TR8-103-107

16. THE GEOLOGY OF THE BURNIE AREA

by L. Matthews.

INTRODUCTION

During the last few years, several landslides have taken place in built up areas of Burnie causing some concern. Although the number and size of the slides that have affected buildings and roads are small, plans for future expansion could include areas more prone to slip. A survey has been undertaken so that areas which are considered unsafe to develop can be indicated. It should be pointed out that although there are many old and active slides in the Burnie district, they are not confined to this area but are often found where basalt occurs on steep to moderately steep slopes. This includes many places on the North West Coast.

The basic need in studying landslips is a detailed geological map of the area concerned. From this, some idea of the possible causes of the slips may be obtained. The geology has been plotted on a map drawn by the Town and Country Planning Commission and contours have been taken from Burnie Council and Lands and Surveys Department maps . (See Figure 38.)

The landscape in general is youthful—streams are deeply incised with interlocking spurs. Erosion is still rapid as shown by the prevalence of landslips. Deposits of gravel and sand on

terraces near the mouths of the Emu and Cam Rivers indicate rejuvenation due to fall in sea level. A marine terrace, rising to about 50 feet above sea level and of varying width, extends from Round Hill to the Cam River, the western edge of the area mapped. Behind the marine terrace, the land surface rises sharply to 250-300 feet.

After they have cut through the basalt, the major streams are controlled to a large extent by the regional NE strike of the basement Precambrian rocks, but minor streams on the basalt appear to have no regular pattern.

Small patches of internal drainage are common in basalt areas. Some of these occur at the heels of old slips but others are found on the tops of flat hills where they may be due to differential weathering of the basalt or removal of some of the underlying material by groundwater and subsequent collapse.

Average rainfall for Burnie from 1945 to 1960 supplied by the Weather Bureau, Hobart, is shown below:—

Jan.	Feb.	Mar.	April	May	June	
132	241	188	341	395	475	
July	Aug.	Sep.	Oct.	Nov.	Dec.	Total
504	426	264	436	322	232	3955

Rainfall is spread fairly evenly with lesser amounts from December to March and maximum falls during June to August. Seasons vary from year to year and periods of 1 to 2 months during the summer with little or no rain are not uncommon. The climate is humid cool temperate.

Apart from the town area, the surrounding land has been cleared of its natural vegetation and is grassed or cropped where the basalt produces a fertile soil. Areas underlain by Precambrian rocks produce a poor soil and these have been left uncleared in most areas. Eucalypt forests with undergrowths of bracken ferns, blackberries and small native shrubs are the main vegetation on the uncleared parts. Some of the steep basalt hillsides have been cleared but have reverted to bracken ferns, blackberries and a few eucalypts. Tea tree grows in some of the swamp lands.

