CCS Opportunities in Victoria

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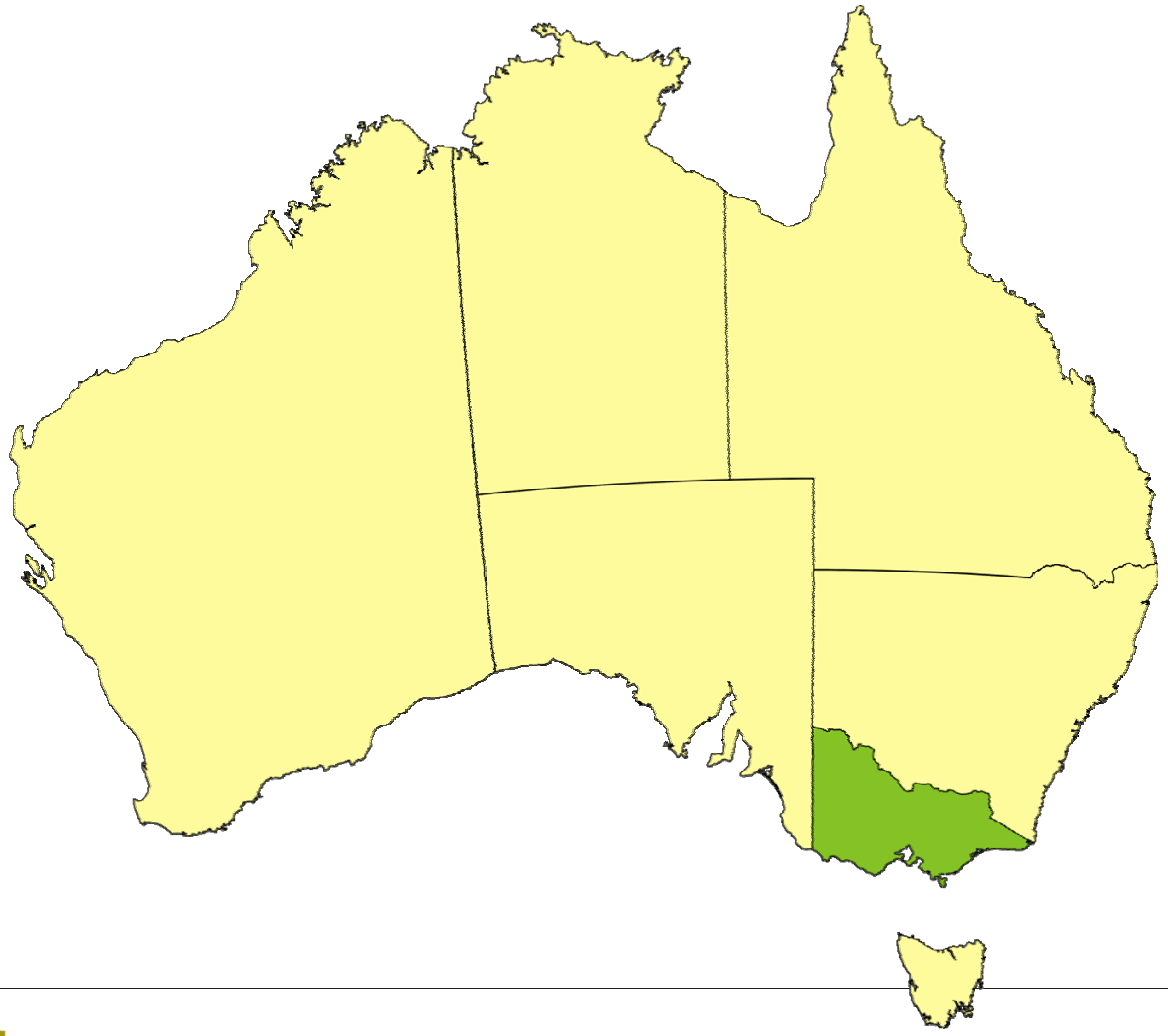
China Australia Geological Storage of CO_2
中澳二氧化碳地质封存

Outline

- Why is geological carbon storage (GCS) important to Victoria?
- Technical issues
- GCS Activity in Victoria
- VicGCS Results Gippsland Basin
  - Imaging the Subsurface
  - Containment
  - Injectivity/Capacity
  - Impacts
- CarbonNet
- Questions & Discussion



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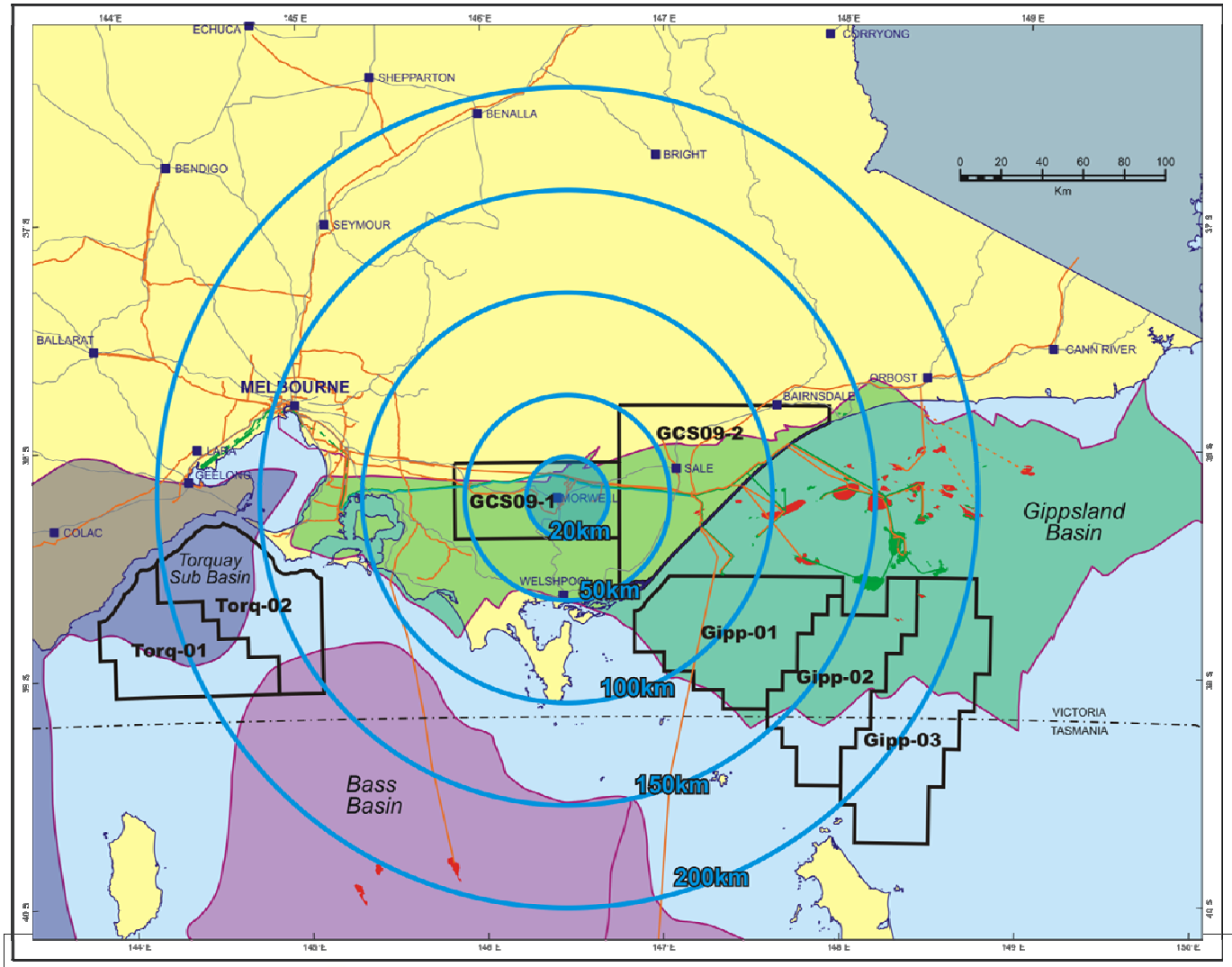
Importance of GCS



