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™



M/S BBCL DEVELOPERS PVT.LTD
NO:20 (old no: 23) 2, Mylai Ranganathan Street, New Colony, T. Nagar, Chennai 600 017

Geotechnical Investigation for "Proposed construction of Apartments (Stilt+5 floors) at Brindhavan Street Extension, West Mambalam, Chennai"

GEO TECHNICAL INVESTIGATION REPORT

JANUARY - 2023

By

Sakthi Developments Coy
Consultants & Engineers

Office	:	Plot-14/Door No.12 II Cross Street, Dr.Radhakrishnan Nagar, Thiruvanmiyur, Chennai-600 041.
Telephone	:	91 - 44 – 2452 4199/ 2452 4828
E-mail	:	consultsdc@hotmail.com
Web	:	www.soilandpile.com

Sakthi Developments Coy
Consultants & Engineers

Geotechnical Investigation for "Proposed construction of Apartments (Stilt+5 floors) at Brindhavan Street Extension, West Mambalam, Chennai"

TABLE OF CONTENT	PAGE NO
INTRODUCTION	3
SCOPE OF WORK	3-4
FIELD INVESTGATIONS	4-5
LABORATORY TESTS	5
SUBSOIL DESCRIPTION	5-6
GROUND WATER TABLE	6
DISCUSSIONS AND RECOMMENDATIONS	6-7

ANNEXURE

ANNEXURE 1 – SITE PLAN

ANNEXURE 2 – FIELD BORE LOGS

ANNEXURE 3 – LABORATORY RESULTS

ANNEXURE 4 – TYPICAL PILE CAPACITY CALCULATIONS.

1. INTRODUCTION

1.1 M/s BPCL Developers Pvt. Ltd., T. Nagar, Chennai -600017 proposed to investigate the subsoil strata at the site of the Proposed construction of Apartments (Stilt+5 floors) at Brindhavan Street Extension, West Mambalam, Chennai- 600 033 to evolve various soil/rock parameters in order to design the suitable type of foundation for the proposed structure.

1.2 The geotechnical investigations were carried out by M/s Sakthi Developments Coy, No 12, Second Cross Street, Dr. Radhakrishnan Nagar, Thiruvanmiyur, Chennai – 600041

1.3 Detailed studies were carried out at the site by drilling one investigation borehole at selected location, conducting relevant in-situ tests, collecting soil samples, and testing the samples in the laboratory.

1.4 This report summaries the field and laboratory test results of one borehole and also furnishes the recommendations for the type of foundation for the proposed structure based on the borehole investigated and tested.

2. SCOPE OF WORK

2.1 The scope of field and laboratory work covers:

(a) Mobilizing all necessary equipment and personnel at the site.

(b) Drilling one borehole at selected locations and collecting disturbed and undisturbed soil samples.

(c) Conducting laboratory tests on soil samples to enable the classification of soils and for obtaining engineering properties of soils.

(d) Conducting SPT Tests in the field.

(e) Computation of bearing capacities for the design of foundations.

2.2 Based on the studies and observations, recommendations are made by covering the following:

(i) Choice of foundation

(ii) Safe bearing capacity for foundation

2.3 The bore log, field observations, results of field and laboratory tests, conclusions, and recommendations are presented in this report.

3. FIELD INVESTIGATIONS

A. BORING AND IN-SITU SAMPLING

3.1 One exploratory borehole of 150mm diameter was drilled from the existing ground level by rotary drilling method supplemented by bentonite mud circulation. The borehole was always kept full with the drilling mud so that a positive head is maintained in the borehole thus preventing any disturbance to the soil within the test zone. While the Progress of boring slowed down considerably near the soil - rock interface, including weathered rock formations ,further drilling work was carried out by using NX size core barrel with TC (Tungsten Carbide) bits. While the progress of drilling using TC bits slowed down considerably, diamond bit drilling was adopted. The percentage CR (Core Recovery) and RQD (Rock Quality Designation) has been recorded for the rock cores extracted and are presented in the bore logs which are furnished in Annexure II. The Borehole BH1 was terminated at 23.50m depth after drilling into harder formations from 20.5m to 23.50m from the existing ground level

. B. STANDARD PENETRATION TEST

3.2 Standard penetration tests were conducted at every 1.0 m interval of depths or at the change of stratum as per Indian Standard IS: 2131 - 1981 and the split spoon sampler was used as per Indian Standard IS: 9640 - 1980.

