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The Geology of the Franklin-Glendevie Area

By

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ABSTRACT

The Franklin-Glendevie area contains Permian and Triassic mudstones, sandstones and shales which have been extensively intruded by dolerite and broken by block faulting, some of which was related to the intrusions, and some much later. The sediments have a regional dip to the south-west and have been intruded by dolerite and syenite sheets and dykes, which have narrow contact margins of baked rock. The upper Permian rocks appear to be thinner than in the Hobart area.

INTRODUCTION

The boundaries of the area in which the investigation was carried out are defined by the co-ordinates 480,000 yards E. to 490,000 yards E. and 670,000 yards N. to 697,000 yards N. on sheet No. 6 of the four-mile State map of Tasmania. The purpose of the investigation was to map and study the geological structures and stratigraphy of this area.

Acknowledgments are due to Prof. S. W. Carey, under whose direction the field work was carried out.

STRATIGRAPHY

PERMIAN SYSTEM

Granton Limestone

The lowest rocks in the Permian sequence in the area outcrop at Castle Forbes Bay. The base of the formation of which about 200 feet is exposed, cannot be seen and a dolerite intrusion obscures the top. The rock types present include dark-brown to blue porous mudstones and shales containing numerous muscovite flakes and indefinite brown spots, possibly representing decomposed pyrite nodules. Sandy laminated bands may also be present. Overlying these rocks are grey mudstones, containing a rich fauna of large *Eurydesma,* Spiriferids and *Platyschisma* interbedded with small bands of unfossiliferous mudstones with a characteristic curved fracture. *Fenestella* and other Bryozoa become more common in the higher horizons where the rock has even bedding and fine grains consisting of quartz, muscovite and feldspar fragments. This formation has been placed in the Granton Formation because it is lower in the sequence than the Grange Mudstone which occurs elsewhere. The typical Berriedale Limestone does not outcrop but is known on the opposite bank of the Huon at Glazier's Bay. It therefore appears that the limestone facies is thinning towards the south-west.

Grange Mudstone

The Grange Mudstone outcrops at Surges Bay, Geeveston, Doody's Hill and South Franklin. The base of the formation is not visible because of dolerite intrusions. Typically the rock consists of massive, hard, creamy-white fine-grained siliceous mudstones showing rhythmic bedding. The mudstones contain abundant erratics of quartz, albite, chert, and quartzite. These are embedded in a finer grained groundmass of quartz fragments less than 0·1 mm. in diameter. The diameters of the erratics, which may be either water-worn or angular, vary from 2 mm. to 100 mm. There are coarser bands similar to the Risdon Sandstone, but these are more silicified and do not weather to the sand characteristic of the Risdon. Efflorescences of epsomite occur where water seeps to the surface on steep faces such as in the road quarry at Waterloo. On Doody's Hill and at South Franklin the lowest part of the Grange Mudstone outcrops as a fine-grained block-jointed shale, containing occasional erratics of granite, quartzite, quartz schist, and conglomerate up to one mm. in diameter, with peculiar dark spots formed by the segregation of chlorite, sericite and limonite. Where observed, the spotted shale occurs in contact with dolerite which may have caused the spotting by development of chlorite in the groundmass through normal low-grade thermal metamorphism.

Richly fossiliferous bands are common in the Grange Mudstone although fossils may be absent in certain parts of the sequence. *Fenestella* and other Bryozoa may be so plentiful as to give a laminated appearance to the rock, as in the quarry at Waterloo. Brachiopods, pelecypods, and coiled gastropods are also common. Large pectinaceans, long-spined productids, moulds of large spiriferids, *Platyschisma,* and *Eurydesma* occur together with other fossils. The maximum thickness of the Grange Mudstone appears to be about 400 feet as exposed on Doody's Hill.

Woodbridge Glacial Formation

This formation, lying conformably between the Grange Mudstone and the Risdon Sandstone has a maximum thickness of about 100 feet. Lying above the Grange Mudstone at the Waterloo Quarry, the Woodbridge Glacial Formation is largely a friable, porous, and highly iron-stained sandy mudstone. Associated with it is a ferruginous material with a gossanous outcrop consisting of limonite and haematite and vitreous hydrated iron minerals. This may have been formed by leaching and concentration of iron in parts of the rock. The unaltered rock consists of fragments of clear and cloudy quartz with an average size of approximately 0·5 mm. Larger angular erratics of clear and cloudy quartz up to 3 mm. in diameter, are present. Fossils are absent.

