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

TANK

Meeting 29:
14 June 2017

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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

Agenda

9:30am	Notices, meeting record
9:45am	Summary of GW science
10.30am	Water age in drinking water supply wells in Heretaunga aquifer
11:30pm	SOURCE model and SW takes
12:30pm	**LUNCH**
1:00pm	Te Tua out-of-stream storage specs and modelling
2:30pm	**COFFEE BREAK**
2:45pm	Decision-tool showing combinations of options and pros/cons
4:00pm	**CLOSE MEETING**

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Meeting objectives

- Continue focus on GW modelling
- Introduce the SOURCE model and explain how it works in relation to surface water takes
- Consider an out-of-stream storage option for augmenting flows in the Ngaruroro River
- Provide a tool for deciding combinations of possible management solutions for future modelling.

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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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Notices

- Possible dates for additional meeting

  OPTIONS:
  1. Thursday, 17 August
  2. Friday, 18 August

- Agreement to extend meetings to 5pm (if required)

- Any from the floor?

Meeting Record – TANK Group 28

- Matters arising
- Action points

Key question from previous meeting

For the purposes of further modelling do you agree/disagree:

Effects of water takes on spring fed streams are best managed by flow augmentation (i.e. not by restrictions on takes) because:

- Stream depletion zones for individual streams cannot be determined.
- Zones of pumping impact for individual takes cannot be established.
- Accounting for the cumulative impact of all takes is important.

Does this match your recollection?

Based on the hydrologists recommendation that it may be feasible, the TANK Group agreed to explore rolling out an augmentation scheme across the Heretaunga Plains for widespread takes but noted that a management group (similar to the Twyford scheme) is essential to "lean" on users. The model is not at a scale capable of accounting for observed stream depleting effects from particular takes. One option is to treat these as treated as surface water takes.

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Action points

ID	Action item	Person	Status
28.1	HBRC Scientists to consider the list of suggestions from the TANK Group on further modelling and come back with possibilities.	Jeff	Later in meeting
28.2	HBRC Scientists to come back with more information on GW levels.	Jeff/Pawel	Future meetings

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Groundwater Modelling: Summary of Science

TANK Collaborative Stakeholder Group Meeting 29

Dr. Jeff Smith

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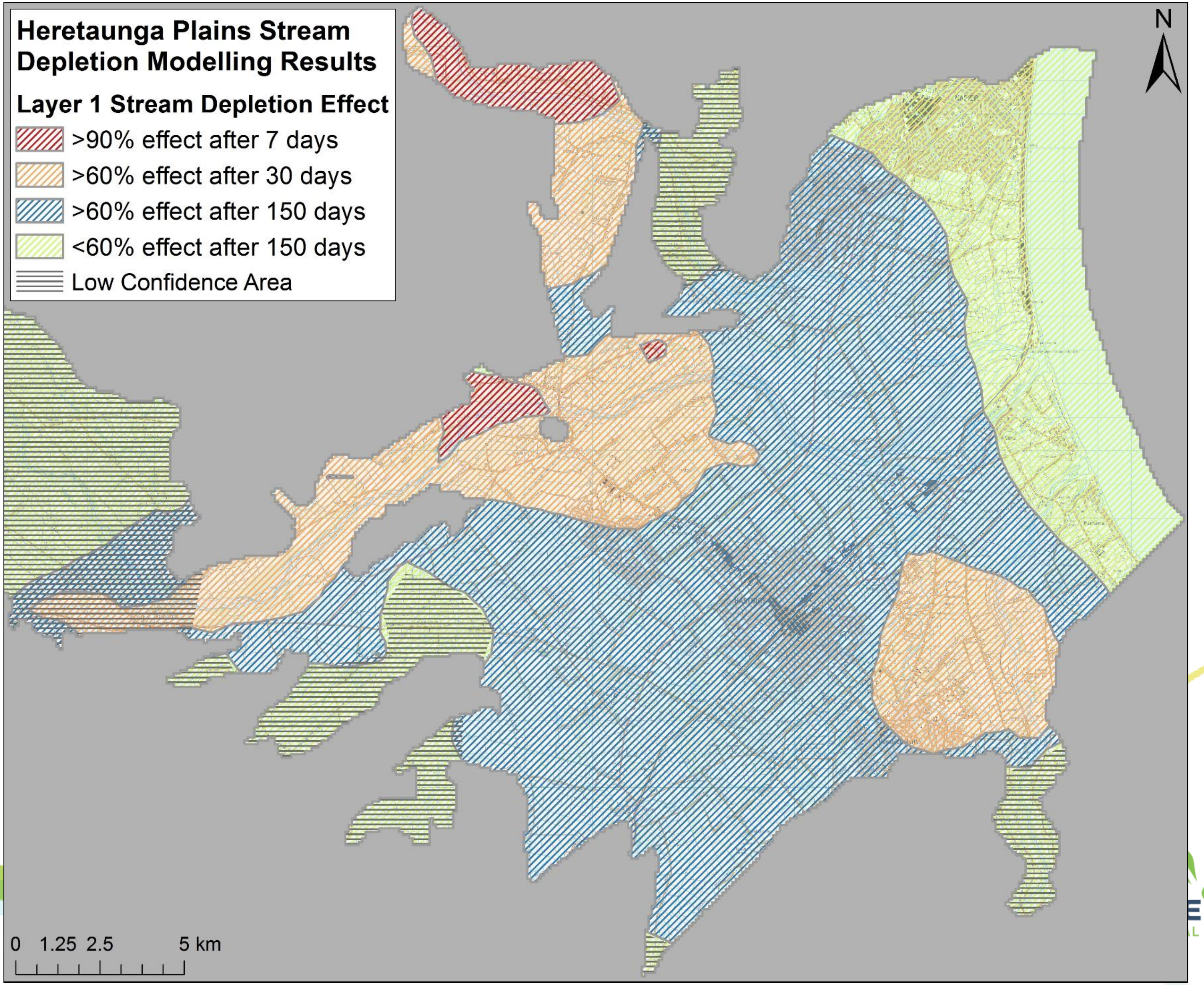
Outline of Presentation:

1. Summary of modelling to date
2. Responses to questions from previous meeting
3. Introduction to sessions today
4. Looking ahead to next meeting

1. Summary of groundwater modelling

Meeting 26: Stream Depletion Modelling



Actual pumping impact distribution

- Distribution of actual effects cannot be used to help define zones … no obvious zones can be seen
- Most takes have very small individual effect
- The combined effect is significant

zone	total effect L/s after 150 days of pumping
allzones	2084.7
Karamu	211.5
Ngaruroro	1048.7
Raupare	93.9

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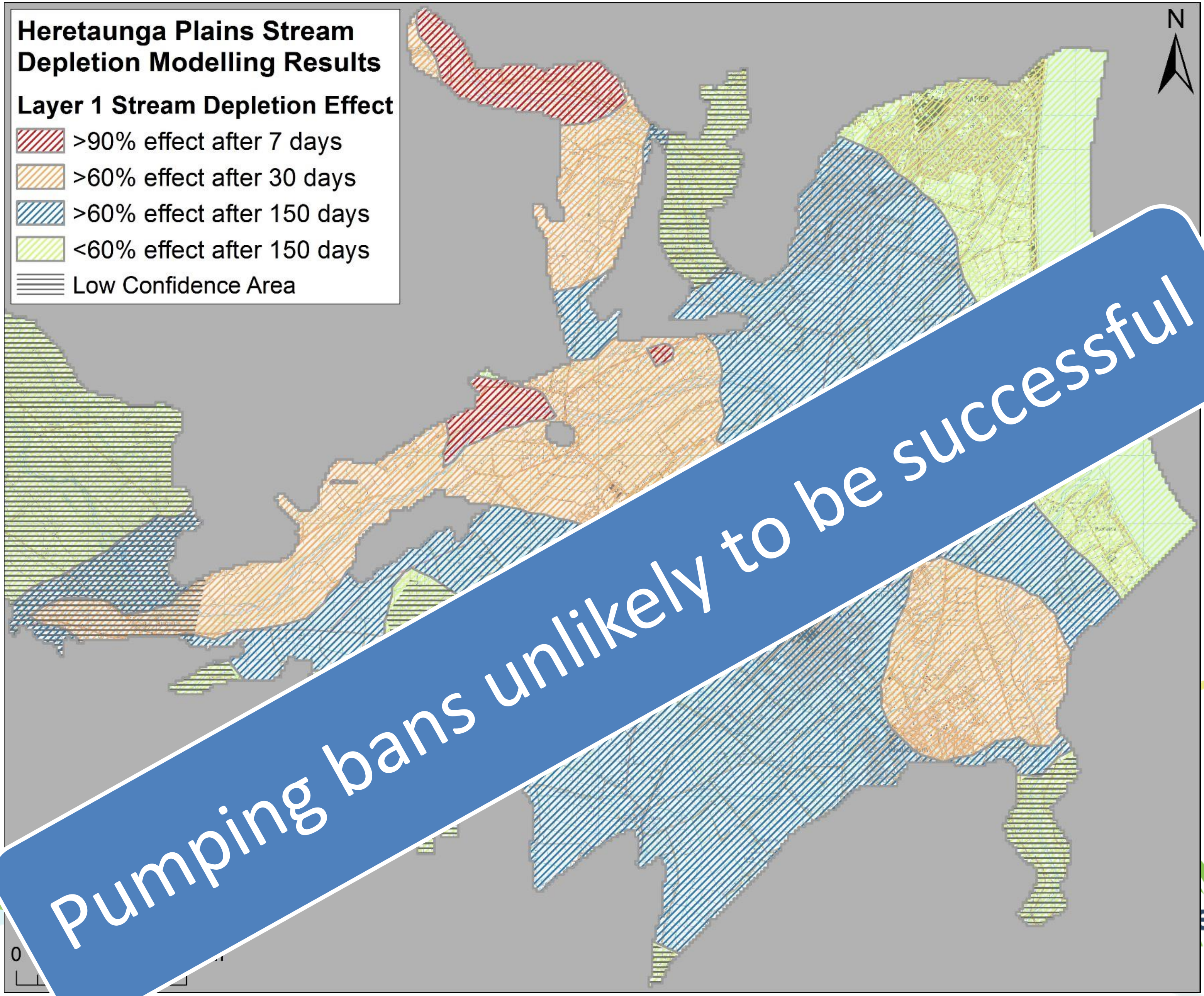
Meeting 26: Stream Depletion Modelling



Pumping bans unlikely to be successful

Agreement sought from TANK Group

Effects of water takes on spring fed streams are best managed by flow augmentation from groundwater because -

- Stream depletion zones for individual streams cannot be determined
- Zones of pumping impact for individual takes cannot be established
- Accounting for the cumulative impact of all takes is important

2. Options raised at previous meeting

- Augmentation from a dam to Ngaruroro, Raupare and Karamu, that shows the quantum of augmentation required
- Flooding Roy's Hill Maraekakaho river flats to use as a recharge; turn into a wetland for co-benefits of increased flows and habitat

2. Options raised at previous meeting

- Using the aquifer as a 'bank' as long as not mining plus possibly artificial recharge
- More attention to "Avoid" options especially:
    - A sliding scale of takes not fully used
    - Protecting groundwater levels – risks of contamination (include domestic wells) and bores running dry.
- Using GW allocation limit to protect GW levels long term

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Reason for stream depletion modelling

Stream Depletion modelling

- Allocation?
- Cease take rules?
- Artificial recharge?
- Augmentation?
- Other management?
- Which streams/rivers?

