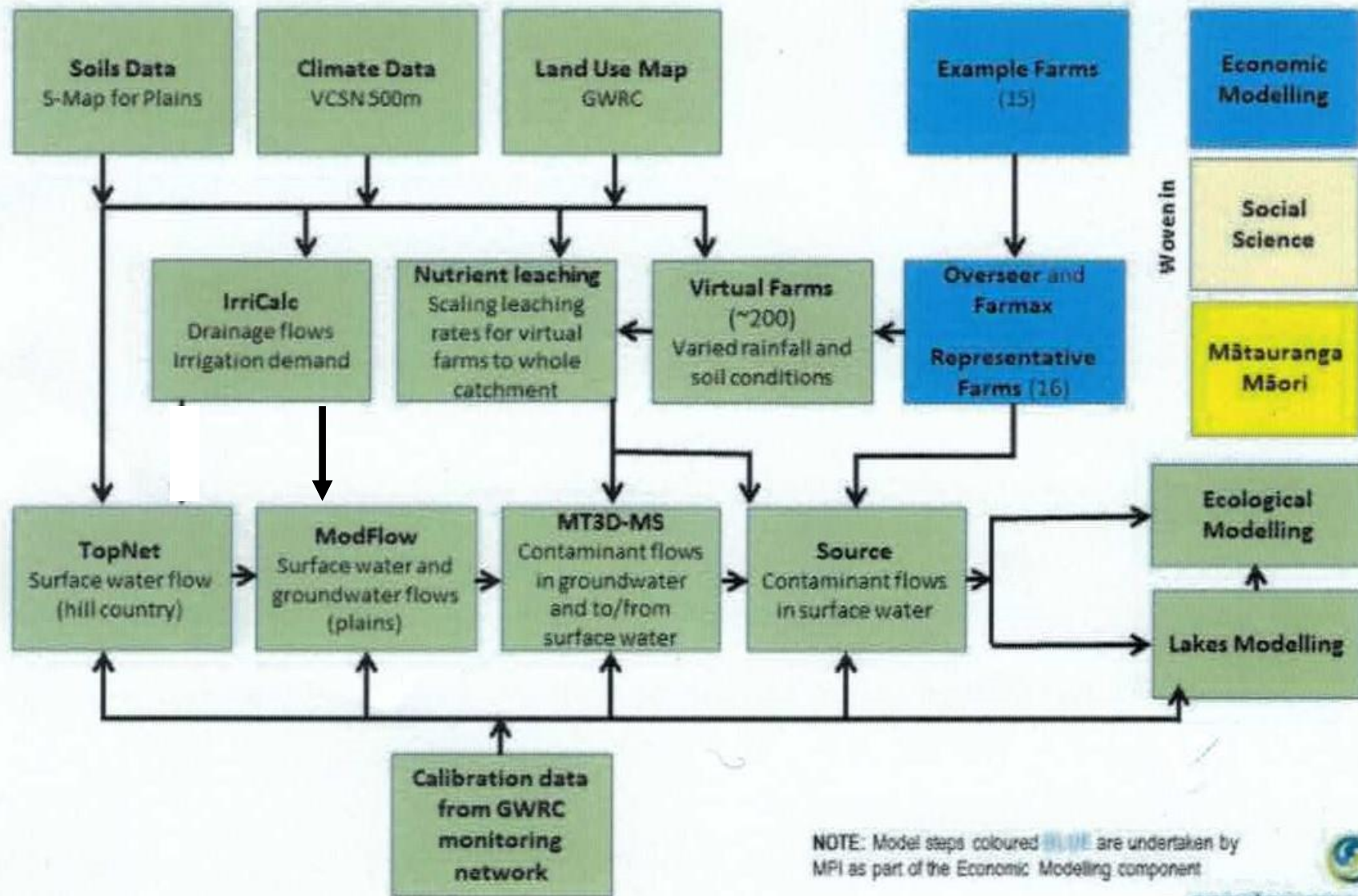


# Modelling Project Update

# The modelling system

- Modelling water flow and contaminant movement from the point they originate, down through the catchment to where they discharge to the sea.
- We use a chain of models to achieve this.



NOTE: Model steps coloured blue are undertaken by MPI as part of the Economic Modelling component

# Calibrating the Status Quo scenario

- Calibrating the modelling system is an iterative process
- Each model is setup, is driven by historical climate, land-use etc. data, and the predicted flows, levels and concentrations are compared to the measurements available.
- There is always a mismatch somewhere.

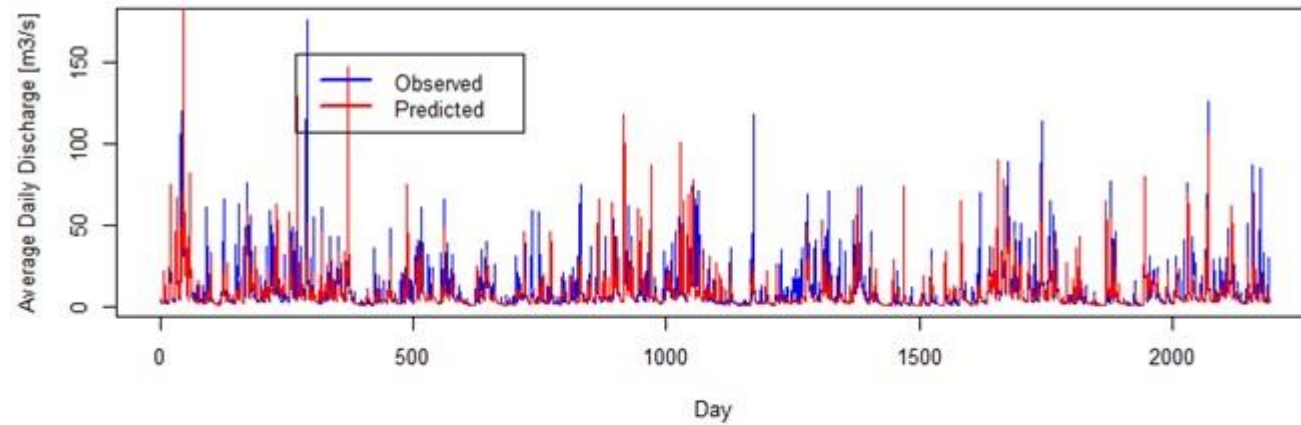
# Calibrating the Status Quo scenario

- The mismatches are analysed to identify any systemic problems with particular models, or the modelling system as a whole.
- If there is, the models are adjusted and we have another go at modelling the status quo.
- This is the process we are in. Completed the first iteration and part way through the second.

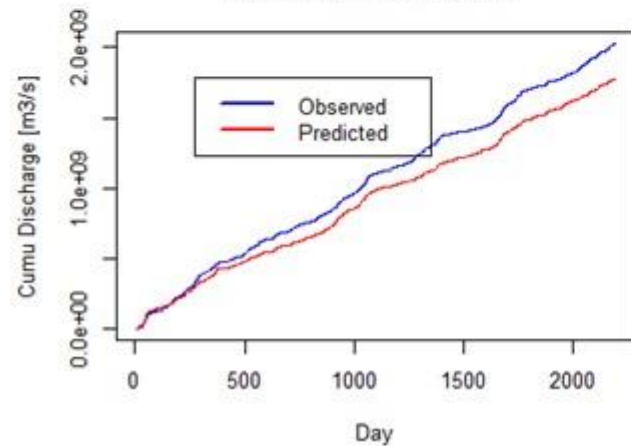
Flow from the hill country (Topnet modelling)

# Ruamahanga at Mt Bruce

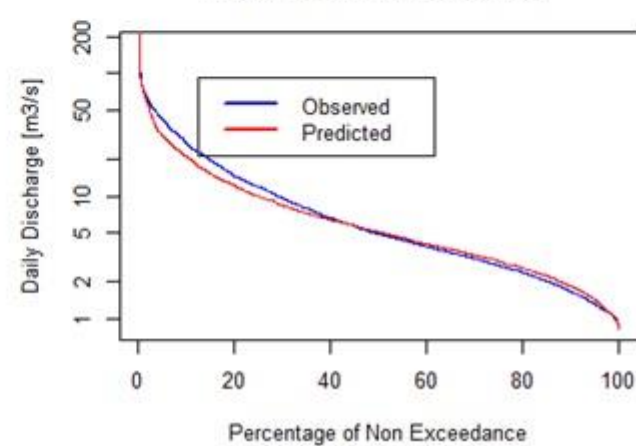
Daily Hydrograph Ruamahanga\_2004\_2014 RCHID= 9250417 Tideda id 29254 ( 78.704 km2)



