

# Coal Seam Gas Groundwater Field Day

AgForce Projects

Moura

Tuesday 18 March 2014

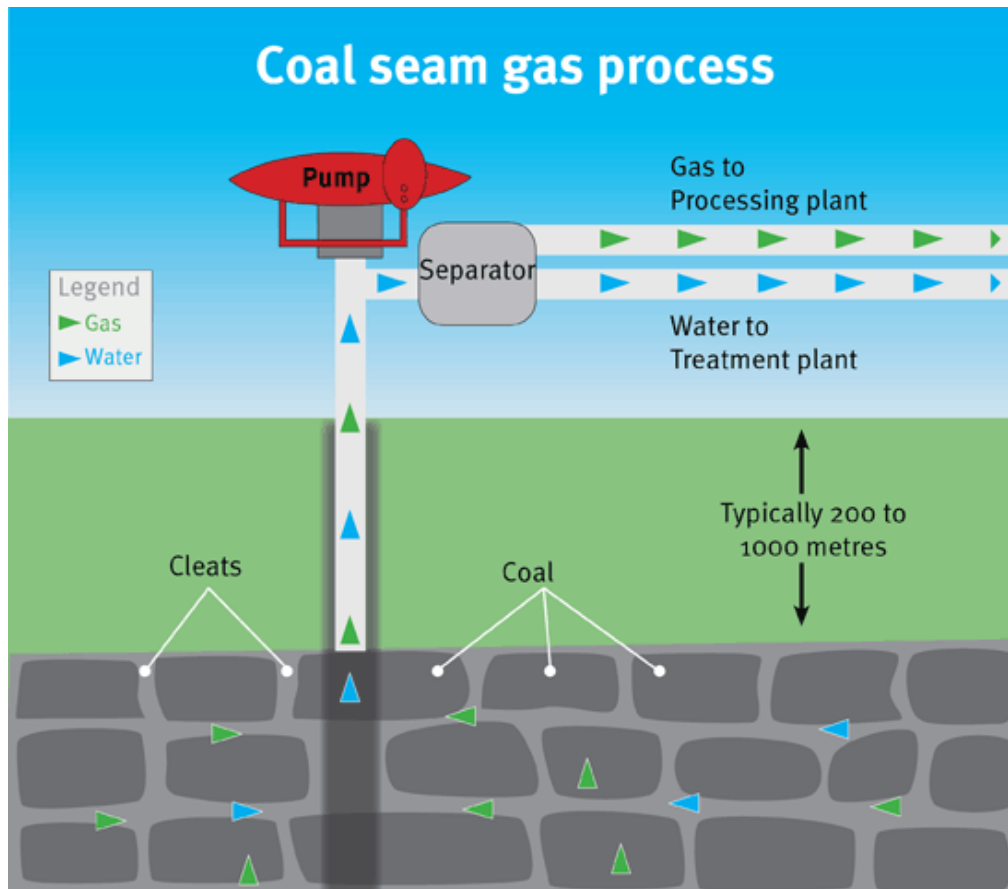
## Today's presentation will cover:

- What is Coal Seam Gas (CSG)
- Hydrogeology Surat VS Bowen Basins
- Groundwater Investigation and Assessment Team (GIAT) - What we do

# WHAT IS COAL SEAM GAS ?

- **Coal Seam Gas (CSG) is predominantly methane (CH<sub>4</sub>)**
- **It is formed as organic matter is converted to coal (can be biogenic or thermogenic in origin)**
- **CSG is attached (adsorbed) along fracture surfaces (cleats) in the coal**
- **CSG is held in place by hydrostatic pressure**

# How is CSG Extracted?

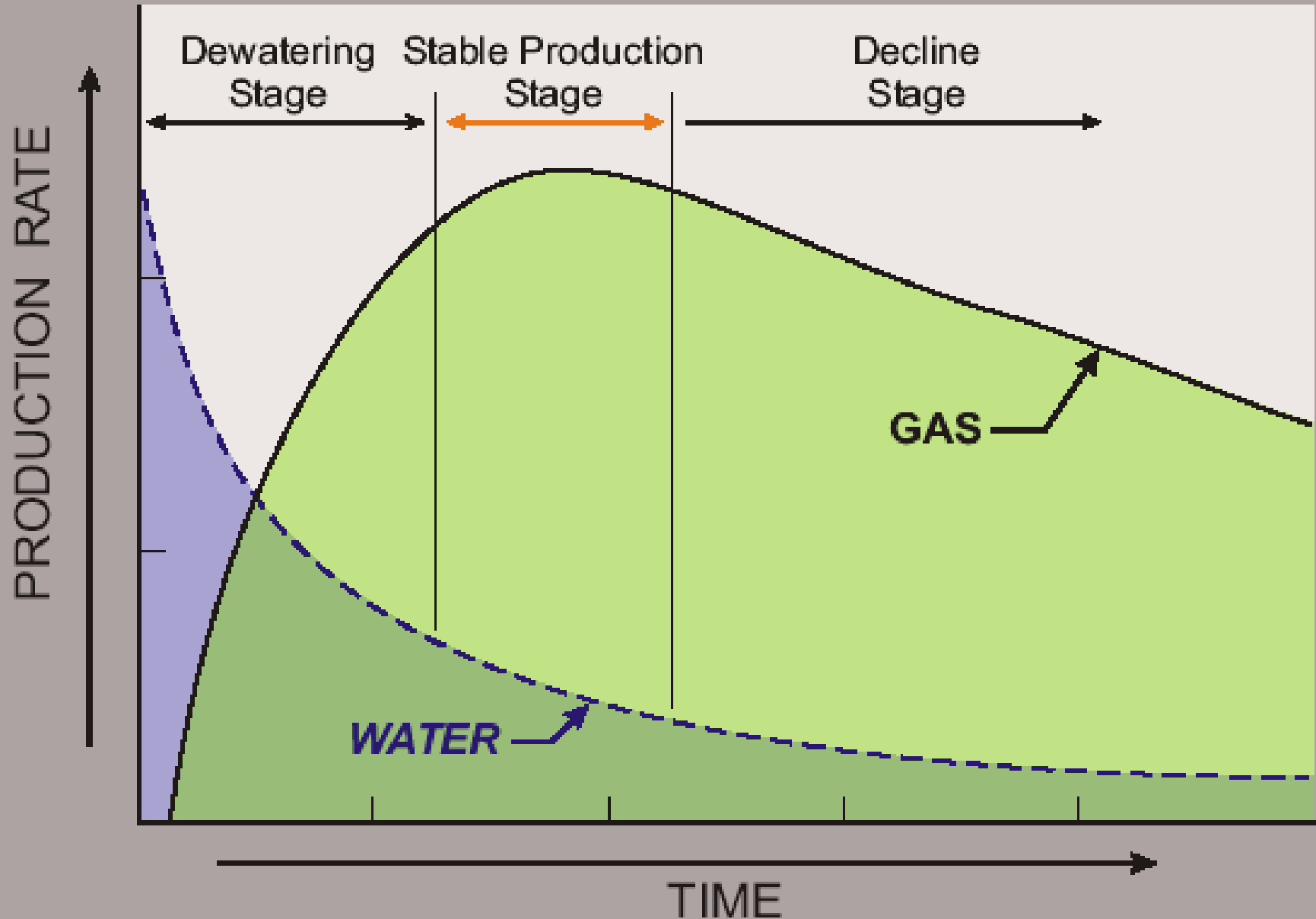


Great state. Great opportunity.

- Wells are drilled into the seam
- Formation water is pumped from the well to lower the pressure
- CSG is released from the coal as pressure on the coal is reduced
- Water is separated from the gas at the surface



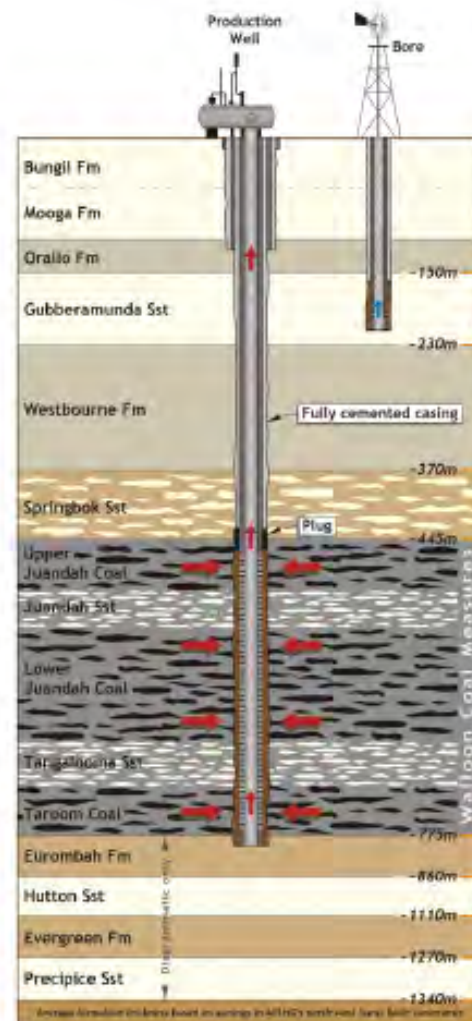
# TYPICAL COALBED METHANE PRODUCTION DECLINE CURVE



