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PROJECT

GEOTECHNICAL INVESTIGATION FOR THE PROPOSED CONSTRUCTION OF HIGH-RISE BUILDING (HRB) CONSISTING OF EXTENDED DOUBLE BASEMENT + STILT + 18 UPPER FLOORS, LOCATED AT JAWAHARLAL NEHRU ROAD, KOYAMBEDU, CHENNAI-600 107, AND IN T. S NO. 1/4, 1/5, 1/17, 1/18, 1/19, 1/20, 1/21, 1/23, 1/24, 1/25, 1/31, & 1/32 KOYEMBEDU VILLAGE, AMINJIKARAI TALUK, CHENNAI DISTRICT, GREATER CHENNAI CORPORATION.

PROJECT CLIENT

M/s APPASWAMY REAL ESTATE,
NO.3, MAGESH STREET,
T. NAGAR, CHENNAI,
TAMILNADU – 600 017

TITLE

GEOTECHNICAL INVESTIGATION REPORT

REPORT NO.: GT- 2453

GEO MARINE CONSULTANTS PVT. LTD. Chennai-41

DATE	REVISON	DESCRIPTION		AUTHORISED SIGNATORY
16/11/2022	FIRST SUBMISSION	SUBMISSION OF FINAL GEOTECHNICAL REPORT	SIGN	
			DATE	16/11/2022
			DESIGNATION	MANAGING DIRECTOR
			NAME	DR. C.V.PRASAD

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CHAPTER-1

INTRODUCTION

1.0 PROJECT INFORMATION MATRIX:

NATURE OF PROJECT	: **PROPOSED RESIDENTIAL BUILDING**
STRUCTURE	: **EXTENDED 2 BASEMENT + STILT + 18 FLOORS**
PROJECT OWNER	: **M/s APPASWAMY REAL ESTATES (P) LTD**
PROJECT LOCATION	: **KOYAMBEDU, CHENNAI**
JOB CODE	: **GT-2453**

1.1 SCOPE OF WORK:

1.1.1 FIELD WORK:

- Conducting three 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
  - From 12.0m to 20.0m SPT is conducted at every 2.0m depth interval
  - Beyond 20.0m SPT is conducted at every 2.5m depth interval till the termination depth.
  - Depth of investigation ranges from 30.0m to 33.0m 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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REPORT TEXT

CHAPTER-2

INVESTIGATION METHODOLOGY & TEST RESULTS

2.0 PREAMBLE:

Three 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.

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 to 2.3. The graphical representation of grainsize distribution curve for the representative samples in each bore is presented in Fig. 2.5 to 2.7.

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 to 2.3. The graphical representation of hydrometer analyses curve for the representative samples in each bore is presented in Fig. 2.8 to 2.18.

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 & 2.5.

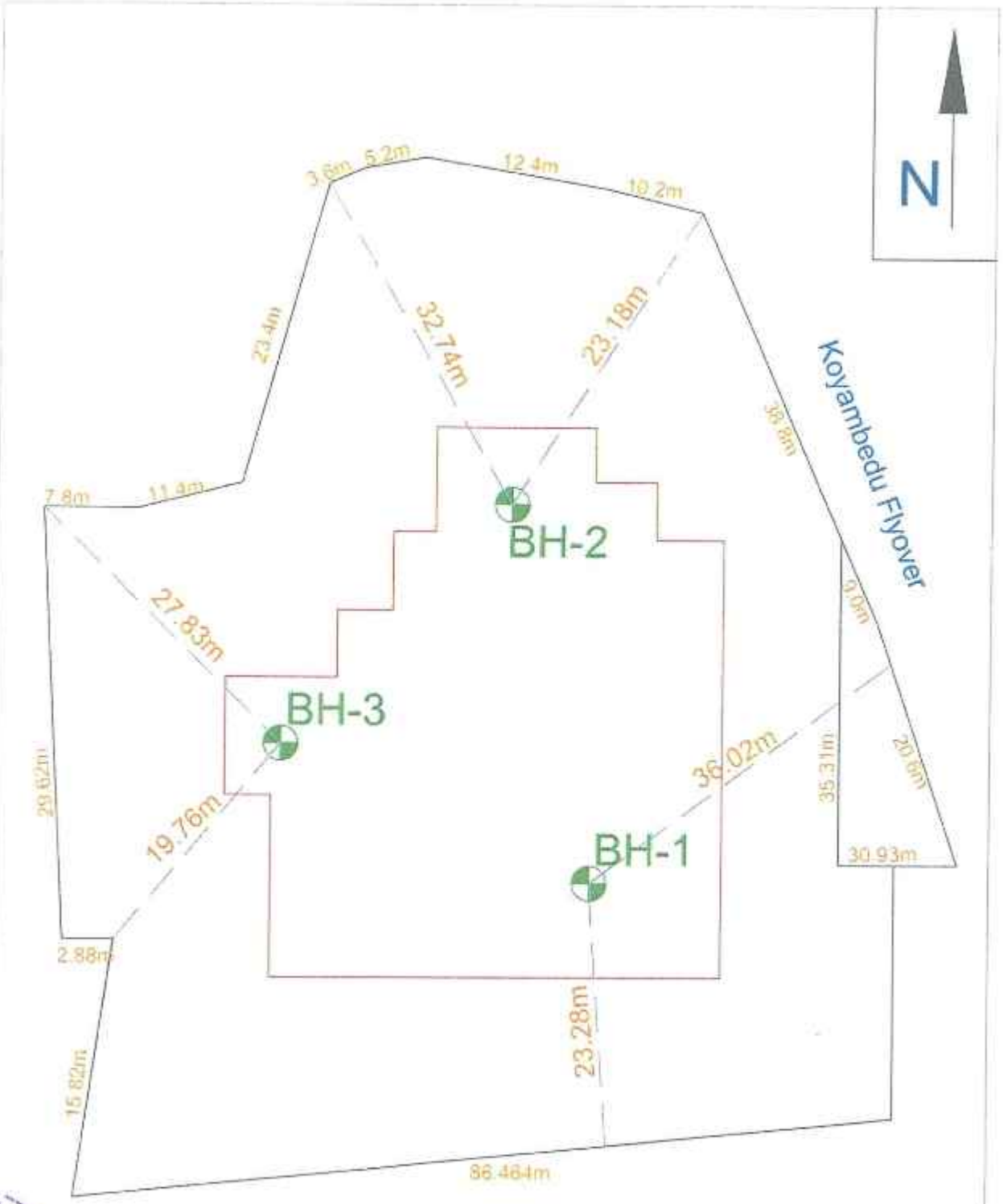
2.3 SUMMARY:

