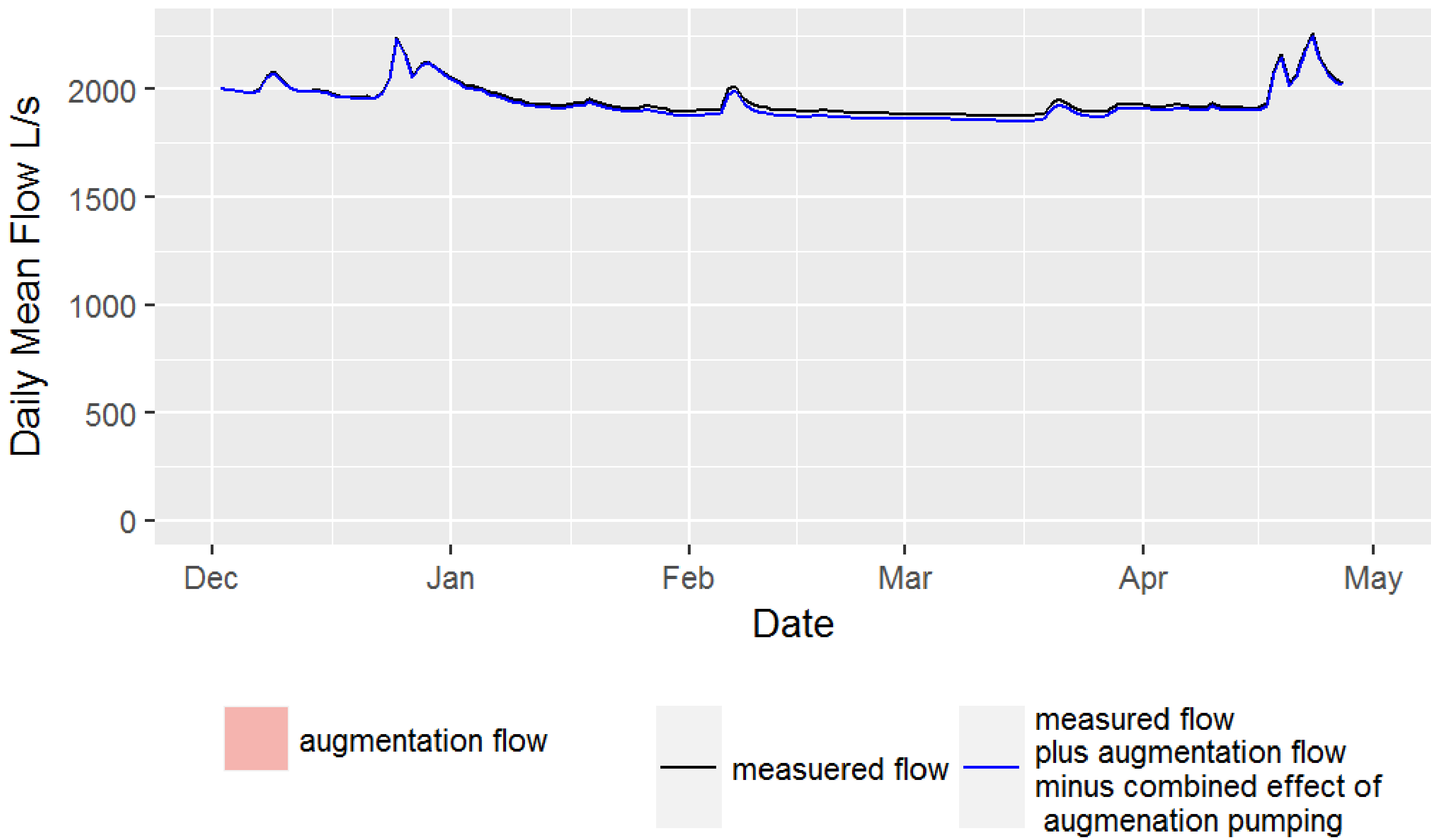
plus augmentation flow
minus combined effect of augmenation pu

Tutaekuri-Waimate :
Required Stream Flow Augmentation
for 2012-2013 Conditions
worst case



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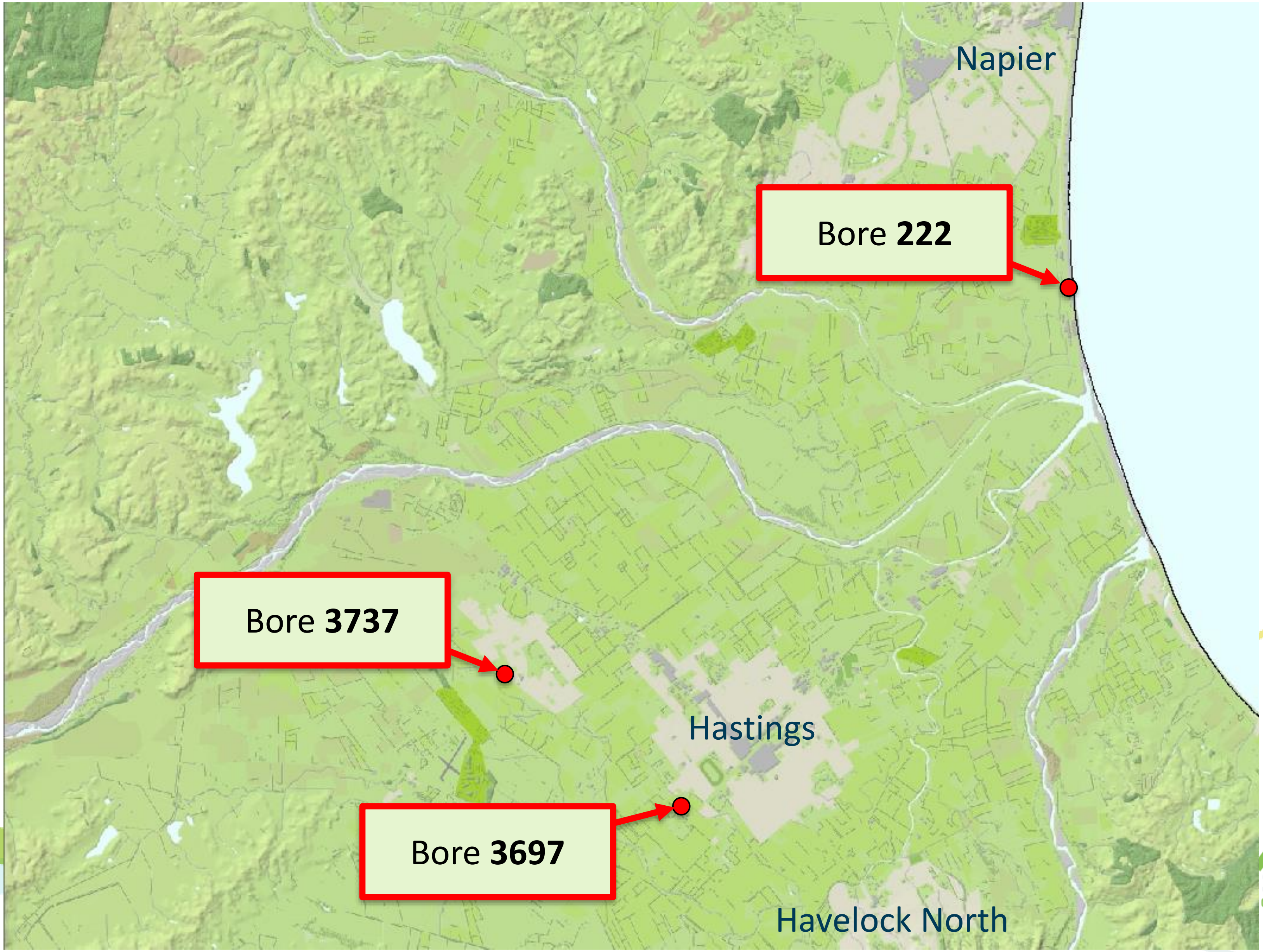
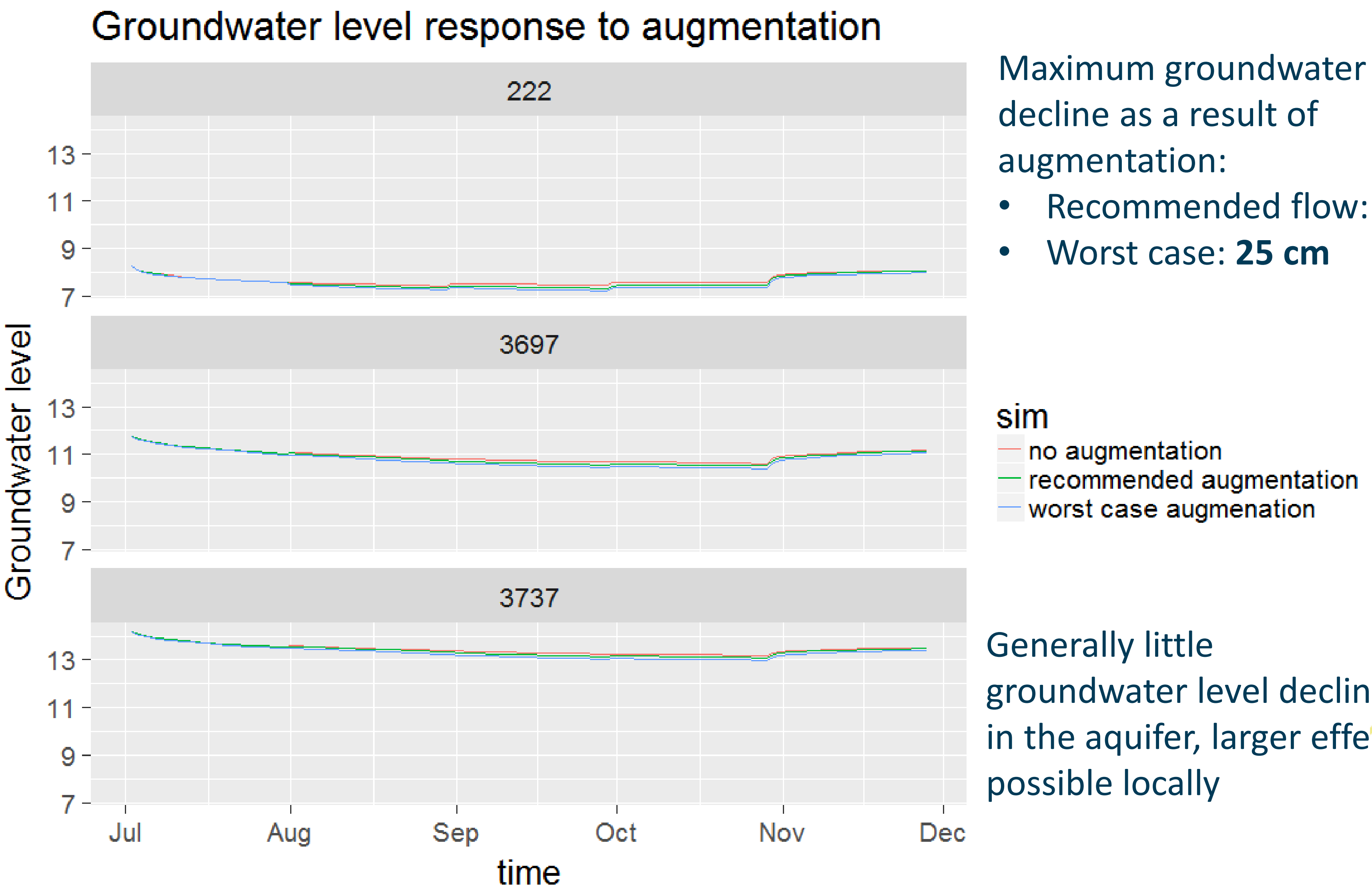
Example bores for investigation





Maximum groundwater level decline as a result of augmentation:

