5. ASPECTS OF THE BACK CREEK GOLDFIELD

by B. Marshall

ABSTRACT

Boreholes drilled in 1882-83 and 1889 suggested that the Tertiary deep leads or gutters of the Back Creek Goldfield rapidly increased in gradient and passed beneath superficial basalt flows into the main Back Creek lead which is now well below sea level. In 1932 a third series of boreholes was located on the Back Creek lead in order to provide a complete cross-section of the rocks filling it and to prove the continuity of the auriferous gravels. No gravel was encountered although about 170 feet of basalt were drilled. The present investigation shows that the auriferous gravels pass laterally into penecontemporaneous basalt and that lateral continuity of the gravel deposits should not have been anticipated since, at the site chosen, Back Creek must have been erosional throughout the period under consideration. There is little chance of finding substantial thicknesses of auriferous gravel along the Back Creek lead and a further drilling programme is not recommended.

INTRODUCTION

The Back Creek Goldfield is located in the Pipers River Quadrangle (Marshall et al., 1965) approximately 6 miles NE of Lefroy and 3 miles NNW of Pipers River. Access from either place is largely via bush tracks which, in very wet weather, are best traversed by four-wheel drive vehicles. The area, which has gentle relief, drains into Back Creek and thence N to Noland Bay (fig. 7).

In the most recent account specifically devoted to the goldfield Broadhurst (1935) gave details of its history and previous literature. Groves (1965) has described the nearby goldfield at Lefroy, much of his stratigraphic and structural data being pertinent to the Back Creek field; whilst Marshall (1969) has described the regional stratigraphy with especial reference to the Cainozoic rocks of the Back Creek district.

GEOLOGY

The basement rocks which are a relatively pelitic assemblage within the Mathinna beds range in age from Ordovician to Devonian. This age is ascribed from the identification of graptolites found at West Turquoise Bluff (Banks. pers. comm.). However Broadhurst (1935, p. 62) erroneously ascribed a Cambro-Ordovician age. Deeply weathered pale grey slate and phyllite, where exposed in the open-cast gold workings, are associated with subordinate sandstone. The bedding and slaty cleavage strike approximately NW to NNW. The beds dip NE at about 40° to 60°, and the cleavage may dip to the NE or, shallowly to the SW.

