

DEPT. NAT. RES & ENV



PE905809

HAWKESDALE - 1

# SHELL DEVELOPMENT

(AUSTRALIA)

PTY. LTD.

WCR

HAWKESDALE - 1

(WS 70)



SHELL/FROME-BROKEN HILL

HAWKESDALE NO. 1

OTWAY BASIN - VICTORIA

WELL COMPLETION REPORT

by

Shell Development (Australia) Pty. Ltd.

(Dr. J.J.K. Poll)

S.D.A. Report No. 110

Melbourne.  
March, 1970

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1. The Brewster N-4 rig on the Moyne Falls No. 1 location
2. Key map of the Otway Basin

ENCLOSURES

- 1a N-S Seismic Sections over Moyne Falls No. 1 and east of Hawkesdale No. 1. Drawing No. 3443.
- 1b Seismic contour map Horizon P (base Eumeralla Fm - Lower Cretaceous). Scale 1:100,000. Drawing No. 3430.
- 1c Seismic contour map Horizon D (top Palaeozoic Basement) Scale 1:100,000. Drawing No. 3432.
- 1d Well velocity data Hawkesdale No. 1. Drawing No. 4096.
- 1e Velocity function, Hawkesdale No. 1. Drawing No. 4119.
- 2a Structural section Pretty Hill - 1, Moyne Falls - 1, Hawkesdale - 1 and Woolsthorpe - 1. Horizontal Scale 1:100,000. Vertical Scale Time Scale. Drawing No. 4051.
- 2b Geological section before and after drilling. Drawing No. 4121.
- 2c Otway group Log correlation Pretty Hill - 1, Moyne Falls - 1, Hawkesdale - 1 and Woolsthorpe - 1. Horizontal Scale 1:100,000. Vertical Scale 1" = 500'. Drawing No. 4122.
- 3a, b Composite well log - Hawkesdale No. 1 (2 sheets). Drawing No. 4120A, B.
- 4a-g Copies of Induction - Electrical logs, Gamma-Ray Sonic logs, Formation Density logs (all on scales 1" and 5" per 100 feet) and a copy of the Continuous Dipmeter log (on scales 2" and 5" per 100 feet).
- 5a, b Copies of Formation Testing Service Reports DST No. 1 and 2.

APPENDICES

- I List of Schlumberger logs run in Hawkesdale No. 1.
- IA Log interpretation of Hawkesdale No. 1, by Schlumberger Seaco Inc.
- II Core and sidewall core descriptions, Hawkesdale No. 1.
- IIA Petrological report of the volcanic sequence in Hawkesdale No. 1 and Moyne Falls No. 1 by J.B. Hocking, Victoria Department of Mines.
- III Palaeontological report, Hawkesdale No. 1.
- IV Palynological report, Hawkesdale No. 1, by Dr. M. Dettmann, University of Queensland.
- V Well velocity data, Hawkesdale No. 1.
- VI Details of Drill Stem Testing, Hawkesdale No. 1.

CORE AND SIDEWALL CORE DESCRIPTIONS

HAWKESDALE NO. 1

by Shell Development (Australia) Pty. Ltd.

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1. DESCRIPTION OF CORES:

Core No. 1      3,568 - 3,596 feet.      Cored 28 feet, recovered 7.25 feet (26%).

Sand to sandstone, 20-25% estimated porosity, good to high permeability, very light greenish-grey, quartzose, silty and argillaceous in part, medium (fine to coarse in part), sorted, subangular to subrounded, slightly consolidated, trace of cement, loose to very friable.

Accessory components : Garnet, light to medium translucent pink, fine, angular to subangular; Chlorite, green, fine; small coal fragments; and Mica.

Low to high angle cross beds  $\frac{1}{4}$ " - few inches thick. The grainsize varies between beds from medium to coarse. The top of the core is coarse grained (3,568 - 3,570 feet), the lower part is mostly medium grained.

Hydrocarbons Pale yellow-brown fluorescence (pin point and patches), mainly on core surface. Gas/oil smell in places.

Core No. 2      3,597 - 3,603 feet.      Cored 6 feet, recovered 0 feet (0%).