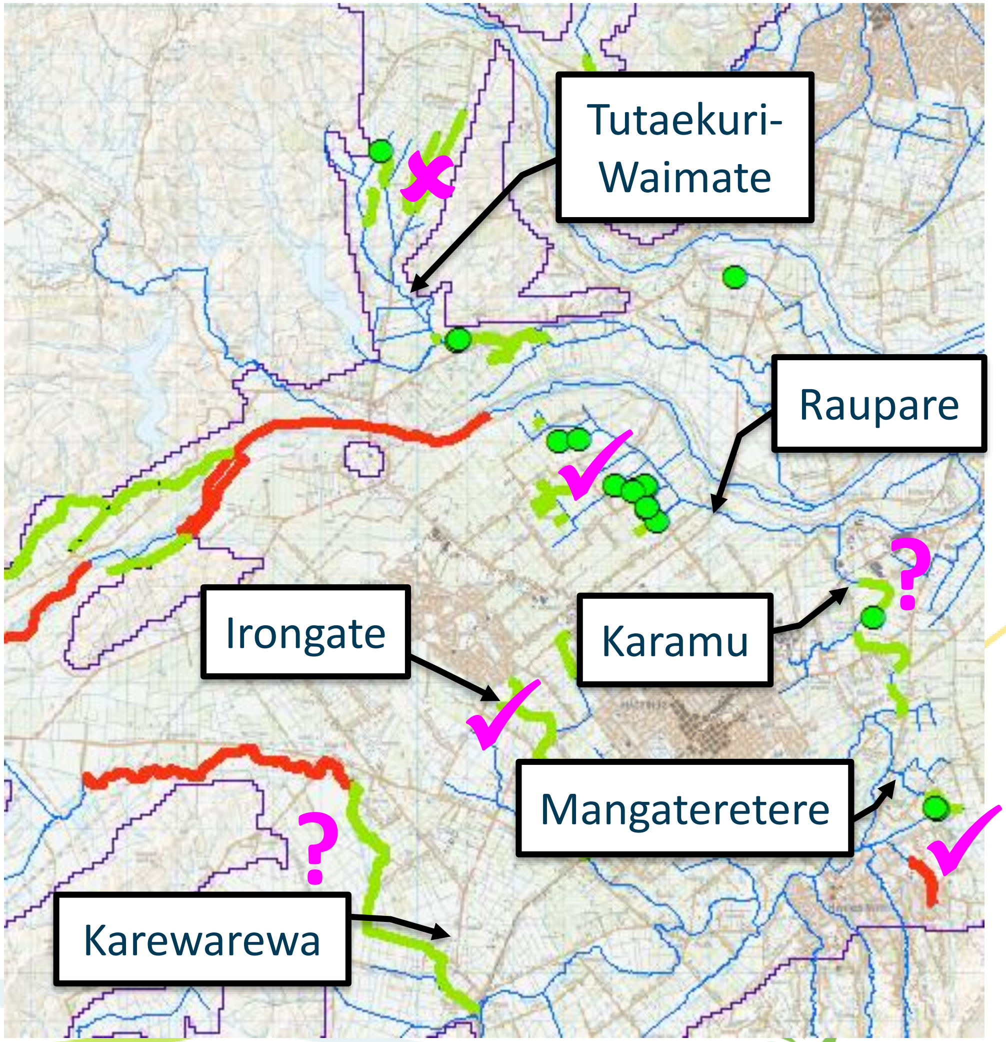
- Recommended flow: **15 cm**
- Worst case: **25 cm**

Generally little groundwater level decline in the aquifer, larger effect possible locally

Augmentation Flows - summary

- **Irongate, Raupare, Karamu, Mangateretere** could be effectively augmented for summer 2012-2013 conditions, although pumping for **Karamu** is large (250-350L/s)

- **Tutaekuri-Waimate** would not require augmentation in summer 2012-2013 for the target flow criteria
- **Karewarewa** full flow restoration may be not possible



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Augmentation – overall conclusions:

- Augmentation from groundwater is technically feasible for mitigating current stream depletion in lowland streams
- Augmentation will have some negative impacts on groundwater levels in Ngaruroro flows
- Augmentation may not be feasible for increased pumping (such scenario was not tested)
- Would require abstraction equivalent to 3-6% of current groundwater use
- Mitigation of Ngaruroro stream depletion via augmentation from groundwater is likely to be impractical

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GW - Stream flow augmentation – costs and benefits

Costs

- Augmentation scheme capital and operational costs
  - bore drilling (where necessary),
  - pumping costs ,
  - on-going administration and operational costs
- Does not address impact on Ngaruroro R low flow

Benefits

- Stream flows maintained a desired levels
- No restrictions on GW abstraction takes during periods of low flow

Challenge 2 – Managing flows in lowland streams

Proposal 2:
To develop GW flow augmentation scheme as a preferred management scenario and further report on costs and implementation.
Possible Implementation;
Through a rule (resulting in consent conditions) that all GW takes contribute to flow augmentation for lowland streams. This would require:

- Extent of contribution to be based on degree of impact on stream depletion (formula under development as presented at TANK#27)
- Timeframes to be specified in the Plan
- Further development of stream augmentation scheme details, initially by Water Augmentation Working Group and Council

Breakout question for Challenge 2

1. Do you agree/disagree that the flow augmentation scheme is a preferred option to manage effects of stream depleting GW takes?

2. If not why not and what other option is there?

3. Can you identify any issues that are likely to arise?

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Challenge 3 – Managing flows in lowland streams; direct takes

Issue: There are a number of direct surface water takes within the HP model boundary that also have impacts on stream flows. Some of these streams are subject to a GW flow augmentation management option.

Options: Allocation limit

1. Cap allocation to existing use

   or

2. Cap allocation at total of existing consented allocations

The difference between these two is that option 2 potentially results in lower security of supply for permit holders.

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Challenge 3 – Managing flows in lowland streams; direct takes

Options; Managing effects –

3. In the Karamu catchment, where g/w flow augmentation scheme is proposed:
    - S/w takes are included in g/w flow augmentation scheme (one for one contributions)

   In the Ngaruroro and Tutaekuri-Waimate catchments where g/w flow augmentation schemes are not proposed:
    - S/w takes will be managed by s/w restriction regime (tbc)
4. All s/w takes managed by s/w restriction regime (tbc)
    - Reduced number of flow management sites have been proposed

Option 3 adds to the size of the augmentation scheme.
S/w takes currently managed by s/w restriction regime

Proposal:
Options 1 and 4 to be developed further

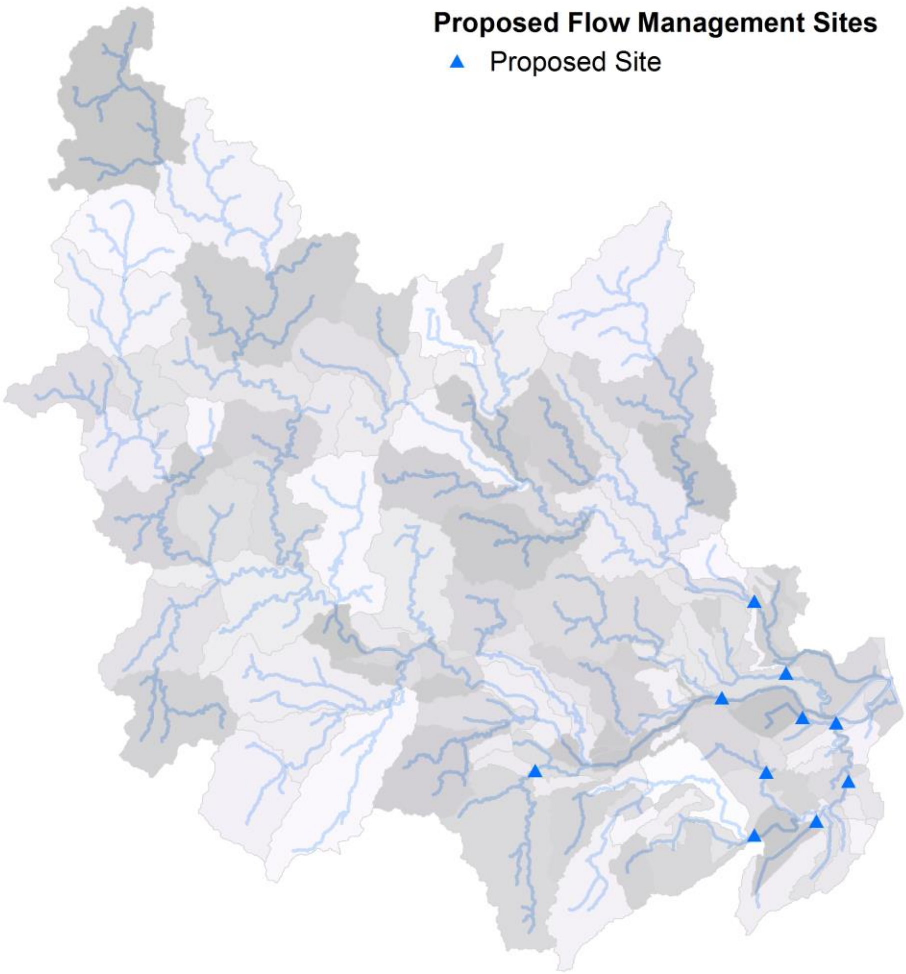
Summary of surface water takes

Rob Waldron
Scientist - Hydrology

Flow Management Sites

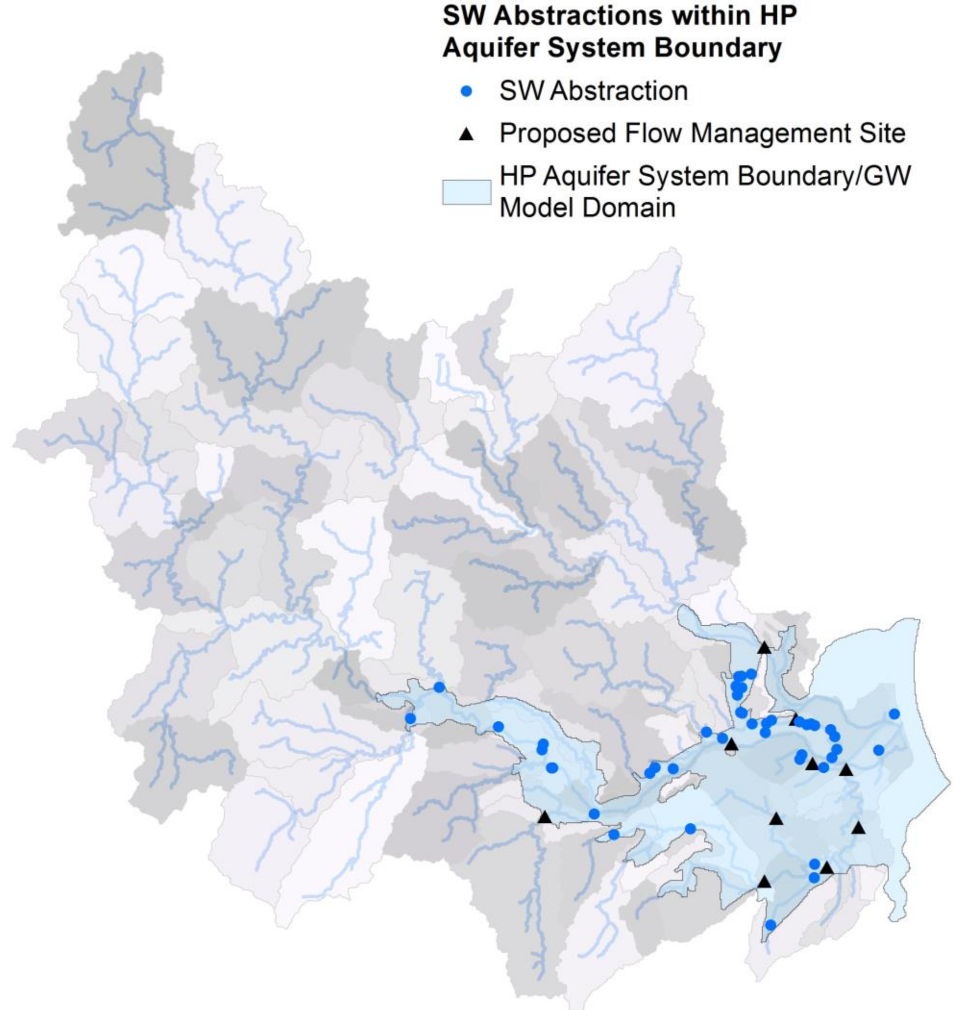
Potential Future Flow Management Site Network

- 10 proposed sites
- Sites may be used to trigger:
  - Restrictions
  - Staged reductions
  - Augmentation
  - Artificial recharge