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 to 2.3.

Further, the cross-sectional variation of the sub surface profile through different bore holes in vertical and horizontal direction longitudinally or transversely are presented in Figs.2.4

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SITE PLAN



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FIG. 2.0 SITE PLAN SHOWING THE FIELD INVESTIGATION BOREHOLE LOCATION

SOIL PROFILES

SITE INVESTIGATION RECORD

GEOMARINE — THE SPIRIT OF ENGINEERING

BORE HOLE No.	BH-01						
SHEET	1	OF	4				
PROJECT NAME	PROPOSED CONSTRUCTION OF A RESIDENTIAL BUILDING			DIA OF BORE HOLE	150mm ✓	NX	
LOCATION	Koyembedu, Chennai	MACHINE No.	-	CHAINAGE (m)	-	BORE START DATE	08/10/2022
STRUCTURE	Extended 2 Basement + Stilt + 18 Floors	DRILLING METHOD	Rotary	CO-ORDINATES	N -	BORE END DATE	12/10/2022
JOB CODE	GT-2453	FLUSHING MEDIUM	Bentonite		E -	TOTAL DRILL DAYS	4

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	Sample Details: RL (m)	Layer Data: Legend	Layer Data: No	Layer Data: Depth	Geotechnical Description
0	08/10/2022	15	20	SC	-	-					0.50	-	WS	-0.5				
		To 15	28															
1		15	40				3	3	4	7	1.25	1	SS	-1.3				Filled Up Building Debris & Sand Mix
		To 15	42	SC	-	-					1.70							
2		15	58				15	14	13	27	2.00	2	SS	-2.0		L1	2.0	
		To 16	00	SC	-	-					2.45					L2	2.5	Filled Up Building Debris & Sand Mix
3		16	21				2	4	7	11	3.00	3	SS	-3.0				
		To 16	24	SC	-	-					3.45							
4		16	49				5	6	9	15	4.00	4	SS	-4.0				Grey Brown,Brown,Moist,Stiff to Very Stiff,Silty CLAY (CI) Lean Clay of Medium Plasticity
		To 18	51	SC	-	-					4.45							
5		09	52				7	12	10	22	5.00	5	SS	-5.0				
		To 09	53	SC	-	-					5.45							
6		10	15				7	13	10	23	6.00	6	SS	-6.0		L3	6.0	
		To 10	16	SC	-	-					6.45							
7	10/10/2022																	Grey,Moist,Fine Grains Sand Mix, Medium Dense,Sandy SILT (ML) With Little to No Plasticity
		10	50				2	2	2	4	7.50	7	SS	-7.5		L4	7.5	
8		To 10	52	SC	-	-					7.95							
9		11	28				1	1	2	3	9.00	8	SS	-9.0				Grey,Moist,Soft,Silty CLAY (CH) of High Plasticity
		To 11	30	SC	-	-					9.45							
10																		