Cum Daily Hydrograph

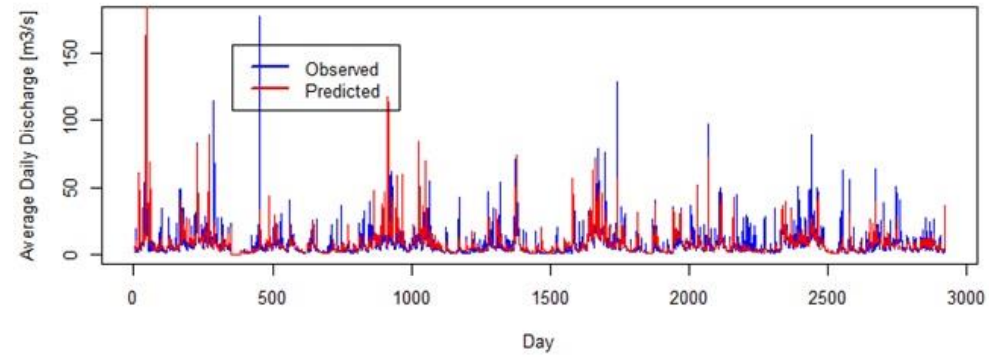


Daily Prob non exceedance

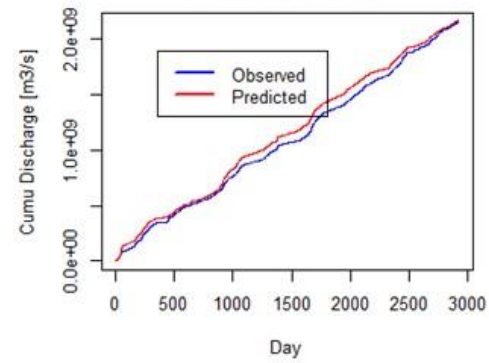


# Tauherenikau

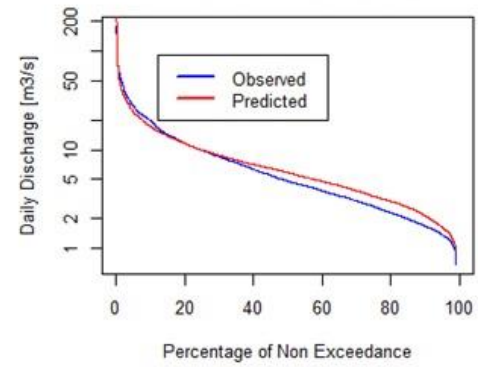
Daily Hydrograph Tauherenikau\_2004\_2014 RCHID= 9259046 Tideda id 29251 ( 114.208 km2)



Cum Daily Hydrograph



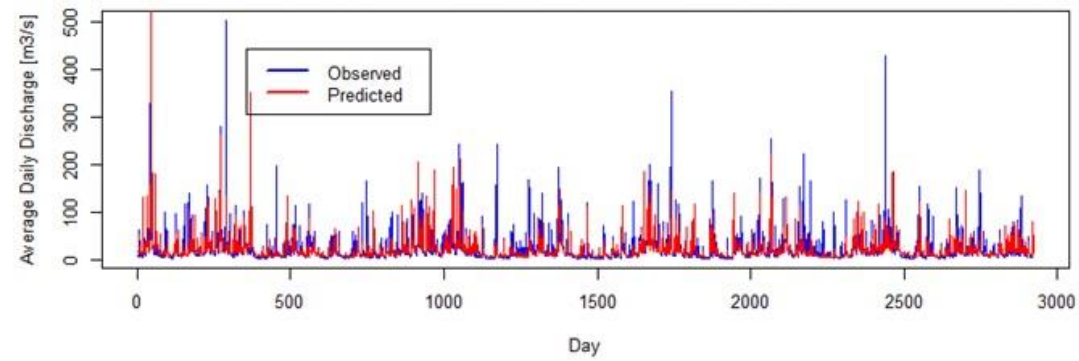
Daily Prob non exceedance



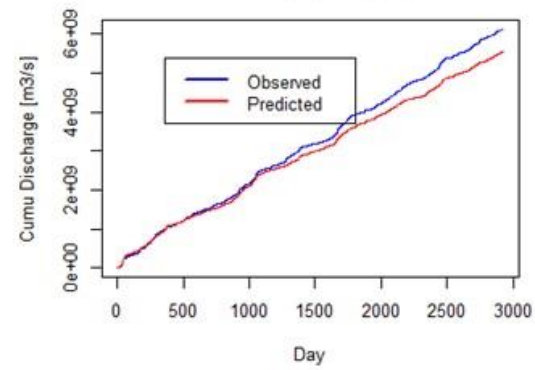


# Waiohine

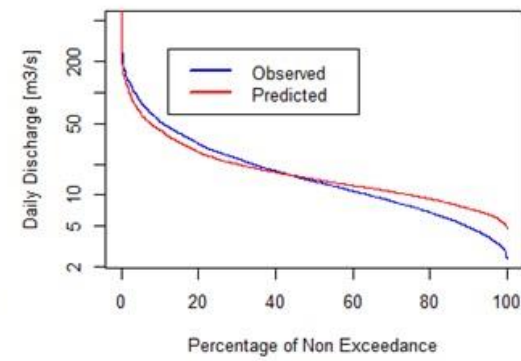
Daily Hydrograph Waiohine\_2004\_2014 RCHID= 9257741 Tideda id 29224 ( 182.658 km2)



