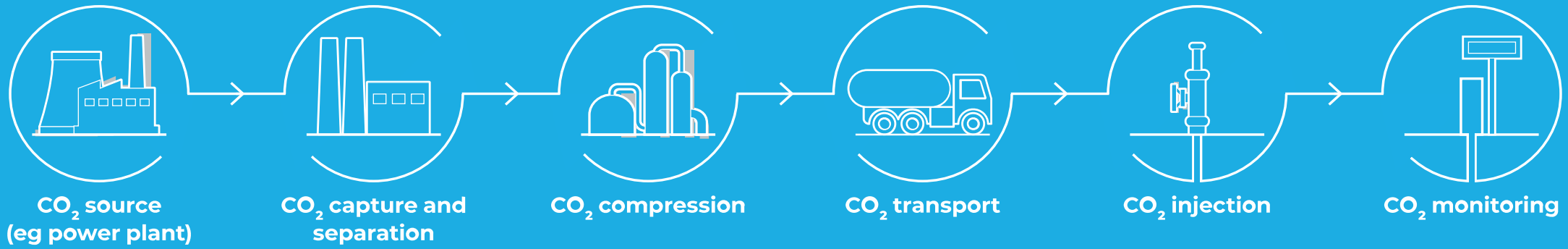
CTSCo
Carbon Transport & Storage

A GLENCORE Company

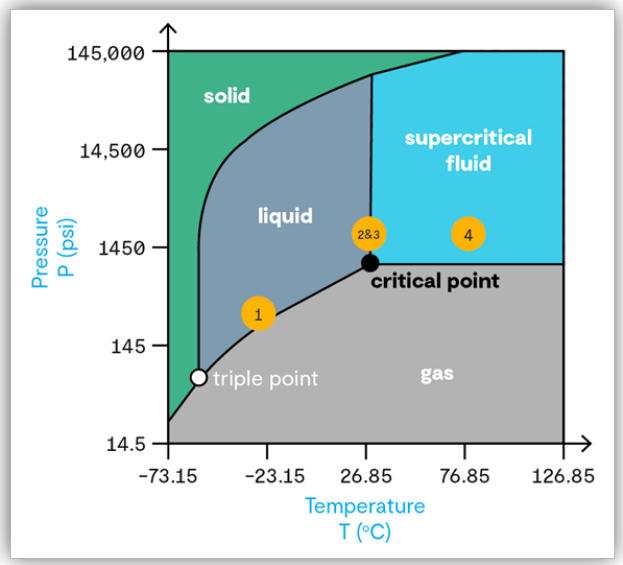


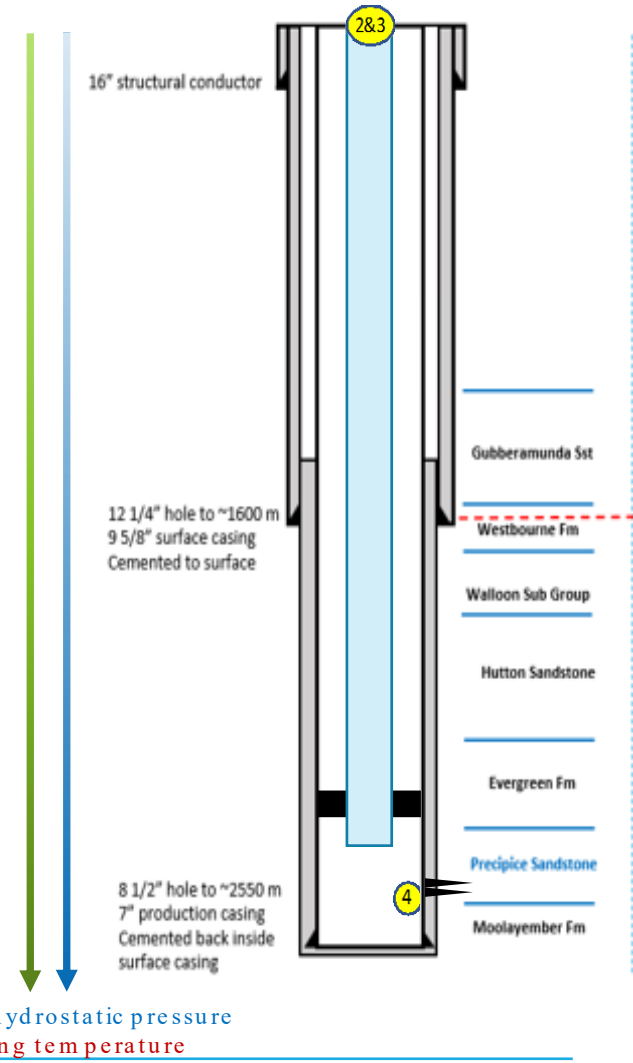
CTSCo Carbon Capture & Storage

QEC
17 August 2022

Carbon dioxide

- CO_2 can exist in several forms
  - Captured as a gas at atmospheric pressure
  - Transported via pipeline as a gas or supercritical fluid, or
  - Transported via truck as a cryogenic liquid
  - Injected for storage as a supercritical liquid
- Supercritical CO_2 is a dense fluid
  - Liquid like
  - Very low viscosity
