

प्रारूप-33

परियोजना का नाम:-नीरगढ कक्ष संख्या-04 में स्थित 0.101 हे0 वन भूमि लीज संख्या-56 के 30 वर्षों

के लिये नवीनीकरण प्रस्ताव।

भू-वैज्ञानिक की आख्या

भू-वैज्ञानिक की आख्या संलग्न है।

ह0/-  
(भू-वैज्ञानिक)  
नाम व मुहर सहित

NOTE ON GEOLOGICAL FEASIBILITY  
OF  
LEASE NO.56,

FOR  
YOGIRAJ RAMANAND TRUST,

AT  
NEERGARH, KHAND 4,  
TEHSIL- NARENDRA NAGAR  
DISTT.-TEHRI GARHWAL,  
UTTARAKHAND



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**KAIN GEOTECH**

Geological, Geotechnical, Mining  
& Environmental Consulting

## INTRODUCTION

KainGeotech, Dehradun was assigned by the client to conduct a preliminary geological examination at the lease no 56, Area of 0.101 ha., of Yogiraj Ramanand Trust, Neergarh, Khand 4, Tehsil – Narendra Nagar, Distt.- Tehri Garhwal Uttarakhand (figure 1). Rishikesh is located in the foothills of the Himalayas in northern India, it is known as the "*Gateway to the Garhwal Himalayas*" and "*Yoga Capital of the World*". The site was visited by Mr. K Sati (Geologist) on 6<sup>th</sup> August 2019, in the presence of Mahant Shri Ajay Nathwani. The proposed location of the land and other details were provided by the owner.



Figure 1: Satellite Imagery of the area.

The exercise was aimed to ascertain the suitability of the land and renewal of lease area. In order to generate site specific geological input data, traverses were taken all around the lease site. The proposed land is located on the right bank of Ganga river at toe of the southern facing hill slope composed of overburden and rocky terrain on the lease hold area no. 56, having the area of 0.101 ha., of Yogiraj Ramanand Trust, Neergarh, Khand 4, Tehsil – Narendra Nagar, Distt.- Tehri Garhwal Uttarakhand at latitude 30°08'06.7" N and longitude 78° 20'31.1" E and falls in the Survey of India Toposheet No. 53J at RL 350.5m. General slope of the area is towards South-western direction. The area is situated on the manmade

terrace on right bank of Ganga River. The slope around the area varies between  $10^{\circ}$  &  $35^{\circ}$  and general slope is  $15^{\circ}$  to  $20^{\circ}$  nearby proposed land. Small seasonal nala /depression is crossing the lease area in eastern direction. In the lease area some trees are tilted towards slope direction. During the rainy season, there is a lot of water passes through in this nala, which may also bring slopewash material with it and deposits it in the lease area. It is envisioned to develop the space in the lease no. 56, falling below on Haridwar-Rishikesh-Badrinath Road (NH-58), about 2.5 Km from Tapovan, Rishikesh. The present report pertains to the investigation of intended for renewal the lease area.

## GEOLOGY

The region forms a part of the main Krol Belt. It comprises of Janusar-Biaini-Krol-Tal sequence folded in the form of major syncline (Known as Mussoorie Syncline) and thrust over the Siwaliks in the south along the Krol Thrust. The thrust dips at the  $28^{\circ}$  to  $35^{\circ}$  due N  $40^{\circ}$ E to east. In this region Krol Thrust coincides with the Main Boundary Fault. The Chandpur Slates represented by highly jointed phyllites and quartzites is thrust over the Siwaliks in the region, while all other formations including the Nagthat series, Blaini Series and Krol Series have normal conformable contacts. The Jaunsar-Biaini-Krol-Tal succession is folded as a major syncline, with its NW-SE trending fold axis. This syncline is thrust over the Siwaliks and at places even on Doon gravels. The limbs of the Mussoorie Syncline are also folded into local anticline and syncline with their axes often oblique to the main axis of the major fold. Such minor folds are prominent in the Krol D and E. The incompetent nature of the intercalated shales in the limestones has given rise to open or tight folding of varied nature. Few of these folds show overturning. In the north and west regions of this syncline the fold axes of minor folds are parallel to the axis of main syncline, whereas in the southern limb these are either oblique or normal. Considerable faulting within the Krol Belt is also noted along with folding.

