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**SOIL INVESTIGATION REPORT FOR THE PROPOSED CONSTRUCTION OF RCC ROOF STILT + 5 FLOORS APARTMENT BUILDING IN S.F.NO: 270/5A2 AT SARAVANAMPATTY VILLAGE, COIMBATORE NORTH TALUK AND COIMBATORE DISTRICT.**

# SOIL INVESTIGATION REPORT

Client:

**M/s. Quanttum Infra Developers Private Limited.,**
Coimbatore.

By

THE COIMBATORE DIGITAL SURVEYORS
30, Second Main Road, Anna Nagar,
Peelamedu (Post),
Coimbatore – 641 004
Tamil Nadu, India
Phone: 9790030071 / 9790090051

June 2023

**THE COIMBATORE DIGITAL SURVEYORS**
*(Specialised in Digital & GPS Survey)*

GSTIN No.: 33BLJPS8355R1Z2

30, Anna Nagar,
Second Main Road,
Peelamedu (Post)
Coimbatore – 641 004
Phone: 9790030071/9790090051
Email: digitalsurvey@gmail.com

Date: 17-06-2023

To

**M/s. Quanttum Infra Developers Pvt Ltd.,**
Coimbatore.

Dear Sir,

**Ref:** Soil / S012 / 2022-2023 / dated 09-06-2023

**Sub:** Proposed Construction of RCC Roof Stilt + 5 Floors Apartment Building in S.F.No: 270/5A2 at Saravanampatty Village, Coimbatore North Taluk and Coimbatore District. Soil Testing Report- Reg.

We take pleasure in submitting the report on Proposed Construction of RCC Roof Stilt + 5 Floors Apartment Building in S.F.No: 270/5A2 at Saravanampatty Village, Coimbatore North Taluk and Coimbatore District. The report describes various soil properties and design parameters for the site. It is hoped that the results presented in this report will provide all the information required for the design of foundations for the proposed structure.

Thanking you,

For Coimbatore Digital Surveyors,

THE COIMBATORE DIGITAL SURVEYORS CBE

Authorized Signatory

# SOIL INVESTIGATION REPORT DETAILS

| | |
|---|---|
| CLIENTS | **: M/s. Quanttum Infra Developers Pvt Ltd.,** Coimbatore. |
| LOCATION | : S.F.No: 270/5A2, Saravanampatty Village, Coimbatore North Taluk, Coimbatore District. |
| STATE | : Tamil Nadu |
| TYPE OF BUILDING | : RCC Roof Apartment Building (Stilt+5) |
| SITE INSPECTION DATE | : 08th June 2023 |
| DATE OF TEST | : 09th June 2023 |
| NATURE OF TEST | : Engineering Status |

# 1 Introduction

Geotechnical Investigation for the **"PROPOSED CONSTRUCTION OF RCC ROOF STILT + 5 FLOORS APARTMENT BUILDING IN S.F.NO: 270/5A2 AT SARAVANAMPATTY VILLAGE, COIMBATORE NORTH TALUK AND COIMBATORE."** was carried out by **THE COIMBATORE DIGITAL SURVEYORS**, COIMBATORE.

# 2 Scope of Work

- One borehole is drilled through mechanically operated rotary drilling machine. Location and depth of borehole represented by client.
- Proposed construction of **Apartment building** up to hard strata for preliminary identification of type and extent of soil layers.
- The Safe Bearing Capacity of layers at different depth is based on Standard Penetration test values which are conducted in the bore holes at regular intervals.
- Submitting geotechnical investigation report for the above project based on field and laboratory test results and recommendation of suitable foundation systems based on as per IS-1892 and IS -2720.

# 3 Field work

Field investigations were carried out through mechanically operated rotary drilling machine in mention location.

## 3.1 Drilling through soil medium

### 3.1.1 ROTARY BORING

Rotary drilling technique was adapted using Rotary drilling machine in the proposed project. In this method, boring is effected by the cutting action of a rotating bit that is kept in firm contact with the bottom of the hole. The bit is attached to the lower end of a hollow drill rod that is rotated by a suitable chuck. Drilling mud (usually Bentonite) is continuously forced down the hollow drill rods. The mud returning upwards though the annular space between the drill rods and the side of the hold bring the cutting to the surface.

