

Abstract

Fingal Tier rises steeply from the floor of the Fingal Valley to a height of 700 m above sea level. Coal crops out around the northern and north-eastern flanks of the Tier.

Coal outcrops south-east of Fingal were first described by Milligan in 1849, and minor mining works in this area were visited by Thureau in 1883. A number of mines have operated in the Fingal coalfield, but all have now closed except for the Duncan Colliery owned by the Cornwall Coal Company N.L.

The Department of Mines has conducted an exploration programme on Fingal Tier since 1959, involving diamond drilling, geophysical surveys, geological mapping, and coal sampling and analysis.

The coal seams occur in a 200-400 m thick fluvial sequence of dominantly lithic sandstone with minor interbedded mudstone, claystone, siltstone and rare tuff, belonging to the Upper Parmeener Super-Group. The coal is of Triassic age.

The coal-bearing strata have been intruded by, and are now capped with Jurassic dolerite.

Coal reserves have been calculated for three seams over part of the Fingal coalfield. The *in situ* reserves are: 68 million tonnes (measured) for the Duncan seam; 60 million tonnes (indicated) for the East Fingal Upper Split; and 100 million tonnes (indicated) for an intermediate seam.

LOCATION AND ACCESS

The Fingal coalfield is located south-east of Fingal in northern Tasmania.

Part of the coalfield is covered by the Fingal Exempt Area (SR 32 of 1981), the rest being held by the Cornwall Coal Company N.L. under Mining Lease 46/80 and part of Exploration Licence 50/82. The extension of the Fingal coalfield to the east is covered by Exploration Licence 5/61 held jointly by the Shell Company of Australia and Industrial & Mining Investigations.

The coal-bearing strata on Fingal Tier lies beneath a cap of Jurassic dolerite. Fingal Tier rises steeply from the floor of the Fingal Valley to a height of 700 m above sea level, and coal seams crop out around the northern and north-eastern flanks of the Tier.

GENERAL GEOLOGY

The regional geology of the area is outlined in Threader (1968) and the geology of the south side of the Fingal Valley and of the Mount St John area (the Fingal Valley Exempt Area) has been described in detail by Baillie and Calver (1980). The geology of the area is shown in Figure 1. The results of a gravity survey of the east coast coalfields are given in Leaman and Richardson (1981).

34-2

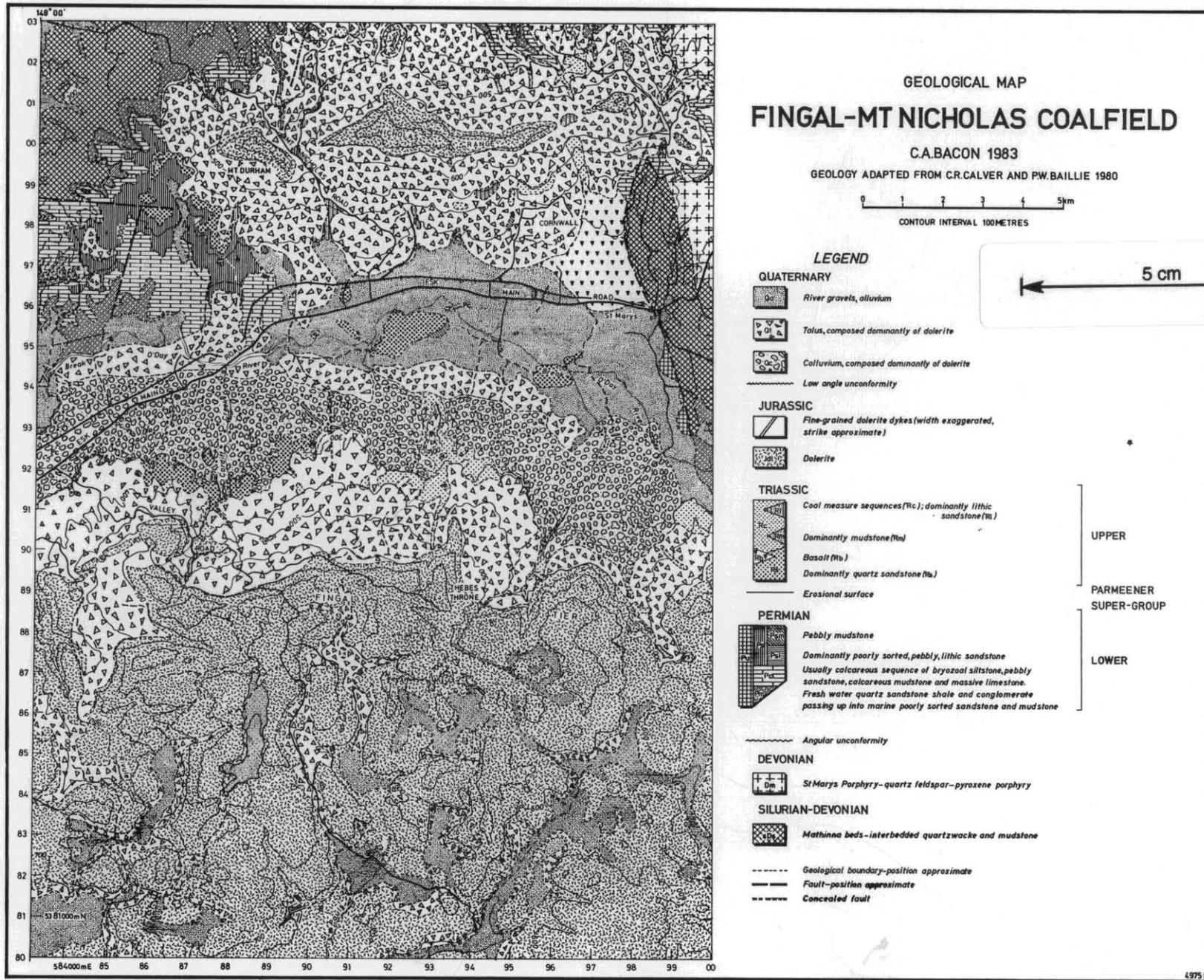


Figure 1.

2/30

In the Fingal area, a glaciomarine sequence of fossiliferous mudstone of the Lower Parmeener Super-Group is paraconformably overlain by coal-bearing sediments of the Upper Parmeener Super-Group.

The sandstone unit immediately overlying the Lower Parmeener Super-Group sediments is a fine to coarse-grained quartzose sandstone, ranging in thickness from 0-50 m. The quartzose sandstone grades up into a dominantly lithic sandstone sequence with minor interbedded mudstone, siltstone, claystone, carbonaceous mudstone, coal, rare conglomerate and rare tuff. The coal-bearing sequence reaches a maximum thickness of about 400 m.

Dolerite of Jurassic age has intruded the sedimentary rocks as a series of sheets and dykes. The thickness of the dolerite capping Fingal Tier varies considerably, depending on the position of the base of the dolerite, the base being very irregular. From drilling information, the dolerite is typically 100-300 m thick on Fingal Tier.

Fine-grained, later stage dolerite dykes have intruded the main dolerite body. These dykes are usually 2-3 m wide, and have been found in outcrop (Baillie and Calver, 1980) and in drill core on Fingal Tier.

Dolerite talus thickly blankets the slopes of Fingal Tier and higher parts of the plateau area.

Immature dolerite stream gravel occurs on the foothills on the southern side of the Fingal Valley. Unconsolidated alluvial sand and gravel are found in low lying areas close to the Break O'Day River, and swamp and marsh deposits cover part of the high plateau area.

COAL SEAM GEOLOGY

There are eight major coal seams on Fingal Tier; these have been labelled seams A-H by the Department of Mines. Some, notably the A and B seams, are better described as carbonaceous intervals, as they consist of plies of coal less than 0.5 m thick interbedded with carbonaceous mudstone and claystone over intervals of 5-10 m. All the seams are characterised by a high inherent ash content, and have only a small (<10%) component of bright coal. The coal is of medium rank, with a high ash and low sulphur content, and is suitable for steam raising purposes.