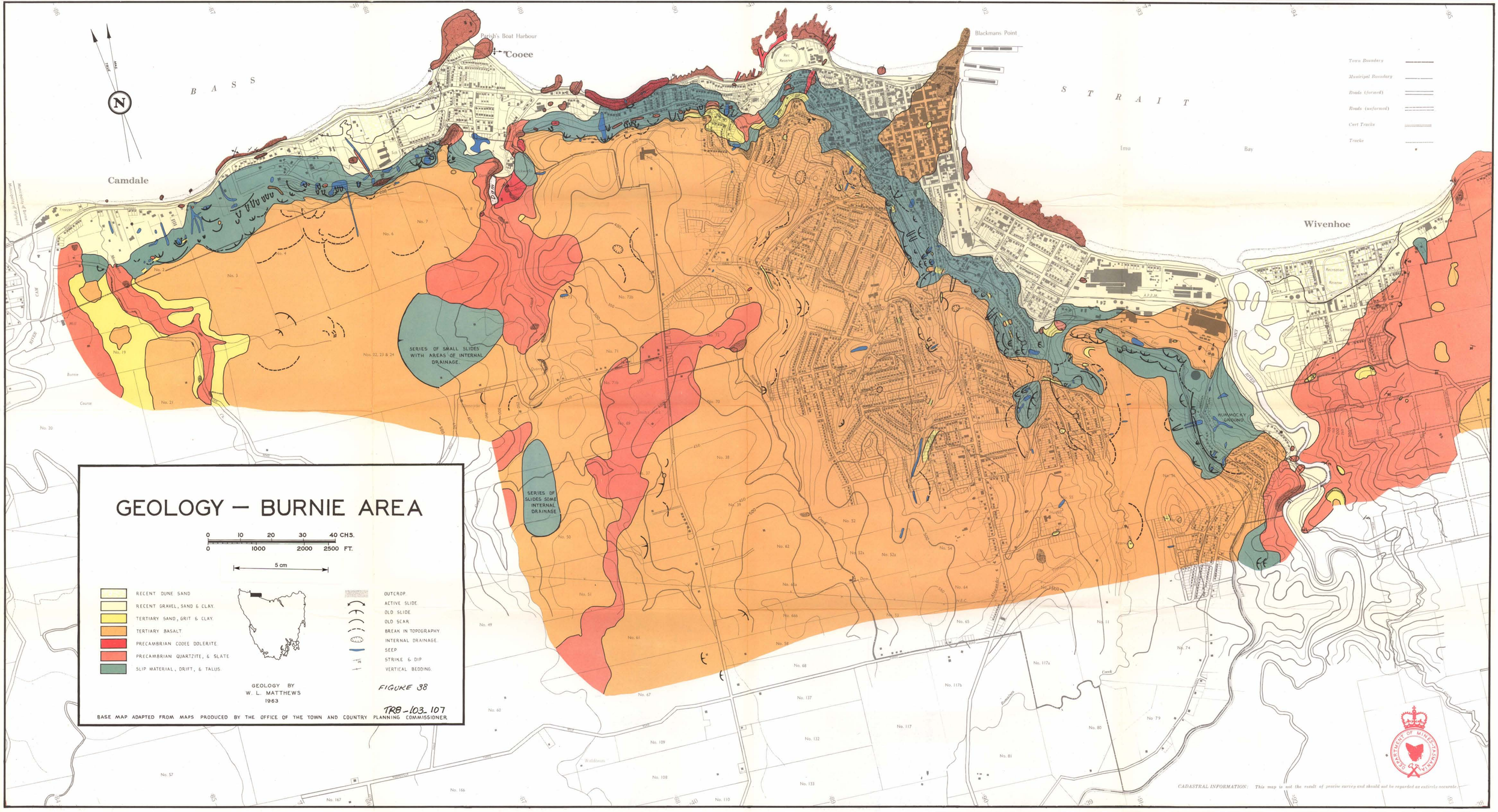
GEOLOGY

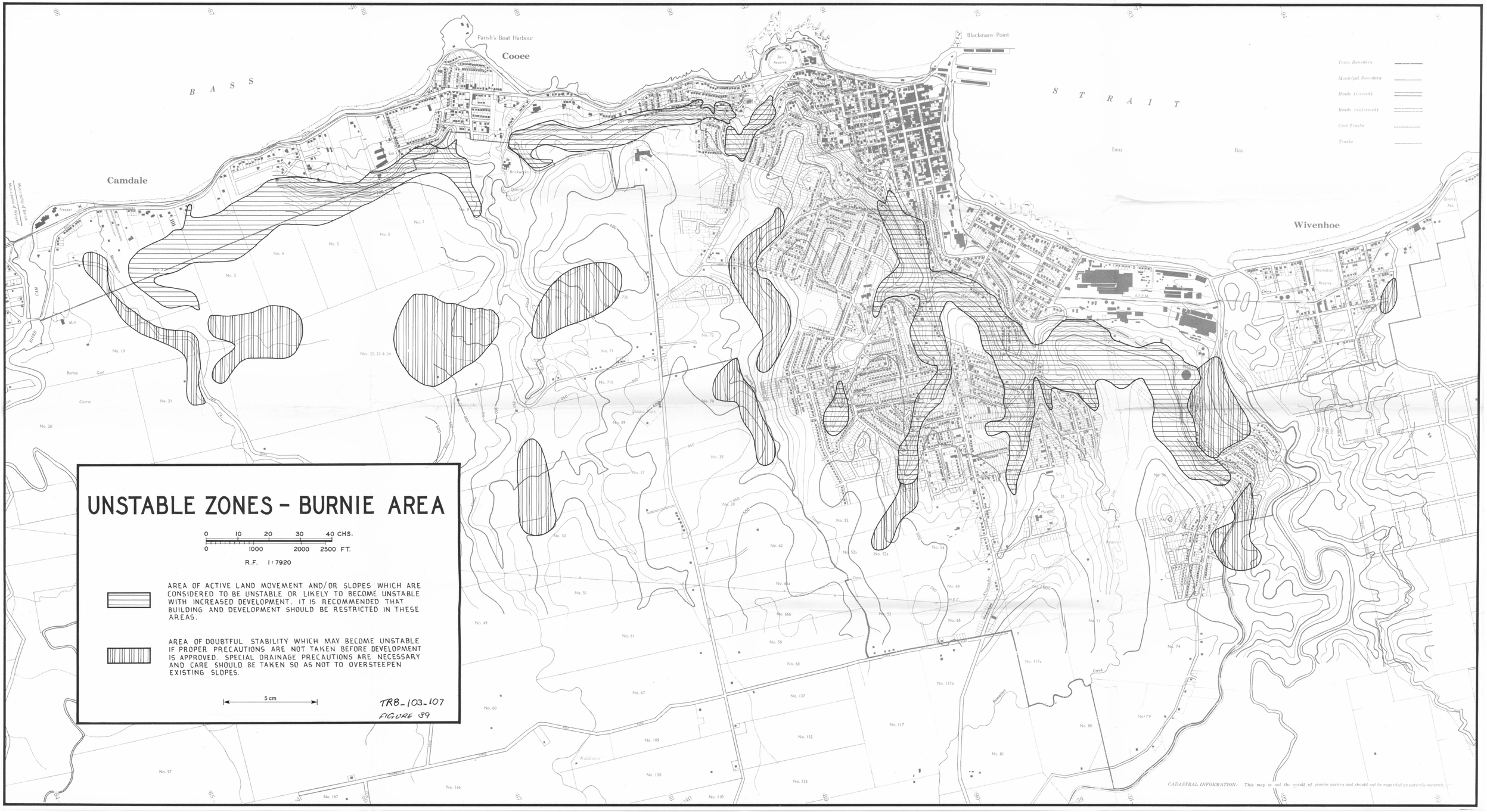
The stratigraphy of the Burnie district is relatively simple, as follows:—

Quaternary:
Dune sand, river and marine gravel, sand, clay.
Tertiary:
Basalt interbedded with sediments.
Precambrian:
Dolerite, quartzite, siltstone and slate.

Precambrian

The basement rocks of the Burnie area consist of interbedded quartzite, siltstone and slate of Precambrian age which have been called the Burnie Quartzite and Slate and placed in the Rocky Cape Group of rocks by Spry, (1957). Basic igneous intrusions into these sediments took place later in the Precambrian. Subsequent folding and faulting has made the stratigraphy difficult to delineate. Quartz veining is common throughout.


Parish's Boat Harbour
Cooee
Blackmans Point
Camdale
Wivenhoe
B A S S
S T R A I T
Emu
Bay
