Verified RealEstate™

Your trusted partner for buying, selling, and managing property, ensuring hassle-free service with 100% transparency.

3/350/2 Mettukuppam,
OMR Thoraipakkam,
Chennai, India

hello@verified.realestate
+91 9996 12 9996

Official Property Record

Digitally Verified Record - Powered by Verified RealEstate™



GEO BUILD ENGINEERING INDIA PVT LTD

Plot No.53 & 54, Lakshmi Nagar, 5th Street, Madipakkam, Chennai-600091.
Website: www.geobuildengineering.in

GEOTECHNICAL INVESTIGATION REPORT

PROJECT: **GEOTECHNICAL INVESTIGATION REPORT FOR THE PROPOSED CONSTRUCTION OF RESIDENTIAL BUILDING (STILT+5 FLOOR) AT OLD NO: 32, NEW NO.74, 2ND MAIN ROAD, R.A. PURAM, CHENNAI-600028.**

CLIENT: ***M/s. SWATHI BUILDERS,***

GBE/23-24/059	06.01.2023	Submission for Design of Foundation		
REV	DATE	Description	GT ENG.	P.G.T ENG.

TELANGANA BRANCH OFFICE:
No1, Fathimapur 1st Cross Street, Fathimapur, Kothur Mandal. Ranga Reddy Dist. Telangana -509325.
9791236504, 9791216286

KARNATAKA BRANCH OFFICE:
#01, Ground Floor, 1st Main Road, 2nd cross, Vinayaka Nagar, Bagalur Cross, Yelahanka, Bangalore - 560064.
9841213334,7871691757

KERALA BRANCH OFFICE:
T.C 21/1866 (1), Punartham, Nedumcade, Karamana, Trivandrum (Dist), Kerala -695002.
9092244333, 9739854231

TABLE OF CONTENTS

Sl.No.	Table of Content	Page No
1.	Introduction	1
2.	Scope of Work	1
3.	Exploration Program & Techniques	2
4.	Laboratory Testing Program	3
5.	Sub Surface Soil Description	4
6.	Ground Water	5
7.	Foundation Recommendations	5
8.	Pile Foundation	5
9.	General Guidelines in Soil Filling	7
10.	Excavation	7
11.	Drainage	8
12.	Certification	9
Appendix	**Table of Content**	
A	Key plan of Boreholes	11
B	Bore Log & Sub Soil Profile	12
C	Laboratory Test Results	18
	Reference	24

INTRODUCTION

This report presents the results of the geotechnical investigations carried out by Geo Build Engineering India Private Limited - Geotechnical & Foundation Engg Division. A detailed soil investigation was requested by the client for obtaining the soil profile and recommendation of the most suitable foundation system for the proposed construction of the Residential Building. This report comprises the details of soil investigation, analysis of field and lab test results and recommendation of the most suitable foundation system. The site is for the Geotechnical Investigation report for the proposed construction of Residential Building (Stilt+5 floors) at Old No: 32, New No: 74, 2nd Main Road, R. A. Puram, Chennai-600028.

This work was authorized by. M/s. Swathi Builders.

Standard Penetration Testing boreholes were drilled at the site up to a maximum depth of 30.0 m below existing ground level. The investigation consists of drilling three boreholes, soil sampling, field and laboratory testing and preparation of a Geotechnical Investigation report

The proposed site has plain terrain in which the borehole has been tested. The site was cleaned while the start of a geotechnical investigation. The total number of boreholes has been decided as three number as agreed by the Client and the Consultant. The borehole has been located in the maximum loaded area of the proposed site; the locations of the borehole were chosen by the Client. The location of a borehole is shown in the borehole location drawing. The nature of field tests includes standard penetration tests, disturbed sampling through split spoon sampler as per GBEI/QSP/08, identification of different soil layers and location of groundwater table complete logging of the borehole etc. The depth of the borehole terminated to a maximum depth of 30.0 m from EGL.

SCOPE OF WORK

The scope of this investigation is to:

i) To determine the probable subsurface conditions such as stratification, denseness or hardness of the strata, the position of the groundwater table etc.
ii) To give a probable range of safe bearing capacity for the structure. To accomplish these purposes, the study was conducted in the following phases.
iii) Drilling boreholes in order to determine site stratification and to collect disturbed & undisturbed soil samples for laboratory testing.
iv) Testing on selected soil samples in the laboratory to determine the physical and engineering properties of the soil samples.

v) Analysing all field and laboratory data in order to develop engineering recommendations for foundation design.

Three boreholes were drilled to a maximum depth of 30.0 m. Soil samples were collected for visual identification, classification and laboratory testing. The Key Plan of the borehole is presented in Appendix ~A~, the bore log subsoil profile is presented in Appendix ~B~, the laboratory test results are given in Appendix ~C~

EXPLORATION PROGRAM & TECHNIQUES

After the visual inspection of the site, the subsurface investigation was carried out as mentioned below:

Three exploration boreholes were drilled to a maximum depth of 30.0 m.

BH - 1 was started on 30.12.2023 and completed on 01.01.2024

BH - 2 was started on 26.12.2023 and completed on 28.12.2023

BH - 3 was started on 02.01.2024 and completed on 03.01.2024

Rotary drilling was performed using water as drilling fluid in the subsoil with a casing pipe to stabilize the borehole up to the required depth. Field testing and sampling were conducted in accordance with IS: 2131-1981. Standard Penetration Test (SPT) was performed on the subsoil. In this test, a standard split spoon length of about 450 mm and cutting-edge diameter of 51/35 mm initially penetrates the soil for 15cm to bypass the expected accumulated sludge at the bottom of the hole by means of a 63.5 kg (140 lb) hammer falling freely along with a guide from a height of 750 mm. The total number of rows of blows (N) required, advancing the spoon into the bore, for another two successive 15cm (a total of 30 cm) is recorded as a measure of the soil relative density or consistency as given in Table ~A~ Along with, for further drilling using NX impregnated Tungsten Carbide cutter to be used to a depth till Weathered rock and NX impregnated Diamond cutter to be used in case of hard rock.