No satisfactory marker horizons have been recognised in the fluvial sequence on Fingal Tier. In order to obtain a reliable correlation of coal seams it has been necessary to drill to the glaciomarine sequence of the Lower Parmeener Super-Group (formerly referred to as 'Permian' sediments). This basement dips gently to the east and forms a known horizon from which correlation of coal seams may be more confidently undertaken. Drill holes must commonly be 500-600 m deep in order to reach the glaciomarine basement.

In the western part of the former (now revoked) exempt area a one metre to three metre thick conglomerate horizon has proved to be a reasonable marker where present. The conglomerate band (informally called the Dalmyne Conglomerate) is composed of well rounded pebbles and cobbles of green and white quartzite, acid pyroclastic rocks, and slate, elongate to spherical in shape, and set in a matrix of coarse-grained lithic sandstone. The conglomerate band is, however, too patchy in areal distribution to be a significant marker bed.

A number of tuff intersections have been recorded in the eastern part of the exempt area. The tuff is an acid, air-fall vitric tuff, with the

intersections <1 m thick. However, the patchy areal distribution of the tuffs makes their use as a marker horizon minimal.

The two seams which are of greatest economic interest on Fingal Tier are the Duncan (seam F) and the East Fingal (seam G).

The Duncan seam is currently mined at the Duncan Colliery and is the only seam to have been extensively worked. Typically the seam consists of 2-3 m of dull coal with minor clay and mudstone partings. The raw ash content is approximately 30% and the specific energy 22-24 MJ/kg. A summary of drill-hole intersections of the Duncan seam is given in Appendix 3.

The East Fingal seam is about 30 m stratigraphically below the Duncan seam, and is commonly split. The Upper and Lower Splits (Gu and Gl) of the East Fingal seam are commonly 1-2 m in thickness, with the intraseam sediments being 0-10 m in thickness. The Upper Split is less well developed west of the Mitchell Fault. The coal quality is similar to that of the Duncan seam.

Further details of the seams on Fingal Tier are given in Threader and Bacon (1983).

The following tentative regional seam correlations have been made between the Fingal Tier, Mount Nicholas, Harefield, and Dalmayne areas.

<i>Fingal Tier</i> (DOM)	<i>Dalmayne</i> (Shell)	<i>Harefield</i> (Shell)	<i>Mount Nicholas</i> (Shell)
A	-		
B	DA		
C	-		
D	DB		
E	-		
F (Duncan)	DC		U8
GU (East Fingal Upper Split)	DD (Upper)) M1
GL (East Fingal Lower Split)	DD (Lower)) M2
Ha)	DE)	DE, E ₂ , E ₃ , DF) L1, L2
Hb)))))
)))))

PREVIOUS MINING ACTIVITY

Milligan (1849) described in detail the coalfields of the east coast, and visited outcrops of coal about four kilometres ESE of Fingal. Milligan mentioned three seams of coal in this area, exposed in the upper two branches of an 'insignificant creek'. The main seam, about 3.6 m thick and

which crops out in both creek branches, was burnt for 20 m along the seam in the most easterly outcrop; the level of this seam was 150-180 m above the level of the plain.

Two smaller seams were also seen; one 0.98 m thick 60 m above the first, and another seam 0.84 m thick 15.2 m below the main seam. These seams appear to have been seen in Cat and Kitten Creek.

Selwyn (1855) visited the same outcrops as Milligan, reporting two seams as being 4.3 m and 0.9 m thick. Gould (1861) wrote at length on the coalfields of the east coast, and also visited the seams near Fingal described by Milligan (1849) and Selwyn (1855). Gould could only see 2.1 m exposed of the 3.6 m seam, and commented that the coal appeared to "contain more ash, and to be, on the whole, inferior in quality to that contained in the same seam upon the opposite side of the valley".

Gould (1861) correlated the seam near Fingal with the 'Killymoon' seam on Mt Nicholas. Milligan (1849) also noted that coal or coal measures cropped out in almost every creek along the range (Fingal Tier) east from the town of Fingal, and described the coal outcrops examined.

Coal was tested by the Launceston Gasworks and on board the steamships 'Tasmania' and 'Monarch' in 1862 (Falconer, 1862), and by the railways in 1883 (Thureau, 1883a).

Thureau (1883b) also visited the thick seam, stating the thickness to be 3.3 m and the seam as having been opened up 'years ago' by means of a tunnel driven in for 13.7 m; the tunnel had recently been extended to 15.2 m. The whole seam was, at the time of Thureau's visit, being mined in large "lumps or junks" by experienced miners. Thureau (1883b) referred to this outcrop (in Cat and Kitten Creek) as the Mt Malcolm coal. He also recorded a seam of coal 0.6 m thick 9.1 m below the 'Mt Malcolm' seam. Thureau recorded two outcrops of coal in Fingal Rivulet, and one 1.2 m thick seam in Telopea Creek which had been worked by some shallow and inextensive workings. This outcrop is probably that of the G (East Fingal seam) at EP84488750. The workings on the 'Mt Malcolm' coal are close to where the Fingal, Duncan, and Tasmanian Mines later worked.

A drill hole was put down in the area of the 'Mt Malcolm' coal, the log of which is given in the Secretary for Mines Report of 1887. The exact location of the hole is not known.

Johnston (1888) described the geology and details of coal seams found in the north-eastern coalfields, basing his writings on earlier reports of Milligan (1849), Selwyn (1855), and Gould (1861).

In 1920 the Fingal Coal Prospecting Syndicate drove two tunnels into an outcrop of coal near Coal Creek (now called Cat and Kitten Creek). About 120 t of coal were produced from these workings in 1920.

Hills et al. (1922) noted "minor works of a prospecting nature" in the Fingal area, and inspected three tunnels. One tunnel (adit) was on Cardiff Creek, near where Barber's Mine later operated; a second tunnel was inspected in Crouchs Creek, east of where Barber's Mine later operated; and a third tunnel was examined near Cat and Kitten Creek.

In 1942 H.J.E. Yeates acquired the leases formerly held by the Fingal Coal Prospecting Syndicate, and mining progressed in a more orderly fashion.

6/30

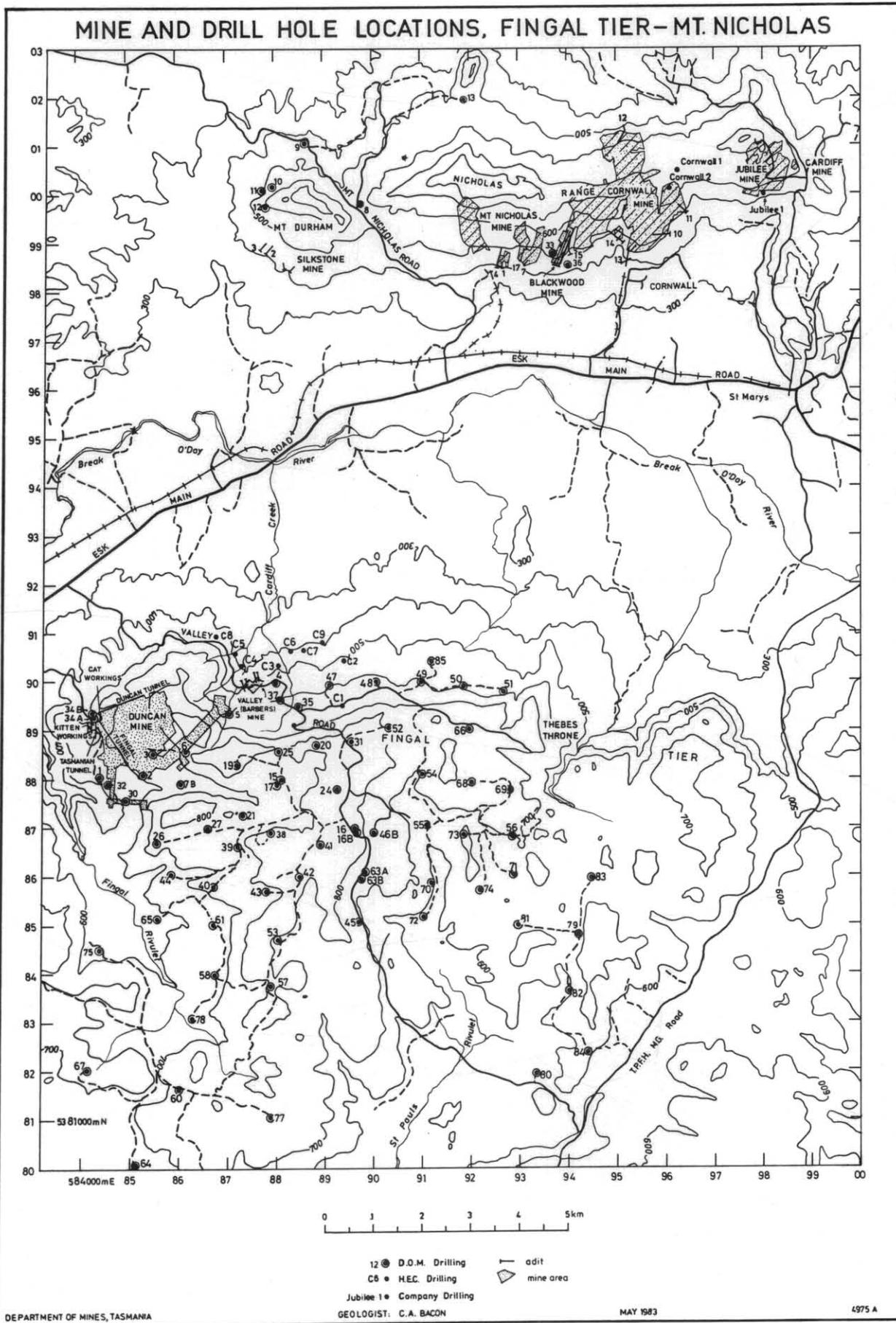
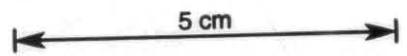