Surface water flow management

- Stream depleting groundwater takes
- Surface water abstractions
- Allocation(s)
- Flow regulation

Groundwater levels and allocation

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2. Options raised at previous meeting

- What would it cost to replicate the Twyford Scheme in terms of management/operational costs?
- Methods to make urban (municipal) and industrial more efficient.
- Hydrological modelling cannot completely answer these questions
- Important issues, for consideration later

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Further modelling requirements

1. Long term sustainability of pumping in terms of groundwater levels
2. Effects of combined lowland stream augmentation
3. Combined augmentation plus MAR

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Modelling since previous meeting

1. Integration with SOURCE model revealed water balance deficit
2. Groundwater discharge to streams was underestimated during winter
3. Groundwater model was recalibrated …
4. … then previous scenarios run again, to confirm no substantial changes

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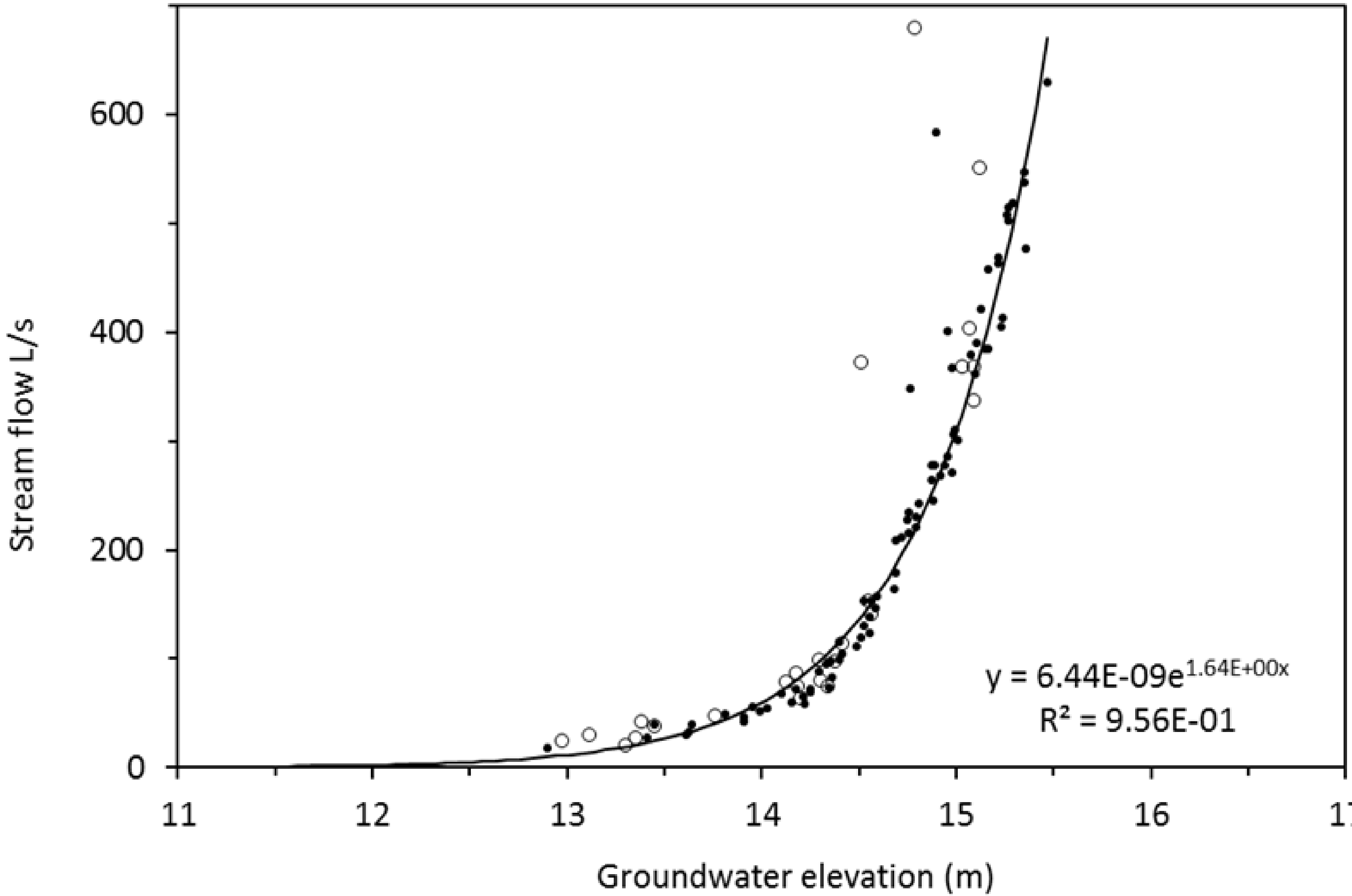

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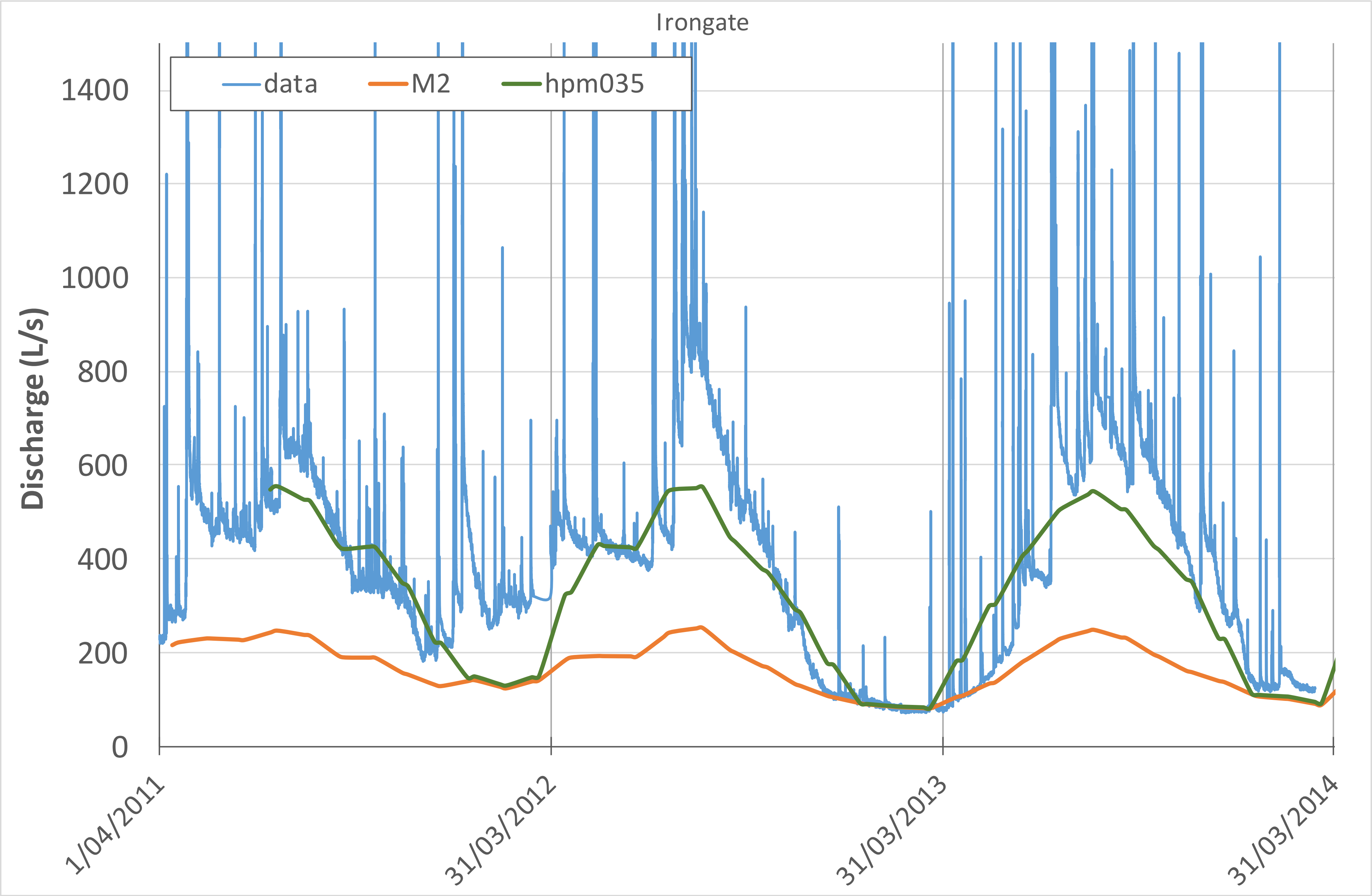
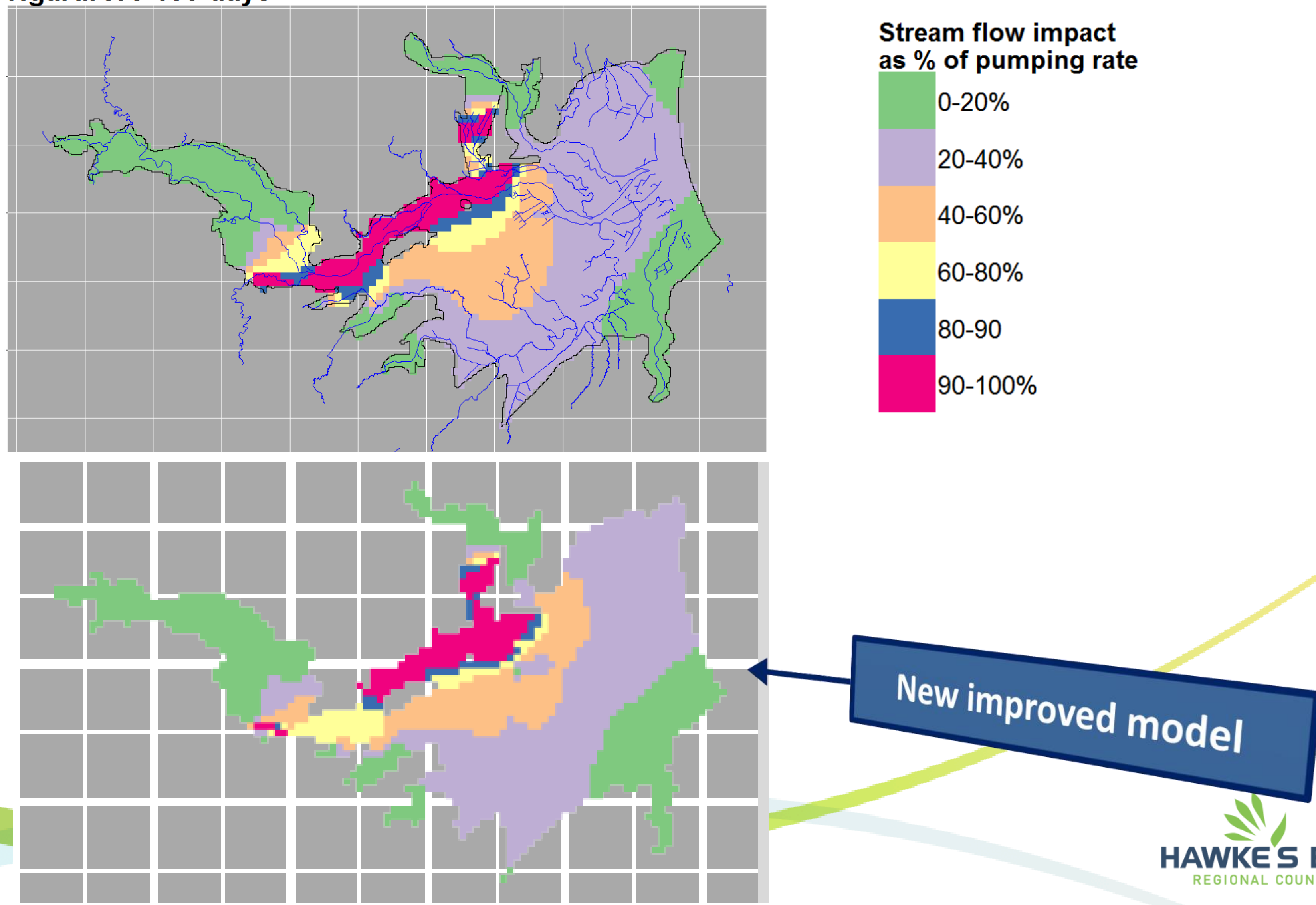
Recalibrated groundwater discharge



