

## Attachment 1

### Otway Basin, Victoria - History of gas exploration and production

#### Structure of the Otway Basin

The Otway Basin is a sedimentary basin which began to form about 145 million years ago, in the Late Jurassic/Early Cretaceous, as the Australia started to separate from Antarctica. During this process, a series of topographic lows, or troughs, formed within the greater Otway Basin and these captured sediments over millions of years. In the onshore Victorian portion of the Otway Basin, these Early Cretaceous deposit centres include the Penola Trough, Portland Trough, Ardonachie Trough, and the onshore portion of the Shipwreck Trough (Figure 1).

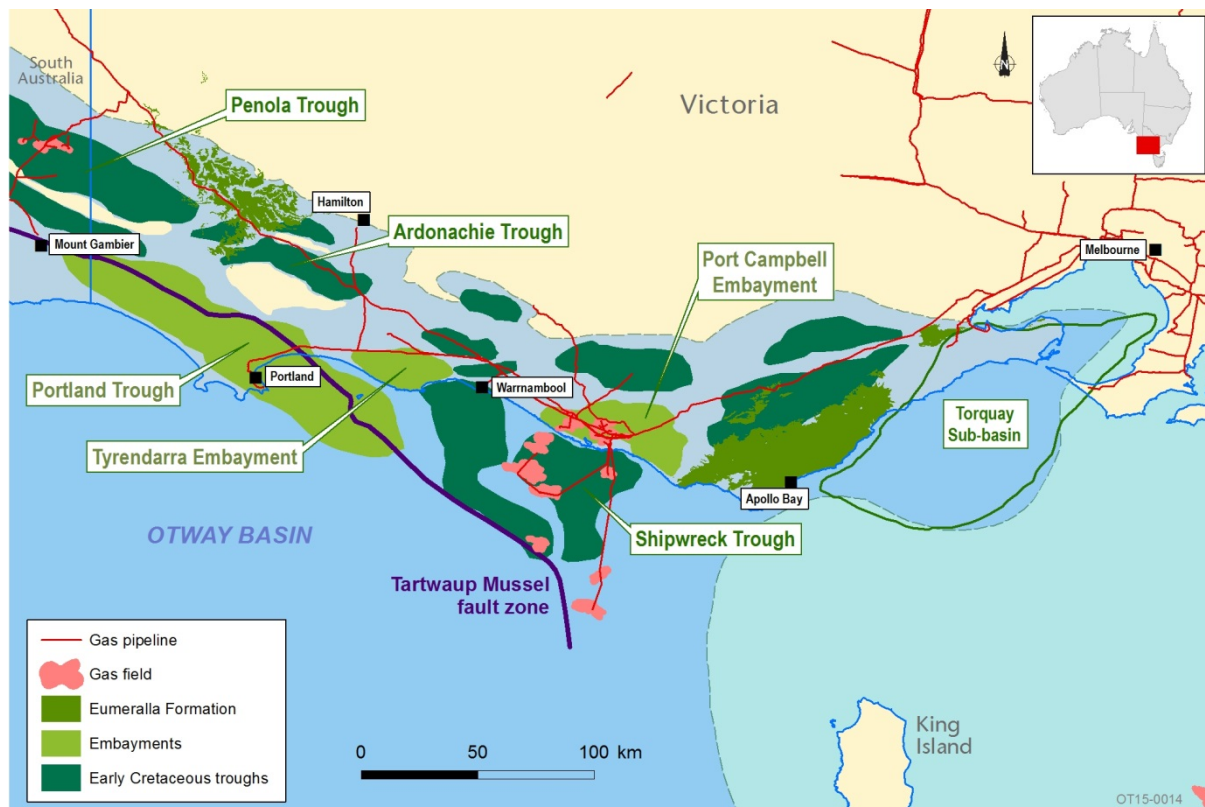


Figure 1: Structural Elements of the Otway Basin, Victoria.

