Geological storage of carbon dioxide

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Melbourne 2011

What is CO2CRC?

CO2CRC is a leading collaborative international CCS R&D organisation, based in Australia, working globally.

- Integrates CCS R&D
- Addresses capture and storage and systems integration
- Brings industry sectors together (coal, gas, power, etc) to provide an exceptional stakeholder base
- Brings together Commonwealth, States, local government and the community in the Otway Project
- Includes major research institutions - CSIRO, GA, Universities, major overseas institutions (LBNL, KIGAM)
- Scale and focus – we bring together over 200 leading researchers in CCS
- Broad international perspective and experience
- Successful track record in running major CCS facilities
- Number of patents and other IP

CO2CRC Participants

for more information see www.co2crc.com.au

Australian Government Geoscience Australia

CSIRO

Curtin University of Technology

MONASH University

The University of Adelaide Australia

The University of Melbourne

UNSW The University of New South Wales Sydney • Australia

ANGLO AMERICAN

BG GROUP

bhpbilliton

bp

Chevron

COAL21 FUND

Foundation for Research Science & Technology

INPEX

한국지질자원연구원 Korea Institute of Geoscience and Mineral Resources

NSW Government Industry & Investment

GNS Science

QR

Queensland Government

RioTinto

sasol reaching new frontiers

Shell

SOLID ENERGY Coals of New Zealand

STANWELL CORPORATION LIMITED

Schlumberger

TOTAL

State Government Victoria Department of Primary Industries

Government of Western Australia Department of Mines and Petroleum

xstrata coal

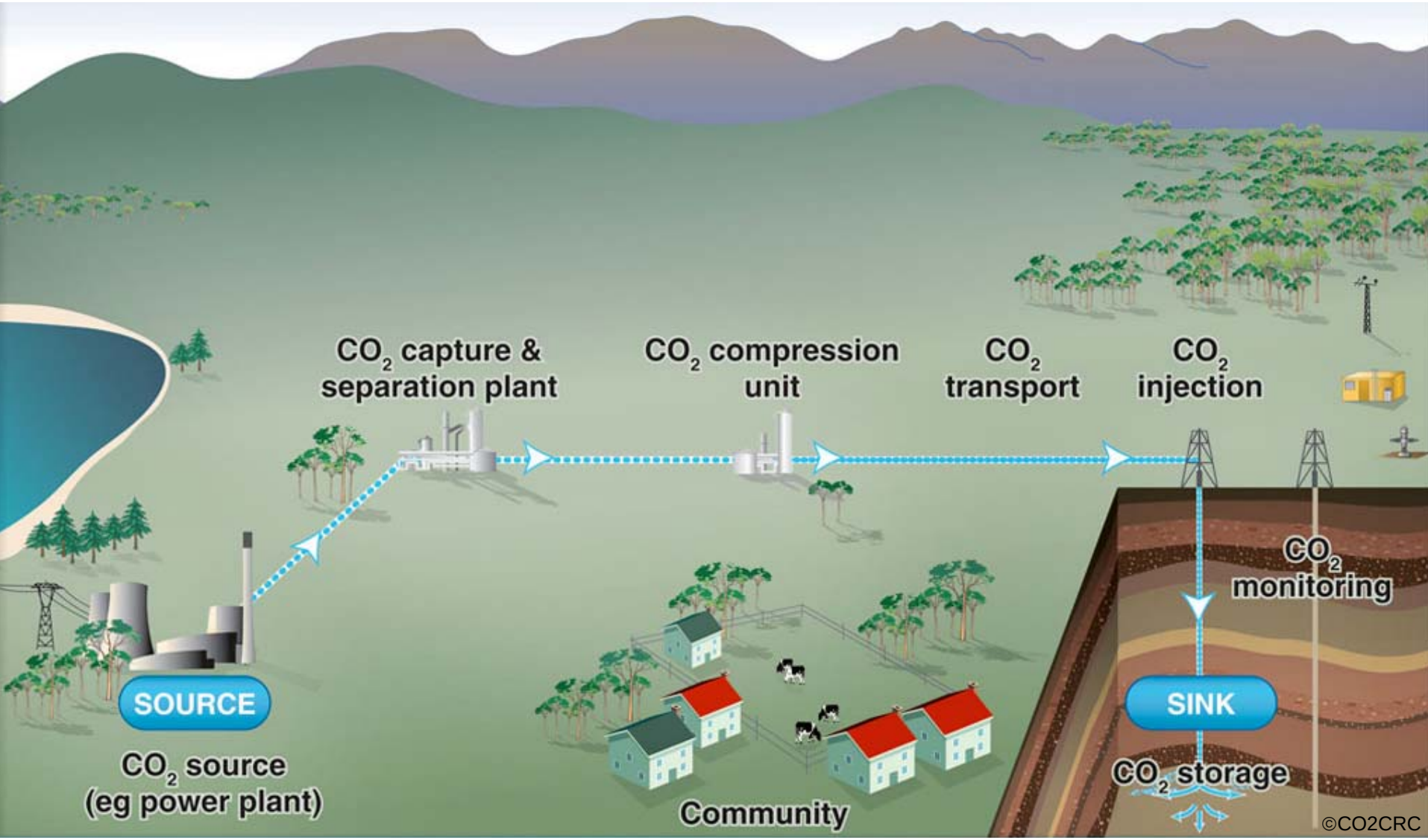
Supporting participants: Department of Resources, Energy and Tourism | CANSYD | Meiji University | Process Group | University of Queensland | Newcastle University | U.S. Department of Energy | URS

CRC Australia

Established & supported under the Australian Government's Cooperative Research Centres Program

CO2CRC

What is CCS?


