

# GROUNDWATER RESOURCE APPRAISAL FOR SOUTH-EAST MELBOURNE, VICTORIA

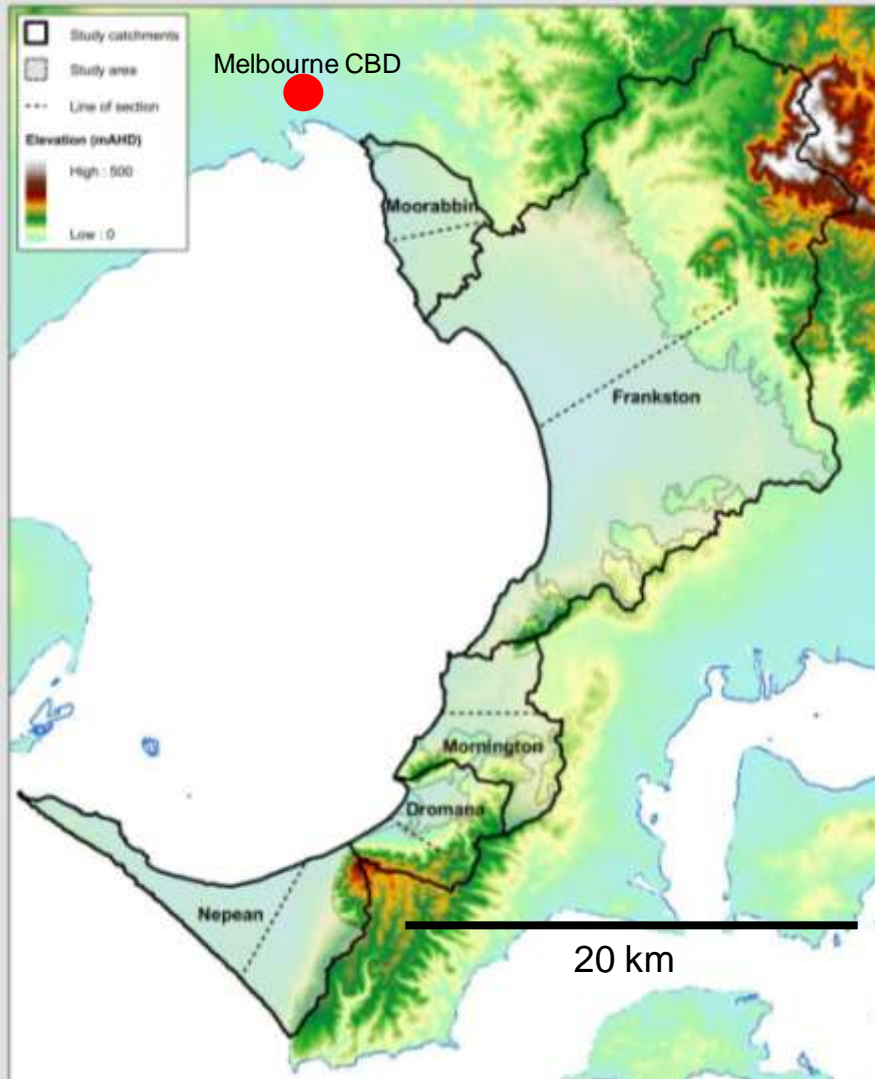


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# Background

- 13 consecutive years of below average rainfall in Melbourne
- Significant increase in bore applications (particularly stock and domestic)
- Uncertainty in existing water balances
- Uncertainty in the impact of groundwater extraction

