

# Annual Report

## EL 17/2010 Fingal



**For the period 8/11/2012 to 8/11/2013**

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## **Introduction**

Exploration Licence 17/2010 was granted to Hardrock Investments Pty Ltd on the 8<sup>th</sup> November 2010. The licence conditions required the holder to complete the following in the first two years;

1. Data review.
2. Drill two HQ diamond holes drill holes.
3. Log and assay the core and metallurgical laboratory testing of the coal.

The minimum expenditure was \$66 000.

The intensive exploration effort on the adjacent EL 16/2010 delayed the drilling to the third year of the licence. A detailed data review was completed in the second year. Two drill holes were recently completed near Mt Slaughter and are currently being rehabilitated. Testing of the drill core is currently under way and will be reported on in the future.

## Location

Exploration Licence 17/2010 Fingal is located 2km south of the township of Fingal (see locality map Figure 1 below).

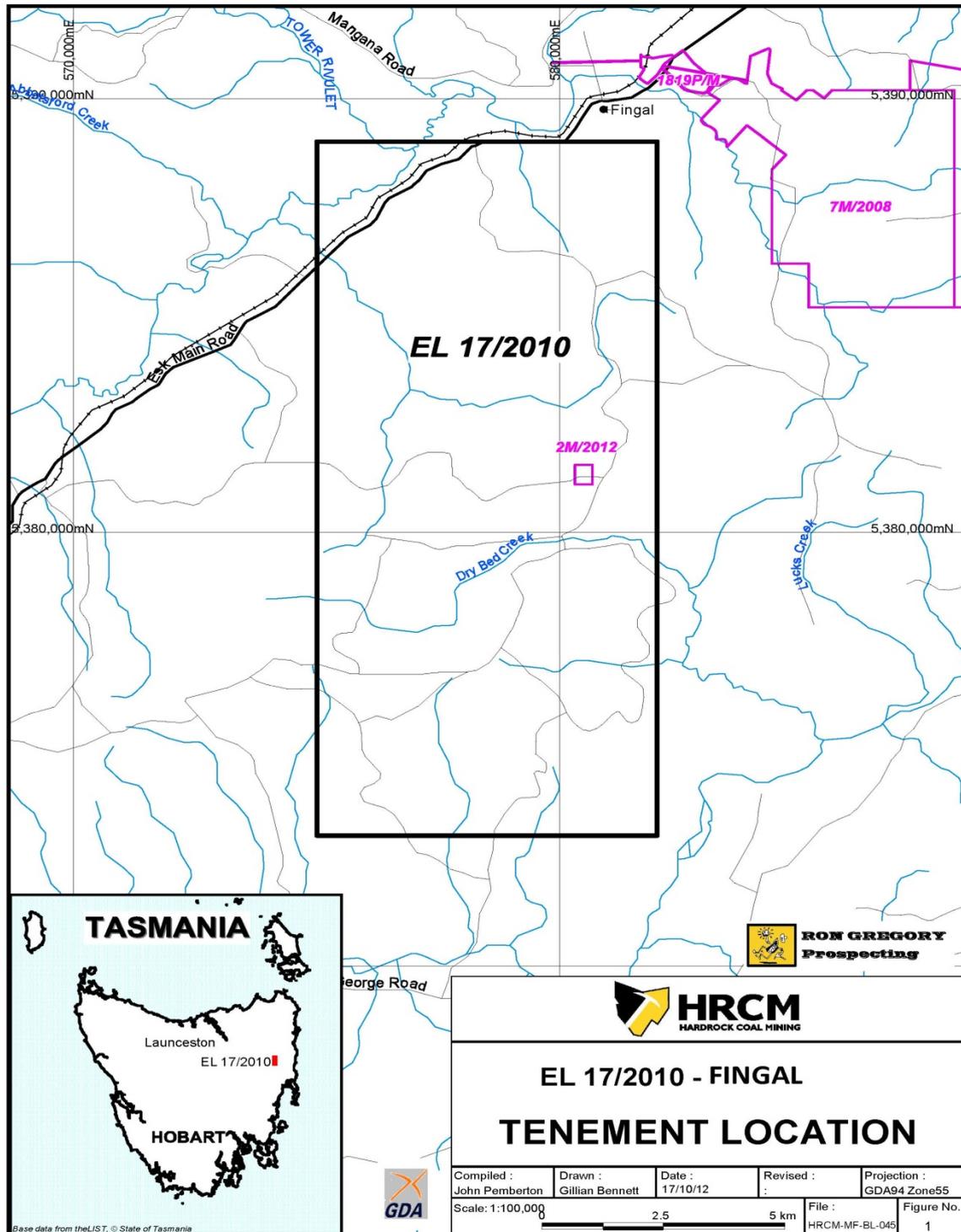


Figure 1 Locality map for EL 17/2010.

## Land Tenure

EL 17/2010 is mostly State Forest with a narrow band of private property along the northern and southern boundary (see Figure 2 below).

