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INDUSTRIAL & MINING INVESTIGATIONS PTY. LTD.

AND

THE SHELL COMPANY OF AUSTRALIA LIMITED

EXPLORATION LICENCE 5/61, GRAY

PROGRESS REPORT ON EXPLORATION IN THE PERIOD NOVEMBER 1979 TO JULY 1980

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CEPR 17/80

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SUMMARY

An exploration programme consisting of the drilling of reconnaissance boreholes to identify coal resources within Exploration Licence (EL) 5/61, Gray was undertaken between November, 1979 and August, 1980.

Throughout most of the area the Triassic coal measure section is covered by thick Jurassic dolerite or dolerite scree. Up to 500 metres of coal measure sediments consisting of sandstone, mudstones, carbonaceous mudstones, and coal seams, overlie Permian marine siltstones.

Fourteen boreholes totalling 5067 metres were drilled by Shell in EL 5/61 during the programme. Four holes were located at Mount Nicholas, two south of St. Marys and the remainder in the Douglas River area. Three major coal intervals were intersected at Mount Nicholas, and of these intervals the middle and lower seams show the most economic potential. In the St. Marys area the Dalmayne D seam is somewhat more variable in thickness and quality than in the Dalmayne area, however, its thickness and quality have improved in the area south of the Douglas River. Major faults with displacements of over 120 metres could limit the occurrence of mineable blocks of coal.

Laboratory analyses indicate that the coal in the lower seam at Mount Nicholas and the Dalmayne D seam is High Volatile Bituminous (A.S.T.M.) with high inherent ash and low sulphur contents. Washing at a separation density of 1.7 reduces the ash content to about 20% with a moderate yield of 70%.

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## 1. INTRODUCTION

### 1.1 SCOPE

This report presents the results of exploration completed in Exploration Licence 5/61 (Gray) during the period from November 1979 to July 1980. A total of twelve boreholes were fully diamond cored and two were part percussion, chip and core drilled. Laboratory analyses of coal samples have been undertaken and results to hand are included in this report.

### 1.2 TENURE DETAILS

Exploration Licence 5/61 (Gray) was granted to Industrial and Mining Investigations Pty. Ltd., (I.M.I.) on the 23rd February, 1961. The Exploration Licence is exclusive of mining leases (total area 1296 hectares) in the Mount Nicholas area which are held by The Cornwall Coal Company N.L., and SR1978/110 held by the Department of Mines (Encl. 1).

The exploration of the area is currently being carried out by The Shell Company of Australia Limited on behalf of a joint venture between I.M.I. and Shell that commenced on 23rd February, 1978.

### 1.3 LOCATION AND ACCESS

Exploration Licence 5/61 (Gray) is situated on the east coast of Tasmania, north from Great Oyster Bay. The main part of the licence covering some 732 square kilometres lies within A.M.G. co-ordinates 5405000-5354000m N and 590000-605000m E, while a separate smaller area (43 square kilometres) lies to the south in the Mt. Paul area within A.M.G. co-ordinates 5349000-534100m N and 601000-607000m E (Encl. 1).

The area is served by the Esk Highway from the west and the Tasman (East Coast) Highway from the south. The North East railway line runs from Launceston, via Conara Junction, to St. Marys, a distance of 130 kilometres.

Conveniently the region can be divided into five areas:-

- Mount Nicholas Area
- Dalmayne Area

- Western Area
- East Coast Area (South from Seymour)
- Mount Paul Area

Exploration during the reporting period has been concentrated in the East Coast and Mount Nicholas Areas. Two additional boreholes have been also drilled south of St. Marys.

To gain access to the drill sites in the East Coast Area it was necessary to construct rough tracks through the bush and to build log bridges across main creeks. Access to boreholes on the Nicholas Range was mainly by pre-existing forestry roads although one track was required to be constructed on the southern side of the Nicholas Range. Approximately 35 kilometres of access tracks were constructed during the drilling programme.

Rugged topography, and adverse weather conditions in the latter part of the programme, led to delays in the construction of access tracks to drillsites and hampered personnel in reaching operational drillsites.

Full details of the topography and climate of the area within EL 5/61 are described in The Shell Company of Australia Ltd. (SCOA) report CEPR 21/78.

2. REGIONAL GEOLOGY

The prospective coal seams in the region occur in an almost flat lying Triassic coal measure sequence up to 500 metres thick. The upper part of this sequence has been intruded by Jurassic dolerite in the form of a slightly discordant sheet of regional extent, with associated feeders and dykes. Both the Triassic and Jurassic sequence has been segmented by tensional faulting with a predominant north-south trend. Most of the regions coal resources are now restricted to fault bound blocks concealed beneath remnant dolerite capping.

A comprehensive account of the regional geology of the area is contained in previous Shell progress reports (CEPR 9/79).

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3. PREVIOUS EXPLORATION

The presence of coal in the EL 5/61 area has been known since last century. Coal mines have operated in the Seymour, Dalmayne and Mount Nicholas areas and numerous exploratory adits have been driven into seam outcrops. The history and geological details of this early exploration and mining have been reviewed in Shell report CEPR 16/78.

Since the 1960's the Tasmanian Department of Mines has undertaken an extensive diamond drilling programme principally in the region of the Fingal Tier to outline coal reserves for the Fingal Mines. Lately this exploration has been widened to areas outside the immediate confines of the mining leases.

During the 1970's Industrial and Mining investigations Pty. Ltd. drilled two holes in the Dalmayne area of EL 5/61. These holes confirmed the existence of the main seams west from the old Dalmayne mine.

Exploration in EL 5/61 by The Shell Company of Australia Ltd. commenced in 1978 and consisted of detailed mapping followed by an 18 hole reconnaissance drilling programme to identify coal resources within the area. The majority of these holes, which were located on a 2 kilometre grid spacing west of the Dalmayne Colliery (Encl. 1), succeeded in locating potentially mineable coal in the Dalmayne D seam.

Indicated in situ reserves of 165 million tonnes were delineated in the Dalmayne area from the 1978/79 drilling. This figure was estimated to be sufficient to support the production of 44 million tonnes of washed coal. Segmentation of the reserves by major faults restricted the potential production of washed coal from an adit entry mine to only 8 million tonnes. The remaining reserves were accessible only by deep shaft entry through the overlying dolerite.

#### 4. EXPLORATION - NOVEMBER 1979 TO JULY 1980

##### 4.1 OBJECTIVES

The prime objective of the 1979/80 programme has been to delineate coal reserves in areas offering potential adit entry. To this end drill holes were located in three areas in reasonable proximity to escarpments exposing the prospective coal horizons. Two of these areas are extensions of the 1978/79 drilling grid and the third is located at Mount Nicholas where previous mining activity and Department of Mines drilling indicated a potential for economic coal development.

##### 4.2 DRILLING

Drilling in EL 5/61 commenced on 13th November, 1979 and was completed on 17th July, 1980. Up to three rigs were used during drilling operations, two supplied by Associated Diamond Drillers and one by Mono Pumps (Australia) Pty. Ltd.

A total of fourteen boreholes were drilled. However, one of these holes (GY19) was abandoned before reaching the target horizon. Drilling statistics are listed in Table 1. Borehole locations and surface elevations have been determined from estimations based on published topographic maps.

Four of the boreholes (GY24, 26, 28, 31) were spaced at intervals of about 2 kilometres at the western end of Mount Nicholas. These holes were drilled to test the extent of seams previously mined further to the east (Shell report CEPR 16/78) and to establish the existence of any further seams.

Eight boreholes (GY19-23, 25, 27, 29), were located south of the holes drilled in the 1978 drilling programme (Shell report CEPR9/79) and extended the grid to south of the Douglas River. These holes were drilled to determine the continuity of the Dalmayne D seam through to the Douglas River and to outline faults that may restrict the extent of mineable panels of coal. A further two holes (GY30, 32), were located to the south of St. Marys at the northern end of the 1978/79 drilling grid, to test the continuity of the Dalmayne seams through to the Break O' Day plain. Locations of all boreholes are shown on Enclosure 1.

TABLE 1: EL 5/61 GRAY

BOREHOLE DETAILS AND DRILLING STATISTICS

BOREHOLE NO.	R.L. (m) SURFACE	DATE COMMENCED	DATE FINISHED	LOCATION CO-ORDS. (AM. G.)	DRILLING METHOD			TOTAL DEPTH (m)
					PER-CUSSION (m)	CHIP (m)	CORE (m)	
GY 19	625	13/11/79	*	598000mE 5379000mN	263.0	191.0	24.4	478.4
GY 20	500	12/12/79	18/2/80	5996000mE 5379000mN	164.0	220.5	87.0	471.5
GY 21	430	14/12/79	28/1/80	6017000mE 5377800mN	-	-	308.4	308.4
GY 22	270	30/1/80	17/2/80	6011000mE 5375900mN	-	-	319.8	319.8
GY 23	250	18/2/80	21/3/80	6023000mE 5373500mN	-	-	361.6	361.6
GY 24	600	7/3/80	11/4/80	5927000mE 5401100mN	-	-	366.5	366.5
GY 25	360	26/3/80	23/4/80	5999000mE 5373000mN	-	-	594.5	594.5
GY 26	600	15/4/80	12/5/80	5911000mE 5400800mN	-	-	340.8	340.8
GY 27	450	29/4/80	11/5/80	5982000mE 5373100mN	-	-	388.7	388.7
GY 28	580	15/5/80	27/6/80	5909000mE 5399500mN	-	-	335.0	335.0
GY 29	370	16/5/80	20/6/80	5988000mE 5371000mN	-	-	430.8	430.8
GY 30	505	25/6/70	3/7/80	5994000mE 5387600mN	-	-	274.5	274.5
GY 31	400	7/7/80	17/7/80	5902000mE 5402200mN	-	-	119.96	119.96
GY 32	400	6/7/80	13/7/80	5989000mE 5389800mN	-	-	277.4	277.4
					427.0	411.5	4229.36	5067.86

\* Drilling in progress from 13/11/79 - 11/12/79  
 19/2/80 - 9/4/80  
 23/6/80 - 4/7/80 hole abandoned

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All core obtained from the coal measures and Permian sequences has been stored at a central core store located at Piccaninny Point. The last 0.1 metres of each core run in dolerite was sampled and has also been retained. The remaining dolerite core is retained at the drill sites.