Town Boundary
Municipal Boundary
Roads (formed)
Roads (unformed)
Cart Tracks
Tracks
SERIES OF SMALL SLIDES WITH AREAS OF INTERNAL DRAINAGE.
SERIES OF SLIDES SOME INTERNAL DRAINAGE
HUMMOCKY GROUND
GEOLOGY — BURNIE AREA
0 10 20 30 40 CHS.
0 1000 2000 2500 FT.
5 cm
RECENT DUNE SAND
RECENT GRAVEL, SAND & CLAY.
TERTIARY SAND, GRIT & CLAY.
TERTIARY BASALT.
PRECAMBRIAN COOEE DOLERITE.
PRECAMBRIAN QUARTZITE, & SLATE.
SLIP MATERIAL, DRIFT, & TALUS.
OUTCROP.
ACTIVE SLIDE.
OLD SLIDE.
OLD SCAR.
BREAK IN TOPOGRAPHY.
INTERNAL DRAINAGE.
SEEP
STRIKE & DIP
VERTICAL BEDDING.
GEOLOGY BY
W. L. MATTHEWS
1963
FIGURE 38
TRB-103-107
BASE MAP ADAPTED FROM MAPS PRODUCED BY THE OFFICE OF THE TOWN AND COUNTRY PLANNING COMMISSIONER
DEPARTMENT OF MINES TASMANIA
CADASTRAL INFORMATION: This map is not the result of precise survey and should not be regarded as entirely accurate.