  - Compressible
- CO_2 is soluble in water
  - Forms carbonic acid in low concentration $CO_{2\,(aq)} + H_2O \rightarrow H_2CO_{3\,(aq)}$
  - Reduces water pH
  - CO_2 in solution occurs naturally in rainfall (rain has a pH 5 – 5.5)



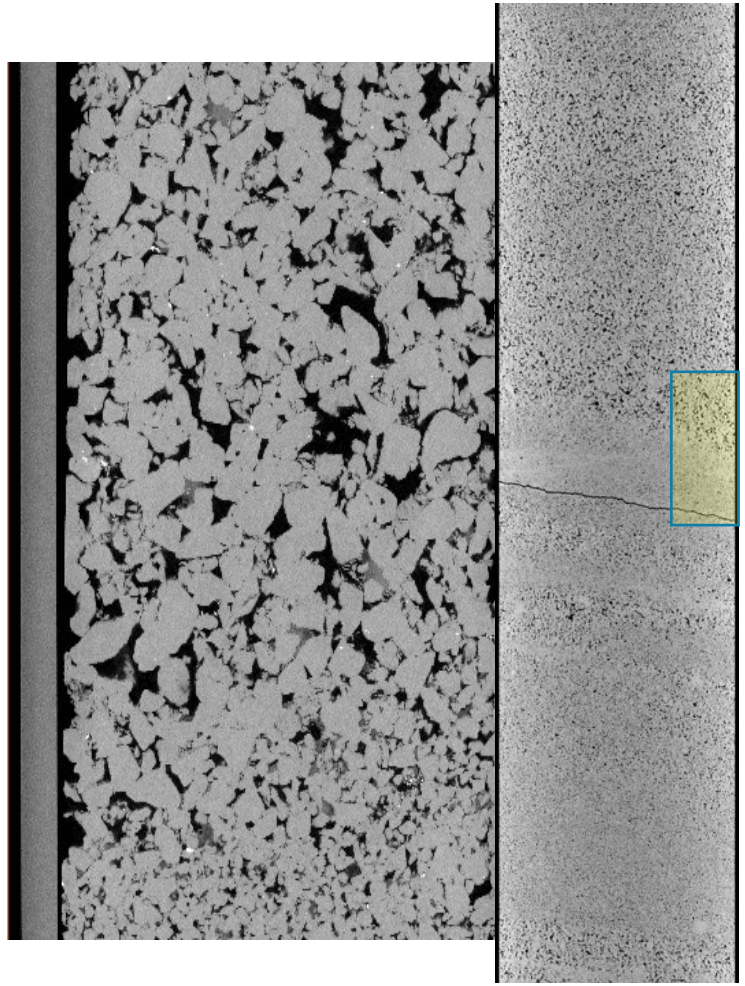


CO_2 storage

Geological requirements for CO_2 storage

- Permeable and porous formation (sandstone)
  - Deeper than ~800m (above 800m - CO_2 will be a gas)
- Sealing formation above and below the storage reservoir
- Non-potable/saline water – no sterilising of a freshwater resource

