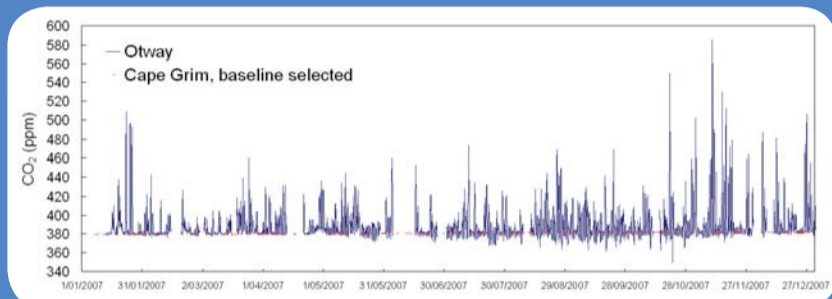


# Atmospheric monitoring

The natural biological flux (emission and uptake) of CO<sub>2</sub> is large and variable compared to the emissions from a hypothetical leak. Local agricultural and industrial emissions can also be significant. Understanding these natural variations plays an integral part in successfully monitoring for leakage.

The CO<sub>2</sub> concentration measured at Otway before CO<sub>2</sub> injection (Figure 1) shows these fluxes cause large variations compared to the CO<sub>2</sub> concentration at Cape Grim, Tasmania, during “baseline” conditions (strong south westerly winds off the ocean).



CO<sub>2</sub> concentration measured during 2007 before injection at Otway compared to that during baseline wind conditions at the Cape Grim Baseline Air Pollution Station (Tasmania). Both data sets are from CSIRO LoFlo instruments, allowing exact comparison. Otway measurements are hourly means from a 10m intake. Cape Grim is a joint program between the Bureau of Meteorology and the CSIRO.

The CO2CRC Otway Project Atmospheric Monitoring Program incorporates ongoing monitoring for many years.

This includes:

- an atmospheric station with a CSIRO LoFlo CO<sub>2</sub> analyser continuously measuring concentrations of CO<sub>2</sub>;
- a CO<sub>2</sub> flux tower continuously measuring surface-air CO<sub>2</sub> fluxes of a representative area of the site;
- soil CO<sub>2</sub> flux measurements taken at many point locations across the region;
- modelling of the ecosystem CO<sub>2</sub> and pre-existing industrial/agricultural CO<sub>2</sub> sources;
- measuring tracers to help confirm the origin of the CO<sub>2</sub> emissions to the local atmosphere and to quantify emissions; and,
- headspace gas sampling to establish the presence, concentration and distribution of any CO<sub>2</sub> gases or related gases, and their distribution within three nominated water boreholes adjacent the project.

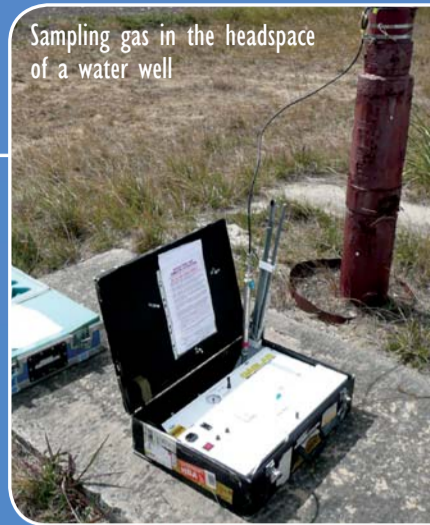
Location of the Otway site relative to other atmospheric facilities in the region and the baseline wind sector



## Key Points

- The atmospheric monitoring installed at the Otway Project site has many benefits: it is continuous, unattended flexible, relatively economical, and not invasive
- The atmospheric monitoring has been important in gaining the acceptance of regulatory bodies and the public
- It has quantified background gas concentrations and fluxes for a year before injection
- Monitoring CO<sub>2</sub> isotopes has shown their potential use as naturally occurring tracers for this project
- If all components of the enhanced strategy are in place, the potential exists to detect and quantify leaks of the order of 1000 t CO<sub>2</sub>/year
- Atmospheric monitoring can potentially provide independent assurance verification to complement other assurance monitoring technologies

Sampling gas in the headspace of a water well



The CO2CRC Otway Project Atmospheric Monitoring Program aims to verify that injected CO<sub>2</sub> stays underground and demonstrate the capacity to detect and quantify surface leakage in the unlikely event of leakage to the surface.

The program will develop, test and deploy new and enhanced monitoring and verification (M&V) technologies that might apply to commercial-scale carbon capture and storage projects in the future.

The program is conducted by CO2CRC and CSIRO Marine and Atmospheric Research. It is one of the most comprehensive atmospheric programs dedicated to monitoring CO<sub>2</sub> stored underground in the world.