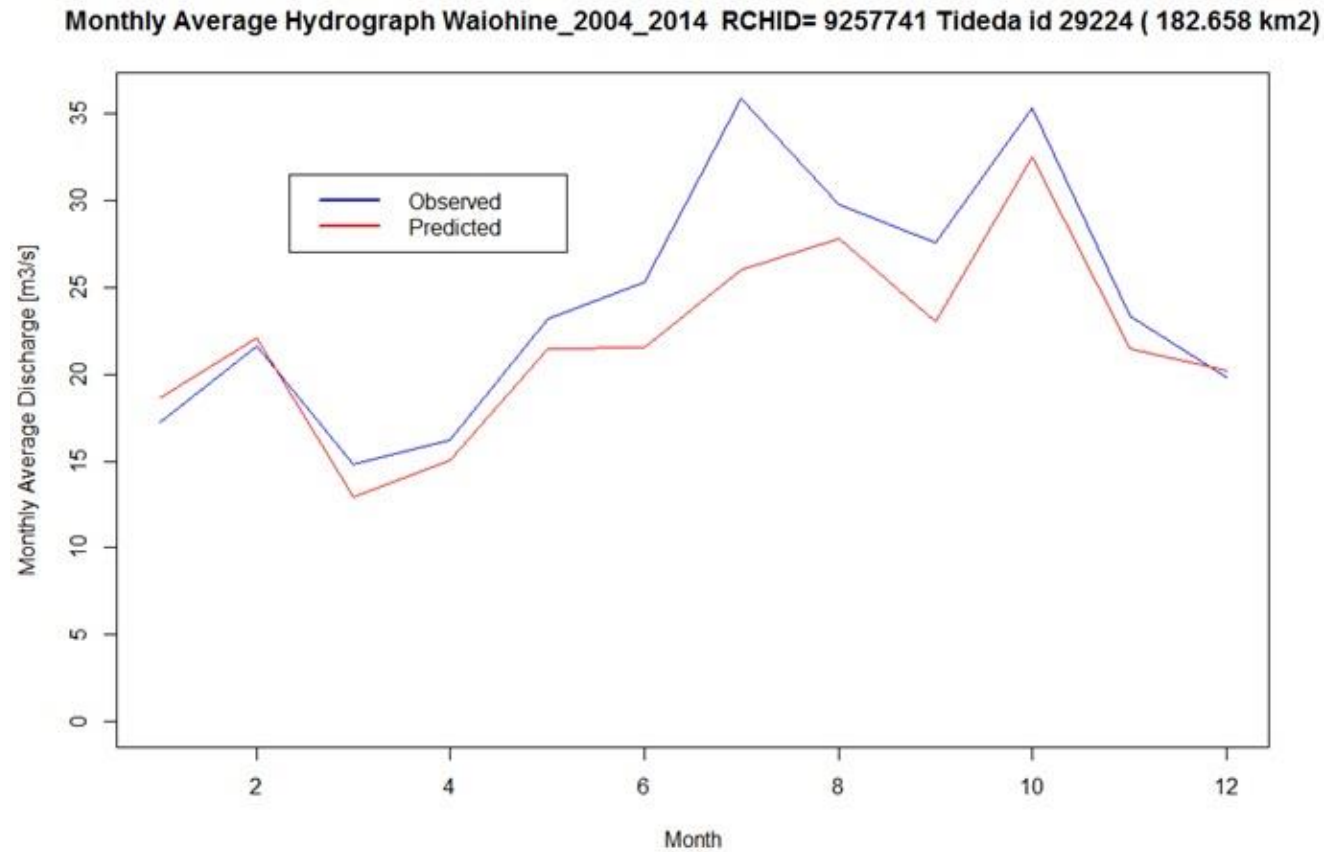
Cum Daily Hydrograph



Daily Prob non exceedance

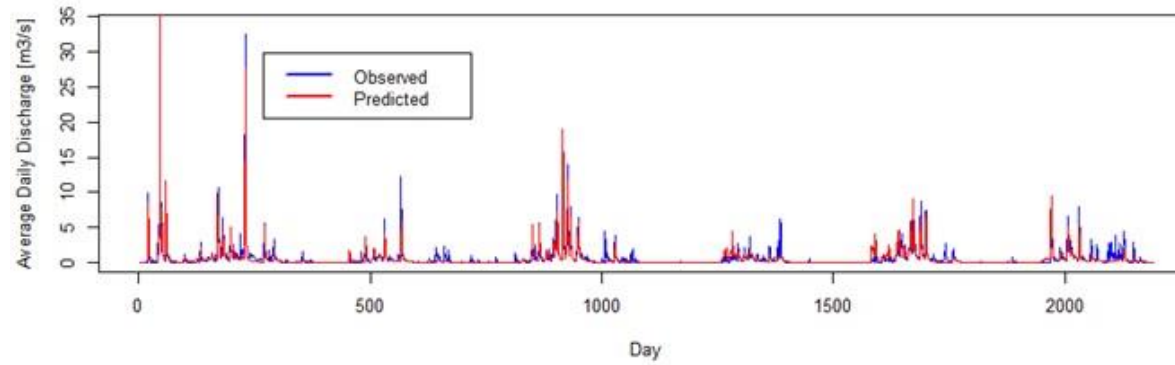


# Waiohine – average monthly flows

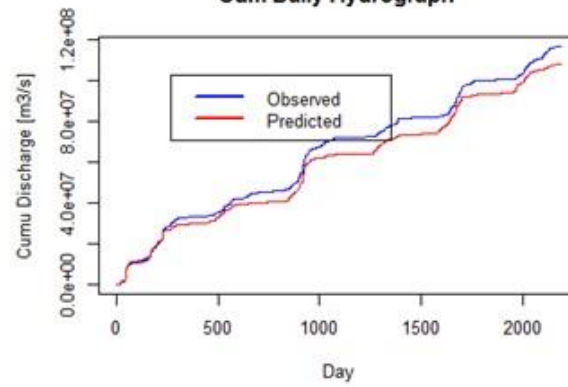


# Whangaehu

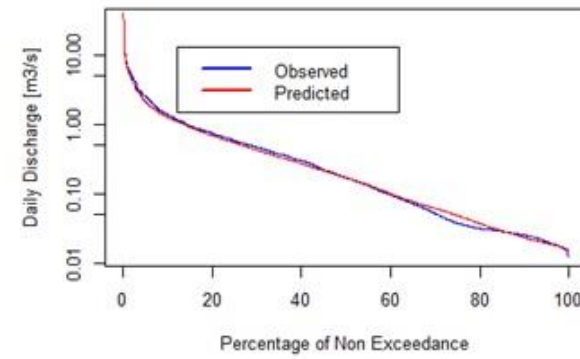
Daily Hydrograph Whangaehu\_2001\_2012 RCHID= 9252727 Tideda id 29244 ( 36.803 km2)



Cum Daily Hydrograph



Daily Prob non exceedance

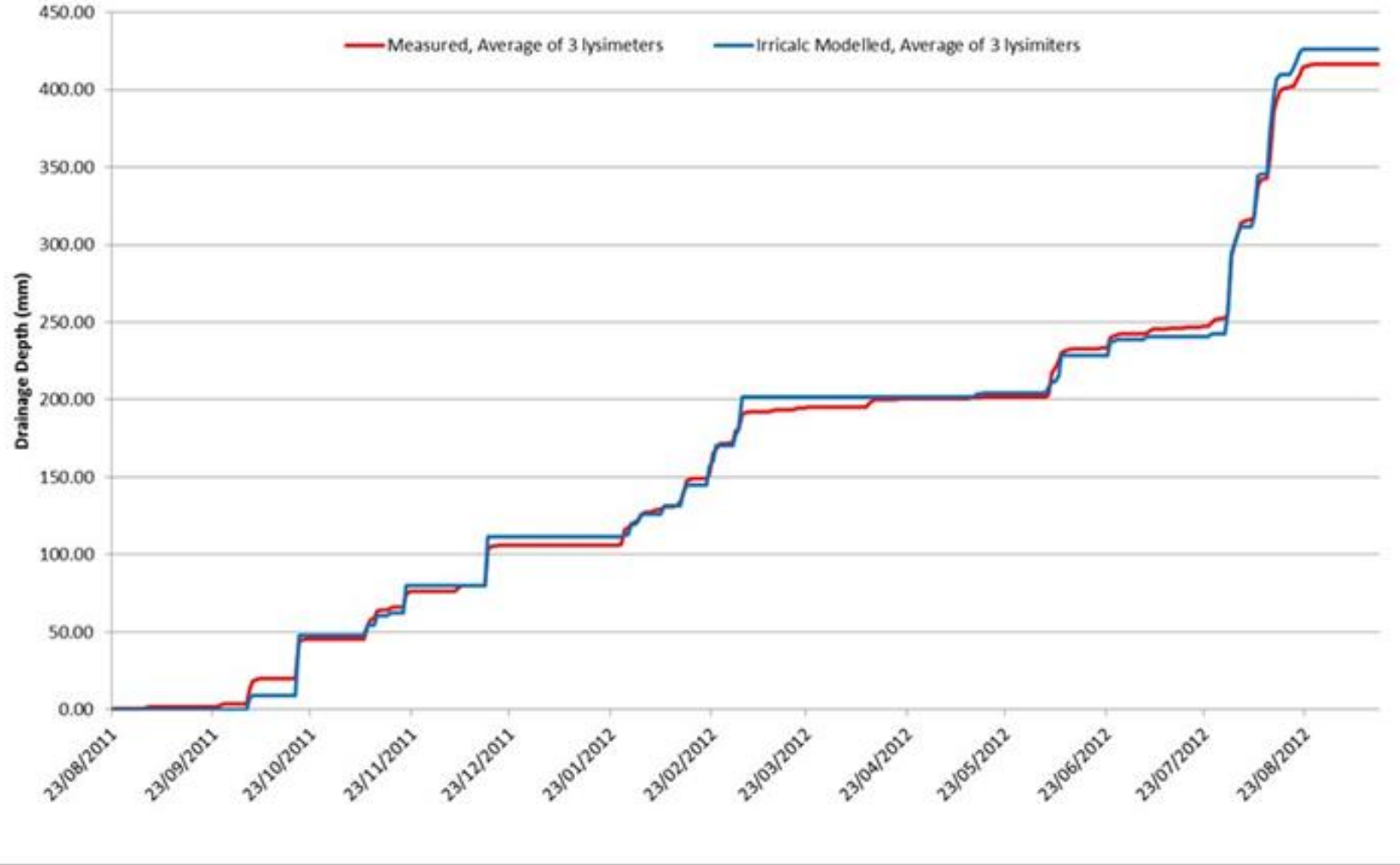


## In summary

- Many of the sub-catchments have calibrated to status quo acceptably well, but for two or three of the larger sub-catchments the modelled flow is too low.
- Some of the rainfall data estimated to have fallen on the western hills is now understood to be too low and thus the modelled flow is too low.
- The rainfall data will be adjusted to fix this.