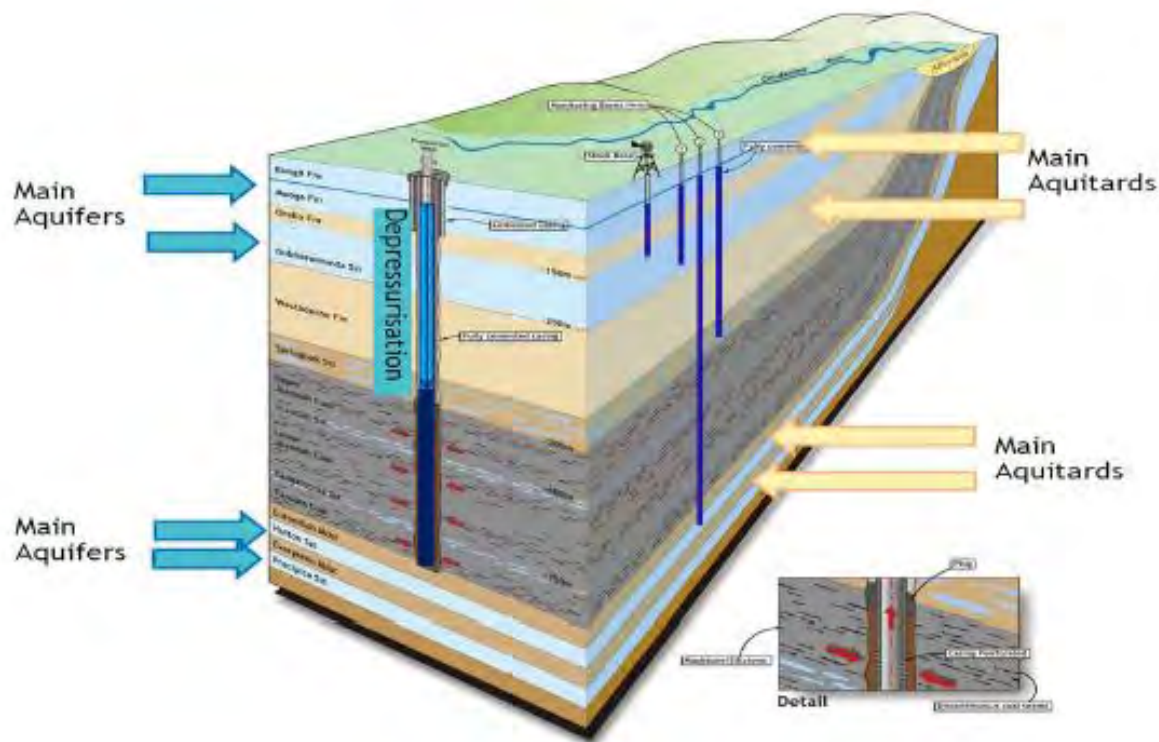


## CSG well design

- Much deeper than most water bores
- Drilled with “mud” or air
- 216mm (8.5”) hole
- 178mm (7”) steel casing - pressure cemented in place
- Sometimes “openhole” over coal seams
- Aquifers used by farmers and communities are protected by cemented steel casing



# CSG Production and Hydrostratigraphy Surat Basin



# CSG Exploration History

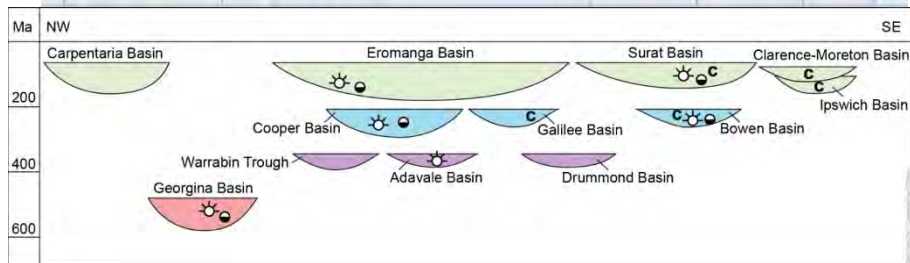
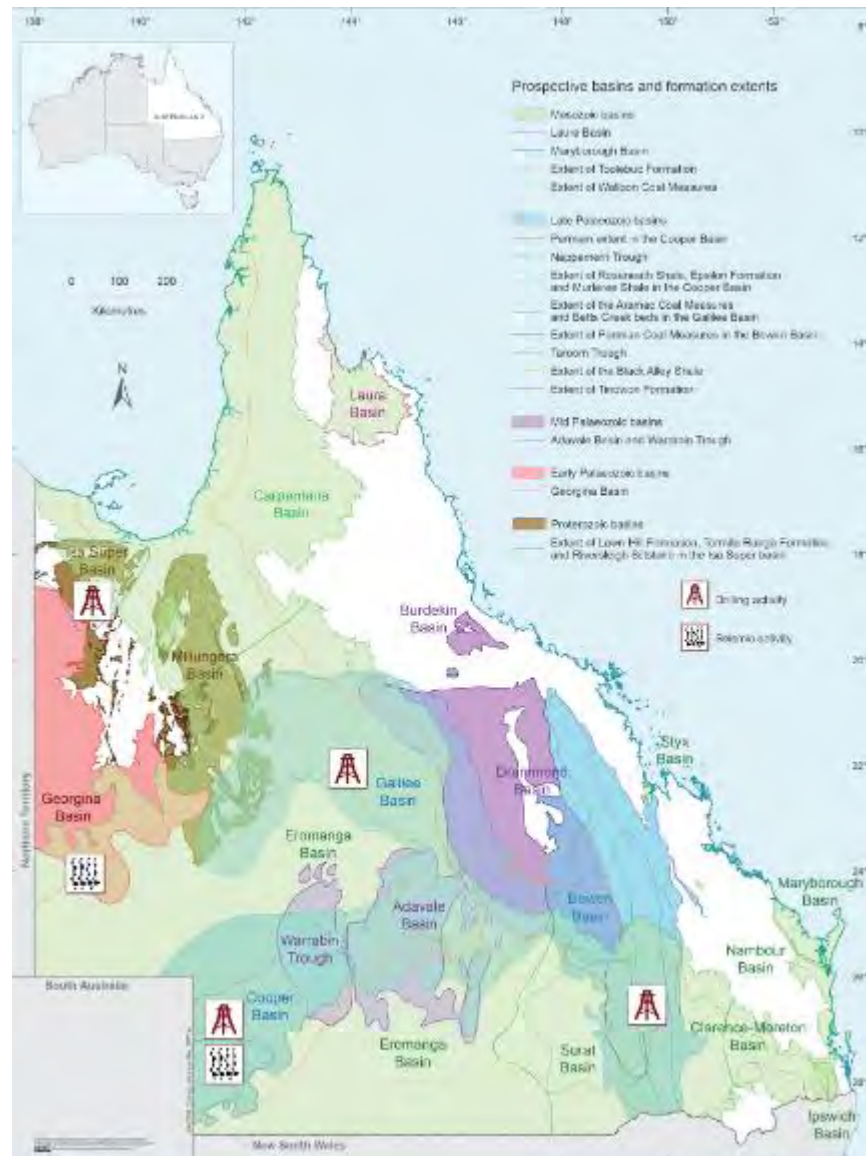
- Exploration commenced 1976 in Bowen Basin
- Technical difficulties / lack of markets
- Commercial production
- Bowen Basin
  - Dawson Valley 1996
  - Injune 1998
  - Moranbah 2005
- Surat Basin
  - Kogan North 2006
  - Berwyndale 2006
  - Dalby to Roma



