Water Resources Retirees' Association Inc.

22 February 2018

Compliance & Engagement in the Coal Seam Gas Industry in Qld

David Free
Chief Hydrogeologist CSG CU, DNRM (Qld)

Outline

- What is Coal Seam Gas (CSG)
- Why is CSG a potential groundwater impact issue
- How CSG impacts are managed
- CSG Net – landholder monitoring
- CSG Online – Continuous logging of landholder bores
- GIAT Research Projects

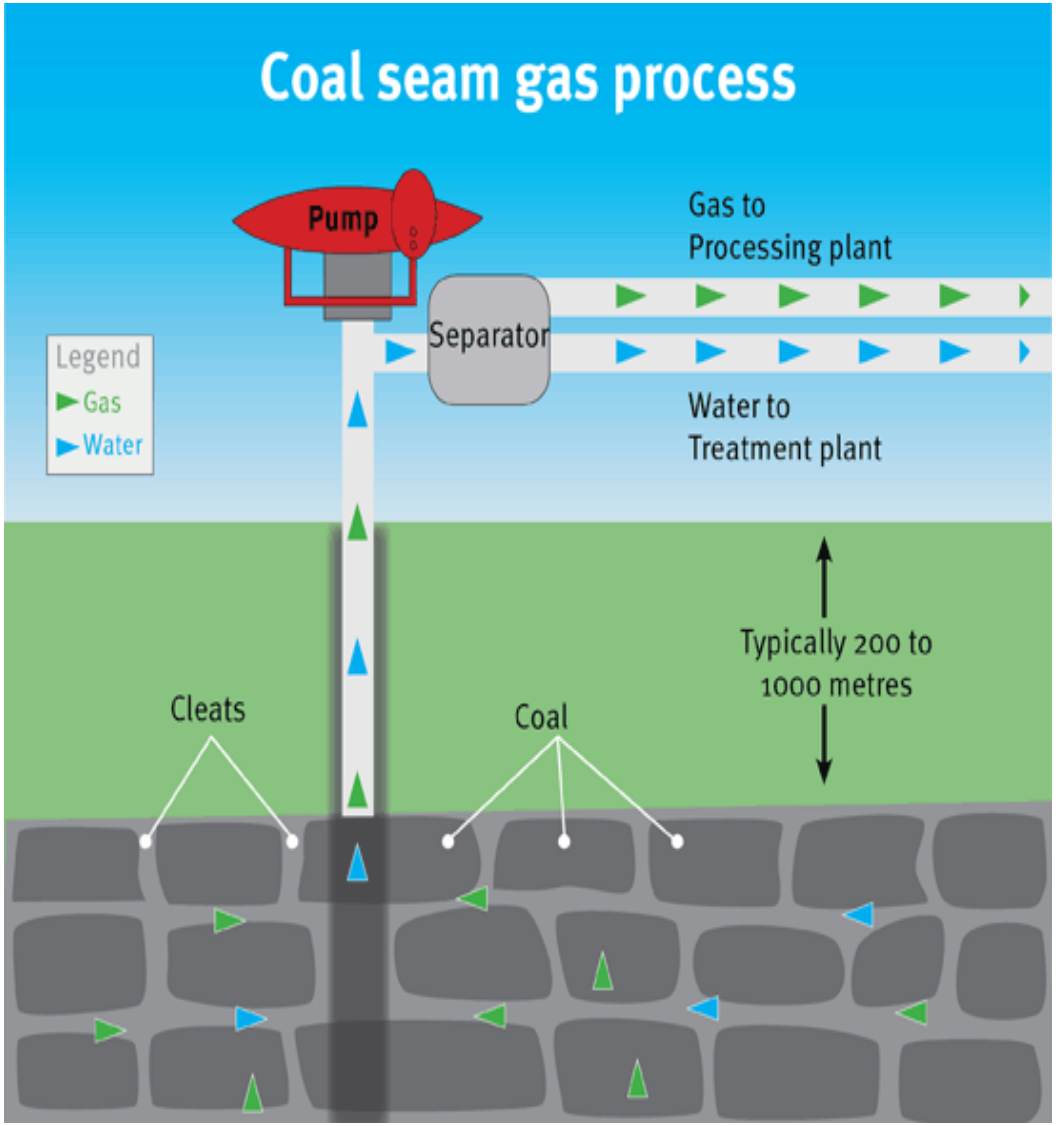
What is CSG ?

CSG is predominately methane (CH4)

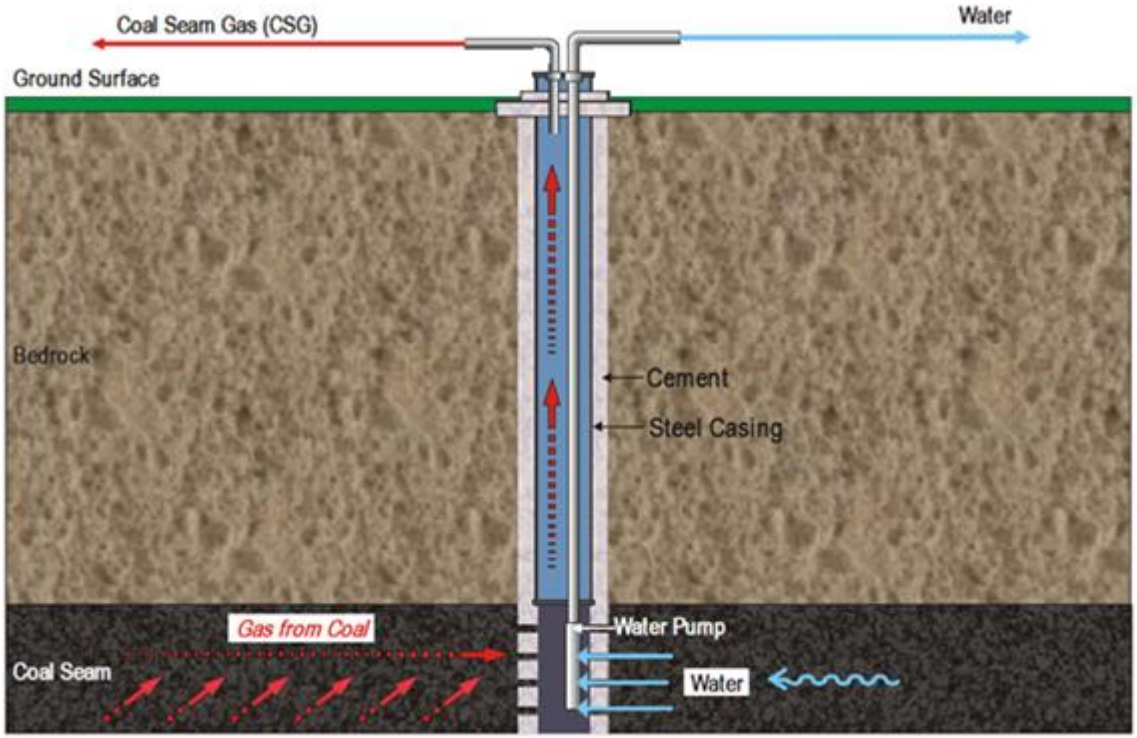
Formed by either thermogenic or biogenic processes

CSG is attached (adsorbed) along fracture surfaces (cleats) in the coal beds

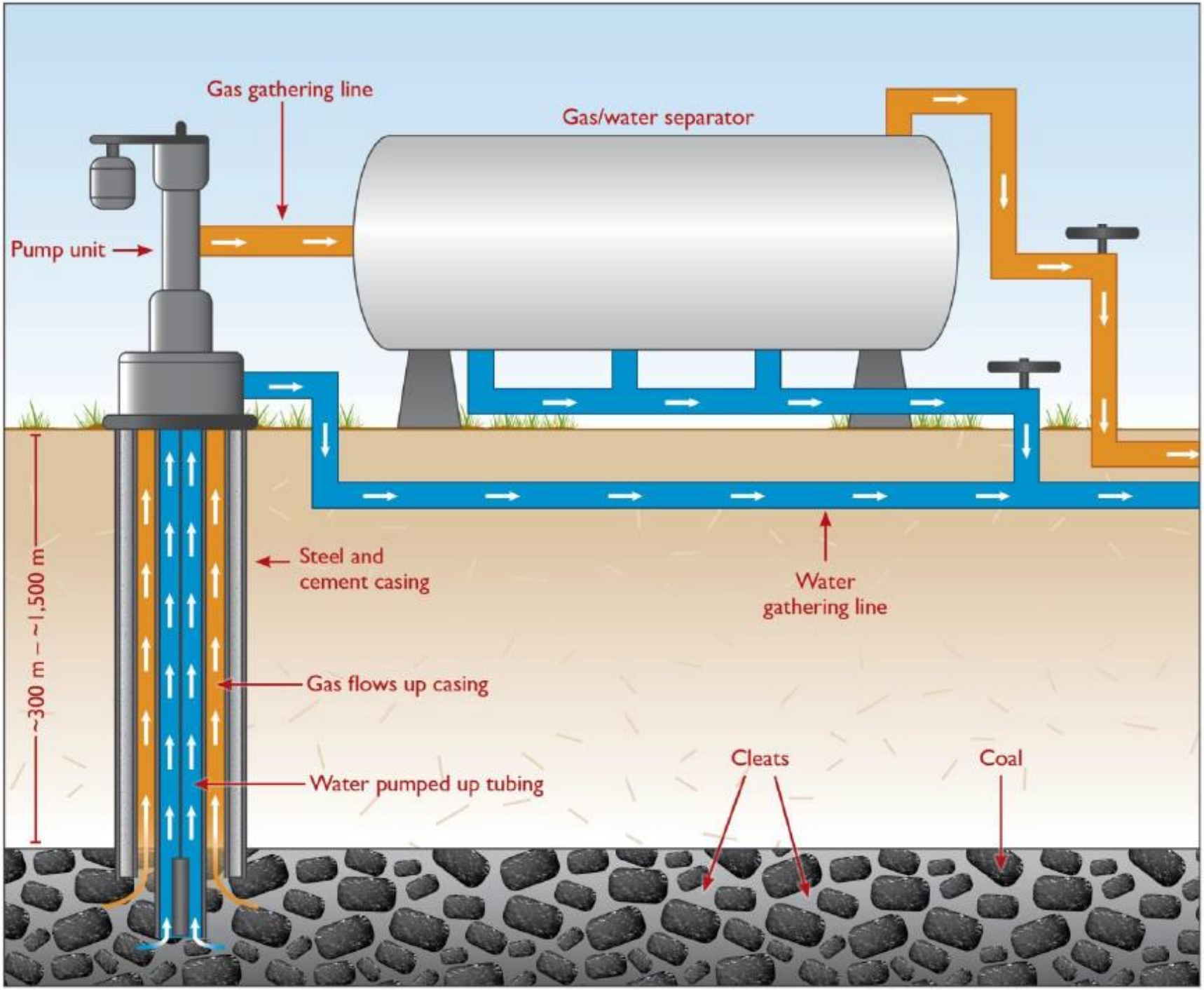
CSG is held in place by hydrostatic (water) pressure



How is CSG Produced ?



- **Drilling well into the coal seam**
- **Isolate all other formations with steel casing and cement grout to seal the well**
- **Pump groundwater to lower the head and reduce hydrostatic pressure**
- **Water and gas flow to the surface and the gas is separated and collected**

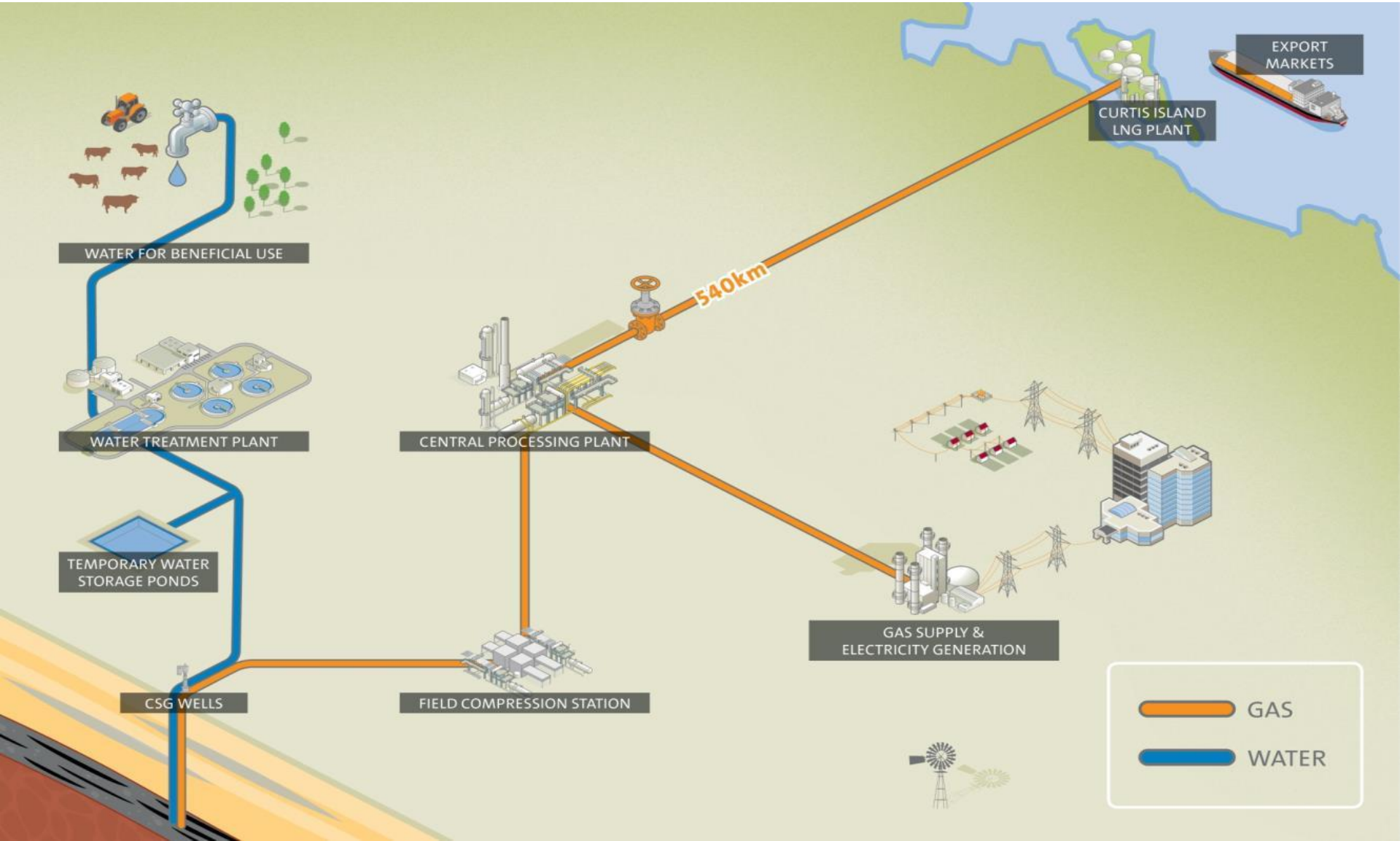

Gas gathering line
Gas/water separator
Pump unit
Steel and
cement casing
Water
gathering line
~300 m – ~1,500 m
Gas flows up casing
Water pumped up tubing
Cleats
Coal

Typical Gas Production Field Layout

- Gas wells vary in depth from 200 m to 1000 m deep
- Wells spaced from 750m to 1000m apart
- Gas treatment plants approximately 18-20 km apart. Associated ponds 50-100 ha in size
- Reverse osmosis water treatment plant typically services 4-5 gas treatment plants
- Grid work of roads, gas and water collection pipelines

A Typical CSG Gasfield

CSG Supply Chain Overview



CSG to LNG (Liquefied Natural Gas)

- **Capitalising on Queensland's extensive CSG reserves to meet a growing global demand for LNG.**

- **LNG is natural gas that has been cooled to minus 161 degrees – the point at which it condenses into a liquid.**