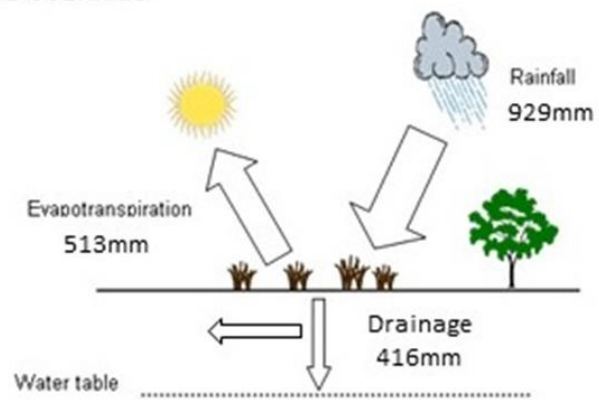
# Groundwater recharge and irrigation demand (IrriCalc modelling)

### Average Cumulative Drainage from Methven Lysimeters 2011/12



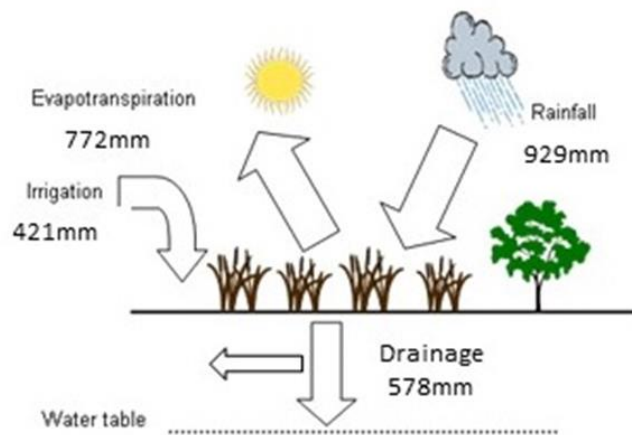
## Taratahi area

### DRYLAND SCENARIO



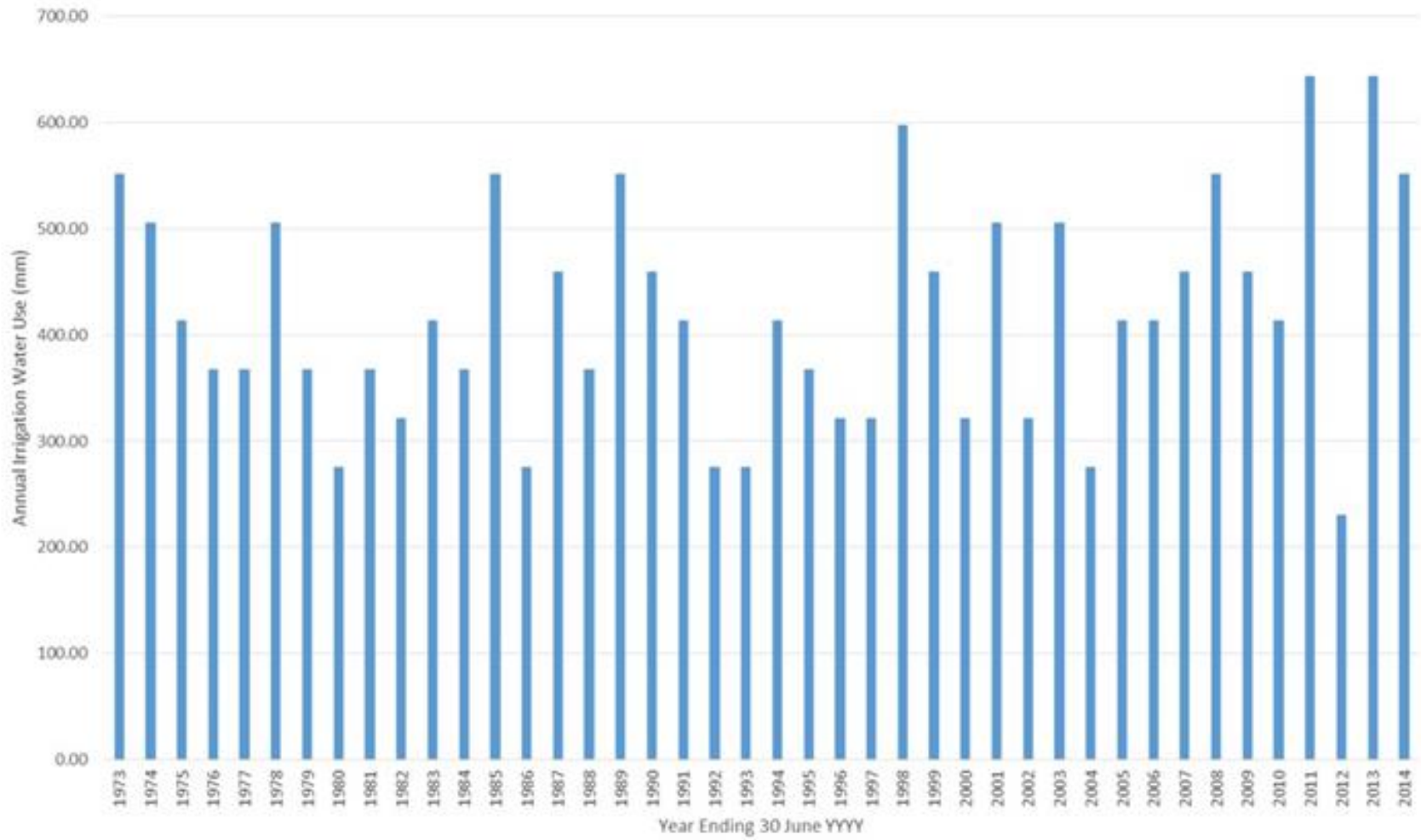
$$\text{Rainfall} = \text{Evapotranspiration}_{\text{dryland}} + \text{Recharge}_{\text{dryland}}$$

