



Australian Government
Geoscience Australia



Geoscience Australia's CO₂ Storage Program

Andrew Feitz

CAGS Workshop

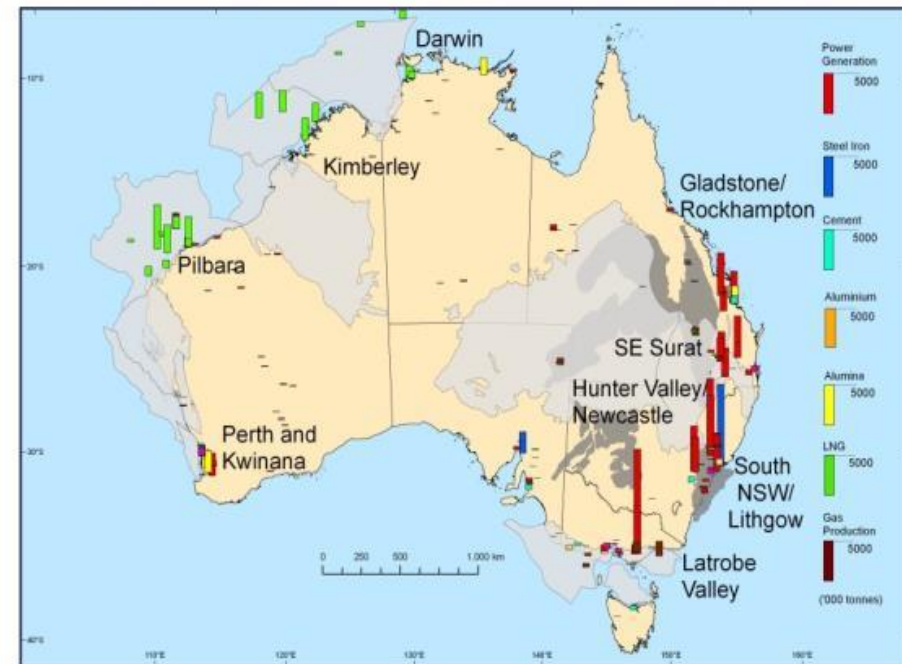
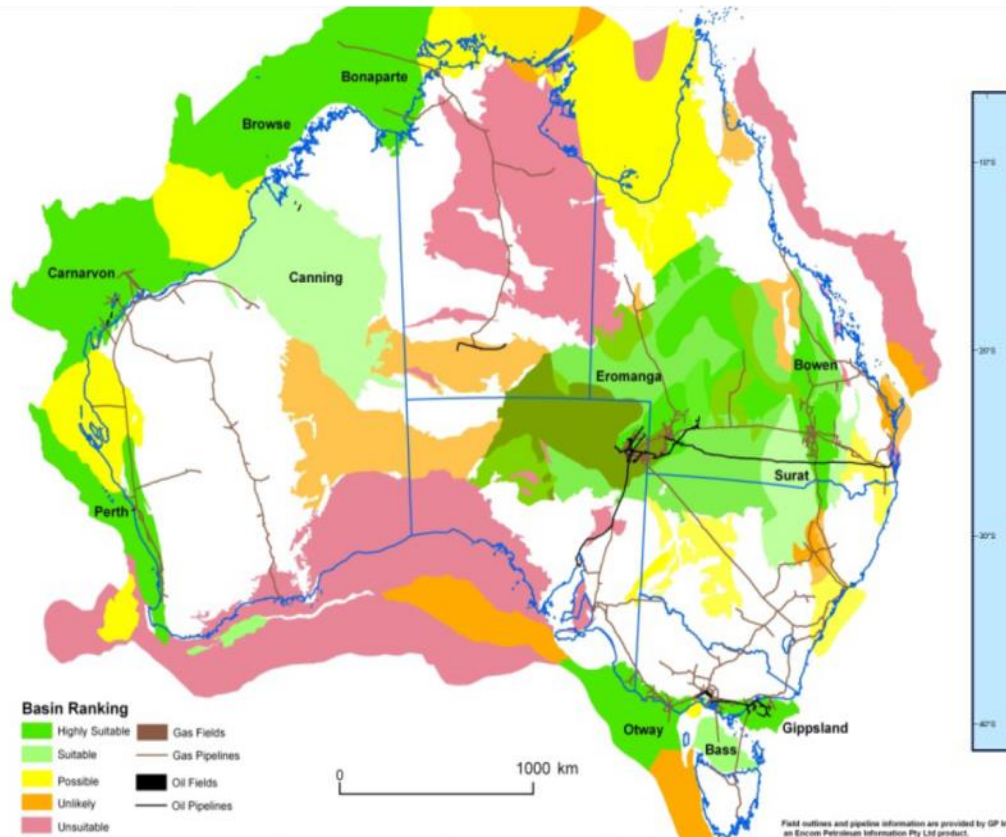
Wuhan, 19-20 November 2014

Outline

- Basin-wide to regional geological storage assessment
- CO₂ Infrastructure Assessment Project (CIAP) Explorer
- Near surface monitoring studies

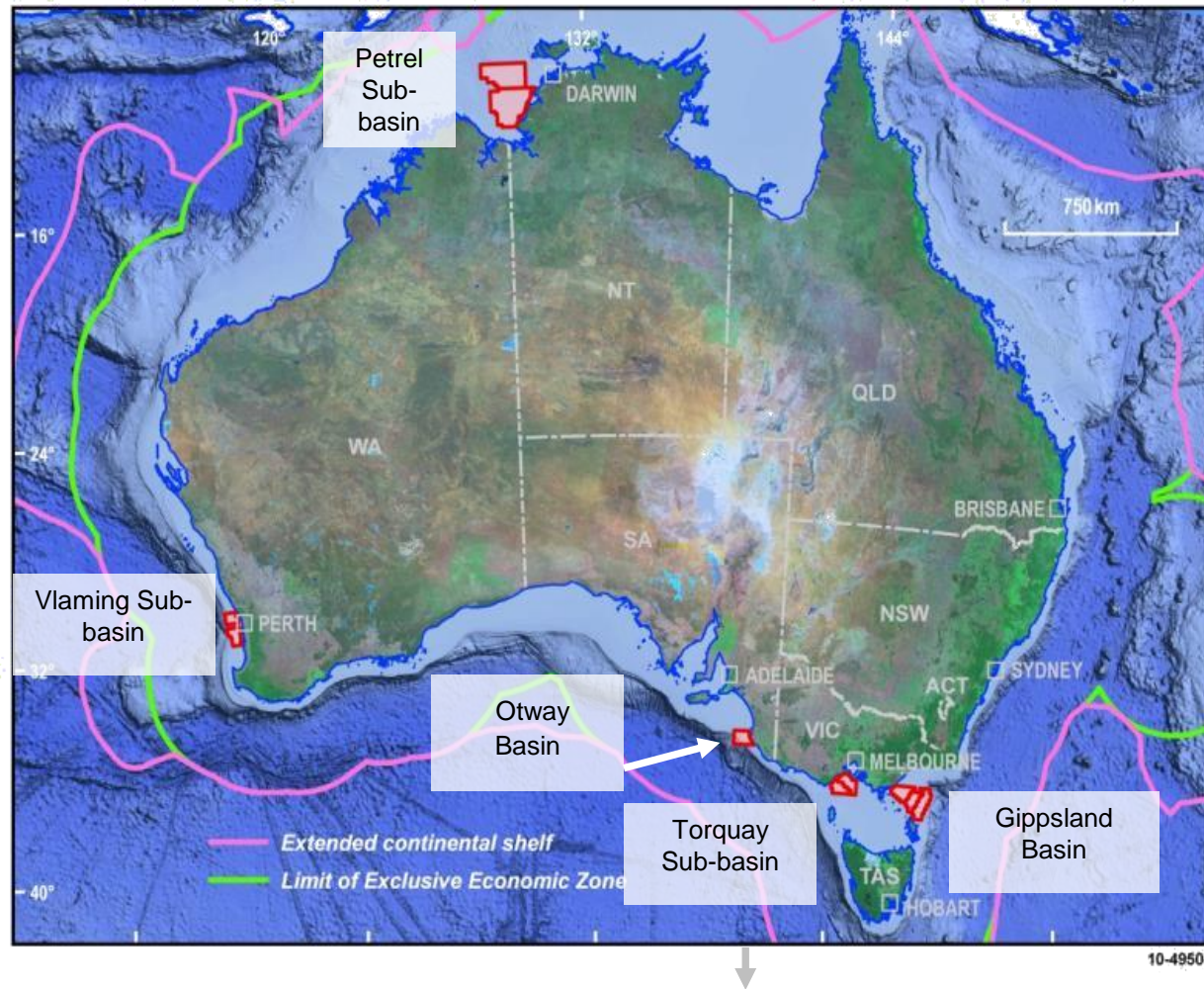
National Carbon Mapping and Infrastructure Plan: 2009