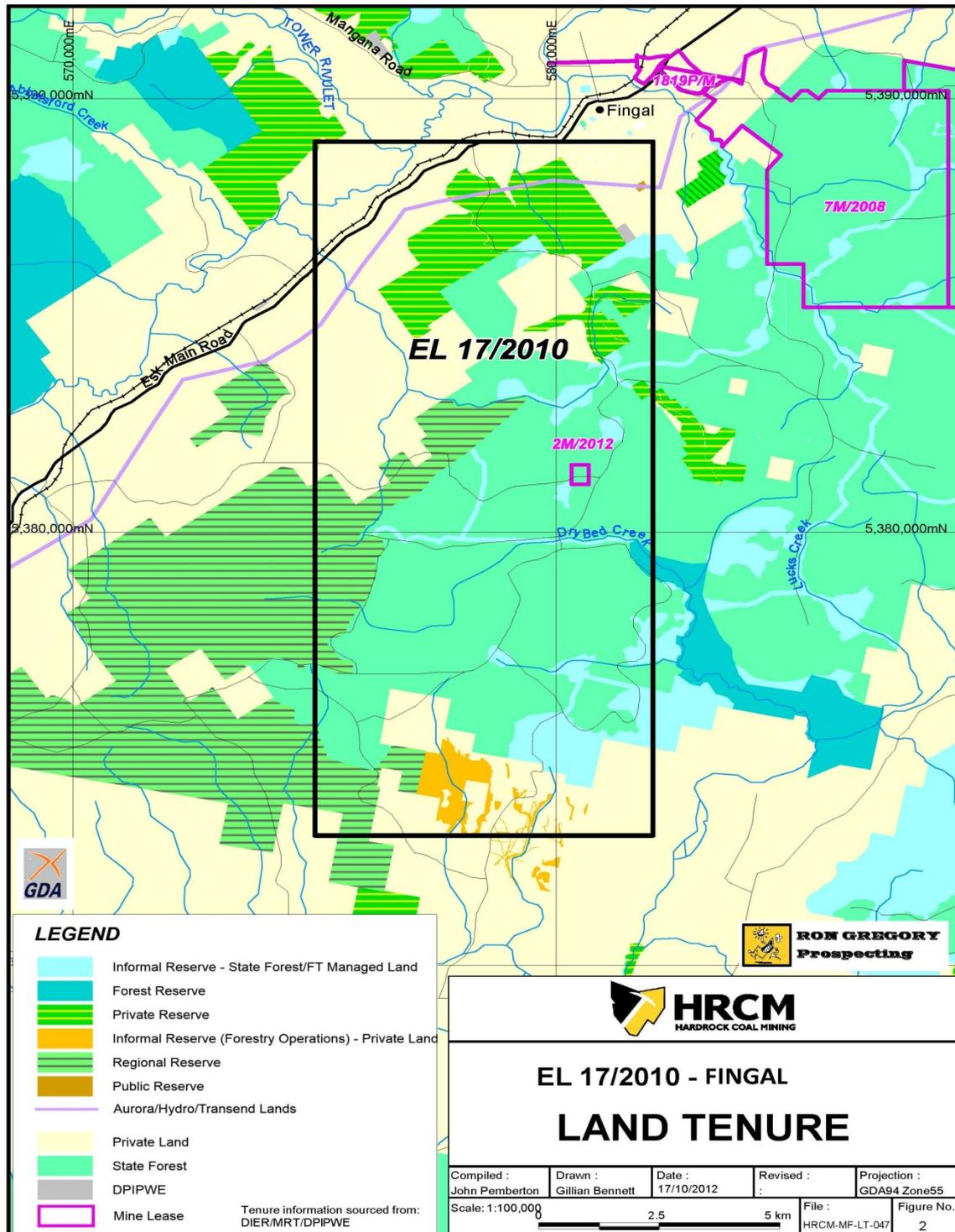


Figure 2 Land Tenure.

The three divisions of State Forest (State Forest, Informal Reserve and Forest Reserve) are all available for exploration and mining as are the areas of private property and the Private Reserves. Mining Lease 2M/2012 held by Tasmanian Pulp and Forest Holdings Pty Ltd is excluded from the licence.

## **Licence Details**

Tenement number:	EL 17/2010
Tenement name:	Fingal
Tenement location:	South of Fingal
Reporting period:	8 November 2012 – 8 November 2013
Tenement holder:	Hardrock Investments Pty Ltd
Tenement operator:	Hardrock Investments Pty Ltd
Tenement area:	112 sq km
Exploration logistics:	Ron Gregory Prospecting

## **Previous Work**

A detailed review of the literature describing the exploration and Department of Mines (DOM) work in this area was completed in 2011-2012.

Modern exploration in the area currently covered by EL17/2010 has concentrated on the Merrywood seam around the old underground and subsequent open cut mine. See Figure 3 below for the localities of the drill holes discussed in this section.

Bacon (1983) tentatively correlates the Merrywood seam with either seam B or C from the Fingal Tier. The seam is relatively thick at around 4m with 2m free of dirt bands.

16 holes have been drilled, with limited success, immediately to the east, south and west of the open cut. The Avoca Transport Company (see Anon., 1987) drilled two holes to the east and intersected the down faulted Merrywood seam. Unfortunately its shallow nature has resulted in weathering and oxidation. The holes to the south (see Morrison, 1992) were below the seam and one of those to the west did not penetrate through the dolerite scree and the other was stopped at 17.5m in sandstone.

Approximately 3.5km west of Merrywood Investigator Coal Exploration Pty Ltd (see Sangster, 1978) drilled DDH 78 RG 3 to 199.5m and intersected a number of seams that could be correlated with Merrywood.

The DOM (see Threader and Bacon, 1983) drilled three holes in this area with DOM DDH 18 Merrywood approximately 1.5km north of the Merrywood Mine. This hole drilled through 371.5m of dolerite and into the lower coal measures with no seams present. DOM DDH 29 on the northern end of the Fingal Tier intersected 346.10m of dolerite and it was interpreted to have intruded at the level of the East Fingal seam (lower part of the coal measures). DOM 28 was just to the south of Fingal below Bare Rock. It intersected the lower part of the

coal measures with some thin seams or bands of “coaly” material before the hole was stopped in the Permian at 160.45m.

Cornwall Coal Company NL (see Bryan, 1984) briefly explored the area and provided very little information in their few reports. Three short open holes on the northern and western slopes of Mt Foster were reported to have intersected the Permian. One diamond hole on the Fingal Tier (Mt Foster DDH 1) was stopped at 255m in dolerite.

The literature review identified the areas of the licence where further work would and would not be warranted.

The conclusion from the literature review included the following observations and recommendations:

- The drilling in the north of the licence and to the north west (DOM DDH 28 and DDH 29 and Cornwall Coal Company hole Mt Foster DDH 1 and RDH 1 to 3) strongly indicate that the dolerite sill has intruded into the lower part of the coal measures and the rafted coal bearing section has subsequently been eroded away.
- The drilling in the south has sterilised the area to the immediate north and east of the Merrywood Mine. DOM Merrywood 18 intersected 371m of dolerite and was stopped at 405m in the lower section of the coal measures. As the dolerite base was at RL 293 it was interpreted that the coal bearing sequence had been rafted up and eroded.
- The area to the north of drill hole 78 RG 3 and Hockeys Creek around Mt Slaughter has good prospectivity as the coal measures are present immediately to the south and the base of the dolerite is high up in the sequence.

Following on from this work two drill holes (see Figure 3 and Figure 4 below for locality) were proposed in the Mt Slaughter area to test the interpretation that the coal measures have not been lost due to the dolerite intruding low in the sequence.

