COMMONWEALTH OF AUSTRALIA

DEPARTMENT OF NATIONAL DEVELOPMENT

BUREAU OF MINERAL RESOURCES, GEOLOGY AND GEOPHYSICS.

RECORDS
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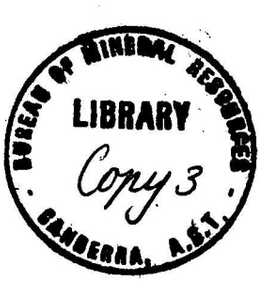
by

D.F. DYSON.



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Preliminary Report on the Resistivity Survey of the Lower West Kiewa Diversion Tunnel

by D.F. Dyson.

The Lower West Kiewa Diversion Tunnel is part of the State Electricity Commission's No. 4 Power Development Scheme. It will feed water from the West Kiewa river into the No. 4 Power Station.

The tunnel was commenced at the north-eastern or outlet portal end. During the early tunnelling operations unpredicted shear and fault zones caused major delays and it was considered that a resistivity survey would provide data from which zones of difficult tunnelling could be predicted. The Commission therefore applied to the Bureau for a resistivity survey to be made along approximately 8,000 feet of the tunnel line, from Creek 6 to the vicinity of the inlet portal on the West Kiewa river; this included 3,600 feet above the tunnel already constructed and 4,400 feet above ground yet to be tunnelled.

The field work was carried out between 13th and 28th March, and on 7th and 8th May, 1956.

At the time of the completion of the survey, the tunnel had been driven from the outlet portal for a distance of about 7,400 feet through gneiss which exhibits jointing and/or weathering in many places and which is intersected by numerous diorite dykes, shear zones and faults. The inlet portal on the West Kiewa river is in granodiorite.

The constant electrode spacing method, with Wenner electrode configuration, was used. Readings were made at 50 ft. intervals. The electrode spacings used were:-

(1) 100 ft., using an Earth Testing Megger.

(2) 200 ft., using a Geophysical Earth Testing Megger.

The resistivity profiles are shown on the accompanying drawing No. M987. The tunnel chainages shown are distances measured from the outlet portal.

Between Creeks 6 and 6A, outcropping rock caused difficulties in obtaining electrode contacts with the ground surface. The high contact resistances may have caused erroneous readings, and it is doubtful whether any reliability can be placed upon correlation of surface readings and sub-surface structure over this part of the traverse.

Information so far supplied to the Bureau by the Commission in regard to the rocks and structural features encountered during tunnelling operations is not sufficient to permit correlation of the resistivity results with the structure at tunnel level. Along the resistivity traverse, the depth below surface to the tunnel level ranges from 50 to 1200 feet. Consequently it will be essential to have detailed information on the strikes and dips of the geological features exposed in the tunnel before any correlation between these features and the resistivity profiles can be established. Estimates of dip could be attempted from correlation of the 100 ft. and 200 ft. electrode spacing profiles, but it is understood that there is evidence of landslips along the tunnel line and it is considered that such estimates of dip from the resistivity profiles would not be reliable in places where there was considerable thickness of landslip material.

The interpretation given below for the uncompleted part of the tunnel is tentative and will be subject to revision when more detailed information regarding the rocks and their structures as so far exposed by the tunnelling operations, is supplied to the Bureau.

In the interpretation of the resistivity profiles, it is considered that steep gradients on the profiles probably indicate faults (or dykes along faults) or shear zones which may give rise to water inflow at tunnel level. These features occur approximately at the following distances in feet from the outlet portal:

7,550,	7,900,	8,650,	9,400,	10,100,
10,300,	10,500	10,800	and	11,700.

