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# GEOTECHNICAL REPORT FOR

## RESIDENTIAL BUILDING AT GANAPATHY STREET, WEST MAMBALAM, CHENNAI

Client :

M/s. JKB Housing Pvt. Ltd.,
Chennai.

Architect :

Consultant :

Structural Consultant :

Job No. : G(C)9884 Date : 15.12.2023

## NAGADI CONSULTANTS PRIVATE LIMITED

Branch :

Chennai

**Project :**

**RESIDENTIAL BUILDING AT GANAPATHY STREET, WEST MAMBALAM, CHENNAI**

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# GEOTECHNICAL INVESTIGATION REPORT

## for Residential Building at Ganapathy Street, West Mambalam, Chennai

### *EXECUTIVE SUMMARY*

M/s. JKB Housing Pvt. Ltd., Chennai are proposing to construct a Residential Building at Ganapathy Street, West Mambalam, Chennai - 600033.

The site for the proposed Residential Building is situated at Plot No.71 on the Northern side of Ganapathy Street in West Mambalam, Chennai - 600033. The site measures approximately 27.4m x 34.1m in size. The site is having boundary wall on all the sides and is fairly level in topography. There is a well of 1m diameter situated in the North-Western corner of the site and water table was observed at 0.3m depth in the well during the period of field investigations.

The proposed Residential building consists of an open stilt floor at ground level and five upper floors.

Geotechnical investigations have been undertaken at the site as per the scope of investigations, stipulated by the client, which consisted of conducting 2 boreholes down to 8m depth.

The results of borehole investigations indicate the presence of Brown clayey silty sand down to 2.8/3.1m depth and underlain by Brown silty sand down to the termination depth of 8m below existing ground level.

The soil strata is in a medium dense state from existing ground level down to the termination depth of 8m below existing ground level.

Ground water was encountered at 0.3m depth in the boreholes during the period of field investigations.

In view of the observed subsoil conditions, the proposed residential building can be supported on *Shallow Foundations - Isolated/Strip Footings or Raft Foundations laid at a minimum depth of 1.8m below the existing ground level. Net allowable bearing pressure for Isolated/Strip Footings*

*for different widths of foundations are given below.*

| Width of Foundations (m) | 1.5 | ≥3 |
|---|---|---|
| Net Allowable Bearing Pressure ($t/m^2$) | 9 | 10 |

*Net allowable bearing pressure of 15$t/m^2$ can be adopted for Raft Foundations.*

The excavated soil can be used for backfilling purposes.

After the excavation for the foundations, the top slush should then be removed and the surface compacted heavily. If any loose pockets are observed, the same shall be filled with brickbats/ gravel and compacted well. Foundations can subsequently be placed over such a prepared surface. Stiff Tie-beams connecting the columns in both directions may be provided which will render additional rigidity to the structure.

There is a well located within the site. In case, the well is not utilised, the well can be closed by backfilling with sand-gravel mix. The backfilling should be done in layers and well compacted. In case the well is to be utilised, the sides should be properly lined. Additionally, the distance of the nearest footing to the well should not be less than the width of the footing.

# REPORT ON GEOTECHNICAL INVESTIGATION FOR RESIDENTIAL BUILDING AT GANAPATHY STREET, WEST MAMBALAM, CHENNAI

## *1.0 INTRODUCTION*

### 1.1 Overview

1.1.1 M/s. JKB Housing Pvt. Ltd., Chennai are proposing to construct a Residential Building at Ganapathy Street, West Mambalam, Chennai - 600033.

1.1.2 The geotechnical investigations have been carried to ascertain the soil conditions for the design of foundations of the proposed Residential building.

### 1.2 Authority

A detailed geotechnical investigations programme has been conducted as per the authorisation by M/s. JKB Housing Pvt ltd, Chennai vide our oral Work Order No.NCC/OWO/JB/084/C/2023.

## *2.0 PROJECT DETAILS*

### 2.1 Site Location

The site for the proposed Residential Building is situated at Plot No.71 on the Northern side of Ganapathy Street in West Mambalam, Chennai - 600033.

### 2.2 Site Layout and Topography

2.2.1 The site measures approximately 27.4m x 34.1m in size. The site is having boundary wall on all the sides and is fairly level in topography. There is a well of 1m diameter situated in the North-Western corner of the site and water table was observed at 0.3m depth in the well during the period of field investigations.

2.2.2 The colour of the exposed soil surface is Brown.

## 2.3 The Structure

As per information provided by the client, the proposed Residential building consists of an open stilt floor at ground level and five upper floors.

## 2.4 Seismic Zone

Site for the proposed Residential building is situated in West Mambalam, Chennai which falls under Seismic Zone III as per IS 1893 (Part 1) - 2016.

## 2.5 Geographical Information

2.5.1 Site for the proposed Residential building is situated at:

a) Latitude : 13°02'

b) Longitude : 80°13'

## *3.0 OBJECT OF INVESTIGATIONS*

3.1 For designing the foundation system of the proposed residential building, the following data are required:

a) Type of foundation system.

b) Depth below the ground level at which the foundation system is to be laid.

c) Allowable bearing pressure on the foundations levels.

3.2 To determine above factors, the following information would be required:

a) The subsoil profile indicating thicknesses of the various soil strata, to a depth down to the influence zone below the foundations.

b) Engineering properties of the soil strata at various levels.

c) Physical characteristics of the soil strata.

d) Variation of the strength of the strata with depth.

3.3 For evaluating the above parameters, field investigations and laboratory investigations on the soil samples collected during the field investigations, have been carried out.

3.4 The results from these investigations have been analysed to provide the recommendations for the design of foundations.

## *4.0 SCOPE OF INVESTIGATIONS*

4.1 Scope of investigations as given in the work order consisted of :

a) Conducting 2 boreholes down to a depth of 8m, as required by the client.

b) Conducting standard penetration tests at 1.5m intervals.

c) Recovering undisturbed soil samples from various levels of the subsoil strata.

d) Recording ground water table levels, if met with.

e) Conducting relevant laboratory tests on soil samples recovered.

f) Preparation and submission of a technical report containing the details of the tests carried out, their analysis and recommendations regarding the foundation system to be adopted. Two copies of the report are to be submitted.

