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PROJECT

GEOTECHNICAL INVESTIGATION FOR THE PROPOSED CONSTRUCTION OF RESIDENTIAL VILLA CONSISTING OF GROUND + 1 UPPER FLOOR AT KARANAI, CHENNAI

CLIENT

M/s DRA AADITHYA SOUTH CITY PROJECT PVT LTD,
NEW NO'S: 109, 111 & 113, AVVAI SHANMUGAM SALAI,
LLOYDS ROAD, ROYAPETTAH,
CHENNAI, TAMIL NADU– 600 014.

TITLE

GEOTECHNICAL INVESTIGATION REPORT

REPORT NO.: GT- 2647

GEO MARINE CONSULTANTS (P) LTD. Chennai 600 041

DATE	REVISON	DESCRIPTION		AUTHORISED SIGNATORY
12/09/2023	FIRST SUBMISSION	SUBMISSION OF FINAL GEOTECHNICAL REPORT	SIGN	
			DATE	12/09/2023
			DESIGNATION	MANAGING DIRECTOR
			NAME	DR. C.V.PRASAD

For DRA AADITHYA SOUTH CITY PROJECTS PVT LTD

Authorised Signatory

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For DRAADITHYA SOUTH CITY PROJECTS PVT LTD

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REPORT TEXT

CHAPTER-1

INTRODUCTION

1.0 PROJECT INFORMATION MATRIX:

NATURE OF PROJECT	: **RESIDENTIAL VILLA**
STRUCTURE	: **GROUND + ONE FLOOR**
PROJECT OWNER	: **M/s DRA AADITHYA SOUTH CITY PROJECT PVT LTD,**
PROJECT LOCATION	: **KARANAI, CHENNAI**
JOB CODE	: **GT-2647**

1.1 SCOPE OF WORK:

1.1.1 FIELD WORK:

- Conducting two soil investigation bore holes of 150 mm diameter in Soil & Overburden.
- In case of rock formation NX Diameter with Core barrel shall be adopted to progress the drilling up the termination depth.
- Conducting Standard Penetration Test (SPT) within the borehole at:
  - Every 1.0m depth interval up to 6.0m.
  - From 6.0m to 12.0m, SPT is conducted at every 1.5m depth interval
- The depth of investigation ranges from 5.0m to 7.5m below the existing ground level.
- Collection of disturbed soil samples at SPT location and undisturbed samples from the clayey strata with SPT-value greater than 2 to less than 15 if met within the investigation depth
- Collection of water samples if groundwater table met within the investigation depth

1.1.2 LABORATORY WORK:

- Natural Moisture Content
- Atterberg's limits
- Grain Size Analysis
- Consolidation test on undisturbed samples if applicable
- Chemical Analysis test on soil and water samples to give pH, Chlorides and Sulphates

1.2 STRUCTURE OF THE REPORT:

- Contents
- Introduction
- Investigation Methodology & Test Results
- Sub-Surface Stratification
- Foundation System
- Recommendation
- Annexure

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CHAPTER-2

INVESTIGATION METHODOLOGY & TEST RESULTS

2.0 PREAMBLE:

Two soil investigation boreholes were put as per the planning of the engineer in-charge and these locations are shown in Fig.2.0. The equipment used and the methodology adopted to carry out the fieldwork is described below.

2.1 METHODOLOGY OF FIELD WORK:

2.1.1 EQUIPMENT USED AND METHOD OF DRILLING:

All the boreholes were sunk by conventional rotary drilling rigs. For borehole Methodology followed for boring conformed to IS: 1892 -2000. Boring was progressed by the cutting action of rotating bit with water circulation and stabilizing the side of the boreholes by using casing pipes/bentonite slurry up to required depth to prevent collapse of sidewall. Boring was continued by normal boring process using MS soil cutter in soil. However Tungsten Carbide (TC) bit drilling was resorted to drill in highly weathered rock stratum where the normal boring process became slow. Diamond Core (DC) bit drilling was adopted in moderately weathered rock formations where penetration using TC bit was became slow.

2.1.2 STANDARD PENETRATION TESTS:

This is a field test to determine "Penetration Resistance of Stratum at the Test Depth". This has been conducted in the boreholes generally up to refusal depth using procedures described in IS: 2131- 2002. In this test, split spoon sampler (50.8 mm OD and 35 mm ID) has replaced driving bit. Sampler is then driven by dropping 63.5 kg hammer on top of driving collar with free fall of 75 cm. The length of sampler is 60 cm.

The tests were conducted at the depth intervals indicated in Chapter-1 (Sec.1.1.1).

2.1.3 COLLECTION OF SOIL SAMPLES:

2.1.3.1 DISTURBED SAMPLES:

The SPT-samples collected were used as disturbed soil samples. These samples were used for visual and physical identification and for conducting laboratory classification tests as per I.S.1498-1970.

2.1.3.2 UNDISTURBED SAMPLES:

From the soft to stiff clay layer, representative undisturbed samples were collected. These samples were used primarily to establish the compressibility parameters to estimate the settlements of shallow foundation system wherever applicable.

2.1.4 COLLECTION OF GROUND WATER SAMPLES:

One representative water sample from each borehole was collected after 24 hours of completing the borehole if water table met within the investigated depth.

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NOTE ON GROUNDWATER TABLE RECORD:

- Groundwater table observation in geotechnical report is predominantly to arrive at foundation design criteria and shall not be construed as design guidelines for the design of dewatering systems
- The groundwater level indicated in the bore logs is specific to the duration of investigation and intensity of the monsoon rains during the time of investigation. Hence, the level shall be taken as guidelines only to plan the investigation for the dewatering system
- No foundation excavation or basement excavations if anticipated within the groundwater table zone shall be carried out without implementing groundwater lowering schemes

2.2 LABORATORY TESTING:

2.2.1 ON COARSE GRAINED SOIL:

On the representative samples, sieve analysis tests were conducted to arrive at grain size distribution. These tests were conducted as per I.S.2720 (part 4)-1985 and the results are presented in Tables-2.1 & 2.2. The graphical representation of grainsize distribution curve for the representative samples in each bore is presented in Fig. 2.3 & 2.4.

2.2.2 ON FINE GRAINED SOIL:

On the SPT sample index property tests were conducted to estimate consistency. These test results are presented in Tables-2.1 & 2.2. The graphical representation of hydrometer analyses curve for the representative samples in each bore is presented in Fig. 2.5.

2.2.3 CHEMICAL ANALYSIS TESTS:

On representative soil and water samples chemical analysis tests were conducted to estimate pH, Chloride and Sulphates and these results are presented in Table - 2.4 to 2.6.

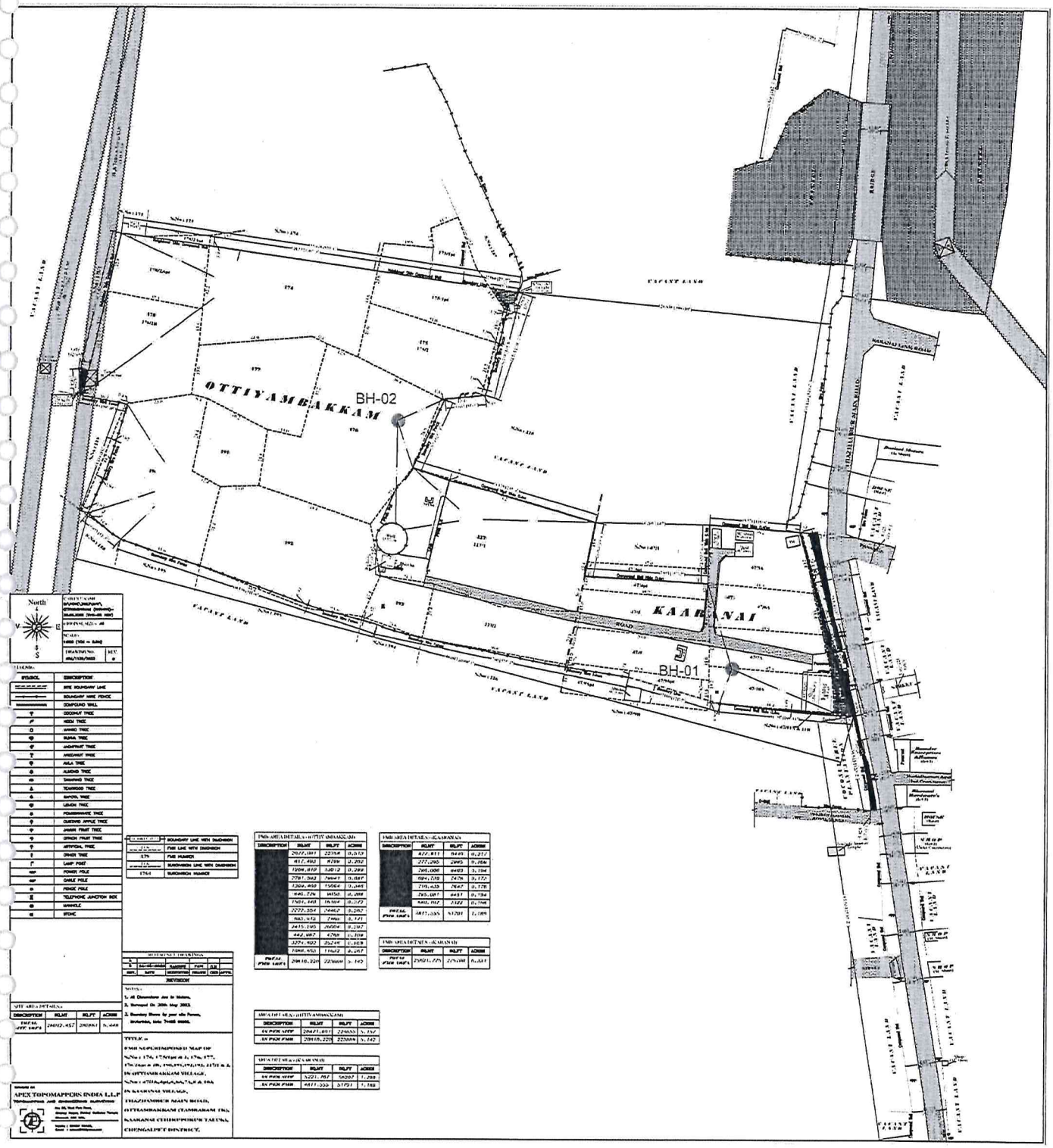
2.3 SUMMARY:

The locations of the field investigation boreholes are shown in site plan given in Fig.2.0. The average sub soil profiles encountered at each location along with their classification and engineering properties are presented in Figs.2.1 & 2.2.