# Study Area

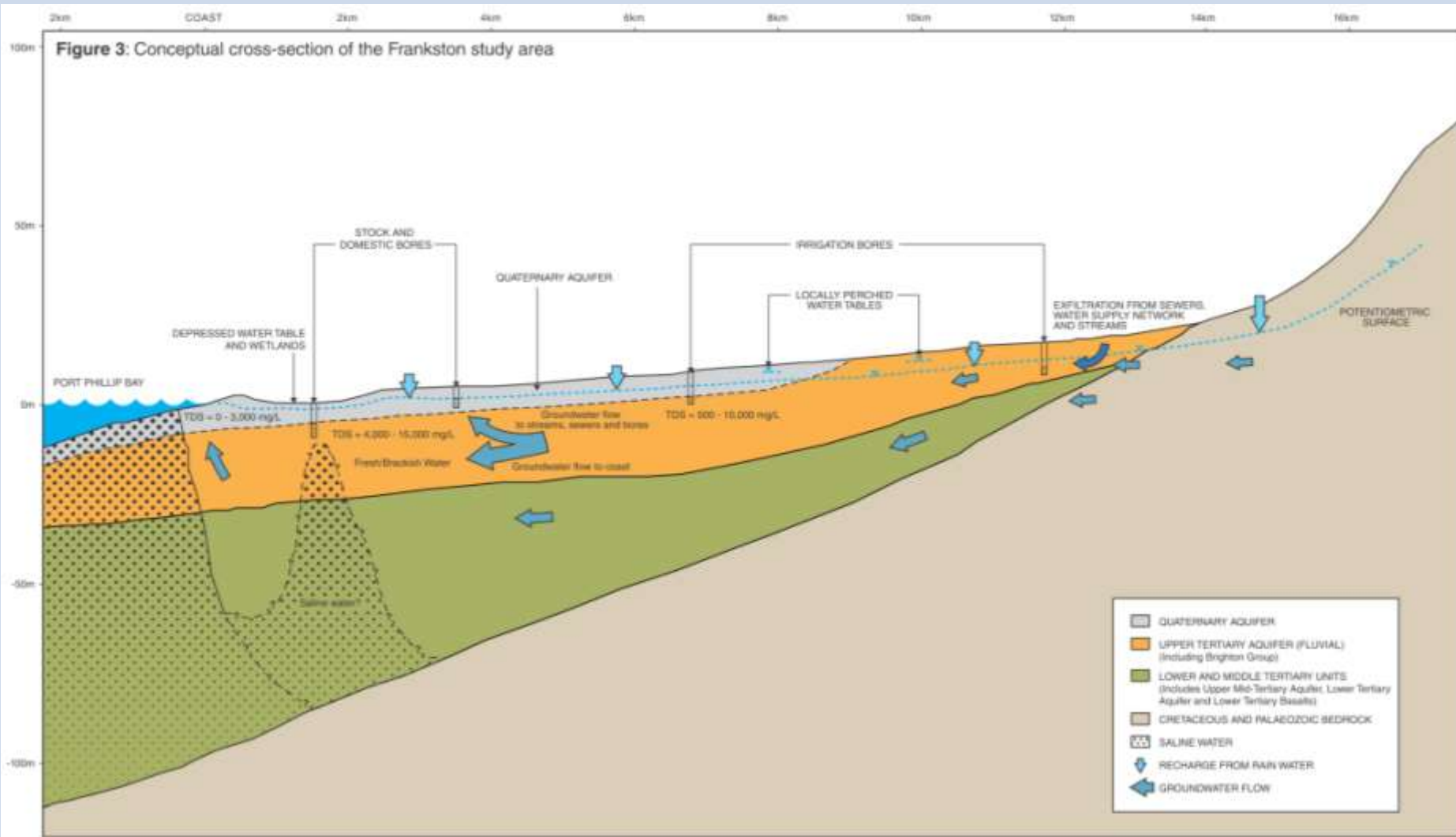


- Quaternary and Upper Tertiary Aquifers in SE Melbourne
- Generally unconsolidated sands
- Population >2 million residents
- 3 existing Groundwater Management Units
- Groundwater uses: stock and domestic, irrigation, industrial