Australian basins ranked for CO₂ storage potential



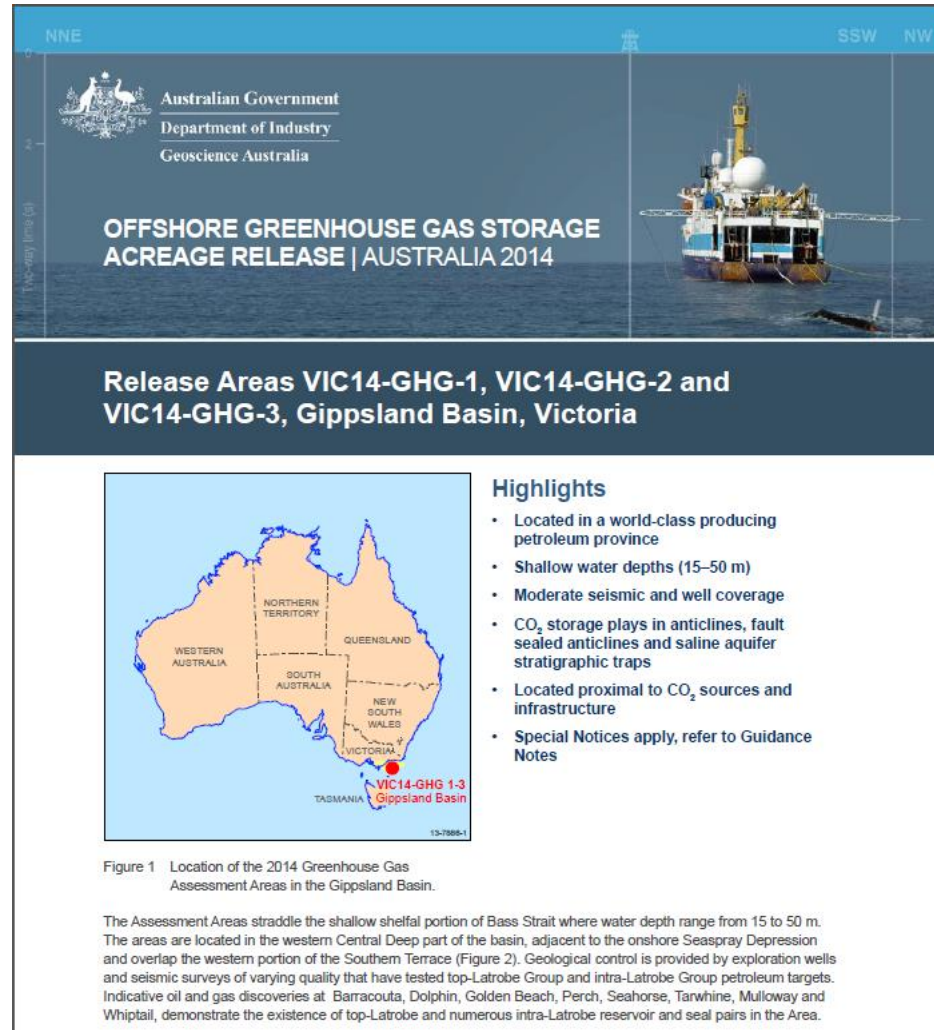
Emissions estimated by 2020
From: National Carbon Mapping and
Infrastructure Plan – Australia, 2009

