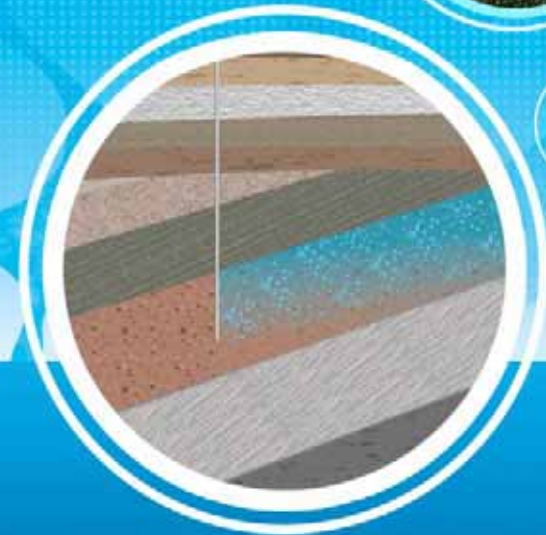


The CO2CRC Otway Project

Stages 1 and 2



Presenter

Dr Saju Menacherry

Cooperative Research Centre
for Greenhouse Gas
Technologies (CO2CRC)

CAGS Summer School
Sanya, China
21-25 August 2011

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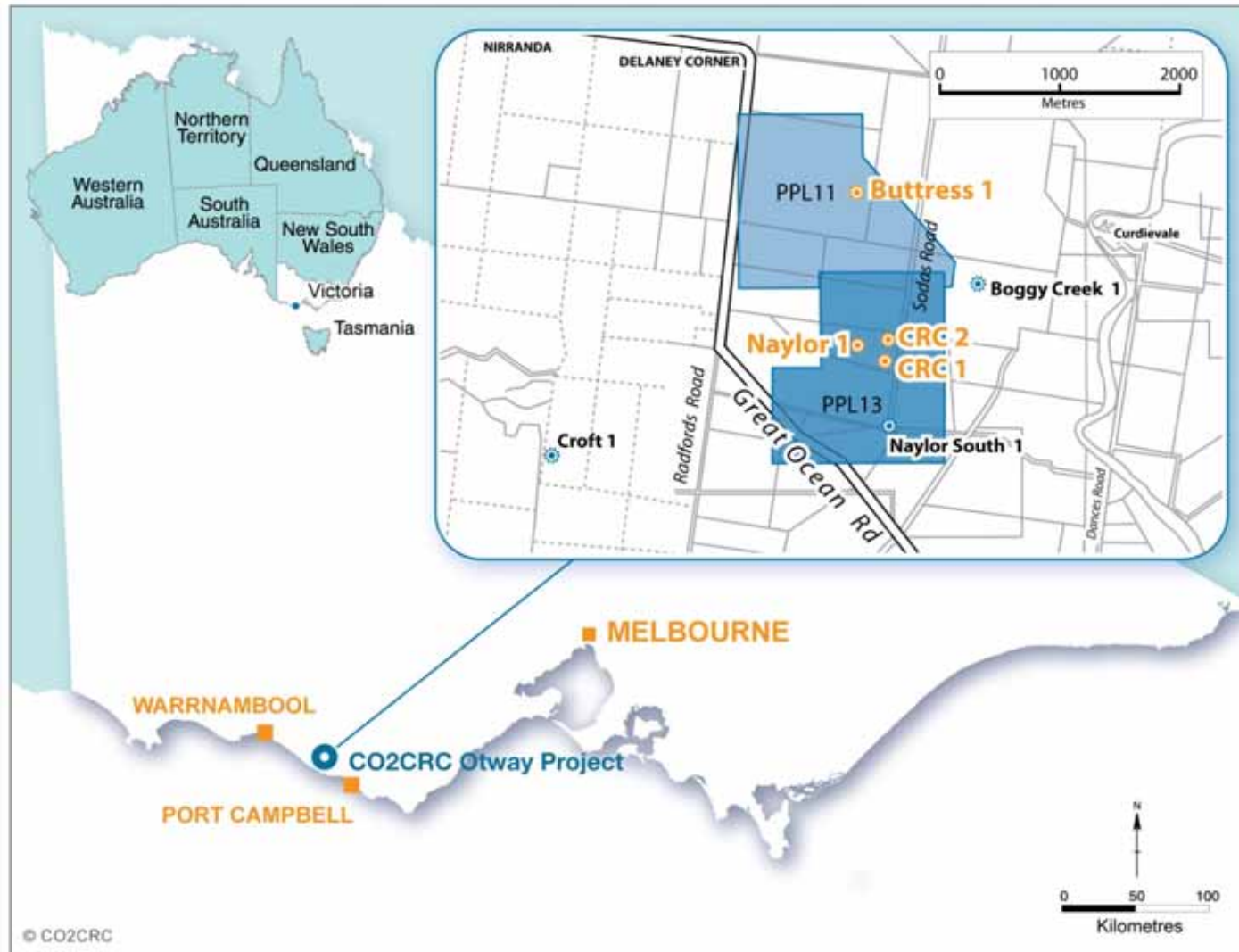
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Location of CO2CRC Otway Project



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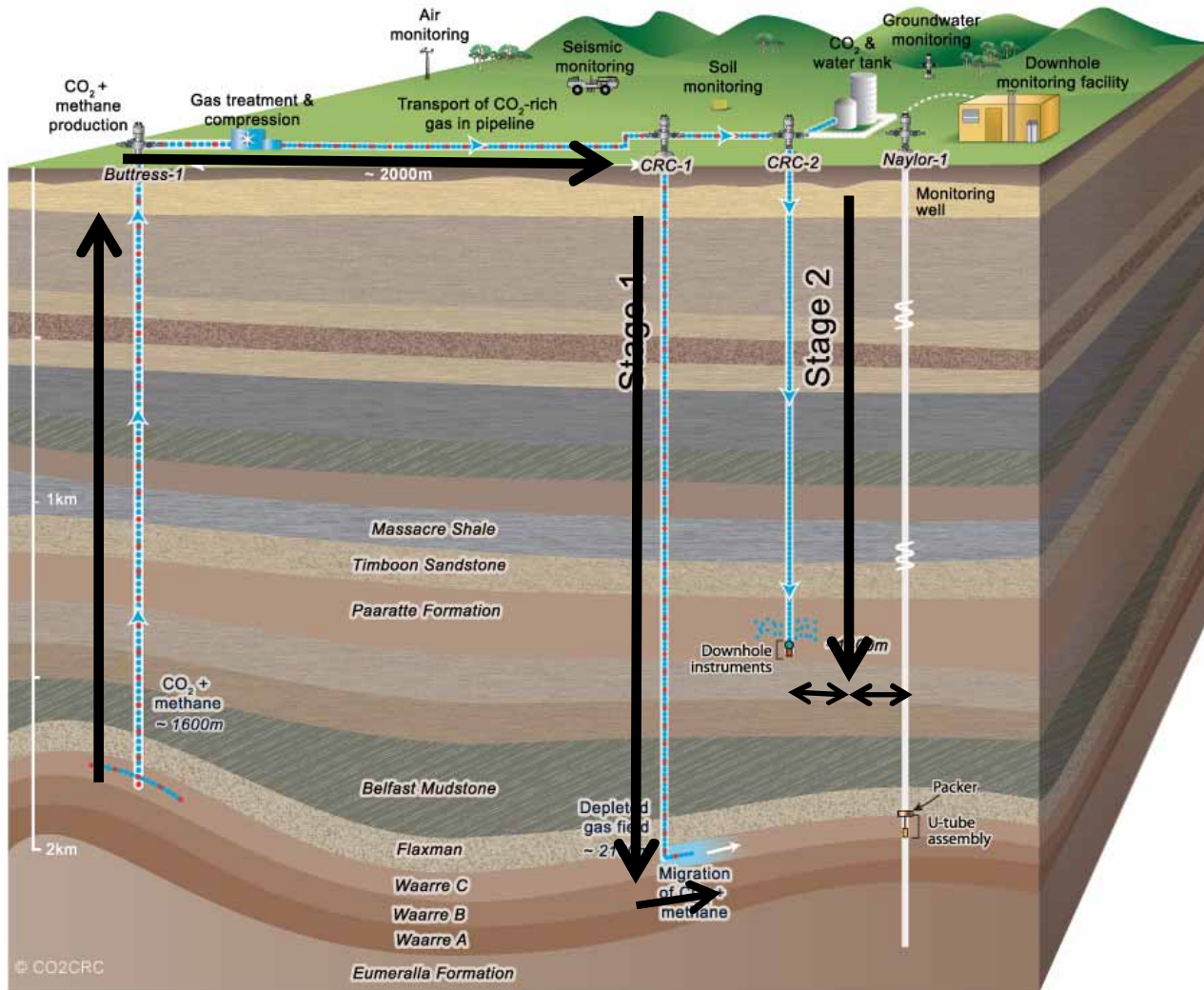
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The CO2CRC Otway Project –concept