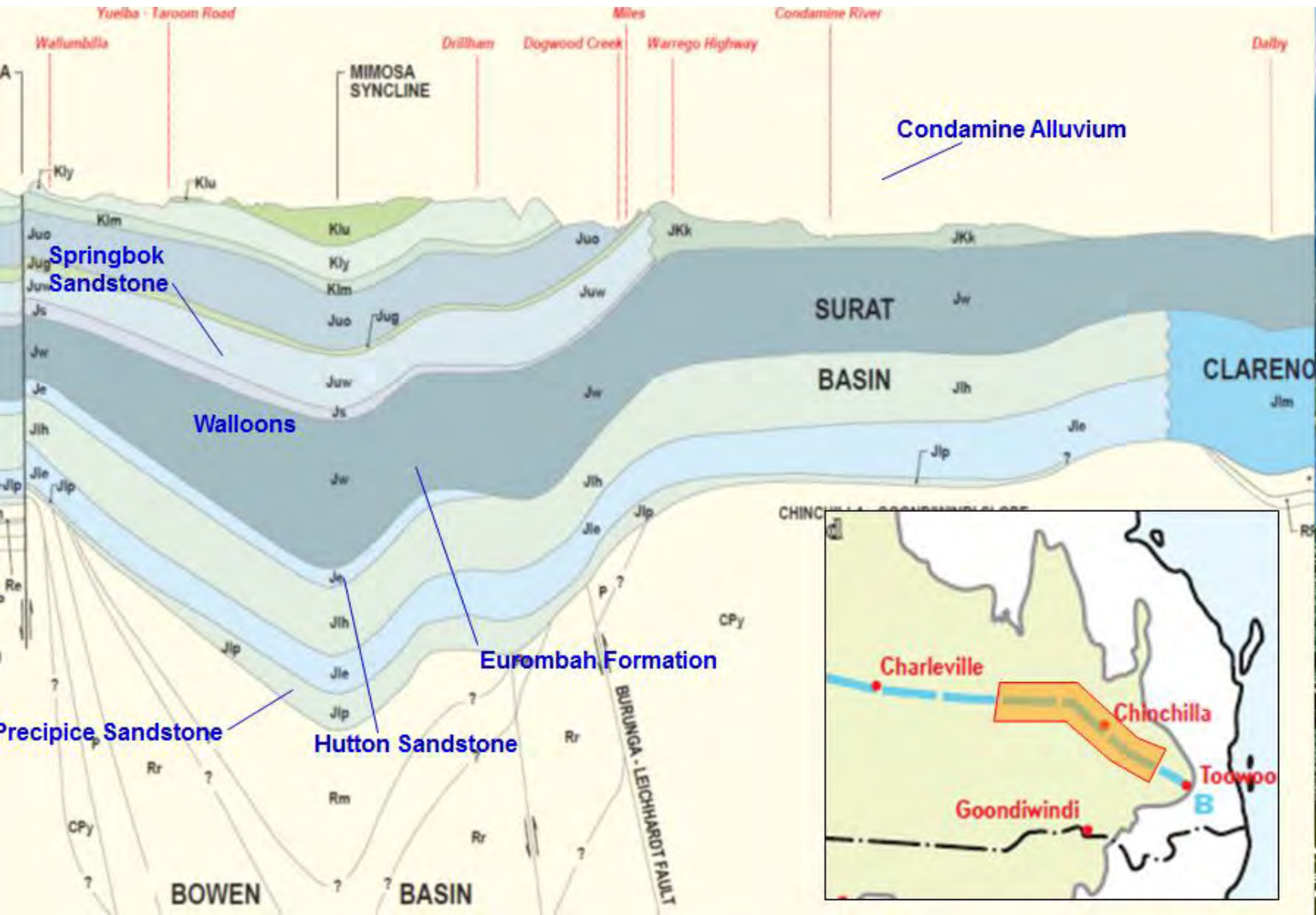
# Hydrogeology Surat Vs Bowen Basins



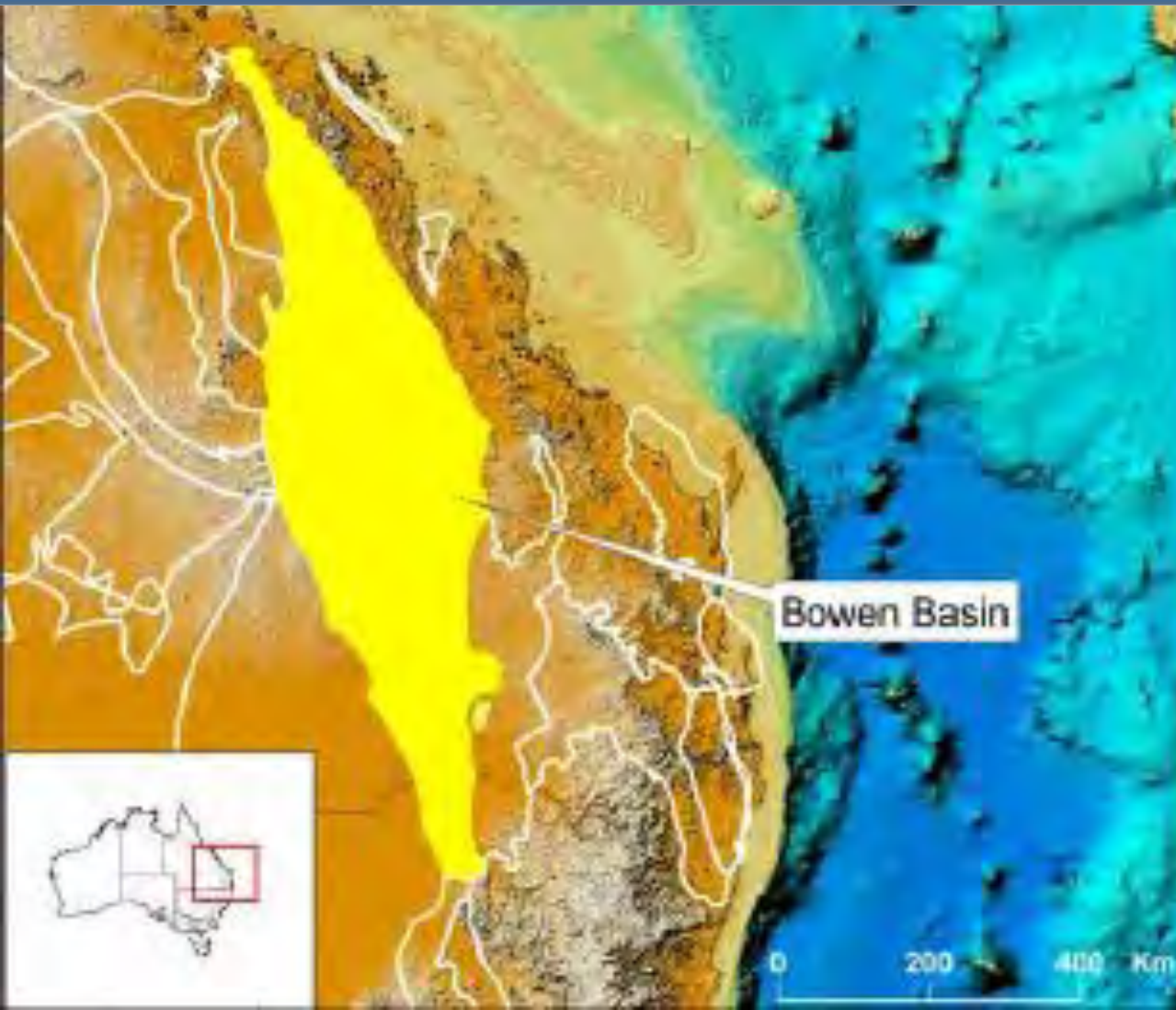
# Geological Basins in Queensland



# Surat Basin overlying Bowen Basin





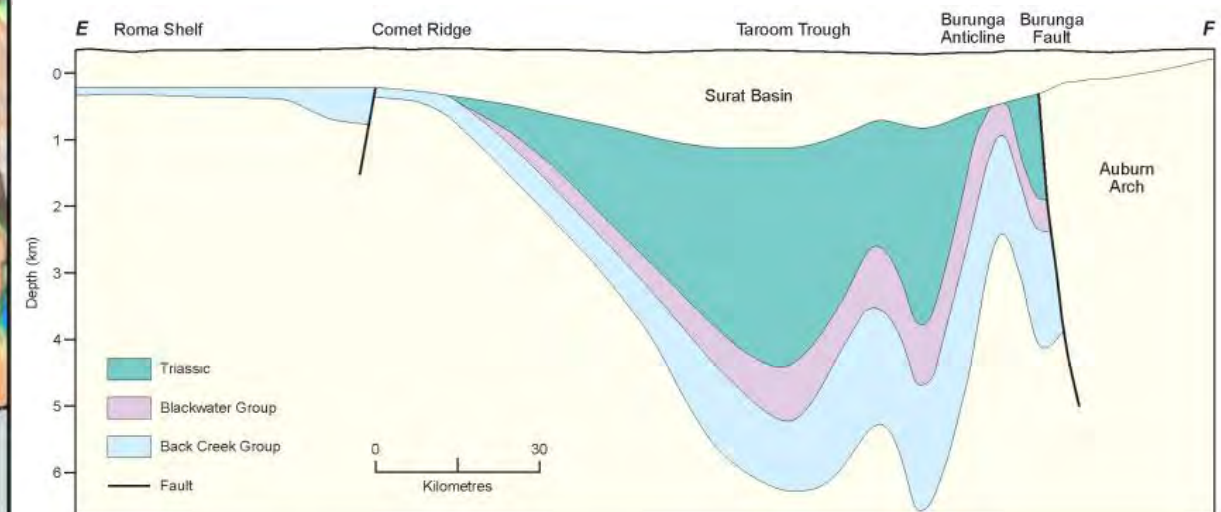
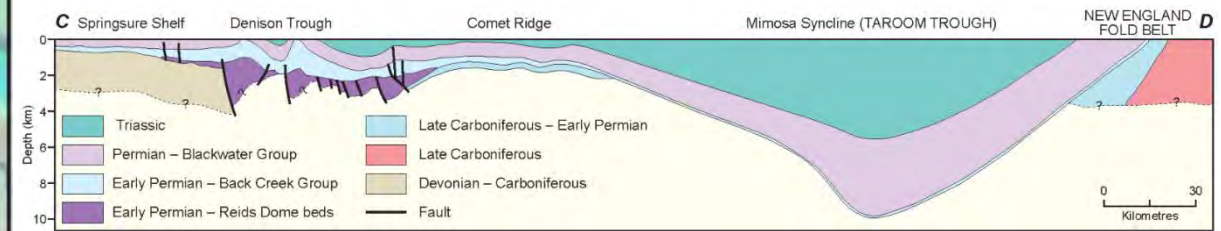
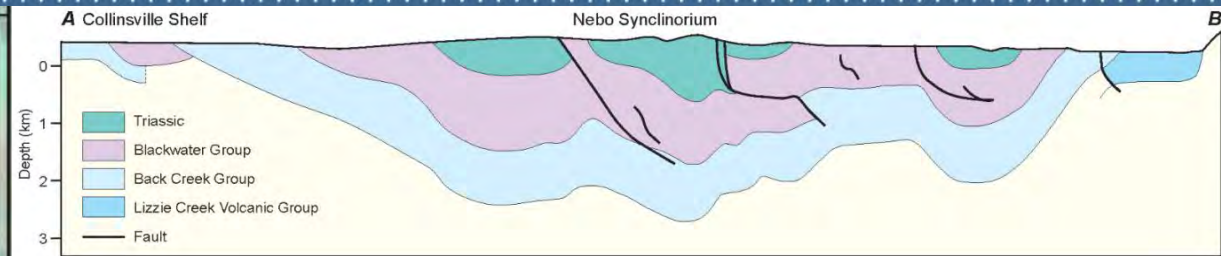
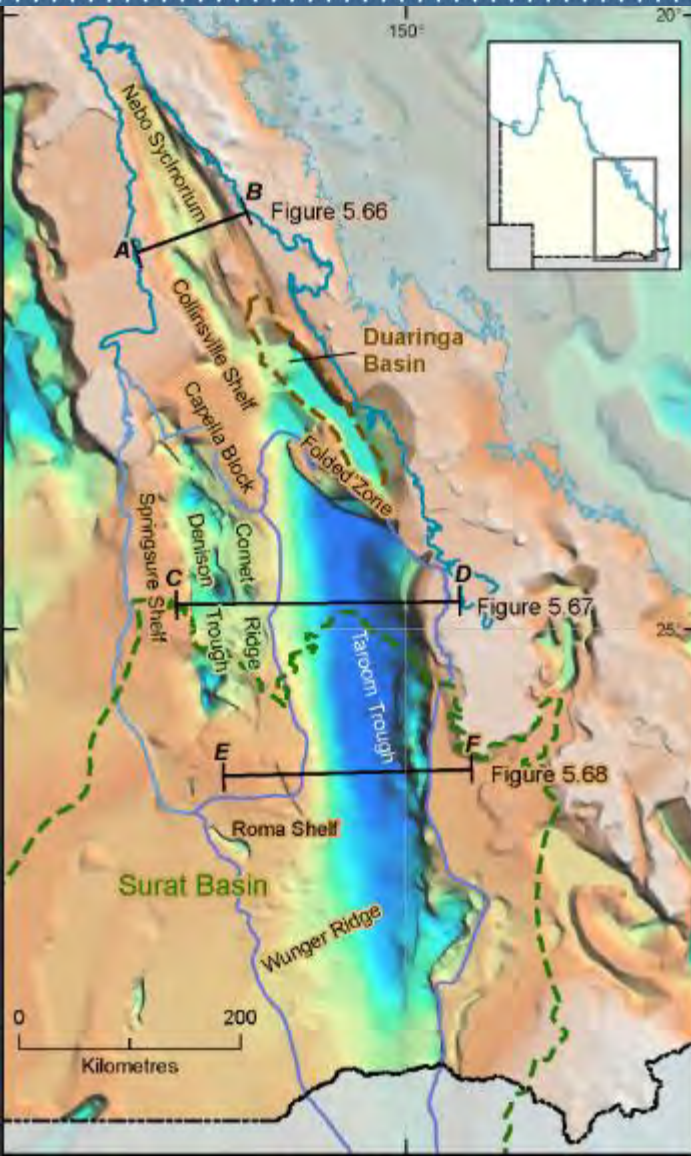


**Northern part of Bowen Basin is exposed while the southern part is buried beneath up to 2000m of Surat Basin sediments**





