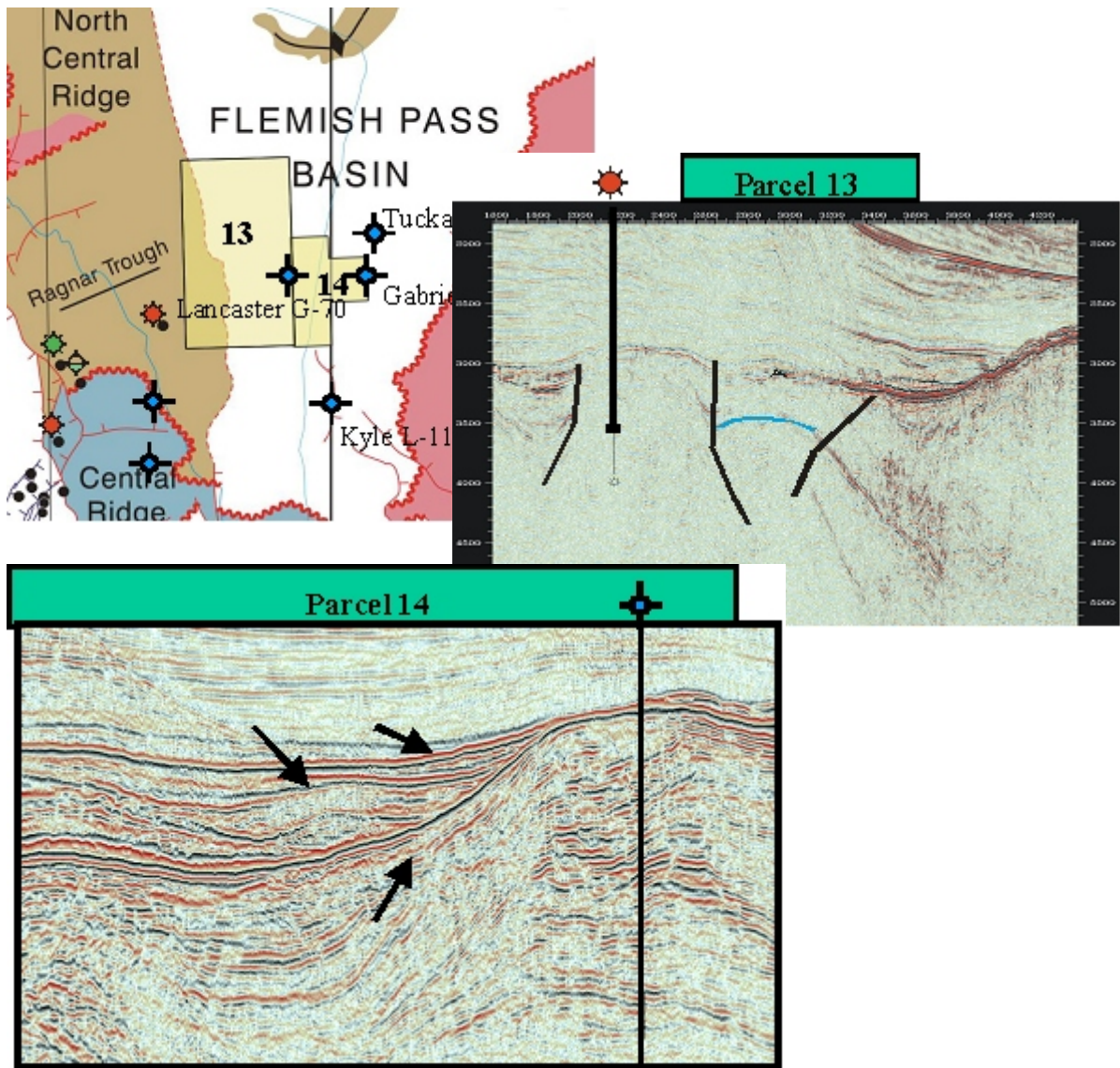


C-NOPB Request for Bids NF-03-01

Parcels 13 – 14 Flemish Pass Basin



Foreword

This report has been prepared by the Department of Mines and Energy to provide information on two land parcels in the Flemish Pass Basin that are being offered in the Canada-Newfoundland Offshore Petroleum Board's (C-NOPB) Call For Bids NF-03-1 which closes on December 17, 2003. A separate report has been prepared by G&G Exploration Consultants to provide information on twelve other parcels being offered in this land sale, which are located in the Orphan Basin.

Users of this report are advised that the figures have been prepared for illustrative purposes to give a general picture of the geology. Land parcels were plotted on the geology maps and seismic sections without the use of a GIS system and therefore small errors may have been introduced.