- Stage 1: Injection of approx 65K tones carbon dioxide.
- CO₂ migration, Monitoring & verification
- Stage 2: improving tests, model and mechanisms – CO₂ residual and dissolution trapping in saline formations

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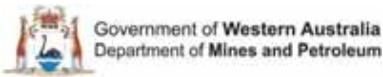


CO2CRC Otway Project Participants

RESEARCH PARTICIPANTS



INDUSTRY AND GOVERNMENT PARTICIPANT FUNDERS





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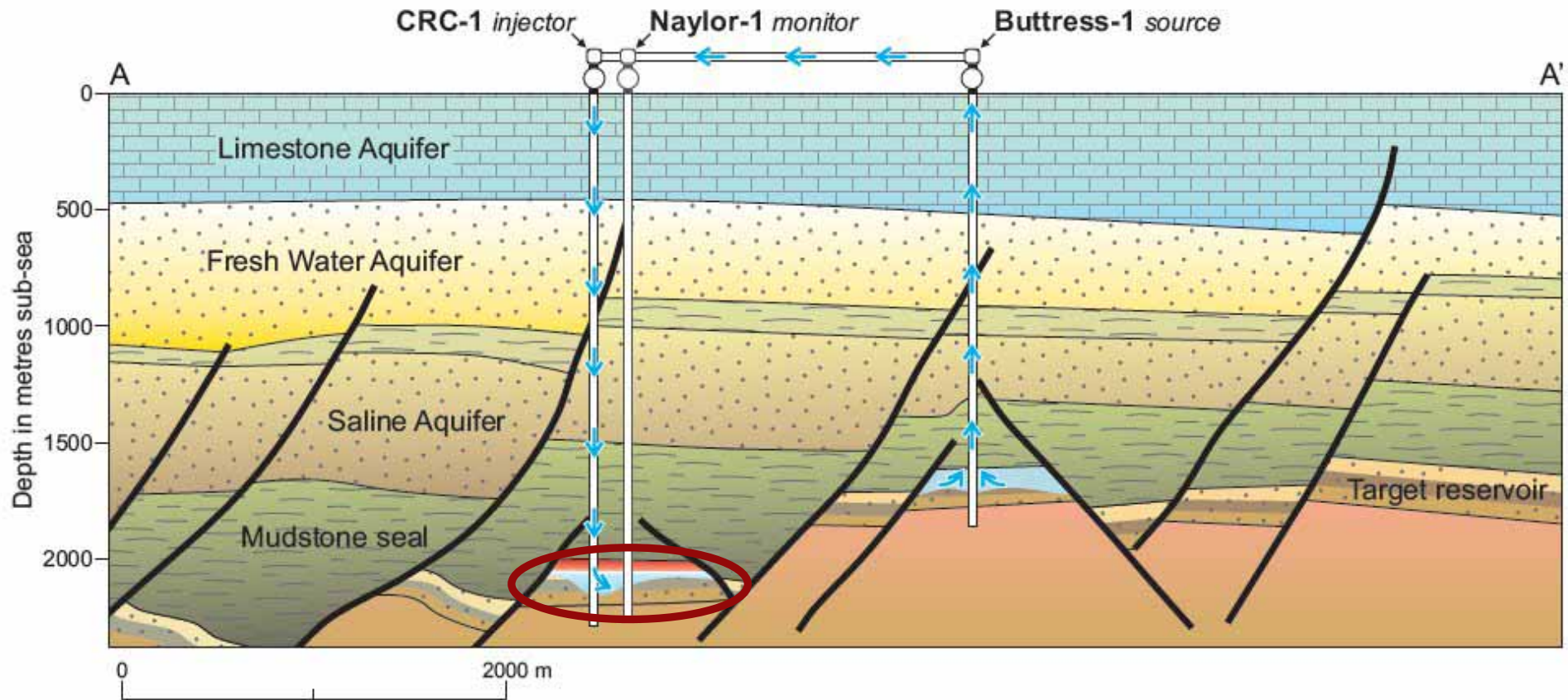
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CO2CRC Otway Project: stage1 geological model



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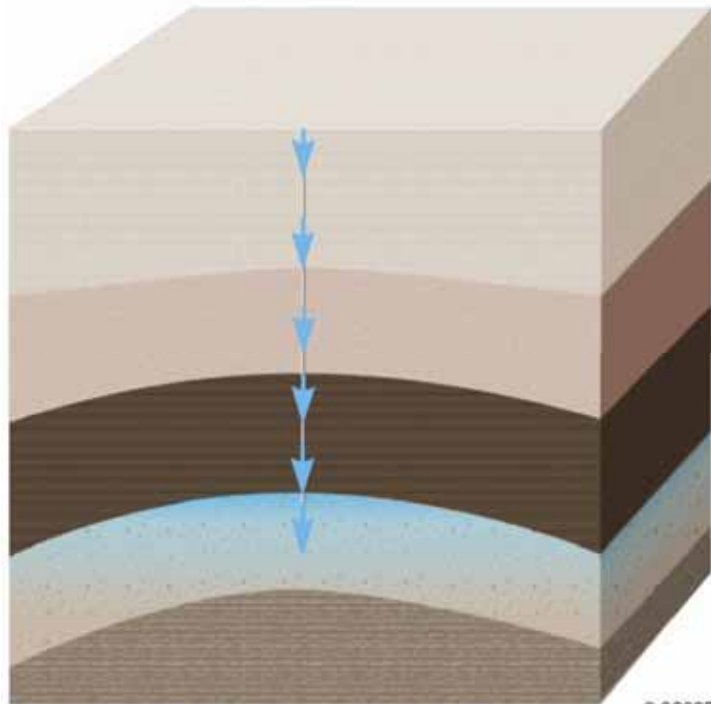


