TR9-77-88

# 11 GEOLOGY OF THE RISDON VALE AREA

by W. R. Moore


## ABSTRACT

This report describes the stratigraphy and structure of an area surrounding the proposed Risdon Brook dam. At least 1400 feet of tilted Permo-Triassic sedimentary rocks have been invaded by Jurassic dolerite intrusions up to 1500 feet thick. The sequence is disrupted by extensive faulting some of which is of Jurassic age. Tertiary basalt occurs at two localities. Underfit streams occupy broad valleys containing extensive alluvial deposits.


## INTRODUCTION

The area covered by this report comprises approximately seventeen square miles along the eastern bank of the Derwent River, extending south from Old Beach to Geilston Bay, inland to the northern flank of Grasstree Hill and south to Flagstaff Gully (Figure 24).

Access throughout the area is excellent with the major roads and coastline providing most of the good outcrops and the only sections within the area. Elsewhere the outcrops are very poor with all the geological contacts hidden by talus. In built-up areas most of the boundaries had to be inferred.

## PREVIOUS LITERATURE

The first mention of the area appears to have been by Darwin (1844) who referred to the limestone at Geilston Bay as also did Strzelecki (1845). Johnston (1888) discussed this limestone under the heading "Geilston Travertin." The Risdon Vale area was first mapped systematically by Nye (1924) in an evaluation of underground water resources, and Carey and Henderson (1945) carried out a more detailed survey from Risdon Vale to Bellerive. In his geology of the Hobart area Lewis (1946) also discussed the Risdon Vale area.

Three students of the Geology Department of the University of Tasmania, Read (1960), Hastie (1961) and Gatehouse (1961) each mapped a portion of the area covered by this report. Other reports, concerned with the proposed Risdon Brook dam-site, were written by Spry (1960), Groves (1963) and Jennings (this volume p. 112).

## PHYSIOGRAPHY AND GEOMORPHOLOGY

The area is one of contrasting topography. In the north, there are high flat-topped ridges and scarps of dolerite with lower Triassic sandstone ridges and cliffs overlying Permian siltstone. In the south the landscape is maturely dissected, with low rounded hills of Permian siltstone and two residuals of Triassic sandstone on Sugarloaf Hill and a ridge north of Flagstaff Gully.

The stream valleys are deeply incised with underfit streams the majority of which are usually dry. The valley floors of the larger streams are aggraded with a considerable infill of alluvium. Along the valley sides steep thick talus slopes occur particularly in the Permian siltstone areas.

The stream pattern of the Risdon Vale area is controlled by block faulting. Streams either flow radially off large uplifted blocks, such as Mount Direction, or along faults.

## GEOLOGY

### Stratigraphy

The following sequence occurs in the area:

| Age. | Rock type. | Thickness. Feet. |
|---|---|---|
| Quaternary | Alluvial and terrace gravels | 10+ |
| Tertiary | Basalt | 80 |
| | Hornblende tuff | 50 |
| | Geilston Limestone | 30 |
| Jurassic | Dolerite | 1500 |
| Triassic | Sandstone | 500 |
| Permian | Ferntree Formation | 650 |
| | Risdon Sandstone | 20-30 |
| | Malbina Formation | 240+ |

#### PERMIAN

*Malbina Formation*

The oldest rocks of the Risdon Vale area are the siltstone and sandstone referred to the Malbina Formation of Banks and Read (1962). These rocks outcrop below the Risdon Sandstone at the junction of Risdon Brook and Grasstree Hill Rivulet, Shag Bay and Geilston Bay. The estimated greatest thickness exposed is 240 feet on the northern flank of Natone Hill.

The contact between the Malbina Formation and the overlying Risdon Sandstone is exposed on the northern shore of Geilston Bay and in Risdon Brook, and was intersected in Bore No. 5 at Risdon Brook damsite (Figure 28). The contact between the two formations is sharp with a highly fossiliferous sandstone and mudstone bed 5-10 feet thick marking the top of the Malbina Formation.

Underlying this fossiliferous bed is a sequence of grey sandy siltstone beds with sparse fossils and exotic pebbles. Minor fine sandstone beds occur in this sequence.

*Risdon Sandstone*

The Risdon Sandstone outcrops forming a low line of cliffs with a characteristic bench on the top of the sandstone in Risdon Brook, Shag Bay and on the northern shore of Geilston Bay. On the north flank of Natone Hill, the Risdon Sandstone was found in a trench at 420 feet altitude. The Risdon Sandstone is 25 feet thick in Bore No. 5 at Risdon Brook damsite (Figure 28).

The Risdon Sandstone is blocky and poorly bedded, weathering to a dark grey-brown colour but in cores it is light grey. The composition, texture and grain size is variable. In the Risdon Vale, Shag Bay and Geilston Bay areas it is similar in appearance but at Natone Hill and areas in Lindisfarne and Warrane the appearance and texture change within short distances along the strike.

In the Risdon Vale localities, the Risdon Sandstone is a poorly sorted, coarse to medium grained, dirty quartzo-feldspathic sandstone with numerous pebbles. At Natone Hill it is a fine to medium grained, clean quartzo-feldspathic sandstone with rare exotic pebbles present.

Where it outcrops the contact between the Risdon Sandstone and the overlying Ferntree Formation appears sharp with a distinct lithological break but in Bore No. 5 the change is transitional.

