# Recharge Estimation in the Surat Basin – Stage 3a Data Analysis

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CCSG Research Review, 9 Dec 2016
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## 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

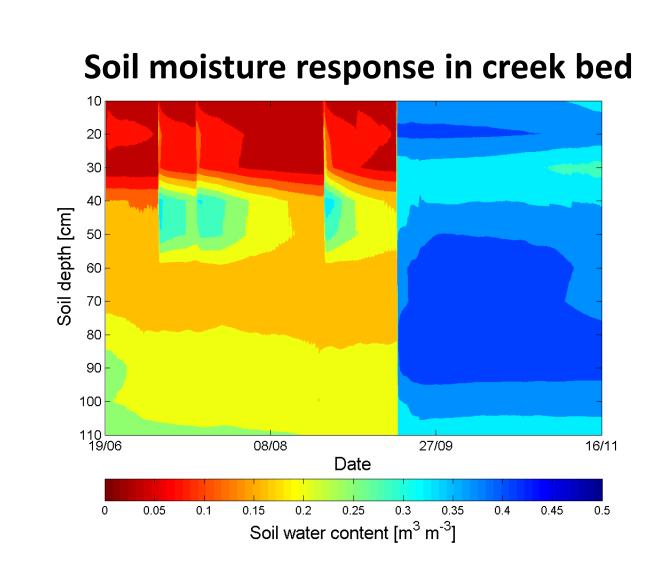
  Fig. 1. Geography of the GAB, the Surat Basin, and
- Provide recommendations for recharge inputs to regional groundwater models: aid groundwater impact assessments and sustainable groundwater management
- Stage 1 (complete) Preliminary recharge Estimates (1 12 months)
- Stage 2 (complete) Field site establishment (13 22 months)
- Stage 3 Multi-scale recharge estimation (23 42 months)

# **MONITORING** at Theten Farm

# Wilkie Creek flooding 14/09/16







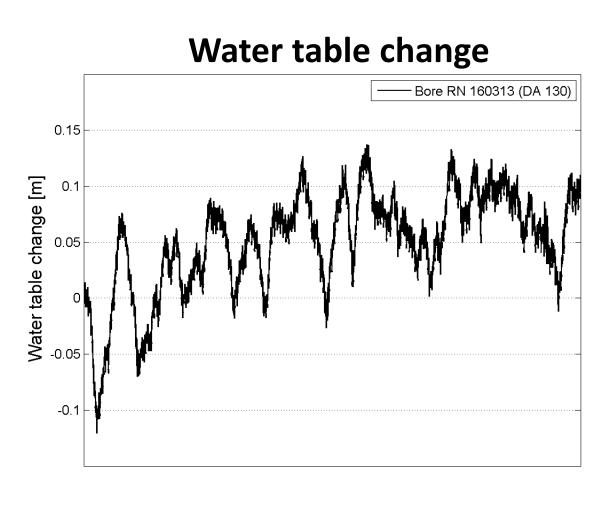


Fig. 2. Example of flood event in Wilkie Creek (left) and corresponding soil moisture response (upper right) and water table change at selected bore (lower right) (see Fig. 3 for locations).