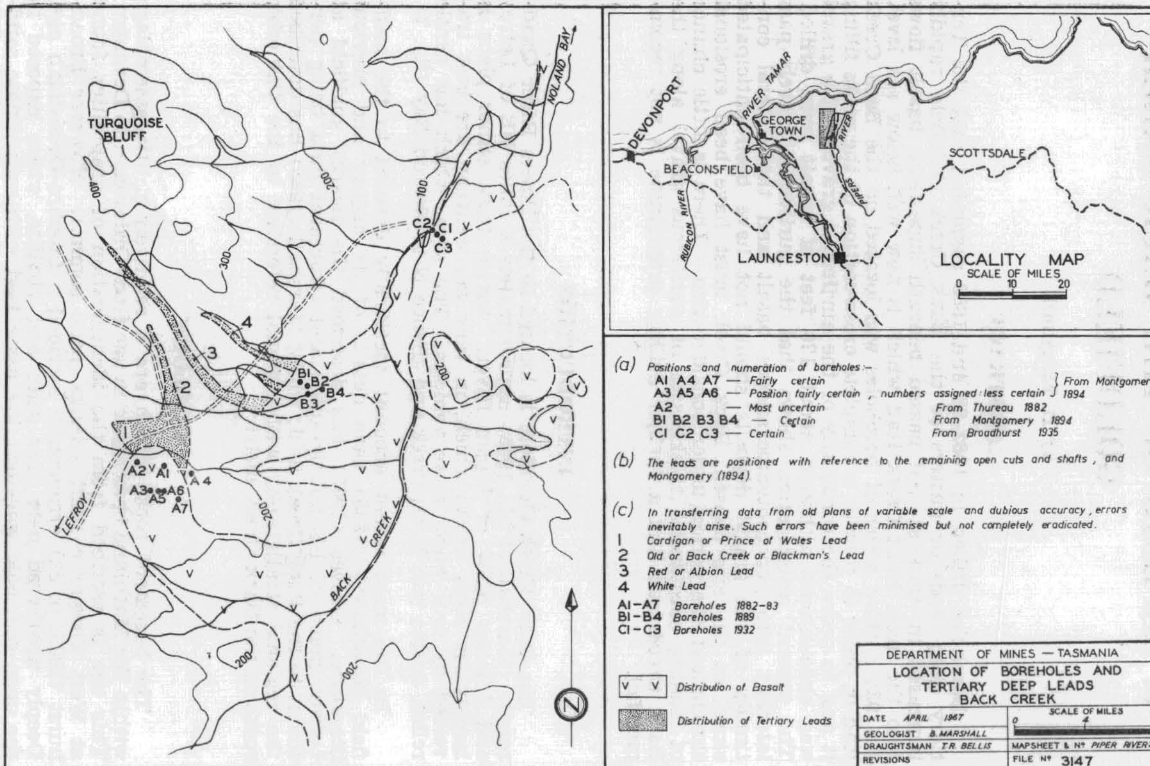
TURQUOISE BLUFF
NOLAND BAY
LEFROY
BACK CREEK
400
300
200
100
A1 A2 A3 A4 A5 A6 A7
B1 B2 B3 B4
C1 C2 C3
1
2
3
4
DEVONPORT
RIVER TAMAR
GEORGE TOWN
BEACONSFIELD
RUBICON RIVER
PIPERS RIVER
SCOTTSDALE
LAUNCESTON
LOCALITY MAP
SCALE OF MILES
0 10 20
(a) Positions and numeration of boreholes :-
A1 A4 A7 — Fairly certain
A3 A5 A6 — Position fairly certain, numbers assigned less certain } From Montgomery 1894
A2 — Most uncertain From Thureau 1882
B1 B2 B3 B4 — Certain From Montgomery 1894
C1 C2 C3 — Certain From Broadhurst 1935
(b) The leads are positioned with reference to the remaining open cuts and shafts, and Montgomery (1894)
(c) In transferring data from old plans of variable scale and dubious accuracy, errors inevitably arise. Such errors have been minimised but not completely eradicated.
1 Cardigan or Prince of Wales Lead
2 Old or Back Creek or Blackman's Lead
3 Red or Albion Lead
4 White Lead
A1–A7 Boreholes 1882–83
B1–B4 Boreholes 1889
C1–C3 Boreholes 1932
V V Distribution of Basalt
Distribution of Tertiary Leads
DEPARTMENT OF MINES — TASMANIA
LOCATION OF BOREHOLES AND TERTIARY DEEP LEADS BACK CREEK
DATE APRIL 1967
GEOLOGIST B. MARSHALL
DRAUGHTSMAN T.R. BELLIS
REVISIONS
SCALE OF MILES
0 4 8
MAPSHEET & Nº PIPER RIVER 31
FILE Nº 3147

FIGURE 7.

Palaeo-stream channels or 'gutters', filled with Tertiary fluviatile deposits and often referred to as leads, occupy the present drainage interfluve. The deposits were sluiced for gold and yielded the greater proportion of the gold won from the Back Creek field. Passing SE the channels and apparently the deposits are lost beneath the tongues of basalt that join the main run of basalt along Back Creek (fig. 7).

Two series of boreholes located on the basalt tongues were drilled in 1882-83 and 1889 and (fig. 8), enabled the channels to be traced. They revealed that there were at least two periods of basalt extrusion, and proved that inter-basalt as well as pre-basalt fluviatile deposits existed. Broadhurst (1935, pp. 67-68, 71) equated the exposed auriferous leads with the inter-basalt deposits of the boreholes.