Locally, around the lease area the rocks are primarily composed of limestone, dolomites/dolostone and shales, belong to Krol- D formation. Krol sequence characterizes a thick sequence of dolomites, limestone and shale that were laid down in quite, shallow water shelf-sea. The Krol Formation has been divided into a

lower and upper limestone member intervened by a red shale member. Auden, 1934 classified the succession into Krol-A, Krol-B, Krol-C, Krol-D and Krol-E members. The upper three members of Auden correspond to the Kauriyala Formation and represent the upper limestone member, whereas Krol-A and Krol-B, also known as the Mahi Formation and Jarashi Formation, correspond to the limestone and red shale member respectively.

The Kauriyala Formation, comprises of grey limestone with interbedded shale, shattered light grey dolomite with occasional pocket of gypsum as fracture filling and purple and grey shale and limestone.

The Jarashi Formation, red shale member, comprises of red and green shale with few inter-beds of shattered dull grey dolomite with gypsum as pocked and fracture filling.

The Mahi Formation, or lower Krol limestone member, consists of light grey limestone, marl and interbedded grey to greenish grey calcareous shale showing current and graded bedding structures.

The rocks present in the site are weathered limestone boulders and calc tuffa belonging to Krol Formation locally known as Mahi Formation. A considerable part of the slope is covered in coarse grain silty sandy matrix with limestone boulder surrounding the slope of the lease, which is composed of angular and sub angular boulders with calcareous soil (matrix), greyish and brownish soil at lease area and near the foot track. Most of the overburden is colluvial in nature and has resulted due to weathering and erosion. Maximum thickness of this overburden appears to be around 2-3m.

Above the foot track, slope is steep ( $30^{\circ}$ - $35^{\circ}$ ) & beyond 50m the slope is very steep ( $40^{\circ}$ - $55^{\circ}$ ). Below the lease near Ganga River right bank big boulders of limestone, quartzite etc are present and RBM deposits are few amount. In essence, the slope forming materials are highly to completely weathered cemented limestone. Thickness of the weathered zone along the foot track is seen about 2-3m. Towards valley side there is no presence of outcrop/ insitu. Brownish & grey limestone/calc tuffa is present in the upper part of the slope. In upper slope of the lease dense forest (Mixed) is present. Some trees and other plants are seen in and around the lease area.

Upper slope of the lease area below the foot track the mixed boulder of limestone & dolomite limestone or Calc tuffa are present. Seasonal washout material goes by the seasonal stream. Along the nala the size of the boulder from 0.5-1.5m is noticed.

#### SEISMICITY:

The site falls in the seismic zone IV as per the Indian Standard Code (Seismic Map of India and Uttarakhand), therefore, the area is always prone to earthquakes. As per the seismic load of zone IV extra safety factor should be considered.

#### REMARKS & RECOMMENDATIONS:

The area in question is geologically favourable provided the following measures are adopted.

- (i) The scattered patches of rock exposed site consist of grey to blackish grey weathered limestone/dolomitic limestone belonging to Krol Group. The rocks are generally highly to completely weathered.
- (ii) The general topography & geological condition appear acceptable for renewal of lease on the basis of surface geological information.
- (iii) Mahi Formation is expected to be encountered at the lease area. The bedding generally dips  $45^{\circ}$  to  $75^{\circ}$  towards  $N40^{\circ}$  to  $N90^{\circ}$ . Fluctuations in bedding dips are generally related to folding in the strata.
- (iv) Weathering effects are more pronounced along the joints/bedding causing unequal weathering at depth. As a result there might be pockets of highly weathered rocks within the fairly fresh rock below the overburden.
- (v) The surface drainage should be properly planned to drain away rain water from building particularly from upper slope through lined drains/pipes and release at safe place at downhill along a gully. It will prevent the erosion of hill surface and decrease the probability of failures. The used water is safely disposed to avoid unfavorable ground percolation.
- (vi) Inclined retaining wall at the back and toe of the riverside should be constructed with provisions of weep holes at specific distance. The retaining walls of side slopes and downhill slope of lease area are indispensable. The

weep-holes passage should be cleared to discharge subsurface water and maintain stability of foundation of lease area.

- (vii) As the area falls in high seismic zone, it is advised to take adequate seismic coefficient to protect the slope.