The fieldwork was carried out under Geo Build Engineering India Pvt Ltd. and a representative from the client in accordance with Indian Standard mentioned earlier. The drilling rig was used for the exploration of a calyx rig with the hand-operated machine, so the SPT was done manually on inspection of our engineer.

Soil Conditions at the site for proposed buildings were explored by BH 1, BH 2 and BH 3. Boring location details are presented on bore log. The boring's number and location was selected to

cover the proposed built up area with due consideration to the presence of Stilt+5 floors buildings. BH 1, BH 2 and BH 3 were drilled in the front open space of the site. BH 1, BH 2 and BH 3 were drilled 30.0 m below EGL and terminated at confirmed hard strata with SPT "N">= 100 in three successively. Borings were drilled beyond 10.0 m depth due to the presence of layers of loose sand soil and weak soil layers between 2.0 m and 10.0 m. Tests were conducted to determine the pertinent index and engineering analyses to develop the required design data.

LABORATORY TESTING PROGRAM

All the extracted soil samples were brought to the Geotechnical & Materials Testing Laboratory of Geo Build Engineering for further examination in accordance with IS: 1498-1970. Collected samples were subjected to the following physical tests.

Disturbed soil samples (DS):

1. Natural Moisture Content (IS: 2720 Part 2-1973)
2. Atterberg Limits (IS: 2720 Part V — 1985)
3. Grain Size Analysis (IS: 2720 Part IV — 1985)
4. Differential Free Swell Test (IS: 2720 part 40 -1977)
5. Specific gravity (IS: 2720 part 3/sec1)-1980

Undisturbed soil samples (UDS):

1. Unconfined Compression Test (IS 2720 (Part 10): 1991)
2. Direct Shear Test (IS-2720-PART-13-1986)
3. Tri-axial Shear Test (IS 2720-11 (1993)
4. Consolidation Test on Clay (IS:2720(Part 15)-1986)

LABORATORY TESTS ON ROCKS

1. Bulk Density
2. Point Load Test
3. Unconfined compressive strength
4. Brazilian Test

CHEMICAL ANALYSIS ON SOIL (IS 2720:P-26) AND WATER (IS 3025:P-11)

1. Sulphate Content (SO4)
2. Chloride Content (Cl)

3. pH Value

The laboratory test results are given in Appendix ~C~.

SUBSURFACE SOIL DESCRIPTION

Borehole no: 1

In the case of BH-1, Brownish Silty Sand is followed by Pinkish Grey Highly Weathered Rock. The index and shear strength properties of soil collected at BH 1 in different depths were listed in the Laboratory test results. The borehole was terminated at 30.0 m depth from the existing ground level (EGL). The groundwater table was located at a depth of 3.65 m below the existing ground level. The stratum is Medium Dense at the top and very dense at a maximum depth of 30.0 m. At a depth of 25.5 m to 30.0 m rock strata, the RQD was found to be less than 10%. It indicates the quality of rock is very poor, so this rock strata are treated as gravel.

Borehole no: 2

In the case of BH-2, Brownish Sand is followed by Blackish Highly Weathered Rock. The index and shear strength properties of soil collected at BH 2 in different depths were listed in the Laboratory test results. The borehole was terminated at 30.0 m depth from the existing ground level (EGL). The groundwater table was located at a depth of 3.65 m below the existing ground level. The stratum is Medium Dense at the top and very dense at a maximum depth of 30.0 m. At a depth of 28.5 m to 30.0 m rock strata, the RQD was found to be less than 10%. It indicates the quality of rock is very poor, so this rock strata are treated as gravel.

Borehole no: 3

In the case of BH-3, Brownish clay followed by greyish Highly Weathered Rock. The index and shear strength properties of soil collected at BH 3 in different depths were listed in the Laboratory test results. The borehole was terminated at 30.0 m depth from the existing ground level (EGL). The groundwater table was located at a depth of 3.65 m below the existing ground level. The stratum is Soft at the top and very dense at a maximum depth of 30.0 m. At a depth of 27.0 m to 30.0 m rock strata, the RQD was found to be less than 10%. It indicates the quality of rock is very poor, so this rock strata are treated as gravel.

GROUNDWATER

The groundwater table was observed at the depth of 3.65 m for all the boreholes from the existing ground level during the time of field investigation. However, it will fluctuate due to seasonal variations and local sewerage disposal practices. Groundwater level at the ground surface is assumed in the design of the foundation to consider the worst conditions (submerged Conditions).

FOUNDATION RECOMMENDATIONS

Based on the borehole information and laboratory test results in addition to the nature of the structure, the recommendations for the proposed structure are given below. Following is a summary of recommendations for a suitable type of foundation. One of the important aspects of any foundation system is to satisfy the settlement criteria apart from bearing capacity criteria. As per IS 8009 (part I) 1976 Sec 9.2 for the calculation of Immediate and Consolidation Settlement.

PILE FOUNDATION

Data from boring infer the presence of soil profiles with weak soil between 2.0 m and 10.0 m. For the proposed building with expected column loads and encountered soil profiles building with a shallow foundation will undergo high total settlements due to the consolidation of very soft clay and can experience sudden settlements in case of a design seismic event. Therefore, to minimize such problems it was recommended to provide a Tractor Mounted Direct Mud Circulation (DMC) Bored Cast In-Situ Pile foundation. This type of pile installation work will have low construction vibrations otherwise it may affect the existing adjacent building's foundations and also lead to objections from adjacent building owners. For this site it was recommended to provide 27.0 m and 25.0 m total and effective length of piles respectively below EGL with a top 1-M pile cut-off for pile caps and tie beams. All piles should have at least 1.5-m embedment into hard stratum weathered rock with SPT "N" >> 100.

