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PERMIAN STRATIGRAPHY
AND SEDIMENTATION IN THE
BARN BLUFF AREA,
CENTRAL TASMANIA

by

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Issued under the authority of
The Honourable ERIC ELLIOTT REECE, M.H.A.,
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PERMIAN STRATIGRAPHY AND SEDIMENTATION IN THE BARN BLUFF AREA, CENTRAL TASMANIA

Abstract

The stratigraphic succession in the Permian rocks of the Barn Bluff area is generally similar to Permian successions in other parts of Tasmania, but some of the formations have unusual shapes and lithologies due to deposition on a surface of marked topographic relief. The succession was deposited on an irregular surface containing an erosional basin six miles long, two miles wide and 1,000 feet deep, with a single narrow outlet to the SW. The basal formation is marine and confined to the basin. The overlying Barn Bluff Conglomerate has the form of a transgressive blanket which rises onto high ground to the NW. It is probably of terrestrial and periglacial origin. The succeeding lower Permian formations transgressively overlap the Barn Bluff Conglomerate. On a regional scale, the picture is advanced of the Barn Bluff Conglomerate occurring as a blanket lying on, and peripheral to, basement rises, and thinning into major basins.

Introduction

Remnants of the Permian succession that covered much of Tasmania are exposed in the Mt Inglis-Barn Bluff-Cradle Mt area in the central highlands of Tasmania. The section is incomplete, but there is a maximum of 1,190 feet extending from the basal conglomerates up to at least the correlate of the Ferntree Group. The main interest in this area is in the lower conglomeratic units which were deposited in a small trough. Deep dissection of the plateau allows the use of structure contours and isopachs to show the geometrical relationships between the individual units.

The area was mapped in conjunction with the regional mapping of Mackintosh Quadrangle, 55/6-44, (Department of Mines, 1966), and covers the SE corner of this sheet, extending a short distance S into the adjoining Murchison Quadrangle. R. D. Gee is responsible for mapping in the Mt Inglis area, and K. L. Burns in the Barn Bluff area. This report was compiled by R. D. Gee.

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GEOLOGICAL SETTING

The flat lying Permian rocks were deposited on the basement of Precambrian quartzite and schist on an erosional surface of considerable relief. Cambrian porphyry, Ordovician conglomerate and Devonian granite formed the basement immediately W at Granite Tor, where the Permian rocks have since been removed. The Permian succession was intruded by a sheet of Jurassic dolerite, which now occurs as remnants capping the higher peaks above the 4,500 foot level. There has been considerable erosion of the Permian and Jurassic rocks, with the development of a well marked plateau at a level of 4,000 feet. This plateau is now deeply dissected. Much of the area is covered by Pleistocene moraine and periglacial material, however the benched nature of the peaks allows the more resistant formations of the Permian succession to be traced between outcrops.

PREVIOUS LITERATURE

The early reports on this area were by Montgomery (1893a, 1893b), Benson (1917), Reid (1919), and Hills *et. al.* (1922). Jennings (1958) outlined the regional geology of the area, and Banks (1962, p. 192, 199) gave a general stratigraphic column for the Permian rocks around Barn Bluff. Burns (1960) described fragmentary sections from the Cradle Mt area, and Gee (1963) described a similar continuous section at Mt Inglis. Banks (1962) has discussed the regional significance of the basal conglomerates on the central highlands, and many of the suggestions of Banks are substantiated.