*Ferntree Formation*

This formation outcrops widely and the siltstone is the commonest sedimentary rock type of the area.

The Ferntree Formation sequence is composed mainly of alternating beds of thick (up to 4 feet 8 inches) siltstone and thin (1-6 inches) muddy siltstone. These alternating beds often form vertical cliffs 10-30 feet high that can be traced for a considerable distance along the strike. Below the cliffs siltstone boulders cover the surface and choke the streams making it difficult to estimate the thickness of this formation. In the Risdon Vale area no complete section from the Risdon Sandstone to the Triassic was found but the thickness of the Ferntree Formation in Faggs Gully and on Grasstree Hill appears to be approximately 600-650 feet.

At outcrop the Ferntree Formation appears to be well-bedded but a closer examination does not confirm this impression. In unweathered drill cores no distinctive bedding planes are apparent. The rocks are massive grey siltstone with dark grey to black subhorizontal mudstone lamellae occurring irregularly through the core. These black lamellae often occur in zones 3-4 inches thick interbedded with the dark grey siltstone and often have disseminated pyrite on the bedding planes. The cores break along these subhorizontal black lamellae and in thin and polished sections they appear to be a fine grained mudstone. Banks and Hale (1957) in their definition of the Ferntree Mudstone described these beds aptly as "an alternation of fissile and non fissile siltstone." No difference in hardness was found in the siltstone cores to account for this fissility. Jennings (pers. comm.) suggested that in the cores the mudstone beds were lost, but in most of the damsite drill holes there is a very high core recovery (95%) and in the cliffed outcrops the thinner beds of muddy or fissile siltstone form at least 5% to 15% of the outcrop thickness. Mudstone lamellae are present in the cores but it is not yet proved that they form the minor beds of the alternating sequence exposed in the cliff outcrops. Only three clay beds (0.5, 3 and 6 inches thick) were found in an exploratory trench dug at the damsite to test the degree of jointing that can be anticipated in the bedrock.

In the drill cores the Ferntree Formation is massive and composed of light grey siltstone intermingled and mixed with darker, coarser siltstone giving an intricate and unusual pattern to the

rock. The same characteristic pattern also appears in the Malbina section of the core below the fossiliferous horizon in Bore No. 5. In the Ferntree Formation the pebbles are quartzite, granophyre, granite and black slate.

Another striking feature of the Ferntree Formation is its highly jointed character. Close subvertical jointing, often curved, gives it a columnar appearance. In the cores these joints are very commonly filled with calcite and pyrite.

In the cores two types of limestone are present: a fine grained muddy limestone and greenish-cream concretionary limestone. Both limestones are thin and lense out rapidly. These limestone lenses probably weather out to form the larger cavities (4-10 feet high) present in the cliffed outcrops of the Ferntree Formation. Small elliptical hollows, 3-6 inches in diameter, are frequently present also in the cliffs. The shape of the hollows and the layered decayed cores lining these hollows appear to indicate that these small holes were formed from the weathering of calcareous concretions even though no unweathered concretions were found in the bores or at outcrops.

Pebbles are rare though usually present throughout the Ferntree Formation but small rock fragments are extremely common and one thin conglomerate band 3-6 inches thick was found on the Risdon road 300 yards south of the jail.

Fossils are very scarce within the Ferntree Formation but spiriferoids occur along the shore north of Shag Bay.

Throughout the Risdon Vale area, the Ferntree Formation is overlain by Triassic sandstone but the contact is nowhere exposed.

### TRIASSIC

The Triassic rocks outcrop extensively in the northern half of the Risdon Vale area forming the high ridges overlooking Risdon Brook, Grasstree Hill Rivulet and the Derwent River approximately north of Restdown Point. Down-faulted blocks of Triassic occur in the valleys of Risdon Brook, Risdon Vale Creek and Grasstree Hill Rivulet and a narrow elongated down-faulted block occurs in the valley followed by the East Risdon Vale Road to Geilston Bay. This block widens south of Geilston Bay over Pilchers Hill southwards to Flagstaff Gully.

Thin discontinuous bands of Triassic sandstone and shale occur within the dolerite around the flanks of Mount Direction and upper Risdon Brook valley at an average altitude of 600 feet. In the south eroded remnants of Triassic sandstone form Sugarloaf Hill and the ridge to the east of the mapped area.

The greatest thickness of Triassic sandstone exposed in the Risdon Vale area is 650 feet on Grasstree Hill but minor faulting may have caused duplication. The Triassic is represented by a sequence of coarsely bedded quartz sandstone beds, frequently coarsely cross-bedded. The stratigraphic position and the percentage of shale that forms the sequence are not known, but the percentage of shale is probably greater than is indicated by outcrop.

The Triassic sandstone is well sorted, fine to medium grained, dominantly quartz with some feldspar; muscovite and graphite are present in minor amounts at outcrop. The shale is dark brown,

soft, very fine-grained, with muscovite flakes on the bedding planes. The shale beds are thin and frequently separated by fine, thin, micaceous sandstone beds. The greatest thickness of these beds exposed is 15-35 feet along Grasstree Hill road.

