

# CR21166

Report No. A1195



GSC027026CA

**BEAUFORT NO. 7**

**WELL COMPLETION REPORT**

**CONFIDENTIAL**

**Distribution:**

AGL Petroleum	2
IOL Petroleum Limited	1
Qld Department of Mines	1

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## SUMMARY

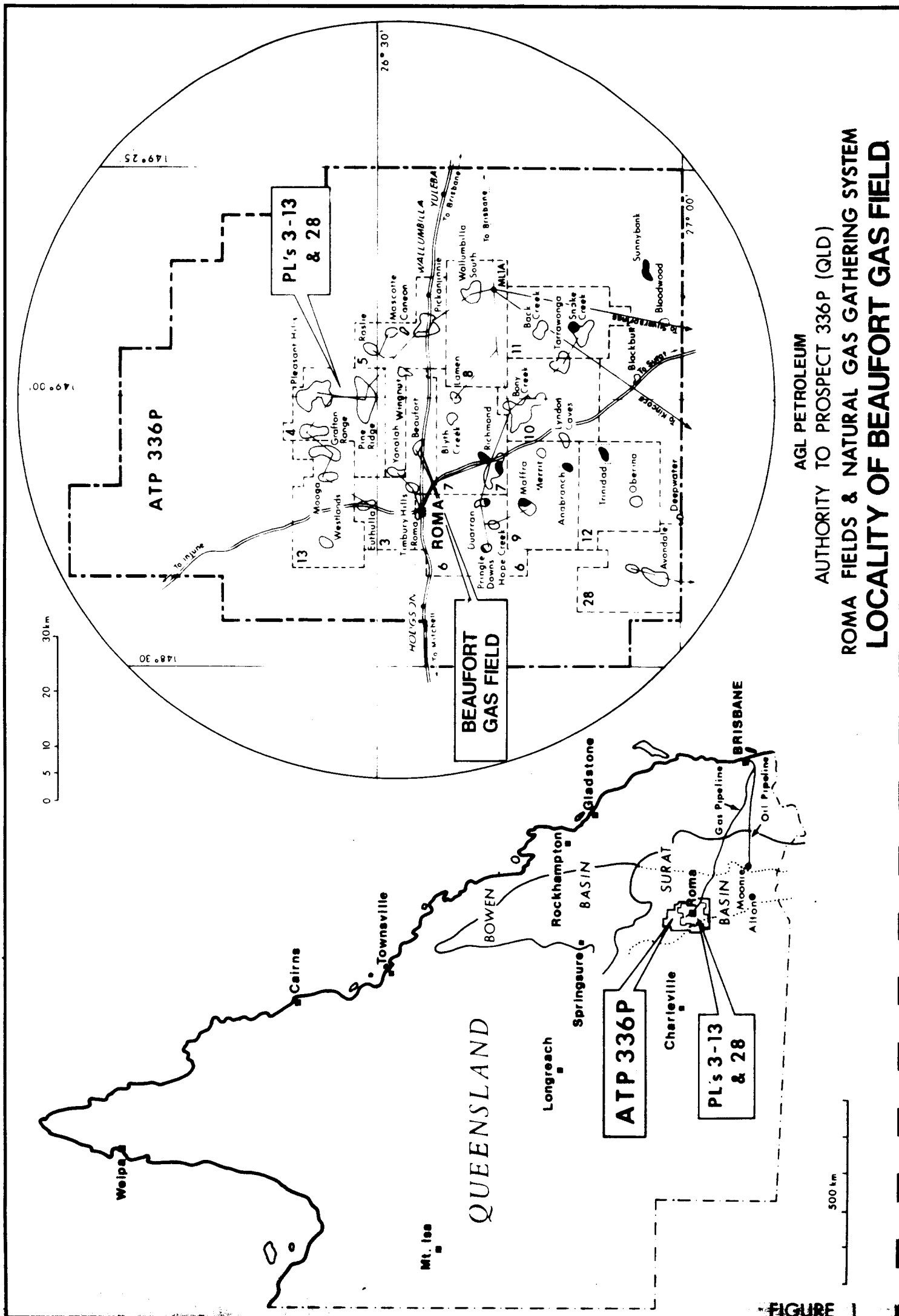
Beaufort No. 7 is situated 780 m southeast of Beaufort No. 1, midway between Beaufort No's 1 & 2 within PL 3, 14 km east of Roma. The well is located 400 m north of seismic Line 85-N44 of the 1985 Niella Seismic Survey.