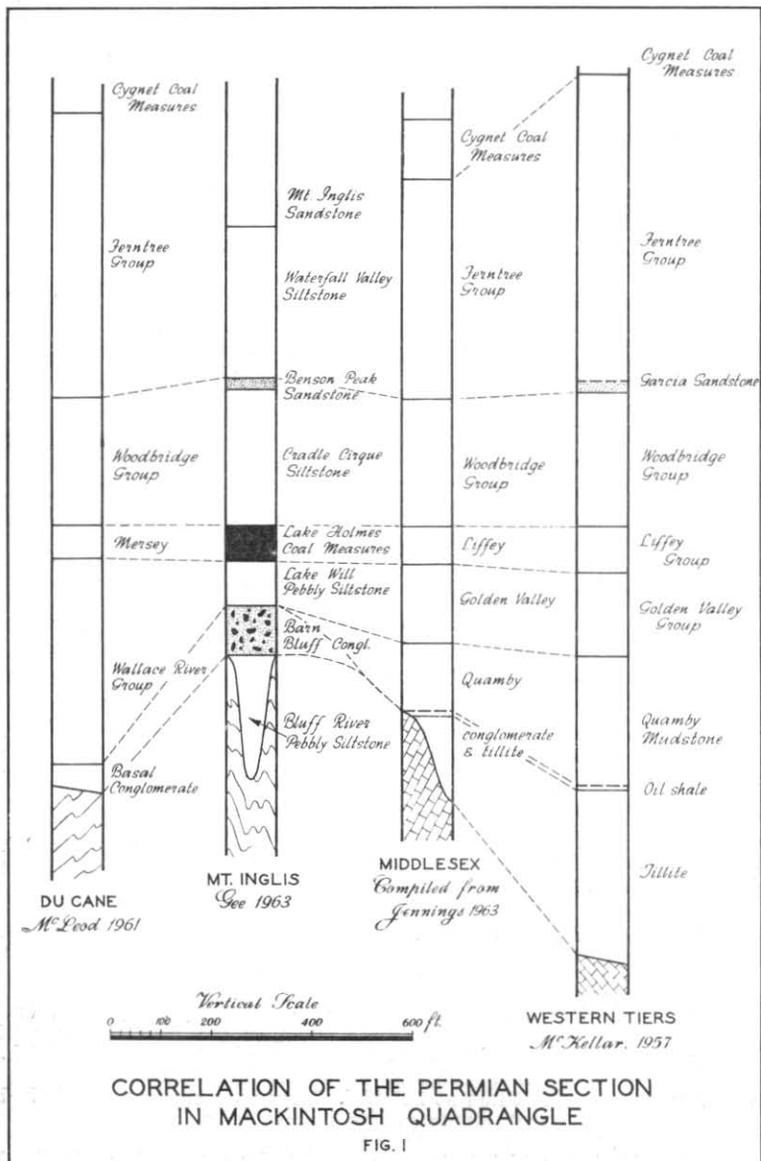
Stratigraphy

The type section of the formations are in the creek that flows SE from the summit of Mt Inglis (Co-ordinates 389,000E, 860,200N, Tasmanian State Grid). The details of this section are given by Gee (1963), and the general stratigraphic column is shown here in Figure 1.

PRE-PERMIAN RELIEF

The deeply dissected present-day topography allows the altitude of the base of the Permian succession to be determined at a sufficient number of points to draw form lines on the surface of deposition. The basin, (Figure 2), is at least six miles long and two miles wide. It is elongated in a NE direction, parallel to the strike of the basement schist and quartzite, and is actually carved out of a major schist belt. There is no evidence on the cause of this erosion, but judging from striated pavements found elsewhere in Tasmania, glacial action may have been a cause.

The basin is closed to the NE, but is open to the SW by an area of low relief with an incised deep gorge-like outlet. Flanking the basin to the NW is a high ridge of quartzite, generally 900 feet



above the basin floor, and to the SE is a broad area of low relief 600 feet above the basin floor. Still higher ground is found to the N, at the present position of Cradle Mt. The total relief in the area is 1,400 feet.

A small NNE trending pre-Permian fault, cuts the northeastern end of the basin. The Barn Bluff Conglomerate was deposited against the low scarp of this fault.

BLUFF RIVER PEBBLY SILTSTONE

In its type section (Gee, 1963) this formation consists of *five* members.

Top	Thickness in feet
(e) dark micaceous mudstone with conchoidal fracture, and containing <i>Peruwispira</i>	40
(d) cobble conglomerate with distinct stratification	80
(c) well-bedded pebbly siltstone and conglomerate, with siltstone, mudstone and sandstone beds	45
(b) micaceous pebbly siltstone with one limestone bed	30
(a) poorly sorted, angular conglomerate	10

The pebbles within these members are rounded, and consist of mainly Precambrian quartzite and schist, with small amounts of Lower Palaeozoic granite, conglomerate and porphyry. Members (e) and (a) are laterally persistent throughout the Mt Inglis area.

The very lowest bed of member (a) in the Mt Inglis section contains both angular and rounded boulders between $\frac{1}{2}$ and 12 inches in diameter. Many of the quartzite boulders occur as slabs which are lying flat in the bedding plane. The matrix is poorly sorted, and dominantly quartz of coarse-silt grade, with subordinate quartz granules and clastic mica flakes. The surface of deposition is smooth, but with no evidence of striae.

In the gorge of the tributary of the Fury River (389,400E, 861,500N); one mile N of the summit of Mt Inglis; the basal bed consists of four feet of conglomerate with a rudimentary sorting due to larger more angular fragments at the base, and smaller more rounded fragments at the top. Overlying this is a three-foot-thick bed of siltstone with about 5% pebbles. In this tributary, member (b) contains at least three thin limestone beds.

In the bottom of the deep cirque (387,550E, 859,750N), one mile W of the summit of Mt Inglis, member (b) contains beds of poorly sorted quartzo-feldspathic sandstone about 18 inches thick. Also in this cirque is an angular unconformity within member (c). One sandstone bed is tilted at 12° SW. The upper surface of this bed contains asymmetrical ripple marks indicating a current direction from the SE. This is overlain by a poorly sorted, unstratified, wedge-shaped cobble bed, which is in turn overlain by a flat-lying, stratified conglomerate with siltstone lenses.

The Bluff River Formation is confined to the deeper parts of the basin, and at higher levels is transgressed by the overlying Barn Bluff Conglomerate which then lies directly on the basement. The established limits of Bluff River sedimentation are shown in Figure 2. The wedging-out against basement rises is seen on the plateau two miles N of Mt Inglis (389,500E, 862,800N), on the eastern wall of the Fury Gorge one mile N of Barn Bluff where the basement rises sharply at an angle of 25° (392,600E, 863,500N), and also at the lip of Lake Will (392,600E, 858,500N).

A marine environment is indicated by gastropods in the top unit, and the presence of bedded limestone. The appearance of ripple-marked sandstone close to the higher ground to the N may indicate the proximity of the strand line. The ripple axes are directed along the axis of the basin. The significance of the angular unconformity associated with the sandstone beds is uncertain, but may be due to littoral slumping.

Most of the boulders and pebbles are of a Precambrian rock, and probably of a local origin. The exotic pebbles are rare and well rounded. The common occurrence of well-rounded and sharply angular fragments suggests that some contribution to the rudite fraction may have come from scree material shed from the high ground to the NW. There is no evidence to indicate deposition by mudflows or glaciers. However, it is possible that some of the isolated pebbles in the siltstone are ice rafted.