Victoria's total CO_2 emissions (~122 MT per year) are dominated (>50%) by those from brown coal-fired electricity generation in the Latrobe Valley

In a carbon-constrained world, this is unlikely to continue

Geological Carbon Storage is a one means of securing a low-emissions future for brown coal

Victoria has several storage options

Key technical elements:

Victorian Geological Carbon Storage Project (VicGCS)

– Containment

- Understand where CO_2 will be contained in the deep sub-surface
- Understand the distribution and capacity of the fine-grained sealing rocks
- Sealed area defines the limits of GCS play fairways

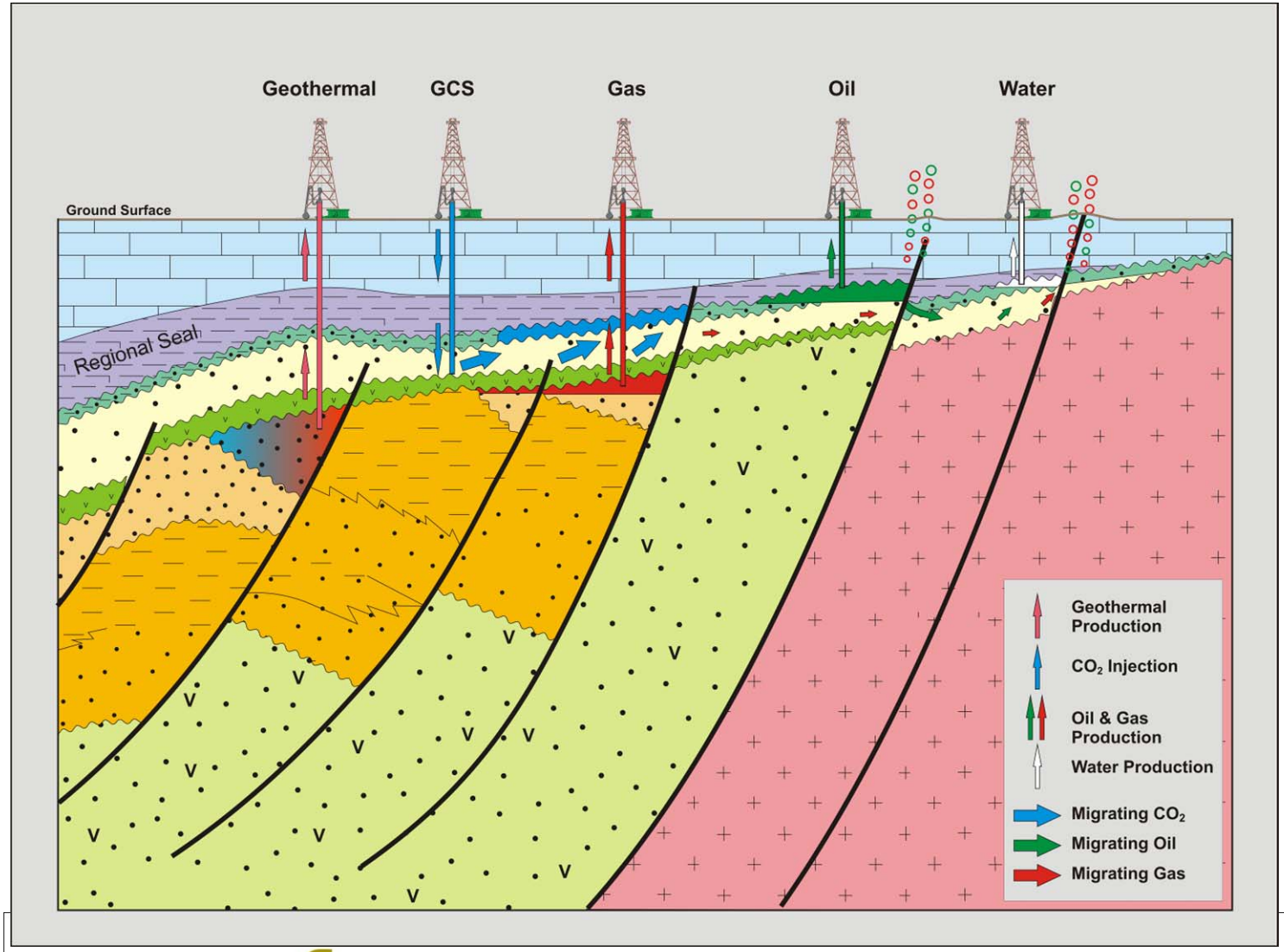
– Injectivity & Storage Potential

- How much CO_2 can be safely put into the deep sub-surface?
- Understand the porous sands or reservoirs underground

– Impacts

- If it is injected, where will it go, in what timeframe and what effects might it have on existing hydrocarbon resources and infrastructure, on undiscovered hydrocarbon and other resources and on the physical and man-made environment?
- Understand CO_2 migration and entrapment

Basins As Multiple-Use Zones



Geoscience information systems need to be adequate to allow the management of the basin as a multiple use zone

This will enable the GCS, geothermal, petroleum and water sectors, inter alia, to co-exist without conflict

Must be at a basin-scale in order to allow assessments of impact and relative value to be made

Who Is Involved?