PILE CAPACITY SPECIFICATION

Pile Length (m)	Effective Pile length below cut off level (m)	Pile diameter (mm)	Safe Load Carrying Capacity (kN)	Uplift Resistance (kN)
27	25	500	415.43	324.07
27	25	600	549.3	394.77
27	25	750	811	504.51

Note:-

1. Pile Load Test must be conducted as per relevant IS Code to confirm the above-estimated pile capacities before completion of the installation of all piles.
2. Pile Installation must be done with extreme care to prevent "Necking" and "Buldging" problems due to the presence of thick very soft to soft clay layers
3. Groundwater level was assumed to rise to ground level in worst-case conditions.
4. Limiting AA. End Bearing Pressure in "Hard Rock" as per IRC code was 500 tons/m^2. Therefore q_b (all) is limited to 300 tons/m^2 in shale

UPLIFT CAPACITY

The uplift capacity of piles shall be considered as per IS 2911-1-1, Clause 6.3.2

PILE GROUPING

The group efficiency shall be worked out based on the number of Piles in a group. Piles shall have a minimum spacing of 2.5 times diameter centre to centre or a minimum of 1.5 times diameter as clear spacing in order to mobilise frictional resistance, which is a key factor in achieving better Pile capacities. Larger spacing is always preferable, in case of bored piles.

PILE TESTING

The group efficiency shall be worked out based on the number of Piles in a group. However, Pile load tests are recommended to observe the performance of the Piles and to re-confirm the theoretical Pile capacities. Load tests are to be carried out after a minimum period of 1 week after driving Pile.

Pile load tests should be conducted by loading up to 1.5 times the service load on the working Pile, while a minimum of two (2) times the service load on Pilot Piles. A pile load test can be conducted for a minimum of 2 % of the total number of piles for the project.

DESCRIPTION OF PILE SOCKETING

- The pile is to be socketed into a minimum depth of 1.5 D in solid rock or weathered rock or as per IS 14593:1998 standards.
- Extreme care should be taken to wash the base of a borehole clean before depositing concrete.
- In the case of socketing in the fractured rock or weak rocks, it is possible to develop the full structural capacity of the pile by providing greater penetration into such rocks in order to carry some load in shear between concrete and the rock.

- Apart from the calculation for pile carrying capacities, a pile load test is to be conducted for accurate results.
- Beyond the critical depth, the values of overburden pressure are constant but we are restricted to a depth to critical depth alone so that the shaft resistance is very less when compared to end resistance.
- The skin friction in a clay layer might be developed completely after a certain period of time.
- In this, pile depth and distance vary from various boreholes so that the pile carrying capacities are calculated separately.
- The pile carrying capacities significantly implies that frictional resistance is greater than end bearing resistance which implies that it is a Bored cast in situ -friction pile.

GENERAL GUIDELINES IN SOIL FILLING

If the foundation material is fine soil (clay and silt) it should be stiff. If the foundation soil is coarse-grained (sand or gravel) it should be dense. Soft, loose, compressible, or organic topsoil is not acceptable for foundation soil and in such cases, the existing weak soil should be replaced up to stiff or dense soil strata below the foundation with well compacted good quality granular soil. The minimum width of a replacement shall be the length of reinforcement plus 1 meter and this will ensure that the foundation soil has sufficient bearing capacity to withstand bearing pressures in both static and as well as seismic conditions. The foundation may be located on the compacted granular soil fill.

GENERAL COMMENTS

The recommendations for foundation design and construction are based on the information obtained from the boreholes drilled at the site. When foundation construction is underway, the recommendations of this report should be checked through field inspection, to validate the information for use during the construction stage. Any variation in underground conditions revealed by the borehole should be brought to our attention for alternate recommendations if needed. The Professional Services performed for the preparation of a report were accomplished in accordance with current and locally accepted geotechnical engineering principles and practices. The recommendations presented in this report are based upon the data obtained from the borings at the indicated locations and/or from other information discussed in this report. In the case of pile foundation, the pile must be rested on the harder rock stratum, if the depth of 1.00m is not strong the pile has to be advanced to till the harder rock stratum.

EXCAVATION

Excavation through the overburdened soil can be carried out by conventional equipment such as dozers and poclain excavators. Under-excavation shall not be done, thereby not disturbing the

existing foundation. Since the proposed structure is nearby the existing building it should be careful that the existing foundation not be disturbed by any causes

DRAINAGE

It is recommended to design an effective rainwater drainage system to get rid of the consequences of the rainwater percolation into these layers. The site should be graded so as to direct rainwater and water away from all planned structures.

FOUNDATIONS ON FILLS

In such cases, the foundations have to be built under controlled conditions with proper compaction that can be designed as a normal foundation. Uncontrolled fills should be excavated and they should be either refilled with controlled fill or foundation should commence from Natural ground level. The Report and SBC calculation were completely based on the boreholes terminated; apart from this, any weak layer encountered during excavations should also be reported to Geo build engineering India Pvt Ltd

CERTIFICATION

This report is issued with the design of Pile Foundation along with The Geotechnical Investigation report for the proposed construction of Residential Building (Stilt+5 floors) at Old No: 32, New No: 74, 2nd Main Road, R. A. Puram, Chennai-600028. At this site, the number of a borehole (Three boreholes) and depth of exploration are also terminated to a maximum depth of 30.0 m. The report (Safe Bearing capacity) is mainly based on the investigation done in and around boreholes explored for Residential Building. The method to adopt a suitable method of Ground improvement techniques as per IS 13094:1992, before laying the foundation System. Enough care may be taken to design a suitable dewatering system while the construction of the foundation is in progress so that the bottom of the excavation and foundation layer shall be relatively dry. The water seeking trees around the proposed structure is also to be removed to avoid shrinkage cracks.

Yours Truly,

For GEO BUILD ENGINEERING INDIA PVT LTD

Er.S.Sakthi Raja, M.E (Geotech)
(Senior Engineer - Design)
CMDA Reg No - GTE/19/04/018

Er.K. Santhosh Kumar, M.E (Geotech)
(Engineer - Design)

CHENNAI METROPOLITAN DEVELOPMENT AUTHORITY
'ThalamuthuNatarajan Building', No.1, Gandhi Irwin Road,
Egmore, Chennai-600 008.