(O'Brien & Thomas, 2007. A technical assessment of the yet-to-find hydrocarbon resource inventory, offshore and onshore Otway Basin, Victoria, Australia. VIMP Report 90, Department of Primary Industries.)

## Exploration and Production History of the Otway Basin

Petroleum exploration in the vicinity of the Otway Basin commenced in 1866 when Australia's first exploration well, Salt Creek 1, was drilled near the Coorong in South Australia, north of the edge of the Otway Basin. In the Victorian sector of the Otway Basin, the first wells were drilled in the 1920's to 1940's in the Anglesea and Torquay areas, however these wells were all relatively shallow.

More modern hydrocarbon exploration in the Victorian Otway Basin commenced in 1956, when PEP's 5 and 6 covering the majority of the onshore Otway Basin was awarded to a consortium led by Frome-Broken Hill Company Pty Ltd. The consortium acquired the first regional seismic survey in PEP 5 in 1958, and in 1959, drilled its first well, Port Campbell-1, within the Port Campbell Embayment. Whilst the well itself proved non-commercial, it marked the first hydrocarbon discovery within the Otway Basin. A total of nine onshore wells were drilled by the Frome-Broken Hill Consortium between 1959 and 1965, with six of the wells encountering gas shows (O'Brien et al, 2006).

In 1965 Shell farmed in to PEP 5, and then in 1968 farmed in to PEP 6. A further six wells were drilled onshore between 1965 and 1973, with three wells having oil and gas shows (O'Brien et al, 2006). During this period numerous seismic surveys were also acquired. The permits were eventually relinquished in 1975.

In 1976, PEP 5 was reissued as PEP 93 and awarded to Beach Petroleum NL. Beach drilled eight wells in the next 6 years, and discovered gas in the Waarre Sandstone within the Port Campbell Embayment at North Paaratte-1 (1979), Grumby-1 and Wallaby Creek-1 in 1981 (Wilkinson, 2011). Onshore gas production from the Victorian Otway Basin commenced in April 1986, when the North Paaratte Field was connected via a pipeline built by the State-owned gas utility Gas and Fuel Corporation of Victoria to Warrnambool, 40 km to the west (Figure 2; Wilkinson, 2011).

In 1988, Beach discovered the Iona Gas Field within the Port Campbell Embayment, which commenced production in July 1992. In December 2000, Iona became the first field to be converted to an underground gas storage facility to satisfy Victoria's high demand for gas during winter, following the construction of the South West gas pipeline in 1999 which connected the Port Campbell Embayment gas fields to Melbourne. Now depleted, the North Paaratte and Wallaby Creek gas fields have also been converted to gas storage.

A total of nineteen small gas fields have been discovered in the onshore Port Campbell Embayment of the Victorian Otway Basin, nine of which were discovered by Santos Ltd between 1999 and 2003 using 3D seismic methods (O'Brien et al, 2006). The most recent discovery in the Port Campbell Embayment, East Wing-1/1<sup>ST</sup>, was made by Essential Petroleum in 2008. Two of the gas fields discovered within the Port Campbell Embayment, Buttress and Boggy Creek, have very high carbon dioxide content. Boggy Creek has been produced as a commercial carbon dioxide operation, whilst the Buttress Field has been used for a pilot carbon dioxide sequestration project by the Cooperative Research Centre for Greenhouse Gas Technologies. More than 300 wells have been drilled within the Victorian portion of the Otway Basin; to date only the Port Campbell Embayment has resulted in commercial gas discoveries.

The SEAgas pipeline, stretching from the Victorian Otway Basin to Adelaide, became operational in 2004.

## Beach Activity in the Victorian Otway Basin

Beach has a long history of exploring for hydrocarbons in the Otway Basin. Early in the company's history, Reg Sprigg, the company founder, mapped a large part of the Otway Basin and undertook surveys to determine whether hydrocarbons existed below the earth's surface. Beach drilled Geltwood Beach-1 in 1963, south west of Millicent in South Australia, to look for oil. As described above, Beach was very active in exploring for gas in Victoria and made the first commercial gas discovery in the Port Campbell Embayment in 1979. Beach discovered four gas fields in the Port Campbell Embayment between 1979 and 1988, and in Joint Venture with Santos Ltd discovered a further four gas fields between 1999 and 2003. Beach was also a Joint Venture participant in the Bogy Creek and Buttress Carbon Dioxide discoveries.