3.3 The split spoon sampler resting on the bottom of the borehole could sink under its own weight; then the split spoon sampler was seated for 15cm with the blows of hammer weighing 63.5kg falling through 75cm. Thereafter, the split spoon sampler was further driven to a depth of 30cm or 50 blows whichever was earlier. The number of blows required for each 15cm of the penetration was recorded. The first 15cm of drive was seating drive. The total number of blows required for the second and third 15cm lengths of penetration is termed as the penetration resistance `N'. If, however, split spoon sampler is driven less than 45cm (total) then the penetration resistance for the last 30cms of penetration is considered and in case where the penetration length is less than 30cms the depth of penetration and the corresponding number of blows are being indicated in the bore logs.

Refusal is considered when the number of blows exceeds 50 for 15 cm penetration.

3.4 The disturbed samples were collected from the split spoon sampler.

4. LABORATORY TESTS

4.1 The soil samples were brought from the site and the following tests were conducted in the laboratory for determining the following properties.

i) Grain Size Distribution (Sieve Analysis)

ii) Hydrometer Analysis

iii) Natural Moisture Content

iv) Atterberg limits or Consistency limits

4.2 The test results on soil sample are tabulated in **Annexure III**

5.0 SUBSOIL DESCRIPTION

5.1 The details of soil conditions encountered at each borehole location is presented in tabular form based on visual identification and engineering characteristics derived from SPT-Value correlation with strength parameters.

Table-1 (BH:1)

B.H. Ref.	Depth from EGL m	Soil description	Average Corrected SPT N	Shear strength	
				Cu T/m²	Φº
1	0-3.0	Medium dense brownish fine to medium sand trace silt SP-SM	23	—	34°
	3.0-4.0	Medium dense brown greyish silty medium to fine sand SM	20	—	33°
	4.0-5.0	Medium dense brown greyish fine to medium sand trace silt SP-SM	20	—	33°
	5.0-6.0	Stiff blackish clayey silt CH	11	6.90	—
	6.0-7.0	Stiff blackish clayey fine sandy silt CH	12	7.50	—
	7.0-8.0	Stiff blackish silty fine sand CH	13	8.10	
	8.0-9.0	Medium dense blackish silty medium to fine sand SM	16		32°
	9.0-10.0	Dense greyish silty medium to fine sand SM	26	—	34°

	10.0-11.5	Medium stiff blackish clayey silt CH	7	4.40	—
	11.5-14.5	Soft blackish clayey silt CH	4	2.50	—
	14.5-19.0	Medium stiff blackish silty clay CH	7	4.20	—
	19.0-20.5	Stiff blackish silty clay CH	9	5.60	—
	At 20.50	*Very dense blackish shale (silty medium to coarse sand with gravel) SM	>60	—	39°
	20.5-23.5	*Blackish shale	—	—	—

* Note: For N>60 the stratum is to be treated as weathered rock rather than soil s per I.S.2911(Part1/Sec2) : 2010

5.2 From the bore log and laboratory test results, it is observed that the subsoil strata at borehole location BH:1 consist of Medium dense brownish fine to medium sand trace silt from the existing ground level to 3.0m depth having recorded SPT 'N' values of 15 to 16. This layer is underneath by Medium dense brown greyish silty medium to fine sand from 3.0m to 4.0m depth having recorded SPT 'N' value of 19, Medium dense brown greyish fine to medium sand trace silt from 4.0 to 5.0m depth having recorded SPT 'N' value of 20, Stiff blackish clayey silt from 5.0 to 6.0m depth having recorded SPT 'N' value of 11, Stiff blackish clayey fine sandy silt from 6.0 to 7.0m depth having recorded SPT 'N' value of 12, Stiff blackish silty fine sand from 7.0 to 8.0m depth having recorded SPT 'N' value of 13, Medium dense blackish silty medium to fine sand from 8.0 to 9.0m depth having recorded SPT 'N' value of 15, Dense greyish silty medium to fine sand from 9.0 to 10.0m depth having recorded SPT 'N' value of 25, Medium stiff blackish clayey silt from 10.0 to 11.50m depth having recorded SPT 'N' value of 7, Soft blackish clayey silt from 11.50 to 14.50m depth having recorded SPT 'N' value of 4, Medium stiff blackish silty clay from 14.50 to 19.0m depth having recorded SPT 'N' values of 6 to 7, Stiff blackish silty clay from 19.0 to 20.50m depth having recorded SPT 'N' value of 9, Very dense blackish shale (silty medium to coarse sand with gravel) at 20.50m depth having recorded SPT 'N' value of greater than 60. Blackish shale from 20.50m depth to the explored depth of 23.50m. The Borehole BH1 was terminated at 23.50m depth from the existing ground level.