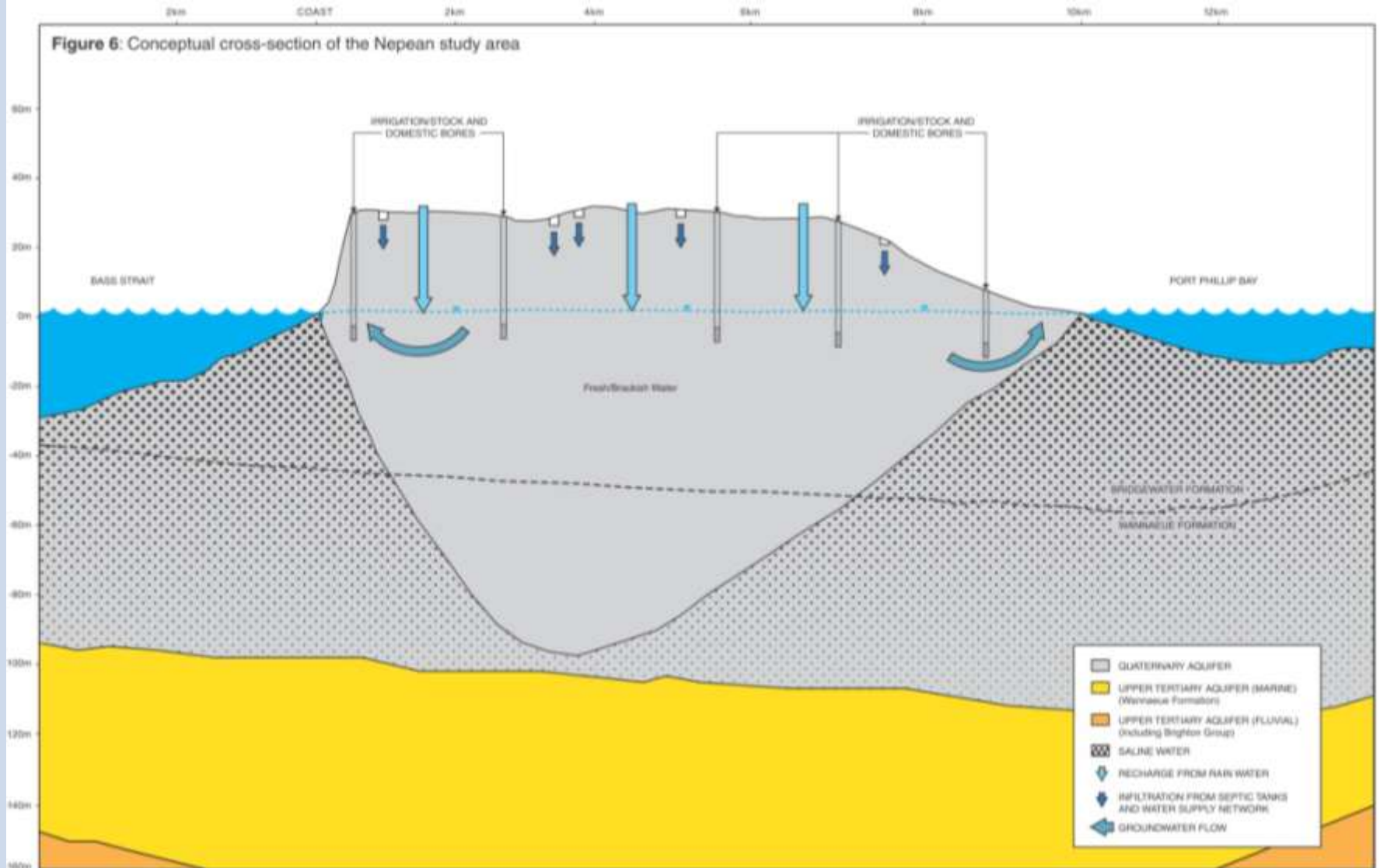
# Data & Literature review

- Melbourne Groundwater Directory (2009)
- John Leonard (various)
- Permissible Annual Volume reports (SKM, 1998)
- Victoria's Groundwater Management System
- SRW GW licensing data
- SE Water reticulation and waste water data
- EPA contaminated site data
- Nepean Peninsula Groundwater Model (SKM, 2007)
- David Lerner (1992) – background of recharge in urban areas