At Geeveston the rock is a white iron-stained sandy mudstone, much finer grained than that at Waterloo. The basal tillite is missing but some coarse conglomerate phases exist near the top of the Grange Mudstone.

Ferntree Mudstone

This formation conformably overlies the Woodbridge rocks. The basal member is the Risdon Sandstone, a distinctive marker, which is very useful in the field. This sandstone is massive, current-bedded and resistant to weathering and outcrops in cliffs or steep slopes. The Risdon varies from a fine-grained to coarse-grained siliceous sandstone containing about 30 per cent feldspar and occasional rounded quartzite boulders, and other erratics up to six inches in diameter. The composition of these does not vary as much as in the Grange Mudstone. The grains of the rock consist mainly of cloudy sub-angular quartz which forms a coarse sand as the rock weathers. The Risdon Sandstone is generally a uniform type; however, near the old Geeveston cemetery the rock is interbedded with a shaly laminated sandstone which is much finer in grainsize than usual and which contains numerous small ironstone concretions. At the Surges Bay clay pit the siliceous sandstone phase has developed an intense green-blue stain. The Risdon Sandstone varies from 10 to 20 feet thick and also outcrops above the Woodbridge Formation at Cairns Bay, Franklin, and the Kermandie River.

Typical Ferntree Mudstone follows the Risdon Sandstone. It is composed of rhythmically bedded, dense, fine-grained, porous, grey to dark-blue mudstones, weathering to white or buff coloured rocks, and contains narrow bands of interbedded shales up to three feet thick. Concretionary structures are common and the higher members of the formation have characteristic dark carbonaceous markings and other organic remains. Microscopically the mudstone contains angular grains of clear quartz and occasional feldspar fragments ranging in size from 0·05 mm. to 0·1 mm. in diameter. Sometimes the rock may be cemented by a ferruginous cement which may make up 50 per cent of the rock. Erratics are not very common. When present they consist of angular dark and clear quartz, granite, quartzite, and mica schist, their size rarely being greater than 3 mm. in diameter although larger dropped pebbles can be found. Animal fossils have not been found but fossil wood occurs in the Bird's Hill quarry. The total thickness of the Ferntree Mudstone as measured from the base of the Risdon Sandstone to the base of the Triassic system on Bird's Hill, is about 300 feet. The typical Ferntree Mudstone outcrops at Franklin, Geeveston, Bird's Hill, Surges Bay, Dover Rivulet and the Esperance River. On the coast south of Killala Bay the Ferntree Mudstone forms small stacks where it overlies intrusions of syenite.

Cygnet Coal Measures

The Cygnet Coal Measures do not outcrop in the area, but on the Esperance River where the basal part of the Triassic System overlies the Ferntree Mudstone, a coarse, loosely consolidated, yellow, laminated, ferruginous sandstone showing slump structures may be the equivalent horizon.

TRIASSIC SYSTEM

Knocklofty Sandstone and Shale

This is the base of the Triassic System which disconformably overlies the Ferntree Mudstone. The formation consists of massive, strongly cross-bedded, well sorted, even grained, quartzose sandstones containing clay pellets and some siderite concretions, together with interbedded bands of friable laminated shales which often pass laterally into sandstone beds. The shales are coloured grey, brown, green and orange, and frequently contain muscovite and graphite on the bedding planes. Microscopically, the Knocklofty Sandstone consists of rounded to sub-rounded clear and cloudy quartz grains from 0·1 to 0·2 mm. in diameter occasionally showing regrowth, with a matrix of sericitic material and often a ferruginous cement. The rock weathers to a uniform quartz sand. No fossils have been identified but carbonaceous remains occur in some of the higher shales. The greatest thickness of this formation is exposed along the Hopetoun Road where about 600 feet outcrops. The sandstone forms steep slopes at Dover, Glendevie, Surges Bay, and Waterloo.

