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DEPARTMENT OF SUPPLY AND DEVELOPMENT.
BUREAU OF MINERAL RESOURCES
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REPORT No. 1950/1

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GEOLOGY AND SHALE RESERVES OF CANBERRA BRICKYARDS

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INTERIM REPORT

by

W. C. SMITH



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1. S U M M A R Y.

Between 50 and 100 acre feet of brick-making shale are readily available above the 1,894 foot contour within the boundary fence of Canberra Brick Yards. There is also a larger quantity of calcareous and sandy beds which cannot be used in the present brickworks, but, if the plant were modified, it may be possible to mix some of these rocks with the shale for brick-making, thereby increasing the reserves.

11. INTRODUCTION.

At the request of the Minister for Works and Housing, a geological survey of the Canberra Brick Yards was commenced in October 1949, to determine present reserves of brick making materials.

A geological plan (No. A.C.T.1-15) and sections (Nos. ACT.1-16 and ACT.1-17) have been prepared by plotting directly on a contour-and-detail-survey plan supplied by the Department of Works and Housing, and on vertical sections drawn from the plan. In this work, information provided by previous incomplete surveys by F. Cahavan and L.C. Noakes has proved most useful. The geological plan included only the brick pits and the area between the brick pits and the eastern boundary fence, but the survey will be extended to the east and south to provide further information from which future limits of the brick pits may be determined. For this purpose, three or four shallow costeens running east from the brick pits will be needed to expose structures obscured by soil cover, and these should provide more accurate information on the area already mapped.

From the geological plan and sections, reserves of readily available shale similar to that previously used for brick making are estimated to be not less than 50 acre feet, and not more than 100 acre feet above the 1894 foot contour within the boundary fence. If the shale were mixed with approximately 10 per cent of calcareous and sandy shales, reserves would exceed 70 acre feet.

This interim report contains a description of the strata and structures exposed in the brick pits, and details of estimates of shale reserves. A full geological report will be prepared when the extended survey is complete.

111. STRATIGRAPHY.

The strata exposed in the brick pits consists of shale, shale with thin limestone bands, fine sandy shale with calcareous nodules, thinly bedded tuffaceous sandstone and shale, and massive tuffaceous sandstone. They are all probably of Middle Silurian age, and are conformably bedded in the sequence given in the following generalized section. The only beds used for brick making in the past were the shale and a little of that part of the sandy shale from which the calcareous nodules had been weathered, because the existing plant cannot effectively crush limestone or sandstone.

With the exception of the sandstones, the beds show every little lateral variation; other than slight differences in fossil assemblages, and thicknesses are approximately constant throughout the brickpits. The tuffaceous sandstones, particularly the thinner bands, show marked lateral variation in both grain-size and thickness, but, as they comprise only the lowest and highest beds exposed in the pits, the exact extent of variation cannot be determined.

GENERALIZED SECTION OF THE BRICK PITS.

<u>Rock Type.</u>	<u>Average Thickness in Feet.</u>	<u>Remarks.</u>
Tuffaceous sandstone and shale, thinly bedded.	More than 10	Exposed in the south-eastern end of the pits.
Sandy shale with calcareous nodules.	30	Exposed in the central and south-western portions of the pits. Only weathered material from the south central portion ^{em/} has been used for brick making.
Shale with few thin fossiliferous bands, and, at the base, rare coralline limestone nodules (Favosites) up to four inches in diameter.	50	Exposed in the southern half of the pits. This has been found suitable for brick making, the weathered material in the south-eastern end being particularly good.
Calcareous shale with numerous thin bands of limestone, composed of calcareous fossils.	18	Exposed in the eastern, central, and north-western portions of the pits.
Shale with at least one thin calcareous fossiliferous band.	65	Exposed in the eastern and northern portions of the pits. This has comprised more than half of the brick-making material taken from the pits.
Tuffaceous sandstone and shale, thinly bedded.	25 - 30	Exposed in the central, northern and eastern portions of the pits.
Shale with few thin fossiliferous bands.	25	Two small exposures in the eastern side of the pits. A few cubic yards have been used for brick-making.
Tuffaceous sandstone	25	Outcropping near the north-eastern end of the pits.
Shale with lenses of tuffaceous sandstone.	More than 20.	Outcropping north-east of the boundary fence.