A Dexon survey was promoted to the company as having the ability to identify and correlate coal seams beneath thick cover such as the dolerite which reaches over 400m on Fingal Tier. Few method specifications were provided other than the technology being labelled by Dexon as “Resonance Frequency Geological Technology”. The program consisted of a gridded helicopter airborne survey and “Vertical Sounding Confirmation Scans” at five sites which were at the time proposed drill sites on EL16/2010. Two of these sites were subsequently drilled and the seam intersections bore no correlation to those predicted by the Dexon survey.

It was concluded that this geophysical method is not effective for generating drill targets in the Valley Road area.

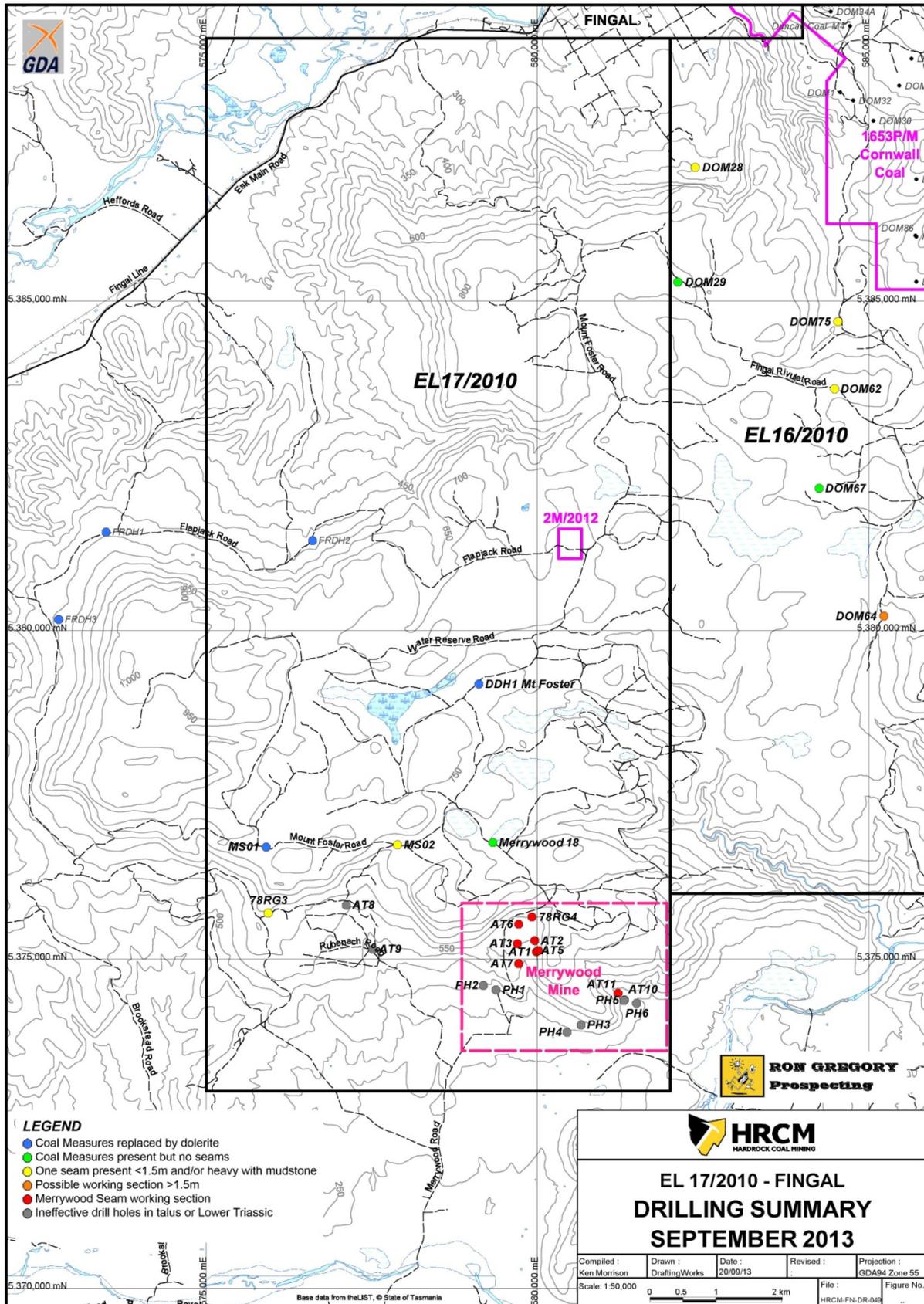


Figure 3 Drilling summary.

Note that these drill holes were subsequently renamed as MS-01 and MS-02.

## **Regional Geology**

Late Triassic coal measures in the Fingal Tier region comprise the uppermost sub division of the Late Carboniferous - Late Triassic Parmeener Supergroup (Tasmanian Geological Survey St Marys, Ben Lomond and Snow Hill 1:50,000 Sheets).

The Parmeener Supergroup unconformably overlies a basement comprising folded Silurian-Devonian meta turbidites of the Mathinna Supergroup, which are locally intruded by Devonian granites (Figure 5). These basement rocks and the Permo - Triassic stratigraphy underlying the coal measures crop out around the Fingal Valley but, with the exception of Triassic quartz sandstones which form the economic basement to the coal measures, are not encountered during coal exploration drilling. At the regional scale the coal measures show a south easterly dip of 1-2°.

Large volumes of Jurassic dolerite have intruded the Parmeener Supergroup stratigraphy, and in the project area dolerite covers most of the coal measures.

Cainozoic tectonic rifting and periglacial landscape development processes through the Fingal and Royal George Valleys have produced the escarpment and benched dolerite talus slope morphology which characterizes the landscape of the project area. The dolerite and derived talus deposits impose significant costs for coal exploration drilling. Dolerite dykes, often infilling faults, are occasionally encountered in the Duncan underground coal mine immediately east of the project area, and probably exist within EL17/2010.