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SITE PLAN



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SOIL PROFILES

For DHANJOTHYA SOUTH CITY PROJECTS PVT LTD

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SITE INVESTIGATION RECORD

BORE HOLE No.	BH-01(47/10A)	SHEET	1 OF 2
PROJECT NAME	PROPOSED CONSTRUCTION OF A RESIDENTIAL VILLA	DIA OF BORE HOLE	150mm ✓ NX ✓
LOCATION	Karanai, Chennai	MACHINE No.	CR-05
Free Fall Energy (%)	60	BORE START DATE	26/08/2023
STRUCTURE	Ground + One Upper Floors	DRILLING METHOD	Rotary
CO-ORDINATES	N - / E -	BORE END DATE	26/08/2023
JOB CODE	GT-2647	FLUSHING MEDIUM	Bentonite
TOTAL DRILL DAYS	1		

Date	Time (Hr. Min.)	Type of Drill Bit (SC / TCB / DB)	Total Core Recovery %	R.Q.D %	Blows/cm. 0-15	15-30	30-45	SPT Value N80	N	Sample Depth	No.	Type	RL (m)
26/08/2023	10 07 To 10 09	SC	-	-	10	11	15	-	26	0.50 – 0.95	1	SS	-0.5
	10 23 To 10 26	SC	-	-	23	18Cm Penet for 56 Blows		-	>100	1.25 – 1.58	2	SS	-1.3
	10 39 To 11 05	DB	11	0	-	-	-	-	-	2.00	3	CS	-2.0
	11 17 To 13 47	DB	75	12	-	-	-	-	-	3.00	4	CS	-3.0
	14 20 To 15 43	DB	32	0	-	-	-	-	-	4.00	5	CS	-4.0
	15 48 To 17 06	DB	53	20	-	-	-	-	-	5.00	6	CS	-5.0

Layer Data

No	Depth	Geotechnical Description
L1	1.25	Brown ,Moist,Poorly Graded, Fine & Medium Grains Sand,Medium Dense and Very Dense, **Clayey Silty SAND (SC)**
L2	2.00	Offwhite Brown,Moist,Very Dense, **Completely Weathered Rock - Grade W5 Rock Formation**
L3	5.00	Grey,Offwhite Grey,Medium to Coarse Grain Structure,Highly Fractured,Discoloured @ Parts,Strong to Extreme Strong,**Moderately Weathered Rock to Slightly Weathered Rock - Grade W3 & W2 Rock Formation** Fractured Hypersthene Granitic Rock

CS - Core Sample	DS - Disturbed Sample	LOGGED	Susil	PROJECT SITE DETAILS		REMARKS
SS - Split Spoon Sample	SC - Soil Cutter	DATE	26/08/2023	GROUND LEVEL (m)	0.00	
UDS- Undisturbed Sample	TCB - Tungsten Carbide Bit	CHECKED	G.Sharmila	WATER TABLE (m)	0.52	
WS - Wash Sample	DB - Diamond Bit	DATE	28/08/2023	CASING DEPTH (m)	0.00	

Borehole terminated at 5 m depth below E.G.L

FIG.2.1 Sub Soil Profile at BH-01(47/10A) Location

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SITE INVESTIGATION RECORD

BORE HOLE No.	BH-02(176)						
SHEET	1	OF	2				
PROJECT NAME	PROPOSED CONSTRUCTION OF A RESIDENTIAL VILLA			DIA OF BORE HOLE	150mm	✓	
					NX		
LOCATION	Karanai, Chennai	MACHINE No.	CR-05	Free Fall Energy (%)	60	BORE START DATE	29/08/2023
STRUCTURE	Ground + One Upper Floors	DRILLING METHOD	Rotary	CO-ORDINATES	N -	BORE END DATE	29/08/2023
JOB CODE	GT-2647	FLUSHING MEDIUM	Bentonite		E -	TOTAL DRILL DAYS	1

Depth below E.G.L. (m)	Drilling progress per metre: Date	Time: Hr.	Time: Min.	Type of Drill Bit (SC / TCB / DB)	Core Details: Total Core Recovery %	Core Details: R.Q.D %	SPT Details: Blows/cm. 0-15	15-30	30-45	SPT Value: N80	SPT Value: N	Sample Details: No.	Type	RL (m)	Layer Data: Legend	No	Depth	Geotechnical Description
0	29/08/2023	10	00	SC	-	-												
		To 10	03				3	4	6	-	10	0.50	1	SS	-0.5			Grey,Moist,Poorly Graded,Fine to Coarse Sand With Grvels,Loose,**Clayey Silty SAND (SC)**
1		10	10	SC	-	-						0.95						
		To 10	14				4	8	12	-	20	1.25	2	SS	-1.3	L1	1.25	
		10	23	SC	-	-						1.70						Grey,Moist,Very Stiff,**Clayey SILT (MH)** Clayey Silt of High Plasticity
2		To 10	26				11	18	29	-	47	2.00	3	SS	-2.0	L2	2.00	
		10	36	SC	-	-						2.45						Grey,Grey Brown,Moist,Fine to Coarse Sand With Gravels,Dense,**Disintegrated Hypersthene Granitic Rock - Grade W5 Rock formation**
3		To 10	39				10Cm Penete for 50 Blows			-	>100	3.00	4	SS	-3.0	L3	3.00	
		10	52	SC	-	-						3.10						
		To 10	53				SPT Hammer Rebounded			-	>100	4.00	-	WS	-4.0			
4		11	21	SC	-	-												
		To 11	24				21	18Cm Penet for 46 Blows		-	>100	5.00	5	SS	-5.0			
5		11	43	SC	-	-						5.33						Brown,Grey Brown,Moist,Fine to Coarse Sand With Gravels,Very Dense, **Completely Weathered Rock - Grade W5 Rock Formation** Fractured & Weathered Hypersthene Granitic Rock Formation
		To 11	46				16Cm Penete for 56 Blows			-	>100	6.00	6	SS	-6.0			
6		12	42	SC	-	-						6.16						
		To 12	46															
7							14Cm Penete for 60 Blows			-	>100	7.50	7	SS	-7.5	L4	7.70	
												7.64						
8																		
9																		
10																		

CS - Core Sample	DS - Disturbed Sample	LOGGED	Susil	PROJECT SITE DETAILS	REMARKS
SS - Split Spoon Sample	SC - Soil Cutter	DATE	29/08/2023	GROUND LEVEL (m) 0.00	
UDS- Undisturbed Sample	TCB - Tungsten Carbide Bit	CHECKED	S.Tysonraj	WATER TABLE (m) 0.80	
WS - Wash Sample	DB - Diamond Bit	DATE	01/09/2023	CASING DEPTH (m) 0.00	

Borehole terminated at 7.5 m depth below E.G.L

FIG.2.2 Sub Soil Profile at BH-02(176) Location

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GRAIN SIZE DISTRIBUTION CURVE

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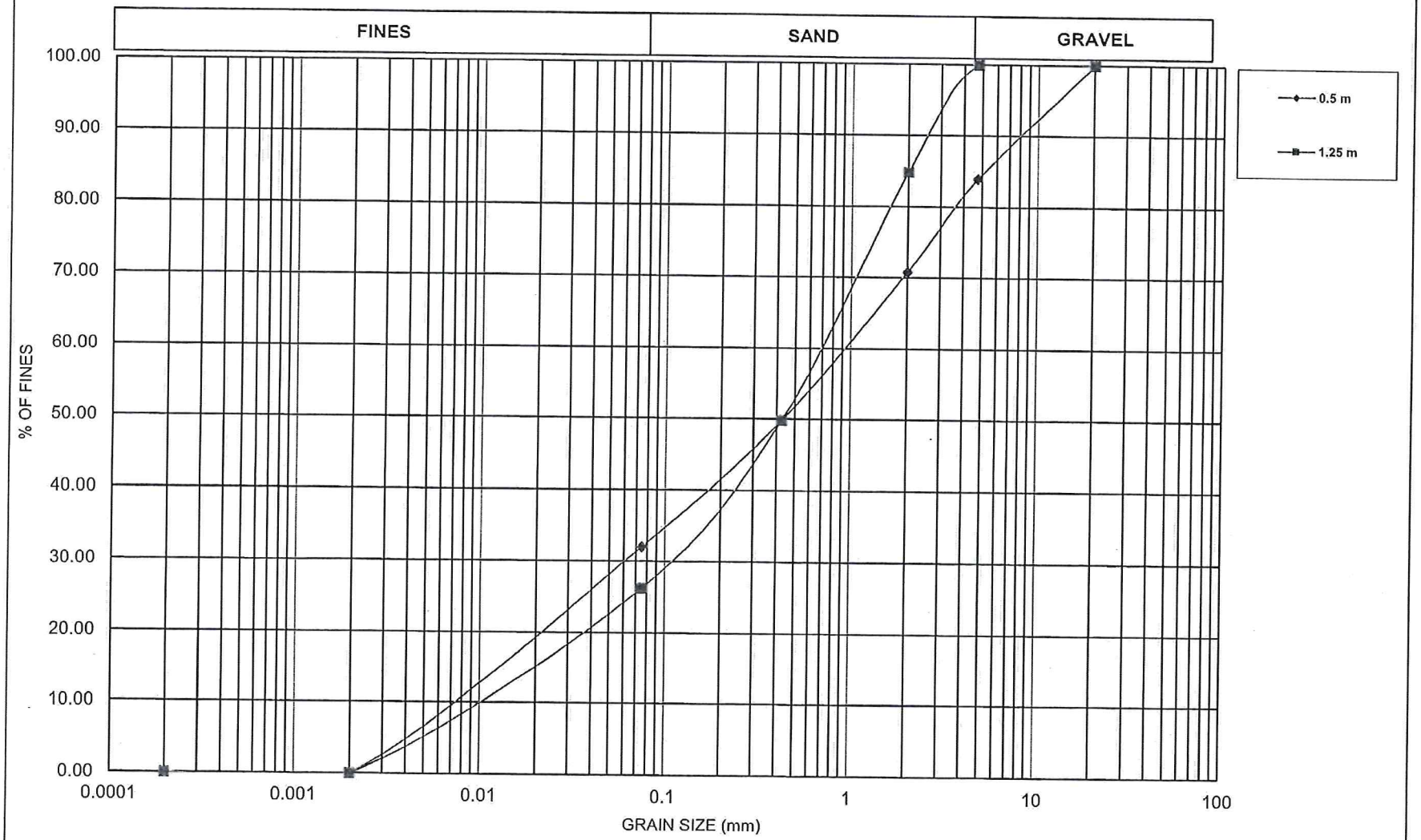