## *5.0 FIELD INVESTIGATIONS*

### 5.1 General Details

5.1.1 The locations of the boreholes were shown at site by the client's representative. A Schematic site plan showing the boreholes locations marked by the client is given in fig.1.

5.1.2 Weather was clear during the period of field investigations which were carried out in the last week of November 2023.

### 5.2 Boreholes

5.2.1 The boreholes were progressed by mechanically operated rotary core drill method.

5.2.2 The boreholes were terminated at 8m depth below the existing ground level as per the stipulated scope of work.

5.2.3 The depths at which ground water table was encountered in the boreholes during the

period of field investigations and termination depths of the boreholes are given below:

| Borehole No. | Depth of Ground Water Table Below EGL (m) | Termination Depth Below EGL (m) |
|---|---|---|
| 1 | 0.3 | 8 |
| 2 | 0.3 | 8 |

5.2.4 Ground water was encountered at 0.3m depth in the boreholes during the period of field investigations.

5.2.5 Standard Penetration Tests were conducted in soil strata at 1.5m depth intervals.

5.2.6 Disturbed soil samples recovered from split spoon sampler were packed in polythene bags, labelled and retained for identification purposes.

5.2.7 Undisturbed soil samples were recovered by thin walled tubes conforming to IS 2132. These tubes had an area ratio of less than 10%. The diameter of soil samples were 50mm and length 45cm.

## *6.0 LABORATORY INVESTIGATIONS*

6.1 The soil samples brought to the laboratory were subjected to various tests to determine the following properties

a) Type of soil and its gradation

b) Consistency limits

c) Natural density

d) Natural water content

e) Shear strength properties

6.2 In order to determine the above properties listed in 6.1, the following tests were conducted.

a) Sieve analysis on the coarse grained soil fraction

b) Hydrometer analysis on the fine grained soil fraction

c) Liquid and plastic limits

d) Natural Density and Water Content tests

e) Triaxial compression tests

f) Free Swell Index tests

## *7.0 RESULTS AND ANALYSIS*

### 7.1 Presentation of Results

7.1.1 The results of borehole investigations and of the laboratory investigations conducted on the soil samples collected from the boreholes have been presented in the form of soil profile tables in Table Nos.1 & 2.

7.1.2 The soil profile tables indicate the following:

a) Standard Penetration Test Values (i.e. N- values observed) at various depths

b) Soil description identifying the type of soil

c) Grain size analysis indicating composition of subsoil

d) Consistency limits

e) In-situ bulk density and Water content

f) Triaxial compression test results

### 7.2 Analysis of Soil Profile

7.2.1 A perusal of the data presented in the soil profile tables indicate the presence of the following substrata.

a) Stratum - I : Brown clayey silty sand

b) Stratum - II : Brown silty sand

7.2.2 The thicknesses in each borehole of each strata described in 7.2.1 is given in the table below:

| BH No. | Depth (m) : from - to | |
|---|---|---|
| | Stratum - I | Stratum - II |
| 1 | 0.0 - 2.8 | 2.8 - 8 |
| 2 | 0.0 - 3.1 | 3.1 - 8 |

7.2.3 The above results show that :

a) Stratum - I consisting of Brown clayey silty sand having significant percentages of sand and varying percentages of clay and silt, has been encountered from ground level down to 2.8/3.1m depth below existing ground level.

b) Stratum - II consisting of Brown silty sand having significant percentages of sand and varying percentages of silt, has been encountered from 2.8/3.1m depth and continued till the termination depth of the boreholes of 8m below existing ground level.

**7.3 Soil Composition**

7.3.1 The grain size distribution of the soil samples at various depths, as determined in the laboratory have been presented in the form of grain size analysis curves in figs. 3a & 3b.

7.3.2 The variations in the grain size distribution - strata wise across the boreholes are as follows:

a) Stratum - I : Brown clayey silty sand

| BH No. | Gravel (%) | Sand (%) | Silt (%) | Clay (%) |
|---|---|---|---|---|
| 1 | 0 | 56 | 25 | 19 |
| 2 | 0 | 53 - 63 | 22 - 27 | 15 - 20 |

b) Stratum - II : Brown silty sand

| BH No. | Gravel (%) | Sand (%) | Silt (%) | Clay (%) |
|---|---|---|---|---|
| 1 | 0 | 79 - 87 | 13 - 21 | 0 |

| BH No. | Gravel (%) | Sand (%) | Silt (%) | Clay (%) |
|---|---|---|---|---|
| 2 | 0 | 81 - 87 | 13 - 19 | 0 |

7.3.3 The above results indicate that the soil in :

a) Stratum - I consists of about 15-20% of clay, 22-27% of silt and 53-63% of sand.

b) Stratum - II consists of about 13-21% of silt and 79-87% of sand.

**7.4 In-situ Bulk Density, Water Content and Dry density**

7.4.1 The in-situ bulk densities, water contents and dry densities obtained from undisturbed soil samples are tabulated below.

| BH No. | Depth (m) | In-situ Bulk Density (g/cm$^3$) | Water Content (%) | Dry Density (g/cm$^3$) |
|---|---|---|---|---|
| 1 | 2 | 1.86 | 14.2 | 1.63 |
| 2 | 1.5 | 1.87 | 15.7 | 1.62 |

7.4.2 The above test results indicates that the soil is in a medium dense state. The undisturbed samples could not be collected beyond 3m depth as the soil was cohesionless and sampling was done below ground water table level.

**7.5 Consistency Limits**

7.6 The Consistency Limits determined for the soil in Stratum - I (Brown clayey silty sand) indicates that the liquid limit varies between 23% to 27%, plastic limit varies between 14% to 16% and plasticity index varies between 9% to 11%.