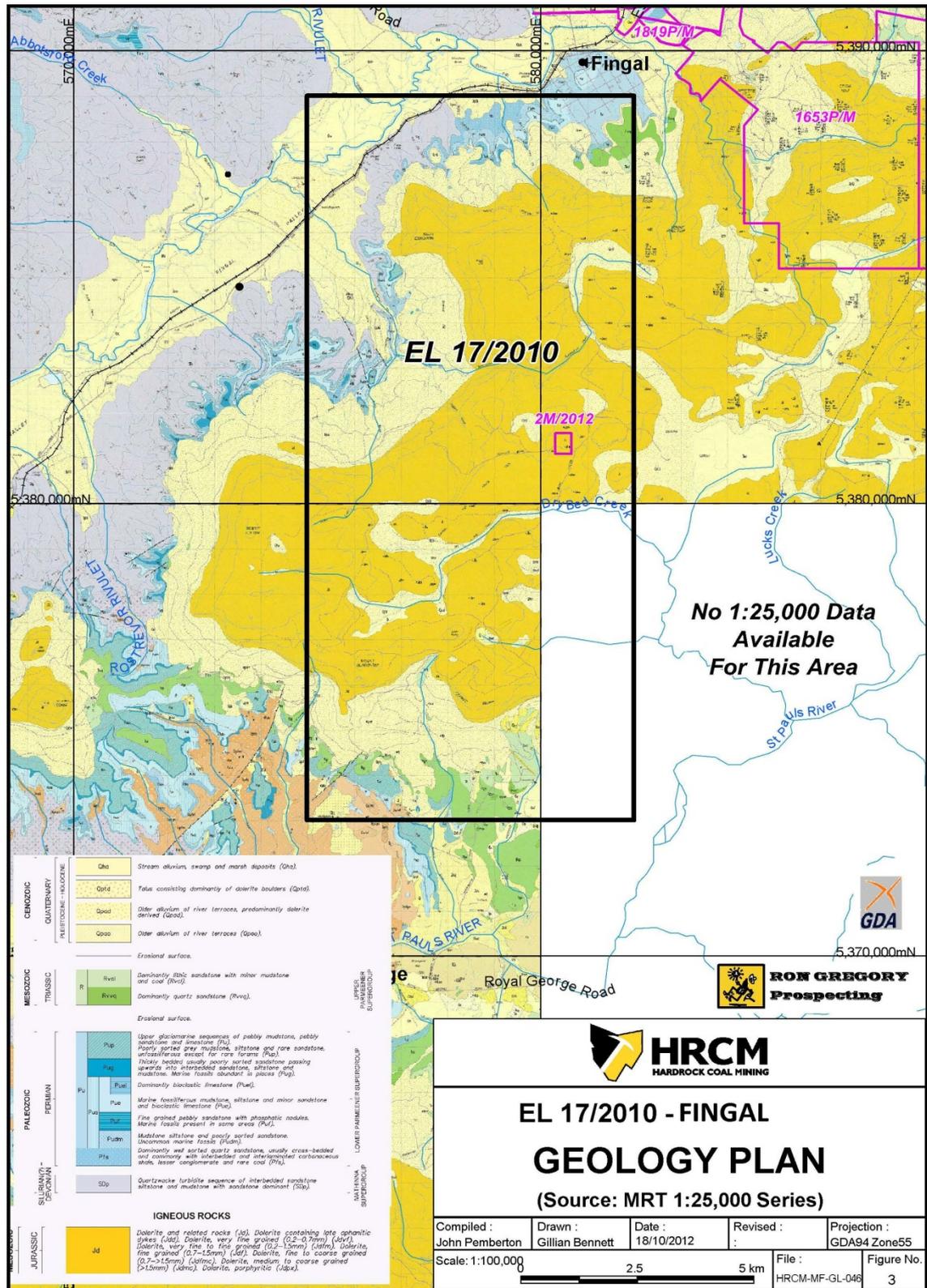


Figure 4 Geology Plan from MRT 1:25,000 map series.

## **Coal Measures Geology**

Correlation of drill core intersections in the Fingal Tier area by the DOM in the 1980s generated a series of 8 seams, labelled A to H from youngest to oldest (see Bacon, 1991). The coal seams are hosted within an approximate thickness of 250m of fluvial lithic sandstones and minor siltstones, argillic and carbonaceous mudstones, and minor airfall volcanoclastics. The lithic sandstones are in part sourced from a felsic volcanic province and the coal measures are dated at 214Ma via a rhyolitic volcanoclastic unit (Bacon and Everard, 1981).

All known coal mined and drilled in the Fingal Tier area (apart from minor occurrences of thermally altered coal near dolerite contacts) would be classed as dull with minor bright bands, inertinite-rich, medium rank, low sulphur, sub bituminous steaming coal.

## **Exploration Completed in 2012 – 2013**

### **Drilling Overview**

Two vertical exploration drill holes were completed in the Mt Slaughter area, accessed via the St Pauls River valley at the southern end of EL 17/2010 (Figure 3 & 4). The holes were designed to test either a north westerly extension of the Merrywood seam or a longer distance south westerly extension of any correlates with the Fingal Tier coal measures seams.

Stacpoole Enterprises, from Launceston, were contracted to drill the holes, using their truck mounted Mobile B90 universal rig with Terry Lodge as the senior driller. The program achieved a total of 664.75 metres, consisting of 111 metres of open hole percussion cuttings and 553.75 metres of HQ3 core. Drilling water was supplied in part from on-site ground sumps at each pad, and in part by water truck carting from a creek fed water hole, some 4 km by road to the north of the two drill sites. Both holes have been plugged by mixed cement-bentonite grout to the surface.