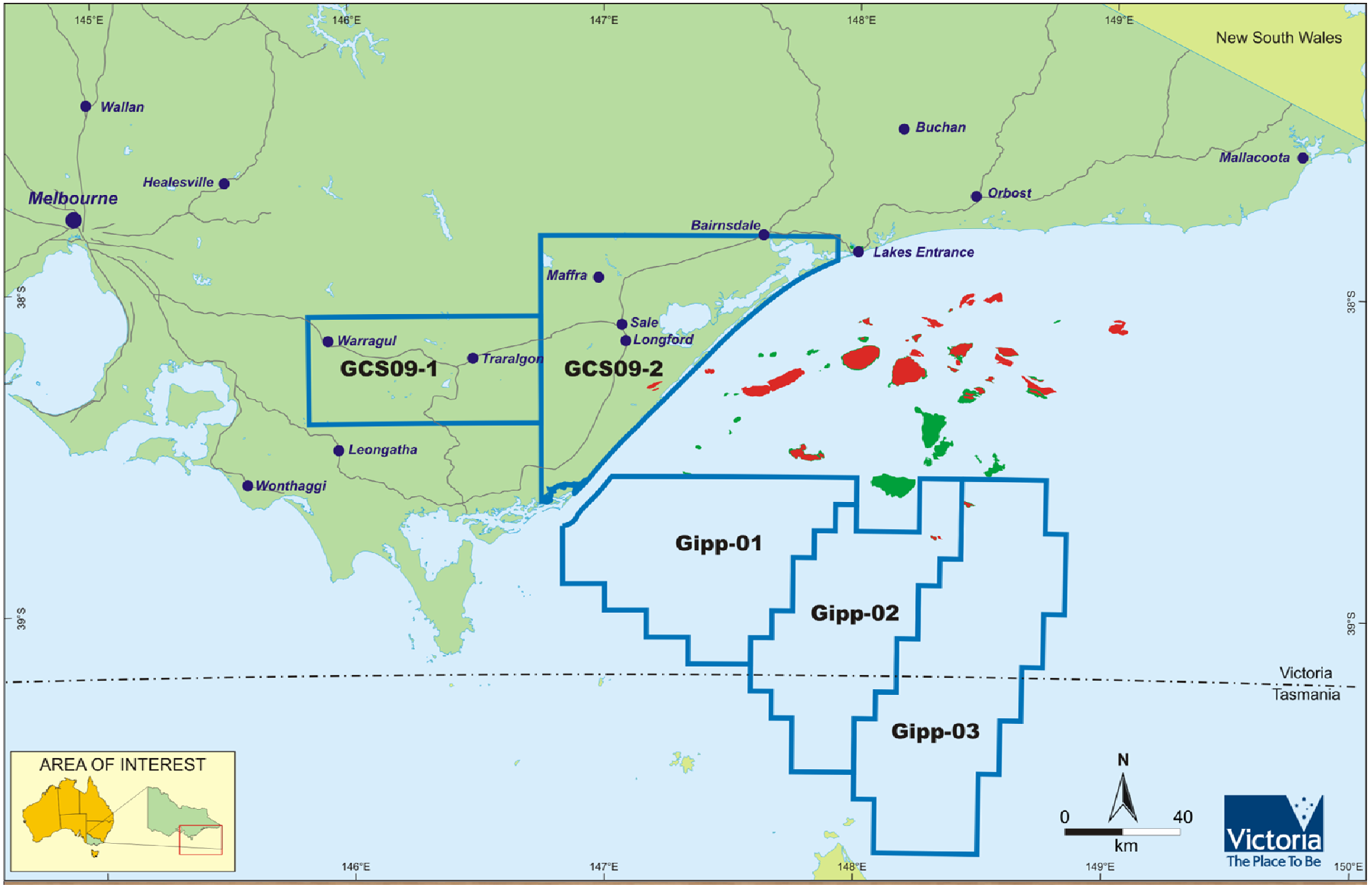
Groups Active in Victoria

- CarbonNet
- CO2CRC – Otway pilot & Gippsland Basin
- GeoScience Victoria/DPI
- Geoscience Australia/DRET
- CSIRO Petroleum
- Australian School of Petroleum
- Universities
- Clinton Foundation
- Carbon Storage Taskforce
- Companies & Contractors

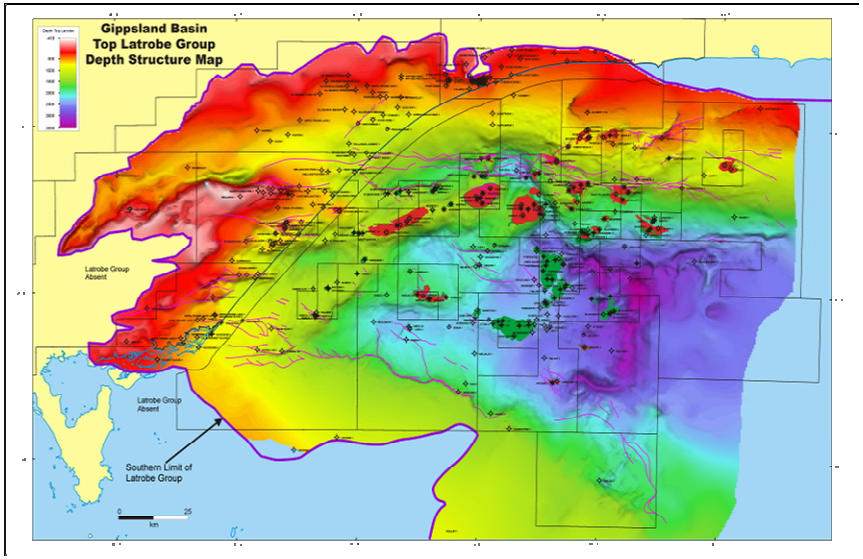
Recent Government Activities

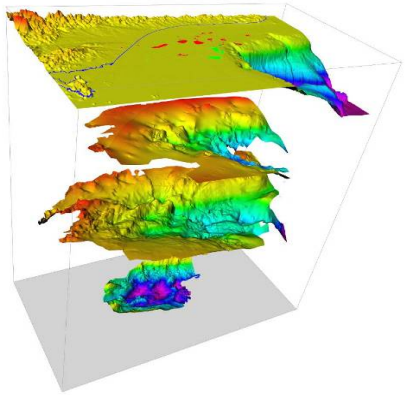
- **2008 VicGCS 5.7 M initiative to understand the regional storage potential of the Gippsland Basin**
- **March 2009 Offshore Acreage Released – bids open**
- **October 2009 Two exploration tender areas were announced for the onshore Gippsland Basin in October 2009, with bids closing on 5 March 2010**
- **Onshore GHG Storage Regulations 2009**
- **Carbon Storage Task Force 2009**
  - Recognised the importance of Gippsland Basin nationally for coal emissions associated with location and storage capacity P90 31 GT
  - Funding associated to increase precompetitive activity – seismic survey
- **June 2010 CCS Flagships bids**
  - Federal initiative for CCS across Australia $2 B .Four “finalists” Victoria’s bid is CarbonNet – requires site for up to 5 Mt/year