#### 4.3 BOREHOLE STRATIGRAPHY

Overlying the coal measures in all 1979/80 holes is dolerite scree or in situ dolerite (Encl. 2,4 and Table 2). The scree varies in thickness from 6.9 metres in GY27 to 138.6 metres in GY23 and consists of large dolerite boulders up to 10 metres in thickness set in a weathered clay matrix. Penetration rates within the unstable scree were slow.

In situ Jurassic dolerite was intersected in holes GY19, 20, 25 and 29 it ranged in thickness from 164.0 metres to 286.86 metres. In GY19 and GY20 the base of the dolerite is above the Dalmayne A seam, however to the south in GY25 and GY29 the dolerite had intruded at a much lower level within the coal measure sequence (Encl. 2). When fresh, the dolerite is generally grey and hard, and is usually medium to fine grained. It is generally widely jointed, with joints greater than 15 metres apart, and dipping at about 60°, although there are occasional zones which exhibit closely spaced, steeply dipping joints with abundant talc, chlorite and calcite infillings. A minor dolerite dyke, some 5 metres in width, was intersected in the lower part of the coal measure sequence in GY22. It is likely that the dyke is an offshoot from the dolerite feeder at Nichols Cap, 1 kilometre to the north-west of GY22.

In GY25 nearly 9 metres of sandstones were encountered within a 278 metre thick dolerite sheet (Encl. 2). The sandstones exhibit baked margins which extend to about a metre from the contact. Dolerite adjacent to the contacts is noticeably chilled and shows a very fine grain size for several metres from the contact. At present it is unclear whether the sandstones are a raft within the sheet or whether the dolerite beneath the sandstones is an offshoot from the overlying major sheet.

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TABLE 2 EL 5/61 GRAY  
BOREHOLE STRATIGRAPHY AND BASE ELEVATIONS

BOREHOLE NO.	R.L. (m) SURFACE	THICKNESS INTERSECTED (m)				TOTAL DEPTH (m)	ELEVATION OF BASE A.S.L. (m)			
		SCREE	DOLERITE	COAL MEASURES	PERMIAN		SCREE	DOLERITE	COAL MEASURES	BOREHOLE
GY 19	625	-	250.28	228.12	-	478.4	-	374.72	incomplete	146.6
GY 20	500	-	164.00	307.50	-	471.5	-	336.00	incomplete	28.5
GY 21	430	27.45	-	280.95	-	308.4	402.55	-	incomplete	121.6
GY 22	270	79.60	-	238.66	1.54	319.8	190.40	-	-48.26	-49.8
GY 23	250	138.62	-	222.98	-	361.6	111.38	-	incomplete	-111.6
GY 24	600	106.30	-	221.09	39.11	366.5	493.70	-	272.61	233.5
GY 25	360	-	286.86	302.16	5.48	594.5	-	73.14	-229.02	-234.5
GY 26	600	109.14	-	230.06	1.60	340.8	490.86	-	260.80	259.2
GY 27	450	6.85	-	381.85	-	388.7	443.15	-	incomplete	61.3
GY 28	580	65.57	-	264.49	4.94	335.0	514.43	-	249.94	245.0
GY 29	370	16.00	24.67	380.97	9.16	430.8	354.0	329.33	-51.64	-60.8
GY 30	505	30.33	-	244.17	-	274.5	474.67	-	incomplete	230.5
GY 31	400	9.11	-	104.56	6.29	119.96	390.89	-	286.33	280.04
GY 32	400	9.98	-	259.93	7.49	277.4	390.02	-	130.09	122.60

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Triassic coal measures were intersected in all recent Shell boreholes with the maximum thickness being recorded in GY27. Despite this hole terminating some 100 metres above the expected base of the Triassic, 388.7 metres of coal measure sediments were intersected (Encl. 2). Typically the coal measures consist of lithic sandstones, siltstones, mudstones, carbonaceous mudstones, shale and coal. The coal is dull to heavy-dull with scattered bright bands. Eight holes were drilled through to the top of the Permian approximately 100m below the Dalmayne D and Mount Nicholas lower seams.

#### 4.4 STRUCTURE

Cross sections (Encls. 7 to 10) illustrate the structure in the Mount Nicholas area while Enclosures 11 to 13 show the structure in the Douglas River St. Marys area. The major feature to emerge from drilling in the Mount Nicholas area is the presence of a fault, with a down throw of some 100 metres to the east, passing through the saddle between Mt. Durham and Mount Nicholas. The fault has been inferred from displacements in the elevation of coal seams and in the elevation of the base of the Triassic between Shell and Department of Mines boreholes (Encls. 9 & 10). A fault with similar throw and orientation has been recognised through Department of Mines drilling on the Fingal Tier, south of the Break O' Day Plain, and has been called Mitchell's Fault (Encl. 1). It is suspected that this fault is present beneath the Break O' Day Plain and passes through the saddle between Mt. Durham and Mount Nicholas.

Small variations between boreholes in the elevation of coal seams and the base of the Triassic may be related to minor faulting and/or an error in the reduced level (R.L.) of the borehole collar. Until the R.L. of the boreholes has been determined accurately by surveying, an error of up to  $\pm 15$  metres may be present in the current estimate of the borehole collar R.L.. The variations evident in the cross sections are up to 20 metres and it is suspected that this is composed of a component due to minor faulting and a component due to borehole R.L. error. As minor faulting was encountered in previous mining operations elsewhere on the Nicholas Range it is likely that minor faulting also occurs within the area presently under investigation by Shell.

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In the Douglas River area several large faults with displacements of over 120 metres have been inferred from borehole results. The largest of these faults has a throw of 200 metres in the vicinity of GY25 and GY29 (Encl. 1). The fault is suspected to occur along a pronounced air photo lineation corresponding to the Denison Marshes. The only faults of this magnitude recognised in the 1978 drilling programme were the east and west graben faults which had throws of about 120 metres and it is therefore likely that the Denison Marsh Fault is a continuation of one of these major graben faults. Cross faults in the mid-Douglas River area detected from mapping and from air-photograph interpretation account for variations in seam elevations (Encl. 1). To the east of the Denison Marsh Fault is a further graben structure containing boreholes GY25, GY23, GY22 and GY21. Present results suggest the existence of several major cross-faults within the graben which would therefore limit the extent of mineable coal reserves within this particular structure (Encl. 12).

The central graben recognised west of Dalmayne, tapers northwards towards St. Marys and has associated with it several cross-faults with displacements of up to 60 metres. Coal seams exposed on the Tasmanian Pulp and Forest Holdings MG road south of St. Marys and dipping up to 8°NNE have probably been tilted by the intrusion of dolerite, as there is a major feeder at nearby Bare Rock (Encl. 1). The tilting is localised and dips gradually lessen to the northeast away from Bare Rock. Correlation of Shell boreholes with the Harefield borehole suggests a shallow regional dip to the south and suggests the possibility that the Dalmayne D seam may partly underly the Break O' Day Plain south of the Harefield Borehole.

#### 4.5 COAL INTERSECTIONS

##### 4.5.1 Mount Nicholas

At Mount Nicholas the Shell boreholes collectively intersected three main coal bearing intervals which are informally referred to as the upper, middle and lower seams (Encl. 4). The upper seam intersected in GY28 occurred as two plies 2.93 metres and 4.70 metres thick (Table 3), of poor quality interbanded coal, carbonaceous mudstone and mudstone, separated by 2.05 metres of mudstone and carbonaceous mudstone. None of the seams warranted analysis.

Three Shell holes (GY24, 26, 28) intersected the middle seam. In each, it consisted of two or three coal beds separated by between 4 metres and 23 metres of clastic sediments (Encl. 4). In GY24 and GY28 the upper coal bed is potentially mineable with respective coal thicknesses of 1.69 metres and 1.95 metres. The three coal beds in GY26 are too thin to be of economic interest, as are the four beds encountered in the Department of Mines borehole DOM 8 immediately to the west of the EL boundary. The lowermost middle seam bed in DOM 13 is 2.18 metres thick and will be of economic potential if its persistence can be demonstrated.

The lower seam, by virtue of its persistence, thickness and quality, is the most attractive in the western Mount Nicholas area. It was intersected in all four recently drilled Shell holes with a thickness range of 1.96 metres to 4.72 metres. In the two thickest intersections however, the seam is split by a mudstone bed 0.94 metres to 1.26 metres thick (Encl. 5). In this situation it may be possible to extract only one of the two splits. All intersections of the lower seam contained a low proportion of dirt bands.

Department of Mines holes in the area (DOM 8, 13) confirm the persistence of the lower seam with respective intersections of 5.09 metres and 4.00 metres. The thicker of the two intersections contains an 0.99 metre thick mudstone bed.

Both Shell and Department of Mines holes suggest that the roof of the lower seam in the Western Mount Nicholas area is predominantly sandstone. If further drilling confirms this indication, then roof control on the mining of the lower seam should not be a major problem.

None of the Shell holes intersected seams of significant thickness in the interval between the lower seam and the top of the Permian.

#### 4.5.2 Douglas River - St. Marys Area

Overall the coal measure sequence in this area shows more variability than in the sequences intersected in the 1978/79 drilling programme (Shell report CEPR 9/79). Although the

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coal seam nomenclature of that programme (Dalmayne A,B,C, D,E,F,G seams) can generally be applied to most of the coal intersections in the 1979/80 boreholes, seam correlations are more tentative due to variations in seam thickness and deterioration of the seams to carbonaceous mudstone.

In the St. Marys area boreholes GY30 and GY32 collectively intersected up to four coal seams (Table 4), however, the Dalmayne D seam is the only one thick enough to be of economic interest.

In both holes it occurs as two coal beds separated by up to 5.19 metres of mudstone and sandstone. The lower bed in GY30 is 5.26 metres thick however, in GY32 only the upper bed is potentially mineable with a thickness of 2.13 metres.