### 3.1.2. STANDARD PENETRATION TEST

It is now most commonly used in site test. The test measures the penetration resistance of the split spoon sampler, when it is driven into the soil, at the bottom of a borehole in a standard manner. The N-value, which is the number of blow required to achieve 300mm penetration of the soil, indicates the relative density of sand or gravel, the consistency of other soil such as silts or clays and the strength of weak rocks. The test is described in IS 2131 - 1981. The split spoon sampler is attached to stiff drill rod and lowered to the bottom of the bore hold. A standard blow consists of dropping a mass of 63.5kg free fall through 750 mm on to an anvil at the top of the rods and ensuing that this amount of dynamic energy is transferred to the sampler as much as possible.

The number of blows required to achieve each 150mm penetration is recorded for a fall penetration of 450mm. The initial 150mm penetration is referred to as seating drive and the blows required for this penetration are not considered as this zone is in disturbed soil. The next 300mm of penetration is referred to as the test drive and the number of blows required to achieve this fully is termed the penetration resistance or N-value. The SPT results are given in the annexure

## 4. SAMPLING:

The disturbed samples were collected through SPT sampler and undisturbed samples were collected through brass tube, properly waxed on both sides then sent to laboratory for analysis.

### 4. 1 LABORATORY TESTS

Following laboratory tests are conducted as per IS codes.

a. Sieve analysis- IS 2720 Part 4
b. Specific gravity –IS 2720-Part 3/Sec 1
c. Unconfined compressive strength-IS 2720-Part 10
d. Direct Shear test-IS 2720 Part 13 & Part 39 Sec 1
e. Natural Moisture Content-IS 2720 Part 2
f. Soil classification as per IS 1498-1970

## 5. Subsoil Conditions

The soil conditions at this site found through Standard Penetration Test samples N Values are obtained. The One borehole is terminated at a maximum depth of 10.00M from Natural Ground level which are shown in bore logs.

## 6. Engineering Appraisal

Based on Laboratory results on the samples collected from investigation locations, the shear strength parameters such as C (Cohesive Strength) and Φ (angle of internal friction) can be correlated with SPT values.

## 7. Design Methodology

The Safe Bearing Capacity of the soil can be calculated on Shear failure Criteria and Settlement Criteria and any foundation system has to satisfy the above said criteria. The former one depends on shear strength and the bearing capacity equation suggested by IS 6403 as follows.

Net ultimate Bearing Capacity is given by

$$C\ Nc\ Sc\ dc\ ic + \gamma\ D\ (Nq - 1)\ Sq\ dq\ iq + 0.5\ \gamma\ B\ N\gamma\ S\gamma\ d\gamma\ i\gamma\ W'$$

The Safe Bearing Capacity is the maximum gross intensity of loading that the soil can carry safely without failing in shear which is obtained by the Net ultimate Bearing Capacity divided by factor of safety (2.5 to 3.0)

The later one follows Settlement Criteria, that the intensity of the loading will cause within the permissible settlement is termed as allowable bearing pressure given by

Safe bearing capacity (SBC) = $1.4\ (N-3)\ \{(B+0.3)/2B\}^2$ X RW X S+P Where,

N = Corrected N value N2

B = Width of Foundation = constant 1

RW = Water Correction, If water table at

founding level is 0.5 and 1.0 for not occur.

FD = Depth of Factor = constant 1

P = Over Burden Pressure

S = Permissible settlement

**8. Safe Bearing Capacity**

The recommended safe bearing capacity at various depth based on SPT results are tabulated in the annexure.

**9. Depth of Foundation**

Minimum depth of foundations is governed by the following factors:

- Avoid Top loose zone.
- Adequate depth of soil above founding level, to ensure mobilization of full safe bearing Capacity.
- Adequate depth of soil strata below founding level of requisite strength to mobilize the safe bearing capacity and at the same time restricts the total and differential settlements within the allowable limits.