BARN BLUFF CONGLOMERATE

The Barn Bluff Conglomerate covers the underlying Bluff River Formation in the lower parts of the basin of deposition, and at higher levels is draped directly onto the basement. It averages 100 feet in thickness. It is the most prominent topographical unit in the area, and forms a well marked bench on the mountain sides throughout the area.

The Barn Bluff Conglomerate is different from the underlying and overlying pebbly siltstone because of its massive or poorly bedded appearance, the poor sorting of both matrix and fragments which form a continuous framework, and the angularity and disorientation of the fragments. It consists of two fragment types, one type rounded and ellipsoidal, the other angular and tabular. In the deep part of the basin, the minor rounded type is more evenly distributed throughout the formation, and the fragment size is usually larger.

In the Mt Inglis section, the top siltstone member of the Bluff River Formation grades upward over an interval of six feet into the conglomerate. Both angular and rounded fragments occur, varying in size from $\frac{1}{2}$ an inch to four feet. Schist fragments are uncommon. The large slabs of quartzite are inclined at all angles.

West of Mt Inglis where the conglomerate laps onto the Precambrian basement, schist fragments are more abundant. At the small outlier (385,000E, 861,000N), two miles W of Mt Inglis it consists of 60% boulders of angular fragments of schist, minor amounts of rounded quartzite and rare granite cobbles. The tabular slabs are not lying flat in the bedding plane but stand at all angles. The matrix is a poorly sorted quartz sandstone with abundant angular quartz granules.

On the edge of the plateau N of Mt Inglis, overlooking the Fury Gorge (389,200E, 862,800N), the Barn Bluff Conglomerate is underlain by interfoliated, vertically dipping quartzite and schist. The rudite fraction consists of equal portions of angular to sub-angular quartzite slabs, and sub-angular slabs of schist. There is no indication of an oriented boulder bed at the base. The fragments vary in size from two inches to three feet, and average 10 inches in diameter. The matrix generally occupies 10% of the rock, and is composed of angular granules of locally derived quartzite and schist in about equal proportions. Silt is generally absent from the matrix.

On the S edge of the Fury Gorge (393,600E, 865,000N), just W of a northerly flowing tributary, the lower portion of the formation consists dominantly of sub-spherical angular quartzite from 3 inches to 18 inches. The rounded type, consisting of ellipsoidal quartzite pebbles up to four inches is dominant toward the top. At this locality there is a lateral diminution in pebble size to the NE. This round-pebbly conglomerate at the top of the Barn Bluff Conglomerate is a characteristic feature in the area from the Little Horn to the Hartnett Gorge.

On the N bank of the Fury River, immediately under the summit of Cradle Mt (395,200E, 866,800N), there is a basal boulder bed six feet thick, draped over the basement quartzite. This contains sub-rounded quartzite boulders up to four feet and averaging six inches, forming 60% of the rock. There are occasional angular boulders up to two feet at the very base derived from the immediately underlying basement. The matrix is composed of angular quartzite chips of coarse-sand grade. The overlying granule conglomerate consists of angular fragments of quartzite, with scattered pebbles of rounded quartzite averaging one inch. These rounded pebbles are ellipsoidal with their long axes parallel to bedding. Bedding is marked by discontinuous bands of coarser conglomerate.

At the Little Horn (396,700E, 868,000N) the angular fragments, comprise 80% of the rudite fraction. The angular fragments average four inches in length although they may occur up to two feet in length, whereas the tabular fragments average two inches with some up to four inches. The matrix is composed of schist and quartzite flakes averaging $\frac{1}{2}$ inch with interstitial granules of quartzite. Bedding is from five to ten feet thick and is marked by variations in the quantity of matrix.

On the N face of Bensons Peak (396,500E, 865,000N), the conglomerate consists of sub-angular, equant quartzite and discoidal schist particles ranging in size from one to six inches. Some rare pebbles of Lower Palaeozoic conglomerate occur. The round-pebble conglomerate contains ellipsoidal pebbles $\frac{1}{2}$ to three inches in diameter. The matrix is a fine quartz sandstone.

Oriented boulder beds at the base of the Barn Bluff Conglomerate are developed on the flat pre-Permian surface SE of the basin, in the Lakes Agnew-McRae-Ellen area.

At Lake Ellen (398,300E 859,600N), the dominant foliation in the basement is sub-horizontal. The basement is overlain by a boulder bed in which the foliations and mullions in the detached slabs are nearly parallel to those in the quartzite. This grades upward into a disorientated boulder bed and then into the normal

conglomerate. The transition zone is lenticular, varying from five to 15 feet in thickness. The detached slabs in the oriented boulder bed vary from two inches to two feet and appear to be controlled by the spacing of joints in the quartzite. The matrix in this basal bed is a fine argillaceous sand containing angular chips of quartzite of coarse-sand size.

