# Recharge Estimation in the Surat Basin – Stage 2 Field Site Establishment

Sven Arnold*, Joshua Larsen, Lucy Reading, Nevenka Bulovic, Warren Finch, Neil McIntyre
**The University of Queensland, Australia**

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**Contact email: s.arnold@uq.edu.au*

## BACKGROUND

- The Surat Basin makes up part of the larger Great Artesian Basin (GAB) and is a major water resource in the semi-arid interior of eastern Australia
- Groundwater resources are heavily utilised by regional agriculture (irrigation and stock), urban water supply, ecosystems and recent coal and coal seam gas developments

**Project aims**:

- Develop quantitative knowledge about groundwater recharge processes and pathways in the Surat Basin
- Focusing on the unsaturated zone and priority geological outcrops and subcrops: *Gubberamunda sandstone, Main Range Volcanics* and the *Condamine River Alluvium*
- Provide recommendations for recharge inputs to regional groundwater models: aid groundwater impact assessments and sustainable groundwater management

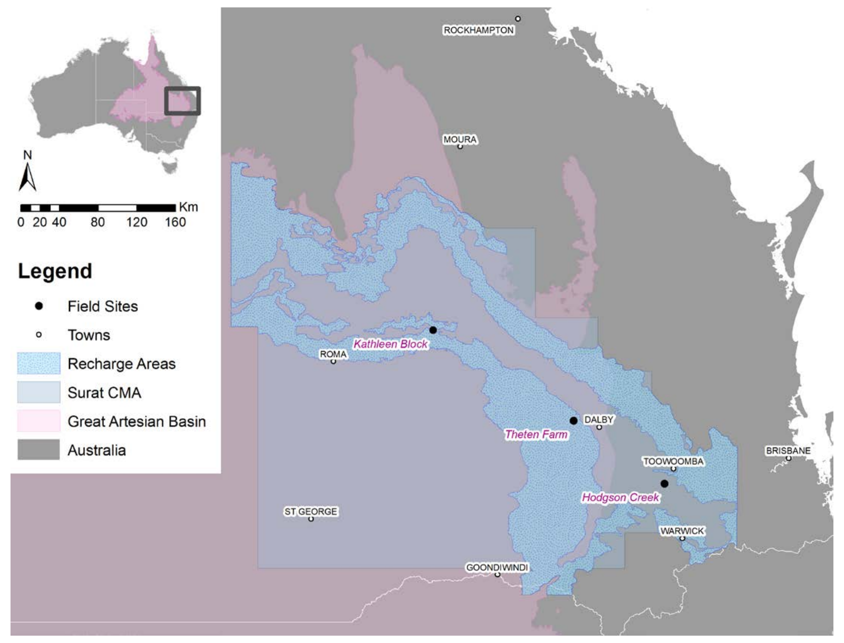


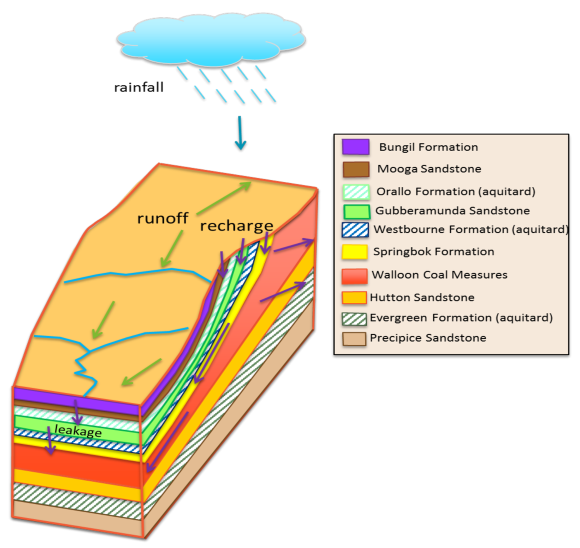

**Fig. 1.** Geography of the GAB, the Surat Basin, and location of study sites.

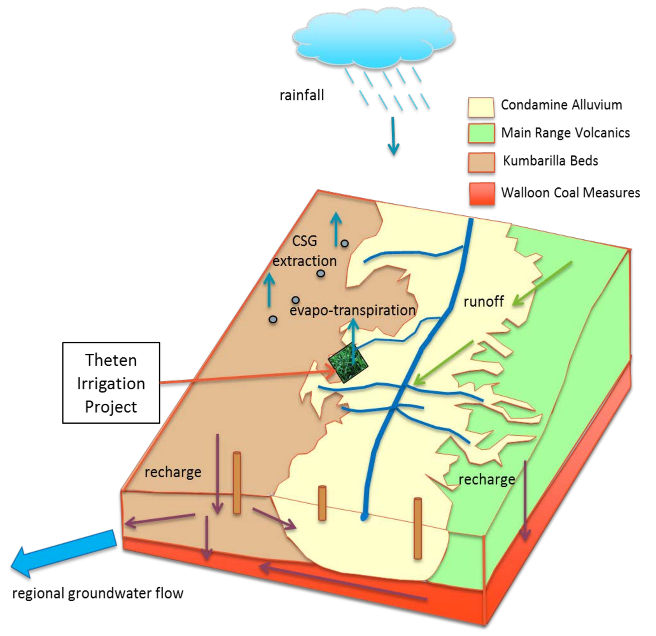
- **Stage 1** (complete) – Preliminary recharge Estimates (1 - 12 months)
- **Stage 2** (complete) – Field site establishment (13 – 22 months)
- **Stage 3** – Multi-scale recharge estimation (23 – 42 months)

## CONCEPTUAL WATER FLOW AT FIELD SITES

**Kathleen Block**

- Extensive sandstone aquifer
- Representative of up to 40 % of basin
- Mild topographical setting



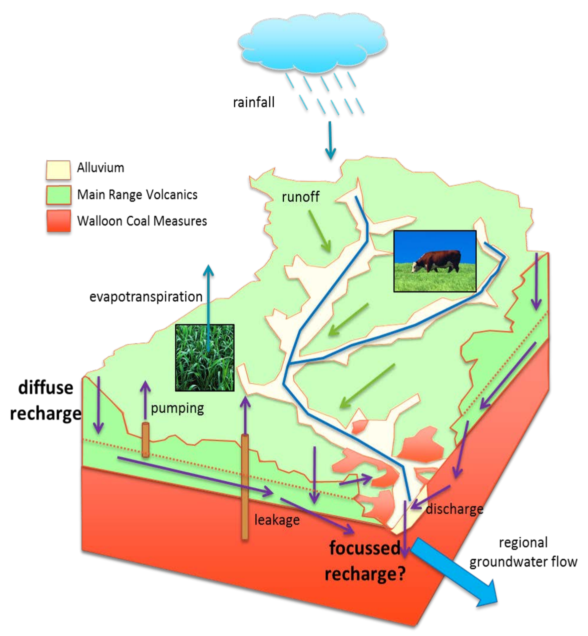




**Theten Farm**

- Quaternary alluvium
- Major groundwater resource
- Anthropogenically modified – irrigated land