7.6.1 The Consistency Limits determined for the soil in Stratum - II (Brown silty sand) indicate that the soil in these strata is non plastic in nature.

7.6.2 The Consistency Limits indicate that the soil in :

a) Stratum - I (Brown clayey silty sand) is low plastic in nature.

b) Stratum - II (Brown silty sand) is non plastic in nature

**7.7 Standard Penetration Tests**

7.7.1 Standard Penetration Test values (N-values observed) are presented in the soil profile table nos.1 & 2.

7.7.2 Standard Penetration Test values (N-values observed) have also been presented in form of plots of N values vs depth in fig.4.

7.7.3 The N-values indicate that the soil is in a medium dense state down to the investigated depth of 8m below existing ground level with observed N-values ranging between 8 to 19.

**7.8 Triaxial Test Results**

The cohesion 'c' obtained from consolidated drained triaxial compression test is 0.14kg/cm² and the angle of shearing resistance 'ϕ' of the soil varies between 22° & 23°.

**7.9 Free Swell Index**

7.9.1 The free swell index of the soil samples collected at various depths are given below:

| BH No. | Free Swell Index (%) at Depth (m) | | | |
|---|---|---|---|---|
| | 1 | 1.5 | 2.5 | 3 |
| 1 | - | 14.3 | - | 5.2 |
| 2 | 16.9 | - | 13.8 | - |

7.9.2 The above results indicate that the soil strata is low swelling in nature. Hence, the excavated soil can be used for backfilling purposes.

**7.10 Compiled Soil Profile**

7.10.1 An overview of the results and their analysis has been presented in the form of a compiled soil (fig. 2).

7.10.2 The above figure shows the various strata encountered and their thicknesses in each of

the boreholes and also gives the soil composition and the observed N-values at various depths along with the depth at which undisturbed soil samples were collected.

## *8.0 DESIGN CRITERIA*

### 8.1 Primary Parameters

8.1.1 The parameters required for the design of foundation system for the proposed residential building are:

a) Type of foundation to be adopted

b) Depth at which the foundations have to be laid

c) Allowable bearing pressure on the soil at the foundation level

8.1.2 On the basis of the analysis of the results of investigations, the required design parameters have been arrived at and are given in the following sections.

### 8.2 Type of Foundations

8.2.1 The type of foundation depends on the following:

a) Subsoil conditions

b) Type of structure

c) Configuration at loading points

8.2.2 As per information provided by the client, the proposed Residential Building consists of an open stilt floor at ground level and five upper floors.

8.2.3 The soil strata is in a medium dense state from existing ground level down to the termination depth of 8m below existing ground level.

8.2.4 In view of the above, *Shallow Foundation -Isolated/Strip Footings* or *Raft Foundations* can be adopted for the proposed residential building.

### 8.3 Depth of Foundations

8.3.1 The depth at which foundations should be laid will be governed by the following

criteria.

a) Top filled up strata/loose soil, if any

b) There should be sufficient thickness of soil above the footing/foundations so that the bearing capacity of the soil can be fully mobilised.

c) Soil below the level of footings/foundations should have the requisite strength to support the anticipated bearing pressures on the foundations without allowing the settlement of footings/foundations to exceed the acceptable limits.

d) Requirements of the type of structure (Residential Building consisting of an open stilt floor at ground level and five upper floors).

*8.3.2* In view of the above factors, foundations of the proposed residential building can be made to rest at a minimum depth of *1.8m below the existing ground level*. The soil available at the founding level will be Brown clayey silty sand.

**8.4 Allowable Bearing Pressure**

8.4.1 Allowable bearing pressure has been evaluated by:

a) Shear failure criteria based on the average soil data

b) Settlement criteria based on the SPT values (N-values)

c) Settlement criteria based on deformation modulus

8.4.2 An allowable settlement of 50mm has been considered to evaluate the allowable bearing pressure for Isolated/Strip footings and an allowable settlement of 75mm has been considered to evaluate the allowable bearing pressure for Raft Foundations.

8.4.3 A water table correction factor of 0.5 has been considered.

8.4.4 On the basis of the above analysis, *net allowable bearing pressure for Isolated/Strip footings for various widths of foundations are given below:*

| *Width of Foundations (m)* | *1.5* | *≥3* |
|---|---|---|
| *Net Allowable Bearing Pressure (t/m²)* | *9* | *10* |

8.4.5 *Net allowable bearing pressure of 15t/m² can be adopted for Raft Foundations.*

## *9.0 RECOMMENDATIONS*

### 9.1 Type of Foundations

a) *Shallow Foundation - Isolated/Strip Footings OR*

*b) Raft Foundations*

### 9.2 Depth of Foundations

*Minimum 1.8m depth below the existing ground level*

### 9.3 Allowable Bearing Pressure

a) *Net Allowable Bearing Pressure for Isolated/Strip footings for various widths of footings for an allowable settlement of 50mm are given below.*

| *Width of Foundations (m)* | *1.5* | *≥3* |
|---|---|---|
| *Net Allowable Bearing Pressure (t/m²)* | *9* | *10* |

b) *Net Allowable Bearing Pressure of 15t/m² can be adopted For Raft Foundations a for an allowable settlement of 75mm.*

### 9.4 Construction Advisories

9.4.1 The soil of each strata has been described with name, colour etc. During excavation, any variations observed in the nature and condition of the soil from those given in this Report should be noted and appropriate action should be taken.

9.4.2 The excavated soil can be used for backfilling purposes.

9.4.3 After the excavation for the foundations, the top slush should then be removed and the

surface compacted heavily. If any loose pockets are observed, the same shall be filled with brickbats/ gravel and compacted well. Foundations can subsequently be placed over such a prepared surface.

9.4.4 Stiff Tie-beams connecting the columns in both directions may be provided which will render additional rigidity to the structure.

9.4.5 There is a well located in the site. In case, the well is not utilised, the well can be closed by backfilling with sand-gravel mix. The backfilling should be done in layers and well compacted. Incase, the well is to be utilised, the sides should be properly lined. Additionally the distance of the nearest footing to the well should not be less than the width of the footing.