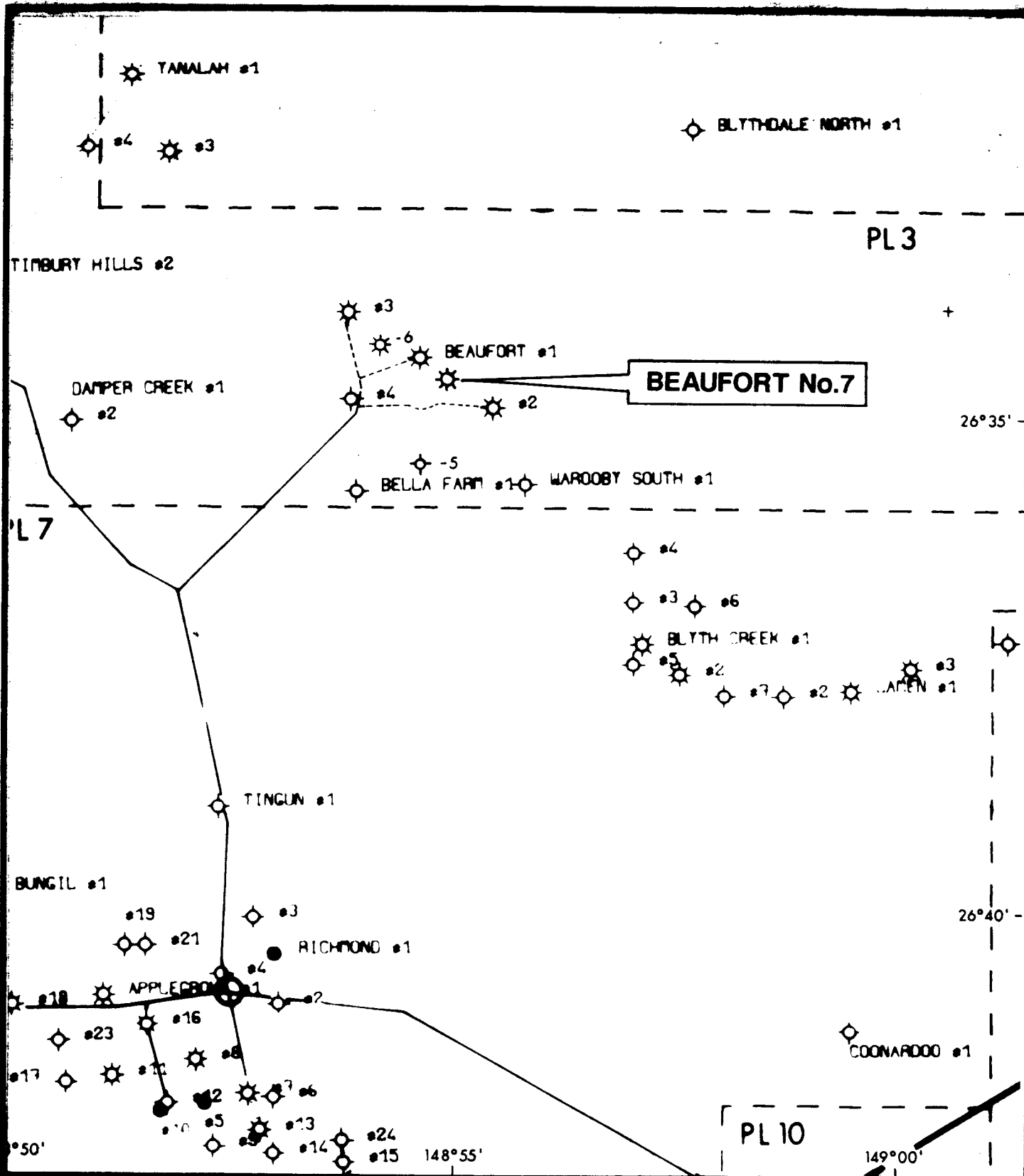
Beaufort No. 7 was the 9th well to be drilled on the Beaufort gas field and was designed to increase the proven reserves of the field and to provide increased deliverability. Principal objectives were the 'B3' and 'B1' reservoir units of the Precipice Sandstone, the Field's main hydrocarbon productive formation.

Beaufort No. 7 was drilled by AGL Petroleum acting as operator for the AGL Petroleum and IOL Petroleum Limited Joint Venture. The well spudded in the Cretaceous Bungil Formation on 20 September 1989 and reached a total depth of 1178.6 m on 26 September 1989 in the Devonian Timbury Hills Formation. Two drill stem tests were run within the Precipice Sandstone interval, though no cores were cut. A mudlogging unit, which included total gas and chromatograph detectors, was operational from the middle of the Mooga Sandstone to total depth, at which wireline logs were run.

Significant gas shows were recorded in the Injune Creek Beds and the Precipice Sandstone, with minor gas shows observed in the Hutton Sandstone and Evergreen Formation. There were no liquid hydrocarbon shows. Log analyses indicates that the lower 'B1' unit of the Precipice Sandstone contains approximately 3.5 m of net gas pay. This was tested by DST No. 2 at 18,282 m<sup>3</sup>/d (0.646 MMCFD) at a wellhead pressure of 175 psig. DST No. 1 over the upper 'B3' unit of the Precipice Sandstone tested gas at rate too small to measure, recovering 40 m of slightly gas cut watery mud. Gas shows from the Injune Creek Beds however, were found to be typically associated with coals, with any porous zones most likely water wet.

7" production casing was run and cemented to total depth and the well suspended as a future Precipice Sandstone 'B1' unit gas producer. The rig was released on 30 September 1989.





PETROLEUM LEASE 3  
SURAT BASIN, QUEENSLAND  
BEAUFORT No.7

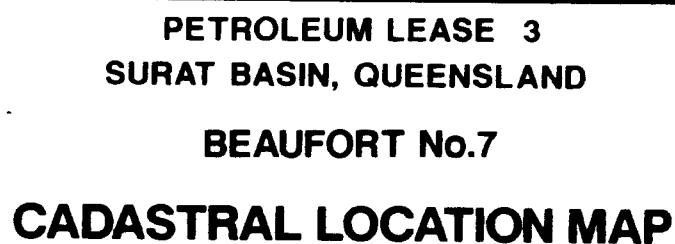
WELL LOCATION MAP

----- GATHERING  
SYSTEM

0 2 4 6 KM



Author: T.O'SULLIVAN	Date: JULY 1989	Datum:
Drawn: PPF	C.I.	Scale 1:100 000
Base No.	FIGURE 2	
Data No. 34613 - Z1		

**FIGURE 3**

**1.0 WELL DATA (See Figure 4 for Well History)**

WELL NAME AND NUMBER : Beaufort No. 7

DESIGNATION/STATUS : Development/Suspended Precipice Gas Well

LOCATION - Geographical : Latitude : 26° 34' 43.5" S  
Longitude: 148° 54' 56.8" E

- AMG : Easting : 690800.1  
Northing : 7058782.9

- Seismic : Line 85-N44 is 400 m to south

- Wells : Midway between Beaufort Nos 1 & 2.

