



# Improvements in River Operations Forecasting using Source

## Goulburn River Case Study

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Goulburn-Murray Water



# Outline

- Background on Goulburn River system
- Overview of River Operations
- Use of Source for river operations
- Advantages of Source
- Forecasting using Source

# Goulburn River System



# What do River Operations involve?



Goulburn Weir & Stuart Murray Canal Offtake  
(TPP, 2010)



Stuart Murray and Cattanach Canals with  
Waranga Basin in the distance (TPP, 2010)

- Management of water stored in and released from dams
- Regulation of water through the river system
- Management of bulk diversions from the river for consumptive use
- Forecasting and planning

## Used in Goulburn River system for

- Planning and forecasting of regulated river operations, including:
  - River flows
  - Tributary inflows
  - Storage levels
  - Environmental flows



Lake Eildon – Goulburn River's main storage  
(G-MW, 2004)

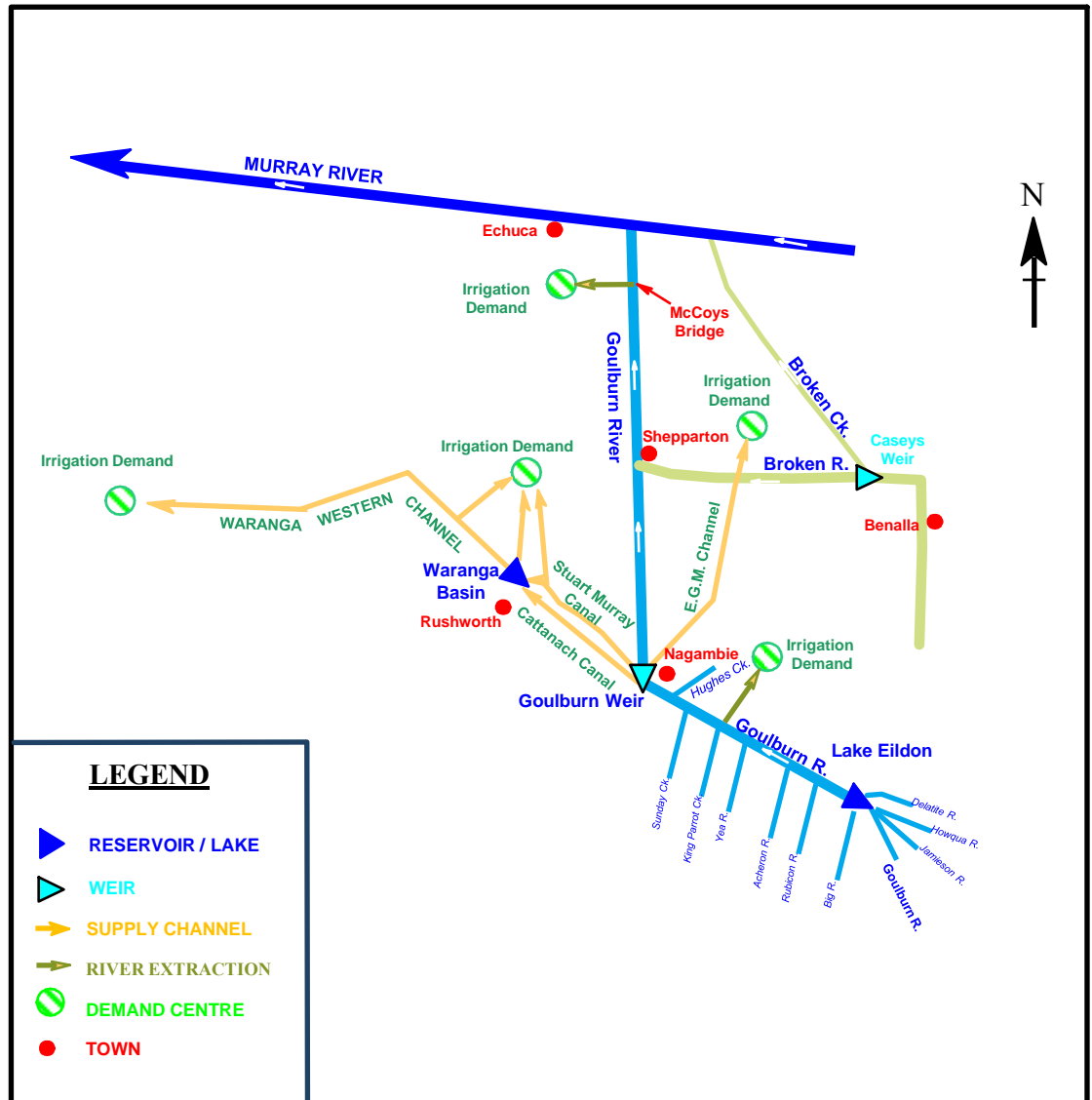
# Goulburn River Schematic



Goulburn Weir (G-MW, 2005)



Waranga Basin Drought Pumping (G-MW, 2005)





# Advantages of Source: Planning Functionality

- Ability to incorporate all planning and forecasting requirements into a single model

Month	Date	WB Actual Volume (ML)	WB Actual Level (rdMCD)	Projected WB Volume (ML)	Projected WB Level (rdMCD)	Surface Area	WB EVAP (mm)	WB EVAP (ML)	TOTAL WB (MCD)	Resource from WB	Resource from Other	Resource from Transfer	Total Resource (ML)	Projected WB (ML)	Projected WB Level (rdMCD)	Surface Area	WB EVAP (mm)	WB EVAP (ML)	TOTAL WB (MCD)
199	4	4-Apr-18	162 747.0	116.9															
200	4	5-Apr-18	162 747.0	116.9															
