

AT FLOWERY GULLY

In connection with the proposed establishment of Cement works in the neighbourhood of Flowery Gully near Beaconsfield, the attention of the investors interesting themselves in the matter has been directed towards the location of suitable deposits of clay for mixing in the proper proportions with the limestone which has been definitely located and can be easily quarried as was indicated by the late W.H. Twelvetrees in his report on these deposits. The analyses, published in that report, of the deposits of clay examined up to that time show that they were not suited for cement manufacture. Recent prospecting, however, has resulted in the location of a deposit of clay, samples taken from various parts of which have a composition suitable for cement manufacture. At the same time however, other samples from the same deposit have a composition which is quite unsuitable for that purpose. The present investigation by the Geological Survey was therefore undertaken to determine the nature of the clay deposit and whether suitable clay could be obtained under practical conditions from the whole or portions of this deposit.

The occurrence under investigation is situated on the side of the Beaconsfield-Winkleigh Road in the property consisting of twenty five acres in the name of T. E. Stonehouse. The State School site occupies the South-eastern portion of this block. The deposits extend into the North-western corner of a fifty acre block in the name of W. Powell, and also into Crown Land west of this latter block.

A series of trenches have been dug about four feet in depth over a total length of twenty chains and extending back from the road a distance of five chains. A series of samples from these trenches were submitted to the Geological Survey Laboratory for analysis on the 9th August. There were ten of these samples but only three of them had a composition which would allow of their being used for cement manufacture. Four of the remainder were unsuitable owing to the high silica content, while the remaining three were unsuitable owing to the high content of alumina and ferric oxide. An examination of the location of the three favourable samples showed that it would be impossible to work these separately from the remainder of the deposit.

The geological examination of the deposit shows that it is a detrital clay formed by the decomposition of argillaceous sandstones and arenaceous shales which occupy the bed rock of the area. The composition of the deposit varies within wide limits in different portions of it, and these variations are of such a character as to preclude any possibility of selecting any portion which has a suitable composition over an area large enough to provide facilities for separate working. The possibility of utilising the deposit in cement manufacture therefore depends on whether the average composition, over an area sufficient to provide a clay reserve of sufficient quantity to warrant the establishment of cement works, is suitable for cement manufacture. The consideration of this question results in a very satisfactory conclusion that the average of the ten analyses representing samples over an area of 20 chains by 5 chains shows a composition which is quite satisfactory in connection with the

manufacture of Portland cement. This average analysis is as follows:-

Ignation Loss	7.75
Silica (Si O ₂)	65.93
Ferric Oxide (Fe ₂ O ₃)	10.08
Alumina (Al ₂ O ₃)	15.31
Lime (Ca O)54
Magnesia (Mg O)12

$$\text{Ratio } \frac{\text{Si O}_2}{\text{Al}_2 \text{O}_3 \quad \text{Fe}_2 \text{O}_3} = 2.55$$

Such a clay as this would be suitable for use in the manufacture of Portland cement by mixing with the limestone of Flowery Gully in the proportion of 22 parts of clay to 78 parts of limestone. The quantity of limestone estimated to be available by the late W.H. Twelvetrees is 1,440,000 tons. Before the erection of cement works is justifiable the quantity of clay available should be definitely ascertained to be the quantity which must be mixed with the limestone in the proportion of 22 to 78. The quantity thus demanded is 406,154 tons. The question therefore arises - is this amount of clay available in the deposit under discussion? The calculation of such quantity must at present be based on a length of 20 chains and a depth varying from nothing at the road level to approximately twenty five feet some distance back from the road. In order to ensure that a total clay reserve of 400,000 tons exists there must be clay continuously from the road to a distance of six chains therefrom. The trenches already cut indicate that this is most probably so, but before deciding to erect the plant the following procedure should be adopted.

Three lines of bores should be put down parallel to the road between the shaft and the northern boundary of T.E. Stonehouse's 25-acre block. In each line the bores should be 100 feet apart. In the first line, which should be just inside the road boundary the depth should be about 10 feet. In the second line, which should be about 3 chains up the hill, the depth should be 15 feet; and in the third line, which should be 6 chains from the road, the depth should be 25 feet. These bores should be put down with a post-hole borer fitted with extension rods of 3-foot sections. The surface soil should be excluded, but in each bore the borings should be thoroughly mixed and quartered down to a convenient sampling size. There will thus be 13 samples from each line of bores. If each series of 13 shows an average similar to that indicated above as the average of the last series of samples taken then justification will exist for the opening up of a quarry of a length of 20 chains which must be worked in 100-foot sections and material drawn concurrently from each section. Only in this way can it be assured that the material going into the bins is of the general average suitable for the manufacture of cement.

The clay contains fragments of sandstone which would increase the cost of crushing, but this will probably be offset by the softness of the greater portion of the clay, and therefore the cost of crushing should not greatly exceed that of crushing the dense shale.

Samples taken of the series of arenaceous shales on Adam's Hill to the left of the road near the limestone quarry show that this series contains too high a silica content to be suitable for cement manufacture.

CONCLUSION

There thus appears to be a deposit of clay suitable for use in the manufacture of Portland cement in the vicinity of the school site at Flowery Gully. The deposit is of such a variable composition that the only method of using it as a source of clay for cement manufacture is to work it in a face 20 chains in length and draw from all parts of it at the same time so that the clay going into the bins has the same composition as the average of the deposit, for it is very important that this average is maintained throughout the whole of the deposit.

If the method of testing indicated above is carried out and confirms the results already obtained, there will be assured a quantity of suitable clay sufficient to ensure the conversion of the present available tonnage of limestone into Portland cement.

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