The section below the lower thinly bedded tuffaceous sandstone and shale has been estimated from poor exposure near the eastern side of the pits, therefore the shale in this section cannot be included in any estimate of reserves elsewhere in the pits, until its existence is proved by drill holes or test pits.

IV. S T R U C T U R E .

Although the regional mapping of Canberra is incomplete, present evidence indicates that the Canberra Brick Yards are situated on a belt of sediments which trends north-south between two areas of porphyry, and forms the eastern limb of a synclinal area which pitches gently to the south.

Within the brick pits, the sediments are folded and faulted along north-south axes, with a general southerly pitch and average dip to the west. Faults with downthrow to the west are confined mainly to the eastern side of the pits, and are intersected by a system of younger faults with downthrow to the east. These younger faults are common throughout the brick pits, and the largest has a displacement of up to 60 feet. Only two major cross faults have been exposed, both with downthrow to the south and displacement of approximately 20 feet.

With the exception of the north-eastern pit and the area east of the brick pits, exposures are sufficient to permit almost continuous mapping, so that errors due to interpolation should be generally less than ten per cent. However, interpolation in the north-eastern pit is much less reliable, due to lack of exposures on the floor, and mapping of structure east of the brick pits is more unreliable because it is based on scattered outcrops of beds which are not exposed in the pits. More reliable information may be obtained if costeens are dug in this area.

V. R E S E R V E S O F S H A L E .

The following estimates of reserves refer only to readily available shale similar to that previously used for brick making in Canberra, because the extent to which the sandy and calcareous rocks may be used for future brick making has not yet been determined.

For the purpose of calculation, the brick yards have been divided into five areas, A, B, C, D, within the pits, and E between the pits and the eastern boundary fence (see Plan No. ACT.1-15). Within these areas, reserves of shale have been calculated to the present depth of the lowest pit, and include only shale which can be quarried or stripped without removing any sandy or calcareous rocks, allowing a maximum slope of 60 degrees on the faces.

Reserves of Shale above the 1894 foot contour on Plan No. ACT.1-15.

<u>Area.</u>	<u>Estimated Reserves.</u>		<u>Remarks.</u>
	cu.yds.	acre feet.	
A	38,000	23	Based on extensive interpolation without sufficient control. Accuracy probably within 30 per cent.
B	13,000	8	Based on more complete mapping. Accuracy probably within 10 per cent.
C	15,000	9	
D	32,000	20	
E	35,000	22	No allowance has been made for two small pits, now filled with sawdust, from which probably less than 200 cubic yards have been removed. Accuracy probably within 10 per cent. Based on poor outcrops of unknown beds. Errors may exceed 50 per cent.
Total	133,000	82	Accuracy probably within 30 per cent.

V. Reserves of Shale (Contd.).

If the shale were quarried, commencing at the 1894 foot level in the north-western pit, grading of the floor to allow drainage to the west may reduce the shale reserves by not more than 20 per cent, but possibly at least the eastern half of the pits may be drained to the east, thereby increasing the reserves. Additional shale may also be obtained by extending the north-western pit in a northerly direction and by working some pits below the general level of the new floor.

Allowing for drainage and for the order of accuracy of the estimates, reserves of readily available shale within the present brick pits and between the pits and the eastern boundary fence are probably not less than 50 acre feet and not more than 100 acre feet. If a mixture containing approximately 10 per cent calcareous and sandy shales were used for brick making, reserves would probably exceed 70 acre feet, because more shale would then become available.