GEOLOGICAL AND GEOTECHNICAL INVESTIGATIONS TO ASSESS SUBSURFACE CONDITIONS OF SOUTH EASTERN UNIVERSITY PREMISES AT OLUVIL – A CASE STUDY

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Introduction

The general objective of a geological and geotechnical investigation is to assess the suitability of a site for the proposed purpose. As such, it involves exploring the ground conditions at and below the surface (Anon, 1976). It is a prerequisite for the successful and economic design of engineering structures and earthworks. Accordingly, a site investigation also should attempt to fore seen and provide against difficulties that may arise during construction because of ground and/or other local conditions (Balasooriya, 2008, Bell, 1980). The complexity of a site investigation depends upon the nature of the ground conditions and the type of engineering structure (Bell, 1983, Cooray 1983, Eddleston, et.al., 1950).

The purpose of this investigation is to assess the surface and subsurface geology and to describe stability condition of soil overburden and the bed rock in designing suitable foundations for proposed buildings and infrastructure in the University Premises of South Eastern of Sri Lanka, and to recommend appropriate precautionary measures to mitigate anticipated environmental impacts due to unfavourable geological conditions.

Methodology

In this study, following geotechnical investigation methodologies and corresponding numbers were used to analyse the subsurface conditions.

- Five numbers (05) of Boreholes terminated 30.0m or upon reaching of the bedrock (Fig. 1).
- Three numbers (03) of Boreholes drilled through the bedrock for further 05m, after encounter of bedrock.
- Twenty numbers (20) test pits representing the areas of proposed structures and access paths.
- Installation of Piezometers in all eight boreholes to measure the ground water level.
- Conduction of Standard Penetration Tests (SPT) and the Dynamic Cone Penetration testing at test pit locations.

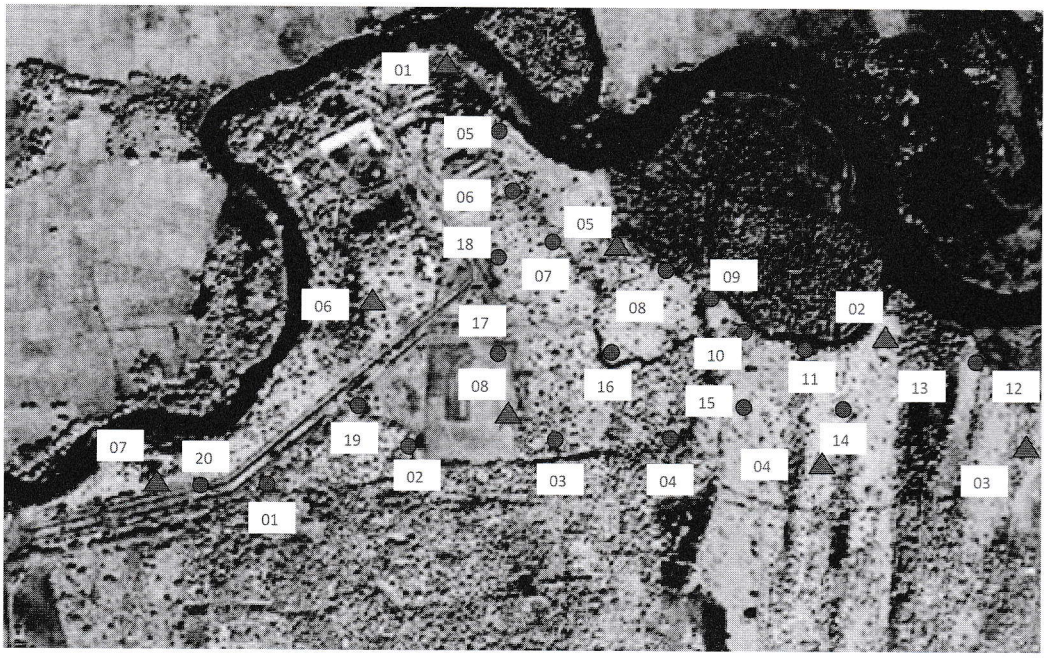


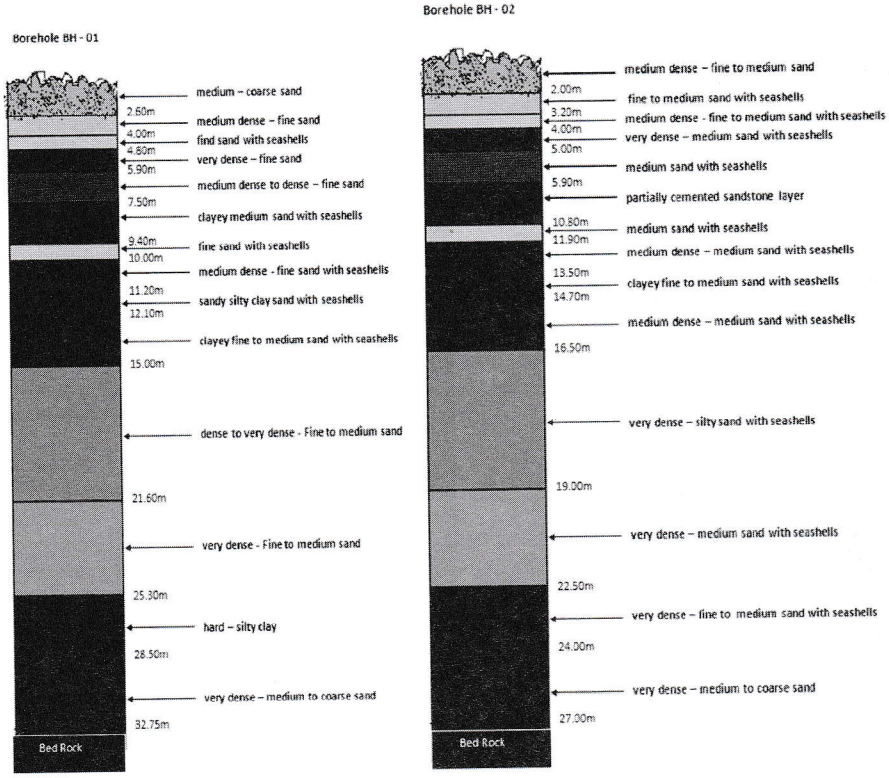
Fig. 1: Location map of the Boreholes - ▲ and Test pits- ⬮