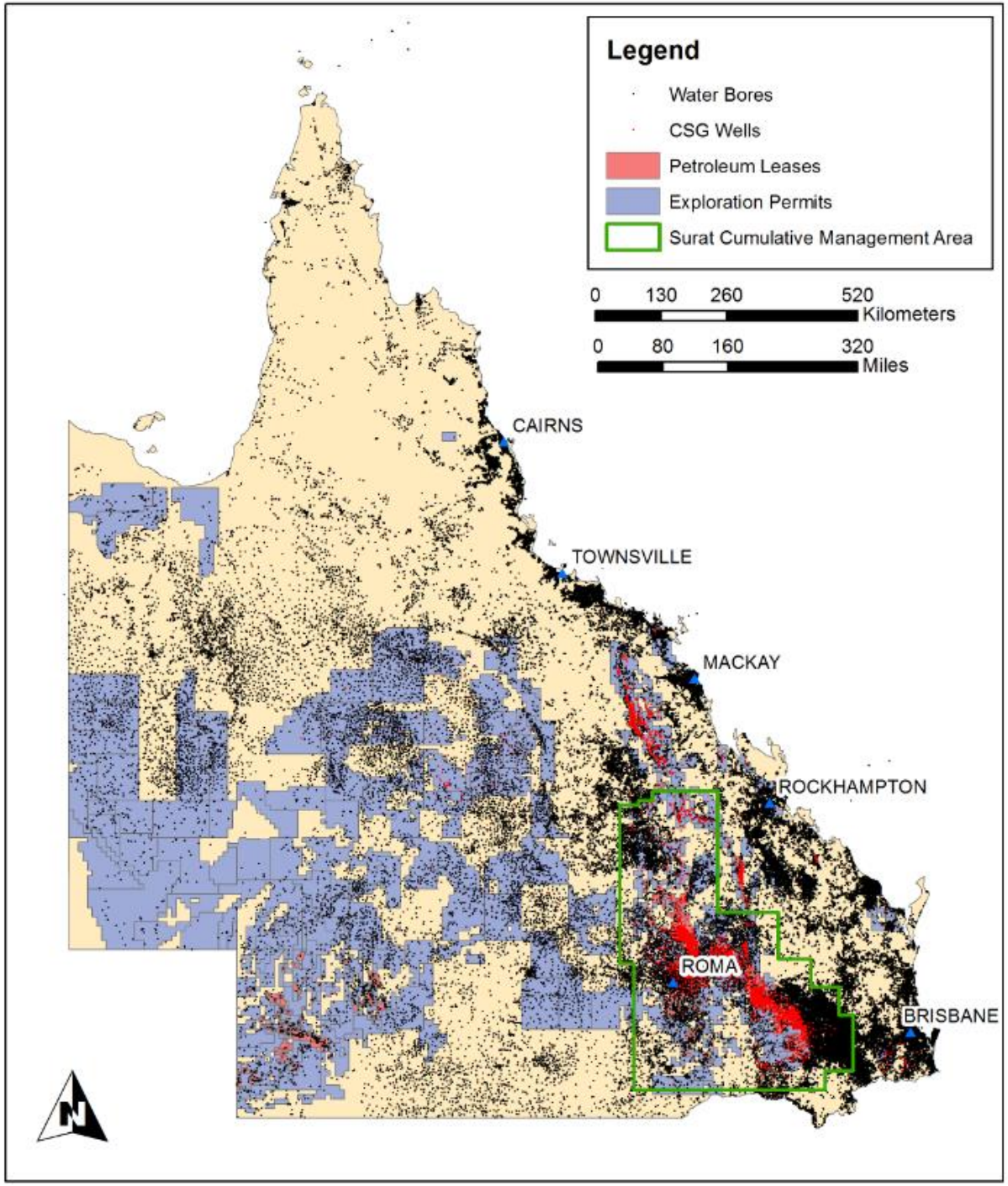
- **When its cooled into liquid form its volume is reduced to 1/600 of its original size which allows gas to be shipped and stored safely and economically to markets throughout the world.**

- **Takes about 32 hours for compressed gas to reach the LNG plants through the export pipelines.**

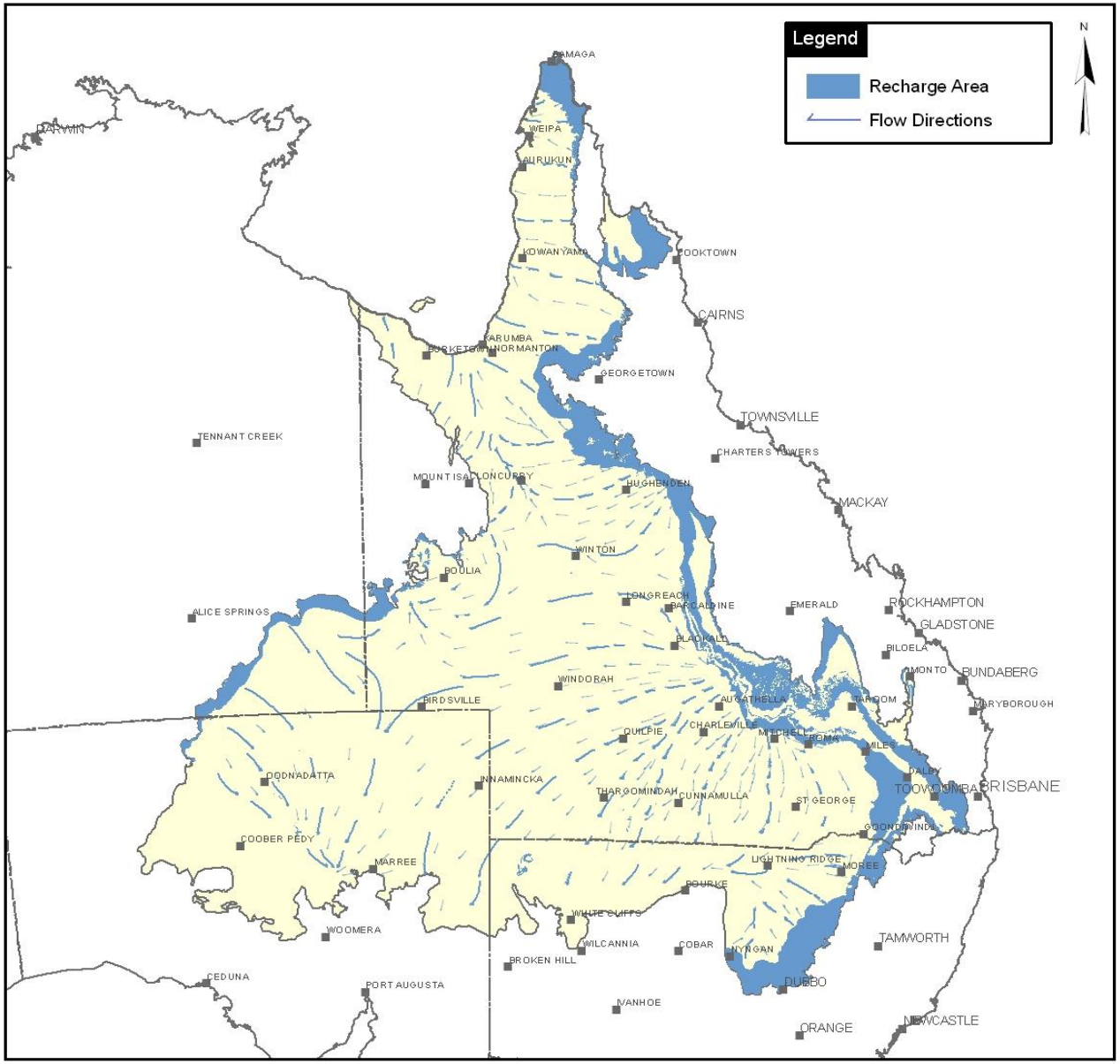
Water bores and CSG wells co-existing in the same footprint.

Several resource companies with tenures butting up against each other.

Surat Cumulative Management Area



The Great Artesian Basin

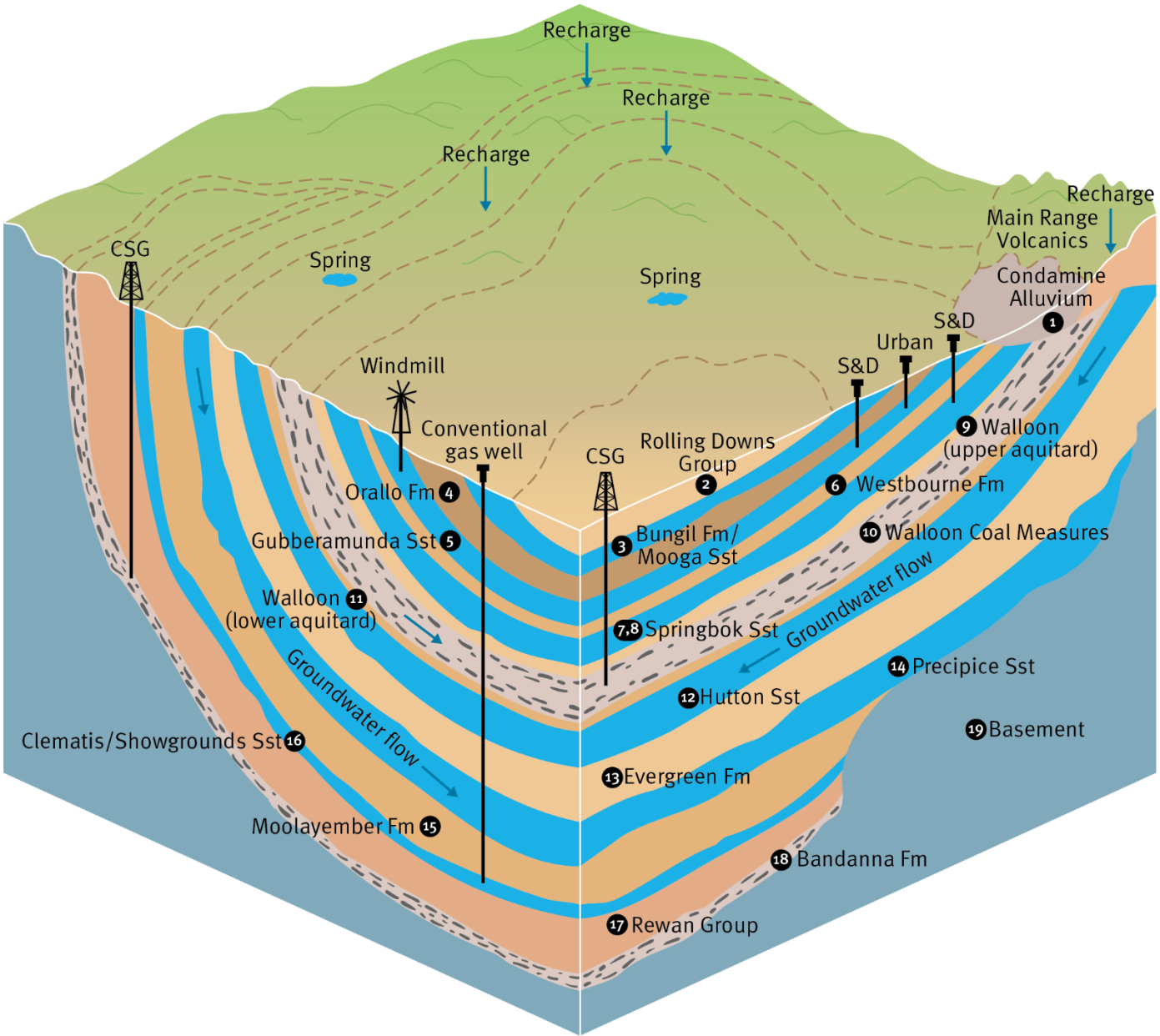


Water is stored in porous sandstone between impermeable layers of mudstone and siltstone

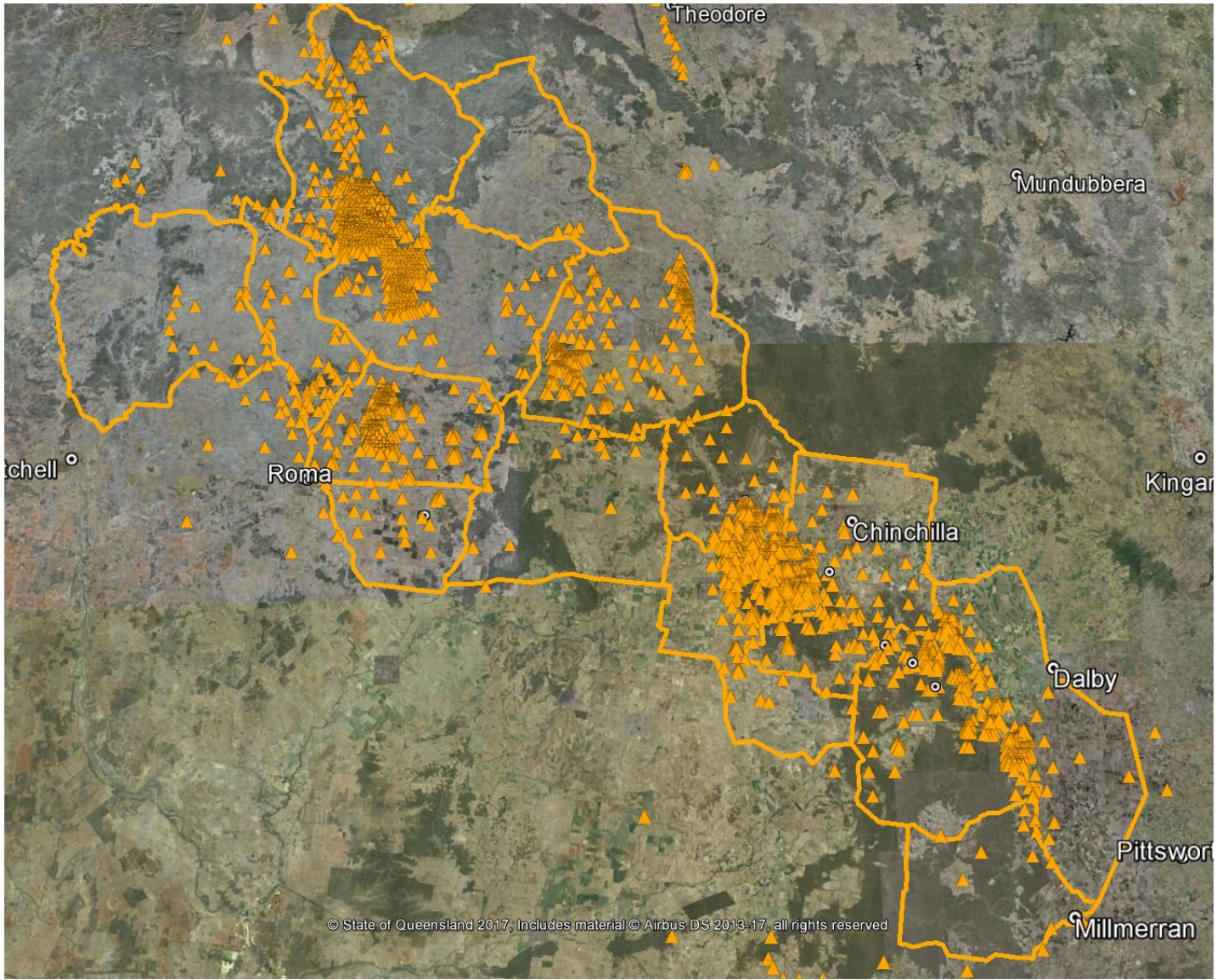
Water recharges the sandstones where they outcrop at the margins of the Basin

Movement is slow 1-5 metres per year

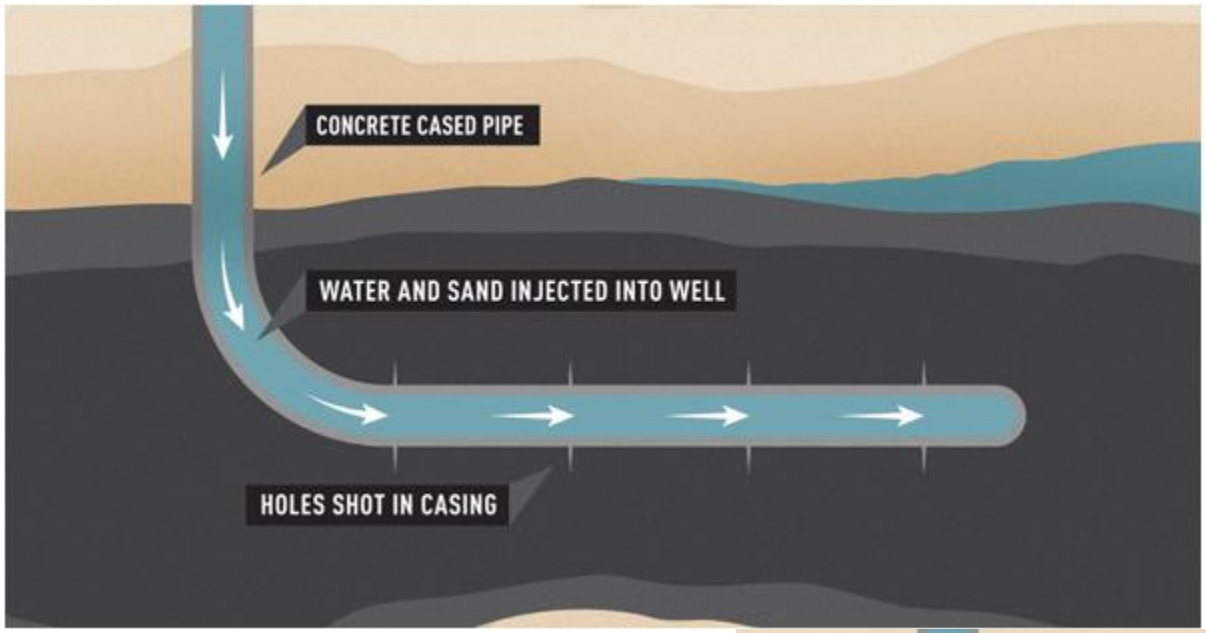
The Great Artesian Basin



Surat Basin - 8500 CSG production wells approx. 20,000 water bores



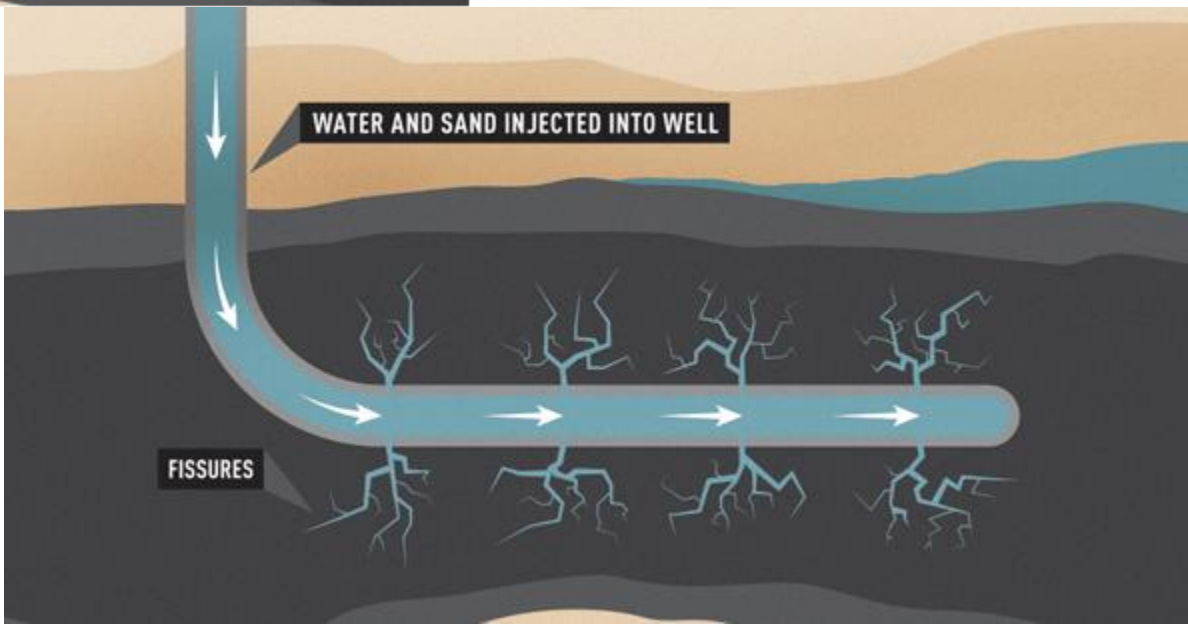
Fracking…



Hydraulic fracturing is used to enhance the natural fractures in the rock, creating new pathways to the well bore or enlarging existing ones

Because Australia has some of the world's most permeable coals it is estimated that only one out of every eight CSG wells requires fraccing.