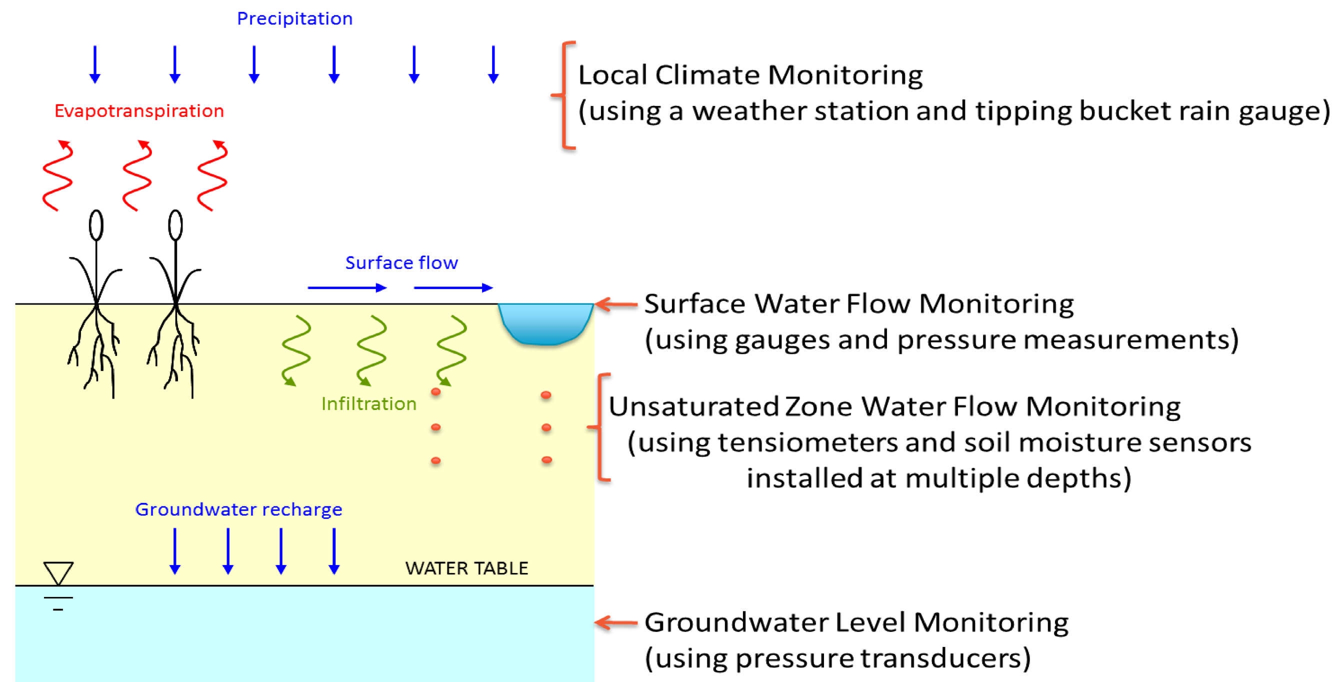
**Hodgson Creek**

- Fractured tertiary basalts
- Regional recharge pathways
- Gaining vs loosing streams