201	4	6-Apr-18	162 747.0	116.9															
202	4	7-Apr-18	162 747.0	116.9															
203	4	8-Apr-18	162 747.0	116.9															
204	4	9-Apr-18	162 747.0	116.9															
205	4	10-Apr-18	162 747.0	116.9															
206	4	11-Apr-18	162 747.0	116.9															
207	4	12-Apr-18	162 747.0	116.9															
208	4	13-Apr-18	162 747.0	116.9															
209	4	14-Apr-18	162 747.0	116.9															
210	4	15-Apr-18	162 747.0	116.9															
211	4	16-Apr-18	162 747.0	116.9															
212	4	17-Apr-18	162 747.0	116.9															
213	4	18-Apr-18	162 747.0	116.9															
214	4	19-Apr-18	162 747.0	116.9															
215	4	20-Apr-18	162 747.0	116.9															
216	4	21-Apr-18	162 747.0	116.9															
217	4	22-Apr-18	162 747.0	116.9															
218	4	23-Apr-18	162 747.0	116.9															
219	4	24-Apr-18	162 747.0	116.9															
220	4	25-Apr-18	162 747.0	116.9															
221	4	26-Apr-18	162 747.0	116.9															
222	4	27-Apr-18	162 747.0	116.9															
223	4	28-Apr-18	162 747.0	116.9															
224	4	29-Apr-18	162 747.0	116.9															
225	4	30-Apr-18	162 747.0	116.9															
226	5	1-May-18	162 747.0	116.9															
227	5	2-May-18	162 747.0	116.9															
228	5	3-May-18	162 747.0	116.9															
229	5	4-May-18	162 747.0	116.9															
230	5	5-May-18	162 747.0	116.9															
231	5	6-May-18	162 747.0	116.9															
232	5	7-May-18	162 747.0	116.9															
233	5	8-May-18	162 747.0	116.9															
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236	5	11-May-18	162 747.0	116.9															
237	5	12-May-18	162 747.0	116.9															

