COMMONWEALTH OF AUSTRALIA

DEPARTMENT OF
NATIONAL DEVELOPMENT

BUREAU OF MINERAL
RESOURCES, GEOLOGY
AND GEOPHYSICS

Record 1972/18

GEOLOGY OF THE GOOGONG RESERVOIR, QUEANBEYAN RIVER, N.S.W.

by

G.B. Simpson

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CONTENTS

SUMMARY

The Googong reservoir is underlain by folded and sheared slate, sandstone, and limestone of the London Bridge Formation, and slate and dacite of the Colinton Volcanics of Silurian age.

The London Bridge Formation and Colinton Volcanics have been intruded by Siluro-Devonian granite. Along the eastern side of the reservoir area the Silurian rocks are faulted against Ordovician greywacke and slate at the Queanbeyan Fault. The Beltana Fault crosses the reservoir area sub-parallel to and west of the Queanbeyan Fault.

The reservoir area is considered to offer no leakage problems. No evidence of sulphide mineralization or of areas of slope instability was detected.

It is recommended that limestone beds in the north of the reservoir area should be mapped in greater detail as part of the design investigation. Studies of the amount and movement of sediment in the Queanbeyan River should be made to detect any possible reservoir silting problems which might occur.

The stability and erodability of steeply sloping areas near Bradley's Creek should be further studied.

Geology of the GOOGONG RESERVOIR

Queanbeyan River, NSW

REFERENCE

See Engineering Geology Table for rock units

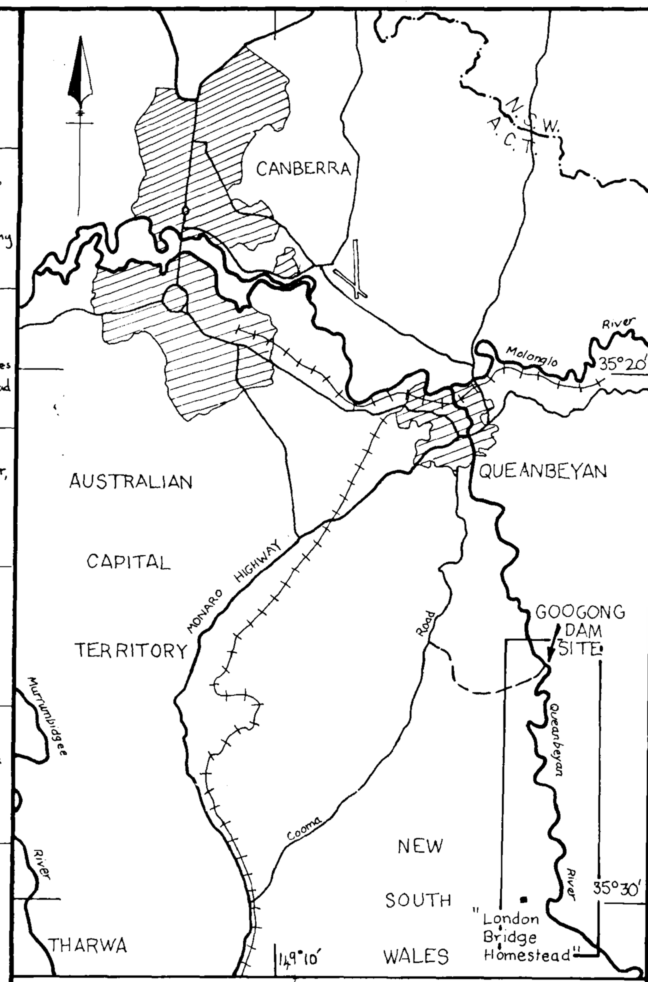
- Geological boundary, position approximate
- Geological boundary, inferred, concealed
- Fault, position approximate
- High angle reverse fault
- Dip and strike of bedding
- Shear zone
- Cleavage, vertical
- Dyke (dolerite)
- Geological section
- Dam wall (proposed)
- Contour, 50ft. interval
- Top storage level, 2185ft.
- Stream
- Building
- Track