CO_2 capture & separation plant
CO_2 compression unit
CO_2 transport
CO_2 injection
CO_2 monitoring
SOURCE
CO_2 source (eg power plant)
Community
SINK
CO_2 storage
©CO2CRC

CO2CRC/International Power H3 Capture Project

Evaluation of three post-combustion capture technologies

Solvent absorption

Membrane separation

Vacuum swing adsorption

process group

International Power

CO2CRC

CO2CRC/HRL Mulgrave Capture Project

Evaluation of three pre-combustion capture technologies

Solvent absorption

Membrane separation

Pressure swing adsorption

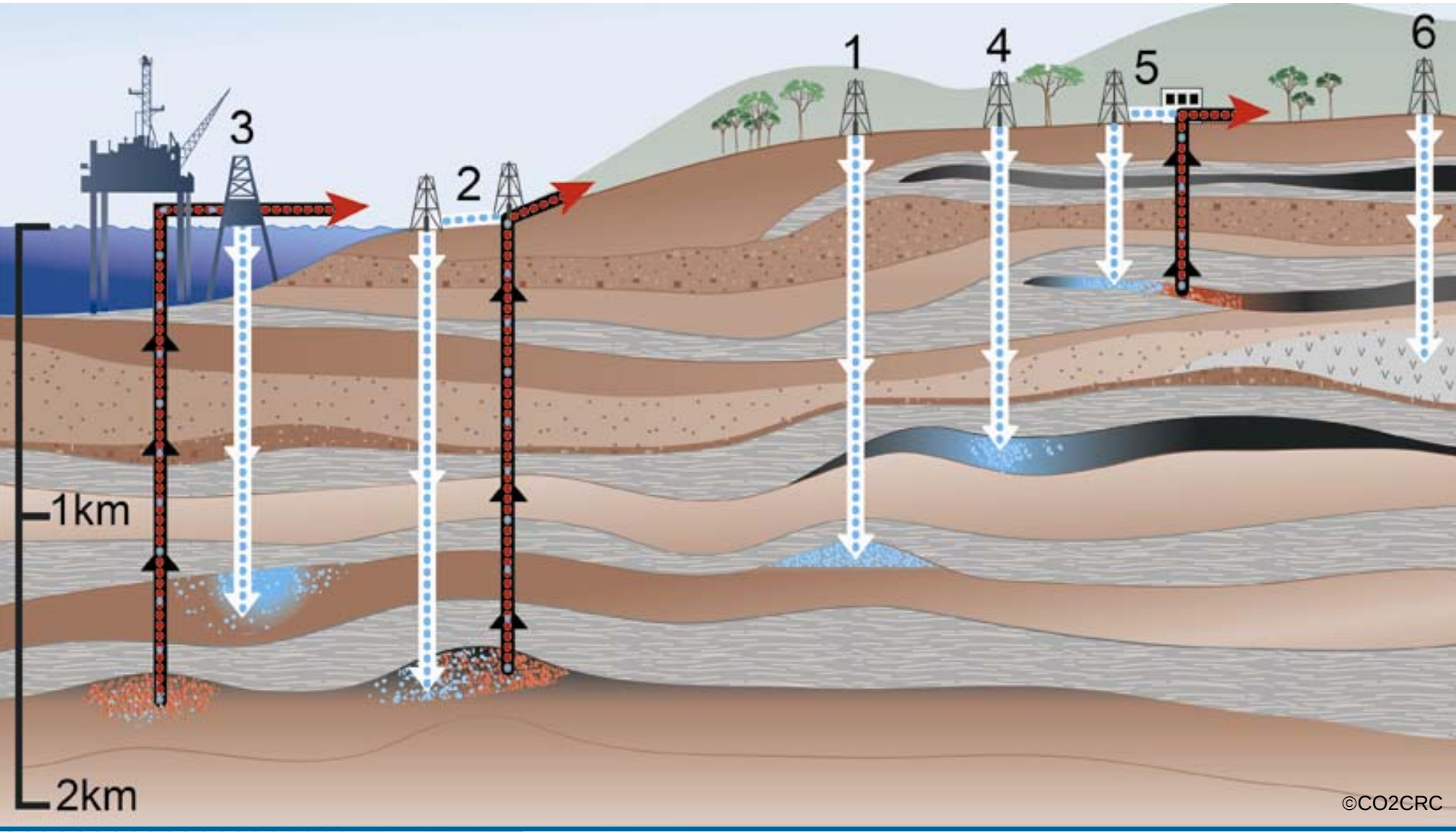
Bringing down CCS costs

- The cost of capture of CO2 is estimated at 80% of the total cost of CCS
- Costs will come down as we gain experience
- The costs of CCS are already lower than some of the options

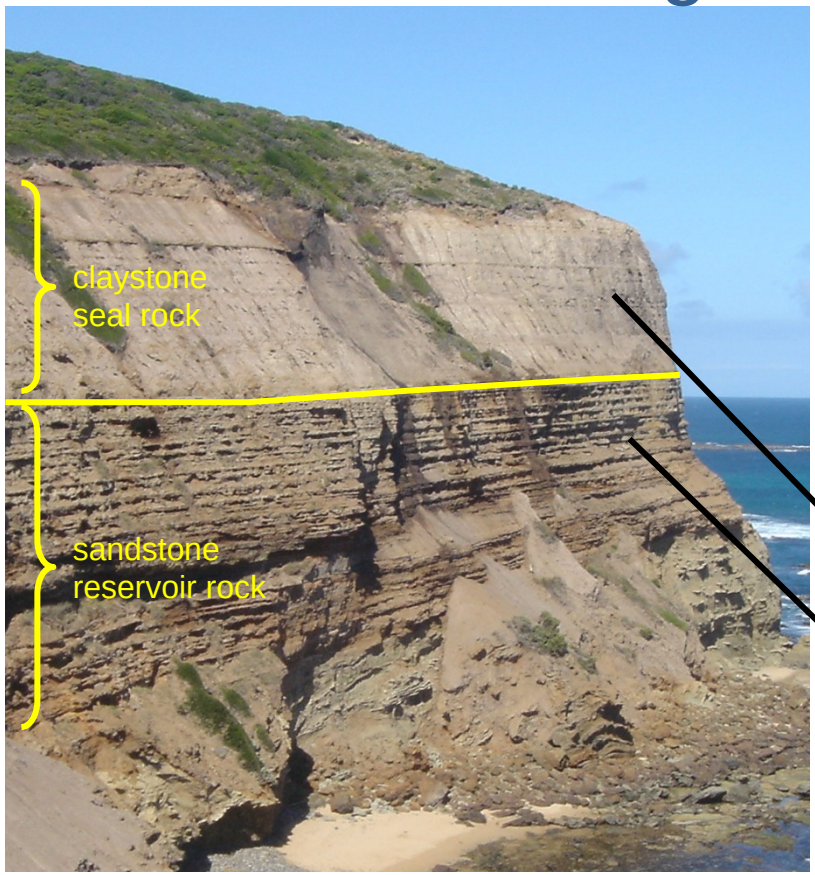
We can store CO2 in ...