Feldspathic Sandstone

This formation is the highest Triassic formation in the area and outcrops east of Glendevie. The rock consists of massive iron-stained sandstones of extremely uniform grain-size representing a very well-sorted sediment. The grains, which consist of quartzite, mica, schist, sericitic material, cloudy quartz, acid plagioclase, orthoclase, and microcline, are about 0·2 mm. in diameter, embedded in an indeterminate groundmass which is heavily stained by a ferruginous cement. The feldspar is easily leached to give a porous siliceous rock similar to leached Knocklofty Sandstone. Overlying the typical sandstone is 50 feet of a dense, dark, carbonaceous shale with a rounded fracture and well developed muscovite flakes on the bedding planes. The total exposed thickness of the formation is about 200 feet.

QUATERNARY SYSTEM

A Pleistocene or Recent deposit occurs on the Esperance River where it forms an unconsolidated mass of dolerite and sandstone boulders about 10 feet thick overlying the Ferntree Mudstone. Along Crooks Rivulet a similar deposit has been consolidated to a conglomerate about 5 feet thick.

Terrace gravels occur along the bank of the Huon River at Franklin and Castle Forbes Bay reaching a maximum height of about 100 feet above the river at Franklin. At Castle Forbes Bay well sorted interstratified gravels and sands are about 50 feet thick.

IGNEOUS ROCKS

Dolerite

The area has been intruded by dolerite in irregular bodies which appear to be dyke-like or sill-like and also as transgressive sheets. The highest Triassic rocks have been intruded by the dolerite, hence the intrusions are post-Triassic in age in this area. The rock is uniformly

fine to medium-grained, and contains 35 per cent of augite and plagioclase of approximate composition Ab_{45} An_{55}. Dolerite is the most common rock in the area. The thickness of the intrusions seems to vary from 100 feet on the top of Doody's Hill to 1,400 feet on the hills west of Franklin. The contact effects of the intrusions are confined to baking of the sediments and chilling of the dolerite on the margins. At Surges Bay, chalcedony has developed on the contact with the Grange Mudstone. Occasional calcareous fossils in the Grange Mudstone at Doody's Hill have reacted with the surrounding material under the influence of the heat of intrusion to form small reaction centres containing prehnite, tremolite, anorthite and biotite.

Syenite

The syenite occurs in a series of small dykes and sills intruded into the Ferntree Mudstone south of Surges Bay. The rock is part of the Cygnet intrusion which lies to the east on the opposite bank of the Huon River. The rock is usually deeply weathered to kaolinite containing relatively unweathered phenocrysts of orthoclase. The unweathered rock is a light-grey, hard, dense porphyritic rock containing abundant large phenocrysts of feldspar, about 2 cm. in diameter, embedded in a grey groundmass containing small crystals of ferro-magnesian minerals. The main minerals present are augite (10 per cent) fresh hornblende (10 per cent), plagioclase (Ab_{90} An_{10}—50 per cent) and orthoclase. Accessory minerals include magnetite, sphene, and apatite. The groundmass constitutes 25 per cent of the rock and consists of minute grains of feldspars, ferro-magnesian minerals, and magnetite. The contact effects of the syenite with the country rock are confined to slight baking of the margins with no evidence of contamination or assimilation. The variation of grain size in the syenite at the contact is not as marked as in dolerite on similar contacts. The syenite appears to have a porphyritic texture right to the edge of the intrusion.

STRUCTURAL GEOLOGY

The structure of the area is controlled by the occurrence of the dolerite intrusions and by faulting, both pre-dolerite and post-dolerite in age. In the Franklin area the major rock type is dolerite which exists as a large transgressive sheet with the underlying rocks showing through "windows" in the dolerite. This sheet is associated with concomitant faulting at Franklin where the sediments have been displaced, but intrusive contacts are present along the line of the faults. Five miles west of Franklin the Ferntree Mudstone outcrops from beneath the dolerite. The position of the Ferntree Mudstone shows that faulting concomitant with the intrusion has taken place. At Castle Forbes Bay the sheet of dolerite appears sill-like over the Granton Formation, with a low dip to the north-east. The intrusion here appears to dip beneath the Grange Mudstone at South Franklin.