Scale 1 : 12,500

0 1000 2000 3000 4000 Feet

0 250 500 750 1000 Metres

SYMBOLS USED ON GEOLOGICAL MAP AND SECTIONS	FORMATION	LITHOLOGY AND MINERALIZATION	PHYSIOGRAPHY	STRUCTURE	WEATHERING	PERMEABILITY	SLOPE STABILITY
m	ALLUVIUM AND COLLUVIUM (Quaternary)	Fluvial sand and gravel; and earth deposits	Braided, point bar and slip-off stream deposits of sand and gravel. Alluvial earth deposits occur in the graded lower reaches of tributary streams	———	Alluvium and colluvium contain weathered rock fragments and some organic material	High intergranular porosity and permeability in alluvial deposits. Water movement in colluvial earth deposits may be restricted by presence of clays	Form no marked slopes. May cause some discolouration of water when eroded by wave action and during rapid drawdown conditions, with minor local failures
+ + +	GOOGONG AND OTHER GRANITES (Siluro – Devonian)	Adamellite	Forms high ground in general, with greatest relief where the country rock is of limestone or slate. Good exposure in blocky outcrops with little or no tor development	Foliation and jointing associated with regional shear direction (210/90), and local weathering joints	Weathering slight in outcrops. Thin soil development. Weathering may be deeper in pockets, areas of intense jointing, shear-zones and areas protected from active erosion	Water movement restricted to joint systems, decreasing with depth due to the tightening of joints. Negligable intergranular porosity where fresh. Some water movement in weathered zones	Forms few major slopes above or below top water storage level. Erosion of slopes on north side of Bradley's Creek may lead to discoloaration of water near the intake tower
	COLINTON VOLCANICS (Middle or Upper Silurian)	Dacite with lenses of slate, limestone and sandstone. Minor amounts of disseminated pyrite	Forms high ground with prominent outcrop ridges in areas of shearing. Good exposure.	Commonly highly sheared parallel to the bedding strike direction (210°), particularly where interbedded with slates. Less sheared where dacite forms thick competent units	Weathering increases with increased shearing. Thin soil development. Deep weathering confined to major shear zones and faults. Rocks moderately to highly weathered in outcrops	Major permeability parallel to cleavage and decreasing with depth. Negligable intergranular permeability	Occurs in the north-west of the reservoir, where slopes are gentle and only minor slumps of material may be expected
	LONDON BRIDGE FORMATION (Middle or Upper Silurian)	Limestone and slate. Limestone is lenticular with either facies or structural control. Limestone, in the north of the reservoir, is silicified owing to granite intrusions. Some hematite mineralization	Forms rounded terrain, with slate giving depressions and limestone ridges. Good exposure on limestone, poor exposure on slate	Slate everywhere highly cleaved. The limestone is less cleaved, and bedding is commonly preserved with minor folding observed. General westerly bedding dip at high angles	Slate weathered to form thicker soils than limestone, with 4-8 feet of soil cover, whilst limestone carries thin soil cover. Limestone moderately to slightly weathered in outcrops	Negligible permeabilities in the slate. Limestone in north of reservoir is silicified, and water movement is restricted to joint and cleavage partings. In the south some solution features are present, but the limestone crops out above top storage level	Gradients low with stable slopes
		Sandstone with minor slate units (<20%). Sandstone silicified in places; with some hematite mineralization.	Forms rounded ridges with steep slopes on river bluffs in areas of dissection. Good exposure	Sandstone has acted more competently than slate, and is less intensely sheared, but bedding can only be observed in good vertical exposures. Bedding dip is in general westerly at high angles, striking 020°	Slightly weathered with development of thin soil	Low intergranular permeability due to silicification. Low permeability parallel to cleavage and joint planes, decreasing with depth. Low intergranular porosity due to poor sorting of sand grains	Steep slopes on river bluffs with thin soil cover. Minor movements of scree material may occur but not involving large volumes of rock
		Slate with minor sandstone (<20%) units.	Forms low ground with poor exposure, and commonly covered by well-developed soils	Strongly cleaved. No bedding preserved, but cleavage probably parallel to the bedding strike direction (020°). Probable near vertical westerly dip	More easily eroded than other rock types, with development of 4-8 feet of soil cover. Rocks moderately weathered in outcrops	Very low permeability	Occurs in low lying areas and problems of slope movement should not occur
		Alternating slate and sandstone units (each > 20%)	Forms higher ground into which the river has eroded a gorge. Outcrop ridges are prominent with good exposure	Slate units highly sheared with sandstone less sheared. Cleavage direction parallel to bedding strike. Bedding near vertical with probable high angle dip to the west (striking 020°)	Generally resistant to weathering with development of thin soils. Sandstone moderately weathered and slate moderately to highly weathered in outcrops	Low permeability in slate. Permeability in sandstone controlled by shearing and joint systems, decreasing with depth. Low intergranular permeability	Forms steep slopes in the south of the area, where only thin soil cover is present. Minor movements of scree material can be expected
	METASEDIMENTS (Upper? Ordovician)	Greywacke and slate	Forming the Queanbeyan Fault scarp and higher ground to the east. Good exposure in stream sections	Dips steeply to the east with isoclinal folds. Slates strongly cleaved, with greywacke units more competent, having little or no cleavage	Shallow weathering with thin soil cover. Steep slopes do not allow accumulation of weathered material. Rocks moderately to slightly weathered in outcrops.	Low intergranular permeability, water movement being restricted to fractures and joints	Movement of scree slope material on the fault scarp is expected but should involve only small volumes of rock and soil

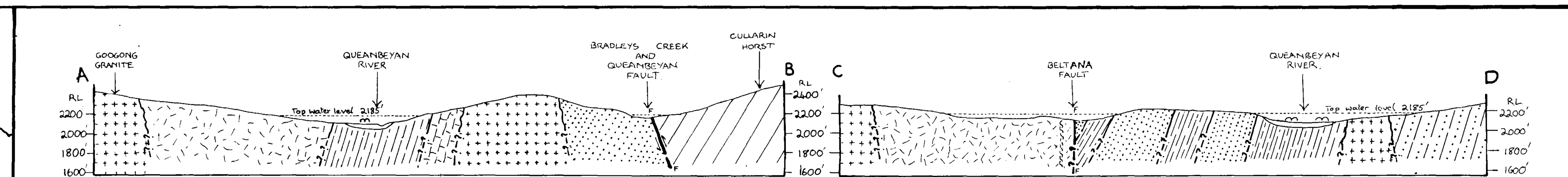


- Built up area
- Principal road
- Highway
- Railway
- Vehicle track
- Territorial boundary

LOCALITY MAP
GOOGONG RESERVOIR
QUEANBEYAN RIVER, N.S.W.

