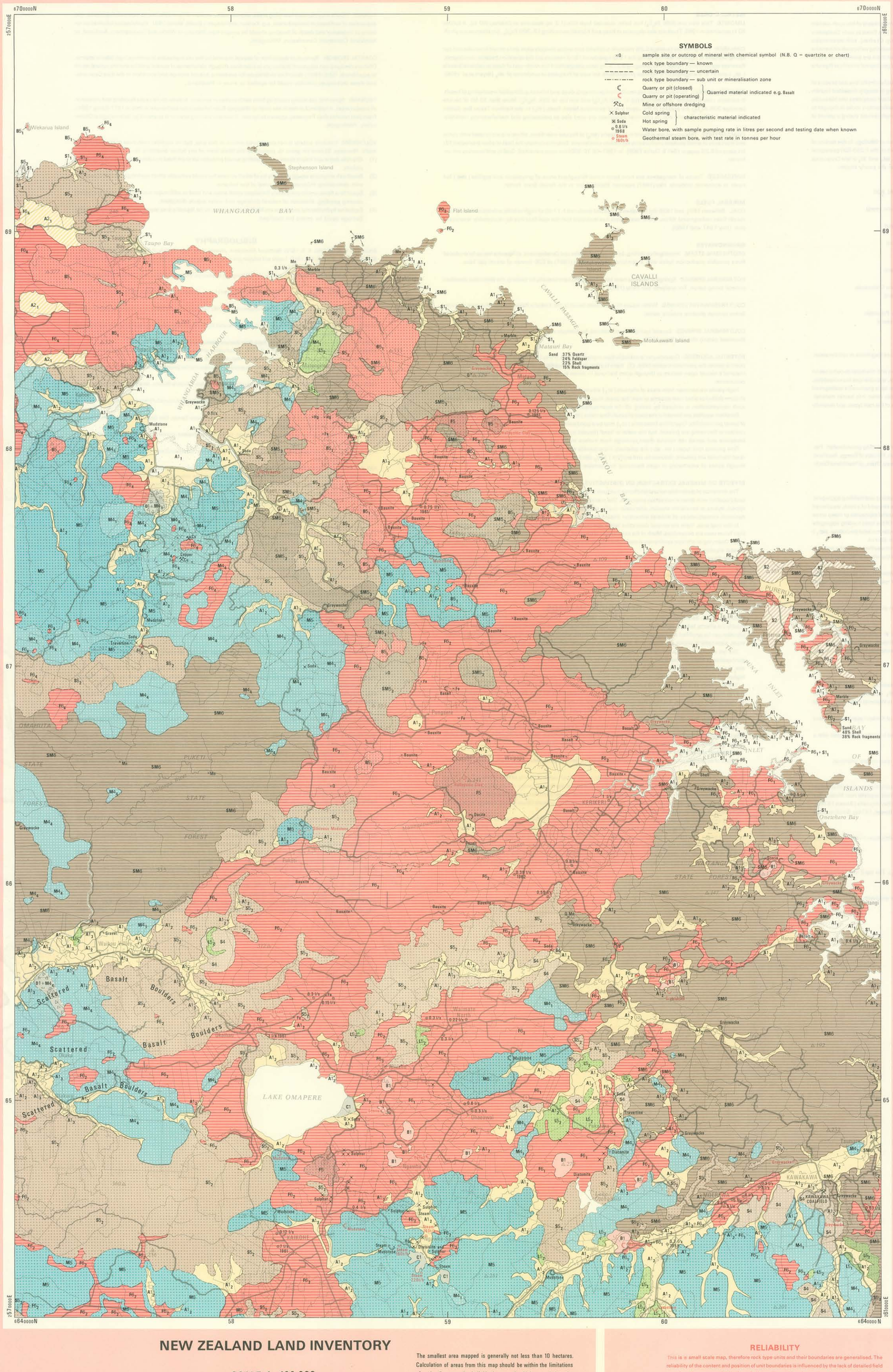
WHANGAROA – KAIKOHE



INTRODUCTION

Rock types maps are intended to help planners and land users to:

i) identify the characteristics of near surface rock types;
ii) recognise areas of existing and potential mineral resources;
iii) become aware of geological hazards.

ROCK TYPE DESCRIPTIONS (LITHOLOGIES)

The map unit symbols are listed alphabetically within the two major rock type categories — sedimentary and igneous. The first letter of each symbol indicates the major lithology. The numeral indicates the typical hardness (see Physical Characteristics table) of the unweathered rock material, and the subscript numeral indicates variation.