However all tight sandstone and shale gas wells are fracced.



Petroleum and Gas Legislative and Regulatory Framework – DNRME/DEHP

- ***Petroleum and Gas (Production and Safety) Act 2004***
  - **Right to take water in the production of petroleum and gas**
  - **Management of groundwater impacts of P&G activities is through other legislation**
  - **Gas Safety**

- ***Water Act 2000 (chapter 3)***
  - **Baseline Assessments and Bore Assessments**
  - **Underground Water Impact Reports (low & high intensity)**
  - **Make Good requirement for impaired water bores**

- ***Environmental Protection Act 1994***
  - **Environmental Authorities for P&G activities**
  - **Environmental Management Plans & CSG Water Management Plans**
  - **Adaptive management approach**

CSG Compliance Unit (CSGCU)

- **A one-stop shop for community/landholder issues, concerns or enquiries relating to CSG**

- **Department of Natural Resources and Mines**

- **A multidisciplinary team with expertise in:**
  - **Groundwater**
  - **Environmental management**
  - **Land access and compliance; and**
  - **Community engagement**

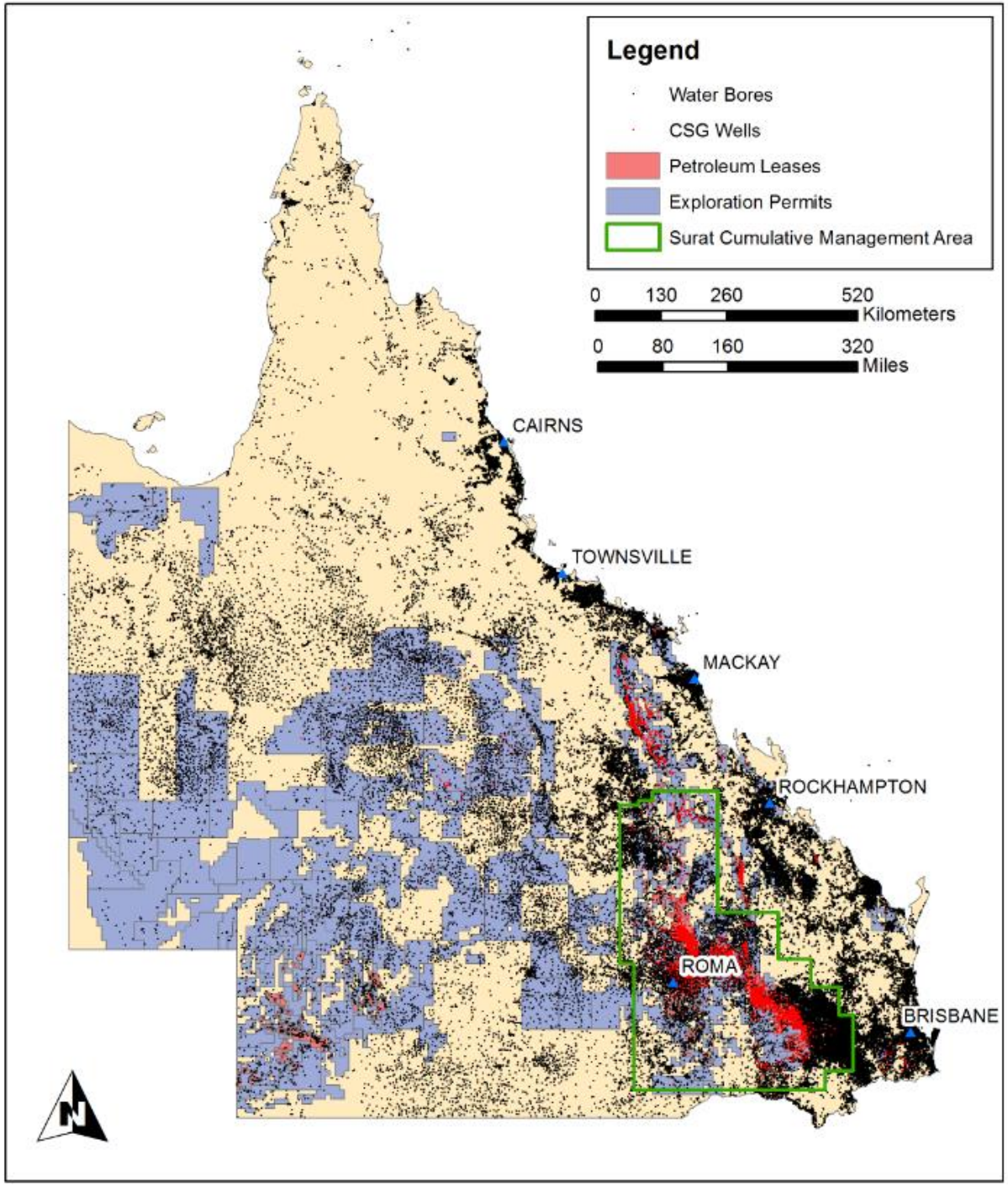
- **Investigates landholder complaints relating to CSG industry, including complaints about water bore impacts**

Groundwater Investigation & Assessment Team (GIAT)

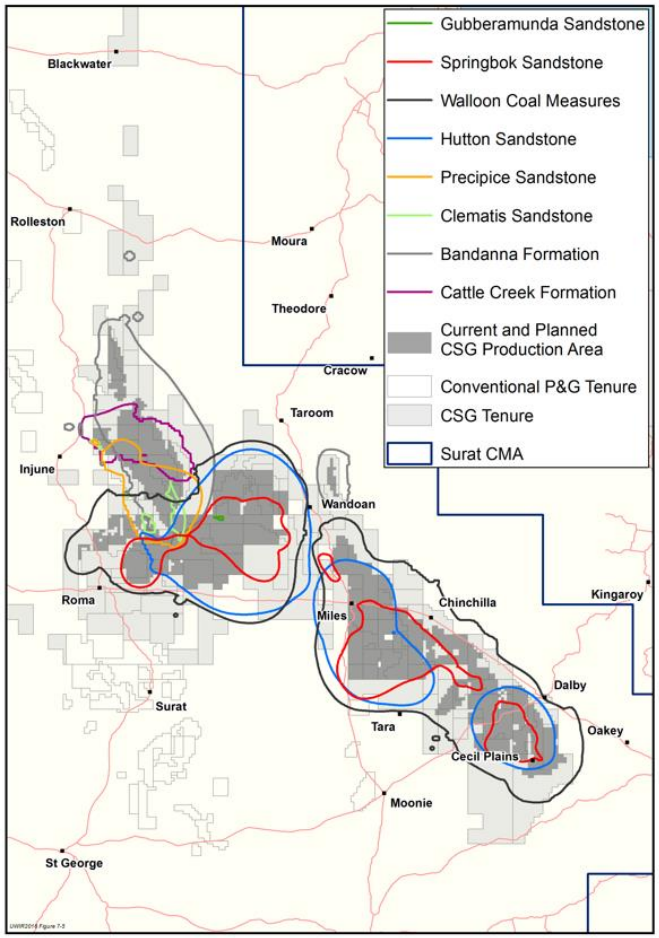
- Groundwater investigations of potentially impaired bores.
- Implement and report on an independent monitoring program – Groundwater Net and Groundwater Online
- Audit water monitoring bore construction and monitoring procedures.
- Community and industry engagement

Surat Cumulative Management Area

water bores and CSG wells co-existing in the same footprint.

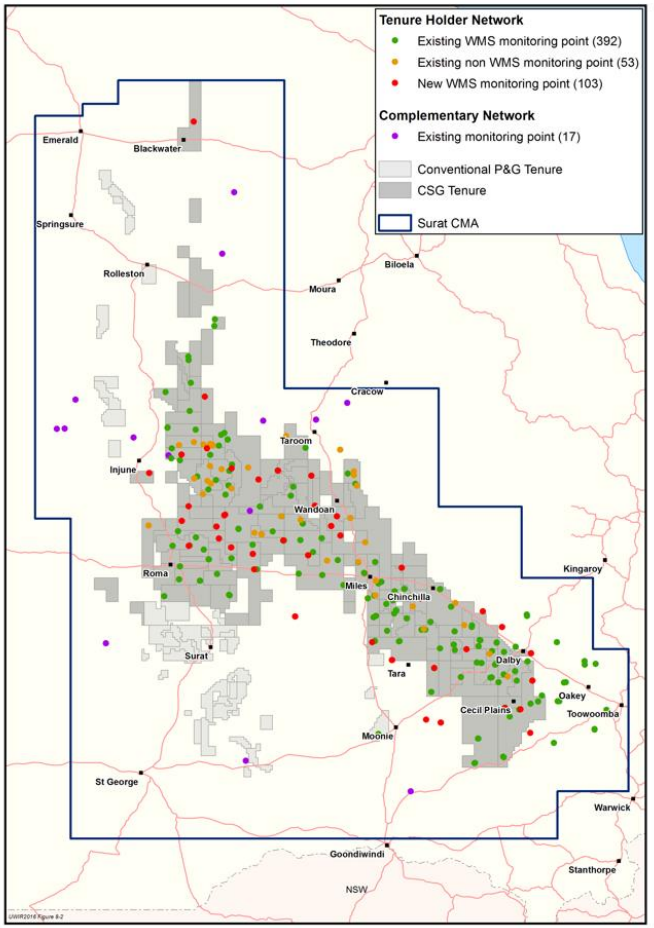


Groundwater Impacts of the CSG Industry



Surat Cumulative Management Area

- **~ 25000 registered water bores**
- **~ 8500 CSG wells**



Surat Underground Water Impact Report Identified:

- **91 bores impacted before 2019**
- **459 bores impacted long term**

Groundwater investigations of potentially impaired bores

- **Common concerns**
- **Falling water levels**
- **Diminished supply**
- **Change in water quality**
- **Increased gas in bore**

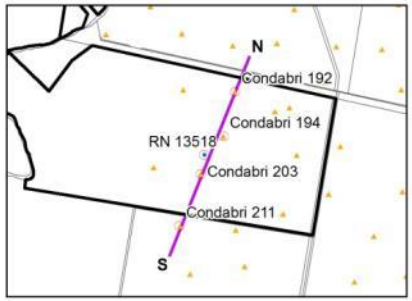
- **Non CSG issues**
  - **What aquifer is my bore targeting?**
  - **Is my bore registered/licensed?**

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**

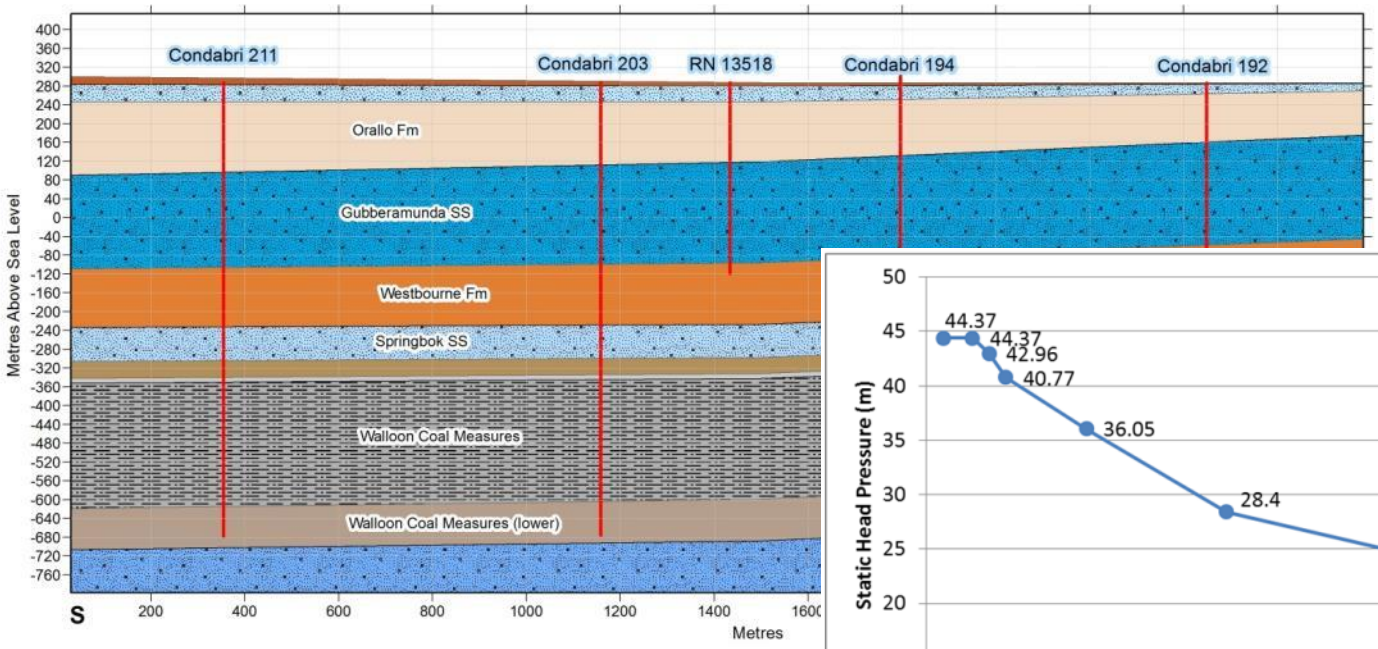


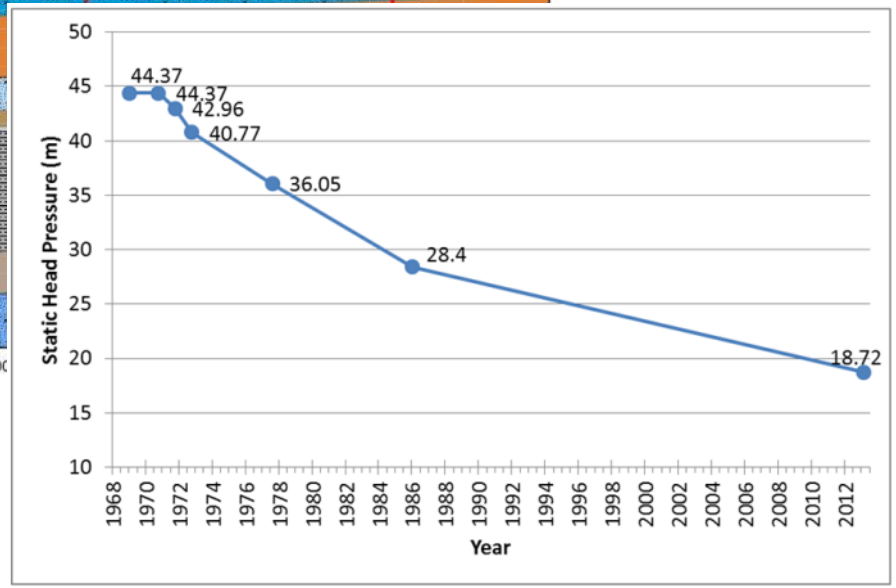
Legend

Geological Formations

- Aquitard, Griman Ck Fm Surat Siltstone and Wallumbilla Fm
- Major Aquifer, Bungil Fm and Mooga SS
- Aquitard, Orallo Fm
- Major Aquifer, Gubberamunda SS
- Aquitard, Westbourne Fm
- Major Aquifer, Springbok SS
- Aquitard, Springbok SS (lower)
- Aquitard, Walloon Coal Measures (upper)
- Productive Coal Measures, Walloon Coal Measures
- Aquitard, Walloon Coal Measures (lower)
- Major Aquifer, Hutton/Marburg SS

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.