Detailed information on the Call for Bids NF-03-01 can be found on the C-NOPB's website:

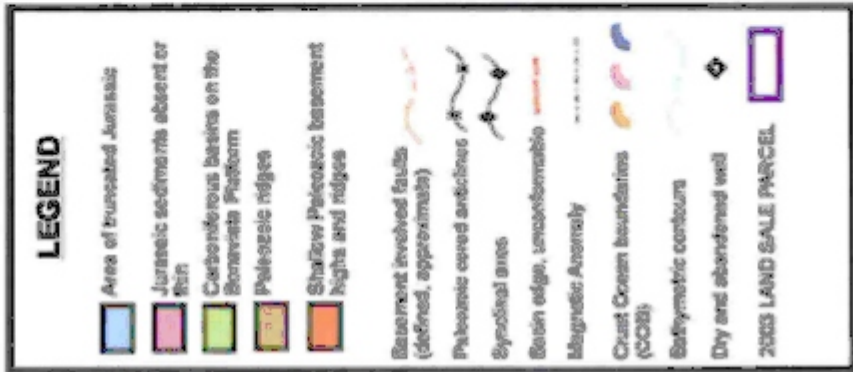
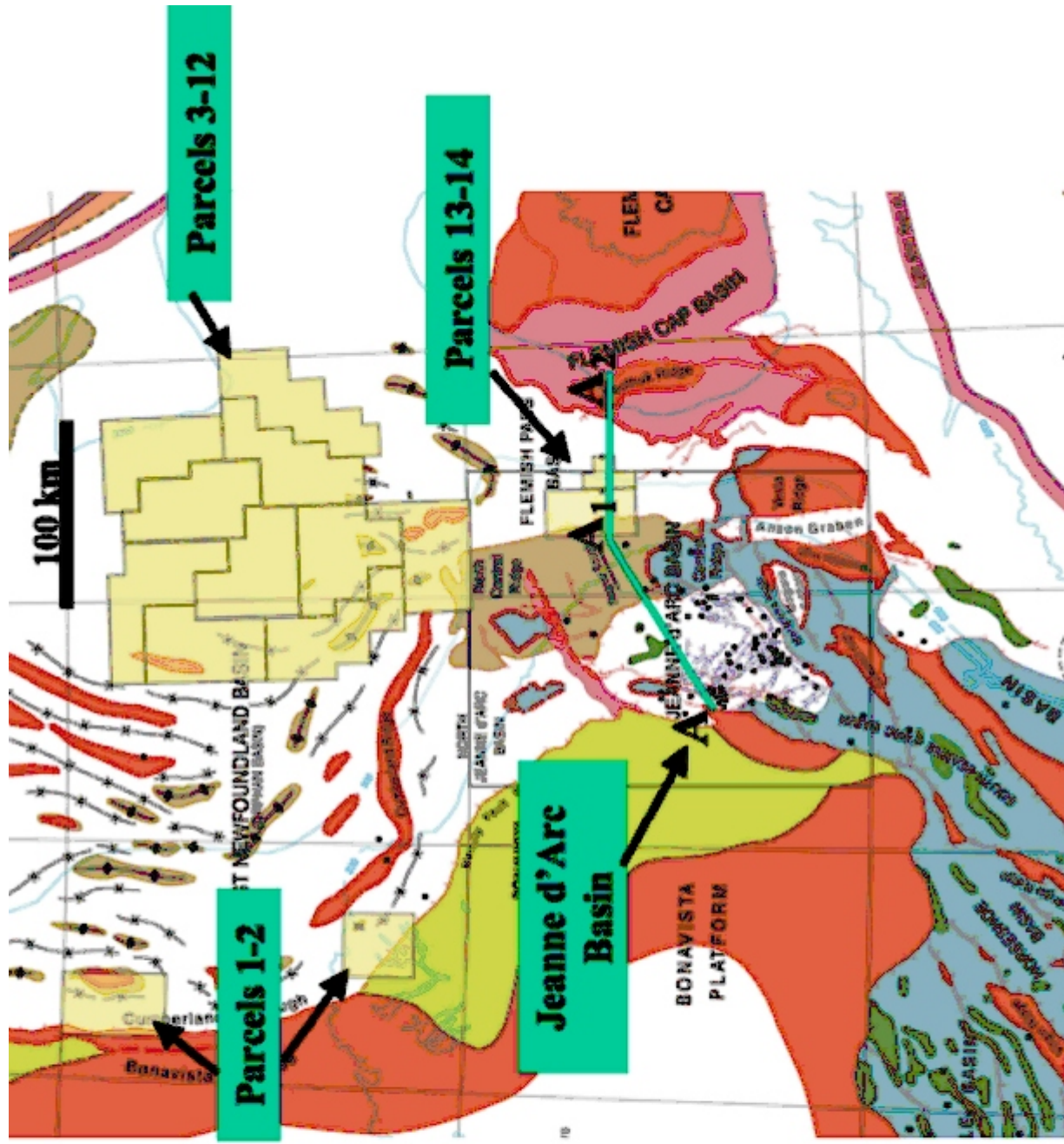
<http://www.cnopb.nfnet.com/>