### IRRIGATED SCENARIO



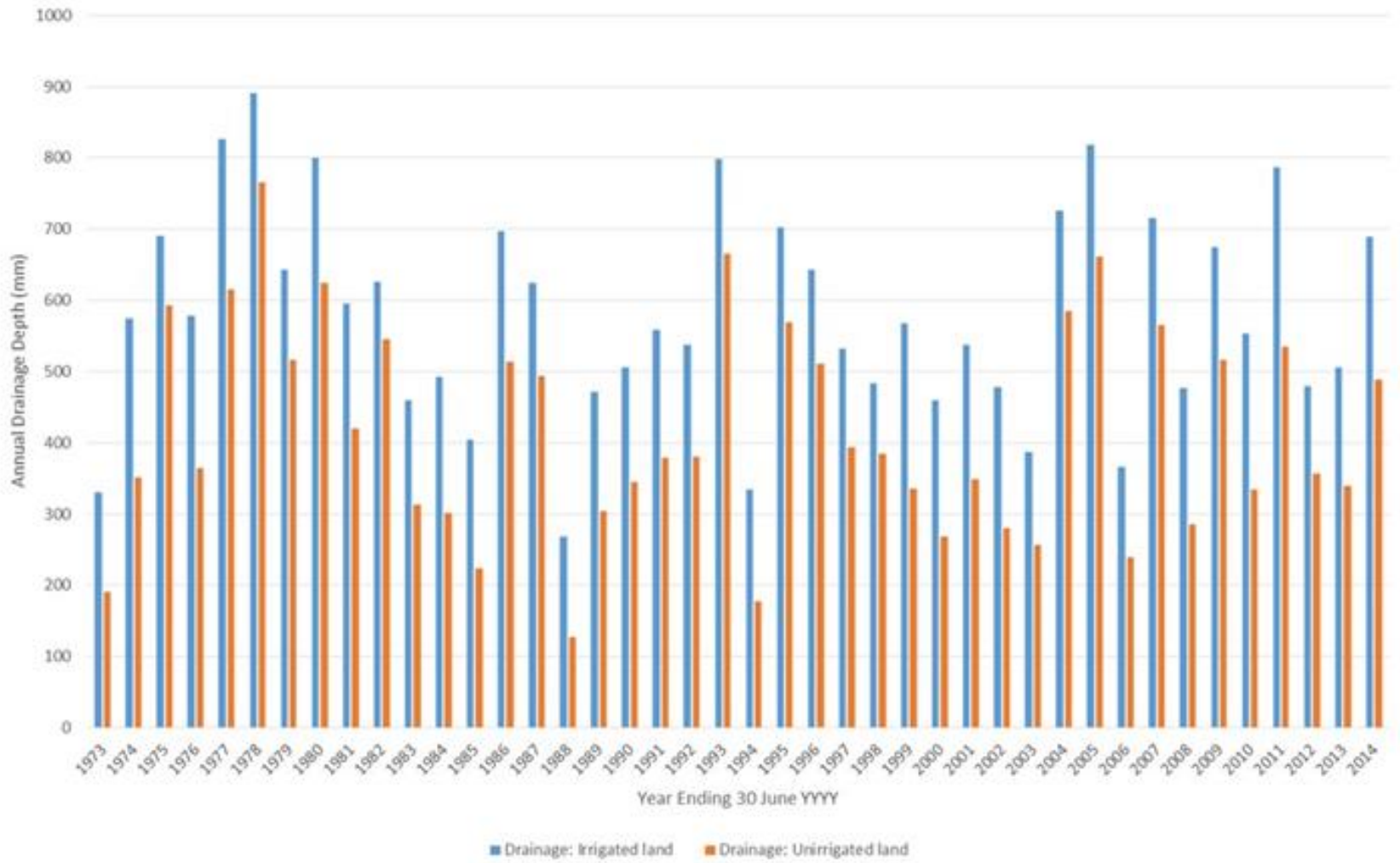
$$\text{Rainfall} + \text{Irrigation} = \text{Evapotranspiration}_{\text{irrigated}} + \text{Recharge}_{\text{irrigated}}$$