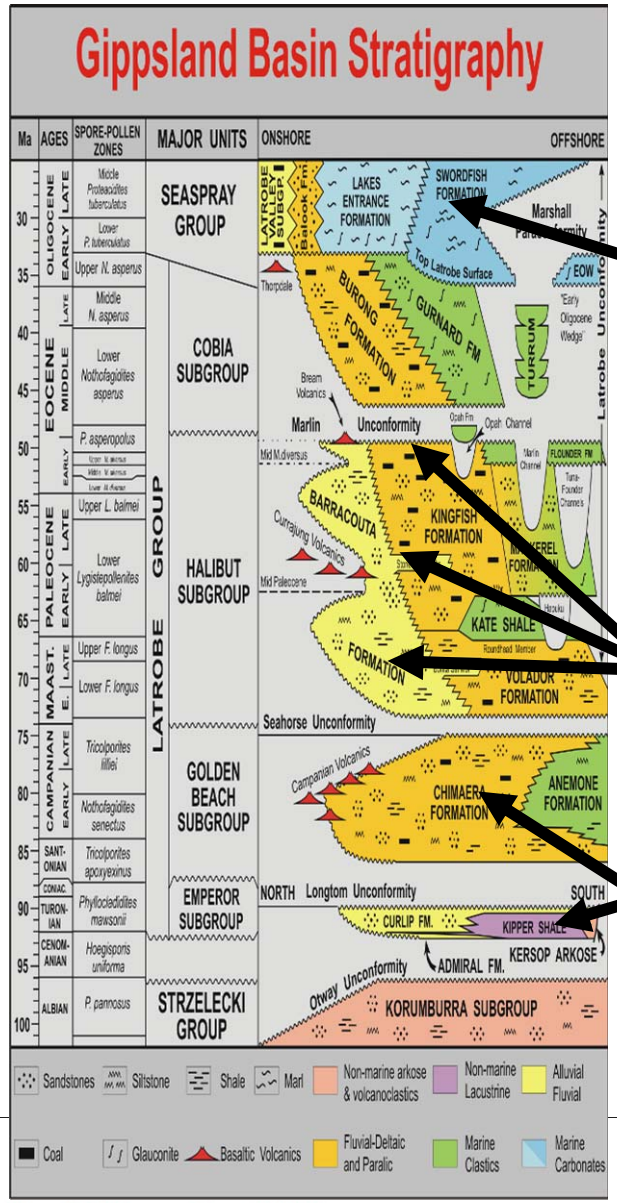
Gippsland Basin GHG acreage



Regional Geology







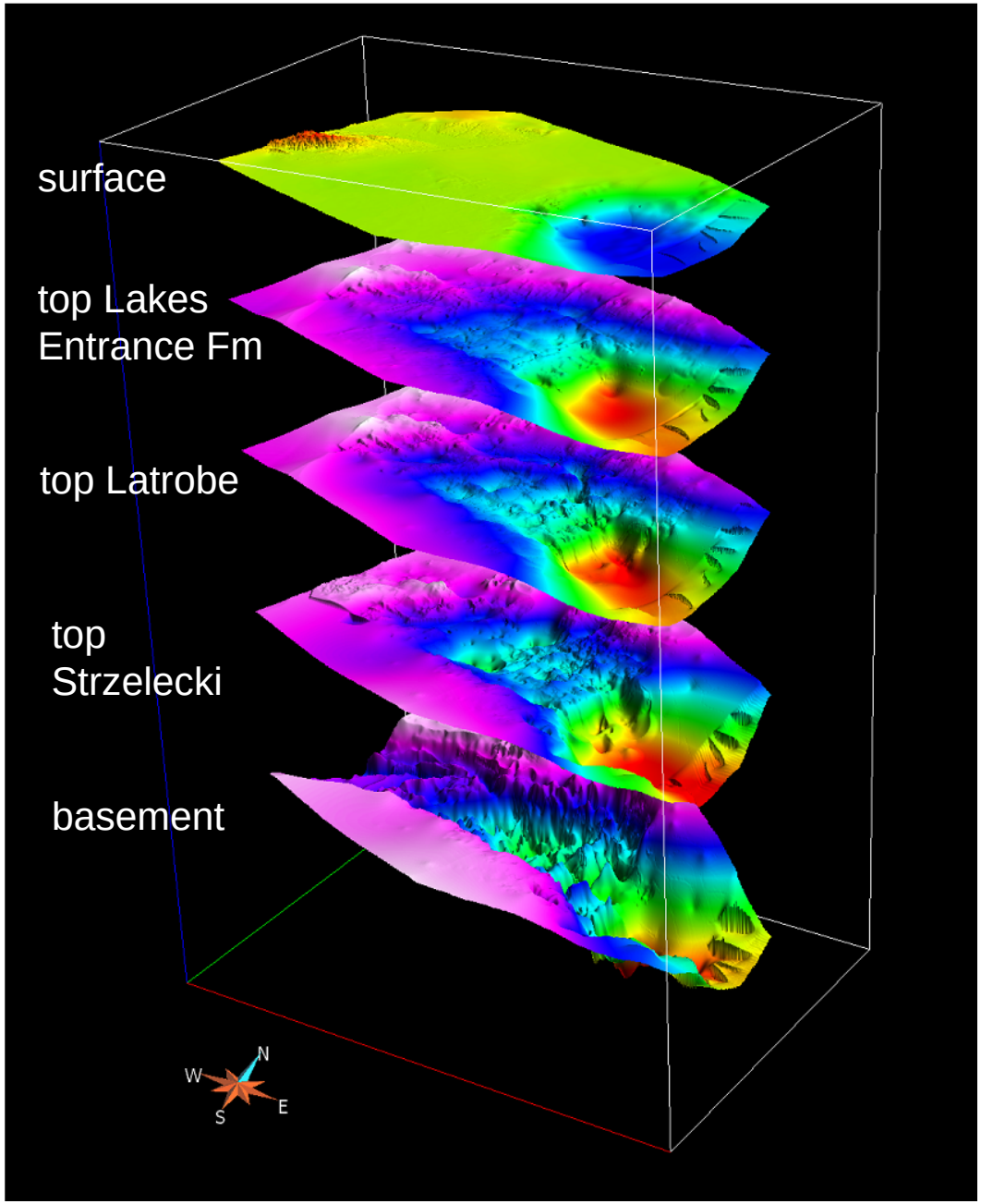
Regional top seal for oil and gas, CO_2 and water

Reservoirs for oil and gas, CO_2 and water

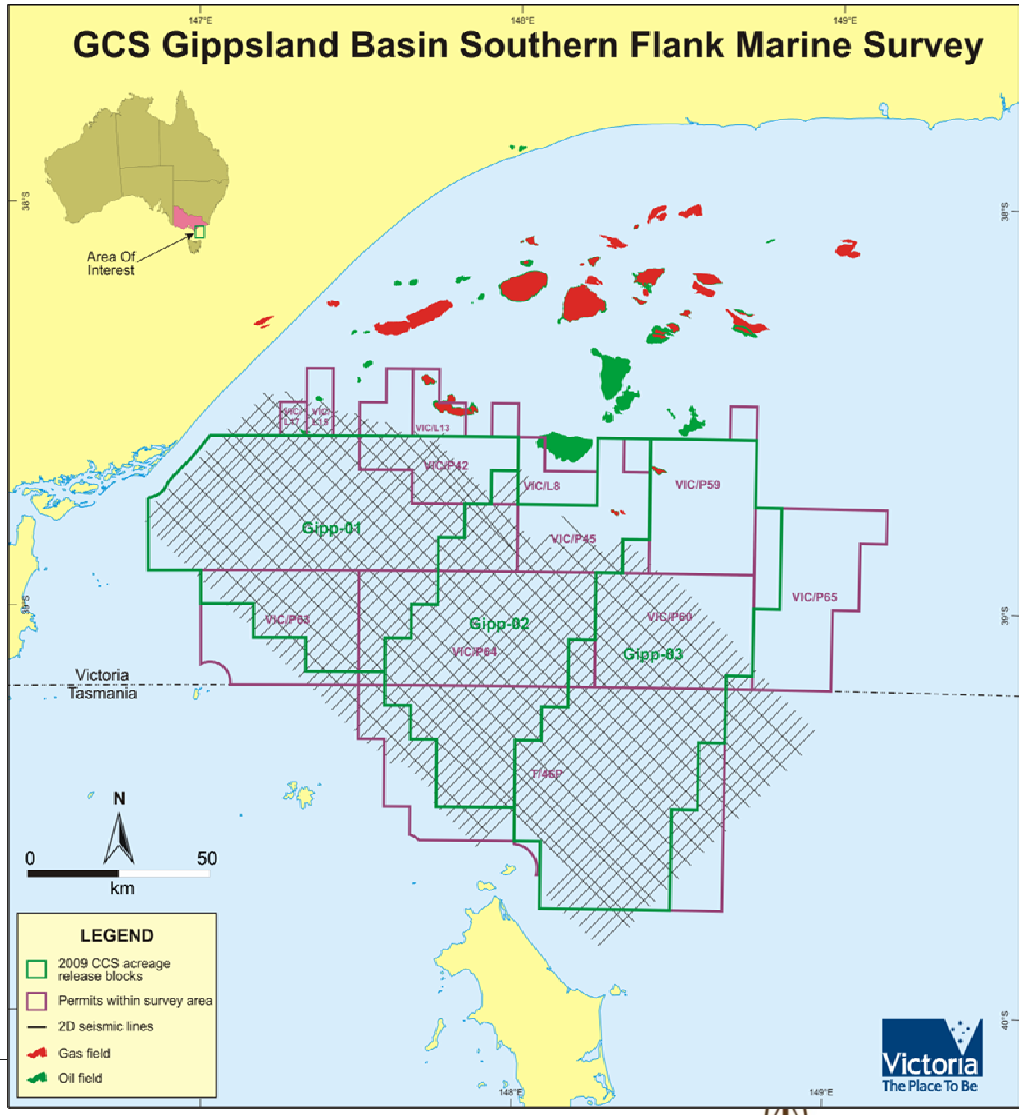
Reservoirs for geothermal

Gippsland Basin Imaging

- Basin-scale 3D geological framework & seismic volume
- Completed - in QC phase



Gippsland Basin Imaging



New 8,000 line kilometre 2D seismic survey acquired, funded by DRET and DPI Victoria