At the base of the Triassic sequence is a zone, 10-35 feet thick, of interbedded coarse sandstone and grit. The grit is composed of coarse angular quartzite grains which are infrequently coarse enough to form a fine conglomerate. This sequence of grit and coarse sandstone does not appear to be always present at the base of the Triassic sequence and a thin grit lense has been found in the cliffs above the Grasstree Hill road. At this location the grit is stratigraphically several hundred feet above the base of the Triassic sequence.

In the Triassic, rare thin beds of iron sands and mudstone pellet conglomerate occur. Both types of beds outcrop at several widely separated localities and their stratigraphic positions are unknown. The thin mudstone pellet conglomerate lenses sometimes contain bone fragments. From one such lens in cliffs on the Old Beach road opposite Dogsear Point, Dr Cosgriff (pers. comm.) collected and identified a small amphibian, indicating definite Lower Triassic age.

On the coast south of Restdown Point, thin dolerite sills intrude Triassic sandstone and shale beds. The transition from normal crystalline dolerite to fine grained dolerite at the chilled margin and then baked mudstone or sandstone and finally normal Triassic sedimentary rock is well exposed at several localities. On the flanks of Mount Direction and the upper Risdon Brook valley 50 feet of Triassic sandstone beds occur within a total thickness of at least 1300 feet of dolerite. The Triassic sandstone is poorly exposed and frequently its presence is only indicated by boulders or sandy soil but baked sedimentary rocks occur at both the lower and upper contacts with the dolerite.

## TERTIARY

### *Geilston Limestone*

The only definite Tertiary sedimentary deposit that outcrops in the Risdon Vale area is the limestone at the head of Geilston Bay. This fossiliferous limestone has been worked intermittantly since before 1836 and was examined by Darwin (1844). Johnston (1880) discussed it at some length. The deposit is practically worked out and the pits have been flooded so that it is difficult to gain an idea of its original extent and appearance or the stratigraphic relationship between the limestone and the associated basalt.

The limestone, or "travertine", is a hard brown rock with calcite-lined cavities interbedded with yellow, soft calcareous sand and reported clay. The thickness of the beds is variable. At Geilston Bay there are two quarries, one approximately 20 feet deep and the other flooded, with a total reported area of 10 acres (Hughes, 1957). Basalt appears to overlie the limestone in the north quarry near the old kiln and basalt also outcrops nearby on the shoreline at the head of Geilston Bay. Nye (1924) reported that "At several points thin layers of limestone occur above the basalt", but these are not exposed now. The rock underlying the limestone is not exposed. From this limestone snails, insect larvae, marsupial bones, fruit and berries have been collected indicating a Lower Tertiary age.

### QUATERNARY

River terrace gravel and valley floor alluvium were mapped as Quaternary but large areas of talus and scree, though Recent, have not been shown.

The thickness of the alluvium and extent of the flood plain of individual streams varies considerably. The underfit, normally dry, Risdon Vale Creek has a wide flood plain which extends up its valley for a long distance, whereas Faggs Gully with a similar size catchment area has a very narrow ribbon-like flood plain. Along the east shore of the Derwent the plain of aggradation of some of the very small streams is surprisingly extensive.

In Risdon Brook and to a lesser extent in Grasstree Hill Rivulet low river terraces occur. It is likely that both the Risdon Brook and Grasstree Hill Rivulet terraces are non-cyclic, unmatched terraces resulting from the stream cutting down through soft alluvium. At Risdon Brook damsite the alluvium exposed at outcrops is no thicker than 10 feet but from preliminary trenching for Bores Nos. 5 and 6 depths of 10-15 feet of river gravel were encountered.

It is expected that the thickness of the gravel will prove variable and its distribution patchy. The gravel in the Risdon Brook area is composed of rounded poorly sorted dolerite boulders and pebbles in a matrix of coarse sand. Elsewhere the alluvium shows all gradations from fine clay and sand to coarse boulders. In the next valley east of Risdon Brook the aggradation plain is extensive with thicknesses of over 15 feet of alluvium composed mainly of Permian siltstone boulders.

## IGNEOUS ROCKS

### JURASSIC

*Dolerite*

In the north of the area dolerite outcrops extensively forming the conspicuous high plateau ridges of Mount Direction, Grasstree Hill and the southern slopes of Gunners Quoin. The dolerite ridge forming Gunners Quoin extends north for two and a half miles. This ridge, with Mount Direction and Grasstree Hill, may have been one extensive thick dolerite sill overlying Triassic sandstone. The thickness of dolerite above the Triassic averages 1000 feet but west and SW of Mount Direction the dolerite extends from sea level to 1469 feet except for a thin raft of Triassic beds half way up the mountain.

The dolerite is generally medium grained although coarser grained varieties occur apparently at random. Fine grained dolerite is frequent in thin sills along the coast south of Restdown Point and the dolerite that outcrops at a lower altitude below the Triassic band on Mount Direction tends to be a finer grained variety. The dolerite is heavily and irregularly jointed.

The contacts of the dolerite with other rocks are hidden by scree except in two areas. South of Restdown Point the dolerite forms thin sills between Triassic shale and sandstone beds. A faulted contact is exposed on both sides of Risdon Cove and at Risdon Ferry, the contact being between Permian siltstone and dolerite.

The major boundary between sedimentary rocks and dolerite extends SW from Grasstree Hill for four miles to sea level north of Courtoys Point. At most localities the contact is hidden by scree but boulders of baked Triassic sandstone have been found NE and NW of Risdon Brook and baked Permian siltstone is commonly present west of Upper Risdon Brook. Boulders of fine grained dolerite have been found here also. This boundary is therefore considered to be primarily intrusive.

