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Geology of the Limestone Ridges District, Queensland

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Introduction and General Geology

The locality known as Limestone Ridges is approximately thirty miles south-west of Brisbane, midway between Ipswich and Boonah. The area studied extends from Flinders in the north to one and a quarter miles south of Limestone Ridges State School, and from Wilson's Plains and Churchbank in the west to Purga Creek in the east, embracing approximately twenty-four square miles. Mapping was carried out with the aid of aerial photographs and based on a double enlargement of the Flinders one inch to one mile military sheet. Six-figure numbers in this paper are grid references of localities.

The oldest exposed rocks in the area are Jurassic Walloon Coal Measures, which outcrop around the periphery. In the centre is a long north-south ridge of Tertiary dolomite with intrusive dolerite and teschenite to the west and basalts to the east. The dolomite is usually underlain by basalt, but in the south the coal measures are beneath it. The Walloon Coal Measures and the Tertiary dolomite have been intruded by teschenite and olivine-analcite-dolerite, and dolerites of a different kind have intruded the coal measures further west near Churchbank and Wilson's Plains.

Previous literature is limited to a report on the suitability of the dolomite for cement manufacture (Dunstan, 1914) and a mineralogical investigation of clays in the dolomite (Rogers, Martin and Norrish, 1954).

Walloon Coal Measures

The Jurassic Walloon Coal Measures form flat to gently undulating country with poor outcrops. They consist of alternating beds of olive shale and ferruginous, calcareous and non-calcareous sandstone. Carbonaceous siltstone and red, ferruginous siltstones are also common. Plant fragments, including *Cladophlebis australis*, are found in some of the shales (831475). Over most of the area the coal measures are horizontal, but dips steepen towards the east.

Tertiary Basalt Flows

The Tertiary lava flows are exposed to the east of Limestone Ridges, where they are horizontal and overlie the Walloon Coal Measures. There are three main lithologic types. One is an olivine-basalt with labradorite, and the other two contain more acid plagioclase, differing only in texture. All three occur throughout the extent of the flows.

The olivine-basalts are black, fine-grained rocks, microporphyritic in labradorite or olivine and exhibit flow structure, marked by parallelism of felspar laths. Augite is pale brown and the olivine, very variable in amount, is often altered to red-brown iddingsite and iron oxides. The latter are sometimes abundant, and in some cases, green chlorite occurs interstitially in scattered areas throughout the rock.

The second type is grey or purplish, weathering to pale brown. It is very fine-grained, has a platy fracture and may be vesicular. The felspars, which are not as idiomorphic or as regularly arranged as in the olivine-basalts, are oligoclase. Augite is colourless to pale green and olivine is usually altered to golden bowlingite or reddish iddingsite.

The third type is brown to brownish-grey and very fine-grained. It has a distinctive silky lustre on fracture surfaces due to marked flow structure of felspar (oligoclase) laths. Augite and iron oxides are rare and there are a few small crystals of a green amphibole. No fresh olivine exists, but abundant greenish-brown, red and golden alteration products may have been derived from olivine.

Providing that these weathering products do represent olivine, rocks of this third group are very similar to the typical mugearites (Harker, 1904). The second type could be termed oligoclase basalt (Walker, 1952), but the two types are very closely related.

Flinders Dolomite

The Flinders Dolomite is an elongate north-south deposit three miles long and one mile wide, forming the Limestone Ridges and extending almost to Flinders in the north.

The dolomite is typically white, massive, dense and extremely fine-grained with a smooth fracture. In cuttings and quarries the dolomite may be hard and massive or friable and clayey. Some outcrops have a brecciated appearance, with angular siliceous dolomite fragments in a matrix of dolomite. In this section, the dolomite is microcrystalline to crypto-crystalline with small areas and irregular veins of chalcedony and sometimes equant grains of quartz surrounded by chalcedony. The occurrence of palygorskite (attapulgite), montmorillonite and sepiolite in clay bands in the dolomite has been described by Rogers, Martin and Norrish (1954).