South of the 1978/79 drilling grid, in the Douglas River area, the Dalmayne seams were again intersected (Encl. 2). Although in some boreholes coal beds in the Dalmayne A, B and C seams are of a mineable thickness, these beds are too variable in thickness to be of economic interest. The Dalmayne D seam is again split by mudstone and sandstone beds up to 2.67 metres thick, although in GY27 the beds have coalesced into a 4 metre thick seam with over a 95% coal content (Encl. 3). In general, the thicker seam sections are found in the boreholes located within the central graben structure (Encl. 1) which suggests this area was probably subsiding at the time of deposition and thereby permitting a greater accumulation of plant material.

In GY20 and GY21 about 1 metre of mudstone overlies the top of the coal seam, but sandstone is present as the roof in all other boreholes. Floor lithology is variable and ranges from mudstone and siltstone through to sandstone.

TABLE 3 EL 5/61 GRAY

SEAM-INTERSEAM DETAILS, MOUNT NICHOLAS SEAMS

## UPPER SEAM

HOLE NO.	UPPER SPLIT		INTERSEAM THICKNESS m	LOWER SPLIT	
	DEPTH TO TOP m	SEAM THICKNESS m		DEPTH TO TOP m	SEAM THICKNESS m
GY24	-	-	-	-	-
GY26	-	-	-	-	-
GY28	80.57	2.93	2.05	85.55	4.70
GY31	-	-	-	-	-
DOM8	-	-	-	-	-
DOM13	1.52	5.95	-	-	-
DOM33	-	-	-	-	-
DOM36	-	-	-	-	-

MIDDLE SEAM *m1**m2*

HOLE NO.	UPPER SPLIT		INTERSEAM THICKNESS m	LOWER SPLIT	
	DEPTH TO TOP m	SEAM THICKNESS m		DEPTH TO TOP m	SEAM THICKNESS m
GY24	160.15	3.19	-	-	-
GY26	160.38	1.68	-	-	-
GY28	138.73	2.08	-	-	-
GY31	-	-	-	-	-
DOM8	23.32	0.30	3.30	26.92	0.39
DOM13	68.89	0.35	4.60	73.84	0.95
DOM33	43.27	5.21	5.27	53.75	3.23
DOM36	-	-	-	-	-

LOWER SEAM *L1**L2*

HOLE NO.	UPPER SPLIT		INTERSEAM THICKNESS m	LOWER SPLIT	
	DEPTH TO TOP m	SEAM THICKNESS m		DEPTH TO TOP m	SEAM THICKNESS m
GY24	246.26	3.02	-	-	-
GY26	250.29	1.31	0.94	252.54	2.48
GY28	234.93	2.57	1.33	238.83	2.15
GY31	22.45	1.96	-	-	-
DOM8	124.05	1.83	0.99	126.87	2.29
DOM13	162.65	4.00	-	-	-
DOM33	119.29	1.30	2.39	122.98	2.02
DOM36	25.21	3.54	3.55	32.30	0.62

TABLE 4 EL5/61, GRAY

SEAM-INTERSEAM DETAILS, DALMAYNE D SEAM

HOLE NO.	UPPER SPLIT		INTERSEAM THICKNESS m	LOWER SPLIT	
	DEPTH TO TOP m	SEAM THICKNESS m		DEPTH TO TOP m	SEAM THICKNESS m
GY20	434.35	2.06	1.83	438.24	0.71
GY21	284.72	1.18	2.67	288.57	0.77
GY22	213.23	0.22	1.23	214.68	0.79
GY23	337.56	1.20	2.30	341.06	1.18
GY25	475.33	1.70	0.63	477.66	1.68
GY27	347.16	4.00	-	-	-
GY29	280.03	2.09	2.65	284.77	2.47
GY30	260.14	1.25	2.67	264.06	5.26
GY32	199.59	2.13	5.19	206.91	0.70

The thin Dalmayne E, F and G seams are best developed in GY22 but in other holes have deteriorated to carbonaceous mudstone or are absent. Their variable nature limits their economic potential.

#### 4.6 COAL QUALITY

##### 4.6.1 General

The Dalmayne D seam and the middle and lower Mount Nicholas seams were logged in detail and sampled for analysis. Sample intervals were based on coal brightness and non-coal bands within potential mining sections (Encls. 3 and 5). To aid in the determination of mining seam intervals, roof and floor material was sampled when necessary and was analysed separately for ash. Attractive seams, i.e. seams with a thickness of greater than 1.5 metres were analysed according to Appendix 1 while seams less than 1 metre in thickness were analysed according to Appendix 2.

A total of four samples were selected from the Dalmayne D seam and the lower Mount Nicholas seam for analysis of their uranium content. Samples were taken from potential mining sections in boreholes that were selected to give the widest

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coverage of the EL (Encl. 6). Analysis was carried out by fluorimetry and was performed on raw coal samples. Results shown in Table 5 indicate normal concentrations of uranium are present, ranging from 0.9 to 1.6 p.p.m.

All coal analyses were carried out by ACIRL at their Bellambi laboratory, except for the uranium analyses which were performed by AMDEL in Adelaide.

TABLE 5  
URANIUM ANALYSIS DATA

Sample Number	Concentration of Uranium p.p.m.
GY 17/3	1.0
GY 18/2	1.3
GY 24/5	1.6
GY 27/2	0.9

#### 4.6.2 Mount Nicholas

Coal ash contents of six sample of the lower seam after washing at a separation density of 1.7 range from 15.8-27.7% with an arithmetic mean of 22.3% (Encl. 14). Specific energy (air dried) is relatively high ranging from 22.1-26.0 MJ/kg and total sulphur averages 0.3%. Wash yields at a separation density of 1.7 range from 53.3%-81.8% with a mean of 69.9%. Mean values of the air dried properties of the lower Mount Nicholas seam are listed below:-

	<u>Washed Coal, F. 1.7</u>	<u>Raw Coal</u>
Mositure %	4.67	4.30
Ash %	22.30	33.67
Volatile Matter %	25.77	
Fixed Carbon %	47.32	
Total Sulphur %	0.30	
Specific Energy MJ/kg	23.50	19.08
Yield %	69.90	100.00

The middle seam was analysed only in GY24 where an ash content of 18.25% was obtained after washing at separation density of 1.7. Specific energy is 24.30 MJ/kg and total sulphur content is 0.36%. Wash yield at a separation density of 1.7 is 53.04%. Air dried properties of the middle Mount Nicholas seam are listed below:-

	<u>Washed Coal, F. 1.7</u>	<u>Raw Coal</u>
Mositure %	5.03	4.69
Ash %	18.25	44.16
Volatile Matter %	30.44	
Fixed Carbon %	46.29	
Total Sulphur %	0.36	
Specific Energy MJ/kg	24.30	15.03
Yield %	53.04	100.00

Roof and floor analyses of the lower and middle Mount Nicholas seams are listed in Enclosure 15.

#### 4.6.3 St. Marys - Douglas River Area

Coal ash contents of mineable plies within the Dalmayne D seam after washing at a separation density of 1.7 range from 14.3 - 26.7% with a mean of 19.83% (Encl. 15). Specific energy (air dried) of washed coal is relatively high ranging from 22.81 - 28.12 MJ/kg with a mean of 25.44 MJ/kg.

Total sulphur is less than 0.5%. Washing yields at a separation density of 1.7 are variable and range from 39.8% in composite sample GY32/1 and GY32/2 to 91.5% in GY30/4. Mean wash yield is 69.6%. Overall, coal quality is comparable to results obtained from boreholes GY1-GY18. Further washing at higher separation densities may improve the yield. Further tests including ash fusion temperature and Hardgrove grindability index are currently being performed on selected samples from the recent drilling programme. Mean values of properties of mineable plies of the Dalmayne D seam are listed below:-

020

	<u>Washed Coal, F. 1.7</u>	<u>Raw Coal</u>
Moisture %	4.41	4.30
Ash %	19.83	33.04
Volatile Matter %	26.80	
Fixed Carbon %	48.95	
Total Sulphur	0.31	
Specific Energy MJ/kg	25.44	20.14
Yield %	69.64	100.0
Thickness m	1.88	1.88

021

5. FUTURE EXPLORATION

While some analyses of samples from the November 1979 to July 1980 programme have yet to be completed, and consequently a final assessment of the drilling results is not yet possible, the objectives of further exploration are clear. Reconnaissance exploration will continue, to identify new areas of potentially mineable coal and fully evaluate the resources of the area. Concurrently, intensive drilling of identified priority areas will be initiated to enable the development of new mines as expeditiously as possible.

Tenders have been called for the drilling of an additional 14 holes in the Mount Nicholas area, and a start to this work is anticipated in late November. These holes, spaced at intervals of less than 1 kilometre, will provide the data for a full mine feasibility study encompassing geotechnical as well as coal resource evaluation.

In addition to reconnaissance drilling and the Mount Nicholas assessment, concentrated assessment is planned for areas at Harefield and Douglas River. In the former area the possibility of the occurrences of open-cut coal will be investigated, while at Douglas River coal which is potentially adit accessible will be more fully delineated.

REFERENCES

SHELL COMPANY OF AUSTRALIA LIMITED, 1978.

A preliminary review of the geology and coal resources of exploration licences 5/61 Gray and 18/77 Avoca. (Unpubl. report CEPR 16/78).

1978 Exploration Licence 5/61, Gray. Six monthly progress report to 23rd August, 1979 (Unpubl. report CEPR 21/78).

1979 Six monthly progress report on exploration conducted in Exploration Licence 5/61 Gray. (Unpubl. report CEPR 9/79).

## APPENDIX 1

## FLOW SHEET, LABORATORY TESTING, ATTRACTIVE SEAMS &gt; 1.5 METRES

50mm CORE SAMPLES

a,B,C,D,e

a = roof

B,C,D = coal

e = floor

CRUSH

(-25mm), S.G.