No recovery, probably due to loose or very friable sands which slipped through the core barrel catchers when pulling out.

Core No. 3      4,459 - 4,469 feet.      Cored 10 feet, recovered 9 feet (90%).

4,459 - 4,464 feet : Basalt, greenish to brownish black with red brown ironoxide patches, fine crystalline with dark green phenocrysts, rims of serpentinite and ironoxide around some phenocrysts. Some chloritic matter in cracks.

4,464 - 4,467 feet Basalt, red brown altered, dark green phenocrysts as above, abundant smaller phenocrysts (augite?), vesicular.

4,467 - 4,468 feet Basalt, as interval 4,459 - 4,464'.

Core No. 4      5,749 - 5,765 feet.      Cored 16 feet, recovered  
16 feet (100%).

5,749 - 5,751 feet Phyllite, medium to dark greenish grey, chloritic and sericitic, banded with Quartzite, light greenish grey, slightly chloritic. Irregular banding, probably sedimentary, ½ - 2 ins. in thickness. Poorly developed fracture and slaty cleavage parallel to the banding with small tight parasitic folds. Banding and cleavage system have a 55° dip.

5,751 - 5,765 feet Quartzite as above with thin phyllitic bands at intervals 5,752' 8", 5,753', 5,754', 5,755', 5,757' 6", 5,759' and 5,764'.



2. DESCRIPTION OF SIDEWALL CORES

- 1,245 feet Clay, light to medium greenish grey, chloritic, coaly, slightly consolidated, moderately soft.
- 1,322 feet Clay, light to medium greyish green, very chloritic, silty, few fine sand grains, slightly consolidated, moderately soft.
- 1,442 feet Clay, medium greenish-grey, very chloritic, silty, slightly carbonaceous, consolidated, moderately soft.
- 1,519 feet Clay, medium greenish-grey, chloritic, silty, slightly carbonaceous, consolidated, moderately soft (minor mica).
- 1,570 feet Clay, medium grey-green, silty, very fine sandy, chloritic, slightly carbonaceous, consolidated, moderately soft.
- 1,657 feet Clay, medium green-grey, chloritic, slightly silty, slightly carbonaceous, consolidated, moderately soft.
- 1,714 feet Clay, medium green-grey, chloritic, slightly silty, slightly coaly, consolidated, moderately soft.
- 1,771 feet Clay, light to medium greyish-green, chloritic, slightly silty, slightly carbonaceous, consolidated, moderately soft.
- 1,844 feet Claystone, light grey, slightly silty, slightly carbonaceous, finely laminated, consolidated, moderately hard.
- 1,918 feet Claystone, light to medium grey, slightly silty, slightly chloritic, laminated, consolidated, moderately hard.
- 2,018 feet Claystone, light to medium grey green, fine sandy, silty, coaly, chloritic, pocket of fine sand with white cement, consolidated moderately hard.
- 2,072 feet Claystone, medium to dark greenish-grey, chloritic, slightly silty, slightly carbonaceous, consolidated, moderately hard.
- 2,140 feet Claystone, light to medium grey, chloritic, slightly silty, finely laminated, consolidated, moderately hard.