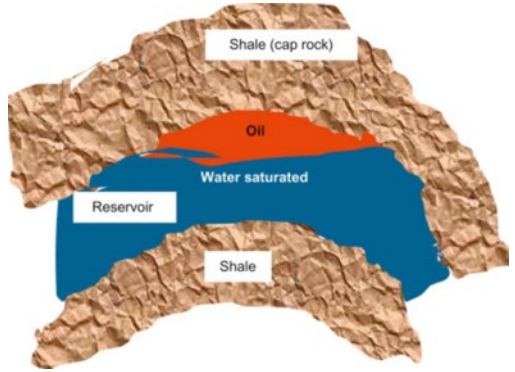
West Moonie 1 – 2314m Core Scan



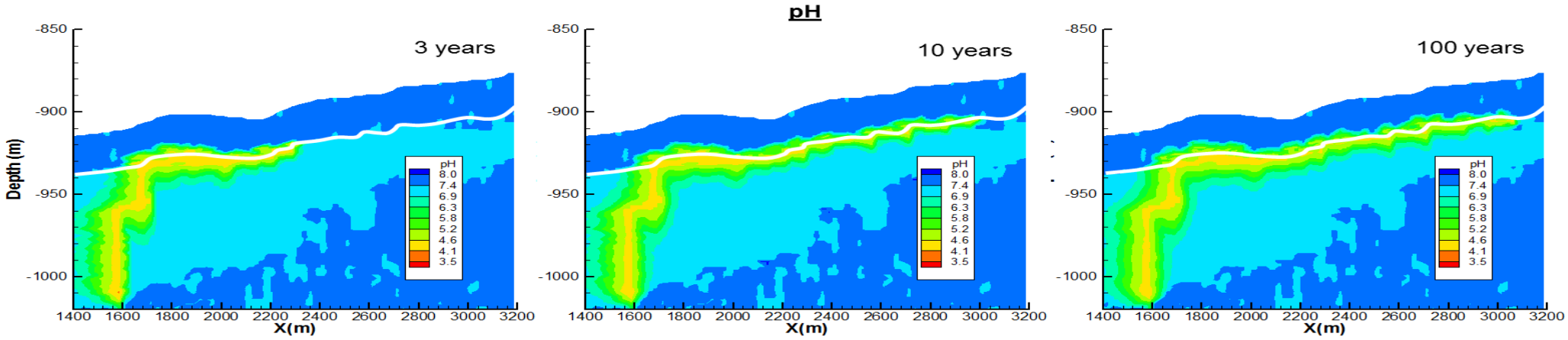
CO_2 storage

Trapping mechanism

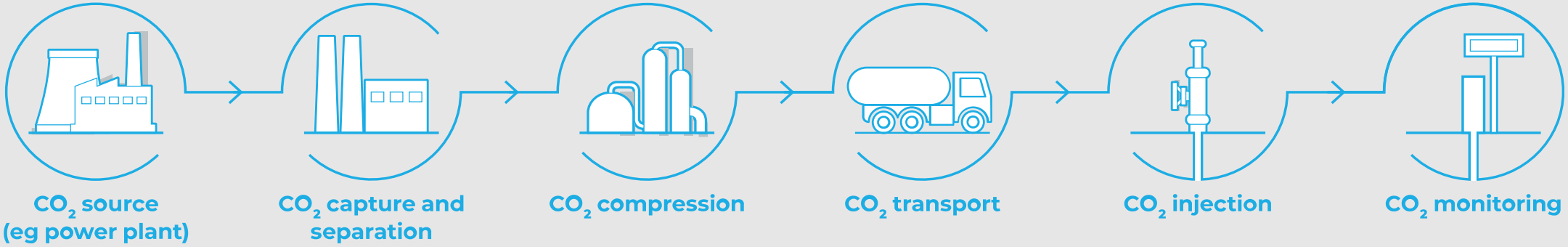
- Anticline trapping
  - Such as legacy oil/gas fields
- Solution trapping
  - CO_2 displaces water around the injection well
  - CO_2 dissolves in the groundwater on the edge of the plume
  - Most large-scale CCS projects rely on solution trapping