Acknowledgments

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GSC East Coast Basin Atlas Series

Figure 1

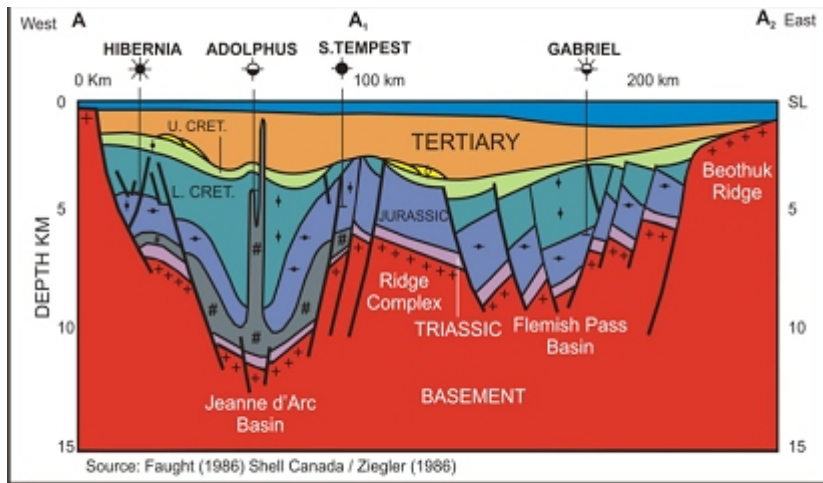


Figure 2
Cross section through the Jeanne d'Arc and Flemish Pass Basins

Petroleum Geology and Drilling History

The Flemish Pass Basin is a deep water (1100 - 1200 metres) Mesozoic aged rift basin located directly east of the Jeanne d'Arc Basin / Ridge Complex area of the Grand Banks. The Mesozoic section is overlain by a prograding Tertiary wedge that onlaps the basement cored Beothuk Ridge and Flemish Cap which combine to form the eastern boundary of the basin (Figs. 1 and 2). Although no discoveries have yet been made in the Flemish Pass Basin, the few wells drilled there have proven the presence of high quality

Kimmeridgian aged source rock and Lower Cretaceous reservoir sands. Despite the presence of the key ingredients for a prolific petroleum system only four wells (Gabriel C-60, Baccalieu I-78, Lancaster G-70 and Kyle L-11) had been drilled in the basin prior to 2003. Gabriel was drilled in 1979, Baccalieu in 1985 and both Lancaster and Kyle were drilled in 1986. In recent years Petro-Canada and its partners Norsk-Hydro and Encana have established a large land position in the basin and acquired extensive 3D seismic coverage. These partners drilled two wells in the basin during 2003, at Mizzen L-11 and Tuckamore B-27. Although these two wells are still under confidential status, the partners have announced that Mizzen L-11 well encountered non-commercial hydrocarbons and Tuckamore B-27 was a dry hole.

Land Parcels

Parcel thirteen (141,525 hectares) lies adjacent to the North Dana significant discovery license (472 bcf recoverable), straddling the eastern flank of the Ridge Complex and the western boundary of the Flemish Pass Basin in water depths ranging from about 400 to 800 metres (Fig. 3). North Dana flow-tested 12.8 million cubic feet per day of gas, and 292 barrels per day of condensate from a 10.4 metre net pay interval in Upper Jurassic "Lower Tempest" sandstones. This bid parcel contains one well, Lancaster G-70 which had a good gas show in the Upper Jurassic, but reservoir sections encountered were thin. As this well was drilled on an old Jurassic high the more prospective Lower Cretaceous section was not present (Fig. 6).