Modelled Annual Irrigation Water Use  
Taratahi area



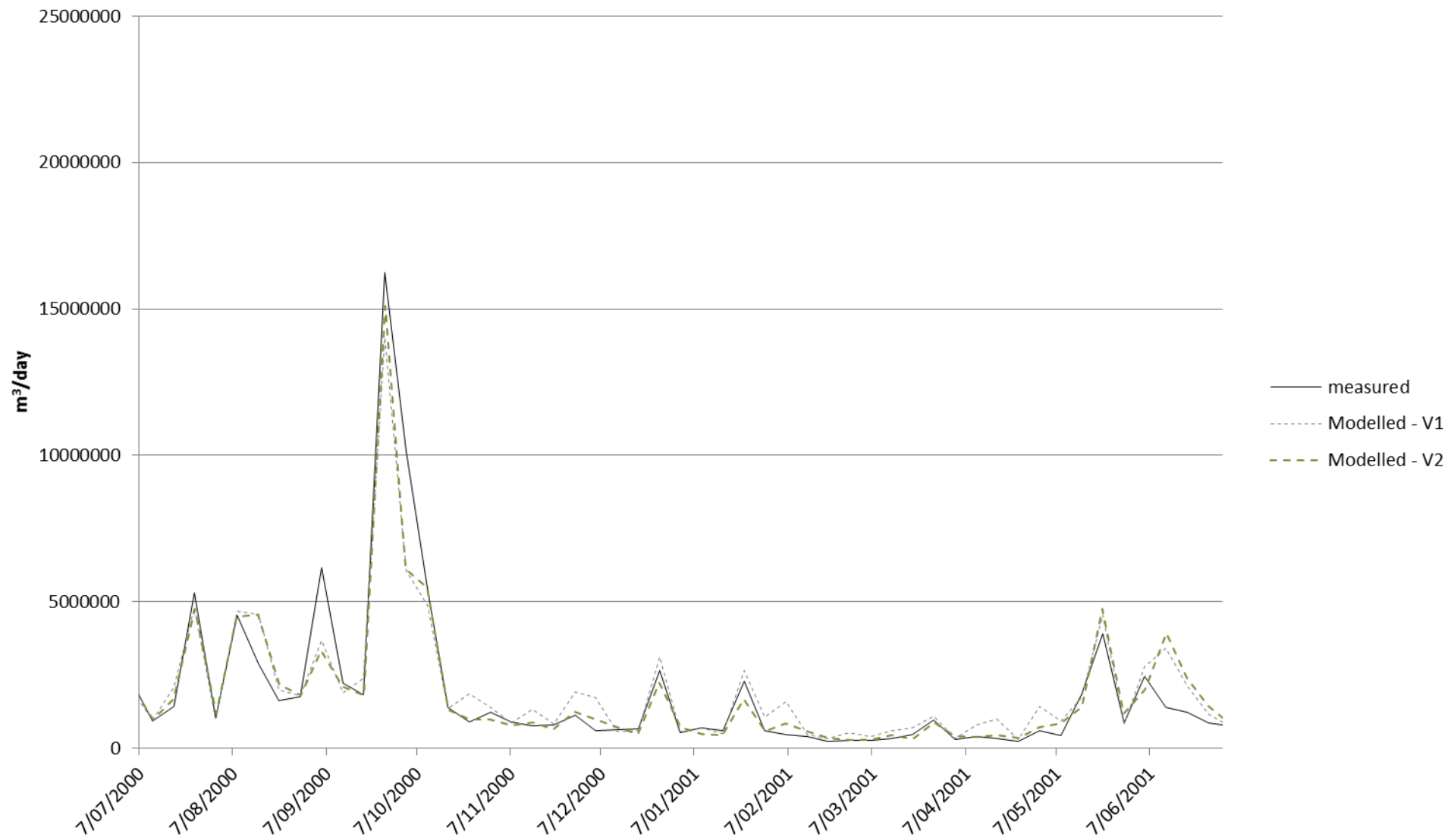


Modelled Annual Drainage: Taratahi area

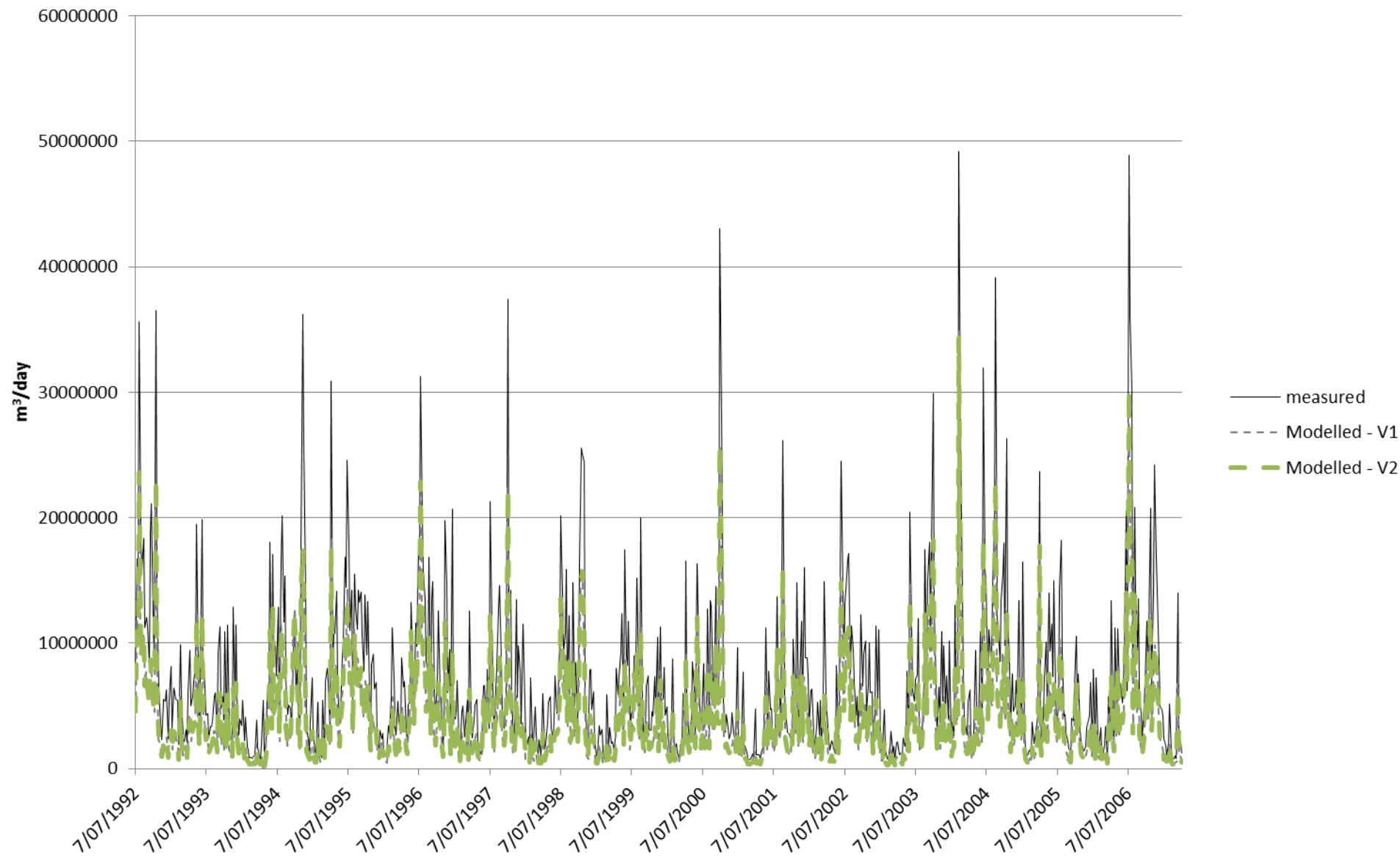


Flow across and under the plains  
(Modflow/SRF modelling)

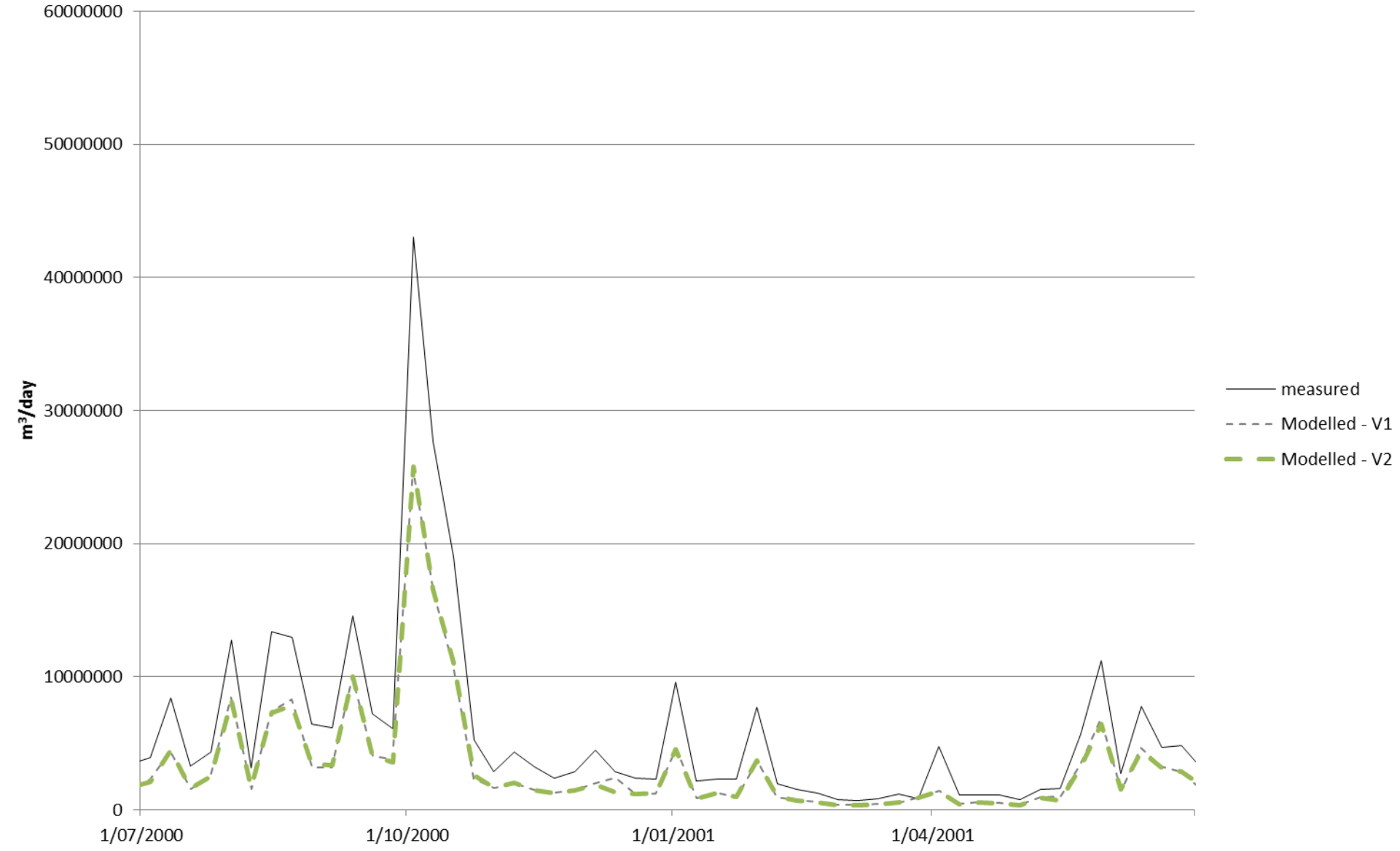
# Ruamahanga at Wardells Modflow/SFR output