**9.5 Appendices**

9.5.1 The calculations for the allowable bearing pressure have been provided in Appendix-A of this report.

9.5.2 The List of IS codes referred for providing the recommendations and that which might be required to implement the same have been given in Appendix-B of this report.

**9.6 Notes**

9.6.1 The recommendations given in this report have been arrived at on the basis of design parameters which have been judiciously adopted by giving due consideration to the results of field and laboratory investigations as well as NAGADI's experience of over four decades in working in various types of soil and rock conditions all over India.

9.6.2 The entire report should be studied before adopting the recommendations given in the report.

## *10.0 LIMITATIONS*

This Geotechnical investigation has been carried out at locations in the site chosen by the client as representing the entire site. The recommendations provided in this Report are hence valid only for those test locations. However, if there is any change in the subsoil conditions and properties at places between or beyond the chosen test locations, Nagadi may be contacted for further actions. Fresh investigations will have to be carried out at such locations.

Dr. N. Santosh Rao
*Technical Director*
*For **NAGADI CONSULTANTS PVT. LTD.***

## ANALYSIS FOR ALLOWABLE BEARING PRESSURE

**Data**

(i) Soil Properties :

c (kg/cm$^2$) = 0.14 $\phi = 22°$ $\gamma$ (g/cm$^3$) = 1.85

(ii) Depth of Foundation, D (m) = 1.8

(iii) Allowable Settlement, s (mm) = 50

**Shear Failure Criterion (Ref. IS : 6403)**

$N_c = 13.95$ $N_q = 5.89$ $N_\gamma = 4.9$ $R_w = 0.50$ $R_w' = 0.50$

$$q_s = \frac{1}{3}\left(c \cdot N_c + \gamma D \cdot N_q \cdot R_w + 0.5 \cdot \gamma \cdot B \cdot N_\gamma \cdot R'_w\right) - \gamma D.R_w$$

| B (m) | 1.5 | ≥3.0 |
|---|---|---|
| $q_s$ (t/m$^2$) | 9.3 | 10.4 |

**Settlement Criterion (Ref. IS : 8009)**

*(i) From N Values*

| B (m) | 1.5 | ≥3.0 |
|---|---|---|
| H (m) | 3 | 6 |
| $N_{av}$ | 13 | 14 |
| $q_a$ (t/m$^2$) | 12.5 | 11.5 |

*(ii) From Triaxial Compression Tests* : $q_a = \dfrac{s \cdot E}{0.7 \cdot H}$

| B (m) | 1.5 | ≥3.0 |
|---|---|---|
| H (m) | 3 | 6 |
| E (kg/cm$^2$) | 90 | 110 |
| $q_a$ (t/m$^2$) | 21.4 | 13.1 |

| ADOPT | B (m) | 1.5 | ≥3 |
|---|---|---|---|
| | q (t/m$^2$) | 9 | 10 |

*Note : $q_s$ and $q_a$ are NET VALUES, Weight of backfill etc. need not be added to the loading except in case of filling above original G.L.*

## LIST OF IS CODES

**Field Investigation**

1. IS : 1498 - 1970 : Classification and identification of soils for general engineering purposes (First Revision) (Amendment 2)
2. IS : 1892 - 1979 : Code of practice for sub surface investigations for foundations (First revision)
3. IS : 2131 - 1981 : Method of Standard Penetration Tests for soils (First revision)
4. IS : 2132 - 1986 : Code of practice for thin walled tube sampling of soils (Second revision)

**Laboratory Tests**

1. IS : 2720 - 1983 (Part 1) : Methods of test for soils: Preparation of dry soil samples for various tests (Second revision)
2. IS : 2720 - 1980 (Part 2) : Method of test for soils: Determination of water content (Second revision) Amendment 1
3. IS : 2720 - 1980 (Part 3/Sec 1) : Method of test for soils : Determination of Specific Gravity : Fine grained soils. (First revision)
4. IS : 2720 - 1980 (Part 3/Sec 2) : Method of test for soils : Determination of Specific Gravity : Fine, Medium & Coarse grained soils. (First revision).
5. IS : 2720 - 1985 (Part 4) : Method of test for soils : Grain size analysis (Second revision)
6. IS : 2720 - 1985 (Part 5) : Method of test for soils : Determination of liquid and plastic limit (Second revision)
7. IS : 2720 - 1977 (Part 40) : Methods of tests for soils: Determination of free swell index of soils.

**Foundation Construction**

1. IS : 1080 - 1986 : Code of practice for design and construction of shallow foundations on soils (other than raft, ring and shell) (Second revision)
2. IS : 1904 - 1986 : Code of practice for design and construction of foundation in soils: General requirements (Third revision)
3. IS 6403 - 1981 : Code of practice for determination of bearing capacity of shallow foundations : First revision (Amendment 1)
4. IS 8009 - 1976 (Part 1) : Code of practice for calculation of settlements of foundations : Shallow foundations subject to symmetrical static vertical loads (Amendment 2)

# TABLES



# SOIL PROFILE

Project: Residential Building at Ganapathy Street, West Mambalam, Chennai - 600033.