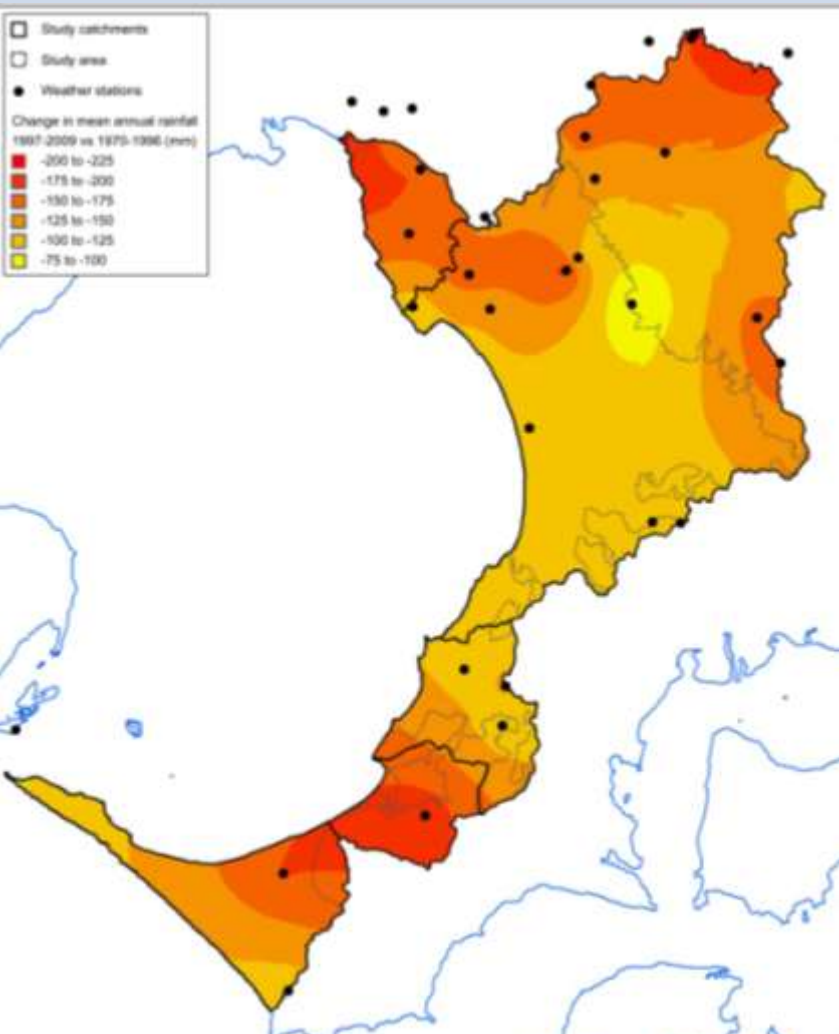
# Frankston Section



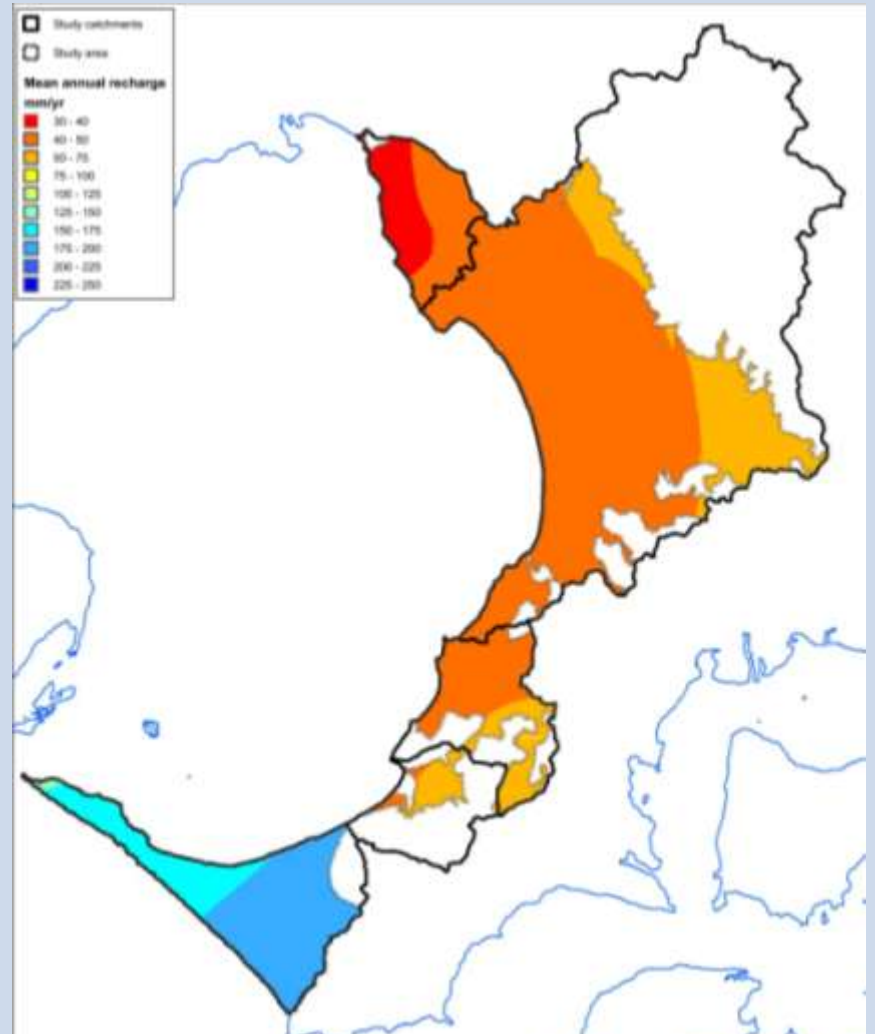
# Nepean Section



# Rainfall and Recharge



Change in rainfall 1970-1996 vs 1997-2009



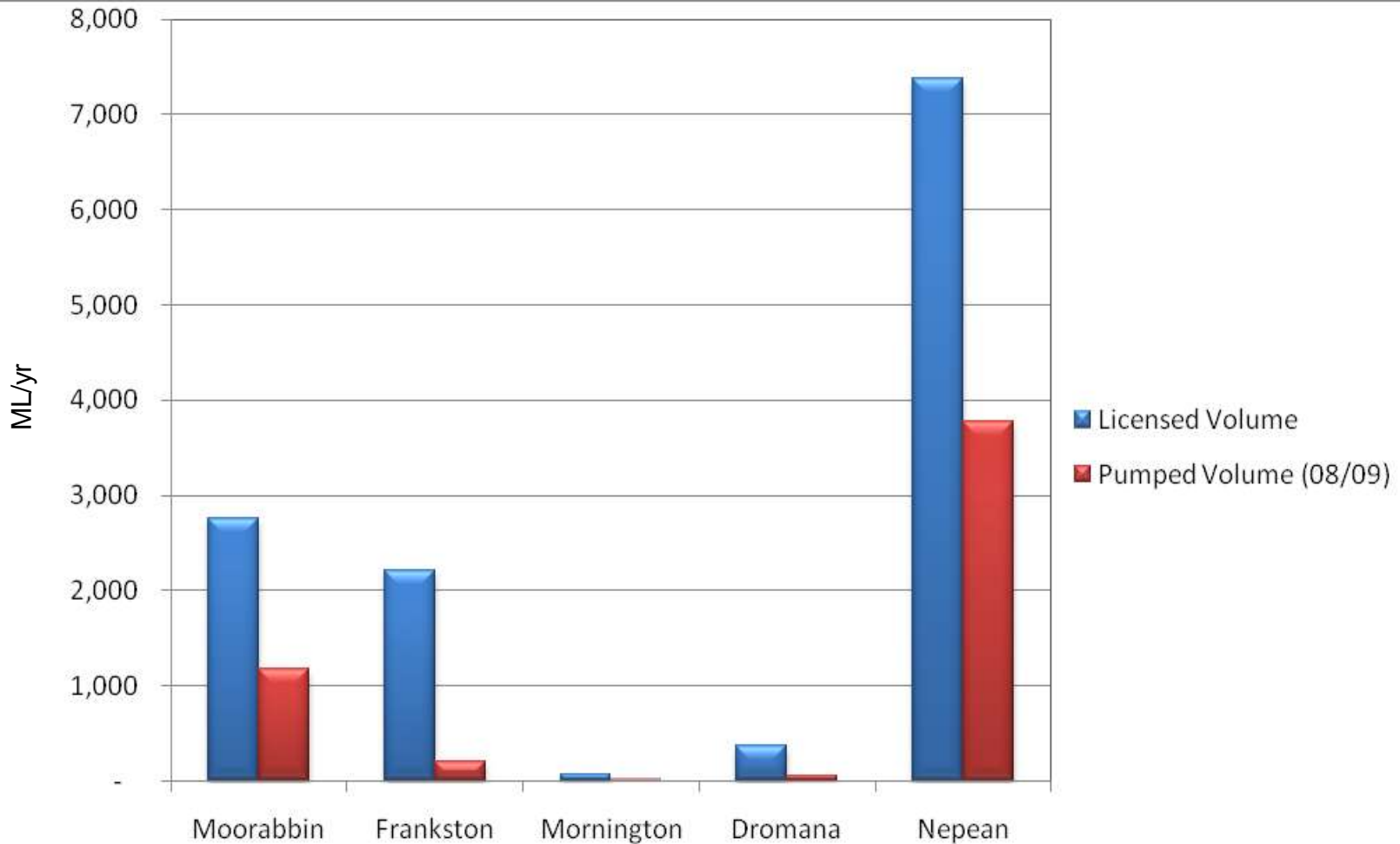
Mean annual recharge (1997-2009)