Example anticline trap



Example CO_2 plume modelling – solution trap



CTSCo Surat Basin CCS Project overview

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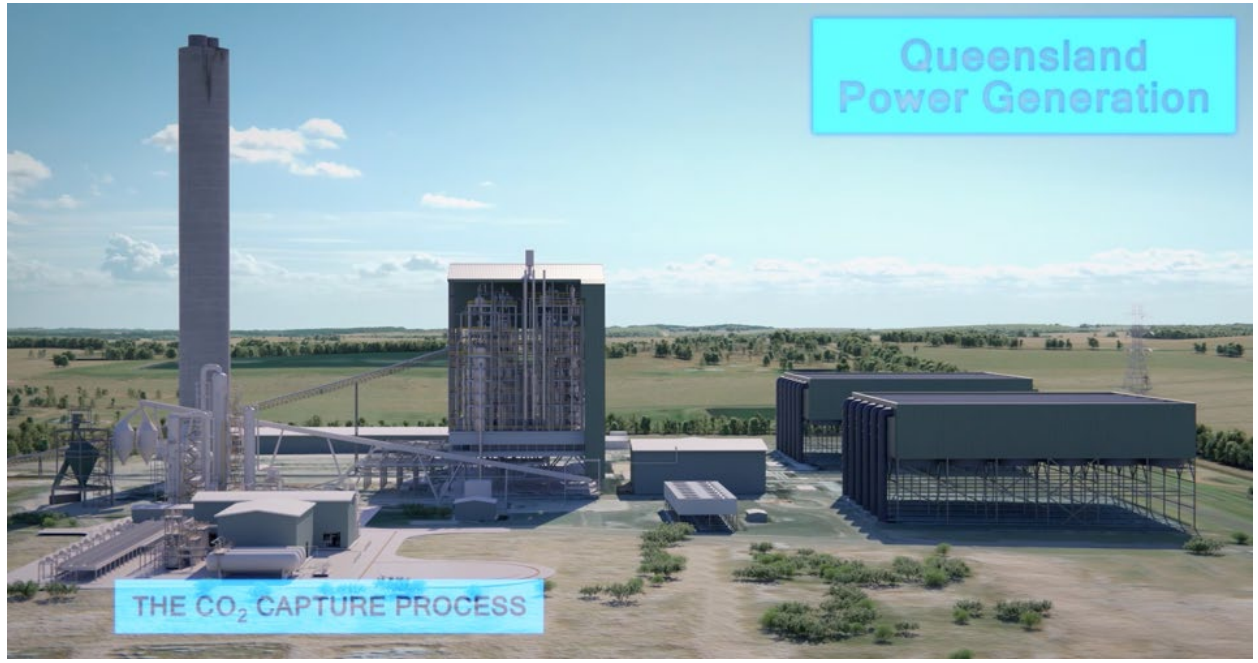
CTSCo Project

- The CTSCo project includes:
  - Capture: a demonstration-scale CO_2 capture plant at the existing Millmerran power station
  - Storage: Transport and CO_2 storage in the Surat Basin
- Currently seeking environmental approval to inject CO_2 via an Environmental Impact Statement (EIS)