In the Geeveston area the dolerite appears to be intruded into the Grange Mudstone as two sills on Doody's Hill. The sills are part of the same intrusive sheet. The bottom dolerite intrudes the Grange Mudstone south of Doody's Hill and becomes transgressive across the Woodbridge

Glacial Formation and Ferntree Mudstone to the north and finally merges with the dolerite of the top sill. The summit of Doody's Hill is an outlier of the top dolerite sill. On the Kermandie River at Geeveston the transgressive nature of the dolerite contact can be seen. West of Geeveston the dolerite appears on the banks of Crooks Rivulet as a sill-like intrusion, dipping at a low angle to the west. On the Kermandie River the intrusion appears as a sill combined with a concomitant strike fault or as a flat sheet trangressing the Ferntree Mudstone.

The discordant sill shown on the map immediately south-west of Geeveston is transgressive over the Ferntree and Woodbridge Formations. An area of baked mudstone and siliceous hornfels exists between this sill and the larger one on the hill-top. The dolerite immediately south of Geeveston is dyke-like and was apparently the feeder channel between two major sedimentary blocks. South of this channel, the Triassic sandstones and shales outcrop, overlying the Ferntree Mudstone. However, north of this the Triassic sandstones do not outcrop until the extreme north-west of the area is reached. The Knocklofty Sandstone and the Ferntree Mudstone are approximately on the same level and have the same strike, so that the block on the southern edge of the dolerite is downthrown with respect to the northern block. The dolerite becomes sill-like in form, west of Cairns Bay where the Permian sediments have been intruded. On the western boundary the dolerite transgresses the Knocklofty Sandstone to form a sill capping the hills. On the coast at Waterloo the outcrop of the dolerite suggests that it occurs at the edge of a sill or a dipping dyke. The small cove, developed at Flights Bay, cuts through the dolerite into the Permian rocks. North of Flights Bay the apparent sill beneath the Ferntree Mudstone and Grange Mudstone may only represent a transgressive contact, the Grange Mudstone being present beneath the dolerite. In the Glendevie area the distribution of the dolerite is relatively simple. Storm Hill, Tongatabu and the hill two and a half miles west of Tongatabu, consist of sills of dolerite capping the Knocklofty Sandstone. Where Riley Creek cuts the northernmost dolerite of the Glendevie sheet, the intrusion is dyke-like and appears to be the feeder for the other sills. Small dykes intrude the Waterloo and Wobbly Creek areas.

Prominent pre-dolerite faults occur at Franklin, Castle Forbes Bay, and one and a half miles south of Geeveston. At Castle Forbes Bay on the southern side of the Valley, typical Grange Mudstone is found, while the Granton Formation outcrops on the northern side. From a consideration of dips and the fact that the intrusive dolerite boundary is not broken, the fault is identified as pre-dolerite intrusion in age. South of Geeveston the dolerite is intruded beneath a block of sediments in which the Grange Mudstone has been faulted against the Ferntree Mudstone. The fault can be seen on the Huon Highway. It is pre-dolerite because the intrusive boundary is not displaced and there is no fault joint pattern in the dolerite.

Post-dolerite faults, which displace the intrusive boundaries, cut the south end of Tongatabu. The Glendevie fault is considered post-dolerite because no intrusive contacts can be seen along its length. The age of the fault through Surges Bay cannot be proved as the Ferntree

Mudstone has been downthrown relative to other lower Permian formations, and no intrusive boundaries are present to show their relation to the fault. The dolerite on the northern side of Flights Bay has been highly sheared and it is probable that this has been caused by a fault running east-west.