Montgomery (1894) considered that neither of the first two series of boreholes were well placed. He drew attention to their location on branch leads that ran into the main Back Creek lead (fig. 7), and pointed out that had a narrow portion of this latter one been drilled, a completed cross section could possibly have been obtained with substantially less drilling. Having emphasised that the bores had proved the existence of a very deep lead beneath Back Creek valley, he continued: 'Taking into consideration the number of auriferous branches that have actually been worked successfully, the favourable nature of the whole of the formation through which the valley has been eroded, and the great probability that unknown reefs have been cut through during this erosion, I am of the opinion . . . that the main lead will prove more or less payable when opened for mining'. In concluding, he recommended the site be ultimately drilled (fig. 7), stating that 'a line of bores would prove the depth of the ground, and show the position of the gutter and depth and character of wash obtained in it'.

Since the location of the 1932 series of bores was an endorsement of Montgomery's reasoning, their failure to encounter substantial horizons of inter- and sub-basalt sediment must have evoked surprise and disappointment, and consequently merits investibation.

The borehole data: correlation and interpretation

An examination of the borehole records (Broadhurst, 1935; Marshall, 1969), has shown that the rocks overlying the Mathinna Beds may be grouped into superficial sandy clays, fluviatile silt, sand and gravel and basalt. Only the latter is likely to be of value in correlation between boreholes and even its interpretation is subject to the manner of basalt emplacement which could have taken two forms:—

(1) Basalt may have flowed down the main Back Creek lead from a southern source, and back up the tributaries in the Back Creek district, or

(2) Basalt may have spread from points on the high ground bounding the drainage system before flowing down the tributaries and the main lead.

The probable extent of the basalt at the end of the period of volcanic activity is shown by Marshall (1969). No volcanic centres were observed adjacent to the Back Creek Goldfield in the area not covered by the basalt, nor was the pre-basalt topography of this 'high' country sufficiently plateau-like to have enabled basalt to spread over it and flow down all the tributaries. Possibility (2) is therefore considered to be unsatisfactory.

With regard to possibility (1), it is easy to envisage basalt flowing down the deeply incised Back Creek valley (for details of the pre-basalt topography see Marshall, 1969), but in order that it should back up the tributaries, the pre-basalt gradients of the main lead and tributaries would need to be shallow. These requirements are satisfied in that pre-basalt grade of the main lead was approximately 1 in 80 (Marshall, 1969) and therefore similar to the present-day grade between the tributary at bore No. 4 and Back Creek at bore No. 3 (fig. 7), whilst that of the tributaries was a very shallow 1:200 as calculated between bores 6 and 3 and 4 and 3, from figures 7 and 8. The earlier basalt flows are thought to have behaved in accordance with postulate (1), but it is probable that, as the valleys became filled with sediment and basalt, later flows spread out into broad sheets that dammed the head-waters of the tributaries.

If the basalt backed up the tributaries, the top of the flow within them should be at a constant height above sea level. In the main lead, the top of the flow would probably have had a downstream gradient but, as indicated by values of bottom-gradients obtained from successive flows in the Back Creek-Pipers River district (Marshall, 1969) the rate of fall most certainly would have been less that that of the gradient down which the basalt flowed.

The foregoing concepts of basalt emplacement have been adhered to in formulating the ensuing ideas, which may be better understood by referring to figure 8.

In figure 8 the thickness of basalt at the base of borehole 4 may be equated with the basalt in bore 3. However, the height of the basalt in bore 3 exceeds that in bore 4, despite the latter being situated up-flow. It would seem, therefore, that an additional flow must be present in the topmost portion of bore 3. Should the collar height of borehole 3 be the top of the flow it would follow, by applying the concept that the top of the flow is horizontal or of shallower grade than the base, that the topmost basalt in bore 3 has no basalt-correlate in bores 6 and 4, and underlies the upper basalts in bores 6 and 4.