### TERTIARY

*Tuff*

A deposit of hornblende tuff, 40 feet thick, occurs to the south and SE of the basalt mapped in the Risdon Brook area. No tuff outcrops or boulders were found elsewhere on the margins of the basalt. The tuff is medium brown, coarse grained and friable with abundant rock fragments of variable size, often exceeding ½ inch in diameter. Vitreous black hornblende crystals are present in the groundmass.

*Basalt*

Basalt outcrops at two widely spaced localities, Geilston Bay and Risdon Brook. In both places it is fine grained, olivine rich and highly vesicular.

Two small outcrops on the southern shore of Geilston Bay are thought to be associated with an ENE fault. The northern one extends inland for a distance of 1000 feet to overlie and interfinger with the Geilston Limestone.

A large and more extensive area of basalt occurs on the low ridges and slopes immediately west of Risdon Brook above the proposed damsite. True outcrops are rare though large boulders are common and basalt scree is extensive on the slopes. In this area the basalt appears to overlie Permian siltstone except in the south and SE where it is partially underlain by basic tuff. Here basalt outcrops at 120 feet altitude and in the north at 400 feet but this altitude difference is no indication of thickness because the basalt probably flowed down a slope to the south and SE to partially envelope and overlie the previously ejected hornblende tuff bed.

Approximately 1500 feet NW of the main basalt area in Risdon Brook a very small outcrop of basalt occurs overlying Triassic sandstone. This small outcrop is at approximately the same altitude as the northernmost outcrops of the main basalt sheet to the south and is thought to be an eroded remnant of this sheet. If this is correct it proves the NW-SE fault immediately north of the damsite to be pre-basalt, probably Jurassic, in age. Further evidence of a pre-basalt age was supplied from two trenches across this fault on the eastern slopes overlooking Risdon Brook damsite. Petrological examination of specimens from this trench showed the rock to be more akin to dolerite than basalt (Jennings, this volume, p. 119).

## Structure

The Risdon Vale area has undergone intense block faulting with vertical or steep normal faults intersecting each other at or near right angles (Figure 24). The dominant fault directions are NNW-