**10. FOUNDATION RECOMMENDATIONS:**

The site for **SOIL INVESTIGATION REPORT FOR THE PROPOSED CONSTRUCTION OF RCC ROOF STILT + 5 FLOORS APARTMENT BUILDING IN S.F.NO: 270/5A2 AT SARAVANAMPATTY VILLAGE, COIMBATORE NORTH TALUK AND COIMBATORE."** The borehole investigation was conducted and SBC was determined.

| Bore Hole | Type of Footing | Size of Footing in m | Depth in m below NGL | SBC of soil Based on N – Value T/$m^2$ |
|---|---|---|---|---|
| 1 | Isolated Footing | 1.50 X 1.50 | 3.00 M | 31.00 |

NOTE: **Recommended SBC of soil is 30.00T/$m^2$ at 3m depth.**

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**MODEL CALCULATION:**
**COMPUTATION OF BEARING CAPACITY AS PER IS: 6403:1981**

**1 Geometrical Data :**

| | | |
|---|---|---|
| Shape considered for bearing capacity design | SQUARE | |
| Length of footing | 1.50 | m |
| Size of Footing (B) | 1.50 | m |
| Breadth to Length Ratio of Foundation (B/L) | 1.00 | |
| Depth of Foundation below E.G.L. ($D_f$): | 3.00 | m |
| Inclination of Vertical Load with the Vertical (a) | 0.00 | Deg. |

**2 Soil Data :**

| | | |
|---|---|---|
| Type of Bearing Strata : | SDR | |
| Design SPT **"N"** value of the Bearing Strata: | 50 | |
| Type of Shear Failure: | General | |
| Design Angle of Shearing Resistance | 31.00 | Deg. |
| Cohesive Strength | 0.00 | $kN/m^2$ |

**3 Design Parameters:**

| | | |
|---|---|---|
| Saturated Density of Soil above the foundation depth ($\gamma_{bulk}$) | 16.00 | $kN/m^3$ |
| Submerged Density of Soil ($\gamma'=\gamma_{bulk}-\gamma_w$) | 6.19 | |
| Effective Overburden pressure at foundation level ($q = \gamma'*D_f$) | 18.57 | $kN/m^2$ |
| Water Table Correction Factor (w') | 0.50 | |

**Bearing Capacity Factors:**

| | |
|---|---|
| $N_c$ = | 33.34 |
| $N_q$ = | 21.38 |
| $N_r$ = | 27.53 |

**Shape Factors:**

| | |
|---|---|
| $S_c$ = | 1.30 |
| $S_q$ = | 1.20 |
| $S_r$ = | 0.80 |

**Depth Factors :**

| | |
|---|---|
| $D_c$ = | 1.62 |
| $D_q$ = | 1.31 |
| $D_r$ = | 1.31 |

**Inclination Factor:**

| | |
|---|---|
| $I_c$ = | 1.00 |
| $I_q$ = | 1.00 |
| $I_r$ = | 1.00 |

**4 Ultimate Bearing Capacity (Qu) :(General Shear Failure)**

**Based on N Value:**

| | | |
|---|---|---|
| Qu =q (Nq – 1) Sq x dq x iq + 0.5 x B x γ x Nγ x Sγ x dγ x iγ x W` | 769.42638 | $kN/m^2$ |

**Safe Bearing Capacity (Qsafe) :**

| | | |
|---|---|---|
| Factor of Safety (F.S.) : | 2.50 | |
| Qsafe : | 307.77 | $kN/m^2$ |
| Qsafe : | 31.38 | $t/m^2$ |

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# SOIL TEST RESULTS

**Name of work: SOIL INVESTIGATION REPORT FOR THE PROPOSED CONSTRUCTION OF RCC ROOF STILT + 5 FLOORS APARTMENT BUILDING IN S.F.NO: 270/5A2 AT SARAVANAMPATTY VILLAGE, COIMBATORE NORTH TALUK AND COIMBATORE."**

| THE COIMBATORE DIGITAL SURVEYORS, COIMBATORE. | BORE NUMBER - 1 | LOCATION: NORTH EAST | GROUND WATER LEVEL:NIL | WORK COMMENCED ON 09/06/2023 | WORK COMPLETED ON 09/06/2023 |
|---|---|---|---|---|---|