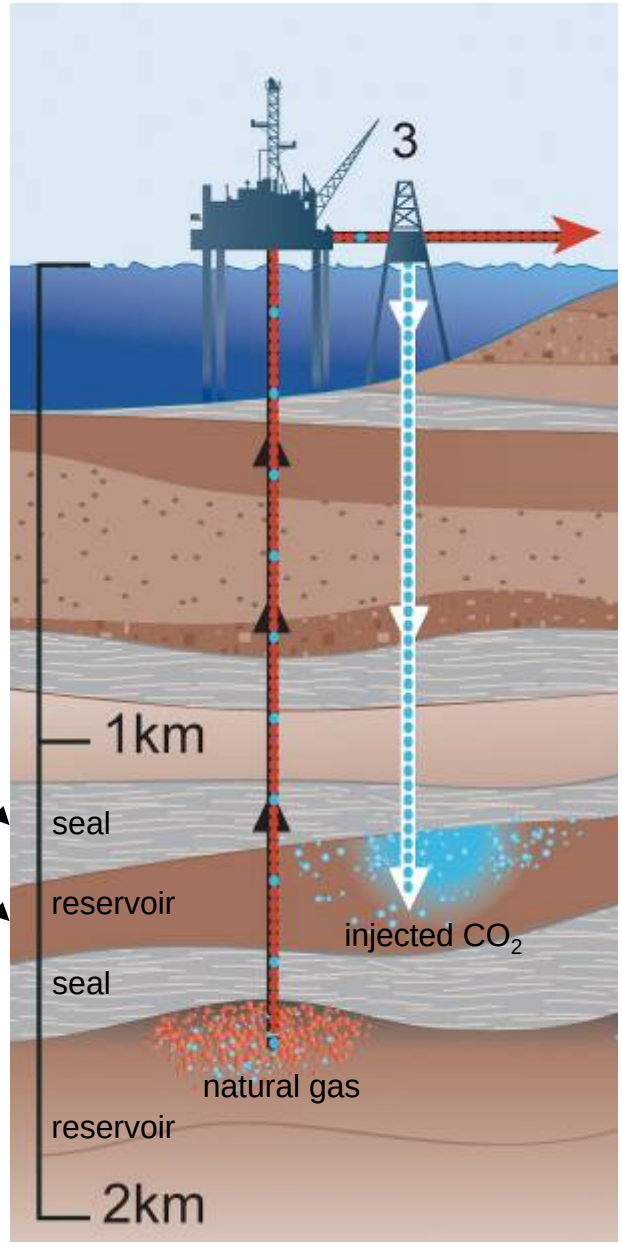
- Minerals
- Algae
- Soils
- Trees
- Rocks

Geological storage options for CO_2



Geological Storage of CO_2



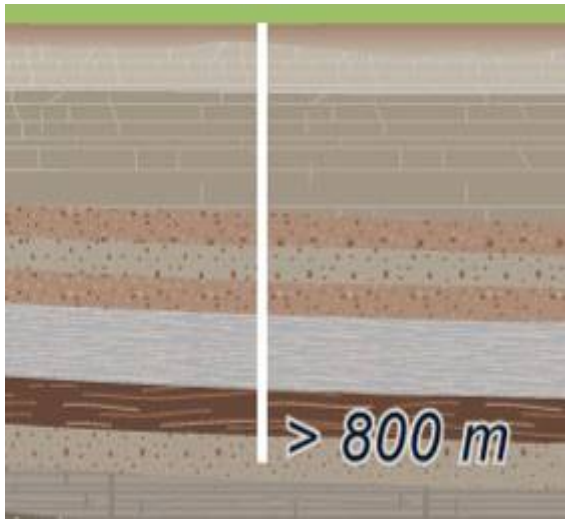


CO_2 storage sites:

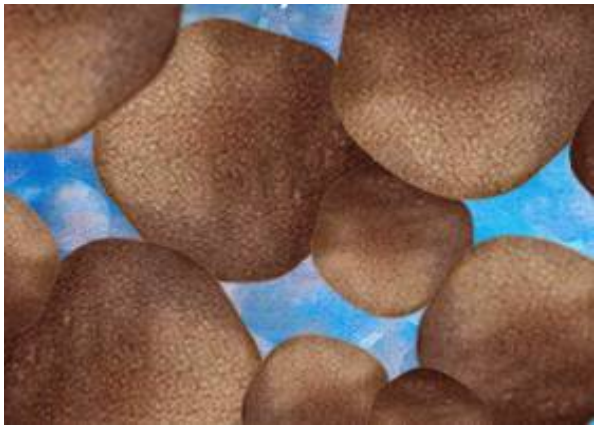
- Several kilometres below surface
- Similar locations to oil and natural gas