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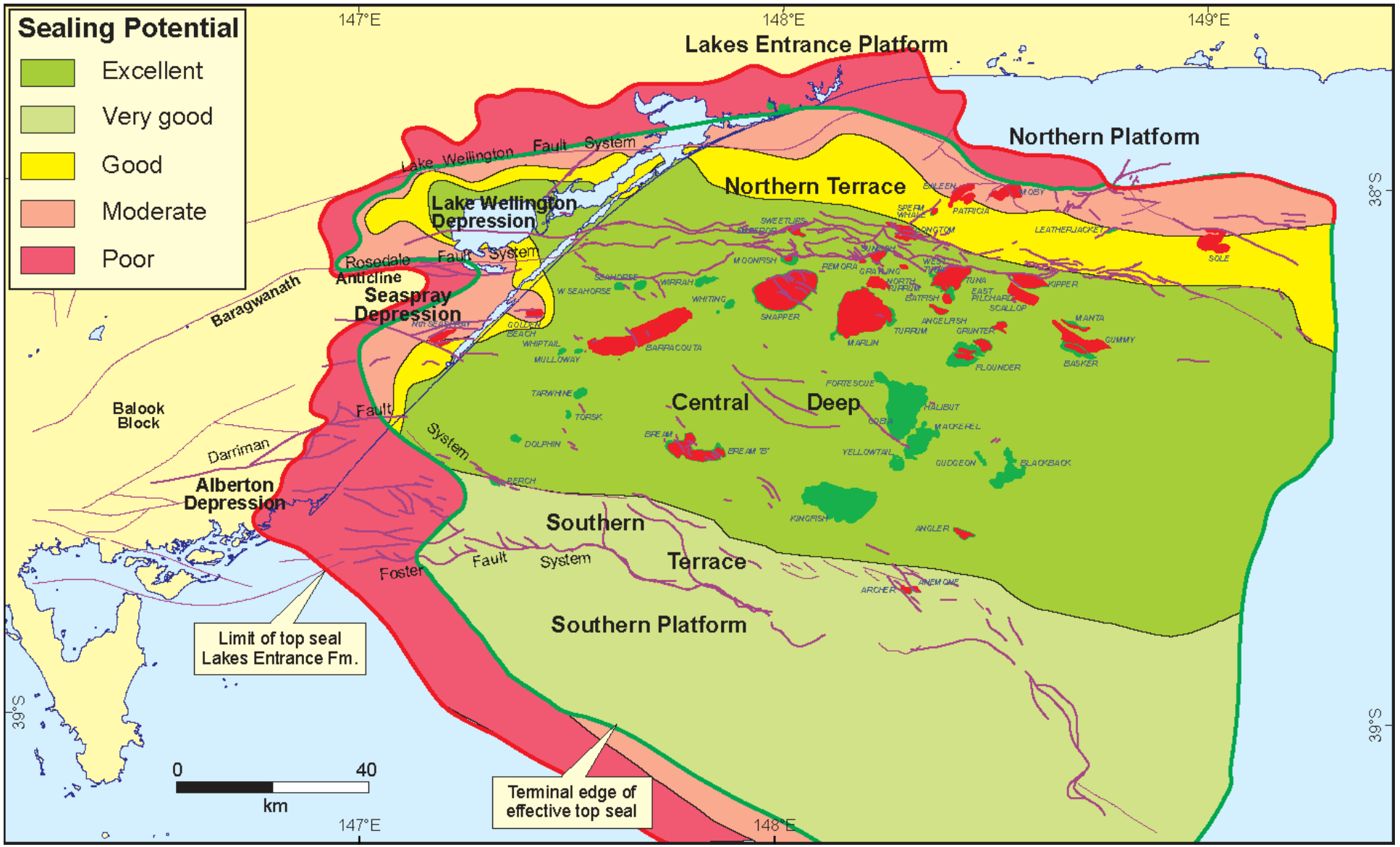
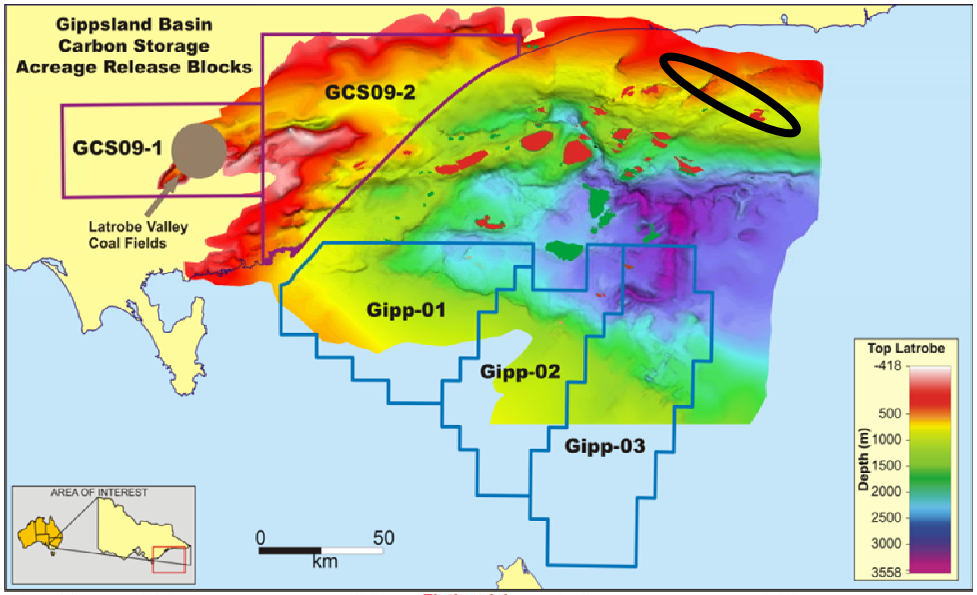
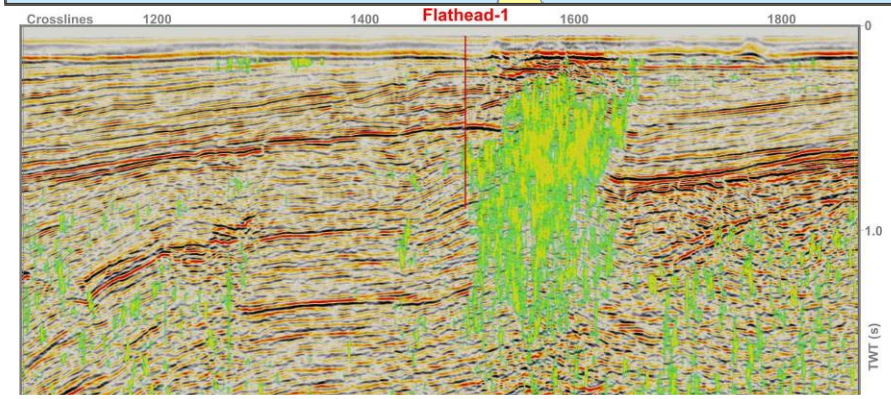
Containment Summary: Top Seal Potential