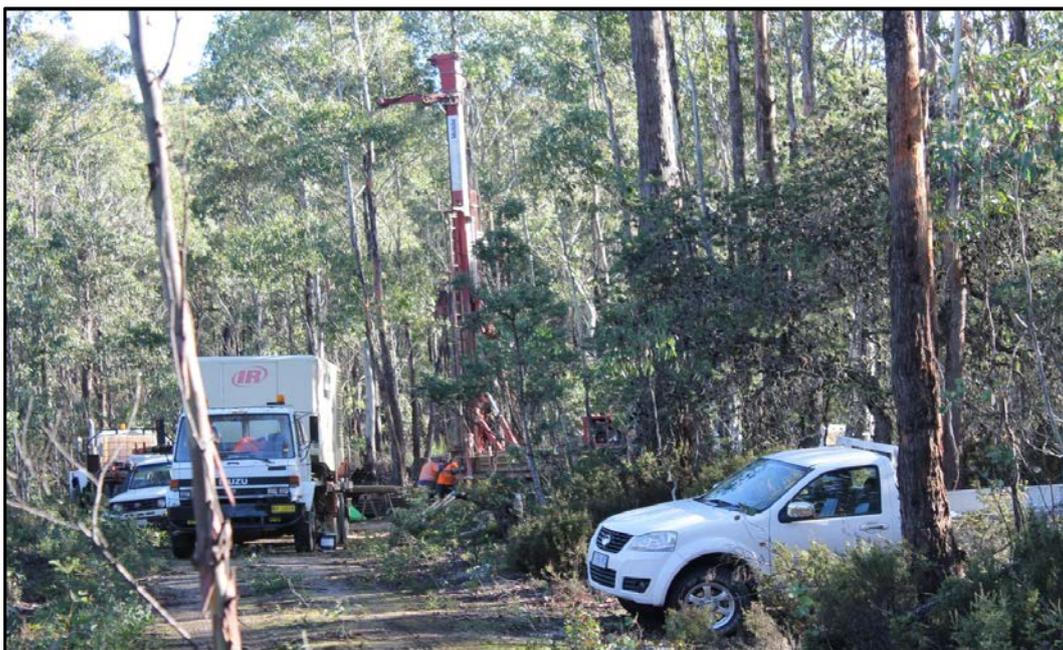
Graphic geological logs and core photos are enclosed in Appendices A and B and geotechnical logs are in Appendix C. Collar surveys at present are limited to hand held GPS control, with elevations scaled from published 10 metre contour data (see below for details). No coal samples have yet been submitted for assay.

MS-01 and MS-02 were collared approximately 2 km apart, but intersected very different geology.

## Drill Hole MS-01

GPS
<b>0575 906mE</b>
<b>5376 708mN</b>
<b>785mRL-scaled</b>
<b>Stacpoole Drilling</b>
<b>B90 truck mounted rig</b>
<b>T.Lodge-driller</b>
Down hole hammer chips to 111.0m
HQ3 core from 111.0-354.85

MS-01 was collared approximately 500 metres northwest of the Mt Slaughter summit, at an RL of 785 metres. The top 111 metres of the hole were drilled by open hole percussion (Down Hole Hammer) and the remaining 243.85 metres to 354.85 metres EOH were drilled with HQ3 core. The hole intersected 15 metres of soils and dolerite talus, overlying fresh dolerite to 334.34 metres, then a sequence of Triassic fluvial sediments comprising quartz and lithic-quartz sandstones, carbonaceous, hematitic and greenish-grey mudstones and siltstones, and minor mud pellet and quartz granule conglomerates, down to 354.85 EOH. These rocks were interpreted as being entirely lower in the Triassic stratigraphy than the target Upper Triassic lithic sandstone coal measures sequence. They are probable correlates of the TRks association of lithologies, as indicated on the Geological Survey of Tasmania Snow Hill 1:50,000 Sheet. The dolerite is thicker at MS-01 than could be extrapolated from the Geological Survey mapping and is yet another example of the unpredictable variation in dolerite thickness overlying the coal measures across Fingal Tier. MS-01 intersected no coal measures; their stratigraphic position having been entirely eroded by the magmatic intrusion of Jurassic dolerite.



**Figure 5** Hammer drilling at MS-01.

### Drill log summary MS-01

Interval From(m)	Interval To(m)	Lithology
0	4	REGOLITH-soil,orange/brown dolerite talus and clay
4	15	DOLERITE TALUS
15	334.34	DOLERITE-grey green uniform medium grained
334.34	337.63	HORNFELS SANDSTONE
337.63	337.96	SANDSTONE-medium grained
337.96	340.16	MUDSTONE-some reworked quartz conglomerate
340.16	341.23	SANDSTONE-light grey quartz sandstone, some cream clay bands
341.23	342.31	RED BEDS-hematite rich mudstone grading into quartz sandstone
342.31	345.22	SANDSTONE/SILTSTONE- orange-red hematite colouring
345.22	350.17	SANDSTONE-pale quartz sandstone
350.17	351.77	SILTSTONE-some interbedded coarse sandstone
351.77	354.45	SILTSTONE/MUDSTONE-muddy interbeds grading into coarse sandstone
354.45	354.85	SANDSTONE-light grey quartz sandstone
EOH	354.85	

### Drill Hole MS-02

GPS
<b>0577 888mE</b>
<b>5376 740mN</b>
<b>720m RL-scaled</b>
<b>Stacpoole Drilling</b>
<b>B90 truck mounted rig</b>
<b>T. Lodge-driller</b>
HQ3 core from 0-309.9m

MS-02 was collared approximately 2 km east of MS-01, close to the source of Hockeys Creek, and at an RL of 720 metres. The hole drilled HQ3 core from surface to 309.9 metres EOH. It intersected 17 metres of soil and dolerite talus, overlying 8.7 metres of weathered dolerite, which has a chilled margin-hornfels contact with underlying Triassic sedimentary rocks. The Triassic rocks consist of Upper Triassic coal measures from 25.7-294.25 metres, overlying Lower Triassic quartz and quartz-lithic sandstones and hematitic and pale greenish - grey mudstones, drilled from 294.25-309.9 metres EOH.

Three intervals of mudstone, carbonaceous mudstone and coal were intersected within the Upper Triassic; at 87.2-103.48 metres, 165.25-185.27 metres and 203.76-211.63 metres (see Appendices A and B). Only the lower interval contains a significant coal seam, comprising two plies of coal separated by 0.99 metres of siltstone/fine sandstone (see below for 1:20 scale graphic log). The upper coal ply is 1.21 metres thick and the lower ply is 1.12