ELEVATIONS : GL: 319.9 m  
KB: 323.9 m  
Seismic Datum: 305 m AMSL

PERMIT : PL 3

NAME & ADDRESS OF OPERATOR : AGL Petroleum  
60 Edward Street  
BRISBANE QLD 4001

RIG : OD & E No. 19 (Kremco K600H)

DATE DRILLING COMMENCED : 20 September 1989

DATE TOTAL DEPTH REACHED : 26 September 1989

TOTAL DEPTH : Driller 1178.6 m  
Logger 1176 m

RIG RELEASED : 30 September 1989

**PARTNERS**

**CONTRIBUTION INTEREST**

AGL Petroleum	85%
IOL Petroleum Limited	15%



TABLE 1

BEAUFORT NO. 7 - STRATIGRAPHIC TABLE

UNIT NAME	DEPTH (M)		THICKNESS (M)
	BELOW KB	REL SL	
Bungil Formation	Surface	+319.9	100.0+
Mooga Sandstone	100.0	+223.9	83.2
Orallo Formation	183.2	+140.7	144
Gubberamunda Sandstone	327.2	- 3.3	66.1
Injune Creek Group	393.3	- 69.4	425.5
Hutton Sandstone	818.8	-494.9	198.8
Evergreen Formation	1017.6	-693.7	103.9
ERM	1044.5	-720.6	
B3 Unit Precipice Sandstone	1121.5	-797.6	20.0
B1 Unit Precipice Sandstone	1141.5	-817.6	12.5
Moolayember Formation	1154.0	-830.1	17.0
Timbury Hills Formation	1171.0	-847.1	7.6+
Total Depth	1178.6	-854.7	