- 2,204 feet Sandstone, 5-10% estimated porosity, light to medium grey-green, very fine quartzose, very argillaceous, silty, consolidated, moderately hard, with dark grey green clay laminae.
- 2,271 feet Sandstone, 5-10% estimated porosity, light to medium grey-green, very fine quartzose, very argillaceous. carbonaceous, consolidated, moderately hard, friable.
- 2,325 feet Claystone, medium to dark greenish-grey, slightly silty, carbonaceous, consolidated, moderately hard.
- 2,380 feet Claystone, light greyish-green, silty, fine sandy, slightly coaly, consolidated, moderately hard.
- 2,456 feet Claystone, light to dark greyish-green, slightly silty, very coaly, consolidated, moderately hard. Part of the sample is Coal, brownish-black.
- 2,467 feet Coal, black, slightly argillaceous in part.
- 2,520 feet Claystone, medium to dark grey, slightly carbonaceous, consolidated, moderately hard.
- 2,576 feet Claystone, dark grey, carbonaceous, consolidated, moderately hard.
- 2,630 feet Claystone, light to medium grey and light to medium greyish green, silty, slightly fine sandy in part, consolidated, moderately hard.
- 2,684 feet Sandstone, 5-10% estimated porosity, light grey-green very fine to fine quartzose, very argillaceous, silty, slightly carbonaceous, slightly cemented, consolidated, very friable. Part of sample: Claystone, dark grey, silty.
- 2,751 feet Claystone, light greyish green, slightly silty and fine sandy, chloritic, consolidated, moderately hard.
- 2,800 feet Claystone, medium to dark green-grey, slightly silty, slightly carbonaceous, consolidated, moderately hard. Thin laminae of Sandstone, light grey, fine quartzose, argillaceous, silty, consolidated, friable.
- 2,819 feet Granite, fine grained, inequigranular with sedimentary (arkosic) appearance in places. The three main mineral components are quartz, feldspar and biotite (50%, 40% and 10% resp.) The potash : plagioclase ratio is 3:1. The rock has a crumbly break.

- 2,838 feet Granite, basically the same as 2,819 ft although biotite is more prolific, although commonly altered to chlorite. The granular appearance is more evident. The rock is rather crumbly.
- 2,850 feet Sandstone/Claystone, no visible porosity, light to medium grey-green, very fine, chloritic, consolidated, moderately hard.
- 2,878 feet Claystone, medium to dark grey-brown, fine sandy and silty, very carbonaceous, micaceous, consolidated, moderately hard.
- 2,913 feet Claystone, dark grey, carbonaceous, consolidated, moderately hard, finely laminated.
- 2,944 feet Sandstone, no visible porosity, light to medium grey-green, sublithic, argillaceous, carbonaceous, very fine, cemented, friable.
- 2,972 feet Claystone, medium to dark grey, very fine sandy (sublithic), carbonaceous, consolidated, moderately hard, laminated with Sandstone, 10% estimated porosity, light grey, very fine, sublithic, friable.
- 3,004 feet Conglomerate of igneous rock fragments, clay, quartz sandstone and dark liinic fragments, white and dark grey mottled, no visible porosity. The sandstone is quartzose, light grey white, cemented, consolidated, moderately hard.
- 3,036 feet Granite, fine to medium grained, partly sedimentary appearance (arkosic). Main texture and composition point to a granitic dike.
- 3,095 feet Claystone, light to medium greenish-grey, sandy and micaceous in part, consolidated, moderately hard.
- 3,132 feet Sandstone, 5-10% estimated porosity, light brownish grey-green, quartzose to sublithic, argillaceous, very micaceous, fine, moderately sorted, moderately cemented, moderately hard.
- 3,159 feet Sandstone, 10-20% estimated porosity, light greenish-grey, quartzose, micaceous, fine to medium, well-sorted, subangular, slightly cemented, very friable.

- 3,220 feet Claystone, medium grey-green, very chloritic, fine sandy, silty and micaceous; with Sandstone, medium grey, quartzose, very micaceous, argillaceous, cemented, moderately hard, friable.
- 3,278 feet Sandstone, 10-15% estimated porosity, quartzose, argillaceous, micaceous, slightly to moderately cemented, laminated, friable.
- 3,299 feet Claystone, medium grey, carbonaceous, slightly silty and micaceous, consolidated, moderately hard.
- 3,309 feet Claystone, medium grey, silty, carbonaceous, slightly micaceous, fine sandy in part, consolidated, moderately hard.
- 3,340 feet Claystone, medium grey, silty, fine sandy (quartzose), micaceous, carbonaceous in part, consolidated, moderately hard.
- 3,396 feet Sandstone, 15-20% estimated porosity, light grey, quartzose, fine, very well sorted, subangular to subrounded, minor mica, slightly cemented, moderately hard and friable.
- 3,463 feet Sandstone, no visible porosity, dark grey, very argillaceous, quartzose to sublithic, very micaceous, slightly carbonaceous, very fine, moderately sorted, consolidated, soft to moderately hard.
- 3,475 feet Sandstone, 5-10% estimated porosity, light to medium grey, quartzose, very argillaceous, micaceous, slightly carbonaceous, very fine, consolidated, moderately hard.
- 3,486 feet Sandstone, 20-25% estimated porosity, light grey, quartzose, medium, subangular to subrounded, moderately sorted, almost no cement, slightly consolidated, very friable (minor mica, coal and pink garnets).
- 3,494 feet Sandstone, 20-30% estimated porosity, light grey, quartzose, medium, well sorted, subrounded to subangular, slightly consolidated, very friable. Accessory components : pink garnets, chlorite etc.
- 3,506 feet  
(2 samples) Sandstone, 25-30% estimated porosity, good to high permeability, light grey, quartzose, medium, well sorted, subrounded, trace of cement only, unconsolidated to slightly consolidated, very friable. Accessory components pink garnets, chlorite etc.