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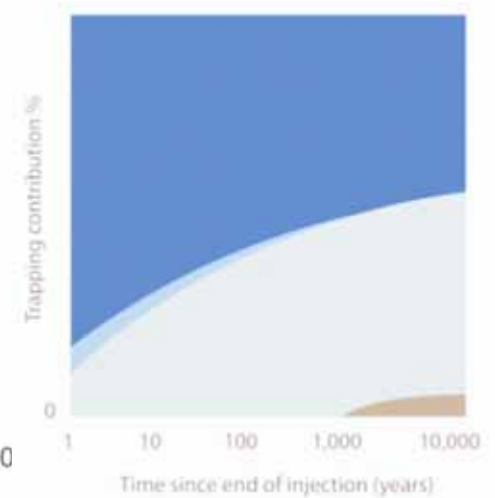
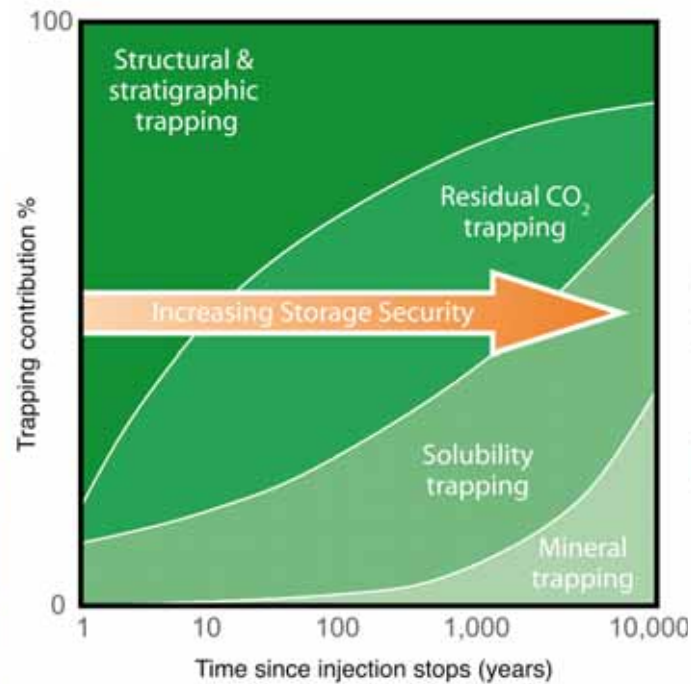


Otway Project: stage 1

Structural trapping dominates



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- Structural & stratigraphic trapping
- Residual trapping
- Solubility trapping
- Mineral trapping



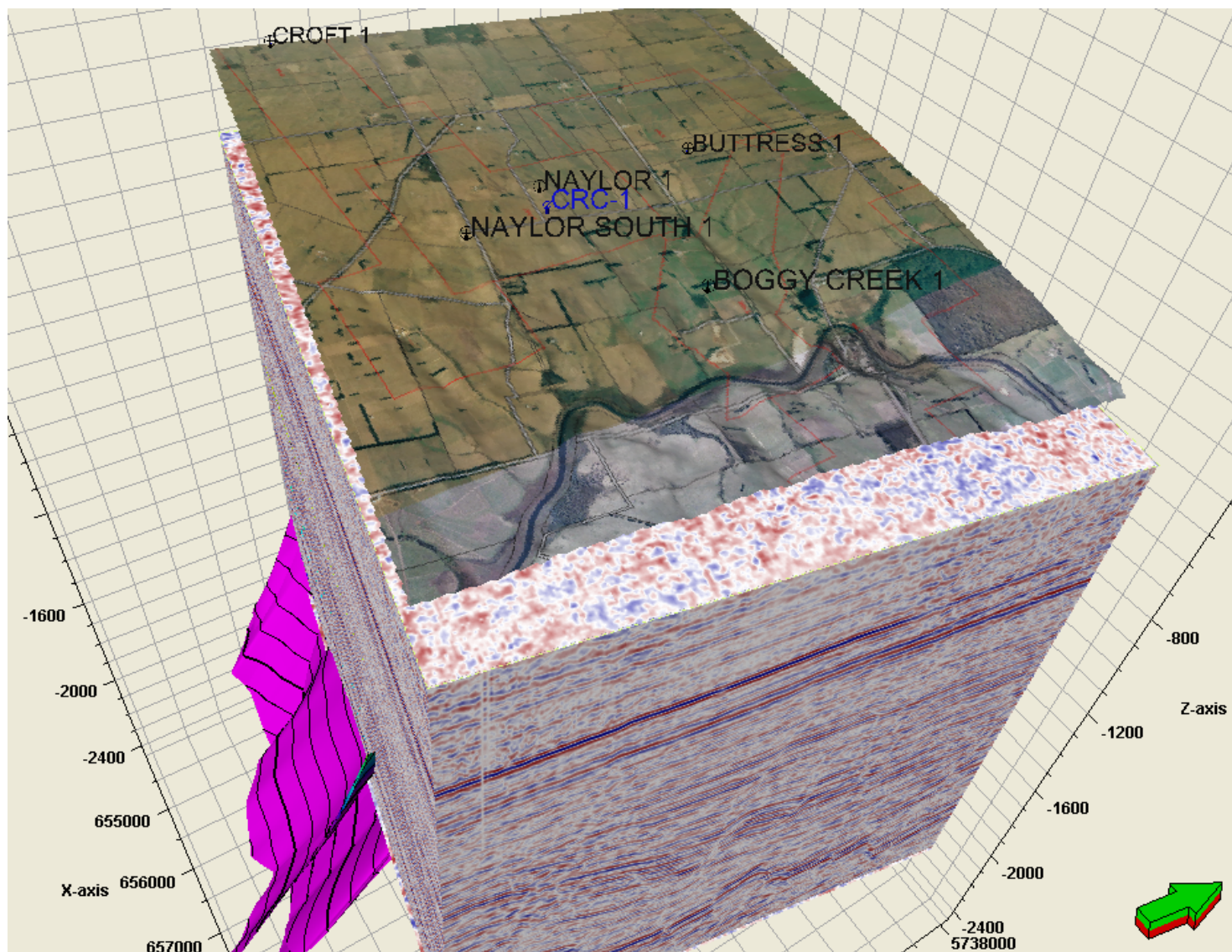
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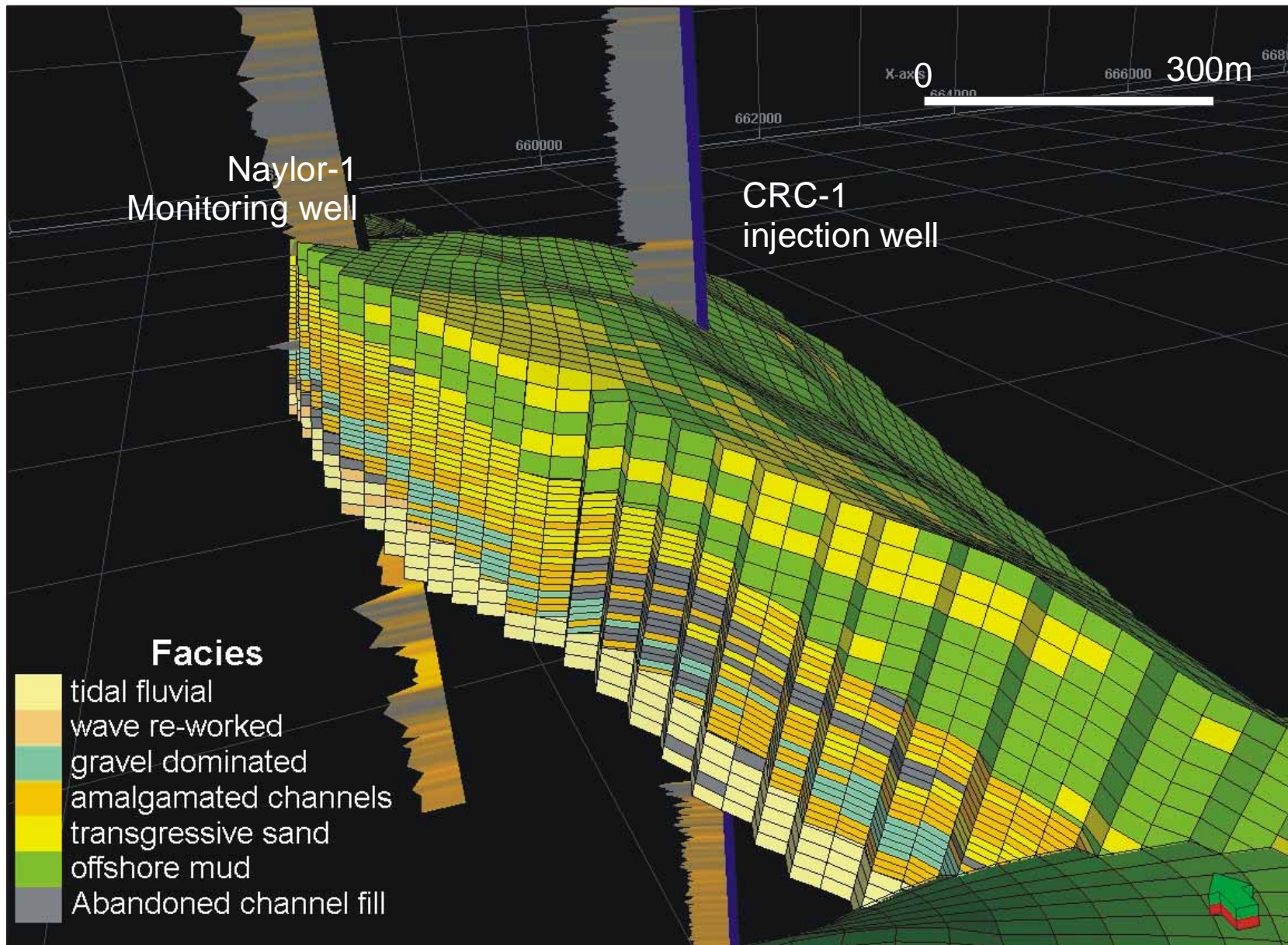


