

SOIL INVESTIGATION REPORT

This report is only reference

Table of Contents

1. Introduction	2
2. Scope of work	2
3. Objectives & Scope of work	3
4. Laboratory Testing Procedures	3
5. Schedule of Investigation	4
6. Water Table	4
7. Sub -Soil Profile	5
8. Bearing Capacity	5
9. Recommendations & Conclusions	7
Appendix	
I. Laboratory Test Results	9
II. Borehole Location Plan	10
III. Grain Size Distribution Curves	11
IV. Borelogs	12



Report on the Geotechnical Investigation for the Proposed Residential Building at Hormavu, Bangalore

1. Introduction

Mr. Deepak Joseph Savial P proposed the above project. Geotechnical Investigation was assigned to M/s. Suguna Engineering Consultancy, Bangalore on 3rd April'2023 in view to furnish the detailed technical information of the nature of subsoil strata for detailed analysis and foundation designs.

The report covers the details of tests carried out at the site and recommendation of net SBC based on the field and laboratory tests carried out on the soil samples collected.

2.0 Scope of Work

The geotechnical investigation at the proposed location has been carried out by Hand Auguring 2 bore holes namely BH-1 to BH-2.

Scope of geotechnical investigation includes the following:

- a) To identify the soil/rock stratification up to a maximum depth of 6m or refusal strata.
- b) To conduct SPT test in boreholes generally at 1.5m and collection of representative samples.
- c) To collect the rock core samples from the boreholes
- d) To identify the water table and seepage water if any
- e) To conduct the following laboratory test on representative samples:
 - Grain Size Analysis
 - Natural Moisture Content

Compilation of field and laboratory test data and submission of report.

2. Objectives and Scope of Work

2.1 Objectives

The primary objectives of the Geotechnical Investigation are:

- Determination of the nature of the deposits of soil
- Determination of the depth and thickness of the various soil strata and their extent in the horizontal direction
- The location of ground water and fluctuations in GWT
- Obtaining soil and rock samples from the various strata
- Determination of the engineering properties of the soil and rock strata that affect the performance of the structure, and
- Determination of the in-situ properties by performing field tests
- To recommend the type and depth of foundation
- To recommend improvements to the weak soil strata, if any.

2.2 Scope of work

The scope of work includes the following field (In-situ) and laboratory tests.

2.2.1 Field (In-situ) Investigations

- i) Boring 150mm dia boreholes in all kinds of soils strata using manual auguring (maximum 6.0 or REFUSAL strata).
- ii) Conducting field tests such as Standard Penetration Tests as per IS 2131- 1981 at various depths in the boreholes.
- iii) Collection of undisturbed soil samples at specified depths for determination of cohesion (C) and friction factor (ϕ) as per IS-2132 - 1986.
- iv) To record the ground water table level if any.

2.2.2 Laboratory Testing Procedures

2.2.2.1 Physical and Engineering Properties of Soil

The scope of laboratory testing as per the relevant parts of IS: 2720.

2.3 Report

This report comprises of soil profiles, recommendations regarding allowable bearing capacity, type and depth of foundations and improvement in bearing capacity if any & submission of report with relevant recommendations.

3.0 Schedule of Investigation

3.1 Method of Field Investigation

3.2 Sampling

From the Standard Penetration tests, disturbed samples have been collected by using split spoon sampler. Representative UDS samples were procured from the semi cohesive strata by using 100mm diameter and 45cm long sampling tubes. To study the subsoil strata, 2 nos. of 150mm/75mm size dia boreholes were bored using manual auguring at the specified locations.

Borehole Termination Depth

Borehole Location	Depth (m)
BH-1	3.9
BH-2	5.0

3.3 Standard Penetration Tests

Standard Penetration Test (SPT), which is conducted to determine penetration resistance was conducted in the boreholes using the procedure as described in IS: 2131. In this method, split spoon sampler (50.8mm OD and 35mm ID) replaces drilling bit and the sampler is driven by dropping collar with a free fall of 75cm. The length of the sampler is 60cm. The sampler is first driven through 15cm as a “seating drive “. It is further driven through 30cm. The number of blows required for drilling the sampler for next 30 cm beyond seating drive is termed as “penetration resistance,” N”. Respective “N” values are presented in bore log sheets.

The depth at which SPT tests were conducted in each borehole is as follows.

Borehole Location	SPT Depth (m)
BH-1	1.5,3.0,3.9
BH-2	1.5,3.0,4.5,5.0

4.0 Water Table

Seepage water has not been observed in the borehole locations during the field investigation.

5.0 Sub Soil Profile

A three layered sub soil has been observed in the bore holes which consists of grayish clayey sand followed by grayish brown silty/clayey sand and underlain by grayish brown silty sand.

The 'N' values recorded at various depths in the borehole are indicated in respective bore-log.

The schematic plan showing the location of boreholes is shown in Fig. 1.