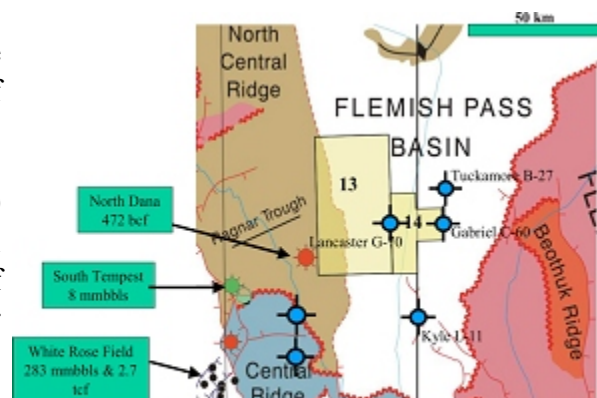


Figure 3
Well locations and geology - parcels 13 and 14

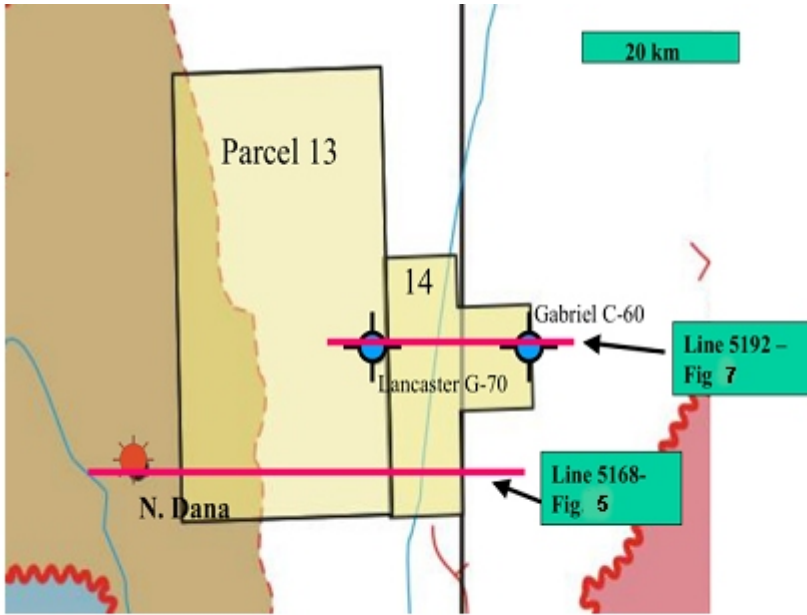


Figure 4
Seismic line locations – for figures 5 and 6

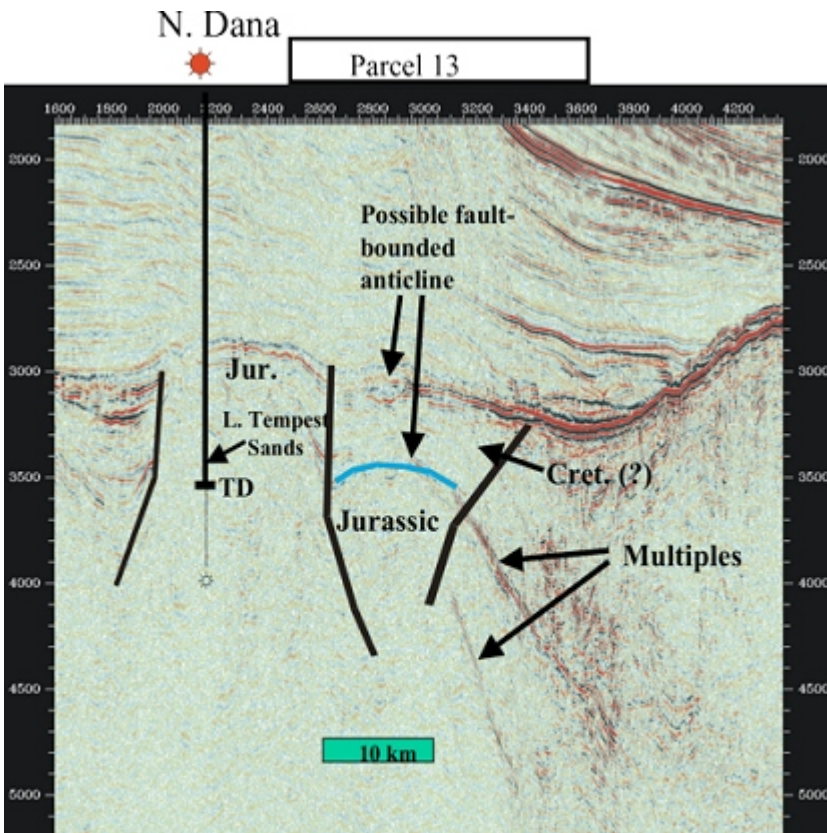


Figure 5
Line 5168: Shows possible fault-bounded anticline in the Jurassic and Cretaceous(?) on Parcel 13

An extensive grid of moderate to generally poor quality, 1983 vintage (Soquip) data, covers these parcels and the surrounding area. This data, and the well data, is available for the cost of reproduction from the C-NOPB, in accordance with the data release provisions of the Canada-Newfoundland Atlantic Accord legislation. Line 5168 (Figs. 4 & 5) is an east-west line that runs through the parcel and shows its structural relationship to the North Dana discovery. Although imaging of the Cretaceous and Jurassic is very poor, the structure at the base of Tertiary indicates the presence of a possible fault-bounded anticline or tilted fault block abutting the eastern flank North Dana structure.