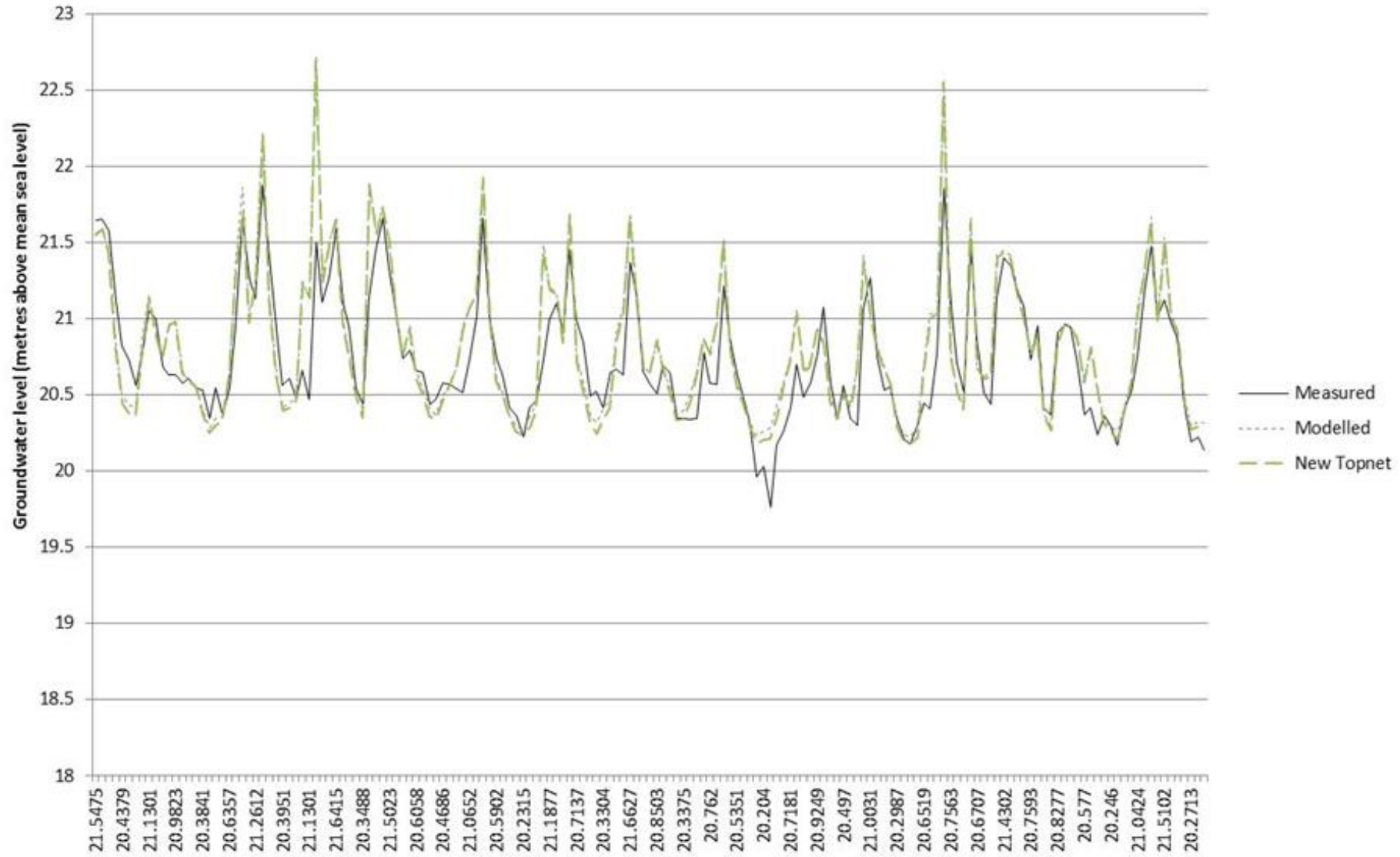
# Ruamahanga at Waihenga



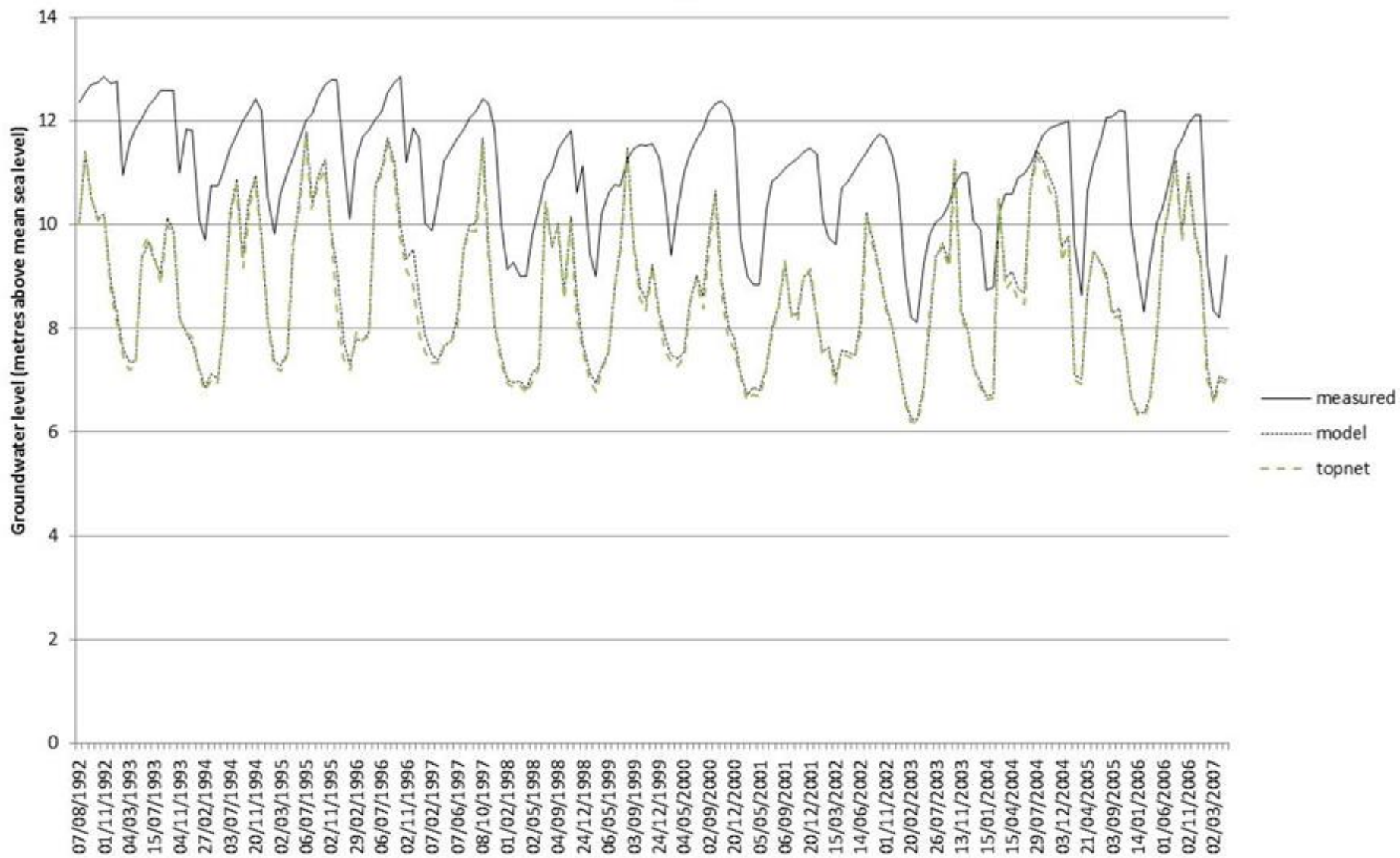
# Ruamahanga at Waihenga



# S27\_0035



# S27\_0271

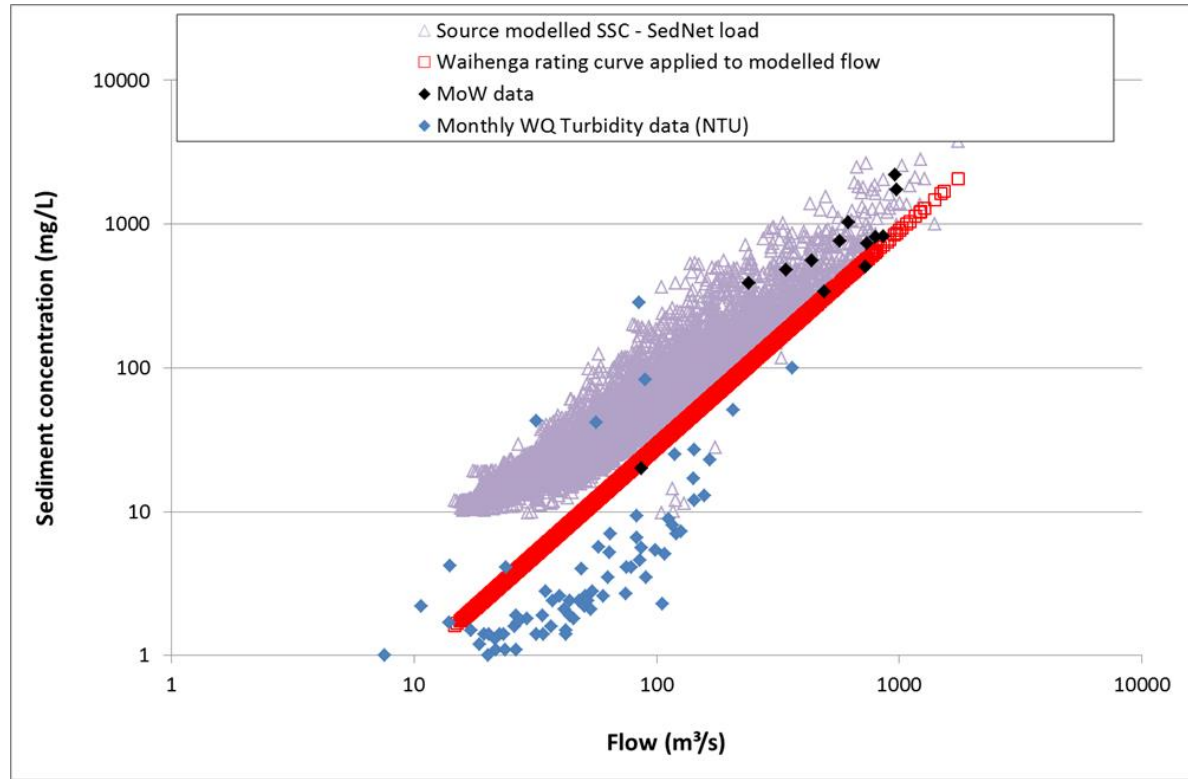


# Contaminant concentration modelling

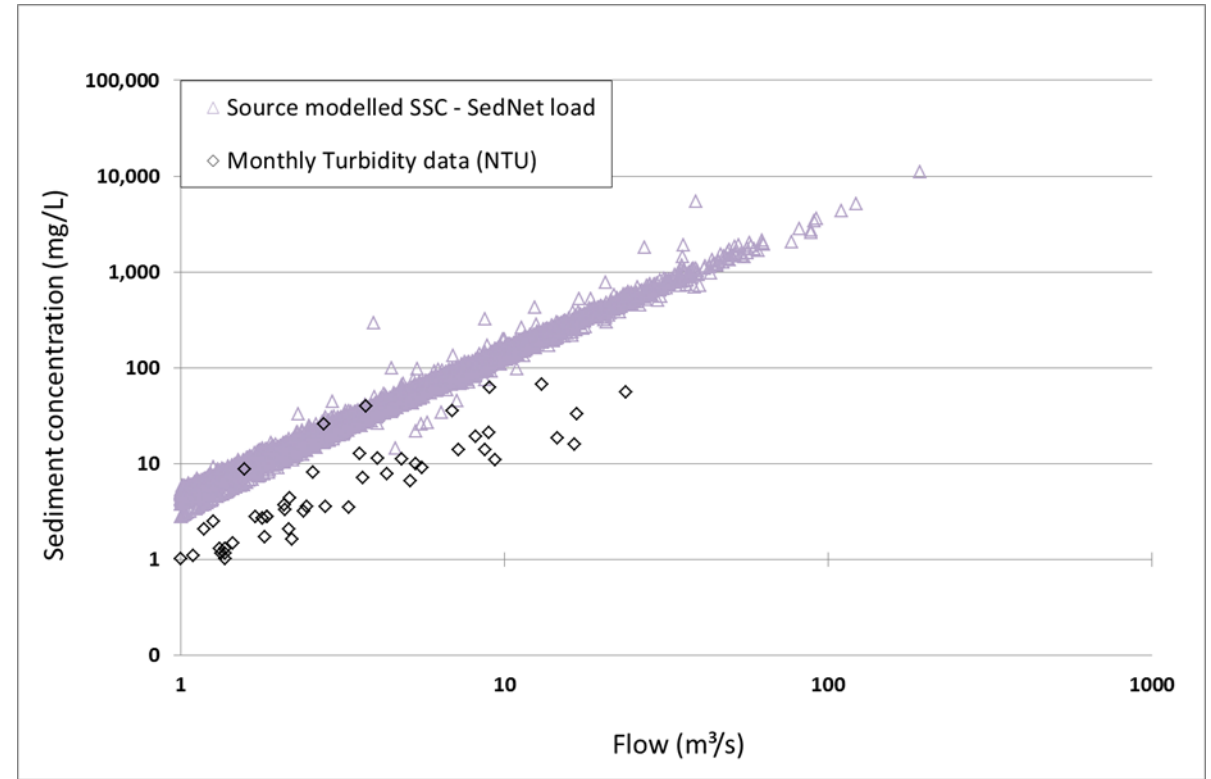
- Nitrate concentration modelling is still a work in progress – changes in the Overseer outputs have not yet worked their way through the chain of models.
- e-Coli
  - There is no relationship between measured concentrations and:
    - Flowrate
    - Time of year
  - There is a relationship between measured concentrations and land-use