LOCALITY INDEX

	Internat. Grid Reference K/55	S. Lat.	E. Long.
Bird's Hill	Picton 87	43° 12′	146° 57′
Cairns Bay	Picton 87	43° 11′	146° 58′
Castle Forbes Bay	Picton 87	43° 08′	146° 59′
Castle Forbes Bay Rivulet	Picton 87	43° 07′	146° 57′
Crooks Rivulet	Picton 87	43° 09′	146° 54′
Doody's Hill	Picton 87	43° 09′	146° 56′
Dover	Dover 94	43° 19′	147° 01′
Dover Rivulet	Dover 94	43° 17′	147° 01′
Egg Islands	Kingborough 88	43° 04′	147° 04′
Esperance River	Adamson 93	43° 18′	146° 54′
Fleurty's Rivulet	Picton 87	43° 06′	146° 56′
Flights Bay	Picton 87	43° 12′	146° 58′
Franklin	Kingborough 88	43° 05′	147° 01′
Geeveston	Picton 87	43° 11′	146° 57′
Glendevie	Picton 87	43° 14′	146° 59′
Kermandie River	Picton 87	43° 10′	146° 54′
Killala Bay	Picton 87	43° 13′	147° 00′
Port Huon	Picton 87	43° 09′	146° 58′
Riley Creek	Picton 87	43° 13′	146° 56′
Scott Rivulet	Picton 87	43° 08′	146° 55′
South Franklin	Picton 87	43° 07′	147° 00′
Surges Bay	Picton 87	43° 13′	147° 00′
Tongatabu	Picton 87	43° 14′	146° 57′
Waterloo	Picton 87	43° 12′	146° 58′

GEOLOGY OF TASMANIA

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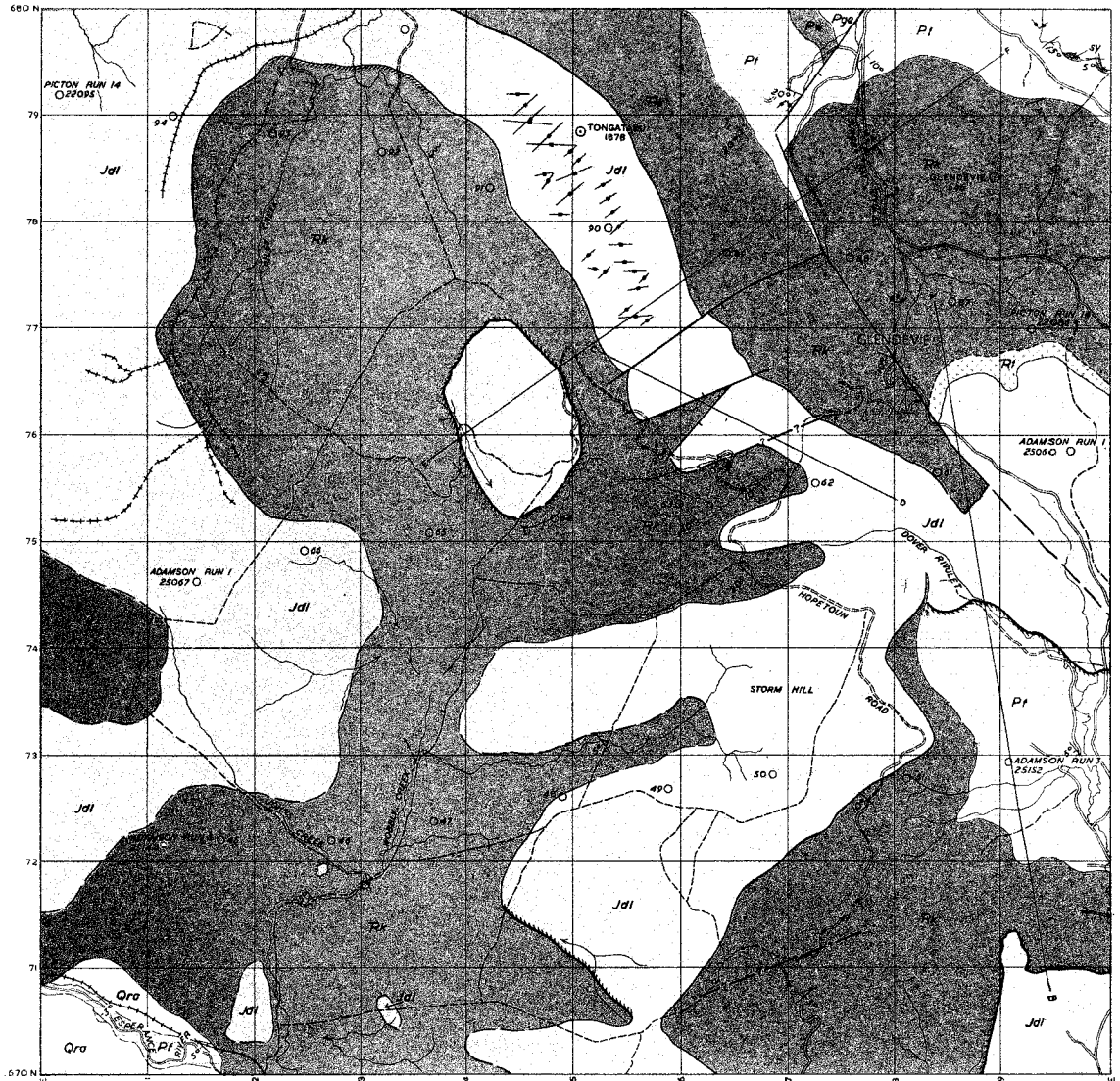
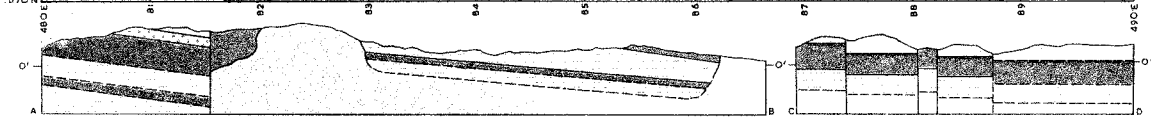
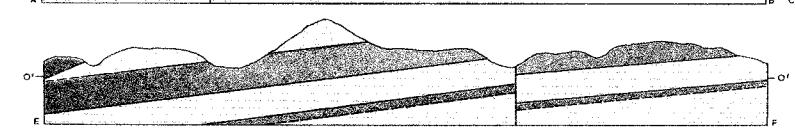
GLENDEVIE