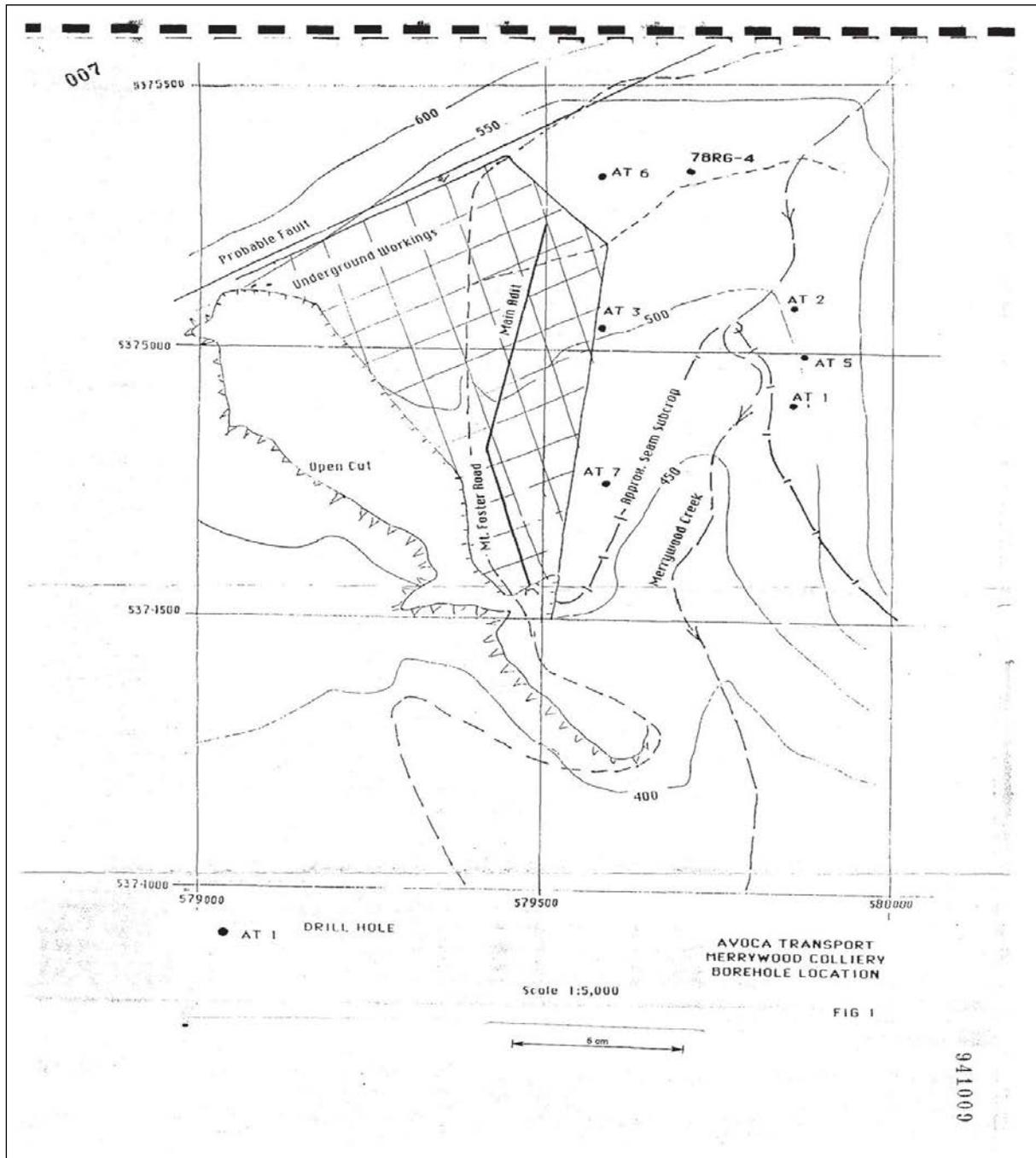
metres thick, but is the better quality coal. The thickness of the interburden siltstone precludes a working section based on either ply. The coal has not yet been sampled for assay.