PROFESSIONAL REGISTRATION CERTIFICATE

This is to certify that the **Thiru S.SAKTHI RAJA** has enrolled as **Registered Geo-Technical Engineer (RGTE)** with Chennai Metropolitan Development Authority (CMDA) who has the qualification of **M.E.,(Soil Mechanics & Foundation Engg.)** and experience in the relevant field for **7 years**.

He has been given the Registration No.**GTE/19/04/018** on **08.04.2019.** He shall be required to comply with the duties and responsibilities prescribed by the Government of Tamil Nadu in Part-V, "Registration of Professionals", Tamil Nadu Combined Development and Building Rules, 2019 approved vide G.O.(Ms) No.18 MAWS (MA1) Dept. dated 04.02.2019.

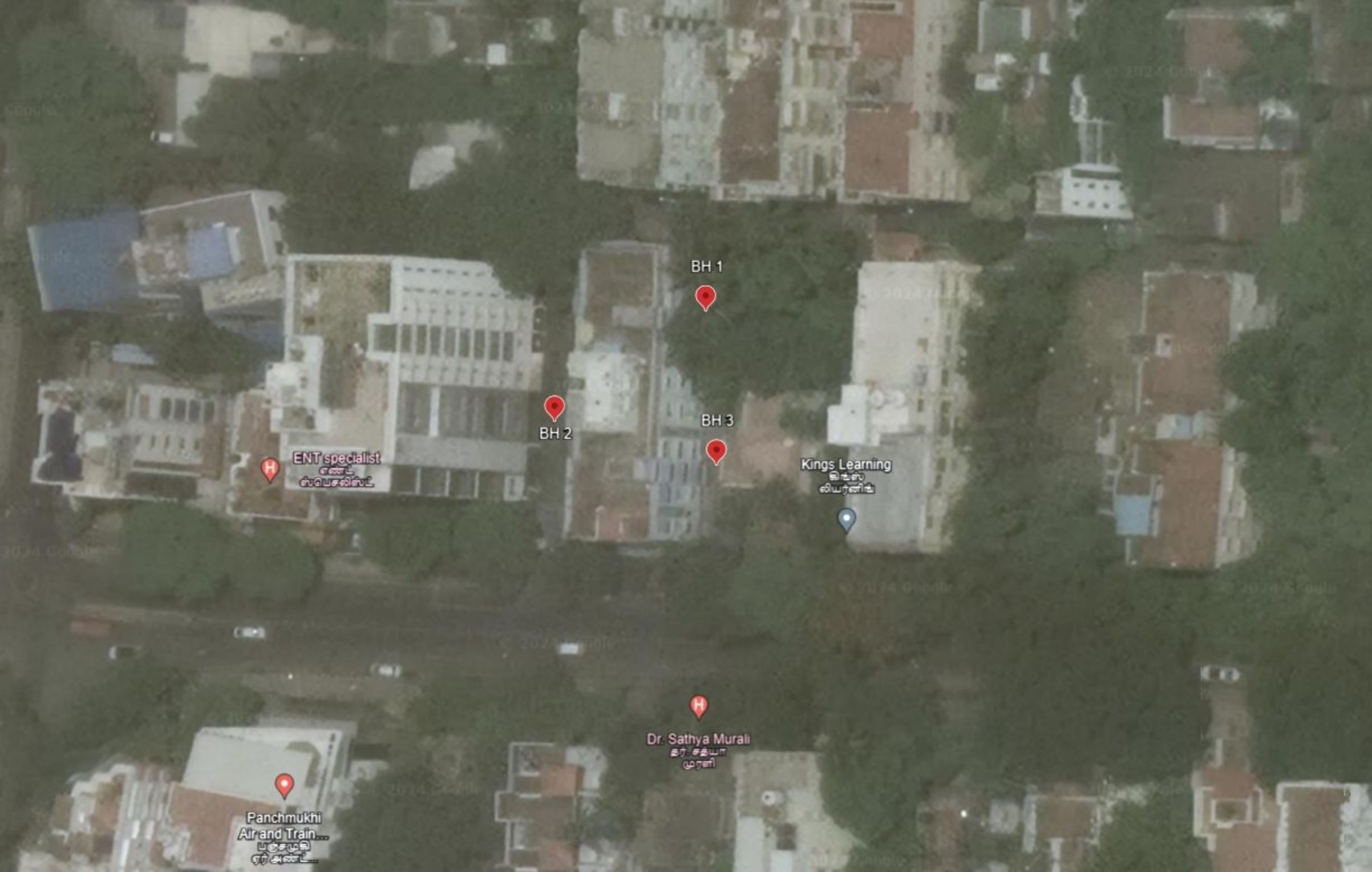
This Registration is valid upto **07.04.2024**.



(R.SHIVAKUMAR)

APPENDIX - A

KEY PLAN OF BORE HOLES


BH 1
BH 2
BH 3
ENT specialist
Kings Learning
Dr. Sathya Murali
Panchmukhi
Air and Train...

ISO/IEC 17025 Accredited Testing Laboratory
by NABL Vide Certificate No TC-8781

APPENDIX - B

BORE LOG & SUB SOIL PROFILE

SOIL BORE LOG PROFILE FOR BORE HOLE: 1

PROJECT: GEOTECHNICAL INVESTIGATION REPORT FOR THE PROPOSED CONSTRUCTION OF RESIDENTIAL BUILDING (SILT +5 FLOORS) AT R.A. PURAM, CHENNAI - 600028.