Geological storage of CO_2

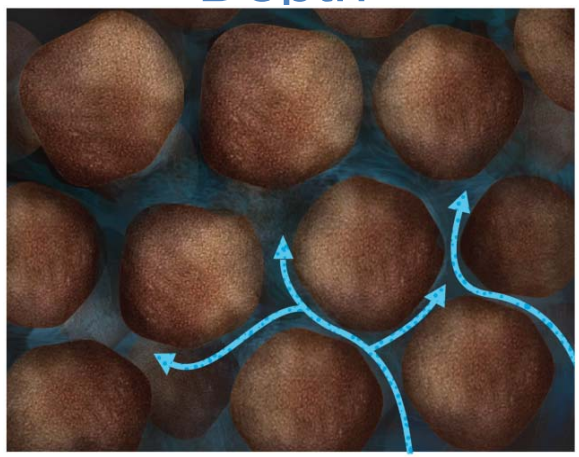
Seal rock above



Depth



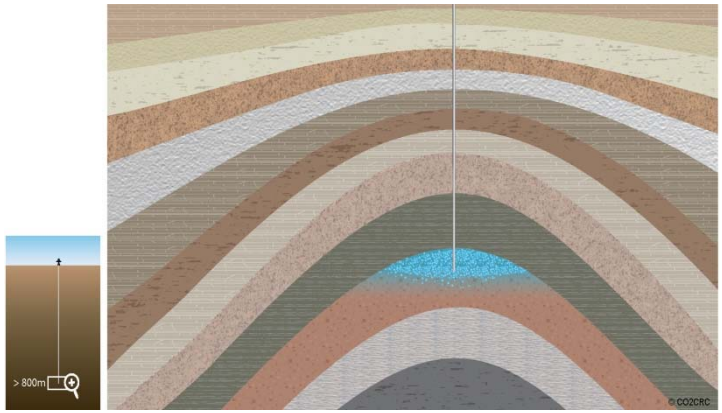
Porosity



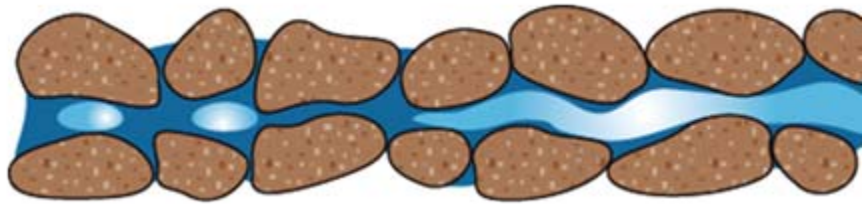
Permeability

Trapping the carbon dioxide

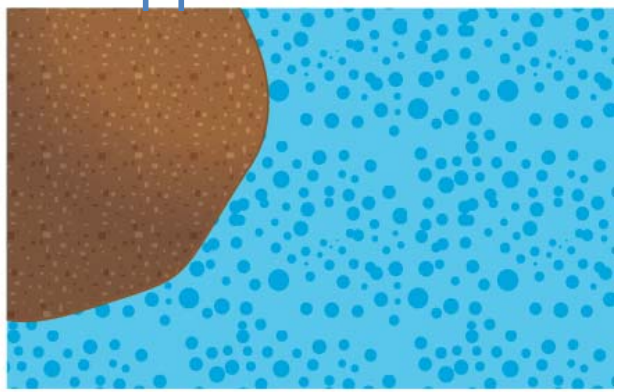
