DM 639/54,
RB 38/68

DEPARTMENT OF MINES.

SOUTH AUSTRALIA.

PRELIMINARY REPORT ON THE GEOLOGY OF THE HINDMARSH VALLEY DAMSITE.

INTRODUCTION

LOCATION:

The proposed dam spans the Hindmarsh River approximately 130 yards upstream from the existing diversion weir on Section 40 Hundred of Encounter Bay, about 9 miles by road from Victor Harbour.

The diversion weir is accessible to road transport from the Hindmarsh Valley road then through Section 40 along a private road. The Hindmarsh River is a perennial stream but it can be crossed on foot exept during occasional floods.

PREVIOUS INVESTIGATIONS:

It was decided by the Parliamentary Standing Committe on Public Works in 1942 that steps should be taken to enlarge the capacity of the Hindmarsh Valley Reservoir. Subsequently, in 1943, a temporary weir was constructed across the by-wash of the reservoir to raise the high water level by 4 feet. This had the effect of increasing the storage capacity of the reservoir from 81,600,000 gallons to 107,600,000 gallons.

Further suggestions were made for raising the storage level of the reservoir but these would involve a higher level inlet and diversion weir on the Hindmarsh River.

Investigation showed that a better scheme would be to place a new reservoir on the Hindmarsh River and retain the present low level reservoir at its original level.

In 1951, Sir Douglous Mawson, Professor of Geology, University of Adelaide, suggested that a reservoir should be constructed on the Hindmarsh River, either near the southern boundary of section 702 or in section A' about 5 chains south of the section boundary.

As far as is known no previous geological examination of the damsite or reservoir area has been made.

ASSOCIATED PLAN 54-227

PRESENT INVESTIGATIONS:

The Engineer in Chief of the Engineering and Water Supply Department requested the Director of Mines in March 1954 for a geological examination of the proposed damsite.

The alternative sites "A" and "B" on the Hindmarsh River had been selected by officers of the Engineering and Water Supply Department as possible localities for the construction of a new reservoir to serve the Encounter Bay District. Site "B" is situated approximately 130 yards upstream from the diversion weir and site "A" is about 1 mile upstream from site "B".

The objects of the present survey were firstly to examine and report on the geological suitability of site "B" for a dam to impound 1,788 million gallons. If this site was not satisfactory for a reservoir of this capacity it would then be considered for some smaller capacity. If site "B" was considered totally unsuitable for a dam then site "A" would be examined.

Geological mapping in the vicinity of site "B" was carried to a maximum height of 240 feet above the valley floor.

FIELD WORK:

Copies of the original survey plans (Nos. 54.81 and 54.82) covering the areas "A" and "B" respectively, were received from the Engineer in Chief in August 1954. The base traverse along the Hindmarsh River was plotted from information supplied by the Engineer for Surveys, Engineering and Water Supply Department.

Geological mapping was commenced on 24th August 1954 and was carried on intermittently until its completion on 16th September 1954. The mapping comprised the preparation of a detailed plan of the environs of the proposed damsite "B" on a seale of 50 feet to 1 inch.

The work was carried out by means of a plane table and telescopic alidade and later by a tacheometer. The topographic survey plan of area "B" supplied by the Engineering and Water Supply Department was used as a base. Additional contouring was carried out northward of the area originally contoured, operating from the base traverse along the river.

Assistance in the field was given by D. Thatcher (Assistant Geologist) and the project was under the supervision of Dr. K.R. Miles (Senior Geologist).

Plans accompanying this report are as follows:-

1. Locality Plan showing proposed Reservoir: Scale 1' to 40 chains.
2. Geological Plan of Hindmarsh Valley Damsite, Area "B": Scale 1" to 50 feet.
3. Geological Section across Damsite "B": Scale 1" to 50 feet.

TOPOGRAPHY

In the area examined the Hindmarsh River and its tributaries have deep V shaped valleys with steep banks, typical of a youthful topography. Downstream from the diversion weir the river valley opens out into soil covered undulating country which continues during its passage to the sea.

The gradient of the river in the area examined is approximately 1 in 85, sufficient to prevent the accumulation of fine alluvium except on the inside of meanders.

The river floor at the damsite lies at 360 feet above datum. The north eastern or left abutment rises steeply from the river to a height of 625 feet, the crest of a spur trending south westerly, the average gradient being approximately 1 in 2. The south western or right abutment rises to a height of 580 feet with a similar gradient and forming a spur trending in the same general direction. At the damsite the area below -R.L. 370 can be considered the foundation and the slopes above this level are the abutments.

GEOLOGY.

Outcrops in the area mapped are rare, the rocks being mostly covered by soil and rubble, particularly on the left abutment.

The bedrocks throughout the area mapped and for a considerable distance upstream along the Hindmarsh River are Early Paleozoic in age (Kanmantoo Group).

The recent deposits within the area comprise unconsolidated river alluvium, boulders and soil. Deposits of alluvial soil and boulders have formed on the inside of meanders but their thickness

is probably not more than a few feet. The river has recently cut a new channel through deposits of this type on the inside of a meander in the north westerly part of the area mapped.

