1984/54. Progress report on the reconnaissance groundwater investigations in the Little Swanport, Rheban and Runnymede areas.

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Abstract

Work carried out on the Little Swanport, Rheban and Runnymede reconnaissance groundwater investigations up to July 1984 is outlined. Twenty-five bores have been drilled with limited success. The principal drilling targets have been Jurassic dolerite, Triassic sediments, and the dolerite/sediment contact.

INTRODUCTION

The purpose of this report is to record the work that has been carried out on the reconnaissance groundwater investigations in the Little Swanport, Rheban, and Runnymede areas. This work can be considered as part of the East Coast Groundwater Investigation which was started in November 1982 in response to the severe drought conditions affecting much of the area. The work has been carried out under the direction of Senior Geologist W.R. Moore, who will be responsible for the final report on the project. Geologist D.J. Sloane investigated the groundwater potential of the sand spit at Rheban and will report separately on this part of the project.

This report is divided into three parts, corresponding to the three separate areas investigated. Each part consists of a brief account of the geology and groundwater targets followed by a report on the individual bores. A summary of all the water bore results is given in Table 1. Field maps and other documents have been given to W.R. Moore.

LITTLE SWANPORT AREA

Geology and groundwater targets

According to the published 1:250 000 geological map (Oatlands), the Little Swanport area is underlain by Jurassic dolerite and Triassic sediments. Mapping and drilling in the area has confirmed the presence of dolerite, mudstone and sandstone. Alluvium occurs in some of the valley floors but has not been investigated as a groundwater source.

The two field mapping sheets (1:15 840) and the coloured compilation (1:50 000) have been given to W.R. Moore. Samples were collected from all the bores drilled, but the bores have not been logged in detail. Variations in grain size in the dolerite and lithology in the sediments will be revealed when the bores are logged.

As far as the geological structure is concerned, the Little Swanport area appears to be a fault-controlled basin in which Triassic sediments are underlain by Jurassic dolerite. The basin is also surrounded by dolerite. The pattern of dolerite outcrop and surface fragments within the basin indicate that there are several faults or steep intrusive contacts striking NE/SW. Some outcrops and several of the bores indicate that dolerite occurs beneath the sediments. Some diagrammatic NW/SE cross-sections are given on the 1:50 000 compilation. The Tasman Highway road cutting immediately south of the Ravensdale Rivulet bridge [EP774097] illustrates the sort of relationship between the sediments and the dolerite which may be typical of the whole area.

Table 1. SUMMARY OF WATER BORE RESULTS

Driller's number	*AMG co-ordinates*	*Landowner*	*Depth (m)*	*Estimated yield, l/sec (gallons/ hour)*	*Geology*
		LITTLE SWANPORT			
31	5795 53128	Ellis	90	-	dolerite
31A	5794 53132	Ellis	40?	0.1 (80)	dolerite
33	5786 53137	Wells	36	1.3 (1000)	dolerite
34	5749 53108	Teniswood	42	0.5 (400)	sandstone, dolerite
36	5795 53111	Dyke	60	-	sandstone, dolerite
37	5755 53075	Wrigley	90	0.1 (80)	sandstone
38	5735 53078	Teniswood	90	-	sandstone, mudstone
40	5765 53107	Mitchelmore	30	1.3 (1000)	sandstone
41	5794 53153	Walters	18	-	clay
41a	5794 53154	Walters	12	-	clay, dolerite
42	5793 53113	Dyke	42	1.3 (1000)	mudstone, sandstone
43	5805 53149	Walters	48	0.1 (80)	dolerite
		RHEBAN			
1	5762 52793	Gray	16	?	sand, dolerite
2	5761 52792	Gray	15	?	sand, dolerite
3	5760 52793	Gray	56	-	clay, sand, dolerite
4	5769 52761	Chesterman	36	0.4 (350)	dolerite
4a	5765 52770	Chesterman	50	-	clay, dolerite
5	5726 52797	Gray	30	-	dolerite
5a	5725 52797	Gray	32	-	dolerite
6	5761 52827	Gray	30	0.06 (50)	dolerite
6a	5759 52827	Gray	16	0.1 (80)	mudstone, dolerite
7	5759 52831	Gray	51	-	sandstone, mudstone, dolerite
8	5748 52842?	Norton	58	-	sandstone
		RUNNYMEDE			
1	5467 52784	Tate	55	-	sandstone, mudstone
2	5459 52787	Eaves	60	0.3 (1000)	mudstone, sandstone