# Bowen Basin Cross Sections – Northern – Central - Southern

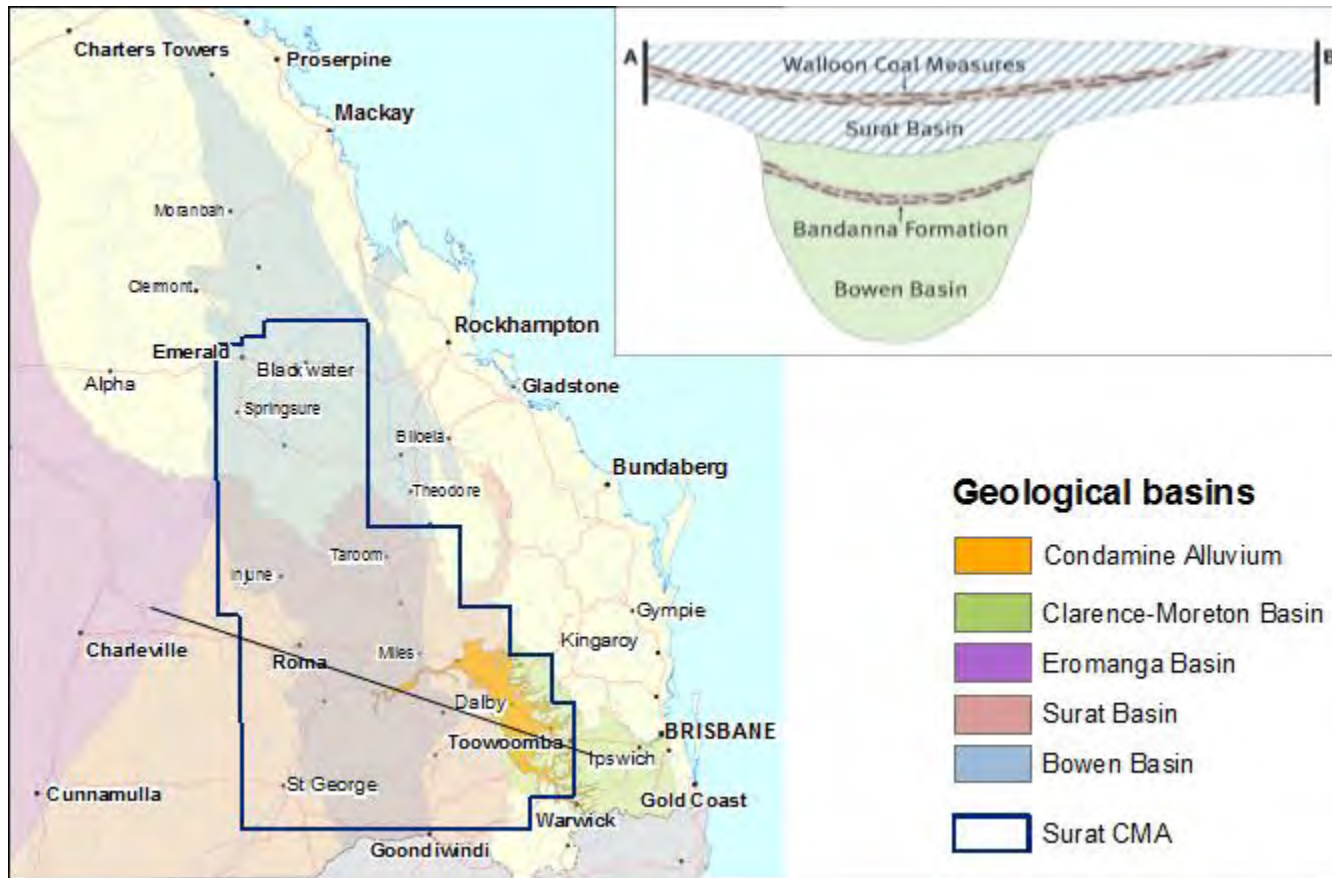




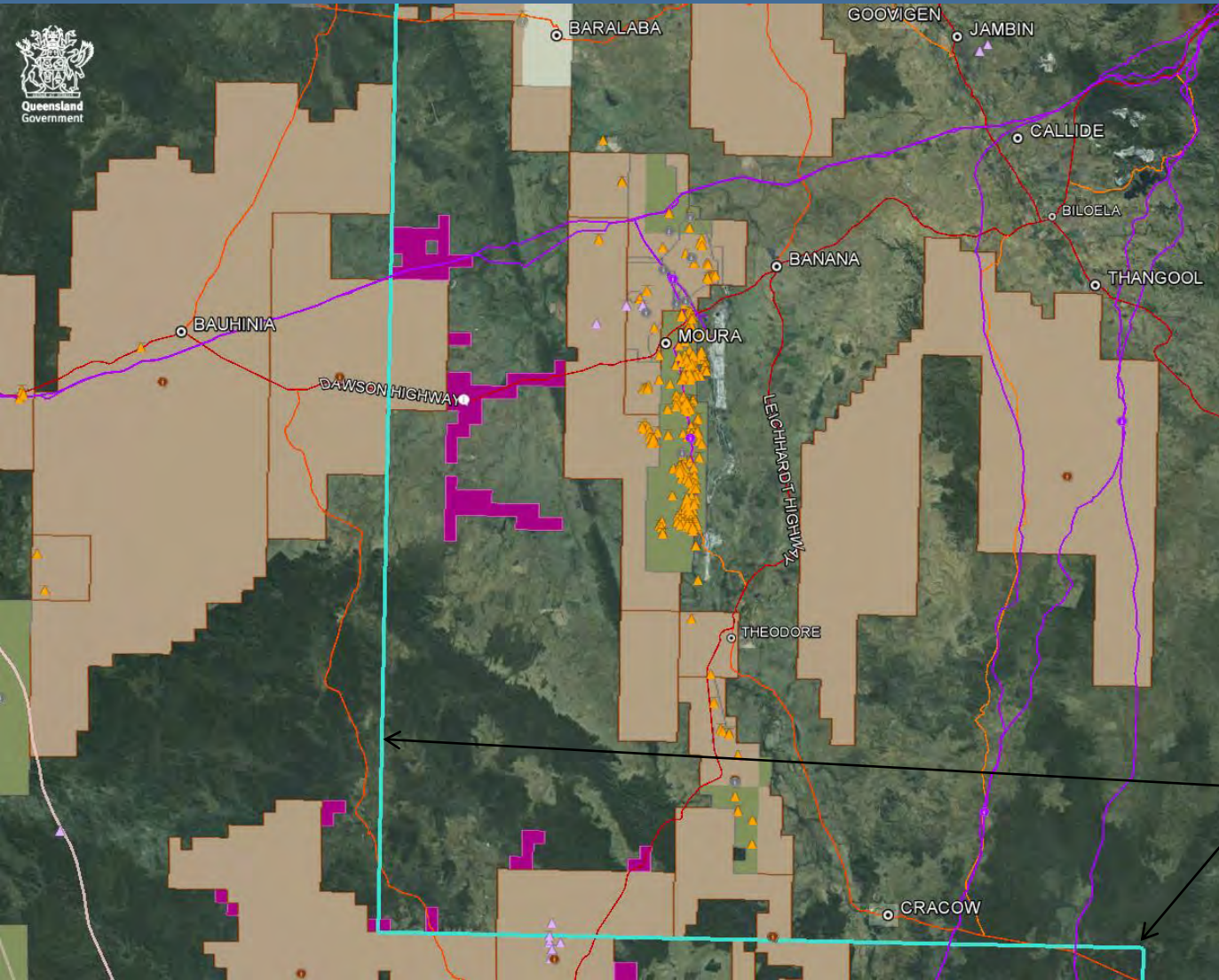
# Surat and Bowen Basin stratigraphy

	Age	Lithostratigraphic Unit		Hydrogeologic Designation
SURAT BASIN	Cretaceous	Rolling Downs Group	Griman Creek Formation	Aquitard
			Surat Siltstone	
			Wallumbilla Formation	
	Jurassic (144 – 213 Ma)	Kumbarilla Beds	Bungil Formation	Aquifer
			Mooga Sandstone	Aquifer
			Orallo Formation	Aquitard
		Injune Creek Group	Gubberamunda Sandstone	Aquifer
			Westbourne Formation	Aquitard
			Springbok Sandstone	Aquifer
			Walloon Coal Measures	Aquifer (coal seams)/ Aquitard (siltstone/mudstone)
	Eurombah Formation		Aquitard	
Hutton Sandstone		Aquifer		
Evergreen Formation		Aquitard		
Precipice Sandstone		Aquifer		
BOWEN BASIN	Triassic (213 – 248 Ma)	Wandoan Formation	Moolayember Formation	Alternating Aquifers and Aquitards
			Clematis Sandstone	Aquifer
	Rewan Formation		Aquitard	
	Permian (248 – 297 Ma)	Blackwater Group	Bandanna Formation (coal measures - west)	Aquifer (coal seams)/ Aquitard (siltstone/mudstone)
			Baralaba Coal Measures - east	
		Back Creek Group	Kaloola Member	Aquitard
Black Alley Shale			Aquitard	
Tinowon Formation		Aquitard		
Muggleton Formation		Aquifer		
Early Permian Undifferentiated				