Re-modelling of previous scenarios

Ngaruroro 150 days



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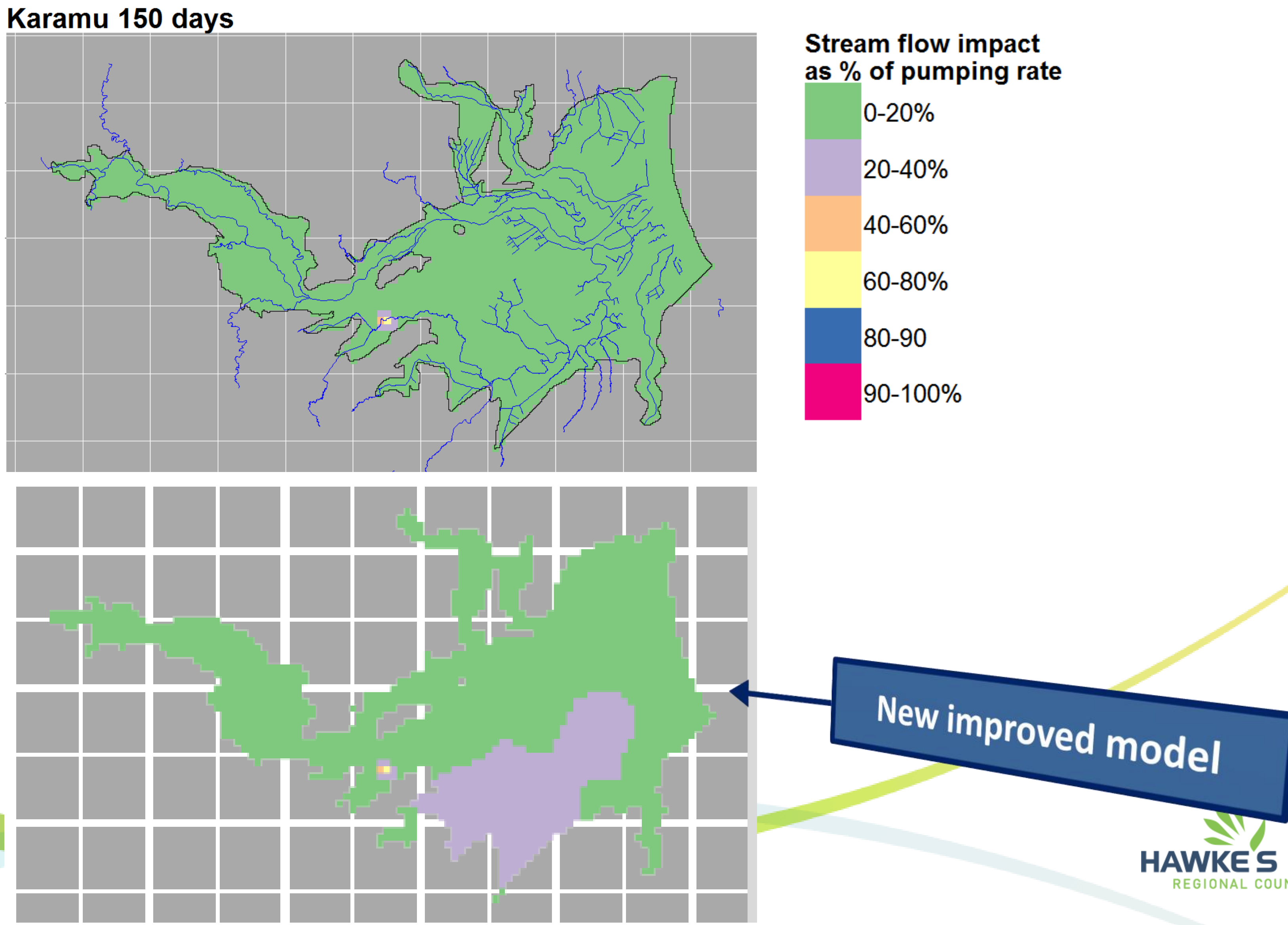
Re-modelling of previous scenarios



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Water budget comparison (10 year average)

	Mm^3/yr	
	New Model	Previous Model
Drains	-1.4	-6.8
Offshore Discharge	-30.0	-92.0
Well pumping	-75.7	-76.3
Recharge	77.9	79.1
River leakage	29.1	96.0

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Modelling was suspended

3. What to expect later today

- GNS water age and tracer investigation of Heretaunga drinking water supply bores
- Configuring the SOURCE surface water flow model
- Out of stream storage for augmentation of Ngaruroro River during low flow periods

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4. Modelling for next meeting

1. Long term sustainability of pumping in terms of groundwater levels
2. Effects of combined lowland stream augmentation
3. Combined augmentation plus MAR

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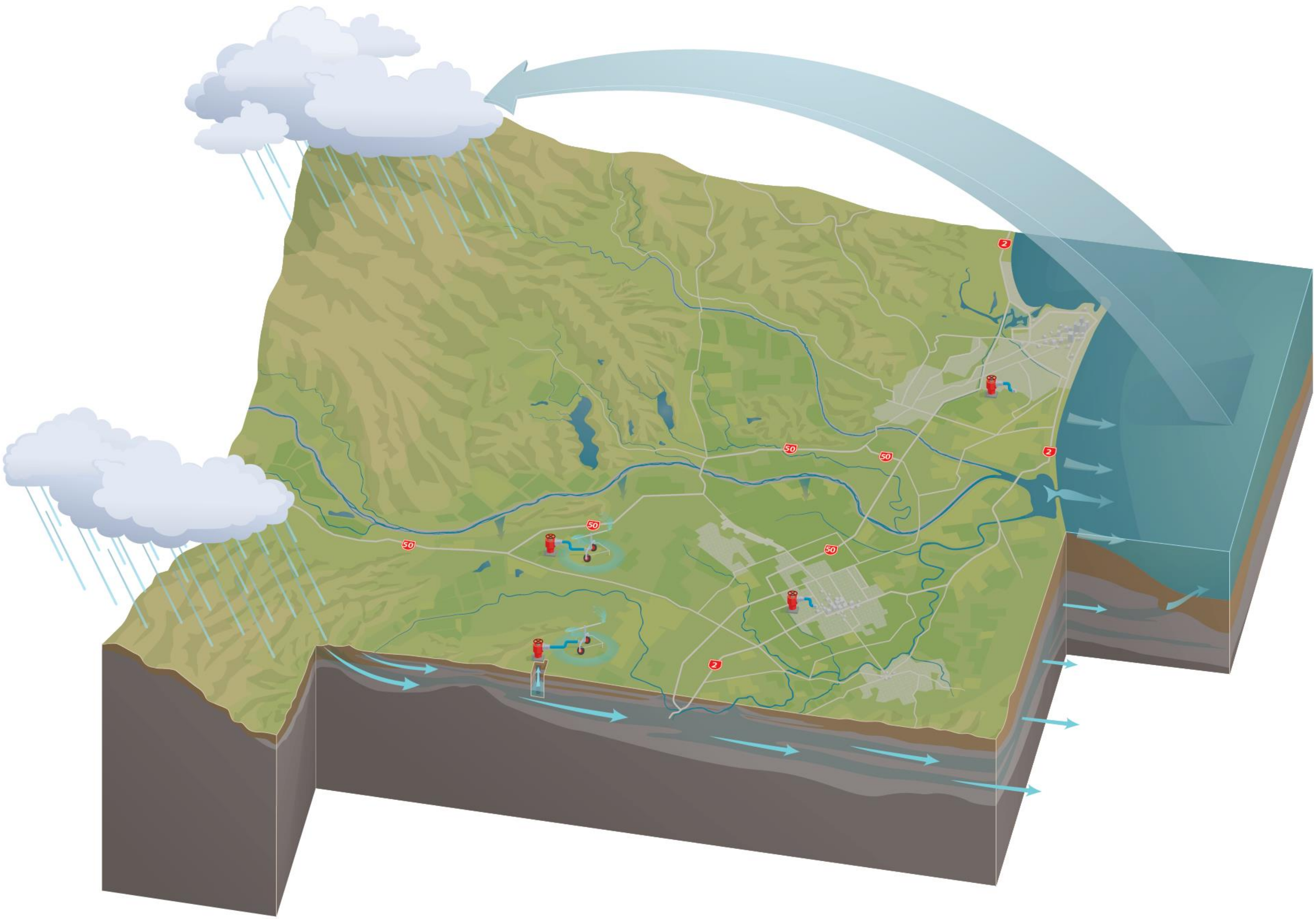
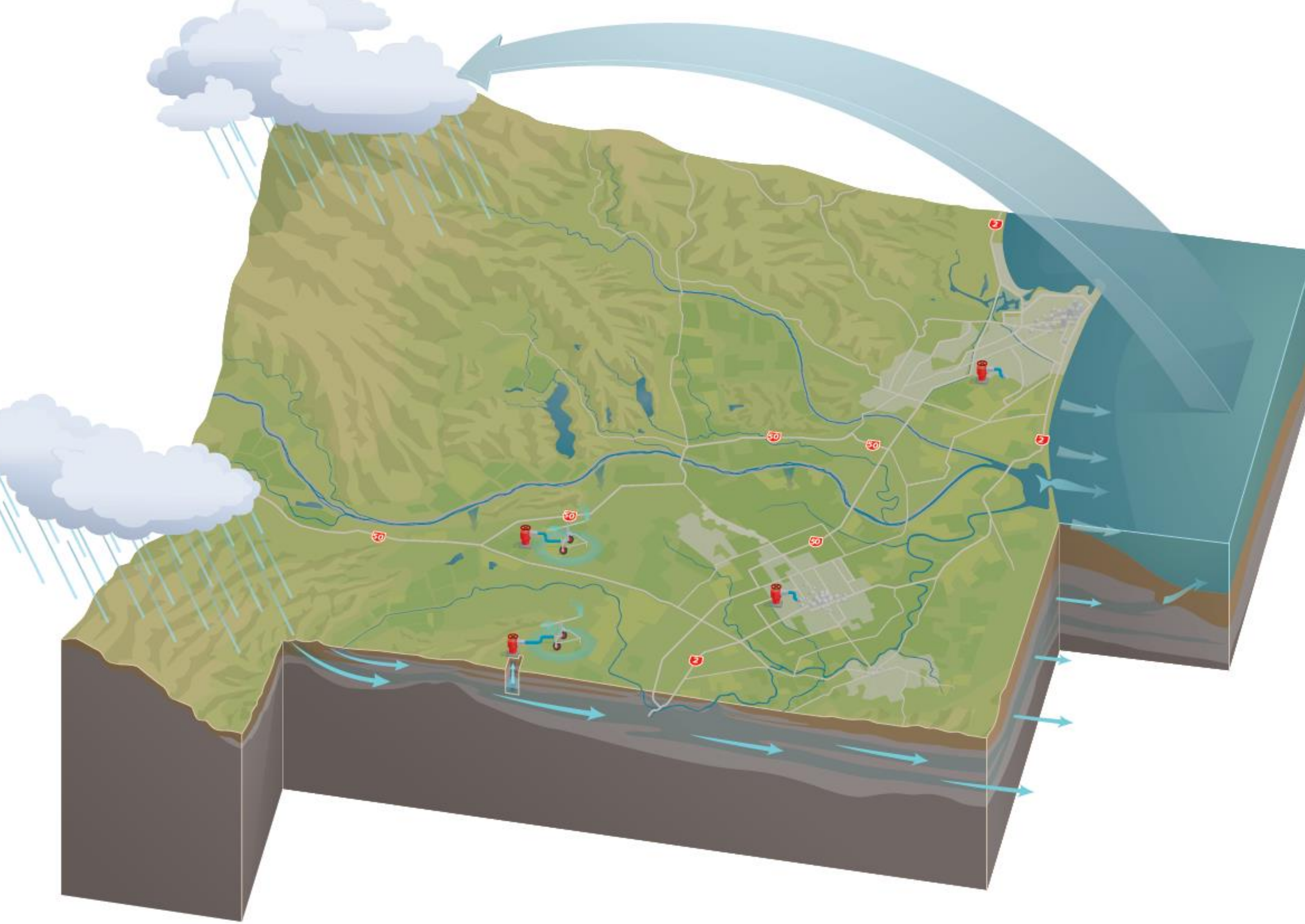
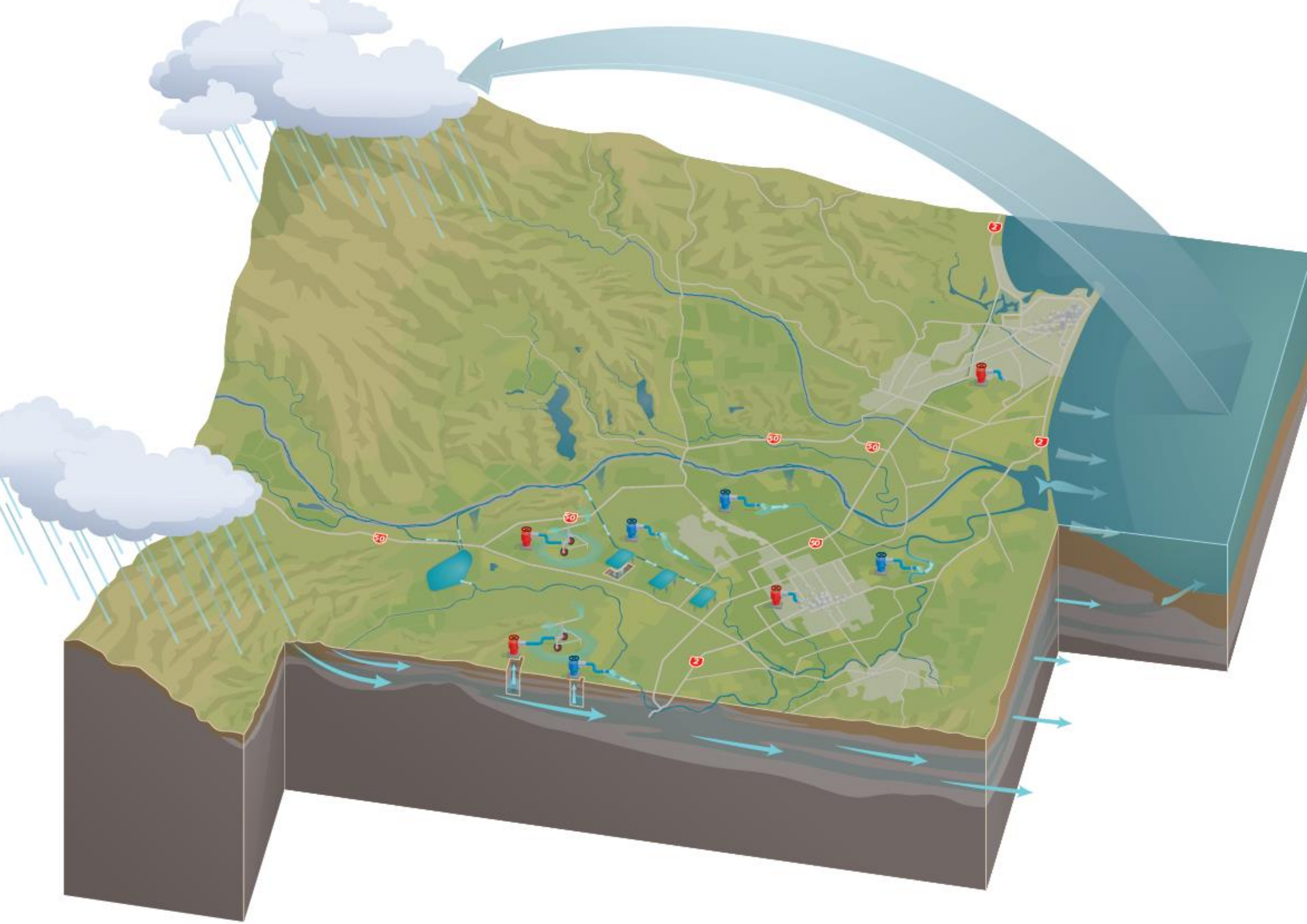
Illustrative description