The Barn Bluff Conglomerate is draped like a thin blanket over the partly filled trough in a manner shown diagrammatically in

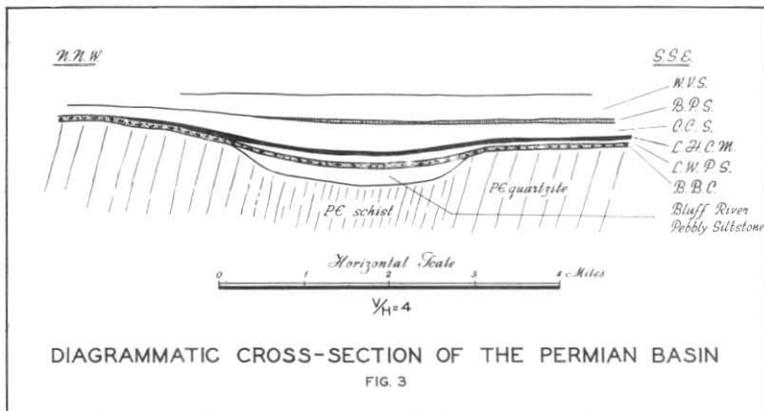
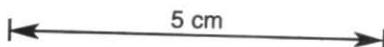


Figure 3. The shape of the top of the conglomerate (Figure 4) still reflects the shape of the initial basin, but with markedly reduced relief. Basinward dips of 6° are common on the NW flank, and more gentle basinward slopes occur on the SE flank. The overlying formations wedge out against the rising Barn Bluff Conglomerate. In the Hartnett River and the Mt Inglis area it is overlain by the Lake Will Pebbly Siltstone. At the head of the Fury Gorge it is overlain by the Lake Holmes Coal Measures, and at the Little Horn it is overlain by the Cradle Cirque Siltstone.

The unusual features of the Barn Bluff Conglomerate suggest that it is neither a glacial nor marine deposit. It is considered to be dominantly a terrestrial scree breccia or periglacial deposit, which formed during a specific interval of time when the basin had partly filled. A derivation predominantly from the local basement is certain, and some of the material on the flat pre-Permian surface has undergone no transport. Figure 4 shows an overall fall on the top of the conglomerate from N to S of 800 feet in four miles. This confirms the suggestion of Banks (1962, p. 200) that much of the material was shed from a high ridge to the NW. Remnants of this high ground exist on the N end of the NW flank of the basin.

LAKE WILL PEBBLY SILTSTONE

The Lake Will Pebbly Siltstone is a well-stratified sequence of dominantly siltstone with conglomerate layers and beds of calcareous siltstone, fossiliferous limestone and sandstone. It is about 90 feet thick. It is more conglomeratic in the deeper part of basin.



In the type section at Mt Inglis, the conglomeratic layers vary from five to 15 feet thick. The fragments vary in size up to six inches, and are sub-rounded to rounded. The matrix is generally poorly sorted, consisting of both silt and sand.

The siltstone layers contain scattered rounded to sub-rounded pebbles in varied proportions. The pebbly layers within the siltstone are rich in fossil fragments, and in places are calcirudites. The lower-most siltstone, lying directly on the conglomerate is rich in *Grantonia* sp. nov., *Martiniopsis*, *Keeneia platyschismoides* Etheridge Fil., *Keeneia [Platyschisma] ocula* (J. de C. Sowerby), *Peruvispira* sp., and *Myalina*. These fossils are found at 388,800E, 861,650N; and 389,450E, 859,050N. The siltstone beds toward the top contain worm tubules arranged parallel to the bedding. These structures have been observed in the Mt Inglis section, and in the wall of the Barn Bluff Cirque.

On one bedding plane in the wall of the Barn Bluff Cirque (394,850E, 862,300N) is a zone of nested rectilinear grooves up to one inch in depth, trending in a direction 040°. These may be the result of glacial sliding or iceberg grounding.

The Lake Will Formation is a marine pebbly siltstone deposited on a broad shallow basin. Its known limits of sedimentation are shown in Figure 4, although it probably forms a regionally expansive sheet. The depositional environment was probably similar to that of the lithologically comparable Bluff River Formation, although the pebbles are probably due more to ice rafting than to the influx of scree from the surrounding high ground.

The rounding of the fragments does not preclude an ice-rafted origin, because rounded fragments are common in accepted tillites found elsewhere in Tasmania, (e.g. rounded quartzite erratics, showing faceted and striated surfaces, occur in the Wynyard Tillite at Wynyard). This rounding in a glaciogene environment may be due to recycling of erratics within multi-glacial and interglacial phases of the Permo-Carboniferous glaciation, incorporation of initially rounded fragments of Lower Palaeozoic conglomerate pebbles into the glacial ice, or to transport by subglacial or supraglacial streams.

After deposition of the Lake Will Formations the basin was nearly completely filled. Isopachs of the three lower conglomeratic formations, taken together, are shown in Figure 5. Comparison of this isopach pattern with the shape of the basin of deposition (Figure 2) shows the precise control of the shape of the lower formations by the initial basin shape.

LAKE HOLMES COAL MEASURES

In the Mt Inglis section, this formation consists of six members.

Top	Thickness in feet
(f) black micaceous siltstone with abundant black carbonaceous fragments	20
(e) well-bedded coarse fissile siltstone and medium-grained flaggy sandstone	12

