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TASMANIA DEPARTMENT OF MINES

GEOLOGICAL SURVEY  
EXPLANATORY REPORT

GEOLOGICAL ATLAS 1:250 000 SERIES

SHEET No. SK-55/4

LAUNCESTON

*by M.P. McCLENAGHAN, B.Sc.(Hons)., Ph.D.,  
and P.W. BAILLIE, B.Sc.*



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## PREFACE

This explanatory report gives a brief outline of the area of the Launceston 1:250,000 sheet. This sheet is the second of a new series of geological maps which it is hoped will provide complete coverage of the State within the next few years.

The geological information is derived from both departmental and external sources.

The list of selected references at the end of the report will serve as a guide to the more important geological publications which deal with the area.

*J.G. SYMONS, Director of Mines*

## PHYSIOGRAPHY

Structure is the dominant control which has affected the development of the major geomorphic units in the Launceston Sheet. These units have subsequently been modified by humid, periglacial, and glacial processes. Highland areas are principally confined to the southern parts of the sheet where dolerite capped mountains and plateaux reach heights in excess of 1500 m. The northern areas are predominantly continuous lowland plains where emerged platforms have been extended seaward by coastal accretion (Davies, 1965). Granitic rocks occupy extensive areas in the eastern part of the sheet, including the highland areas in the north-east.

The stepped and scarped hills near the Tamar River result from the major faulting which produced the Tamar Trough. This faulting is responsible for the formation of the Cressy and Tamar lowlands which contained the sites of lakes in Tertiary times (Longman, 1966). The Early Tertiary drainage was considerably modified by basalt flows which caused the diversion of some rivers, and the twinning of others. These rivers have been later superimposed on resistant dolerite with the consequent development of steep gorges such as Cataract Gorge [EQ1011].

Drainage of the eastern part of the sheet is largely controlled by jointing and bedding of folded Mathinna Beds. In the lowland areas granite usually occupies areas of negative relief. On the Mathinna Plains [EQ5515] erosion has only just exposed the folded basement. This surface is considered to be the pre-Permian surface, and is also exposed on Mt Arthur [EQ2430] (Longman, 1966; Marshall, 1969).

The northern coast is thought to result from repeated down-flexing of the Bass Strait region (Davies, 1965). At present, beaches occupy greater than 50% of the coast. Parabolic, or blow-out dunes extend many kilometres inland on parts of the coast, e.g. Great Forester River area [EQ4262]. These are thought to have been formed since the nineteenth century as a result of burning and grazing of dune country previously stabilised by vegetation.

During Pleistocene times an ice cap formed on the Central Plateau, the north-eastern extension of which terminated at Drys Bluff [DP8583] in the south-western corner of the Launceston Sheet. The coalescing of several small plateau glaciers resulted in almost complete ice cover of the upper surface of the Ben Lomond massif (Davies, 1965). The effects of periglacial processes are more widespread, resulting in extensive block fields on Mt Barrow [EQ3519] (Caine, 1968), Mt Arthur [EQ2430] (Longman, 1966) and talus deposits around the major highland areas.

## PRECAMBRIAN

Rocks of Precambrian age occur west of the Tamar River principally in the Asbestos and Dazzler Ranges.

In the south-west of the sheet are small areas of metamorphosed quartzite, schist and phyllite that are probably part of the Tyennan nucleus, which extends from the south-west coast of Tasmania. The rocks are highly deformed and show a strong foliation and two penetrative lineations (Pike, 1973).

In the Asbestos and Dazzler Ranges is a comparatively unmetamorphosed sequence of interbedded quartzwacke and phyllitic mudstone (Gee and Legge, 1974). The quartzwacke is composed of detrital quartz and mica in a chloritic-sericitic matrix. Internally the beds often show graded bedding with

laminated tops and small scour structures on the soles. The beds are considered to be turbidites (Gee and Legge, 1974). These rocks show tight folding and at least two deformation phases are recognised. Folds of both phases have a NNW-SSE trend. The axial portion of the Asbestos Range is broadly anticlinal. The folding is considered to have occurred during the Penguin Orogeny of Late Proterozoic age.