Australian Government Offshore GHG Acreage Release March 2009



10 areas –
5 basins

New Acreage Release Areas – Gippsland Basin 2014



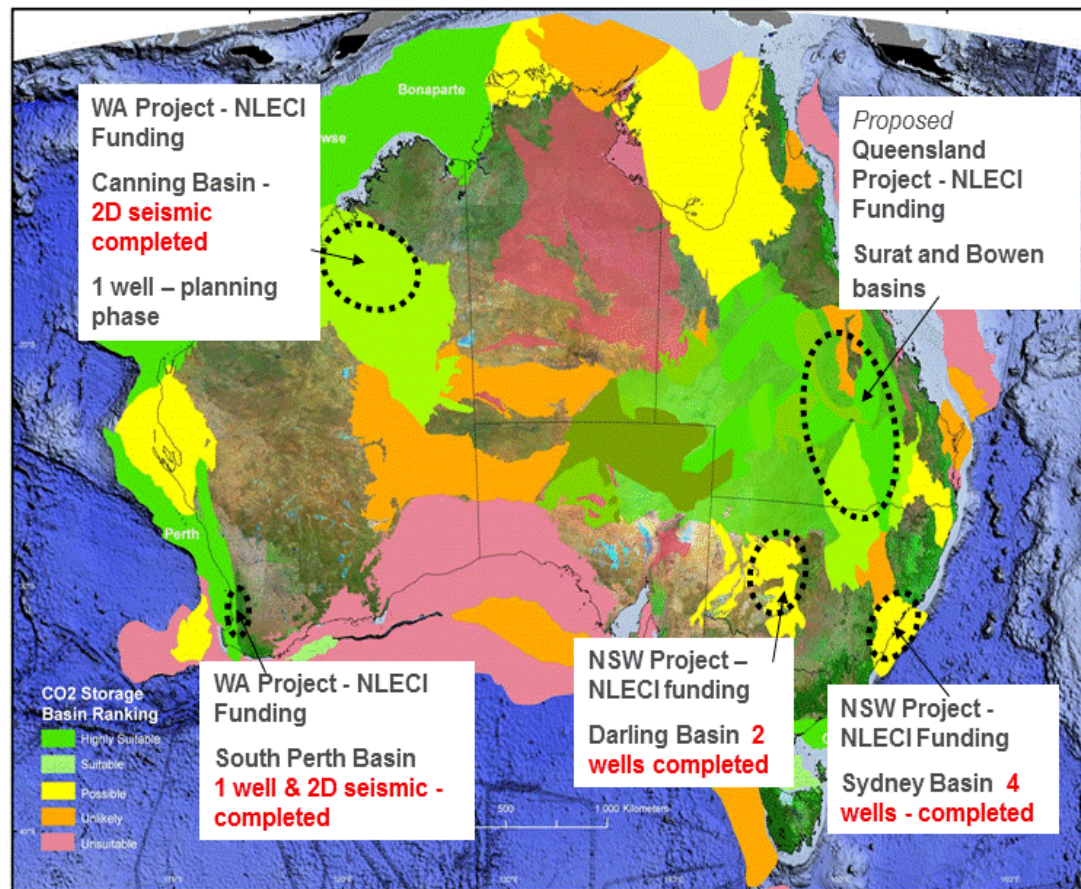
Gippsland Basin, offshore
Victoria

3 release areas

- VIC14-GHG-1
- VIC14-GHG-2
- VIC14-GHG-3

Bids close 27 November, 2014

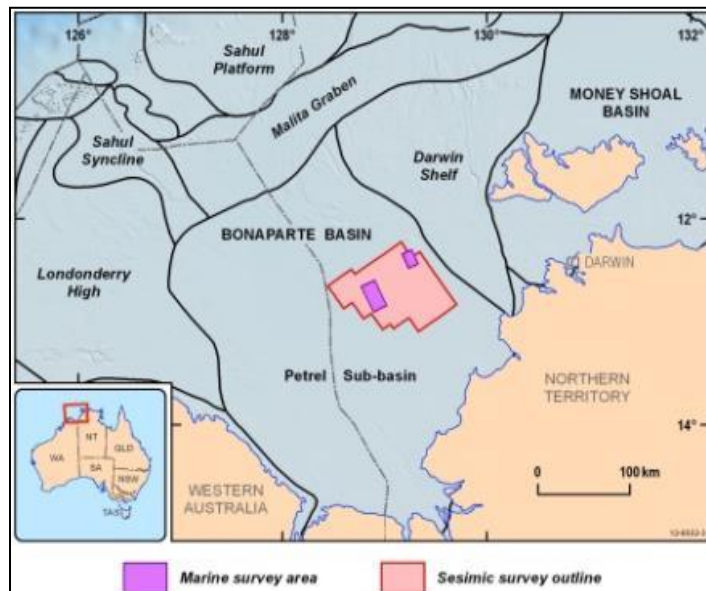
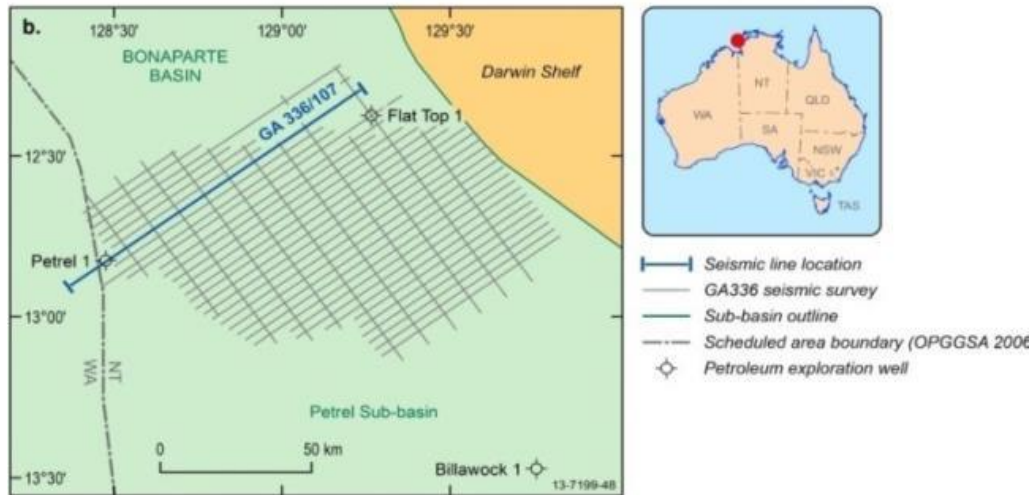
Pre-exploration data acquisition: Onshore program



Pre-competitive carbon storage data acquisition funded by the Australian and state governments and industry (ACALET)



Pre-exploration data acquisition: Petrel Sub-basin



- 2D seismic, 4091 line km
 - Completed
- 2 marine surveys
 - Containment assessment
 - Baseline monitoring
 - Completed
- Regional assessment of CO₂ storage prospectivity report
 - Completed

Pre-exploration data acquisition: Petrel Sub-basin

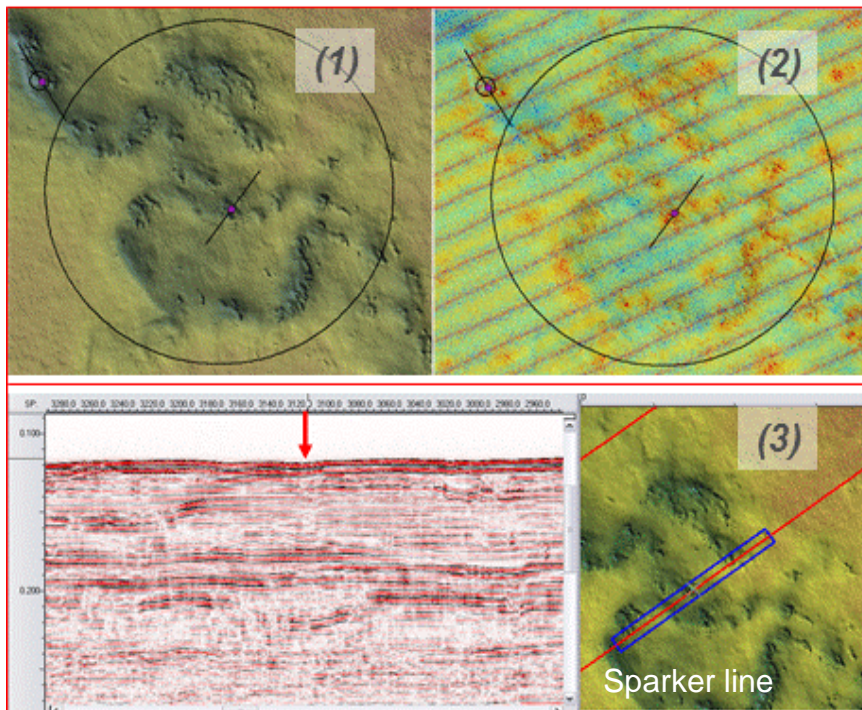


Petrel Marine Survey

Baseline monitoring and seepage study

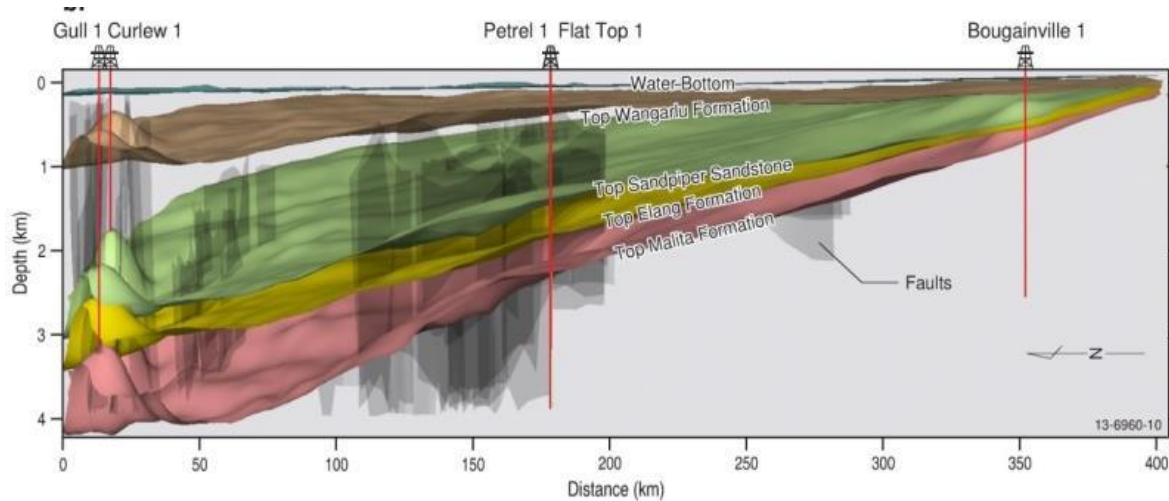
650km² of seabed and subsea data

- Detailed bathymetry
- Back-scatter imaging
- Sub-bottom profiler- first 100m
- Sediment, geochemical and biological sampling