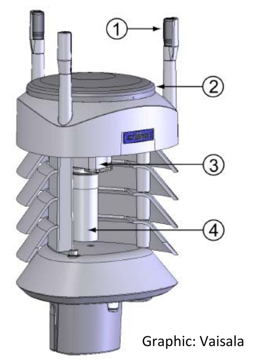



## FIELD SITE ESTABLISHMENT

### Overview

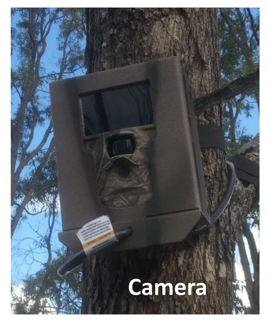



### Climate monitoring




1. Wind transducer
2. Precipitation sensor
3. Pressure sensor
4. Humidity and temperature sensors

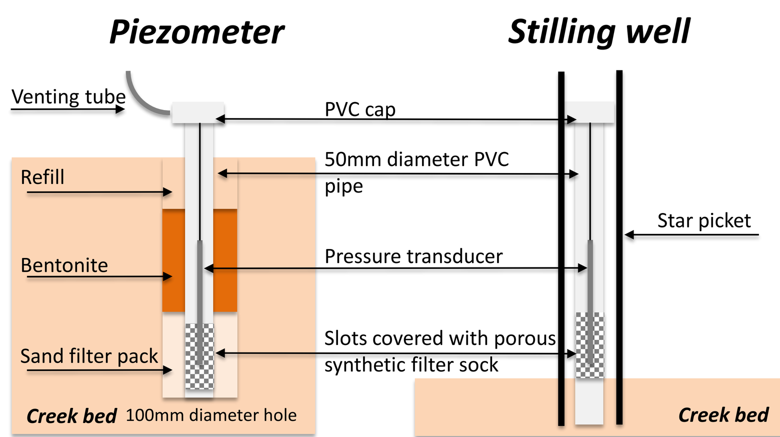

### Surface water monitoring




Stream velocity
Depth
Temperature


### Surface and groundwater monitoring

Pressure transducers

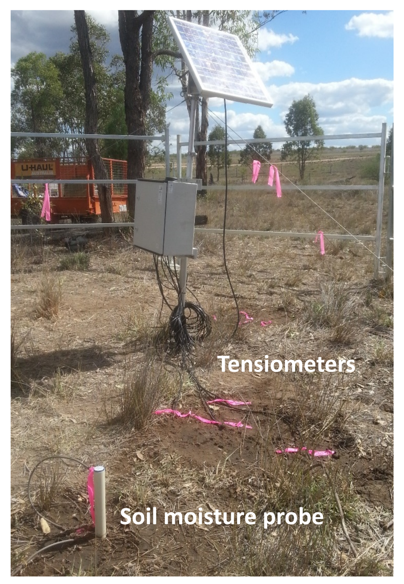






### Vadose zone monitoring


Soil water pressure

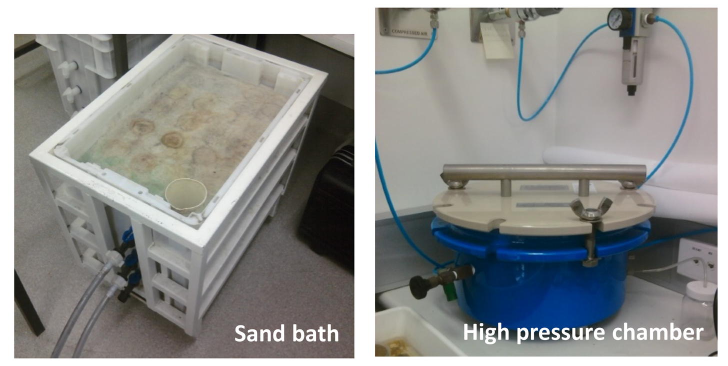

Soil water content
Salinity
Temperature




## LAB WORK AND DATA ANALYSIS

### Hydraulic experiments

- Relationship between soil water content and soil water potential is determined on soil samples by desiccation (sand bath, suction plates, high pressure chamber)
- Saturated hydraulic conductivity is determined by the falling head method