(a,e)

B,C,D

(i) if 40% floats 1.7  
determine Ash only

(ii) if 40% floats 1.7  
determine Ash

Specific Energy  
Moisture  
Sulphur

Determine on Floats 1.7

Mass  
Proximate Analysis  
Total Sulphur  
Specific Energy  
Hardgrove Grindability\*  
Ash Fusion Temperatures  
(red. atmos.)\*  
Ash Analysis\*  
Ultimate Analysis\*  
(\* selected samples  
only)

Determine on Sinks 1.7

Mass  
Ash  
Moisture  
Specific Energy



Dinned inside front cover

EXPLORATION LICENCE 5/61 (GRAY) - TASMANIACoal Resource Estimates

The Gray Exploration Licence covers an area of 775 km<sup>2</sup> N.E. Tasmania. Approximately one half of this area is underlain by coal measures which would contain coal seams of mineable quality and thickness. In theory the coal resources of the area for an average seam thickness of 2m would be well in excess of a billion tonnes. However in practice both seam thickness and quality vary so that some areas of coal measures contain no coal of economic potential. More significantly, the areas which do contain potentially mineable coal are segmented by major faults and in the main blanketed by a thick dolerite capping. Consequently potential mine access to reserves blocks varies. Some would be accessible by adits, while others would require costly vertical shafts often through thick dolerite capping.

The two SCOA reconnaissance drilling programmes in Gray have prospected an area of approximately 130 km<sup>2</sup>. Total in situ indicated reserves of 271.4 megatonnes have been delineated in three main areas, viz. Dalmayne, Douglas River and Mt. Nicholas.

Parts of the reserves in the two first mentioned areas are accessible only by shaft entry while all of the Mt. Nicholas reserves are accessible by adit entry.

In the accompanying table in situ reserves in terms of adit or shaft accessibility are shown for each of the three areas. The maximum core hole spacing of 2 km. gives the estimates Indicated Class 1 status. A conservative raw coal relative density of 1.45 has been applied and exclusions have been made in the following basis.

- minimum working seam thickness 1.5m
- maximum working seam thickness 3.0m
- minimum seam separation 8.0m
- minimum indicated washed quality - 30% ash, 60% yield.

Estimates of mining and production tonnages have been based on arbitrary and test supported recovery factors. A 30% loss has been allowed for faulting and poor roof conditions, with a further 50% loss for mining methods. The mineable coal has been further reduced by 5% for mining dilution. Test supported washery yield estimates of 80% for Dalmayne and Douglas River and 70% for Mt. Nicholas have been applied to derive potential product tonnages.

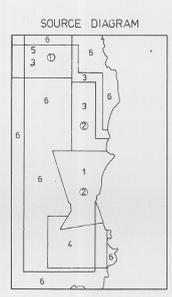
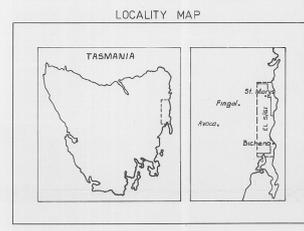
026

Location	Reserves In Situ Indicated (tonnes x 10 <sup>6</sup> )	Mining and Beneficiation Estimates			
		In Situ Recoverable (tonnes x 10 <sup>6</sup> )	In Situ Mineable (tonnes x 10 <sup>6</sup> )	R.O.M. (tonnes x 10 <sup>6</sup> )	Clean Product (tonnes x 10 <sup>6</sup> )
Dalmayne (Adit)	32.2	22.5	11.3	10.7	8.6
Dalmayne (Shaft)	158.5	111.0	55.5	52.7	42.2
Dalmayne (Total)	190.7	133.5	66.8	63.4	50.8
Douglas River (Adit)	24.6	17.2	8.6	8.2	6.5
Douglas River (Shaft)	6.1	4.3	2.1	2.0	1.6
Douglas River (Total)	30.7	21.5	10.7	10.2	8.3
Mt. Nicholas (Adit)	50	35	17.5	16.6	11.6
Mt. Nicholas (Total)	50	35	17.5	16.6	11.6
Exploration Licence (Adit)	106.8	74.7	37.4	35.5	26.7
Exploration Licence (Shaft)	164.6	115.3	57.6	54.7	43.8
Exploration Licence (Total)	271.4	190.0	95.0	90.2	70.5

W.N. KOPPE  
Head of Coal Exploration - Southern States

15.12.1980

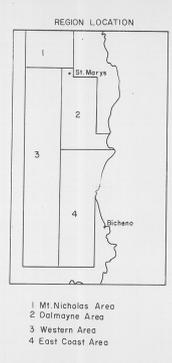
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Unpublished mapping by:

1. P. Sansom (Shell)
2. J. Ivett (Shell)
3. C. Colver (Tas. Dept. of Mines)
4. C. Bacon (Geology Dept. of University of Tas.)
5. R. Coetlander (Tas. Dept. of Mines)
6. D. Leaman (East Coast coal project geology survey, Part I, Tas. Dept. of Mines, Unpubl. Report 1978/33)

Major Source 1  
Minor Source 2



LEGEND

- |          |                 |   |
|----------|-----------------|---|
| Qsg      | QUATERNARY      | aeolian sand, marine sand and gravel                          |
| Qa       |                 | alluvial sand and gravel, swamp deposits                      |
| Qs       |                 | scree   |
| Tg       | TERTIARY        | gravels   |
| Jdl      | JURASSIC        | dolerite  |
| Rb       | TRIASSIC        | basalt  |
| R        |                 | undifferentiated sandstones, mudstones, coal                  |
| P        | PERMIAN         | undifferentiated conglomerate, sandstone, mudstone, limestone |
| Dg       | DEVONIAN        | undifferentiated granitic rock                                |
| Sm       | SILURO-DEVONIAN | Mothna Beds, quartzite, slate, siltstone                      |
| —        |                 | geological boundary (approx. position)                        |
| -?-?     |                 | geological boundary (inferred)                                |
| —        |                 | fault   |
| -?-?     |                 | fault (inferred)  |
| ✳        |                 | dolerite feeder   |
| ●        |                 | coal outcrop  |
| —        |                 | adit (abandoned)  |
| DOM 49 ⊕ |                 | Dept. of Mines borehole                                       |
| GYZ ⊕    |                 | Shell borehole drilled  |
| ○        |                 | Shell borehole proposed                                       |
| MDS ⊕    |                 | Mines Dept. Bicheno borehole                                  |
| SZ ⊕     |                 | Seymour borehole  |

SCALE 1:40 000



004028



THE SHELL COMPANY OF AUSTRALIA LTD.

TASMANIA BASIN TASMANIA  
SHELL-IMI EL 5/61 GRAY

GEOLOGICAL MAP  
EL 5/61

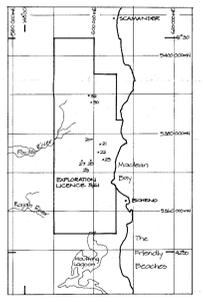
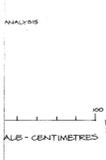
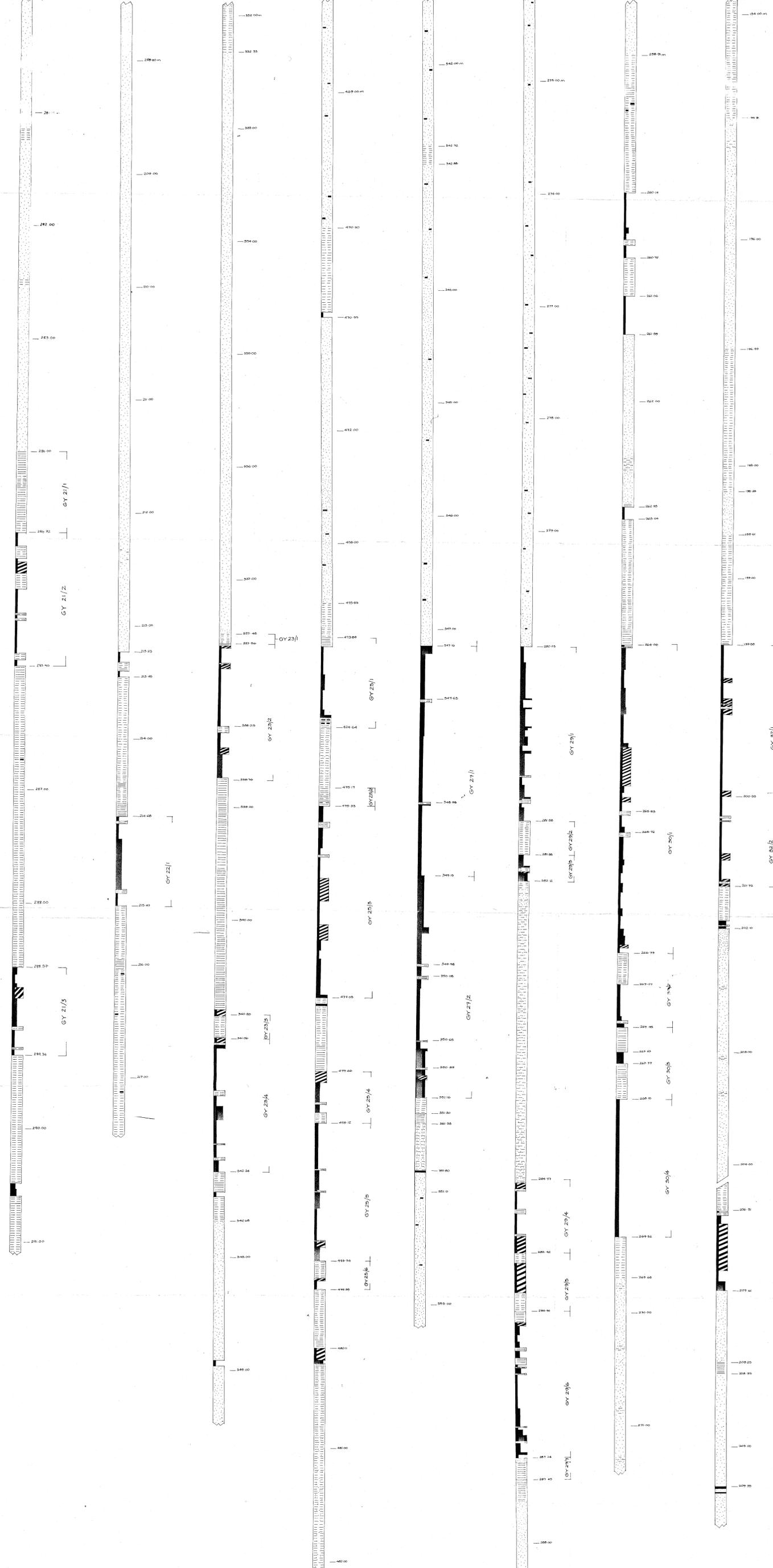
Scale 1:40 000

