UNDERGROUND WATER RESOURCES OF THE BOTHWELL DISTRICT

GENERAL:

Bothwell is a small town some 46 miles from Hobart and is surrounded by many large and some small grazing properties. The River Clyde runs through the centre of the area but it is not a large stream and most of the creeks flowing into it in this district are not permanent streams. Springs are numerous and these have been utilised to the fullest extent to provide water for stock etc. Rainfall in the district is extremely low; the average monthly rainfall for the past ten years being:-

January	: 192 points	
February	: 139 "	
March	: 161 "	
April	: 122 "	
May	: 149 "	This represents
June	: 191 "	an average yearly
July	: 174 "	rainfall of 21
August	: 181 "	inches.
September	;192 "	
October	:219 "	
November	:179 "	
December	: 204 "	

Because of all these factors, the majority of farmers and graziers are eager, and in some cases, anxious to obtain supplies of underground water and will be impatiently awaiting the arrival of the boring plant in their Municipality.

ACCESS:

The district is well served by roads and most of the proposed bore sites are in close proximity to a road of some description. Except after heavy rain, a

vehicle may be driven across the paddocks in almost any part of the area.

TOPOGRAPHY:

The topography of the area has been mainly determined by the type of outcropping rock. Thus the dolerite, more resistant to erosion than the sandstones and mudstones forms most of the higher country. Super-imposed on this selective erosion, is the effect of the Clyde and its larger tributaries. In the Southern portion the river has cut a deep channel through and round the basalt which filled the valley of the Tertiary Clyde. The head of this youthful erosion reaches to about one mile south of Bothwell. North of the town the river is in a more mature stage, meandering across wide alluvial flats which reach their maximum extent between "Nant" and "Dennistoun".

Bothwell itself lies at an elevation of some 1175 feet above sea level and this is the general level of the alluvial flats. At the southern edge of the mapped area the Clyde has cut down to 800 feet above sea level. The highest dolerite peaks on the mapped area reach about 2,000 feet.

GEOLOGY

There are two ages of Sedimentary Rocks outcropping in this district, Permian and Triassic. The Permian are predominently mudstones while the bulk of the Triassic are sandstone, although some narrow mudstone beds do occur in this series.

Into these two systems have been injected great masses of dolerite and later still basalt flows have covered the sediments and intrusions alike.

PERMIAN

Most of the Permian rocks outcropping in this

area consist of greyish white mudstones which sometimes weather to a yellowish white colour. They occur near the top of the Permian, sometimes underlying the coarse sandstones and grits at the base of the Triassic and may be correlated with the Lindisfarne stage. The Woodbridge Glacial Stage is also indicated to exist in places here by the presence of erratics of quartzite and slate and in one locality a bed of Bryozoal Limestone.

The mudstones are, in the main, barren of fossils but one small piece was found containing a splendid array of Permian Marine Fossils.

Near the dolerite intrusions some mudstones have been baked to hard compact cherts.

TRIASSIC.

Sometimes occurring in faulted relationships to the Permian, sometimes overlying the Lindisfarne Stage in normal stratigraphical sequence are beds of sandstones and grits, in places many hundreds of feet in thickness. These are the Ross Sandstones and Basal Grits of the Triassic. Often these sandstones are reddish in colour, due to iron staining from the dolerite and near the dolerite contact the quartz has often been fused and then solidified to a hard impervious rock. Narrow beds of mudstones also occur in this System.

DOLERITE.

Intruding the sandstones and mudstones is a bewildering series of dolerite injections. There are definite sills and dykes, it is true but there are also every type of gradation from the vertical dyke to the more or less horizontal concordant sill. Some of these intrusions are on a large scale but many, particularly dykes are of the order of a chain or two in width

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and very careful mapping is necessary to determine the limits of the dolerite.

BASALT.

Large outpourings of basalt occurred during the Tertiary mainly along the valley of the then existing river.

The Clyde at this time must have had a much wider valley than at the present time and the basalt has reached a thickness of several hundred feet. As well as this large area of basalt occurring along the river valley, are smaller plugs some of which, as at Green Hill, are at much higher altitudes. The basalt may be correlated with the Ouse Type of Dr. A.B. Edwards who describes it as composed of "corroded idiomorphic phenocrysts and microphenocrysts of fresh or serpentinised olivine, grading down to granules and small laths of plagioclase, set in an abundant metostasis of black glass".

The basalt has been erroded by the present river and excellent sections may be seen in cliff faces. Sometimes, as at the falls, sections of ancient sandstone hills may be seen entirely surrounded by basalt flows.

STRUCTURE.

The sedimentary rocks of the district are, with the exception of small local distortions in the neighbourhood of faults, almost horizontally bedded. No major dips measured exceeded 8^{o}. Thus no acute folding has occurred among these sediments but broad gentle folds and large scale warping.

Faults, on the other hand, are numerous. Some may be determined by the direct evidence of slickensides, fault breccia etc. while others are apparent by the lateral juxtaposition of Permian and Triassic Sediments.

One such fault may be observed crossing the main road about three miles East of Bothwell where Sandstone outcrops to the west and mudstone to the east. This fault is particularly interesting in that the fault plane is occupied by a narrow dolerite dyke, indicating that this faulting at any rate occurred prior to or contemporaneously with the dolerite intrusion.