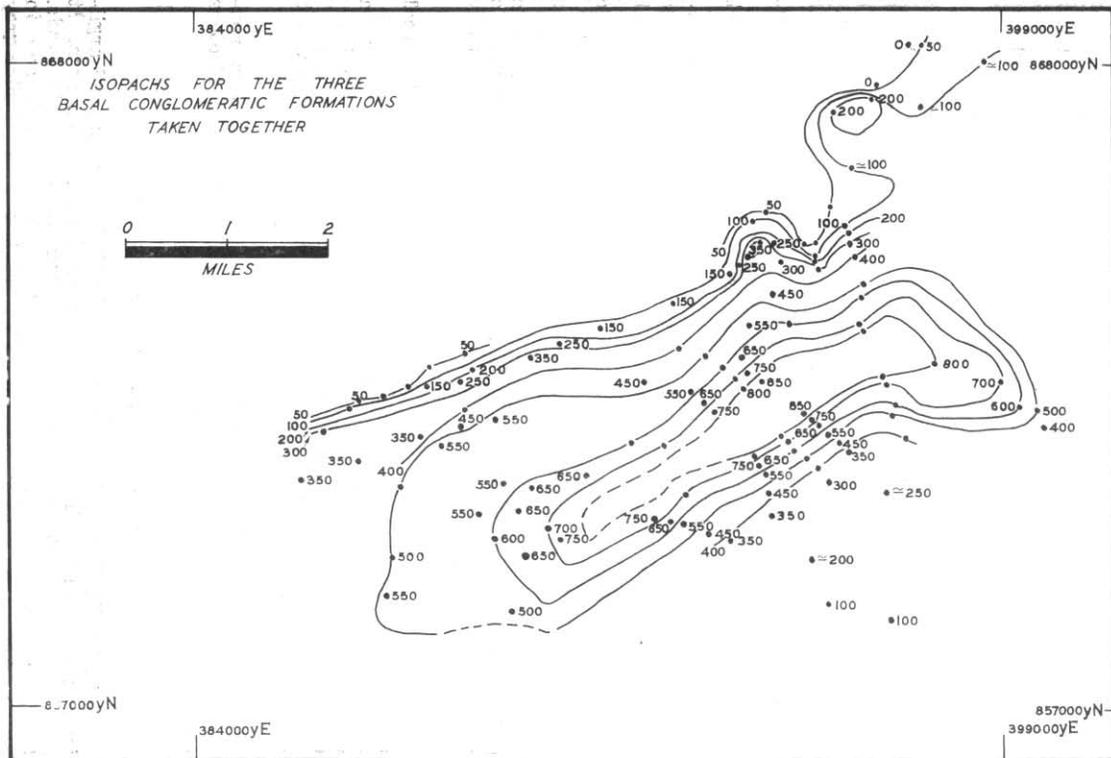


Fig. 5.

15

5 cm

	Thickness in feet.
(d) single bed of cross-bedded quartzo-feldspathic, micaceous, medium to coarse grained, white sandstone. The bottom few inches is gritty, containing angular and sub-rounded granules of quartz and quartzite	4
(c) well-bedded black, micaceous fissile siltstone,	10
(b) interbedded coarse-grained, fissile siltstone and medium-grained quartzo-feldspathic, micaceous siltstone. The sandstone is cross-bedded	20
(a) black carbonaceous fissile siltstone with films of pyrite on bedding planes. It contains about 1% pebbles	5

The Lakes Holmes Coal Measures is 70 feet thick in the Mt Inglis section, thins to 50 feet just E of Barn Bluff and appears to wedge out against the underlying Lake Will Pebbly Siltstone further E.

The coal seam that is reported in the early reports (Montgomery, 1893a, 1893b), was not observed in the Mt Inglis area and is thought not to exist there. In the Barn Bluff area its outcrop is limited by the extensive periglacial and moraine material and was not seen at the time of this mapping. It has been observed previously by one of the authors (K.L.B.) on the Overland Track, on the spur N of Waterfall Valley. The coal seam is a clastic deposit eight inches thick, and occurs at the top of unit (c). Fragments of coal are abundant in the glacial moraine on the spur between Lake Holmes and Barn Bluff (395,150E, 860,400N). Montgomery (1893a) records the plant fossils *Neoggerathiopsis* and *Glossopteris* in the shale which is probably unit (c).

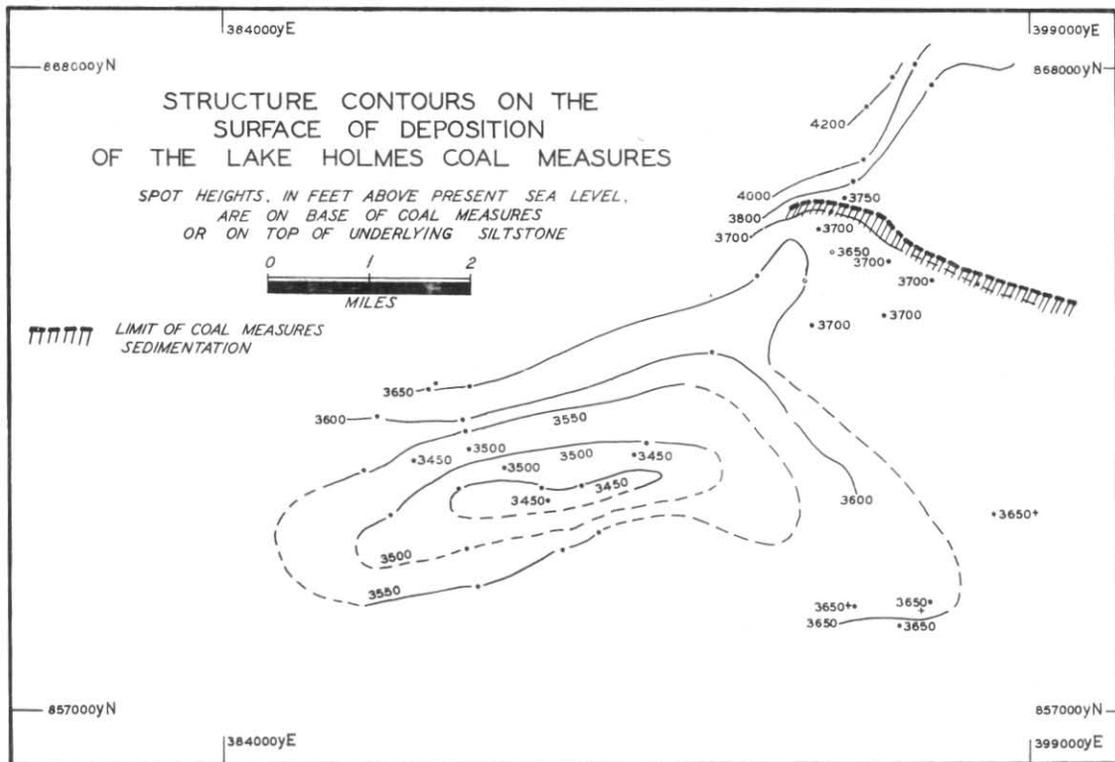
Figure 6 shows structure contours on the base of the coal measures (or on the top of the Lake Will Formation where the coal measures do not occur), showing the shape of the landform upon which the coal measures were deposited. Just S of Cradle Mt the Overlying Cradle Cirque Siltstone lies directly on the Barn Bluff Conglomerate. This is an area of slightly higher ground upon which the coal measures were probably never deposited.