The water bore drilling project was designed to investigate the following three possible sources of groundwater;

(1) the dolerite

(2) the sediments, especially the sandstone

(3) the contact between the dolerite and the sediments

Individual water bores - dolerite

Holes 31 and 31a. These bores in dolerite were unsuccessful. An attempt to improve the yield of Hole 31a, by detonating explosives at the bottom of the hole, failed to make any noticeable difference.

Hole 33. This bore in dolerite produced a reasonable amount of water but the quality was poor (4500 to 5000 mg/*l*).

Hole 43. This bore in dolerite produced very small quantities of water.

Individual water bores - sediments

Hole 36. This bore was drilled in sandstone although it bottomed in dolerite. Very little water was found in the sandstone which was soft and weak. It may have been highly weathered. A second bore on the property (Hole 42), located near a possible dolerite dyke, was more successful and is discussed below.

Hole 37. This bore was drilled in soft and weak sandstone and very little water was found.

Hole 38. This bore was planned to explore the contact between the sediments and the dolerite. However, after drilling 90 m of sediment which produced very little water the bore was abandoned. Dolerite crops out within about 100 m both east and west of this bore. Thus the sediments either occupy a deep fault-bounded trough, or are not underlain by dolerite at the site of the bore. Seismic refraction or reflection surveys may indicate which geological model applies.

Hole 40. This bore, drilled entirely in sediments, produced moderate quantities of stock-quality water. The sediments at this site appeared stronger and less weathered than the sediments drilled elsewhere but this impression should be checked by detailed logging.

Individual water bores - dolerite/sediment contact

Hole 34. This bore started in sandstone, continued into baked mudstone or hornfels, and finished in dolerite. Water occurred in both the hornfels and the dolerite.

Holes 41 and 41a. These bores were planned to explore the sediment/dolerite contact. They were both unsuccessful as the sediment was extremely weathered (clay). Fragments of fossil wood found nearby may indicate that Tertiary deposits occur in this area. The possibility that some of the clay reported from these bores is of Tertiary age may be worth investigating.

Hole 42. This bore was sited on the line of a NE/SW trending fault, intrusive contact, or dolerite dyke (see maps). On the surface, near to the bore, fragments of sandstone, hornfels, and dolerite can be found.

The bore encountered mudstone and sandstone. The bore cuttings should be examined to see whether the sediments are indurated. They were certainly stronger and less weathered than the neighbouring bore (Hole 36). Moderate quantities of stock-quality water were encountered.

Overall assessment

None of the three groundwater targets investigated proved very encouraging in terms of quantity and quality of water found. The quality is consistently poor throughout the area (3000 to 5000 mg/*l*).

The dolerite is an unreliable aquifer. Three out of four of the bores drilled entirely in dolerite would generally be regarded as unsuccessful. Whether seismic refraction surveys could be used to locate more fractured zones in areas of poor outcrop is doubtful, as weathering also produces lower velocities.

The quantities of water obtained from the sediment were also low. Most of the sandstone drilled was weak and soft and may have been highly weathered. In the one successful hole the sediments were stronger and harder. The same situation applies to the sediment/dolerite contact targets. It may be that sediments which are either fresh and strong, or indurated may be better groundwater targets. This could be because the fractures in weathered sediments are filled with clay.

It does not generally appear possible to predict whether sediments in contact with dolerite will be indurated. In fact, it is hard enough predicting where the dolerite might occur. However, seismic refraction surveys may be useful in determining the depth of weathering in the sediments, which may be relevant to the groundwater potential.