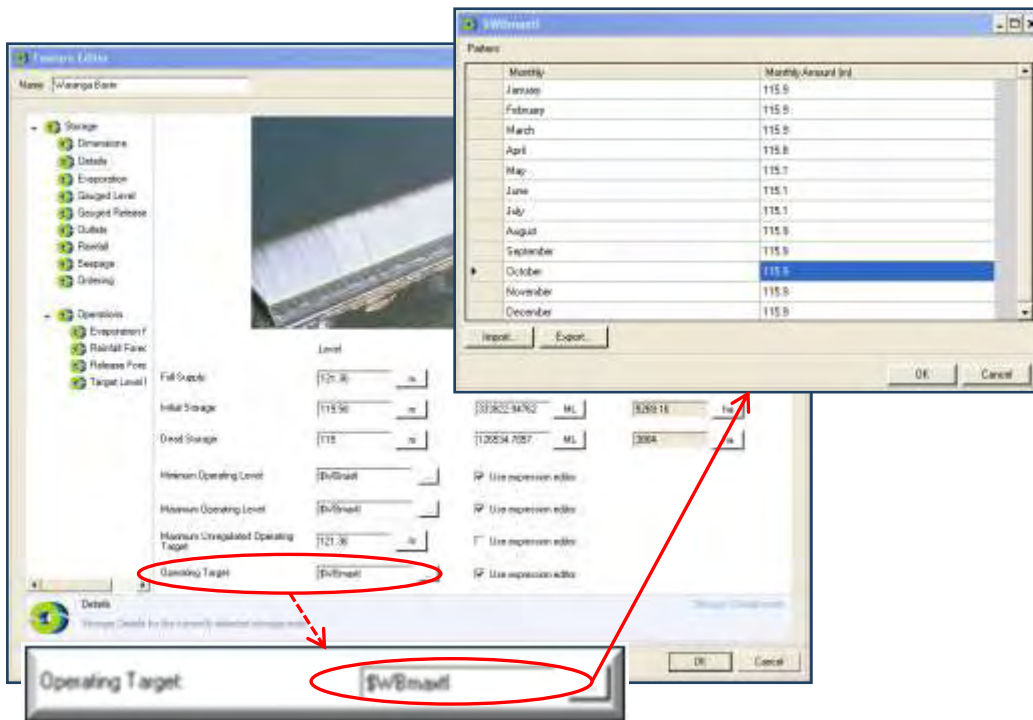
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# Advantages of Source: Use of Logic

- Source provides improved ease of incorporating logic into a model



Target Level configuration in Source IMS

Month as Number	Month	Operating Target (mAHD)
1	January	115.9
2	February	115.9
3	March	115.9
4	April	115.8
5	May	115.1
6	June	115.1
7	July	115.1
8	August	115.9
9	September	115.9
10	October	115.9
11	November	115.9

plus

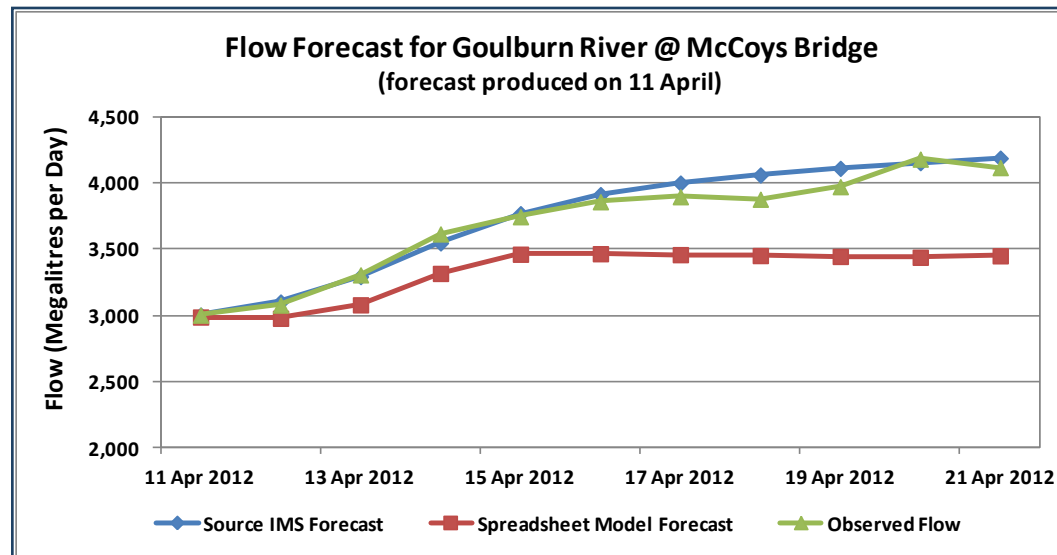
```
=IF(D237<=VLOOKUP(A237,$AK$225:$AM$236,3,FALSE),K238+L238-(G237-(MAX(0,linint(VLOOKUP(A237,$AK$225:$AM$236,3,FALSE), Rating!$K$13:$L$146,2))))),0)
```