48 - 67







- FAULT WITH DOWNTHROW SIDE INDICATED
- FAULT – POSITION APPROXIMATE
- FAULT INFERRED
- FORMATION BOUNDARY
- DOLERITE BOUNDARIES
- CONCORDANT SILL
- DISCORDANT INTRUSIVE BOUNDARIES
- DISCORDANT INTRUSIVE BOUNDARIES WITH CONCOMITANT FAULTING
- VERTICAL JOINTS
- STRIKE AND DIP
- ROADS
- VEHICULAR TRACK
- TRACK
- TRAMWAY
- DISUSED TRAMWAY
- HORIZONTAL CONTROL STATION

— SCALE —

0 2 MILES

0 1 2 3 4 5,000 10,000 FEET

KEY MAP SHOWING MAGNETIC VARIATIONS

9.5°E 10°E 10.5°E

Compilation from Aerial Photographs. Trigonometric Station Control by courtesy Lands and Surveys Dept. Origin of co ordinates 400,000 yds West and 1,800,000 yds. South of True Origin of Zone 7.

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Quaternary System
RECENT SERIES
- Qra ALLUVIUM

Triassic System
- Rf FELSPATHIC SANDSTONE
- Rk KNOCKLOFTY SANDSTONE AND SHALE

Permian System
- Pf FERNTREE MUDSTONE
- Pfw WOODBRIDGE GLACIAL FORMATION
- Pge GRANGE MUDSTONE