BH NO	1	**Ground water level**	-3.65 m from EGL
Site	Mylapore	**Ground level**	0.0 m from EGL
Día of boring	150 mm	**Date of starting**	30.12.2023
Type of boring	Rotary (Calyx) / Power Rig – Wash Boring	**Date of completion**	01.01.2024

Drilling Depth below EGL (m)	Ground water level	Soil Profile	Description / Classification of Soil	Depth of Samples Collected (m)	Standard Penetration Test (SPT) In cm				Relative Density / Consistency
					15	30	45	N	
1.0	-3.65 m		Filled up Soil	1.0	-	-	-	-	-
2.0			Blackish Silty Sand	2.0	3	8	8	16	Medium Dense
3.0			Blackish Silty Sand	3.0	6	10	10	20	Medium Dense
4.0			Blackish Silty Sand	4.0	5	8	14	22	Medium Dense
5.0			Blackish Clay	5.0	4	4	4	8	Firm
6.0			Blackish Silty Sand	6.0	6	12	12	24	Medium Dense
7.5			Blackish Silty Sand	7.5	5	12	12	24	Medium Dense
9.0			Blackish Silty Sand	9.0	7	10	14	24	Medium Dense
10.5			Blackish Silty Sand	10.5	2	3	3	6	Loose
12.0			Blackish Silty Sand	12.0	3	3	7	10	Loose
13.5			Blackish Silty Sand	13.5	2	3	3	6	Loose
15.0			Blackish Clay	15.0	4	6	6	12	Stiff
16.5			Blackish Clay	16.5	2	3	3	6	Firm
18.0			Blackish Clay	18.0	2	3	3	6	Firm
19.5			Blackish Clay	19.5	3	3	6	9	Stiff
21.0			Blackish Clay	21.0	3	3	6	9	Stiff
22.5			Blackish Clay	22.5	2	4	5	9	Stiff
24.0			Blackish Clay	24.0	3	6	6	12	Stiff
25.5			Blackish SDR	25.5	SPT REBOUND			>50	Very Dense

25.5-27.0			Brownish Grey Highly Weathered Rock	27.0	CR=9%; RQD<10%	-	-
27.0-28.5			Brownish Grey Highly Weathered Rock	28.5	CR=6%; RQD<10%	-	-
28.5-30.0			Pinkish Grey Highly Weathered Rock	30.0	CR=14%; RQD<10%	-	-
Bore hole termination depth at = 30.0 m from Existing ground level							

SOIL BORE LOG PROFILE FOR BORE HOLE: 2

PROJECT: GEOTECHNICAL INVESTIGATION REPORT FOR THE PROPOSED CONSTRUCTION OF RESIDENTIAL BUILDING (SILT +5 FLOORS) AT R.A. PURAM, CHENNAI - 600028.

BH NO	2	**Ground water level**	-3.65 m from EGL
Site	Mylapore	**Ground level**	0.0 m from EGL
Día of boring	150 mm	**Date of starting**	26.12.2023
Type of boring	Rotary (Calyx) / Power Rig – Wash Boring	**Date of completion**	28.12.2023

Drilling Depth below EGL (m)	Ground water level	Soil Profile	Description / Classification of Soil	Depth of Samples Collected (m)	Standard Penetration Test (SPT) In cm				Relative Density / Consistency
					15	30	45	N	
1.0	-3.65 m		Brownish Sand	1.0	5	7	9	16	Medium Dense
2.0			Brownish Silty Sand	2.0	7	12	16	28	Medium Dense
3.0			Brownish Silty Sand	3.0	8	11	16	27	Medium Dense
4.0			Brownish Silty Sand	4.0	9	12	16	28	Medium Dense
5.0			Brownish Silty Sand	5.0	8	13	16	29	Medium Dense
6.0			Blackish Brown Silty Sand	6.0	9	4	6	10	Loose
7.5			Blackish Brown Silty Sand	7.5	8	10	8	18	Medium Dense
9.0			Blackish Brown Silty Sand	9.0	6	10	10	20	Medium Dense
10.5			Blackish Silty Sand	10.5	2	1	1	2	Very Loose
12.0			Blackish Clay	12.0	4	6	6	12	Stiff
13.5			Blackish Clay	13.5	2	2	4	6	Firm
15.0			Blackish Clay	15.0	3	4	5	9	Stiff
16.5			Blackish Clayey Sand	16.5	1	2	2	4	Very Loose
18.0			Blackish Clay	18.0	1	2	3	5	Firm
19.5			Blackish Clay	19.5	2	2	2	4	Soft
21.0			Blackish Clay	21.0	2	4	4	8	Firm
22.5			Blackish Clay	22.5	3	3	8	11	Stiff
24.0			Blackish Clay	24.0	4	6	10	16	Very Stiff
25.5			Blackish Clayey Sand	25.5	Hammer Rebound for 50 No of Blows With 7 cm balance	SPT REBOUND	SPT REBOUND	>50	Very Dense

27.0			Blackish Sand	27.0	Hammer Rebound for 70 No of Blows With 7 cm balance	SPT REBOUND	SPT REBOUND	>100	Very Dense
28.5			Blackish Sand	28.5	Hammer Rebound for 90 No of Blows With 14 cm balance	SPT REBOUND	SPT REBOUND	>100	Very Dense
28.5-30.0			Blackish Highly Weathered Rock	30.0	CR=25.33%; RQD<10%			-	-
Bore hole termination depth at = 30.0 m from Existing ground level									

SOIL BORE LOG PROFILE FOR BORE HOLE: 3

PROJECT: GEOTECHNICAL INVESTIGATION REPORT FOR THE PROPOSED CONSTRUCTION OF RESIDENTIAL BUILDING (SILT +5 FLOORS) AT R.A. PURAM, CHENNAI - 600028.