UNDERGROUND WATER SUPPLIES.

Geological conditions most favourable to the accumulation and storage of underground water are beds of porous rocks, capable of allowing the passage of water, surrounded by impervious rocks which prevent the escape of such water.

A glance at the accompanying geological plan of this District would suggest that certain portions of it are ideal for this purpose; that is, large areas of sandstone, an ideal water carrying rock, surrounded by impermiable barriers of dolerite or mudstone. However a note of warning must be given. In many places the base of the sandstone may be seen overlying impervious mudstones. In other places, due to faulting, only sandstone occurs at the surface. What must be stressed is that in these sandstone areas the permiable rock may not extend down to the water table. In other words the sandstone outcropping at the surface may be close to the bottom of the Triassic and the depth of it may not be sufficient to carry water. Again Dolerite intrusions are so varied and numerous that dolerite itself may occur at no great depth below the surface marked as sandstone on the map. However, these risks are always to be faced in the search for underground water and should not deter the exploration for it.

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I have interviewed the following graziers, all of whom are interested in obtaining supplies of underground water:-

I. Mr. C.N. Archer (representing Archer Bros.) of "Norwood".

Mr. Archer was the instigator of the boring scheme for the Bothwell District and for some time now has been agitating for the removal of the plant to this Municipality. In consultation with him three sites have been selected at "Norwood". All these sites have sandstone outcropping at the surface and unless mudstone intervenes before the water table is reached should intersect adequate supplies of underground water at reasonable depths. The position of the bore sites are indicated on the plan. These and those mentioned hereafter are only approximate sites but give an indication of the general locality.

II. Mr. E.N. Archer of "Ratho"

The site indicated for Mr. Archer is in sandstone but it will be noted on the plan that two small dolerite intrusions occur nearby. These should be avoided.

III. Mr. C.L. Campbell wishes to obtain water on that portion of his property known locally as "Campbell's Square" in the vicinity of Green Hill. This is perhaps the most favourable locality of all as the sandstone can be traced to many hundreds of feet below the site chosen. The depth to water here may be greater than at several other localities.

IV. Mr. K.M. Campbell of "Nant".

The position of this bore is a little doubtful. Mr. Campbell desires to obtain water either north or south of the dolerite ridge which crosses the Waddamana road at the Quarry Site about two miles north

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of Bothwell. Either site shows sandstone outcropping at the surface.

V. Mr. J.C. Rogers of"Meadsfield" indicated two places where underground water would be helpful to him. Unfortunately the geological conditions at neither site were favourable. The first occurs on the summit of a basalt plateau underlain by mudstone, while the second is situated in a belt of mudstone.

VI. Mr. R.A. Ellis is interested in obtaining water on two of his properties "Ibbotvale" and "Humbie". That on "Ibbotvale" to the east of the Hamilton Road appears to be in a favourable position. The site on the "Humbie" run through which the road to Berriedale passses can be fixed in a sandstone belt but the one required on the "Humbie" run near the Clyde is on the summit of a basalt plateau. Although Sandstone probably underlies the basalt, the thickness of the latter rock is too great to risk boring through it.

VII. Mr. R.V. Bowden of "Cluny" has selected two sites for boring. That near "Cluny" homestead is unfavourable as mudstone outcrops nearby. However, a small alluvial flat occurs here and a small amount / of water could probably be obtained from this. Mr. Bowden is so much in need of water that he is willing to take the risk of sinking a bore here. The other position near the southern boundary of "Cluny" is more favourable. Indeed if the sandstone outcropping at the surface extends to any depth the position is an ideal one, - a sandstone basin surrounded by dolerite hills. A narrow dolerite dyke crosses this basin near the selected site and care must be taken to avoid this.

VIII. Mr. W. Bramendale of "Rochford". This property is outside the mapped area, being about 12 miles

north of Bothwell. The site where Mr. Brazendale requires water is unfortunately occupied by Permian mudstones which renders the site quite unsuitable. Mr.Brazendale however is fortunate in that the Shannon River runs through his property and he should be able to utilise water from this river.

IX. Mr. J.W. Butler of "Woodspring".

Although sandstone outcrops on portion of the run which Mr.Butler desires to be watered, it appears to be near the base of the Triassic, and mudstones occur not far away. Supplies of underground water may be obtained here but there is a doubt if the depth of sandstone is sufficient.

X. Mr. G.B. Edgell of "Dennistoun" is interested in obtaining supplies of underground water on that portion of his property "Fordell" to the north of Campbells Square". This area appears to be suitable.

Messrs. H. Jones of "Pear Tree", J.Baker and Bale are owners of smaller properties who are also interested in obtaining the boring plant. Portions of their farms appear suitable for supplies but I have suggested that they await results of other holes to give them some indications of costs, etc.

CONCLUSION.

The majority of the sites selected for boring in this Municipality appear suitable for obtaining supplies of Underground Water but until a few bores have been put down it is impossible to estimate the depth to the water table, quantity and quality of water and costs involved.

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It should also be noted that there is, in some localities, a danger that mudstone may extend above the water table, even though sandstone does occur on the surface.

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