MILES 0 1 2 3 4 5 6

KILOMETRES 0 1 2 3 4 5 6 7 8 9



GEOLOGICAL SECTIONS AB and CD
H/V=1, 1 inch=1000 feet

General geology of the reservoir

The London Bridge Formation and the Colinton Volcanics, of Upper Silurian age, underlie most of the reservoir area. These formations have been intensely folded and sheared, and dip at high angles to the west. The cleavage, a major feature of the units, is generally parallel to the strike of the bedding, and vertical.

Accurate determination of the lithological succession and unit thicknesses is difficult owing to the possibility of isoclinal folding and strike faulting, which may be obscured by the strong cleavage.

Granite of Siluro-Devonian age has been intruded into the sediments and volcanics, and shows evidence of foliation and shear systems related to the regional structure.

The eastern side of the valley is defined by the Queanbeyan Fault, an high angle reverse fault, with a downthrow of at least 800 feet to the west bringing Ordovician metasediments of the Cullarin Horst into contact with the London Bridge Formation.

The Beltana Fault, bearing 170°, sub-parallel to the Queanbeyan Fault, occurs along the eastern margin of the reservoir. It causes an effective southerly displacement of the rocks on the western side of the fault.

Reservoir leakage

The clastic sediments, volcanics and granites in the reservoir have negligible intergranular porosity and water movement will mainly occur in joints and fractures.

Limestone of the London Bridge Formation crops out in two areas of the reservoir. In the north it will be covered by up to 150 feet of water. Here the limestone is silicified and is unlikely to show solution features which might provide leakage paths; however further investigations should be made. In the vicinity of London Bridge, and further south, the limestone crops out above and below top storage level. The limestone is not silicified and shows solution features but would not cause leakage from the reservoir.

Mineralization

No evidence of sulphide mineralization was seen, and only minor amounts of pyrite were recovered from drill holes at the dam site. Some hematite mineralization was seen in the limestones and sandstones.

Slope stability

Calculations indicate that waves in excess of 2 feet in height may be expected on the reservoir under storm conditions. Waves of this order may cause undercutting and erosion at water surface level. The undercutting and erosion may be increased where the waves move into confined areas of the reservoir such as at Bradley's Creek and in the area to the south of 5800S. Some slumping of slopewash and weathered rock material may occur as a result of the undercutting of steeper slopes in such areas.

Silting

A large proportion of the reservoir recharge will be supplied by flood water from the Queanbeyan River catchment area. The flood water may carry appreciable amounts of sediment, and silting problems may result.

Recommendations

1. Further investigation of the limestone in the north of the reservoir should be made by costeaning to gain information about leakage paths that could be provided by possible solution features.

2. Studies of the suspended and bed load of the river under flood conditions should be made to give an indication of the silting problems which might occur.

3. The stability of the Queanbeyan Fault scarp in the vicinity of Bradley's Creek should be further investigated; wave action at the base of the slope should be taken into consideration.

4. In view of the erodable nature of several of the rock and soil units occurring close to top water level, further mapping should be undertaken to determine areas which may require treatment; the exposure of slopes and the long fetches available in the storage should be taken into consideration.

5. The storage area narrows markedly south of 5800S. Silt, that may be deposited in the narrow area could become unstable under flood or rapid draw-down conditions.

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AMENDMENTS					
No.	DESCRIPTION	AUTHOR	DATE	CHECKED	DATE
A1	Minor amendments to text and fig.	GBS	3/2/72	GBS	4/2/72
A2	Minor amendments to text	GBS	24/2/72	GBS	24/2/72
A3					
A4					
A5					
A6					

SCALE 1 : 12,500

BASE MAP/SURVEY
Base Map – Snowy Mountains Authority
Grid – Department of the Interior (Stromlo)

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COMPILED AND CHECKED: [signature] 15/5/71 PROJECT GEOLOGIST
CHECKED AND APPROVED: [signature] 10/1/72 SENIOR GEOLOGIST

SUPERVISING GEOLOGIST

PLATE I

COMMONWEALTH OF AUSTRALIA
BUREAU OF MINERAL RESOURCES
CANBERRA, A.C.T.

TITLE: Geology of the GOOGONG RESERVOIR.

PROJECT: Googong Dam Site, Queanbeyan River N.S.W.

TO ACCOMPANY RECORD	DRAWN BY	DRAWING NUMBER
1972/18	G.B.S.	I 55/A16/850