Investigation into a report of diminished supply

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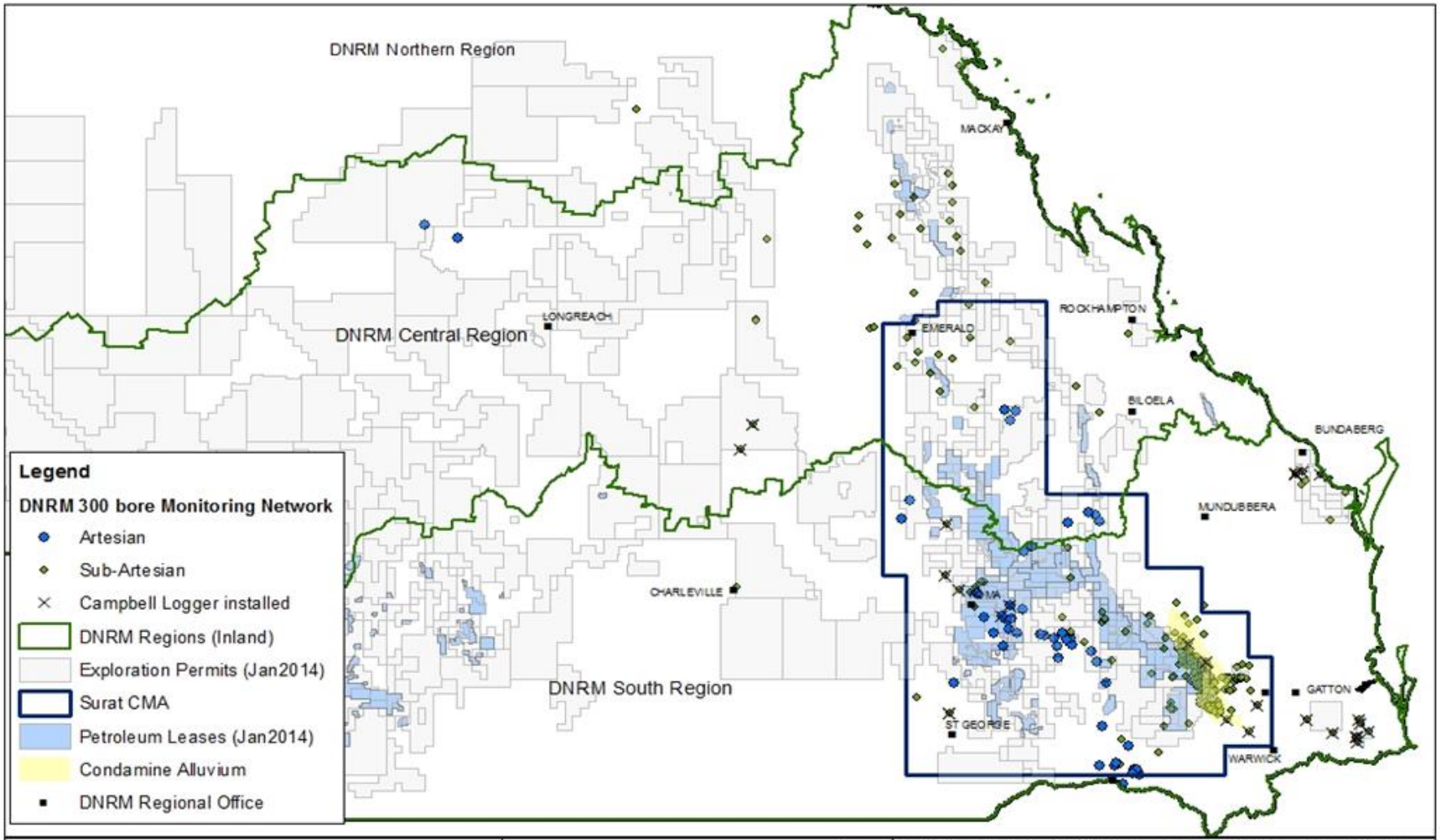
  - Confirm bore construction details and assess current condition (this may involve taking a downhole video)
- Consider:
  - History of regional declines
  - Water extraction from surrounding CSG wells and the potential for impacts to the bore in question
  - Water extraction from surrounding water bores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

INVESTIGATION REPORT
BORE RN 123456

John Smith
Roma

Contents

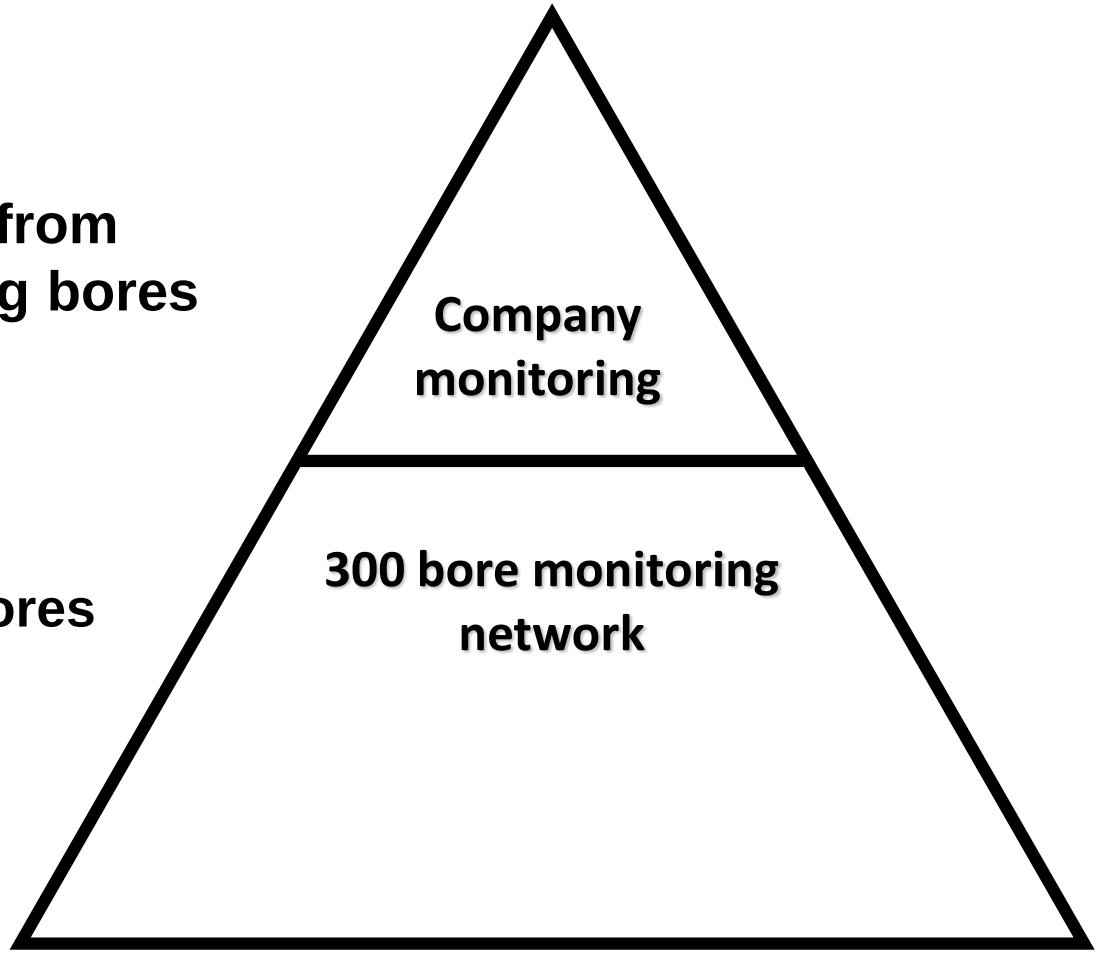
DNRM's Previous Independent Bore Monitoring Program



Previous CSG Groundwater Monitoring Arrangements

Audited monitoring from dedicated monitoring bores

Government and private bores manually measured 1 – 4 times/yr



CSG Groundwater Monitoring

- **Company Monitoring**
- Dedicated monitoring bores,
- audited by CSGCU

- **CSG Online**
- At least 60 strategically located bores equipped with loggers and telemetry and monitored continuously
- **CSG Net**
- Broadscale monitoring of bores by landholders across the Surat Basin

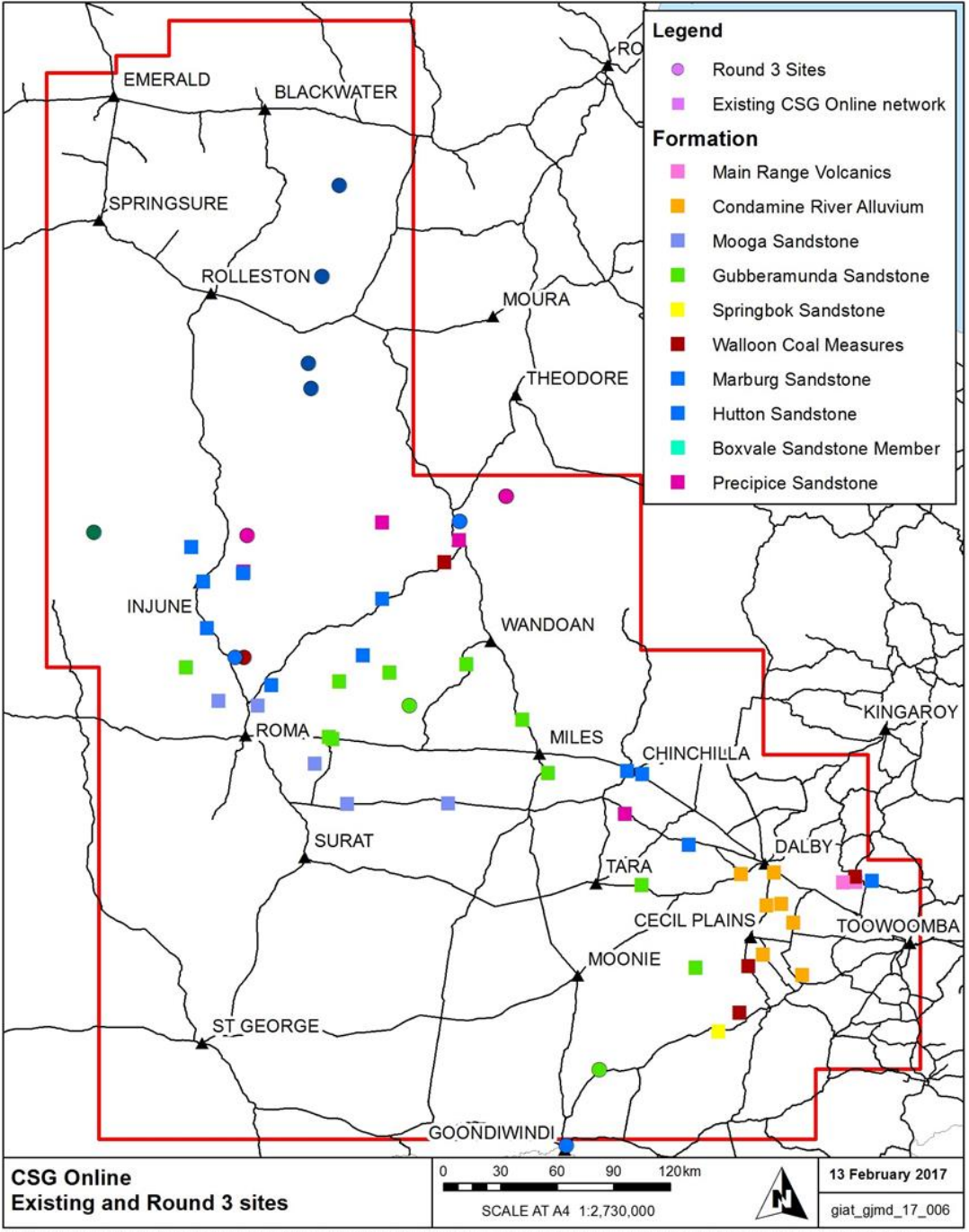
Qld Govt. independent groundwater monitoring network

Broad objectives of CSG Net & CSG Online

- **Additional monitoring of CSG extraction impacts**
- **Cross check of industry monitoring**
- **Contribute to the improvement of landholder knowledge in relation to local geology, hydrogeology, aquifer performance and bore pumping characteristics**

Groundwater Net (community groundwater monitoring program)

- **Landholders monitoring their own bores in or adjacent to areas of resource development**
- **Information on local hydrogeology and bore monitoring techniques**
- **Collect, store and report**
- **Annual forum for sharing information**



Groundwater Online

- **Installation of 60 continuous monitoring loggers**
- **Data is transmitted via telemetry using either the mobile phone or satellite networks**
- **Data used to review water level trends in surrounding areas.**

CSG Online

Installation of 60 continuous monitoring loggers

3 year program to December 2017

Available to public ‘Live and On-line’

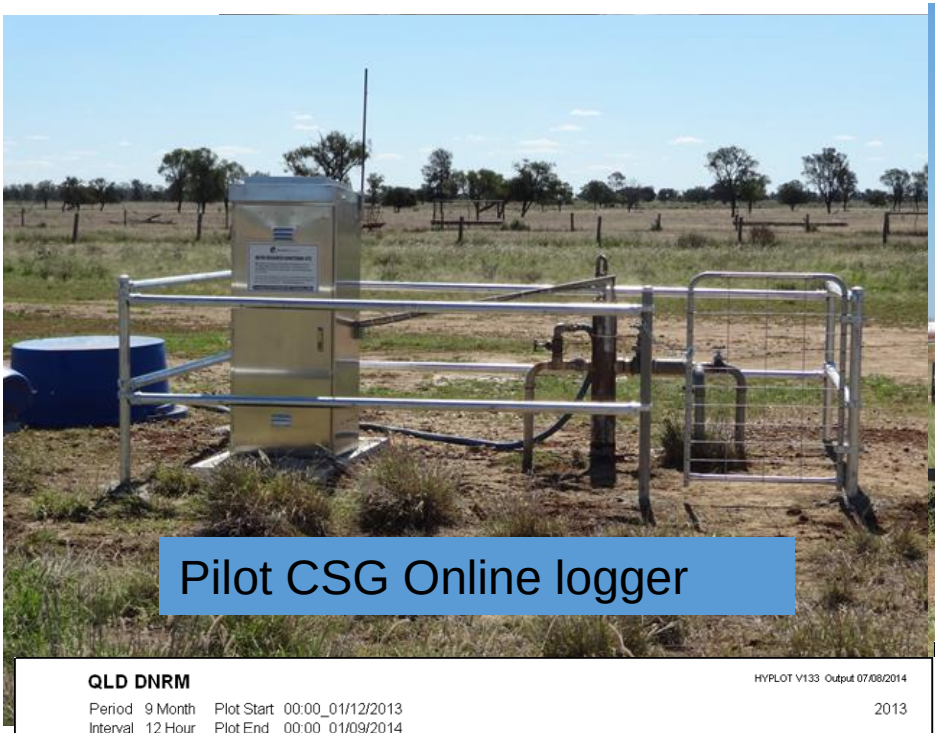
CSG Online

- Initial site selection

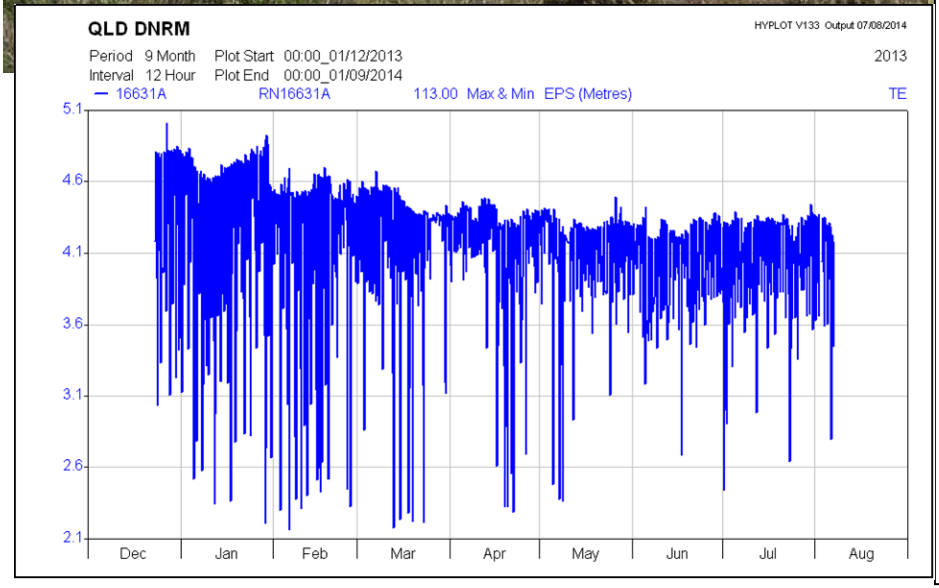
CSG Online

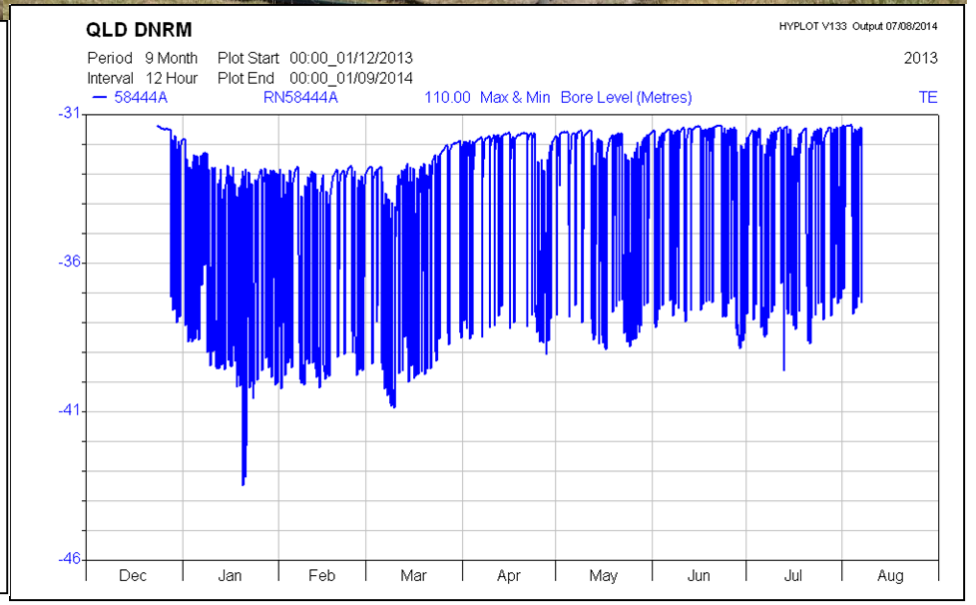
- Installation of telemetry equipped water level logger

Wallumbilla South CSG Net Group – Pilot Project Sept 2013



Pilot CSG Online logger





CSG Net annual report

Queensland Government

Department of **Natural Reso**

Wallumbilla South C

Annual groundwater

Contents

Background

The Wallumbilla South CSG Net Group was established on the 11 September 2013 with support from the Department of Natural Resources and Mines (DNRM) CSG Compliance Unit (CSGCU). The group was formed amid landholder concerns for the impacts of Coal Seam Gas (CSG) activities on their private water bores.