Author: P. SANSON Date: August 1980 Encl. 1  
Report No. CEP 17/80 Drawing No. 1800





GY 21 R.L. 430m      GY 22 R.L. 270m      GY 23 R.L. 250m      GY 25 R.L. 360m      GY 27 R.L. 450m      GY 29 R.L. 310m      GY 30 R.L. 505m      GY 32 R.L. 400m



004030

GY24

GY26

GY28

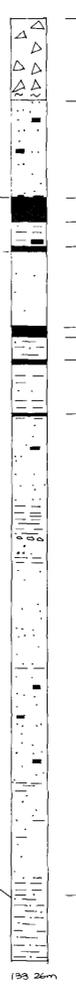
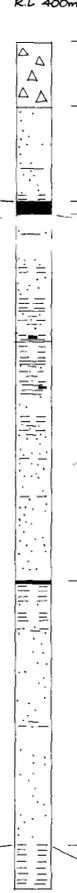
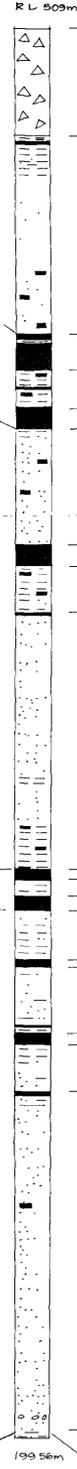
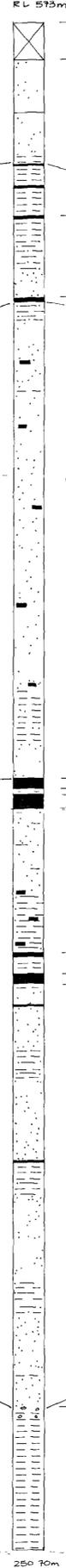
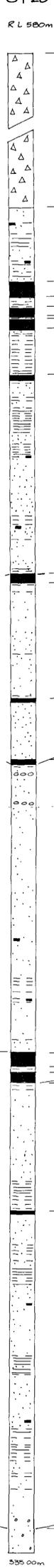
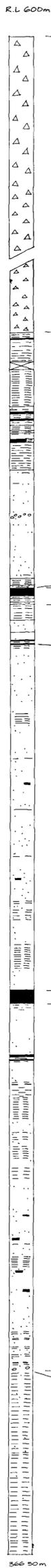
DEPT. OF MINES 13

DEPT. OF MINES 8

DEPT. OF MINES 33

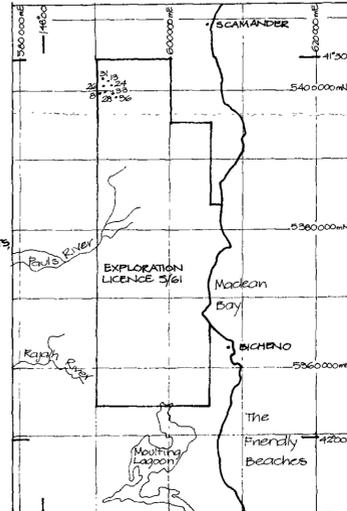
GY31

DEPT. OF MINES 36



LEGEND

- SURFICIAL DEPOSITS
- DOLERITE SCREE
- CONGLOMERATE, PEBBLY SANDSTONE
- SANDSTONE
- SANDSTONE WITH MUDSTONE BANDS
- SANDSTONE WITH COAL FRAGMENTS, STREAKS AND BANDS
- SILTSTONE
- MUDSTONE
- MUDSTONE WITH SANDSTONE BANDS
- MUDSTONE WITH COAL BANDS
- CARBONACEOUS MUDSTONE
- COAL
- CORE LOGS

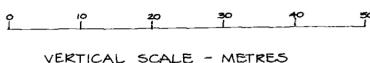


2904

THE SHELL COMPANY OF AUSTRALIA LTD.

TASMANIA BASIN, TASMANIA  
 SHELL-IMI E.L. 5/61, GRAY  
**GENERALISED BOREHOLE LOGS  
 & COAL SEAM CORRELATIONS**  
 NICHOLAS RANGE

Author P Sansom Date August, 1980  
 Report No. CEPR 17/80 Drawing No. C-1803 Encl. 4

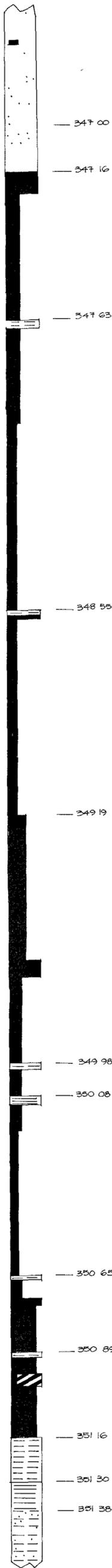


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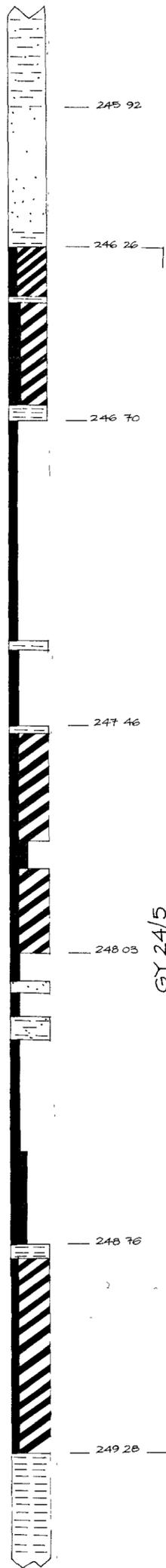
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RL 450m



GY 24

RL 600m



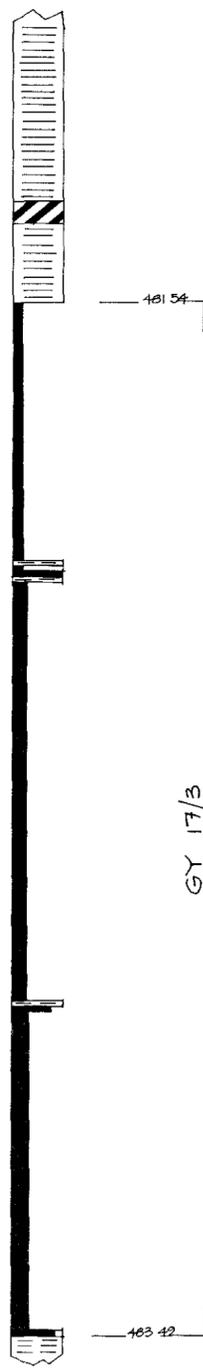
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RL 490m



GY 17

RL 680m

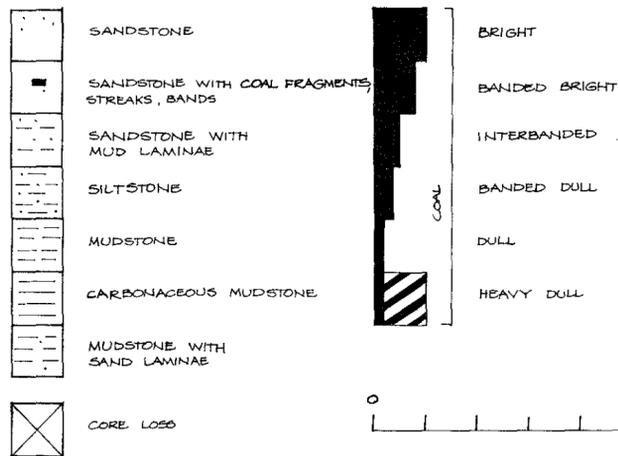


GY 18/2

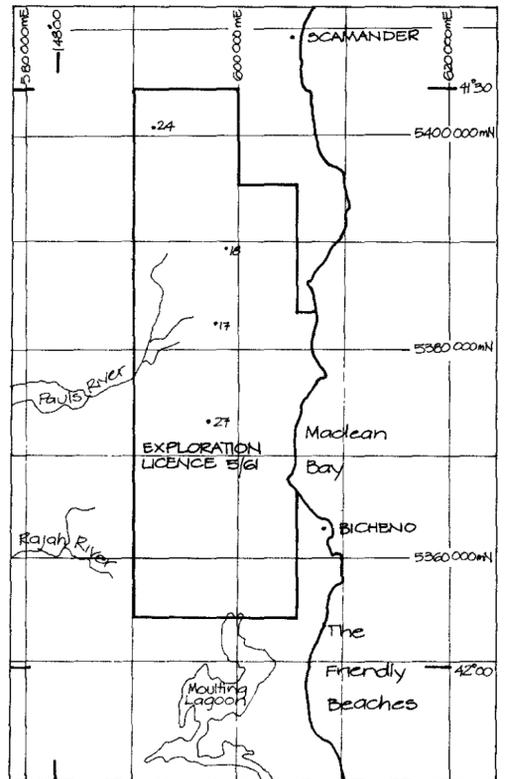
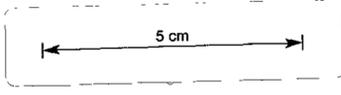
GY 17/3