# WELL HISTORY CHART

BEAUFORT No.7

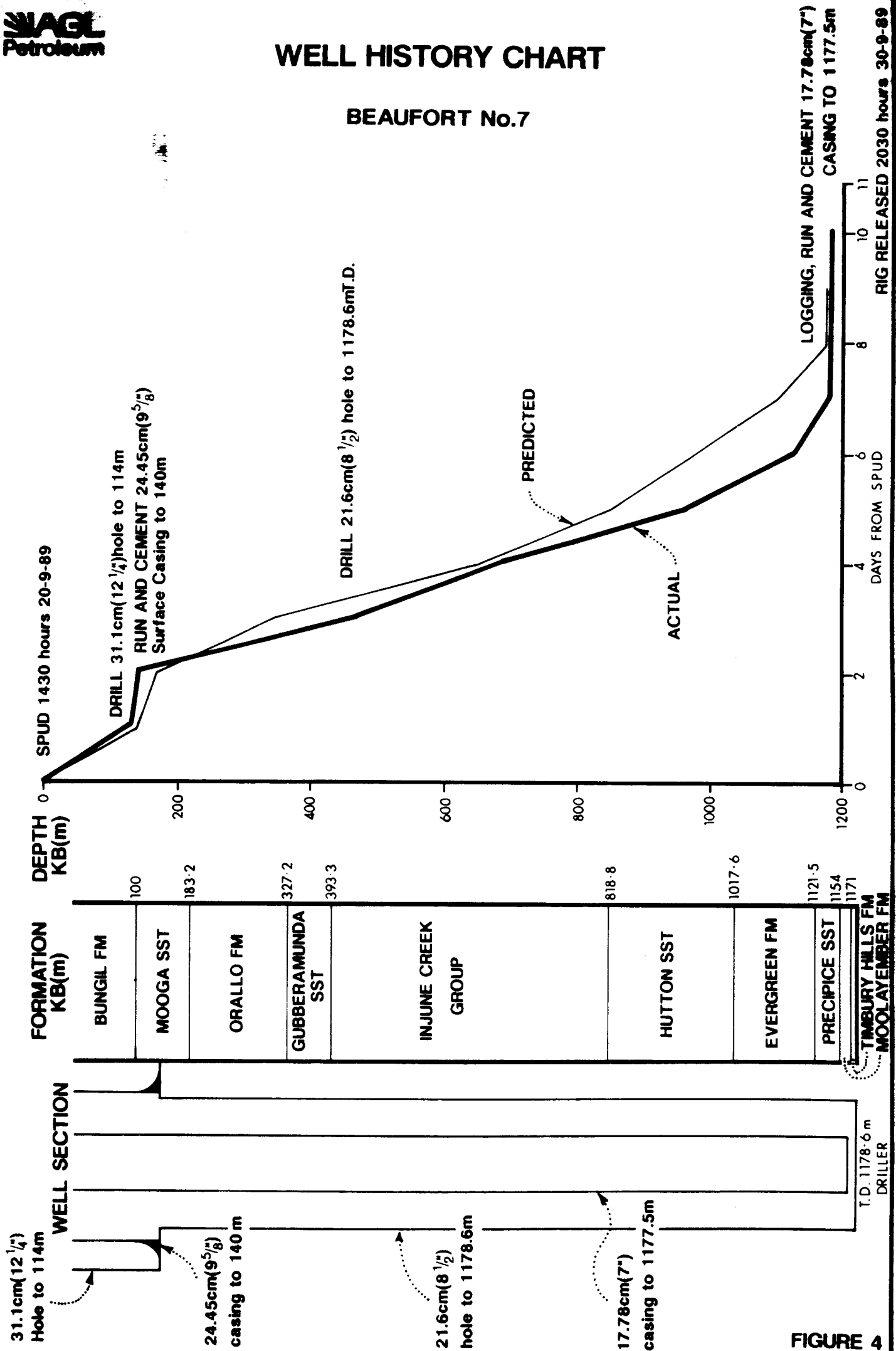
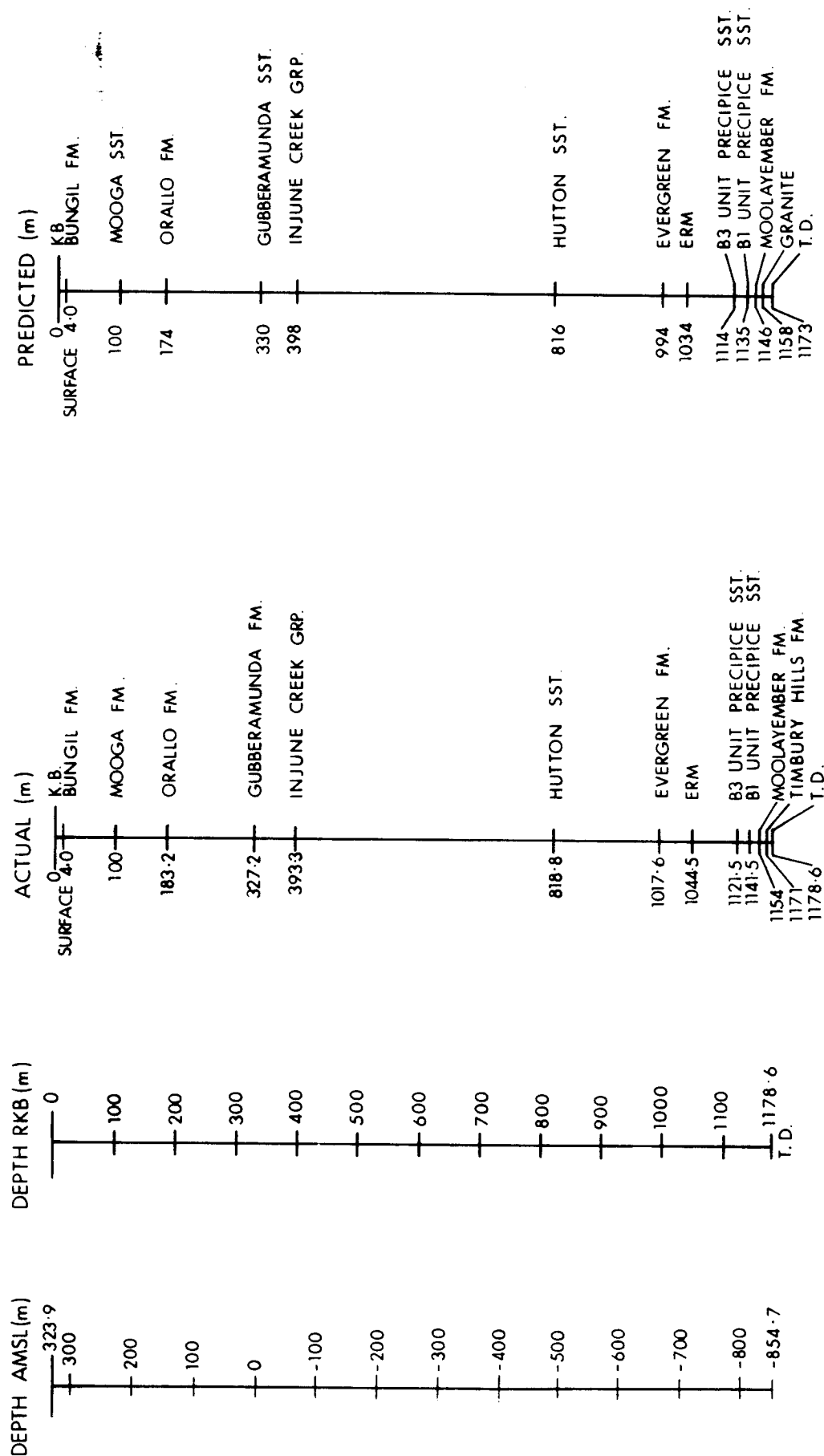
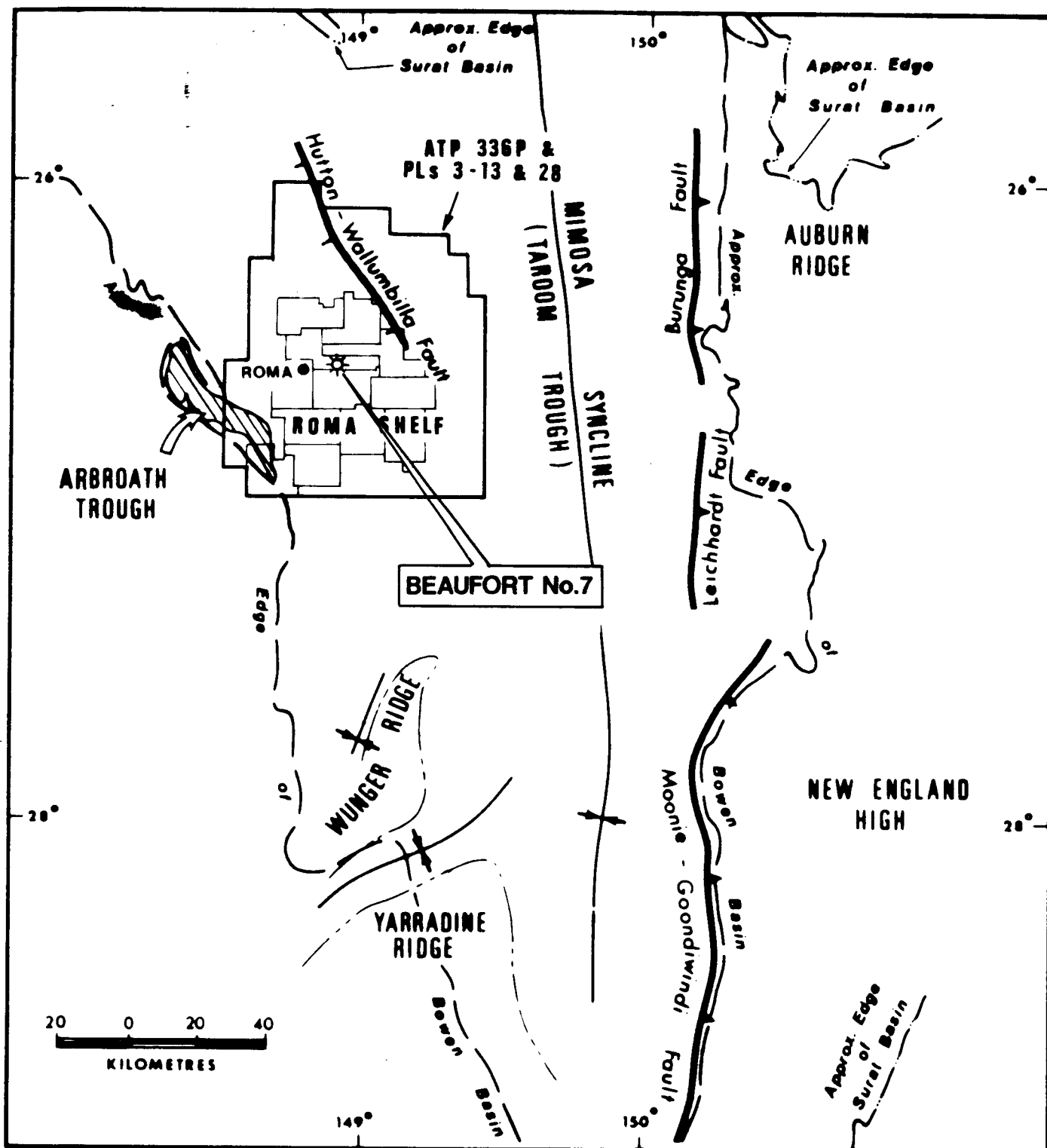