Parish's Boat Harbour
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S T R A I T
Camdale
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Emu
Bay
Town Boundary
Municipal Boundary
Roads (formed)
Roads (unformed)
Cart Tracks
Treeks
UNSTABLE ZONES - BURNIE AREA
0 10 20 30 40 CHS.
0 1000 2000 2500 FT.
R.F. 1:7920
AREA OF ACTIVE LAND MOVEMENT AND/OR SLOPES WHICH ARE CONSIDERED TO BE UNSTABLE OR LIKELY TO BECOME UNSTABLE WITH INCREASED DEVELOPMENT. IT IS RECOMMENDED THAT BUILDING AND DEVELOPMENT SHOULD BE RESTRICTED IN THESE AREAS.
AREA OF DOUBTFUL STABILITY WHICH MAY BECOME UNSTABLE IF PROPER PRECAUTIONS ARE NOT TAKEN BEFORE DEVELOPMENT IS APPROVED. SPECIAL DRAINAGE PRECAUTIONS ARE NECESSARY AND CARE SHOULD BE TAKEN SO AS NOT TO OVERSTEEPEN EXISTING SLOPES.
5 cm
TRB_103_107
FIGURE 39
CADASTRAL INFORMATION: This map is not the result of precise survey and should not be regarded as entirely accurate.

These rocks outcrop best along the shoreline and have been studied in detail by Spry (1957). Dark grey to almost white even grained quartzite is interbedded with black, banded and light coloured siltstone. A slaty cleavage has been developed in some areas, while from Round Hill to Alexander Creek the fine grained members, light green in colour, are almost phyllitic. Slump structures and an intraformational breccia outcrop on Cooee Point. Graphite is a common constituent of some of the slate zones and chalcopyrite has been noted in small specks on the foreshore near Cadbury's milk depot.

Topographic high zones project through the basalt plateau to the south and SE of Cooee, but the more resistant quartzite beds dominate the outcrops. Precambrian rocks outcrop in several of the larger streams and along the east and west boundaries of the area mapped. Along the scarp from Messengers Creek to West Park, outcrop is rather limited but appears to be fairly consistent at about 100 feet above sea level. Several shallow wells have been dug to obtain water from seeps and in some of the associated spoil heaps Precambrian material can be seen. Small areas of Precambrian outcrop on the marine platform.

The basic instrusions are concordant in most cases and are doleritic in nature. They outcrop best along the foreshore and are confined to the area between Cadbury's milk depot and Queen Street. Two intrusions have been traced inland. A large sill on the shoreline at Parklands has a zone of pegmatite with crystals of amphibole up to 3 inches in length. The dolerite weathers more rapidly than the Burnie Quartzite and Slate. In the brick works quarry in Brickport Road, it has weathered to a depth of at least 30 feet. A soil similar to Tertiary basalt soil is produced, although it is slightly redder.

Folding has been intense and several orders of magnitude can be found. A hand specimen collected from a quarry about ½ mile up the Emu River has three orders in an argillite bed. Two main directions of folding occur, indicating at least two periods of major folding. These are probably the result of the Penguin Movement and Tabberabberan Orogeny. The dominant strike direction is NE but folds with NW trending axes are present. Other smaller scale folding may have taken place.

Faulting is a common feature but the magnitudes and effects are not known.

Tertiary System

The Tertiary Era is represented by a series of basalt flows and interbedded sediments deposited during lulls in volcanic activity. The basaltic lava flowed down the pre-existing valleys, filling them and over-flowing the divides in many places. Such flows occur under the central part of Burnie near the mouth of the Emu River and in Park Street, Parklands.

Basalt

There appear to be at least four separate flows with bands of sediment greater than 5 feet thick between them. Isolated thin outcrops of sediment in many areas indicate that there are probably more. Large, well formed columns are a feature of the lowest flow on Blackmans Point. Smaller and more poorly developed columns outcrop in other areas, e.g. Mount Street, Dobson's Quarry

to the West of Mooreville Road and in the old quarry near Harrison Street. The basalt is deeply weathered forming a fertile red brown clay soil so that the rock itself can be seen only in deep excavations. The tops of flows tend to be very vesicular and weather evenly, while the lower parts weather around the joints first, leaving centres of unweathered rock. The final product is red brown soil but many colours are represented in the intermediate stages of weathering.