SW Abstractions within HP Aquifer System Boundary

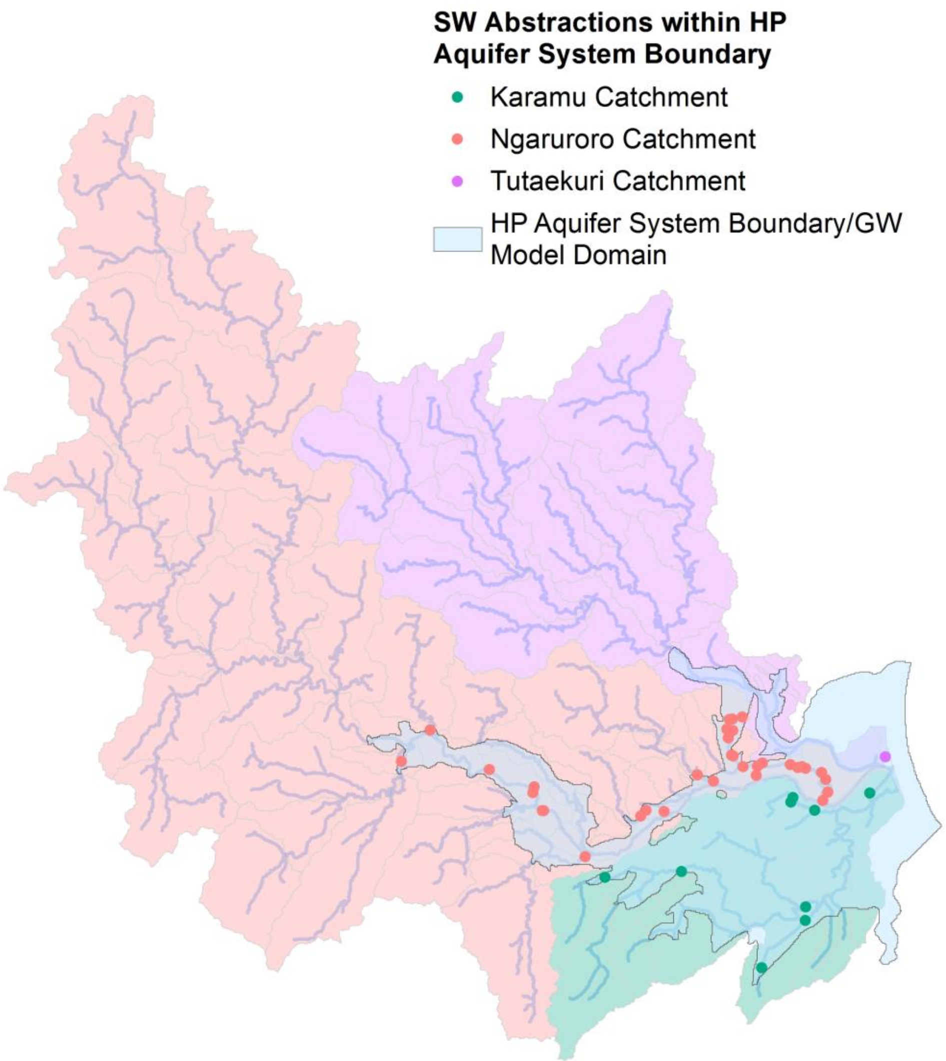
- Approx 45 abstractions
- Total allocated average rate of take = 1325 l/s



SW Abstractions within HP Aquifer System Boundary

SW Abstractions by Catchment

- Tutaekuri Catchment:
  - 1 abstraction
  - Average rate of take = 15 l/s
- Ngaruroro Catchment:
  - 35 abstractions
  - Combined average rate of take = 1240 l/s
- Karamu Catchment:
  - 9 abstractions
  - Combined average rate of take = 70 l/s



Challenge 3 – Managing flows in lowland streams; direct takes

Proposal 3:

To develop the following options as the preferred management scenario;

Option 1. Cap allocation to existing use

Option 4. All s/w takes managed by s/w restriction regime (tbc)

Breakout Question for Challenge 3

1. Do you agree with the proposed management scenario to manage s/w takes from lowland streams?
2. If not, why not and what other option is there?
3. Can you identify any issues that are likely to arise?

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Challenge 4 – Managing the flow depleting effect on Ngaruroro River from GW takes

Issue: Cumulative effect of stream-depleting groundwater takes is up to 1200 l/s on Ngaruroro River flow (including proposed GW flow augmentation).

However neither;

- restricting individual takes

nor

- restricting takes in specified areas/zones

is likely to be cost effective for achieving recovery of flows to desired levels in a timely manner.

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Challenge 4 – Managing the flow depleting effect on Ngaruroro River from GW takes

Options:

1. "Live with impact" on Ngaruroro from GW takes in plains and include in SW allocation
2. Reduce total allocations below current levels (at permit renewal – or by review)
3. Ban/restrict all/some takes in all zones at specified flow
4. Develop mitigation option (i.e water storage and release or ?) and incentivise or require contribution.
   - e.g. progressively reduce GW allocations at specified times if mitigation option not developed (through rules and consent conditions) or any other measure?

Proposal: Further develop option 4

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Effect of groundwater abstraction on Ngaruroro River flow

By Pawel Rakowski

2017-08-17

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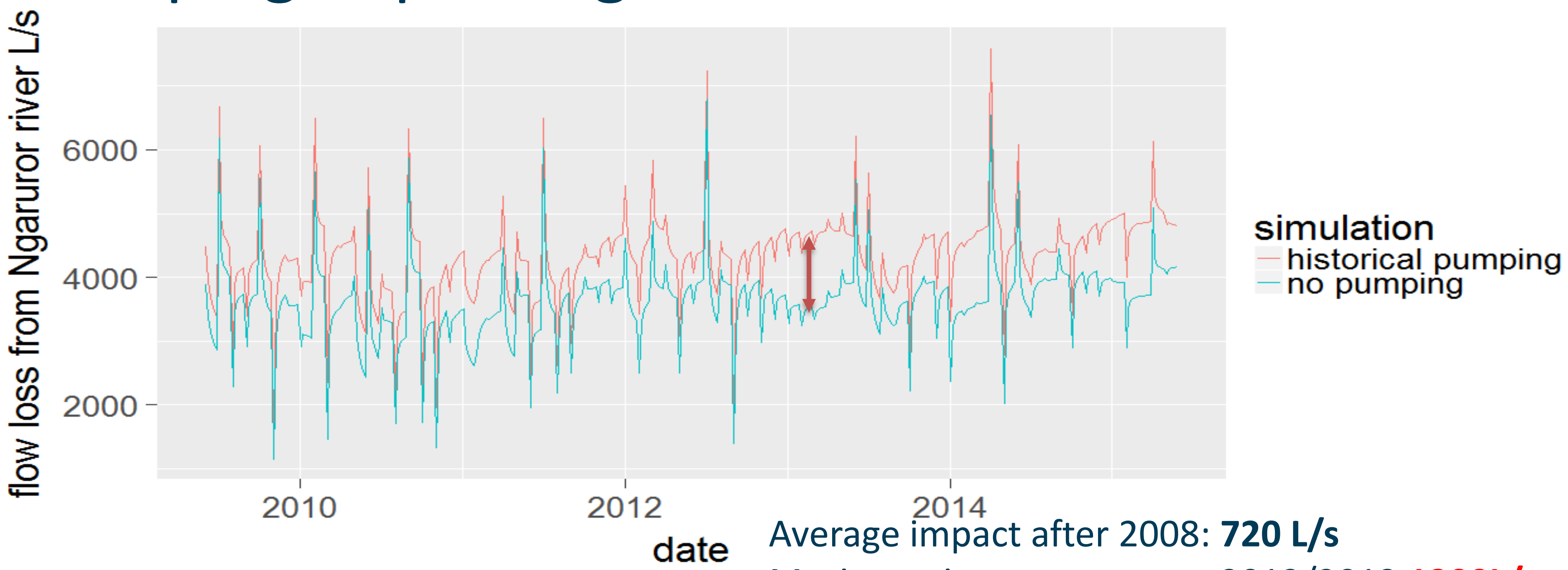
Aim

- Estimate impact on pumping on Ngaruroro River flow
- Total impact of pumping
- Impact of augmentation pumping

Methodology:

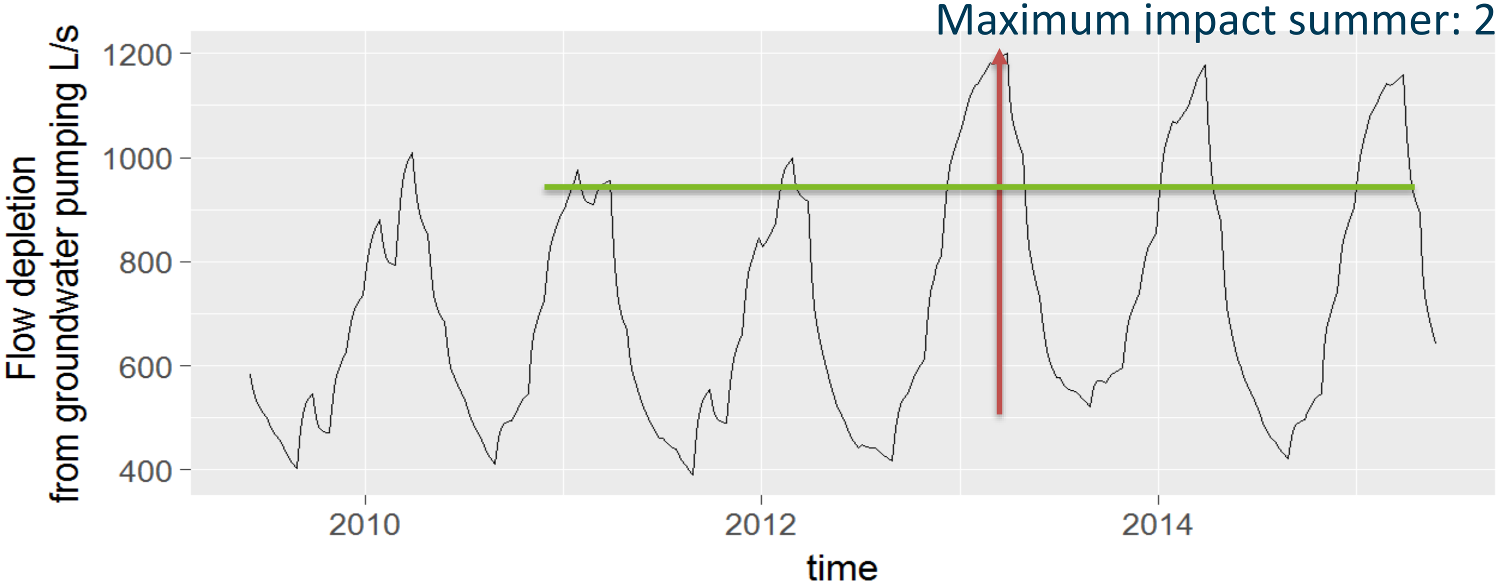
- Run model with and without pumping and compare calculated river loss
- Total loss in Ngaruroro river including variable loss section below Fernhill

Pumping impact Ngaruroro River 2005-2015



Average impact after 2008: **720 L/s**

Maximum impact summer: 2012/2013 **1200L/s**



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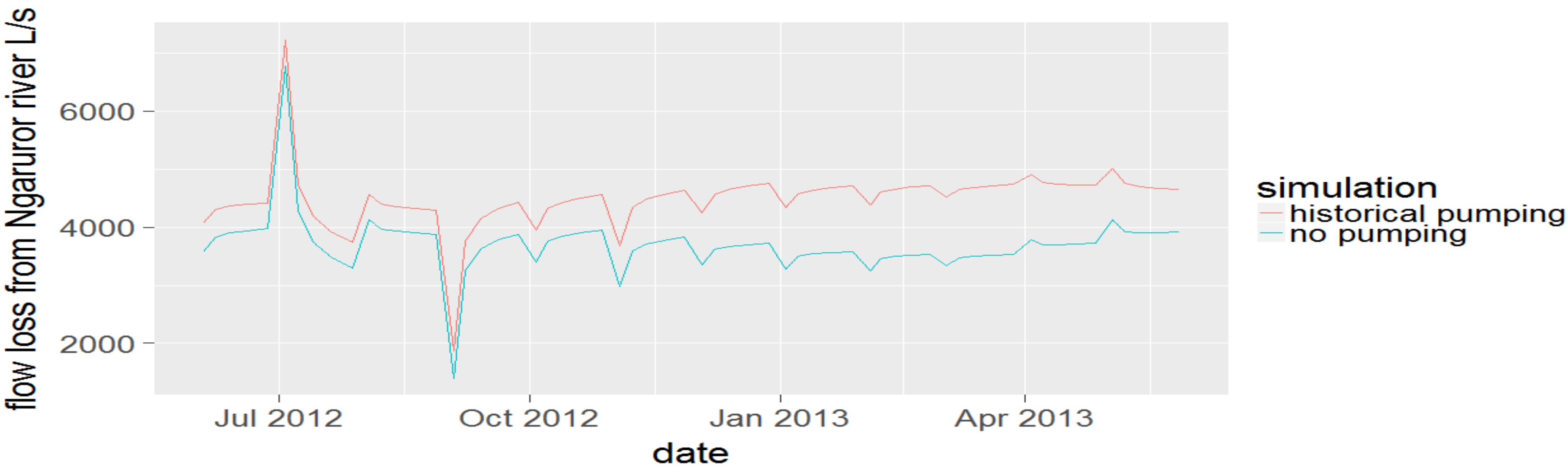
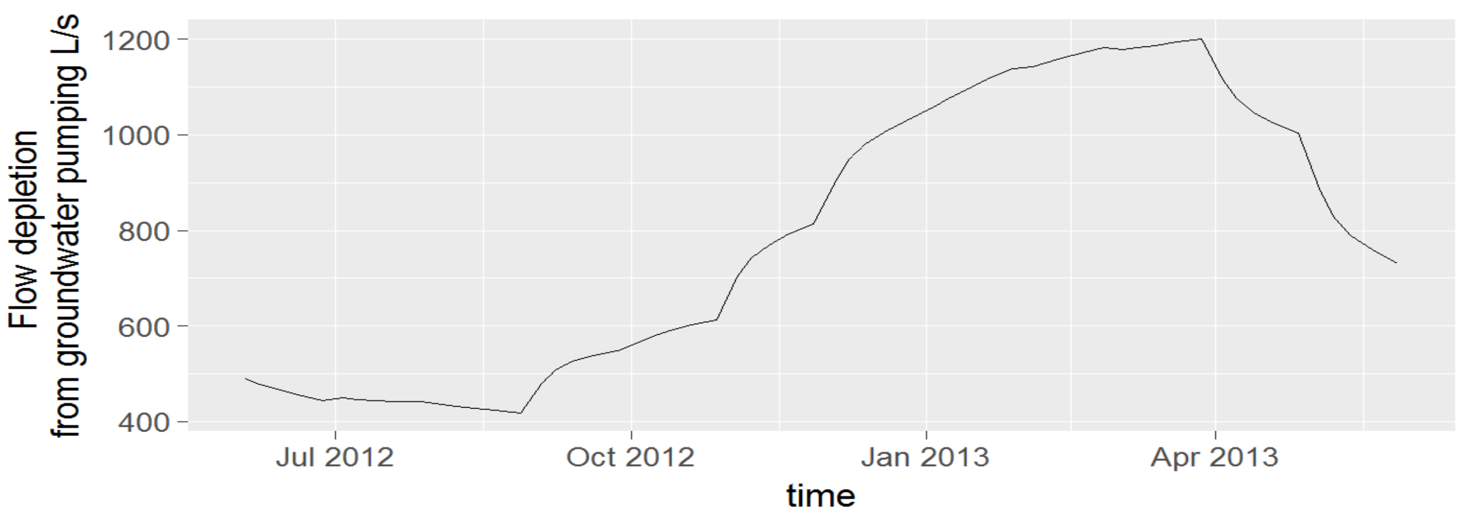
Pumping impact Ngaruroro River 2012-2013