Containment - N Margin of Basin: Flathead Gas Chimney

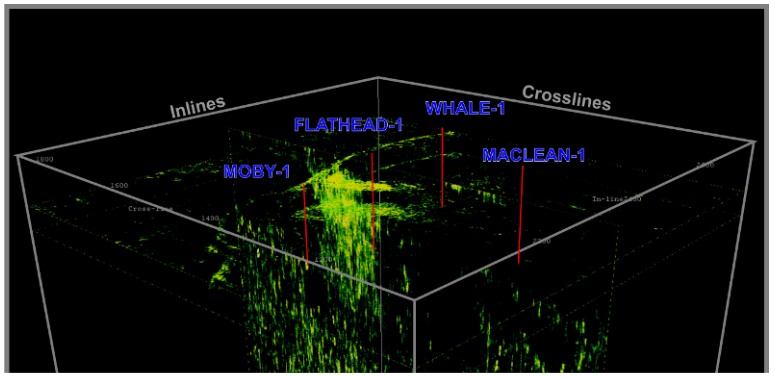




Gas chimneys on northern flank of basin occur where seal begins to fail

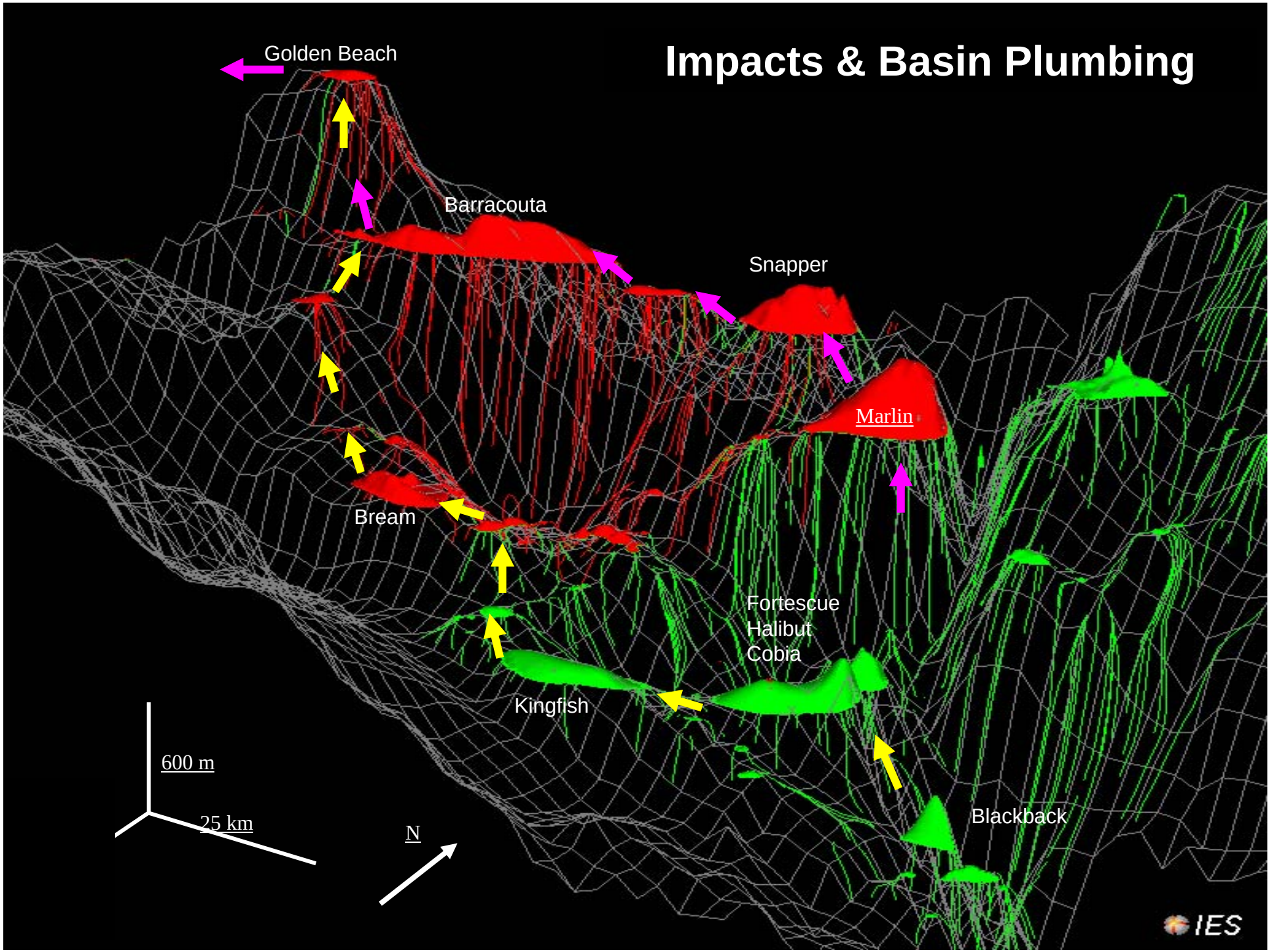
These mark the edge of effective top and fault seal

CO_2 should never get to these locations!