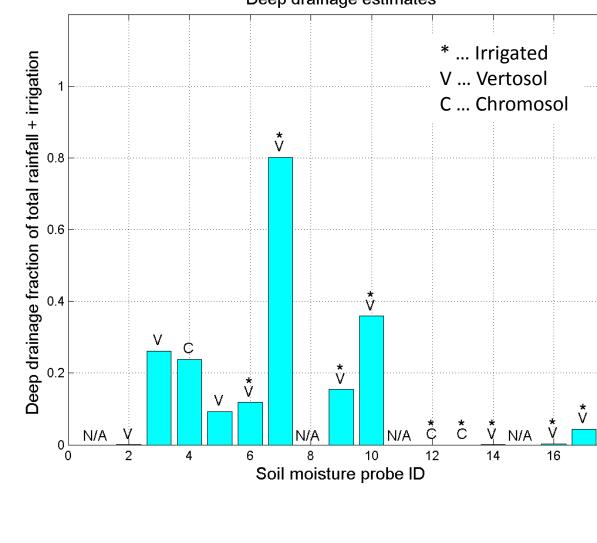
# **DEEP DRAINAGE at Theten Farm**

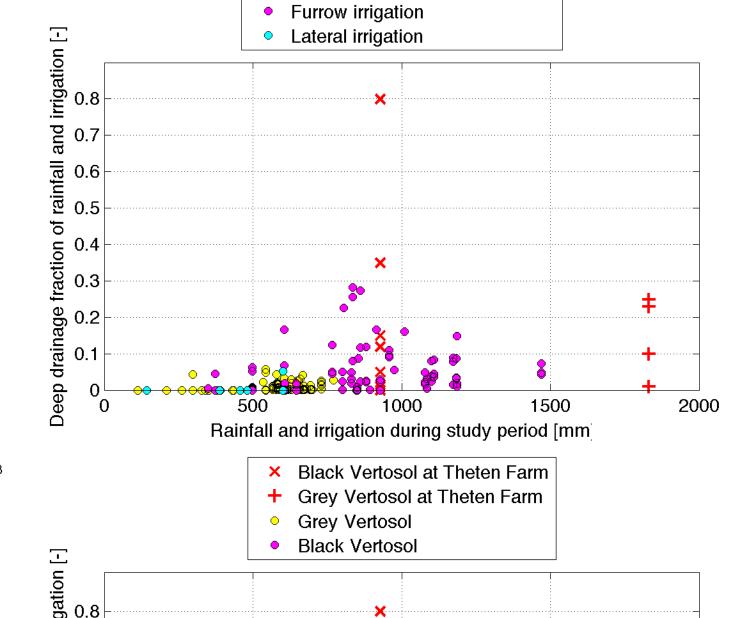
# Weather Station Soil moisture probe Lithological logs (italicised) Irrigation areas Black vertosol Chromosol Creek SM02, DA142, DA151 SM10 SM04 SM05 SM03 SM12 SM12 SKM12 SKM13 DA133, DA 132 Dam DA139 DA139 DA139 SM05 SKM05 SKM05

- 16 Sentek EnviroScan soil moisture probes
- Each probe has 8 sensors over 4 m depth
- Up to 4 years of monitoring data
- Water retention curves for three soil types: Black / Grey Vertosol, Chromosol
- Event-based approach of deep drainage assessment including potential climate controls and preferential flow paths

Fig. 3. Location of the soil moisture monitoring equipment, soil types, and irrigated areas at Theten Farm.

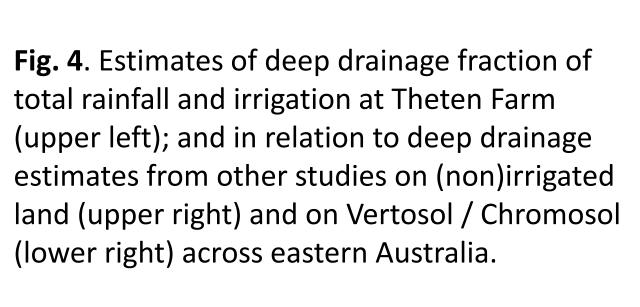
# Deep drainage estimates Deep drainage estimates

