COMMONWEALTH OF AUSTRALIA.

DEPARTMENT OF SUPPLY AND SHIPPING.

BUREAU OF MINERAL RESOURCES GEOLOGY AND GEOPHYSICS.

REPORT No. 1949/25

GEOLOGICAL SERIES No. 10

DAM SITES ON THE LALOKI RIVER, PAPUA

by

M. A. CONDON, B.Sc.
Senior Geologist.

Melbourne

28th April, 1949

DAM SITES ON THE LALOKI RIVER, PAPUA.

REPORT NO. 1949/25 M.A. Condon.

GEOLOGICAL SERIES NO.10

INTRODUCTION:

For the projected development of the hydro-electric power resources of the Laloki River, Papua, a diversion weir will be required. Two sites have been selected, by the officers of the Department of Works and Housing, downstream from Rouna Falls and another site, upstream from the falls, which would be suitable for a large scale power development. An inspection of these sites was made in order to indicate any geological difficulties which may be expected.

SITUATION:

The Laloki River flows from the Astrolabe Range north-westerly to Redscar Bay. The Rouna Falls is some 20 miles by road easterly from Port Moresby. The proposed hydro-electric scheme is shown on the accompanying plan.

PHYSIOGRAPHY:

The valley of the Laloki River in this area is divided by the Rouna Falls. Upstream from the waterfall the valley is mature with undulating topography, low gradients in the streams, and alluvial flats. Downstream the valley is a very young gorge with steep sides, high gradient in the river bed, boulder-strewn bed, tributary hanging valleys. Landslips are developed on a large scale.

GEOLOGY:

The outcropping rocks of the area comprise the Astrolabe agglomerate which consists of beds up to 30 feet thick of volcanic agglomerate. The agglomerate is made up of angular fragments of basalt, andesite and scoria with a few pieces of quartz and mica schist. Individual fragments range in size from about 10 feet diameter down to dust. The fragments are cemented together, possibly by volcanic glass, into a solid rock. The bedding is near horizontal and the formation is vertically jointed into columns of some 50 feet diameter. The bedding planes are not generally planes of weakness although there are some beds of tuff which are very weak as compared with the solid agglomerate. The combination of the deep gorge, the vertical jointing and the weak horizontal beds of tuff has resulted in many large landslips, which are nearly continuous along either side of the valley from about one mile downstream of the falls.

Dam Site at Point No.3: (See Figure 1).

The valley profile at this point shows a very steep V-shaped valley at the bottom with a pronounced shoulder about 100 feet above river bed. From this shoulder the surface steepens upwards to the near-vertical rock faces nwar the top of the gorge.

There is no undisturbed rock outcropping in this area below the rock faces. The shoulders mentioned above are the relatively flat-topped surfaces of large landslips into which the river has cut the steep V-shaped valley. The bed of the river is strewn with boulders of agglomerate up to 50 feet in diameter. These boulders move in time of high floods - as shown by the movement of the central bridge pier (near point No.1) which was built on one of these very large blocks.

Dam Site at Point No.5: (See photo No.2)

This site is very similar in all respects to the site at Point 3, but farther upstream. The Main landslip is from the left side of the valley. The road is cut into this slip. In the road cuttings the landslip material is seen to be very badly pulverized in places although other parts are very little changed except for tilting.

Cont'd....2/

Dam Site at Point No.7:

The valley profile at the site above Rouna Falls is mature. Solid agglomerate outcrops up either side of the valley and across the river bed. The mature valley upstream probably would provide a large storage if this were required.

Geology in relation to proposed structures.

The two lower sites (at points 3 and 5) are similar geologically. With the low dam which is planned foundations should not cause concern although if any future scheme involves high dams the absence of sound rock at these sites - particularly in the abutments - would present problems of design and construction.

There are a few places along the valley which have not been effected by slipping although no place was seen where sound rock occurs on either side of the valley bottom. The mass permeability of these large landslips is unknown but is likely to be high in places.

Any reservoir built in the valley below the falls will receive a large amount of sediment so that the effective life of a small reservoir may be very short indeed. If the dam is not high enough to reduce flood velocities through the pond below 6 feet per second boulders may be carried through and do damage to the dam.

The very steep gorge section between point 5 and the falls is unstable and large slips are likely to occur. Such a slip would cause the filling of a dam at either of the downstream sites with sediment, and may cause structure damage to a dam at point 5.

The site above the falls has everything to recommend it - solid rock outcropping right across the valley, an open valley of low gradient upstream, a relatively small siltation rate. A high dam may produce seepage problems (through the vertical joints of the agglomerate) but these could be met by grouting. This site is so good that it should be reserved for a future maximum power development but, if required for immediate small-scale development, a small diversion weir could be constructed closer to the falls.

CONCLUSION:

The construction and maintenance of a dam immediately downstream of the Rouna Falls involves many problems most of which would not occur in a similar dam above the Falls. These problems include the absence of solid foundation and the possible high permeability of the abutments (due to the presence of large landslips) the large amount of sediment and the large size of some of the individual boulders which are moved by high floods.

PHOTO I LALOKI VALLEY ABOVE ROUNA FALLS (LEFT)
SHOWING MATURITY OF VALLEY.

PHOTO 2   LALOKI VALLEY LOOKING DOWNSTREAM FROM NEAR ROUNA FALLS.

SHOWS (1) Steep slip faces

(2) Landslips

(3) Boulder-strewn bed

(4) Hombrom Bluff

Fig. 1.

TERRITORY OF PAPUA - NEW GUINEA

LALOKI HYDRO-ELECTRIC SCHEME

LOCATION PLAN