Fig. 2.3 GRAIN SIZE DISTRIBUTION CURVE - BH-01

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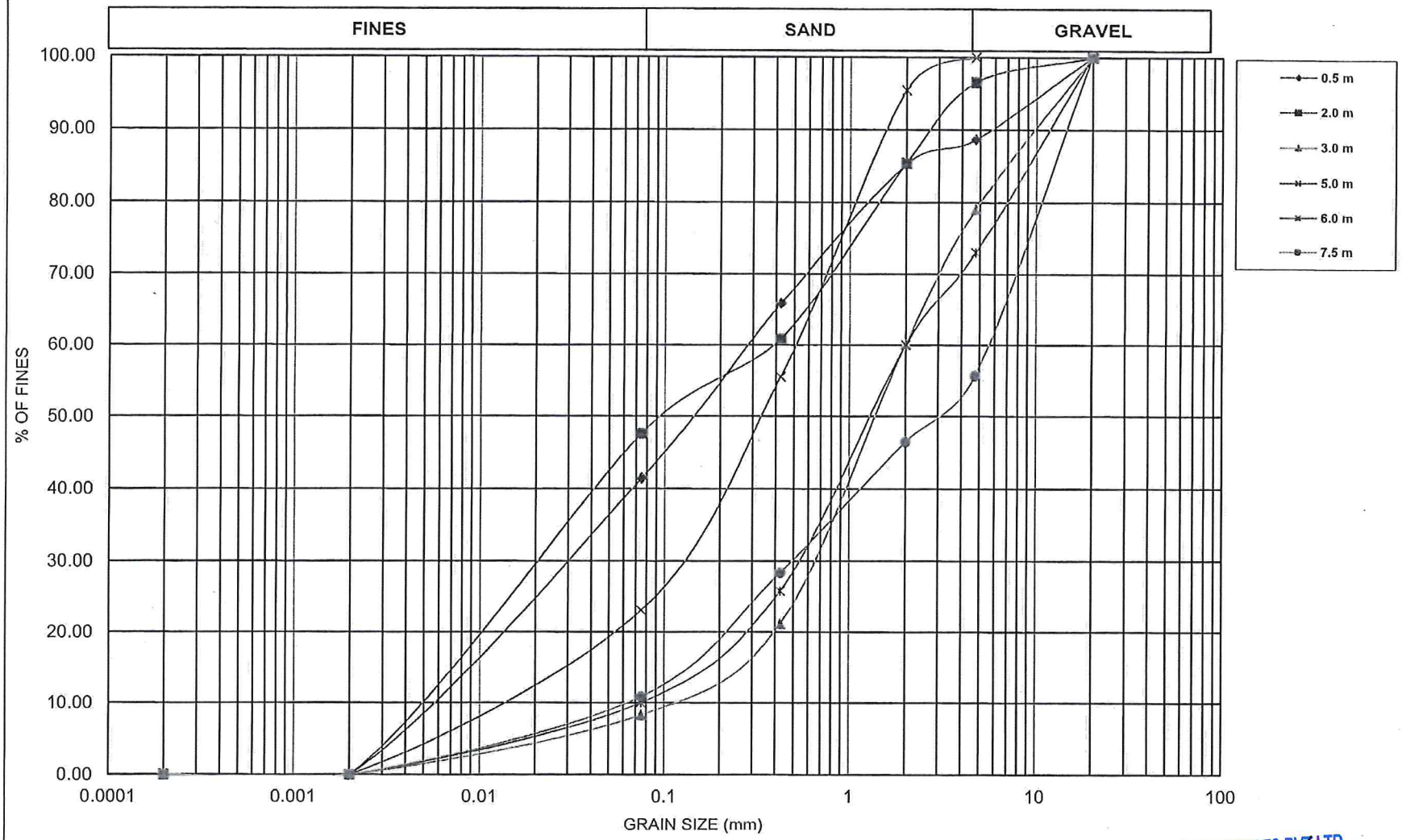


Fig. 2.4 GRAIN SIZE DISTRIBUTION CURVE - BH-02

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HYDROMETER ANALYSIS CURVE

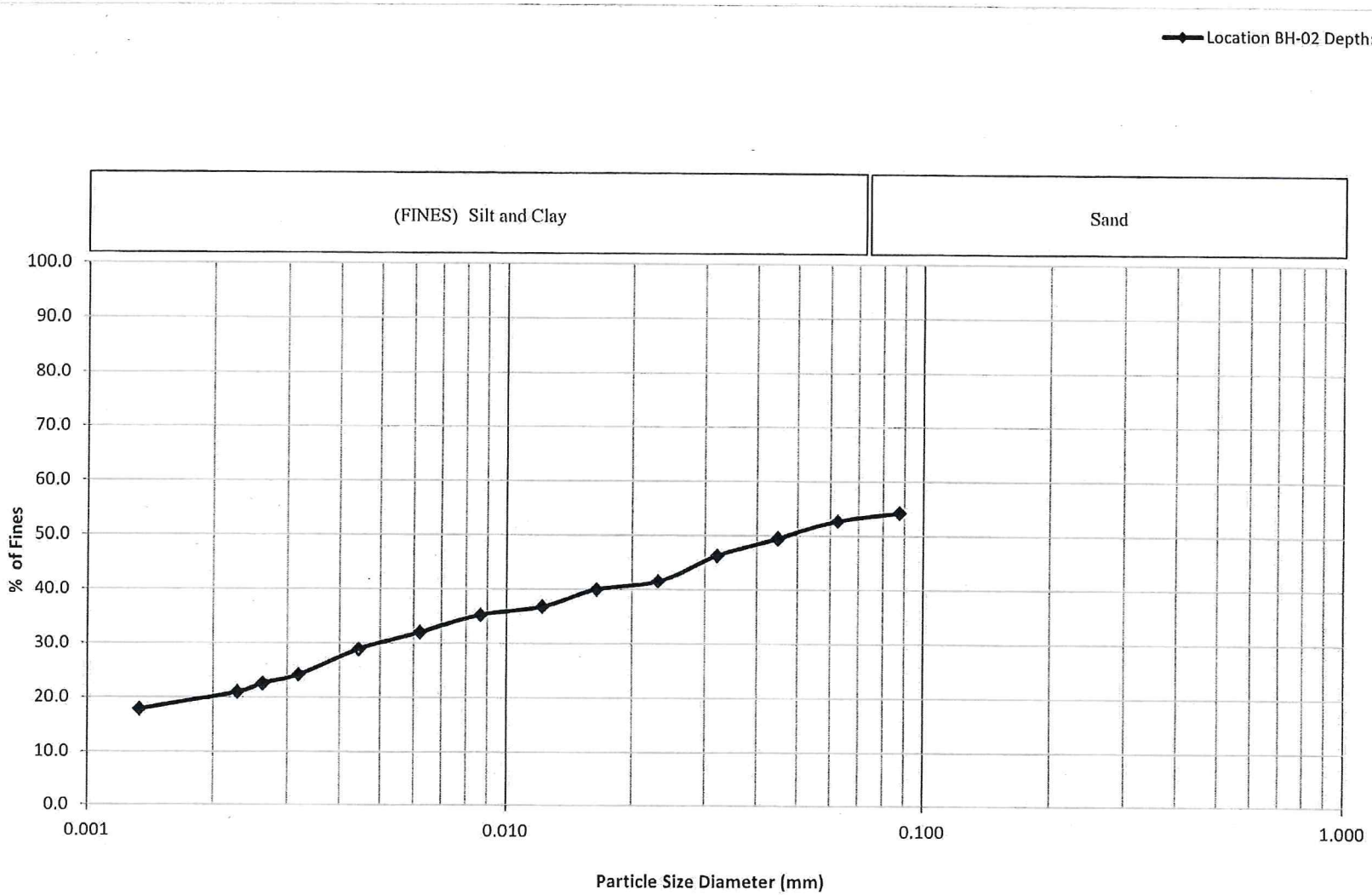


Fig 2.5 Hydrometer Analysis Master Curve

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Approved Signatory

For DAVANTHOO AYRTON AND CO. LTD.