BH NO	3	**Ground water level**	-3.65 m from EGL
Site	Mylapore	**Ground level**	0.0 m from EGL
Día of boring	150 mm	**Date of starting**	02.01.2024
Type of boring	Rotary (Calyx) / Power Rig – Wash Boring	**Date of completion**	03.01.2024

Drilling Depth below EGL (m)	Ground water level	Soil Profile	Description / Classification of Soil	Depth of Samples Collected (m)	Standard Penetration Test (SPT) In cm				Relative Density / Consistency
					15	30	45	N	
1.0	-3.65 m		Filled up Soil	1.0	-	-	-	-	-
2.0			Brownish Clay	2.0	2	2	2	4	Soft
3.0			Blackish Clay	3.0	2	3	5	8	Firm
4.0			Blackish Silty Sand	4.0	3	4	6	10	Loose
5.0			Blackish Clay	5.0	2	4	8	12	Stiff
6.0			Blackish Silty Sand	6.0	4	7	7	14	Medium Dense
7.5			Blackish Silty Sand	7.5	3	6	6	12	Medium Dense
9.0			Blackish Silty Sand	9.0	2	3	3	6	Loose
10.5			Blackish Silty Sand	10.5	1	4	5	9	Loose
12.0			Blackish Clay	12.0	2	3	5	8	Firm
13.5			Blackish Clayey Sand	13.5	2	2	3	5	Loose
15.0			Blackish Clay	15.0	2	2	2	4	Soft
16.5			Blackish Clay	16.5	2	3	5	8	Firm
18.0			Blackish Clay	18.0	1	2	3	5	Firm
19.5			Blackish Clay	19.5	2	2	3	5	Firm
21.0			Blackish Clay	21.0	0	1	1	2	Very Soft
22.5			Blackish Clay	22.5	2	3	3	6	Firm
24.0			Blackish SDR	24.0	SPT REBOUND			>50	Very Dense
25.5			Blackish SDR	25.5	SPT REBOUND			>50	Very Dense

27.0			Blackish SDR	27.0	SPT REBOUND	>50	Very Dense
27.0-28.5			Greyish Highly Weathered Rock	28.5	CR = 11%; RQD = 0%	-	-
28.5-30.0			Greyish Highly Weathered Rock	30.0	CR = 3%; RQD = 0%	-	-
Bore hole termination depth at = 30.0 m from Existing ground level							

APPENDIX - C

LABORATORY TEST RESULTS

TABLE NO: 1

LABORATORY TEST RESULTS														
Client (^)	**M/s. Swathi Builders,**			**Project (^)**	**GEOTECHNICAL INVESTIGATION REPORT FOR THE PROPOSED CONSTRUCTION OF RESIDENTIAL BUILDING (SILT +5 FLOORS) AT R.A. PURAM, CHENNAI - 600028**									
Bore Hole No	1	Sampled date	01-01-2024	Tested Date	01-01-2024				Reporting Date	04-01-2024				
Depth (m)	Soil Description / Classification	Is classification	Index Properties					Specific Gravity	Grain Size Analysis (%) Wet / Dry				
			(NMC) %	Liquid Limit, %	Plastic Limit %	Plasticity Index	Free Swell Index %		Gravel %	Coarse Sand %	Medium Sand %	Fine Sand %	Silt & Clay %
1.0	Filled up Soil	-	-										
2.0	Blackish Silty Sand	SM	15	NON-PLASTIC			0	2.65	3	2	56	26	13
3.0	Blackish Silty Sand	SW-SM	18				0	2.65	0	1	60	30	9
4.0	Blackish Silty Sand	SW-SM	19				0	2.65	0	0	66	25	9
5.0	Blackish Clay	CI	22	43	23	20	40	2.70	6	1	9	13	71
6.0	Blackish Silty Sand	SM	23	NON-PLASTIC			0	2.65	0	0	15	72	13
7.5	Blackish Silty Sand	SW-SM	17				0	2.65	0	2	71	19	8
9.0	Blackish Silty Sand	SP-SM	16				0	2.65	1	3	68	18	10
10.5	Blackish Silty Sand	SM	20				0	2.66	0	1	30	48	21

12.0	Blackish Silty Sand	SP-SM	19	NON-PLASTIC			0	2.65	0	1	72	22	5
13.5	Blackish Silty Sand	SM	14				0	2.65	3	3	15	63	16
15.0	Blackish Clay	CL	20	31	18	13	10	2.68	4	1	12	33	50
16.5	Blackish Clay	CH	14	81	22	59	140	2.72	1	0	1	2	96
18.0	Blackish Clay	CH	9	82	21	61	60	2.72	0	0	0	4	96
19.5	Blackish Clay	CI	7	45	19	26	40	2.71	0	0	0	14	86
21.0	Blackish Clay	CL	9	32	32	0	40	2.69	0	1	1	31	67
22.5	Blackish Clay	CI	6	43	20	23	60	2.69	1	1	10	19	69
24.0	Blackish Clay	CL	9	33	32	1	110	2.72	0	1	1	6	92
25.5	Blackish SDR	-	SPT Sample Recovery Nil										
25.5-27.0	Brownish Grey Highly Weathered Rock	-	CR=9%; RQD<10%										
27.0-28.5	Brownish Grey Highly Weathered Rock	-	CR=6%; RQD<10%										
28.5-30.0	Pinkish Grey Highly Weathered Rock	-	CR=14%; RQD<10%										

Er. S. Sakthi Raja, M.E (Geotech)
(Technical Manager)

TABLE NO: 2

LABORATORY TEST RESULTS

Client (^)	**M/s. Swathi Builders,**	**Project (^)**	**GEOTECHNICAL INVESTIGATION REPORT FOR THE PROPOSED CONSTRUCTION OF RESIDENTIAL BUILDING (SILT +5 FLOORS) AT R.A. PURAM, CHENNAI - 600028**

Bore Hole No	2	Sampled date	28-12-2023	Tested Date	28-12-2023	Reporting Date	03-01-2024