# Anthropogenic recharge

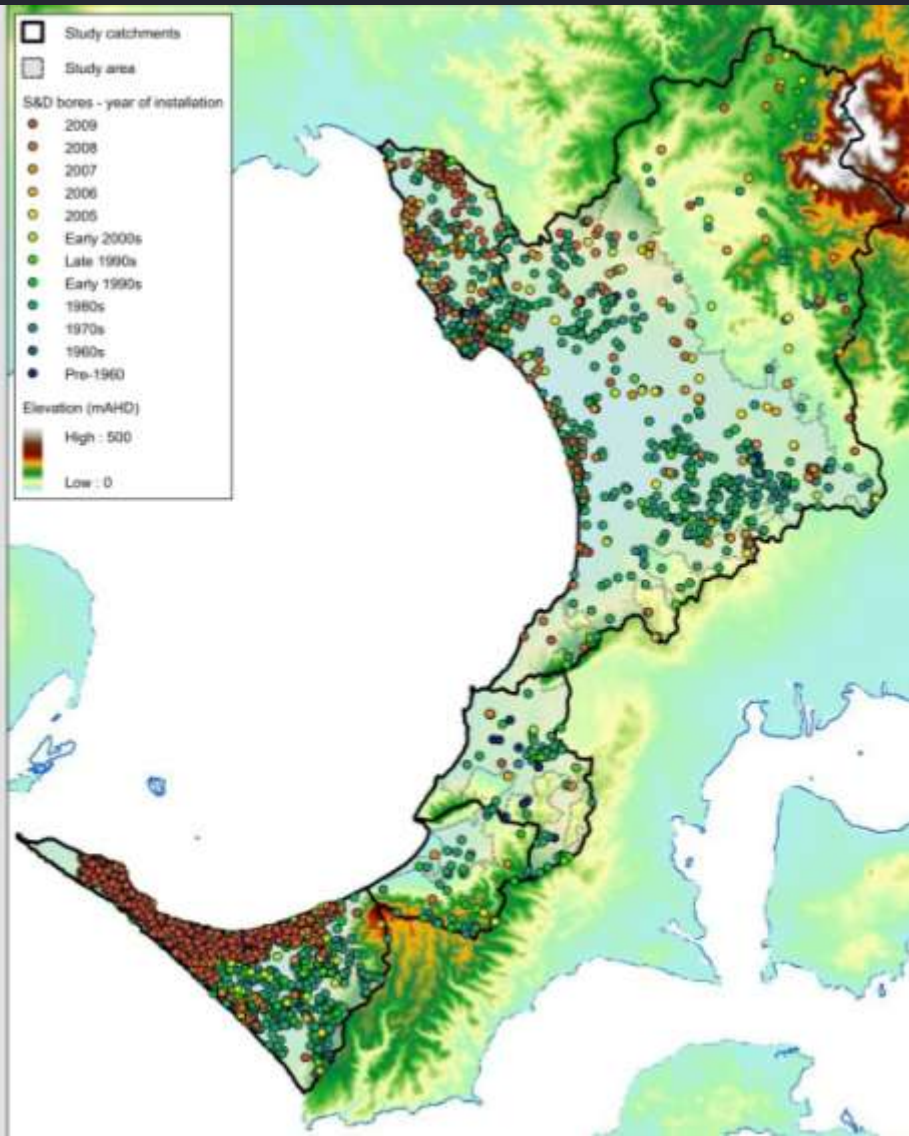
- SE Water supply 129,000 ML/yr across the study area of which **10,000 ML/yr is lost to the ground**
- SE Water collects 101,000 ML/yr in waste water. This provides a **net recharge of 600 ML/yr** (depending on where you are the sewer actually exports water)
- SE Water supply 4,000 ML/yr to un-sewered properties in the Nepean area. **About 3,000 ML/yr of this recharges groundwater via septic tank infiltration.** This also causes nutrient problems.