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3D layered Earth model





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Onshore drilling rigs

CRC-1 Well (Mar 07)

42.9 M Core



Full Suite of Logs

- Gamma ray, neutron, density, resistivity and caliper log
- NMR
- ECS (elemental capture spectroscopy)
- FMI (image log)
- Sonic Scanner
- Formation tester
- 3D VSP



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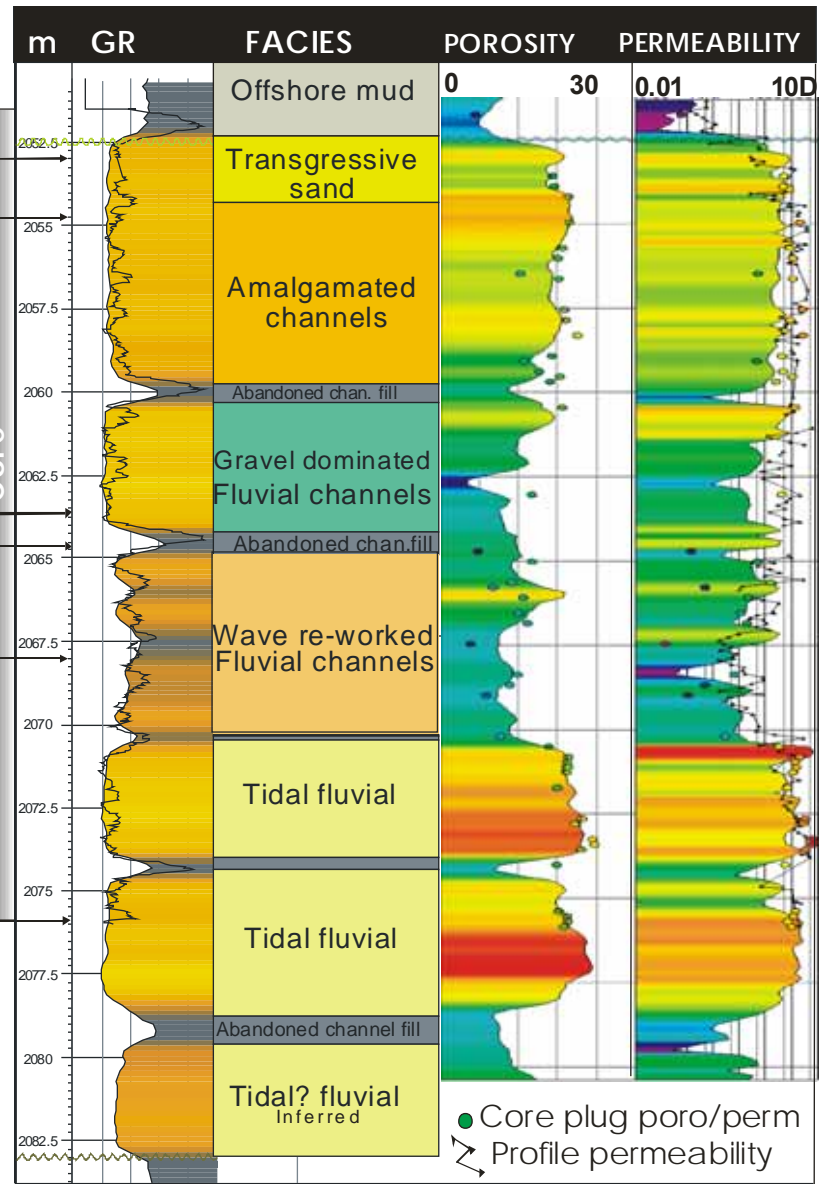
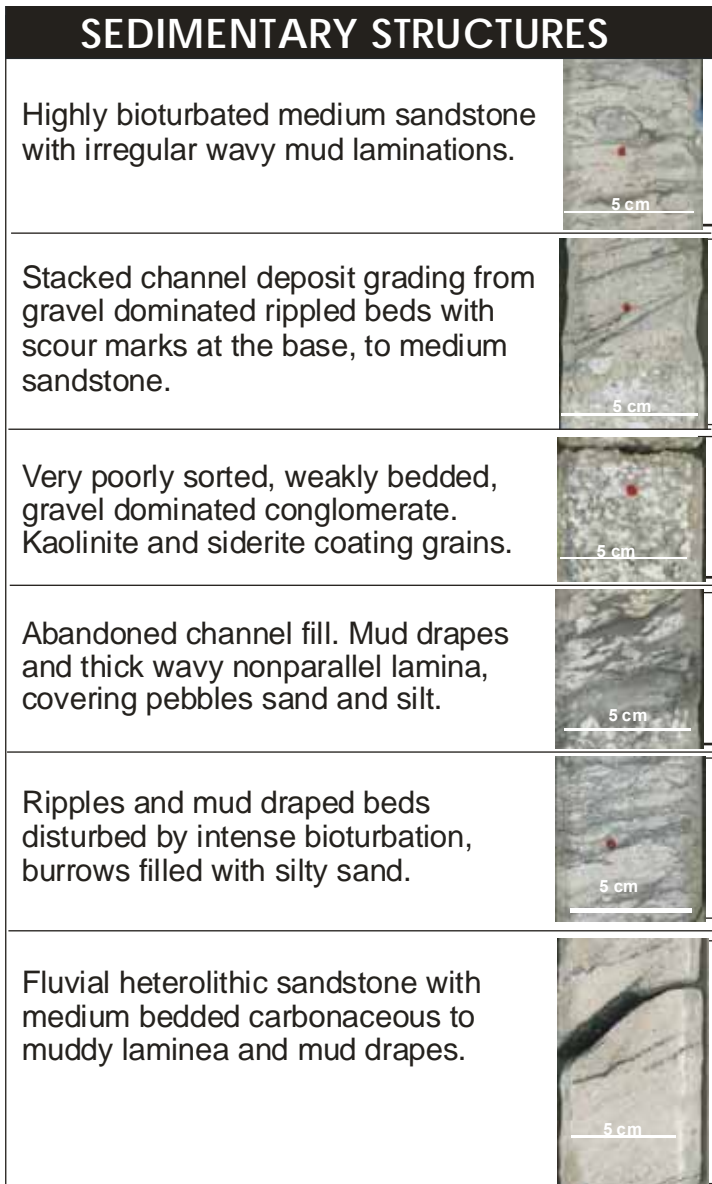
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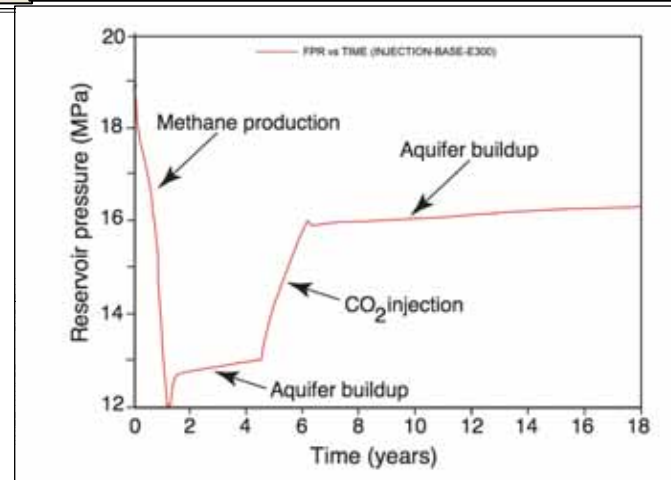
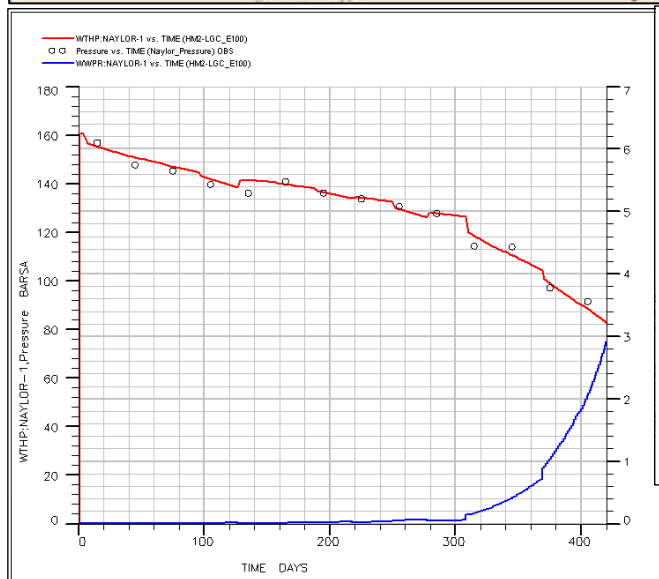
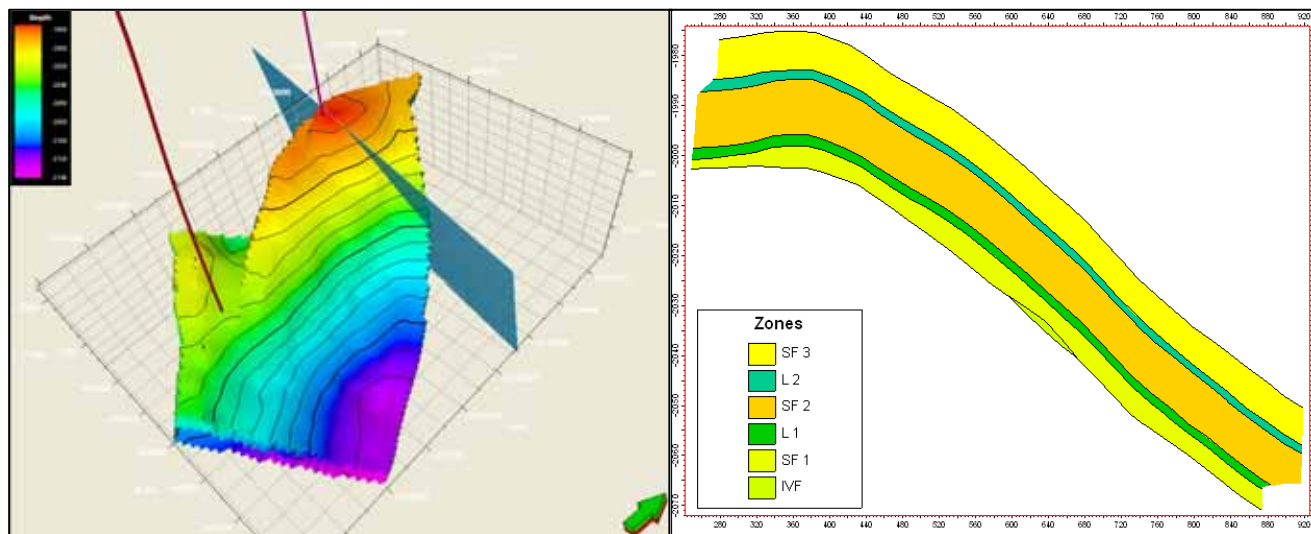