CSG Net aims to assist landholders to effectively monitor water levels in their own water bores. The water level data is then forwarded on to DNRM where it is stored on the Groundwater Database.

History of gas industry in Ro

The gas industry has had a presence in Roma and the surrounding area since the early 1900s, with major development during the 1960s through to the 1980s. Due to the depletion of the conventional gas fields, these types of operations have come to a close.

Conventional gas is generally an accumulation of gas that has migrated from its source somewhere deep in a basin and has been trapped within a

The long history of gas and oil exploration and production in the area has led to the presence of a number of legacy wells. Some have been converted to water bores that would fail to meet the high standards of construction required today. Many of these wells/bores have left a number of water bearing formations directly connected to each other. This provides possible pathways for water and/or gas to move between formations where normally movement would not occur.

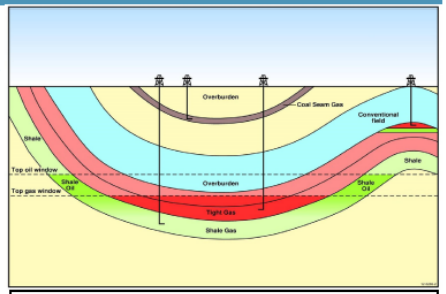


Figure 1: *Diagram showing conventional gas accumulation on the right and unconventional gas types in the centre.*

Hydrogeology

Wallumbilla South is located in the Surat Basin of the Great Artesian Basin (GAB) and is comprised of a sequence of alternating layers of permeable sandstone aquifers and shale, siltstone and mudstone aquitards. These formations generally dip in a south-westerly direction, the typical direction of the flow of groundwater within the Surat Basin.

Groundwater in the GAB moves very slowly at velocities ranging from 1 to 5 metres per year.

As seen in *Figure 2* on page 3, the predominant aquifers in the Surat Basin are the Bungil Formation, Mooga Sandstone, the Gubberamunda Sandstone, the Springbok Sandstone, the Hutton Sandstone and the Precipice Sandstone.

The major aquitards are the Wallumbilla Formation, Griman Creek Formation, the Orallo Formation, the Westbourne Formation, the Walloon Coal Measures and the Evergreen Formation.

The Springbok Sandstone is variable and in places has a high content of low permeability mudstone and siltstone. The Wallooon Coal Measures is the target formation for CSG in the this area and consists of mudstone and narrow coal seams.

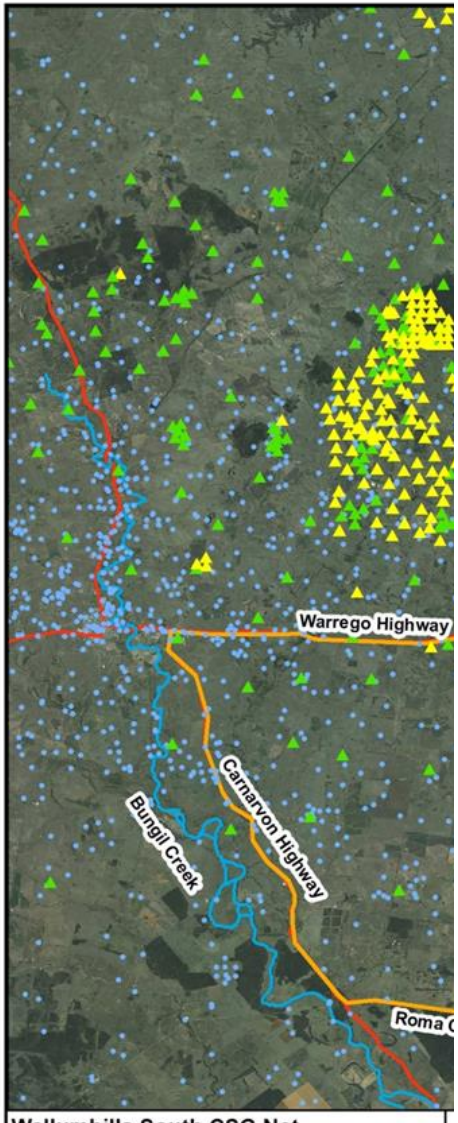
Underlying the Surat Basin is the Bowen Basin. This consists of the Moolayember Formation and the Clematis Sandstone which are aquifers and the Rewan Group which is an aquitard.

Gas separator trial

There have been a number of issues with gas affecting water bores in the Wallumbilla South area. This led to the trial of a gas separator that was recovered from a landholders property and renovated. The gas separator was installed on Lee McNicholl's bore by DNRM staff with the assistance of Steve Gray, who obtains water by agreement from the bore. It appears that this has not worked as well as hoped. CSGCU is currently working with CSG companies on what methods of separation may work.

The CSIRO have since been contracted to carry out research in a number of areas related to gas in water bores. Research areas include:

- Australian research into gas in water bores, in particular those in the Surat and Bowen Basins including assessment of the occurrence, volume, stable isotopic composition and source formation of the gas
- International sampling techniques and protocols to collect representative groundwater samples of dissolved or free gas
- Methods for determining methane gas migration potential including gas migration processes and mitigating factors affecting vertical/lateral gas migration.



Summary

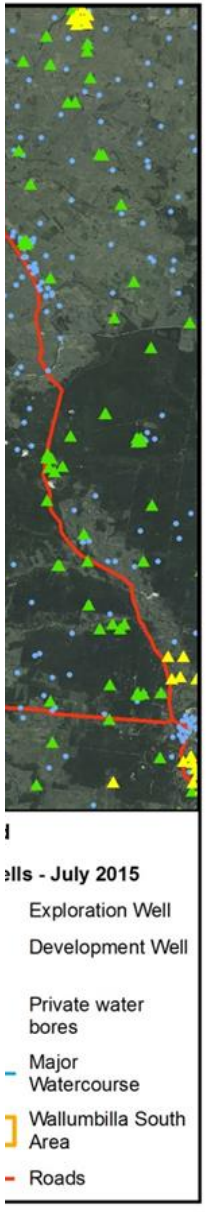
Groundwater data in Wallumbilla South is available from CSG Net, CSG Online and the Santos monitoring program. Wallumbilla South CSG Net has provided a total of 70 measurements from 10 bores this year. There are two CSG Online bores within Wallumbilla South that have been online since December 2013. Santos has provided data from 16 different monitoring points from within Wallumbilla South from September 2014 to April 2015.

Overall it appears that groundwater levels and static heads in Wallumbilla South over the past twelve months have remained relatively stable. CSG Online bore RN 16631 and some Santos monitoring bores are showing signs of decline in the Mooga Sandstone in certain areas. However, at this stage the rate of decline is no more than can be expected in many GAB aquifers across the Surat Basin.

The Surat Basin as a whole is showing long term declines in water levels and static heads. This long term decline coupled with the likely commencement of CSG production in the area makes continued and regular monitoring of the resource all the more important.

There are now ten CSG Net groups that have been established across the Surat Basin. The DNRM's CSG Compliance Unit is working on the establishment of more groups as well as the continued expansion of the CSG Online network.

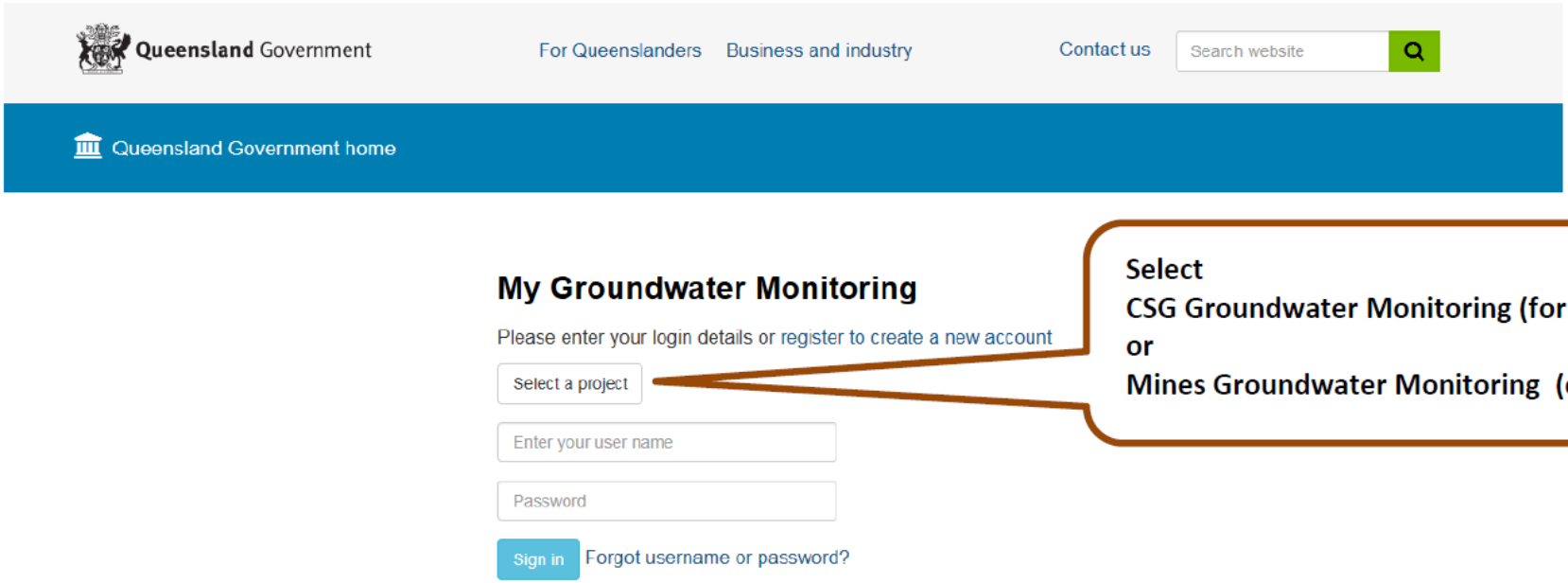
It has been encouraging to see standing water level and static head pressure measurements coming from the Wallumbilla South CSG Net Group over the past two years. This data has been added to the GWDB and is providing DNRM with some much needed information on system performance and groundwater levels in the area. Monitoring your own bore can provide an early warning to changes in water levels/static heads in your immediate area and can indicate maintenance issues associated with the pump or the physical condition of the bore.



My Groundwater Monitoring Quick Guide for Users

Logon to My Groundwater Monitoring

https://www.dnrm.qld.gov.au/qld/my-groundwater-monitoring



Online lodgement of water bore monitoring data by landholders – My Groundwater Monitoring

My Groundwater Monitoring

Add new measurement | Print

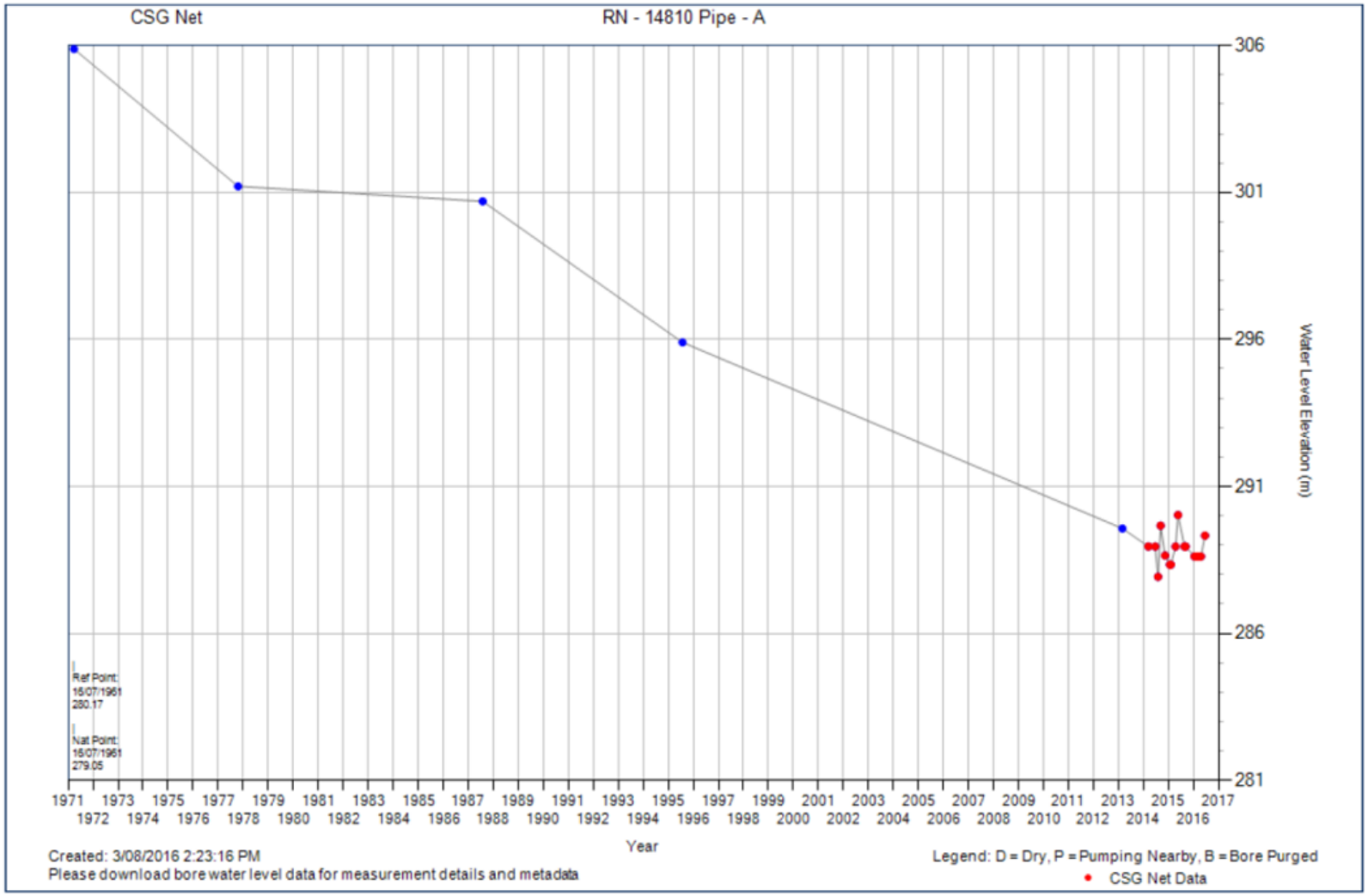
Registered bore 11351

Bore type	Artesian
Bore name	BIDGOODS BORE
Distance from RP to ground	0.50 metres Change reference point
Download:	Bore location map (PDF) Bore details report (PDF) Water level plot (PDF)

Previous five measurements

Measurement date	Pipe	Measurement recorded	Collection method	Water level measurement below RP
10/11/2015	A	2.00 Metres	Pressure Gauge	2.00 Metres
9/11/2015	A	45 Kilopascals	Pressure Gauge	4.60 Metres
5/11/2015	A	4.00 Metres	Pressure Gauge	4.00 Metres

Online lodgement of water bore monitoring data by landholders – My Groundwater Monitoring



GWOL - Groundwater Online Admin (v1.3)

Welcome Mabbie Elson

> Bore Groups > **Query Bore Groups**

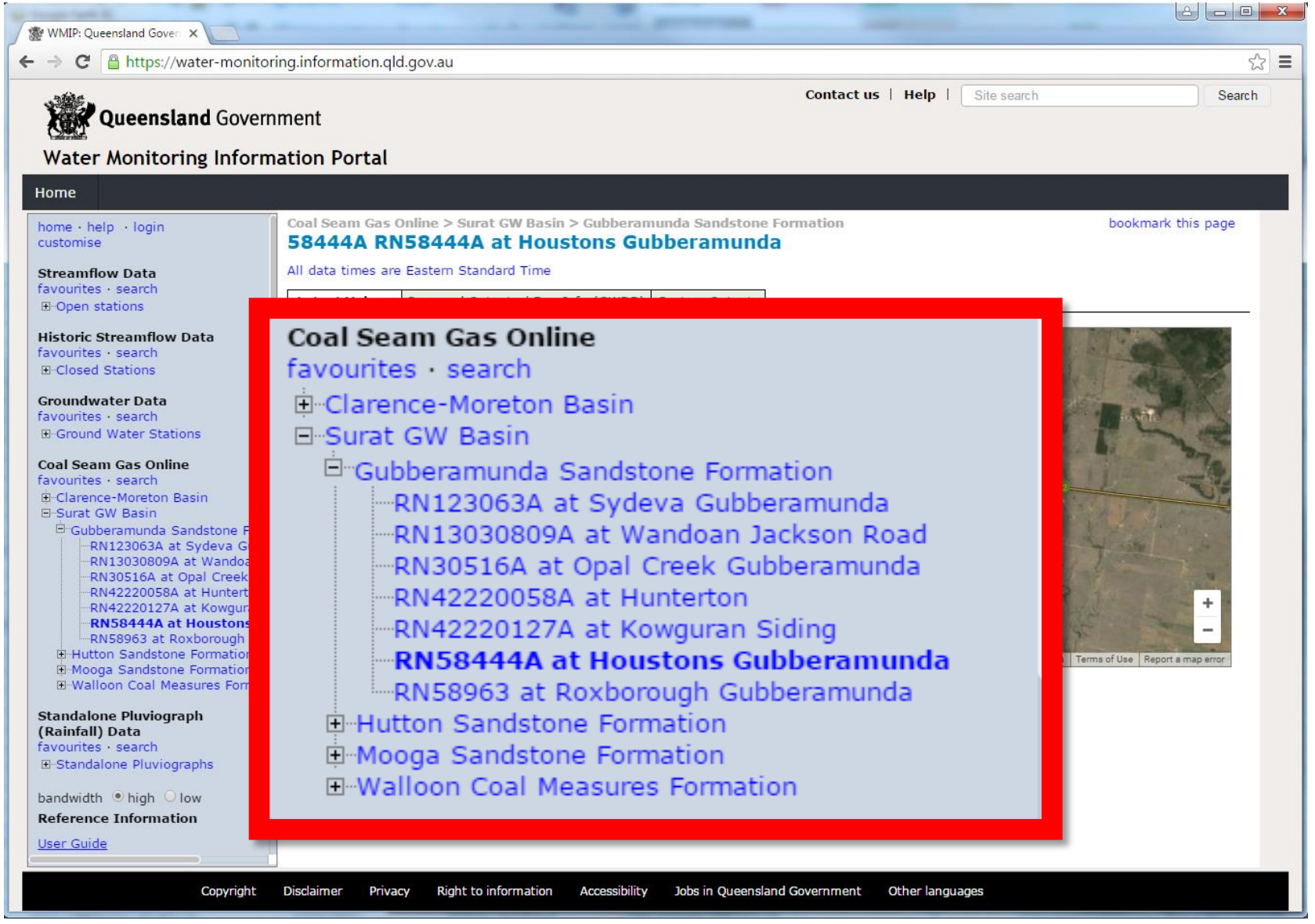
- External Requests
  - Query Requests
  - View New Requests
  - Created By Me
  - Create New Request
- Maintain Clients
  - Query Clients
  - Query Clients by Client Request
  - Query Clients by Client Bore
  - Create New Client
- Maintain Client Requests
  - Query Client Requests
  - Create New Client Request
- Water Level Measurements
  - Query WL Measurements
  - Create New WL Measurement
- Reference Point Measurements
  - Query RP Measurements
  - Create New RP Measurement