| SOIL PROFILE AND DEPTH IN METRES | DEPTH OF SAMPLING | IS SOIL CLASSIFICATION | NATURAL WET DENSITY | NATURAL MOISTURE CONTENT % | INDEX TEST | | | SIEVE ANALYSIS % RETAINED IS SIEVE ANALYSIS | | | | | | SPECIFIC GRAVITY | SHEAR TEST | | STANDARD PENETRATION TEST | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | LIQUID LIMIT % | PLASTIC LIMIT % | PLASTICITY INDEX | GRAVEL | COARSE SAND | MEDIUM SAND | FINE SAND | SILT | CLAY | | COHESION C Ton / $M^2$ | ANGLE OF INTERNAL FRICTION $^0$ | DEPTH OF TESTING M | OBSERVED N VALUE | CORRECTED N VALUE | SAFE BEARING CAPACITY $T/m^2$ |
| | | FS | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 1.50 | - | - | - |
| | 1.50 | | | | | | | | | | | | | | | | 2.50 | >50 | 50.00 | 35.83 |
| | | | | | | | | | | | | | | | | | 3.50 | >50 | 50.00 | 36.88 |
| | | | | | | | | | | | | | | | | | 4.50 | >50 | 50.00 | 37.93 |
| | | | | | | | | | | | | | | | | | 5.50 | >50 | 50.00 | 38.98 |
| | | WR | | | | | | | | | | | | | | | 6.50 | >50 | 50.00 | 40.03 |
| | | | | | | | | | | | | | | | | | 7.50 | >50 | 50.00 | 41.08 |
| | | | | | | | | | | | | | | | | | 8.50 | >50 | 50.00 | 42.13 |
| | | | | | | | | | | | | | | | | | 9.50 | >50 | 50.00 | 43.18 |
| | | | | | | | | | | | | | | | | | 10.50 | >50 | 50.00 | 44.23 |
| | | | | | | | | | | | | | | | | | 11.50 | >50 | 50.00 | 45.58 |
| | 11.50 | | | | | | | | | | | | | | | | | | | |

| Depth (m) | Core Recovery (%) | Rock Quality Designation (%) | Ultimate crushing strength (mpa) |
|---|---|---|---|
| 1.50-2.50 | SMALL PIECES RECOVERY | SMALL PIECES RECOVERY | - |
| 2.50-3.50 | | | - |
| 3.50-4.50 | | | - |
| 4.50-5.50 | | | - |
| 5.50-6.50 | | | - |
| 6.50-7.50 | | | - |
| 7.50-8.50 | | | - |
| 8.50-9.50 | | | - |
| 9.50-10.50 | | | - |
| 10.50-11.50 | | | - |

FS-FIILING SOIL, WR-WEATHERED ROCK, SBC based on SPT N value. NP – Non plastic.

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# FIELD BORE LOG REPORT

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Name of Work | SOIL INVESTIGATION REPORT FOR THE PROPOSED CONSTRUCTION OF RCC ROOF STILT + 5 FLOORS APARTMENT BUILDING IN S.F.NO: 270/5A2 AT SARAVANAMPATTY VILLAGE, COIMBATORE NORTH TALUK AND COIMBATORE. | | | | | | |
| Name of Contractor | THE COIMBATORE DIGITAL SURVEYORS, COIMBATORE. | | | | | | |
| Name of Client | M/s. QUANTTUM INFRA DEVELOPERS PRIVATE LIMITED., | | | | | | |
| Type of Bore: | Rotary Circular Drilling | | | | CH :- | - | |
| Period: | 09-06-2023 | | | | RL:- | - | |
| Bore No : | 1 | LAT: | 11.070521 | LONG: 77.001054 | Water Table in Metre : | NOT MET | |
| LOCATION | NORTH EAST | | | | Weather Condition: | SUNNY | |

| Graphic Log | Depth in Metre | Soil Description | Thickness of each soil Layers in metre | Depth in metre | Standard Penetration Test (SPT) Data IS : 2131 - 1981 | | | | Soil Collection | | Rock Samples IS : 11315 (Part. 11) -1985 | | Graphical Representation of Penetration Resistance ( SPT in No. of Blows / 30 cm Penetration ) Depth Vs Blows | Remarks |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | 0.0 - 15.0 Cms | 15.0 - 30.0 Cms | 30.0 - 45.0 Cms | SPT Value in No.of Blows/Cms | UDS/DS | IS CLASSIFICATION | Percentage of Rock Core Recovery | Percentage of Rock Quality Designation (RQD) | | |
| | **1.50** | **FILLING SOIL** | **1.50** | 1.50 | - | | | | - | FS | - | - | 0 20 40 60 80 100 | **ABBREVIATIONS : GL -Ground Level . DS -Disturbed Soil .UDS -Undisturbed Soil .RB -Rebound .WS -Washing Sample** |
| | | **WEATHERED ROCK** | **10.00** | 2.50 | SMALL PIECES-4 | | | | DS | WR | - | - | | |
| | | | | 3.50 | SMALL PIECES-3 | | | | DS | | - | - | | |
| | | | | 4.50 | SMALL PIECES-5 | | | | DS | | - | - | | |
| | | | | 5.50 | SMALL PIECES | | | | DS | | - | - | | |
| | | | | 6.50 | SMALL PIECES-5 | | | | DS | | - | - | | |
| | | | | 7.50 | SMALL PIECES | | | | DS | | - | - | | |
| | | | | 8.50 | SMALL PIECES | | | | DS | | - | - | | |
| | | | | 9.50 | SMALL PIECES | | | | DS | | - | - | | |
| | | | | 10.50 | SMALL PIECES | | | | DS | | - | - | | |
| | **11.50** | | | 11.50 | SMALL PIECES-3 | | | | DS | | - | - | | |