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Site characterisation process

- Build detailed reservoir model using current state of the art modelling packages
- History match with actual production data to validate model.
- Predict future trend.



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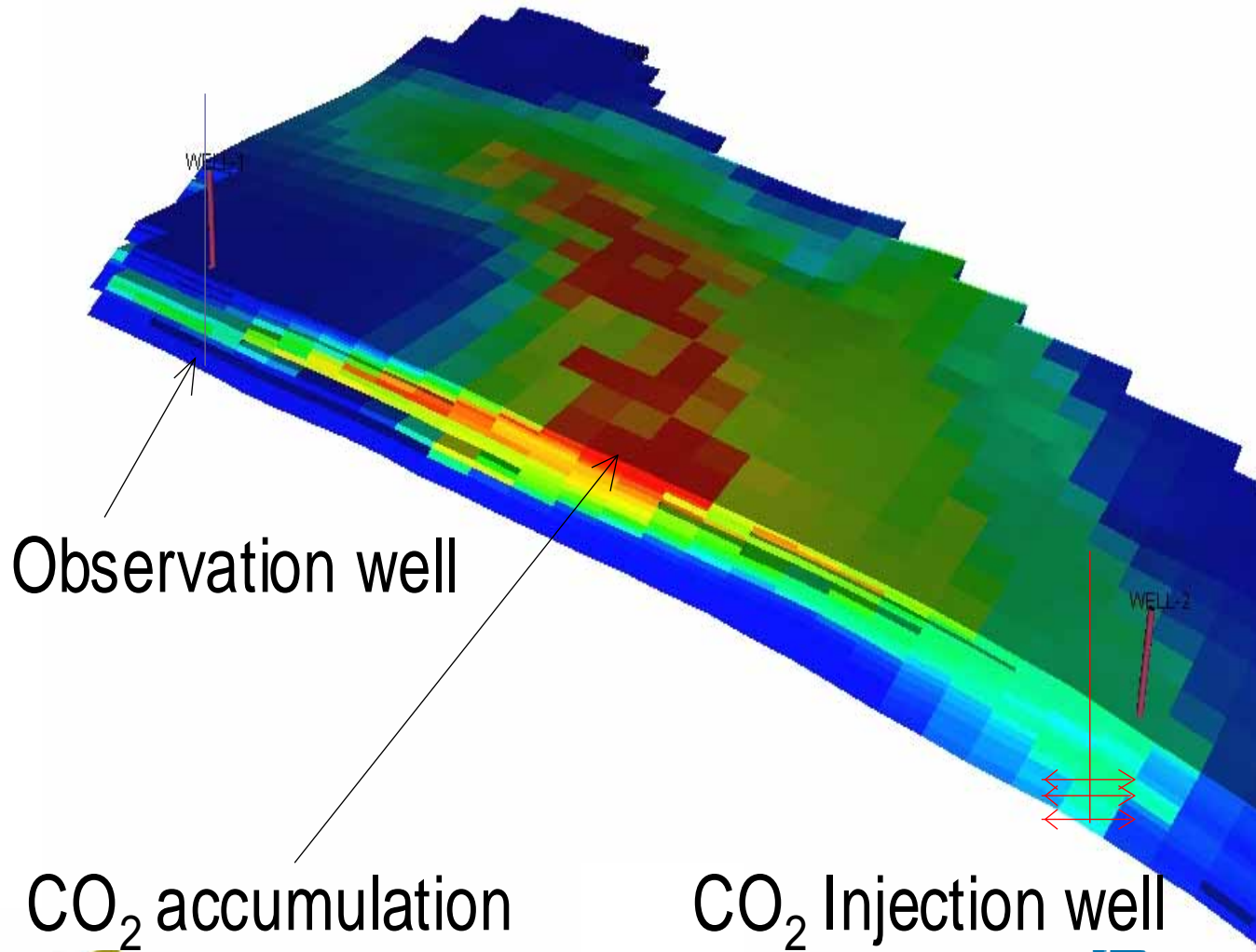
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Conceptual model