### **Drill log summary MS-02**

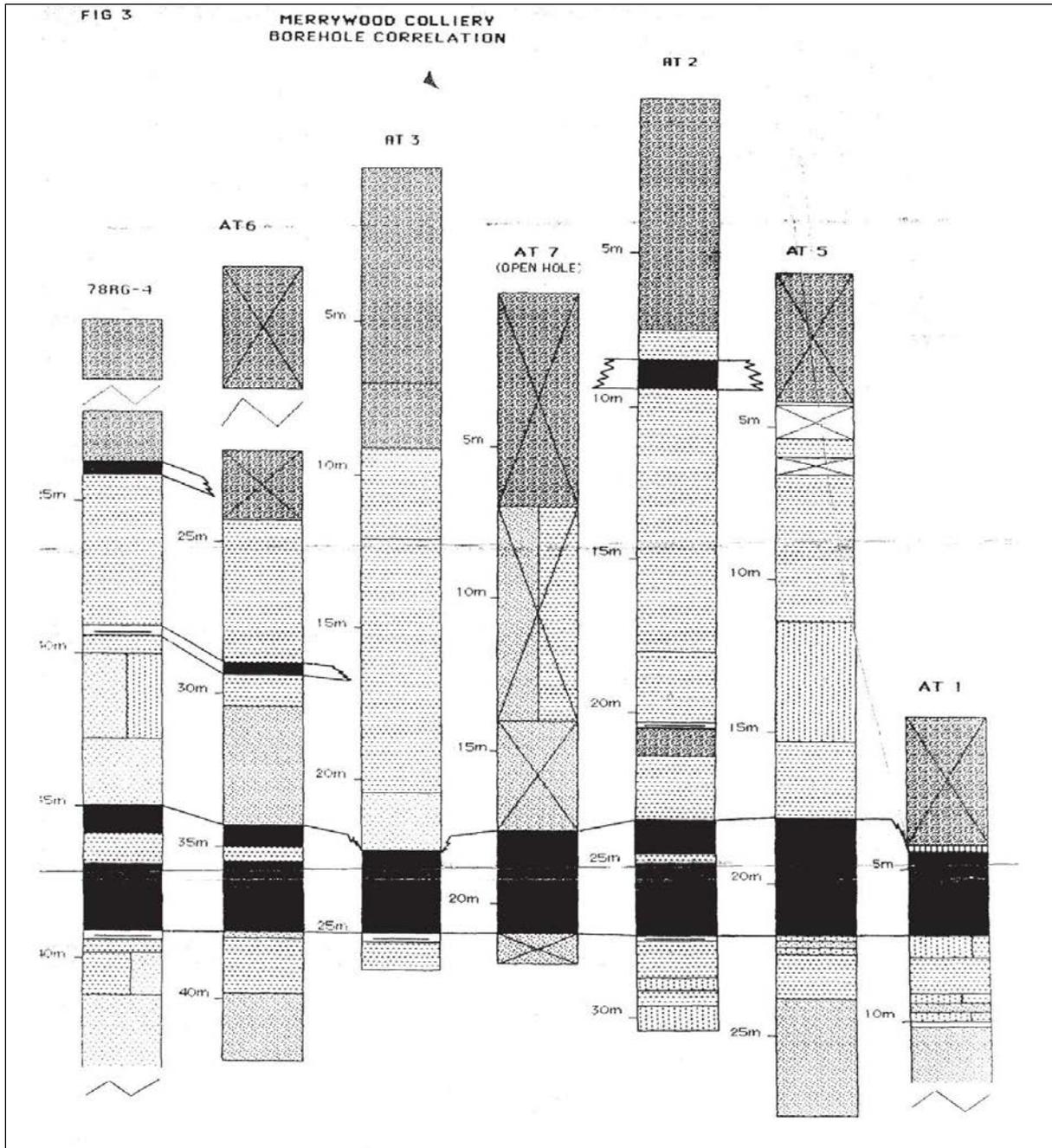
Interval From(m)	Interval To(m)	Lithology
0	17	TALUS-predominantly dolerite rocks and clay, minor siltstone, hornfels
17	25.7	DOLERITE-very weathered, broken and chilled
25.7	26.4	SILTSTONE-indurated hornfels
26.4	87.2	SANDSTONE-lithic sandstone with minor mudstone and coaly debris
87.2	104.51	MUDSTONE-interbedded mudstone, fine sandstone and five thin coal bands <0.5m thick
104.51	142.33	SANDSTONE-lithic sandstone with coaly debris and very minor mudstone
142.33	142.92	COAL-dull heavy coal seam
142.92	165.25	SANDSTONE-lithic sandstone, fining up cycles with mudstone tops
165.92	185.14	MUDSTONE-mudstone and siltstone, 0.95m COAL SEAM at 180.95m, multiple thin coal bands <0.25m
185.14	203.76	SANDSTONE-fining up cycles of medium to fine lithic sandstone, 6cm coal band at 197.6m
203.76	208.31	SILTSTONE-thin interbeds of grey siltstone, mudstone, and coal; Carbonaceous Mudstone 72cm thick at 206m
208.31	209.52	COAL-dull minor bright ,increasing bright bands in basal 0.5m
209.52	210.51	SILTSTONE-sandy laminae, coaly wisps.
210.51	211.63	COAL-good quality, bright over basal 0.33m
211.63	220.9	SANDSTONE-fining upwards lithic sandstone unit with mudstone top
220.9	242.52	MUDSTONE-interbedded mudstone, siltstone, carbonaceous mudstone, coaly bands (incl 0.48m at 229m)
242.52	264.59	SANDSTONE-fining up cycles of medium to fine lithic sandstone with coal debris and flasers
264.59	265.62	SILTSTONE- siltstone, 0.4m coal band
265.62	270.72	SANDSTONE-sandstone interbedded with siltstone
270.72	284.12	SANDSTONE -medium grained sandstone, lithic; bands of siltstone rip-up clasts, sparse organic detritus
284.12	287.86	SANDSTONE -fine grained sandstone, lithic, coaly laminae, mudstone bands to 0.5m thick
287.86	289.8	SANDSTONE-white, quartzose, fine-medium grained, contains coaly laminae
289.8	291.91	SANDSTONE -fine-grained, interlaminated with grey mudstone
291.91	292.6	MUDSTONE -dark grey black mudstone, slightly carbonaceous top and base, pink quartz lithic Sandstone band
292.6	294.25	SILTSTONE -pale grey-green
294.25	309.3	SANDSTONE-interbedded quartz lithic sandstone, red bed mudstones and carbonaceous mudstones
309.3	309.9	CORE LOSS -0.65m left down hole
EOH	309.9	

The 203.76-211.63 metre coal swamp interval is at a reasonable elevation, relative to the basal coal measures contact, to correlate with the Merrywood seam, which is located about 2 km southeast of MS-02. The detailed stratigraphy of the MS-02 coal bearing interval however, is very different from the Merrywood seam and the Merrywood seam drill hole intersections and mine exposures span approximately 2 km NW-SE (Figure 6 & 7 below), with little variation to the detailed seam stratigraphy. Therefore there is no convincing case to correlate MS-02 to Merrywood. Similarly, there appears to be no potential to reliably correlate marker horizons in the MS-02 coal measures section with the seam stratigraphy

established for the Duncan and Valley Road deposits, further to the northeast under Fingal Tier dolerite.



**Figure 6** Merrywood Colliery drill hole locations from Avoca Transport, 1987.



**Figure 7** Merrywood drill holes graphic logs from Avoca Transport, 1987.

The lack of drilling based fault control and the dramatic variation in dolerite thickness in the southern part of EL 17/2010 have so far precluded the generation of a vector towards a thicker seam of decent quality coal, outside the perimeter of the abandoned Merrywood workings.



**Figure 8** Terry Lodge and Les Johnston drilling MS-02.

### **Geotechnical Investigations**

Geotechnical logging was undertaken on HQ3 core (61mm diameter) from MS-01 and MS-02. Both holes are vertical and alpha angles on planar structures determine the dip angles, but no core orientation facility was used to determine the dip direction.

Data are recorded in Geotechnical Logs at Appendix C, including interval depths (metres), Rock Quality Designation, rock strength, defect descriptions and defect measurements. No other geotechnical or hydro-geological tests were undertaken (e.g. point load, immersion testing, UCS etc).

Core was logged on average within a week of being drilled.

### ***Jurassic Dolerite***

The dolerite in MS-01 is a massive very hard, strong rock displaying regular blocky jointing and zones of fine and medium grain size. The 334 metre rock mass is unweathered below its immediate surface (indicated by return of fresh grey chips after one metre) except where percolating water has exploited joints throughout the full thickness of the sill and caused minor wallrock alteration and deposition of zeolites, chlorite and occasionally carbonates, as thin veins (rarely >1cm thick). The joints are also commonly stained with pyrolusite and iron oxides with haloes extending up to 10cm into the groundmass.