## CAMBRIAN ROCKS

Rocks assigned to the Cambrian System are faulted against Precambrian basement rocks in three main areas west of the Tamar River. They consist of variable sequences of clastic and pyroclastic suites in association with both intrusive and extrusive igneous rocks. Trilobites found 4.5 km SSW of Beaconsfield [DQ8735] indicate a Late Cambrian age (Green, 1959) in this particular locality. No other Cambrian fossils have been found within the area of the Launceston Sheet. On the grounds of lithological similarity with proved Cambrian rocks elsewhere, the remaining rocks are assigned to the Cambrian.

A sequence of slaty siltstone, greywacke, chert and dolomite occurs in a meridional belt on the western side of the Dazzler Range in the Port Sorell area [DQ6636], (Gee and Legge, 1974). Tabular dolerite bodies, ranging in thickness from a few metres to 30 m, intrude siltstone. These dolerite bodies are considered to represent post-folding, high-level, near-surface intrusions (Gee and Legge, 1974).

A eugeosynclinal suite of slate, chert and greywacke with minor keratophyre occurs west of Beaconsfield [DQ8440]. Four structural slices of Cambrian rocks occur within an imbricate thrust zone. In the Middle Arm Creek area [DQ8535] the sequence is 370 m thick. One hundred metres of slate is overlain by interbedded slate and greywacke which is overlain by a discontinuous lens of keratophyre. Above this is a siltstone with thin discontinuous laminae of fine sandstone which contains a fauna of fragmented trilobites of Late Cambrian age. In the Andersons Creek area [DQ7838] a narrow strip of slate and chert lies between an ultramafic mass and Precambrian rocks.

The ultramafic mass is an elongate body of serpentinite, pyroxenite and gabbro considered to be primarily a layered complex that has been tectonically re-emplaced as an alpine-type body (Gee and Legge, 1974). Three included septa of metamorphic rocks are also present and are thought to have been included in the ultramafic body by stoping as the magma rose prior to serpentinitisation. Slate and chert adjacent to the mass show the development of andalusite indicating a degree of contact metamorphism just above the boundary between the albite-epidote hornfels facies and the hornblende hornfels facies.

South of Deloraine the Cambrian has been divided into lutite, arenite and rudite-rich sequences (Pike, 1973). Each sequence contains volcanic rocks. South of Pumicestone Ridge [DQ7101], conglomerate and graded sandstones of the rudaceous sequence appear to overlie slate, phyllite and shale of the lutite sequence. The volcanic rocks consist of basic lavas, volcanic breccia, tuffs and acid crystal tuff. At the eastern end of Pumicestone Ridge, beds of conglomerate and greywacke unconformably underlie a sequence of massive quartz sandstone. Both rock types have been intruded by a quartz porphyry and a number of the porphyry layers may be extrusive. Thick sequences of graded-bedded units of greywacke and conglomerate and the occurrence of associated volcanic rocks suggest rapid deposition occurred in a deepening trough in an unstable environment (Pike, 1973).

## JUNEE GROUP CORRELATES (ORDOVICIAN SYSTEM)

The lower sequences of the Junee Group correlates consist predominantly of quartz sandstone with minor siliceous conglomerate. Near Needles [DQ6300] the sandstone occasionally displays cross-bedding, but is generally planar, in units which range in thickness from 50-600 mm. Worm casts, where present, generally lie normal to the bedding.

On Cubits Sugarloaf [DP6995] the conglomerate beds are unfossiliferous, white to pinkish, with quartz cement and crop out in beds 1.5-3 m thick. The pebbles of the conglomerate have an average diameter of 40 mm and are composed of quartz and quartzite with rare occurrences of slate and quartz schist.

In the Cabbage Tree Hill area [DQ8439] interlayered fine-grained, black pyritic mudstone and siliceous sandstone are overlain by medium- to coarse-grained sandstone which is in turn overlain by flaggy, cross-bedded medium- to fine-grained sandstone. The uppermost part of the sequence is a well-bedded association of flaggy, micaceous sandstone and buff coloured siltstone (Gee and Legge, 1974). Marine shelly faunas from these rocks indicate an Early Ordovician age (Green, 1959).

The siliceous clastic rocks unconformably overlies Cambrian and Precambrian rocks e.g. Lake Highway [DP7196]; Pumicestone Ridge [DQ7101]. These rocks have been used as a source of silica and, more commonly, of road metal.