Trapped by rock type/rock structure



Trapped in rock pores

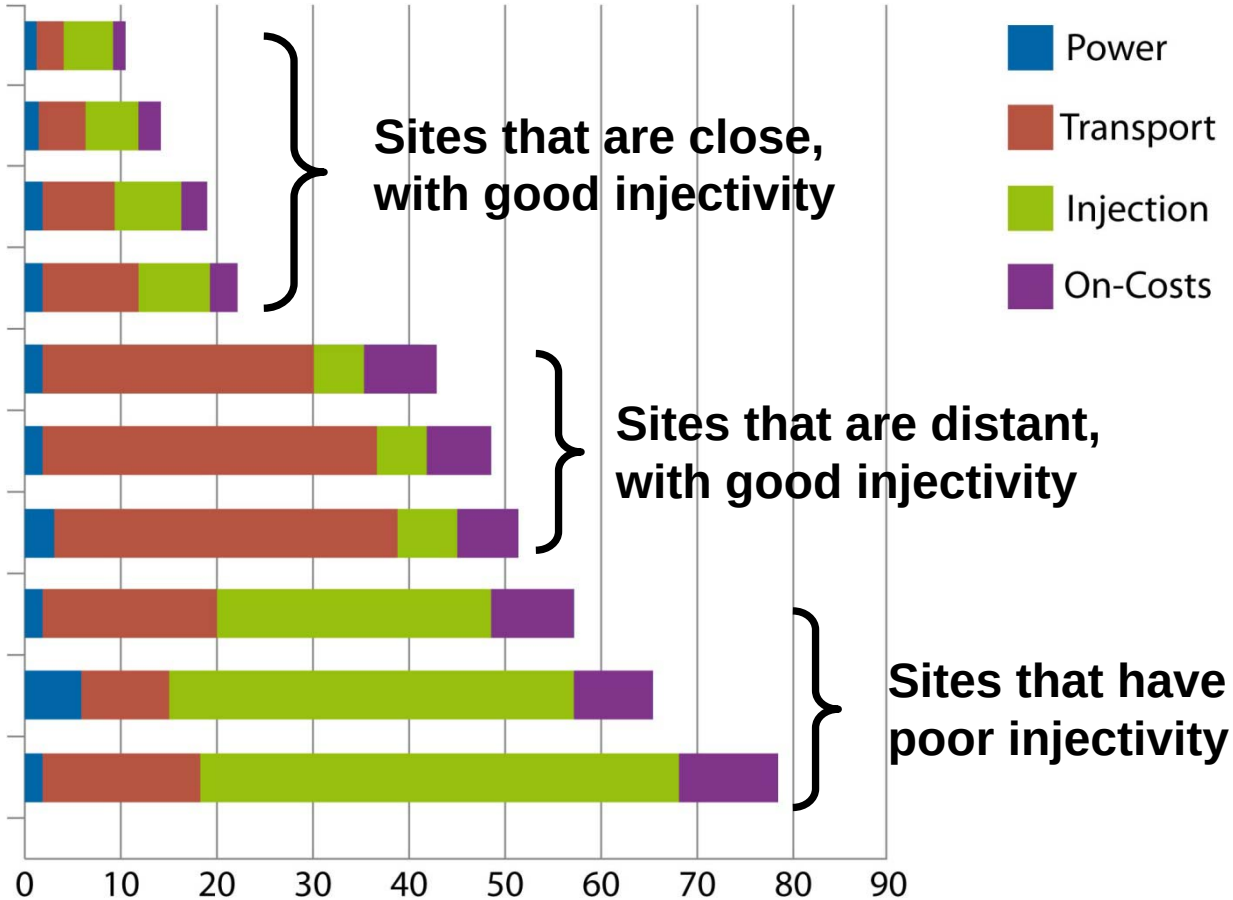


Trapped in solution

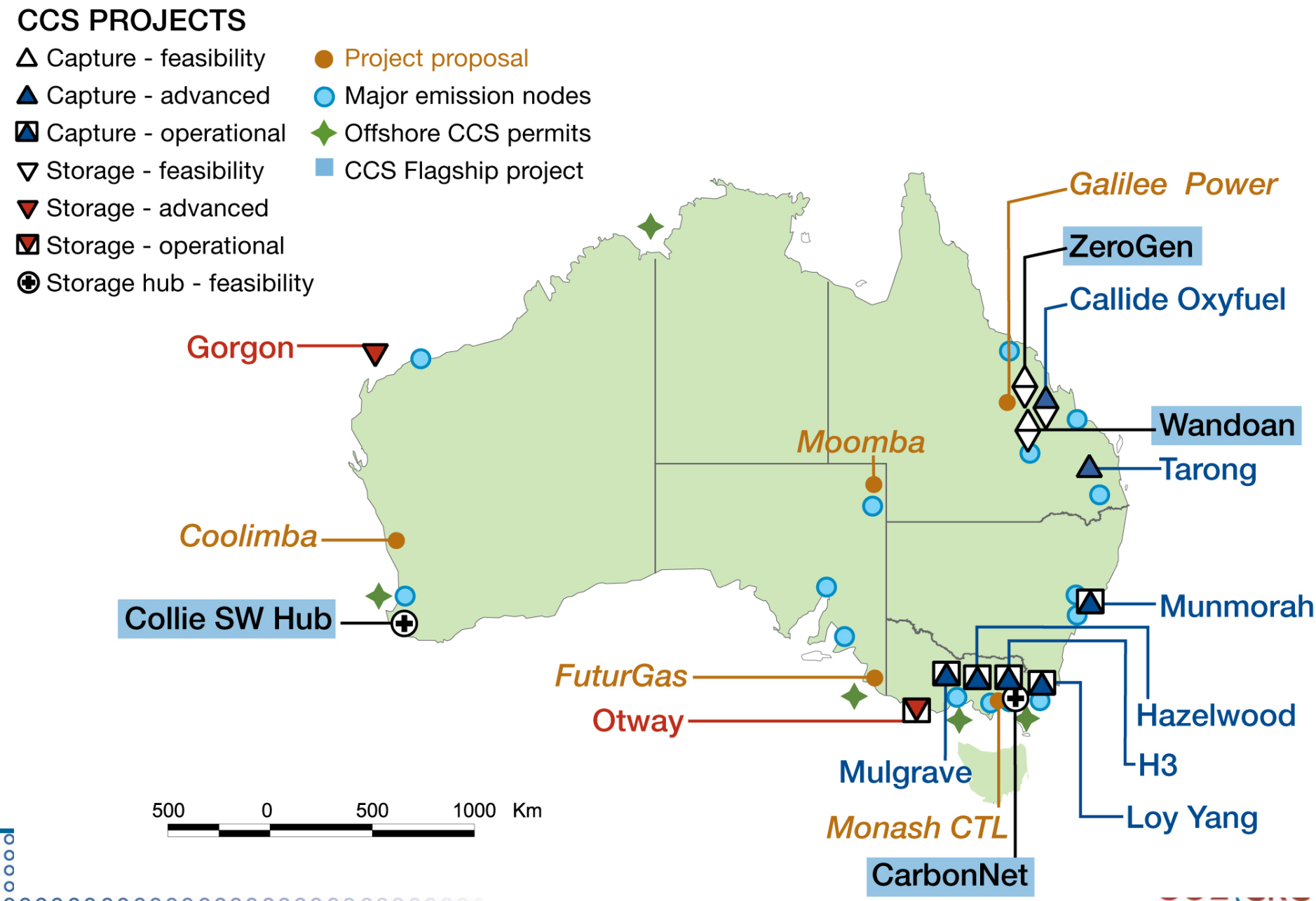


Trapped as a mineral

Cost of CO_2 transport and storage at various Australian locations



Cost per CO_2 avoided.
Single source-sink.