# Licensed extractions



# Proliferation of stock and domestic bores



- S&D bores almost doubled since 2005

- Particularly prevalent around the Nepean area

- Total volumes likely to be small to moderate (est. 550 ML Nepean)

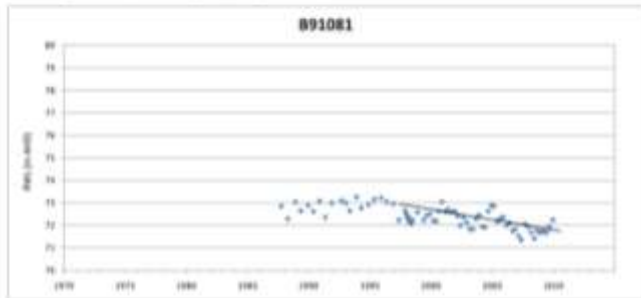
- Potential for localised impacts

# Hydrographs

## Frankston Zone



**Figure 13a:** Hydrograph from the Upper Tertiary Aquifer near Beaumaris (B0245) showing declining groundwater elevations, particularly since 2000.



**Figure 13b:** Hydrograph from the Upper Tertiary Aquifer in the southern part of Frankston study near Coxsburne (91081) showing declining groundwater elevations.



**Figure 13c:** Hydrograph from the Upper Tertiary Aquifer in the eastern part of Frankston study near Lynburnt (62949) showing declining groundwater elevations.

## Nepean Zone



**Figure 14a:** Hydrograph from the Quaternary Aquifer in the north-western end of Nepean (B4891) showing stable long-term groundwater elevation.