Some of the weathered zones in cuttings have a granular texture not unlike tuff. If the volcanic centre was relatively close to Burnie, beds of tuffaceous material could have been deposited there.

Zeolites commonly fill the vesicles and other cavities. Fine specimens of acicular natrolite were collected from Dobson's Quarry.

Sediments.

At least four levels of sediments occur, while other isolated outcrops may represent other levels or may be continuations of these four bands on a different level. The lowest sedimentary beds can be seen underlying columnar basalt behind the railway station. The outcrop of quartz grit and light brown clay is about 2 feet thick, but the total thickness of the deposit is probably not exposed.

The thickest and most extensive band of Tertiary sediments occurs about 150 feet a.s.l. over-lying the lower basalt flows and sometimes overlying the Precambrian rocks directly. This unit reaches a maximum thickness of 40-50 feet on the Ridgley Road and in the vicinity of West Park. It is variable, however, and lenses out completely in some areas (e.g. in an old quarry up Brickport Road).

It is made up mainly of quartz particles: fine pebbles, coarse grit, grit and sand sizes with some clay and fine silica in the matrix. Limonite derived from overlying basalt has cemented the normally unconsolidated sediments in some areas. The particles are dominantly sub-rounded to rounded and many have a high sphericity indicating extensive working. Occasional weathered basalt fragments, often vesicular, have been noted in the sediments. These are probably ejectamenta from the volcanic centre.

Sand beds are common and two bands of medium blue-grey clay, 18 inches thick, were exposed in trenches in Park Street. A pebble bed, 2 feet thick, containing well rounded disc shaped fragments of probable Precambrian origin, is also exposed in Park Street.

There are two general levels of sediments above this main band—one at about 300 feet a.s.l. and another at about 400 feet. These are made up of quartz grit, quartz sand, blue-grey clay and light brown clay. Good exposure of light brown clay can be seen in a road cutting just to the south of Hume's factory and near the junction of Bird and Morse Streets.

The grit particles in these thinner bands tend to be rather more angular than in the thicker band. Nodules of grit with a cement of a black manganese mineral can be seen in an excavation between View Road and Elizabeth Street.

There is extensive induration near the basalt contacts in some localities. On the foreshore in front of the Burnie Hospital, large blocks of quartzite conglomerate and breccia occur. Other areas showing induration occur at the mouth of the Emu River, to the south of Wivenhoe, and along West Park Road. Two areas about 1 mile up the Emu River show baking although limonite cementing has also contributed to the hardness of the rocks here. Quartzite and quartz boulders are the main constituents of the rudites and boulders up to 1 foot across have been found.

The 300 foot and 400 foot sediment levels may be continuous but soil creep and talus drift has elminated continuous outcrop. The other possibility is that they are lenticular beds deposited by streams in which case they need not be continuous. Talus might cover the band at the 150 foot level for most of the distance along the scarp from Parklands to Camdale as it is only exposed in isolated outcrops. Some of the beds on other levels are almost certainly lenticular (e.g. a 1 foot grit band in Mount Street just above Wyatt Crescent and a 2 inch band of blue clay near the A.P.P.M. mill on Surrey Road). Regardless of their origin they are evidence of several flows of basalt.

Quaternary Deposits

River gravel and sand are common along the Emu and Cam Rivers, while gravel, sand and clay have been deposited on the marine terrace. In some respects some of these deposits are similar to the Tertiary sediments but the Quaternary gravels contain rounded unweathered basalt boulders. Two areas of dune sand have been indicated on the plan—one at Wivenhoe and the other in front of the Burnie High School.

Talus, slip material and soil drift have been grouped together because boundaries between them are complicated and difficult to separate accurately.

REFERENCE

SPRY, A., 1957.—The Precambrian rocks of Tasmania, Pt. 1, Dolerites of the North-West Coast of Tasmania. *Pap. Roy. Soc. Tas.*, 91, 81-93.