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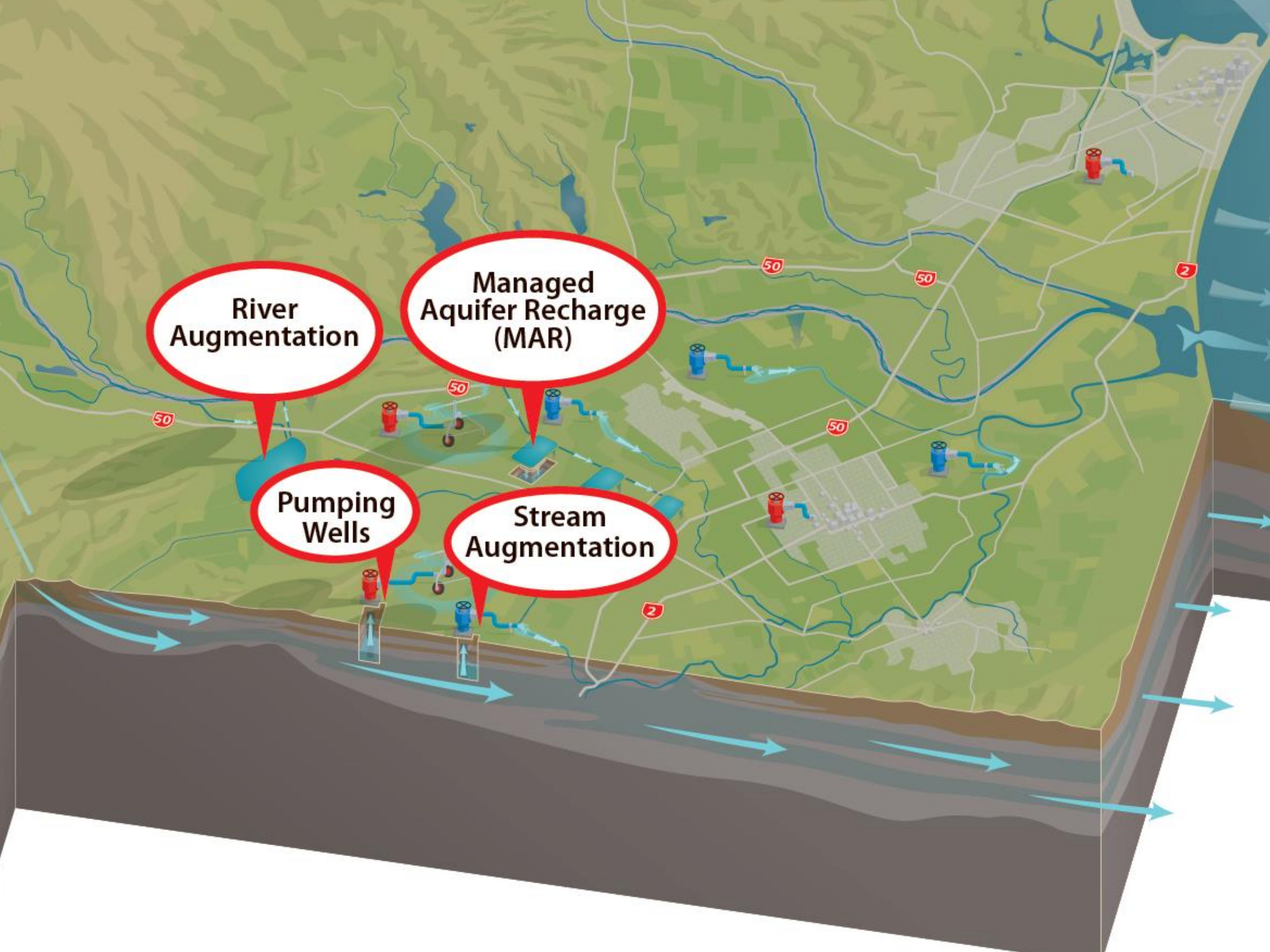
River Augmentation
Managed Aquifer Recharge (MAR)
Pumping Wells
Stream Augmentation
50
2

Questions?

Water Quantity Modelling

TANK Stakeholder Group Meeting 14th June 2017

Rob Waldron

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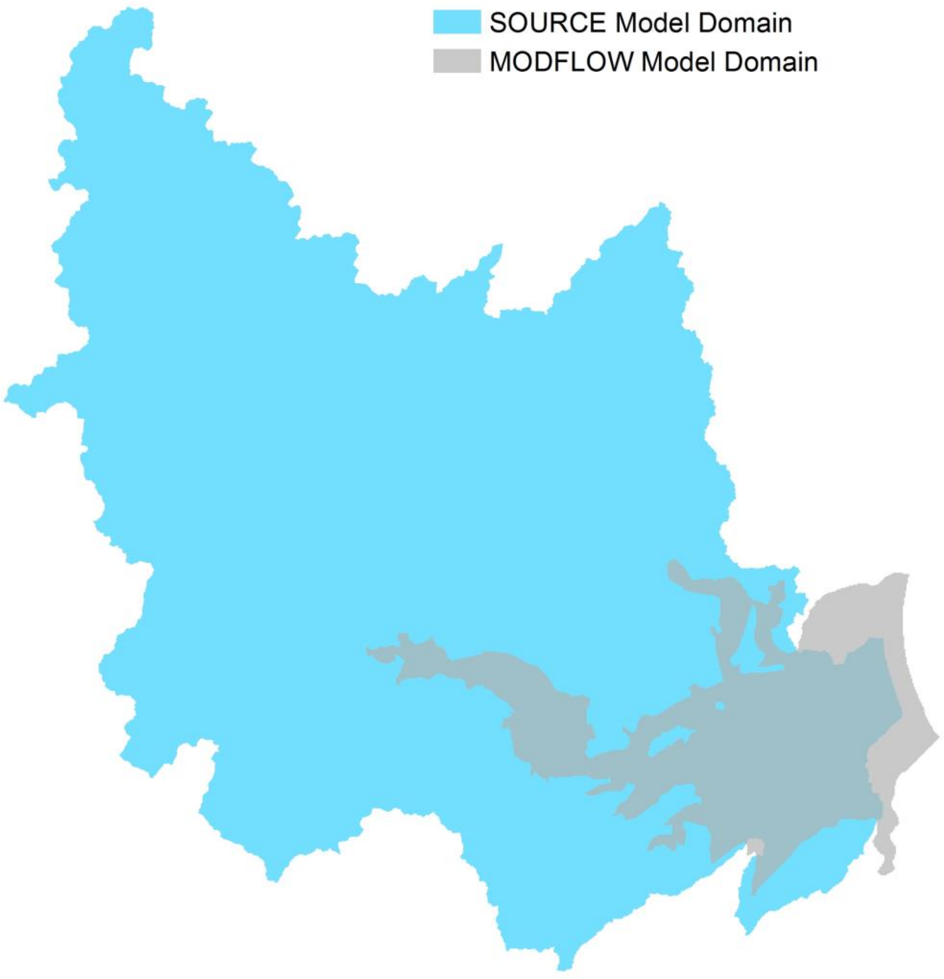
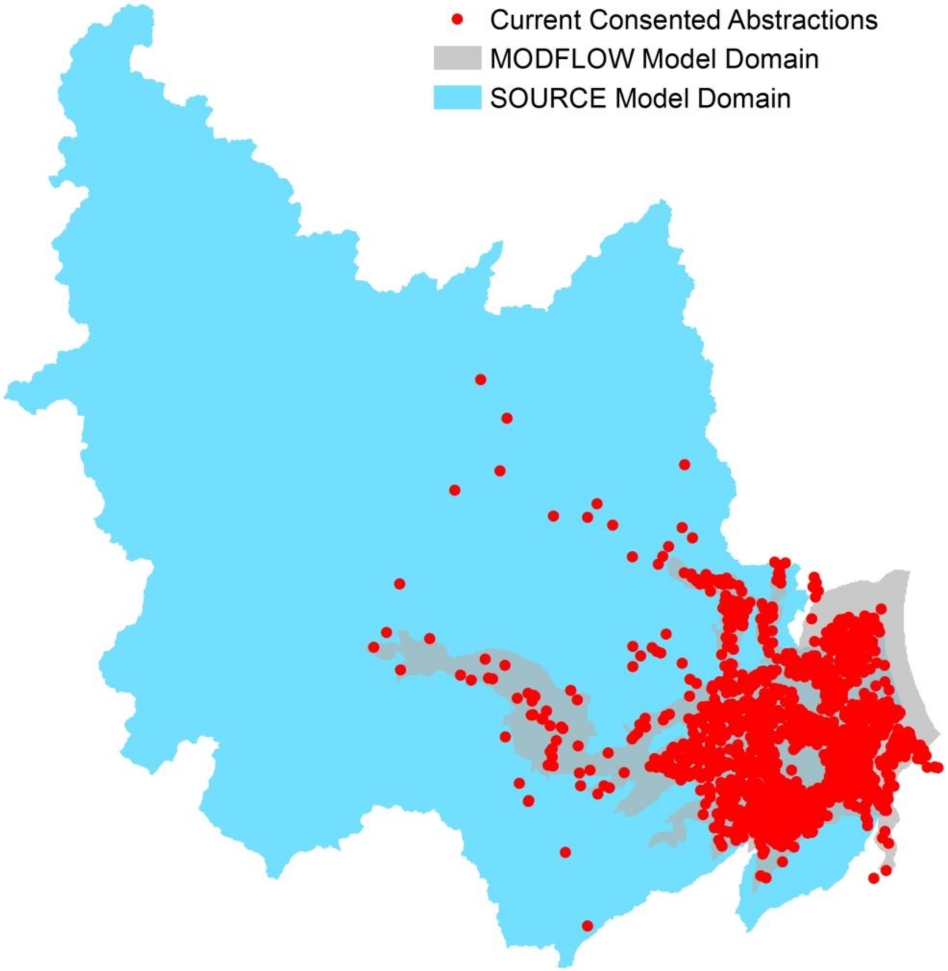
Water Quantity Modelling