FIGURE 4

# ACTUAL vs. PREDICTED SECTION





AGL PETROLEUM

# REGIONAL TECTONIC ELEMENTS MAP OF THE SURAT AND BOWEN BASINS

SHOWING LOCATION OF BEAUFORT No.7

## **2.0 SAMPLING, LOGGING AND TESTING**

### **2.1 Ditch Cuttings**

Ditch cuttings were collected at 10 m intervals from below surface casing (set at 140 m) to 995 m (near Top Evergreen Formation), and at 5 m intervals from 995 m to 1090 m. Below 1090 m to T.D. (1178.6 m) samples were collected at 3 m intervals.

From base of surface casing to 1090 m one washed and dried sample was collected at 5 m and then 10 m intervals and stored in polythene bags. From 1090 m to TD an additional washed and dried sample was caught at 3 m intervals and stored in clear plastic sample trays.

From base of surface casing to T.D., one unwashed air dried sample was collected every sample interval and stored in HUBCO cloth bags.

All samples were delivered to AGL Petroleum, 60 Edward St., Brisbane.

### **2.2 Geochemical Sampling**

No geochemical canned samples were collected. One sample of mud used to drill the lower hole section and one sample of mud from the last circulation were collected in 2X one litre plastic bottles and 10-20 ml of their filtrate stored in two small (approx 50 ml) plastic jars.

### **2.3 Mud Logging**

Mud Logging services were provided by Gearhart Pty Ltd from below surface casing to T.D. ROP, total gas, and gas composition were monitored and samples described and checked for hydrocarbon shows. The mud log is included as Enclosure 2.

A wellsite geologist was on location from 1070 m (below Top Evergreen) to T.D., and was responsible for supervision of the mud logging, full sample description and hydrocarbon show analysis. Lithological descriptions are presented in Appendix 1.

## 2.4 Conventional/Sidewall Cores

No conventional or sidewall cores were cut.

## 2.5 Wireline Logs

Wireline logs were run by Schlumberger over the following intervals.