GY 24/5

GY 27/2



VERTICAL SCALE - CENTIMETRES

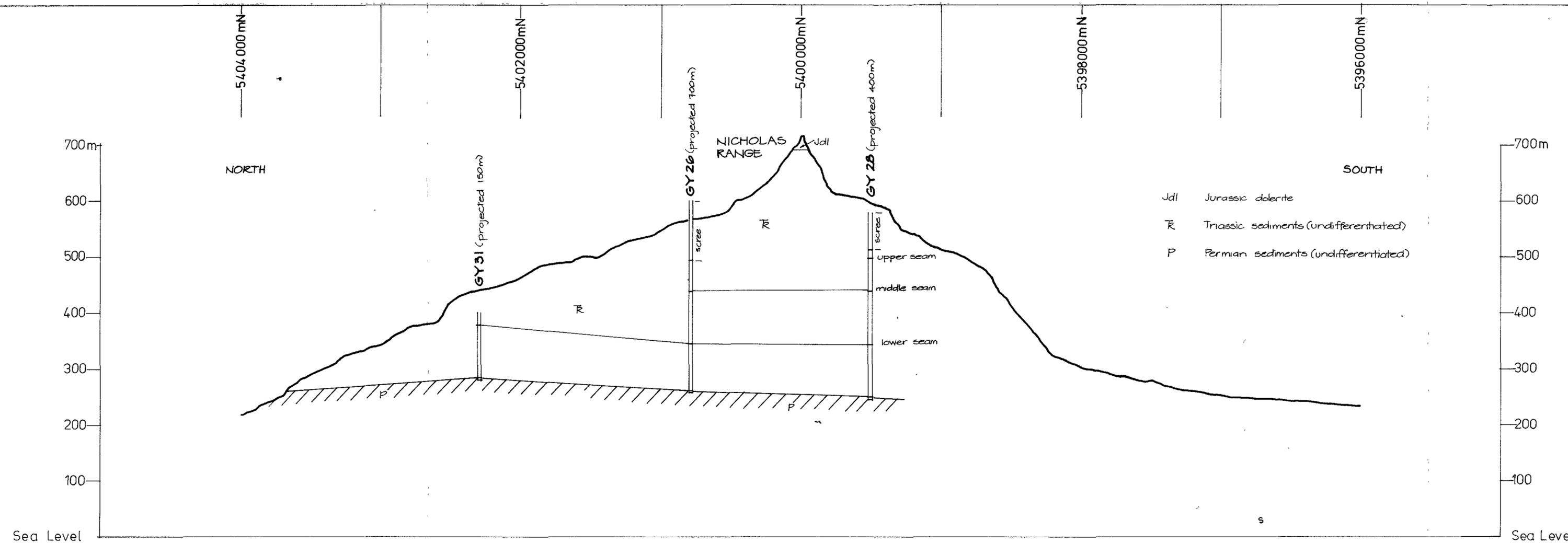


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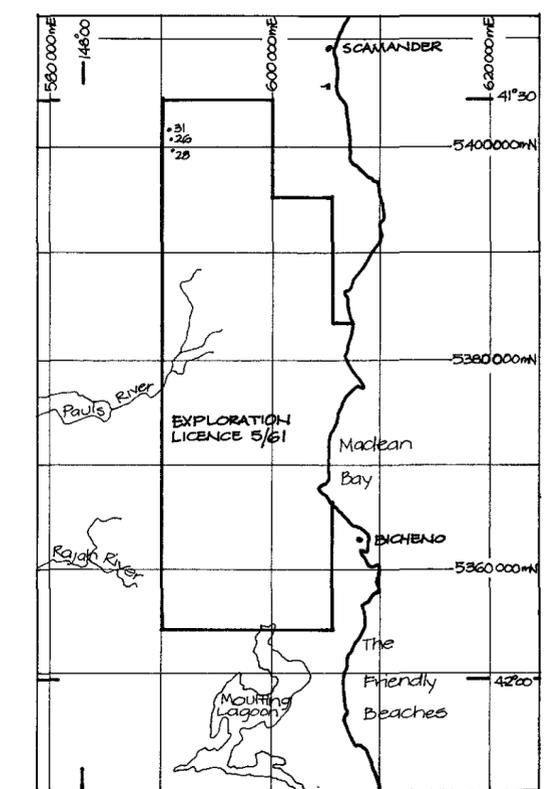
**THE SHELL COMPANY OF AUSTRALIA LTD.**

TASMANIA BASIN, TASMANIA  
SHELL-IMI EL 5/61, GRAY  
**DETAILED SEAM SECTIONS  
SAMPLES ANALYSED FOR  
URANIUM**  
Scale 1:10

Author P Sansom	Date August 1980	Encl. 6
Report No. CEPR 17/80	Drawing No. C-1805	



Jdl Jurassic dolerite  
 R Triassic sediments (undifferentiated)  
 P Permian sediments (undifferentiated)

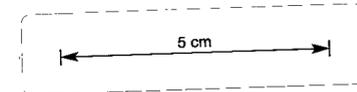


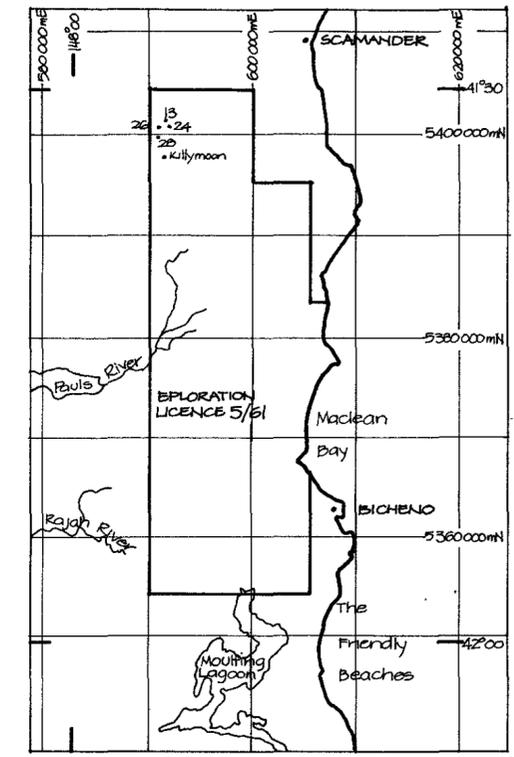
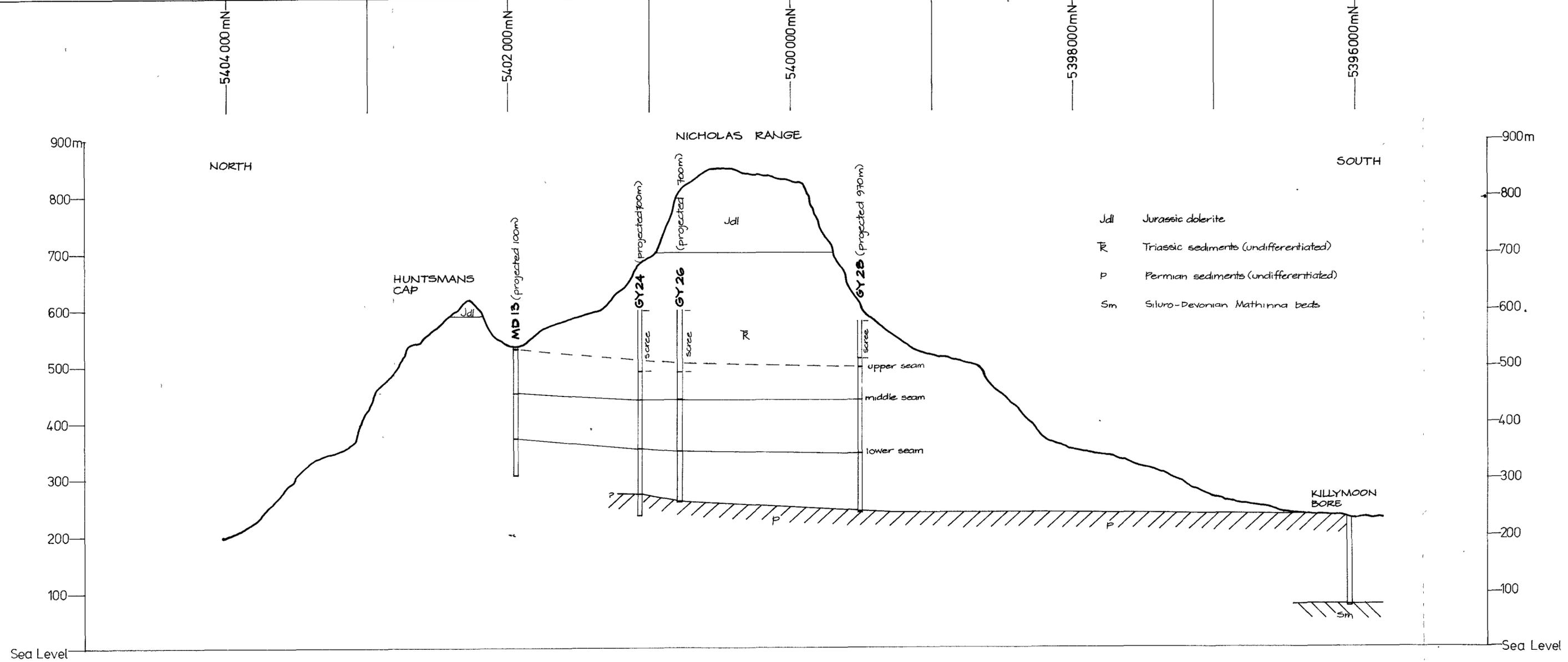
MD Mines Department borehole  
 GY Shell borehole 2907

**THE SHELL COMPANY OF AUSTRALIA LTD.**  
 TASMANIA BASIN, TASMANIA  
 SHELL-IMI EL 5/61, GRAY  
**GEOLOGICAL CROSS SECTION**  
**LINE 5905000mE**  
 Horizontal Scale 1:20,000

Author: P Saneom	Date: August, 1980	Encl. 7
Report No: CEPR 17/80	Drawing No: C-1806	

