

CHAPTER - 2

PHYSICAL FEATURES

2.1 Topography

a) Damanganga river upto Bhugad dam site

The catchment area of Damanganga basin upto Bhugad dam site is 729 sq km. The length of river upto Bhugad dam site is 55 km. Dawan and Shrimant are the principal tributaries joining Damanganga upto the proposed dam site. The river Damanganga forms boundary between Gujarat and Maharashtra near Bhugad dam site which is located near village Bhugad in the Peint taluka of Nasik district of Maharashtra State on left bank of river and near Modusi village of Kaprada taluka of Valsad district of Gujarat State on its right bank. At Bhugad dam site, the Damanganga river flows through a well defined channel with a change in direction from North-East to South-South West. The reservoir area lies in Dharampur taluka of Valsad district of Gujarat State and in Peint taluka of Nasik district of Maharashtra State. The Bhugad reservoir shall spread in an area of 1903 ha at FRL 163.87 m. The elongated reservoir shall extend along Damanganga river with fetch length of 14 km, a narrow arm of reservoir also extends along Bila Nala upto Bhadri and along Rasani river upto village Fanaspada. The deepest bed level of the river Damanganga at proposed Bhugad dam site is 99.645 m. The proposed Bhugad dam site is flanked by steep slope (40°) at the right bank rising from RL 102 m to RL 245 m and forming a prominent rock scarp between RL 220 m and RL 245 m. On the left bank the river is characterised by a narrow river terrace (RL 106 m to 110 m) with a microscarp (23 m) exposing cross stratified sandy and bouldary river fill. Further beyond the terrace, the left bank is characterised by a wide spread area of highly guilled undulating and hummocky topography with hummocks rising to maximum height of RL 132 m. The left abutment rises at moderate slopes (20°) to level of RL 190 m.

b) Vagh river upto Khargihill dam site

The proposed Khargihill dam across Vagh river shall be located near village Behadpada in Mokhada taluka of Thane district of Maharashtra State. The catchment area of Vagh river upto Khargihill dam site is assessed to be 710 sq km. The length of river upto proposed Khargihill dam site is 44 km. The Val, the Rayte, the Dhamni, the Domihira and the Lendi are principal tributaries of river Vagh. The Vagh river at Khargihill dam site flows in northerly direction through a well defined channel and its deepest bed level is 83.30 m. The reservoir area lies in Peint taluka of Nasik district and Jawhar & Mokhada taluka of Thane district of Maharashtra State. The Khargihill reservoir shall spread in an area of 1558 ha at FRL 154.52 m, which shall entirely lie in Maharashtra. The area is flanked on the right bank by steep rock-cut slopes attaining a maximum level of 185 m with a prominent 35 m vertical scarp at the crown. On the left bank beyond the bouldary zone on channel bed lies as 258 m wide section of alluvial fill characterized by terrace between RL 91 m and RL 96m and undulatory topography. The left abutment rises at a slope of 30° and terminates into plateau with a scarp between RL 147 m and RL 174m. Further 1.5 km towards south west of dam site the plateau comes down to a level of RL 137m forming a prominent saddle north of village Vavar.

(c) Pinjal dam

The proposed Pinjal dam shall be located across Pinjal river near village Khidse in Jawhar taluka of Thane district of Maharashtra State. The area around the proposed dam site is bounded by high hills of the western ghats rising to an elevation of 243 m. The Pinjal river originates at an elevation of 1245 m above MSL It has a meandering course in the

south-west upto its confluence with the Vaitarna river about one km north-west of Alman village in Thane district.

(d) Bhugad-Khargihill tunnel

The intake portal of the tunnel is located at 1.8 km upstream of Bhugad dam axis on left bank at RL 118.19 m near village Bapanvahir and the outlet portal is located at RL 102.78 m near village Nangarbari at on the right bank of Val river upstream of the confluence of Vagh and Val rivers. The length of Bhugad-Khargihill tunnel will be 16.85 km.

The Bhugad-Khargihill tunnel is proposed to be aligned across Bapinvahir plateau, chain residual hills at Garmal and Chaura. The proposed link tunnel from Bhugad to Khargihill shall lie in the terrain consisting of basaltic lava flows. The topography along the tunnel route is undulatory with deep cut, V shaped rivulets and rounded hill tops and most of area is covered with dense forest. The hill slopes are covered by a thin veneer of soil and rolled basaltic boulders. The lower most level along the tunnel route is met in Ranapada rivulet at RD 2.400 km of link tunnel with 149.00 m RL and highest level at the top of Chorra hill at RD 13.650 km of link tunnel with RL 420.00 m.

e) Khargihill-Pinjal link tunnel

The Khargihill and Pinjal reservoir are proposed to be connected by a tunnel of 5.25m-diameter diameter tunnel. The intake portal of the tunnel is located at 12 Km upstream of Khargihill dam site on left bank at RL 104.25 m near village Bejpada and the outlet portal is located at RL 86.78 m near village Ene at Ene nala. The length of Khargihill-Pinjal tunnel is 25.70 km.

The tunnel alignment will pass through hilly region with surface contour averaging more than R.L. 400 m. The Khargihill-Pinjal tunnel has been aligned across extensive high level Jawhar plateau attaining a maximum level of R.L. 425 m at RD 14.5 km near village Hatichapada. In this alignment towards west the plateau descends with terraces to sea coast and towards east it is incised by Domihira & Jawhar rivers.