- 3,604 feet Silty Claystone, dark grey with white sandstone laminae. The claystone is carbonaceous, sandy, micaceous, consolidated and moderately hard. The sandstone is fine, quartzose, has a 10% estimated porosity, contains pink garnets, is moderately cemented and friable. The lamination is contorted.
- 3,611 feet Claystone, silty, fine sandy, carbonaceous, consolidated, moderately hard with Sandstone laminae, white, quartzose, very fine, sorted, 10-15% estimated porosity, slightly cemented, friable. The lamination is irregular in thickness.
- 3,626 feet Sandstone, 10-15% estimated porosity, medium grey to white, laminated, quartzose, slightly cemented, friable. The dark laminae are argillaceous, micaceous and carbonaceous. Part of the sample is quartz sandstone, white, fine to medium, subangular, moderately cemented, friable. Pink translucent garnets throughout.
- 3,698 feet Sandstone, 10-15% estimated porosity, light grey-white, quartzose, medium, moderately sorted, subangular, moderately cemented, very friable. Accessory components : pink translucent garnets and chlorite.
- 3,774 feet Sandstone, 20% estimated porosity, light to medium grey-green, quartzose to sublithic, fine to medium, chloritic, slightly cemented, very friable with abundant pink translucent garnets throughout.
- 3,810 feet Sandstone, 30% estimated porosity, very high permeability, light grey-white, quartzose, medium, well sorted, subangular to subrounded, trace of cement, slightly consolidated, very friable. Light to dark pink translucent garnets throughout.
- 3,840 feet Sandstone, 15-20% estimated porosity, light grey-white, quartzose, very fine to medium, poorly sorted, slightly cemented, slightly consolidated, very friable. Accessory components : light to medium pink translucent garnet, some lithic fragments and chlorite.
- 3,884 feet Sandstone, 15-20% estimated porosity, light grey, quartzose, medium, moderately sorted, subrounded, slightly cemented, slightly consolidated, very friable. Accessory components : light to medium pink translucent garnets, some lithic fragments and chlorite.

- 3,895 feet Sandstone, 20-25% estimated porosity, light grey-white, quartzose, fine to coarse, subangular to subrounded, moderately sorted, trace of cement only, slightly consolidated, very friable. Accessory components : light to medium pink translucent garnet, pyrite, some lithic fragments and coal.
- 3,925 feet Argillaceous Sandstone to sandy Claystone, no visible porosity, medium grey-green, very chloritic, sublithic, fine to coarse very poorly sorted, well rounded, consolidated, moderately hard.
- 3,948 feet Sandstone, 25-30% estimated porosity, high permeability, light grey-white, quartzose, subrounded, well sorted, no cement, only slightly consolidated, very friable. Accessory components : light to medium pink translucent garnets and some lithic fragments.
- Pretty Hill*
- 3,977 feet Tuff, red brown (iron stain) and white mottled, completely altered, zeolitic, glass shards, lithic fragments, tightly cemented, soft to moderately hard.
- Casterton*
- 4,090 feet Tuff, red brown (iron stain), very altered, zeolitic, medium to very coarse well rounded quartz grains, rounded vesicles with chlorite infill, tight, soft to moderately hard.
- 4,148 feet Tuff, red brown (iron stain), very altered, zeolitic, lithic fragments, some well rounded quartz grains, tight, soft to moderately hard.
- 4,205 feet Tuff, red brown to black, zeolitic, ? carbonaceous, some well rounded sand grains, lithic fragments, tight, soft to moderately hard.
- 4,270 feet Tuff, red brown (iron stain), zeolitic, round vesicles with chlorite infill, lithic, vesicles with ?zeolite, tight, soft to moderately hard.
- 4,318 feet Volcanic, severely altered, high proportion of amygdules and veins (approx. 50%) enclosed by hematitic clay. The amygdules consist of colorless to very pale green fibrous chlorite.
- 4,618 feet Volcanic rock, ?tuff, red brown, altered, zeolitic, small rounded vesicles with chloritic substance, tight, moderately hard.

