

The best estimate of β value for the project area is 0.84 as shown by the analysis of micro seismic events. The design earthquake for the project is consistent with an $M_s = 7.0$ earthquake, the epicenter of which is located within 5 km from the project site and at a depth of 15 km. The maximum credible earthquake is 8.3 Richter Scale. The foundation of the tunnel is on the bed rock and most of the alignment is covered with the fair rock mass. The surge tank and inlet portal of the tunnel has exposed rock which is competent and are favourably dipping against slope face direction. In general, the stability condition is good and some of the wedges formed by joints are critical. The powerhouse and tailrace area lie in the Naudanda Quartzite, is situated at the low land depressed valley.

Construction Material

A reconnaissance survey for construction material was conducted in the vicinity of the intake, powerhouse sites as well as in the Kaligandaki River near Maldhunga. Previously, the investigation was focused on locate and estimation of quality of sand and other possible construction material around the construction site.

Disposal Area

The excavated materials from the tunnel can be disposed on the right bank of the Modi Khola just in front of the proposed Adit-1 and Adit-2 on the left side of the Bhupi Sherchan Marga. The proposed disposal area at Adit-1 is presently used as the wet cultivated land and situated about 10 m above from the Modi Khola riverbed whereas the proposed disposal area at Adit-2 is on the riverbed.

Project Optimization

This optimization study is carried out to determine the optimum size of the project to obtain the best financial indicators. According to the feasibility study guidelines of DoED, the optimum project size is that which has maximum IRR and B/C ratio. Therefore, similar approach has been adopted here to obtain the optimum plant capacity of the project. Different alternatives at 19.5 MW, 20 MW and 20.5 MW have been considered for this purpose. Comparing these alternatives, the option with an installed capacity of 20 MW corresponding to 40 % probability of exceedence of flow is found optimum with IRR of 16.08%.

Project Description

The project comprises design discharge of 28.8 m³/s and net head of 83.43m. The main structures of the project are weir, undersluice, intake, gravel trap, approach canal, settling basin, forebay, headrace tunnel, surge shaft, penstock, powerhouse and tailrace. An Ogee shaped weir located at about 120 m downstream from the confluence of Pati and Modi Khola diverts stream flow through side intake to the gravel trap and then to settling basins through approach canal. The weir is 3.87 m high from the river bed and has overall length of 35m. Two number of undersluice of 6 m width each and four numbers of orifice type side intakes with opening of 4.7 m by 2.2 m each is provided in the right bank of the river. Two 15 m long, 9 m wide and 5 m deep hopper shaped gravel traps are provided immediately after the intake to settle and flush out the particles larger than 2mm. Two approach canals of about 153 m each are provided after the gravel traps to carry water to the settling basin. They are 3.6 m wide and 2.97 m

deep. Two hopper type surface settling basins having dimension of 113 m x 16 m x 7.95 m are provided to trap at least 90% of sediment above 0.2 mm at 150C. The outlet transition zone of Settling basin functions as a headpond. The headpond has dimensions of 7 m x 32.4 m x 10.20 m. A power culvert of 5 m length and 4.05 m x 4.05 m size begins from the forebay and joins inverted D shaped headrace tunnel of same size and 4,021 m length. In order to address the water hammer effect, a vertical non-spilling type surge shaft is provided at the end of headrace tunnel. It is 57.50 m high with internal diameter of 10 m. From the surge shaft, a 454 m long steel penstock pipe with 3.5 m internal diameter runs to the powerhouse located in the right bank of Modi Khola. Two turbines are installed in the powerhouse to generate rated output of 20 MW. Rectangular tailrace channel of 3.25 m x 3.25 m are provided to discharge water from powerhouse to Modi Khola. The power generated will be evacuated to the existing substation at NEA Modi power station through 132 kV transmission line.