The description for each map unit may include common name, distinctive landform, colour, hardness, grain size, bedding, fracturing and chemical composition. Major and minor lithologies are described and also the weathered material in terms of changes in colour, hardness and grain size. Range of depth of the weathered mantle is also given. (See also 'Definition of Descriptive Terms').

SEDIMENTARY ROCK TYPES

ALLUVIUM

$A1_1$ — Undifferentiated intertidal deposits: mud, sand, gravel and shell; unconsolidated.

$A1_2$ — Alluvium: mud, sand and gravel with minor peat, forming river bed and flood plain deposits up to 10 m above stream or sea level, in places forming a thin (1–3 m) veneer over rugged surfaces of lava flows ($F6_1$, $F6_2$); unconsolidated to very soft. Unweathered.

$A1_3$ — Alluvium: mud, sand and gravel with minor peat, forming terrace deposits up to 30 m above stream or sea level and as much as 30 m thick; unconsolidated to very soft. Unweathered, or weathered to brown stained material to depths of 2 m.

$A2_1$ — Alluvium: mud, sand and gravel, with some iron oxide pans, forming dissected terrace surfaces 30–120 m above sea level; very soft to soft. Weathered to brown, very soft clay with some rock fragments to depths of 10 m.

PEAT

C1 — Peat: dark brown, fibrous, carbonaceous deposits, some mud and sand, usually less than 5 m thick; unconsolidated to very soft.

DEBRIS

$D1_2$ — Debris: scattered loose basalt boulders ($F6_2$, $F6_4$) down slope from source material.

LIMESTONE

LS_1 — Crystalline limestone: medium grained crystalline calcium carbonate (up to 96%) containing some sand grains, with minor greensand ($S4$), thinly to medium bedded and widely fractured; many distinctively fluted outcrops; moderately hard to hard. Weathered to brown clay to depths of 2 m.

LS_2 — Muddy limestone: grey, 50–75% calcium carbonate, closely fractured, in places siliceous or interbedded with minor greensand ($S4$) and mudstone ($M4_1$); moderately hard to hard. Weathered to brown, very soft, slightly calcareous clay to depths of 2 m.

MUDSTONE

$M4_1$ — Mudstone: grey, brown and green, thinly bedded and closely fractured, locally calcareous or siliceous, with minor muddy limestone (LS_2), greensand ($S4$), and micaceous sandstone (SS_2), moderately soft to moderately hard. Weathered to soft clay to depths of 10 m, unstable in places.

$M4_4$ — Mudstone with sandstone: blue-grey, medium to thickly bedded mudstone with beds of sandstone in places, especially where close to greywacke, both lithologies locally calcareous; moderately fractured; moderately soft to moderately hard. Weathered to soft, silty clay to depths of 10 m.

M5 — Siliceous mudstone: dark grey or pinkish white, closely fractured with a silica content of up to 90% (known locally as 'shale'); moderately hard to hard. Weathered to light grey, soft clay containing harder cores to depths of 10 m.

SAND AND SANDSTONE

$S1_1$ — Sand: quartz and feldspar, and in places shell and rock fragments, forming intertidal and beach deposits; unconsolidated.

$S1_2$ — Sand: quartz and feldspar with minor shell fragments forming active dunes; unconsolidated and unweathered.

S2 — Clayey sand: white, quartzose, with minor feldspar and a clay content of up to 20%, with minor silt and lignite beds; very soft. Weathered to cream or brown, very soft, clayey sand to depths of 10 m.

S4 — Glauconitic sandstone (greensand): quartz-feldspar sandstone containing up to 5% glauconite, in places calcareous or carbonaceous, thickly bedded and widely fractured; moderately soft to moderately hard. Weathered to soft, brown, non-calcareous silty clay to depths of 10 m.

SS_2 — Micaceous sandstone: blue-grey, quartz-feldspar sandstone, with a mica content of up to 5%, in places calcareous, thinly to thickly bedded and moderately fractured; in places with mudstone ($M4_1$, $M5$), conglomerate and carbonaceous material and local large calcareous concretions; moderately hard to hard. Weathered to soft, brown silty clay to depths of 10 m.

$SM5_2$ — Interbedded sandstone and mudstone: grey, quartz-feldspar sandstone and grey mudstone (known to quarrymen as 'greywacke'), minor conglomerate and calcite cemented concretions; moderately hard to hard. Weathered to light coloured clay to depths of 10 m.