6.0 GROUNDWATER TABLE

The groundwater table was met at 2.60m depth in the borehole BH1 from the existing ground level at the time of carrying out the soil investigation. Groundwater will fluctuate due to seasonal variations.

7.0 DISCUSSIONS AND RECOMMENDATIONS

7.1 A detailed analysis of field and laboratory tests has established that there is a medium dense sand with silt for a depth of 5m. This is underlined by stiff clayey silt of high plasticity from 5.0m to 8.0m, medium dense to dense silty sand strata from 8.0m to 10.0m, blackish clayey silt of soft to medium stiff clayey silt /silty clay of high plasticity up to 20.50m, shale exists from 20.50m to 23.50m.There are no appropriate /adequate soil strata up to the significant depth of foundation to support stilt plus five floors Hence, it is advisable to support the super structures by resorting to deep foundation in the form of bored cast in-situ piles.

The pile shall be terminated either in rock or very dense or very stiff soil with 'N' value greater than 100

7.2 The allowable carrying capacity for various diameters of piles placed at various depths below existing formed ground level are tabulated below.

Table : 1

Diameter (m) (D)	Pile Embedment in rock layer (m) 3.0 D +0.5m	Vertical (kN)	Uplift (kN)	Lateral - Fixed (kN)	Remarks
0.45	1.85	563	229	24	1.85 m Weathered rock layer
0.5	2.0	695	283	30	2 m Weathered rock layer"
0.6	2.3	1001	407	43	2.3 m Weathered rock layer"
0.75	2.75	1564	636	68	2.75 m Weathered rock layer"

In bore hole.1, weathered rock layer shall be considered from 20.50m from E.G.L

The structural capacity of the pile will also govern the design and the safe load carrying capacity Q_s for M_{25} concrete with permissible compressive strength of Concrete limited to $5N/mm^2$ (5000 kn/m²) for various diameters of the piles are Also tabulated below:-

Table :2

Diameter of pile ,m	0.45	0.5	0.6	0.75
Safe Capacity, Kn	796	982	1414	2210

The recommended Pile capacity does not exceeded the structural capacity of pile and hence the recommended pile capacity tabulated above in Table : 1 may be adopted for the design of Pile Foundation.

7.3 The allowable carrying capacity of the bored cast in situ pile foundation is arrived based on IS 2911(Part1/Sec 2):2010.

7.4 Since the pile load carrying capacity is not only a function of soil shear parameters, but also a function of installation technique and care, the above mentioned safe loads shall be considered as provisional and shall be confirmed by conducting pile load tests as per IS:2911 (Part IV)

7.5 Adequate care shall be taken to ensure proper cleaning of bottom of bore holes before concreting. Also, the mud used for the circulation for bored piles shall be made out of sodium bentonite with density maintained at 1.05 to 1.08 gr/cc.

7.6 The above recommendation is based upon the field data collected and laboratory test carried out on soil samples recovered from only one bore hole and our experience in this regard. If the sub-soil conditions during installation of piles at various locations of foundation vary substantially from what has been reported above, the consultants are to be referred for suggestions.

For Sakthi Developments Coy,

SAKTHI DEVELOPMENTS COY CHENNAI 600 041.

Er.S.Lognathen M.E.,FIE.,FIGS.,FIV.,CE(I)
Executive Partner& Geotechnical Consultant.
CMDA Registration No. GTE/19/04/021

ANNEXURE II

SAKTHI DEVELOPMENTS COY
Consultants & Engineers
Tel No: 91 - 44 - 24524199, 24524828
Email: consultsdc@hotmail.com

Bore log

Name of work	**Soil Investigation for "Proposed construction of Apartments (Stilt+5 floors) at Brindhavan Street Extension, West Mambalam, Chennai"**
Location	Sheet 1
Bore Number: 1	G.L; Bore type: Calyx; Bore dia: 150 mm; Ground water level: 2.60m
Work commenced on: 09.01.2023	Work completed on : 10.01.2023