Maximum impact summer: 2012/2013 **1200L/s**

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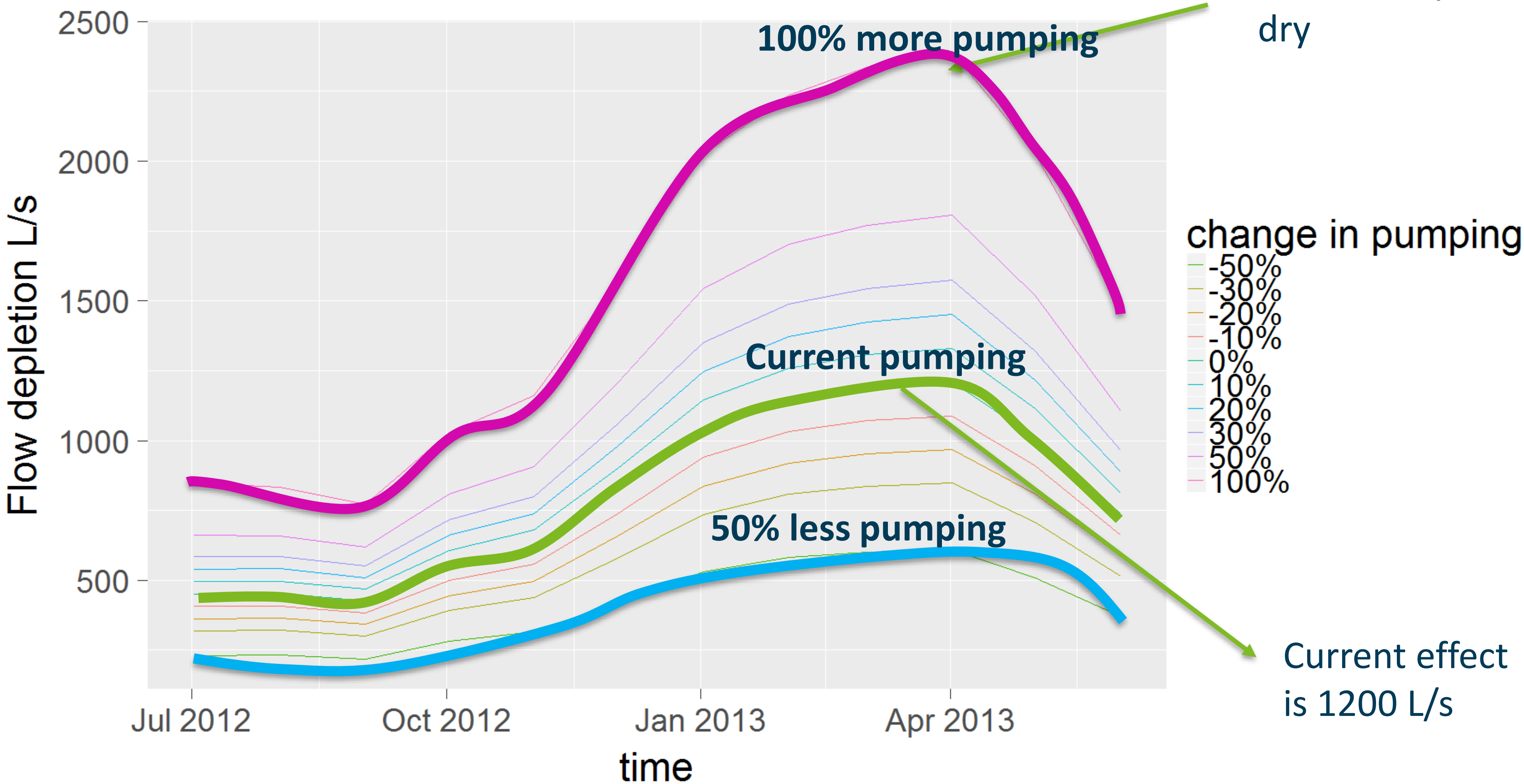
Sensitivity of Ngaruroro flows to changes in pumping volumes



River nearly dry

Current effect is 1200 L/s

Even with no pumping, flow in Ngaruroro would reach current minimum flow of 2400 L/s in summer 2012-2013 conditions

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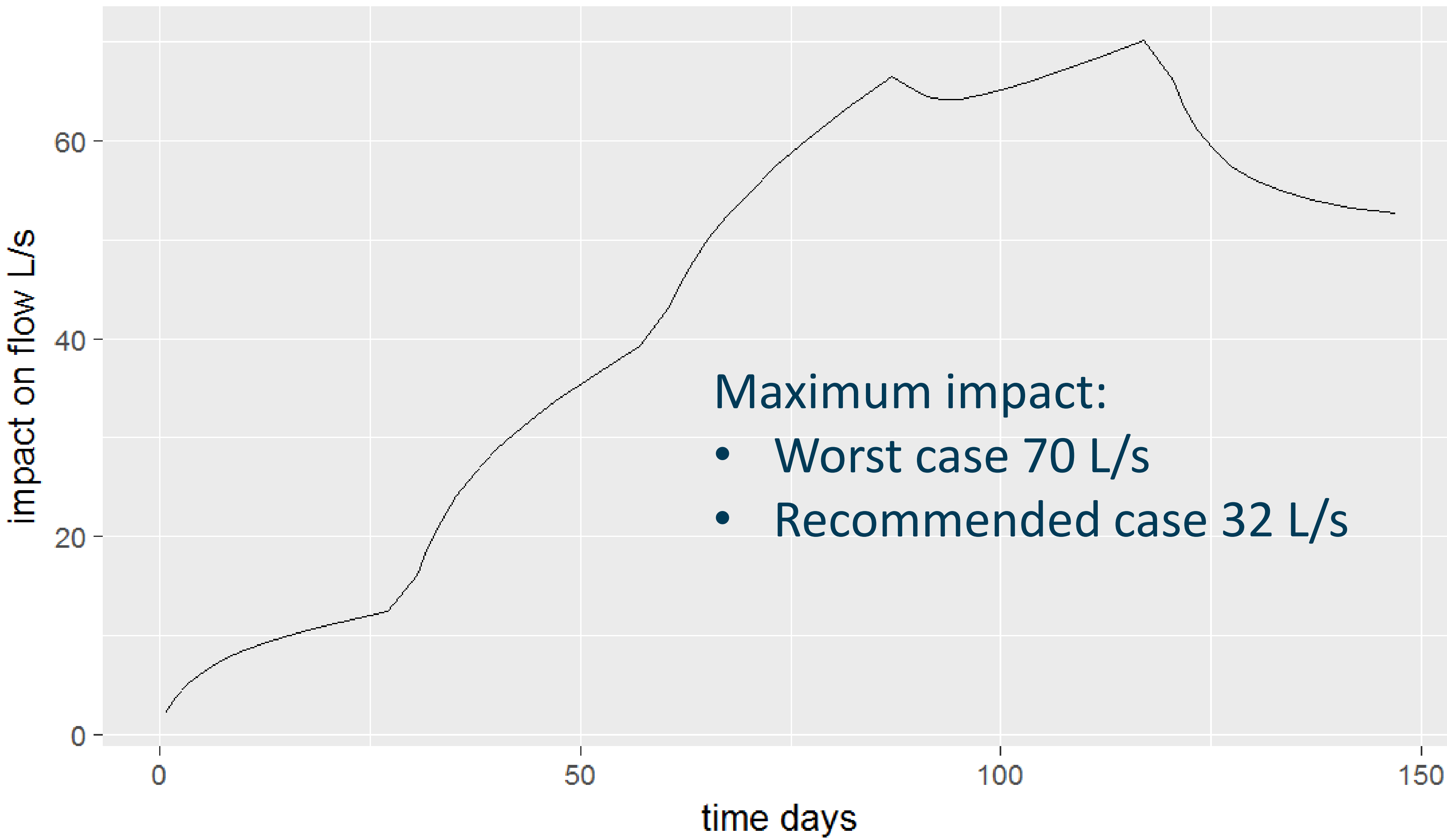
Impact of augmentation pumping on Ngaruroro flow (worst case)



Maximum impact:

- Worst case 70 L/s
- Recommended case 32 L/s

Options:

1. Continue to "live with impact" on Ngaruroro from GW takes in plains and include in SW allocation
2. Reduce total allocations below current levels (at permit renewal – or by review)
3. Ban/restrict all/some takes in all zones at specified flow
4. Develop mitigation option (i.e water storage and release or ?) and incentivise or require contribution.
    - e.g. progressively reduce GW allocations at specified times if mitigation option not developed (through rules and consent conditions) or any other measure?

Proposal: Further develop option 4

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Conclusions

- Groundwater pumping effect on Ngaruroro flow:
  - Average 720 L/s
  - In dry summer up to 1200 L/s
- Even with no pumping flow in Ngaruroro would reach current minimum flow of 2400 L/s in summer 2012-2013 conditions
- Increase in pumping will increase impact significantly resulting in dry river
- Augmentation pumping will result in additional reduction of Ngaruroro flow of up to 70 L/s

Proposal 4. Develop mitigation option (i.e water storage and release or ?) and incentivise or require contribution.

- e.g. progressively reduce GW allocations at specified times if mitigation option not developed (through rules and consent conditions)
- or any other ?

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Costs and Benefits for Option 4

Costs

Transitional management approach

- Adverse flow impact continues in the interim

Detangling surface water abstraction effects

Scheme operation and maintenance costs

Solution is dependant on future infrastructure

- Would need supporting policy and LTP commitment by council.

Benefits

Enables effects to be directly addressed

Avoids reduction in total abstraction

Costs imposed according to level of impact

Could be developed to meet new water demand or surface water security of supply at the same time

- Allows for multi- purpose approach

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Breakout Question for Challenge 4

1. Do you agree to further develop proposal 4 as the preferred management option for managing the flow depleting effects of GW takes on the Ngaruroro R?
2. If not why not and what other option is there?
3. Can you identify any issues?

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Challenge 5 – Managing effect of pumping on groundwater levels

Review groundwater trend information and test effects of increasing or reducing GW abstraction

Issue:

GW level is currently at a dynamic equilibrium at current levels of abstraction.

- Increasing GW abstraction will have further negative effects on lowland stream flow, and Ngaruroro River low flows (effects on aquatic ecosystem, mauri and other instream values and other flow-on impacts)and will further impact on GW levels

- Reducing GW abstraction will have positive effects on lowland stream flow and Ngaruroro River flows (effects on aquatic ecosystem, mauri and other instream values) and on GW levels

- Reducing GW abstraction will have negative impacts on existing users (economic effects on users and other flow-on impacts)

Challenge 5– Managing Effect of pumping on groundwater levels

Options;

1. Allow pumping to increase (to new allocation limit) but still maintain specified flows in lowland streams by flow augmentation.
   - What happens to groundwater levels across the plains with increased pumping?
   - What happens to Ngaruroro R flows?
   - Where might this affect existing access to groundwater and what solutions exist to address this?
2. Reduce total allocations
3. Cap allocation at total of existing consented allocations
4. Cap allocation to existing use
5. Commitment to further investigate option 1

Proposal: Option 4 is the recommended approach.
Option 5 could also be considered (further investigate costs and benefits for some increased pumping).