6.0 Bearing Capacity

6.1 Bearing Capacity Based on the Field Testing

Bearing capacity has been determined based on SPT as per relevant IS codes. The N Values from SPT at various depths are given in the respective bore logs. Based on the average N value over the significant depth below the foundation, the safe bearing pressure has been determined as per IS 8009 (Part 1) – 1976 for an allowable settlement of 25 and 40mm and it was recommended for 25mm settlement.

SBC calculations have been carried out based on a foundation of width 2.0m. While estimating the SBC's the water table has been assumed at the base of footing.

For SBC calculations, both shear criteria and settlement criteria is considered.

The so called SBC values are tabulated as under.

For BH1

Depth (m)	SBC (t/m²) For 25mm settlement
1.5	-
1.8	17.0
3.0	18.0
3.9	19.0

For BH2

Depth (m)	SBC (t/m²) For 25mm settlement
1.5	-
1.8	17.0
3.0	18.0
4.5	19.0

6.2 Recommendations and Conclusions

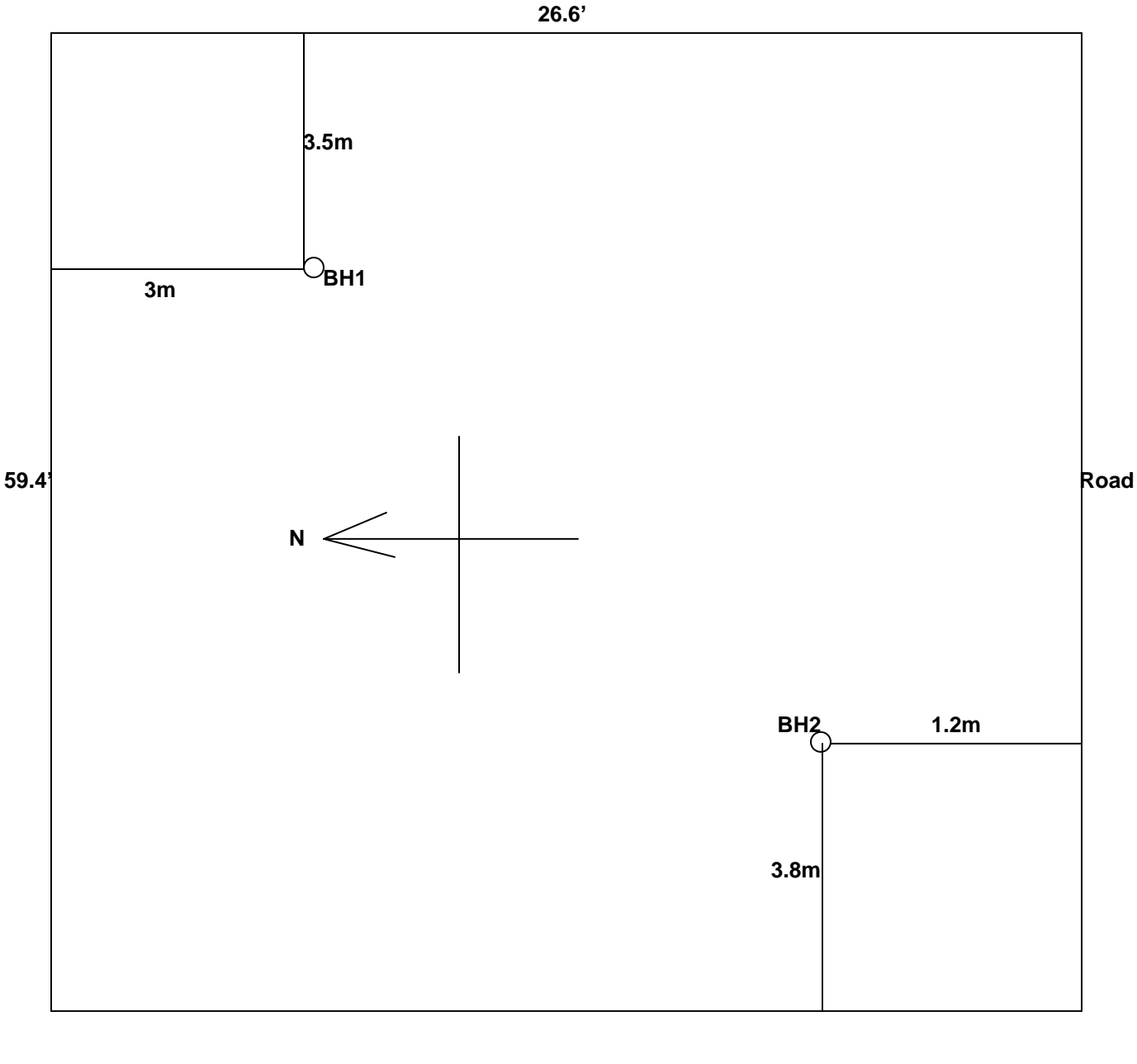
- **A three layered sub soil has been observed in the bore holes which consists of grayish clayey sand followed by grayish brown silty/clayey sand and underlain by grayish brown silty sand.**
- **Minimum depth of the foundation to be 1.8 with an estimated SBC of 17.0 T/m² for a maximum permissible settlement of 25mm.**
- **Open foundations of type isolated is recommended based on the sub soil strata.**
- **Depth of the foundation to be 1.8m and beneath the foundation shall be compacted with soling to about 200mm thick.**
- **All the observations and the recommendations are pertaining to these borehole locations only.**
- Shallow foundations are recommended for the proposed structures
- The structure shall be founded on shallow foundation. This may be isolated footing. It is advisable to go for a raft foundation if the footing area exceeds 50% of the plinth area.
- Profile diagrams should be taken as indicative with regards to soil profile.
- The stability of foundation against overturning should be checked. While dimensioning the foundations the factor of safety against overturning should be as per IS:1904 (1986), art, 17.2
- Whenever loose pockets of soil are encountered, it may be necessary to increase the depth of foundations.
- All depths of foundations is given with respect to the natural ground level.
- The refilling of foundation shall be done with care so as not to disturb the constructed foundation, and shall be compacted in layers in layers not exceeding 200 mm loose and compacted to 150mm thick with sprinkling of minimum quantity of water necessary for proper compaction
- All observations and calculations were made based on the field investigation at the locations specified by the client.