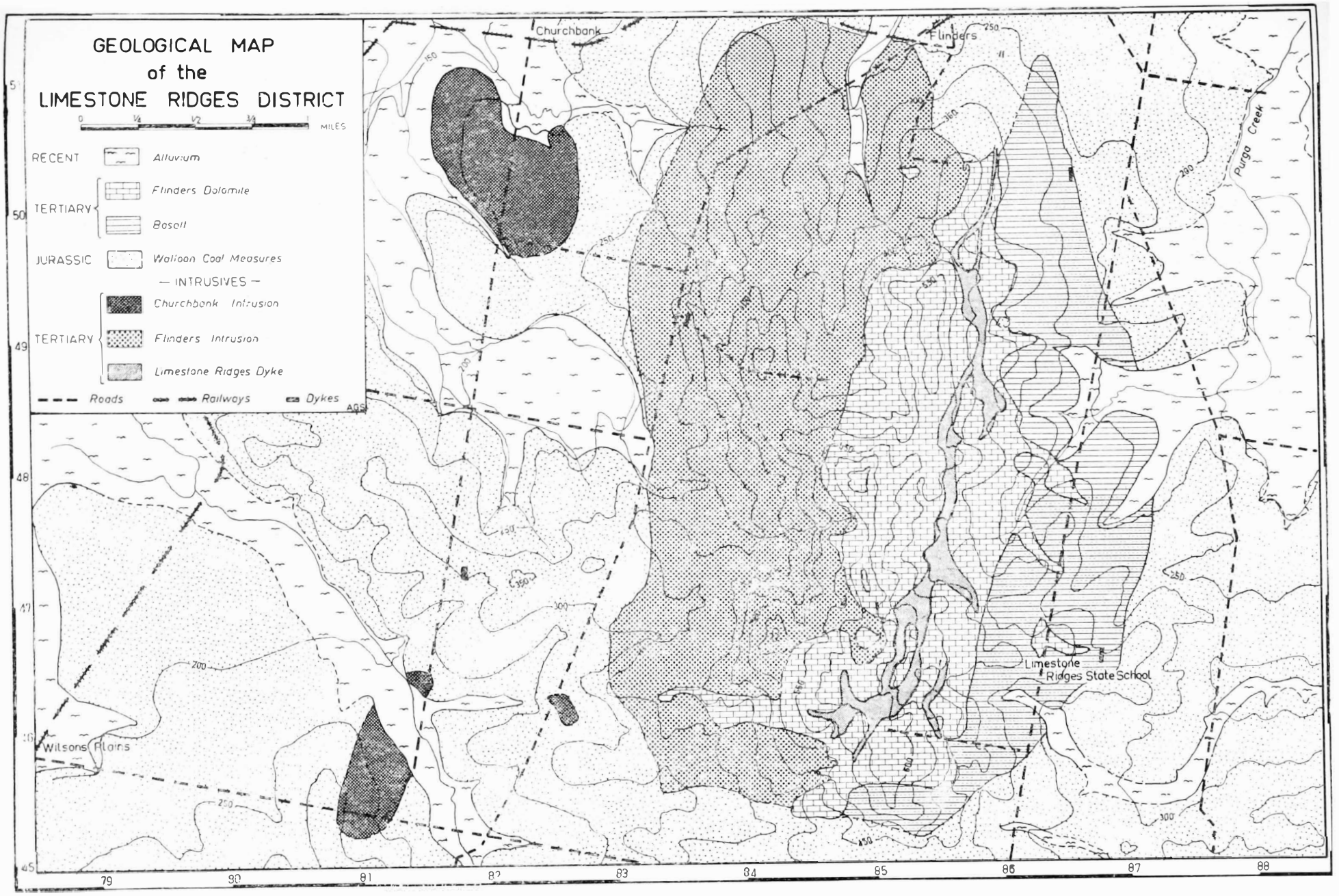
A conglomerate composed of unsorted pebbles and boulders of massive and vesicular basalt in a white calcareous matrix occurs at the base of the dolomite north of Limestone Ridges School (864484, 861485 and 863478).