Weak reflections within the Jurassic support this interpretation. A similar feature seen on line 5192 (Figs. 4, 6 & 7) about 20 km to the northeast (on parcel 14), suggests that a large terrace or a series of tilted fault blocks may be present along the eastern flank of the ridge complex. This sets up the possibility of large traps in the Lower Cretaceous and Jurassic. The best potential would likely be in the Lower Cretaceous which had thick high quality reservoir sands at Gabriel C-60 (a portion of which bled oil from core), and which appears to be present above the “terrace” on both parcels. Seismic line 5192 (Fig. 8) shows that parcel fourteen (36,760 hectares) also has the potential for Cretaceous and Lower Tertiary pinchouts against the Gabriel high, as well as fan deposits in the Lower Tertiary.

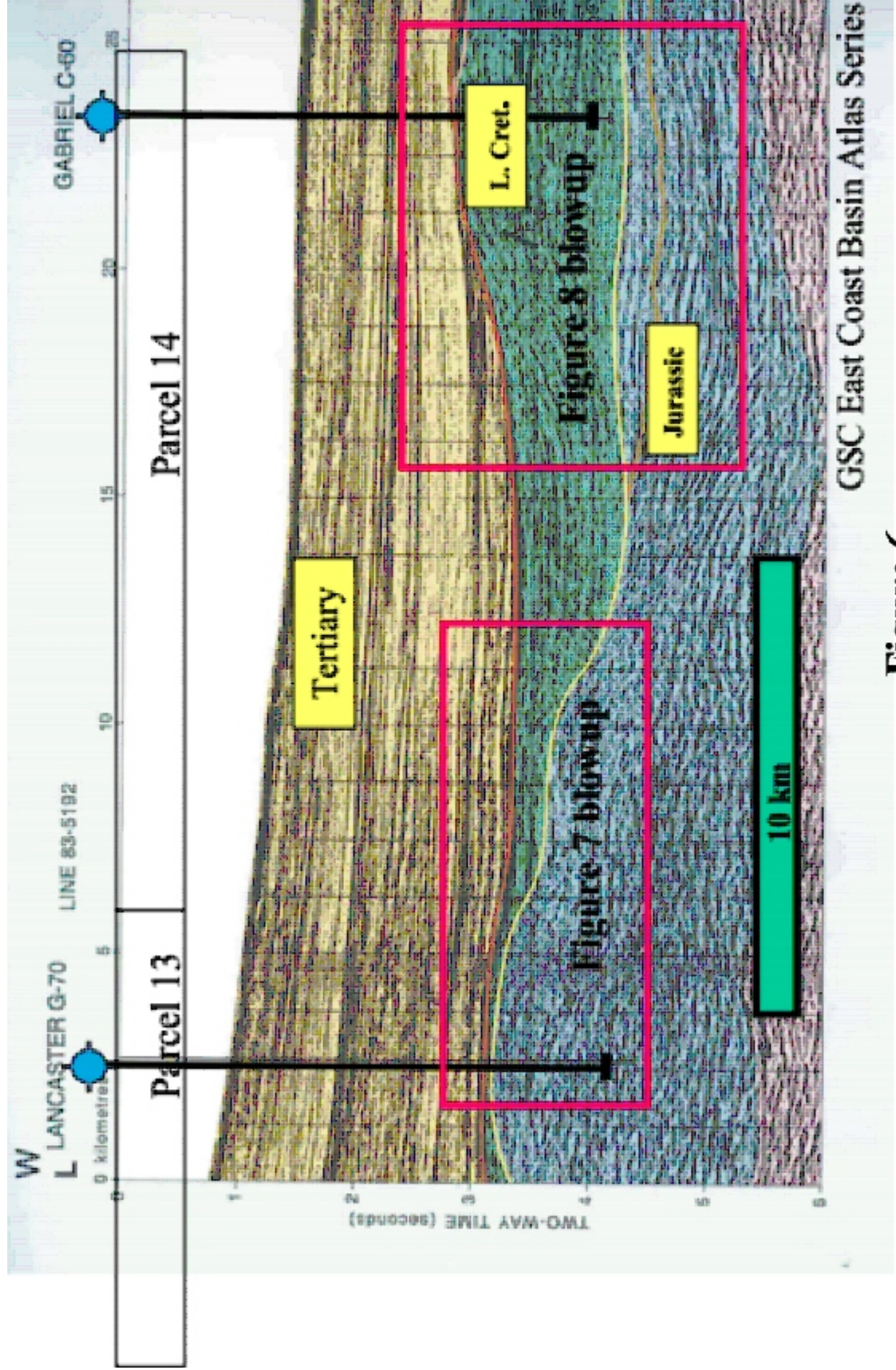


Figure 6

Line 5192 - Section and interpretation from GSC Basin Atlas Series. More detailed views are given in figures 7 and 8.

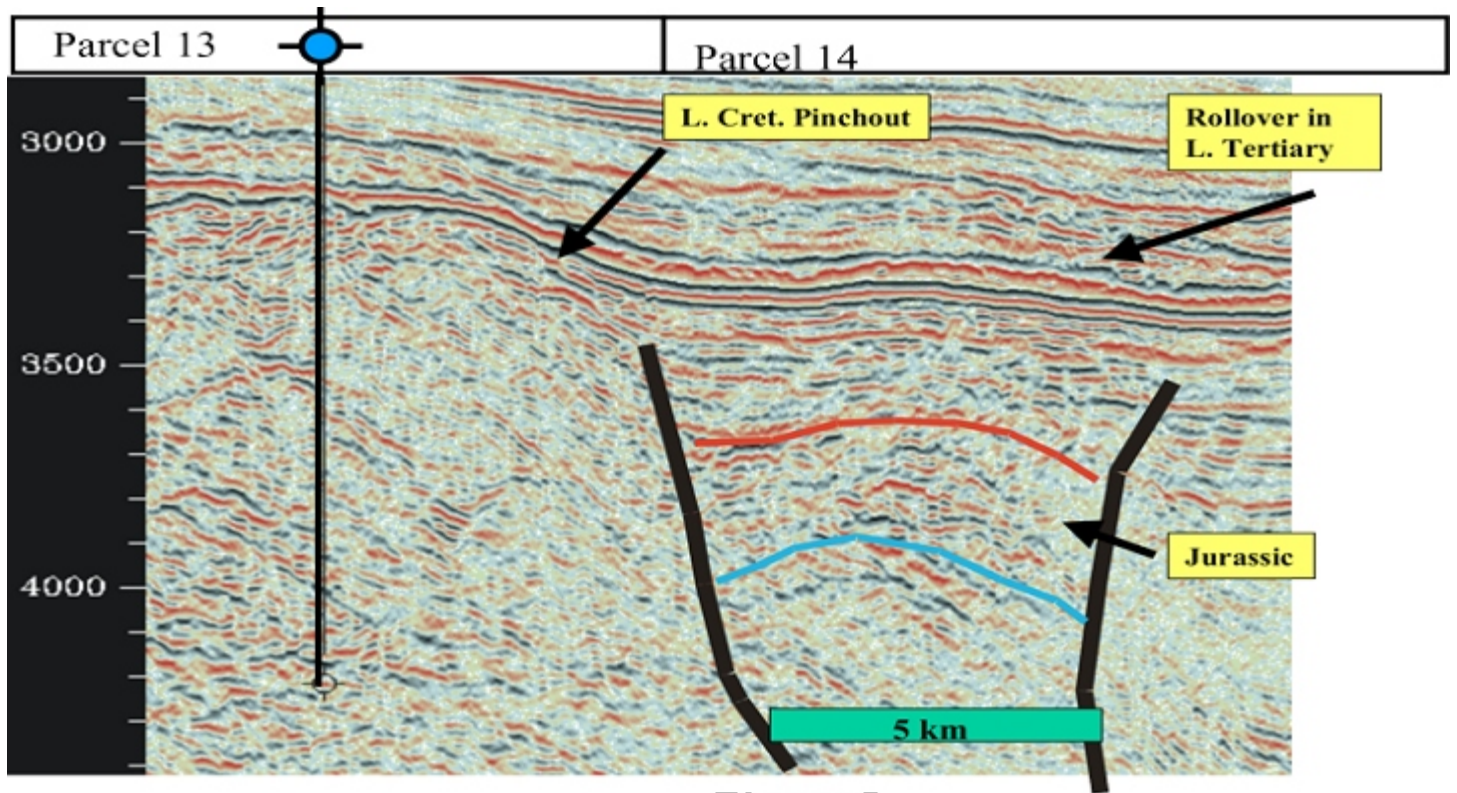


Figure 7

Line 5192: Play possibilities on parcel 14 – Jurassic fault-bounded anticline and Lower Cretaceous pinchout