Figure 2.



The Duncan Mine opened in 1945 and the Tasmanian Mine in 1954. These three mines (Mr Yeates' Fingal Mine, the Cornwall Colliery's Duncan Mine, and the Tasmanian Mine) all worked the Duncan seam, and were located within a few hundred metres of each other on the eastern bank of Cat and Kitten Creek.

The Tasmanian Mine closed in 1957, but was reopened briefly by the Fingal Coal Company Pty Ltd from 1962-63. The Fingal Mine closed in 1965, but in 1970 the Cornwall Coal Company reopened the Fingal (Cat) tunnel, as unstable ground was forcing closure of the adjacent Duncan Mine. The Fingal (Cat) tunnel was retimbered and driven ahead into virgin coal, and now forms part of the main heading and part of the belt road of the current Duncan Mine. The return air from the current mine is directed through the old workings around the Duncan Tunnel.

Several kilometres east of these workings, in a tributary of Cardiff Creek where Hills *et al.* (1922) saw prospecting works, another small mine opened in 1955. This was known as Barber's No. 1, later renamed the Valley No. 1 Mine. A second set of headings a few hundred metres east of the first were driven in 1963; these were called Barber's No. 2 or the Valley No. 2 Mine, and were owned by Mr Barber who had formed the Valley Coal Company Pty Ltd.

The Fingal Mine (1920-1965)

In 1920 the Fingal Coal Prospecting Syndicate drove two tunnels into an outcrop of coal near Coal Creek (now called Cat and Kitten Creek; the seam is now called the Duncan Seam). Over the next twenty years almost 18 000 tonnes of coal were produced. The two tunnels were known locally as the Cat and the Kitten. The Kitten workings were abandoned after coal was found to have been intruded by dolerite 220 m from the entrance (Blake, 1960).

The leases were transferred to H.J.E. Yeates in 1942, who formed the Fingal Coal Company Pty Ltd and began a series of mine improvements. The old Cat tunnel was renamed the Fingal tunnel, and a new adit was dug adjacent to the Fingal tunnel to serve as a return airway. This was simply called the Main Return Airway.

Production increased from 847 t in 1938 to 4000 t in 1942 from four employees. A ventilation fan was installed in 1946 and a water pump in 1948. The coal was mined by hand, using the bord and pillar method. Production steadily increased, from 12 565 t (15 employees) in 1949 to 22 608 t (17 employees) in 1950, which, at 1738 tonnes/man/year was the highest production per employee of any mine in the State for 1950. Mining was done by hand on a contract basis.

In 1958 seam conditions began to deteriorate and in 1960 large faults with throws of up to six metres were encountered in both the Fingal (Cat) tunnel and the Main Return Airway. In 1962 pillars were pulled along the boundary of the Fingal Colliery-Duncan Colliery leases. In 1965 the mine closed due to the loss of a major market when the Goliath Cement Company's factory at Railton changed from burning coal to oil.

In 1969 the Fingal tunnel was reopened due to the forced closure of the adjacent Duncan Mine. The Fingal (Cat) tunnel was wholly rehabilitated and now serves as part of the main heading for the current Duncan Mine.

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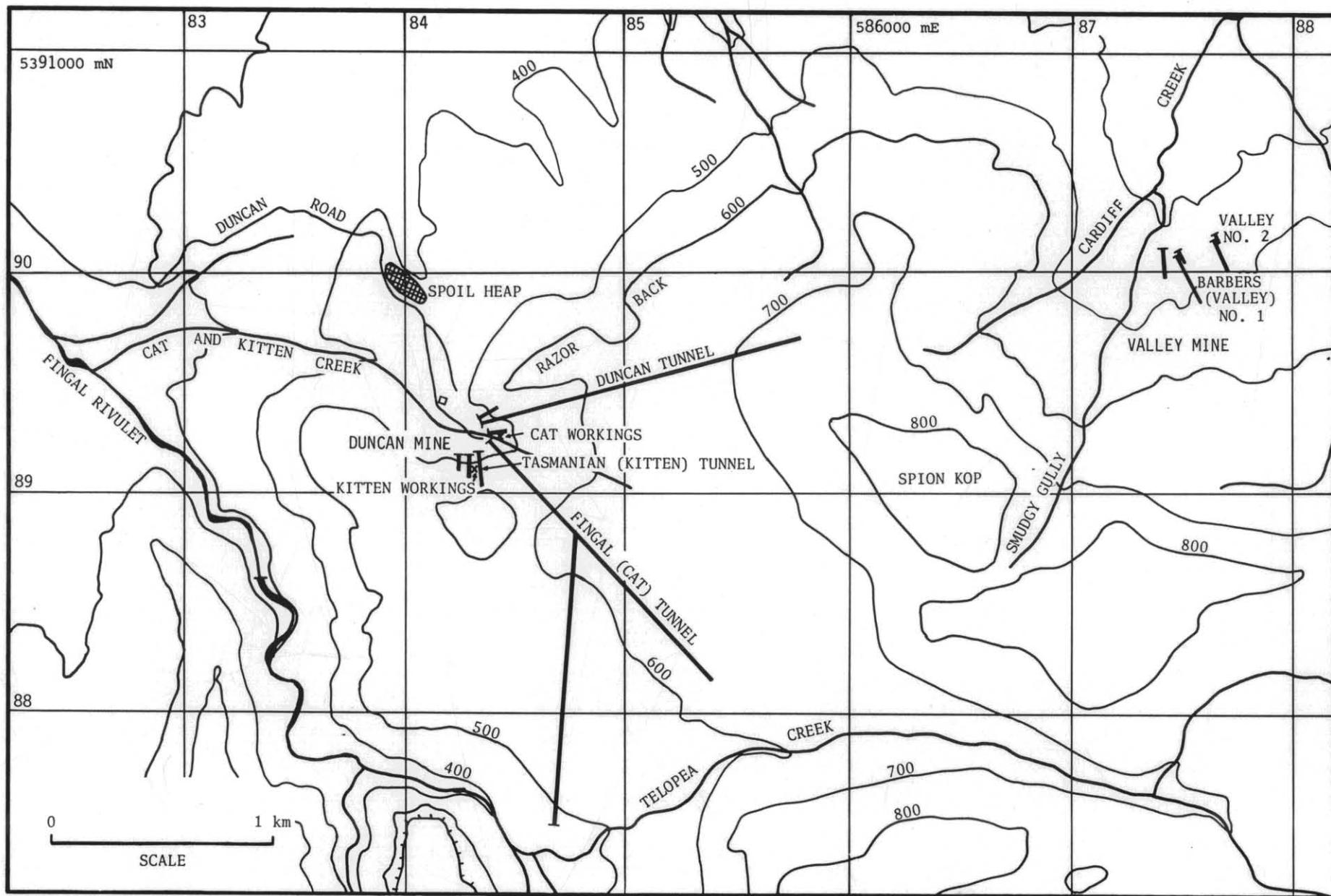


Figure 3. Location of mine adits, Fingal Tier. Contour interval = 100 m.