**Bore Terminated at 10.00m from EGL**

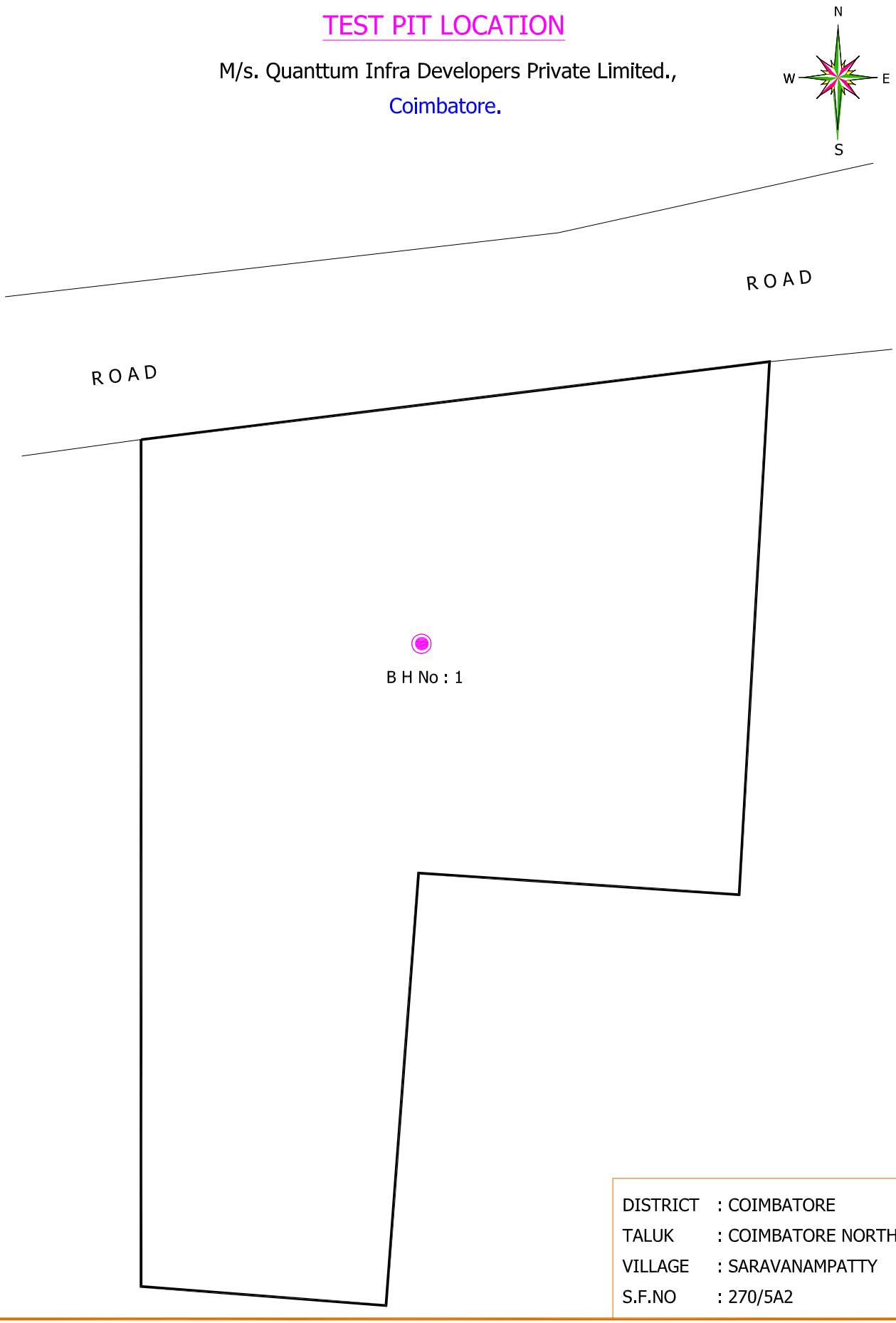
| | | | | |
|---|---|---|---|---|
| **Note :** | **1.The bore has been closed as per the field officers instruction.** | | **4. Number of Soft Rock Core Bits ... ... .** | - |
| | **2. Number of Disturbed Samples ( DS )... ... ... .....** | **10** | **5. Number of Hard Rock Core Bits ... .... ...** | - |
| | **3. Number of Undisturbed Soil Samples ( UDS ) ... ... .....** | - | **6. Soft / Hard Rock Core Dia ( Ø ) ... .. ....** | - |