# CSG Targets in the Surat and Bowen Basins







Westside Corporation

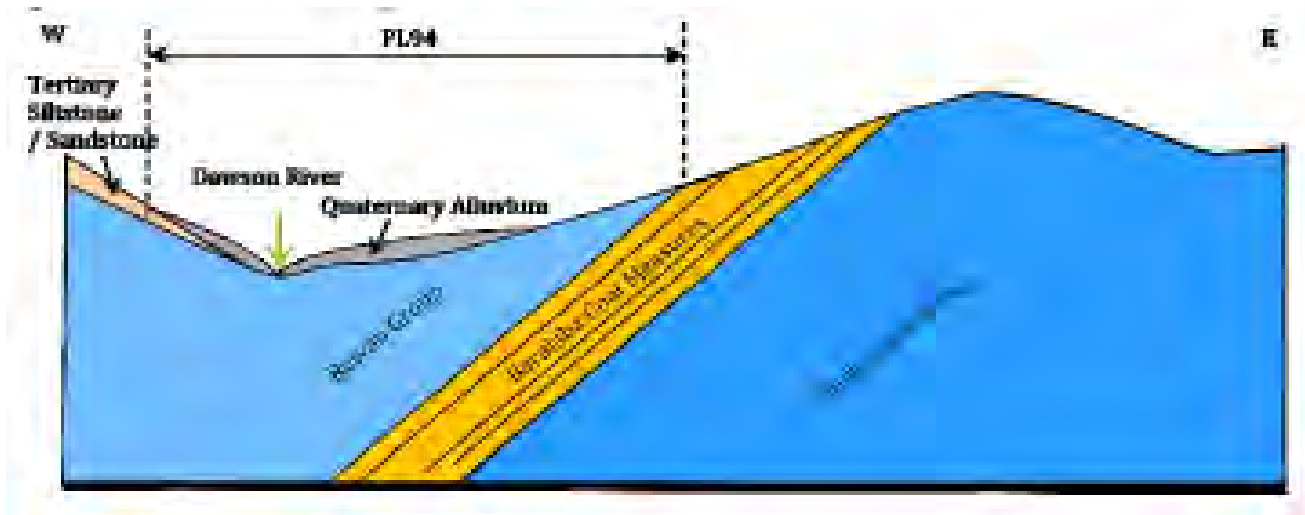
Meridian Gas Project

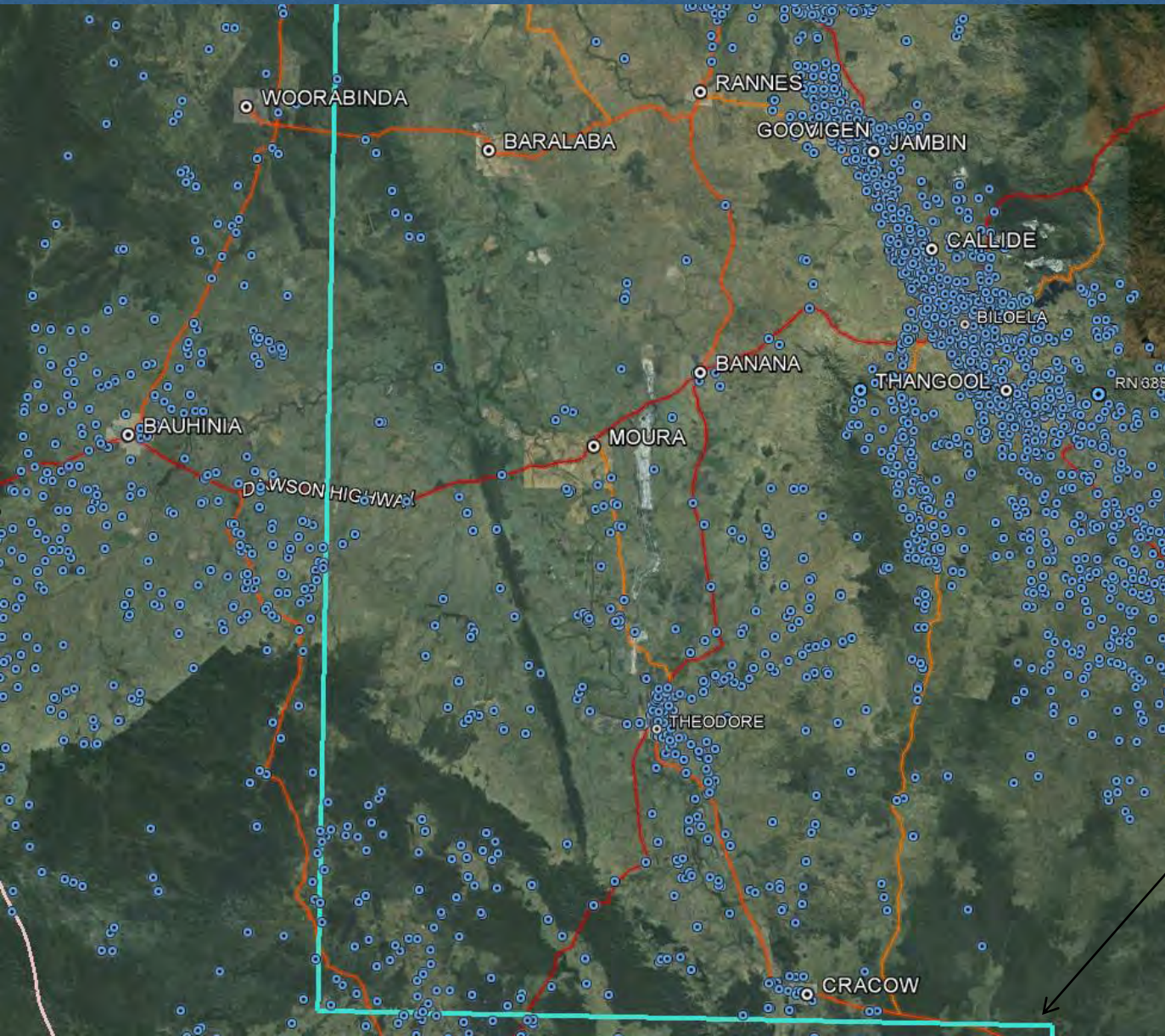
PL94  
(light green north south through Moura)

CMA boundary



## Geological cross section (east – west) through PL94 (from Meridian Gas Project Underground Water Impact Report)





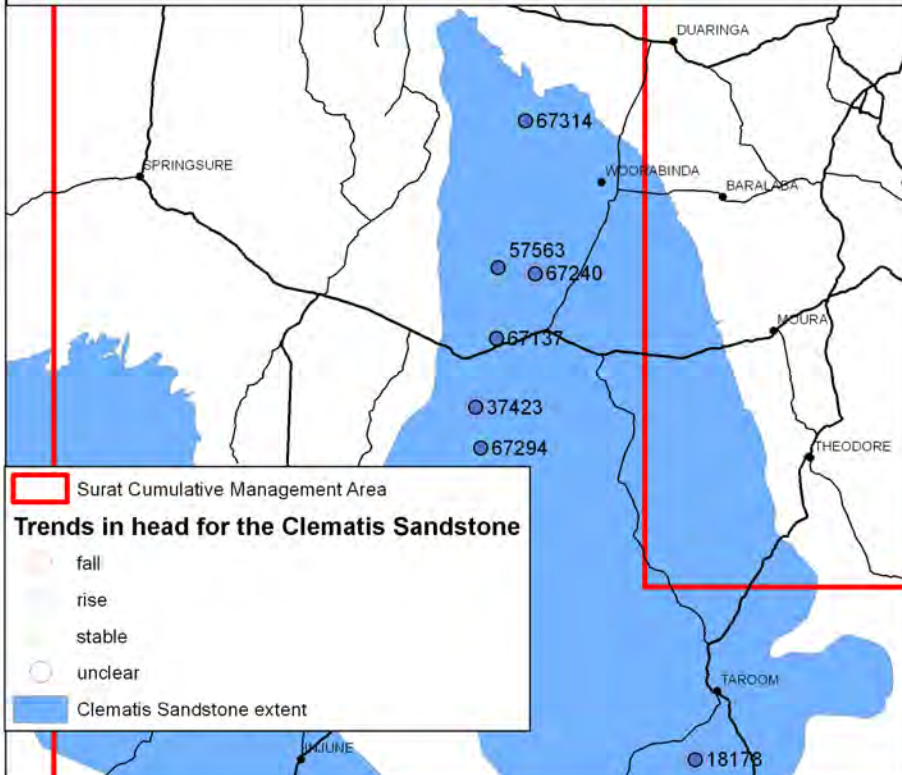
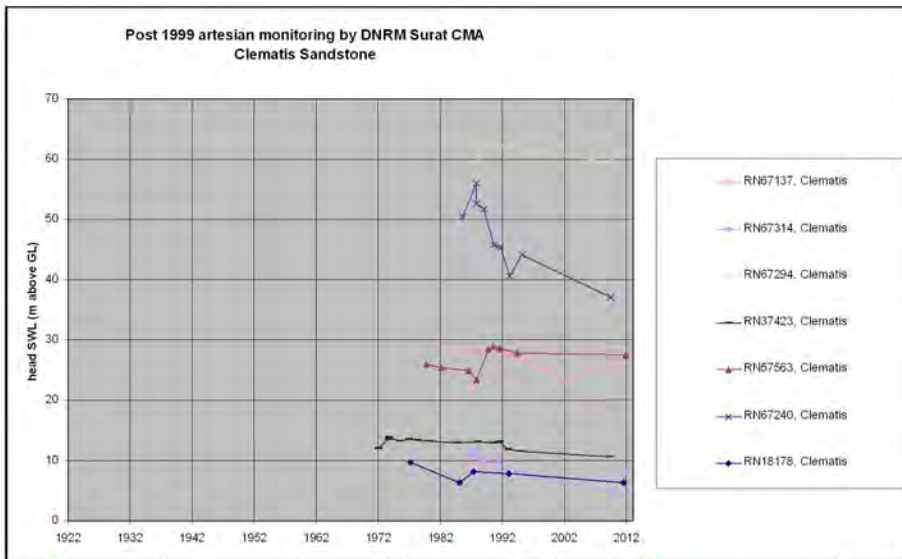
## Water Bores registered in the GWDB