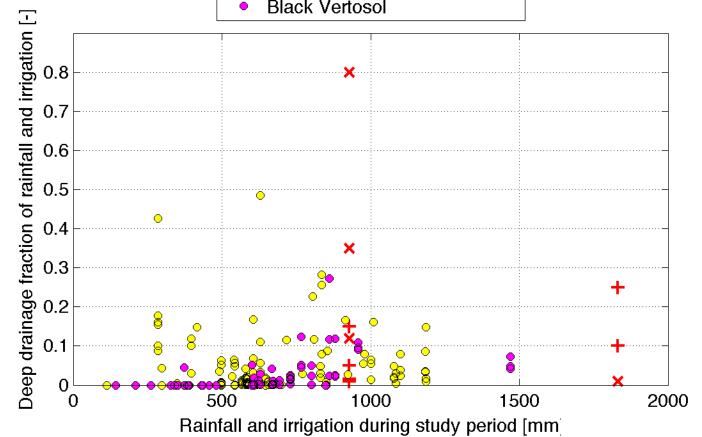




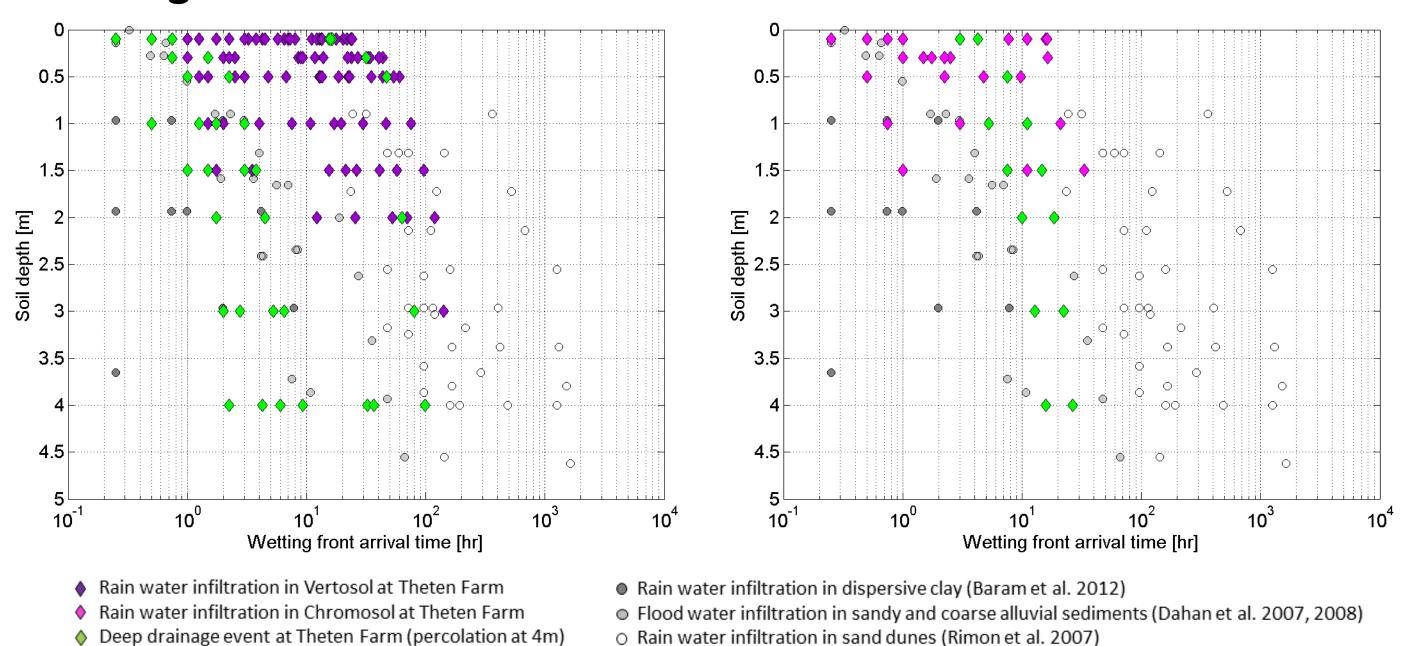
+ No irrigation at Theten Farm

No irrigation





# Wetting-front arrival times



**Fig. 5**. Estimates of the wetting-front arrival times for Vertosol (left) and Chromosol (right) at Theten Farm in comparison with arrival times in dispersive clay, sandy and coarse alluvial sediments, and sand dunes.