Discussion and Conclusion

Interpretation of Borehole results: Eight boreholes (BH-01 to BH-08) represent the particular locations and all of these boreholes were drilled down the level of bedrock. The descriptions of materials in each borehole location were described and stratigraphy of sediments, soils and rocks were correlated. Basic geologic analyses were carried out to obtain the overall geologic information. This area occupied high-grade lithologically and isotopically distinct, proterozoic metamorphic rocks, which belongs to Vijayan Complex of Sri Lanka. The bed rock is granitic gneiss and depth to the bed rock is 32.50m at BH-01. The lowest depth to bed rock is 27.00m at BH-02 (Fig. 2). The groundwater level is 0.80m at the meandering of the river (BH-01) which contains a thick sand aquifer and the ground water level is following the morphology. The average groundwater level is 180-1.90m in the study area. Characteristics of soil profiles and ground water levels were recoded for each test pit.

The following recommendations were proposed:

- to decide on safe foundations based on the field tests and engineering properties of soils in borehole locations.
- to assess the baring capacity profiles for the particular locations based on the borehole data.
- for sub grade improvements in access paths based on the CBR values at test pit locations.


Borehole BH - 01
medium – coarse sand
2.60m
medium dense – fine sand
4.00m
find sand with seashells
4.80m
very dense – fine sand
5.90m
medium dense to dense – fine sand
7.50m
clayey medium sand with seashells
9.40m
fine sand with seashells
10.00m
medium dense - fine sand with seashells
11.20m
sandy silty clay sand with seashells
12.10m
clayey fine to medium sand with seashells
15.00m
dense to very dense - Fine to medium sand
21.60m
very dense - Fine to medium sand
25.30m
hard – silty clay
28.50m
very dense – medium to coarse sand
32.75m
Bed Rock
Borehole BH - 02
medium dense – fine to medium sand
2.00m
fine to medium sand with seashells
3.20m
medium dense - fine to medium sand with seashells
4.00m
very dense – medium sand with seashells
5.00m
medium sand with seashells
5.90m
partially cemented sandstone layer
10.80m
medium sand with seashells
11.90m
medium dense – medium sand with seashells
13.50m
clayey fine to medium sand with seashells
14.70m
medium dense – medium sand with seashells
16.50m
very dense – silty sand with seashells
19.00m
very dense – medium sand with seashells
22.50m
very dense – fine to medium sand with seashells
24.00m
very dense – medium to coarse sand
27.00m
Bed Rock

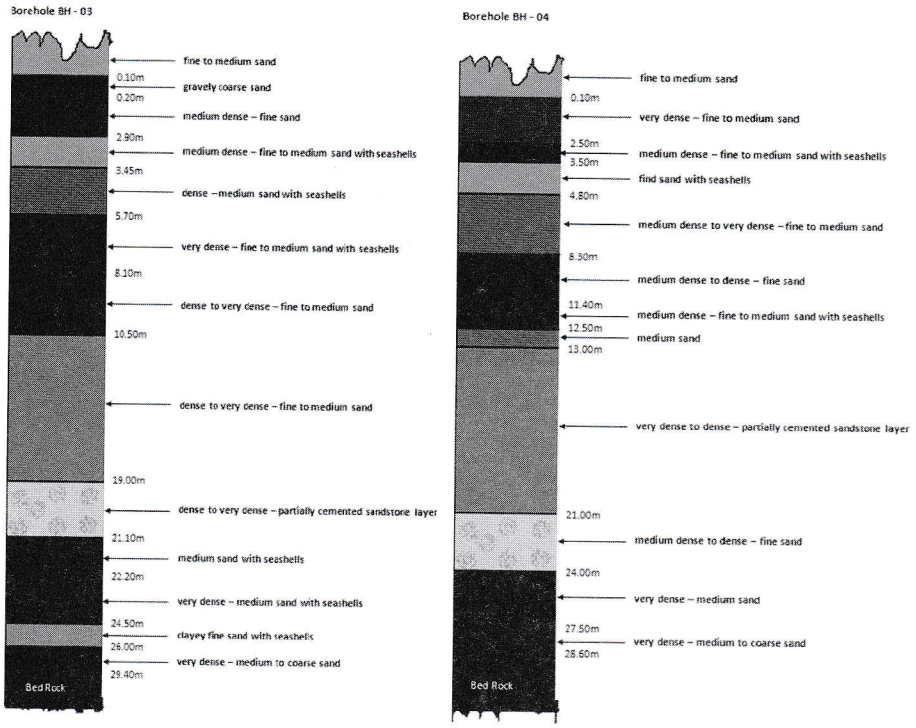


Figure 2: Startigarphy of the area

On an appraisal of the analysis of geotechnical parameters and data collected in the field and conclusion made based on the field observations, the proposed area can be recommended for the above project only with the applications of location specific guidelines and precautionary measures for the prevention of future geological and geotechnical failures.

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