CMA boundary



Queensland Government





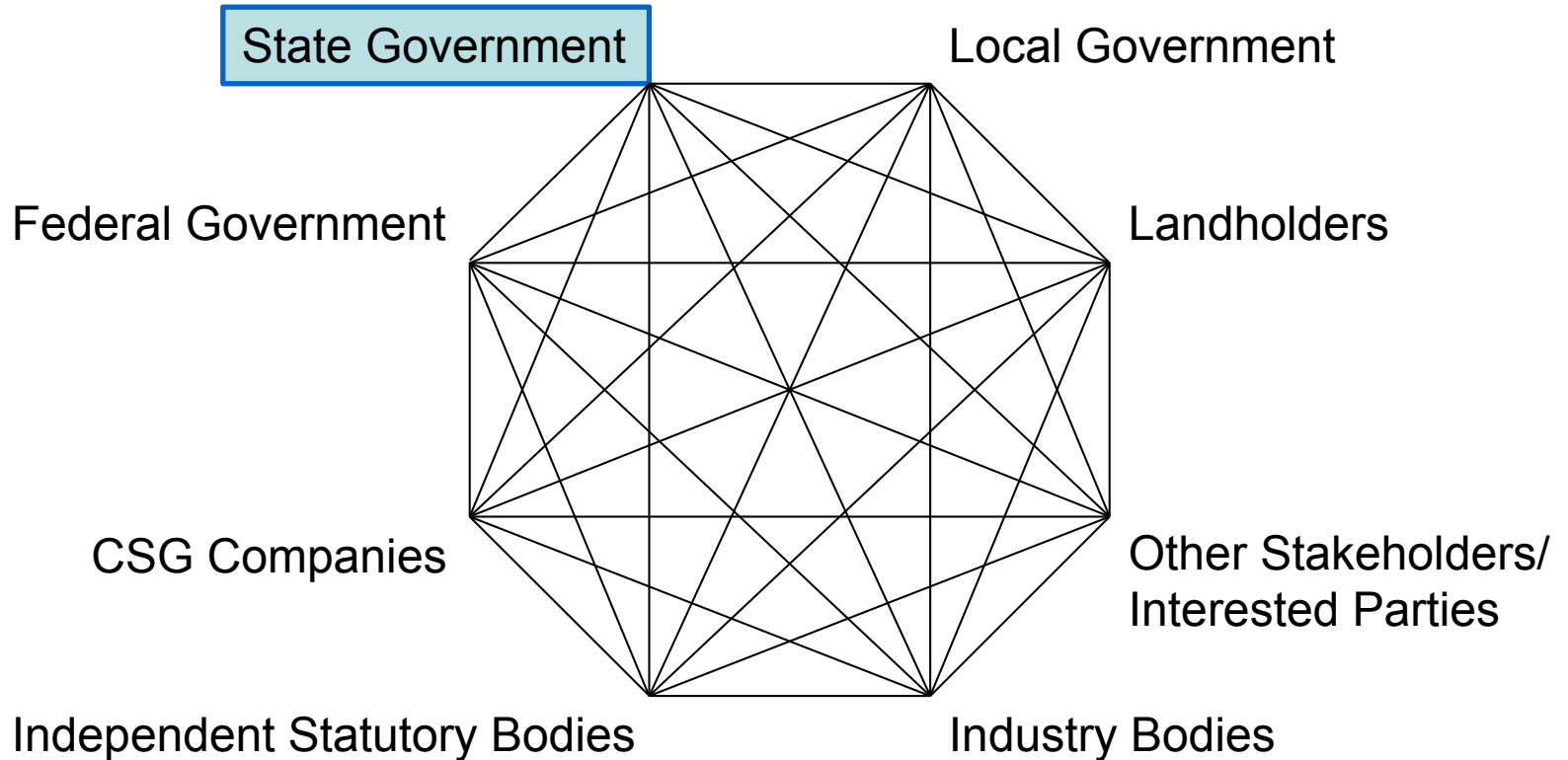
# Clematis Sandstone extent in the Mimosa Syncline and water level trends

# Groundwater Investigation and Assessment Team (GIAT)

## What we do



# CSG the broader picture



This is for illustrative purposes only. As with everything, the *real* web would be much more complex!

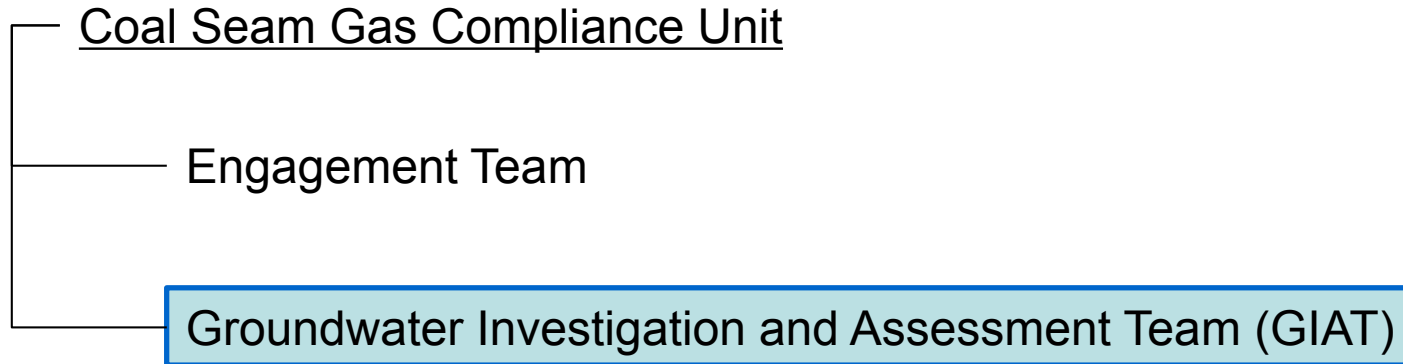
# State Government

- DNRM
- EHP
- Other Departments (DSITIA, Health)
- Office of Groundwater Impact Assessment
- GasFields Commission



**Queensland** Government

# DNRM



## Other Work Units

Water Licensing

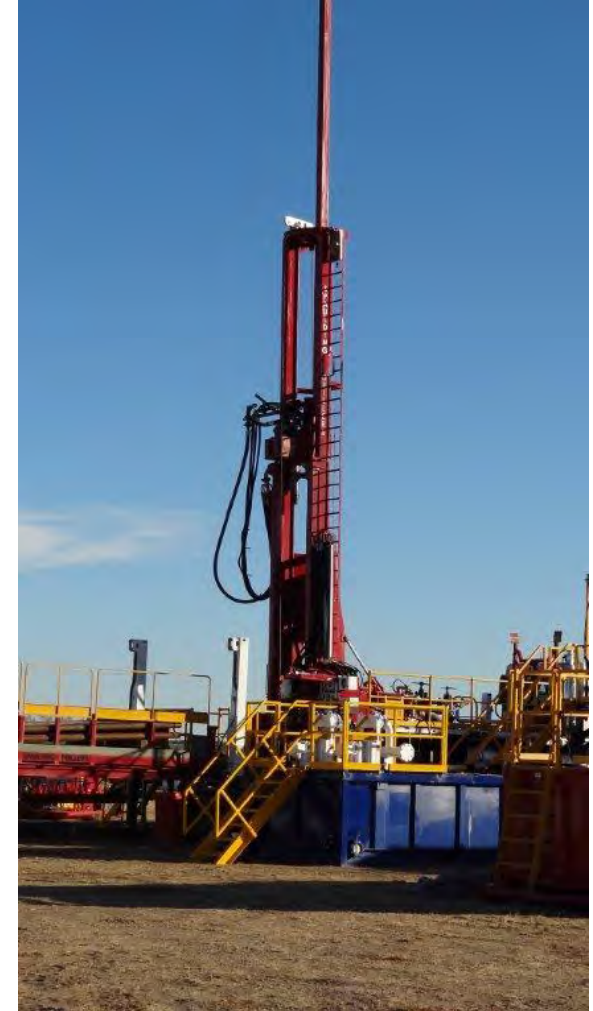
Petroleum and Gas Inspectorate

Etc

Office of Groundwater Impact Assessment

# Groundwater Impact Assessment Team (GIAT)

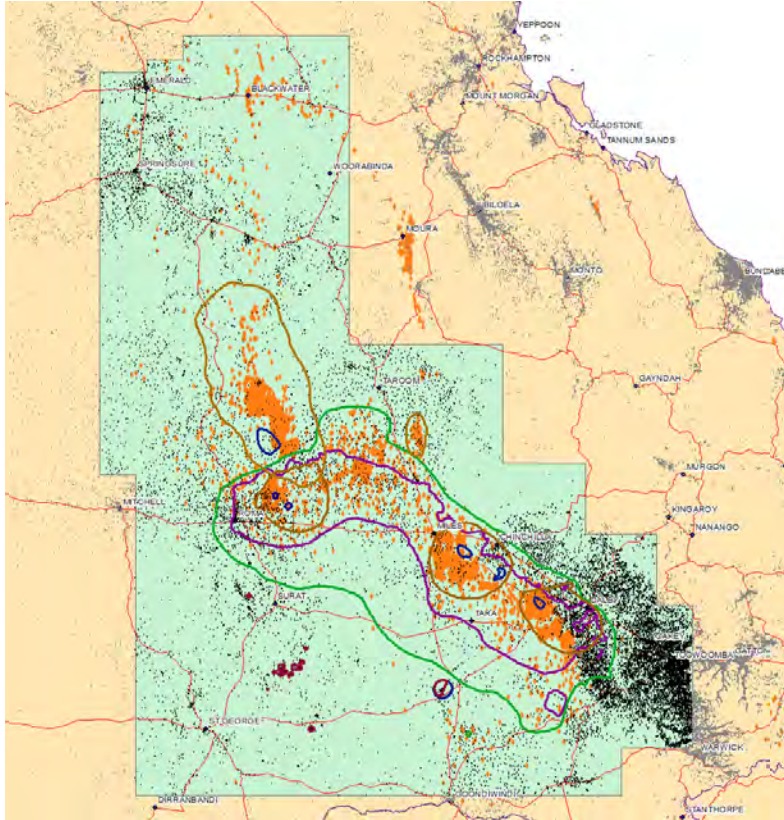
- Comprised of 7 staff
  - Individuals with over 40 years practical experience in groundwater assessment and water bore construction





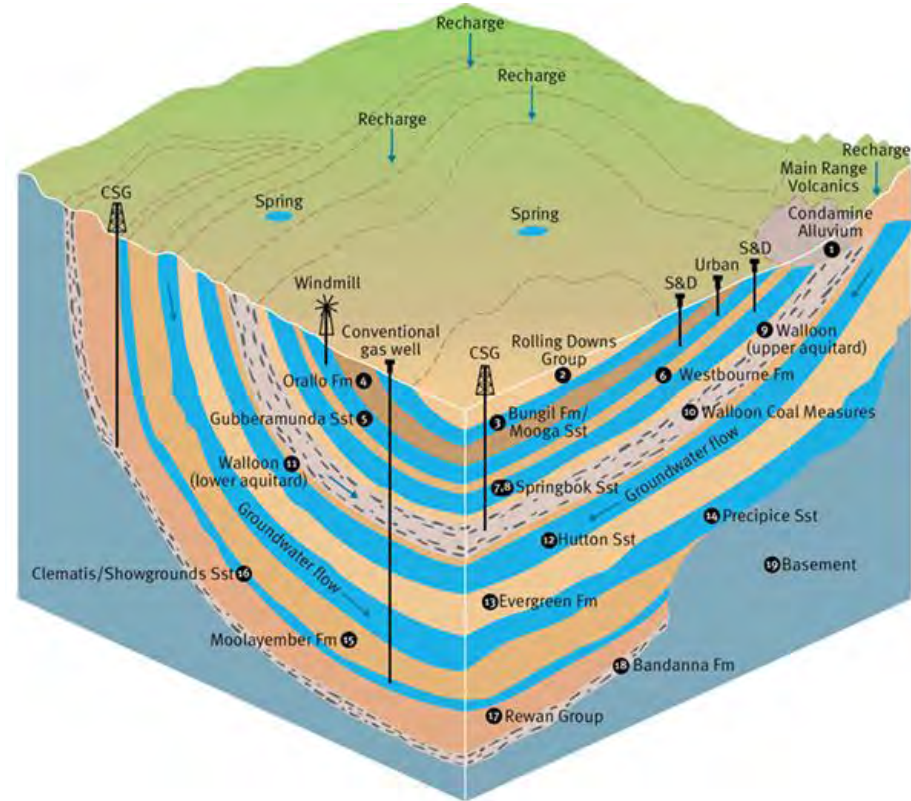
# GIAT

Key focus is the groundwater impacts of the CSG industry



## Surat Cumulative Management Area

- 25000 registered water bores
- 5000 CSG wells



## Surat Underground Water Impact Report Identified:

- 85 bores impacted before 2015
- 415 bores impacted long term

# GIAT Responsibilities

- Groundwater investigations of potentially impaired bores
- Implement and report on an independent monitoring program
- Audit water monitoring bore construction, well completion reports for water monitoring bores and water sampling procedures
- Engagement with industry and community stakeholders on CSG development and impacts



Coal Seam Gas  
Engagement and Compliance Plan 2013



Great state. Great opportunity.