SM6 — Interbedded sandstone and mudstone (greywacke and argillite): blue-grey quartz feldspar greywacke sandstone, thinly to thickly interbedded with dark grey argillite mudstone, with minor chert, quartzite and volcanic (spilite) beds (outcrops of chert or quartzite are marked on the map by Q), closely fractured and quartz veined, and locally very siliceous; hard to very hard. Weathered to soft, brown, sandy clay with harder cores to depths of 30 m.

IGNEOUS ROCK TYPES

VOLCANIC BRECCIA

B1 — Scoria: cones (50–130 m high) consisting of red-brown moderately soft to moderately hard, coarse to very coarse fragments of vesicular, very fine to fine grained crystalline basalt. Unconsolidated and unweathered.

$BS1_1$ — Andesite breccia: coarse to very coarse angular fragments of fine to medium grained crystalline andesite in a matrix of medium grained tuff, interbedded with minor lava flows ($F6_3$), widely fractured; moderately hard to hard. Weathered to soft clay with moderately soft fragments to depths of 10 m.

$BS1_2$ — Basalt and dolerite breccia: coarse angular fragments of very fine to medium grained crystalline basalt and dolerite, in a matrix of medium grained tuff; closely to widely fractured; moderately hard to hard. Weathered to soft clay with moderately soft fragments to depths of 20 m. (Not mapped separately on this sheet.)

EXTRUSIVE ROCK

F5 — Rhyolite: domes and flows of very fine to medium grained crystalline rhyolite, and rare obsidian; moderately fractured; moderately hard to very hard. Weathered and hydrothermally altered to soft white or whitish brown halloysitic clay to depths of 30 m.

$F6_1$ — Basalt with scoria: flows and cones of very fine to medium grained crystalline basalt, dense or vesicular, interbedded with scoria (B1) in places, moderately fractured; hard to very hard. Surfaces conspicuously rocky. Weathered to soft red brown rubbly clay to depths of 3 m.

$F6_2$ — Basalt: flows and cones of very fine to medium grained crystalline basalt, dense and moderately fractured; hard to very hard. Surfaces form terraces and plateaus generally without rocky outcrops. Weathered to soft red brown or dark grey brown clay to depths of 20 m with many rounded corestones.

$F6_3$ — Andesite: flows of very fine to medium grained crystalline andesite, moderately fractured; hard to very hard. Weathered to soft brown clay to depths of 20 m.

$F6_4$ — Basalt and dolerite: very fine to medium grained crystalline basalt and dolerite lava with some breccia (BS_2) and minor tuff, minor blocks of sandstone (SS_2), mudstone ($M4_1$) and limestone (LS_2) in places, closely to moderately fractured with curved jointing; hard to very hard. Altered and weathered to soft clay to depths of 30 m.

PHYSICAL CHARACTERISTICS OF UNWEATHERED ROCK TYPES, AND A GUIDE TO EXCAVATION METHODS

TERM	NUMBER & PATTERN	*DIAGNOSTIC FEATURE	§GUIDE TO EXCAVATION METHODS
Very Hard	7	Not scratched with knife or hammer point.	Explosives generally required.
Hard	6	Scratched with knife or hammer point only with difficulty.	Heavy machinery generally required; explosives will be needed where rocks widely fractured.
Moderately Hard	5	Scratched with knife or hammer point.	
Moderately Soft	4	Grooved or gouged to depth of about 3mm by firm pressure on knife or hammer point.	Machinery required; explosives may be needed where rocks widely fractured.
Soft	3	Grooved or gouged readily with knife or hammer.	Machinery required.
Very Soft	2	Carved with knife or scratched with finger nail.	Can be dug with spade, light excavators suitable.
†Unconsolidated	1	Disaggregated by hand, or easily moulded.	Can be dug by hand.

*Refers to hand sized samples of fresh rock of the map unit.

§Fractures can have a significant effect on the ease of excavation; e.g. hard rocks if closely fractured, may be excavated as readily as softer material. (see table on fracture spacing):

†Units such as gravel or scoria are unconsolidated as a mass but consist of fragments with individual hardnesses of up to 7.