LABORATORY TEST RESULTS

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LABORATORY TEST REPORT

GEOMARINE CONSULTANTS PVT LTD- TESTING LABORATORY

NO.11 2nd MAIN ROAD, KANNAPA NAGAR, CHENNAI-600041

ULR NO.	:	TC114102300000156F	SAMPLE IDENTIFICATION NUMBER	:	GMC/0823/737
REPORT ISSUED TO	:	M/s DRA AADITHYA SOUTH CITY PROJECT PVT LTD,	TEST REPORT NUMBER	:	GT-2647
DISCIPLINE/GROUP	:	MECHANICAL (SOIL AND ROCK)	SAMPLE RECEIPT DATE	:	28/08/2023
SAMPLE DESCRIPTION	:	CLAY AND SOIL	PERIOD OF TESTING	:	29/08/2023 to 04/09/2023
SAMPLE CONDITION	:	SATISFACTORY	REPORT ISSUE DATE	:	09/09/2023
TEST METHOD	:	BUREAU OF INDIAN STANDARDS	NO. OF PAGES	:	One

Table-2.1 Laboratory Classification of Soil Samples from BH-01 (47/10A)

Sampling Depth (m)	"N" Value	Type of Sample	Moisture Content (%) AS PER IS 2720 (P-II) - 1973, RA-2015	LIQUID LIMIT (%) AS PER IS 2720 (P-V) - 1985, RA-2015	PLASTIC LIMIT (%) AS PER IS 2720 (P-V) - 1985, RA-2015	Plasticity Index (I_P= LL-PL)	SHRINKAGE LIMIT (%) AS PER IS 2720 (P-VI) - 1972, RA-2011	FREE SWELL INDEX (%) AS PER IS 2720 (P-XL) - 1977, RA-2011	SPECIFIC GRAVITY AS PER IS 2720 (P-III, SEC-1) - 1980, RA-2010	GRAIN SIZE ANALYSIS AS PER IS 2720 (P-IV) - 1985, RA-2015						DIRECT SHEAR TEST IS 2720 PART 13:1986 (RA 2016)		Uniformity Co-Efficient $C_U=D_{60}/D_{10}$	Co-Efficient of Curvature $C_c=D_{30}^2/(D_{10}\times D_{60})$	Consistancy	Relative Density	IS-Notation		
										Gravel (%)	Coarse (%)	Medium (%)	Fine (%)	Silt (%)	Clay (%)	Cohesion (kg/cm^2)	ϕ (Degrees)					Fine Grain Soils	Gravely Soils	Sandy Soils
0.5	26	SPT	12.0	29.8	16.4	13.4	17.7	15.4	2.61	16.1	13.1	21.0	17.8	32.1						-	M.Dense	-	-	SC
1.25	>100	SPT	10.1	25.1	Non Plastic Binder			8.3	-	0.0	15.2	35.0	23.6	26.3						-	V.Dense	Completely Weathered Rock		

** END OF REPORT**

Terms and Conditions

(1) The test results furnished corresponds to the sample received

(2) The tested sample will not be retained for more than 45 days from the date of issue of test report except in the case as required by the applicable regulations.

(3) Any correction in this reports invalidates the reports

Authorised Signatory
A. VINOTH
(Technical Manager)

For DRA AADITHYA SOUTH CITY PROJECTS PVT LTD

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GEOMARINE
the spirit of excellence
Phone No.: 044-24481485, 044-24480305

LABORATORY TEST REPORT

GEOMARINE CONSULTANTS PVT LTD- TESTING LABORATORY

NO.11 2nd MAIN ROAD, KANNAPA NAGAR, CHENNAI-600041

ULR NO.	:	TC114102300000156F	SAMPLE IDENTIFICATION NUMBER	:	GMC/0823/737
REPORT ISSUED TO	:	M/s DRA AADITHYA SOUTH CITY PROJECT PVT LTD,	TEST REPORT NUMBER	:	GT-2647
DISCIPLINE/GROUP	:	MECHANICAL (SOIL AND ROCK)	SAMPLE RECEIPT DATE	:	01/09/2023
SAMPLE DESCRIPTION	:	CLAY AND SOIL	PERIOD OF TESTING	:	01/09/2023 to 07/09/2023
SAMPLE CONDITION	:	SATISFACTORY	REPORT ISSUE DATE	:	09/09/2023
TEST METHOD	:	BUREAU OF INDIAN STANDARDS	NO. OF PAGES	:	One

Table-2.2 Laboratory Classification of Soil Samples from BH-02(176)

Sampling Depth (m)	"N" Value	Type of Sample	Moisture Content (%) AS PER IS 2720 (P-II) - 1973, RA-2015	LIQUID LIMIT (%) AS PER IS 2720 (P-V) - 1985, RA-2015	PLASTIC LIMIT (%) AS PER IS 2720 (P-V) - 1985, RA-2015	Plasticity Index (I_P= LL-PL)	SHRINKAGE LIMIT (%) AS PER IS 2720 (P-VII) - 1972, RA-2011	FREE SWELL INDEX (%) AS PER IS 2720 (P-XL) - 1977, RA-2011	SPECIFIC GRAVITY AS PER IS 2720 (P-III, SEC-1) - 1980, RA-2010	GRAIN SIZE ANALYSIS AS PER IS 2720 (P-IV) - 1985, RA-2015						DIRECT SHEAR TEST IS 2720 PART 13:1986 (RA 2016)		Uniformity Co-Efficient $C_U=D_{60}/D_{10}$	Co-Efficient of Curvature $C_c=D_{30}^2/(D_{10}xD_{60})$	Consistancy	Relative Density	IS-Notation		
										Gravel (%)	Coarse (%)	Medium (%)	Fine (%)	Silt (%)	Clay (%)	Cohesion (kg/cm^2)	ϕ (Degrees)					Fine Grain Soils	Gravely Soils	Sandy Soils
0.5	10	SPT	24.0	37.7	24.6	13.1	14.9	16.7	-	11.4	3.4	19.3	24.4	41.5						-	Loose	-	-	SC
1.25	20	SPT	20.0	62.3	38.2	24.1	10.9	66.7	-	2.7	3.0	17.1	22.0	43.7	11.6					V.Stiff	-	MH	-	-
2.0	47	SPT	23.5	55.4	26.7	28.7	14.5	21.4	2.60	3.5	11.1	24.4	13.3	47.7						-	Dense	-	-	SC
3.0	>100	SPT	13.6	-	-	-	-	-	-	20.9	18.9	39.0	12.9	8.3						-	V.Dense	Completely Weathered Rock		
4.0	>100	WS	SPT Hammer Rebounded. Wash Sample Collected for Observation							72.9	17.6	8.1	1.4	0.0						-	V.Dense			
5.0	>100	SPT	20.1	Binder				9.1	-	0.0	4.6	39.8	32.5	23.1						-	V.Dense			
6.0	>100	SPT	18.2	-	-	-	-	-	-	27.0	12.9	34.2	15.8	10.0						-	V.Dense			
7.5	>100	SPT	14.2	-	-	-	-	-	-	44.2	9.3	18.1	17.5	10.9						-	V.Dense			

Terms and Conditions

(1) The test results furnished corresponds to the sample received

(2) The tested sample will not be retained for more than 45 days from the date of issue of test report except in the case as required by the applicable regulations.

(3) Any correction in this reports invalidates the reports

Authorised Signatory
A. VINOTH
(Technical Manager)

For DRA AADITHYA SOUTH CITY PROJECTS PVT LTD

Authorised Signatory

GEOMARINE
Phone No.: 044-24480305

LABORATORY TEST REPORT
GEOMARINE CONSULTANTS PVT LTD- GEOTECHNICAL LABORATORY
NO.11 2nd MAIN ROAD, KANNAPA NAGAR EXTN,
KOTTIVAKKAM, CHENNAI

TC-11410

Table 2.3 Result of Rock Test

ULR NO.	TC114102300000157F		
REPORT ISSUED TO	M/s DRA AADITHYA SOUTH CITY PROJECT PVT LTD,	Sample Identification Number:	GMC/0823/737
DISCIPLINE/GROUP	MECHANICAL/SOIL AND ROCK	Period of Testing:	08/09/2023
SAMPLE DESCRIPTION	ROCK	Report Date:	09/09/2023
SAMPLE CONDITION	SATISFACTORY	Test Report No.:	GT-2647
TEST METHOD	BUREAU OF INDIAN STANDARDS	Test Report Pages:	One Page

S.No	Bore Hole Number	DEPTH (m)	POINT LOAD STRENGTH INDEX, mPa AS PER IS 8764 - 1998, RA-2019	WATER CONTENT, % AS PER IS 13030 - 1991, RA-2021	SLAKE DURABILITY, % AS PER IS 10050 - 1981, RA-2021	TENSILE STRENGTH, mPa AS PER IS 10082 - 1981, RA-2021
1	BH-01(47/10A)	1.25 to 2.00	5.85	0.13	99.25	4.32
2	BH-01(47/10A)	2.00 to 3.00	6.79	0.09	98.99	4.26
3	BH-01(47/10A)	3.00 to 4.00	5.66	0.10	99.00	4.23
4	BH-01(47/10A)	4.00 to 5.00	6.03	0.11	99.04	5.03

** END OF REPORT**

Authorised Signatory

A. VINOTH
(Technical Manager)

Terms and Conditions

(1) The test results furnished corresponds to the sample received

(2) The tested sample will not be retained for more than 45 days from the date of issue of test report except in the case as required by the applicable regulations.