### Wetting response time and deep drainage estimates (Theten Farm)

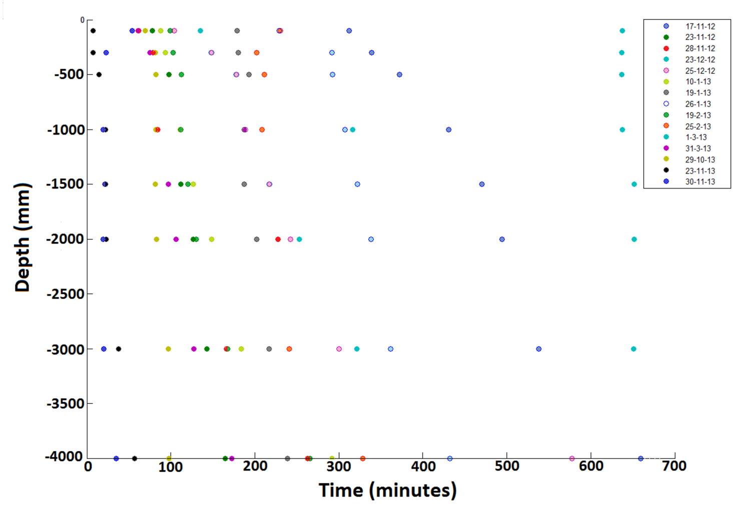



**Fig. 2.** Wetting response time of selected rainfall events.

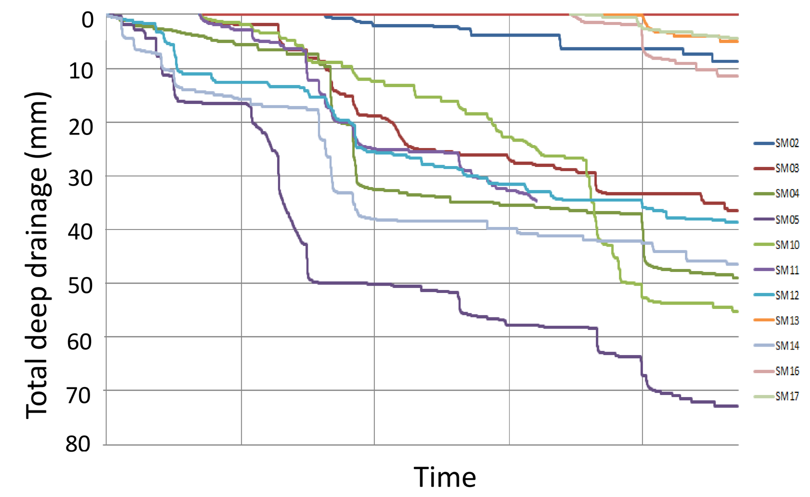



**Fig. 3.** Total deep drainage of selected locations based on soil moisture changes in 3 – 4 m depth over a period of two years.

- Wetting response time depends on soil type, rainfall intensity, and antecedent soil moisture conditions

## FURTHER DIRECTIONS

- Extrapolate small-scale estimates of groundwater recharge and merge data sets across scales (e.g., water balance method)
- Apply multi-scale modelling approaches
  - Small-scale 1/2D soil water simulations (e.g., zero-flux plane method)
  - Large-scale regional hydrological simulations
- Groundwater signal analysis (e.g., water table fluctuation method)
- Utilise remote sensing data to estimate regional groundwater recharge (Fig. 4)
- Recruitment of PhD and undergraduate students

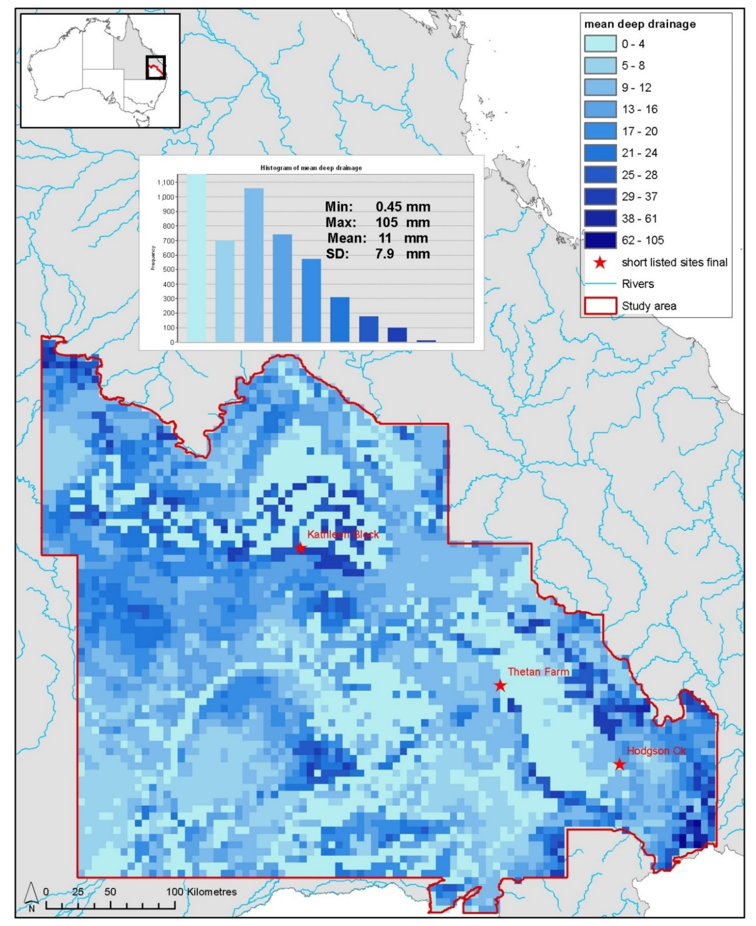



**Fig. 4.** The spatial variability of average recharge; and location of three experimental sites.

## ACKNOWLEDGEMENTS

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