5 cm

8/30

The Duncan Mine (1946-present day)

The Duncan Mine was opened by the Cornwall Coal Company in 1945 and originally consisted of a main heading (the Duncan tunnel) and an adjacent return airway. Production in the first full year of operation was about 3300 t of coal from six employees, climbing to about 27 000 t from 31 employees in 1953.

The mine was partly mechanised in 1955 with the introduction of an arc-wall coal cutter and two shuttle cars. Some hand mining continued until 1961 when the mine was completely mechanised. A washing plant was installed adjacent to the Esk Highway and railway line in 1959, and was used for the first time in 1960, washing coal from the Company's Cornwall Mine near St Marys and the Duncan Mine at Fingal. Output from the mine increased to 83 100 t in 1961, and was again increased in 1964 when the Cornwall Mine closed and the company sought to fulfil all orders with coal from the Duncan Mine. Developmental work was reported to be intermittent in 1966. In 1966 the Company drilled one hole in the vicinity of the Fingal (Cat) tunnel in order to test a lower seam (East Fingal seam). Mechanisation was improved in 1968 with the addition of a CM38H Lee Norse Continuous Miner. Creep which had hindered mining activity forced the mine to close in 1969 and all activity was transferred to the nearby Fingal (Cat) tunnel, in the same seam close to the Duncan tunnel.

By 1970, the Fingal tunnel was completely re-timbered and work proceeded through the old workings to virgin coal beyond. Minor production came from the 'Burma Section' of the old Duncan Mine in 1970. In 1971, dewatering of the old main heading (Duncan tunnel) commenced, and the Duncan Mine finally consisted of the old Duncan workings through which the return airway was vented, and the Fingal (Cat) tunnel, which was used partly as a main heading and partly as a belt road. An area between the Duncan and Fingal tunnels has been called the Cat Workings. This is shown on Figure 2. Production in 1978 was 223 957 t from 107 employees. Infrastructure such as a pit office, bath house, and first aid room was added to the mine. A centrifuge was added to the washery, and another continuous miner acquired for work in the mine. In 1979 mining conditions were reported to be poor, and in 1981 an attempted break out in the area above the old Valley Mine was abandoned due to dolerite intrusions and excessive floor heave. A second point of egress was provided in 1982 in the south-western part of the mine area. Problems with water, floor heave and minor faulting have been present since the mine opened, however, production has increased from about 3300 t from six employees in 1946 to 264 962 t in 1981/82.

Tasmanian Mine (1954-1957, 1962-1963)

This mine opened in 1954, with the digging of two adits a few metres to the south-west of the old Kitten tunnel, which was renamed the Tasmanian tunnel and used as access to the new mine.

The coal was mined from the Duncan seam, worked also by the Fingal and Duncan Mines. Production for the first year was 1540 t of coal, and employment was provided for nine men. The mine closed in 1957. The workings, which were not extensive, were in badly faulted ground. A minor connection was made between the Tasmanian Mine and the adjacent Fingal Mine. The position of the mine workings is shown on Figure 3. On the closure of the Tasmanian Mine in 1957, the leases were taken over by the Fingal Coal Company, which reopened the mine briefly from 1962-1963, but the mine was closed as ventilation and safety regulations could not be met.

Barber's (Valley) Mines (1955-1964)

Two kilometres north-east of the Duncan, Fingal and Tasmanian Mines are two small mines, the first of which started in 1955 and was known as Barber's Mine. This seam appears to be a locally developed lower split of the main Duncan Seam mined in the Duncan and Fingal Mines.

An adit was put in on an outcrop of coal in a seam which measured 2.01 m thick, and 623 t of coal were removed. A fault was encountered a short distance to the left of the main heading and the tunnel was abandoned. A new tunnel was driven in a short distance to the east of the first. Both these adits comprised Barber's Mine. In 1960, a second entrance for a return airway was built next to the 'new' tunnel and a fan installed. In 1962, these workings were renamed the Valley Mine, but closed at the end of the year. Two new adits to the east of the Valley Mine were dug in 1963, and these were named the Valley No. 2 Mine. Coal was cut mechanically but loaded by hand and drawn to the surface by horse-drawn skips. The Valley No. 2 closed at the end of 1964 due to a loss of markets, when the part-owners, Goliath Cement Ltd, changed their Railton plant from coal to oil burning. Inspections of the workings were made by Hughes (1955, 1959); Hughes (1959) calls the workings the Cardiff Colliery, as the mine was located on a tributary of Cardiff Creek.

COAL QUALITY

Results of analyses from Department of Mines drilling are given in Threader and Bacon (1983). A summary of analytical data pertaining to the Duncan Seam is given in Appendix 3.

An average analysis for *in situ* coal from the Duncan seam would be:

Moisture (%)	5-10
Ash (%)	≈30
Volatile matter (%)	≈30
Fixed carbon (%)	≈30-35
Total sulphur (%)	<0.5
Specific energy (MJ/kg)	22-24

The following analyses are from mines which worked the Duncan seam:

	(1)	(2)	(3)	(4)	(5)	(6)
Moisture (%)	5.2	7.9	4.28	4.27	4.37	4.38
Ash (%)	26.3	24.10	43.60	21.1	21.60	22.30
Volatile matter (%)	25.4	25.50	18.70	23.5	23.90	23.7
Fixed carbon (%)	43.1	43.50	33.42	51.1	50.13	49.62
Total sulphur (%)	0.27	0.26	-	0.24	0.21	0.30
Specific energy (MJ/kg)	21.1	20.0	-	23.3	23.5	23.4

- (1) Hughes (1955) spot sample, Barber's Colliery, 12.8 m from portal.
- (2) Hughes (1955) spot sample, Barber's Colliery, end of drive, 24.7 m from portal.
- * (3) DOM 1965, Valley No. 2; lower seam near portal.
- * (4) DOM 1965, Valley No. 2; main seam near portal.
- * (5) DOM 1965, Valley No. 2; main seam near face.
- * (6) DOM 1965, Fingal Colliery.

* Collected by V.M. Threader, 1965.

RECENT EXPLORATION

Coal exploration by the Department of Mines began in 1959 with a scout drilling programme aimed at delineating extensions of the seams worked at the Duncan, Fingal, and Valley mines (Blake, 1959; Baird, 1960; Threader, 1965). In 1972 drilling commenced on a half-mile grid to prove a reserve of coal for power generation. The grid was changed from half-mile to one kilometre in 1978. Drilling in 1978 concentrated on an area of 94 km² entitled the Fingal Valley Exempt Area, Statutory Rule 1978/110 (amended SR 1964/167). In 1979 two other areas were added to the Department of Mines Exempt Area:

- (a) Mount St John Exempt Area 78 km² SR 1979/107.
- (b) Fingal Exempt Area 368 ha, SR 1979/107 (amended to 176 ha, 1979/168).

The total area investigated by the Department of Mines was 174 km². From 1972-1982 sixty-nine holes were drilled in the area, including eight holes drilled to assist the coal company to locate new adit entries. An additional five holes were drilled nearby for stratigraphic control of the gravity survey of the coalfields.

In March 1981 the western part of the exempt area was taken up by the Cornwall Coal Company N.L. as EL 17/81, which was later consolidated as part of EL 50/82. The remainder of the exempt area is referred to as Fingal Exempt Area SR 1981/32.

The Department of Mines constructed 45 km of access road in addition to upgrading old forestry roads which traversed the area. Five drilling rigs were employed during the programme. The drill locations and collar elevations were surveyed and tied to State datum (Appendix 1).