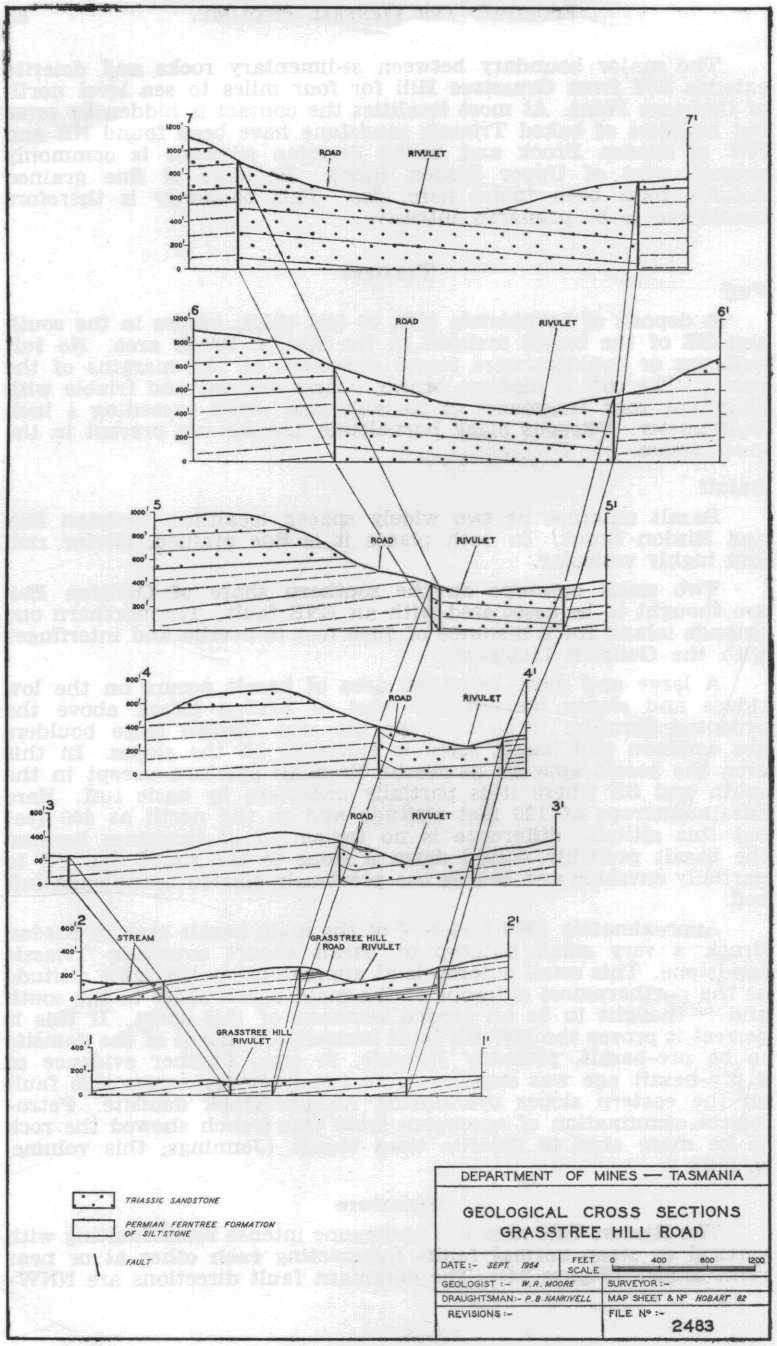

5 cm
7
7'
ROAD
RIVULET
6
6'
ROAD
RIVULET
5
5'
ROAD
RIVULET
4
4'
ROAD
RIVULET
3
3'
ROAD
RIVULET
2
2'
STREAM
GRASSTREE HILL ROAD RIVULET
1
1'
GRASSTREE HILL RIVULET
TRIASSIC SANDSTONE
PERMIAN FERNTREE FORMATION OF SILTSTONE
FAULT
DEPARTMENT OF MINES — TASMANIA
GEOLOGICAL CROSS SECTIONS
GRASSTREE HILL ROAD
DATE :- SEPT. 1954
FEET SCALE 0 400 800 1200
GEOLOGIST :- W.R. MOORE
SURVEYOR :-
DRAUGHTSMAN :- P.B. NANKIVELL
MAP SHEET & Nº HOBART 82
REVISIONS :-
FILE Nº :- 2483

FIGURE 17.

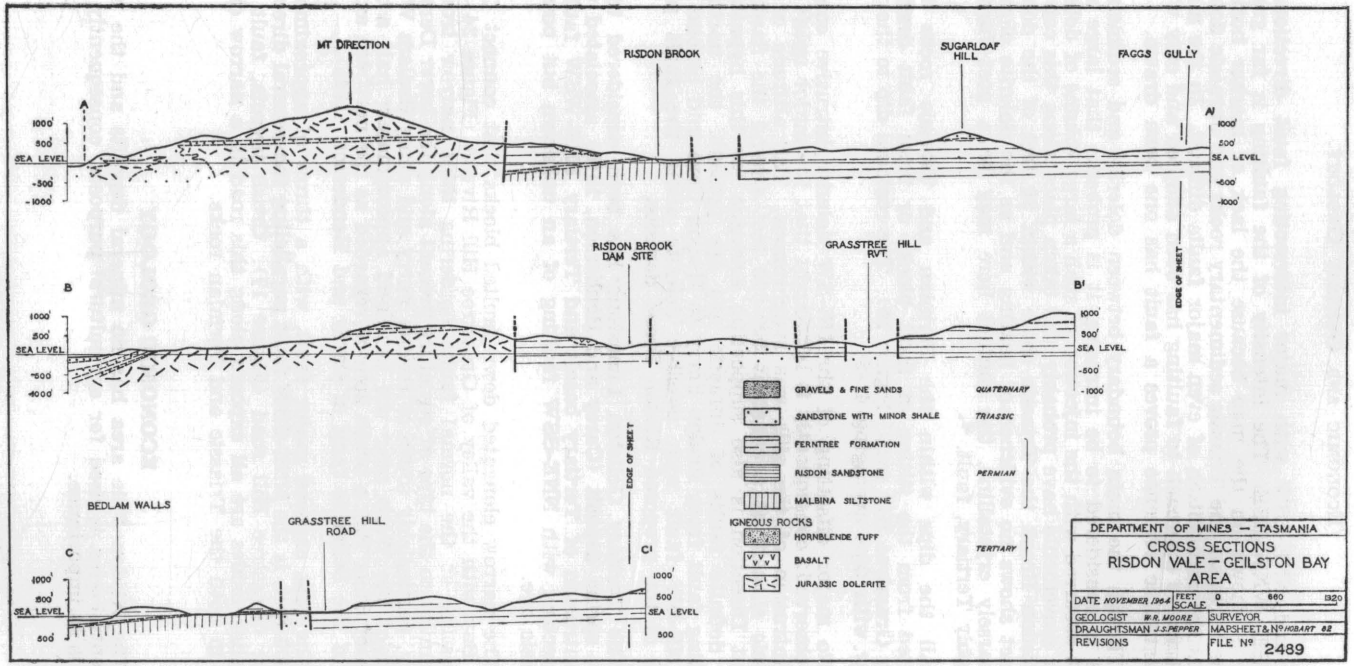



FIGURE 18.

5 cm

SSE and NNE-SSW with major intersecting fault directions of NW-SE, WNW-ESE. The intensity of the faulting is far greater than is shown on the map because the lack of marker horizons in the Permian and Triassic sedimentary rocks and Jurassic dolerite makes the recognition of even major faults difficult. In the map a conservative approach to faulting has been adopted and only where stratigraphic evidence proves a fault has one been drawn.

Though the main boundary between dolerite and sedimentary rocks is considered to be intrusive, it is probable that large scale uplift occurred with the injection of such a large volume of dolerite. Later movements have probably also taken place along this contact. In Risdon Brook the Triassic shale within 30 feet of the dolerite contact shows no evidence of heating and as the dolerite close by is coarsely crystalline, the contact here may be a post-Jurassic, probably Tertiary, fault.

All the dips within the Permian and Triassic rocks have resulted from the tilting of fault blocks or from fault drag, as along Grasstree Hill road (Figure 25). The regional dip to the west is low with dips averaging 4°-5°.