(3) Any correction in this reports invalidates the reports

For DRA AADITHYA SOUTH CITY PROJECTS PVT LTD

Authorised Signatory

GEOMARINE
THE SPIRIT OF ENGINEERING
Phone No.: 044-24480305

LABORATORY TEST REPORT
GEOMARINE CONSULTANTS PVT LTD- TESTING LABORATORY
NO.11 2nd MAIN ROAD, KANNAPA NAGAR EXTN,
KOTTIVAKKAM, CHENNAI

TC-11410

Table 2.4 Result of Chemical Test

ULR NO	:	TC114102300000158F	SAMPLE IDENTIFICATION NUMBER	:	GMC/0823/737
REPORT ISSUED TO	:	M/s DRA AADITHYA SOUTH CITY PROJECT PVT LTD,	TEST REPORT NUMBER	:	GT-2647
DISCIPLINE/GROUP	:	CHEMICAL - WATER	SAMPLE RECEIPT DATE	:	28/08/2023
SAMPLE DESCRIPTION	:	GROUND WATER	PERIOD OF TESTING	:	01/09/2023 to 04/09/2023
SAMPLE CONDITION	:	SATISFACTORY	REPORT ISSUE DATE	:	09/09/2023
TEST METHOD	:	BUREAU OF INDIAN STANDARDS	NO. OF PAGES	:	ONE

S No.	Bore Hole Number	Water			
		DEPTH OF SAMPLE (m)	pH AS PER IS 3025 (P-XI) - 2022	SULPHATES (mg/l) AS PER APHA 23rd Edn.2017-4500	CHLORIDES (mg/l) AS PER IS 3025(P-XXXII) - 1988, RA-2019
1.0	BH-01	0.52	7.49	385.0	140.8
2.0	BH-02	0.80	7.37	-	369.1

** END OF REPORT**

Authorised Signatory
A. VINOTH
(Technical Manager)

Terms and Conditions

(1) The test results furnished corresponds to the sample received

(2) The tested sample will not be retained for more than 30 days from the date of issue of test report except in the case as required by the applicable regulations.

(3) Any correction in this reports invalidates the reports

For DRA AADITHYA SOUTH CITY PROJECTS PVT LTD

Authorised Signatory

GEOMARINE
Phone No.: 044-24480305

LABORATORY TEST REPORT
GEOMARINE CONSULTANTS PVT LTD- TESTING LABORATORY
NO.11 2nd MAIN ROAD, KANNAPA NAGAR EXTN,
KOTTIVAKKAM, CHENNAI

TC-11410

Table 2.5 Result of Chemical Test

ULR NO	:	TC114102300000159F	SAMPLE IDENTIFICATION NUMBER	:	GMC/0823/737
REPORT ISSUED TO	:	M/s DRA AADITHYA SOUTH CITY PROJECT PVT LTD,	TEST REPORT NUMBER	:	GT-2647
DISCIPLINE/GROUP	:	CHEMICAL - SOIL AND ROCK	SAMPLE RECEIPT DATE	:	28/08/2023
SAMPLE DESCRIPTIOI	:	SOIL	PERIOD OF TESTING	:	01/09/2023 to 04/09/2023
SAMPLE CONDITION	:	SATISFACTORY	REPORT ISSUE DATE	:	09/09/2023
TEST METHOD	:	BUREAU OF INDIAN STANDARDS	NO. OF PAGES	:	ONE

S No.	SOIL (2:1)		
	Bore Hole Number	DEPTH OF SAMPLE (m)	pH AS PER IS 2720 (P-XXVI) - 1987, RA-2021
1.0	BH-01	1.25	7.60
2.0	BH-02	3.0	7.79

** END OF REPORT**

Authorised Signatory
A. VINOTH
(Technical Manager)

Terms and Conditions

(1) The test results furnished corresponds to the sample received

(2) The tested sample will not be retained for more than 30 days from the date of issue of test report except in the case as required by the applicable regulations.

(3) Any correction in this reports invalidates the reports

For DRA AADITHYA SOUTH CITY PROJECTS PVT LTD

Authorised Signatory

GEOMARINE
Phone No.: 044-24480305

LABORATORY TEST REPORT
GEOMARINE CONSULTANTS PVT LTD- TESTING LABORATORY
NO.11 2nd MAIN ROAD, KANNAPA NAGAR EXTN,
KOTTIVAKKAM, CHENNAI

Table 2.6 Result of Chemical Test

REPORT ISSUED TO	: M/s DRA AADITHYA SOUTH CITY PROJECT PVT LTD,	SAMPLE IDENTIFICATION NUMBER	: GMC/0823/737
DISCIPLINE/GROUP	: CHEMICAL - SOIL	TEST REPORT NUMBER	: GT-2647
SAMPLE DESCRIPTIC	: SOIL	SAMPLE RECEIPT DATE	: 28/08/2023
SAMPLE CONDITION	: SATISFACTORY	PERIOD OF TESTING	: 01/09/2023 to 04/09/2023
TEST METHOD	: BUREAU OF INDIAN STANDARDS	REPORT ISSUE DATE	: 09/09/2023
		NO. OF PAGES	: ONE

S No.	SOIL (2:1)			
	Bore Hole Number	DEPTH OF SAMPLE (m)	SULPHATES (mg/kg)	CHLORIDES (mg/kg)
1.0	BH-01	1.25	38.56	19.43
2.0	BH-02	3.0	39.71	14.57

** END OF REPORT**

Terms and Conditions

(1) The test results furnished corresponds to the sample received
(2) The tested sample will not be retained for more than 30 days from the date of issue of test report except in the case as required by the applicable regulations.
(3) Any correction in this reports invalidates the reports

Authorised Signatory
A. VINOTH
(Technical Manager)

For DRA AADITHYA SOUTH CITY PROJECTS PVT LTD

Authorised Signatory

CHAPTER-3

GEOLOGY & SUB-SURFACE STRATIFICATION

3.0 PREAMBLE:

Geotechnical investigation carried out at a specific site provides location specific sub surface engineering characteristics. However in major project sites where the construction activities spread over a very large area location specific sub surface strata characteristics are studied together with the geological mapping data.

This is required to incorporate the impact of any documented macro-level geological characteristics of the region on the foundation design, irrespective of the location specific sub surface strata characteristics.

In view on the above, though it is beyond the scope of the present study to carry out macro-level geological investigation the regional geology based on the published data is presented and discussed.

3.1 CLIMATE AND RAINFALL:

The study area receives the rain under the influence of both southeast and northeast monsoons. Predominantly northeast monsoon contributes rainfall and most of the precipitation occurs in the form of cyclonic storm caused due to the depressions in Bay of Bengal. The north east monsoon occurs between October & December. The southwest monsoon rainfall is highly erratic and summer rains are negligible.

The normal annual rainfall over the study area varies from 1100 mm to 1200mm.

3.2 GEOMORPHOLOGY:

Chennai district forms part of coastal plains of northern Tamil Nadu. Major part of the district is having flat topography with very gentle slope towards east. The altitudes of land surface vary from 10 m above MSL in the west to sea level in the east.

Fluvial, marine and erosional landforms are noticed in the district. Marine transgression and regressions and neo-tectonic activity during the recent past have influenced the morphology and resulted in various present landforms.

Meandering streams with small sand bars are present along the course of Adyar River. The pediment and buried pediment in Guindy area in and around the reserved forest, is the only area where the ecological system is less disturbed, while the other areas are completely disturbed by built up area with large-scale human interference and pollution.

3.3 GEOLOGY OF CHENNAI DISTRICT:

Chennai district is underlain by various geological formations from ancient Archaean to the Recent Alluvium. The geological formations of the district can be grouped into three units, namely

i) Archaean crystalline rocks

ii) Gondwana (Consolidated Clay/Clayey Silt) and Tertiary sediments and

iii) Recent Alluvium.

The Archaean crystalline rocks of the district comprise chiefly of Charnockite, gneisses and the associated basic and ultra-basic intrusive dykes.

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3.4 GEOLOGICAL ORDER OF THE STUDY AREA:

Geologically, the present site is located in a coastal region with sub surface consisting of sedimentary deposits. The top sedimentary deposit is under laid by upper Gondwana system, particularly lower stage of Sriperumpudur. The formation mechanism of the sediments is chiefly due to transportation of surface water and marine deposition.

The above geological characteristics are also observed in the direct borehole investigation, which confirms that the present site does not depict any surprising geological features that are different from that of the region.

3.5 DESIGN SUB SOIL PROFILE: (WRT Foundation Engineering Application)

The sub soil characteristics obtained at the test location are further processed to arrive at the design soil parameters required for the design of sub structure using the following shear strength correlations with respect to the Standard Penetration Test Values of different layers.

- For Coarse Grained Material, Ref. IS: 6403 to estimate Angle of Shearing Resistance (Reproduced and shown in Fig.A1)
- For Fine Grained Material, Ref. Terzaghi & Peck, 1948, to estimate Unconfined Compressive Strength (Reproduced and shown in Fig.A2)

Based on the above, the average design soil characteristics are given below:

REFERENCE BORE HOLE					BH-01	Ref R.L. of G.L. (m):			0.00		
Layer No.	Layer Thk. (m)			Type of Strata	Colour	Ave. Design SPT	Relative Density	Consistency	(γ) kN/m³	Shear Parameters	
	Top BGL	Bottom BGL	Thickness							(Cu) kPa	(ϕ) Deg.
1.0	0.00	1.25	1.25	Clayey Silty Sand	Brown	26	Medium Dense	-	19	-	34.8
2.0	1.25	2.00	0.75	Completely Weathered Rock	Off-white Brown	>100	Very Dense	-	21	-	42.5
3.0	2.00	5.00	3.00	Moderately to Slightly Weathered Rock	Grey	CRR: 11% to 75%; RQD:0% to 20%					

REFERENCE BORE HOLE					BH-02	Ref R.L. of G.L. (m):			0.00		
Layer No.	Layer Thk. (m)			Type of Strata	Colour	Ave. Design SPT	Relative Density	Consistency	(γ) kN/m³	Shear Parameters	
	Top BGL	Bottom BGL	Thickness							(Cu) kPa	(ϕ) Deg.
1.0	0.00	1.25	1.25	Clayey Silty Sand	Grey	10	Loose	-	15	-	30
2.0	1.25	2.00	0.75	Clayey Silt	Grey	20	-	Very Stiff	20	133	-
3.0	2.00	3.00	1.00	Residual Soil	Grey	47	Dense	-	20	-	40.325
4.0	3.00	7.70	4.70	Completely Weathered Rock	Brown	>100	Very Dense	-	21	-	42.5

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FOUNDATION SYSTEM

CHAPTER-4

FOUNDATION SYSTEM

4.0 PREAMBLE:

In the design of foundation system, the stress-strain compatibility of the super structure, sub structure and the bearing strata should be satisfied both individually and as a combined system. In view of this, the following data are needed for the design of foundation system, defined in terms of the type of sub structure and the bearing strata characteristics.