COMPILATION METHODS

This map was compiled by L.O. Kermode, N.Z. Geological Survey, D.S.I.R. Distinctive landforms were delineated from aerial photographs (scale 1:10 000, 1:15 840, 1:43 560), and then correlated with rock type information derived from records of outcrop sites (often with incomplete descriptions). Information was obtained from manuscript maps (Bowen 1968 a,b. Ferrar 1925, Hay 1960, Parsons 1966; unpublished maps by Bowen, Petty, and Skinner), notes from N.Z. Mines Division, Ministry of Energy (compiled 1961 – 79), and unpublished theses by Maehl 1970, Mason 1973, and Mulheim 1973. Various other publications and unpublished reports filed at N.Z. Geological Survey, Otara were also referred to. Unit boundaries were plotted on to 1:63 360 contoured topographic maps (NZMS 1). The later topographic maps differ from the NZMS 290 topography (based on older editions of NZMS 1), particularly in regard to river courses. Thus the distribution of some rock type units, e.g. alluvium, will not correspond exactly to the base.

Refer to this map as:
Kermode, L.O.1982: "Whangaroa–Kaikohe".
NZMS 290 Sheet P04/05, 1:100 000.
New Zealand Land Inventory, Rock Types.
Department of Lands and Survey, Wellington, New Zealand.

NOTE: Descriptive text and references are shown on the reverse side of this map.

ROCK TYPES

NEW ZEALAND LAND INVENTORY

SCALE 1 : 100 000

SHEET INDEX

Metres 1000 0 1 2 3 4 5 6 7 8 Kilometres

AREAL SCALE

500 hectares divided into units of 25 hectares

REFERENCE

WHANGAREI Cities
KAIKOHE Towns
Houhora Settlements
State highways
Other roads
Tracks
Railways
Rivers and streams
Trig stations
Vincula (separate parcels under same ownership)
Land holding boundaries
Sand and mud
Wetlands
Rocks

Area covered by "Rock Types" maps.

COMPILATION NOTE:– The base map is compiled from the NZMS 1 series (1:63360) dated 1965,69,72

EDITION 1 1982

The smallest area mapped is generally not less than 10 hectares. Calculation of areas from this map should be within the limitations of scale. For example, individual areas should be rounded to the nearest 5 hectares. Accumulated areas should be rounded to the nearest 50 hectares.

Compiled by L.O. Kermode, New Zealand Geological Survey, Department of Scientific and Industrial Research.

Published by the Department of Lands & Survey, New Zealand, under the authority of W.N. Hawkey, Surveyor General.

P.D.Hasselberg, Government Printer, Wellington, New Zealand.

This map is one of a series. Themes mapped in this study are :– Land Tenure and Holding, Rock Types, Soils, Existing Land Use, Wildlife, Indigenous Forest.

This map is drawn on the New Zealand Map Grid Projection, a minimum–error conformal projection. The grid is the New Zealand Map Grid, showing coordinates in metres in terms of the Geodetic Datum 1949, based on the International (Hayford) Spheroid.

RELIABILITY

This is a small scale map, therefore rock type units and their boundaries are generalised. The reliability of the content and position of unit boundaries is influenced by the lack of detailed field mapping, the uneven distribution of observation points, the variety of rock materials within some units, the degree of distinctiveness of the topography as seen on aerial photos, and the variability in the accuracy and completeness of the existing descriptions of the rock types.

No systematic field checking of original data or boundaries has been done. Some small significant areas have been exaggerated.

For more detailed information on selected areas write to:

The Director
N.Z. Geological Survey, DSIR,
P.O. Box 30-368,
Lower Hutt.

Note:

This map should not be used for planning major engineering projects, large scale quarrying operations, or detailed work, for which individual site investigations are required.

DEFINITION OF DESCRIPTIVE TERMS

GRAIN SIZE

SIZE	CRYSTALLINE ROCK	UNCONSOLIDATED SEDIMENT	CONSOLIDATED SEDIMENT	FRAGMENTAL VOLCANIC DEBRIS
	glassy			
less than 2 microns	very fine grained crystalline	clay } mud	claystone } mudstone	
2 to 60 microns	fine grained crystalline	silt }	siltstone }	tuff
60 microns to 2mm	medium grained crystalline	sand	sandstone	
2 to 60mm	coarse grained crystalline	gravel	scree (angular) } conglomerate } breccia (angular)	volcanic breccia
more than 60mm	very coarse grained crystalline	cobbles and boulders		

BEDDING

The following terms denote bedding thickness ranges:

thinly bedded	less than 200mm
medium bedded	200–600mm
thickly bedded	more than 600mm

FRACTURING

The following terms denote fracture spacing ranges:

closely fractured	less than 20mm
moderately fractured	20–200mm
widely fractured	more than 200mm

HEIGHTS ARE IN METRES ABOVE MEAN SEA LEVEL