- SOURCE model simulates surface water
- MODFLOW simulates groundwater
- Both models interact to simulate the complete system and SW-GW interaction
- SOURCE and MODFLOW model domains overlap



Modelling SW and GW Abstractions

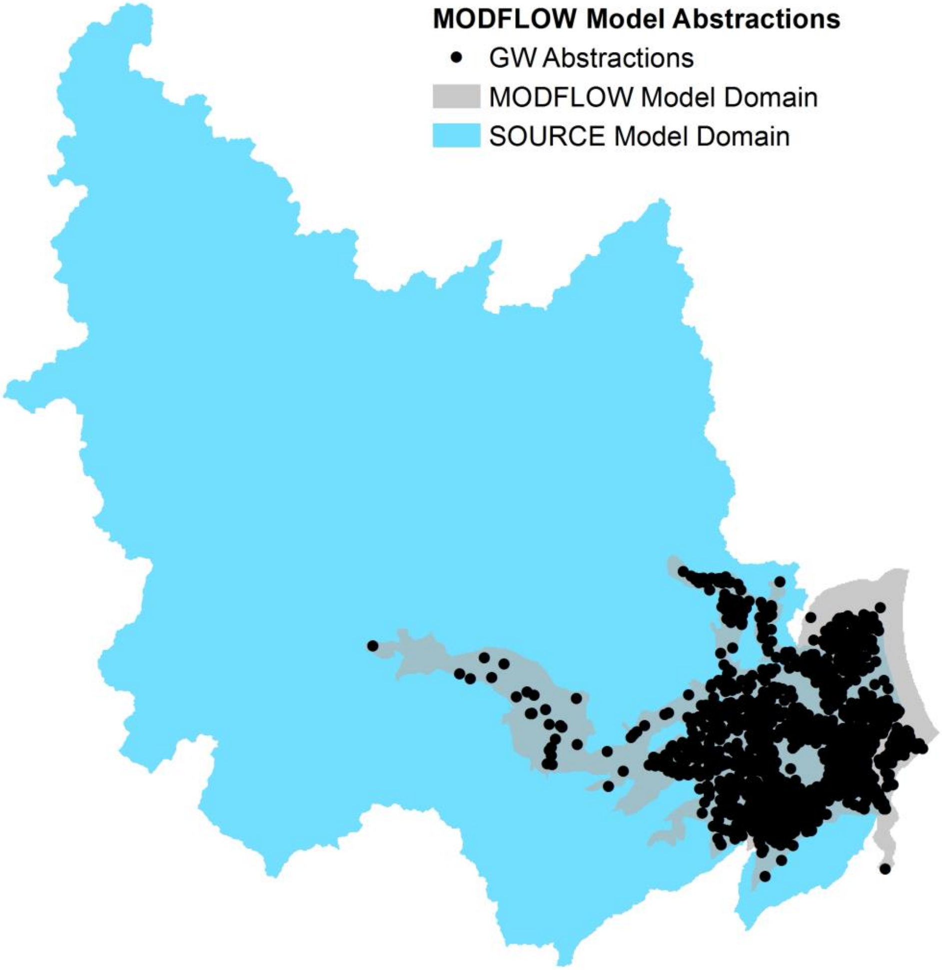
- Approximately 1500 current consented abstractions to be simulated using combination of both models



Modelling SW and GW Abstractions

MODFLOW Model

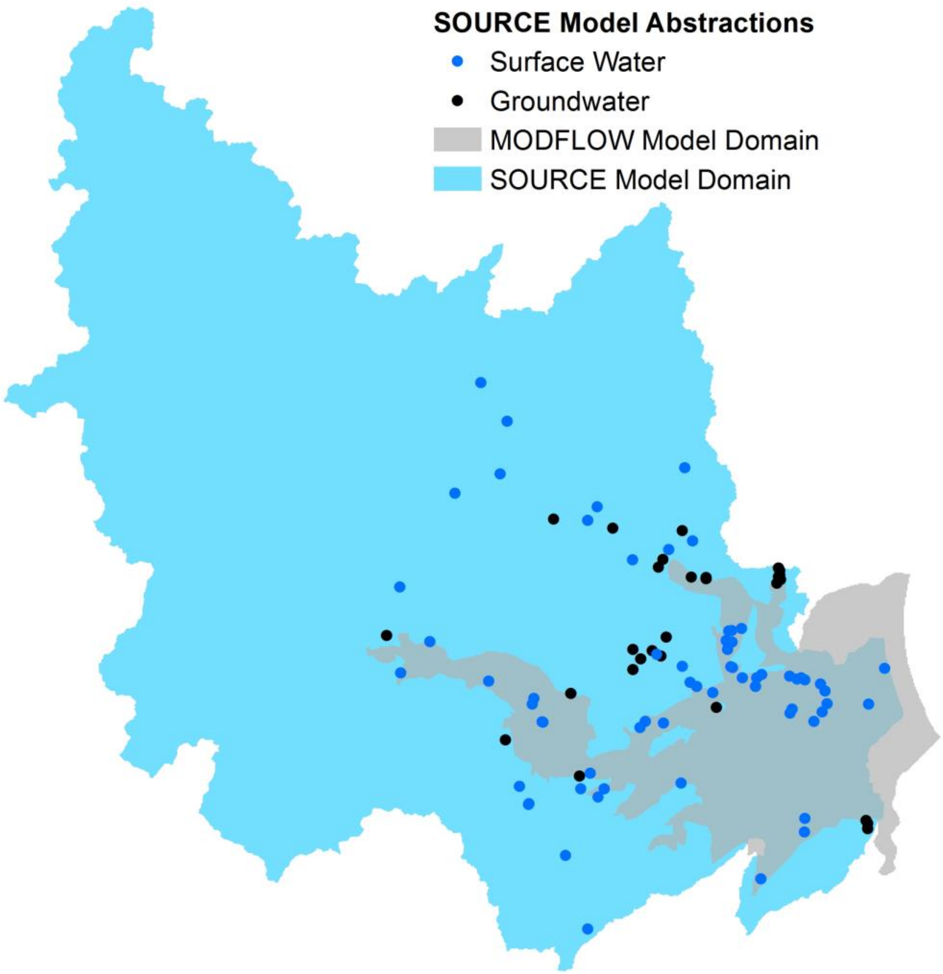
- Simulates all groundwater abstractions within the MODFLOW model domain



Modelling SW and GW Abstractions

SOURCE Model

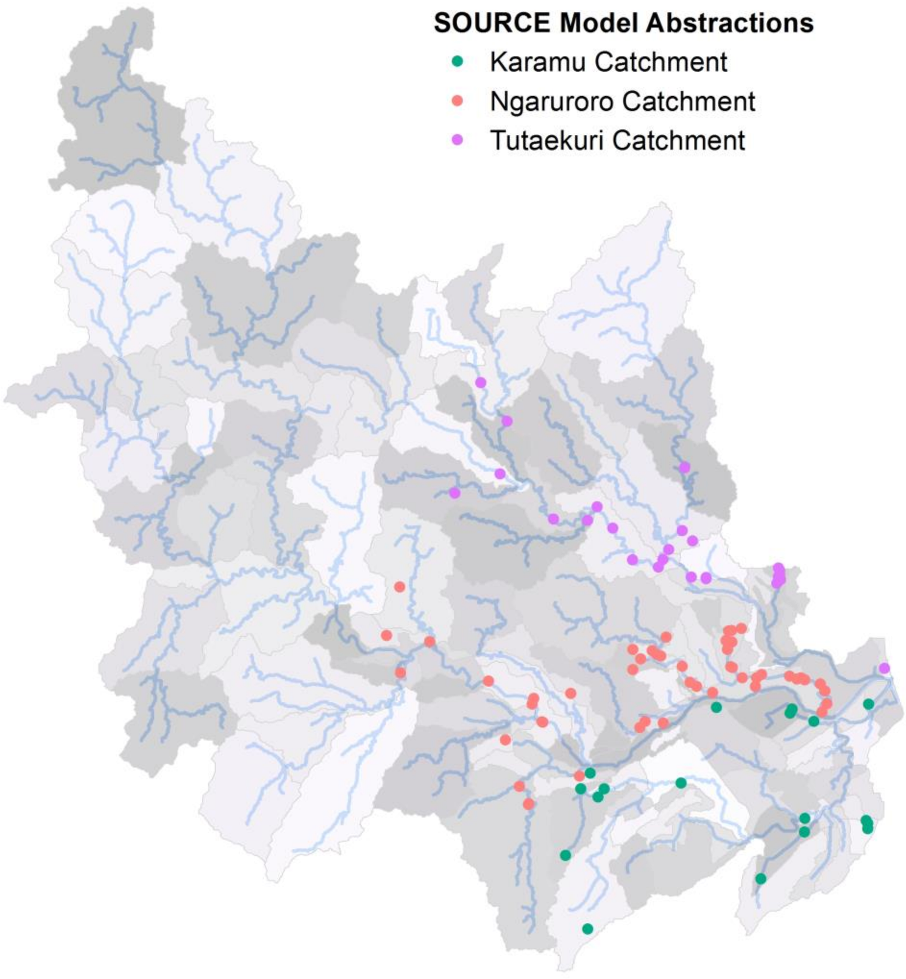
- Simulates all SW abstractions within the SOURCE model domain
- Also simulates GW abstractions located outside the MODFLOW model domain



Modelling SW and GW Abstractions

SOURCE Model

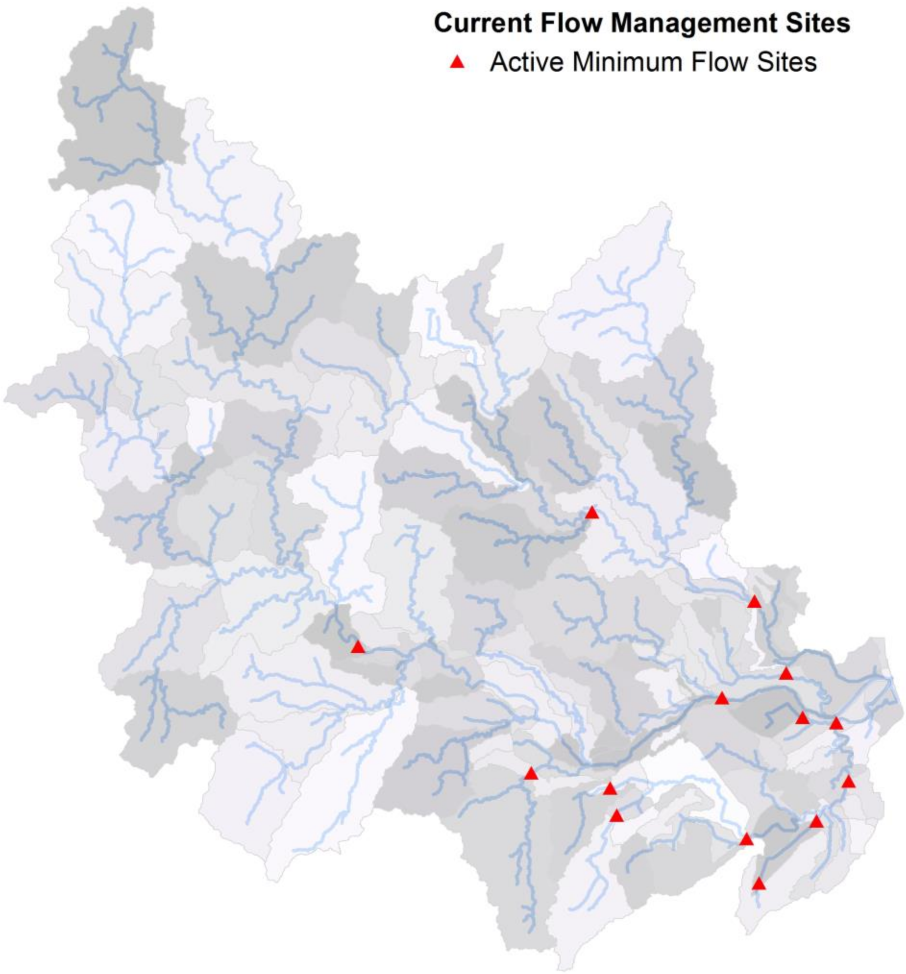
- Simulated abstractions located in numerous sub-catchments within the SOURCE model.