004034





MD Mines Department borehole  
GY Shell borehole

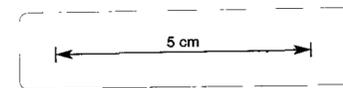
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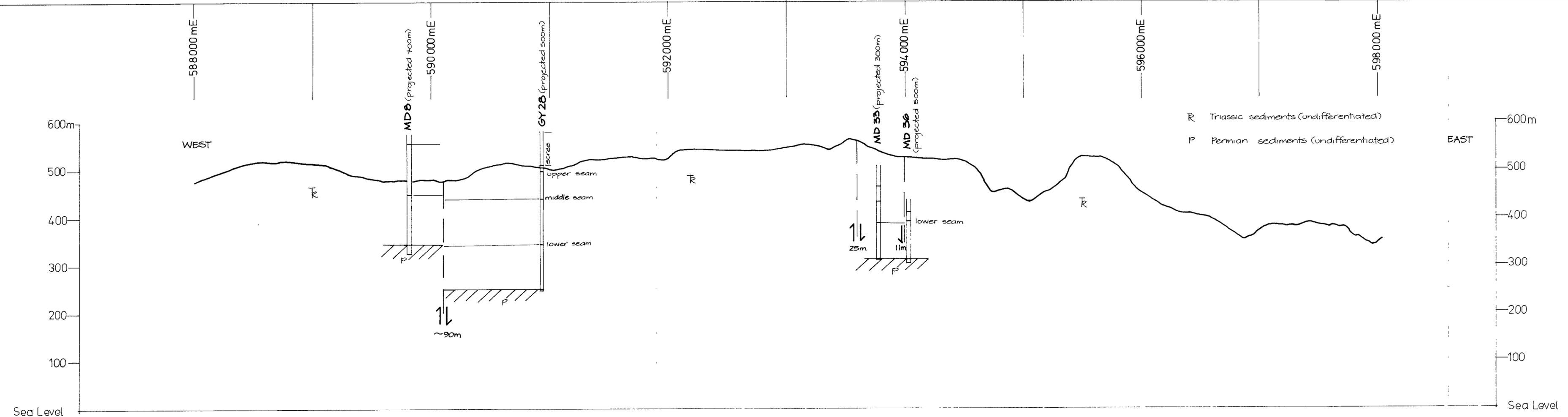
**THE SHELL COMPANY OF AUSTRALIA LTD.**

TASMANIA BASIN, TASMANIA  
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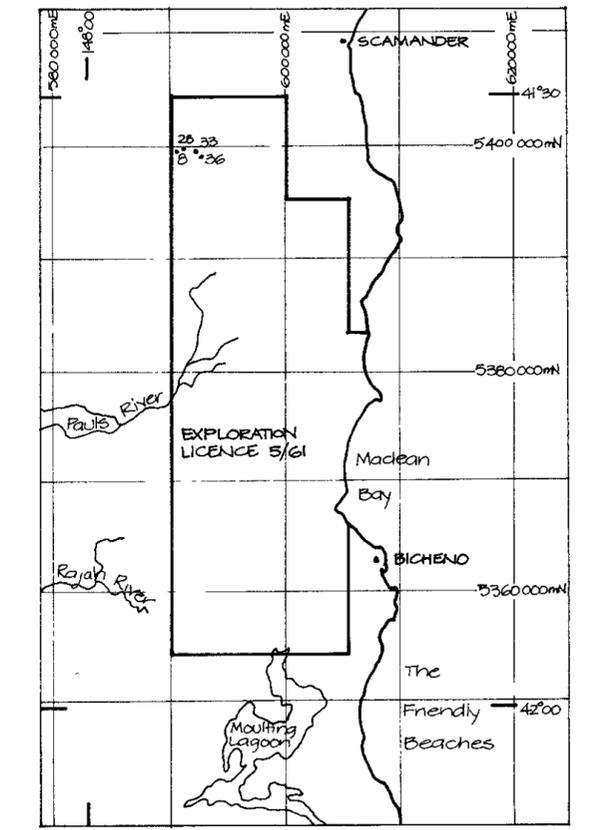
Author P Sansom      Date August 1980  
Report No. CEPR 17/80      Drawing No. C-1807      Encl. 8

004035





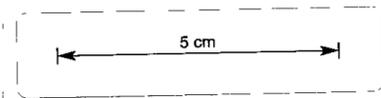
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 P Permian sediments (undifferentiated)

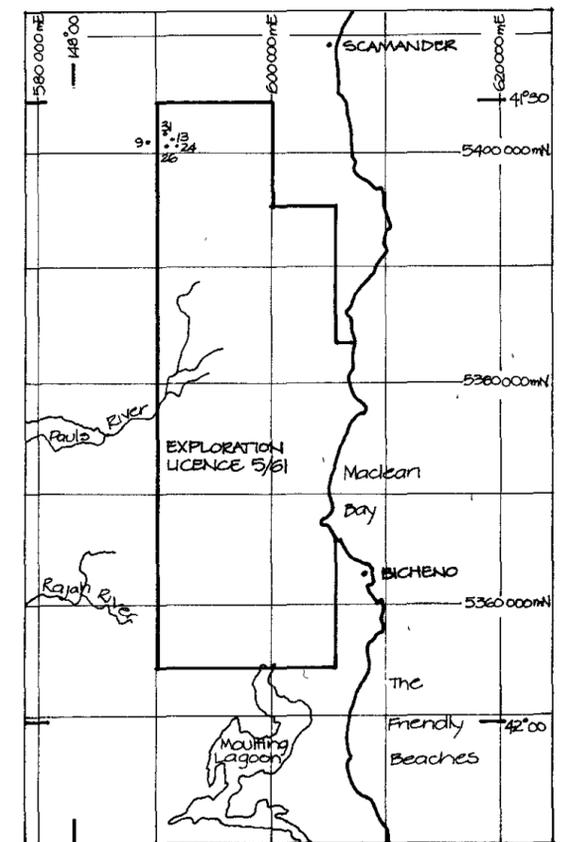
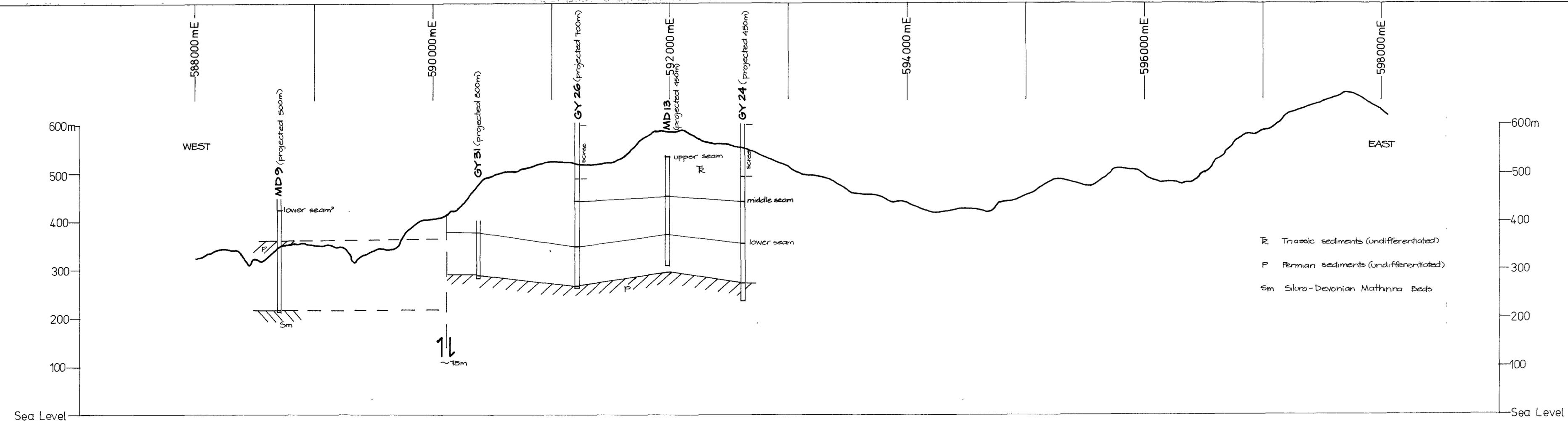


MD Mines Department borehole  
 GY Shell borehole  
 2909

<b>THE SHELL COMPANY OF AUSTRALIA LTD.</b>		
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<b>GEOLOGICAL CROSS SECTION LINE 5399000 mN</b>		
Horizontal Scale 1:20,000		
Author: P Sansom	Date: August, 1980	<b>Encl. 9</b>
Report No. CEPR 17/80	Drawing No. C-1808	

004036





MD Mines Department borehole  
GY Shell borehole

2910

**THE SHELL COMPANY OF AUSTRALIA LTD.**

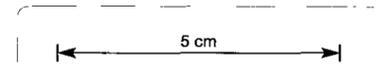
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SHELL-I.M.I. EL 5/61, GRAY

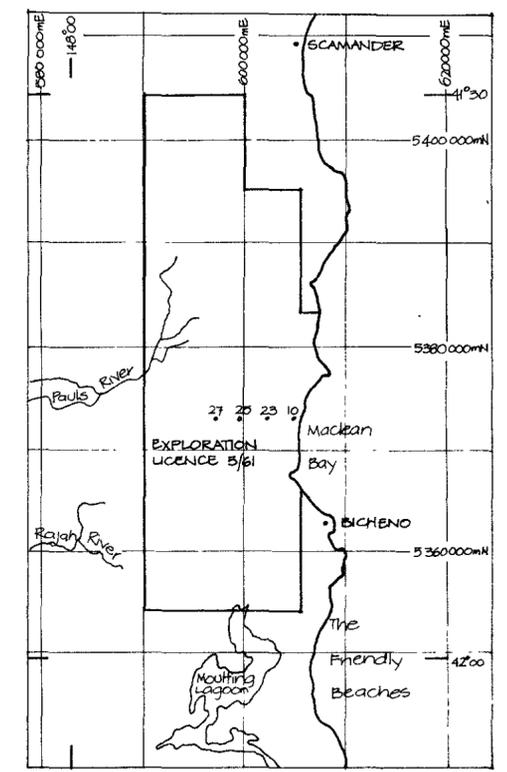
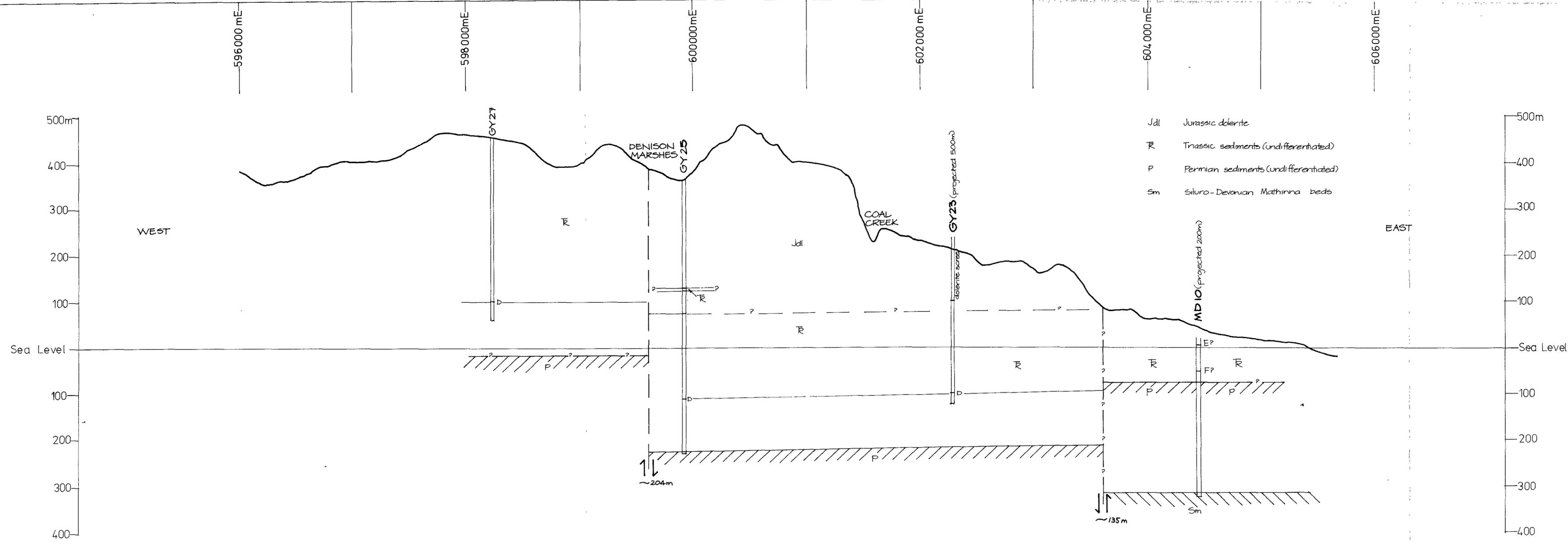
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LINE 54015 000 mN**