All holes were fully cored. Coal sections were sampled for analysis, the results of which are given in Threader and Bacon (1983).

A detailed gravity survey was conducted by the Department of Mines over the Fingal Tier area. The results are given in Leaman and Richardson (1981). The survey defined dolerite feeders, dolerite cap variations, and specified definite exploration target zones.

POTENTIAL FOR FUTURE EXPLORATION

In the estimation of the reserves the following parameters have been used:

- (1) The seam thickness is more than 1.5 m and less than 3.0 m.
- (2) Areas where the ash content of the seam is known to be more than 40% have been excluded from the calculation. Analyses are not available for all seam intersections and so there is no quality control over parts of the reserve areas.
- (3) No consideration has been given to mining access, which in SR 32/81 is likely to prove difficult.

The areas of EL 50/82 and ML 46/80 are held by the Cornwall Coal Company N.L. and the area SR 32/81 is exempt from the Mining Act. Further details on reserve calculations are given in Threader and Bacon (1983).

The Department of Mines has proved the following reserves on Fingal Tier:

Seam	Area	Reserves (x 10 ⁶ t)	
		Measured	Indicated
D	part of EL 50/82 SR 32/81		67.4
			<u>37.4</u>
	Total		104.8
F (Duncan)	part of EL 50/82 ML 46/80	35.7	
		<u>32.5</u>	
	Total	68.2	
Gu (East Fingal Upper Split)	part of EL 50/82 ML 46/80		59.9
G1 (East Fingal Lower Split)	SR 32/81		17.7

Total measured and indicated reserves : 250.6 million tonnes

Tonnages of recoverable coal are dependant on geological and mining constraints, coal quality and market conditions, and cannot be calculated on the available data for the D and G (East Fingal) seams. The recoverable reserves of the Duncan seam are likely to be in the order of 50% of the *in situ* reserve, i.e. 34 million tonnes.

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[27 July 1983]

APPENDIX 1

Collar elevations and AMG co-ordinates of diamond drill holes, Fingal Tier

Hole No.	AMG Reference (m)		Level (m)	Hole No.	AMG Reference (m)		Level (m)
	Easting	Northing			Easting	Northing	
1	584 453	5 387 990	525.5	42	588 516	5 385 917	813.1
2	585 344	5 388 092	608.7	43	587 864	5 385 657	785.1
3	585 529	5 388 506	641.9	44	585 907	5 386 010	668.5
4	588 032	5 389 999	546.8	45	589 749	5 385 088	707.8
5	587 035	5 389 374	575.8	46A	590 032	5 386 888	772.9
6	586 187	5 388 579	739.8	46B	590 029	5 386 893	773.0
7	586 095	5 387 915	619.7	47	589 126	5 389 948	587.3
8	589 793	5 399 657	560.5	48	590 064	5 390 018	610.6
9	588 701	5 401 002	450.2	49	591 006	5 390 003	598.5
10	587 995	5 400 162	527.9	50	591 939	5 389 903	563.2
11	587 821	5 400 073	500.2	51	592 737	5 389 825	534.3
12	587 816	5 399 779	574.9	52	590 324	5 389 038	795.8
13	591 967	5 401 970	536.4	53	588 076	5 384 684	795.1
14	588 384	5 389 039	662.0	54	591 021	5 388 112	711.8
15	588 142	5 387 979	766.3	55	591 126	5 387 069	626.4
16	589 656	5 386 946	837.0	56	592 886	5 386 808	701.0
16B	589 652	5 386 933	834.1	57	587 913	5 383 734	803.0
17	588 085	5 387 885	777.5	58	586 755	5 383 968	637.9
18	579 211	5 376 590	664.5	59	587 494	5 382 058	802.3
19	587 233	5 388 295	847.2	60	586 038	5 381 636	725.2
20	588 884	5 388 677	811.0	61	586 760	5 385 011	639.3
21	587 379	5 387 365	758.5	62	584 367	5 383 489	704.5
22	586 294	5 373 414	407.4	63A	589 819	5 386 004	751.2
23	588 575	5 387 335	804.6	63B	589 792	5 385 902	746.4
24	589 313	5 387 760	830.8	64	585 114	5 380 032	626.0
25	588 094	5 388 535	784.1	65	585 601	5 385 115	572.7
26	585 602	5 386 673	733.8	66	591 979	5 389 037	778.2
27	586 664	5 386 968	745.7	67	584 136	5 381 975	742.0
28	582 264	5 386 855	442.0	68	592 064	5 387 912	779.1
29	582 003	5 385 109	686.4	69	593 017	5 387 754	715.1
30	584 953	5 387 560	519.4	70	591 243	5 385 885	603.6
31	589 551	5 388 735	828.9	71	592 905	5 386 048	653.9
Cornwall				72	591 054	5 385 192	580.8
1	596 328	5 400 593	624.8	73	591 885	5 386 843	706.8
Cornwall				74	592 215	5 385 722	643.0
2	596 125	5 400 132	624.5	75	584 421	5 384 507	585.2
32	584 649	5 387 867	533.3	76	586 327	5 379 532	745.8
33	593 770	5 398 700	509.3	77	587 891	5 381 024	732.4
34A	584 310	5 389 219	478.0	78	586 301	5 383 073	646.5
34B	584 228	5 389 354	466.4	79	594 214	5 384 798	675.7
35	588 478	5 389 500	630.8	80	593 300	5 381 907	592.2
36	594 048	5 398 509	436.2	81	593 053	5 385 006	647.5
37	588 097	5 389 662	596.3	82	593 978	5 383 650	588.6
38	587 950	5 386 903	810.2	83	594 484	5 385 832	675.7
39	587 224	5 386 540	778.7	84	594 343	5 382 402	639.1
40	586 728	5 385 786	724.3	85	591 218	5 390 466	533.8
41	588 949	5 386 618	812.4				

HEC Drilling

C1	EP89408953	C4	EP90338727	C7	EP88609069
C2	EP89449046	C5	EP87169060	C8	EP86769090
C3	EP88059038	C6	EP88159066	C9	EP89999084

LOCATION OF ADITS, FINGAL TIER

Fingal Mine

584 360 mE	5 389 245 mN	Fingal or Cat tunnel; now part of main and belt headings of current Duncan Mine
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Duncan Mine

584 315 mE	5 389 330 mN	Minor
584 300 mE	5 389 340 mN	Duncan tunnel; now part of return airway system of current Duncan Mine

Tasmanian Mine

584 265 mE	5 389 180 mN	Minor - into Kitten workings
584 220 mE	5 389 180 mN	Minor - into Kitten workings
584 340 mE	5 389 210 mN	Tasmanian tunnel into Kitten workings

Valley and Barber's Mines

587 395 mE	5 390 095 mN
587 450 mE	5 390 070 mN
587 455 mE	5 390 080 mN
587 625 mE	5 390 155 mN
587 620 mE	5 390 135 mN

APPENDIX 2

Data relating to dolerite thickness, quartzose sandstone,
and glaciomarine basement