Project: -- all -- Bore Group No: -- all -- Provide keywords of Name or Description

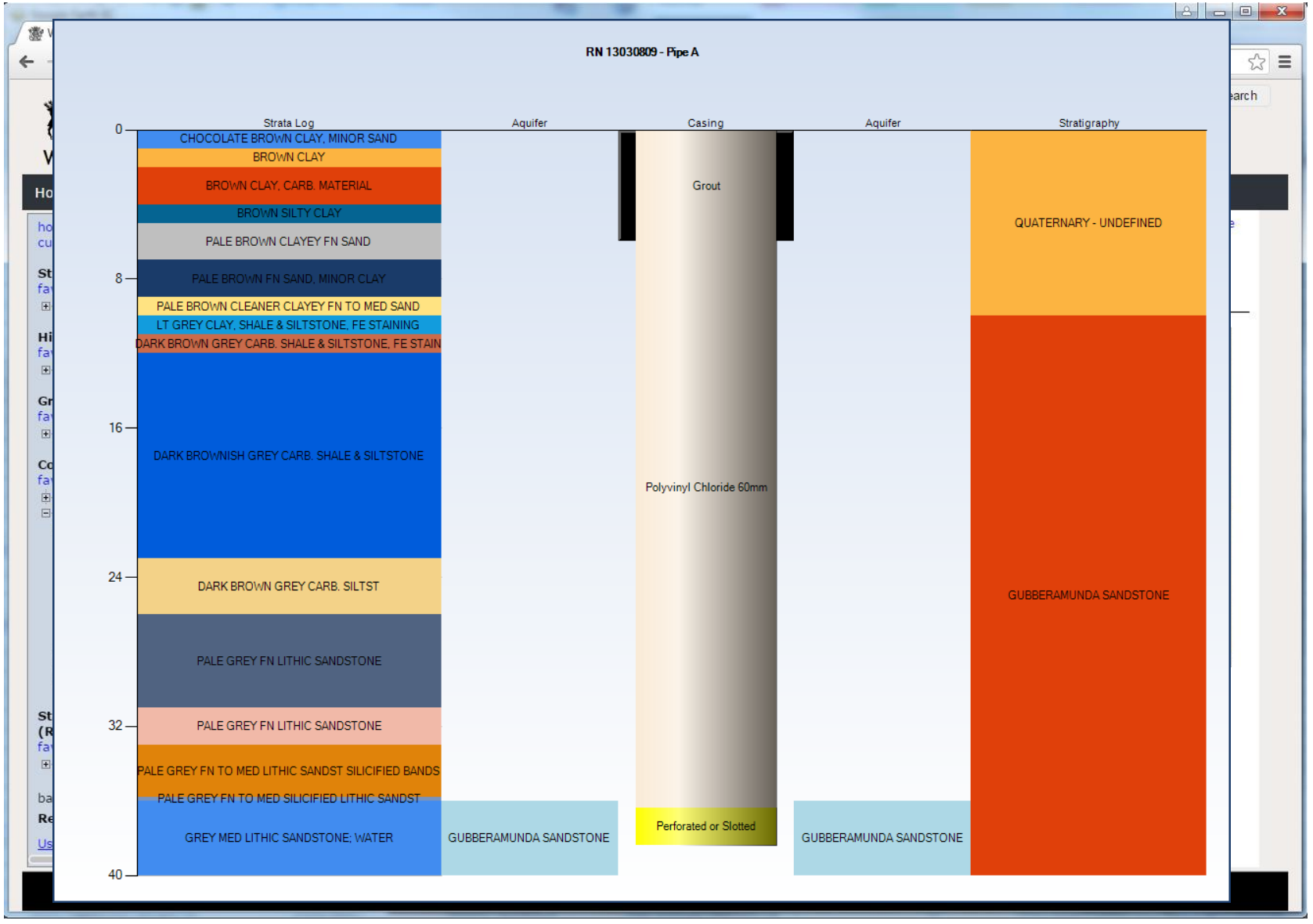
Records = 17 Reset Filters

	Project	Bore Group No	Name	Start Date	End Date	Description
Details	CSGNET	1	Eurombah Creek	11/06/2014		CSGNET LANDHOLDER MONITORING GROUP
Details	CSGNET	2	Injune Southwest	5/02/2014		CSGNET LANDHOLDER BORE MONITORING GROUP
Details	CSGNET	3	Injune East	30/10/2014		CSGNET LANDHOLDER BORE MONITORING GROUP
Details	CSGNET	4	Wallumbilla North	10/09/2014		CSGNET LANDHOLDER BORE MONITORING GROUP
Details	CSGNET	5	Wallumbilla South	20/02/2012		CSGNET LANDHOLDER BORE MONITORING GROUP
Details	CSGNET	6	Taroom West	11/02/2015		CSGNET LANDHOLDER BORE MONITORING PROGRAM
Details	CSGNET	7	Wandoan	28/10/2015		CSGNET LANDHOLDER BORE MONITORING GROUP
Details	CSGNET	8	Noonga-dulacca	15/10/2015		CSGNET LANDHOLDER BORE MONITORING GROUP
Details	CSGNET	9	Miles/drillham	15/10/2015		CSGNET BORE MONITORING GROUP
Details	CSGNET	10	Condamine	2/10/2014		CSGNET LANDHOLDER BORE MONITORING GROUP
Details	CSGNET	11	Chinchilla	21/04/2015		CSGNET LANDHOLDER BORE MONITORING GROUP - INCLUDES TARA
Details	CSGNET	12	Kumbarilla	27/05/2015		CSGNET LANDHOLDER BORE MONITORING GROUP
Details	CSGNET	13	Millmerran South	26/05/2015		CSGNET LANDHOLDER BORE MONITORING GROUP
Details	CSGNET	14	Goondiwindi	18/08/2015		CSGNET LANDHOLDER BASED BORE MONITORING GROUP
Details	CSGNET	16	Individuals	1/07/2015		Bore Owners without a CSGNET group
Details	MINENET	15	Acland	1/10/2015		CSGNET LANDHOLDER BASED BORE MONITORING GROUP
Details	MINENET	16	Kingaroy	1/07/2016		CSGNET LANDHOLDER BASED BORE MONITORING GROUP

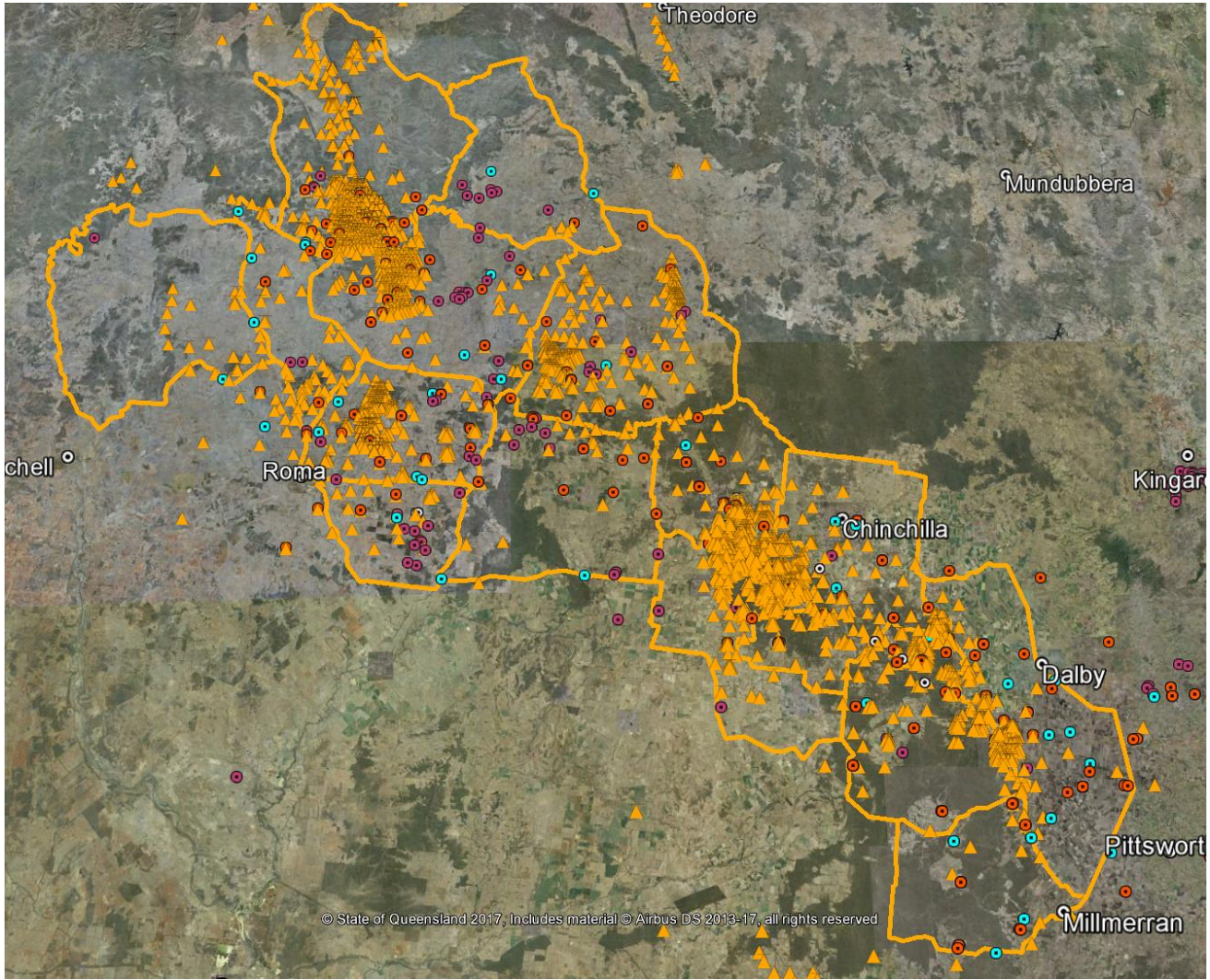
Water Monitoring Portal



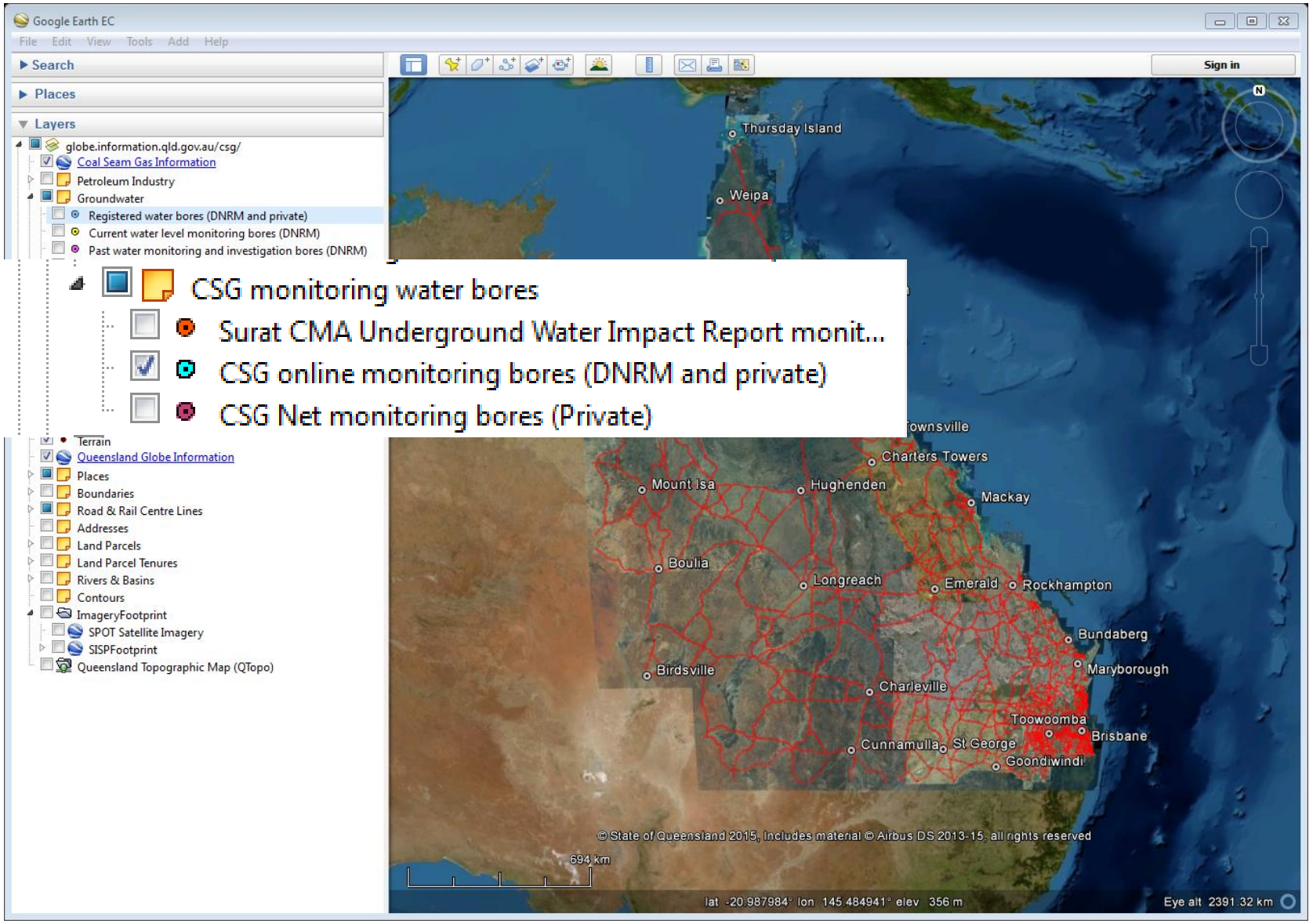
Water Monitoring Portal



Queensland Globe monitoring – landholder, company, government



QLD Globe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Coal Seam Gas Information
Petroleum Industry
Groundwater
Registered water bores (DNRM and private)
Current water level monitoring bores (DNRM)
Past water monitoring and investigation bores (DNRM)
CSG monitoring water bores
Surat CMA Underground Water Impact Report monit...
CSG online monitoring bores (DNRM and private)
CSG Net monitoring bores (Private)
Terrain
Queensland Globe Information
Places
Boundaries
Road & Rail Centre Lines
Addresses
Land Parcels
Land Parcel Tenures
Rivers & Basins
Contours
ImageryFootprint
SPOT Satellite Imagery
SISPFootprint
Queensland Topographic Map (QTopo)
Thursday Island
Weipa
Townsville
Charters Towers
Mount Isa
Hughenden
Mackay
Boulia
Longreach
Emerald
Rockhampton
Bundaberg
Maryborough
Birdsville
Charleville
Toowoomba
Brisbane
Cunnamulla
St George
Goondiwindi
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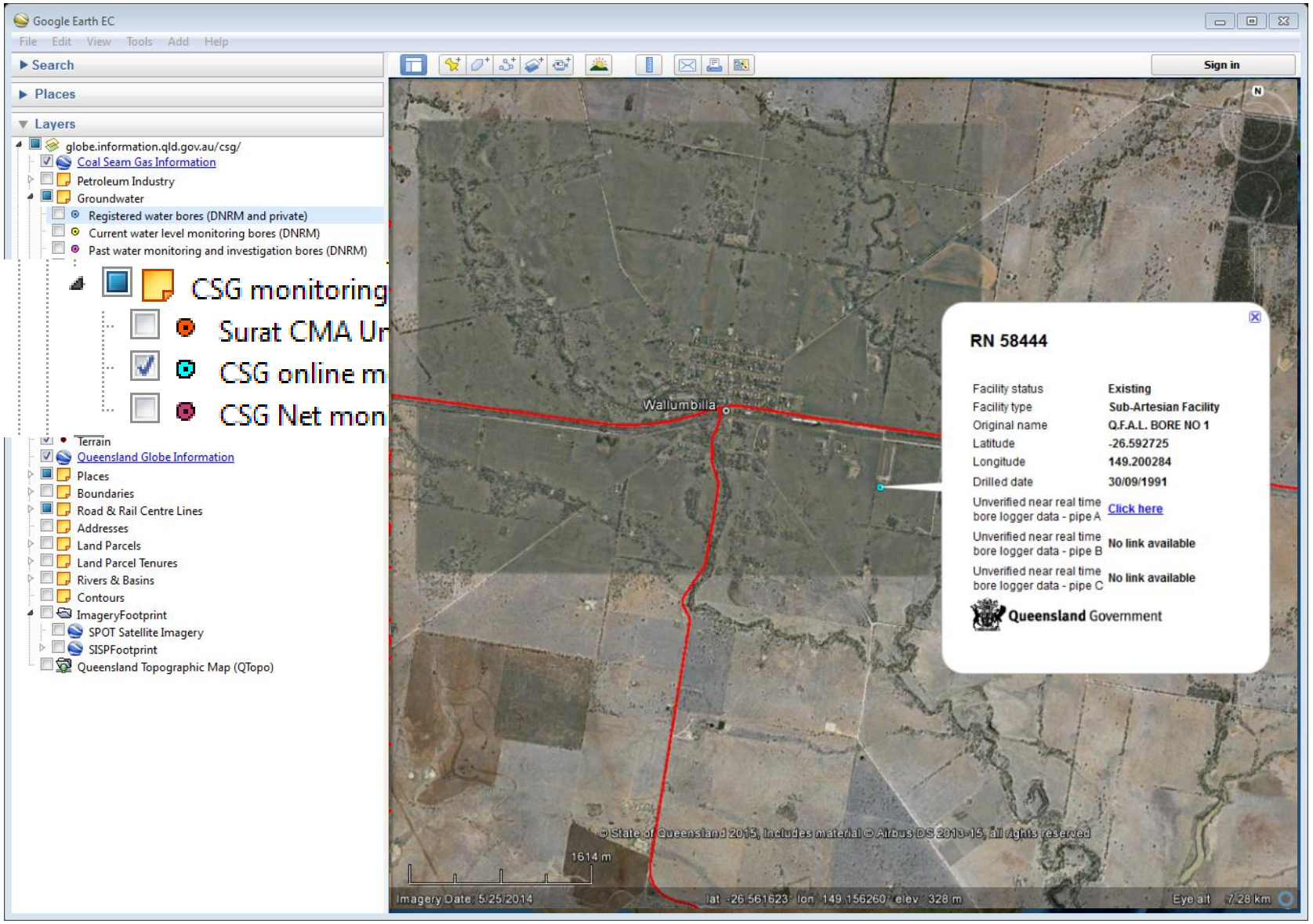
694 km
lat -20.987984° lon 145.484941° elev 356 m
Eye alt 2391.32 km