EARLY PALEOZOIC - KANMANTOO GROUP.

The rocks exposed in the area belong to the Kanmantoo Group -- a series of rocks forming an extensive belt through the eastern Mt. Lofty Ranges.

The Kanmantoo Group in this area is represented by various types of sandstones which are transitional one to another and grade in parts to an impure quartzite. The sandstones contain a high proportion of ferromagnesian minerals and in general can be classified as greywacke. In parts the rocks grade to a fine grained micaceous sandstone which on the weathered surface is sofe and friable.

The rocks throughout the area are generally fine grained and thinly bedded with occasional more massive and harder beds in which there is little sign of bedding. This latter type has impeded the flow of the Hindmarsh River causing it to drain in a south westerly direction until it has breached this harder band some 400 feet north of the proposed dam site and turned through roughly 90° to flow in a south easterly direction.

Current bedding on a small scale is visible at several points indicating that the strata is "right side up". Small scale slump structures have been observed in the bedding at isolated points but in general the rocks are evenly bedded.

GEOLOGICAL STRUCTURES.

Throughout the area mapped the bedding trens in a north easterly direction, the strike ranging from N 35° E to N 52° E magnetic and dips are consistently south easterly at angles ranging from 38° to 50°. Thus in the area of the proposed dam the strike of the beds lies at approximately 60° to the direction of the river, and the dip is downstream. The bedding planes in general do not represent a plane of parting.

JOINTING.

Jointing, which occurs in two major directions roughly at right angles to each other, is the cause of the blockly outcrops in the area mapped. The first of these

joint systems is running N. 30°-45° E. -- roughly parallel to the strike of the bedding, and dipping at 50°-70° N.W. with occasional steeper dips. It has been observed that this jointing follows changes in the strike of the bedding.

The second system of jointing is running E 20°-35° S and dipping either vertically or at steep angles to the north east or south west. A minor line of jointing was measured running S20° E and dipping steeply north easterly.

FAULTING:

There is no evidence of any faulting throughout the area mapped. The beds generally are undisturbed except for minor crumpling and a small drag fold observed at one point, pitching 5° S.S.W.

Quartz-felspar veins up to 6 inches thick traverse the bedding at several points. Where it was possible to measure, these veins appeared to be parallel to the joint system running E 20°-35° S, and at isolated points they follow the bedding for short distances.

PERMEABILITY.

The extent to which water under a high hydrostatic pressure will penetrate through the bedrock at the damsite is dependent upon the permeability of the rocks and the number of partings such as bedding planes, joints, faults, cleavage and other open fractures.

At the surface the permeability of the rocks of this area may vary considerably as some of the exposures are quite porous. However, below the zone of weathering the rocks should be dense and relatively impermeable.

As mentioned previously the bedding planes generally do not represent a potential plane of parting and very little water loss can be expected along the bedding. The incidence and size of partings in the rock mass will influence the water loss to a degree dependent upon the depth to which they persist. Jointing will be important in this connection as no faulting or cleavage were observed. The system of joints trending N 30°-45° E. will tend to form a natural barrier, while the jointing running E 20°-35° S. will assist the passage of the water to some extent.

The latter jointing is running almost parallel to the river channel at the site of the proposed dam. However, it is unlikely that this jointing will have much effect on water loss, as the width of openings on the surface will reduce rapidly with increasing depth. It is concluded that a small amount of leakage through the bedrock may occur but natural silting should reduce this.

FOUNDATION AREA.

The width across the normal river channel at the proposed dam is 25 feet and the width of the flood level is 130 feet. No outcrops were observed in this area but the superficial material should not extend to a depth of more than 10 feet. The rocks of the foundation area should have adequate bearing capacity for a high level narrow base dam of either straight gravity or arch structure. However, investigation by diamond drilling will have to be carried out to determine the physical condition of the foundation and abutments.

For a dam to impound 1,788 million gallons a wall 190 feet high at its centre would be required. On geological considerations alone this height of wall should be safely carried by the foundation rock.

ABUTMENTS:

Along the line of the proposed dam both abutments are mostly covered by a mantle of soil. However, solid rock should be found at relatively shallow depths and the abutments should have adequate bearing strength to carry a narrow base dam structure. Investigation by drilling will reveal the depth of soil cover and the depth to solid rock.

SUMMARY AND CONCLUSIONS:

Geological mapping has been carried out over an area of approximately 25 acres surrounding the proposed dam site "B" on the Hindmarsh River, 9 miles from Victor Harbour.

As a result of the investigation it is concluded that this site should be suitable for a high level narrow base dam (either gravity or arch section) and the risk of leakage at the damsite or upstream appears to be low.

The geological conditions at the damsite are simple; however, jointing may assist the passage of water across the line of the dam.

Due to the deep narrow valleys of the proposed reservoir the surface area of the water impounded will be small in proportion to its volume, hence evaporation losses should be relatively low.