B. H. Location: | Water Table: 0.3m | Term. Depth : 8.0m | B.H. No. : 1

| N - Value# | Depth (m) | Soil Description | Grain Size Analysis | | | | Atterberg Limits | | In-situ properties | | Triaxial Test | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Gravel (%) | Sand (%) | Silt (%) | Clay (%) | Liquid (%) | Plastic (%) | Density* (g/cm³) | Water Cont (%) | Type | c (kg/cm²) | Φ (°) |
| | 0.0 | Ground level | | | | | | | | | | | |
| 7 | 1.5 | Brown clayey silty sand | 0 | 56 | 25 | 19 | 27 | 15 | | | | | |
| | 2.0 | Brown clayey silty sand | | | | | | | 1.86 | 14.2 | CD | 0.14 | 22 |
| | 2.8 | Change of strata | | | | | | | | | | | |
| 11 | 3.0 | Brown silty sand | 0 | 82 | 18 | 0 | - | NP | | | | | |
| | 3.5 | Brown silty sand | | | | | | | | | Sample slipped | | |
| 14 | 4.5 | Brown silty sand | 0 | 79 | 21 | 0 | - | NP | | | | | |
| | 5.0 | Brown silty sand | | | | | | | | | Sample slipped | | |
| 17 | 6.0 | Brown silty sand | 0 | 87 | 13 | 0 | - | NP | | | | | |
| | 6.5 | Brown silty sand | | | | | | | | | Sample slipped | | |
| 21 | 7.5 | Brown silty sand | 0 | 85 | 15 | 0 | - | NP | | | | | |
| | 8.0 | Brown silty sand | | | | | | | | | | | |

*-Natural Bulk Density # -N Values (Observed)


NAGADI

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Sheet No. : 1

# SOIL PROFILE

Project: Residential Building at Ganapathy Street, West Mambalam, Chennai - 600033.

B. H. Location: | Water Table: 0.3m | Term. Depth : 8.0m | B.H. No. : 2

| N - Value# | Depth (m) | Soil Description | Grain Size Analysis: Gravel (%) | Sand (%) | Silt (%) | Clay (%) | Atterberg Limits: Liquid (%) | Plastic (%) | In-situ properties: Density* (g/cm³) | Water Cont (%) | Triaxial Test: Type | c (kg/cm²) | Φ (°) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 0.0 | Ground level | | | | | | | | | | | |
| 8 | 1.0 | Brown clayey silty sand | 0 | 53 | 27 | 20 | 23 | 16 | | | | | |
| | 1.5 | Brown clayey silty sand | | | | | | | 1.87 | 15.7 | CD | 0.14 | 23 |
| 8 | 2.5 | Brown clayey silty sand | 0 | 63 | 22 | 15 | 23 | 14 | | | | | |
| | 3.0 | Brown clayey silty sand | | | | | | | | | Sample slipped | | |
| | 3.1 | Change of strata | | | | | | | | | | | |
| 13 | 4.0 | Brown silty sand | 0 | 81 | 19 | 0 | - | NP | | | | | |
| | 4.5 | Brown silty sand | | | | | | | | | Sample slipped | | |
| 16 | 5.5 | Brown silty sand | 0 | 86 | 14 | 0 | - | NP | | | | | |
| | 6.0 | Brown silty sand | | | | | | | | | Sample slipped | | |
| 19 | 7.0 | Brown silty sand | 0 | 87 | 13 | 0 | - | NP | | | | | |
| | 8.0 | Brown silty sand | | | | | | | | | | | |

*-Natural Bulk Density  # -N Values (Observed)

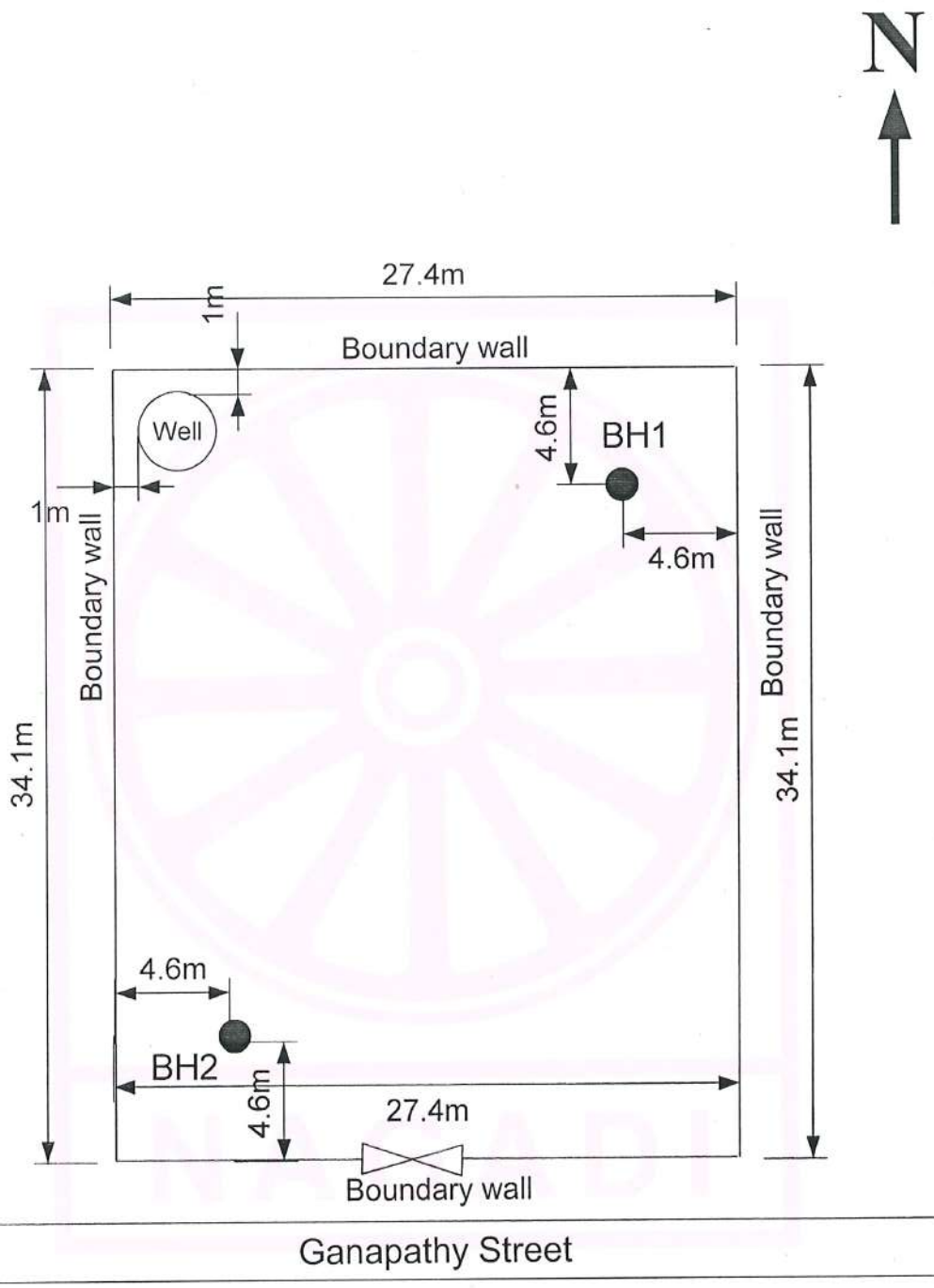

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# FIGURES






**Legend**

● BH -Borehole

**SCHEMATIC SITE PLAN**

(Not to Scale)