Appendix 2

Hole number	Collar elevation (m.a.s.l.)	Depth to base of dolerite (talus*) (m)	Dolerite (talus*) base R.L. (m.a.s.l.)	Depth to top of quartzose sandstone unit (m)	Quartzose sandstone surface R.L. (m.a.s.l.)	Depth to Permian (m)	Permian surface R.L. (m.a.s.l.)	Depth of hole terminating in Triassic sediments (m)	Total depth of hole (m)	Quartzose sandstone thickness (m)	Upper Permian Super-Group thickness (m)
1	525.5	27.0*	498.5	216.41	309.09	n.r.	-	217.93	217.93	-	>190.93
2	608.7	60.35*	548.35	n.r.	-	n.r.	-	184.0	184.0	-	>123.65
3	641.9	88.39*	553.51	n.r.	-	n.r.	-	216.71	216.71	-	>128.82
4	546.8	12.48*	534.32	245.06	301.74	254.2	292.6	-	330.12	9.14	241.72
5	575.8	6.10*	569.7	n.r.	-	n.r.	-	269.60	269.60	-	>263.50
6	739.8	129.54	610.26	432.21	307.59	451.1	288.7	-	457.81	18.89	321.56
7A	619.7	9.14*	610.56	n.r.	-	n.r.	-	52.12	52.12	-	>42.98
7B	619.7	30.49*	589.21	312.93	306.77	341.58	278.12	-	351.74	28.65	311.09
14	662.0	300*(?)	362(?)	n.r.	-	n.r.	-	n.r.	300(?)	-	-
15	766.3	74.7	691.6	n.r.	-	n.r.	-	n.r.	74.7	-	-
16A	837.0	263.0	574	n.r.	-	n.r.	-	364.25	364.25	-	>101.25
16B	834.1	≈260	≈574.1	n.r.	-	n.r.	-	(?)	(?)	-	-
17	777.5	323.46	454.04	497.09	280.41	n.r.	-	505.29	505.29	-	>181.88
19	847.2	246.90	600.3	n.r.	-	n.r.	-	313.15	313.15	-	>66.25
20	811.0	246.81	564.19	n.r.	-	n.r.	-	465.54	465.54	-	>218.78
21	758.5	282.54	475.96	482.41	276.09	491.94	266.56	-	502.40	9.53	209.40
23	804.6	341.01	463.59	544.59	260.01	545.96	258.64	-	553.63	1.37	204.95
24	830.8	385.91	444.89	n.r.	-	n.r.	-	523.26	523.26	-	>137.35
25	784.1	193.83	590.27	498.46	285.64	511.02	273.08	-	525.93	12.56	317.19
26	733.8	240.80	493.0	446.60	287.2	n.r.	-	459.22	459.22	-	>218.42
27	745.7	259.91	485.79	454.20	291.5	478.53	267.17	-	487.96	24.33	218.62
30	519.4	27.0*	492.4	213.35	306.05	231.85	287.55	-	254.85	18.50	204.85
31	829.6	302.29	527.31	559.59	270.01	565.99	263.61	-	575.98	6.40	263.70
32	533.3	40.2*	493.1	224.49	308.81	256.02	277.28	-	274.67	31.53	215.82
34A	478.0	-	-	n.r.	-	n.r.	-	65.32	65.32	-	>65.32
34B	466.4	-	-	n.r.	-	n.r.	-	47.18	47.18	-	>47.18
35	630.8	94.6*	536.2	n.r.	-	n.r.	-	n.r.	94.60	-	-

34-17

17/30

Appendix 2 (continued)

Hole number	Collar elevation (m.a.s.l.)	Depth to base of dolerite (talus*) (m)	Dolerite (talus*) base R.L. (m.a.s.l.)	Depth to top of quartzose sandstone unit (m)	Quartzose sandstone surface R.L. (m.a.s.l.)	Depth to Permian (m)	Permian surface R.L. (m.a.s.l.)	Depth of hole terminating in Triassic sediments (m)	Total depth of hole (m)	Quartzose sandstone thickness (m)	Upper Permian Super-Group thickness (m)
37	596.3	48.88*	547.42	295.81	300.49	309.16	287.14	-	311.72	13.35	260.28
38	810.2	340.19	470.01	535.14	275.06	552.14	258.06	-	558.59	17.00	211.95
39	778.7	295.21	483.49	492.35	286.35	518.30	260.4	-	522.26	25.95	223.09
40	724.3	235.69	488.61	442.55	281.75	461.23	263.07	-	465.80	18.68	225.54
41	812.44	227.82	584.62	539.22	273.22	569.98	242.46	-	584.93	30.76	342.16
42	813.1	338.90	474.2	540.96	272.14	570.94	242.16	-	576.83	29.98	232.04
43	785.1	315.01	470.09	503.02	282.08	n.r.	-	506.03	506.03	-	>191.02
44	668.5	178.16	490.34	338.99	329.51	402.64	265.86	-	407.23	63.65	224.48
45	707.8	126.00	581.8	440.25	267.55	468.74	239.06	-	471.22	28.49	342.74
46A	772.9	38.08	734.82	n.r.	-	n.r.	-	-	38.08	-	-
46B	773.0	199.89	573.11	513.72	259.28	545.85	227.15	-	547.21	32.13	345.96
47	587.33	44.16*	543.17	n.r.	-	n.r.	-	n.r.	44.16	-	-
48	610.56	45.68*	564.88	n.r.	-	n.r.	-	n.r.	45.68	-	-
49	598.52	165.15	433.37	395.77	202.75	408.87	189.65	-	414.04	13.10	243.72
50	563.20	79.00	484.20	343.52	219.68	366.60	196.60	-	368.30	23.08	287.60
51	534.30	59.00*	475.30	n.r.	-	n.r.	-	261.00	261.00	-	>202.00
52	795.8	411.93	383.87	538.93	256.87	552.82	242.98	-	557.42	13.89	140.89
53	795.1	212.70	582.4	n.r.	-	n.r.	-	467.85	467.85	-	>255.15
54	711.8	391.55	320.25	511.86	199.94	524.09	187.71	-	530.45	12.23	132.54
55	626.4	98.01	528.39	427.91	198.49	441.84	184.56	-	470.65	13.93	343.83
56	701.0	198.05	502.95	n.r.	-	n.r.	-	405.44	405.44	-	>207.39
57	803.4	247.86	555.54	551.31	252.09	570.17	233.23	-	573.80	18.86	322.31
58	637.9	9.00*	628.9	360.0	277.9	392.16	245.74	-	399.00	32.16	383.16
59	802.3	232.13	570.17	548.5	253.8	n.r.	-	572.68	572.68	>24.18	>342.68
60	725.2	134.34	590.86	453.79	271.41	n.r.	-	-	474.00	-	>339.66
61	639.3	150.10	489.20	364.50	274.80	394.96	244.34	-	462.00	30.46	244.86
62	704.5	338.15	366.35	442.72	261.78	450.76	253.74	-	452.83	8.04	112.61

Appendix 2 (continued)

Hole number	Collar elevation (m.a.s.l.)	Depth to base of dolerite (talus*) (m)	Dolerite (talus*) base R.L. (m.a.s.l.)	Depth to top of quartzose sandstone unit (m)	Quartzose sandstone surface R.L. (m.a.s.l.)	Depth to Permian (m)	Permian surface R.L. (m.a.s.l.)	Depth of hole terminating in Triassic sediments (m)	Total depth of hole (m)	Quartzose sandstone thickness (m)	Upper Parmeener Super-Group thickness (m)
63A	751.2	24.38*	726.82	n.r.	-	n.r.	-	n.r.	24.38	-	-
63B	746.4	16.76*	729.64	n.r.	-	n.r.	-	n.r.	16.76	-	-
64	626.0	124.20	501.80	369.00	257.00	392.81	233.19	-	397.02	23.81	268.61
65	572.70	155.20	417.50	293.20	279.50	n.r.	-	-	301.00	-	>145.80
66	778.2	426.17	352.03	n.r.	-	n.r.	-	581.61	581.61	-	>155.44
67	742.00	432.88	309.12	480.99	261.0	n.r.	-	-	488.81	-	>48.11
68	779.1	452.6	326.5	602.75	176.35	614.11	164.99	-	620.69	11.36	161.51
69	715.1	441.82	273.28	537.42	177.68	n.r.	-	546.11	546.11	-	>104.29
70	603.6	349.18	254.42	406.15	197.45	n.r.	-	416.27	416.27	-	>67.09
71	653.9	234.30	419.6	n.r.	-	n.r.	-	489.50	489.50	-	>255.20
72	580.8	342.65	238.15	373.15	207.35	382.40	198.40	-	391.00	8.95	39.75
73	706.8	196.56	511.24	n.r.	-	n.r.	-	496.69	496.69	-	>301.13
74	≈643.0	176.93	466.07	430.43	212.57	477.21	165.79	-	481.23	46.78	300.28
75	585.20	209.15	376.05	291.53	293.67	339.75	245.45	-	374.15	48.22	130.63
76	745.8	301.28	444.52	508.71	237.09	543.42	202.38	-	549.83	34.71	248.55
77A	732.40	34.90	697.50	n.r.	-	n.r.	-	132.20	132.20	-	-
77B	732.40	160.00	572.40	n.r.	-	n.r.	-	445.00	445.00	-	>285.00
78	646.50	31.88	614.62	n.r.	-	n.r.	-	148.80	148.80	-	>116.92
79	675.70	152.89	522.81	490.95	184.75	496.93	178.77	-	502.00	5.98	344.04
80	592.20	236.52	355.68	417.94	174.26	426.81	165.39	-	438.70	8.87	190.29
81	647.50	105.97	541.53	n.r.	-	n.r.	-	438.62	438.62	-	>332.65
82	588.60	59.40	529.20	408.78	-	426.27	-	-	428.13	-	368.73
83	675.70	93.35	582.35	n.r.	-	n.r.	-	296.03	296.03	-	>202.68
84	639.10	133.10	506.00	n.r.	-	n.r.	-	253.89	253.89	-	>120.79
85	533.80	84.77*	449.03	n.r.	-	n.r.	-	283.05	283.05	-	>250.75