Long term groundwater trends investigation: summary and further findings

By Pawel Rakowski

2017-08-17

Main findings of long term trends investigation

- Aquifer groundwater levels and streams flow have declined as a result of increasing groundwater pumping over past decades
- Aquifer response is fast and if pumping stabilizes, aquifer will remain in a new dynamic equilibrium without any significant further decline (no groundwater mining)
- Increasing aquifer abstractions will result in further decline of water levels and spring flows, eventually leading to drying out of some streams and saline intrusion
- **Caveats:** this assessment focuses on long term overall trend; local stresses, extreme weather may cause water levels and streams flows to reach lower levels at times in some locations, despite no long term decline

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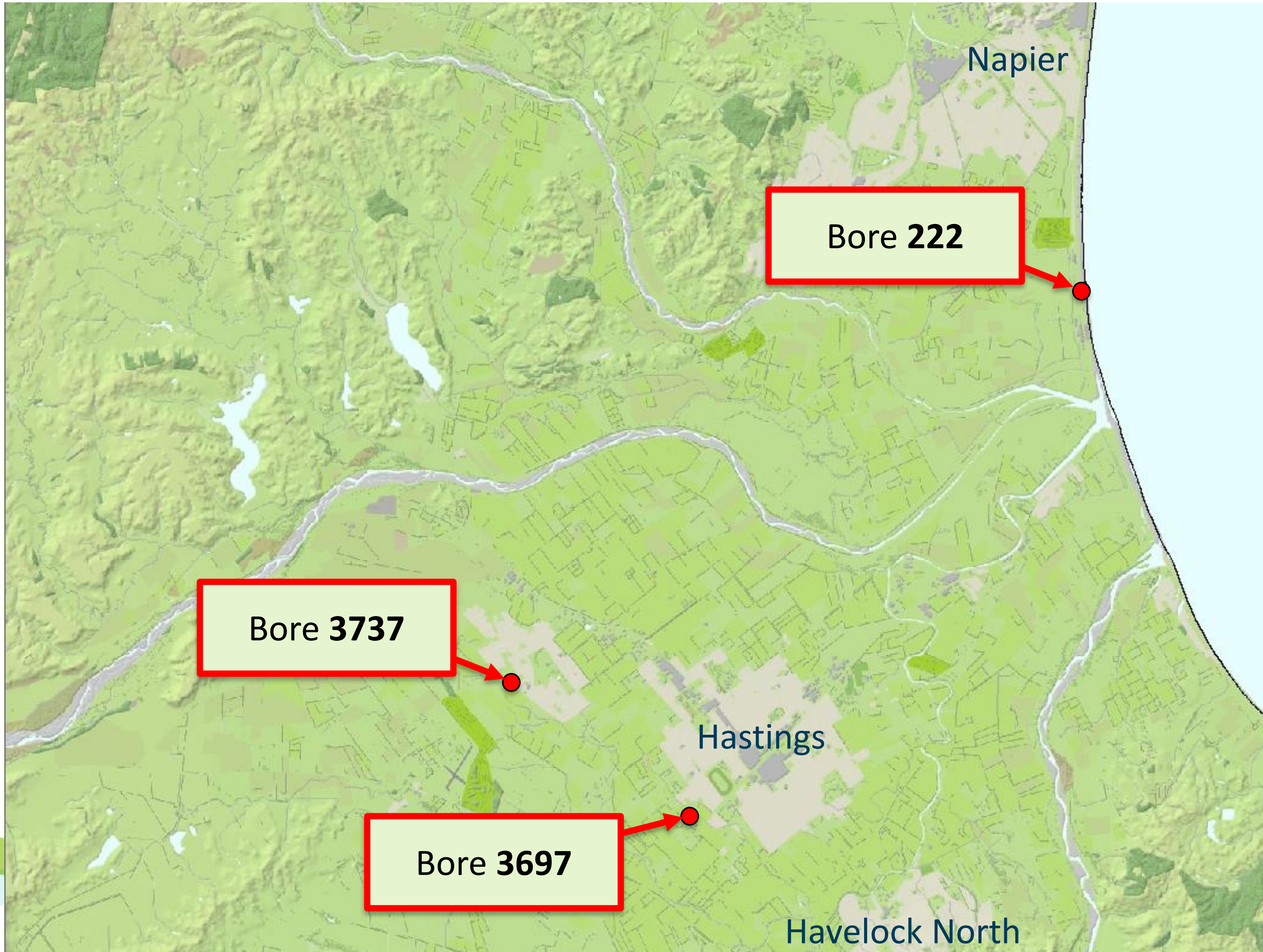
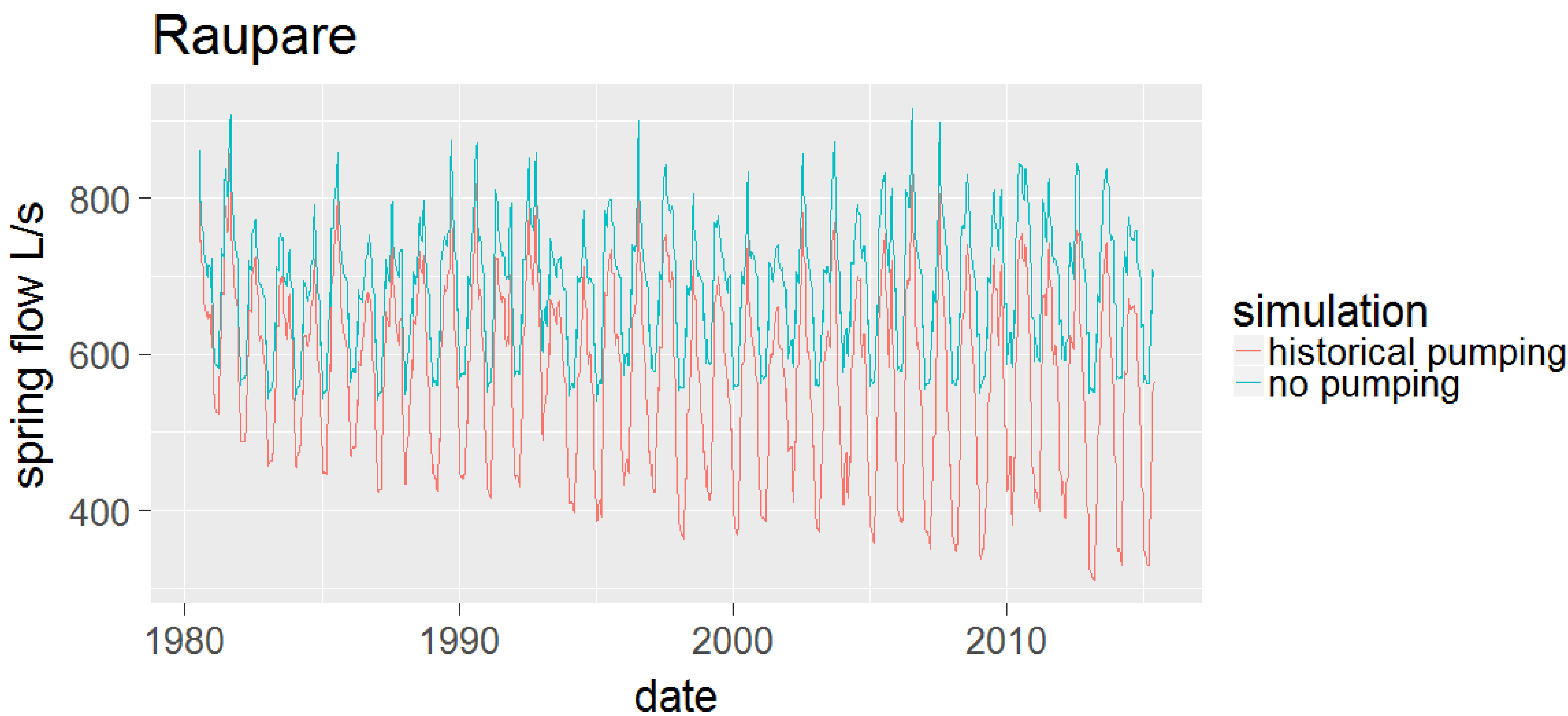
Example bores for investigation

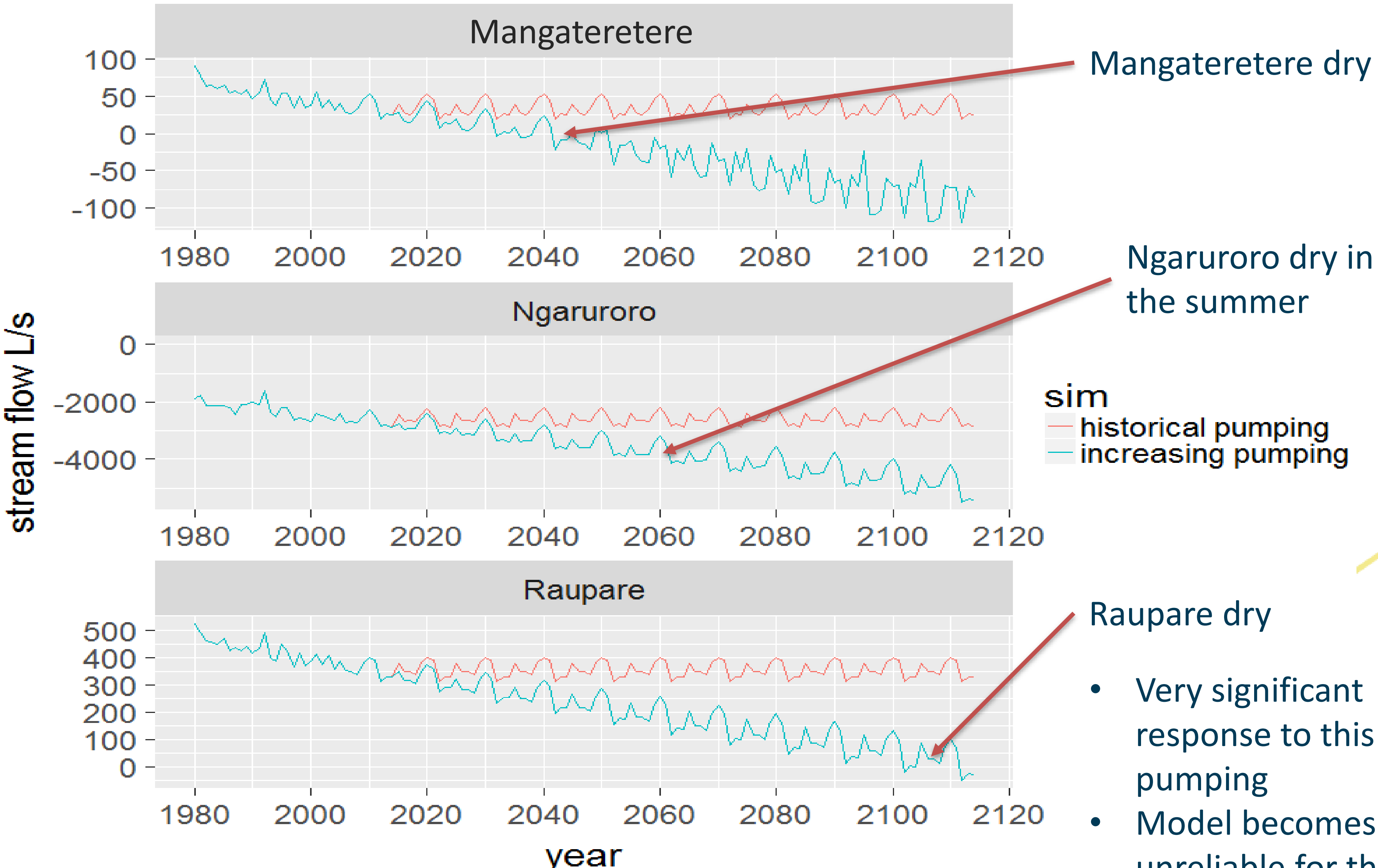


Modelling response to pumping

Use model with and without pumping – spring discharges



Modelling results – stream flows



- Very significant response to this pumping
- Model becomes unreliable for this extreme scenario

Further analysis

- Aim: Establish what happens to groundwater levels and river flows for small 10%, 20% etc change to groundwater pumping
- Methodology: run 20 year model, using past 10 year pumping record with 10%, 20% change in pumping stress, report how extremes respond
- (minimum water levels, minimum stream flows)

Groundwater use scenarios tested:

-50% -30% -20% -10% 10% 20% 30% 50% 100%

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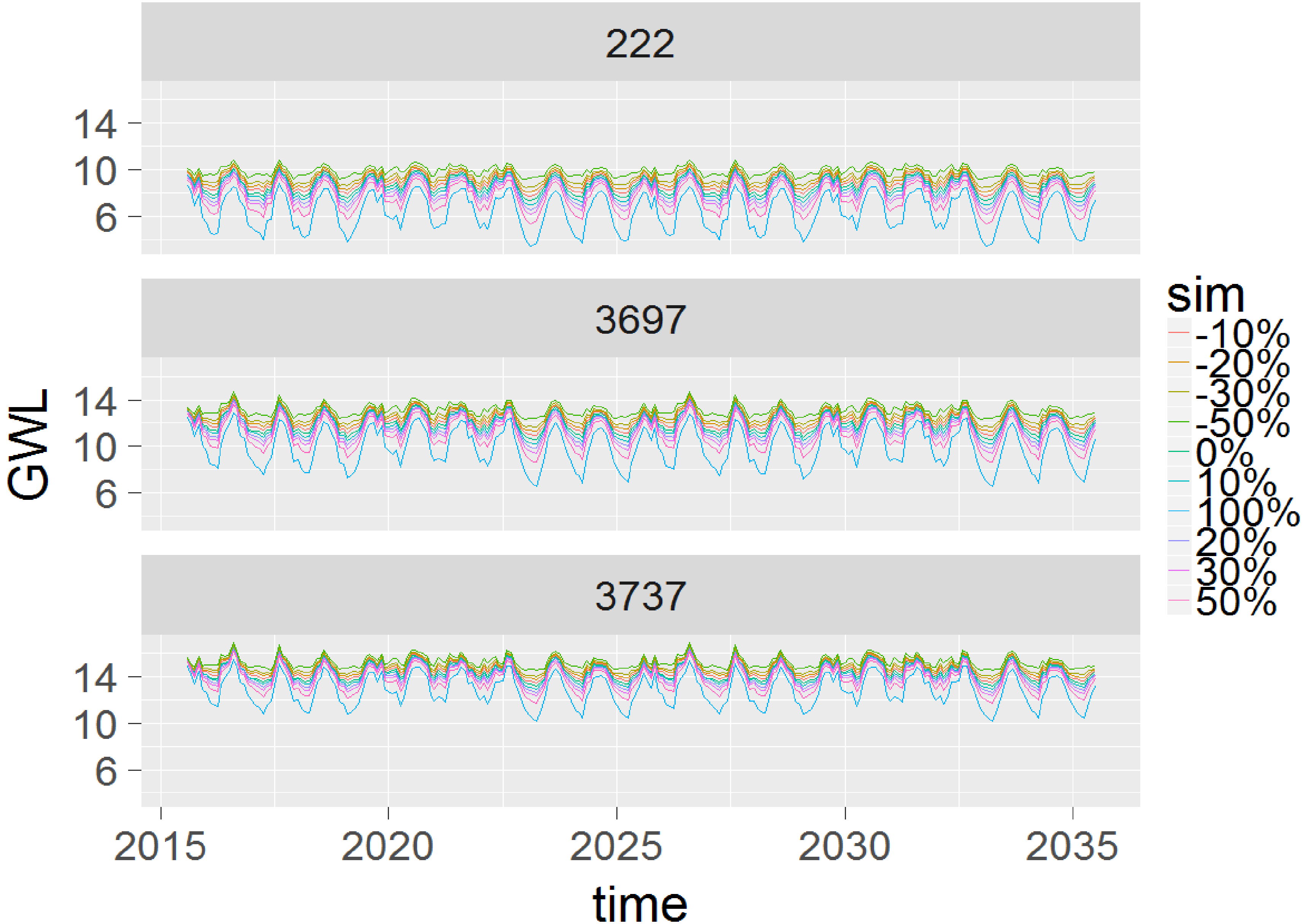
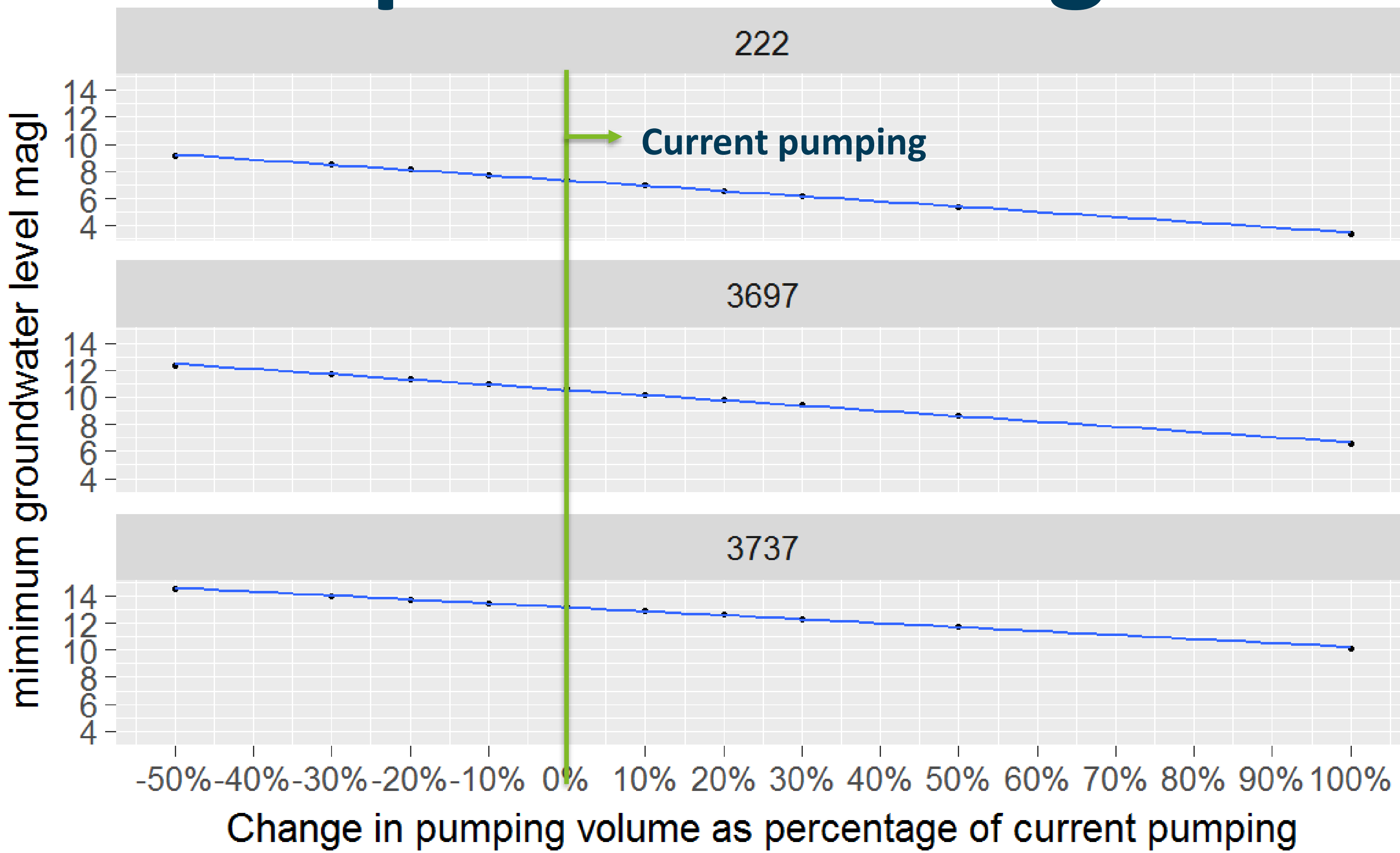
Sensitivity of groundwater level to pumping