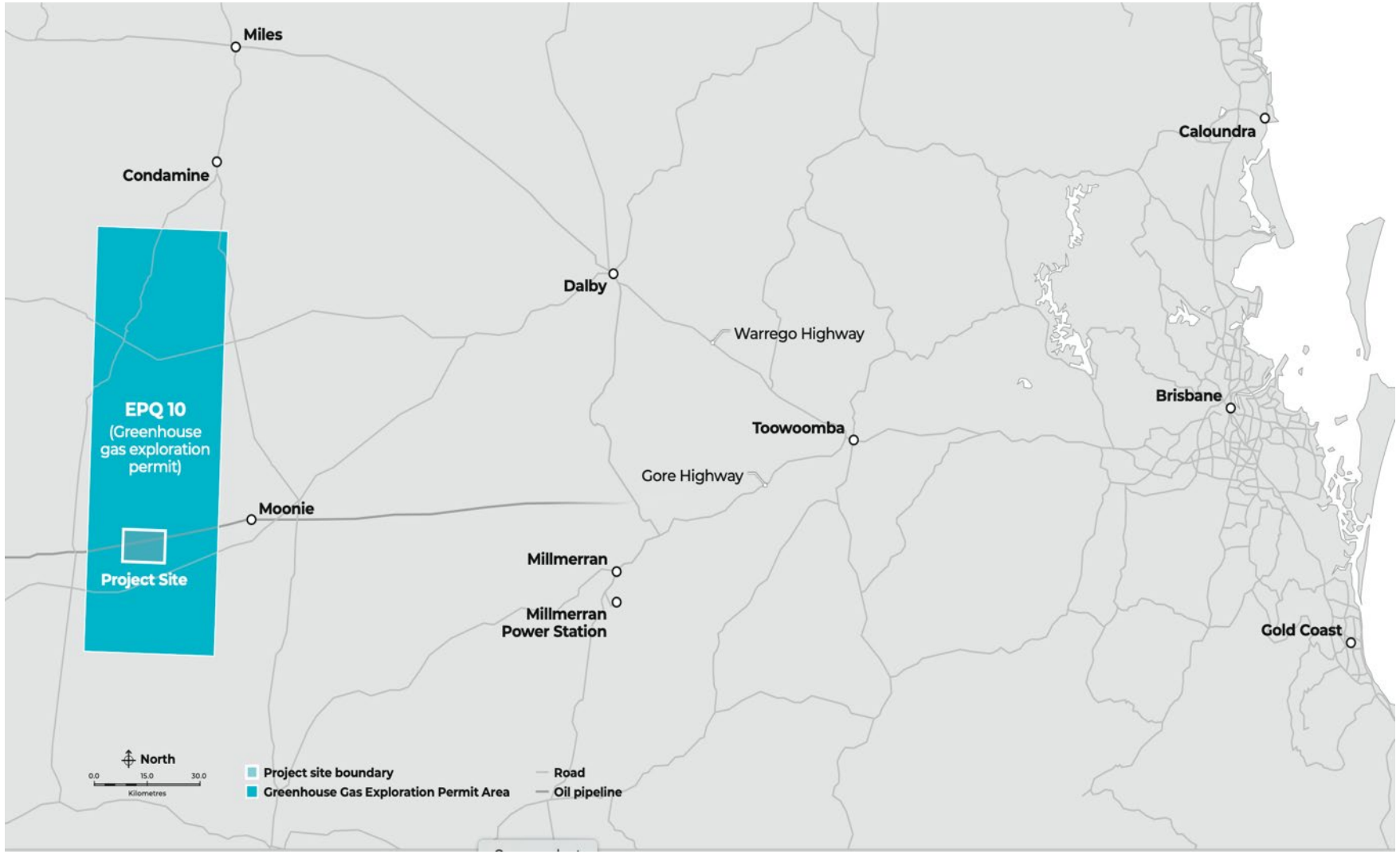


- Demonstrate effective capture of CO_2 from an existing power station
  - Advance CO_2 capture technology
  - Provide a source of CO_2 for the storage demonstration
- Verify a large-scale CO_2 storage basin that can be used by industry, generators, and potential future low-emissions hydrogen projects
  - Provide regulatory certainty for storage
  - Develop a large-scale, long-term, and cost-effective CO_2 storage solution that is close to the source
  - Provide foundation storage infrastructure for future large-scale storage

Storage location

The project site

- Close to transport infrastructure
- Close to some of Australia's youngest power stations
- Close to other existing and future CO_2 sources
- Tenure held 100% by Glencore
  - Currently the only active Greenhouse gas exploration tenure in Queensland
  - 3652 km^2 area
  - >500 million tonne storage potential