QLD Globe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ImageryFootprint
SPOT Satellite Imagery
SISPFootprint
Queensland Topographic Map (QTopo)
Wallumbilla
RN 58444
Facility status Existing
Facility type Sub-Artesian Facility
Original name Q.F.A.L. BORE NO 1
Latitude -26.592725
Longitude 149.200284
Drilled date 30/09/1991
Unverified near real time bore logger data - pipe A Click here
Unverified near real time bore logger data - pipe B No link available
Unverified near real time bore logger data - pipe C No link available
Queensland Government
© State of Queensland 2015, Includes material © Airbus DS 2013-15, all rights reserved
1614 m
Imagery Date: 5/25/2014
lat -26.561623° lon 149.156260° elev 328 m
Eye alt 7.28 km

Water Monitoring Information Portal
Bymount State School – Hutton Sandstone Formation

Queensland Government

Water Monitoring Information Portal

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Coal Seam Gas Online
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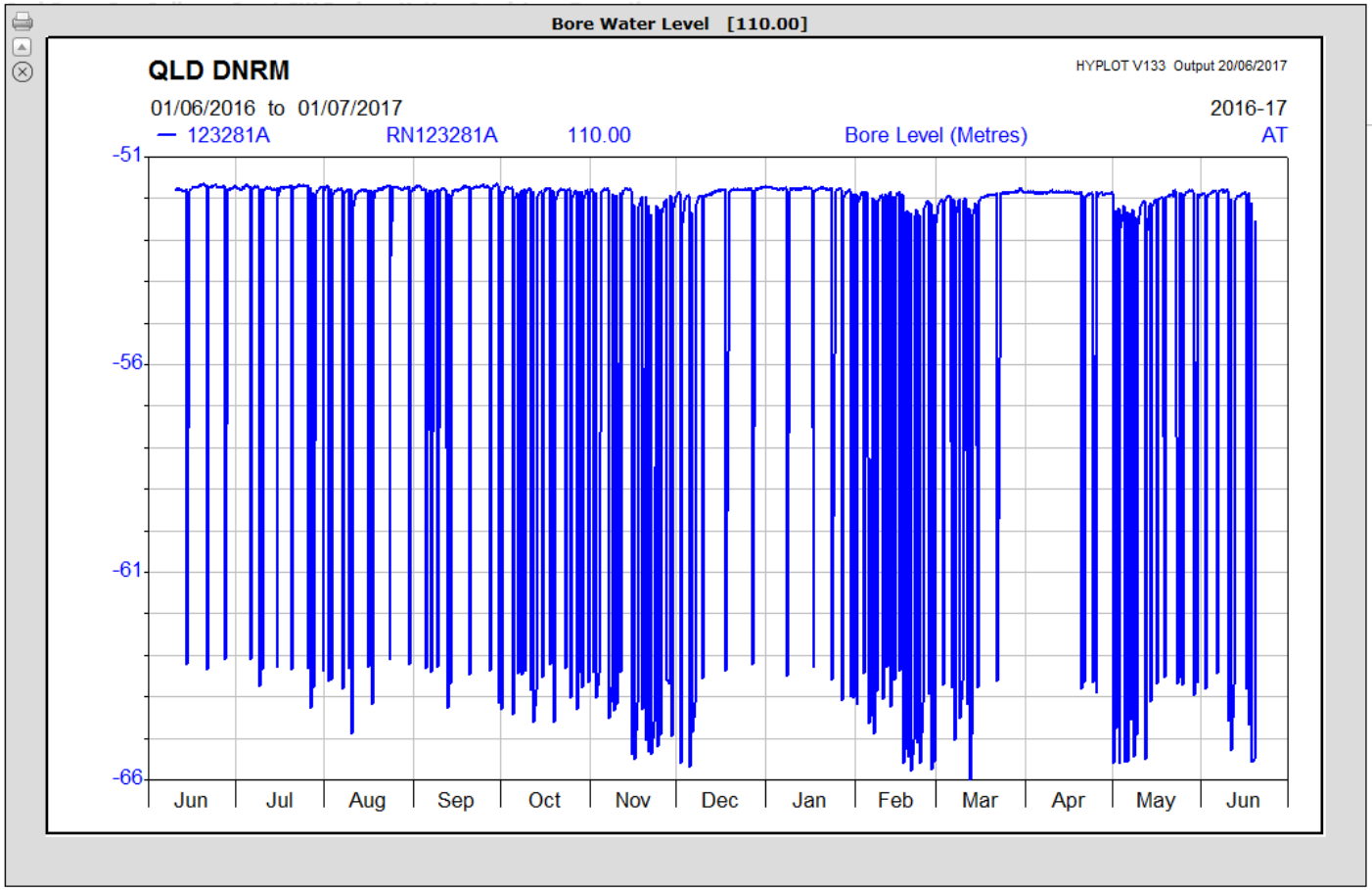
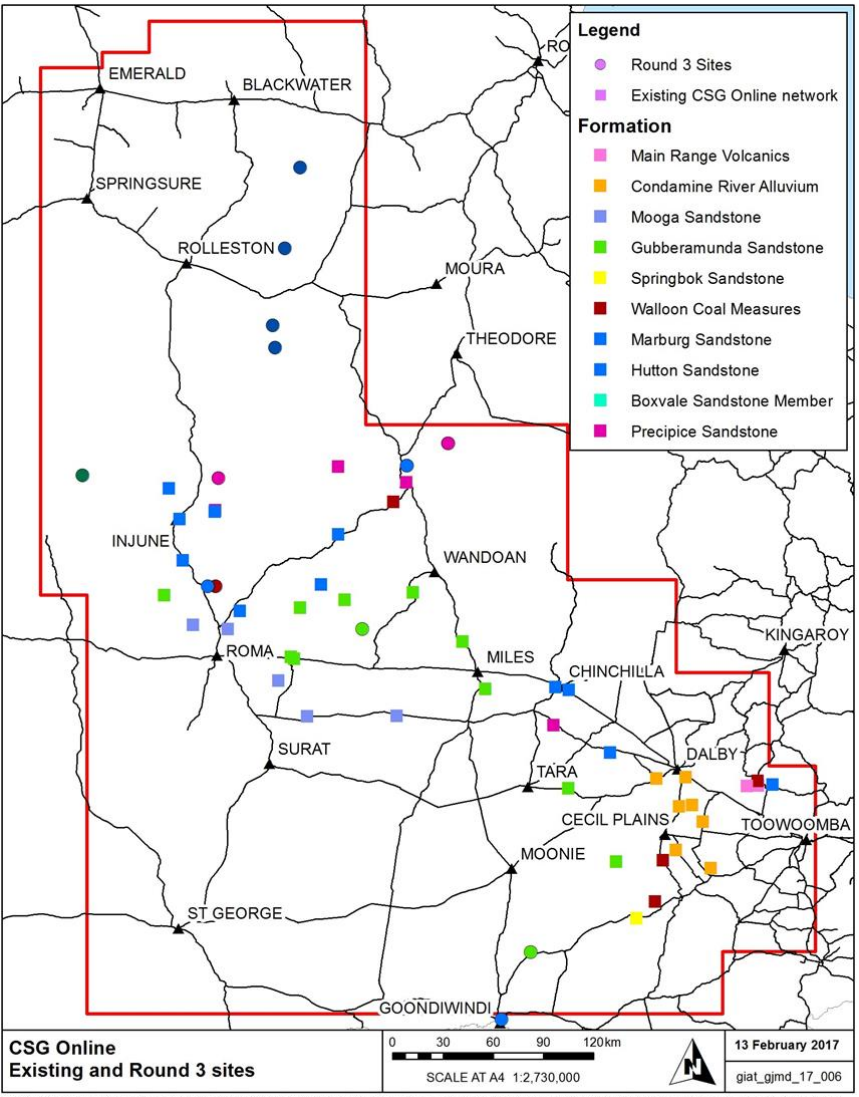
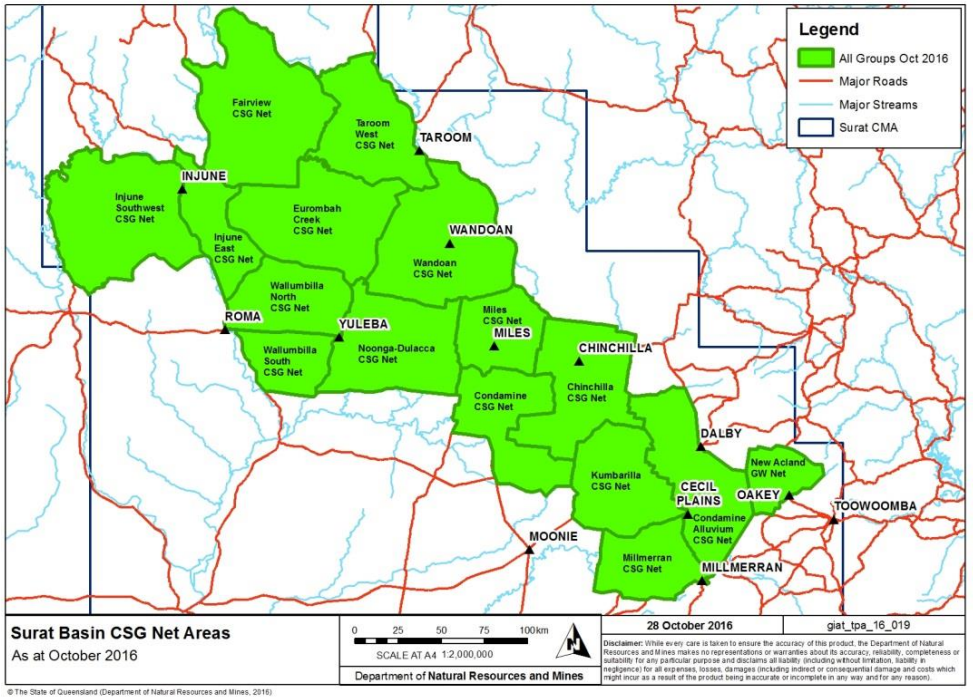
- Clarence-Moreton Basin
- Surat GW Basin
  - Boxvale Sandstone Formation
    - RN13030883A Artesian at Springrock
  - Gubberamunda Sandstone Formation
    - RN123063A at Sydeva
    - RN123318A at Wallumbilla Town Bore
    - RN13030809A at Wandoan Jackson Road
    - RN137972A off Neates Road, Weranga
    - RN14358A at Baiden
    - RN30516A at Opal Creek
    - RN42220058A at Hunterton
    - RN42220127A at Kowguran Siding
    - RN58444A at Houstons
    - RN58963 at Roxborough
  - Hutton Sandstone Formation
    - RN119493A at Chinchilla Bore
    - **RN123281A at Bymount State School**
    - RN123444A at Piccadilly
    - RN13030613A at Doboy
    - RN13030884A at Springrock
    - RN26281A at Glen Hutton
    - RN58037A at Brookfield
    - RN58729A at Brindley Park
    - RN83262A at Cattle Camp
  - Mooga Sandstone Formation
    - RN123262A at Whyworry
    - RN16631A at Iona
    - RN22798A at Appletree
    - RN42220061A at Kingull
    - RN58975A at Borabbey
  - Precipice Sandstone Formation
    - RN119965A at Edenvale Regional Monitori...
    - RN123470A at Springrock
    - RN13030882A at Springrock
    - RN32735A Artesian at Taroom Town Bore
    - RN62284A at Parraweena
  - Springbok Sandstone Formation
    - RN147598A at Bitadirt
  - Walloon Coal Measures Formation
    - RN107312A at Captains Mountain
    - RN13030814A at Taroom Roma Road



Groundwater Net / Groundwater Online



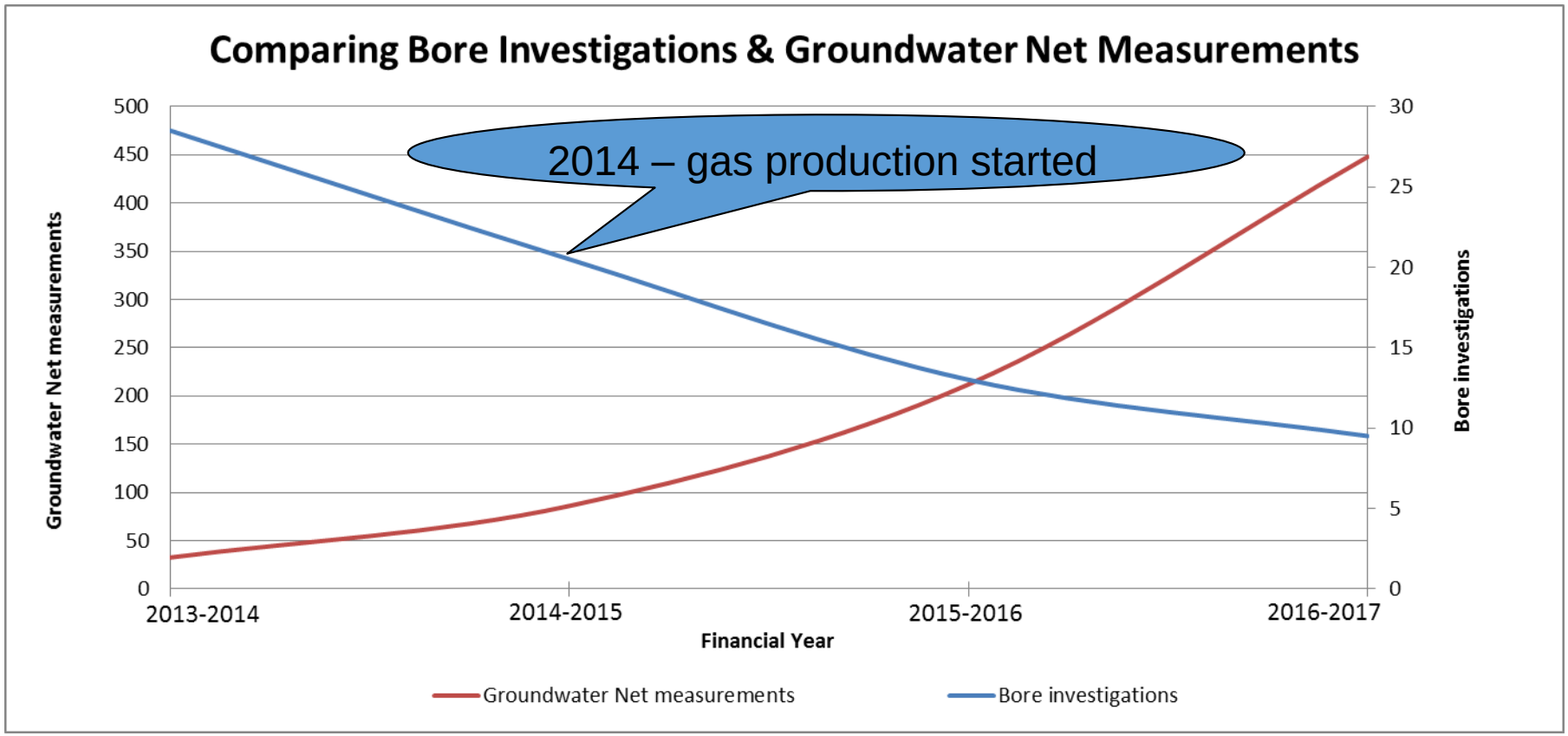


- **16 landholder monitoring groups formed**
- **80 bores monitored – 800 landholder measurements**
- **60 bores equipped with continuous loggers**
- **Data freely available – transparent access**
- **Origin / QMDC monitoring equipment subsidy scheme $300,000 (GIAT facilitated)**
- **Expansion into other areas of resource development (Galilee Basin)**

Outcomes

- Landholders are more knowledgeable, and feel involved, empowered and protected.
- Government has a transparent, effective and efficient monitoring network.
- Monitoring results are used to independently verify CSG company monitoring providing enhanced community confidence in the industry.
- Effectively involving stakeholders provides a forum for engaging in robust discussions about current groundwater issues.