Depth (m)	Soil Description / Classification	Is classification	Index Properties					Specific Gravity	Grain Size Analysis (%) Wet / Dry				
			(NMC) %	Liquid Limit, %	Plastic Limit %	Plasticity Index	Free Swell Index %		Gravel %	Coarse Sand %	Medium Sand %	Fine Sand %	Silt & Clay %
1.0	Brownish Sand	SP	19	NON-PLASTIC			0	2.65	0	7	87	4	2
2.0	Brownish Silty Sand	SP-SM	17				0	2.65	0	2	70	18	10
3.0	Brownish Silty Sand	SP-SM	22				0	2.65	0	0	32	57	11
4.0	Brownish Silty Sand	SM	22				0	2.65	5	1	29	46	19
5.0	Brownish Silty Sand	SP-SM	23				0	2.65	1	0	58	36	5
6.0	Blackish Brown Silty Sand	SP-SM	30				0	2.65	0	0	34	56	10
7.5	Blackish Brown Silty Sand	SW-SM	19				0	2.65	2	5	62	23	8
9.0	Blackish Brown Silty Sand	SP-SM	18				0	2.65	2	3	57	30	8
10.5	Blackish Silty Sand	SM	30				0	2.66	1	0	2	71	26

12.0	Blackish Clay	CH	47	53	22	31	50	2.70	3	1	16	10	70
13.5	Blackish Clay	CI	45	42	20	22	30	2.69	0	0	6	31	63
15.0	Blackish Clay	CI	61	39	20	19	40	2.72	0	0	1	9	90
16.5	Blackish Clayey Sand	SC	34	30	18	12	10	2.67	0	0	14	41	45
18.0	Blackish Clay	CH	61	75	22	53	90	2.72	0	0	1	1	98
19.5	Blackish Clay	CH	59	70	21	49	30	2.72	0	1	2	3	94
21.0	Blackish Clay	CI	63	46	18	28	60	2.71	0	0	6	6	88
22.5	Blackish Clay	CI	64	44	19	25	60	2.72	0	1	1	3	95
24.0	Blackish Clay	CI	62	40	30	10	90	2.72	0	0	2	7	91
25.5	Blackish Clayey Sand	SC	16	30	17	13	10	2.66	14	8	23	29	26
27.0	Blackish Sand	SP	3	NON-PLASTIC			0	2.65	7	22	58	11	2
28.5	Blackish Sand	GP	4				0	2.65	88	4	2	3	3
28.5-30.0	Blackish Highly Weathered Rock		CR=25.33%; RQD<10% (7 cm, 6 cm, 4 cm, 4 cm, 3 cm, 3 cm, 4 cm, 4 cm, 3 cm, Small pieces)										

Er. S. Sakthi Raja, M.E (Geotech)
(Technical Manager)

TABLE NO: 3

LABORATORY TEST RESULTS														
Client (^)	**M/s. Swathi Builders,**			**Project (^)**	**GEOTECHNICAL INVESTIGATION REPORT FOR THE PROPOSED CONSTRUCTION OF RESIDENTIAL BUILDING (SILT +5 FLOORS) AT R.A. PURAM, CHENNAI - 600028**									
Bore Hole No	3	Sampled date	03-01-2024	Tested Date	03-01-2024			Reporting Date	08-01-2024					
Depth (m)	Soil Description / Classification	Is classification	Index Properties					Specific Gravity	Grain Size Analysis (%) Wet / Dry				
			(NMC) %	Liquid Limit, %	Plastic Limit %	Plasticity Index	Free Swell Index %		Gravel %	Coarse Sand %	Medium Sand %	Fine Sand %	Silt & Clay %
1.0	Filled up Soil	-	-										
2.0	Brownish Clay	CL	27	32	22	10	40	2.68	0	0	2	42	56
3.0	Blackish Clay	CL	26	30	21	9	40	2.70	0	0	4	21	75
4.0	Blackish Silty Sand	SP-SM	25	NON-PLASTIC			0	2.65	0	0	3	85	12
5.0	Blackish Clay	CI	44	42	23	19	40	2.71	0	0	2	14	84
6.0	Blackish Silty Sand	SP-SM	20	NON-PLASTIC			0	2.65	0	0	40	49	11
7.5	Blackish Silty Sand	SP-SM	20				0	2.65	2	1	40	46	11
9.0	Blackish Silty Sand	SM	32				0	2.66	0	0	7	65	28
10.5	Blackish Silty Sand	SM	31				0	2.66	0	0	8	63	29

12.0	Blackish Clay	CI	38	35	20	15	10	2.68	0	0	1	49	50
13.5	Blackish Clayey Sand	SC	34	40	20	20	30	2.67	0	0	0	64	36
15.0	Blackish Clay	CI	41	41	22	19	30	2.69	0	1	5	32	62
16.5	Blackish Clay	CI	50	47	23	24	60	2.69	1	1	4	30	64
18.0	Blackish Clay	CI	44	48	22	26	30	2.68	2	1	5	33	59
19.5	Blackish Clay	CI	57	48	22	26	50	2.71	0	0	2	16	82
21.0	Blackish Clay	CH	63	82	21	61	60	2.72	0	0	1	3	96
22.5	Blackish Clay	CH	64	45	19	26	40	2.72	0	0	1	3	96
24.0	Blackish SDR	-	SPT Sample Recovery Nil										
25.5	Blackish SDR	-	SPT Sample Recovery Nil										
27.0	Blackish SDR	-	SPT Sample Recovery Nil										
27.0-28.5	Greyish Highly Weathered Rock	-	CR = 11%; RQD<10%										
28.5-30.0	Greyish Highly Weathered Rock	-	CR = 3%; RQD <10%										

Er. S. Sakthi Raja, M.E (Geotech)
(Technical Manager)

CERTIFICATION

The total no of pages in this report is 27; this report is issued by Geo Build Engineering India Pvt Ltd for the project, **Geotechnical Investigation report for the proposed construction of Residential Building (Stilt+5 floors) at Old No: 32, New No: 74, 2nd Main Road, R. A. Puram, Chennai-600028.** All the above tests were done within our laboratory.

Yours Truly,

For GEO BUILD ENGINEERING INDIA PVT LTD

Er. S. Sakthi Raja, M. E (Geotech)
(Senior Engineer - Design)
CMDA Reg No - GTE/19/04/018

Er. K. Santhosh Kumar, M.E(Geotech)
(Engineer - Design)

NOTE:

1. The results enclosed are only related to the sample tested by us.

2. The report shall not be reproduced in full or part without written permission from Geo Build Engineering India Pvt Ltd.