Depth from GL (m)	Thickness of Layer (m)	Soil Profile	Visual description of strata	Sample details: Depth	Sample details: Type	SPT- Details: Depth m	SPT- Details: 0-15 Cm	SPT- Details: 15-30 Cm	SPT- Details: 30-45 Cm	SPT- Details: N-Value	Graphical Representation of N value	Core Drilling: Run From	Core Drilling: Run To	Core Drilling: % C.R.R (%)	Core Drilling: % R.Q.D (%)
											20 40 60 80 100				
			Brownish fine to medium sand trace silt	1.00	SPT	1.00	4	7	8	15					
				2.00	SPT	2.00	6	8	8	16					
3.00	3.00			3.00	SPT	3.00	7	9	10	19					
			Brown greyish silty medium to fine sand	4.00	SPT	4.00	6	8	12	20					
4.00	1.00														
			Brown greyish fine to medium sand trace silt	5.00	SPT	5.00	3	5	6	11					
5.00	1.00														
			Blackish clayey silt	6.00	SPT	6.00	4	5	7	12					
6.00	1.00														
			Blackish clayey fine sandy silt	7.00	SPT	7.00	3	6	7	13					
7.00	1.00														
			Blackish silty fine sand	8.00	SPT	8.00	4	7	8	15					
8.00	1.00														
			Blackish silty medium to fine sand	9.00	SPT	9.00	9	14	21	35					
			Greyish silty medium to fine sand	10.00	SPT	10.00	2	3	4	7					
10.00	2.00														
			Blackish clayey silt	11.50	SPT	11.50	1	2	2	4					
				13.00	SPT	13.00	2	2	2	4					
14.50	4.50			14.50	SPT	14.50	2	3	4	7					
			Blackish silty clay	16.00	SPT	16.00	2	3	3	6					
				17.50	SPT	17.50	3	3	4	7					
				19.00	SPT	19.00	3	4	5	9					
20.50	6.00			20.50	SPT	20.50	60/8cm hammer rebound			>60					
			Greyish Shale	21.50	Core	21.50	6+4+4+4+2+2+2+2+small pices 10					20.5	21.5	36	nil
				22.50	ore and Sl	22.50	3+3+3+3+2+2+2+2+2+2+small pieces 5					21.5	22.5	31	ni
23.50	3.00			23.50	Core	23.50	4+4+3+3+2+2+2cm					22.5	23.5	20	nil

ANNEXURE-III

LABORATORY TEST RESULTS

SAKTHI DEVELOPMENTS COY

Consultants & Engineers

Plot-14/D-12 II Cross Street, Dr.R.K.Nagar, Thiruvanmiyur, Chennai-600 041.

Soil Investigation for "Proposed construction of Apartments (Stilt+5 floors) at Brindhavan Street Extension, West Mambalam, Chennai"

BH.No	Depth (m)	Type of Soil	IS Soil Classification	Natural Moisture %	Atterberg Limits %			Grain size Distribution %						γ Bulk density KN / m^3	c Cohesion Kg/cm2	φ Angle of friction	Standard Penetration Test			
					LL	PL	PI	Gravel (>4.75mm)	Sand			Fines < 0.075MM					Depth of testing	N value for 30 cm	Corrected N	Consistency / Relative density
									Coarse (4.75 to 2.00 mm)	Medium (2.00 to 0.425mm)	Fine (0.425 to 0.075 mm)	Silt	Clay							
1	1.00	Brownish fine to medium sand trace silt	SP-SM	25.79	_	NP	_	3	7	57	25	8		16	_	34°	1.00	15	24	M.Dense
	2.00	Brownish fine to medium sand trace silt	SP-SM	28.97	_	NP	_	3	6	57	26	8		16	_	34°	2.00	16	22	M.Dense
	3.00	Brown greyish silty medium to fine sand	SM	22.78	_	NP	_	2	5	11	41	41		16	_	33°	3.00	19	20	M.Dense
	4.00	Brown greyish fine to medium sand trace silt	SP-SM	21.88	_	NP	_	0	1	50	42	7		16	_	33°	4.00	20	20	M.Dense
	5.00	Blackish clayey silt	CH	30.67	65	25	40	0	0	0	1	62	37	18	0.69	_	5.00	11	11	Stiff
	6.00	Blackish clayey fine sandy silt	CH	37.56	68	25	43	1	1	0	1	87	10	18	0.75	_	6.00	12	12	Stiff
	7.00	Blackish silty fine sand	CH	24.55	70	26	44	0	0	1	43	47	9	18	0.81	_	7.00	13	13	Stiff
	8.00	Blackish silty medium to fine sand	SM	23.86	_	NP	_	0	0	1	61	38		16	_	32°	8.00	15	16	M.Dense
	9.00	Greyish silty medium to fine sand	SM	19.41	_	NP	_	0	0	30	54	16		17	_	34°	9.00	35	26	Dense
	10.00	Blackish clayey silt	CH	57.51	89	30	59	0	0	1	2	50	47	16	0.44	_	10.00	7	7	M.stiff
	11.50	Blackish clayey silt	CH	51.62	87	28	59	0	0	1	4	60	35	15	0.25	_	11.50	4	4	Soft
	13.00	Blackish clayey silt	CH	71.06	89	40	49	4	2	1	1	52	40	15	0.25	_	13.00	4	4	Soft
	14.50	Blackish silty clay	CH	61.20	90	42	48	0	1	1	2	41	55	16	0.44	_	14.50	7	7	M.stiff
	16.00	Blackish silty clay	CH	58.05	90	31	59	1	0	1	1	48	49	16	0.38	_	16.00	6	6	M.stiff
	17.50	Blackish silty clay	CH	59.11	76	30	46	0	0	1	1	45	53	16	0.44	_	17.50	7	7	M.stiff
	19.00	Blackish silty clay	CH	57.37	88	36	52	0	0	4	4	42	50	18	0.56	_	19.00	9	9	Stiff
	20.50	Blackish shale (silty medium to coarse sand with gravel)	SM	15.52	_	NP	_	19	30	28	5	18		_	_	39°	20.50	60/8cm rebound	>60	V Dense
	20.5-21.5	Blackish shale	_	_	_	_	_	_	_	_	_	_	_	_	_	_	20.5-21.5	_	_	_
	21.5-22.5	Blackish shale	_	_	_	_	_	_	_	_	_	_	_	_	_	_	21.5-22.5	_	_	_
	22.5-23.5	Blackish shale	_	_	_	_	_	_	_	_	_	_	_	_	_	_	22.5-23.5	_	_	_