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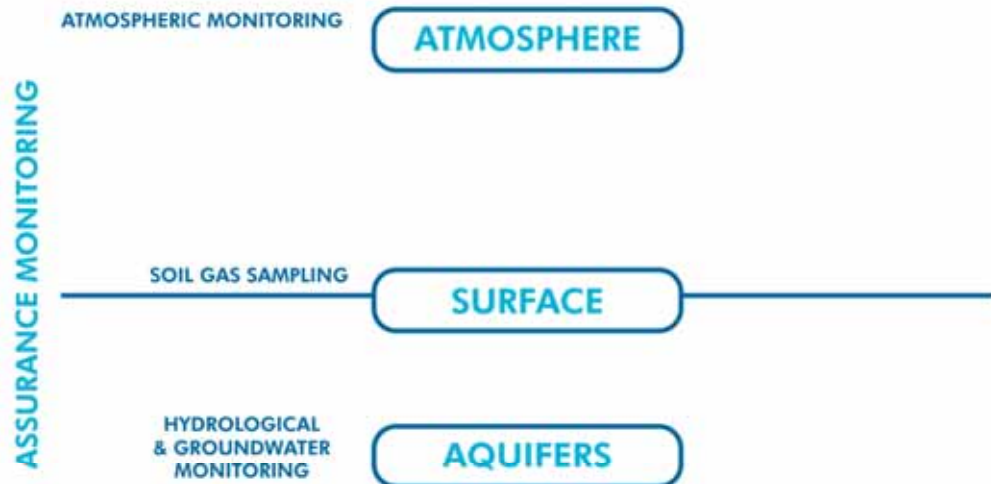
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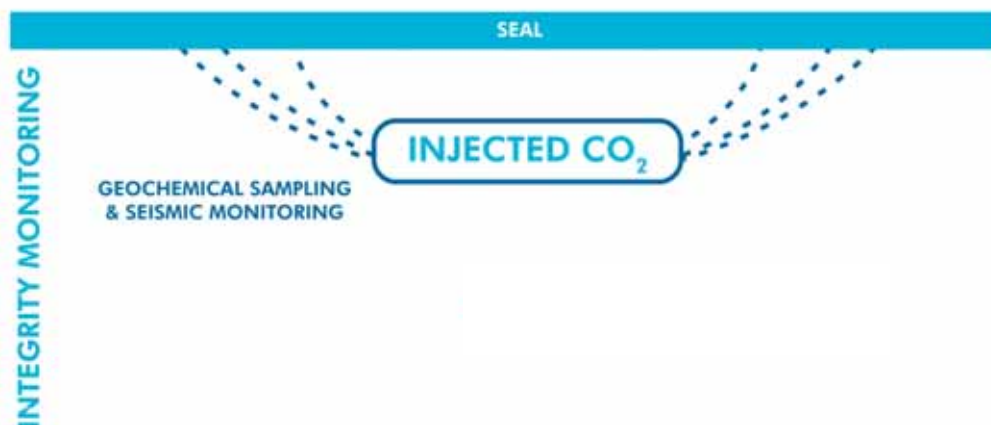
Monitoring the injected CO₂



Measuring the atmospheric concentration of CO₂

Measuring the concentration of CO₂ in the soil

Analysing the groundwater



Measuring the temperature and pressure, recording sound waves and detecting chemical changes

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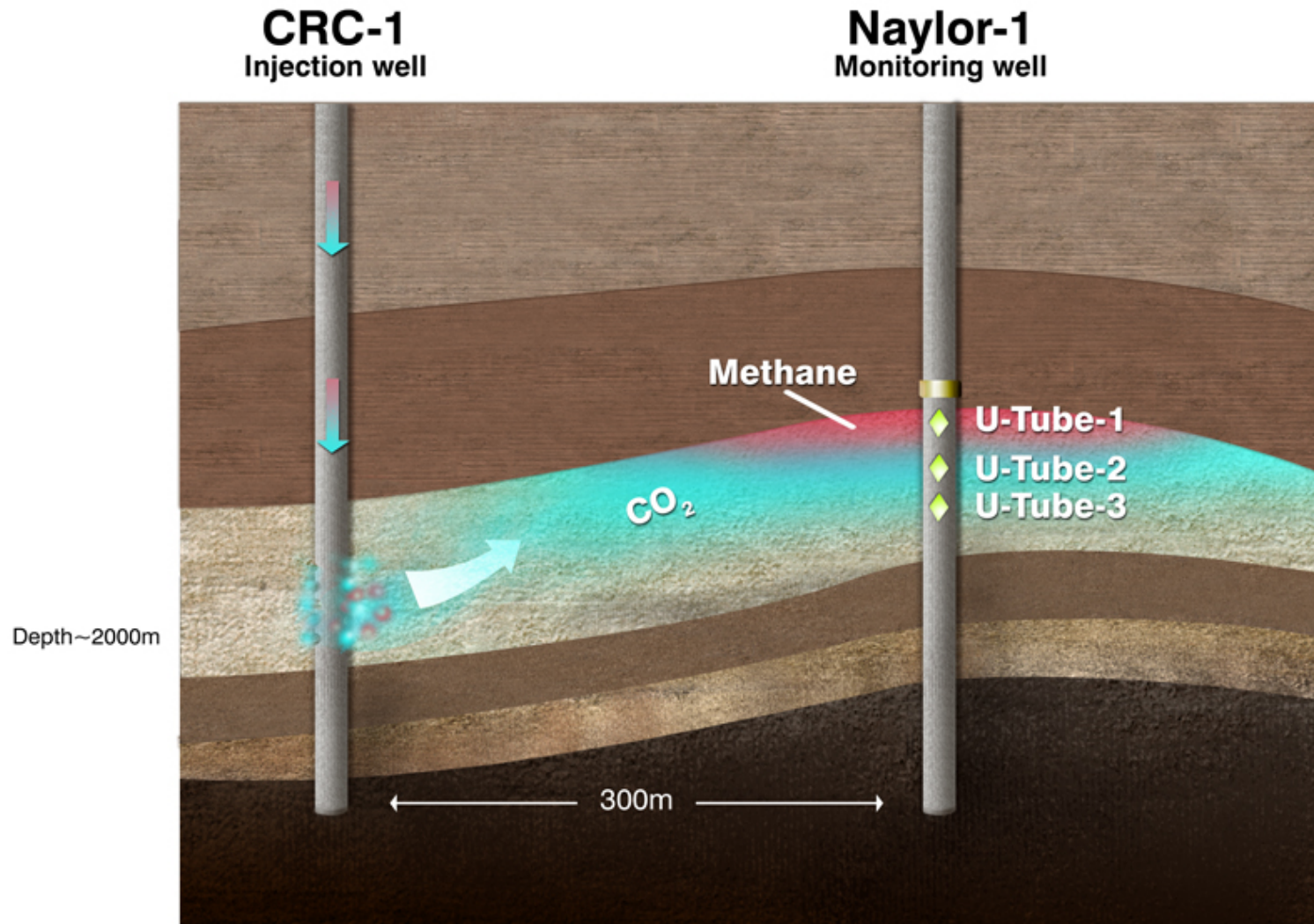
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Downhole geochemical monitoring