# Groundwater investigations of potentially impaired bores

## Common concerns

- Falling water levels
  - Diminished supply
  - Change in water quality
  - Increased gas in bore
- 
- Indirect issues
    - What aquifer is my bore targeting?
    - Is my bore registered/licensed?

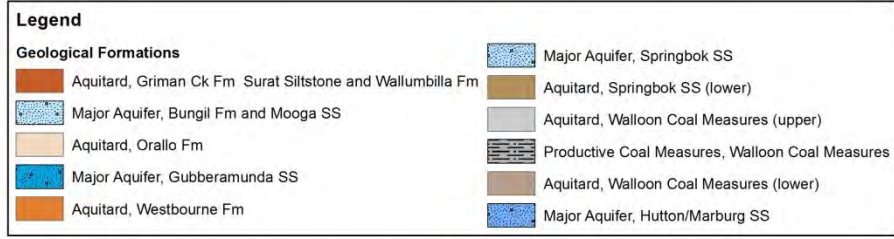
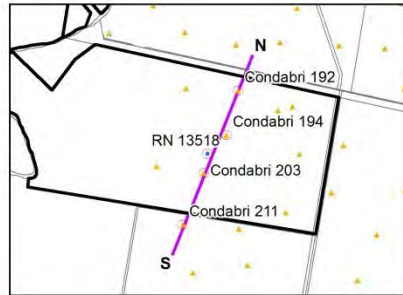




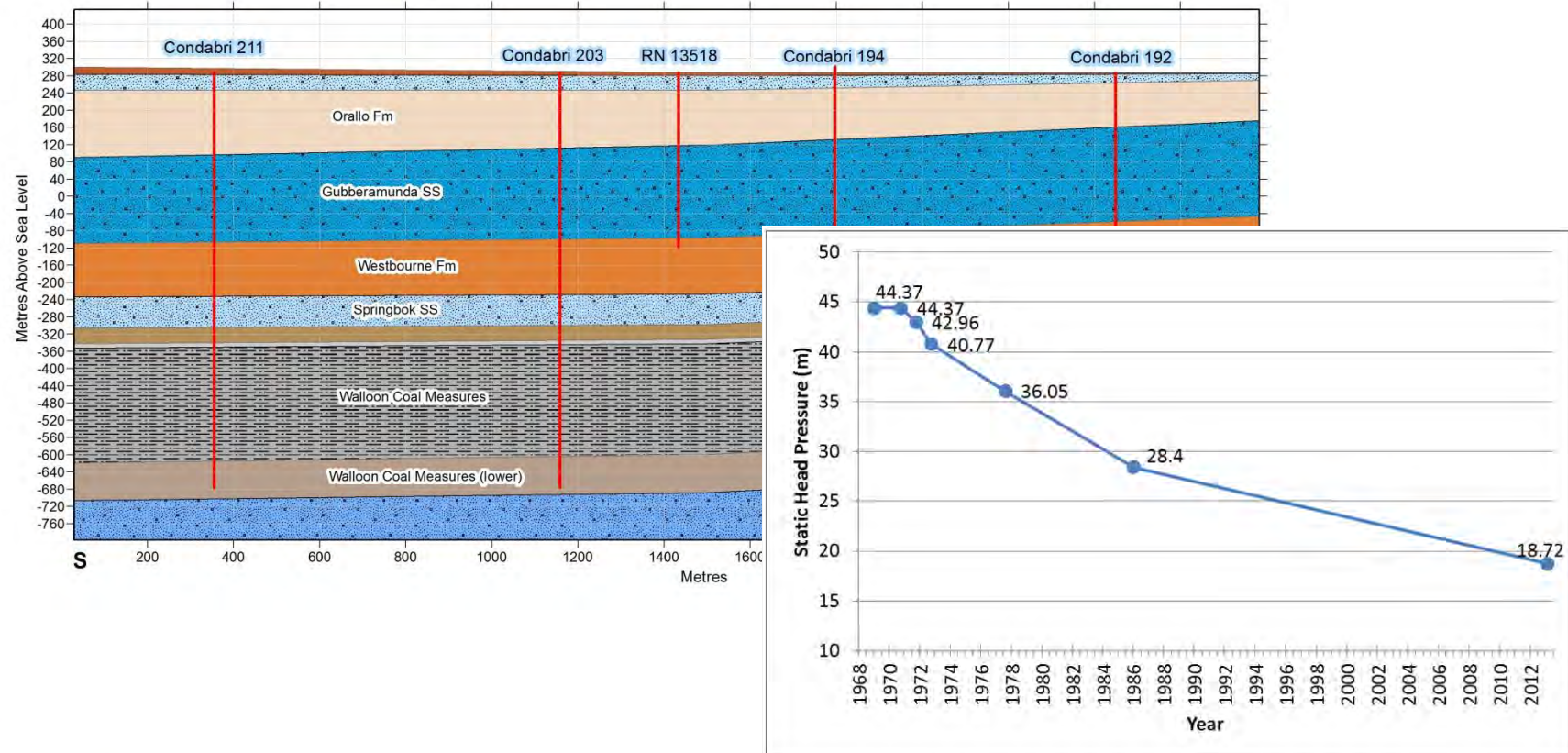
# Investigation into a report of diminished supply

- Compile and review available information in order to develop a conceptual understanding of:
  - The hydrogeology of the area
  - The construction of the bore in question
  - The CSG activities in the area
- Undertake site visit(s) in order to:
  - Take water level readings
  - Undertake pump tests
  - Confirm bore construction details and assess current condition (this may involve taking a downhole video)
- Consider:
  - History of regional declines
  - Water extraction from surrounding CSG wells and the potential for impacts to the bore in question
  - Water extraction from surrounding water bores and the potential for impacts to the bore in question
  - Potential problems with the bore construction

# Investigation into a report of diminished supply



This cross section has been constructed using model layers produced for the Surat Underground Water Impact Report. Some local scale variation in depths may not be shown due to the scale of these layers.

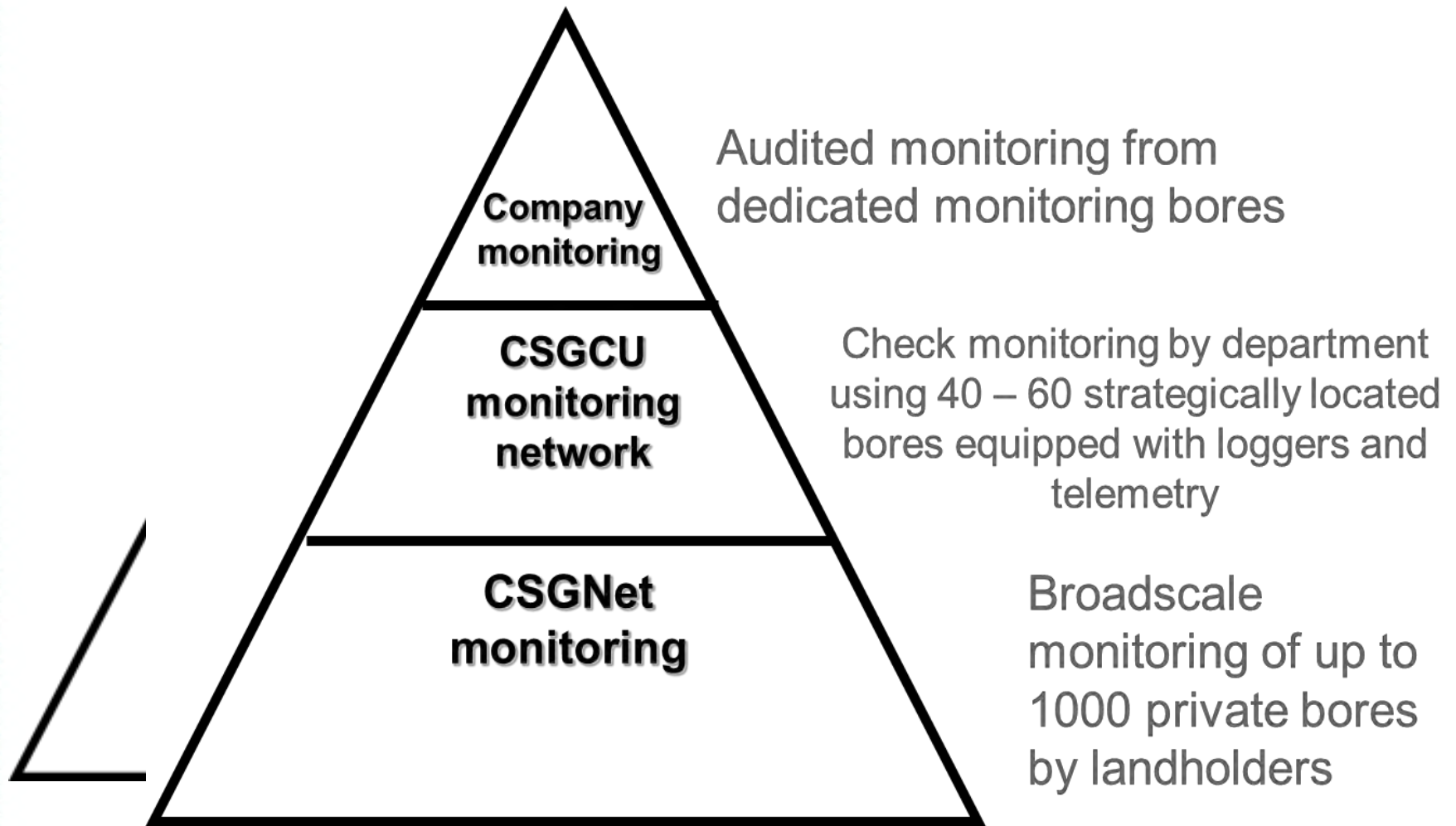


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  - Water extraction from surrounding CSG wells and the potential for impacts to the bore in question
  - Water extraction from surrounding water bores and the potential for impacts to the bore in question
  - Potential problems with the bore construction
- Action
  - Communicate findings to the landholder and relevant CSG company
  - Direct CSG company to make good
  - Recommend continued monitoring
  - Eliminate CSG activities as a potential cause