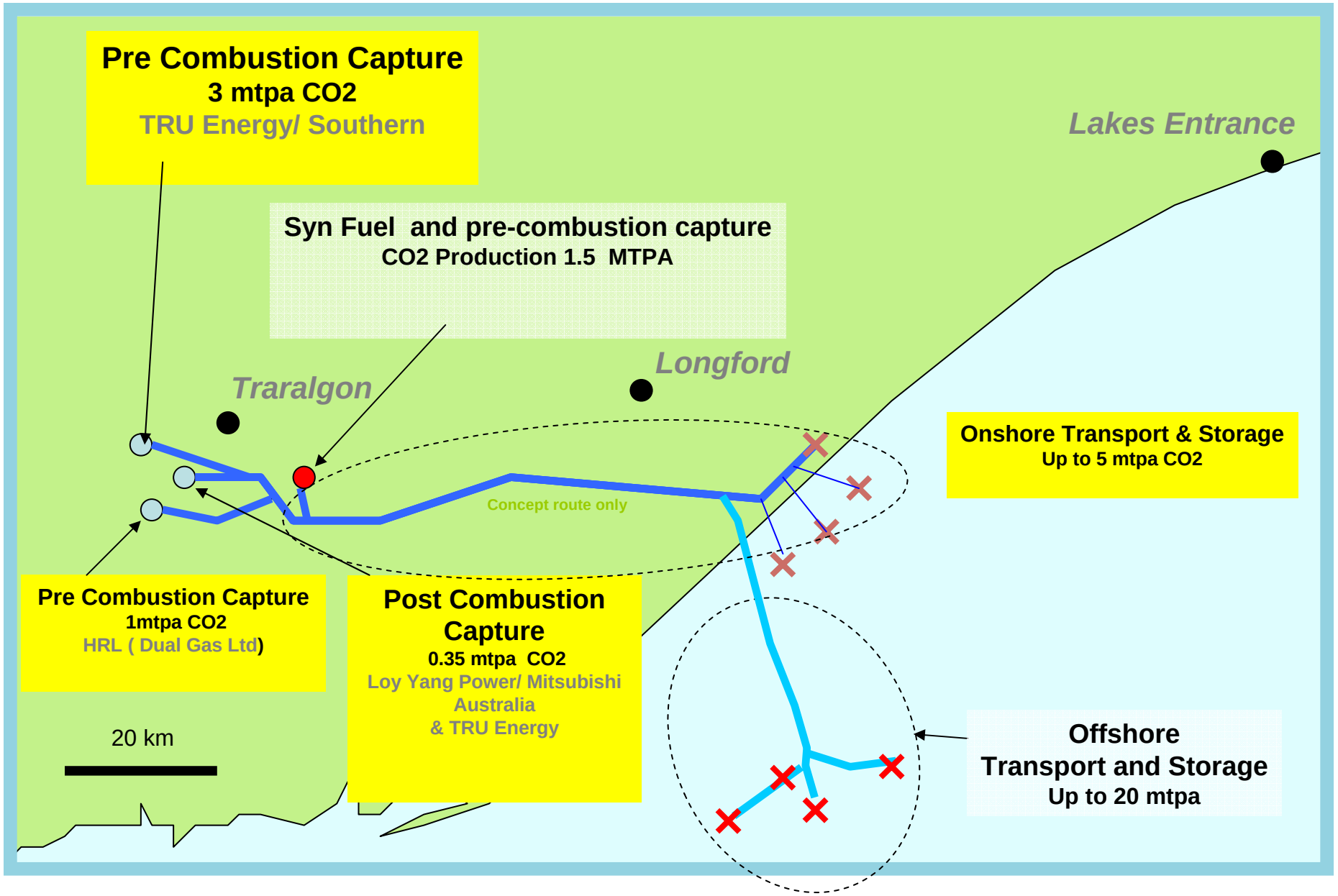


IMPACTS
Assessment & Management

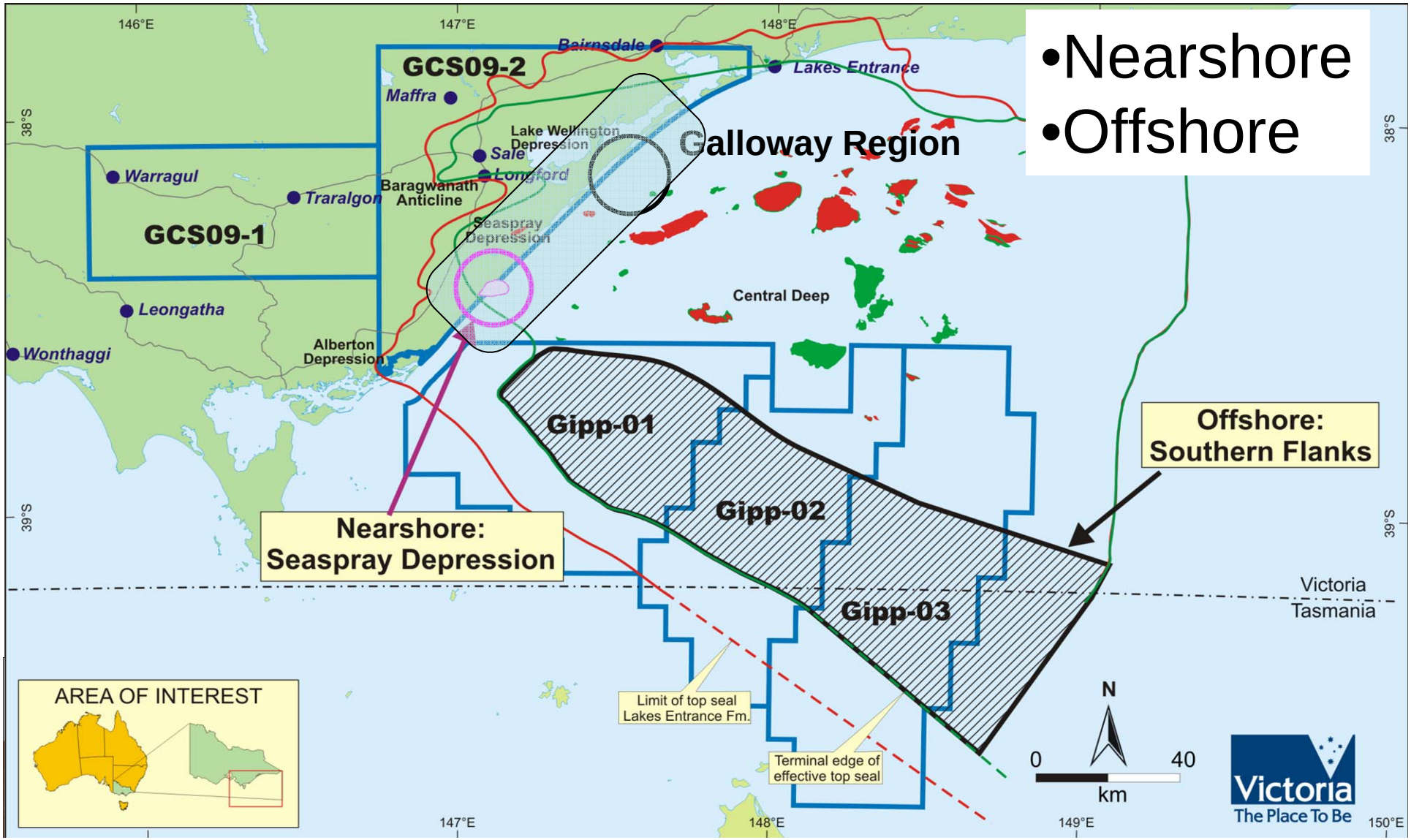
- **Focus: Understand the potential and likely impacts of the geological storage of CO2 in the Gippsland Basin**
- **Activities**
  - **Petroleum systems modelling**
  - **CO2 systems modelling**
  - **Hydrological modelling**
  - **Impacts: Assessment & Modelling**
    - **Petroleum, geothermal and water resources**
      - » Known
      - » Unknown
    - **Infrastructure**
      - » Petroleum: current and legacy
    - **Natural and man-made systems**
      - » Humans
      - » Towns
      - » Wildlife, flora


Impacts & Basin Plumbing
Golden Beach
Barracouta
Snapper
Marlin
Bream
Fortescue
Halibut
Cobia
Kingfish
Blackback
600 m
25 km
N
IES