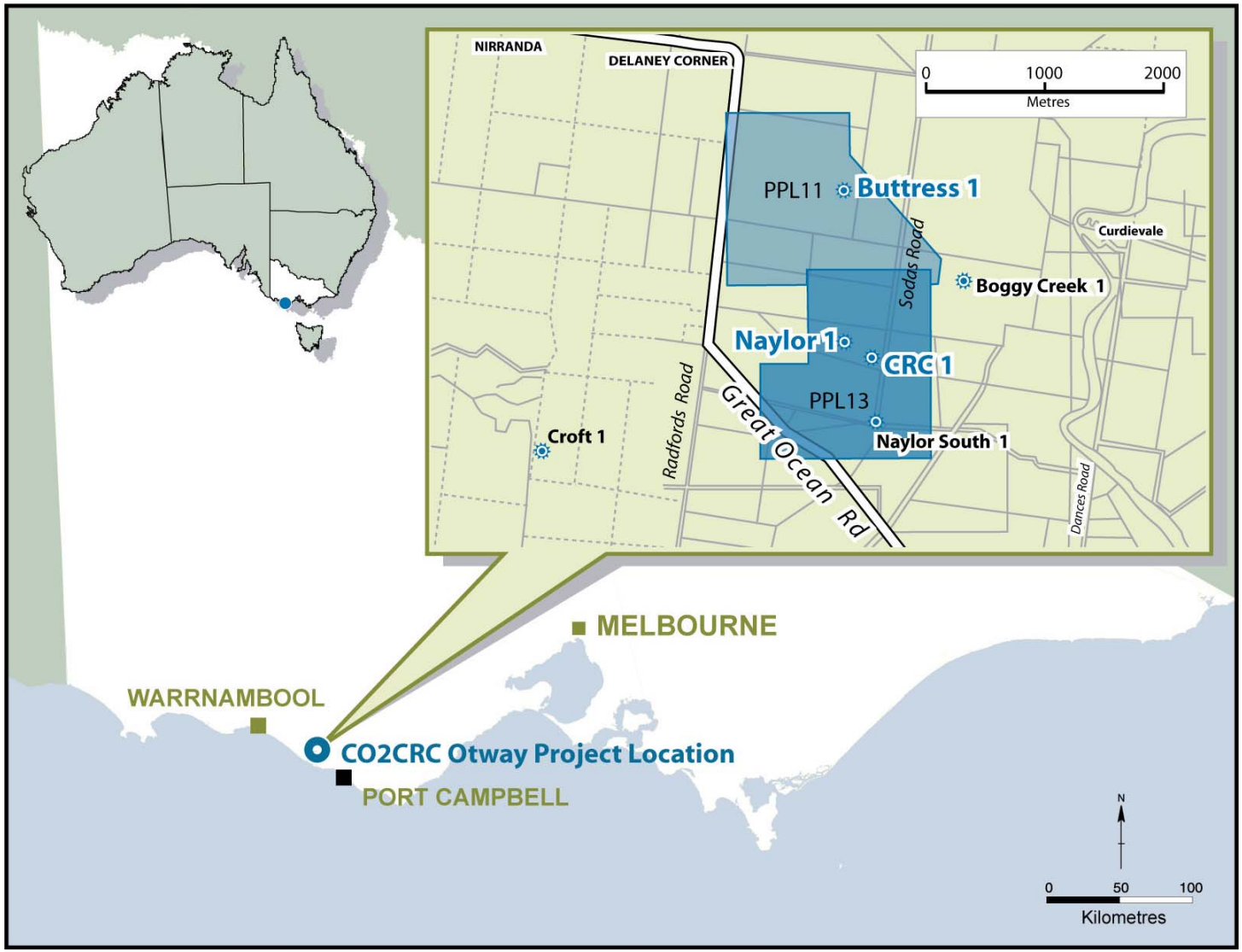

CCS PROJECTS
Capture - feasibility
Capture - advanced
Capture - operational
Storage - feasibility
Storage - advanced
Storage - operational
Storage hub - feasibility
Project proposal
Major emission nodes
Offshore CCS permits
CCS Flagship project
Galilee Power
ZeroGen
Callide Oxyfuel
Wandoan
Tarong
Gorgon
Moomba
Coolimba
Collie SW Hub
Munmorah
FuturGas
Otway
Hazelwood
H3
Mulgrave
Loy Yang
Monash CTL
CarbonNet
500 0 500 1000 Km

CO2CRC Otway Project

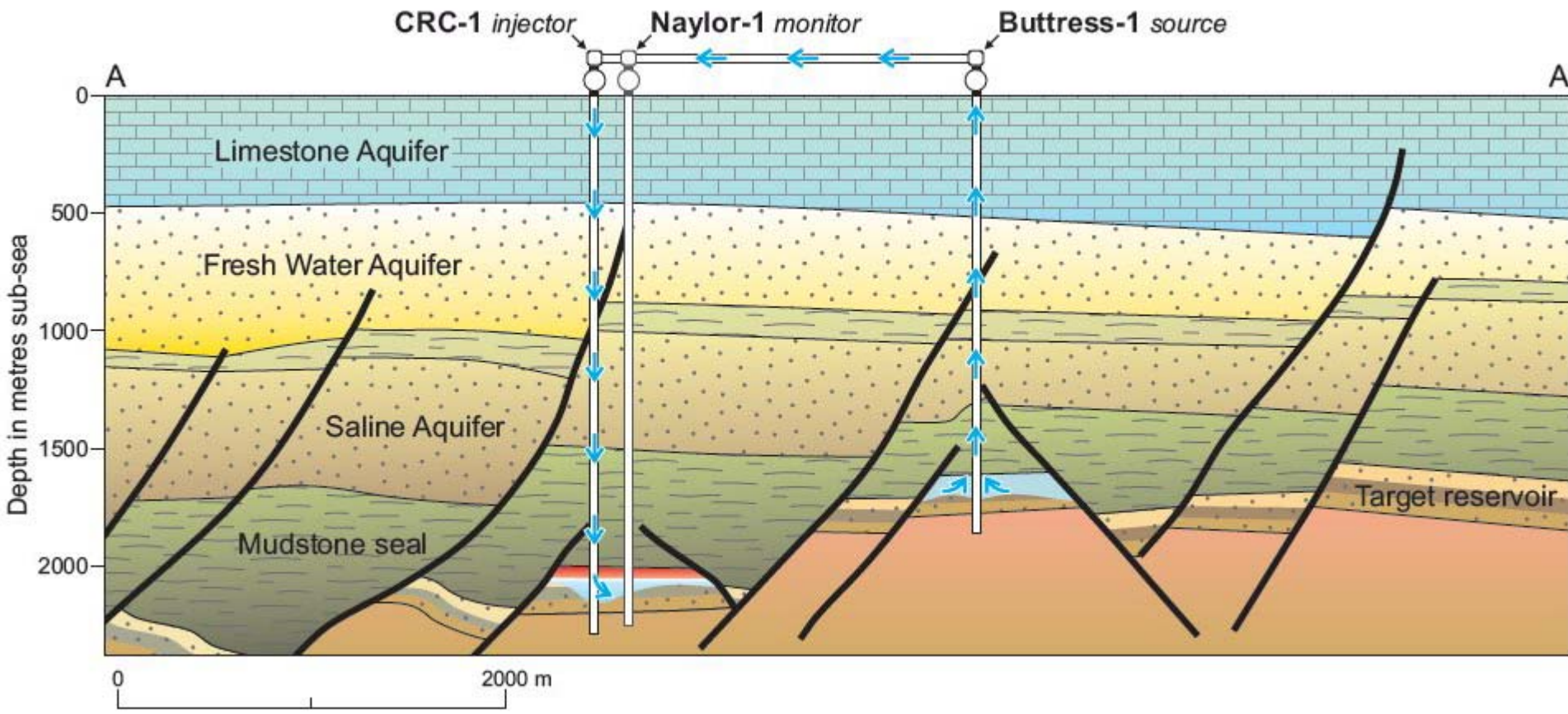
Australia's first demonstration CO_2 storage project

