Tasmania Department Of Mines — Report 1992/04

# Gas seeps at Smithton and Kimberley

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*Abstract*

Isotopic analysis suggests that gas seeping near Smithton may be of geothermal origin and that gas seeping at the Kimberley thermal springs is of bacterial (biogenic) origin.

## INTRODUCTION

Matthews (1978) reported gas associated with a thermal spring in the Kimberley area south of Devonport (grid reference DQ575168) and concluded that the spring originated at depth, possibly in limestone.

Naturally-occurring gas was reported seeping in an open paddock near Smithton about 1.5 km northeast of Briant Hill (grid reference CQ460779). The gas discharge, only observable into standing water, consisted of numerous strongly-discharging bubble trains over an area of at least 50 square metres. The landowner (Mr A. House) reports that the seep has been active for over 50 years. As numerous spring mounds (both calcareous and siliceous) are known from the Smithton area, apparently related to the distribution of carbonate rocks, it was initially thought that the gas could be related to carbonate decomposition.

Samples of gas from both seeps were collected by water displacement into glass bottles which were then stored upside-down and promptly forwarded to CSIRO, North Ryde NSW, for analysis.

## ANALYTICAL RESULTS

Results of analyses carried out on the gas samples are:–

| | *Smithton* | *Kimberley* |
|---|---|---|
| | ***Chemical analyses, %v/v*** | |
| Methane* | 0.07 | 19.8 ppm |
| Carbon dioxide | 59.8 | 1.2 |
| Oxygen+ | 8.7 | 10.9 |
| Nitrogen | 31.5 | 87.9 |
| | ***Isotopic analyses, ‰ PDB#*** | |
| Methane $\delta^{13}C$ | -32.3 | -77.4 |
| Carbon dioxide $\delta^{13}C$ | -4.0 | -18.2 |
| Carbon dioxide | -4.9 | -5.9 |

* FID detector
\+ Includes argon
\# International Standard Peedee Belemnite

## SMITHTON SEEP

Bedrock in the immediate environs of the Smithton seep is likely to be the Late Proterozoic Black River Dolomite, although at the surface the gas is seeping through coastal sands of probable Last Interglacial age.

The chemical and isotopic composition of the gas is similar to those reported from geothermal areas in New Zealand and the United States (*cf.* Hoefs, 1973). Isotope differences ($^{13}CO_2 - ^{13}CH_4$) of +28.3 equate to a final gas equilibration temperature of approximately 260°C (Bottinga, 1969).

As there are no obvious relatively recent volcanics in the area, and if the gas is of geothermal origin, it is probably related to a deep-seated intrusive source.

If the gas is of geothermal origin then it is possible this energy source could be exploited. It is therefore recommended that a drilling program be undertaken to determine both the geothermal gradient and thermal conductivities of basement rocks. An initial hole of at least 500 m is warranted.

## KIMBERLEY SPRINGS

The Kimberley gas sample is chemically and isotopically quite different to the Smithton sample. The isotopic signature of the methane suggests a bacterial origin and the isotopic composition of the $CO_2$ is consistent with derivation by oxidation of organic matter. It should be noted that although the $CO_2$ could also have been derived by oxidation of the methane, the chemical and isotopic composition of the sample suggest it is unlikely that the reaction occurred during transportation of the sample.

## ACKNOWLEDGEMENTS

M. R. Hargreaves assisted with collection of the Kimberley sample. The analyses were performed by Don Rigby (CSIRO).

## REFERENCES

BOTTINGA, Y. 1969. Calculated fractionation factors for carbon and hydrogen isotope exchange in the system calcite-carbon dioxide-graphite, methane-hydrogen-water vapour. *Geochim. Cosmochim. Acta* 33:49–64.

HOEFS, J. 1973. *Stable Isotope Geochemistry.* Springer Verlag : Berlin, Heidelberg, New York.

MATTHEWS, W. L. 1978. Thermal spring at Kimberley. *Unpubl. Rep. Dep. Mines Tasm.* 1978/12.

[24 February 1992]