The lithological features indicate the environment was non-marine, shallow water, at times with free current action and at other times with restricted circulation.

CRADLE CIRQUE SILTSTONE

The Cradle Cirque Siltstone is a well-bedded micaceous and argillaceous siltstone which is 270 feet thick in the Mt Inglis area. It contains up to 10% pebbles of rounded quartzite in certain bands. *Spiriferids*, *strophomenids* and *fenestellids* are abundant, and in places the siltstone is calcareous. At least two beds of blue-grey limestone occur near the top of the formation.

5 cm



At Barn Bluff, many more limestone beds are exposed at the same stratigraphic interval. These beds are between three inches and two feet in thickness, and are interbedded with thin calcareous siltstone beds. The limestone beds are richly fossiliferous, containing spiriferids, stenoporids strophomenids and crinoids.

BENSON PEAK SANDSTONE

The Benson Peak Sandstone forms a prominent bench at the 3,800 foot level around Mt Inglis, on the N slopes of Barn Bluff, and at Bensons Peak.

It is a light cream coloured quartzo-feldspathic sandstone, in bedding units averaging three feet thick. It contains angular quartz grains of very coarse-sand and coarse-silt grade, disorientated muscovite flakes, clay pellets of coarse sand grade, and probably glauconite. Some of the beds contain up to 15% of angular fragments of quartzite, siltstone, mica schist and fossil shell fragments.

At Mt Inglis it is 15 feet thick and the lower beds contain thin conglomerate bands two to three inches thick. These have a continuous framework and are composed of rounded quartz and quartzite up to two inches.

Three miles to the NE at Barn Bluff, it is only eight feet thick. The lowermost bed is five feet six inches thick and is a massive white feldspathic, medium-grained sandstone. The lowest three inches of this bed is a conglomerate composed of rounded and spherical quartzite and schist granules up to one inch. Minor amounts of pebbles of Devonian granite and Cambrian quartz porphyry are present. Two miles further to the NE, at Bensons Peak, it is only three feet thick and is a conglomeratic sandstone with rounded quartzite pebbles up to two inches.

WATERFALL VALLEY SILTSTONE

The Waterfall Valley Siltstone consists of 250-300 feet of blue-grey siltstone which weathers to a light brown colour. It is poorly exposed and is incompletely known.

At Mt Inglis, immediately above the Benson Peak Sandstone, is seven feet of thickly bedded argillaceous siltstone containing isolated pebbles. These pebbles are well rounded, and dominantly of quartzite with rare Cambrian quartz porphyry.

One hundred feet above its base is 20 feet of grey-blue mudstone with a conchoidal fracture. It contains abundant sub-angular to sub-rounded quartz granules and clastic mica flakes 2mm in diameter. Rare fenestellids occur at Mt. Inglis and Barn Bluff.

This formation is outwardly similar to the Cradle Cirque Siltstone, but differs by its finer grain size, paucity of fossils and pebbles, and lack of limestone.

MT INGLIS SANDSTONE

The Mt Inglis Sandstone forms the capping of Mt Inglis. Its base is not clearly exposed, and it has a minimum thickness of 140 feet.

The lower portion consists of regularly bedded greenish grey mudstone in beds two to three feet thick with thinner sandstone beds. The sandstone has a weak colour lamination parallel to the bedding. It contains small globular discoid clay pellets 0.5 to 2 mm in diameter. It is unfossiliferous, but contains abundant small black carbonaceous fragments. Pebbles are rare.

The upper portion is a well-bedded quartzo-feldspathic sandstone, interbedded with thin mudstone beds. The sandstone beds average three feet. The sandstone is a creamy brown colour, faintly green due to glauconite.

At Barn Bluff, the Mt Inglis Sandstone is similar. The lower 100 feet is dominantly a yellow argillaceous mudstone with abundant worm casts and mud pellets. This passes upward into a feldspathic sandstone which contains angular quartz fragments varying from 2 to 10 mm.

Between this sandstone and the base of the dolerite at Barn Bluff are scattered outcrops of a black carbonaceous shale with sandstone bands up to $\frac{1}{2}$ an inch thick, commonly as cross-bedded lenses. This sandstone contains black carbonaceous fragments. The section at Mt Inglis is not high enough to include this rock type.