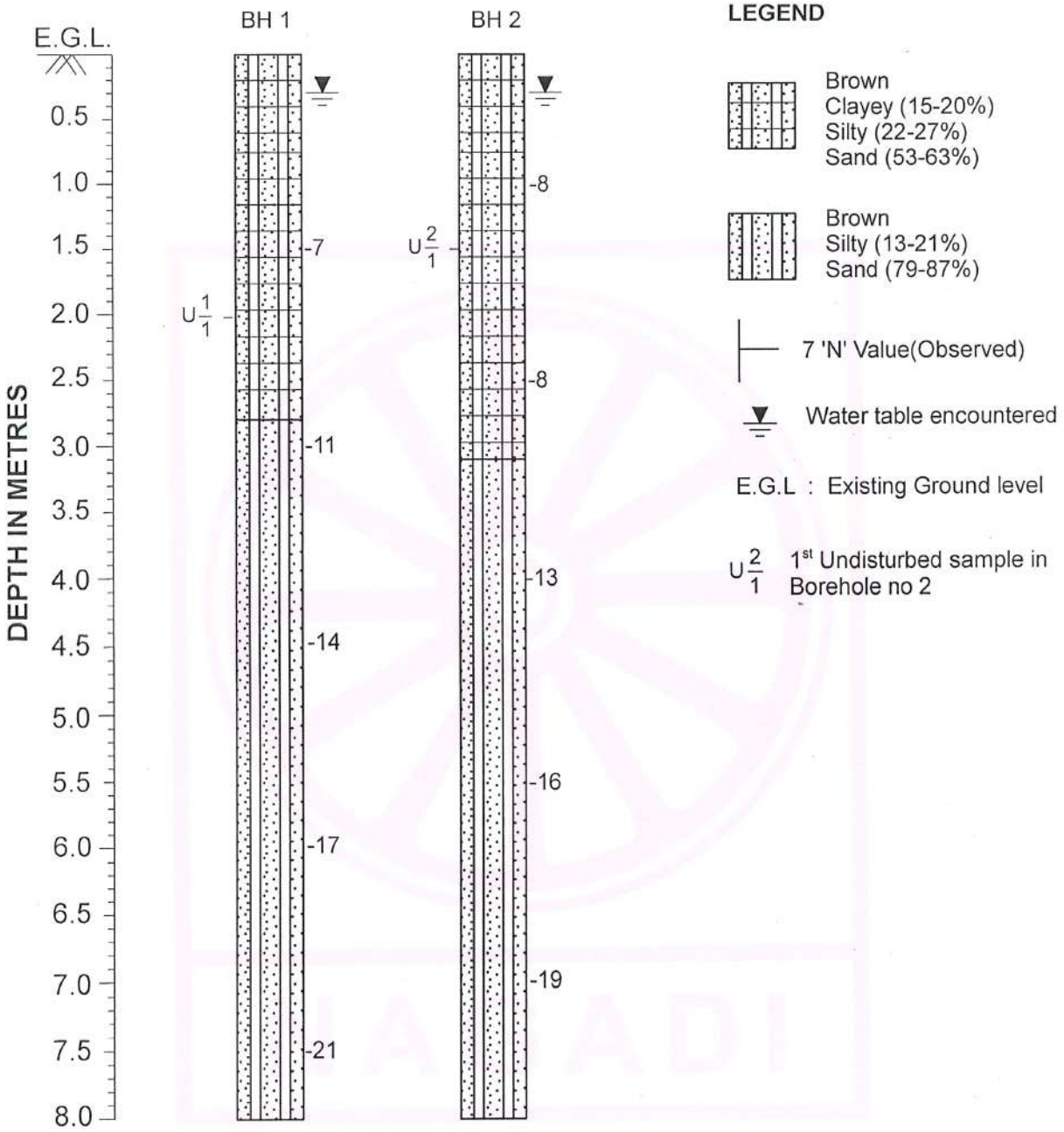

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## COMPILED SOIL PROFILE

## PROJECT : RESIDENTIAL BUILDING AT GANAPATHY STREET, WEST MAMBALAM, CHENNAI


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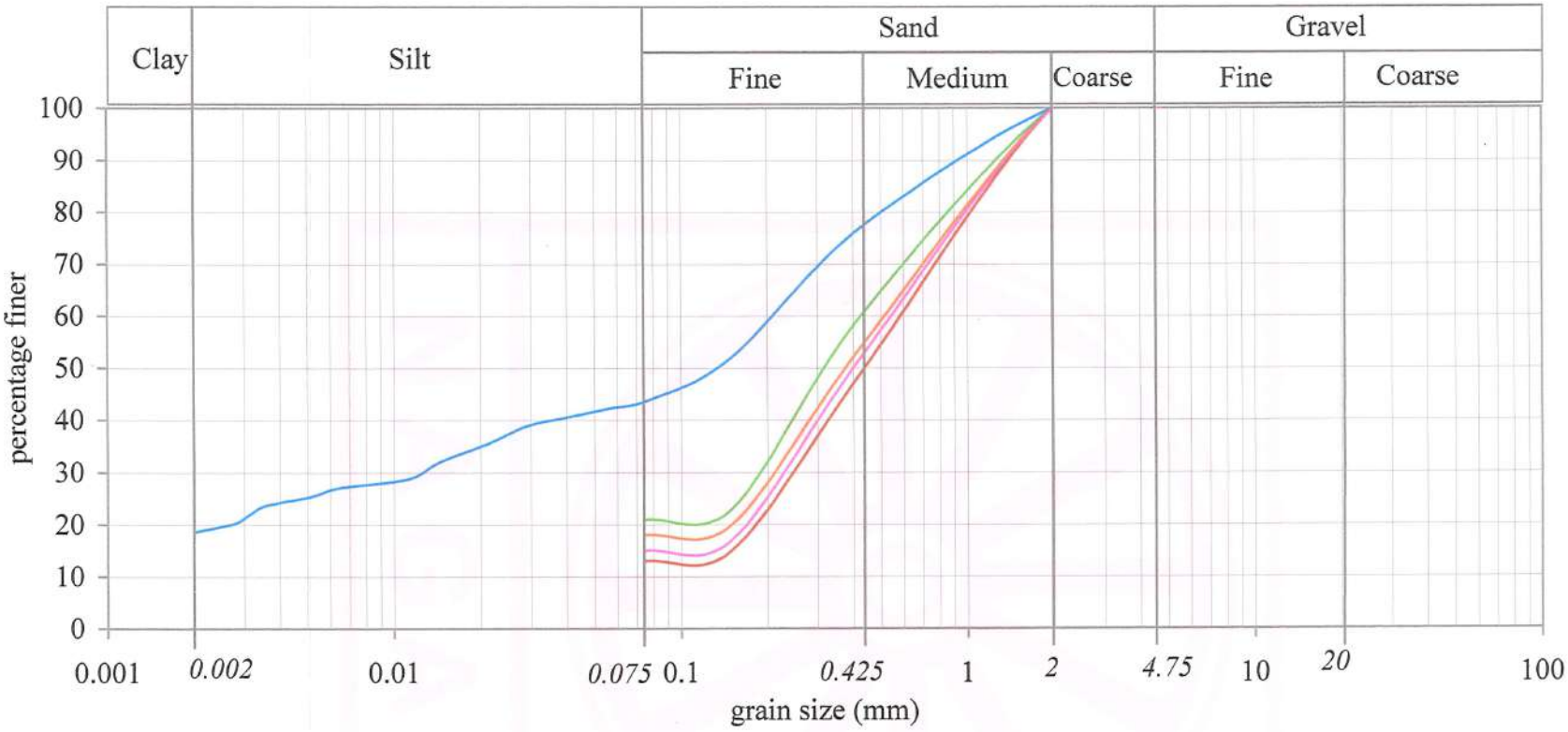
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Sheet No. : 3a