The siliceous beds are followed, probably conformably, by a limestone sequence about 500 m thick in the Flowery Gully area [DQ8432] where massive grey limestone is overlain by a sequence of interbedded siltstone, impure sandstone and quartzite (Gulline *et al.*, 1973). Limestone from Flowery Gully is used for industrial purposes.

## ELDON GROUP CORRELATES (SILURIAN AND LOWER DEVONIAN SYSTEMS)

Quartzite and slaty siltstone with rare conglomerate occurs near Frankford [DQ8123]. It contains highly sheared brachiopods which may suggest a possible correlation with the Eldon Group of Western Tasmania.

## MATHINNA BEDS (ORDOVICIAN, SILURIAN AND LOWER DEVONIAN SYSTEMS)

The Mathinna Beds comprise all the folded pre-Parmeener Super Group sedimentary rocks in north-eastern Tasmania (Banks, 1962). The lack of marker horizons has made the determination of their structure and stratigraphy difficult. However, two lithological associations have been recognised; an older, dominantly lutite association and a younger, dominantly arenite association (Banks, 1962; Longman, 1966; Marshall, 1969; Threader, 1967). Graptolites from the Back Creek area (Banks and Smith, 1968) indicate an Early Ordovician age, and farther east vascular plants from Warrentinna [DQ6051] and Scamander [FQ0509] together with graptolites indicate an Early Devonian age (Cookson, 1937; Banks, *in Groves*, 1972a). Structural profiles indicate a younging of the sequence from west to east.

The argillaceous sequence consists of slate and phyllite with sparse horizons of fine- to medium-grained feldspathic siltstone. The arenaceous sequence is largely siltstone, poorly-sorted sandstone, and minor intercalations of slate. Graded units, sole markings, small-scale slumping, convolute-folding and cross-laminae suggest a turbidity current origin for the coarser deposits (Williams, 1959). Deposition took place in a south-easterly trending

basin with turbidity currents originating from a number of sites of unstable accumulation at the southern and western basin edges (Williams, 1959).

West of the Tamar River, sedimentary rocks of comparable age to the Mathinna Beds, such as Ordovician siliceous clastic beds and limestone, represent much shallower water deposition than that of the Mathinna Beds and would thus be expected to be separated by transition deposits. It has been suggested that these transition deposits have been faulted out by large lateral movements along the site of the Tertiary Tamar Trough (Williams, Solomon and Green, in press).

### TABBERABBERAN OROGENY

The major tectonism of Lower Palaeozoic rocks in the area of the Launceston Sheet is ascribed to the Tabberabberan Orogeny. The orogeny is younger than Early Devonian since it folds the Mathinna Beds and older than undisturbed late Middle Devonian deposits in folded Ordovician limestone at Eugenana [DQ4235] on the Burnie Sheet (Balme, 1960).

West of the Tertiary Tamar Trough, folds generally trend in a north-westerly direction which is the second main phase of deformation ascribed to the Tabberabberan Orogeny (Williams, Solomon and Green, in press). Associated with the north-west trending folds east of the Asbestos and Dazzler Ranges is a north-east dipping imbricate thrust zone, which has interlayered Ordovician and Cambrian sequences (Gee and Legge, 1974). South of Deloraine [DQ7103] west-north westerly trending folds are broad and asymmetrical with axial surfaces dipping north-east (Pike, 1973). Vergence of folds of all orders indicates transportation from the north-east.

East of the Tamar, NW-trending asymmetrical folds dominate the deformation of the Mathinna Beds. Vergence is usually to the north-east indicating transportation from the south-west which is directly opposite to that found west of the Tamar Trough.

The facing of bedding can be recognised in the Mathinna Beds by sedimentary structures, and generally throughout the region strikes NNW. Folding has taken place resulting in elongate domes and basins with steep axial surfaces, long fairly planar limbs, and abrupt zones of closure. Hinges of minor folds trend NW to NNW and plunge both north and south. The axial surfaces generally dip steeply towards the west. A slaty cleavage is present associated with the folds and may form fans with a dihedral angle of up to 70° (Williams, 1970).