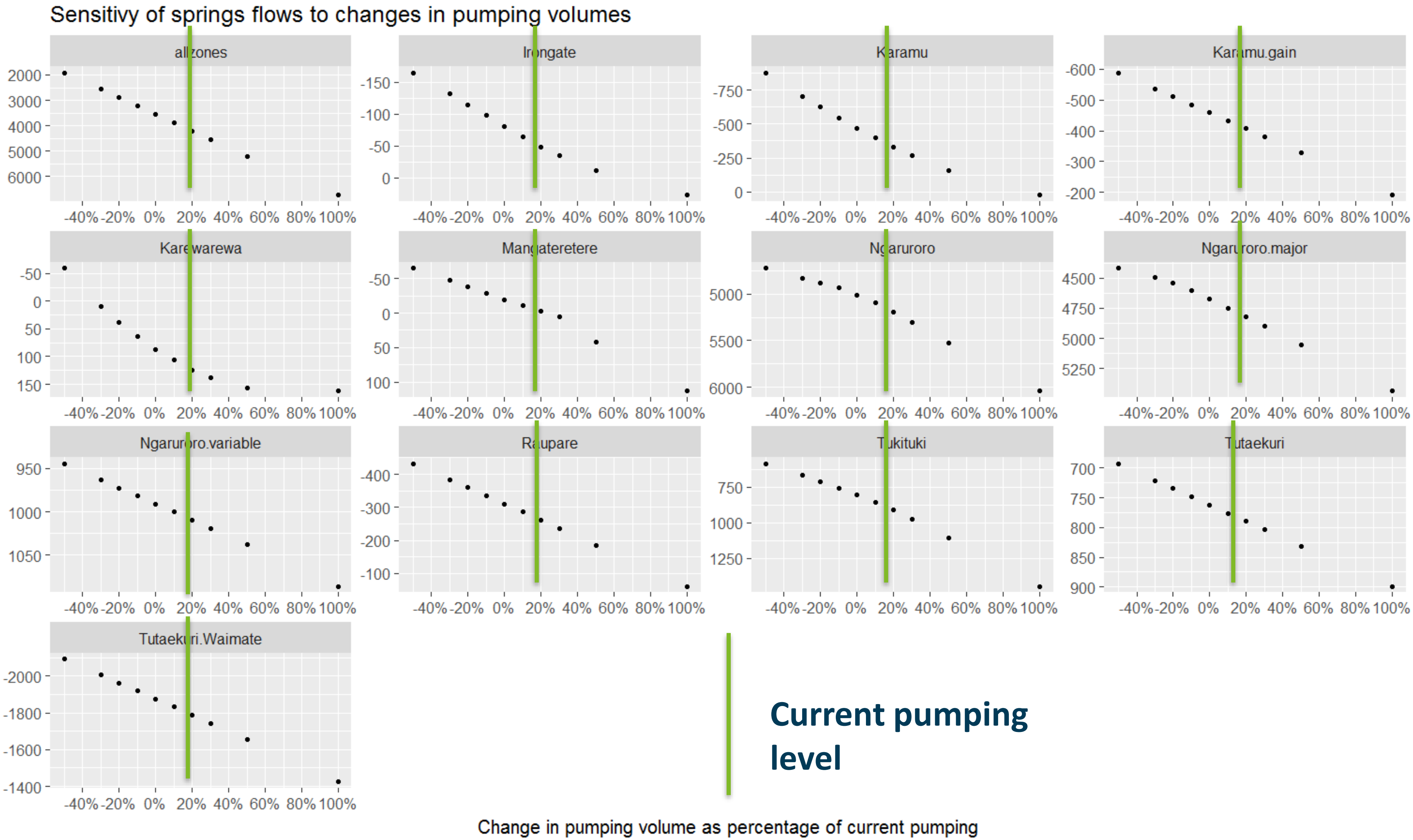


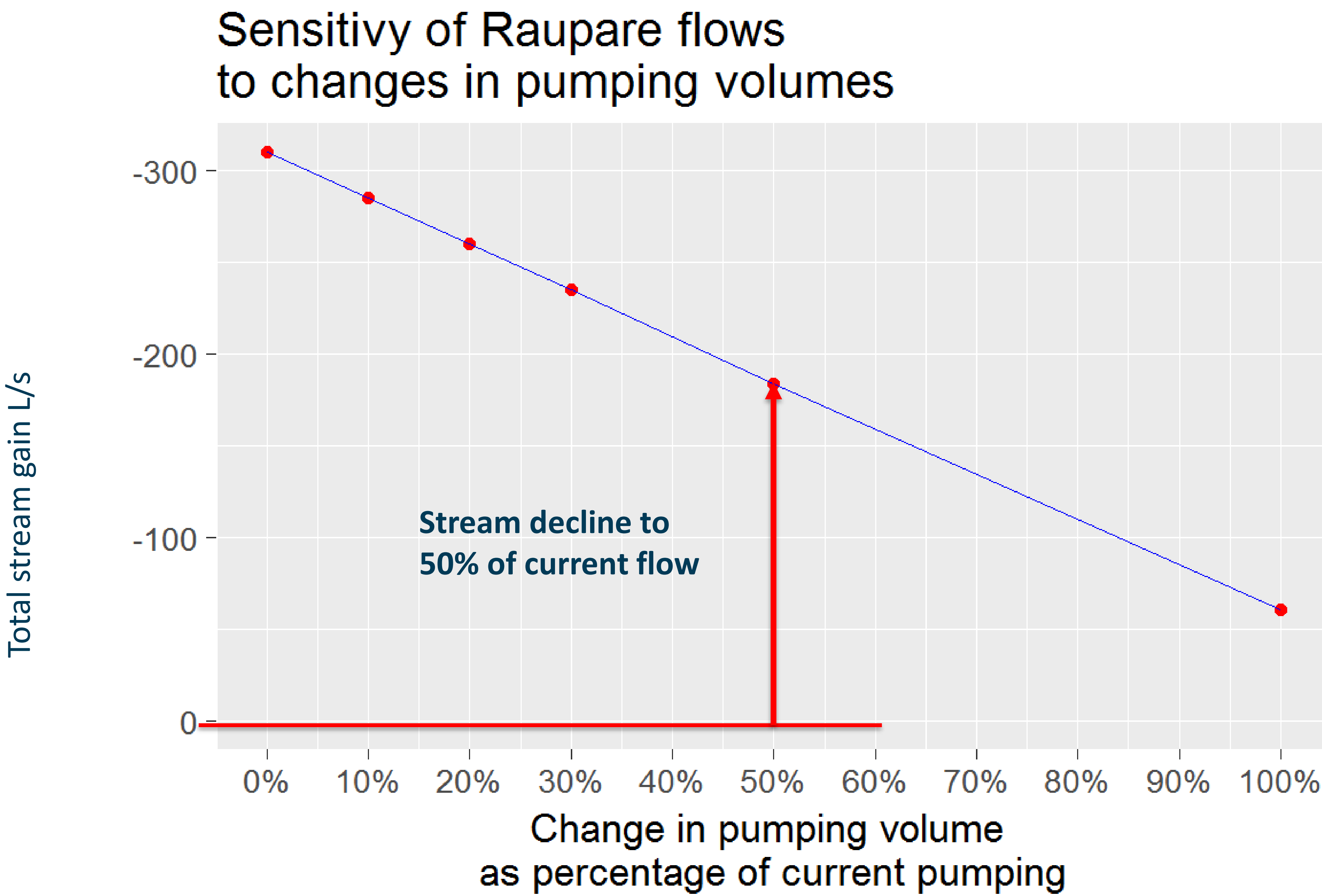
Sensitivity of groundwater level to pumping - summary

0.35m per 10% change



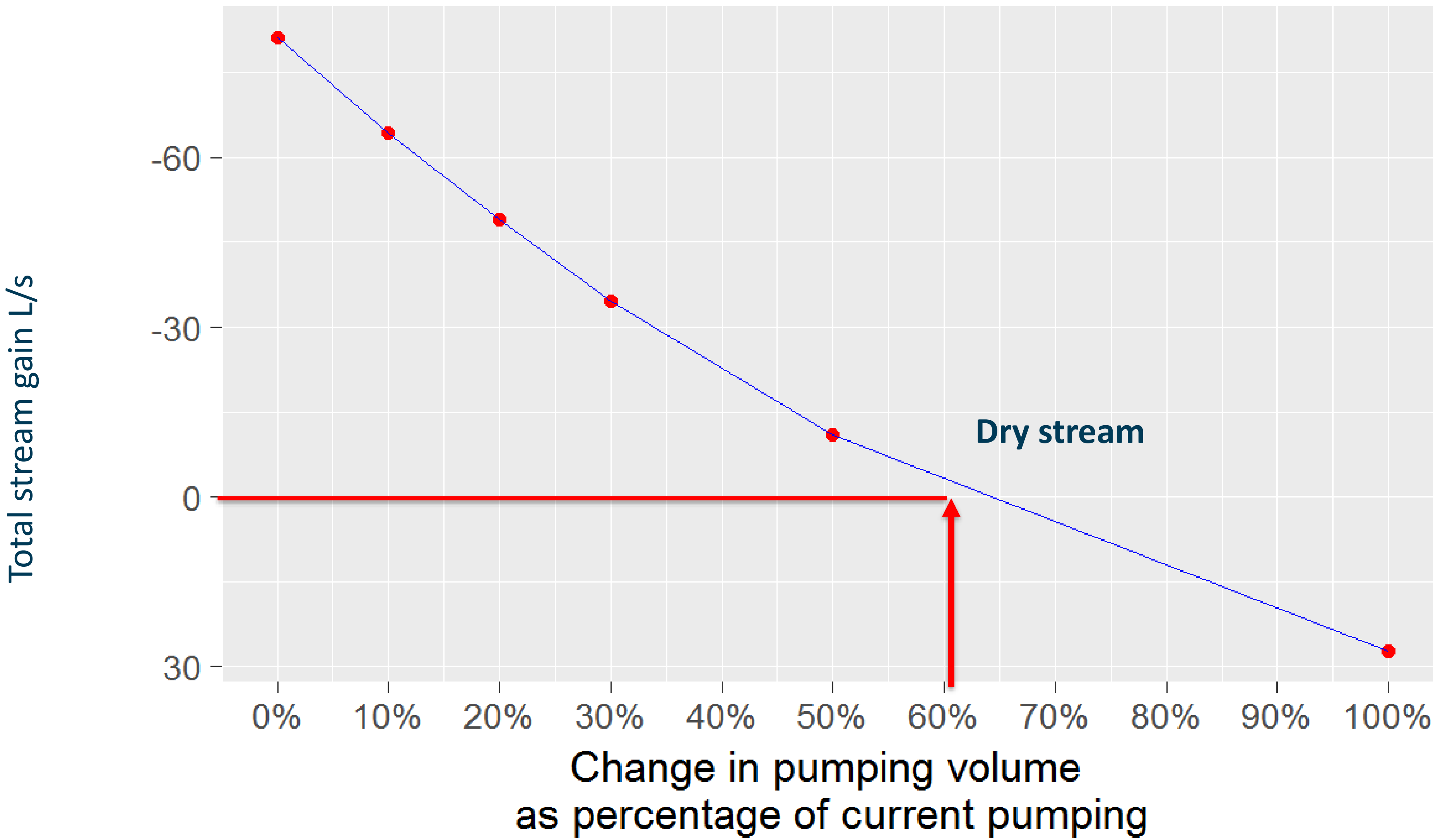
Sensitivity of spring flows and river losses to pumping

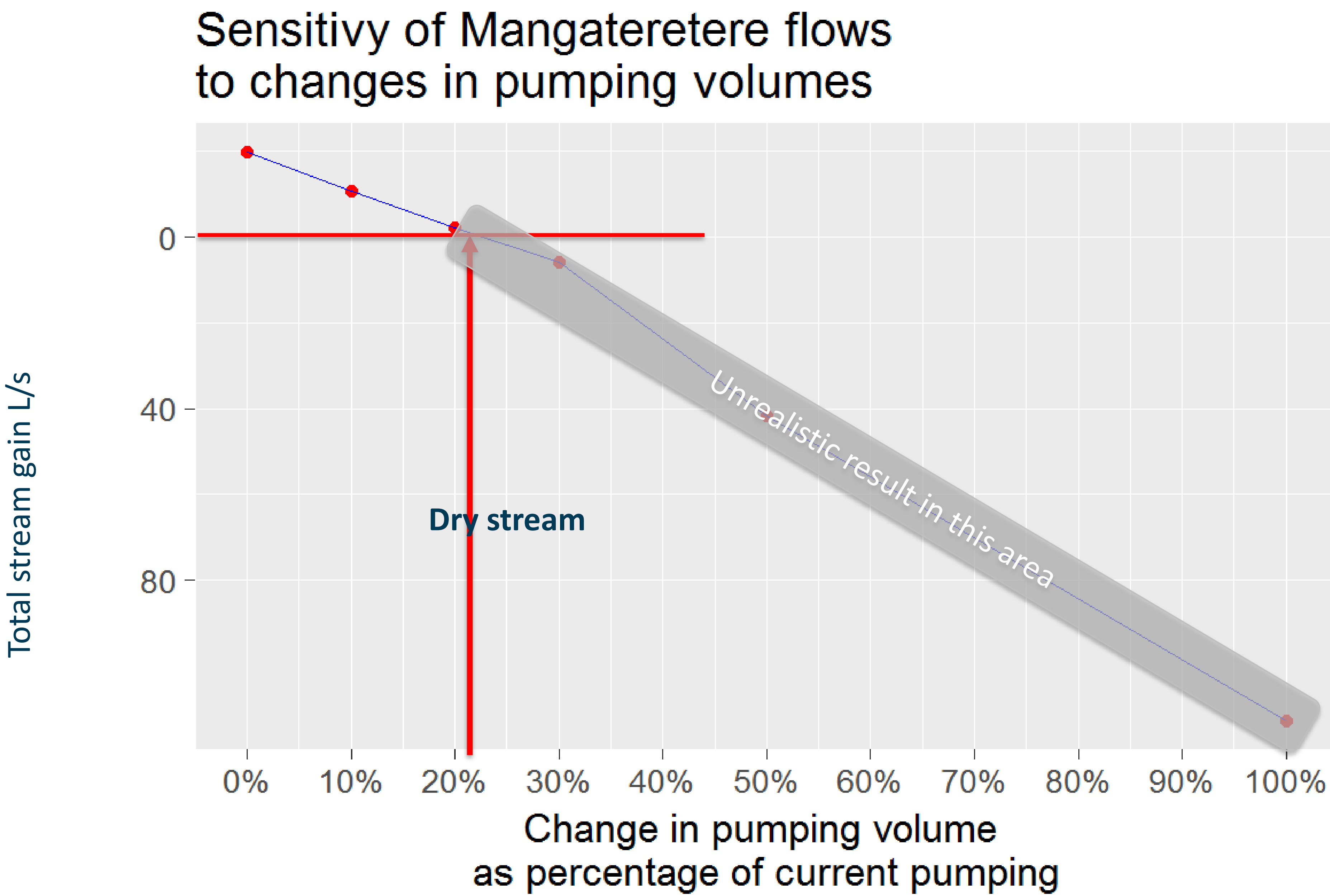




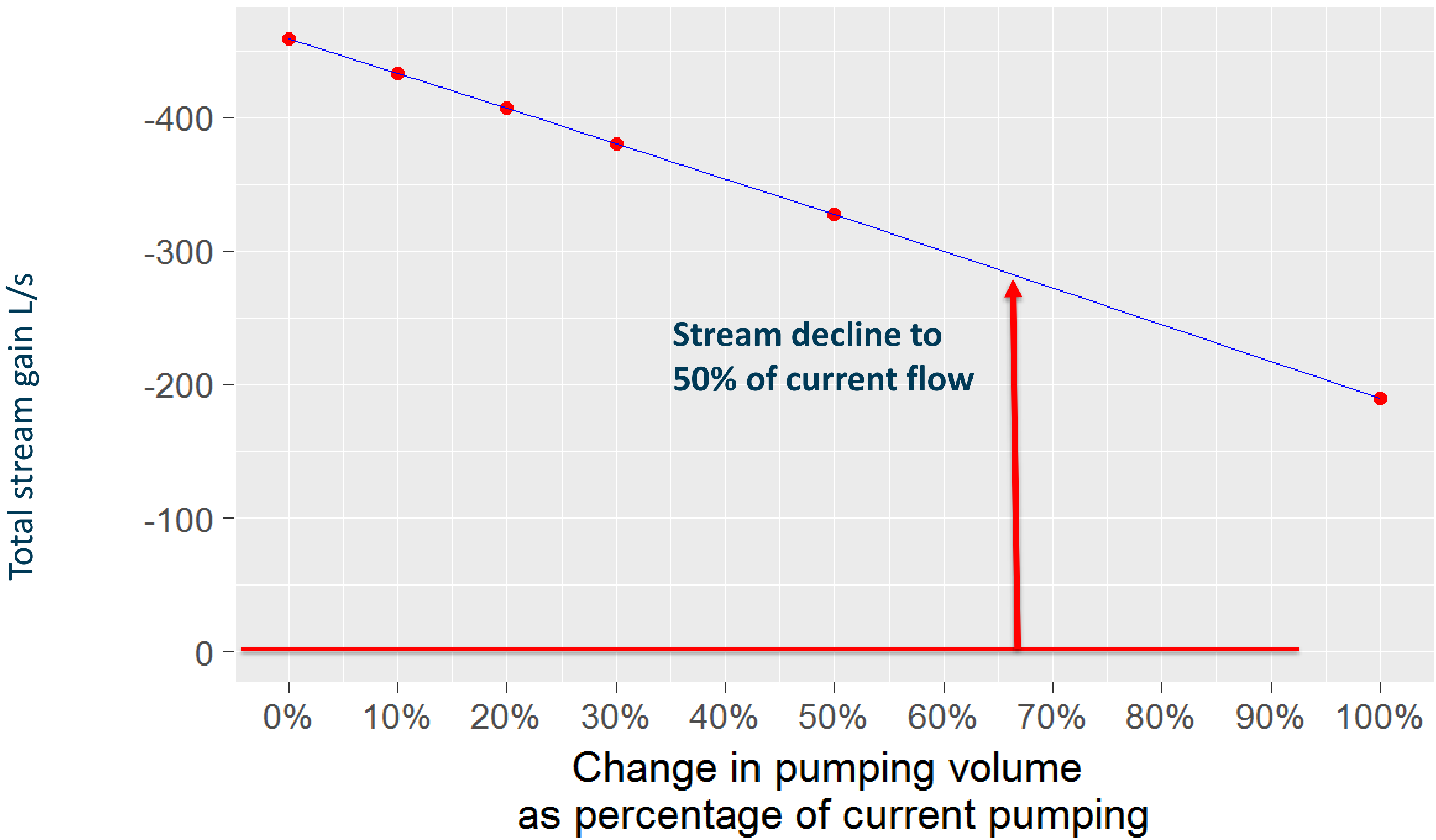
Sensitivy of Raupare flows
to changes in pumping volumes
Total stream gain L/s
-300
-200
-100
0
Stream decline to
50% of current flow
0%
10%
20%
30%
40%
50%
60%
70%
80%
90%
100%
Change in pumping volume
as percentage of current pumping