- The super structure characteristics along with the loading pattern on the sub structure
- The sub soil characteristics that define the required substructure configuration for a safe transfer of super-structural loads to the bearing strata

Considering the above aspects of the foundation design, the suitable type of foundation system is presented below.

4.1 PROPOSED STRUCTURES:

An understanding of the proposed construction and the order of loads on the foundations is needed for choosing the appropriate foundation system. In the present case, the proposed structure is configured with ground + one upper floor meant for residential occupancy. For this kind of structure, the column loads could vary between 750 kN to 1500 kN.

The above mentioned loads have no bearing on the design of either sub or super structures and are mentioned just to provide an insight to choose an appropriate foundation system with respect to subsoil conditions.

4.2 SUBSOIL FORMATION:

The sub surface geological variation is classified with respect to SPT test and given below:

0.0m to 1.25m	Medium Dense & Very Dense, Clayey Silty Sand in BH-01 Loose, Clayey Silty Sand in BH-02
1.25m to 2.0m	Completely Weathered Rock- Grade W5 Rock Formation in BH-01 Very Stiff, Clayey Silt in BH-02
2.0m to 7.7m	Moderately to Slightly Weathered Rock Formation- Grade W3 & W2 Rock Formation in BH-01 Completely Weathered Rock- Grade W5 Rock Formation.

4.3 FOUNDATION SYSTEM:

For the kind of proposed structure and sub surface characteristics, open foundation system shall be adopted. The isolated column footing can be located at a depth of 1.5m over a well compacted sand-gravel (1:1) mix or quarry dust of 300mm thickness laid in non-compacted layers of 150mm and compacted at optimum moisture content using a plate compactor.

The overall depth of foundation excavation shall be 1.8m below the existing ground level and the schematic arrangement of the foundation is shown in Fig.4.1. The footings shall be designed for a recommended allowable net safe bearing pressure of 250kPa.

Typical computations are presented in Annexure-I.

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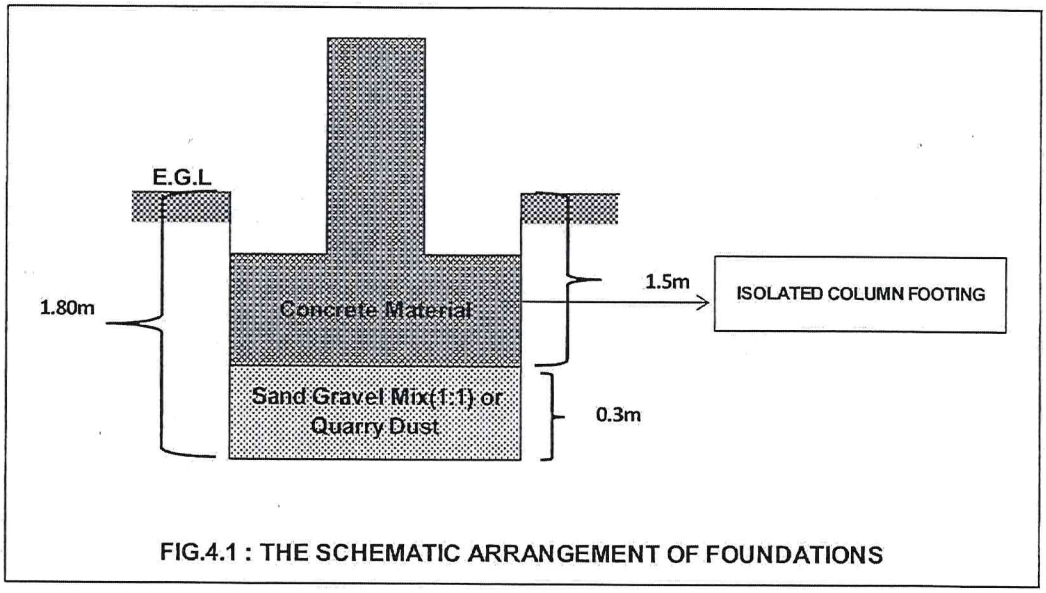


FIG.4.1 : THE SCHEMATIC ARRANGEMENT OF FOUNDATIONS

For DRA AADITHYA SOUTH CITY PROJECTS PVT LTD

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RECOMMENDATIONS

CHAPTER-5

RECOMMENDATIONS

5.1 RECOMMENDATION FOR SHALLOW FOUNDATION:

- For the kind of sub soil conditions open foundation system shall be adopted.
- The depth of foundation excavation shall be 1.8m below the existing ground level and shall be back filled with either sand-gravel mix (1:1) or quarry dust of 300mm thickness laid in non-compacted layers of thickness not more than 150mm and compacted at optimum moisture content using a plate vibrator.
- The isolated column footing can be located at 1.5m over the prepared bed and shall be designed for an allowable net safe bearing pressure of 250 kPa.
- All columns shall be connected with grade beams in both the directions at plinth level.
- The ground floor shall be minimum 600mm above the natural ground and the plinth shall be filled with sand/ gravel/ quarry dust. This height is recommended to contain the influence of soil volume change in the flooring. In case, floor is not raised, the ground floors shall be constructed as a suspended R.C.C. slab.

5.2 GENERAL RECOMMENDATIONS:

- The chlorides content in ground water & soil-water extract is less than the permissible limit of 500 mg/l as per IS 456 Table 1.0. Hence no special reinforcement is required for the construction.
- Corresponding to the sulphate content in 2:1 Water-Soil extract and ground water use Table 4.0 of IS 456 for minimum cement content. In the present case, ordinary Portland cement (OPC) is suitable for the constructions.
- The present project site falls in seismic zone-III as per IS 1893-P-I.

AUTHORISED SIGNATORY

GEO MARINE CONSULTANTS PVT. LTD. Chennai 600 041

DR. C. V. PRASAD
GEOMARINE CONSULTANTS PRIVATE LIMITED

DRA AADITHYA SOUTH CITY PROJECTS PVT LTD

Authorised Signatory

ANNEXURE-I

GEOMARINE

TYPICAL BEARING CAPACITY COMPUTATIONS FOR SHALLOW FOUNDATIONS

1.0 COMPUTATION OF BEARING CAPACITY AS PER IS:6403

Ref BH No 02

1.1 Geometrical Data :

Shape of the Foundation	Square
Total foundation excavation below E.G.L"Df"(m)	1.80
Thickness of soil replacement (m)	0.30
Depth of foundation below E.G.L"Df" (m)	1.50
Breadth of Footing "B" (m)	1.00
Length of Footing "L" (m)	1.00
L/B:	1.00
Inclination of Vertical Load with the Vertical (a)	0.00
Thickness of Fill (m)	0.00

1.2 Soil Data :

Type of Effective Bearing Strata :	Sand
Average SPT N of the Bearing Stratum:	47.00
Design SPT-value of the Bearing Stratum::	30.00
Type of Shear Failure:	General
Angle of Shearing Resistance	36

1.3 Design Parameters:

Bulk Density of Soil above the foundation depth (γ_{bulk})	18.0
Water Table Correction Factor (w')	0.50
Effective Overburden pressure at foundation level including the thickness of fill (q)	14.40
Bearing Capacity Factors:	
N_c =	N/A
N_q =	39.48
N_g =	60.31
Shape Factors:	
S_c =	-
S_q =	1.20
S_g =	0.80
Depth Factors :	
D_c =	-
D_q =	1.02
D_g =	1.02
Inclination Factor:	
I_c =	1.00
I_q =	1.00
I_g =	1.00

1.4 Ultimate Bearing Capacity (Qu) :

Qu=q*(Nq-1)*Sq*Dq*Iq + 0.5*B*g*Ng*Sg*Dg*Ig*w' 902.99 kPa

(g should be read as gama)

1.5 Safe Bearing Capacity (Qsafe) :

Factor of Safety (F.S.) :	2.50	
Qsafe :	361.20	kPa
Say Q_{safe}	**250**	**kPa**

2.0 Computation of Settlement for Maximum Pressure and Size of Footing: (as per IS:8009-Part-I-Ref. Eq.11) (Elastic Analysis)

The immediate elastic settlement (S_e):	$qB(1-m^2)*I/E_s$	
q= bearing pressure:	250	
Poission's Ratio (μ):	0.25	
Modulus of Elasticity (E_s)(Ref. Joseph E Bowels,1996,page316,Table5.6, Japanese design standards)		
Modulus of Elasticity (E_s):	122200	
Size of footing considered for maximum settlement(m):	1.00	
Influence factor:	0.95	
Depth Factor:	1.00	
Rigidity Factor:	0.80	
Elastic Settlement (S_e):	1.46	mm
	<50	mm

