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GEOLOGICAL REPORT ON SOGERI NO. 3 DAM SITE

UPPER LALOKI RIVER, CENTRAL DISTRICT, PAPUA.

by

H. L. DAVIES.

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Scale 20 feet = 1 inch.

SUMMARY.

The Commonwealth Department of Works proposes to construct a low dam above Rouna Falls to provide a small storage and intake for the pipeline and penstock which will feed a power station at the foot of the Falls.

Sogeri dam site No. 3 was investigated by plane-table outcrop mapping, by two diamond drill holes totalling 125 feet, and by water pressure testing of one of these drill holes.

The Astrolabe Agglomerate is exposed at the dam site where it consists of fresh horizontally-bedded volcanic agglomerate with minor tuff beds. Vertical joints strike diagonally across the river. Testing indicated moderate leakage along one of these joints and a shallow grout curtain is therefore recommended.

INTRODUCTION.

Sogeri dam site No. 3 is on the Laloki River, about half a mile upstream from Rouna Falls and 18 miles east of Port Moresby. Access is by foot-track from the Rouna-Sogeri Road.

The investigation of Sogeri dam site No. 3 is part of a programme being carried out by the Commonwealth Department of Works, to expand the Laloki Hydro-electric Scheme. A dam between 15 and 30 feet high would provide a small storage and intake for the pipeline and penstock to No. 2 Power Station, which is to be constructed at the foot of Rouna Falls.

Dam site No. 3 was one of two sites selected by Messrs. L. C. Noakes and D. E. Gardner in December, 1958 (Gardner and Noakes, 1959)

The writer surveyed the site with plane-table and telescopic alidade on the 18th November, 1959, and recommended the drilling of one hole on the right abutment. Drilling commenced on the 28th November and was completed on 9th December with the drilling of a short hole on the left abutment.

REGIONAL GEOLOGY.

The Astrolabe Agglomerate consists of volcanic agglomerate with minor tuff, rare lava flows, and a basal conglomerate consisting chiefly of volcanic material. The formation is generally flat-lying and blankets an area up to 20 miles long by 6 miles wide.

At Rouna Falls the base of the formation is probably between 800 and 900 feet above sea level and the conglomerate-agglomerate interface is at approximately 1060 feet. The highest peaks of agglomerate in the vicinity of Rouna reach an altitude of approximately 2,000 feet.

For a more detailed account of the regional geology see Davies (1959).

DAM SITE GEOLOGY.

Rock types exposed at the dam site are volcanic agglomerate and tuff, which are in places veined by calcite and an unidentified soft, dark green mineral.

The left abutment is dominated by a rock promontory about

fifty feet wide and rising from RL 1425 to RL 1460. Downstream there is no outcrop but upstream rock is generally at or near surface, especially above the 1440 contour.

The river bed is approximately 70% outcrop and is transgressed by a system of joints mostly striking at 20 degrees (magnetic). River bed outcrop is at RL 1422 approximately.

The right abutment is marked by (i) a steep rock face rising from the riverbed outcrop to RL 1440. (ii) a bench at RL 1440 on which overburden has accumulated to a depth of 12 to 16 feet, and (iii) a second steep rock face rising from RL 1460 to about RL 1490. Immediately upstream from the proposed axis of the dam outcrop is obscured by boulders and soil of unknown depth.

Joints in the river bed outcrop strike at approximately 20 degrees (magnetic). Most are open at some point along their length but close at shallow depth or disappear into solid rock when traced along strike. Two joints marked "a" and "b" in Plate 2, are represented by a narrow belt of no outcrop in the river bed. These would project laterally into areas in which there are no outcrops on the right and left banks.

ENGINEERING GEOLOGY.

River level at the proposed dam site is RL 1422, and maximum top water level is at RL 1452, assuming that the wall will not be more than 30 feet high.

Drill hole R 16 (104') was designed (i) to intersect joints "a" and "b" and test them for leakage, and (ii) to measure the depth of overburden on the proposed axis of the dam. A zone of broken, iron-stained, and moderately weathered agglomerate was intersected at 41'; this is probably the continuation of joint "a". The zone was tested at 20 p.s.i. water pressure and leakage was insignificant. A zone of moderately weathered agglomerate split by clay-coated fractures sub-parallel to the core was intersected between 77' and 80'; this is probably the continuation of joint "b" Leakage in this section was at the rate of 11.2 g.p.m. at 45 p.s.i.

