ASSESSMENT OF ENGINEERING GEOLOGICAL CONDITIONS OF MORAGOLLA HYDROPOWER PROJECT, SRI LANKA

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Moragolla hydropower project is a run-off the river hydropower scheme with 35 m high roller-compacted concrete (RCC) dam, 2.9 km long head race tunnel and a power house with expected capacity of 26.5 MW. A feasibility study was conducted in 2009/2010 to obtain subsurface geological information of dam site, tunnel trace and power house. Assessment of the possible complications and optimize the results of the feasibility study was required. Hence, an assessment of engineering geological conditions and an account of expected complications are discussed during the present study.

This study focusses on assessing engineering geological condition in terms of stability of dam foundation, water tightness of dam foundation, kinematic stability of excavation slopes, subsurface geological condition of both proposed and finalized tunnel traces, stability of finalized tunnel and subsurface geological condition of the foundation of power house.

Geological cross section was prepared along the dam axis. Lugeon values were plotted on a cross section along dam axis and values were contoured to create zones of similar permeability. Kinematic stability of dam abutments was analyzed using DIPANALYST using major discontinuity sets. Intake and outfall of both proposed and the finalized tunnel traces were assessed using the longitudinal sections prepared using borehole data. Cross sections were prepared perpendicular to the finalized tunnel trace. Longitudinal section along finalized tunnel trace was prepared. Finalized tunnel trace was sub dived in to three tunnel sections based on the trend of the tunnel. UNWEDGE 5.0 was utilized to determine potential unstable wedges in each tunnel section.

Geological cross section shows an inconstant bed rock in the left bank. Dam foundation is mostly impermeable except few slightly permeable rock masses in the left bank and in the upper right bank. Rock slopes on both left and right banks are kinematically stable. Thick overburden was observed in both tunnel intakes. Overburden thickness of proposed tunnel outfall is 27 m. Hard rock was encountered at 6 m in finalized tunnel outfall. Kinematic analysis results eight possible wedges in finalized tunnel. Hard rock level in power house is 11 m.

Large excavation may be required in the left bank. Also excavation boundaries may intercept with the industrial zone. Hence, it is recommended to shift the dam axis 50m downstream and conduct detailed geotechnical investigation. Both tunnel intakes are not geologically feasible for tunneling. Therefore it is recommended to shift the tunnel intake downstream of the dam site. Outfall area of the finalized tunnel is geologically feasible. However it recommended to conduct geological investigation along the penstock path. Site for surge shaft in the proposed tunnel trace is engineering geologically suitable than the surge shaft site in the finalized tunnel trace. Inter-banded quartzite layers can be intercepted between 1+200 km and 2+000 km of finalized tunnel. Wedge analyses of indicate all three tunnel sections are structurally stable apart from few possible wedge formations on the roof. Deep excavation may be required for the foundation of the power house. Slope stability problems and ground water seepage problems may occur in power house site.