In the Lefroy-Pipers River area [EQ0550] a second phase of folding is developed which is associated with a second cleavage crenulating the earlier one. These folds are asymmetrical and open, plunging shallowly south with axial planes steeply inclined to the north-east (Marshall, 1969). Other cleavages may be developed, as at Stony Head [EQ0263] where the enveloping surface of the folded Mathinna Beds dips south-west, more shallowly than the slaty cleavage. Vergence of minor folds is to the north-east (Williams, 1970). In the Lefroy-Pipers River area [EQ0550] the vergence of folds is to the south-west and the cleavage dips more shallowly to the south-west than the enveloping surface. The bedding in the Lefroy area is usually overturned. These relations suggest a large recumbent syncline trending NNW-SSE with an axial surface dipping south-west (Gee and Legge, 1974).

Minor folds are well exposed in the Elephant Pass area where they trend NNW and swing slightly towards the north as they ascend through the structure.

The axial surfaces of the folds dip steeply west with those on the extreme east of the section being steepest suggesting the proximity of a crest to a north-pitching anticlinorium in the area. This is supported by the northward plunge of the minor folds and their vergence to the east (McNeil, 1965).

The lithological differences and structural contrasts on either side of the Tertiary Tamar Trough, together with some gravity evidence (Longman and Leaman, 1971), indicate that the Tertiary Tamar Trough is the site of the fracture system along which lateral movements have brought the Palaeozoic sequences in the eastern and western parts of the Launceston Sheet into juxtaposition (Williams, Solomon and Green, in press).

## UPPER DEVONIAN GRANITE OCCURRENCES

Granitic rocks of Upper Devonian age (McDougall and Leggo, 1965) crop out over a large part of north-eastern Tasmania and occur in three main masses; the Scottsdale Batholith, the Blue Tier Batholith and the Ben Lomond Batholith. The batholiths are composite and intrude Mathinna Beds and have narrow metamorphic aureoles ranging from 500 m to 2 km. The granitic masses have an approximate N-S trend which parallels the Tabberabberan structural trends but they are essentially discordant and the intrusions are high level and post-tectonic (Groves, in press).

To the east of St Marys [FP0198] the St Marys Porphyry occurs as a sheet composed of biotite, hypersthene, adamellite porphyry about 1300 m thick dipping shallowly southward (McNeil, 1965). Sanidine and anorthoclase phenocrysts indicate that the magma was at a high temperature when they were formed and their unaltered state in the contact zone suggests that the magma was still at a high temperature when intruded.

The Blue Tier Batholith has an area of about 1800 km<sup>2</sup> and is made up of a number of discrete bodies (Gee and Groves, 1971).

North-west of St Helens [FQ0424] the granitic bodies fall in three main lithological types. These are biotite and hornblende granodiorites, porphyritic coarse-grained biotite granite and adamellite, and biotite and muscovite adamellite and granite. The latter two rock types have not been distinguished on the map and have been included together as dominantly adamellite and alkali-granites. The Pyengana Pluton (which lies to the south-west of Pyengana [DQ8428], and the Gardens Pluton, stretching between Gladstone [EQ 8565] and the Gardens [FQ0742] are lithologically similar and consist dominantly of biotite-hornblende granodiorite. The eastern margin of the Pyengana Pluton has a 3 km zone containing a steeply dipping cataclastic foliation which is cross-cut by porphyritic biotite granite and adamellite of the Poimena Pluton.

The Poimena Pluton shows a foliation of aligned feldspar phenocrysts which on the western margin near Derby [EQ6745] dips steeply and is approximately parallel to the boundary. Towards the interior of the pluton there are two foliations approximately at right angles. In the Blue Tier area [EQ 8238] the Poimena Pluton is intruded by a representative of the third granite type, a biotite-muscovite alkali granite which has an irregular distribution. Recent work has shown that the granite may have a dome shape (M. McClenaghan, Unpubl. Dep. Rep., 1973), similar to the Mt Paris Mass which has a similar lithology and lies a short distance to the west, south of Derby [EQ6745].

Several other masses of muscovite-biotite granite and adamellite occur in the Mt William [FQ0071], Mt Cameron [EQ7963], and Little Mt Horror [EQ6963] areas and have sheet-like forms intruding the Poimena Pluton.