The left abutment is solid rock to RL 1460 on the line of the proposed axis. A shallow vertical hole, R 17, was drilled 50 feet upstream from the proposed axis and showed that solid rock is 11 feet below surface at this point. The hole was not water pressure tested.

Summary of water pressure testing results.

D.D.H. R 16.

39' 6" - 44'	0.28 g.p.m.	at	20 p.s.i.	(u)
54' - 64' 6"	0.3 g.p.m.	at	30 p.s.i.	(u)
64' - 84' 3"	11.2 g.p.m.	at	45 p.s.i.	(c)
84' -104' 3"	0.71 g.p.m.	at	60 p.s.i.	(c)

"c" indicates that corrections for (i) column of water in pipes and (ii) turbulence and friction within pipes, have been applied; "u" indicates that no corrections were applied as leakage was insignificant.

Tension joints under the river have not been tested, but the leakage shown in drill hole R 16, at 40 feet below the surface, suggests that moderate leakage might be expected at places along the axis of this dam and that a shallow grout curtain would be worthwhile.

REFERENCES.

DAVIES H.L., 1959 - Geological report on Sirinumu dam site No. 2 B.M.R. Records (in preparation)

GARDNER, D.E., and NOAKES, L.C., 1959 - Geological reconnaissance of Laloki River hydro-electric projects - Port Moresby. B.M.R. Records 1959/21.

APPENDIX.

Geological Logs of Diamond Drill Holes.

The cores were logged by H. L. Davies. The following abbreviations are used in the logs:-

agglom.	-	agglomerate
bldr.	-	boulder
cpts.	-	components
ctg.	-	coating
fllg.	-	filling
fracs.	-	fractures
irreg.	-	irregular
med.	-	medium grained
mod.	-	moderate
sec.	-	secondary
wtd.	-	weathered
wtrg.	-	weathering

GEOLOGICAL LOG OF DIAMOND DRILLING.

LOCATION: SOGERI 3 Dam site - right abutment.

OBJECTIVE: Joints & depth of overburden.

DIRECTION: 074°M. ANGLE: 35°. CORE SIZE: NMLC.

HOLE NO.: R 16. CORE BARREL TYPE: SSIT

Date	Depth	Amount Core	Recovery
28.11.59	25' 6"	nil	
30.11.59	34' 3"	8' 9"	100%
1.12.59	64' 6"	30' 3"	"
2.12.59	84' 3"	19' 9"	"
3.12.59	104' 3"	20'	"

END OF HOLE

From	To	Core Description
0	25' 6"	Soil and scree; not cored.
25' 6"	28' 10"	Med agglom; wtrg increases to moderate at 28' 1" solid.
28' 10"	29' 7"	Med agglom; mod wtd; 40 degree frac at 28' 10", irreg frac at 29' 3", both with clay fllg, also irreg frac at 29' 7".
29' 7"	41' 2"	Med agglom; fresh and slightly wtd; few fracs.
41' 2"	41' 10"	Zone of broken agglomerate bounded by two 30 degree fracs; fragment surfaces are iron-stained with some clay; mod wtd.
41' 10"	48' 6"	Med agglom with one 17" bldr; fresh and slightly wtd; few fracs.
48' 6"		50 degree frac with hard sec ctg; adjacent rock mod wtd.
48' 6"	49' 4"	Med agglom; mod wtd; solid.
49' 4"	54' 4"	Med agglom; fresh; few fracs.
54' 4"	55' 6"	Med agglom; wtrg increased to moderate; solid.
55' 6"	56' 0"	Med agglom; mod wtd; split lengthwise into 1" - 4" frags; clay ctg on faces.
56' 0"	61' 2"	Med agglom; mod wtd; core broken around 40 degree frac at 57' 6", iron-stained fracs at 60' 6" and 60' 10", a few other irreg fracs.
61' 2"	73' 0"	Med agglom with a few 6" cpts, some matrix lost at 72' 3"; fresh; solid few fracs.
73' 0"	73' 1"	Irreg frac filled with very fine grey clay or ash which shows some lamination. Some laminae are lustrous with green tint at margins. In adjacent cavities there is some calcite and finely granular soft green powder.
73' 1"	77' 3"	Med agglom; fresh; solid.