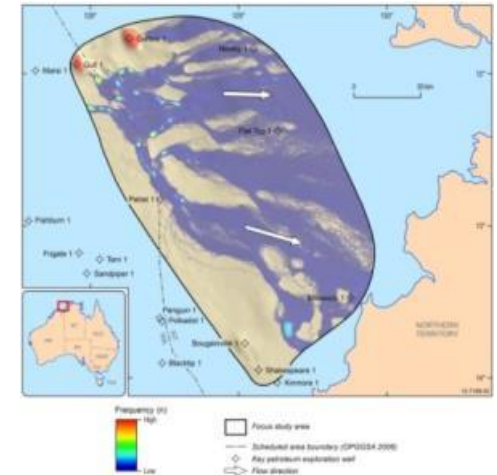


Pre-exploration data acquisition: Petrel Sub-basin

Geological model

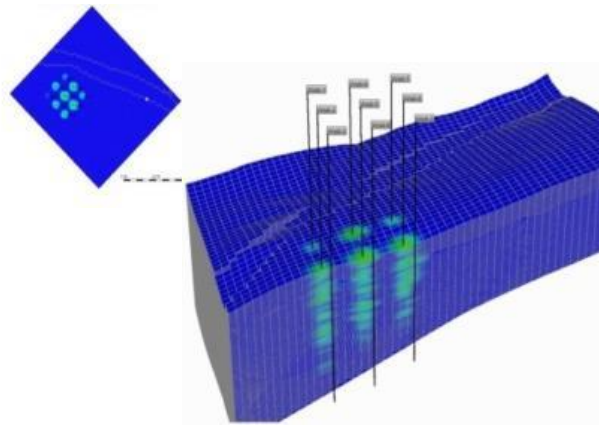


CO₂ migration pathway analysis



Yr. 30

Reservoir simulation

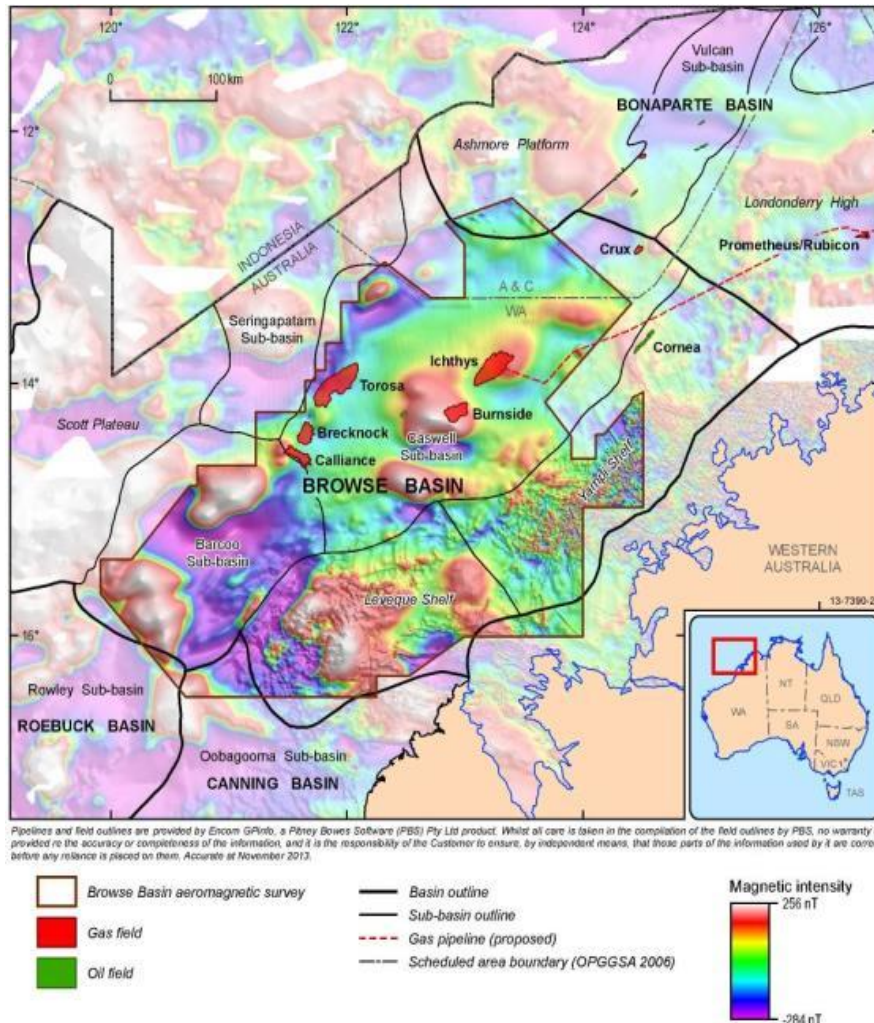


Storage potential



Pre-exploration data acquisition: Browse Basin

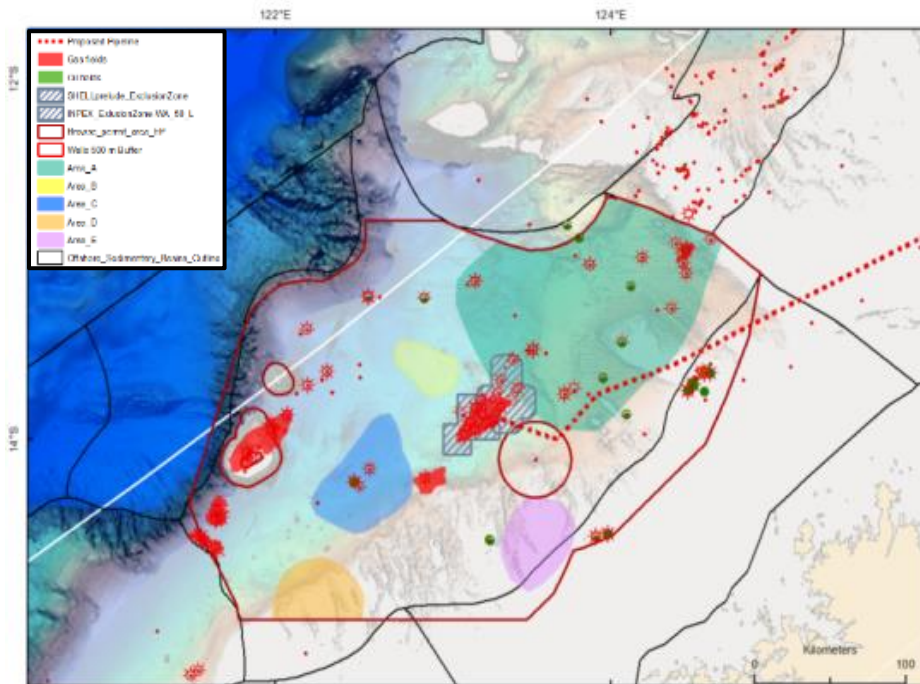
Regional-scale airborne magnetic data



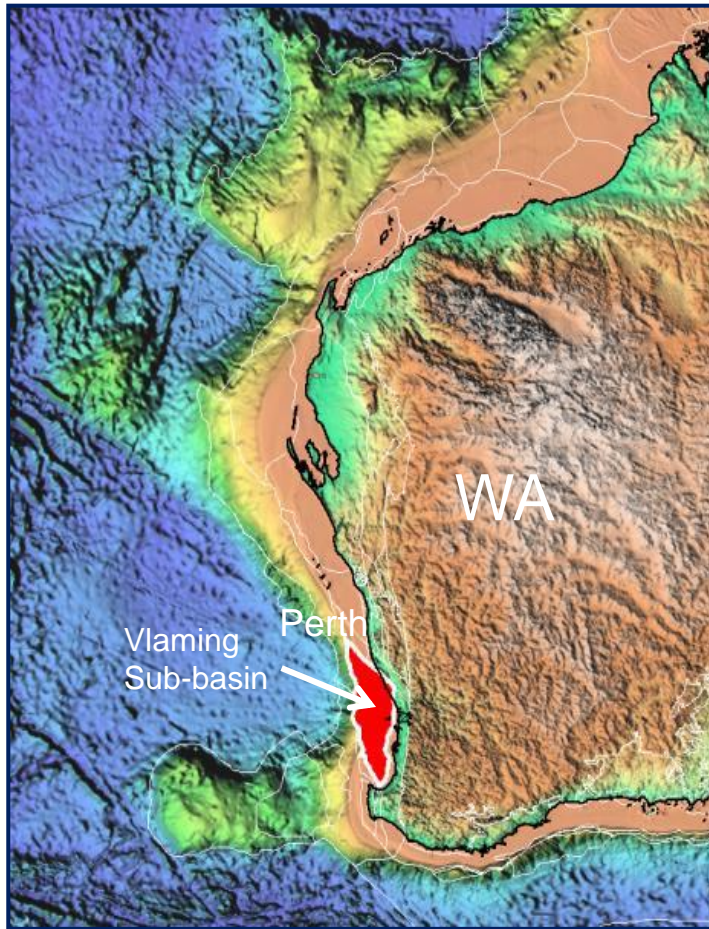
- ~191,000 line kilometres of aeromagnetic data collected
- Aeromagnetic data will assist mapping the distribution of volcanics which impact reservoir quality.