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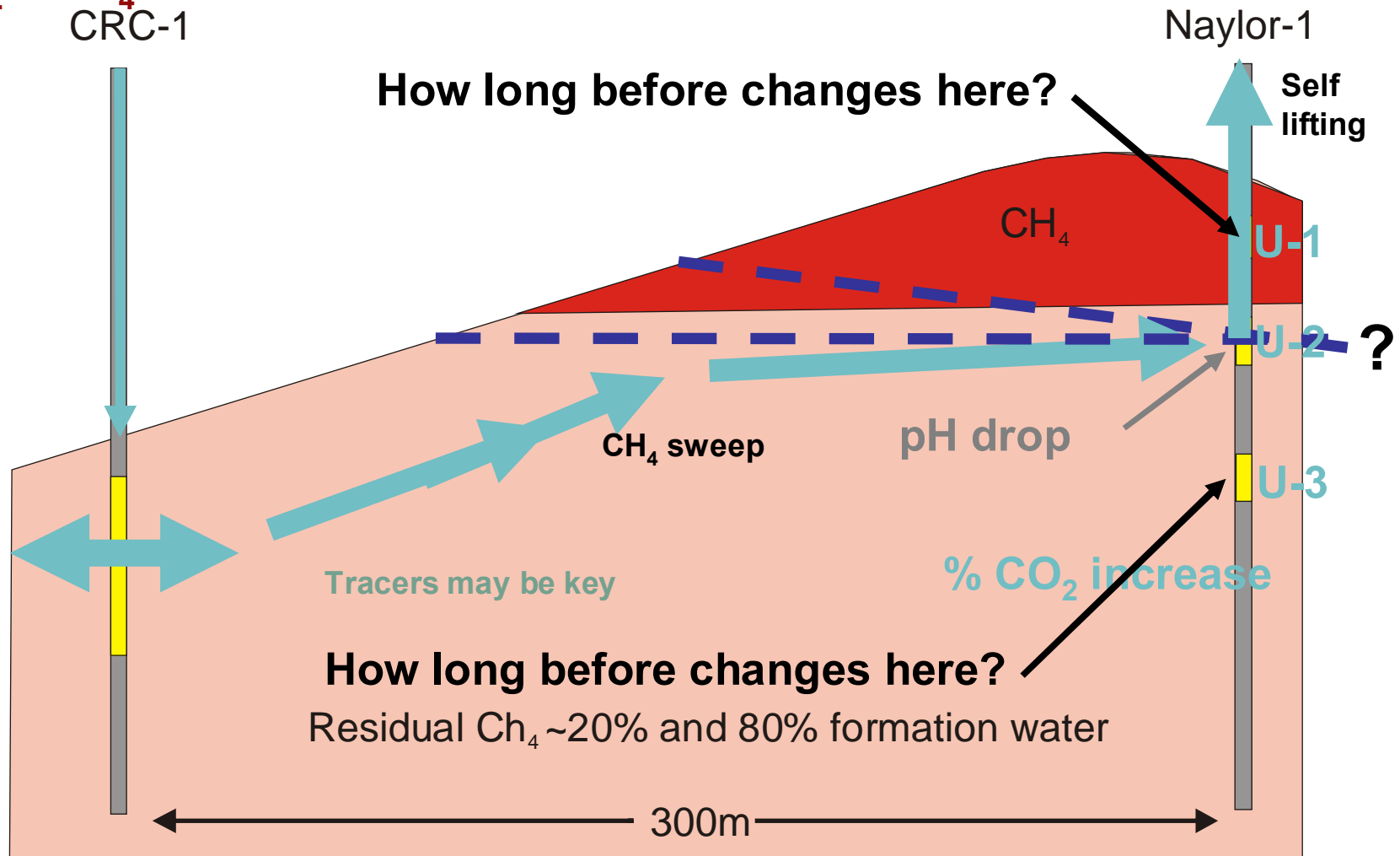
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What should the data tell us?

CO₂ + CH₄ + Tracers
CRC-1

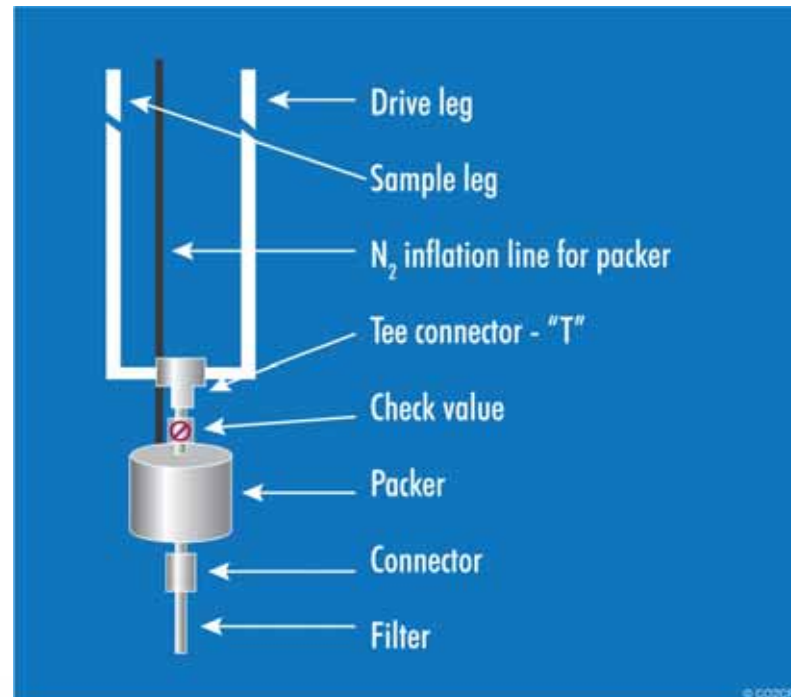
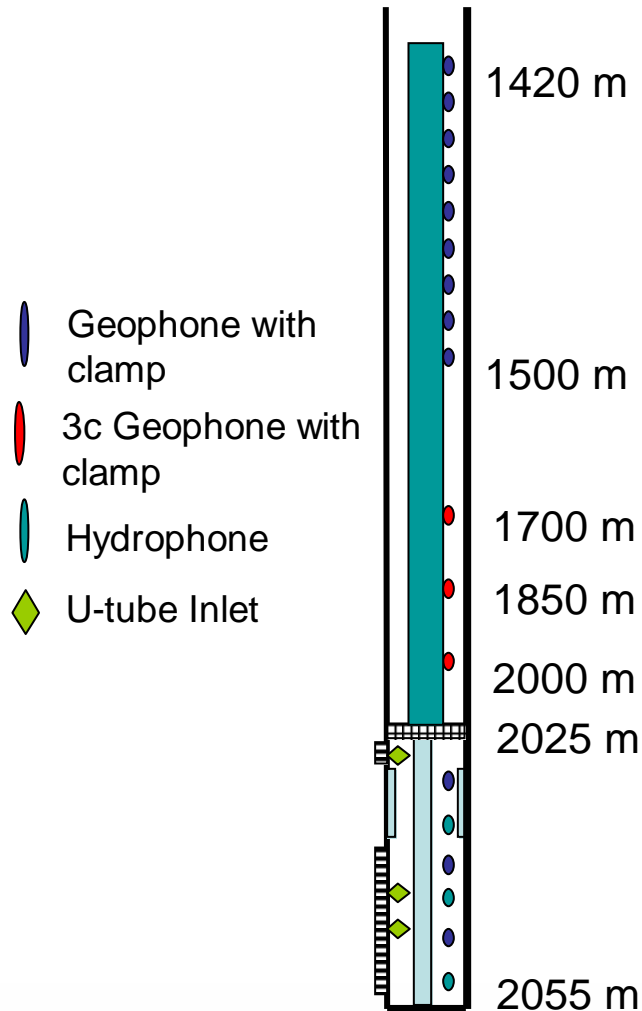