...and some other data

Target Level Configuration in Spreadsheet Model

# Forecasting River Flow

- Produces more accurate river flow forecasts with less user input
- Reduces reliance on user to directly control variables such as travel time and attenuation

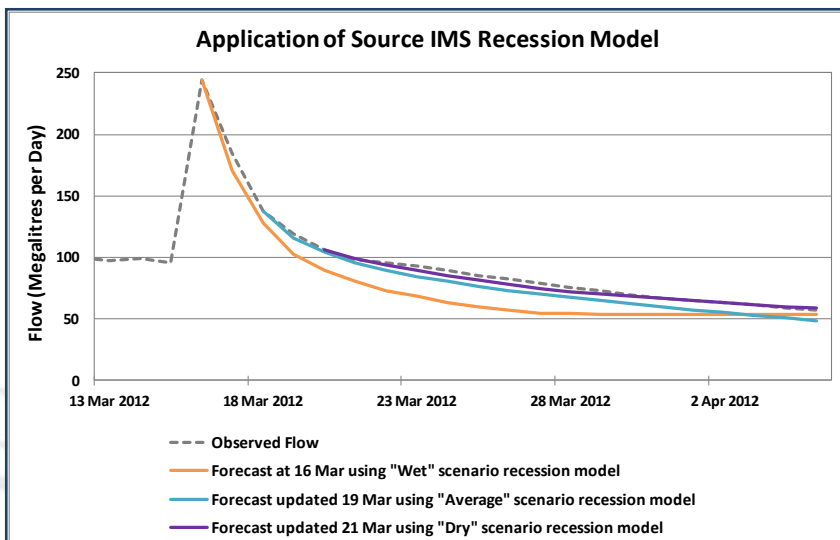
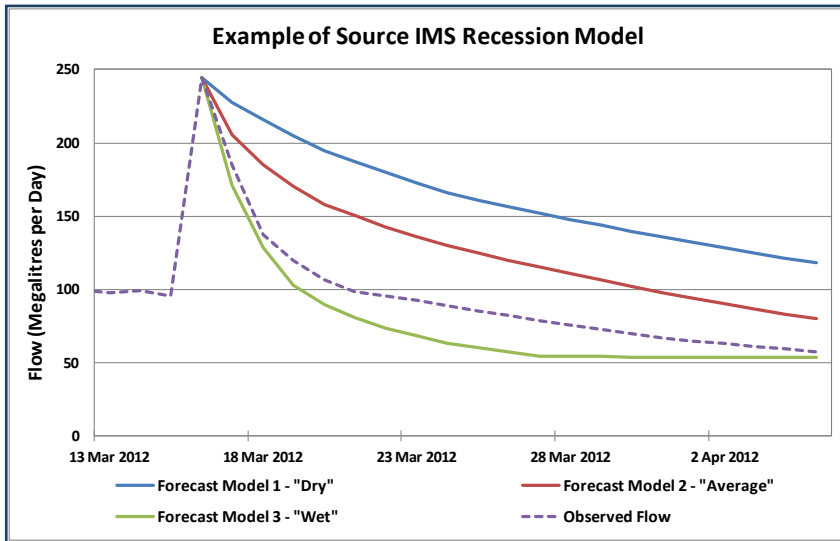


# Forecasting Releases from Storage

- Source uses information on system travel times, river losses, tributary inflows and demand inputs to determine the volume of water to be released from storages.
- Forecasting incorporating all of the above was not achievable with a spreadsheet model



# Forecasting with Recession Models



- Recession models configured for all tributaries in the Goulburn River model
- These represent 3 parts of recession curve
- Can improve efficiency of river operations and increase water harvesting ability

# Summary

## Source for River Operations

- Improved interface
- Better planning functionality than existing models
- Easier to incorporate logic into model
- Improved river flow forecasts
- New ability to forecast storage release requirements

# Thank you

## Contact Details

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Lake Eildon at 9% of capacity  
(G-MW, 2003)



Lake Eildon at 99% of capacity  
(G-MW, 2011)



# Source 2012



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