<u>LOG</u>	<u>INTERVAL (metres)</u>
DLL-MSFL-GR-SP	1169.5 - 140
LDL-CNL-GR	1173.2 - 375
DDBHC/GR	1170.6 - 375
Synthetic Microlog and Neutron Playback	1169.5 - 1100

Films and prints of the logs were provided at scales of 1:200 and 1:500. A magnetic tape was also provided. Prints of the logs at 1:200 and 1:500 scales are presented in Enclosures 3-6.

## 2.6 Velocity Survey

No velocity survey was run.

## 2.7 Deviation Surveys

The following deviation surveys were conducted.

<u>DEPTH (metres)</u>	<u>DEVIATION (degrees)</u>
47	0.25
106	0.5
143.9	1.25
294	0.75
447	0.75
523	0.5
689	1.0
831	0.25
996	0.5
1167	0.75

## 2.8 Drill Stem Tests

Two drill 'stem tests were conducted and are summarised below. Complete Reports may be found in Appendix 3 and Hydrocarbon Analyses in Appendix 4.

## 2.9 Hydrocarbon/Fluid Analyses

Detailed analyses of hydrocarbon and fluid recoveries from DST's 1 & 2 are given in Appendix 4 & 5.

Gas analysis from DST No. 2 over the Precipice 'B1' unit shows a dominantly methane (88.7%) and ethane (4.85%) composition, with minor nitrogen (2.1%) and a trace of carbon dioxide (< 0.01%).

### Drill Stem Test No. 1

Interval : 1126 - 1144 m                      Formation: Precipice Sandstone

First Flow : 10 minutes (Strong air blow, no gas to surface).

Second Flow : 30 minutes (Moderate air blow throughout. Gas to Surface in 28 minutes at rate too small to measure).

Recovery : 40 m, slightly gas cut watery mud.

Comments : Fluid level in annulus dropped approx 3 m on opening tool.

Samples : 2 x 1 litre plastic jars from top fluid recovery.  
          2 x 1 litre plastic jars from middle fluid recovery.  
          2 x 1 litre plastic jars from just above test tool.

Drill Stem Test No. 2

Interval : 1146 - 1152 m      Formation: Precipice Sandstone 'B1'

First Flow : 10 minutes (Strong air blow, gas to surface 9.5 mins).

Second Flow : 120 minutes (gas at 0.646 MMCFD, FFWHP 175 psi,  
3/8" choke.

Recovery : 110 m gas cut mud.

Comments : Fluid level in annulus dropped 6-8 m on opening tool.

Samples : 2 x 1 litre plastic jars from top fluid recovery.  
2 x 1 litre plastic jars from top fluid recovery.  
2 x 1 litre plastic jars from top fluid recovery.  
2 x 500 cc gas bombs.



### 3.0 GEOLOGY

#### 3.1 Summary of Previous Exploration

##### 3.1.1 Seismic

The Beaufort area was mapped by a number of early singlefold surveys, including the 1960 East Roma Seismic Survey, the 1962 Roma-Injune Seismic Survey, the 1963-64 Muckadilla-Yuleba Seismic Surrvey and the 1964 Arbroath-Richmond Seismic Survey. The 1985 Niella Seismic Survey (Oveden and Wilkinson 1985) established an evenly spaced grid of modern multifold data over the Beaufort structure.