From	To	Core Description
77' 3"	78' 4"	Med agglom; slightly and mod wtd; broken into 2 and 4" frags by irreg sub-parallel fracs with yellow clay ctg. Frac at 78'4" has green sec ctg and there is green filling in adjacent vesicles.
78" 4"	79' 6"	Med agglom; mod wtd; two rough fracs 45 and 60 deg with thin yellow clay ctg and some blue powdery ctg (calcite?)
79' 6"	80' 11"	Med agglom; mod wtd; split by irreg fracs sub-parallel to core, yellow clay ctg to 80'4", blue-green powdery ctg 80' 4" to 80' 11".
80' 11"	-104' 3"	Fine and med agglom with one 12" bldr, some matrix removed at 93' 3"; fresh and slightly wtd; small broken zones at 81' 3" and 84' with green film on faces, a few other fracs most of which show fresh faces, mostly solid.

END OF HOLE

GEOLOGICAL LOG OF DIAMOND DRILLING.

LOCATION: SOGERI 3 dam Site - left abutment.

OBJECTIVE: Depth of overburden. HOLE NO.: R 17.

ANGLE: Vertical. CORE SIZE: NMLC. CORE BARREL TYPE: SSIT

Date	Depth	Amount Core	Recovery
9.12.59	19' 8"	19' 8"	100%

From	To	Core Description
0	3"	Cement.
0' 3"	7' 2"	Med agglom; slightly and mod wtd; 2", 3", and 12" - 18" lengths. Probably a boulder weathering out in situ.
7' 2"	9' 9"	Clay showing rock fabric, broken into small frags.
9' 9"	11' 0"	Med agglom; mod wtd; broken at 10' 4".
11' 0"	14' 2"	Med agglom, slightly wtd; irreg fracs at 12' 2" with green and black ctg.
14' 2"	16' 2"	Tuff, coarse and fine, well cemented, apparently permeated by soft green minerals which gives it green tint and fills any small fissures; 6" lengths.
16' 2"	17' 8"	Med agglom with high proportion of tuff; mod wtd
17' 8"	18' 9"	Med agglom, mod wtd.
18' 9"	19' 3"	Coarse tuff with greenish tint; fresh; solid.
19' 3"	19' 8"	Med agglom; fresh.

END OF HOLE.

LOCALITY MAP — SIRINUMU AREA
TRACED FROM AERIAL PHOTOGRAPHS
UBERI RUNS 3A. AND 4.