In the top 200 metres of the dolerite, the core is fractured every 20cm to 30cm by joints most commonly at angles of 30°, 60° and 78° to the horizontal, and by persistent sub-vertical joints heavily coated with secondary clay minerals. Beyond 200 metres, the strength of the dolerite is less affected by the cross-cutting sets, but still vulnerable to the sub-vertical set almost parallel to the core axis. Jointing in dolerite intrusives can be caused by contraction on cooling as well as by regional structural stresses, and the sub-vertical set could represent columnar jointing, which is displayed in cliffs on nearby Cowies Bluff.

The 8 metres of dolerite intersected below the talus (18m deep) in MS-02 is light orange brown throughout, sandy-textured and moderately weak in the top 4 metres, changing abruptly to a mid grey, iron/manganese stained rock in the lower 4 metres. It is broken by closely-spaced joint sets into fragments no greater than 5cm thick, however the lower 4 metres consists of moderately hard rock, and it fitted together as a whole unit in the drilling splits. Although difficult to measure, the angles of the joints appear to be consistent with those in the dolerite sill interval in MS-01.

### **Triassic Coal Measures**

A sequence of 268 metres of Triassic Coal Measures was intersected in MS-02. The lithology is predominantly medium-strength fine-medium grained lithic sandstones and siltstones with subordinate weak mudstones, coal and claystones.

The thin capping of dolerite towards the top of MS-02 restricts weathering and alteration of the Coal Measure sequence to the vicinity of joints bearing groundwater and meteoric waters. The Coal Measure sequence is virtually 100 percent fresh *in situ*.

As shown in the table below, average rock quality index (RQD) for the sandstone *in situ* is 97 (percentage of core in sections greater than 0.1m) and for mudstone is 65. Out of its resting place, the core becomes subjected to new impacts and strains, caused by drilling impacts, a one-week exposure in covered trays, confinement/stress release and handling.

<b>RQD</b>	<b>SANDSTONE</b>	<b>SILTSTONE &amp; SAND/SILTSTONE</b>	<b>MUDSTONE &amp; MUDSTONE/COAL</b>
<b>In situ</b>	97	88	65
<b>Impacted</b>	92	63	36

The table shows that rock quality decreased markedly in muddier sedimentary rocks, which fretted and became brittle and fissile (breaking on bedding planes). Rare claystone bands swelled. Rock quality will reduce again with further exposure and stress release. For example, between 18/09/13 and 27/09/13 the 'impacted' RQD for the mudstone at 234

metres reduced from 40 to zero. Sandstones with a muddy matrix have deteriorated in quality while others showed little impact.

Bedding dips range from 80° to 88°. The siltstone bedding is commonly wavy and mixed, with some shallow cross-bedding (75°) apparent in the sandstones. True dip of the bedding can be assumed in the range of 3° to 5° from horizontal. The sequence is prone to splitting along bedding planes particularly in the upper 150 metres. Defects in the more competent sandstones occur in the core around mudstone and coal fragments and laminae, but these defects are unlikely to be persistent.

From 27 metres to 70 metres the Coal Measure core is fractured approximately every half-metre on the variably dipping bedding planes and possibly a low angle joint set. From 70 metres, joints occur most commonly at angles of 30°, 60°, 45°, and 78° and 12°, to the horizontal. The lack of core orientation certainty means that some of these dips with similar values could be at different orientations, notably the 45° measurements. It could be postulated that three conjugate sets of stresses have operated. A fourth set at 85° (with 5% of the count) and 5° (parallel to bedding) might be significant, given that the vertical orientation of the borehole gives fewer opportunities to intersect sub-vertical structures.

Significant joint dip angles from the horizontal are indicated in the table below.

Dip Angle	Count of joints	%
85°	14	5
75°	19	7
70°	13	5
60°	25	10
55°	18	7
50°	13	5
45°	26	10
30°	15	6
20°	11	4
12°	10	4

There is no definite evidence of faulting in either borehole. Slickensides can be observed on joints in the mudstone but displacement is not evident. Micro-scale displacements are abundant in the disturbed wavy bedding, but these appear to be syn-depositional or diagenic soft sediment deformation caused by dewatering and differential compaction of the sediment load.

### ***Lower Triassic Interval***

Lower Triassic sedimentary rocks were intersected in both boreholes – 20 metres thickness in MS-01 below the dolerite sill and 15 metres in MS-02 below the Coal Measures.

Lithology consists of fine-grained sandstones, siltstones and mudstones that are generally stronger than those encountered in the Coal Measures (possibly due to higher quartz content and lower clay components). In the finer grained rocks the core is brittle across bedding planes and joints, however, with breaks every 5 to 10cm. The quartz and quartz-lithic sandstones tend to be more competent.

Joint dip angles in the Lower Triassic sequence are similar to the Coal Measures (5, 12, 20, 30-35, 45, 60, 75, 85 degrees) with no set appearing to dominate structure or defects.

## Year 4 Exploration Program

The program of work for 2014 will consist of:

- One drill hole to the base of the coal measures.
- Analysis of prospective coal samples.
- Inputting of data into the geological, structural and coal quality model. This model will progressively include the ML M4/2012 , EL16/2010 and EL17/2010.
- The use of down hole geotechnical tools if there is one available in Tasmania at the time.

The expenditure will be approximately \$250,000.

## Environment

The drilling of MS-01 and MS-02 was completed on the 18<sup>th</sup> September 2013. Both holes were grouted to surface with a bentonite/cement mix. Rehabilitation of the drill sites is planned for October 2013.



**Figure 9** Drill site MS-02 in an existing Forestry Tasmania borrow pit.



**Figure 10** MS-02 after drilling prior to back filling sumps.



**Figure 11** MS-01 four sumps set up to allow for water storage.

## Expenditure

The total expenditure on EL 17/2010 at 30<sup>th</sup> September 2012 and following an internal review requested by MRT, was \$177,606. During the period 1<sup>st</sup> October 2012 to 30<sup>th</sup> September 2013 a further \$333,917 was spent making a total of \$511,523. This cross-matches to the 2013 Q3 report. Expenditure by category for the 2012 to 2013 period is therefore;

Geology and exploration support activities	\$ 54,002
Drilling	\$ 234,533
Feasibility	\$ 29,400
Administration	\$ 15,982
<b>TOTAL</b>	<b>\$333,917</b>

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