Flow Management Sites

Current Flow Management Site Network

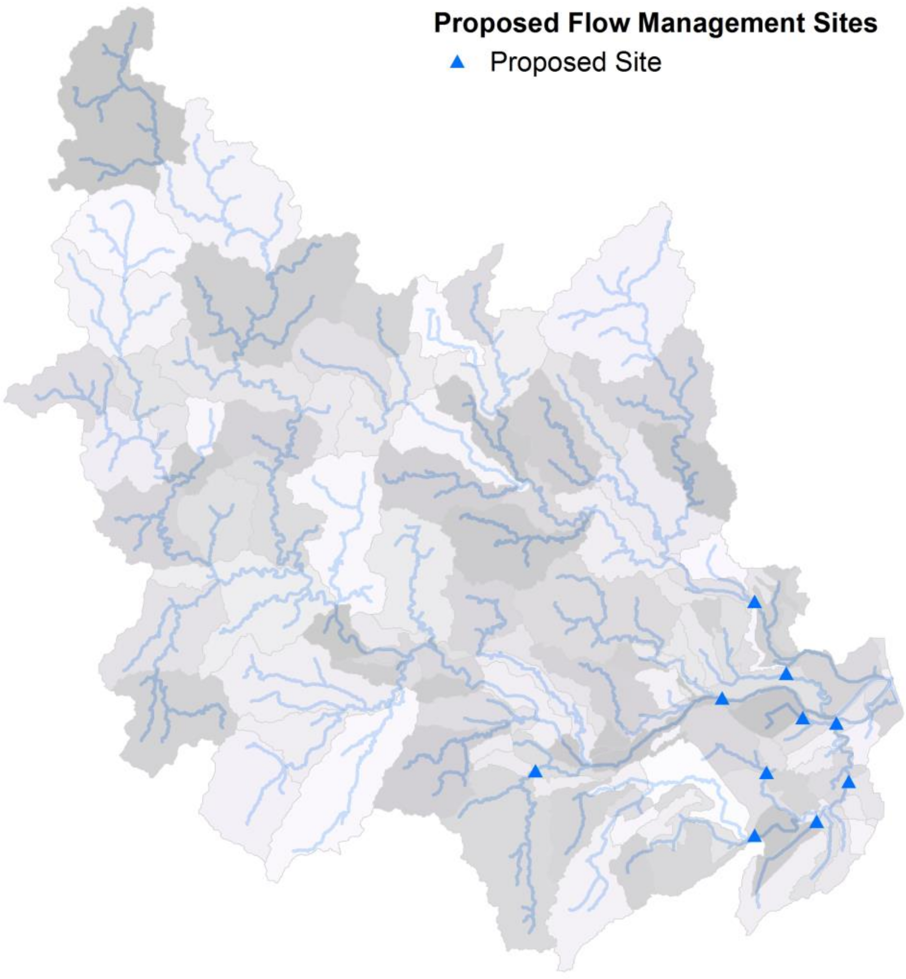
- 14 current active minimum flow sites located within the SOURCE model domain.
- Traditional minimum flow sites used to manage the restriction of abstractions



Flow Management Sites

Potential Future Flow Management Site Network

- 10 proposed sites
- Focus on sites for effective management of instream habitat & oxygen requirements
- Sites may be used to trigger:
  - Restrictions
  - Staged reductions
  - Augmentation
  - Artificial recharge



Current Flow Management Sites

Catchment	14 Current Sites
Tutaekuri	Tutaekuri River at Ngaroto
	Tutaekuri River at Puketapu HBRC Site
Ngaruroro	Maraekakaho Stream D/S Tait Road
	Ngaruroro River at Fernhill
	Ngaruroro River at Whanawhana
	Tutaekuri Waimate Stm at Goods Bridge
Karamu	Karamu Stream at Floodgates
	Karewarewa Stream at Paki Paki
	Louisa Stream at Te Aute Road
	Mangateretere Stream at Napier Road
	Ongaru Drain at Wenley Road
	Paritua Stream at Water Wheel
	Raupare Drain at Ormond Road
	Te Waikaha at Mutiny Road

Potential Future Flow Management Sites

Catchment	10 Proposed Sites	Latest Flow Assessment Approach
Tutaekuri	*Tutaekuri River at Puketapu HBRC Site	Habitat-flow modelling
Ngaruroro	*Maraekakaho Stream D/S Tait Road	Hydrological/ecological
	*Ngaruroro River at Fernhill	Habitat-flow modelling
	*Tutaekuri Waimate Stm at Goods Bridge	Oxygen-flow modelling
Karamu	Awanui Stream at Flume	Oxygen-flow modelling
	Irongate Stream at Clarkes Weir	Oxygen-flow modelling
	*Karamu Stream at Floodgates	Oxygen-flow modelling
	*Louisa Stream at Te Aute Road	Oxygen-flow modelling
	*Mangateretere Stream at Napier Road	Oxygen-flow modelling
	*Raupare Drain at Ormond Road	Oxygen-flow modelling

*Existing active flow management sites


TIME FOR
LUNCH

Outline of Presentation:

1. Purpose of modelling
2. Methods and assumptions of the model
3. Results
4. Next steps

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1. Purpose of Te Tua storage modelling

- A preliminary investigation of the feasibility of Te Tua storage for offsetting the effects of abstraction in the Ngaruroro River

2. Methods and assumptions

- Excel spreadsheet used to simulate:
  - Inflows to storage from Ngaruroro River
  - Volume and surface area of the storage facility for different water levels
  - Rainfall inputs and evaporation outputs at the lake surface
  - The ability of the storage volume to offset the effects of abstraction between 2008 and 2016
  - Various cease-take flows can be simulated

2. Methods and assumptions

- Assumptions:
  - Maximum depletion of river flows from groundwater abstraction = **800 L/s**
  - Maximum offset required for groundwater and surface water abstraction = **1,600 L/s**
  - A delivery system for entire offset flow is assumed
  - Maximum storage 5,000,000 m^3 unless specified otherwise

2. Methods and assumptions

- Assumptions:
  - Rainfall and evaporation depth records from Bridge Pa were used, along with surface area of the lake, to calculate volume gains/losses
  - 800L/s inflow is assumed, when cease-take flow conditions are met (Ngaruroro at Fernhill)

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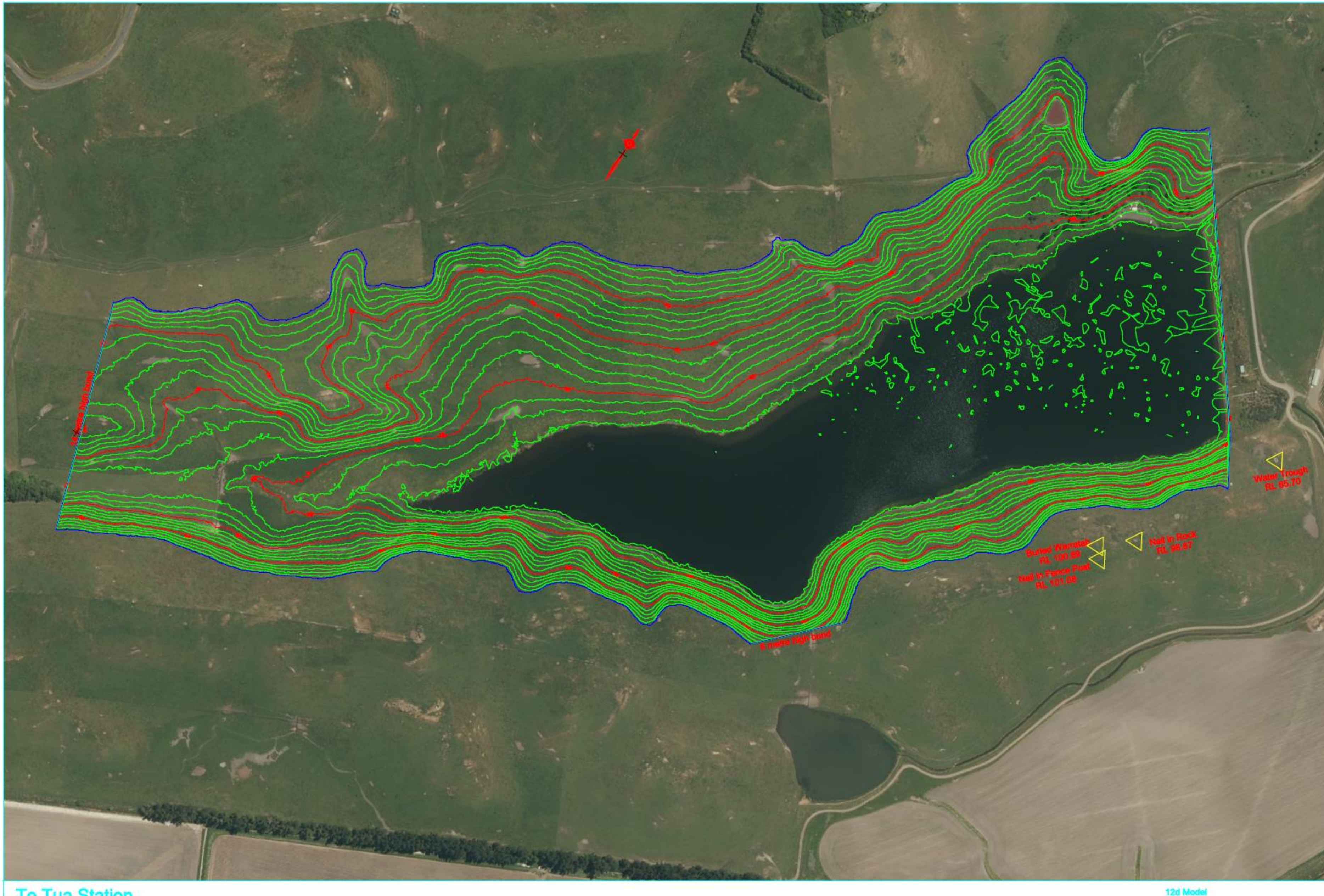
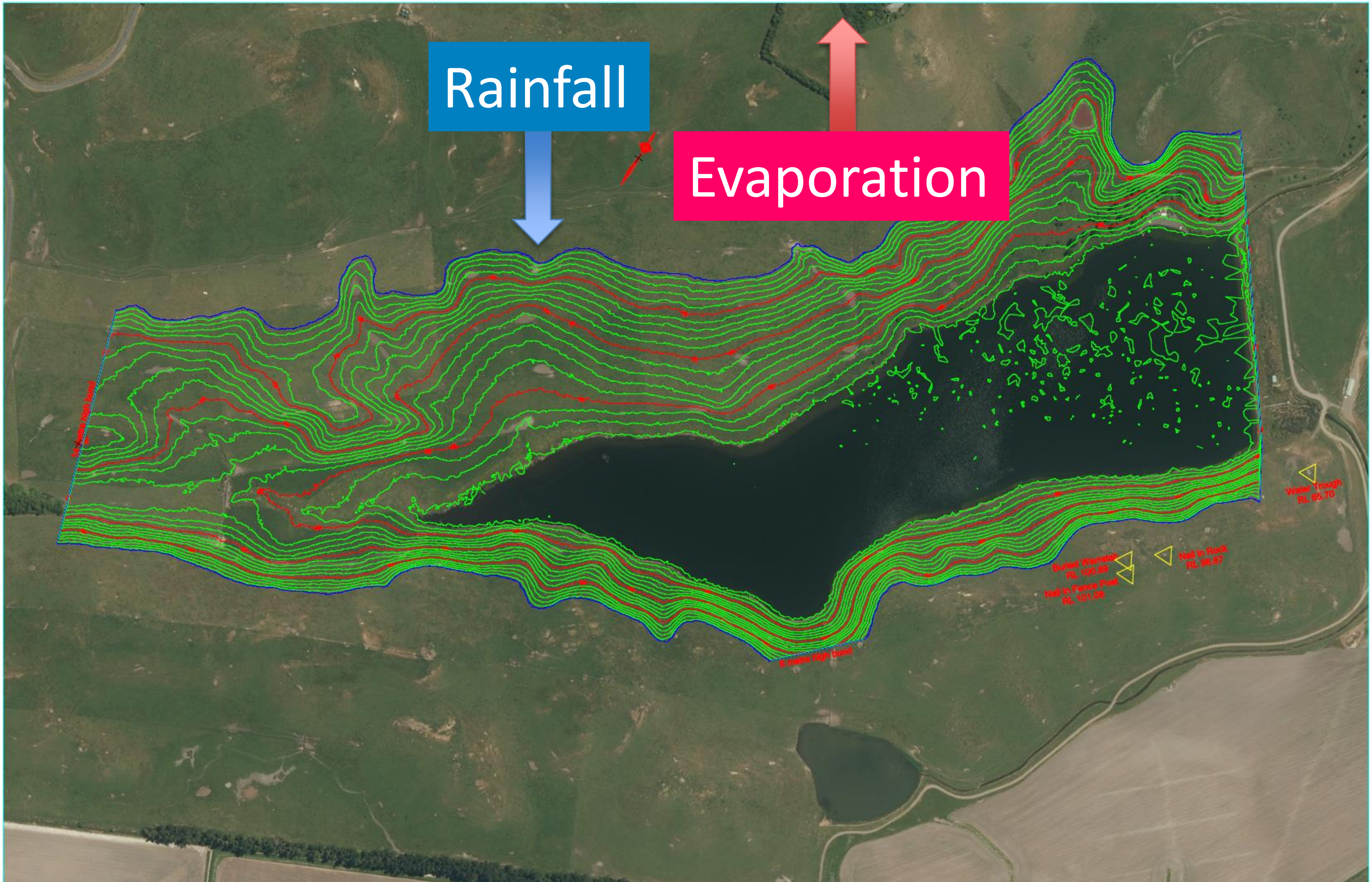
Cease-take flow at Fernhill
Inflow 800 L/s
Offset flow 800 L/s or 1,600 L/s
Lake Te Tua storage
50