Appendix 2 (continued)

Hole number	Collar elevation (m.a.s.l.)	Depth to base of dolerite (talus*) (m)	Dolerite (talus*) base R.L. (m.a.s.l.)	Depth to top of quartzose sandstone unit (m)	Quartzose sandstone surface R.L. (m.a.s.l.)	Depth to Permian (m)	Permian surface R.L. (m.a.s.l.)	Depth of hole terminating in Triassic sediments (m)	Total depth of hole (m)	Quartzose sandstone thickness (m)	Upper Permian Super-Group thickness (m)
MT NICHOLAS											
8	560.5	0.10*	560.4	215.37	345.13	227.46	333.04	-	250.70	12.09	227.36
9	450.2	0	0	87.58(?)	362.62(?)	88.39	361.81	-	236.52	0.81(?)	88.39
10	527.9	43.28*	484.62	n.r.	-	n.r.	-	-	43.28	-	-
11	500.2	42.06*	458.14	n.r.	-	n.r.	-	139.57	139.57	-	>97.51
12	574.9	44.60*	530.3	208.82	366.08	218.19	356.71	-	223.93	9.37	173.59
13	536.4	1.52*	534.88	n.r.	-	n.r.	-	228.50	228.50	-	>226.98
33	509.3	15.62*	493.68	188.73	320.57	198.34	310.96	-	199.56	9.61	182.72
36	436.2	11.50*	424.7	n.p.	-	124.30	311.9	-	133.26	-	112.80
MERRYWOOD											
18	664.5	371.50	293	n.r.	-	n.r.	-	424.80	424.80	-	>53.3
LOCHABER											
22	407.4	0	407.4	n.r.	-	n.r.	-	228.56	228.56	-	>228.56
VERTICAL ACRE											
28	442.0	0	442.0	116.26	325.74	150.57	291.43	-	160.48	34.31	150.57
29	686.4	346.10	340.3	394.02	292.38	424.63	261.77	-	431.43	30.61	78.53

Note: n.r. = not reached n.p. = not present

34-20

20/30

APPENDIX 3
Summary of Duncan seam data

Appendix 3

DDH No.	Depth from (m)	Depth to (m)	Recovery (m)	Seam Interval (m)	Working Section (m)	Ash content, mass%, dry basis		
						Plys	Whole seam	Working Section
2	176.99	178.69	1.70	2.00	2.00	23.2	25.0	25.0
	178.71	178.99	0.28			49.9		
3	210.21	211.56	1.35	2.34	2.34 or 1.70	23.7	32.9	27.4
	211.56	211.91	0.35			42.8		
	211.91	212.55	0.64			48.2		
4	122.73	123.44	0.71	0.71	-	47.9		
	127.87	128.40	0.51	0.51	-	52.3		
5	143.00	144.02	0.91	1.02	1.81	26.8		
	147.14	148.95	1.80	1.81		30.7		
6	305.05	305.97	0.69	2.75	2.75	22.3	26.7	26.7
	305.97	306.88	0.69			19.8		
	306.88	307.80	0.69			38.0		
7	183.54	185.01	1.47	2.23	2.23	24.4	29.5	29.5
	185.01	185.77	0.76			39.4		
8-16	either lie outside the exempt area or were abandoned							
17	380.11	381.43	1.32	1.32	-	34.3		
18	Outside the exempt area							
19	428.25	429.80	0.55	1.55	1.55	32.6	25.0	25.0
			1.00			21.6		
20	412.78	413.94	1.16	2.32	2.32	34.7	31.8	31.8
			413.94			415.10		
21	348.04	349.07	1.03	2.07	2.07	26.8	26.7	26.7
			349.07			350.11		
22	79.28	79.83	0.45	0.45	-	24.3	24.3	-

34-22

22/30

Appendix 3 (continued)

DDH No.	Depth from (m)	Depth to (m)	Recovery (m)	Seam Interval (m)	Working Section (m)	Ash content, mass%, dry basis		
						Plys	Whole seam	Working Section
23	412.30	-	0.99	2.83	2.83	31.1	27.0	27.0
	-	-	0.97			27.6		
	-	415.13	0.77			21.6		
24	441.12	441.22	0.10	2.53	2.13	21.8	36.3	28.6
	441.52	442.18	0.66			31.6		
	442.18	442.91	0.73			19.4		
	442.91	443.65	0.74			35.2		
25	376.07	376.45	0.38	1.64	-	51.2	42.7	
	376.45	376.99	0.54			23.5		
	376.99	377.14	0.15			44.2		
	377.28	377.71	0.43			33.2		
26	310.35	310.57	0.22	2.60	2.60	26.8	34.6	34.6
	310.57	310.70	0.13			100.0		
	310.70	311.07	0.37			28.7		
	311.07	311.08	0.01			100.0		
	311.08	311.68	0.60			29.6		
	311.68	312.18	0.50			29.8		
	312.18	312.55	0.37			28.0		
	312.55	312.60	0.05			44.9		
	312.60	312.95	0.35			38.5		
27	334.13	334.28	0.15	2.59	2.59	48.3	34.4	34.4
	334.28	334.36	0.08			100		
	334.36	334.44	0.08			22.8		
	334.44	334.51	0.07			100		
	334.51	334.81	0.30			22.8		
	334.81	335.11	0.30			26.6		
	335.11	335.19	0.08			100		
	335.19	335.37	0.15			24.1		
	335.37	336.04	0.55			24.1		
	336.04	336.72	0.55			29.0		

34-23

23/30

Appendix 3 (continued)

DDH No.	Depth from (m)	Depth to (m)	Recovery (m)	Seam Interval (m)	Working Section (m)	Ash content, mass%, dry basis			
						Plys	Whole seam	Working Section	
28	collar elevation below the Duncan seam								
29	dolerite intruded to below level of the Duncan seam								
30	71.49	71.77	0.28	2.32	2.32	28.2	40.6	40.6	
	71.77	72.01	0.24			56.1			
	72.01	72.35	0.33			35.9			
	72.35	72.49	0.13			100			
	72.49	72.87	0.37			27.7			
	72.90	72.81	0.88			25.0			
31	431.67	432.17	0.50	0.50	-	-	-		
32	82.24	83.09	0.85	1.63	1.63	43.4	39.5	39.5	
	83.17	83.87	0.70			27.8			
33-36	lie outside the exempt area, failed to intersect the Duncan seam or were abandoned								
37	180.30	180.48	0.16	2.07	-	59.1	47.2		
	180.48	181.26	0.78			27.4			
	181.67	181.84	0.17			44.5			
	181.86	182.23	0.37			25.4			
	182.23	182.37	0.13			43.0			
38	411.58	414.65	2.28	5.89	2.49	90.1	63.0	26.1	
	414.65	417.14	2.49			26.1			
	417.14	417.47	0.33			87.1			
39	365.71	368.18	2.47	5.30	2.83	85.8	55.9	31.2	
	368.18	369.25	1.07			39.1			
	369.25	371.01	1.76			26.3			
40	307.84	308.29	0.45	3.19	1.59	65.5	49.7	29.1	
	308.29	309.88	1.45			29.1			
	309.88	311.03	1.15			72.2			

34-24

24/30

Appendix 3 (continued)