Down-hole Monitoring



Image, CO2CRC

- Fluid sampling
- Use of tracers
- Temperature and pressure



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Ground water monitoring

Objective:

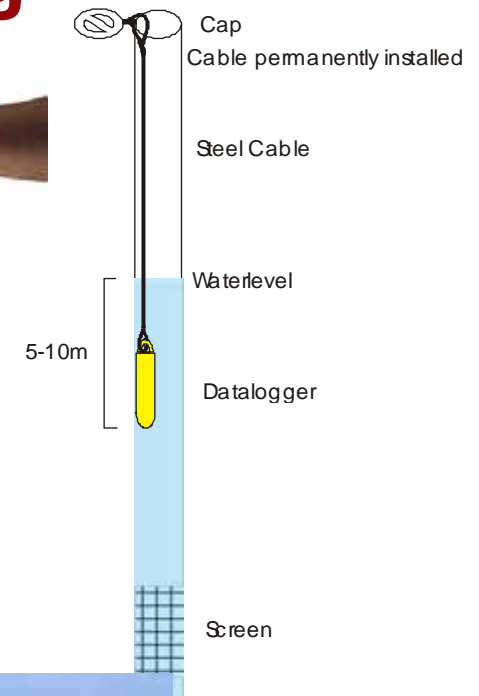
- Monitor water levels to determine seasonal variation, flow rate and direction
- Identify any chemical changes associated with possible CO₂ leakage

Methods:

- Dataloggers
- Water chemistry

Aquifers monitored:

- Shallow unconfined Port Campbell Limestone,
- Deep confined Dilwyn aquifer



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Soil gas monitoring

Objective:

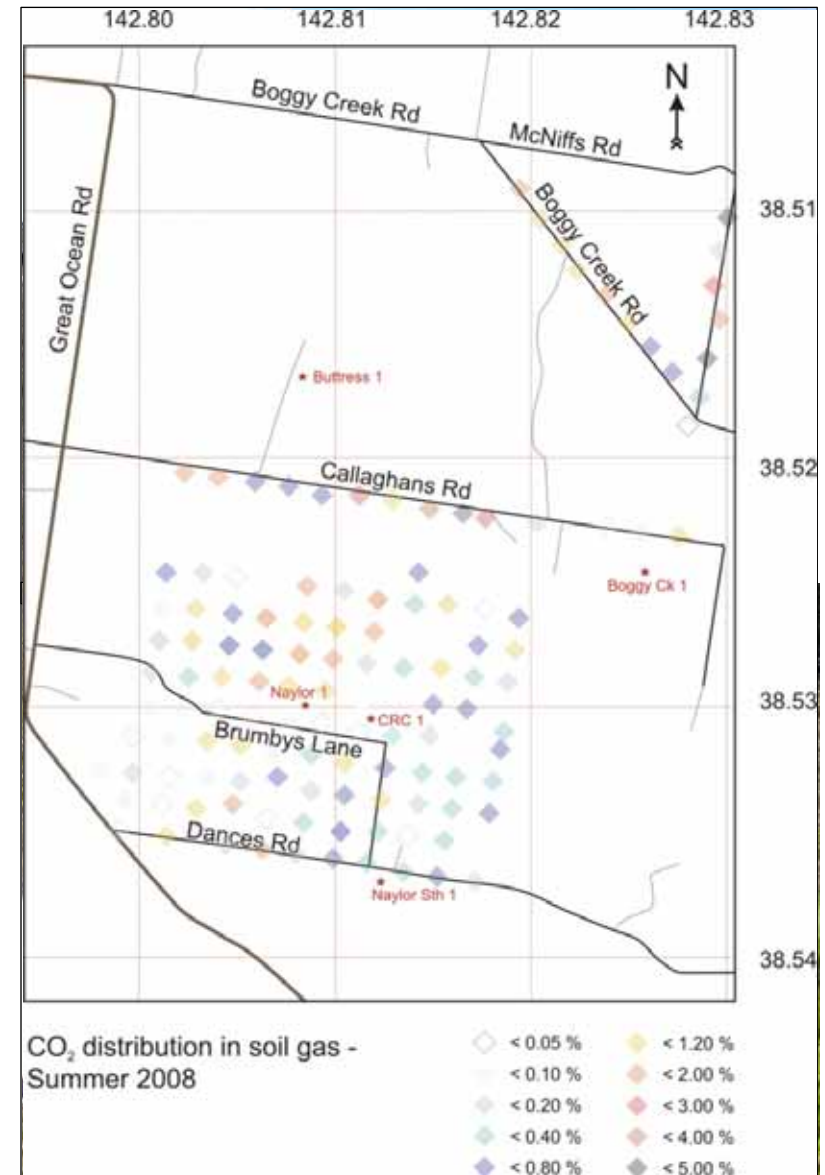
- Establish CO₂ variations within the extended area beyond the CO2CRC tenements
- Determine the likely source of origin
- Differentiate natural from injected CO₂.

Methods:

- The soil gas program extracts air from the unsaturated soil zone above the water table.
- Samples are analysed on site (portable gas chromatograph) and in the laboratory for CO₂, CH₄ and isotopes.

Frequency

- Baseline: Four surveys
- Once a year during and after the injection



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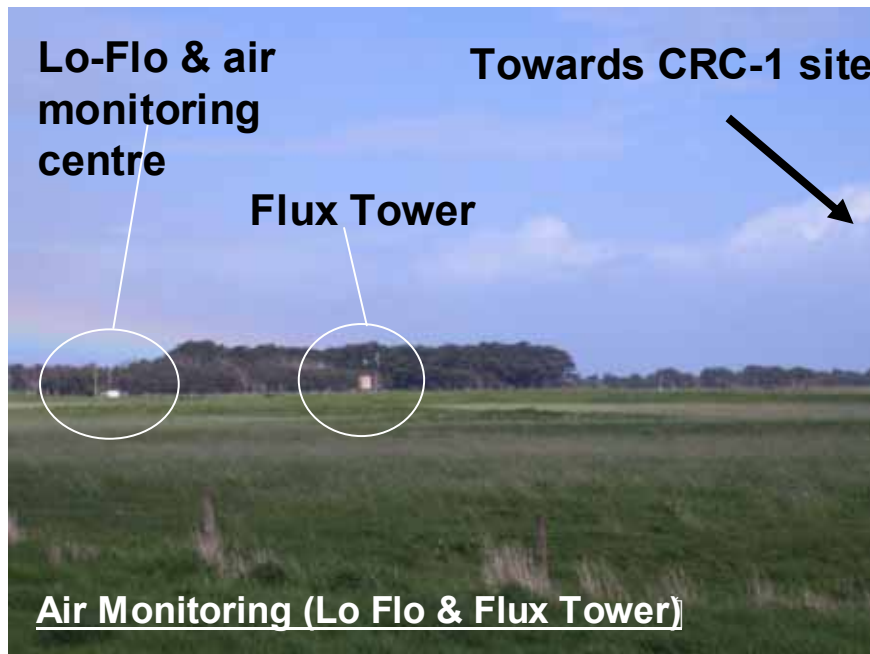
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Atmospheric monitoring

Objectives:

To verify that injected CO₂ stays underground; or in the unlikely event of leakage to surface, demonstrate the capacity to detect and quantify surface leakage



Monitoring using CO₂ concentration alone needs ideal conditions, so other species including CH₄, SF₆, CO and ¹³CO₂ are monitored to enhance sensitivity

D. Etheridge et al CSIRO

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