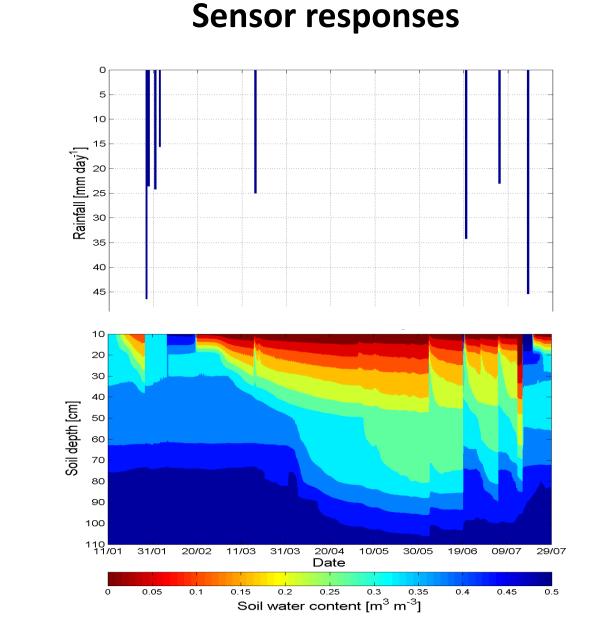
# **MONITORING** at Kathleen Block

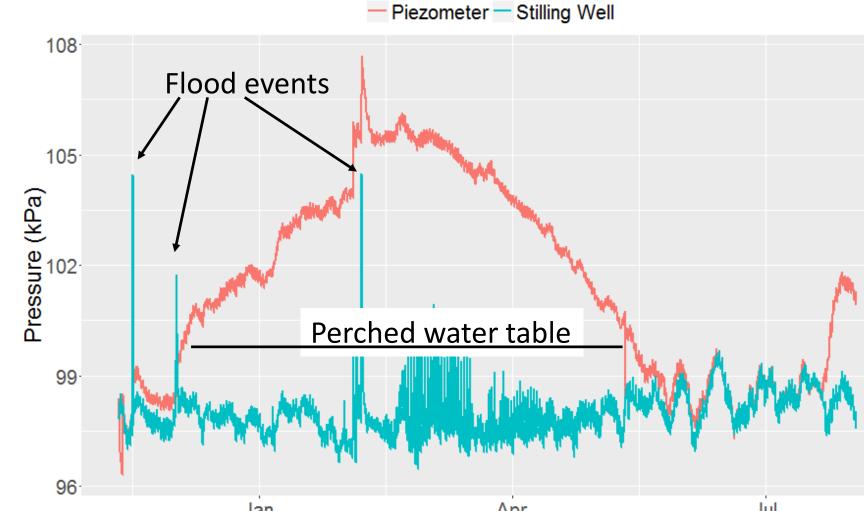












**Fig. 6**. Example of flood event in Nine Mile Gully (left) and corresponding rainfall (upper right), soil moisture response (middle right) and piezometer / stilling well responses (lower right).

# REGIONAL RECHARGE

• Estimated annual recharge using a simple water balance approach:

Recharge = Rainfall – AET – Runoff

- Data sources:
  - AET and Rainfall: AWRA-L
  - Runoff: Qld WMIP
- Assessment carried out for each water year
   (March to February) from 2005 to 2015
- 3 gauged catchments selected from the BoM Hydrologic Reference Stations list (Fig. 7):
  - Barker Creek at Brooklands (yellow)
- Dogwood Creek at Gilweir (blue)
- Kings Creek at Aides Bridge (red)
- Variable results suggest the simple water balance is missing a key input

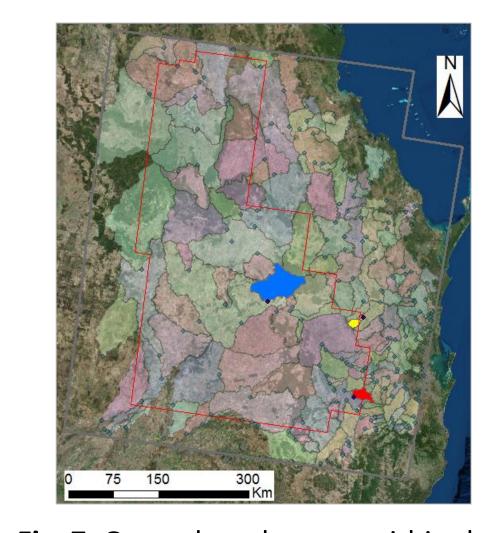


Fig. 7. Gauged catchments within the Surat CMA (red outline). The catchments were determined from the DEM (extent shown by grey outline) using tools available in ArcGIS.

### **ACKNOWLEDGEMENTS**

This work was funded by the Centre for Coal Seam Gas, The University of Queensland. For more information about the Centre's activities and governance see http://www.ccsg.uq.edu.au/

# REFERENCES

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