2. Methods and assumptions

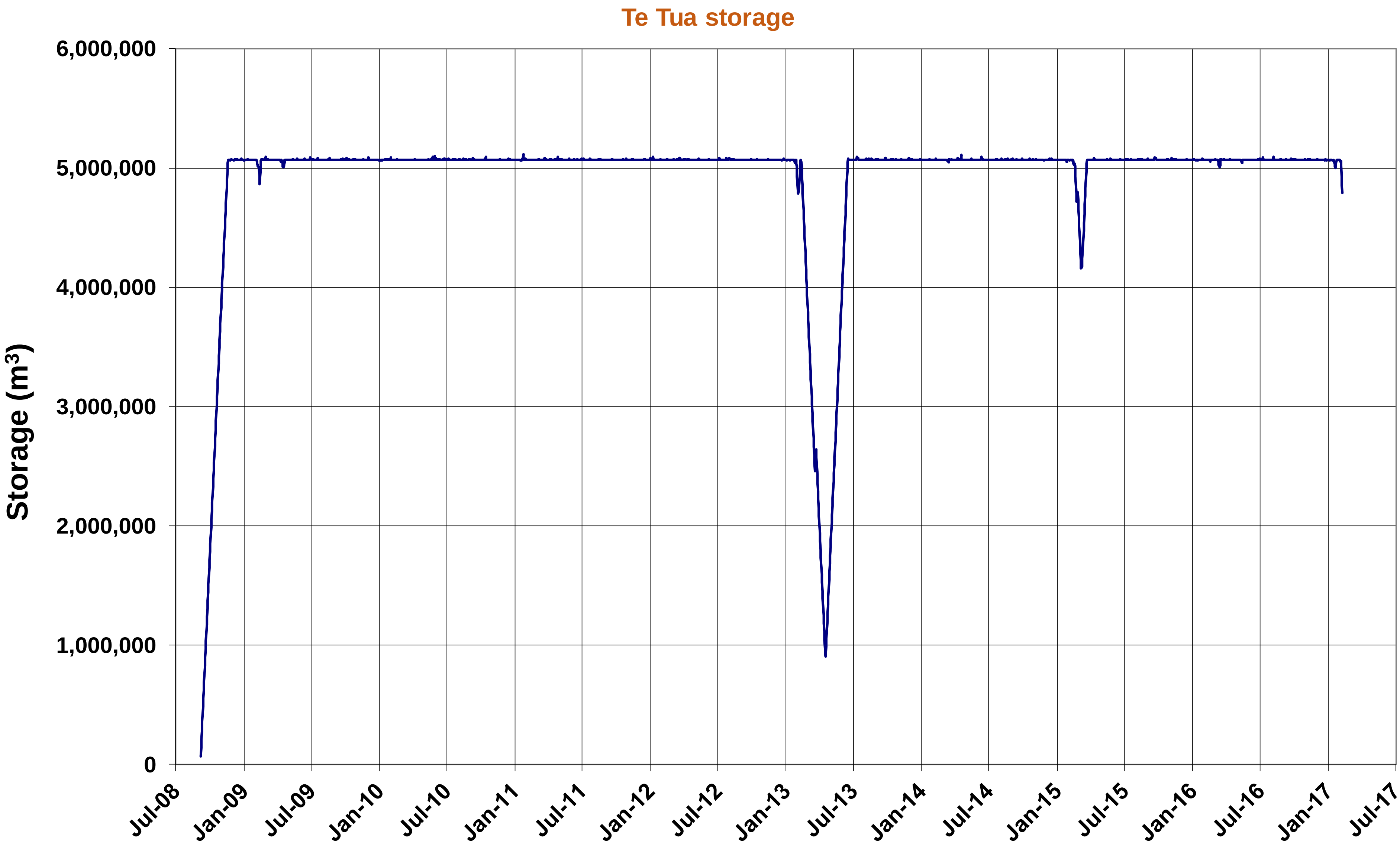


2. Methods and assumptions



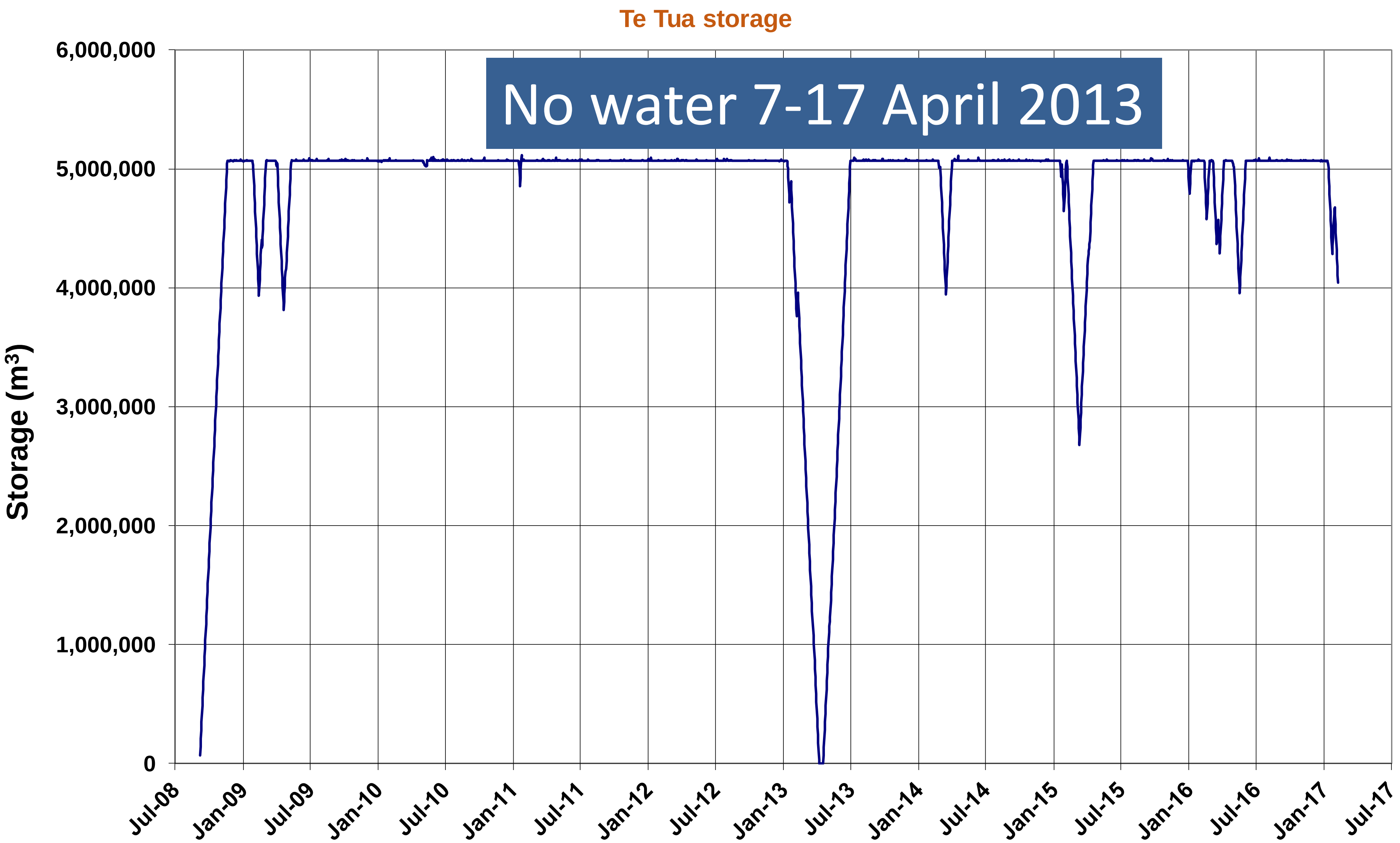
3. Results – offsetting 800 L/s from groundwater takes