For DRA AADITHYA SOUTH CITY PROJECTS PVT LTD

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GEOMARINE

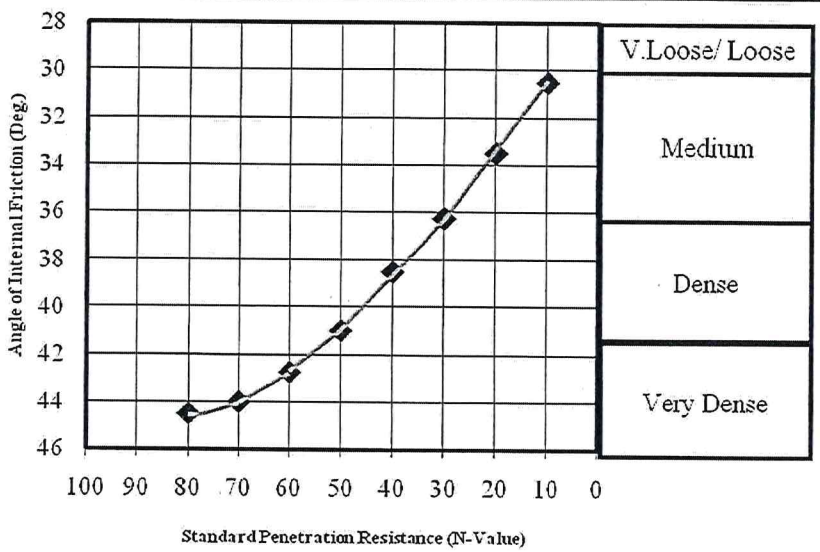


FIG. A1 Relation Ship between Angle of Internal Friction & N-value (Reproduced from IS:6403-1981)

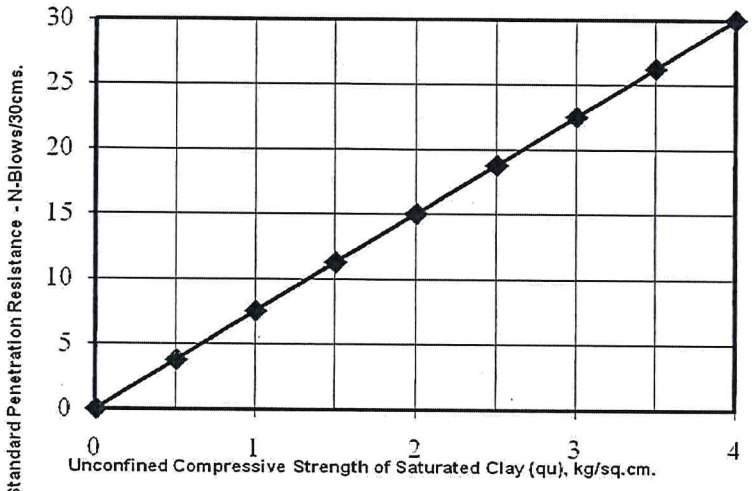


FIG. A2 : Relationship between UCC & SPT-Value (N) of Saturated Clay (AfterTerzhagi & Peck, 1948)

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ANNEXURE-II

For DRA AADITHYA SOUTH CITY PROJECTS PVT LTD

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GEOMARINE
THE SPIRIT OF ENGINEERING

SITE INVESTIGATION RECORD

PROJECT NAME	DRA					BORE HOLE No.	01 (47/10A)
						PAGE No.	1
						DIA OF BORE HOLE	150mm / 100mm
LOCATION	Kovanai	MACHINE No.	CR-05	CHAINAGE (m)		BORE START DATE	26/08/2023
STRUCTURE		DRILLING METHOD	Rotary	CO-ORDINATES	N	BORE END DATE	26/08/2023
JOB CODE		FLUSHING MEDIUM	Bentonite		E	TOTAL DRILLING DAYS	1

Depth below E.G.L. (m)	Drilling progress per metre: Date	Time: Hr.	Time: Min	Type of Drill Bit (SC / TCB / DB)	Core Details: Total Core Recovery %	Core Details: R.Q.D %	SPT Details: Blows/cm. 0-15	SPT Details: Blows/cm. 15-30	SPT Details: Blows/cm. 30-45	SPT 'N' Value	Sample Details: Depth	Sample Details: No.	Sample Details: Type	Layer Data: Depth (m)	Geotechnical Description
1	26/8	10	07	SC			10	11	15	26	0.50 mts	01	SS		Dense, Grey to brown highly weathered rock.
		10	09												
2	26/8	10	23	SC			23	18cm / 56blS			1.25 mts	02	SS		Dense, white to brown highly weathered rock.
		10	26												
3	26/8	10	39	CB	11	0					2.00 mts	03	CS		Hard, greyish to white partially weathered rock.
		11	05												
4	26/8	11	17	CB	75	12					3.00 mts	04	CS		Hard, greyish to white partially ~~weathe~~ fractured rock
		13	47												
5	26/8	14	20	CB	32	0					4.00 mts	05	CS		Hard, greyish to white partially fractured rock.
		15	43												
6	26/8	15	58	CB	53	20					5.00 mts	06	CS		Hard, greyish to white partially fractured rock.
		17	06												
7															
8															
9															
0															

CS - Core Sample	DS - Disturbed Sample	SUPERVISOR NAME	Susil	PROJECT SITE DETAILS	
SS - Split Spoon Sample	SC - Soil Cutter	SIGNATURE		GROUND LEVEL (m)	
UDS-Undisturbed Sample	TCB - Tungsten Carbide Bit	DATE	26/08/2023	WATER TABLE (m)	0.52mts
WS - Wash Sample	DB - Diamond Bit	CLIENT IN-CHARGE		CASING DEPTH (m)	

For DRA AADITHYA SOUTH CITY PROJECTS PVT LTD

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GEOMARINE
THE SPIRIT OF ENGINEERING

SITE INVESTIGATION RECORD

BORE HOLE No. 02 (176)
PAGE No. 1

PROJECT NAME	DRA					DIA OF BORE HOLE	150mm ✓ / 100mm
LOCATION	KARANAT	MACHINE No.	CR-05	CHAINAGE (m)		BORE START DATE	29/08/2023
STRUCTURE		DRILLING METHOD	Rotary	CO-ORDINATES	N	BORE END DATE	29/08/2023
JOB CODE		FLUSHING MEDIUM	Bentonite		E	TOTAL DRILLING DAYS	

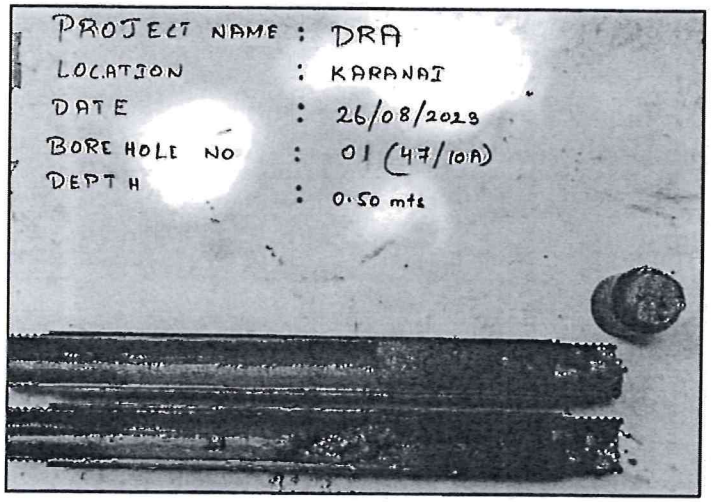
Depth below E.G.L. (m)	Drilling progress per metre: Date	Time: Hr.	Time: Min	Type of Drill Bit (SC / TCB / DB)	Core Details: Total Core Recovery %	Core Details: R.Q.D %	SPT Details: Blows/cm. 0-15	SPT Details: Blows/cm. 15-30	SPT Details: Blows/cm. 30-45	SPT 'N' Value	Sample Details: Depth	Sample Details: No.	Sample Details: Type	Layer Data: Depth (m)	Geotechnical Description
1	29/8	10	00				3	4	6	10	0.50 mts	01	SS		Dense, fine to medium grey silty clay.
		10	03												
2	29/8	10	10				4	8	12	20	1.25 mts	02	SS		Dense, fine to medium grey silty clay.
		10	14												
3	29/8	10	23				11	18	29	47	2.00 mts	03	SS		Dense, fine to medium grey silty clay with rock particles
		10	26												
4	29/8	10	36				10cm / 50blws				3.00 mts	04	SS		Weak, coarse to medium Brownish weathered rock
		10	39												
5	29/8	10	52				Hammer rebound				4.00 mts	05	WS		Weak, coarse to medium Brownish highly to completely weathered rock
		10	53												
6	29/8	11	021				21	18cm / 46blws			5.00 mts	06	SS		Dense, fine to medium brownish silty clay with rock particles.
		11	24												
7	29/8	11	43				46	16cm / 56blws			6.00 mts	07	SS		Dense, fine to medium Brownish weathered rock
		11	46												
8	29/8	12	42				14cm / 60blws				7.50 mts	08	SS		Dense, fine to medium Brownish weathered rock
		12	46												
9															
0															

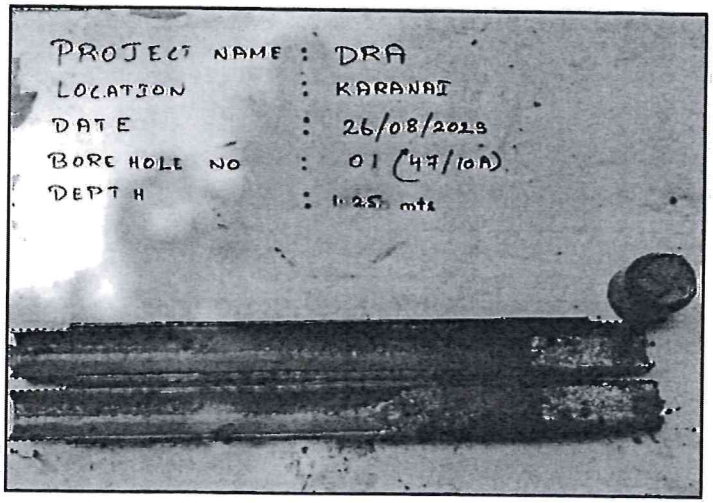
CS - Core Sample	DS - Disturbed Sample	SUPERVISOR NAME	SUSIL	PROJECT SITE DETAILS	
SS - Split Spoon Sample	SC - Soil Cutter	SIGNATURE	Susil	GROUND LEVEL (m)	
UDS-Undisturbed Sample	TCB - Tungsten Carbide Bit	DATE	29/08/2023	WATER TABLE (m)	0.8 mts
WS - Wash Sample	DB - Diamond Bit	CLIENT IN-CHARGE		CASING DEPTH (m)	