6.2.1 Precautions

- The columns should be tied with R.C.C beam at plinth level.
- If any loose pockets of soil or filled up soil wherever encountered should be completely removed and back filled with well compacted earth. Thereafter a layer of 40-50mm size stone aggregates should be rammed into the back filled earth. A leveling course of lean concrete should then be laid over the aggregate course and construction of foundation can be taken up subsequently.

Bore hole	Sample	Depth (m)	NMC (%)	Grain Size Distribution		
				Gravel (%)	Sand (%)	Silt & Clay (%)
BH1	SPT	1.5	22.37	2	73	25
	SPT	3.0	14.70	0	55	45
	SPT	3.9	15.20	0	65	35
BH2	SPT	1.5	12.17	0	68	32
	SPT	3.0	10.18	0	70	30
	SPT	4.5	14.02	3	62	35
	SPT	5.0	11.14	1	72	27

Appendix – I
Fig. 1 – Borehole Location Plan



Not to scale

Appendix –III

Fig.2 Grain Size Distribution curves for BH-1

GRAIN SIZE DISTRIBUTION CURVES

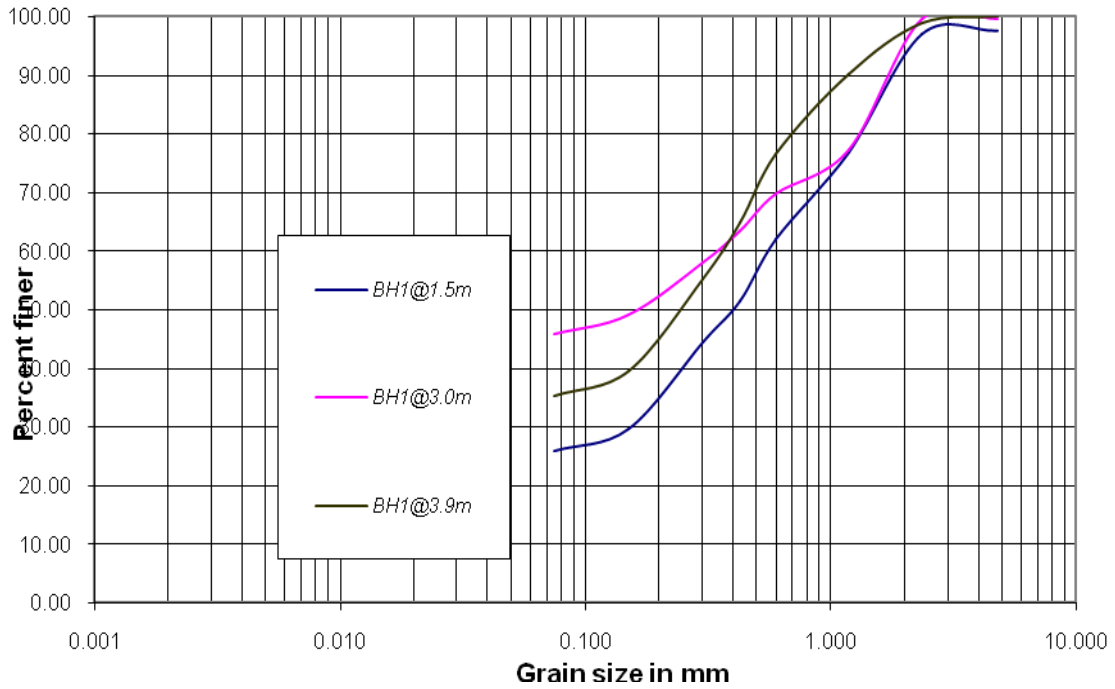


Fig.3 Grain Size Distribution curves for BH-2

GRAIN SIZE DISTRIBUTION CURVES

