

TR 5 - 214 - 216

## WATER BORING ON J. F. BELL'S PROPERTY, REDPA

by I. B. Jennings.

Since no alternative source of water supply is available during dry periods, two bores have been sunk on this property by the Mines Department plant. The first bore, put down a few years ago, encountered water at about 40 feet in limestone but became exhausted during the summer periods.

The second bore has recently been completed in an effort to locate a more permanent source of water. The bore penetrated about 60 feet of unstable clays, decomposed siltstones and silts &c., before encountering limestone. Water was encountered in the silts at about 40 feet but was cased off due to the unstable nature of the ground. When the limestone was encountered it proved to be exceedingly dense, hard and slow to drill. Consequently the hole was only carried a few feet into the limestone before the boring was stopped. A flow of about 400 gallons per hour of satisfactory water was obtained with the casing driven to within about 18 inches of the bottom of the hole.

Subsequently a pump house and power supply was provided and efforts made to develop the bore. Despite several attempts all efforts to pump from the bore simply resulted in a heavy and rapid inflow of silt so that it has become necessary to abandon the bore. Advice has been sought on the subject.

So far as can be seen at the bore site at present, the heavy silting seems to have been due to the inflow of a mixture of clay, silt and sand probably with a few limestone pebbles. The last-mentioned are important but unfortunately it is difficult to be precise regarding them. The area surrounding the bore is littered with relicts of both the original sludges and the silt removed by Mr. Bell in endeavouring to clear out the bore. There are certainly many fragments of limestone of an inch or so across, lying about the ground, some are angular and others rounded, but which are due to the boring and which (if any) to subsequent silting would be difficult to establish. However Mr. Bell reported recovering rounded or sub-rounded pebbles during his de-silting operations. Any angular fragments of fresh rock recovered by him would simply represent pieces left on the bottom of the hole by the driller and subsequently flushed upwards by the inflow of silt. Such an occurrence is quite probable.

The inflow of silt could be due to one or more of several factors which are discussed below:—

- (1) Inflow between the bottom of the casing and the sides of the bore. I have spoken to Mr. Harper on this subject and he reports that the casing was driven firmly onto the bedrock and indeed that he had considerable difficulty in driving it the last few inches. This seems to preclude the possibility of any serious silting by this process. The presence of rounded pebbles in the silt strengthens this view as it is difficult to envisage gaps in excess of an inch existing

at the bottom of casing which was driven with difficulty onto hard rock. The surface around the bore has been covered by a cement floor so that no evidence of surface subsidence around the casing is visible.

- (2) The silt may be due to interbedded silt layers in the limestone. If such bands are present then it would be difficult indeed to prevent further silting. However the pebbles, if we can be sure of this evidence, suggest that the source of the incoming material is not a silty layer. Also, the rapid rise of the material in the bore suggests that it is under some hydraulic head and not from a source at the very bottom of the bore.
- (3) The original suggestion by Mr. Hughes that the material is coming from a cavity in the limestone seems to fit all the observed facts. It accounts for the presence of pebbles in the silt and for the rapid inflow of the silt apparently under hydrostatic head. The silt was reported to have risen quite rapidly to about 18 feet and apparently flushed chips of limestone an inch or two across up to this height, during the process.

These facts seem to support the view that the inflow is from a cavity which:—

- (1) Is of relatively large size compared to the bore.
- (2) Has access to the silty sediments overlying the limestone.
- (3) Has access to an aquifer above the limestone (perhaps the flow encountered at 40 feet in the bore).

The chances of overcoming the problem are therefore not very promising. However, Mr. Bell has indicated that he desires the plant to return to the site when available and has asked for recommendations in this event. Before proceeding with these recommendations it is necessary to state clearly that in our present state of knowledge concerning the geology of this area one can give no firm assurance whatsoever that all or any of the suggested procedures will result in a successful bore.

## RECOMMENDATIONS

### At present bore

- (1) It would be worthwhile, in view of the expenditure to date on boring and development, to attempt to bail the hole for a day or two and try to empty the cavity of silt. However, the fact that the cavity seems to be connected to higher silt horizons indicates that there is a possibility of more or less controlled silting. On the other hand if the cavity is fairly small and pipe-like it may possibly be cleared out satisfactorily. During such work a careful watch should be kept for signs of surface subsidence in the area and all efforts abandoned if such subsidence is noted.
- (2) Failing a cessation of silting by (1) after say, a couple of days, it would probably be better to try to carry on with this hole a little further before (or instead of) attempting a new hole. The area subject to silting will of course have to be cased off. Further boring here will be slow and expensive and no guarantee can be given that the hole may not run out of limestone into silts again.

If this occurs the only course will be to keep boring in search of a lower aquifer. This could result in a more assured water supply ultimately.

#### **New bore**

Although the last bore was not sited by a geologist it is one which might reasonably have been selected. There is always an element of risk in drilling such areas but results in the district to date indicate that the risk generally speaking is acceptable. Any new bore sited here will be subject to the risks taken with the previous two bores and it is for Mr. Bell to assess whether he is prepared to accept the risk of a third unsatisfactory bore. A new bore could be located at any suitable place near the power line between the last bore and the house. I consider that it would be advisable to shift at least 100 yards from the present site and that the next bore be situated as far away as possible from any obvious surface depressions which may indicate underground water drainage channels. Within these limits the bore could be sited at any convenient spot on the flat near the road.

If all these measures fail, or if Mr. Bell is unwilling to accept the risks involved, it is worthwhile to point out that in an emergency there seems to be every possibility that the original bore would again provide a limited quantity of water to help over a very dry period. The aquifer feeding the bore is apparently small but in the period which has elapsed since the bore was last used it should have been recharged and thus yield small quantities of water over a limited period.