Correlation of the Permian Section

The general sequence of pebbly siltstone with limestone containing Lower Permian fossils, followed by a coal measures horizon and then siltstone with strophomenid limestone beds, forms a basis for correlation in near-by areas. The Lake Holmes Coal Measures can be correlated confidently with the Liffey Group (McKellar, 1957), as suggested by Banks (1962, p. 192).

ABOVE THE LAKE HOLMES COAL MEASURES

The succession above the Lake Holmes Coal Measures has broad lithological similarities with other areas in the central highlands. The Cradle Cirque Siltstone and the Waterfall Valley Siltstone correspond respectively to the 'Woodbridge Group' and Ferntree Group as used by Jennings (1963), McLeod *et al.* (1961), and McKellar (1957).

The Benson Peak Sandstone is lithologically similar to the resistant sandstone, 30 feet thick, between the Woodbridge and Ferntree Groups in the Du Cane Quadrangle. McLeod (1961, p. 23) considered this to be the Garcia Sandstone, at the base of the Ferntree Group in the Poatina section, but Banks (1962, p. 208) suggested correlation with the Malbina Formation in the Hobart area.

The Mt Inglis Sandstone, consisting dominantly of massive cream feldspathic and carbonaceous sandstone, appears to equate with the correlate of the Cygnet Coal Measures in the Du Cane Quadrangle and the Poatina section.

BELOW THE LAKE HOLMES COAL MEASURES

The Lake Will Pebbly Siltstone, immediately below the coal measures, is correlated on lithological and stratigraphical grounds with the Wallace River Group of McLeod *et. al.* (1961) and the Kansas Creek Beds of Jennings (1963). Both of these units have been correlated with the Golden Valley Group of McKellar (1957) and Wells (1957).

Correlation of the Barn Bluff Conglomerate and the Bluff River Formation with rock units in neighbouring areas is problematical, because as this work has shown, the 'basal conglomerates' at different localities are not always the same conglomerate, and there are several such conglomerate horizons which are lithologically similar. It is suggested that these two lower formations are facies variants, and possibly time equivalents of the Quamby Mudstone in Middlesex Quadrangle (Jennings, 1963).

The Bluff River Formation, especially the top unit, is lithologically similar to the Quamby Mudstone. However, the Bluff River Formation is confined to the depths of the depositional basin which has only one outlet to the SW, and is physically disconnected from other formation to the E at that stratigraphic level. Any connection that may exist is by a narrow tongue running SW from Barn Bluff, and would appear as an indentation in the isopach form lines of Banks (1962, p. 195, fig. 30c.).

The Barn Bluff Conglomerate is the basal conglomerate at Lake McRae and Lake Ellen. Previous mapping indicates that the conglomerate can be traced from Lake McRae south to Frog Flat, Pelion Plains and Cathedral Mountain (McLeod *et. al.* (1961). It appears to connect with the conglomerate at Fish River and Western Bluff (Ford, 1960), where it is 50 feet thick and is basal. In the Western Bluff area the conglomerate is overlain by the Quamby Mudstone. East of Western Bluff the conglomerate thins rapidly and disappears by inter-fingering with the Quamby Mudstone (Jennings, 1963, p. 64).

Further to the E the basin rapidly deepens into the major basin of Permian sedimentation, shown by Banks (1962, figs. a. and b.). This basin is filled with variable thicknesses of Stockers Tillite (Wells, 1967) which is overlain by the Quamby Mudstone. Between Dairy Plains and South Mole Creek the tillite and the oil shale horizon, near the base of the Quamby Mudstone wedge out against the basement rising to the W, so that the Quamby Mudstone with the basal thin Barn Bluff Conglomerate directly overlies the basement.

On the regional scale, the Barn Bluff Conglomerate is seen as a restricted blanket lying on, and peripheral to the major basin, whilst the tillite is thick in the major basin and thins out onto the basement rises. This interpretation is shown in Fig. 1.

Conclusions

The Cradle Mt-Barn Bluff area provides an example of a local and complete basin, where the mutual relations between the rock units of the Lower Permian can be examined. Of particular interest

is the influence of the shape of the basin on the sedimentary history of the lower pebbly formations. The basin is six miles long and two miles wide and 1,000 feet deep. Not until the deposition of the Lake Holmes Coal Measures did the basin cease to be an effective restriction on sedimentation.

The basal Bluff River Pebbly Siltstone is marine and is confined to the buried valley beneath Mt Inglis. The overlying Barn Bluff Conglomerate is draped over the pre-Permian surface on the flanks of the basin. The succeeding Lower Permian formations wedge out against the Barn Bluff Conglomerate which rises onto high ground on the NW flank of the basin.

The Barn Bluff Conglomerate exhibits unusual features. It is an unstratified blanket deposit composed dominantly of angular, unsorted fragments of Precambrian quartzite and schist, in a silty and sandy matrix. In places it has a considerable depositional slope, and where it directly overlies Precambrian basement, parts of the deposit can be shown to be untransported.

The conglomerate was probably continuous across the basement high in Central Tasmania, covering a region extending from Barn Bluff to Cathedral Mountain and Western Bluff.

Banks (1962, p. 196-197) has advanced the picture of this central region as an ice-covered island in the Permian sea at the time of initial sedimentation, with tillite accumulating in the major basins to the S and E. Following this the ice retreated allowing Quamby Mudstone to form in the major basins and a more pebbly variant in the smaller basin beneath Mt Inglis.