Field relationships indicate a general evolution towards more alkali-rich acid rocks with time (Reid and Henderson, 1928; Groves, 1972b). This trend is coupled with a reduction in proportion of xenoliths. Tin mineralisation is associated with the biotite-muscovite granites and associated leucogranites, aplites and pegmatites.

The Scottsdale Batholith covers an area of approximately 750 km and extends between Bridport in the north to the northern flank of Ben Lomond in the south. The composition of the batholith is fairly uniform and ranges from hornblende biotite to biotite granodiorite. Several masses of alkali granite occur in the Kamona area [EQ5442] showing that it is a composite intrusion.

The batholith discordantly intrudes the Mathinna Beds and the contact is well exposed at Bridport [EQ3363], where it is sharp and mostly parallel to bedding but in some places joint controlled. Three dimensional irregularity of some minor folds near the contact suggest plastic mobilisation which modified existing folds rather than having evolved new ones (Marshall, 1969). The metamorphic aureole in the area west of Scottsdale [EQ4343] varies in width up to a maximum of 2 km.

In the area from Springfield [EQ4137] to Burns Creek [EQ3910] numerous roof pendants and remnants of chilled margins occur indicating that the roof of the granite is just exposed (Longman, 1966).

Xenoliths are common in the west Scottsdale area where they have an approximate ellipsoidal form suggesting that they have been shaped by flow (Marshall, 1969). The majority are of dioritic composition and are probably cognate. They have a preferred orientation parallel to the granite boundary. Similar xenoliths occur near the granite margin as far south as Burns Creek [EQ3910] and are also oriented parallel to it (Longman, 1966).

The approximately straight eastern boundary of the batholith is in marked contrast to the western margin. A foliation shown by mineral alignment in the granodiorite north of Kamona is steeply dipping and strikes parallel to the boundary (Turner, Unpubl. Dep. Rep., 1974). The metamorphic aureole maintains a constant width along the contact and it seems probable that it is intrusive, possibly controlled by a pre-existing fault.

At several localities (e.g. Lisle, [EQ2836], Golconda [EQ2643]), gold-quartz veins occur in, or adjacent to granodiorite (Klomínský and Groves, 1970). Other gold deposits (Mangana-Mathinna-Alberton) occur along a line following a shear zone between the Blue Tier and Scottsdale batholiths (Threader, 1967). The remainder of gold deposits e.g. Beaconsfield, occur at great distances from exposed granitic rocks.

The Ben Lomond Batholith forms an elongate mass stretching between the Ben Lomond Plateau and St Pauls River. The dominant rock type is a porphyritic biotite alkali granite. Towards the contacts, which are discordant and joint controlled (Williams, 1969), the granite becomes fine-grained, frequently containing tourmaline and muscovite. The sharp contacts of the fine-grained granite with the Mathinna Beds suggests that the granite was emplaced at shallow depth (Blissett, 1959). The main granite mass is intruded by irregular dykes, tongues and other masses of often porphyritic microgranite. Cassiterite-wolframite-sulphide-quartz fissure veins occur at Storys Creek [EP6190] and Rossarden [EP6287] in Mathinna Beds immediately above cupola-like bodies of microgranite. The microgranite is a late differentiate of the alkali granite and is frequently greisenised in zones that may be concordant with the country rock boundary (Williams, 1969). At Rex Hill [EP5682]

a rich pipe containing cassiterite and sulphides is considered to have a diatreme origin (Urquhart, 1967).

### PARMEENER SUPER-GROUP (UPPER CARBONIFEROUS-PERMIAN-TRIASSIC)

The Tabberabberan Orogeny was followed by prolonged erosion which continued until Late Carboniferous times. The sediments that followed can be divided into the Lower Marine, Lower Freshwater, Upper Marine and Upper Freshwater Sequences on the basis of lithology or environment. The boundaries between the divisions vary in age from place to place and the completeness and thickness of the sediments are controlled in part by the presence of basement highs (Clarke and Banks, in press).

The boundary between the Carboniferous and Permian Systems occurs near the base of the Lower Marine Sequence, and that between the Permian and Triassic occurs above the base of the Upper Freshwater Sequence. The Super-Group is divided into Upper and Lower Divisions the boundary being coincident with the base of the Upper Freshwater Sequence.