- **Completed** - November 2013

Pre-exploration data acquisition: Browse Basin

- **Underway** - Investigate modern seepage that may compromise storage prospectivity or help better understand petroleum systems
- Collect environmental baseline data before storage activities



Pre-exploration data acquisition: Vlaming Sub-basin

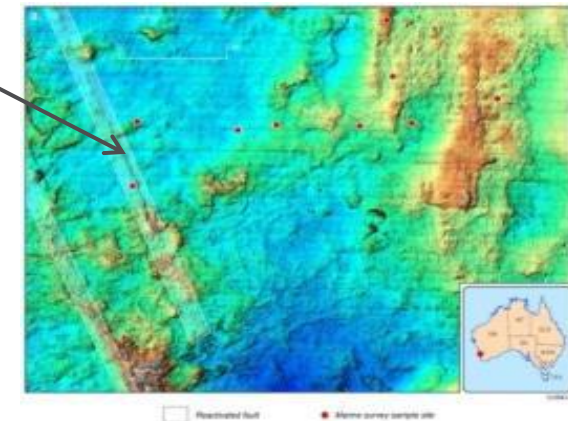
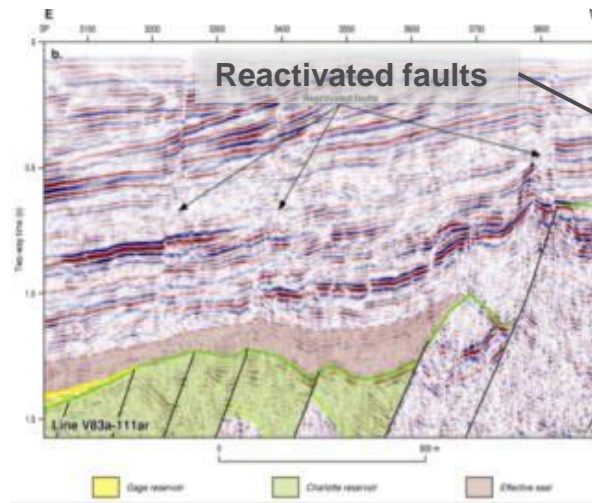
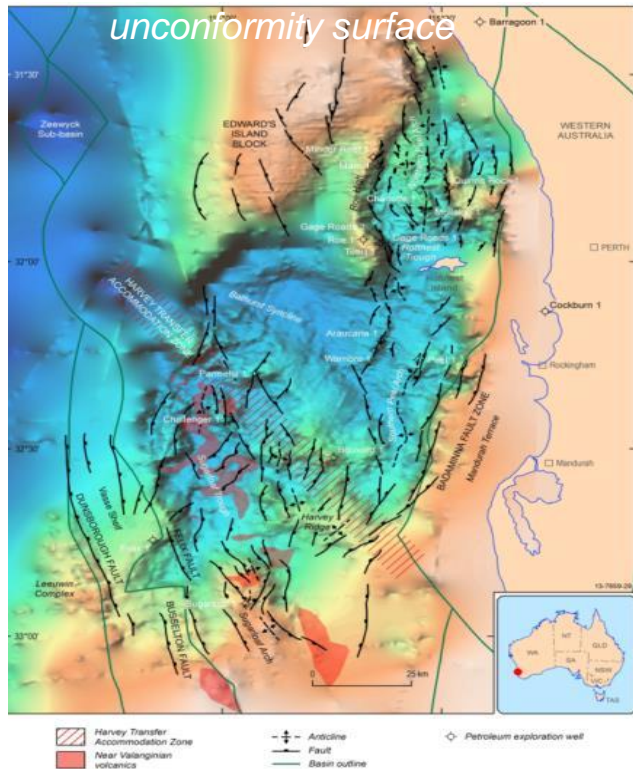


- Vlaming Sub-Basin – mostly offshore depocentre within the southern Perth Basin with up to 15 km sediments
- 17 exploration wells/no commercial accumulations/no current permits