Cease-take flow = 2,400 L/s



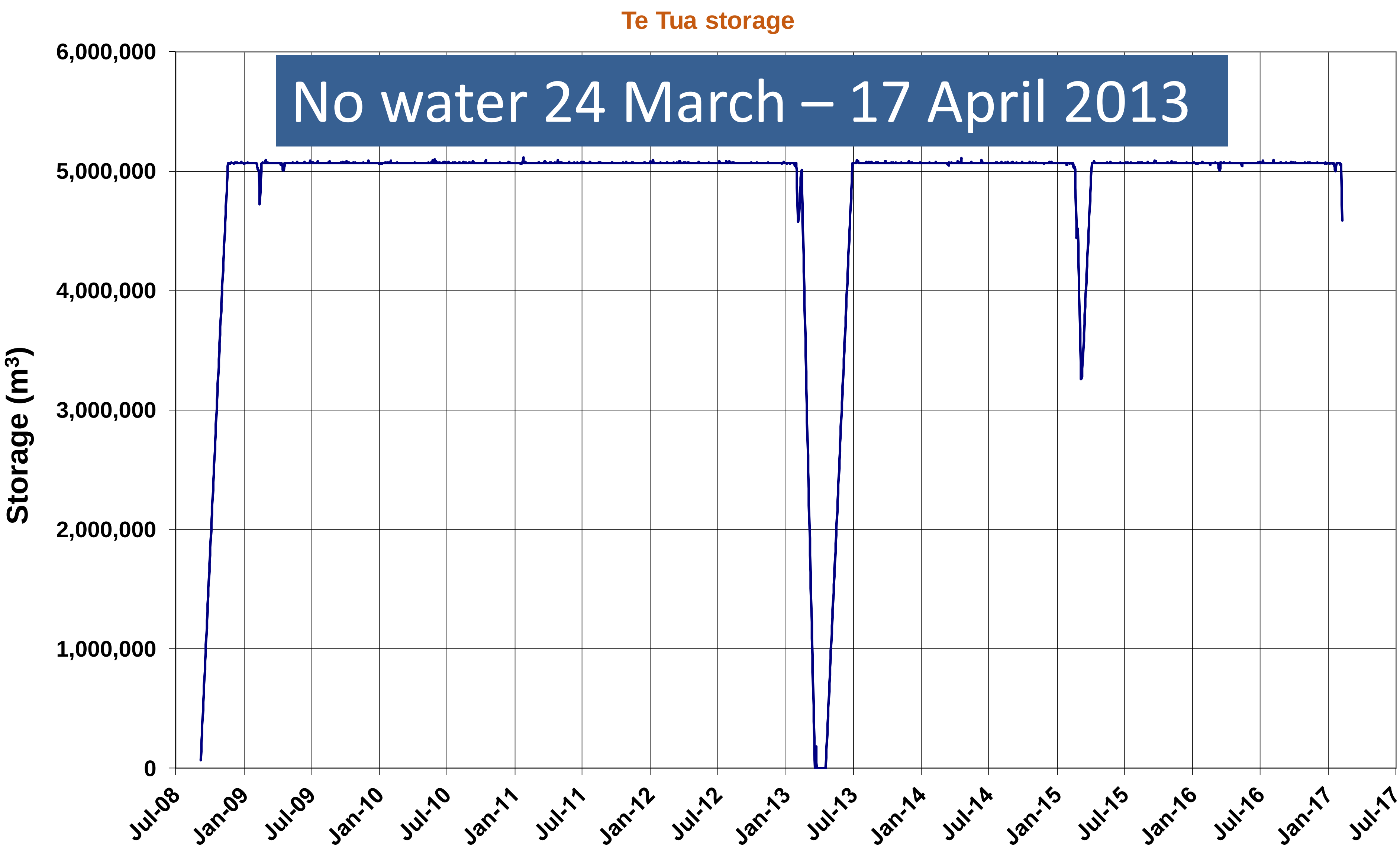
3. Results – offsetting 800 L/s from groundwater takes

Cease-take flow = 4,000 L/s



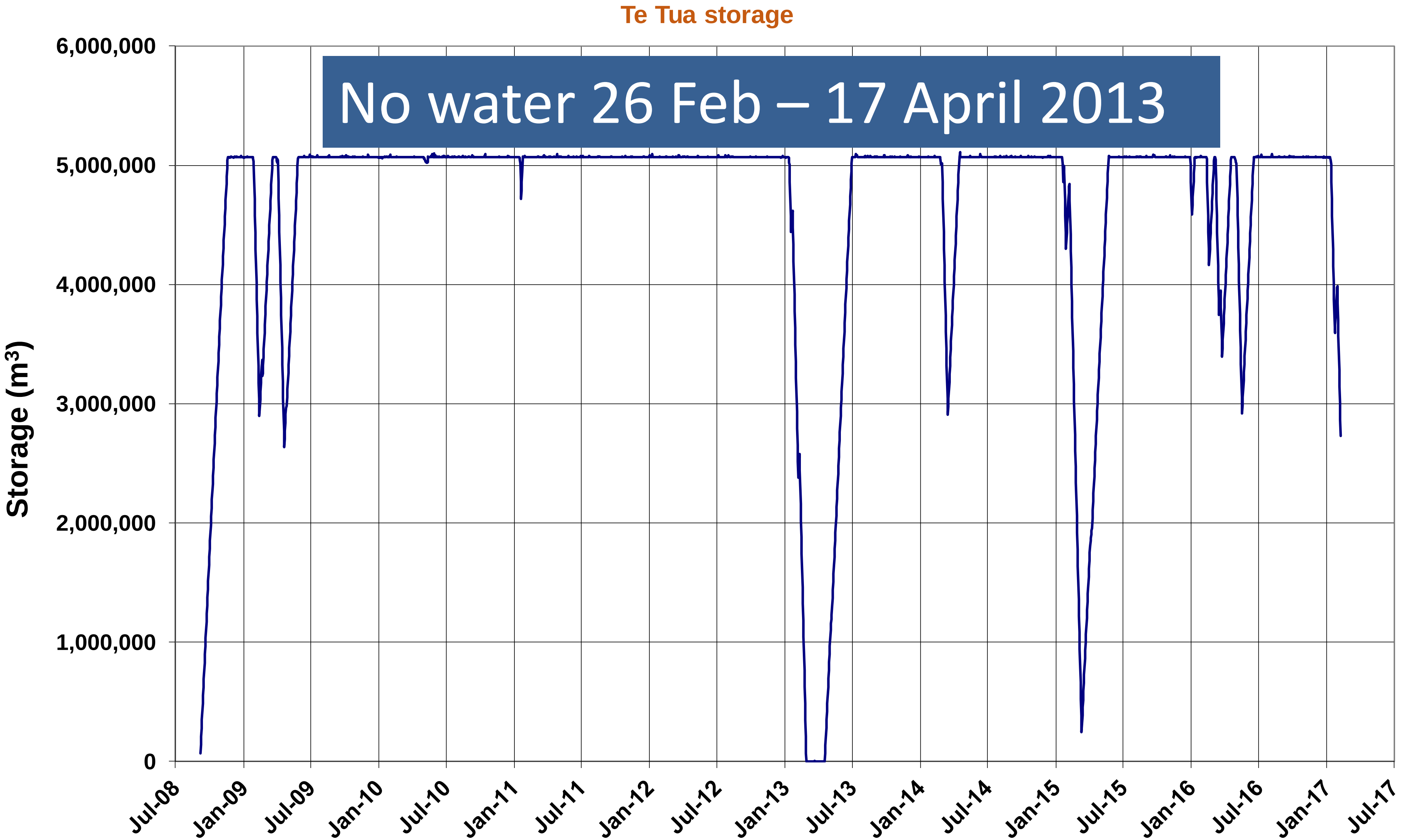
3. Results – offsetting 1,600 L/s from all takes

Cease-take flow = 2,400 L/s



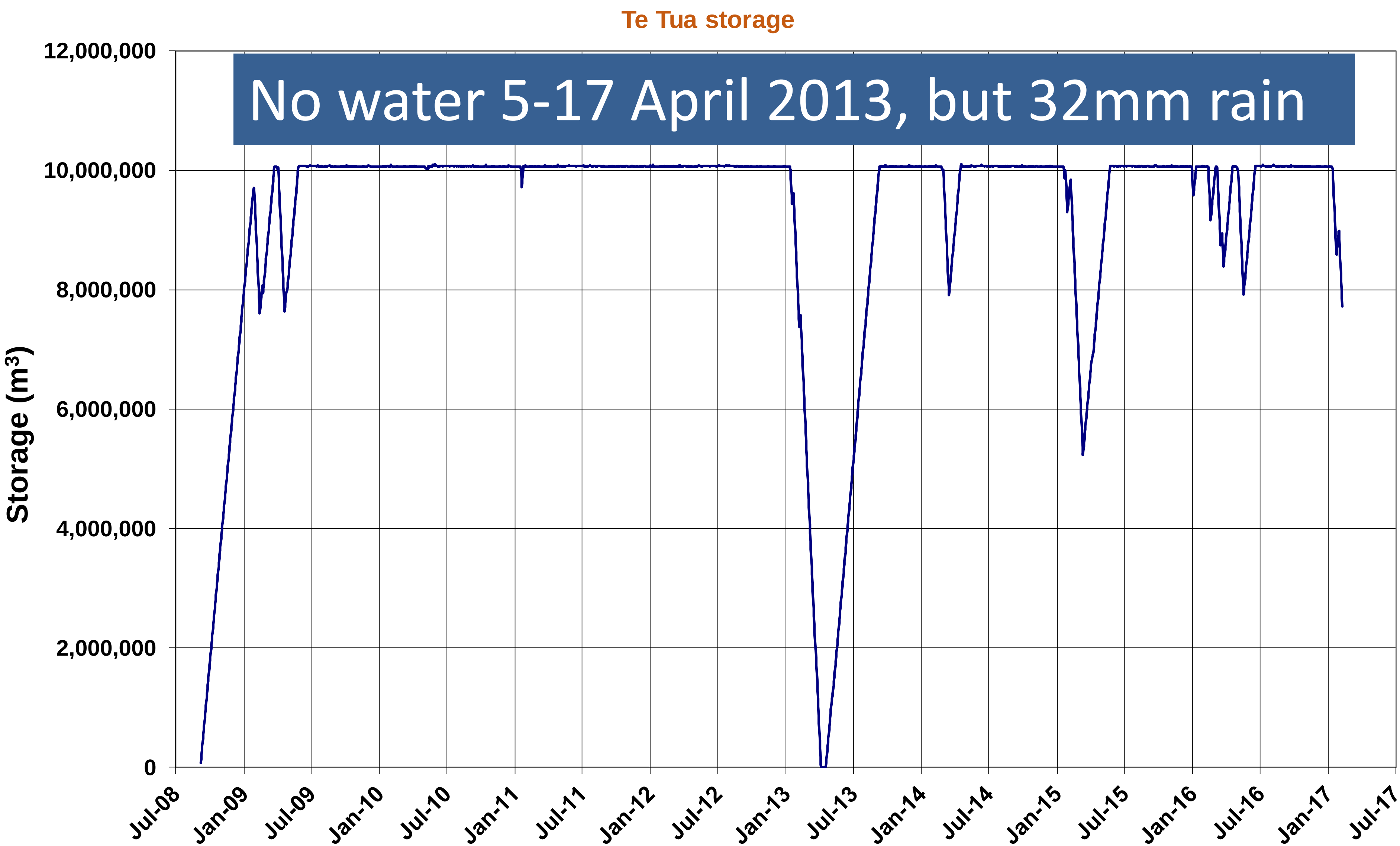
3. Results – offsetting 1,600 L/s from all takes

Cease-take flow = 4,000 L/s



3. Results – offsetting 1,600 L/s from all takes

Cease-take flow = 4,000 L/s; increased storage



4. Future modelling options

1. Revise spreadsheet model for improved inputs and assumptions
2. Evaluate effects of storage take on Ngaruroro River flows
3. Apply the Heretaunga GW/SW model for a sophisticated model – including losses to groundwater from Ngaruroro River
4. Investigate Te Tua storage for augmenting Paritua and Karamu

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Water Allocation Options Assessment

Mary-Anne Baker

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Values matrix

	Values	Economic	Ecosystem Health		Wairua	Mauri	ground water levels
	Attributes	SoS	Flow - %habitat	Flow – dissolved oxygen		Natural state	
Management Scenario	1						
	2						
	3						
	4						
	5						
	6						
	7						
	8						
	9						
	10						

Key

- Strong alignment
- Medium
- Low
- Natural state

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Values matrix

	Values	**Economic**	**Ecosystem Health**		**Wairua**	**Mauri**
	Attributes	SoS	Flow - %habitat	Flow – dissolved oxygen	Flow	Natural state
Management Scenario						
Ground water	1. No restriction					
	2. Zone based restriction					
	3. Whole of plains restriction					
	4. River flow augmentation					
	5. Managed aquifer recharge(MAR)					
	6 Maintain current allocation					
	7. Reduce allocation					
	8. Increase allocation					

Key

- Strong alignment
- Medium
- Low
- Natural state

Values matrix

	Values	Economic	Ecosystem Health		Wairua	Mauri	Ground water levels
	Attributes	SoS	Flow - %habitat	Flow – dissolved oxygen		Natural state	
Management Scenario							
Surface Water	1. No restriction						
	2. Minimum flow restriction						
	3. Staged reduction + minimum flow restriction						
	4. Flow sharing + minimum flow restriction						
	5. Flow sharing (without minimum flow restriction)						
	6. Maintain current allocation						
	7. Reduce allocation						
	8. Increase allocation						

Key

- Strong alignment
- Medium
- Low
- Natural state

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Verbal updates from Working Groups

- Engagement
- Economic Assessment
- Stormwater
- Wetlands/Lakes
- Mana whenua

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Next meeting – 27 July 2017

1. **Clive River management options**
   - Options for flow and channel management
2. **Further GW/SW modelling results**
3. **Stormwater management, including updates from:**
   - NCC on Ahuriri wetlands
   - HDC on plan change
4. **Nutrient management options**

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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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