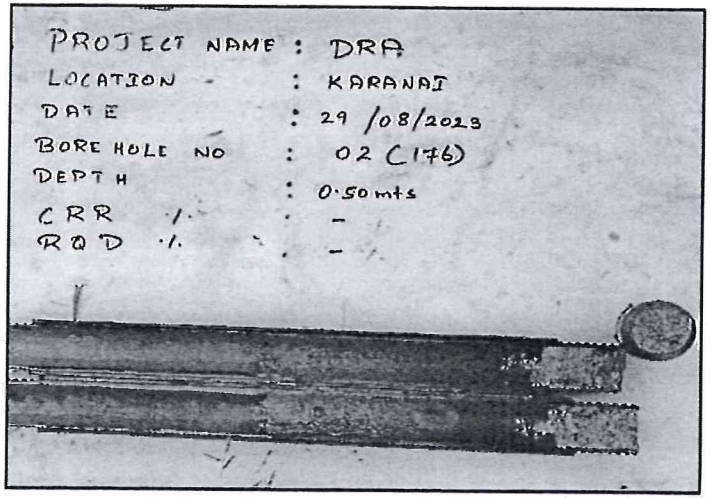
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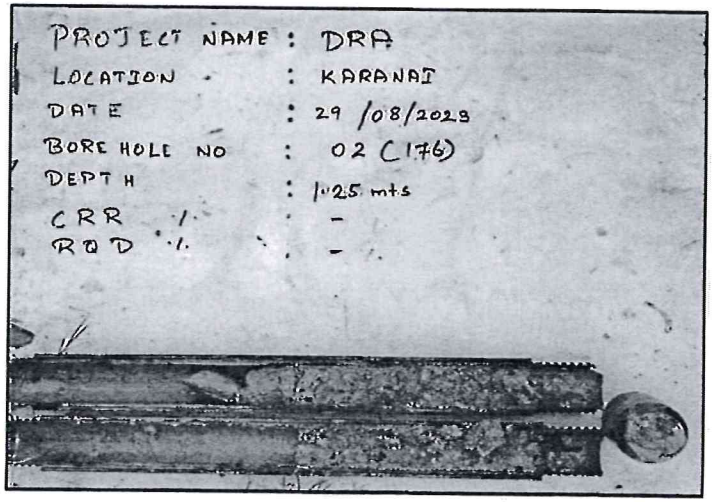
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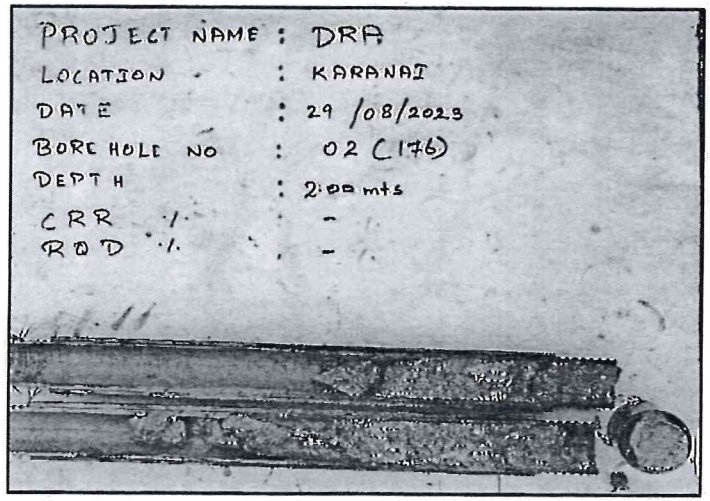


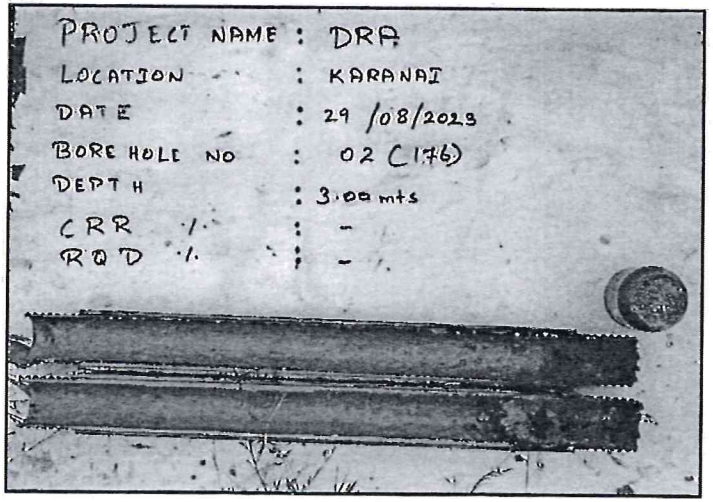


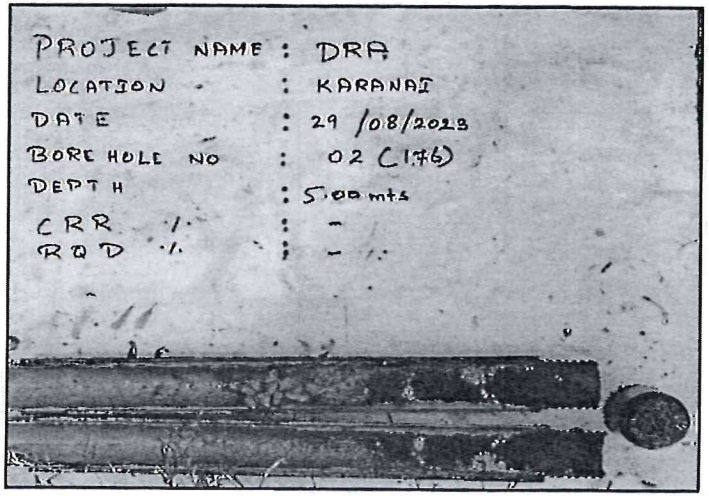
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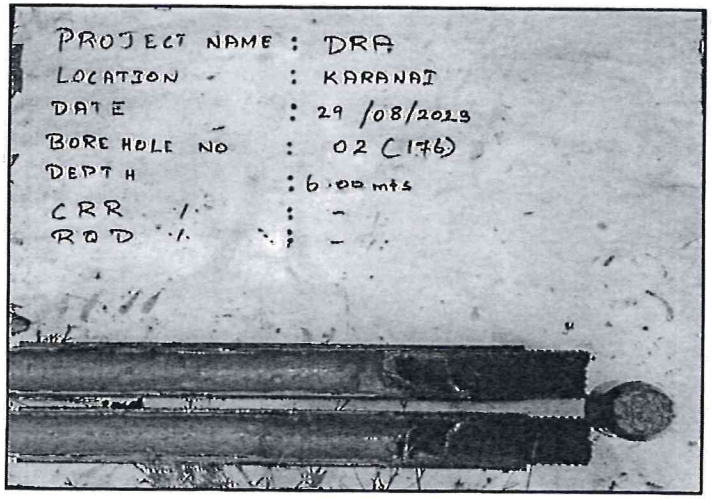
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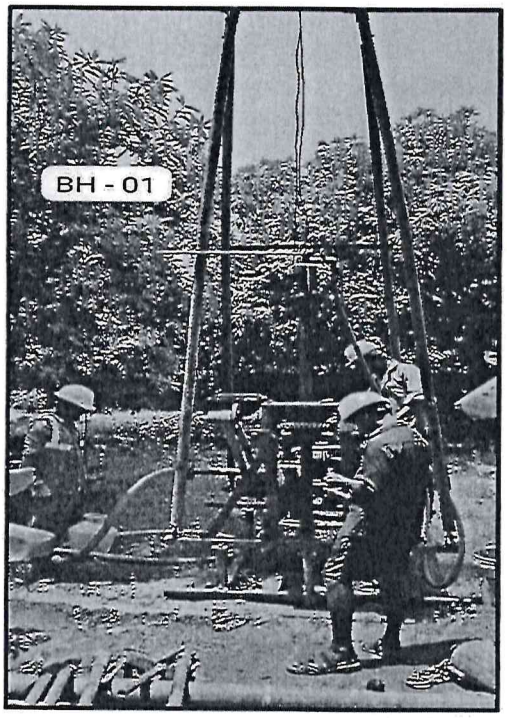


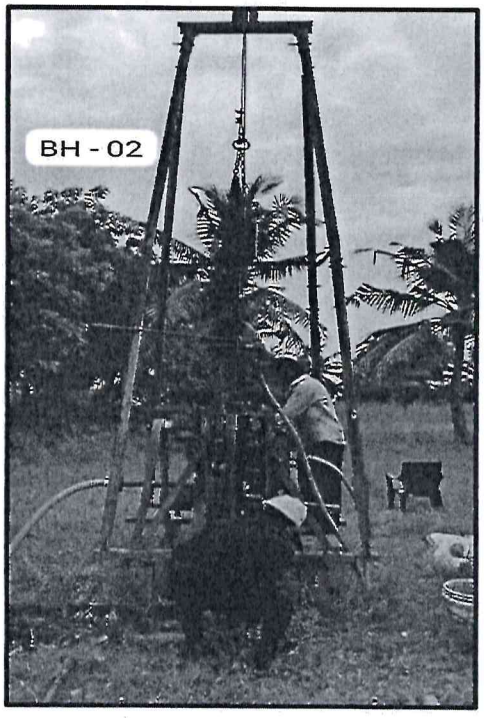


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Our services go beyond

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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.

Smarter Tools, Stronger Decisions

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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

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