Our proactive and transparent approach is paying dividends



Industry recognition of the value of CSG Net - funding subsidy

- **Origin monitoring subsidy scheme providing $300,000 over 3 years**
- **Application process/funding/monitoring - managed by Queensland Murray Darling Committee (QMDC)**
- **Eligible - landholders/bore owners within CSG Net areas**
- **Up to 75% of the cost of installation of monitoring equipment**
- **Commitment - minimum of 4 water level readings per year**
- **Kick off 2017 (launch, letters to bore owners, networks, workshops)**

QMDC / Origin Subsidy Scheme for Monitoring Equipment

- Subsidy covers 75% of cost of purchase and installation of monitoring equipment

Audit CSG Company Monitoring Bore Construction Integrity & Monitoring Procedures

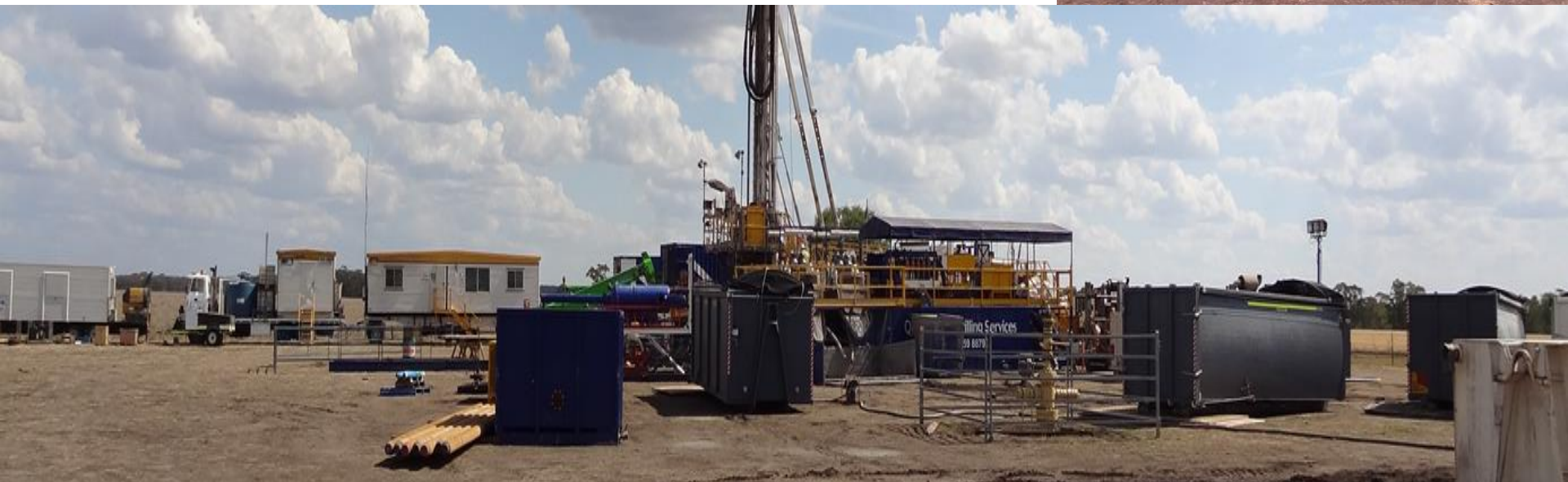
Ensure monitoring bores meet, Minimum Construction Standards or,
Code of Practice for CSG wells

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 Construction Techniques and Procedures

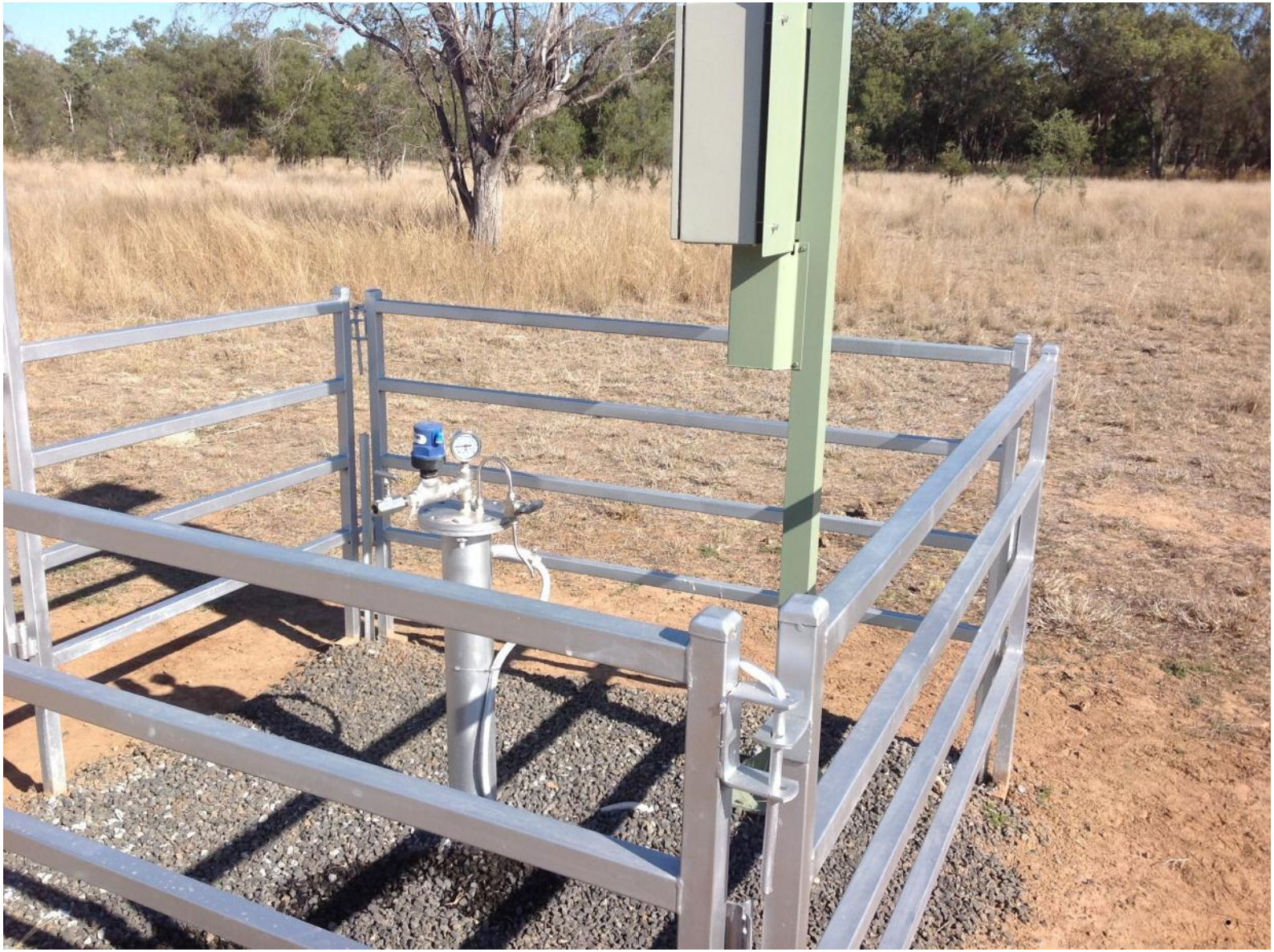
GW Monitoring Bore Construction Integrity Audits

- **The objective of the audits is to assess compliance with the relevant drilling standards and or codes and involves;**
  - **Site inspections/audits of new monitoring bore installations.**
  - **Review of monitoring bore completion reports.**



Audit CSG Company Monitoring Bore Construction Techniques and Procedures

Completed CSG Water Monitoring Bore

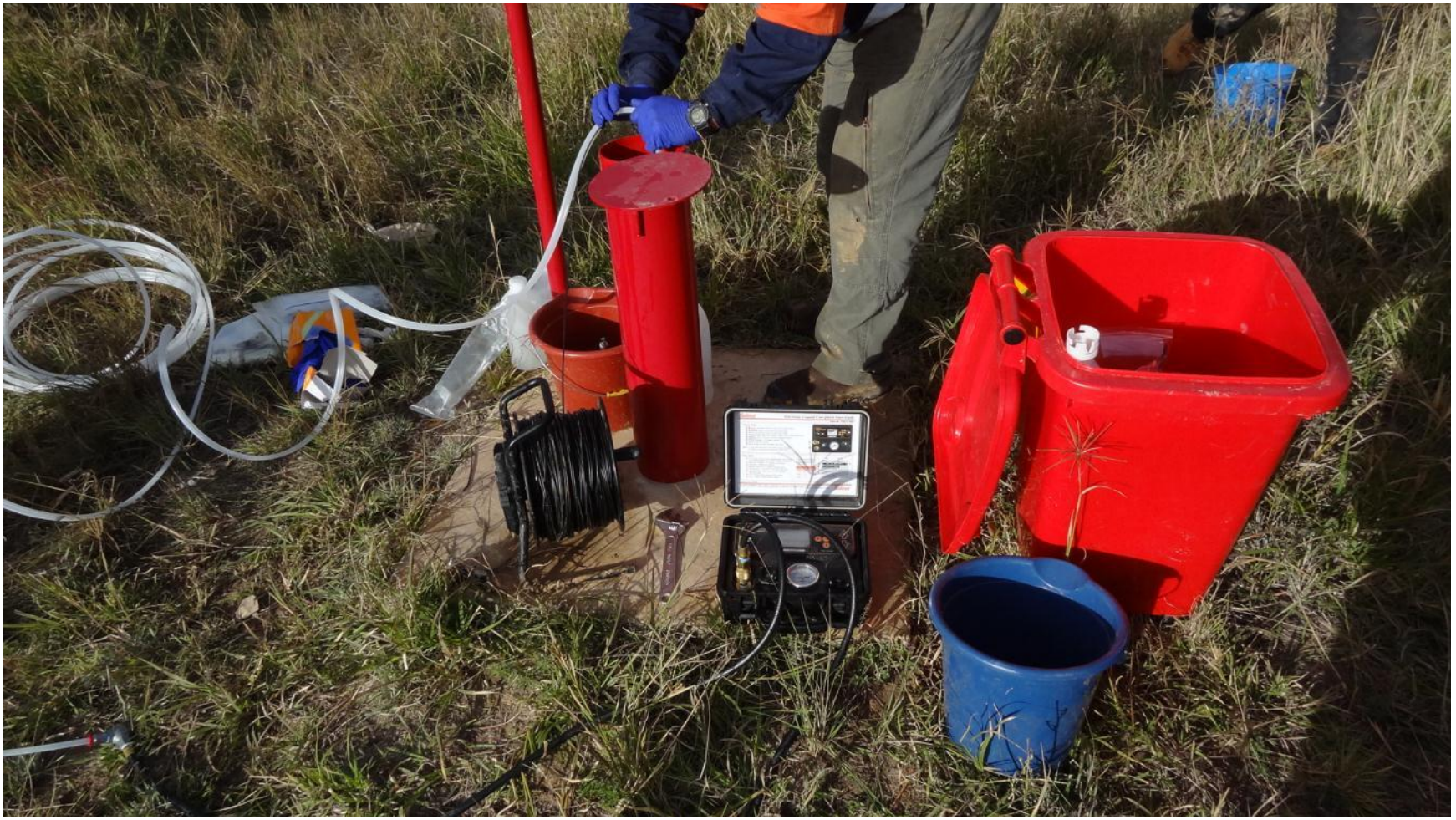


Completed CSG Water Monitoring Bore

Completed CSG Water Monitoring Bore ready for manual monitoring

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

Engagement with Industry and Stakeholders on CSG Development and Impacts

Involving NRM / Landcare

NRM / Landcare contracted to:

Assist with the formation of new CSG Net groups.

Support landholders in groundwater monitoring and data submission.

Use existing networks to further engage landholders.

Maintain communication between CSG Net groups and the department.

Involving Pump Suppliers

Pump companies important conduit to landholders

Encourage landholders to install airlines whenever installing / maintaining pumps

Annual workshops to provide support and share information & methods

GIAT Research Projects

- **Gas in Water Bores Stage 1 - Literature review and Information Sheet ‘Methane in Water Bores’ (CSIRO)**
- **Stage 2 - Operational procedures for undertaking field investigations and Decision Support Tool (CSIRO)**
- **Stage 3 - Impacts from gas on bores (KCB)**
- **Microbial Aspects of Groundwater Quality & CSG (Smith-Comeskey GW Science)**

Roma gas works (ca. 1906) – plant for separating natural gas from artesian water (Source: State Library of Queensland)

Stories from the vault

“The Water Supply Department intended to take measures to separate the gas from the water, and convert the flow from the two bores into one flow, which will be available for the use of the townspeople. If the efforts to be made to secure the gas be successful, it will be possible, it is hoped, to use it for illuminating purposes, which will be incalculable advantage to Roma.” (The Brisbane Courier (Brisbane), Saturday 8 December 1900, page 11)

Groundwater issues in strategic resource development areas

Baseline data collection

- **Galilee – strategic monitoring near proposed coal mines**
- **Cooper – developing a GW monitoring plan, characterising hydrocarbon signatures**

Local area investigations

- **Galilee – water quality mapping (salinity concerns)**
- **Cooper – assessing aquifer sources/connectivity for priority groundwater supplies (e.g. local government water supply bores) or to characterise potential hydrogeological complexities at local-scale (e.g. aquifer connectivity across faults)**

Galilee Basin - Priorities for 1st 10 loggers

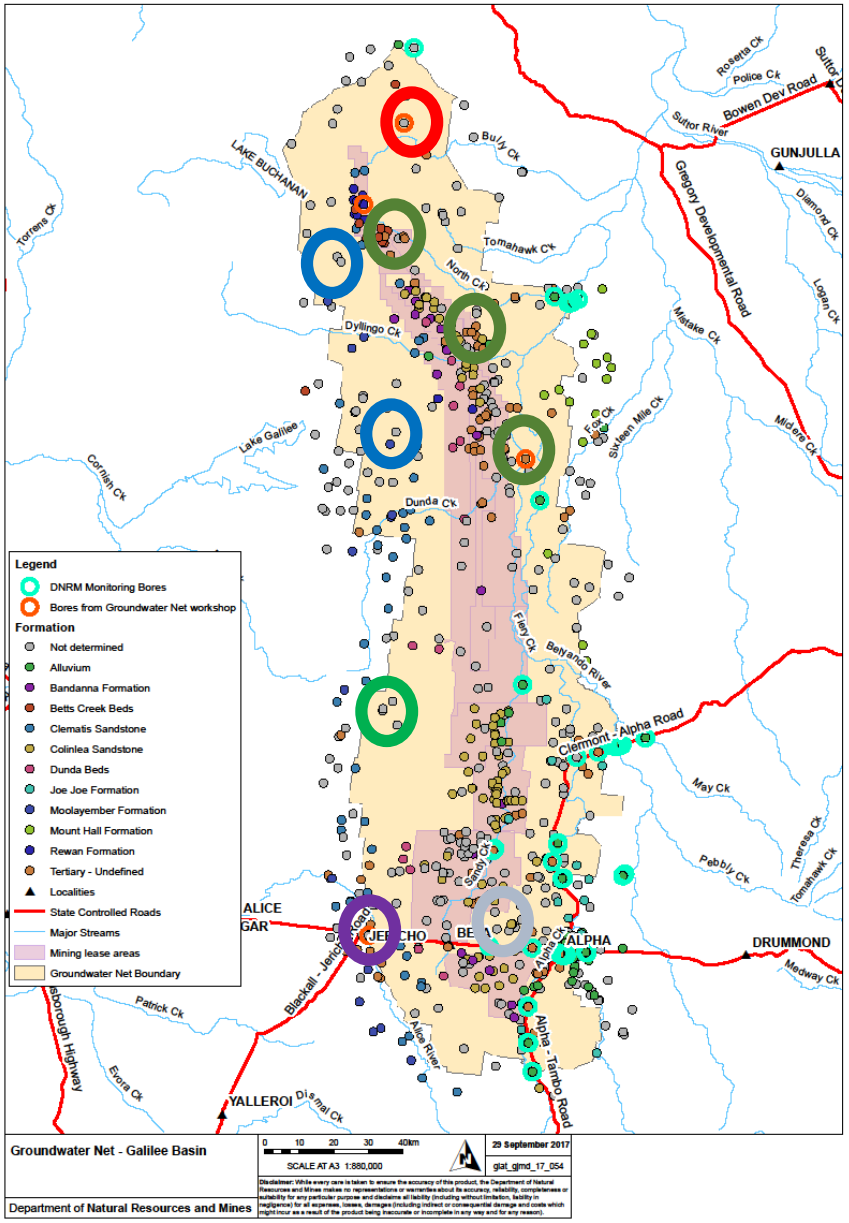
1. Complimenting company monitoring off tenure

2. Complimenting Clematis monitoring off tenure

3. Complimentary monitoring for recharge and early impact propagation

4. Town Water Supply monitoring (Alpha and Jericho)

5. Better understanding Tertiary recharge processes (interactions with alluvium)




Thank you for listening

Questions ?