ANNEXURE IV

Calculation of Safe Load on Pile socketted in Weathered Rock /Soft disintegrated rock
(based on IS 2911 Part I Sec 2 - 2010)

Geotechnical Investigation for "Proposed construction of Apartments (Stilt+5 floors) at Brindhavan Street Extension, West Mambalam, Chennai

$$Qa = C_{u1}\, N_c\ \pi B^2/(4F_s) + \alpha C_{u2}\, \pi BL/F_s$$

Ref: Bore hole location.2

Qa = Allowable load on the Pile (kN)

C_{u1} = Shear Strength of rock below the base of the pile (kN/sq.m)

Nc = Bearinc capacity factor taken as 9

Fs Factor of safety usually taken as 3

α = 0.9

C_{u2} = Average shear strength of rock in the socketed length of pile (kN/sq.m)

B = Minimum width of pile shaft in m

L = Socket length of pile in m

In the present case

Pile diameter	B	=	0.5	m
Length of Socktet length	L	(2 - 0.5)	1.5	m
From 20.5m	To 22.5m			
Average SPT N value base (cole & stroud)		=	100	
Shear Strength at base	Cu1	=	700	kN/sq.m
Average SPT N value shaft		=	60	
Shear Strength along shaft	Cu2	=	400	kN/sq.m
Factor of safety	F	=	3.0	
Allowable Vertical pile load capacity		=	695.1	kN
Allowable Uplift pile load capacity		=	282.7	kN

Lateral Load Carrying Capacity of Pile

For Piles in Preloaded Clays

Type of pile (Free/ Fixed head)		=	**Fixed**	
Diameter / Size of pile		=	0.5	m
Average SPT N value		=	15	
Grade of concrete for pile material		=	M 30	
Modulus of elasticity of pile material	E	=	27386	MPa
Moment of Inertia of pile material	I	=	0.0031	m^4
Modulus of subgrade reaction	η h	=	2.12	MN/m^3
Stiffness factor [$T = (EI/\eta h)^{(1/5)}$]	T	=	2.51	m
Unsupported length	L_1	=	0	m
	L_1 / T	=	0	
	L_f / T	=	2.2	
	L_f	=	5.52	m
Permissible deflection at pile head	y	=	5	mm
Lateral capacity fixed head [y x 12EI / (L1+Lf)^3	H	=	30.0	kN

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.LOGANATHEN** 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 **40 years**.

He has been given the Registration No.**GTE/19/04/021** on **22.04.2019.** 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 **21.04.2024**.



CHENNAI METROPOLITAN DEVELOPMENT AUTHORITY

22/04/2019

(R.SHIVAKUMAR)
ASSISTANT PLANNER
CHENNAI METROPOLITAN DEVELOPMENT AUTHORITY
CHENNAI - 600 008

CMDA REGISTERED
Registration No.
GTE/19/04/021
GEO-TECHNICAL ENGINEER



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