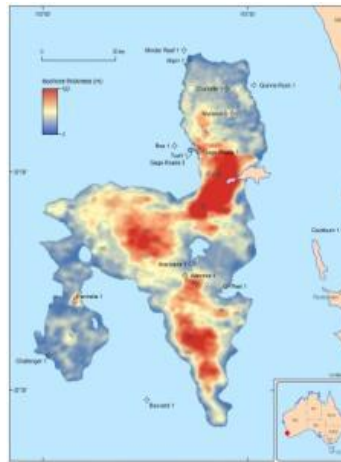
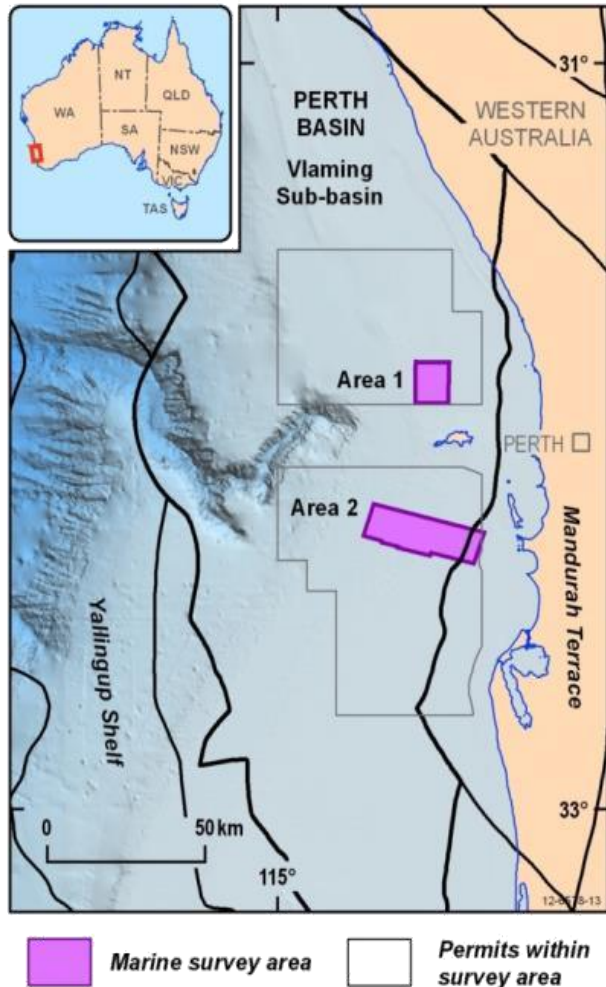
Pre-exploration data acquisition: Vlaming Sub-basin

Containment - new findings

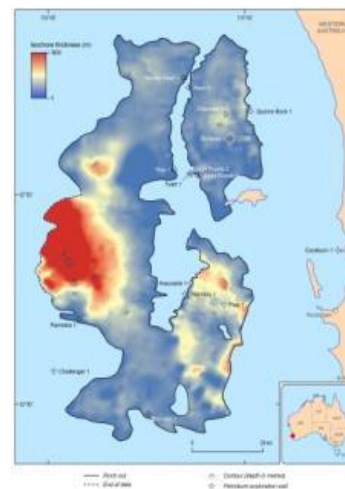
- Widespread signs of recent fault reactivation in seismic data
- Evidence of fault reactivation in the new (GA Marine survey 2012) multibeam data
- Modelling results:
 - If CO₂ is injected close to a fault, reactivation and seepage may occur



Pre-exploration data acquisition: Vlaming Sub-basin



Gage Sandstone



Charlotte Sandstone

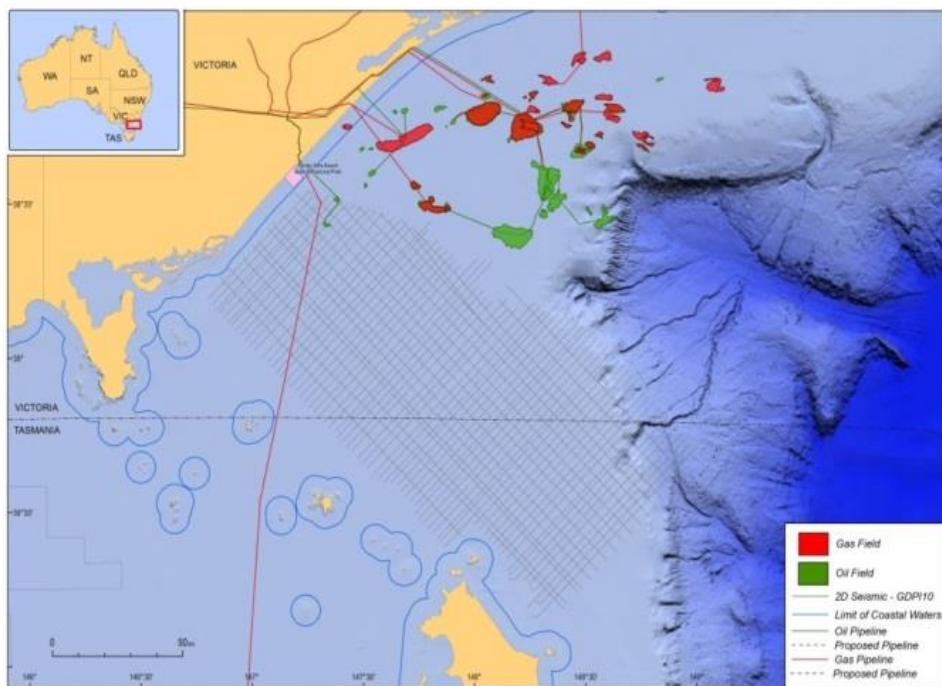
Marine survey - **completed**

- Basin studies – **completed**
- Final report - **completed**

The new storage capacity estimate for the Gage Sandstone is 493 Mt (P50)

Charlotte Sandstone storage capacity is 1983 Mt (P50)
seal poorly constrained

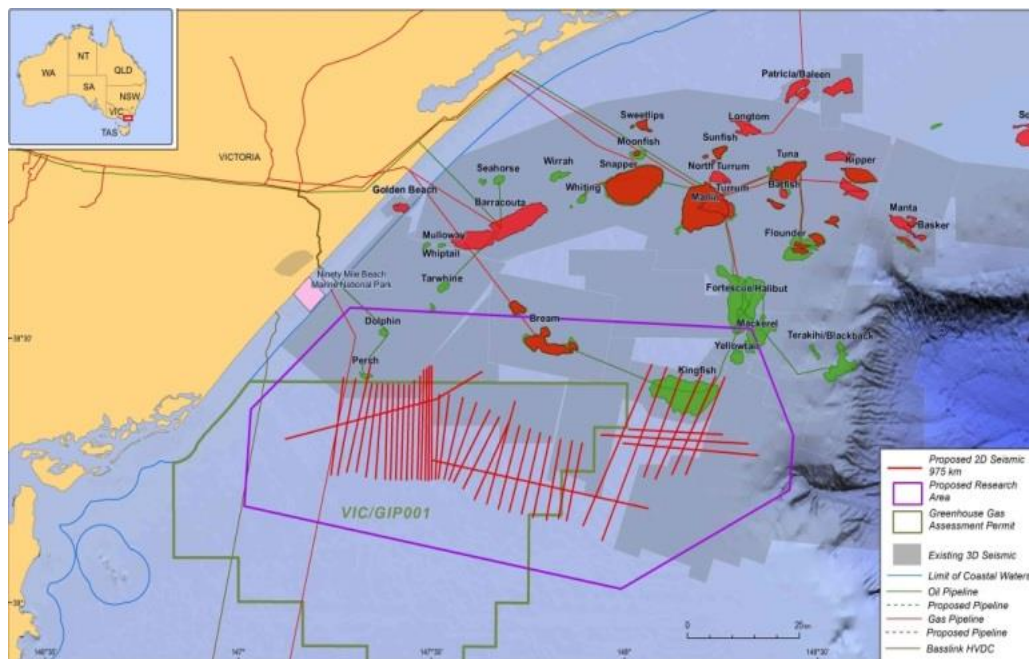
Pre-exploration data acquisition: Gippsland Basin