3. All the lab related tested values are as per the standard conditions followed by the lab.

4 Symbol (^) indicates details given by client.

5. Samples will be disposed after 30 days from sample receipt date at lab.

6. Statement of conformity not reported, so Decision rule is not applicable

LIST OF METHOD USED AS FOLLOWED

➢ IS 1892 - 1979	Code of Practice for Sub-Surface Investigation of Foundations
➢ IS 2720 (Part 2);1973	Natural moisture content
➢ IS 2720 (Part 3);1980	Specific Gravity test on Soils
➢ IS 2720: Part 4 :1985	Grain size Analysis Dry &Wet Sieve Analysis
➢ IS 2720 (Part 5):1958	Liquid limit test & Plastic limit test
➢ IS 2720 (Part 7);1980	Proctor density-Light (standard) compaction
➢ IS 2720 (Part 8);1983	Proctor density-Heavy (modified) compaction
➢ IS 2720 (Part 16);1987	Laboratory California Bearing ratio
➢ IS 2720 (Part 28);1974	Dry density Determination by Sand Replacement method
➢ IS 2720 (Part 29);1975	Dry density Determination by Core cutter method
➢ IS 2720 (Part 40);1977	Free Swell Index
➢ IS 1498 - 1970	Classification and Identification of Soils
➢ IS 6403:1981	Code of practice for determination of bearing capacity of shallow foundation
➢ IS 8009 (part I)-1878	Code of practice for calculations of settlements of foundations
➢ IS 13094 - 1992	Selection of ground improvement technique for foundation in weak soils
➢ IS:2911 -1980	Code of practice for design and construction of pile foundation - part 1 section 2 – Bored cast in situ pile
➢ IS 13030:1981	Method of test for laboratory determination of water content, Porosity, Density and related Properties rock materials
➢ IS 8764 - 1998	Method of Determination of Point load Strength index of rocks
➢ IS 4464-1985	Core Description in Foundation Investigation
➢ IS 12070 - 1987	Code of Practice for Design and Construction of Shallow Foundations on Rocks
➢ IS 14593:1998	Pile foundation on Rock

NOTE

ABBREVIATION:

WN	=	Natural Moisture content (%)
WL	=	Liquid limit (%)
WP	=	Plasticity Limit (%)
IP	=	Plasticity Index (%)
FSI	=	Free Swell Index (%)
IS	=	Indian Standard Classification
CL	=	Low compressibility Clay of WL < 35%
CI	=	Inorganic Clay of 35% < WL <50%
CH	=	High Compressibility Clay of WL > 50%
ML	=	Low compressible Silt
SW	=	Well graded sand
SP	=	Poorly graded sand
SM	=	Silty Sand
SC	=	Clayey Sand
GW	=	Well graded gravel
GP	=	Poorly graded gravel
SDR	=	Soft Disintegrated Rock
RQD	=	Rock Quality Designation
CR	=	Core recovery
RMR	=	Rock Mass Rating

Table No: ~A~.

Correlations of SPT N values with Common properties of soils

A) Granular Soil

Standard Penetration No., SPT N	Description	Relative Density, D_r %	Approx. Angle of Internal Friction, Φ°	Approx. Rang of Most. Unit Wt kN/m^3
< 4	Very loose	< 20	< 29	11-16
4-10	Loose	20-40	29-30	14-18
10-30	Medium	40-60	30-36	17-20
30-50	Dense	60-80	36-41	17-22
> 50	Very Dense	> 80	> 41	20-29

B) Cohesive Soil

Standard Penetration No., SPT N	Description	Unconfined Compressive Strength, kPa	Approx. Rang of Most. Unit Wt kN/m^3
< 2	Very Soft	0-25	14.4-16
2-4	Soft	25-50	16-17.4
4-8	Firm (medium)	50-100	17.6-19.2
8-15	Stiff	100-200	19.2-20.8
15-30	Very Stiff	200-400	20.8-22.4
> 30	Hard	> 400	> 20

Note: These values are most appropriate values in general. However, the soil properties vary between sites to site and hence it shall be used only for guidance

End of Report



our services doesn't just end there

Buying & Selling Services

Property Buying Assistance, Property Selling Support, Market Price Analysis, Owner Outreach and Negotiation.

Legal & Documentation Services

Certified EC, Patta, legal opinions, property verification, due diligence, litigation solutions, and legal heir certificates.

Property Development & Approvals

Building plan approvals, construction, layout and sub-division approvals, zone conversion, and occupancy certification.

NRI & Investment Services

Escrow Services, Rentals, Litigation Solutions, Property Valuation and Property Management

Compliance & Special Services

Demolition, Vaasthu checks, regularization of unauthorized buildings, and office space solutions.



empowering your real estate decisions with smart tools

Property Valuation & Cost Estimation

Guideline Value, Apartment Composite Value, Stamp Duty & Registration Fees Calculator, Building Value Calculator, Capital Gains Calculator, Area Unit Converter, Length Unit Converter

Ownership, Compliance & Legal Verification

Encumbrance Certificate (EC) Search, Find Your SRO, Temple Property Check, WAQF Property Check, View Patta/Chitta, View FMB, Patta Analyzer, EC Analyzer

Zoning & Land Use Analysis

Land Use Zone Finder, CRZ Zone Check, Aquifer Zone Check, CBA Check, EWS Check, Road Width Check, Proposed Road Widening Check, FSI Calculator

Property Documentation & Workflow Tools

Forms & Templates, Document Generator, Document Translation, Dictionary

Vastu & Property Management Tools

Home Vastu Shastra, Plot Vastu Shastra, Property Management

Verified RealEstate™

We're honored to be part of your real estate journey

3/350/2 Mettukuppam,
OMR Thoraipakkam,
Chennai, India

hello@verified.realestate
+91 9996 12 9996
www.verified.realestate