DDH No.	Depth from (m)	Depth to (m)	Recovery (m)	Seam Interval (m)	Working Section (m)	Ash content, mass%, dry basis		
						Plys	Whole seam	Working Section
41	404.27	404.64	0.37	2.71	2.71	36.4	30.8	30.8
	404.64	405.84	1.20			27.4		
	405.84	406.98	1.14			32.6		
42	423.95	424.44	0.49	2.82	2.82	40.6	29.68	29.68
	424.44	425.72	1.28			24.4		
	425.72	426.77	1.05			31.9		
43	386.30	387.67	1.37	2.57	2.57	27.8	27.9	27.9
	387.67	388.87	1.20			28.7		
44	250.16	251.51	1.35	2.73	2.73	29.8	28.2	28.2
	251.51	252.89	1.38			26.6		
45	309.55	310.90	1.35	1.35	-			
46	371.33	372.91	1.58	2.14	1.58	31.6	45.4	31.6
	372.91	373.47	0.56			84.7		
47-48	pre-collared only							
49	Duncan seam not present							
50-51	Duncan seam not present							
52	411.99	412.81	0.81	0.81	-	58.2	58.2	-
53	396.67	399.03	2.36	2.36	2.36	26.4	26.4	26.4
54	391.55	392.20	0.65	0.65	-	no analysis		
55	297.60	299.19	1.59	1.59	-	54.1	54.1	-
56	Duncan seam not reached (drill hole abandoned)							

34-25

25/30

Appendix 3 (continued)

DDH No.	Depth from (m)	Depth to (m)	Recovery (m)	Seam Interval (m)	Working Section (m)	Ash content, mass%, dry basis		
						Plys	Whole seam	Working Section
57	416.04	419.16	3.12	3.12	1.72	no analysis		
58	229.56	230.73	1.17	1.17	-	42.6	42.6	-
59	423.29	424.03	0.74	0.74	-	no analysis		
60	324.79	325.52	0.73	0.73	-	no analysis		
61	228.47	228.67	0.20	2.49	-	no analysis		
	228.67	229.62	0.95					
	229.62	231.16	1.54					
62	dolerite intruded to below level of Duncan seam							
63A-63B	pre-collared only							
64	multiple dolerite intrusions; Duncan seam not present							
65	dolerite has intruded to below the level of the Duncan seam							
66	477.56	478.13	0.27	0.27	-	-	-	-
67	dolerite has intruded to below the level of the Duncan seam							
68	481.74	482.56	0.80	1.98	-	51.4	62.14	}
	482.56	483.72	1.16			69.3		
69	dolerite intruded to below level of the Duncan seam							
70	dolerite has intruded to below the level of the Duncan seam							
71	378.12	379.37	1.25	1.25	-	-		
	383.15	383.85	0.70	0.70	-	-		
72	dolerite intruded to below the level of the Duncan seam							
73	397.02	398.00	0.98	0.98	-	53.3		

34-26

26/30

Appendix 3 (continued)

DDH No.	Depth from (m)	Depth to (m)	Recovery (m)	Seam Interval (m)	Working Section (m) .	Ash content, mass%, dry basis		
						Plys	Whole seam	Working Section
74	354.64	355.90	1.26	1.26	-	56.0	56.0	-
75	dolerite has intruded to below the level of the Duncan seam							
76	Duncan seam not present							
77	353.70	354.20	0.50	0.50	-	no analysis		
78	Duncan seam not reached							
79	384.56	385.30	0.64	0.64	-	24.0	24.0	-
80	Duncan seam not present							
81	363.42	364.13	0.71	0.71	-	56.9	56.9	-
	366.51	366.95	0.44	0.44	-	31.0	31.0	-
82	294.65	299.01	4.36	4.36	?	no analysis		
83	Duncan seam not reached							
84	Duncan seam not reached							
85	Duncan seam not present							

34-27

27/30

APPENDIX 4

Ancillary analytical data, ash and ultimate analyses

Ancillary analytical data, Fingal Tier

DDH	82	82	82	82
From (m)	246.41	246.41	335.80	335.80
To (m)	249.47	249.47	337.74	337.74
Interval (m)	3.06	3.06	1.94	1.94
Seam	D	D	G	G
Sample	4B-4E	4B-4E Fl.7	9A-9C	9A-9C Fl.7
Air dried moisture (%)	4.6	4.5	4.0	3.8
Analysis (dry basis)				
Ash (%)	38.5	21.7	35.4	21.8
Volatile matter (%)	23.8	28.5	21.7	23.4
Fixed carbon (%)	37.7	49.8	42.9	54.8
Total sulphur (%)	0.34	-	0.26	-
Chlorine (%)	0.02	-	0.02	-
Specific energy				
db MJ/kg (gross)	19.88	-	20.48	-
daf MJ/kg (gross)	32.32	-	31.70	-
Crucible swelling number	‡	-	‡	-
Hardgrove grindability index	52	-	58	-
Fusibility of ash (reducing)				
Deformation temperature (°C)	1370	-	1320	-
Spherical temperature (°C)	+1550	-	+1550	-
Hemisphere temperature (°C)	+1550	-	+1550	-
Flow temperature (°C)	+1550	-	+1550	-

29/30

Ash analyses, Fingal Tier

DDH	82*	82*	+	°	°
From (m)	246.41	335.80			
To (m)	249.47	337.74			
Interval (m)	3.06	1.94			
Seam	D	G (East Fingal)	F (Duncan)	F (Duncan)	F (Duncan)
Sample	4B-4E	9A-9C	bulk; 250 lb from wash- ery	whole seam (inc. bands)	F1.6
Silicon as SiO ₂ (%)	63.0	56.2	62.2	62.7	63.0
Aluminium as Al ₂ O ₃ (%)	28.0	34.3	29.0	22.9	20.2
Iron as Fe ₂ O ₃ (%)	4.77	2.45	3.0	4.66	6.70
Calcium as CaO (%)	0.73	4.16	2.5	4.31	4.63
Magnesium as MgO (%)	1.29	0.64	1.2	1.01	1.19
Titanium as TiO ₂ (%)	1.20	1.25	nd	0.85	0.92
Sodium as Na ₂ O (%)	0.16	0.19	0.25	0.23	0.05
Potassium as K ₂ O (%)	1.55	0.79	1.1	1.19	0.36
Phosphorous as P ₂ O ₅ (%)	<0.01	<0.01	0.056	<0.01	<0.01
Manganese as Mn ₃ O ₄ (%)	0.10	0.12	nd	0.14	0.15
Sulphur as SO ₃ (%)	<0.01	1.24	0.58	0.68	1.35

* Department of Mines 1981 drilling; ° Department of Mines 1983

+ from BROWN, D.R. 1971. [Report on Fingal coal]. *Unpubl.Rep.Gippsland Minerals N.L.*

nd = not determined

Duncan Colliery - proximate and ultimate analyses of bulk coal samples

Coal state	run of mine* (unwashed)	washed ⁺	washed*
Date	October 1979	July 1971	May 1976
Seam	Duncan (F)	Duncan (F)	Duncan (F)
Sample	R-786 (2 tonnes)	250 lb	760531
<i>Ultimate Analysis</i>			
basis	dry ash free	not stated	oven dried
Carbon (%)	82.04	49.0	62.1
Hydrogen (%)	4.59	3.4	3.4
Nitrogen (%)	1.28	nd	0.84
Sulphur (%)	0.48	0.59	0.44
Oxygen (%)	11.61	nd	nd
Carbonates (%)	0.26	nd	0.29
<i>Proximate Analysis</i>			
Moisture (%)	4.6 ^{°°}	8.3 ^{°°}	6.5 [°]
Ash (%)	30.7	32.9	21.6
Volatile matter (%)	nd	nd	28.4
Fixed carbon (%)	nd	nd	49.9
Forms of sulphur			
Pyritic (%)	0.13	nd	nd
Sulphate (%)	0.02	nd	nd
Organic (%)	0.16	nd	nd
Hardgrove grindability index	54	nd	nd
Specific energy (MJ/kg)	nd	19.21	25.3

* Department of Mines

+ Brown (1971)

nd = not determined

° dry basis

°° basis not stated