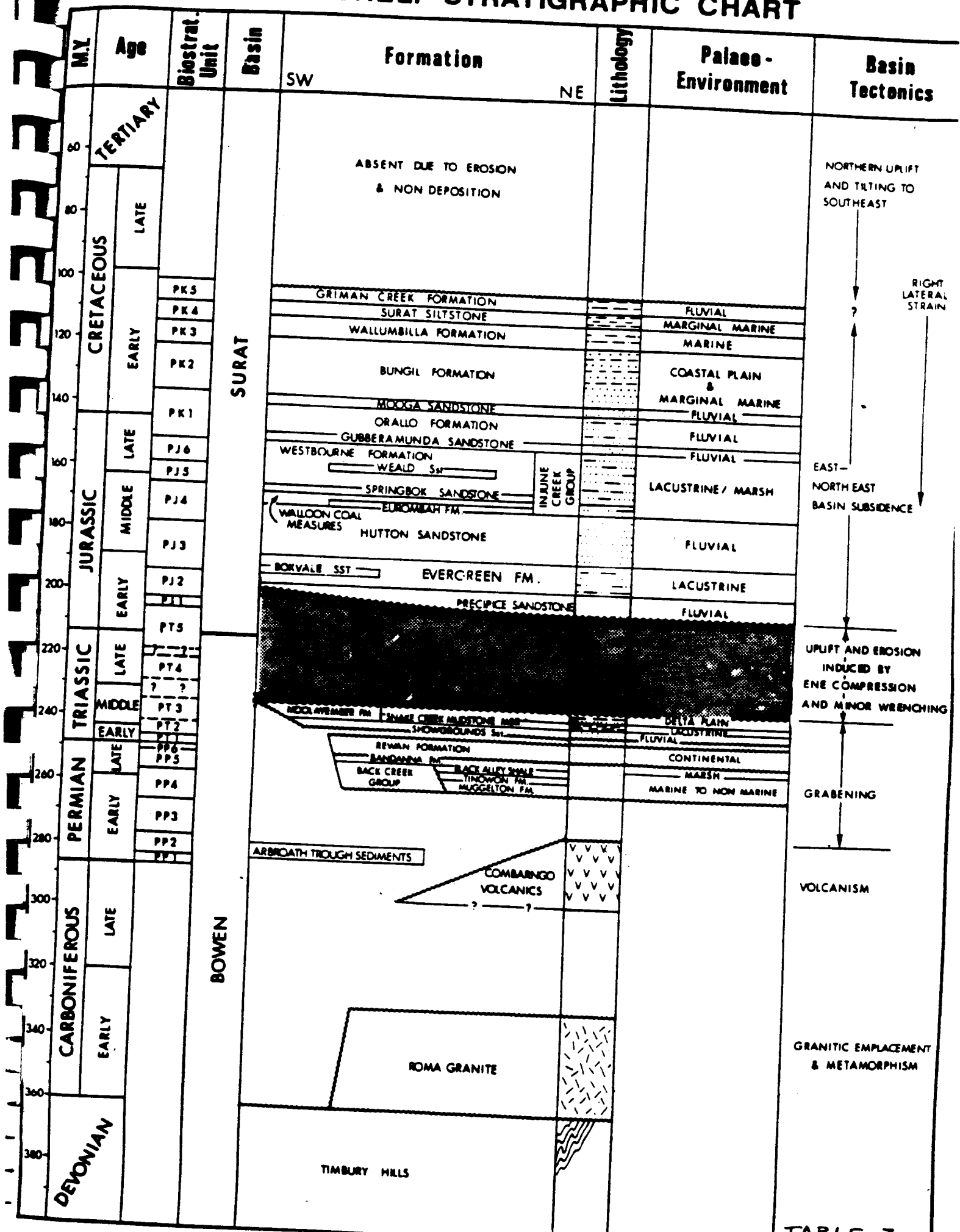
##### 3.1.2 Previous Drilling

The earliest wells drilled in the area were ARO No's 4,5,8 & 11 in 1929, 1930 & 1931 respectively. The data from these wells is limited and vague at best. Oil and gas indications were however, reported in the sandstones of the 'lower section' of the holes. The depths of these are interpreted to coincide with the depths of the Precipice and Moolayember/Showgrounds Sandstone in the area.

In 1934 O.S.L. No. 1, named 'Warooby' after the property, was drilled over the northern end of the present Beaufort Field. The Precipice Sandstone flowed approximately 100 mcf/d on drill stem test and up to 650 mcf/d on production test with 2,000 gallons of water per hour. This well is presently cased and suspended with a well head still in place.

Warooby South No. 1 was drilled in February 1964 near the southern end of the anticline defining the Beaufort gas field. The Precipice Sandstone is poorly developed at this location and flowed a maximum of 80 mcf/d on drill stem test. The well was subsequently plugged and abandoned.

## ROMA SHELF STRATIGRAPHIC CHART



### TABLE 3

Beaufort No. 1 was drilled from 23 June to 1 July 1964 and resulted in a Precipice Sandstone gas well, flowing 914 mcf/d on drill stem test. This was followed in late August to early September by Beaufort No's 2, 3 & 4 in surrounding locations on the structure. These wells flowed respectively 676 mcf/d, 824 mcf/d and 189 mcf/d decreasing to a rate too small to measure on drill stem test. No's 2 & 3 were completed as gas wells, No. 4 was plugged and abandoned. Since being completed and put on production a number of workovers have been undertaken on the No's 1, 2 & 3 wells including fracture stimulation to increase deliverability. A complete history of these wells is presented in the Beaufort Field Study (Haigh and Papinczak (1988)). In January 1988, Beaufort No. 5 was drilled between No. 1 & 2, and failed to encounter porous and permeable reservoirs in the upper Precipice Sandstone reservoirs, Haigh (1988). Beaufort No. 6 was drilled in February 1988 and tested gas at 1.4 MMCF/D from the lower, Precipice 'B1' reservoir and 1.8 MMCF/D from the Showgrounds Sandstone. This was the first time the latter reservoir had been encountered in the Beaufort Field.

### 3.2 Regional Geology

The positive nature of the Roma Shelf is due to Carboniferous granites which intruded the Devonian Timbury Hills Formation. The resultant metamorphism and granitic inliers created an erosion resistant basement high that has influenced sediment distribution from the Permian to Early Jurassic times.

On the eastern flank of the Roma Shelf, Permo-Triassic Bowen Basin sediments onlap basement. Major structuring and erosion during Permian and Triassic times has caused extensive truncation of these sequences (Table 3).

The Jurassic-Cretaceous Surat Basin sediments were deposited in fluvial to lacustrine environments on the Roma Shelf and Comet Ridge. There was little marine influence prior to the widespread deposition of the Wallumbilla Formation, in the early Cretaceous.

### 3.3 Local Geology

Interpretation of seismic data indicates that the Beaufort Field is an irregularly shaped low amplitude feature overlying a large granitic intrusion. This granitic intrusive body was intersected by the Beaufort No. 1,2,3 & 6, wells along the crest of the structure. Surrounding wells intersected Devonian Timbury Hills metasediments.

The Beaufort Field is bounded by some minor faults associated with grabens containing Permian sediments. The field itself has only a thin section of Triassic sediments overlying the granite basement. This distribution of faults and sediments indicates both late Permian and mid-Triassic tectonic events occurred in the area.

### 3.4 Local Structure

The seismic structure is an elongate, northeasterly trending anticline, formed in response to recurrent movement of a basement structural high. A prominent basement horst, bounded by high angle reverse faults, is the dominant structural feature. Late Permian and, predominantly, mid-to-late Triassic structural events probably reactivated normal basement faults. Some fault reactivation has occurred through to the level of the Boxvale Seismic Marker. Late Cretaceous - Early Tertiary compressional enhancement of the feature has occurred, giving it the presently mapped configuration.