Jurassic System
- Jdl DOLERITE

SYENITE PORPHYRY

GEOLOGY OF TASMANIA

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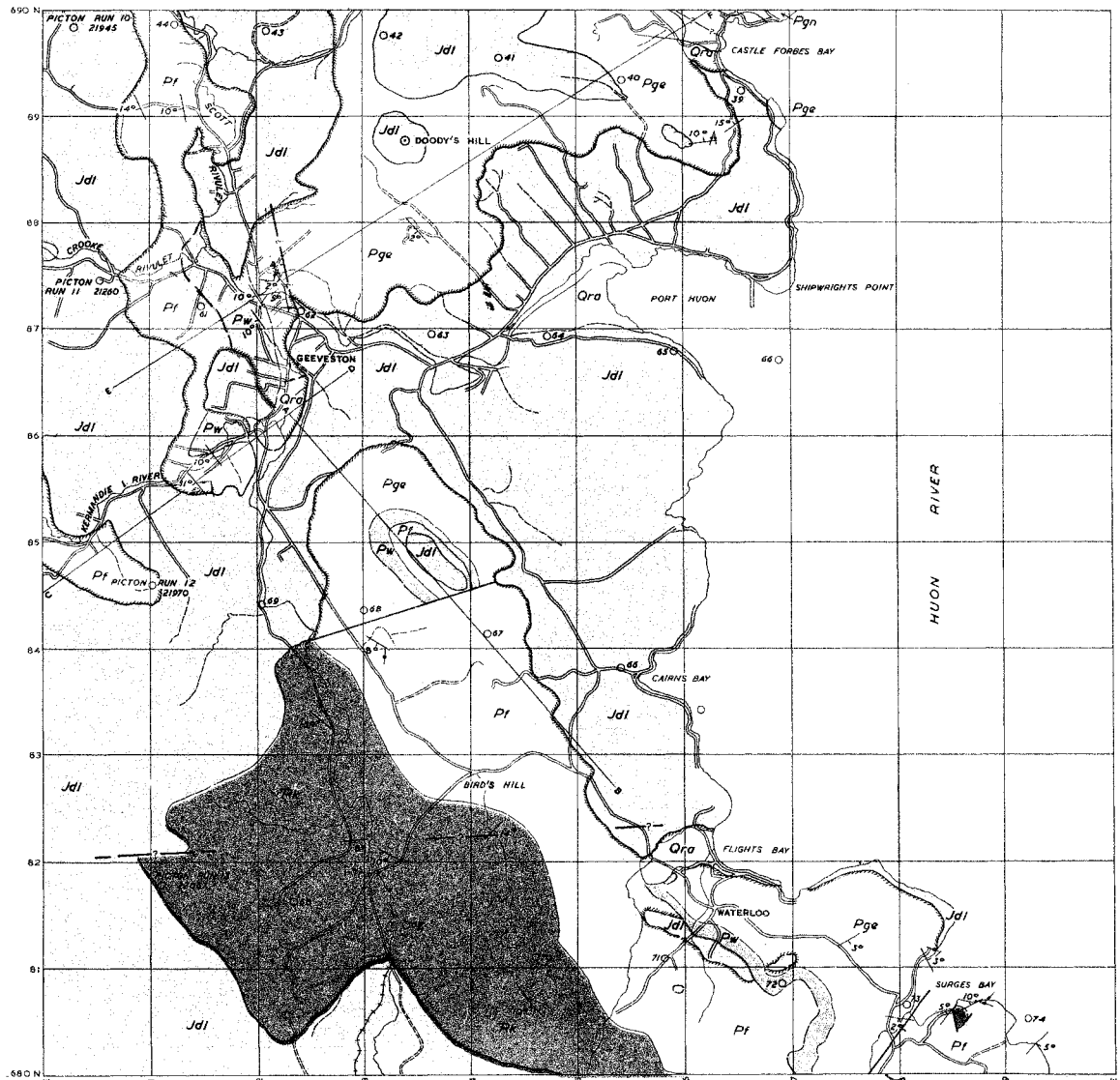
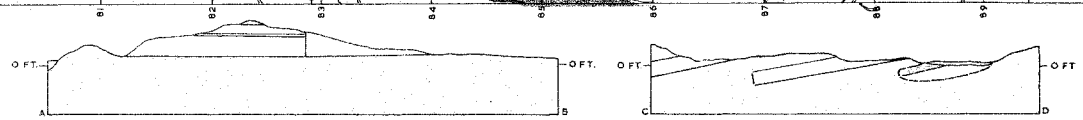
GEEVESTON