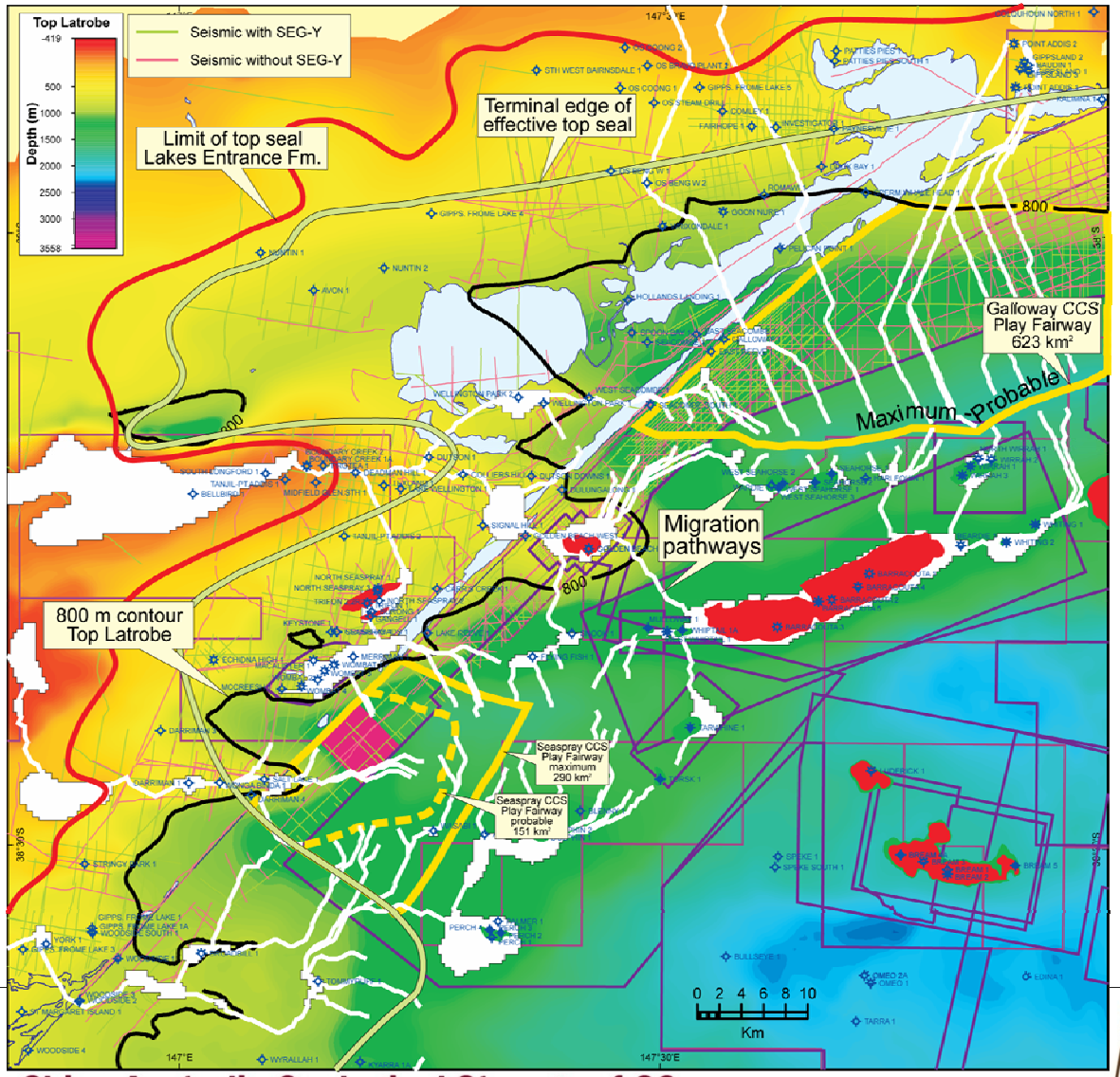
CarbonNet

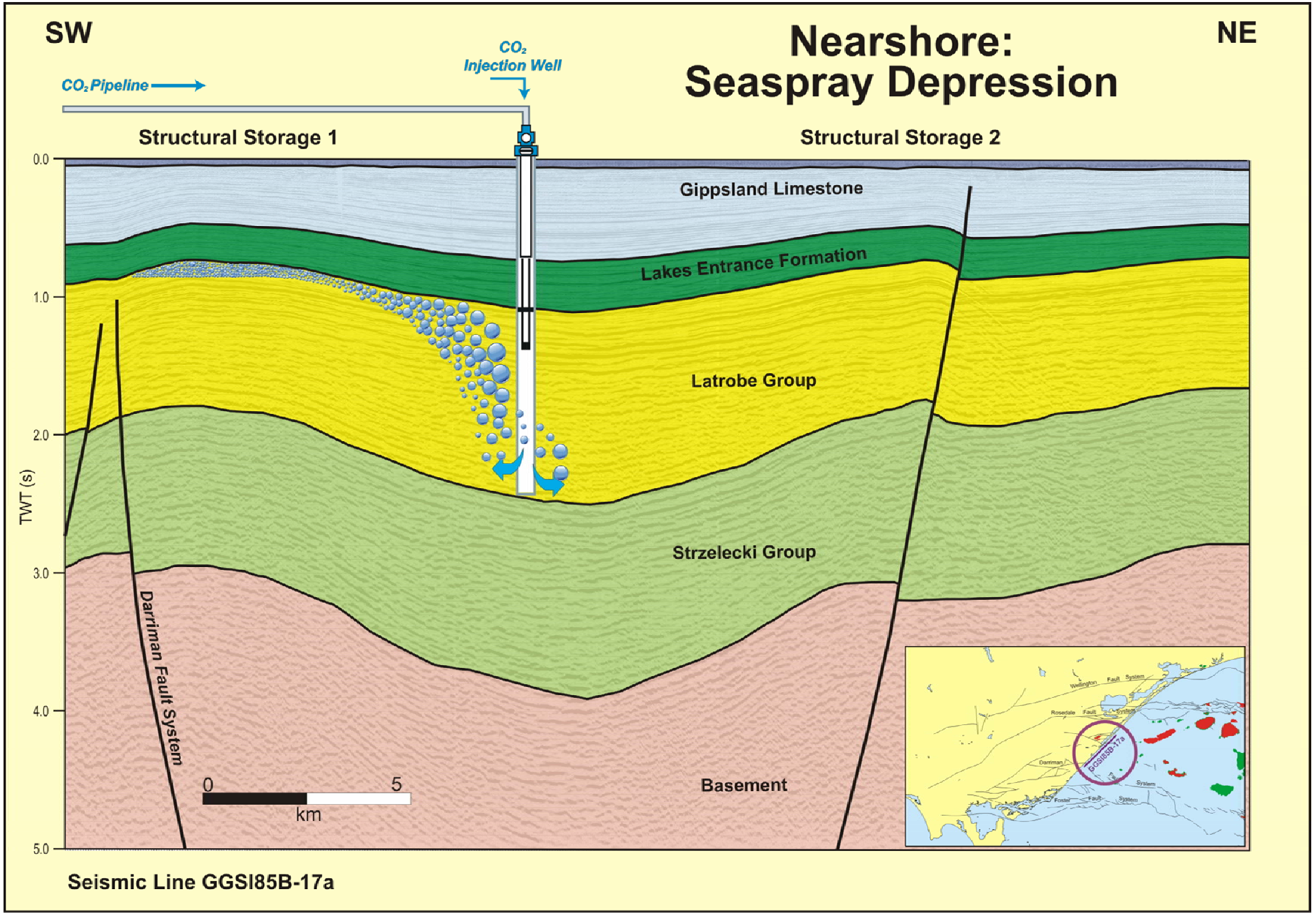

Pre Combustion Capture
3 mtpa CO2
TRU Energy/ Southern
Lakes Entrance
Syn Fuel and pre-combustion capture
CO2 Production 1.5 MTPA
Longford
Traralgon
Onshore Transport & Storage
Up to 5 mtpa CO2
Concept route only
Pre Combustion Capture
1mtpa CO2
HRL (Dual Gas Ltd)
Post Combustion Capture
0.35 mtpa CO2
Loy Yang Power/ Mitsubishi Australia
& TRU Energy
20 km
Offshore Transport and Storage
Up to 20 mtpa

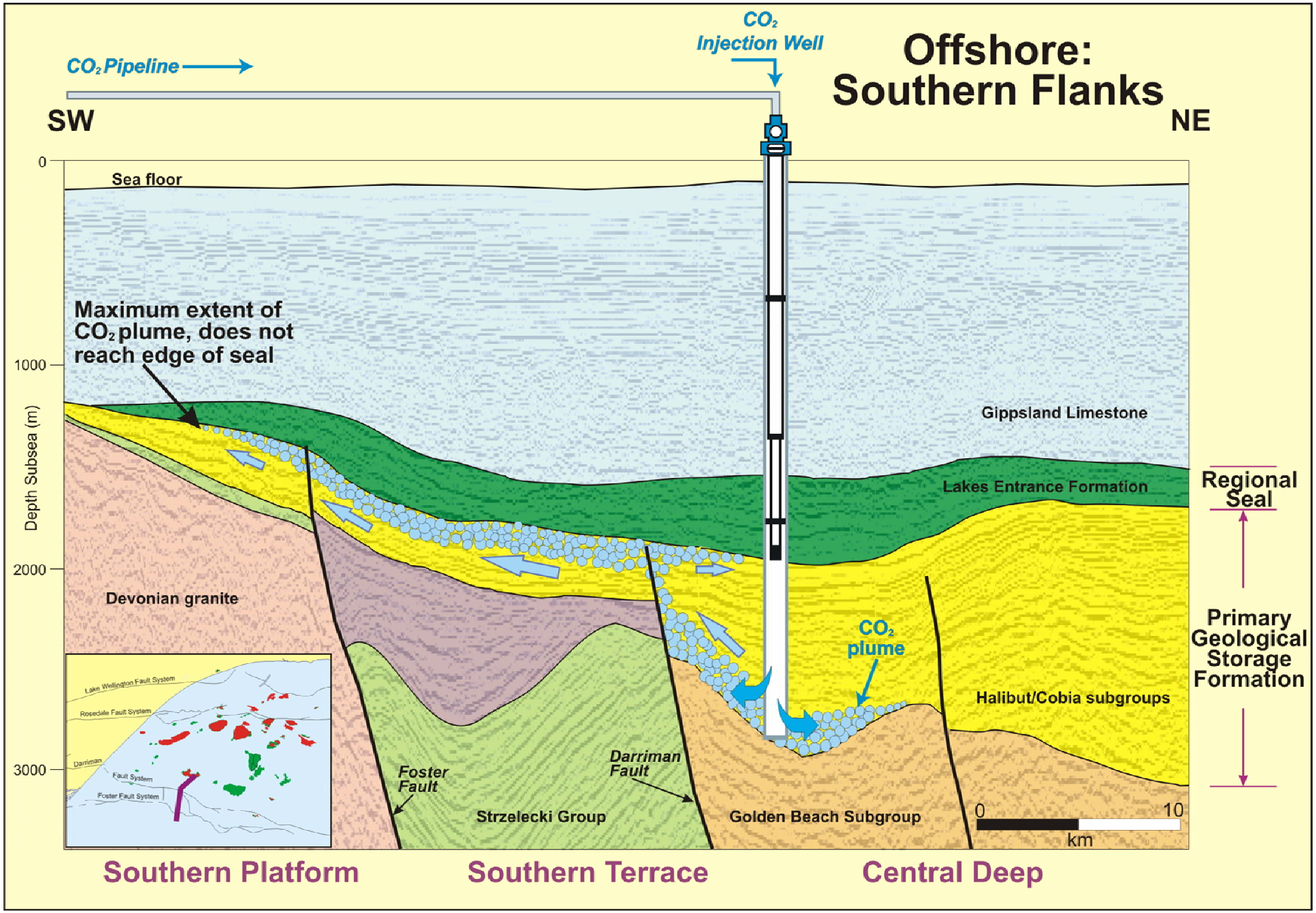
CarbonNet Focus Areas



Regional Nearshore




SW
NE
Nearshore:
Seaspray Depression
CO_2 Pipeline
CO_2 Injection Well
Structural Storage 1
Structural Storage 2
Gippsland Limestone
Lakes Entrance Formation
Latrobe Group
Strzelecki Group
Basement
Darriman Fault System
TWT (s)
0.0
1.0
2.0
3.0
4.0
5.0
0
5
km
Seismic Line GGSI85B-17a


CO_2 Pipeline
CO_2 Injection Well
Offshore:
Southern Flanks
SW
NE
0
Sea floor
Maximum extent of CO_2 plume, does not reach edge of seal
1000
Depth Subsea (m)
2000
3000
Gippsland Limestone
Lakes Entrance Formation
Regional Seal
Devonian granite
CO_2 plume
Halibut/Cobia subgroups
Primary Geological Storage Formation
Lake Wellington Fault System
Rosedale Fault System
Darriman Fault System
Foster Fault System
Foster Fault
Darriman Fault
Strzelecki Group
Golden Beach Subgroup
0
10
km
Southern Platform
Southern Terrace
Central Deep

Conclusions

- Victoria is fortunate – it has significant storage potential but not all parts of the Gippsland Basin are equally suitable on a regional and local scale.
- Petroleum systems and hydrological analysis are necessary.
  - easier to assess a region with active petroleum generation and migration.
- Significant regional evaluation prior to site analysis is needed to understand issues for basin management and impacts.
- The Flagships bid CarbonNet offers an opportunity for significant CCS advances.