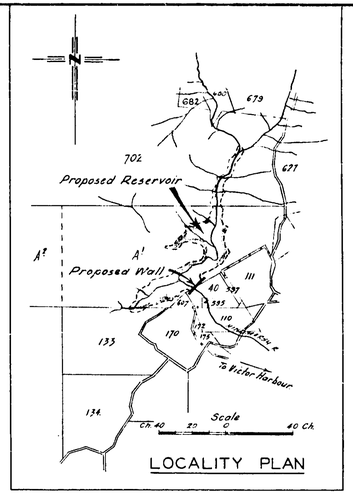
RECOMMENDATIONS FOR DRILLING:

It will be necessary to diamond drill a number of holes across the damsite, both in the abutments and foundation. These will provide more data on the rock type underlying the proposed dam as well as providing material for the necessary physical tests, and particularly should supply valuable information on the depth it would be necessary to excavate to reach sound rock in the largely soil covered slopes of the abutments.

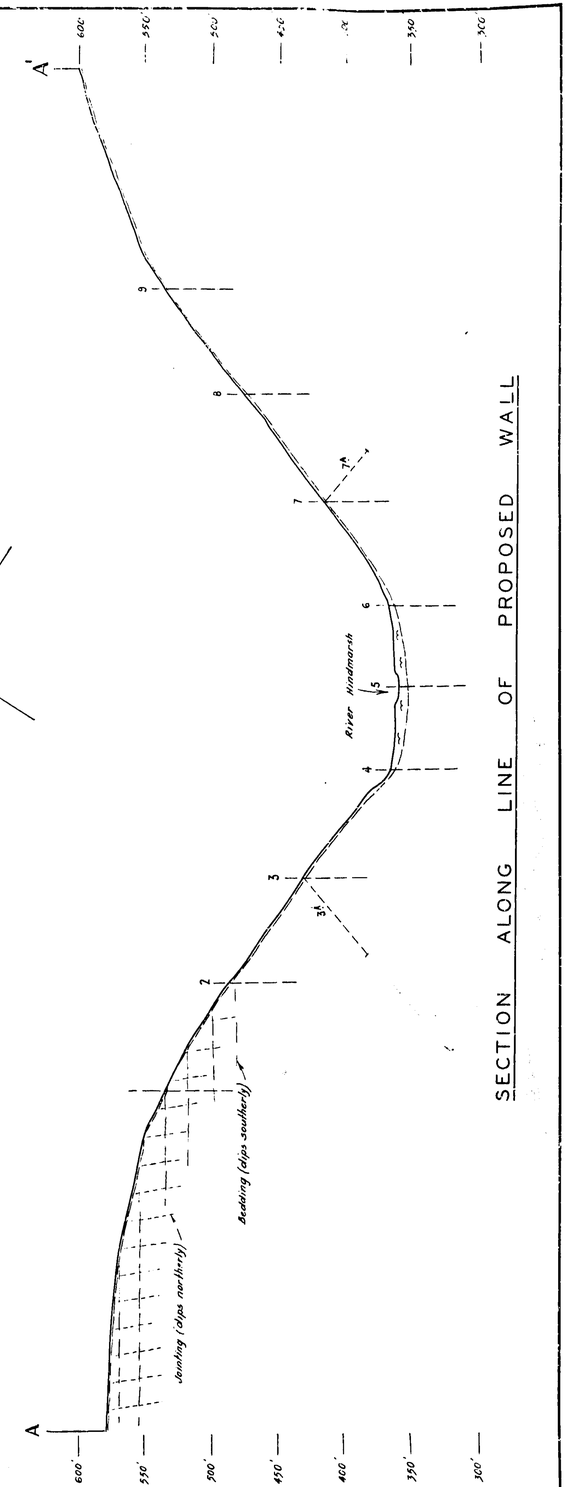
The suggested minimum number of bore holes required is twelve, nine of which are arranged along the line of the proposed dam as shown on the accompanying plan. The remaining three placed 100 feet upstream from the line of the proposed dam will provide additional data particularly if an arch dam is contemplated. The suggested drilling programme should then provide sufficient information for the type of dam structure contemplated at this site.

R.G. Shepherd

R.G. SHEPHERD.
ASSISTANT GEOLOGIST.
ENGINEERING GEOLOGY & MINERAL RESOURCES SECTION.



LOCALITY PLAN



SECTION ALONG LINE OF PROPOSED WALL

— LEGEND —

KANMANTOO SERIES
Greywacke, Quartzite & Micaceous Sandstone

Strike and Dip of Bedding

Strike and Dip of Jointing

Surface Contours (10 ft interval)

Diamond Drill Holes

To accompany report by R.G. Shepherd.

S. A. DEPT. OF MINES

HINDMARSH RIVER PROPOSED DAM SITE "B"
GEOLOGICAL PLAN & SECTION

Req. No.		Approved	Passed		Scale Horiz. 30ft to 1in.
D.M.				Drn.	54-227
Compiled from				Trd. M.B.L.	
		Director of Mines		Ckd.	Date 6-10-58. H.C.B.
Associated Drawing	No.	No.	Amendment	Exd. Date	