The sedimentary sequences in the western part of the sheet are similar to those in the north-west of Tasmania and all four divisions are present.

At the base of the Lower Marine Sequence is a tillite, seen to rest unconformably on Ordovician rocks at Dairy Plains [DP6094], and is highly variable in thickness (0-100 m), indicating irregular depressions in the pre-Parmeener surface (Pike, 1973). The tillite is overlain by marine sandstone, siltstone, mudstone with calcareous horizons rich in shelly faunas. The Lower Marine Sequence is about 350 m thick in the Quamby area.

This is followed by 35 m of pale brown, carbonaceous, coarse-grained, well-washed, cross-bedded quartz and quartz mica sandstone with minor carbonaceous shale, bearing fossil plants indicative of freshwater conditions. This constitutes the Lower Freshwater Sequence which maintains an approximately uniform character and thickness throughout the area of the map sheet. Most of the eastern part of the map sheet is an area of basement high where the Lower Marine Sequence is not developed and the Lower Freshwater Sequence rests directly on folded Siluro-Devonian sediments and Devonian granites. The Lower Marine Sequence occurs in the Musselroe Bay area, separated from the main outcrop by a basement high. At Rossarden [EP6287] the Lower Freshwater Sequence is approximately 45 m thick and consists of conglomerate and arkose together with coarse sandstone and carbonaceous shale (Blissett, 1959).

The Upper Marine Sequence in the Quamby area has an approximate thickness of 265 m. This consists of 87 m of fossiliferous, erratic-rich, massive mudstone and sandstone, overlain by 178 m of sparsely fossiliferous, medium to dark grey, quartz and mica mudstone containing a thin, unfossiliferous, conglomerate sandstone and a thin, unfossiliferous, quartz conglomerate. At Rossarden a limestone unit, 3 m thick, occurs 40 m above the base of the sequence. The Upper Marine Sequence increases in thickness to the south-east, and at Elephant Pass [FP0390] it is approximately 40 m thick. Shale and siltstone which occur within the limestone unit are calcareous and extremely rich in Bryozoa and brachiopods. At Rossarden the limestone is followed by 13 m of grey sandstone, pebbly grit and gritty mudstone. This sandstone unit is glauconitic and is very variable in thickness. It is overlain by 60 m of light grey and yellowish siltstone and mudstone.

In the extreme western part of the map sheet the Upper Parmeener Super-Group and 'Triassic' follows conformably and consists of approximately 630 m

of predominantly feldspathic sandstone with minor carbonaceous shale and coal bands, but in the east is disconformable. Minor conglomerate lenses, some of rounded quartzite pebbles, and others of clay pellets, are associated with the sandstone. Shallow water sedimentary structures are common and include large-scale current-bedding and mud cracks. Plant remains and silicified wood are commonly associated with the shales. The coal seams were deposited in small lakes and are of variable thickness and persistence, and range from about 0.5-5 m thick. The coal is of economic importance and has been mined at Fingal [EP8190] and St Marys [EP9799].

### JURASSIC DOLERITE

Thick sills and sheets of massive, medium-grained dolerite of Jurassic age intrude the Parmeener Super-Group and other rocks over a large part of the map sheet. The dolerite is of tholeiitic composition and is similar to that found in other parts of the State. In the Launceston area a dolerite sill has a thickness greater than 160 m, and has an undulating upper surface, with a low area between Mt Barrow and Patersonia, and relatively high areas to the north-west and south of this (Longman, 1966). Dolerite is frequently used as a road material.

### CRETACEOUS APPINITIC ROCKS

Appinitic rocks consisting of a porphyrite complex, lamprophyre dykes and andesite flows occur in the Cape Portland area [EQ8489] (Jennings and Sutherland, 1969). Petrological similarities between the appinites suggest they have a common origin and age. The flows rest on a mature dissected surface of Jurassic dolerite, and eroded remnants of Tertiary basalts occur at a higher level. This indicates an intermediate age which is supported by the appinites' similarities to the intermediate intrusive rocks of Middle Cretaceous age at Port Cygnet in southern Tasmania. A lamprophyre dyke on King Island similar to the Cape Portland lamprophyre has been dated at 137 m.y. (Jurassic-Cretaceous: McDougall and Leggo, 1965).