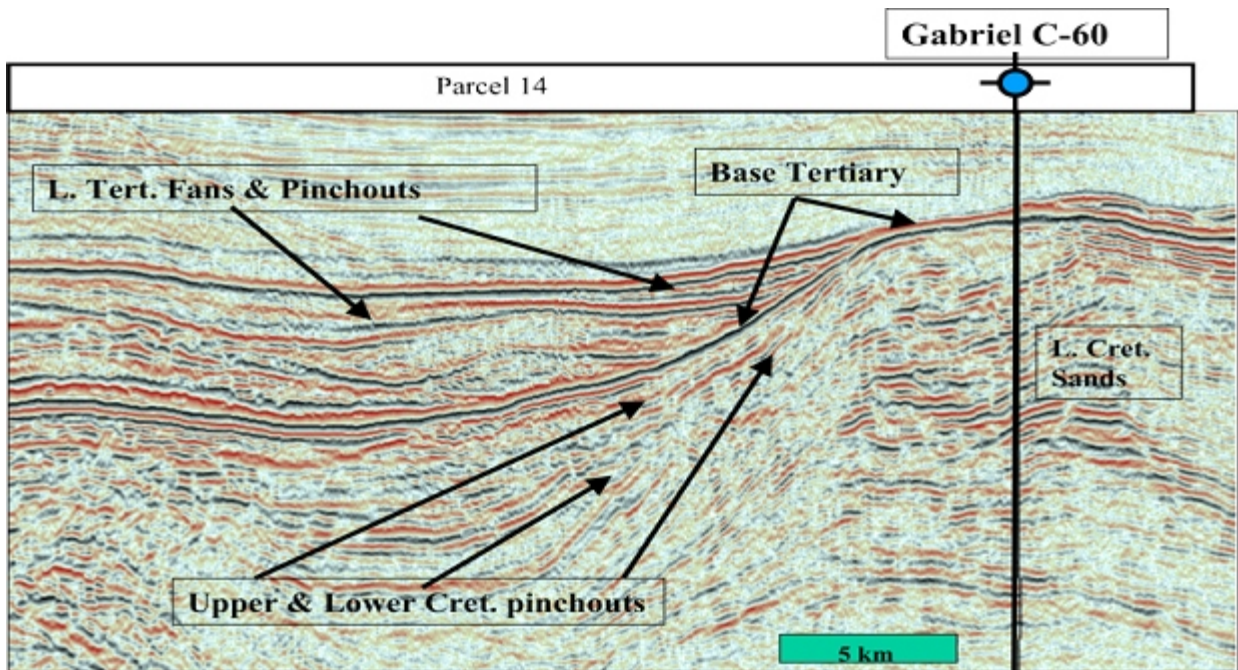


Figure 8

Line 5192: Play possibilities on parcel 14.

Appendix "A"

Well descriptions (Gabriel, Lancaster and North Dana)

Well Name: Gabriel C-60
Operator: Esso Resources Canada Limited
Partners: Voyager
Year: 1979 (1st well drilled in Flemish Pass Basin)
Water Depth: 1109.0 m
RT: 24.1 m

Tertiary

- 1364.9 m thick
- Claystone, minor marlstone
- No reservoir quality intervals or hydrocarbon shows encountered
- Base of Tertiary U/C: 2473.9 m MSL

Upper Cretaceous

- Top: 2473.9 m MSL
- 7.0 m thick
- Marlstone, limestone
- No reservoir quality intervals or hydrocarbon shows encountered

Lower Cretaceous

- Top: 2480.9 m MSL
- 2666.0 m thick to TD
- Predominantly sandstone, siltstone and shale; minor limestone, dolostone beyond 4800 m to TD
- Reservoir quality intervals and hydrocarbon shows encountered

TD (Total Depth): 5146.9 m MSL in Fortune Bay (Lower Cretaceous) shales

Comments:

A 1613.0 m section of Hibernia equivalent sandstone, siltstone and shale were encountered in this well. Reservoir quality shallow marine facies sands occur sporadically throughout the section with one interval exhibiting 10 to 20 % porosity and numerous oil shows over 215 metres (Report GP - CNOPB - 89 - 1). A core cut between 4436.5 to 4451.9 m, within the above referenced reservoir section, showed bleeding oil distributed along a sandstone / shale interface at 4451.75 metres (Esso et al. Gabriel C-60 Well History Report, 1981). Geochemical analysis of this oil indicates a Kimmeridgian source.