Offshore Gippsland

- ~8000 km 2D seismic - **completed**

Pre-exploration data acquisition: Gippsland Basin



Marine environmental baseline study – **underway**

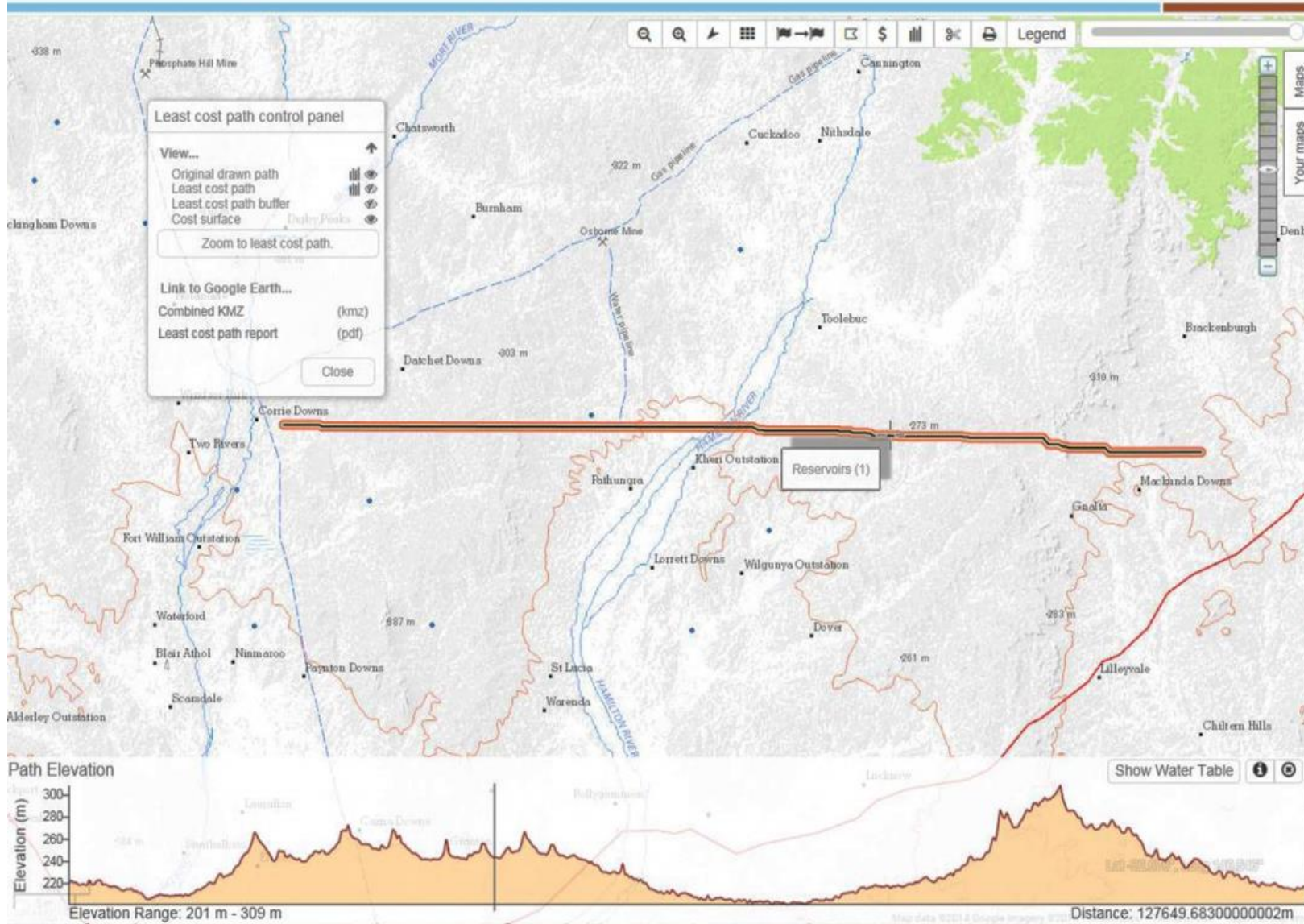
New offshore ~1000 km 2D seismic – **planned for April 2015**

Basin-wide CO₂ storage assessment - **underway**

CO₂ Infrastructure Assessment Project (CIAP)

Explorer

- Powerful web based decision support tool for first-pass route planning and area assessment including
 - CO₂ and other pipelines, roads and rail
 - Site assessment for infrastructure such as power stations, ports and water catchment areas



Confirm least cost path relative weightings

Opportunity

- ☒ Electricity transmission lines
- ☒ Pipelines
- ☒ Easements
- ☒ Railways
- ☒ Roads

Highly constrained

- ☒ Lakes
- ☒ Reservoirs

Variable rating (from Opportunity to Unsuitable)

- ☒ Slope percentage
- ☒ Reserves

Unsuitable

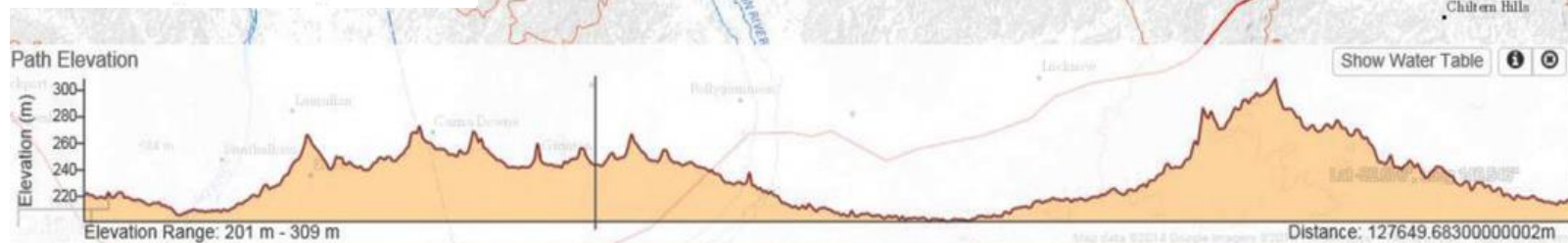
- ☒ Urban Centres and Localities
- ☒ Prohibited areas

Path bounding box buffered by: 25 %

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CO₂ Infrastructure Assessment Project (CIAP)

Explorer

- Available anywhere, anytime, using common devices including mobile devices
- Targeted towards planners, regulators and for use by senior managers
- One-stop access and delivery of relevant licenced data
- Provides a platform for fast strategic options assessment
- Adaptable to meet specific planning requirements
- Free to use

Near surface monitoring research



GA-CO2CRC Ginninderra shallow controlled release facility (2012+)



GA-CSIRO Arcturus atmospheric monitoring project (2010 – 2014)



GA-China Geological Survey natural seep and Ordos surveys (2014)



Great Artesian Basin Hydrogeology Atlas
(publish in Dec 2014)