No major offsetting of the NE-SW dolerite intrusive contact was observed; consequently it is thought that the major uplift and the intrusion of the sills was synchronous. The altitude of the Triassic slithers at a constant 500-600 feet around the flanks of Mount Direction is also supporting evidence for this hypothesis. Two definite faults of Jurassic age are present: the northerly trending fault from Risdon Ferry to Risdon Cove and beyond and the NE-SW fault with possible dolerite along the fault plane north of the proposed Risdon Brook damsite.

The Tertiary Geilston Limestone has been considered to be a hot spring deposit (Carey and Henderson, 1945) associated with the intrusion of Tertiary basalt and Tertiary ENE-WSW faulting intersecting with NNE-SSW faulting of an unknown but possible Jurassic age.

The narrow elongated down-faulted blocks that connect Geilston Bay with the valley of Grasstree Hill Rivulet (Figure 24) are interesting as the normal faults bordering these narrow troughs are similar to the type of structure present along the lower Derwent Valley, particularly south of Risdon Ferry and along Bedlam Walls. North of the Walls near the headland approximately half a mile north of Shag Bay a crush zone is regarded as the northern extension of the Bellerive fault of Carey and Henderson (1945).

The best exposed major fault, with a throw of approximately 400-600 feet, is the NNE-SSW fault paralleling the general direction of the Grasstree Hill road (Figure 17). Crush breccia, fault pug and slickensides are all exposed along this road in a narrow crush zone in both the Triassic and Permian rocks.

## ECONOMIC GEOLOGY

The Risdon Vale area has no mineral deposits and the non-residential area is used for agricultural purposes, consequently soil type is of importance.

*Soils*

The best type of soil is found in the river valleys north of Risdon Ferry on the eastern shore of the Derwent River. These soils are mainly alluvial silts and sands with high organic content and are used for market gardens and orchards.

The hill country is used for extensive sheep farming with allied industry such as fire wood collection and pig farming. This area is best regarded as marginal land and has a low stock carrying capacity with most of the area still covered with eucalypt forest and scrub.

The Triassic sandstone areas provide the most fertile soils of the hill country. The soil is a light and sandy loam which dries out rapidly. Even the high Triassic sandstone ridges above Grass-tree Hill are at present being cleared for use as pastures.

Both the alluvial soils of the river valleys and soils derived from Triassic sandstone are being removed and sold for gardens.

Permian siltstone gives only a thin poor soil cover and frequently the surface of the Permian hill slopes are covered with scree. Even in the flatter areas the Permian-derived soils are infertile, supporting mainly scrub and poor tussock grasses, and most of them are still covered with light forest.

The dolerite weathers to form heavy clay loams where the relief is low but in Risdon Vale the majority of the dolerite areas have a high relief and the soils are thin or non-existent. The basalt areas are too small to be of any agricultural importance.

Any future development of the area for agriculture will depend on irrigation as the rainfall is low and the possibility of large supplies of underground water is very slight.

*Quarries*

All the major rock types of the Risdon Vale area have been or are being quarried for various purposes. Some of the deposits have been worked out and abandoned quarries are very common throughout the area.

There is now only one small quarry working Triassic sandstone for paving and ornamental stone. This quarry is situated on the southern cliff faces overlooking an eastern tributary of Risdon Brook.

The Permian siltstone has been quarried extensively for filling and road metal but the only quarry working continuously is the quarry above Flagstaff Gully dam. In this quarry baked Ferntree Formation siltstone as well as dolerite is being quarried and crushed for road metal. Several quarries in the Ferntree Formation are worked spasmodically when local requirements demand.

The cemented talus slopes of Permian siltstone are quarried extensively along the valley of Risdon Vale Creek. The talus requires no blasting or crushing and is used for road metal.

The dolerite of Risdon Vale has been quarried only when some nearby construction warranted its use, but with residential areas rapidly encroaching on the dolerite quarries of Hobart, permanent quarries in the dolerite of this area appear likely in the near future.

## REFERENCES

BANKS, M. R. & HALE, G. E., 1957.—Type section of the Permian System in the Hobart area. *Pap. Roy. Soc. Tas.*, 91, 41-65.

BANKS, M. R. & READ, D. E., 1962.—The Malbina Siltstone and Sandstone. *Pap. Roy. Tas.*, 96, 19-32.

CAREY, S. W. & HENDERSON, Q. J., 1945.—Report on the prospects of underground water supply in Bellerive-Risdon District. *Rep. Dep. Min. Tas. (Unpublished)*.

DARWIN, C., 1844.—Van Diemen's Land; *in* Geological Observations on Volcanic Islands. Pt. 2 *of* The Geology of the Voyage of the Beagle. *Smith, Elder & Co.*, London, pp. 138-142.

GATEHOUSE, C. G., 1961.—The Richmond-Sorell area, Tasmania. *Thesis, Geol. Dep., Univ. Tas. (Unpublished)*.

GROVES, D. I., 1963.—Geology of the Risdon Brook damsite. *Rep. Dep. Min. Tas. (Unpublished)*.

HASTIE, L. M., 1961.—Geology of the Lindisfarne-Cambridge area, Tasmania. *Thesis, Geol. Dep., Univ. Tas. (Unpublished)*.

HUGHES, T. D., 1957.—Limestones of Tasmania. *Miner. Resour. Geol. Surv. Tas.*, 10, 263-264.