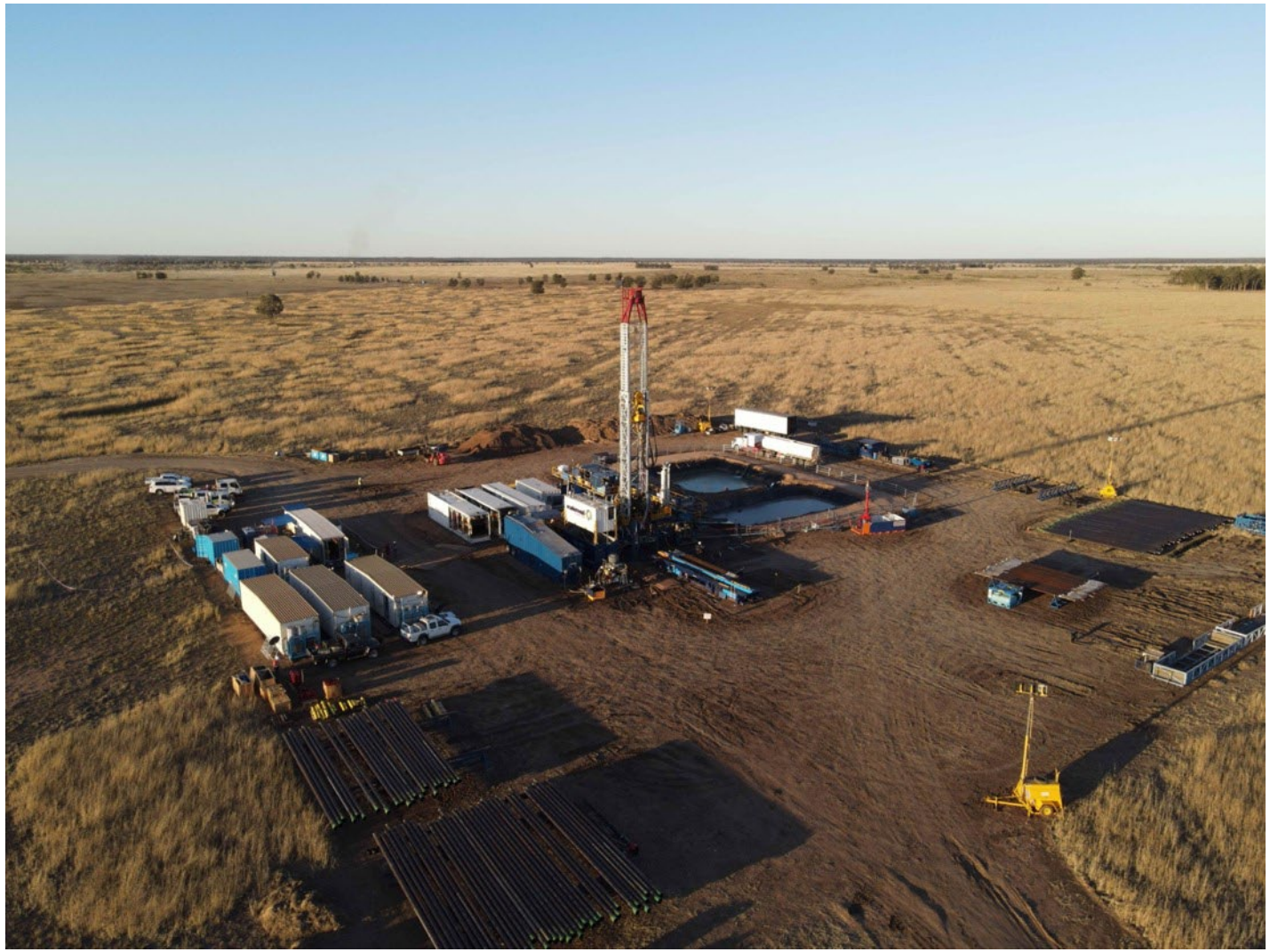


CTSCo storage location

- Injection well drilled (2020)
- Deep monitoring well drilled (2021)
- Shallow monitoring well drilled (2021)