| Line Style | Bore hole | Depth (m) | Description | Gravel (%) | Sand (%) | Silt (%) | Clay (%) | $d_{60}$ | $d_{10}$ | U |
|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 1.5 | Clayey silty sand | 0 | 56 | 25 | 19 | 0.210 | - | - |
| | 1 | 3.0 | Silty sand | 0 | 82 | 18 | 0 | 0.510 | - | - |
| | 1 | 4.5 | Silty sand | 0 | 79 | 21 | 0 | 0.425 | - | - |
| | 1 | 6.0 | Silty sand | 0 | 87 | 13 | 0 | 0.600 | - | - |
| | 1 | 7.5 | Silty sand | 0 | 85 | 15 | 0 | 0.550 | - | - |
| | | | | | | | | | | |
| | | | | | | | | | | |
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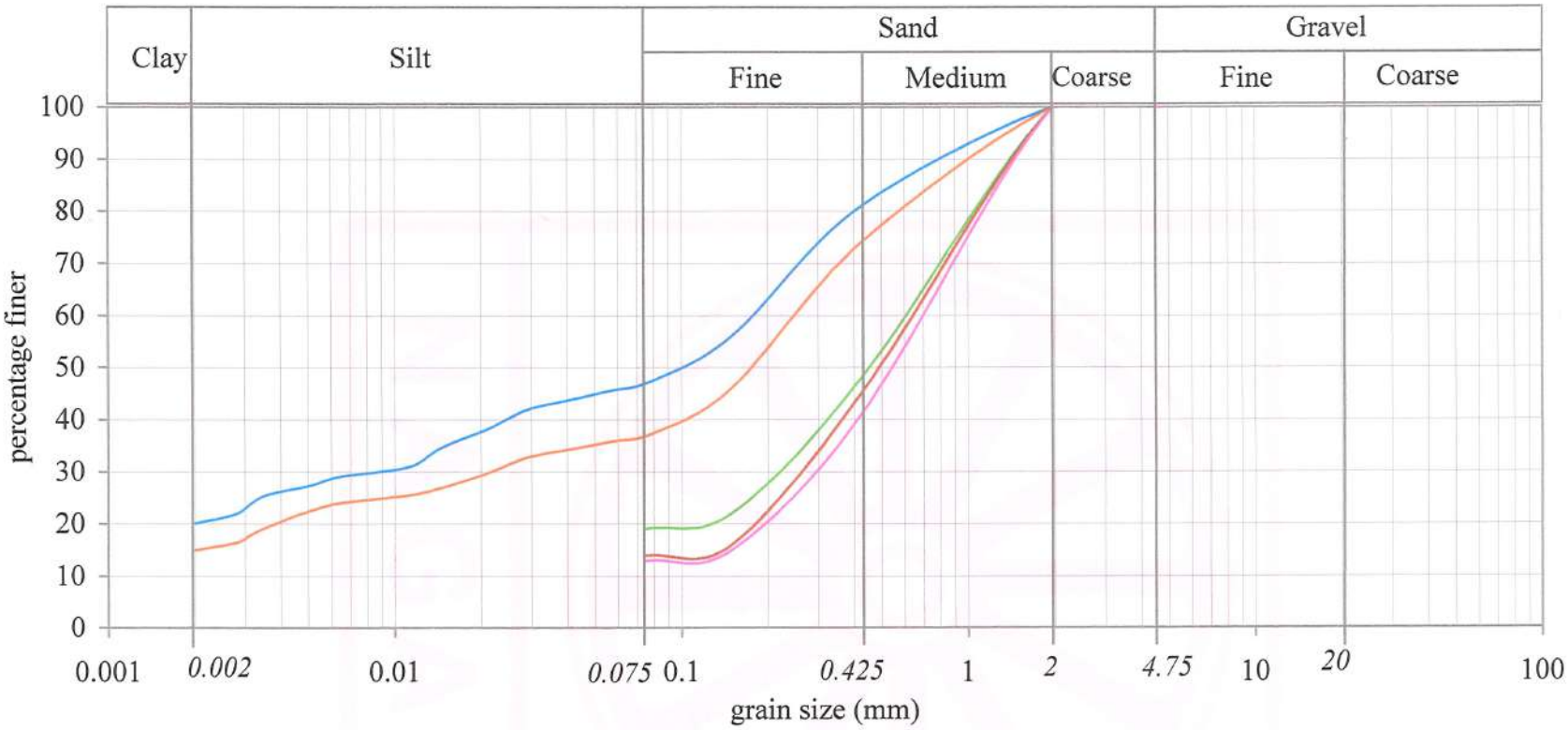
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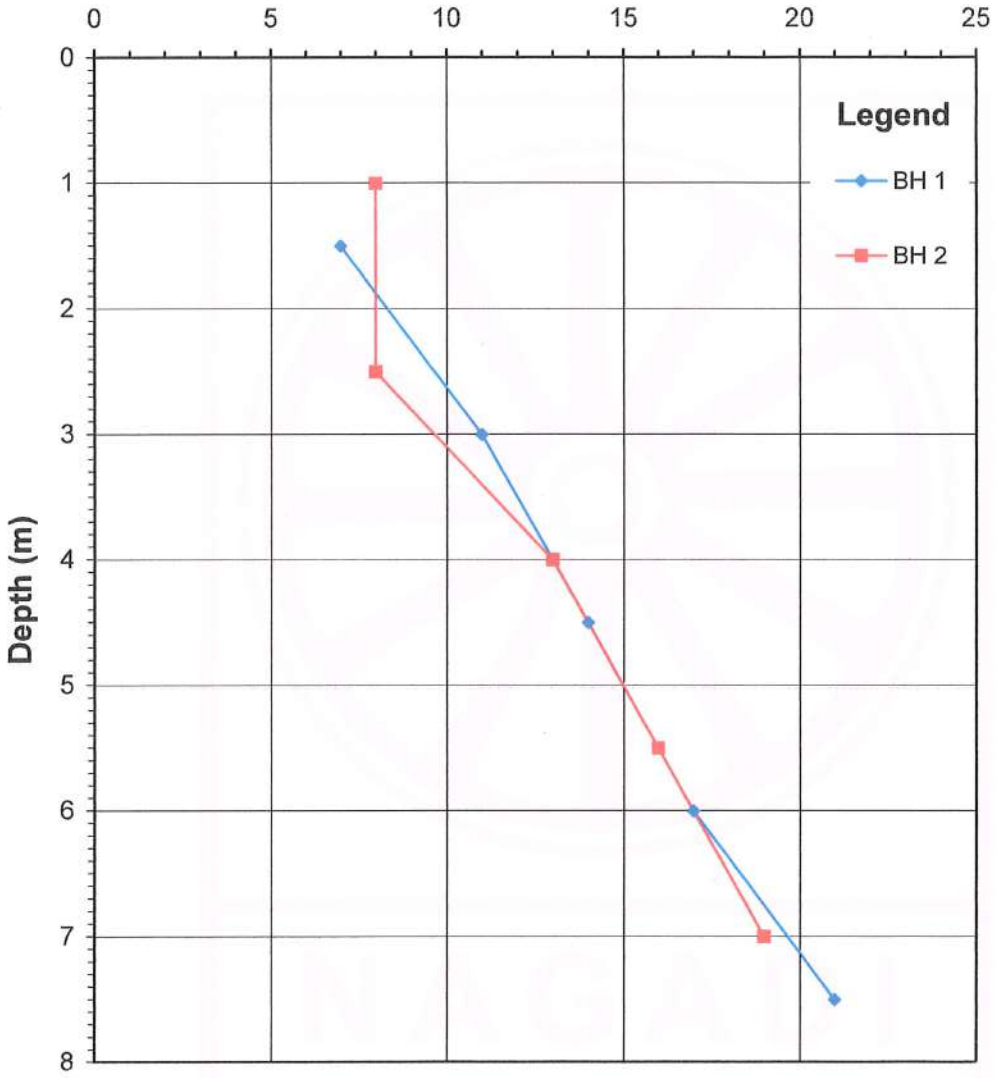
Job No. : G(C)9884

Sheet No. : 3b




| Line Style | Bore hole | Depth (m) | Description | Gravel (%) | Sand (%) | Silt (%) | Clay (%) | $d_{60}$ | $d_{10}$ | U |
|---|---|---|---|---|---|---|---|---|---|---|
| | 2 | 1.0 | Clayey silty sand | 0 | 53 | 27 | 20 | 0.180 | - | - |
| | 2 | 2.5 | Clayey silty sand | 0 | 63 | 22 | 15 | 0.250 | - | - |
| | 2 | 4.0 | Silty sand | 0 | 81 | 19 | 0 | 0.600 | - | - |
| | 2 | 5.5 | Silty sand | 0 | 86 | 14 | 0 | 0.640 | - | - |
| | 2 | 7.0 | Silty sand | 0 | 87 | 13 | 0 | 0.700 | - | - |
| | | | | | | | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | |

## SPT Values (Observed)




**SPT Values (Observed) Vs Depth Curves**


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