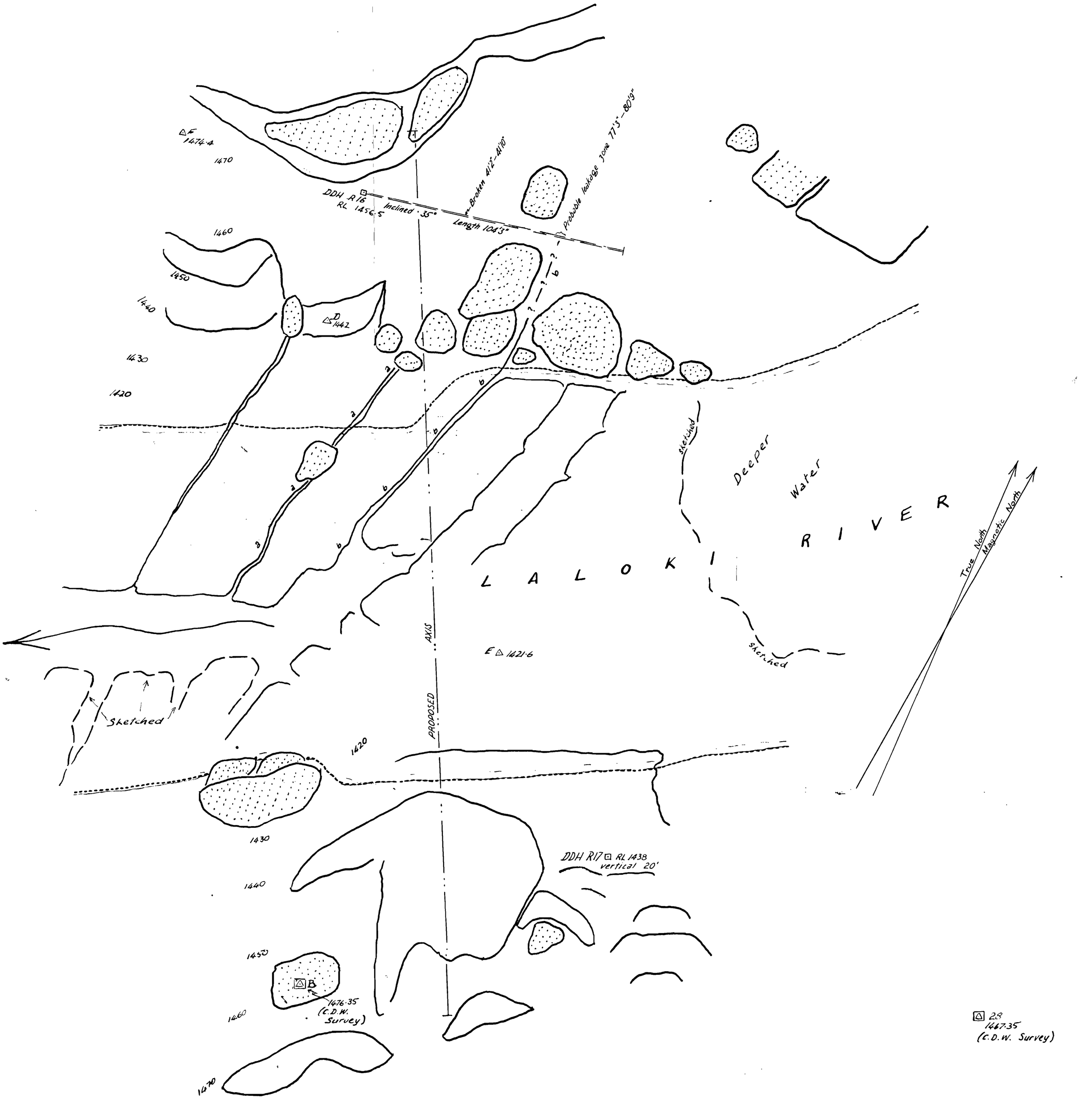
1 0 1 2 3 MILES

P.S. 1
LALOKI RIVER
Proposed P.S. 2
Rouna Falls
SOGERI No. 3 DAMSITE
Low-level Bridge
Sogeri School
Port Moresby — 19 miles
Iarowari School
LALOKI RIVER
Eilogo Plantation
House
Eilogo Creek
House (Mr. J. Lukin)
Approximate True North
N°6 DAMSITE
Sirinumu Gorge
N°2 DAMSITE
Iewadubo Village

SCALE:- 1" = 16 miles approx.

9°S.
Laloki River
Rouna Falls
Sirinumu
PORT MORESBY
Musgrave — Kemp Welch River
CORAL SEA
RIGO
10°S
147°E
148°E

Plate 1



REFERENCE

Outcrop, showing benches and steep faces

Boulder

D.D.H. Diamond drill hole.

The only rock types are volcanic agglomerate and tuff, horizontally bedded.