More recently, Beach drilled the gas exploration well Glenaire-1 in 2006 in the Victorian portion of the Penola Trough. All of these wells were searching for hydrocarbons in conventional reservoirs, i.e. reservoirs that might flow naturally, unassisted by fracture stimulation. Beach's current onshore tenement holdings in the Victorian onshore Otway Basin are shown in Figure 2.

In March 2012, Beach acquired 102 line kilometres of data in the Mactra 2D seismic survey in PEP 168 within the Port Campbell Embayment. In February-March 2014, Beach and partner Cooper Energy acquired a further 162 line kilometres of data in the Ostrea 2D seismic survey in PEP 168.

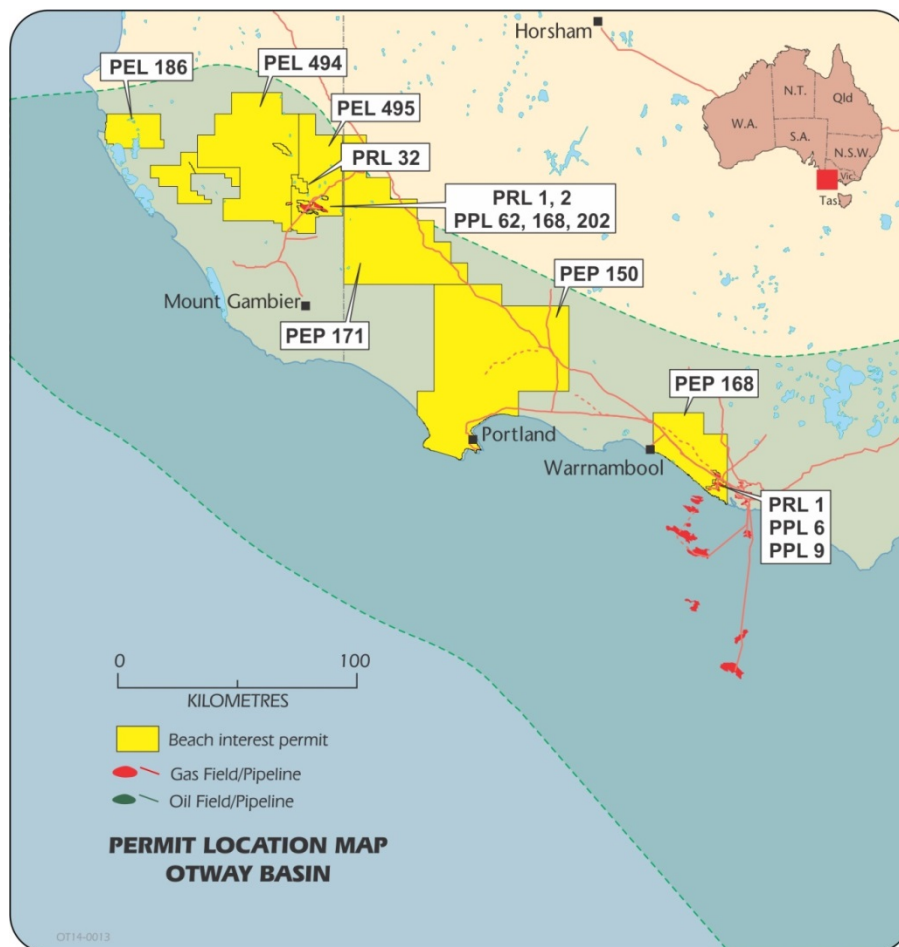


Figure 2: Map of Beach's onshore tenement holdings within the onshore Otway Basin.

## References

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