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# TEST PIT LOCATION

M/s. Quanttum Infra Developers Private Limited.,

Coimbatore.



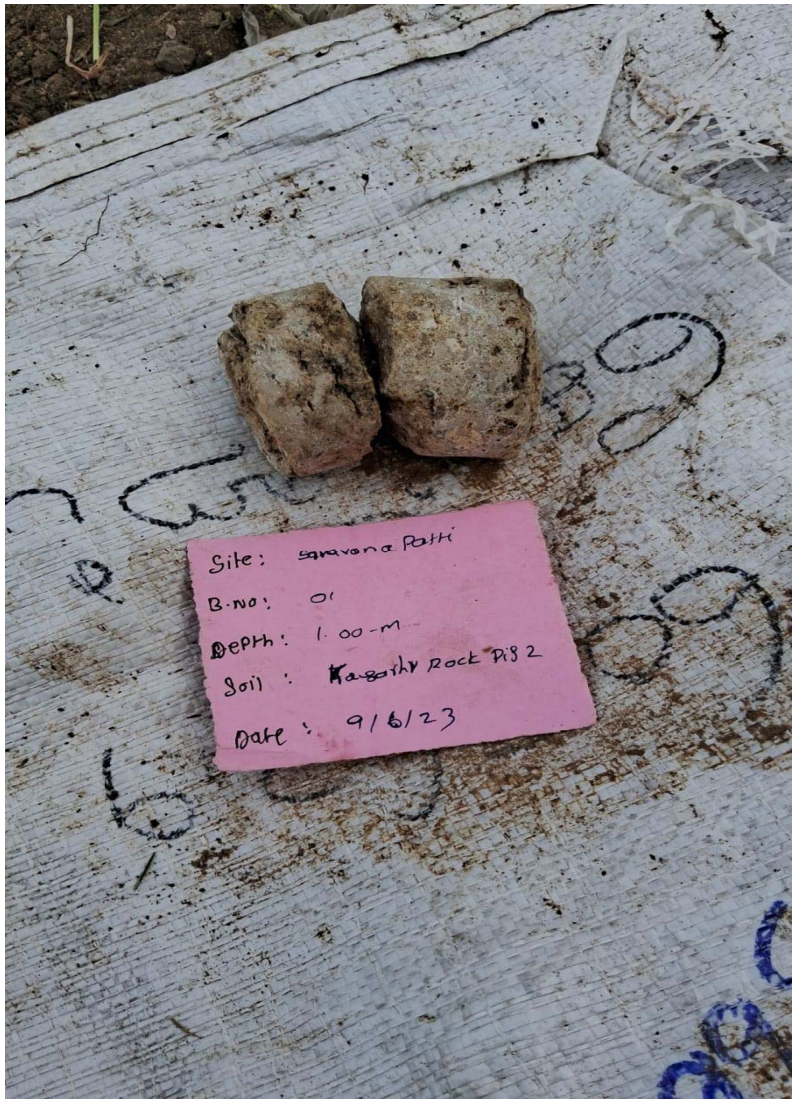

| | |
|---|---|
| DISTRICT | : COIMBATORE |
| TALUK | : COIMBATORE NORTH |
| VILLAGE | : SARAVANAMPATTY |
| S.F.NO | : 270/5A2 |

# SITE IMAGES

**Name of work:** SOIL INVESTIGATION REPORT FOR THE PROPOSED CONSTRUCTION OF **RCC ROOF STILT + 5 FLOORS APARTMENT BUILDING IN S.F.NO: 270/5A2 AT SARAVANAMPATTY VILLAGE, COIMBATORE NORTH TALUK AND COIMBATORE**.



SPT IMAGE




ROCK SAMPLE



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