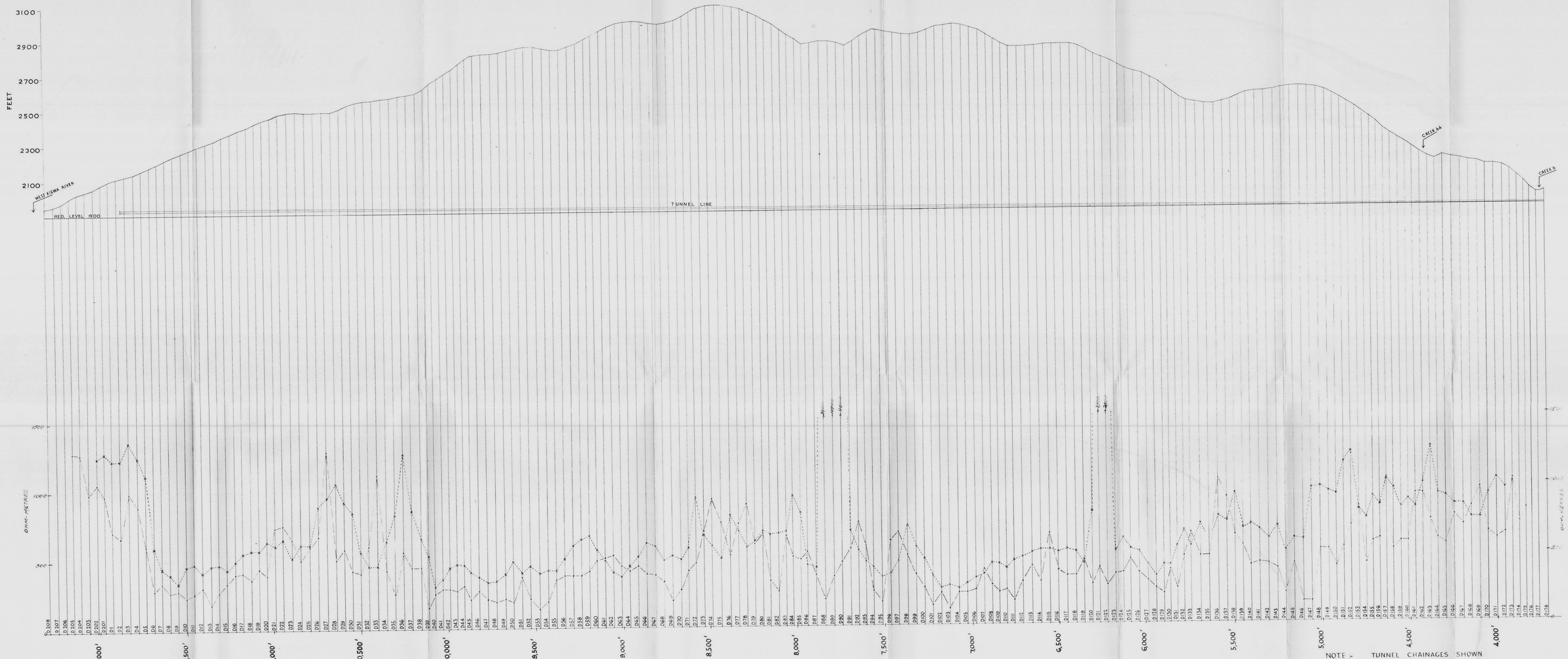
Relatively low values of resistivity, which may indicate jointed, broken or weathered rock, occur between 9,400 ft. and 9,500 ft., 9,650 ft. and 9,750 ft. and between 11,300 ft. and 11,700 ft.

The sharp change in values at 11,650 ft. is such as may be expected at the boundary of two rock types of different resistivity and can be attributed to the contact between the granodiorite and the gneiss.

The corresponding figures at the tunnel level will depend upon the dip and strike of the structures causing the changes in resistivity values at the surface, and also upon the distance between the surface and the tunnel levels.

The above interpretation should be used only as a general guide for the tunnelling operations. It is recommended that the Commission should supply the Bureau with all available geological information and evidence from the tunnel completed and additional information as the tunnel is driven further. The Bureau will then be in a better position to interpret its results, and will advise on any necessary revision of the preliminary interpretation.

STATE ELECTRICITY COMMISSION OF VICTORIA



NOTE - TUNNEL CHAINAGES SHOWN

FIELD PLOT ONLY.

Refer to Drg No K 5920 for Location

RESISTIVITY SURVEY
CONSTANT ELECTRODE SPACING -
WENNER CONFIGURATION
200' SPACING
100' SPACING

KIEWA SCHEME
LOWER WEST KIEWA DIVERSION
GEOPHYSICAL TRAVERSE - LONG^{L} SECTION

SCALE IN FEET
200 0 200 400 600
VERTICAL SCALES AS SHOWN

M 987

G 232-5