The structure and distribution of the appinites suggests an eroded sub-volcanic chamber represented by the porphyritic complex, within which the outcrop of a coarse biotite-augite porphyrite may represent a volcanic pipe and from which dykes intrude the country rocks, locally erupting lava.

### TERTIARY SYSTEM

Pre-Tertiary faults trending NW and NNW occur throughout the Tamar region. In the Pipers River area the faulting is later than the dolerite intrusion (Marshall, 1969).

Tertiary deposits occur in fault-controlled troughs along the Tamar and North Esk Valley and consist of interbedded clay, sandstone, conglomerate, lignite and basalt. The total thickness of the sequence may attain a maximum of 330 m. This belt, termed the Tamar Trough consists of a series of narrow, elongate basins formed by the step-faulting of blocks tilted to the south-west and with upthrown sides to the west. Near Launceston these faults constitute a half graben which changes to a full graben farther north (Longman, 1966; Gee and Leggo, 1974).

The sediments were deposited under deltaic conditions and show scour and fill structures, randomly directed current-bedding, rare graded-bedding and rapid variation in grain size. Lignite and laterite horizons, some

representing land surfaces, occur throughout the sequence (Longman, 1966).

A similar but reduced sequence occurs in the Port Sorell Trough to the west and thinner blankets of sediments spill out of the troughs and lap on to topographically higher areas (Gee and Legge, 1974).

Sandstone and conglomerate of Tertiary age associated with basalt flows occur as narrow strips and isolated patches in the Pipers River area. The nature of the sediments depends on whether the provenance of the detritus was Mathinna Beds, Devonian granite, or Jurassic dolerite. Small amounts of silicified greybilly are associated with basalt occurrences (Marshall, 1969).

Variable thicknesses of coarse, poorly consolidated sandstone, siltstone with minor clay lenses occur south-west of Mt Cameron and are overlain by basalts considered to be of Tertiary age. These sediments have largely been derived from the nearby granites and have proved a rich source of detrital tin.

In the Quamby area, gravel beds consisting of well sorted quartzose pebbles in a quartz-rich, grey-brown sandy matrix, and sandstone, occur both beneath and between basalt flows. East of Bracknell [DP9588] the sediments extend to a depth of approximately 520 m (Pike, 1973).

A veneer of unconsolidated waterworn pebbles of quartz and quartzite scattered in a loamy soil, with isolated occurrences of bedded ferruginous quartz conglomerate, occurs on the coastal plain south of St Helens and is considered to be of Tertiary age (Walker, 1957). A fluvial or flood plain origin for the sediments is probable.

The extensive basalt flows associated with Tertiary sediments over a large part of north-eastern Tasmania range in composition from highly under-saturated alkali basalts, to lavas of almost tholeiitic composition (Edwards, 1950). Volcanic centres are suggested in the East Arm-Rowella area by a coarse-grained basalt (Gee and Legge, 1974) and in the area south-east of Weldborough by an agglomerate mass capped by basalt and cut by basalt dykes (McClenaghan, Unpubl. Dep. Rep., 1973). In the Pipers River area the flows may have been produced by fissure eruptions related to NNW-trending faults (Marshall, 1969).

## QUATERNARY

Deposits formed by periglacial processes cover extensive areas in the higher parts of the Launceston Sheet. On Mt Barrow, block-streams contain unsorted dolerite boulders whose long axes are aligned parallel to slope, which is usually less than 8° (Longman, 1966; Caine, 1968). Talus around the Western Tiers (Pike, 1973), Mt Barrow and Ben Lomond (Longman, 1966) consists of variable sized blocks of dolerite up to 6 m in diameter in a clay matrix. A reverse grading may be present (Davies, 1969). Talus may be formed from other rock types e.g. Triassic sandstone near Western Tiers (Pike, 1973) or basalt (Marshall, 1969).

Associated with glacial and periglacial deposits are waterworn dolerite deposits laid down during pluvial phases of the Pleistocene.

During drier episodes of the glacial period, aeolian action produced wind blown deposits in several areas in the Longford basin e.g. lunettes at West Lagoon, Longford [EP0395].

Extensive Quaternary alluvial deposits of sand, silt and clay have been laid down by the present major river systems. Major sand dunes and related deposits have been developed in coastal regions.

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