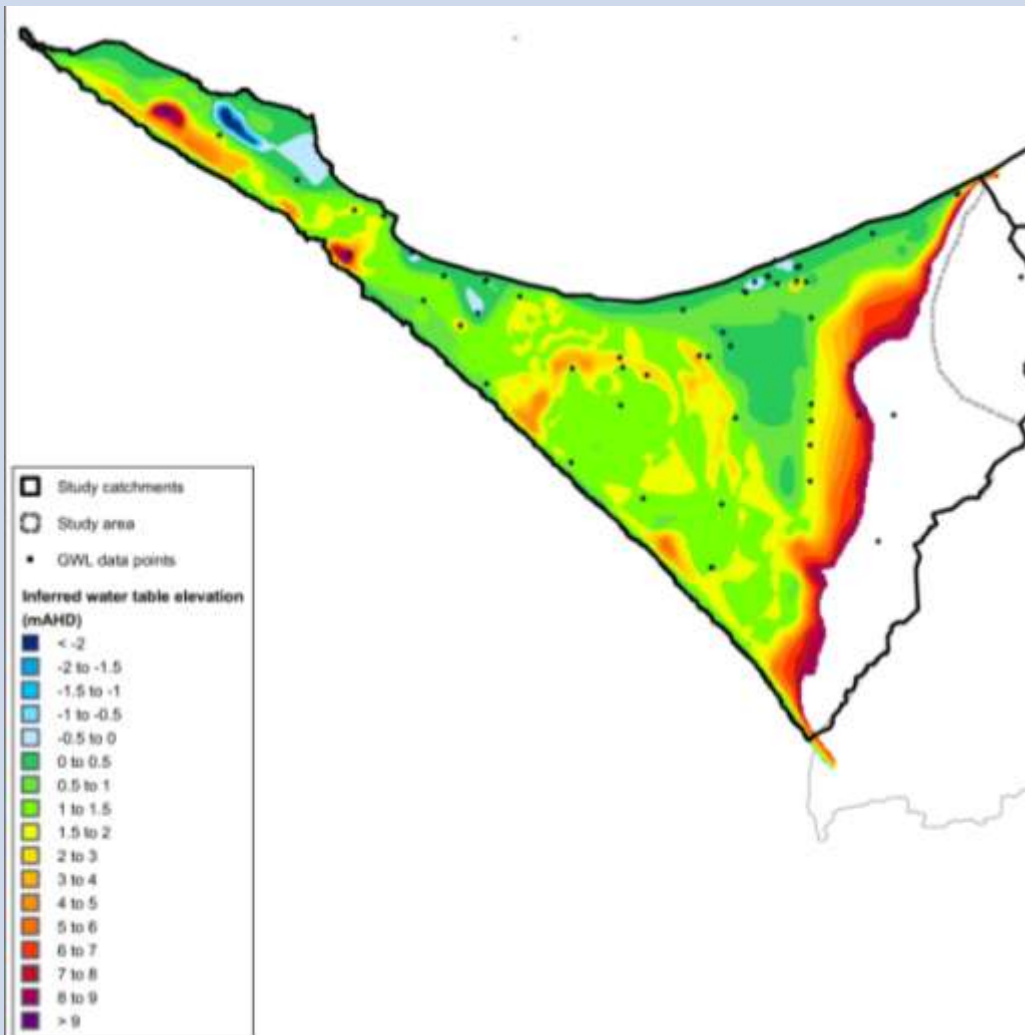


**Figure 14b:** Hydrograph from the Quaternary Aquifer in the centre of Nepean (B4895) showing approximately 0.7 m decline in groundwater elevation since 1987.



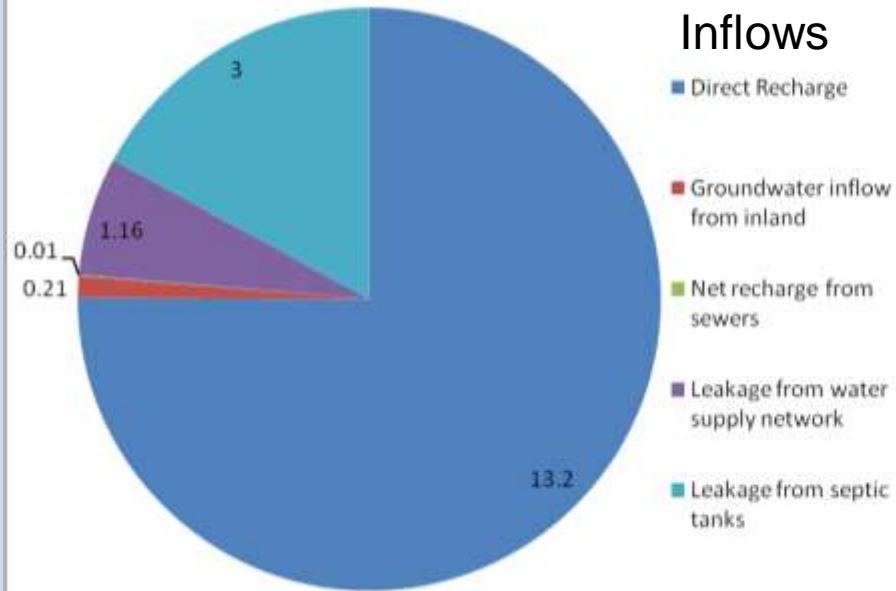
**Figure 14c:** Hydrograph from the Quaternary Aquifer in the south-east end of Nepean (100023) showing approximately 1.5 m decline in groundwater elevation since 1987.

# Nepean groundwater elevation



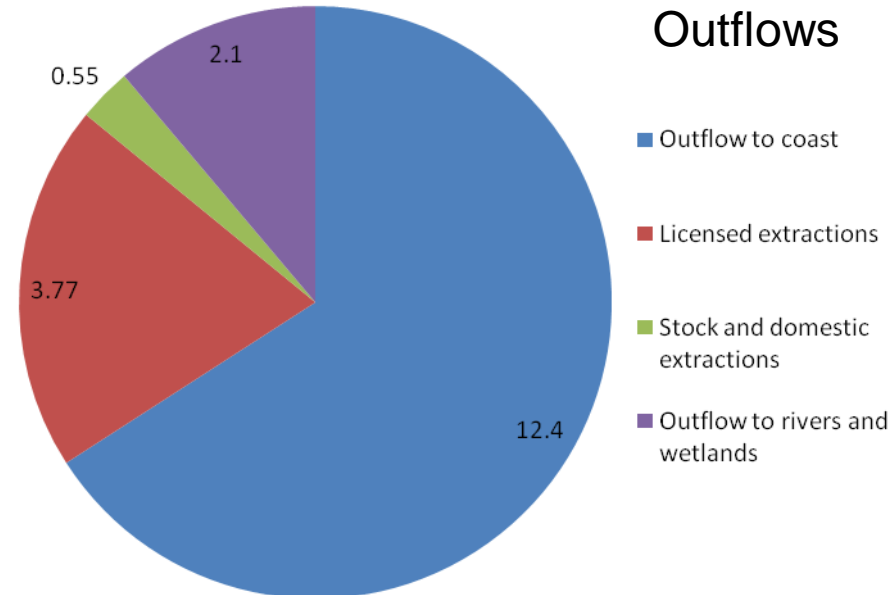
- Mostly <math>< 2\text{m}</math> above sea level
- Below sea level at a some locations