RHEBAN AREA

Geology and groundwater targets

According to the published 1:63 360 geological map (Buckland), the Rheban area is underlain by Jurassic dolerite, Triassic sediments, Tertiary sediments, and Quaternary alluvium and beach sands. Very little mapping has been carried out for this project (one 1:15 840 field sheet has been given to W.R. Moore) and the bore cuttings have not been logged.

Little is known about the geological structure but it is probably similar to the Little Swanport area. There are less Triassic sediments in the Rheban area but there are Tertiary sediments.

Faulting probably plays an important part in the geological history and the topography suggests that higher Quaternary sea levels may have modified the landscape, although no direct evidence of this was observed.

In addition to the three possible sources of groundwater investigated in the Little Swanport area, the groundwater potential of the Quaternary beach sand deposits were also investigated. A report on this investigation is being written by D.J. Sloane.

Individual water bores

Holes 1, 2 and 3. These bores were drilled under the supervision of W.R. Moore. Varying depths of sand were encountered over weathered dolerite. No water was found in the dolerite.

Hole 4. This bore, drilled in dolerite, encountered small quantities of poor quality water.

Hole 4a. This bore was drilled through 49 m of clay which is probably of Tertiary age. The hole ended in dolerite. The bore was planned to check for the presence of gravel within the sediments. There was some clayey gravel within eight metres of the surface but very little water was obtained.

Holes 5 and 5a. These bores were sited in areas where reconnaissance geological mapping by W.R. Moore had indicated the possibility of more closely-jointed dolerite occurring. The drillers reported that the dolerite was broken but it was also highly weathered and very little water was obtained.

Holes 6 and 6a. These bores were sited in the area covered by the 1:15 840 field mapping sheet. Sketch cross-sections are also included on the map sheet. The bores were sited in areas of indurated sediments (sandstone/quartzite and hornfels) which were assumed to overlie dolerite. It was hoped that the baked sediments and the dolerite would be fractured close to the contact. The bores were also in a topographically favourable situation, but both were unsuccessful. Hole 6 went straight into dolerite, although there were scattered fragments of sediment at the surface. Hole 6a did encounter some mudstone above the dolerite but there was very little water.

Hole 7. This bore was drilled in sandstone and mudstone and bottomed in solid dolerite (see field sheet). The bore was unsuccessful.

Hole 8. This bore, drilled entirely in sandstone, was unsuccessful.

Overall assessment

The success rate for bores drilled in the Rheban area was very low and further investigation or contract drilling in the future is not recommended. The comments made about the weathering and strength of the sediments and the groundwater potential in the Little Swanport area may also be applicable to the Rheban area.

RUNNYMEDE AREA

Geology and groundwater targets

According to the published 1:63 360 geological map (Buckland), the Runnymede area is underlain by Jurassic dolerite, Triassic sediments and Tertiary basalt. Reconnaissance field mapping on a scale of 1:31 680 (given to W.R. Moore) indicated that Quaternary deposits, including alluvium and a lunette, also occur.

The detailed lithology is not discussed here as the bores have not been logged but the overall geological structure of the Runnymede basin is probably similar to the other two areas. The only difference is that some basalt has been extruded into the fault-controlled basin.

As several bores have been drilled in the Runnymede area in the past only two bores were drilled in the present programme. The objective of the two bores was to explore the Triassic sediments to a greater depth than had been previously drilled.

Individual water bores

Hole 1. This bore was drilled into sandstone and mudstone. A very small amount of water was encountered in the sandstone but the hole was abandoned.

Hole 2. This bore was drilled into mudstone and sandstone. Moderate quantities of fair quality (1000 mg/*l*) water were encountered in the sandstone.

Overall assessment

The overall success rate for bores drilled in Triassic sediments in the Runnymede area is good. However, the criteria for the selection of sites have not been established. The Triassic sediments do not crop out in the Runnymede area and the presence of faults will make correlations between boreholes rather tenuous. In an attempt to determine whether the lithology or the depth of weathering could be indicated by seismic velocities, four seismic refraction surveys were carried out at locations which are shown in red on the field sheet. Details of the surveys have been given to W.R. Moore but a preliminary interpretation does not suggest that the results will be directly useful for bore siting.

[30 July 1984]