With regard to the basalts in borehole 6, the thin lower horizon must correlate with part of the substantial thicknesses in boreholes 4 and 3. The upper horizon is less easily resolved since, from previous reasoning, it has no correlate in bore 3, whilst correlation between boreholes 6 and 4 is impeded as they are on different tributaries. Even making allowances (approximately 25 feet) for a fall in the top level of the basalt flow between the tributaries in the main lead, only the bottom portion of the upper basalt in bore 6 may be correlated with the upper basalt in bore 3. This indicates that a higher flow has been stripped from the vicinity of the second series of boreholes (fig. 7), and provides an interesting comparison with Montgomery (1894) who concluded

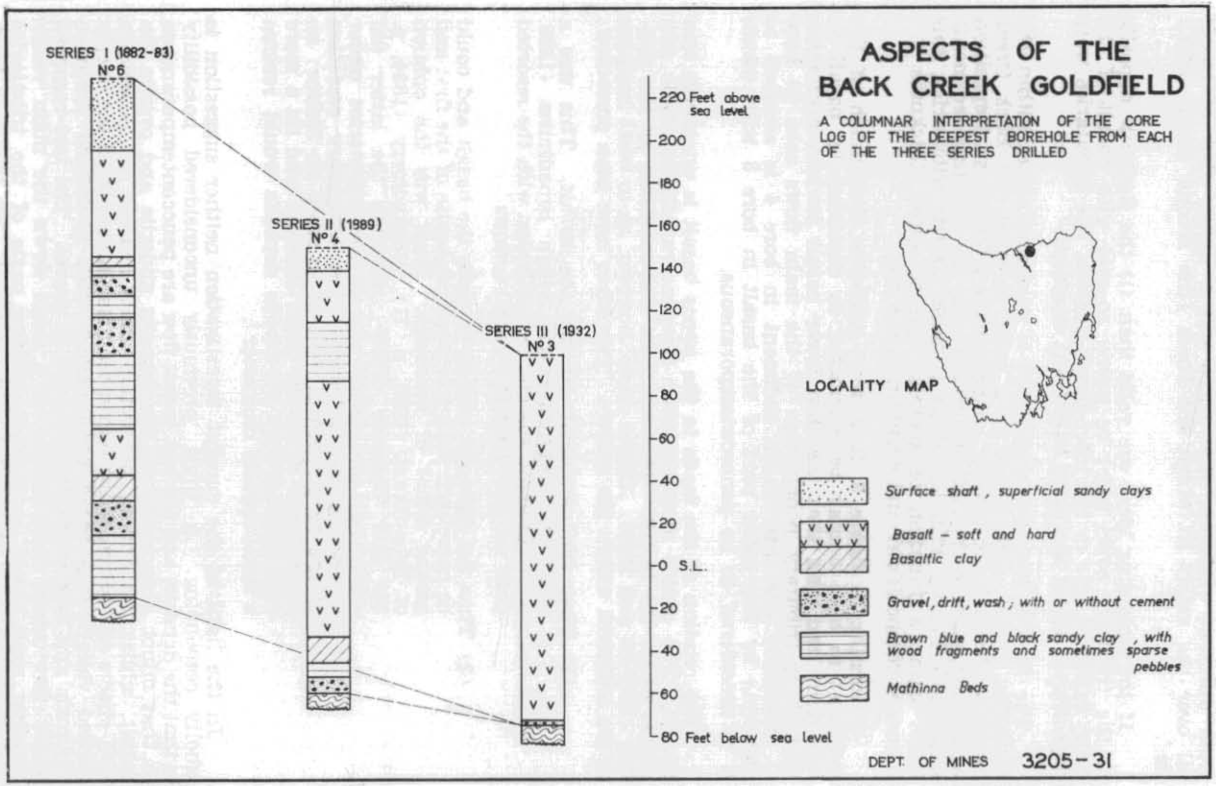
ASPECTS OF THE BACK CREEK GOLDFIELD
A COLUMNAR INTERPRETATION OF THE CORE LOG OF THE DEEPEST BOREHOLE FROM EACH OF THE THREE SERIES DRILLED
SERIES I (1882-83)
Nº 6
SERIES II (1889)
Nº 4
SERIES III (1932)
Nº 3
220 Feet above sea level
200
180
160
140
120
100
80
60
40
20
0 S.L.
20
40
60
80 Feet below sea level
LOCALITY MAP
Surface shaft, superficial sandy clays
Basalt - soft and hard
Basaltic clay
Gravel, drift, wash; with or without cement
Brown blue and black sandy clay, with wood fragments and sometimes sparse pebbles
Mathinna Beds
DEPT. OF MINES 3205-31

FIGURE 8.