Australia's only operational storage project and a world class research facility, that has safely stored 65,000 t of CO_2 , and attracted wide community interest and support

Location of CO2CRC Otway Project



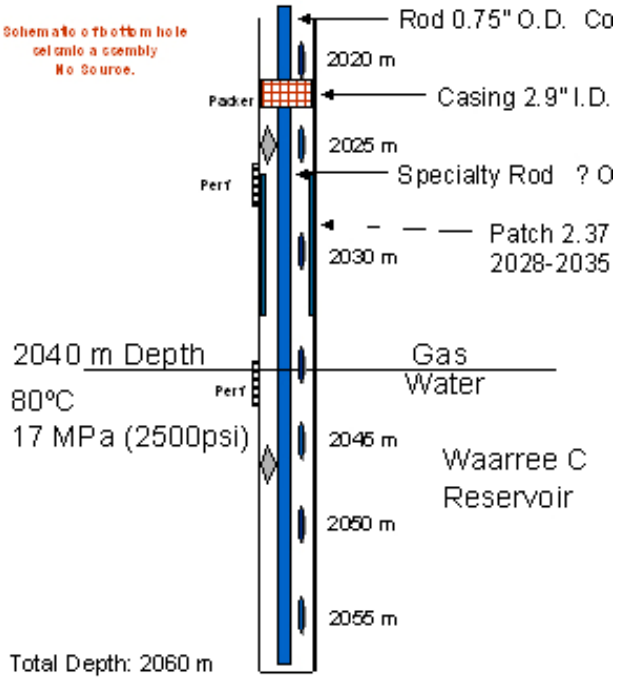
Otway geological model



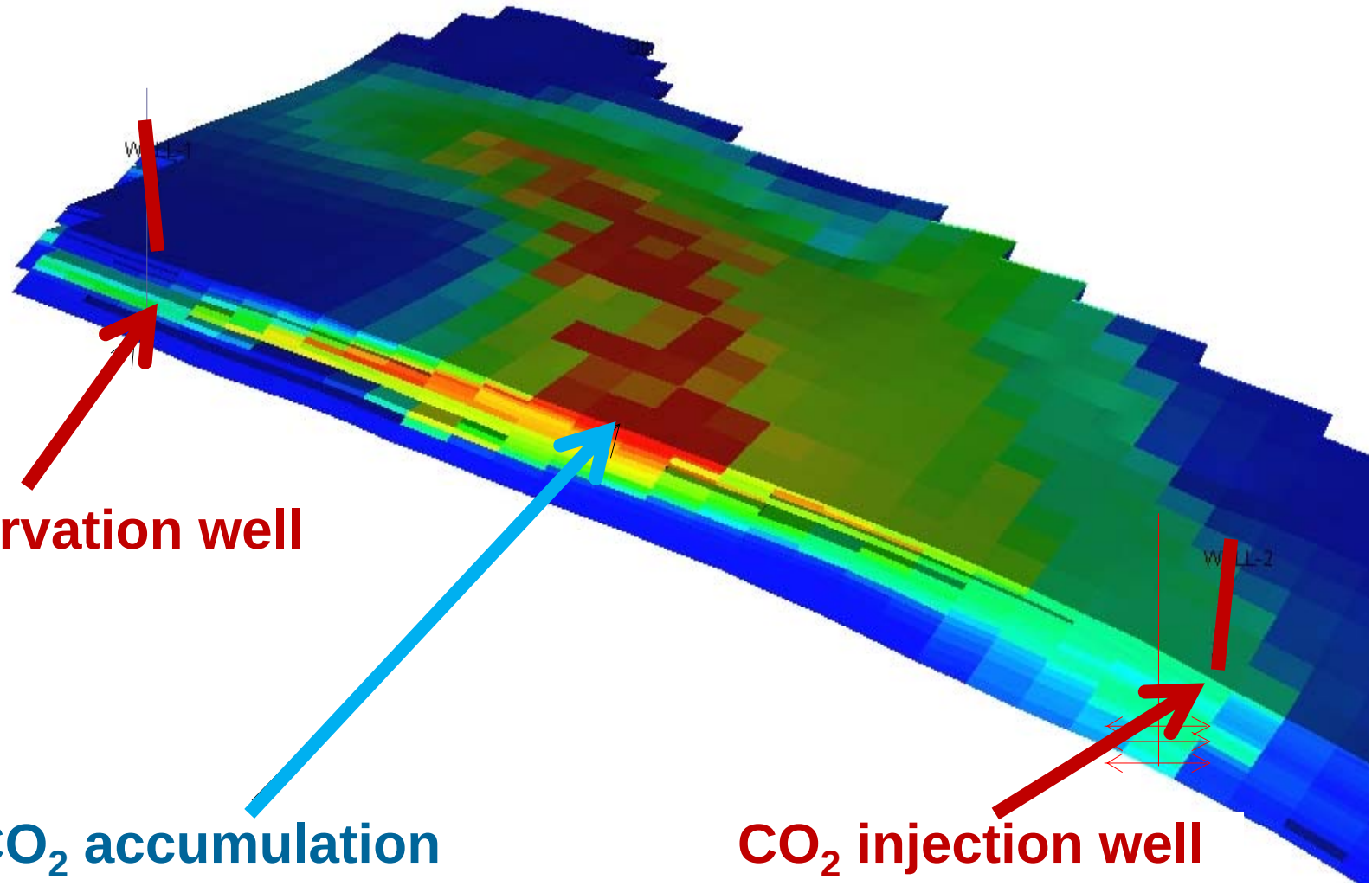
Storing carbon dioxide at a depth of 2 kms