### 3.5 Local Stratigraphy

The stratigraphic section encountered in Beaufort No. 7 consists of typical Surat Basin fluvial, lacustrine and marginal marine sediments of Cretaceous to Jurassic age, underlain unconformably by non to marginal marine Triassic to Permian sediments and associated volcanics of the Bowen Basin. Basement at Beaufort 7 was metasediments of the Devonian Timbury Hills Formation.

Table 1 gives the depths and thicknesses of the formations intersected in the well, based on wireline logs. Table 2 shows the predicted versus actual sections and Table 3 summarises the stratigraphy of the Roma Shelf.

### 3.6 Exploration Objectives

The primary objectives of Beaufort No. 7 were both the B3 and B1 reservoirs units of the Precipice Sandstone. The Showgrounds Sandstone encountered in Beaufort No. 6 was not expected to be present at this location. If successful, Beaufort No. 7 was expected to capture 2.5 Bcf of additional gas in place (1.5 Bcf recoverable) as well as providing increased deliverability for the Beaufort field.

### 3.7 Lithology

Detailed lithological descriptions from below surface casing (set at 140 m in the middle of the Mooga Sandstone to total depth are presented in Appendix 1.

A summary description of the well's main hydrocarbon reservoir - the Precipice Sandstone - is given below :

#### Precipice Sandstone

Interval : 1121.5 - 1154 m

Thickness : 32.5 m

Lithology : The Precipice Sandstone consists of predominantly medium to coarse sandstones with lesser interbedded siltstones and shales. Sandstones were off white to light grey, medium to coarse and occasionally very coarse grained, moderately well sorted, quartzose, weakly cemented with minor calcite and silica, minor to locally abundant white to cream clay matrix, and fair to good visual porosity. No fluorescence or cut was observed.

Siltstones were medium grey to grey brown, sub fissile, non calcareous, with common carbonaceous specks and laminae. Shales were medium to dark grey, fissile to sub fissile, very finely micaceous and carbonaceous, grading to shaley siltstones in part.

Environment  
of Deposition : Low energy fluvial.

Age : Early Jurassic.

### **3.8 Porosity and Permeability of Sediments Penetrated**

Visual estimates of the bulk porosity of the ditch cuttings are included in Appendix 1. Neutron/Density and Sonic porosity wireline logs were run over zones of interest and are included as Enclosures 4 & 5.

### **3.9 Relevance to the Occurrence of Hydrocarbons**

Gas detection and the logging of ditch cuttings commenced in the Mooga Sandstone and continued to total depth in the Timbury Hills Formation.

Significant gas shows were recorded in the Injune Creek Beds and the Precipice Sandstone and are described below. There were no liquid hydrocarbon shows. Minor gas shows were also observed in the Hutton Sandstone (max 19 units) and Evergreen Formation (max 8 units).

The Precipice Sandstone, the well's primary objective, is estimated to contain approximately 3.5 metres of net gas pay in its lower B1 unit. This is based on the synthetic microlog and neutron/density log responses. The upper B3 unit appears water wet from log analysis, although the recovery of gas at RTSTM from DST No. 1 indicates there is some gas saturation.

#### **Injune Creek Group (393.3 - 818.8 m)**

Background gas increased on penetrating the Injune Creek Group and there were numerous peaks of up to 114 units associated with thin coal seams.

Porosity wireline logs were only run over the upper Injune Creek from 357 to 615 m. A quick-look log analysis (Table 4) indicates sands within this section have high porosity but are water wet.

#### **Precipice Sandstone (1121.5 - 1154 m)**

Gas units over the Precipice Sandstone ranged from 2 - 1244 in the upper 'B3 unit' reservoir (1121.5 - 1141.5 m) and from 15 - 148 in the lower 'B1 unit' reservoir (1141.5 - 1154 m).

Log analysis indicates that sands of the B3 unit, although porous, are dominantly water wet. From the gamma ray, sands are less clean, and the synthetic microlog shows little permeability development except for one thin zone from 1129.5 - 1130 m. Dst No. 1 however, tested this zone and most of the remaining B3 interval, recovering slightly water cut mud and gas at a rate too small to measure.

The Lower Precipice B1 unit was characterised by a relatively clean, 'bar' shaped sand which log analysis indicates has an average porosity of 19.5% and an approximate water saturation of 65%. This sand was tested by DST No. 2, flowing 0.646 Mmcf gas/day. Calculated net pay was 3.5 m. 7" production casing was run and cemented at total depth and the well suspended as a future Precipice Sandstone 'B1' unit producer.

TABLE 4

LOG ANALYSIS SUMMARY

FORMATION	DEPTH (M)	Rw OHMS	RD OHMS	ND Ø %	Sw %	NET PAY (M)	REMARKS
Injune Creek	469	2.5	8	23.5	100	-	
	538	2.5	20	13	100	-	
	573	2.5	20	23	100	-	
Precipice	1129.5	1.05*	22	19.5	96	-	
B3 Unit	1139	1.05	12	19	100	-	
B1 Unit	1149	1.05	50	19.5	65	3.5	

\* Note: Rw based on Beaufort No. 5 Precipice test - 0.87 at 142.3°F.  
Rw for Injune Creek derived from SP deflection.