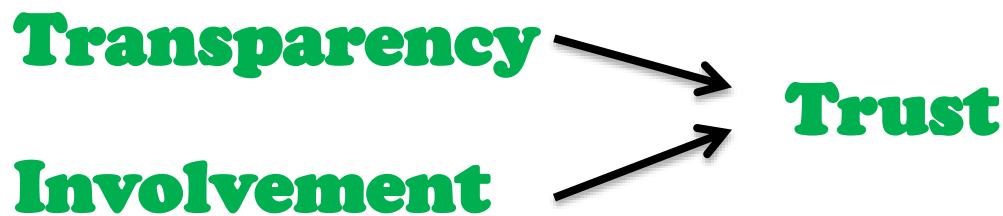


# Monitoring

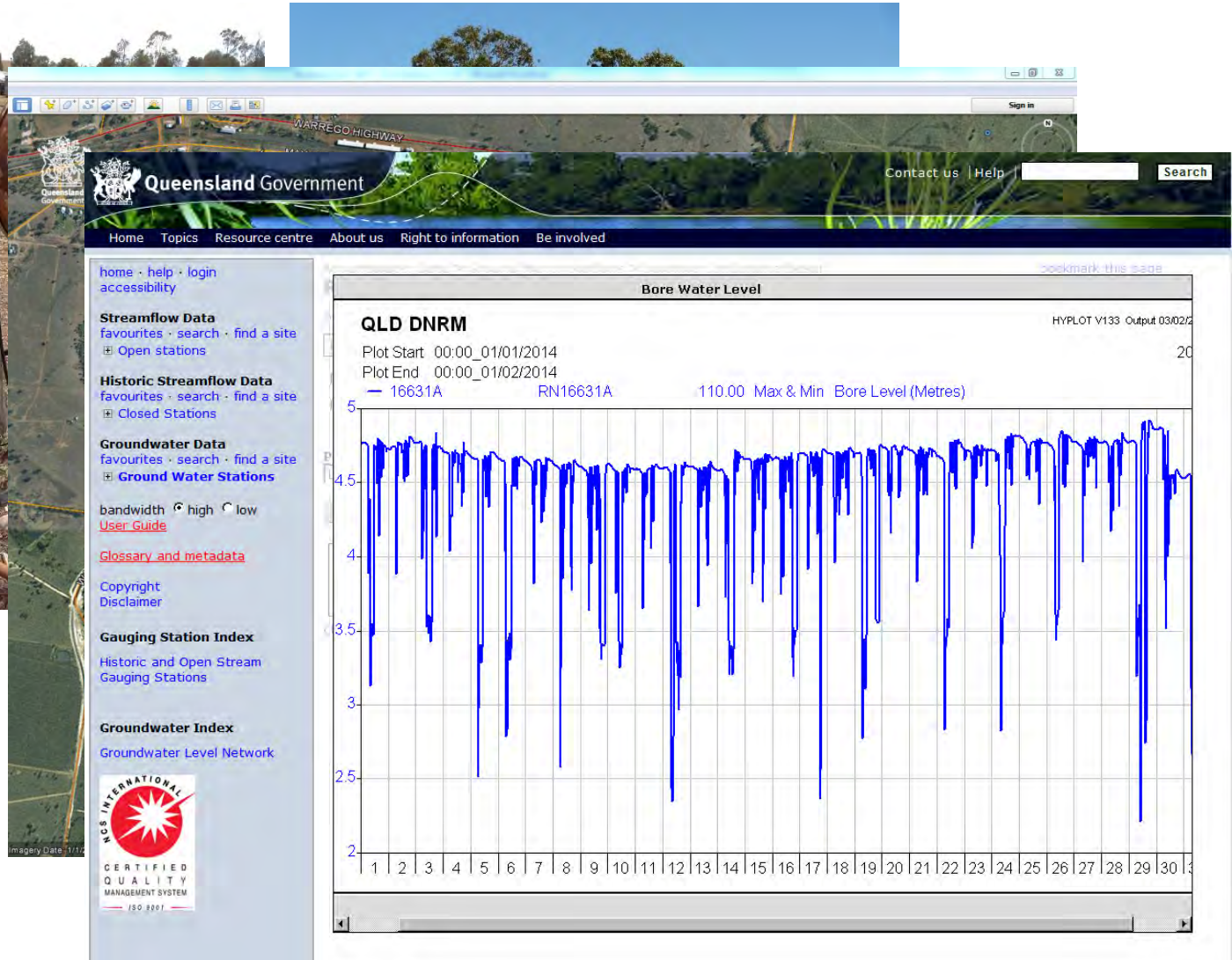


# CSGNet

- Proactive program
- Landholders collecting data from their bores
- Provide current information on CSG development and monitoring
- Inform landholders on local hydrogeology and bore information
- Collect, store and report back
- Provide annual forum for sharing information



# CSG Online





# Audit CSG Company Monitoring Bore Construction and Monitoring Procedures



Ensure monitoring bores meet, Minimum Construction Standards or, Code of Practice for CSG wells

Ensure both Safe Work Practices (SWP's) and Standard Operating Procedures (SOP's) for all aspects of bore monitoring are best practice



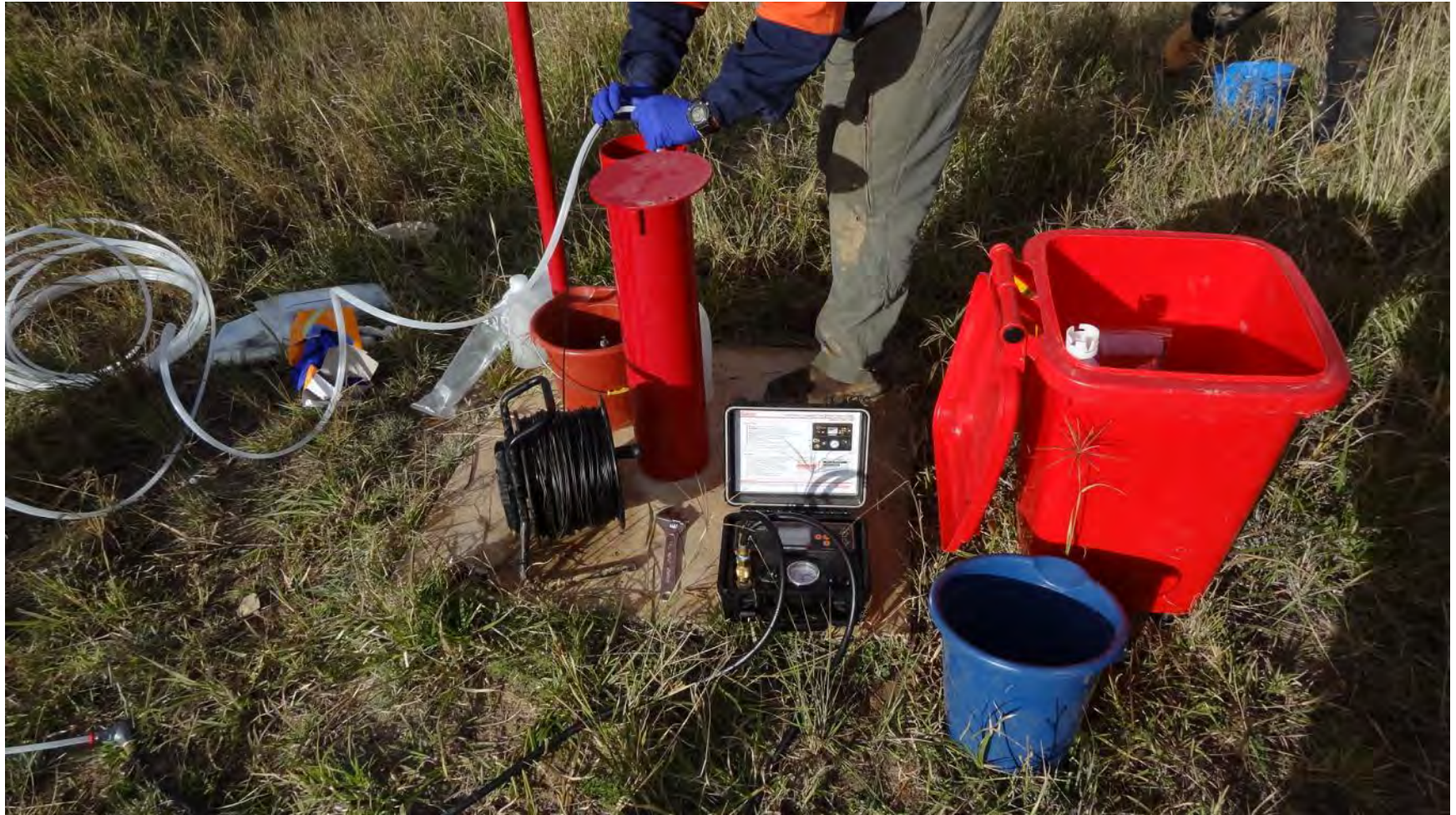


# Audit CSG Company Monitoring Bore Water Level / Pressure and Sampling Procedures





# Audit CSG Company Monitoring Procedures





# Audit CSG Company Monitoring Procedures





# Audit CSG Company Groundwater Sampling, Preservation, Storage and Handling Procedures



# Audit CSG Company Monitoring Bore Construction Techniques and Procedures





# Audit CSG Company Monitoring Bore Construction Techniques and Procedures





# Completed CSG Water Monitoring Bore





# Completed CSG Water Monitoring Bore





# Completed CSG Water Monitoring Bore ready for manual monitoring





# Engagement with Industry and Stakeholders on CSG Development and Impacts



A large, multi-bladed metal windmill stands in the center of a rural landscape. The windmill is mounted on a tall, rusted metal tower. In the foreground, a white SUV is parked on the left, and several people are gathered around it. To the right of the windmill, a person is sitting on a bench or similar structure. The background features a flat, open field with scattered trees under a clear blue sky. The text "Thank you" is overlaid in the center of the image.

# Thank you