

RESPONSE TO THE PETRO-FIND GEOCHEM LTD. STUDY

Major efforts worldwide have been underway since the mid-1990's to explore all facets of the geological storage of CO₂. These efforts range from small-scale injection pilots, which are designed to improve our scientific understanding of subsurface CO₂ injection, migration, and monitoring, to large-scale demonstration projects that involve all aspects of the CCS chain. As one of the larger-scale international efforts, the IEAGHG Weyburn-Midale CO₂ Monitoring and Storage Project, was established in 2000 to study the science of geological CO₂ storage using, as the research field site, Cenovus's Weyburn CO₂ – Enhanced Oil Recovery (EOR) project in SE Saskatchewan. The IEAGHG Research Project has focused on the application of scientific procedures and techniques to assess integrity of the geological storage system and to explore the range of measurement and monitoring technologies suitable for the verification of effective long-term storage of CO₂. Along with extensive site characterization, these technologies include near-surface sampling techniques, wellbore monitoring, and deep subsurface imaging.

To this end, more than 30 internationally recognized research organizations – and more than one hundred leading researchers from across North America and Europe – have deployed numerous methods to monitor CO₂ in the deep subsurface where it is injected, and test for any evidence of anthropogenic CO₂ at the surface. One of the many on-going studies is an extensive soil gas monitoring program conducted by a self-funded European Union Group including the British Geological Survey (BGS-UK), Bureau de Recherches Géologiques et Minières (BRGM-France), Istituto Nazionale di Geofisica e Vulcanologia (INGV-Italy) and the University of Rome. Research results provided by the various project teams have been subject to rigorous internal peer- and project-reviews, with the ultimate goal of publication in the open scientific literature.

Based on the extensive scientific research conducted by the IEA-GHG Weyburn-Midale CO₂ Monitoring & Storage Project, no results have been found that would support the recently reported conclusion that CO₂ injected as part of the CO₂-EOR Project has migrated through the geological storage system to the surface.

A recent report, *Geochemical Soil Gas Survey, A site investigation of SW30-5-13-W2M Weyburn Field, Saskatchewan*, by consultant Paul Lafleur of Petro-Find Geochem Ltd., describes results from a soil gas sampling survey conducted July 7, 2010 on the Kerr property. This property is located at the southern margin of the Weyburn oil field, over 2 km away from the nearest CO₂ injection wells. In this study, soil gas samples were collected from approximately 1 m depth using an aluminum probe and hand drill; 26 soil gas samples were analysed for CO₂ and light hydrocarbon concentrations, and six samples (higher concentrations only) selected for stable isotope analyses. The Petro-Find report concludes that the source of high CO₂ soil-gas concentrations on the property is clearly leakage of the CO₂ injected into the Weyburn reservoir. The following summary points list the conclusions of Petro-Find and challenge their use of data and conclusions.

SUMMARY POINTS

The following points address Petro-Find’s claim that “the source of the high concentrations of CO₂ in soils of the Kerr property is clearly the anthropogenic CO₂ injected into the Weyburn reservoir”.

Petro-Find states that the high CO₂ concentrations in soils of the Kerr property are clearly anthropogenic because their stable carbon isotope compositions approximate those of the CO₂ being injected into the Weyburn reservoir.

Carbon isotopic compositions of soil gases collected on the Kerr property are similar to those found in prairie soils elsewhere. Published, peer-reviewed studies have shown these compositions to be produced by biological processes. Thus, the reported carbon isotopic signature of soil gas from the Kerr property is not anomalous and does not fingerprint leakage from the Weyburn oil reservoir.

Furthermore, stable carbon isotopic analyses of lower CO₂ concentration samples were not conducted, thus depriving the study of critical local controls.

Petro-Find claims that a major shift in the isotopic composition of CO₂ in soil gases at the Kerr property has occurred since CO₂ injection began at Weyburn.

There is no evidence for a change in carbon isotope concentrations in soil gases due to CO₂ injection at Weyburn in the sampling performed by Petro-Find. In fact, Petro-Find incorrectly uses baseline values from a deep geologic formation to infer near-surface soil gas baseline values.

Petro-Find states that CO₂ concentrations in soil gases at the Kerr property are anomalously high and suggest leakage from the Weyburn reservoir.

The concentrations of CO₂ in soil gases collected by Petro-Find are similar to those found in prairie soils in the vicinity of Weyburn. Natural biogenic CO₂ concentrations in prairie soils are generally higher during the summer and in moist, low-lying areas similar to sampling sites at the Kerr property. Thus, soil-gas CO₂ concentrations reported for the Kerr property are not anomalous and do not provide a signal for leakage from the Weyburn oil reservoir.

Petro-Find infers a link between soil gas CO₂ concentrations and threshold atmospheric limits for health concerns.

CO₂ concentrations that would be of concern in the air above ground are actually quite normal in soil gas at a depth of 1 m. There are no data in the Petro-Find report demonstrating dangerous levels of CO₂ in the atmosphere.

Petro-Find suggests that open “deep-seated faults/fractures” provide the only explanation for CO₂ to rapidly migrate over 2 km south to the Kerr property.

There is no credible evidence that the surface lineaments proposed by Petro-Find indicate a 1.5 km deep open fault.

Petro-Find invokes that a breach of the cap rock of the Weyburn reservoir must have occurred in their scenario.

The anhydrite cap has retained over 1.4 billion barrels of oil in the Weyburn reservoir for millions of years. Moreover, for leakage to reach the surface this would require breaching a further 1,500 m of strata, including 5 major geological barriers totaling 800 m in thickness. In addition, for CO₂ to migrate 2 km south it would have to move counter to mapped formation-water flow and the natural tendency of CO₂ to migrate up dip, north and away from the Kerr property.

The Petro-Find report reaches a conclusion that is unsubstantiated by the limited data in their study. The report contains technical errors, invokes undocumented data, and provides minimal to no information on their scientific methods or analytical techniques.

In summary, there is no substantiated evidence in the Petro-Find report to support their claim that “the source of the high concentrations of CO₂ in soils of the Kerr property is clearly the anthropogenic CO₂ injected into the Weyburn reservoir.” The phenomena observed at the Kerr property can be explained by near surface processes including microbial generation of soil CO₂ and methane.