Horizontal Scale 1:20,000

Author: P Sansom	Date August 1980	Encl. 10
Report No. CEPR/17/80	Drawing No. C-1809	

004037





MD Mines Department borehole  
GY Shell borehole

2911

**THE SHELL COMPANY OF AUSTRALIA LTD.**

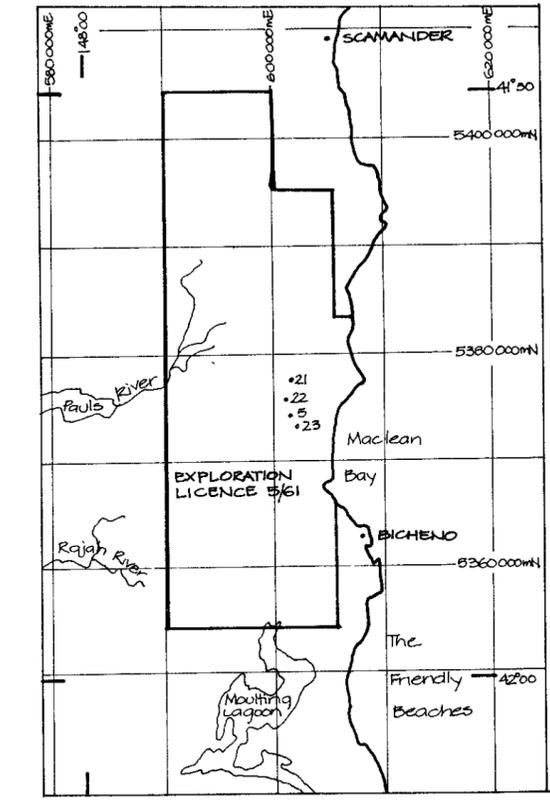
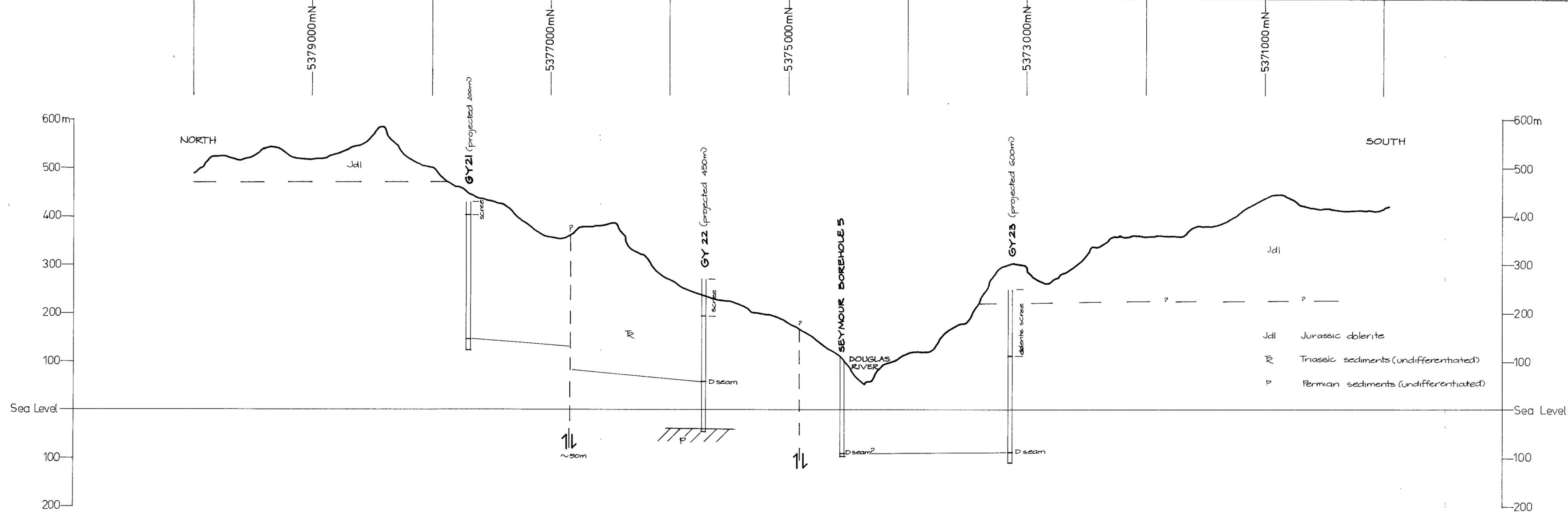
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SHELL-IMI EL 5/61, GRAY  
**GEOLOGICAL CROSS SECTION**  
**LINE 5373 000 mN**  
Horizontal Scale 1:20,000

Author: P Sansom Date: August 1980  
Report No: CEPR 17/80 Drawing No: C-1810

Encl. 11

004038

5 cm



2912

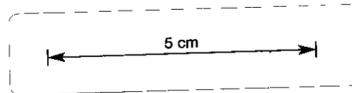
THE SHELL COMPANY OF AUSTRALIA LTD.

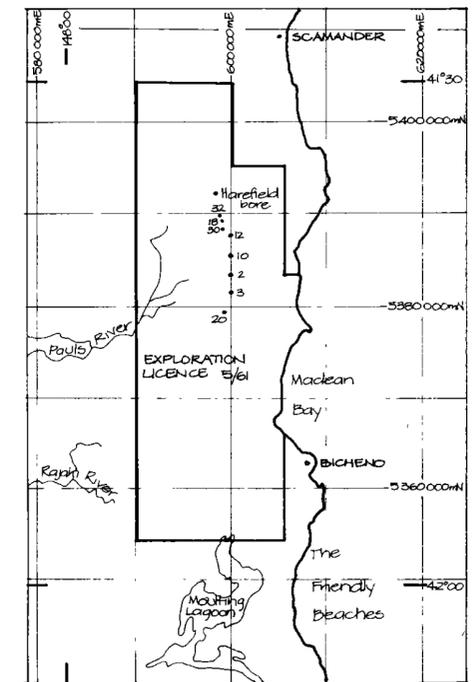
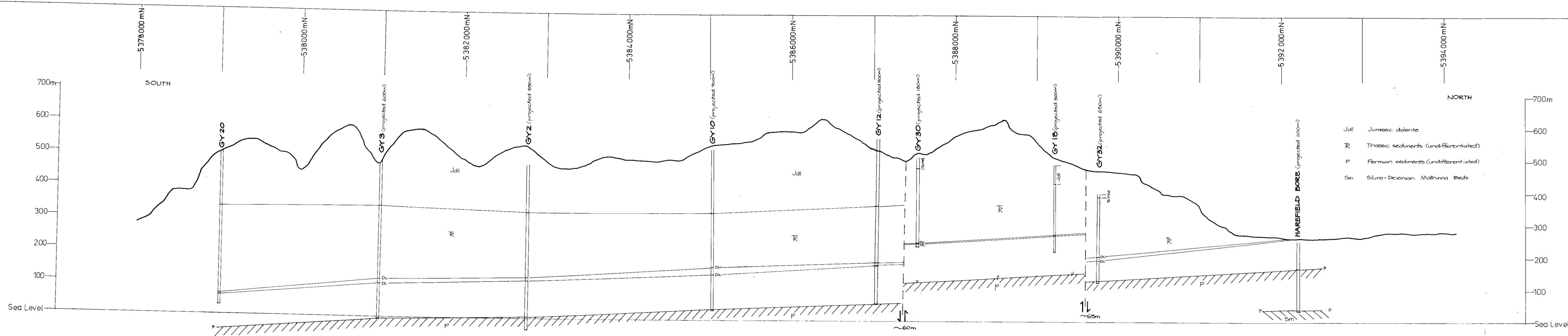
TASMANIA BASIN, TASMANIA  
SHELL-I.M.I. EL 5/61, GRAY

**GEOLOGICAL CROSS SECTION**  
**LINE 6015000 mE**  
Horizontal Scale 1:20,000

Author P Sansom	Date August, 1980	Encl. 12
Report No. CEPR 17/80	Drawing No. C-1811	

004039





004040      2913

**THE SHELL COMPANY OF AUSTRALIA LTD.**

TASMANIA BASIN, TASMANIA  
SHELL-IMI EL5/61, GRAY

**GEOLOGICAL CROSS SECTION**  
**LINE 5995 000mE**

Horizontal Scale 1:20,000

Author: P Sansom	Date August 1980
Report No. CEPR 17/80	Drawing No. G-1812

**Encl. 13**