2.2 Physiography:

The Damanganga river originates from Triambak hill ranges and traverses Gujarat plains. Physiographically, the basin is a part of the Western Ghats region in Maharashtra State and is mainly covered by Deccan traps. The proposed project area is characterised by low level plateaus, prominent among them are Peint plateau (<550 m) and Bapinvahir-Harsul plateaus (370 m). Geomorphically the area has been classified as EA3, a region of low level plateaus (300m-500m).

Proposed Bhugad dam site shall be encountered by steeply rising (at 40° angle) abutment formed by exposed Pahoehoe lava flows (RL 103 m to RL 250 m). A narrow belt of fill terrace followed by an undulating terrain (RL 106 m to 110 m) flanks the river on the left bank. The site has the advantage of shorter length of dam axis (845 m), shallow foundation in central river and on right bank, less amount of retaining wall on left side, suitable conditions available to house spillway on the central river bed, with proper location for stilling basin and for flood routing.

The Khargihill dam area can be divided into six sectors physiographically & geomorphically.

- i) Steep right abutment (RD 728 m to 845 m)
- ii) River channel (RD 632 m to 728 m)
- iii) Left bank terrace segment (RD 529 m to 632 m)
- iv) Undulating terrain with deep gulling and entrenched weathering (RD 110 m to 529 m)
- v) The moderately sloping left abutment (RD 0.00 m to 110 m)

The Khargihill dam area can be divided into six sectors physiographically & geomorphically.

- i) Left abutment terminating into plateau at RL 170 m (RD 0 to RD 87 m).
- ii) Zone of Palaeo river fill (RD 87 m to 315m).
- iii) Narrow belt of river terrace (RD 315 m to 345 m)
- iv) Active river channel (RD 345 m to 460 m)
- v) Right abutment with steep rock-cut slope (45°) (RD 450 m to RD 690 m)
- vi) High level plateau with deep Nala on right bank (beyond RD 690 m)

The tunnel alignment shall pass through basin area which can be described as rugged and hilly. Major part of this region is covered by thick forest and basaltic flows referred as Deccan traps. These flows are interrupted by a large number of dykes of varying thickness.

The Pinjal dam site area is also encountered by nine lava flows of Deccan basalt, varying in thickness from 7 m to 25 m.

2.3 Geology

The project area of Damanganga-Pinjal link lies west of Triambak in northern part of Western Ghats characterised by highly dissected terrain with flat summits, mural slopes, serrated ridges and deeply entrenched valleys. This area exposes thick pile of Deccan lava flows consisting of compound Pahoehoe and simple flows which are grouped as Salher and Ratangarh formations (Ghodbole S M. Et al - 1996). Satellite imagery analysis indicate dykes crisscrossing one another and for rosette (prominent one at Khand Talav – which depicts zones of maximum tectonic disturbances. The project is located South of Tapi tectonic unit between Ghod (in South) and Upper Godavari (in the North) lineaments lying east of the conjectured west coast fault.

The Bhugad reservoir area is covered with and surrounded thickly forest by 200 m to 300 m high steep (45° to 70°) hills on both sides of Damanganga river and its tributaries. The entire reservoir lies in the Deccan volcanics. The rock assemblage exposed has been classified as Salher formation, which comprises of group of Pahoehoe flows successions. No major fault or shear zone was noticed in the area. Drilling test in this site encountered with massive basalt and amygdular basalt type rocks.

The Khargihill reservoir area is made of Pahoehoe and flows of Deccan volcanics belonging to lower part of Salher Formation. The reservoir is surrounded by steep hills. The rocks are hard massive and devoid of any fault or shear zones. The joints are mostly right and as such pose no problem towards reservoir leakage. The rocks encountered are massive basalt and amygdular basalt.

The Bhugad-Khargihill tunnel alignment traversing Bapinvahir plateau & chain residual hills at Garmal and Chaura has ground levels varying from RL 370 m to RL 145 m and with thickness of the burden ranging from 20 m to 145 m. The basal compound Pahoehoe flow traversed by dykes would be forming the tunnelling media. The flows are

reported to grade at 1: 140 towards S - W direction and accordingly the tunnel would be intercepting several units of massive and any modular character.

The Khargihill-Pinjal tunnel alignment has a tunnel grade around RL 120 m and is overlain by horizontally disposed basaltic flows reaching upto height around 400 m. The main tunnel would encounter unit of basal compound Pahoehoe flow of the Salher formation, which are anticipated to be good tunnelling media.

The area around the proposed Pinjal dam across the Pinjal river near Khidse village is covered with Deccan basalt and flows consisting of dense amygdaloidal basalt with tuff breccia and pink slightly tuffaceous amygdaloidal basalt are encountered down to RL 11 m.

2.4 Basin characteristics

The entire Damanganga and Vaitarna basins lie in the western ghat region. These are bounded on the west by the Arabian sea and on the east by the Sahayadri hill ranges. The climate of the basins is characterised by a hot summer and is in general dry except during the south-west monsoon season from June to September. The rainfall, temperature, relative humidity and wind speed in the Damanganga basin are described below:

2.4.1. Rainfall

The basin receives most of rainfall from south-west monsoon during June to September. Almost 97% of annual rainfall occurs during monsoon season. The average annual rainfall in the basin is 2247 mm. Maximum and minimum rainfalls are 3052 mm and 1734 mm respectively.

2.4.2 Temperature

There are two meteorological observation stations located at Valsad and Dahanu in the vicinity of the basin. The monthly mean temperature varies from 10° to 30° C during January and 40° to 42° C during April.

2.4.3 Relative humidity

The relative humidity is high during monsoon and low during March. The relative humidity varies from 32% during March to 89% during August.

2.4.4 Wind speed

The mean daily wind speed is maximum 13.5 km/hr during June and minimum 4.3 km/hr during December.