Monitoring carbon dioxide

Monitoring technologies used in the Otway Project



Modeling migration of carbon dioxide within the reservoir



Observation well

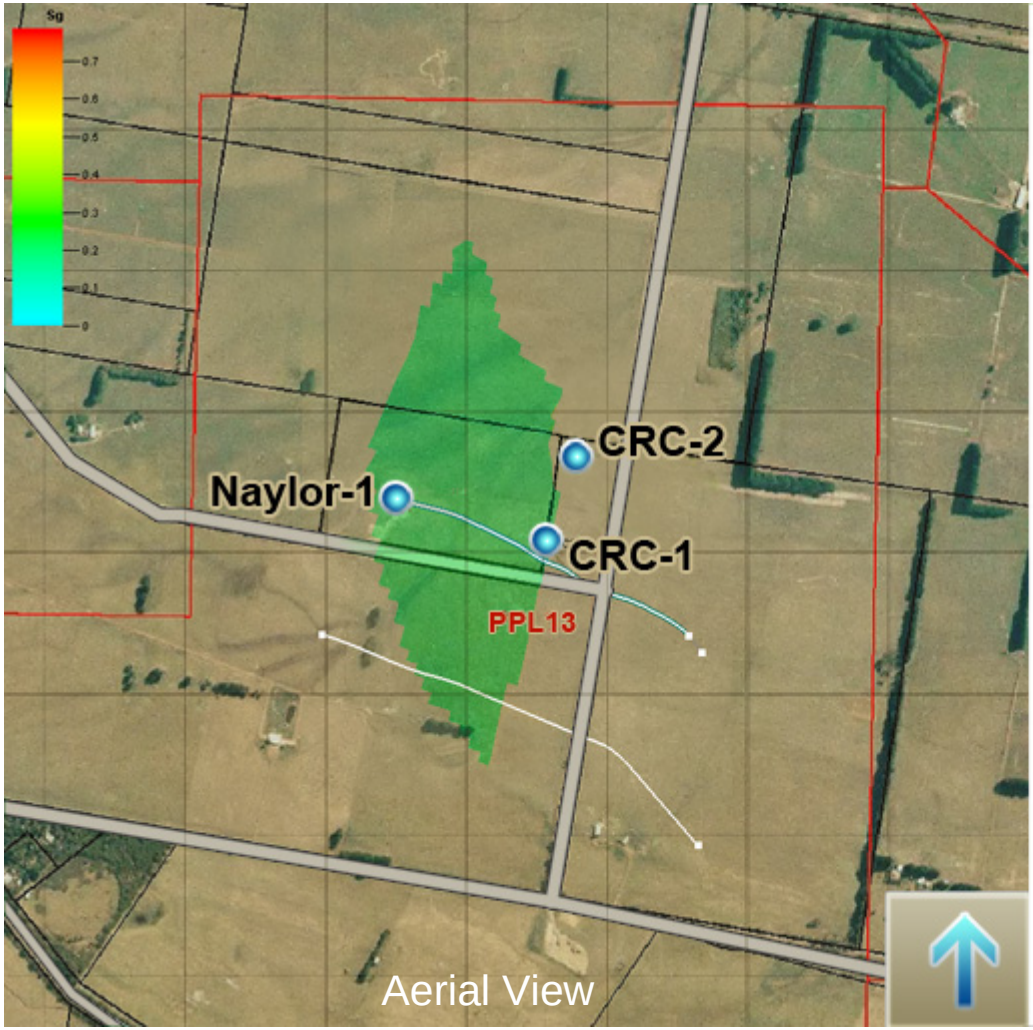
CO_2 accumulation

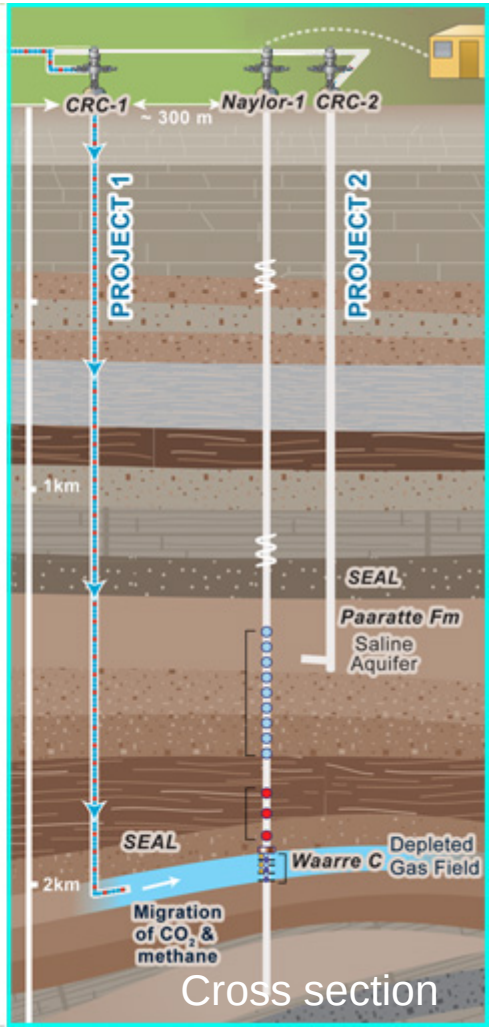
CO_2 injection well

What has CO2CRC achieved so far?

- **Demonstrated safe and effective storage of 65000 tonnes of CO_2 in a depleted gas field with no leaks**
- **Confident in ability to detect a small 'leak' into the overlying formation**
- **Confident in ability to detect a significant leak into the atmosphere and the soil.**
- **The reservoir models gave good predictions of "break through"**
- **Have been able to sample 'in situ' formation waters from 2 km depth**
- **The seismic results giving an image which is consistent with the reservoir model.**
- **The community has remained supportive and interested**
- **The regulators are happy**

CO2CRC Otway Project - Stage 2





Implementing CCS at Otway

- Technology challenges
- Legal issues
- Financing and insurance
- Public and community acceptance

THANK YOU

For more information see www.co2crc.com.au