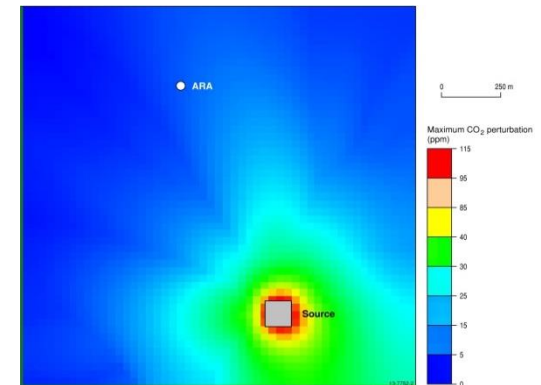
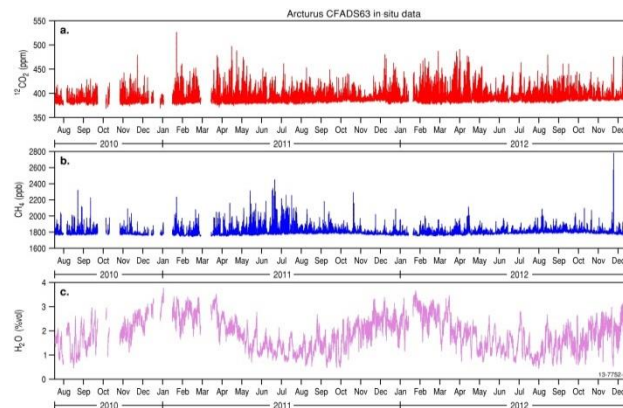
Ginninderra - techniques trialled to date

- Soil gas
- Soil flux
- Soil analysis
- Atmospheric tomography
- Scanning laser
- Eddy covariance
- Tracer studies (soil gas and atmospheric analysis)
- Ground penetrating radar
- Airborne CO₂ detection using a rotorcraft UAV
- Electromagnetic surveys
- Airborne hyperspectral and thermal imaging
- In-field phenotyping (hyperspectral, thermal, 3D imaging)
- Microbial soil genomics
- Plant biochemistry and physiology



Assessing the effectiveness of atmospheric monitoring

- 4 years of high precision greenhouse gas measurements
- Completely remotely operated (e.g. calibrations, 1700 km from GA!)
- Conducted modelling to determine minimum detection limits for leak detection using atmospheric techniques

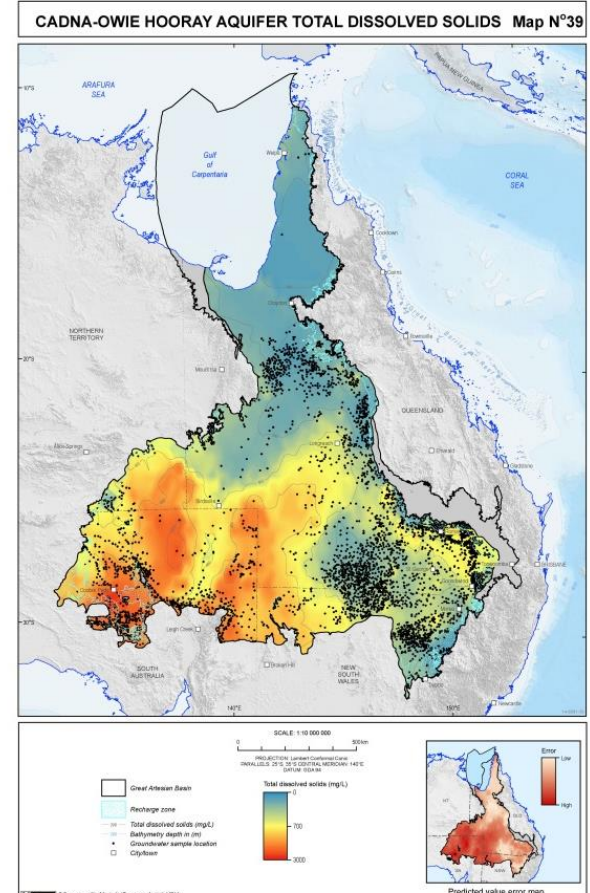
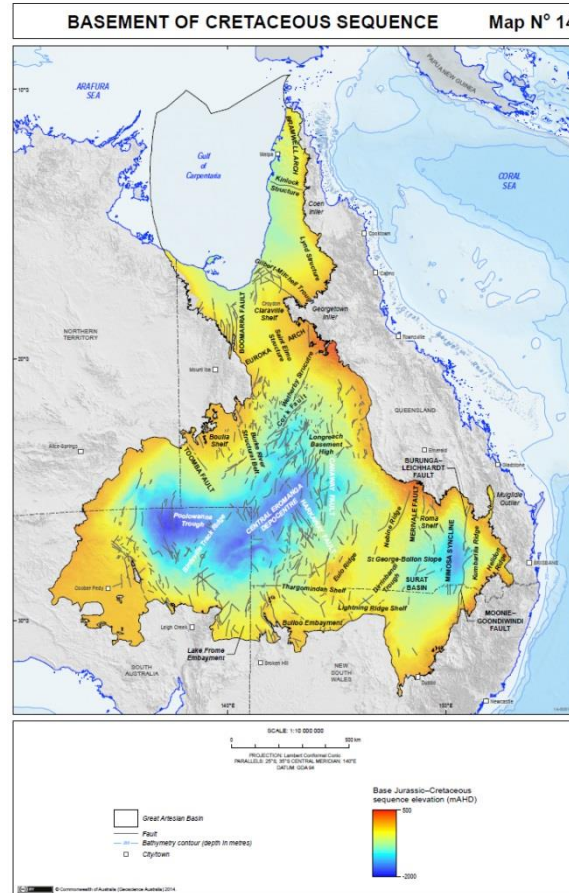
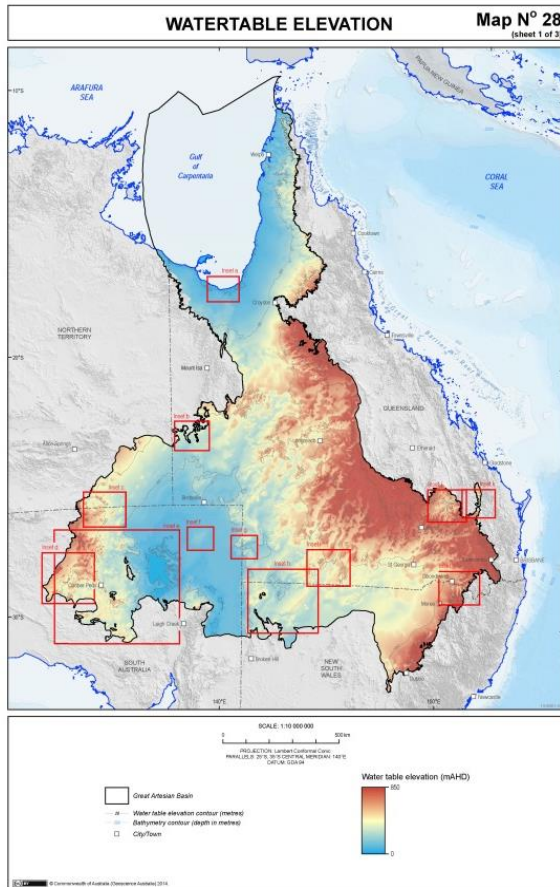


GA-CGS Scientific Exchange

- First scientific exchange between the two agencies where an Australia government employee has worked in China
- Joint soil gas and soil flux surveys at Ordos, Qinghai and Xi'an



Groundwater Atlas for the Great Artesian Basin - Preview



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Summary

- GA has recently conducted marine (seismic and environmental) surveys and recently completed several offshore regional storage assessments
- Produced a powerful web based decision support tool for first-pass route planning and area assessment
- Evaluated monitoring technologies and produced a Hydrogeology Atlas of Australia's most important groundwater resource (The Great Artesian Basin)



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Thank you!

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