  - This relationship is build into NIWA's CLUES software. This package will be used in the scenario analyses.



# Sediment concentration modelling

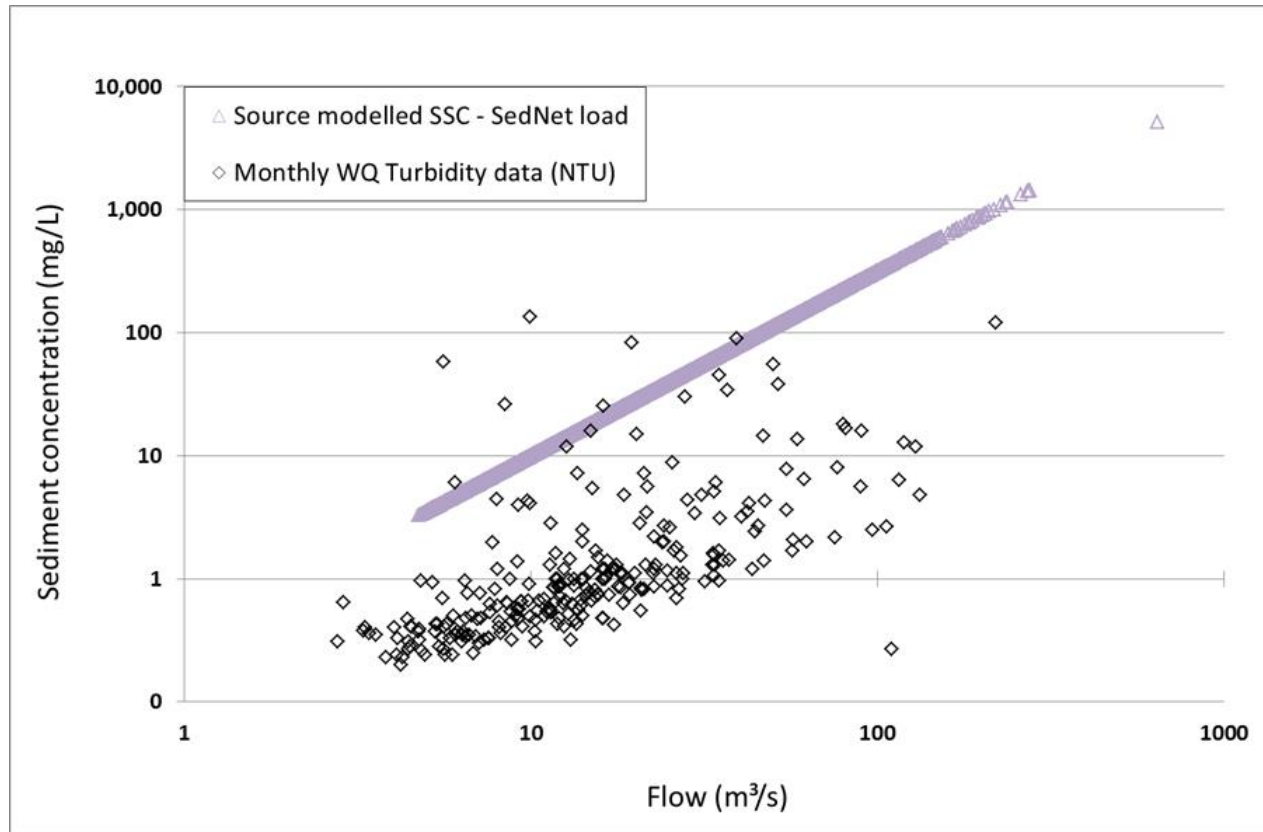


Ruamahanga and Waihenga



Kopuaranga at Stuart

# Sediment concentration modelling



Waiohine at Gorge

# Overall position

- Further refinement is needed for:
  - Some of the river flow modelling
  - Sediment concentration modelling
- But, there will always be a degree of mismatch between modelled and measured values. When to stop the refinement is a matter of judgement.