A replacement origin is generally favoured for the majority of large dolomitic deposits, but most features of the Flinders Dolomite suggest a sedimentary origin. According to Grim (1953), palygorskite and sepiolite form in dry desert lakes where salts and carbonate accumulate. Krumbein and Sloss (1953) believe that true evaporitic limestones are more commonly dolomitic than calcitic; dense primary dolomites being characteristic of their arid "restricted" basin association. Clarke (1924) regards carbonate lakes as young lakes, calcium and magnesium carbonates being the first deposits of a restricted basin. It seems most likely that the Flinders Dolomite was deposited in a small restricted lake that existed for a limited time during a period of arid climatic conditions.

There is no direct evidence for the age of the Flinders Dolomite, but it was formed under similar conditions to the deposit at Ipswich, which contains *Planorbis* sp. and is regarded as Oligocene (Bryan and Jones, 1945).

Intrusive Rocks

The Flinders Intrusion. Teschenite and olivine-analcite-dolerite form an elongate intrusion (termed the Flinders Intrusion) into Walloon Coal Measures and Flinders Dolomite along the western margin of the latter.


GEOLOGICAL MAP
of the
LIMESTONE RIDGES DISTRICT
0 1/4 1/2 3/4 MILES
RECENT
Alluvium
TERTIARY
Flinders Dolomite
Basalt
JURASSIC
Walloon Coal Measures
— INTRUSIVES —
TERTIARY
Churchbank Intrusion
Flinders Intrusion
Limestone Ridges Dyke
Roads
Railways
Dykes
AGS
Churchbank
Flinders
Purga Creek
Limestone
Ridges State School
Wilsons Plains
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A coarse teschenite outcrops around the hill one mile south-west of the main dolomite quarry (text fig. 1). To the north and south, the grain size is finer, and the rocks may be termed medium-grained olivine-analcite-dolerites. Outcrops, particularly of the coarser phase, are frequently highly weathered.

The only exposed contacts with the dolomite are in the small quarries at the northern end of the dolomite outcrop (856504). Here the junctions are mostly vertical. The contact is not sharp and a grey zone of dolerite nodules in a carbonate matrix separates the spheroidally weathered intrusive from the dolomite.

The coarse teschenite contains large crystals of labradorite up to 7 mm. long, and brown titaniferous augite in ophitic relationship, with interstitial analcite, radiating aggregates of zeolite, iron oxides and calcite. Analcite also replaces the felspars along cracks and cleavages and is euhedral in zeolite. There is no fresh olivine, but red-brown iddingsite is present in some sections.

The medium-grained phase of the intrusion contains abundant fresh olivine, pink-brown titaniferous augite, subhedral labradorite laths and accessory iron oxides and analcite. The olivine-dolerites near the dolomite contact are distinctive in that a yellow isotropic mineral occurs interstitially.

The Churchbank Dolerite. This rock is found in three separate intrusions into the Walloon Coal Measures; at the cemetery near Churchbank and two miles further south. It is distinguished from the other intrusions by the lack of olivine and the stouter habit of the labradorite. The augite is titaniferous, and chlorite and an isotropic yellow-green mineral are interstitial.

The Limestone Ridges Dykes and Other Minor Intrusions. A somewhat irregular north-south dyke of analcite-bearing olivine dolerite has intruded the Flinders Dolomite for almost its entire length. It often forms a slightly flatter portion on the sides of the ridges and is frequently masked by silicified cobbles from the dolomite. Vertical contacts have been observed in the south at 851464, and in the north, where the dyke is exposed between two dolomite quarries.

The rock resembles the medium-grained phase of the Flinders Intrusion, except that it contains less olivine and more often shows an ophitic texture.

Dykes of similar rock intrude the dolomite and the basalt flows east of Limestone Ridges, but two quite different types occur to the west. One, a dyke intrusive into the teschenite (at 835492) is an andesite, consisting mainly of andesine, with iron oxides and a little augite. The other (at 817472) is a pale grey weathered basalt porphyritic in labradorite.

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