- 4,676 feet Tuff, red brown, very altered, zeolitic, pockets of ?zeolite, chloritic rock fragments, tight, moderately hard.
- 4,930 feet Tuff, red brown, very altered, zeolitic, rounded chloritic vesicles, some rounded quartz grains, lithic rock and crystal fragments (?epidote) tight, moderately hard.
- 5,015 feet Volcanic, red brown and grey green, very altered, devitrified glass, zeolitic, tight, moderately hard.
- 5,160 feet Volcanic. micro crystalline chloritic base that surrounds common amygdules of colourless to pale brown chlorite. The isotropic nature of the material suggests that it may be glassy.
- 5,240 feet Tuff, red brown to grey, very altered, zeolitic, rounded lithic fragments, tight, moderately hard.
- 5,481 feet Volcanic, severely chloritised ranging from green to light brown. The chlorite encloses in parts augite, plagioclase and a chloritic replacement of olivine.
- 5,627 feet Carbonaceous Sandstone, light grey to black, less than 5% estimated porosity, quartzose, very fine, consolidated, moderately hard, friable.
- 5,643 feet Carbonaceous Siltstone, medium grey, no visible porosity, quartzose, very fine sandy, micaceous, consolidated, friable.
- 5,690 feet Shale, light grey-green, very chloritic, silty, consolidated weathered or reworked basement.

Sed.  
section  
of Castets

Petroleum Technology Laboratory, Bureau of Mineral Resources, Geology and Geophysics, Canberra

CORE ANALYSIS RESULTS

NOTE: (i) Unless otherwise stated, porosities and permeabilities were determined on two plugs (V&H) cut vertically and horizontally to the axis of the core. Ruska porosimeter and permeameter were used with air and dry nitrogen as the saturating and flowing media respectively. (ii) Oil and water saturations were determined using Soxhlet type apparatus. (iii) Acetone test precipitates are recorded as Neg., Trace, Fair, Strong or Very Strong.

WELL NAME AND NO. HARKESDALE NO. 1

DATE ANALYSIS COMPLETED 17th January, 1970

Core No.	Sample Depth		Lithology	Average Effective Porosity two plugs (% Bulk Vol.)	Absolute Permeability (Millidarcy)		Average Density (gm/cc.)	Fluid Saturation (% pore space)		Core Water Salinity (p.p.m. NaCl)	Acetone Test	Fluorescence of freshly broken core
	From	To			V	H		Dry Bulk	Apparent Grain			
1	3570'		Sstn, grto c.gr, arg.	32	5.093	H.D.	1.82	2.68	88	H11	Neg.	N11
1	3572'		Sst; m.gr. arg.	32	2.036	2.209	1.81	2.64	78	H11	Neg.	N11
1	3575'		Sst; m.gr. v. arg.	26	64	308	2.01	2.70	79	H11	Neg.	H11
3	4462'		Volc; weathered	11	H.D.	N11	2.68	3.02	95	N11	Neg.	N11
4	5755'8"		S1st; aren- calc.	5.7	H.D.	H.D.	2.59	2.75	62	N11	Neg.	N11

Remarks: - Core No. 2-no recovery.

General File No. 69/599 69/1414  
Well File No. 69/2032