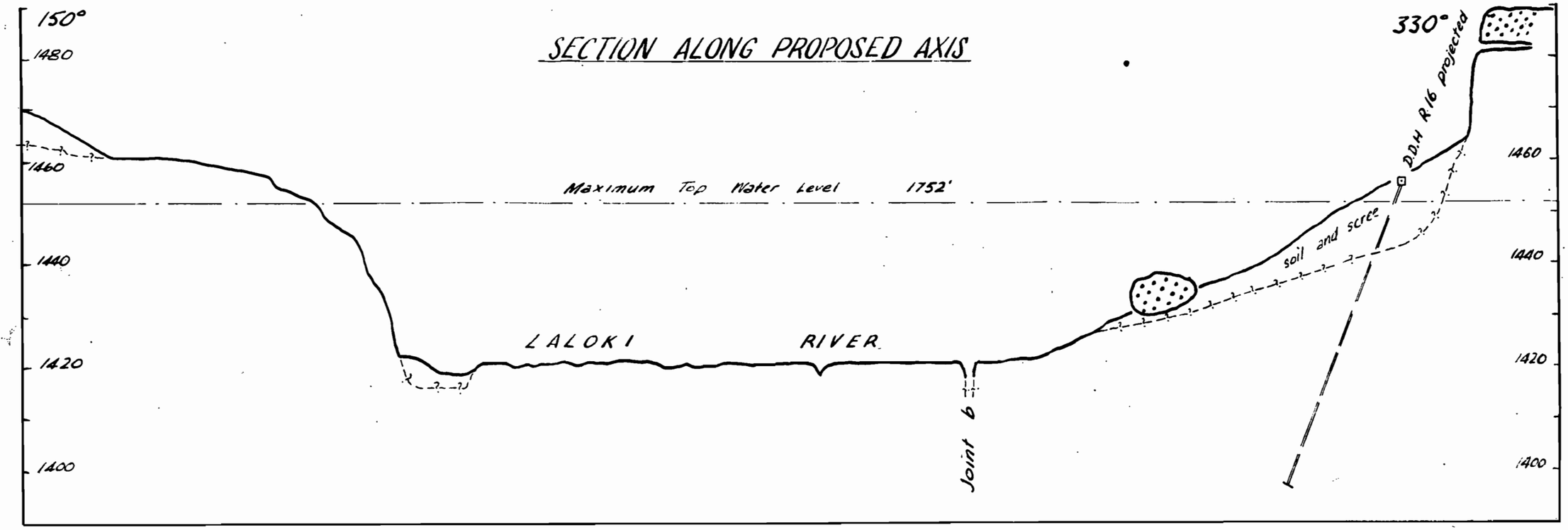
SOGERI No 3 DAM SITE

SCALE 20 FEET = 1 INCH

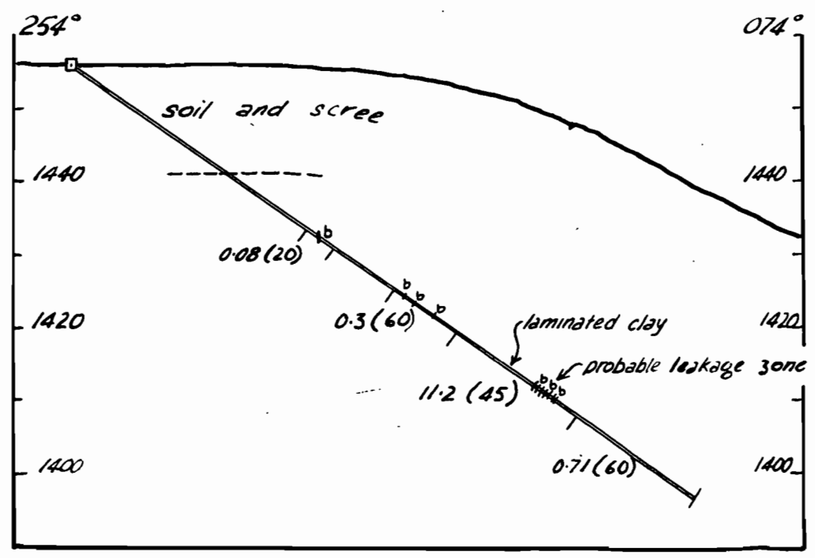
Plane-table survey by H.L. Davies, with base-line from C.D.W. survey.

PLATE 2

SECTION ALONG PROPOSED AXIS



SECTION ALONG D.D.H. R 16



REFERENCE

Boulder

----- Bedrock surface

--?--?- " "
position approximate

b Broken

0·3(60) Water pressure testing result, ie a leakage of 0·3 g.p.m. at 60 p.s.i.

The only rock types are volcanic agglomerate and tuff, horizontally bedded.

SECTIONS
SOGERI No 3 DAM SITE

SCALE 20' = 1"

PLATE 3