48-68





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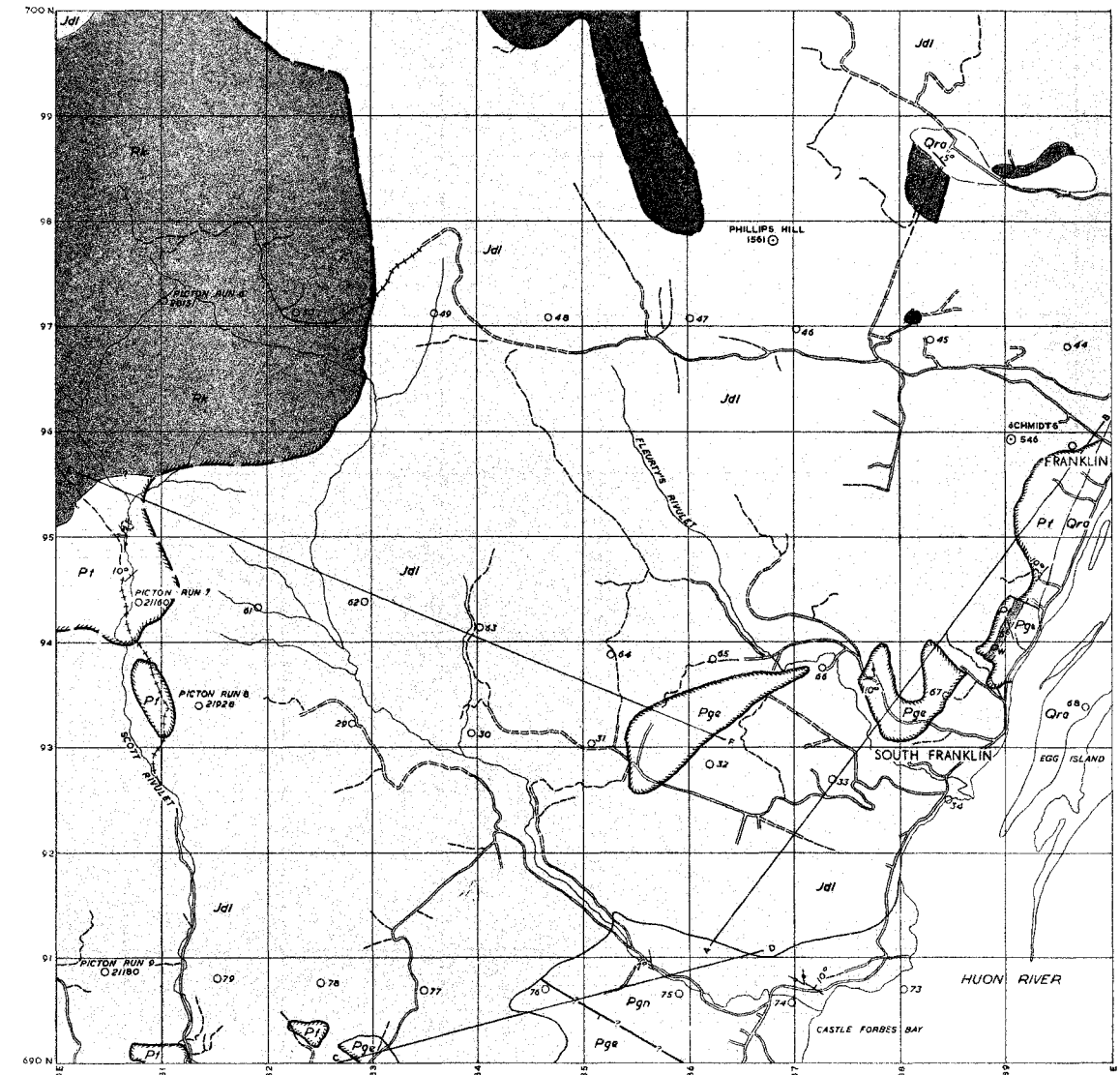
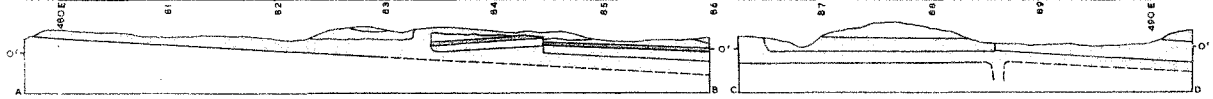
FRANKLIN

48-69





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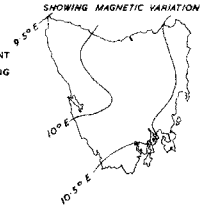

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JANUARY 1952

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