JOHNSTON, R. M., 1880.—Notes on the relation of the yellow limestones (travertin) of Geilston Bay. *Pap. Roy. Soc. Tas. for* 1879, pp. 81-90.

———————, 1888.—Systematic Account of the Geology of Tasmania. *J. Walsh and Son*, Hobart.

LEWIS, A. N., 1946.—Geology of the Hobart District. Roy. Soc. Tas., Hobart.

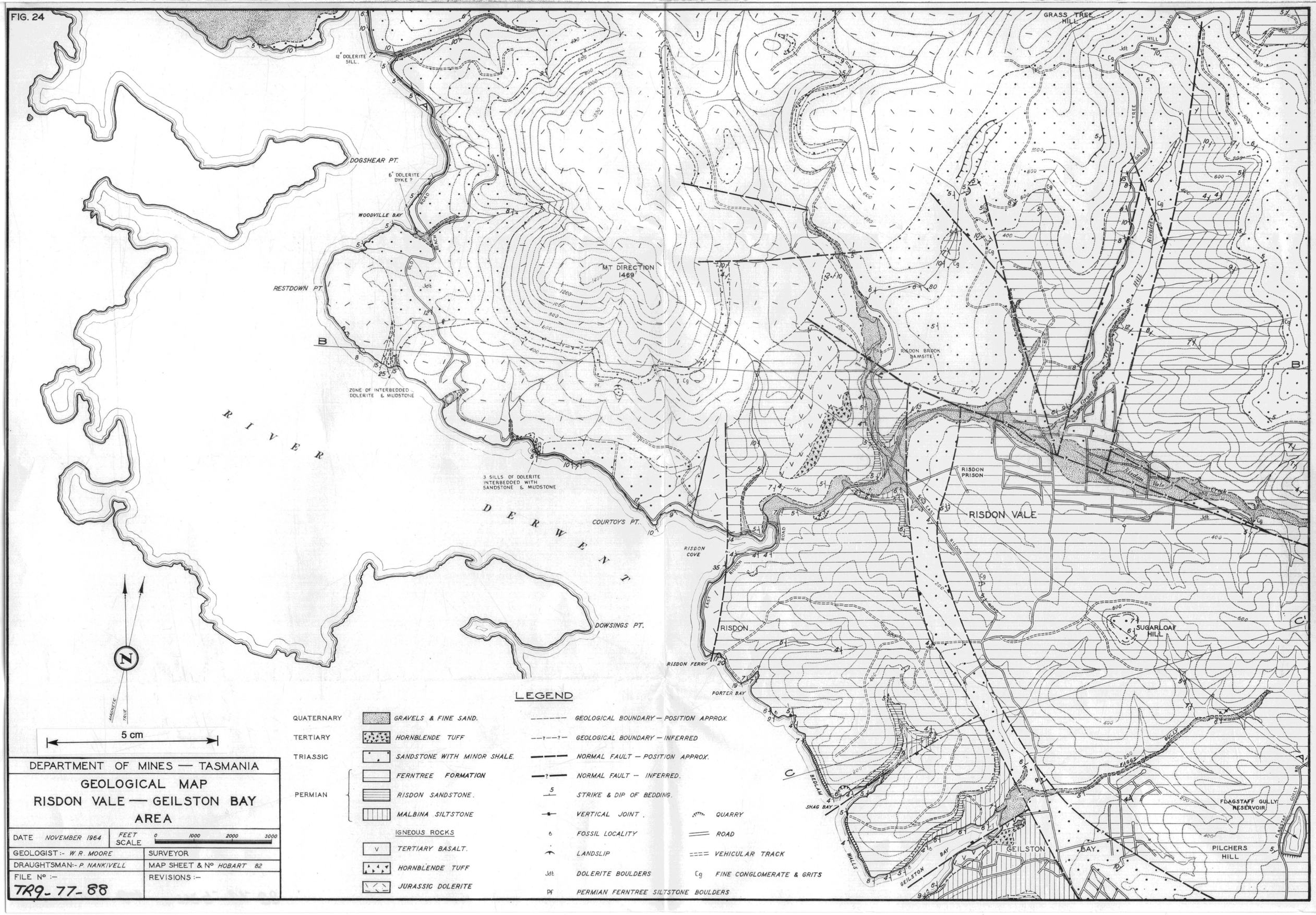
NYE, P. B., 1924.—The underground water resources of the Richmond-Bridgewater-Sandford District. *U'ground Water Sup. Pap. Geol. Surv. Tas.*, 3.

READ, D. E., 1960.—Geology of the Bridgewater-Claremont area, Tasmania. *Thesis, Geol. Dep., Univ., Tas. (Unpublished)*.

SPRY, A. H., 1960.—Preliminary Geological report on the damsites at Flagstaff Gully and Risdon Brook. *Rep. to Gutteridge Haskins and Davies (Unpublished)*.

STRZELECKI, P. E. de, 1845.—Physical Description of New South Wales and Van Dieman's Land. *Longman*, London.