Sensitivy of Irongate flows to changes in pumping volumes

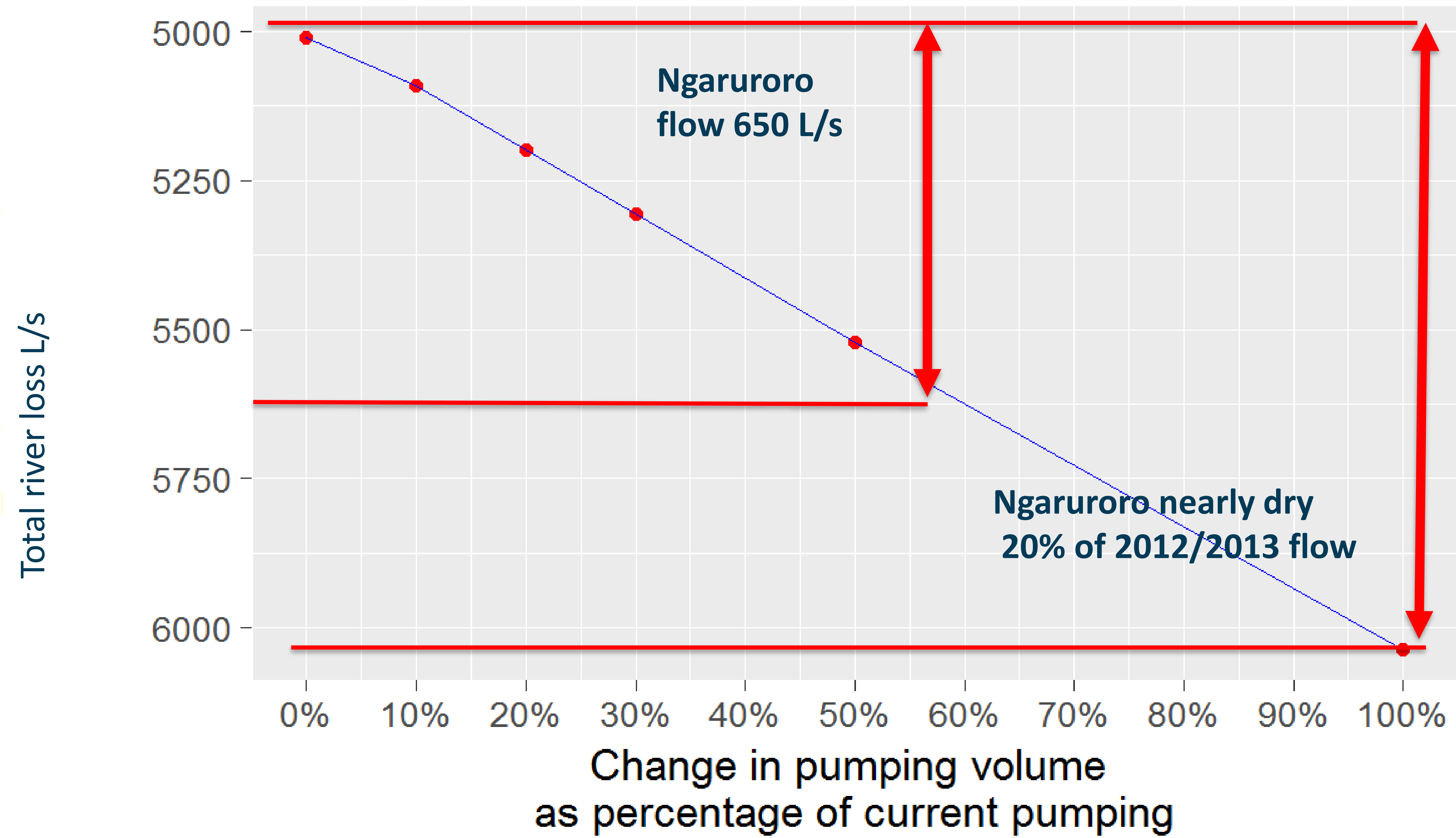



Sensitivy of Mangateretere flows
to changes in pumping volumes
Total stream gain L/s
0
40
80
0%
10%
20%
30%
40%
50%
60%
70%
80%
90%
100%
Change in pumping volume
as percentage of current pumping
Dry stream
Unrealistic result in this area

Sensitivy of Karamu - gains flows to changes in pumping volumes



Sensitivy of Ngaruroro flows to changes in pumping volumes



Sensitivity of stream flows to groundwater pumping - summary

stream	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%
Raupare	-8%	-16%	-24%	-32%	-41%	-49%	-57%	-64%	-72%	-80%
Irongate	-21%	-40%	-58%	-72%	-87%	-96%	-105%	-115%	-124%	-134%
Mangateretere	-46%	-89%	-129%	-220%	-310%	-382%	-454%	-526%	-597%	-669%
Karamu (gains in main stem)	-6%	-11%	-17%	-23%	-29%	-35%	-41%	-47%	-53%	-59%
Karewarewa	-22%	-43%	-59%	-69%	-79%	-80%	-82%	-83%	-84%	-85%
Ngaruroro *	-6%	-14%	-23%	-31%	-39%	-47%	-55%	-63%	-71%	-79%
* % based on 1300 L/s river flow										

>25% flow lost

>50% flow lost

dry

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Limitations:

- Extreme weather may make it even worse
- Local impact could make it worse
- Uncertainty of model for extreme stress increases

Conclusions

- Clear effect even for small increase in pumping for water levels and stream flows
- Very significant effect for large increase with significantly lower flows and dry streams

Challenge 5– Managing Effect of pumping on groundwater levels

Proposal 5 : Option 4 to cap total abstractions at existing levels of abstraction.

Consider option 5 to further investigate costs and benefits of increasing pumping

Breakout question

1. Do you agree with the proposal to cap GW takes at existing levels of abstraction ?

2. Do you agree to include a commitment to further investigate opportunities (costs and benefits) for increased pumping?

3. If not, why not and what other option is there?

4. Can you identify any issues likely to arise?

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Summarise and Confirm Decisions Made

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Verbal updates from Working Groups

- Economic Assessment
    - Peter Kay update from farmer reference group

Next meeting – 7 September 2017

- Nutrient management (Sandy, Oli, Anna, Nathan, Barry, MAB)
- Plan framework for attribute objectives and reporting (Sandy/MAB)
- SW-GW modelling outputs and further scenario refinement (Hydrologists)
- Report from Farmer Reference Group
- Report from Wetland Working Group (Gavin)

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Closing Karakia

Nau mai rā

Te mutu ngā o tatou hui

Kei te tumanako

I runga te rangimarie

I a tatou katoa

Kia pai to koutou haere

Mauriora kia tatou katoa

Āmine

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WCO conversation

TANK Submission Draft V1

The TANK Group is a community-based collaborative group representing tangata whenua, environmental, recreational, social, economic and local government interests in water management in the Greater Heretaunga area. The TANK Group is mandated by the Hawke's Bay Regional Planning Committee. This committee was established under the Hawke's Bay Regional Planning Committee Act 2015 and it provides for co-governance of natural resources between Treaty Settlement entities and the Regional Council.

The TANK Group has been working since 2012 to develop a plan change to the Hawke's Bay Regional Resource Management Plan for the TANK catchments to give effect to the National Policy Statement for Freshwater Management (NPSFM) and is now in the final year of its work to develop the plan change. The Group includes representatives from WCO co-applicants Ngati Hori ki Kohupatiki Marae, and Fish and Game Hawkes Bay and Napier and Havelock North branches of Forest and Bird.

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Submission Draft V1

The TANK Group is committed to developing a plan which protects Te Mana o Te Wai and the life supporting capacity of freshwater and the other values the community considers important. The TANK Group believes it is important to take an integrated approach to land and water management that holistically supports environmental, cultural, recreational, social and economic values. The TANK Group supports the NPSFM requirement to identify and protect the significant values of the Greater Heretaunga area's outstanding fresh water bodies.

The TANK Group believes it is important that any water conservation order in the Greater Heretaunga zone aligns to the broader objectives for land and water management for the catchment, and is part of the 'package' of measures to improve water quality.

The TANK Group unanimously agrees that the upper reaches of the Ngaruroro River have very high environmental, recreational and cultural values, which are worthy of protection. The Group will be considering high levels of protection for the upper reaches with this plan change. It considers these values to be such that the upper reaches warrant consideration for a WCO by the Special Tribunal.

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Submission Draft V1

The TANK Group acknowledges that there are a wider range of values and views in the community regarding the lower reaches of the Ngaruroro and Clive Rivers. The Group's work has identified important cultural, social and recreational, environmental and economic values in these lower reaches. Protecting water quality and enhancing aquatic habitat in the lower reaches of the Ngaruroro is an important objective for the TANK Group, which will be reflected in the objectives, policies and rules that will be contained in the recommended Plan Change for the TANK catchments.

The TANK Group acknowledges the lower reaches are used for a wide range of purposes, including being managed for community flood protection, abstraction for irrigation and land drainage for horticulture, as well as being the major source of recharge to the Heretaunga aquifer system, that provides municipal water for 80% of the regional population

Due to the multiple values that exist in the lower reaches the TANK Group considers that the TANK plan change is the primary vehicle for considering these and managing land and water in an integrated manner.

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Submission Draft V1

The TANK Group therefore requests that the Special Tribunal divide its process into two stages to recognise the importance of integrated management between land and water and the value of using collaborative processes to determine this. The approach being sought by the TANK Group is for the Tribunal to consider submissions relevant to the upper reaches of the Ngaruroro in the first stage and to allow the TANK Group the opportunity to develop proposals for protecting important values in the lower reaches before any WCO consideration is undertaken in this part of the catchment.

The TANK Group would take the findings and recommendations of the Special Tribunal on the upper reaches and align the Plan Change provisions in the upper reaches to reinforce a WCO through the RRMP. This provides an opportunity to consider land use policies and rules that support the objectives of a WCO.

Once the locally-driven TANK Group process is completed and a TANK Plan Change has been notified, the Special Tribunal could then consider the case for further protection in the lower reaches to determine whether further protection is warranted. The TANK Group seeks that the Tribunal take into account the consensus decisions made by the TANK Group in its consideration of submissions on this. Any findings and/or recommendations of the Special Tribunal on the lower reaches could then be considered during the formal hearings phase and finalisation of the Plan.

Tank Submission Draft V2

The TANK Group is a community-based collaborative group representing tangata whenua, environmental, recreational, social, economic and local government interests in water management in the Greater Heretaunga area. The TANK Group is mandated by the Hawke's Bay Regional Planning Committee. This committee was established under the Hawke's Bay Regional Planning Committee Act 2015 and it provides for co-governance of natural resources between Treaty Settlement entities and the Regional Council.

The TANK Group has been working since 2012 to develop a plan change to the Hawke's Bay Regional Resource Management Plan to give effect to the National Policy Statement for Freshwater Management (NPSFM) and is now in the final year of its work to develop the plan change. The Group includes representatives from WCO co-applicants Ngati Hori ki Kohupatiki Marae, and Fish and Game Hawkes Bay and Napier and Havelock North branches of Forest and Bird..

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TANK Submission Draft V2

The TANK Group is committed to developing a plan which protects Te Mana o Te Wai and the life supporting capacity of freshwater and the other values the community considers important, where those are compatible with the national objectives. The TANK Group believes it is important to take an integrated approach to land and water management that holistically supports environmental, cultural, recreational, social and economic values within environmental limits. The TANK Group supports the NPSFM requirement to identify and protect the significant values of the Greater Heretaunga area's outstanding fresh water bodies.

The TANK Group unanimously agrees that the upper reaches of the Ngaruroro River have very high environmental, recreational and cultural values, which are worthy of protection. The Group will be considering high levels of protection for the upper reaches with the TANK plan change. It considers these values to be such that the upper reaches warrant WCO status.

The TANK Group has not reached a consensus view with respect to the lower river and accordingly does not wish to submit on that aspect of the WCO application.

HAWKE'S BAY REGIONAL COUNCIL