# Water Balance - Nepean

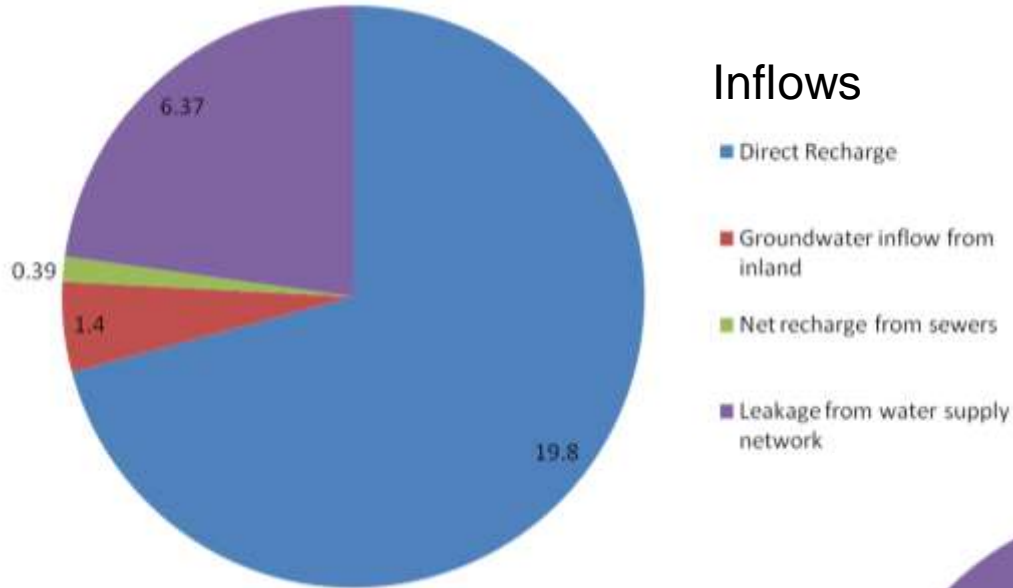


- Current deficit of 1.3 GL/yr correlates well with hydrograph trends

- Recharge and outflow to the coast moderately constrained

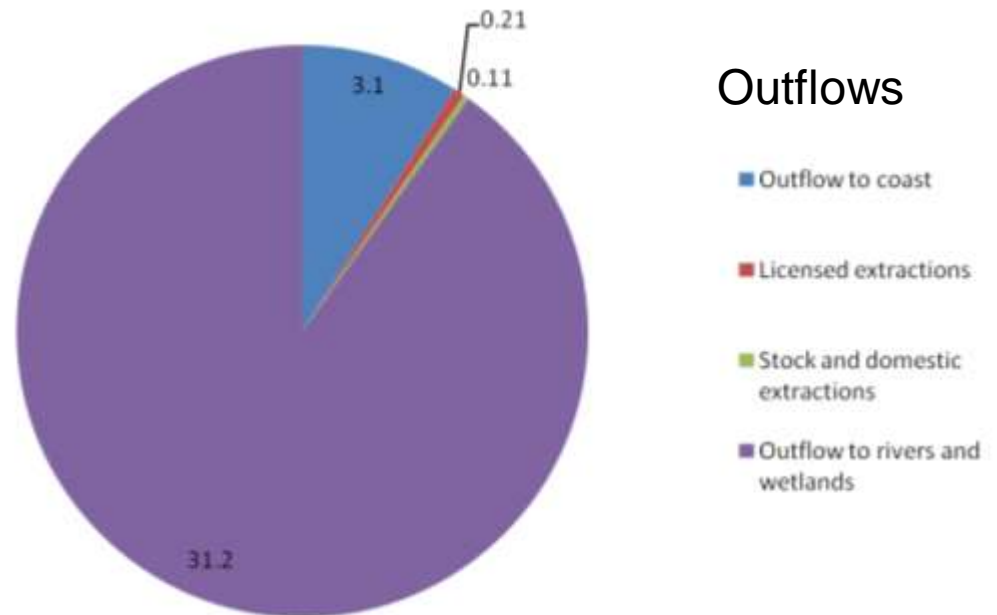


# Water Balance - Frankston



- Current deficit of 6 GL/yr correlates well with hydrograph trends

- Outflows to rivers and wetlands are poorly constrained



# Key Findings

- In this study the aquifer system was divided into **5 areas based on flow divides** and should be considered when changing the groundwater management framework.
- **Groundwater levels have declined** by about 1.5m in the Frankston area and upto to 2m in the central Nepean area. Long-term hydrograph coverage is patchy, particularly near the coast and Dromana, Mornington and Moorabbin areas.
- **Urbanisation** certainly changes recharge systems but **does not necessarily reduce recharge**.
- The total number of **stock and domestic bores has grown by over 40% in the last 5 years**. They don't, as a whole, account for a large amount of extraction but potentially can have localised impacts (eg Portsea area).
- The **risk of saline water intrusion** is greatest in the Nepean area and low lying parts of the Frankston area.
- A number of **significant groundwater dependant ecosystems** (eg. RAMSAR Edithvale-Seafood Wetland) were identified but further work is required to understand the level of reliance on groundwater and potential risk.

# Questions



Brighton Group outcrop  
(Upper Tertiary Aquifer)