5 cm

from different evidence 'that there was a higher flow of basalt all over the valley in which the bores (the second series—B.M.) lie'.

If the preceding ideas are valid then (i) the fluviatile deposits in the tributary cores must be partly co-eval with basalt of the main valley or, (ii) in the inter-basalt periods, the tributaries were depositional whilst the main valley was erosional.

The first of the two suggestions is preferred since, within the confining valley, early flows must have elevated the Back Creek drainage channel and partially dammed the tributaries. Deposition would take place within the tributaries, and the resulting sediments would intertongue with basalt as it back up the tributaries, this latter being a function of factors such as speed, thickness (= chemical composition) and duration of the flow.

Returning to figure 8, it is most probable that much of the sediment in bore 6 may be attributed to damming by basalt in the main lead, and that the thin lower basalt horizon represents limited up-tributary penetration of the main flows seen in bore 3. Similarly the inter-basalt sediment in bore 4 is ascribed to damming by the upper part of the basalt in bore 3 with which it is considered to be penecontemporaneous.

The relation of the leads to the upper basalt is uncertain (see fig. 7). The gutter most certainly steepens rapidly in grade and passes under the basalt. This has been demonstrated by the drilling (1882-83 and 1889). Doubt exists, however, as to what happens to the sediment within the gutters. Two ideas have been presented:

(1) That that sediment overlies the basalt. This was a belief of unknown origin which Broadhurst (1935, p. 74) thought was due to 'confusion with the resorted gold in the modern water courses'.

(2) That the sediment passed beneath the basalt and could be correlated with interbasalt deposits of the first and second series of boreholes. Such was the opinion of Broadhurst (1935, p. 71), Montgomery (1894, p. 54) and Thureau (1882), although the latter did state that the abrupt dip of the tributaries under the basalt accounted for 'the temporary cessation of the occurrence of gold at so steep an incline; no doubt lower down the main channel, and on a more even bedrock the auriferous deposits would resume a more regular character'.

In the light of the current investigation neither suggestion is wholly convincing. A third, previously unconsidered possibility is that the deposits and the last basalt flow are penecontemporaneous in that minor proportions of the deposits underlie and overlie the basalt, whilst the greater proportion abuts against it. Successive lava-sheets and sedimentary sequences must have altered the deeply incised valleys into broad open valleys with ill-defined drainage channels and thin insignificant tracts of gravel. The last-recorded basalt flow would have spread as a sheet down the main valley covering such gravel as existed, infilling parts of the tributaries and damming their remaining upper portions. Up-tributary from the basalt, fine sand, silt and silty clay would have been deposited over the large boulders, blocks and coarse wash that probably underlies the most recent basalt. Whether the finer grained deposits ultimately spread over the basalt would have depended upon whether the tributaries followed their pre-basalt courses, or became lateral streams.

CONCLUSIONS

The 1932 series of boreholes (fig. 7) were located according to the premise that the auriferous gravels would persist into the main Back Creek lead. Since basalt flowed down Back Creek and backed up the tributaries to interfinger with penecontemporaneous fluviatile deposits there is every reason to conclude that these deposits did not persist into the main lead. Even in the inter-basalt period when river deposits may have formed along the main lead, it seems likely that the elevation of base-level by the basalt would have caused Back Creek to be erosional rather than depositional. This would particularly apply in the case of the slot-like pre-basalt gorge where the 1932 series of bores were located. Thus one of the main reasons for the location of the 1932 series of boreholes, that the basalt was very narrow and complete cross section of the lead could be obtained with a minimum of drilling, has ensured that a maximum thickness of basalt and a minimum amount of sediment were encountered.

The prospects of obtaining gold are unlikely to improve downstream, nor is it likely that any thick auriferous gravel deposits are to be found upstream. Were further drilling contemplated, and such a course of action is not recommended, then investigation down-tributary from the first series of boreholes is suggested since cores 1 and 7 (Marshall, fig. 6, 1969) revealed a pocket of gravel some 60 feet thick, and similar pockets might be anticipated before the pre-basalt valley levelled out closer to its confluence with Back Creek (Marshall, fig. 13, 1969).

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