FIG. 24




## LEGEND

| | | |
|---|---|---|
| QUATERNARY | GRAVELS & FINE SAND. | GEOLOGICAL BOUNDARY — POSITION APPROX. |
| TERTIARY | HORNBLENDE TUFF | GEOLOGICAL BOUNDARY — INFERRED |
| TRIASSIC | SANDSTONE WITH MINOR SHALE. | NORMAL FAULT — POSITION APPROX. |
| PERMIAN | FERNTREE FORMATION | NORMAL FAULT — INFERRED. |
| | RISDON SANDSTONE. | STRIKE & DIP OF BEDDING. |
| | MALBINA SILTSTONE | VERTICAL JOINT. |
| | IGNEOUS ROCKS | FOSSIL LOCALITY |
| | TERTIARY BASALT. | LANDSLIP |
| | HORNBLENDE TUFF | Jdt DOLERITE BOULDERS |
| | JURASSIC DOLERITE | Pf PERMIAN FERNTREE SILTSTONE BOULDERS |

QUARRY

ROAD

VEHICULAR TRACK

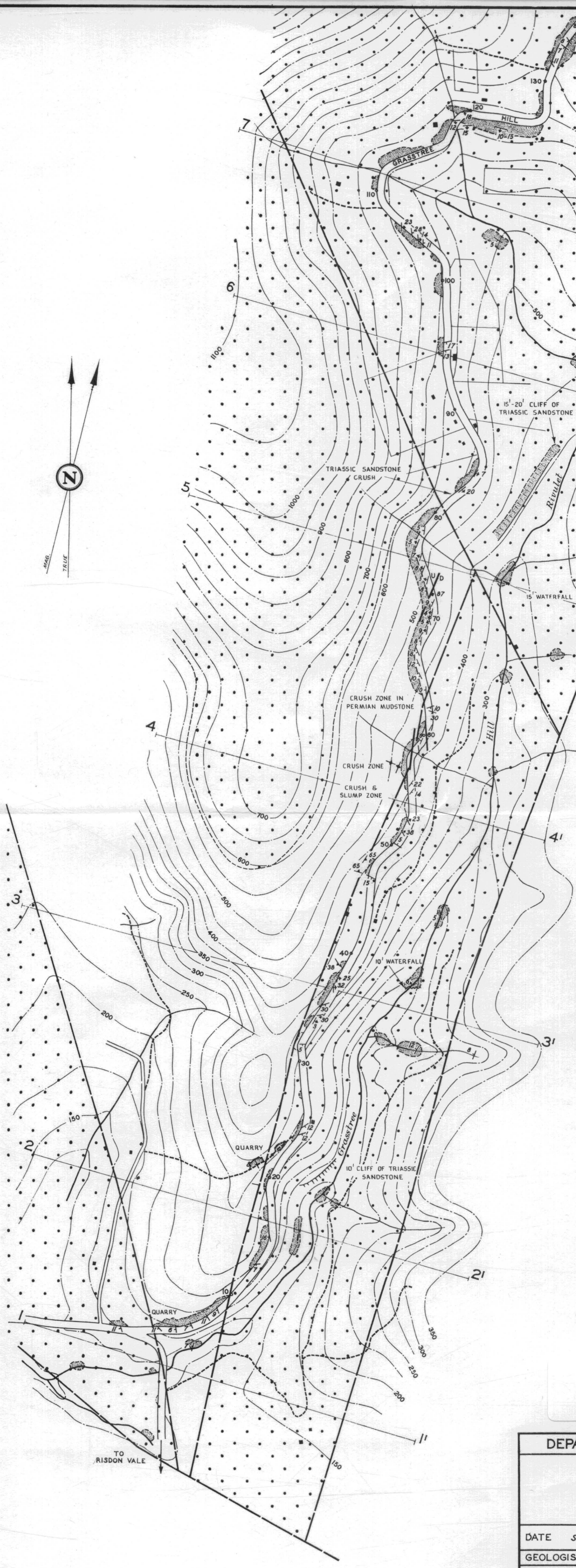
Cg FINE CONGLOMERATE & GRITS

DEPARTMENT OF MINES — TASMANIA

# GEOLOGICAL MAP RISDON VALE — GEILSTON BAY AREA

| | |
|---|---|
| DATE NOVEMBER 1964 | FEET SCALE 0 1000 2000 3000 |
| GEOLOGIST:- W.R. MOORE | SURVEYOR |
| DRAUGHTSMAN:- P. NANKIVELL | MAP SHEET & N° HOBART 82 |
| FILE N° :- TR9-77-88 | REVISIONS :- |

FIG. 25




## LEGEND

- UNDIFFERENTIATED TRIASSIC SANDSTONE WITH MINOR THIN MUDSTONES BEDS.
- PERMIAN FERNTREE SILTSTONE FORMATION.
- OUTCROP
- FAULT
- STRIKE & DIP
- PROBABLE STRIKE & DIP
- MAJOR JOINT
- VERTICAL JOINT
- CONTOUR
- ROAD
- TRACK
- HOUSE OR BUILDING
- TRAVERSE STATION
- LINE OF CROSS SECTION

5 cm

DEPARTMENT OF MINES — TASMANIA

# GEOLOGICAL MAP GRASSTREE HILL ROAD

| | | | |
|---|---|---|---|
| DATE | SEPT 1964 | FEET SCALE | 0 400 800 1200 |
| GEOLOGIST | W.R. MOORE | SURVEYOR | |
| DRAUGHTSMAN | P.B. NANKIVELL | MAP SHEET & Nº | HOBART 82 |
| REVISIONS :- | | FILE Nº:- | 2481 |

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