At a specific interval of time, probably while Quamby sedimentation was continuing, climatic conditions were such that an extensive periglacial scree blanket formed on the central island. This was followed by a marine transgression onto the island, as a result of which the top layer of the scree was reworked to form the top round-stone conglomerate. Some of the debris may have been washed away and incorporated as conglomeratic lenses in the Quamby Mudstone.

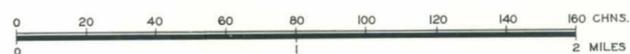
The deposition of the Lake Will Pebbly Siltstone (Golden Valley) marks a complete transgression and a sandy, shelly environment. The gradual warm-up culminated in the formation of the coal measures in a shallow-water, free-circulating, non-marine environment.

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PERMIAN GEOLOGY CRADLE MOUNTAIN-MT INGLIS AREA

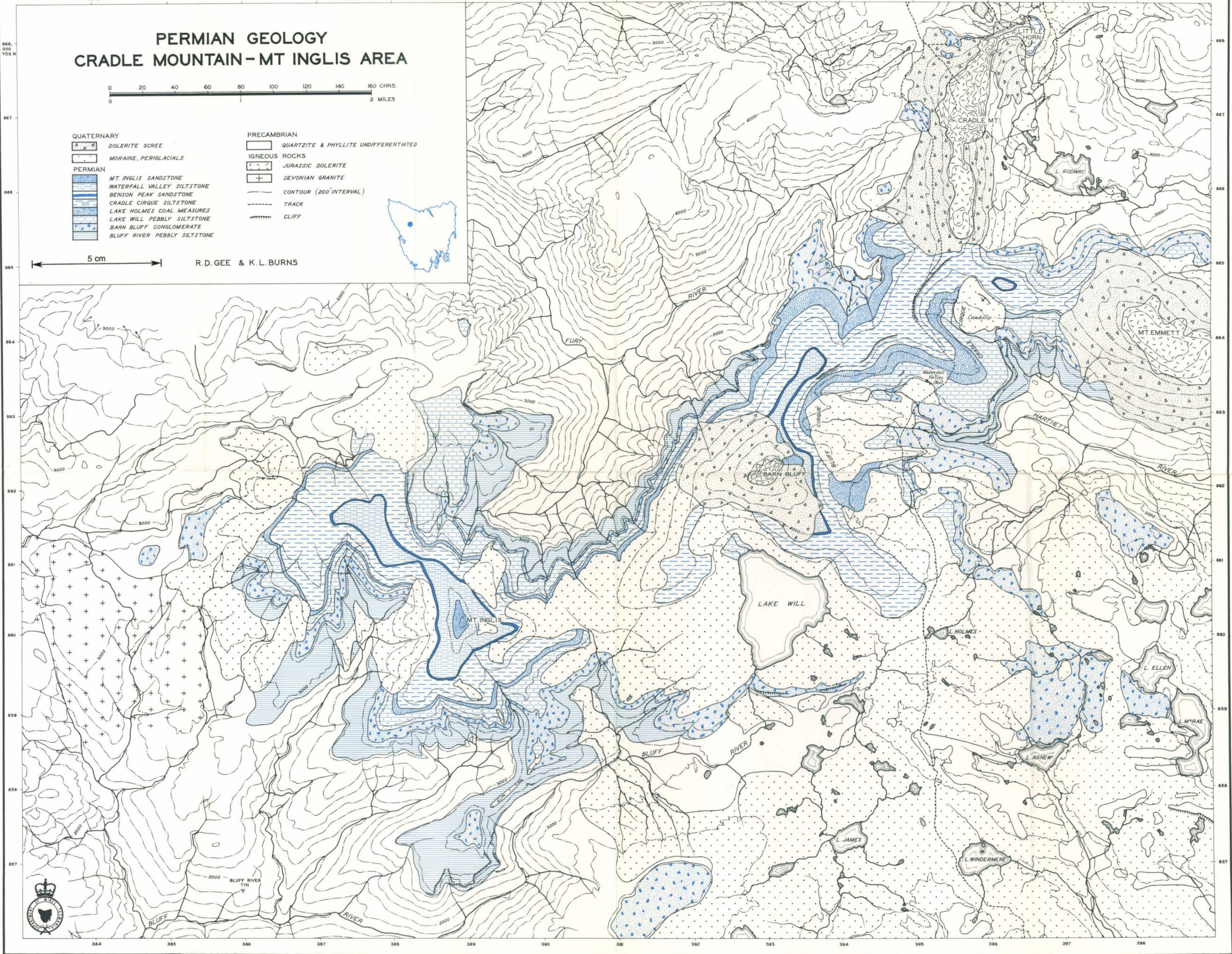


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| PERMIAN | JURASSIC DOLERITE |
| MT. INGLIS SANDSTONE | DEVONIAN GRANITE |
| WATERFALL VALLEY SILTSTONE | CONTOUR (200' INTERVAL) |
| BENSON PEAK SANDSTONE | TRACK |
| CRADLE CIRQUE SILTSTONE | CLIFF |
| LAKE HOLMES COAL MEASURES | |
| LAKE WILL PEBBLY SILTSTONE | |
| BARN BLUFF CONGLOMERATE | |
| BLUFF RIVER PEBBLY SILTSTONE | |



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R.D.GEE & K.L.BURNS



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