Well Name: Lancaster G-70
Operator: Petro-Canada
Partners: Petro-Canada
Year: 1986
Water Depth: 726 m
RT: 24.1 m

Tertiary

- 2456.9 m thick
- Interbedded claystone and shale with minor friable sandstone; limestone towards base
- No shows encountered within Tertiary section
- Base of Tertiary U/C: 3182.9 m MSL

Upper Cretaceous

- Not present

Lower Cretaceous

- Not present

Upper Jurassic

- Top: 3182.9 m MSL
- 1987.0 m thick
- Interbedded sandstone, limy sandstone, limestone, marlstone, siltstone and shale
- Occasional thin, reservoir quality sandstone intervals
- No oil shows, good presence of gas in sandstone at 3348 m

Mid Jurassic

- Top: 5169.9 m MSL
- 507.0 m thick to TD
- Predominantly shale; minor interbedded sandstone, siltstone, limestone and marlstone
- No reservoir quality sandstone intervals encountered
- No oil shows throughout section

TD: 5676.9 m MSL in Voyager Fm. (Mid Jurassic) shales

Comments:

Although numerous, thin to moderately thick sands were encountered throughout the Jurassic interval, most were tightly cemented thereby reducing overall reservoir quality. Porosity logs and RFT data in combination with cuttings examination however indicate narrow zones of good porosity and permeability in non- to weakly cemented sections. Since most sand intervals, whether porous or non-porous appear well sorted and moderately clean, reservoir quality would be expected to improve as the percentage of cementation decreased elsewhere in the basin. No oil shows were observed in this well but geochemical analysis (Fowler et al, 1990) and wireline log interpretation (GP-C-NOPB -94-01) supports the presence of significant source potential within the Kimmeridgian section.

Well Name: North Dana I-43
Operator: Mobil
Partners: Petro-Canada, Gulf, Pan Canadian, Norcen, Canterra, Roxy
Year: 1982 (re-entry 1985)
Play Type: Tilted fault block
Water Depth: 220.8 m
RT: 27.4 m

Tertiary

- 3118.8 m thick
- Claystone and marlstone grading with depth to shale
- No shows encountered within Tertiary section
- Base of Tertiary U/C: 3339.6 m MSL

Upper Cretaceous

- Top: 3339.6 m MSL
- Interbedded lime mudstones and shale
- No shows encountered within Upper Cretaceous section
- 193 m thick

Lower Cretaceous

- Not present

Upper Jurassic

- Top: 3532.6 m MSL
- Interbedded shale, siltstone and sandstone, minor limestone
- Between 4440 - 4455 m, patchy, light brown to black oil stain in sandstone, poor to good (up to 15%) inferred porosity
- 1743.6 m thick to TD

TD: 5276.2 m MSL in Lower Kimmeridgian (Jurassic) source rock

Comments:

A total of four DST's were attempted for this well, of which only one was successful. DST #2 (4536.7 - 4548.3 m RT) flowed gas at 361,606 m³/d (12.8 MMCF/day) and 52.7⁰ API condensate (292 bbls/day) through a 6.35 mm choke from "Lower Tempest" sandstones of the Upper Jurassic Rankin Formation (C-NOPB, Schedule of Wells). Net pay interval was 10.4 m and overall reserves are estimated at 472 BCF gas and 11 MMBbls NGL. Geochemical analysis indicates good source potential within both the upper and lower Kimmeridgian zones. According to Geochem Laboratories (1984), Upper Kimmeridgian source rocks between 4058 and 4403 m RT exhibit TOC values between 0.57 to 2.67 % (avg. 1.48%) with an HI range of 64 to 170. A subsequent report by Fowler and McAlpine (1994) indicate a TOC range of 1.22 to 1.93 % (avg. 1.58 %) between 3883 to 4000 m RT. HI values for the same interval plot from 157 to 219. These upper source rocks are mature (Geochem Laboratories; Avery (1988)) and considered to be a good to very good source of oil and associated gas in the well (Geochem Laboratories, 1984). Lower Kimmeridgian source rocks between 4588 and 5303.6 m RT (FTD) exhibit a TOC range from 0.41 to 1.85 % (avg. 1.19 %) with a HI range of 14 to 92. Low TOC and HI values at North Dana as compared to other wells drilled along the Outer Ridge Complex appear related to greater oxidizing conditions prevalent during deposition of the Egret Member (Fowler and McAlpine, 1994). Other wells located within the Outer Ridge area consistently exhibit higher TOC values (eg., Panther P-52, up to 8.22%) and elevated HI values (500 to 700 range) where the Egret Member is immature (Fowler and McAlpine, 1994).