Results

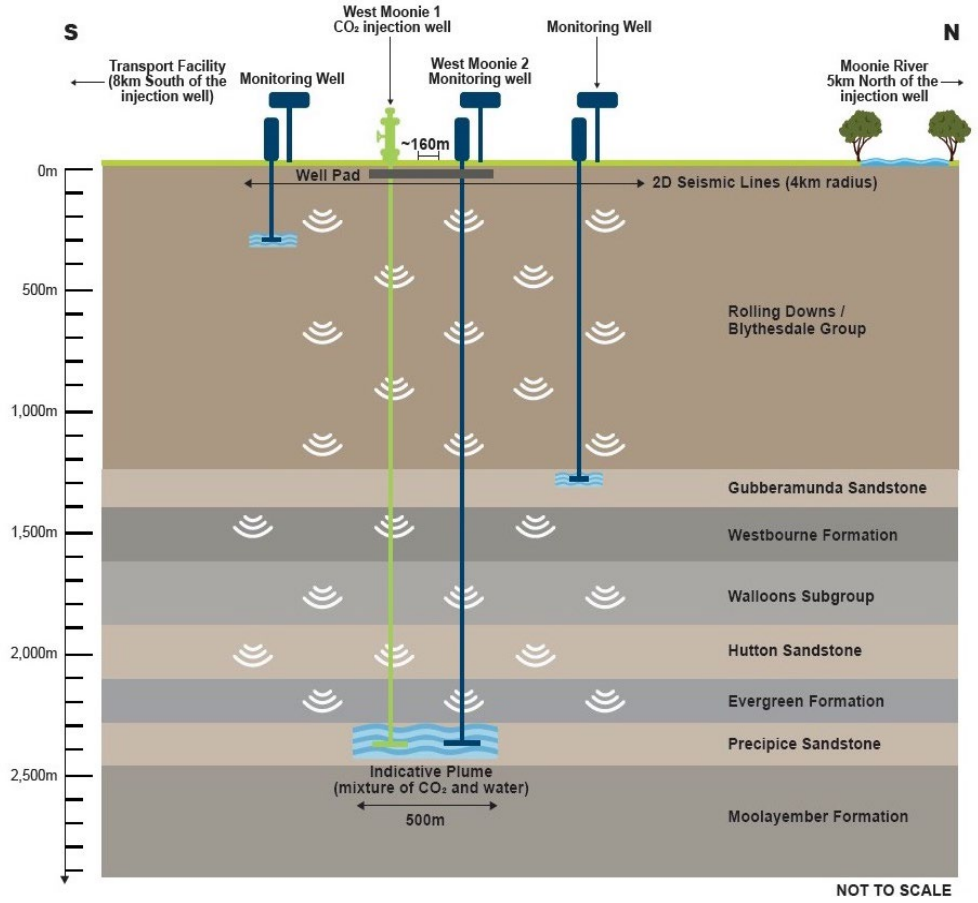
- Viable storage reservoir confirmed
  - Very high permeability
  - Low injection pressure
  - Non-potable water
- Seal formations verified
- Wells designed as future high-rate injectors
- Strong landowner support

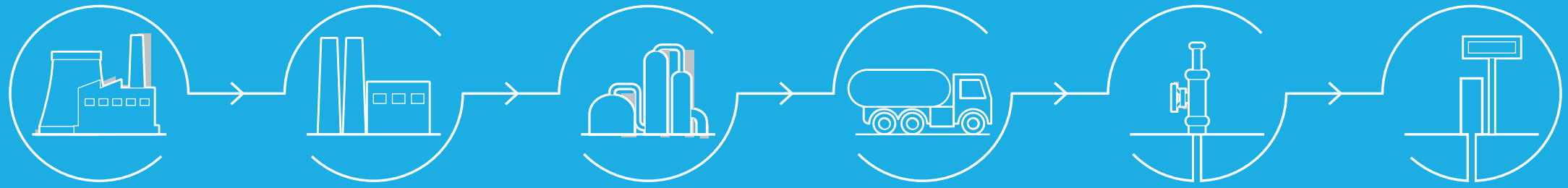


General CCS facts

- Permeability and reservoir thickness govern injection rate
- Storage efficiency is typically low
  - Reservoir heterogeneity assists in improving storage efficiency
  - Reservoir pressure increase is often the limiting factor for injection volume
- Proving reservoir seal integrity is crucial

- Carbon storage is an established technology globally
  - CCS to date has been a market failure not a technical failure
  - No examples of storage failure/CO2 storage leakage
- A future QLD Blue hydrogen industry is reliant on successful carbon storage
- Community acceptance and regulator approval are the immediate challenge for CCS in Queensland




CO_2 source (eg power plant)
CO_2 capture and separation
CO_2 compression
CO_2 transport
CO_2 injection
CO_2 monitoring

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