CS - Core Sample	DS - Disturbed Sample	LOGGED	K. Loganthan	PROJECT SITE DETAILS	REMARKS
SS - Split Spoon Sample	SC - Soil Cutter	DATE	10/10/2022	GROUND LEVEL (m) 0.00	
UDS - Undisturbed Sample	TCB - Tungsten Carbide Bit	CHECKED	S. Dhanapal	WATER TABLE (m) 0.60	
WS - Wash Sample	DB - Diamond Bit	DATE	21/10/2022	CASING DEPTH (m) 0.00	

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GEOMARINE
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SITE INVESTIGATION RECORD

BORE HOLE No.	BH-01						
SHEET	2	OF	4				
PROJECT NAME	PROPOSED CONSTRUCTION OF A RESIDENTIAL BUILDING			DIA OF BORE HOLE	350mm	✓	
					NX		
LOCATION	Koyembedu, Chennai	MACHINE No.	-	CHAINAGE (m)	-	BORE START DATE	08/10/2022
STRUCTURE	Extended 2 Basement + Stilt + 18 Floors	DRILLING METHOD	Rotary	CO-ORDINATES	N -	BORE END DATE	12/10/2022
JOB CODE	GT-2453	FLUSHING MEDIUM	Bentonite		E -	TOTAL DRILL DAYS	4

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 'N' Value	Sample Details: Depth	No.	Type	RL (m)	Layer Data: Legend	No	Depth	Geotechnical Description
10																		
11	10/10/2022	11	45	SC	-	-	2	2	4	6	10.50	9	SS	-10.5		L5	10.5	Grey,Moist,Soft,Silty CLAY (CH) of High Plasticity
		To									10.95							
		11	50															
12							0	3	3	6	12.00	10	SS	-12.0				Grey,Moist,Medium Stiff, Silty CLAY (CI) Lean Clay of Medium Plasticity
											12.45							
		12	16															
13		To		SC	-	-												
		12	18															
14							2	5	12	17	14.00	11	SS	-14.0		L6	14.0	
											14.45							
		14	18															Pale Grey,Moist,Poorly Graded,Fine & Medium Grains Sands,Medium Dense, Clayey Silty SAND (SC)
15		To		SC	-	-												
		14	21															
16							7	12	25	37	16.00	12	SS	-16.0		L7	16.0	
											16.45							
		15	06															
17		To		SC	-	-												
		15	20															
18							12	15	20	35	18.00	13	SS	-18.0				Brown Grey,Moist,Hard,Sub Fissile,Silty CLAY (CH) Clay of High Plasticity
											18.45							
		16	09															
19		To		SC	-	-												
		16	42															
20							20	52	10cm Pencil for 51 blows	>100	20.00	14	SS	-20.0		L8	20.0	
											20.40							Brown Grey,Moist,Poorly Graded,Fine & Medium Grains Sands,Very Dense, Silty SAND (SM)

CS - Core Sample	DS - Disturbed Sample	LOGGED	K. Loganthan	PROJECT SITE DETAILS		REMARKS	
SS - Split Spoon Sample	SC - Soil Cutter	DATE	10/10/2022	GROUND LEVEL (m)	0.00		
UDS- Undisturbed Sample	TCB - Tungsten Carbide Bit	CHECKED	S. Dhanapal	WATER TABLE (m)	0.00		
WS - Wash Sample	DB - Diamond Bit	DATE	21/10/2022	CASING DEPTH (m)	0.00		

GEOMARINE
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SITE INVESTIGATION RECORD

BORE HOLE No.	BH-01						
SHEET	3	OF	4				
PROJECT NAME	PROPOSED CONSTRUCTION OF A RESIDENTIAL BUILDING			DIA OF BORE HOLE	150mm	✓	
					NX		
LOCATION	Koyembedu, Chennai	MACHINE No.	-	CHAINAGE (m)	-	BORE START DATE	08/10/2022
STRUCTURE	Extended 2 Basement + Stilt + 18 Floors	DRILLING METHOD	Rotary	CO-ORDINATES	N -	BORE END DATE	12/10/2022
JOB CODE	GT-2453	FLUSHING MEDIUM	Bentonite		E -	TOTAL DRILL DAYS	4

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 "N" Value	Sample Details: Depth	No.	Type	RL (m)	Layer Data: Legend	No	Depth	Geotechnical Description
21	11/10/2022	09	30	SC	-	-												
		To																
		09	38															
22							14	23	32	55	22.50	15	SS	-22.5				
23											22.95							
		10	54															Brown Grey,Moist,Poorly Graded,Fine & Medium Grains Sands,Very Dense, Silty SAND (SM) & Clayey Silty SAND (SC)
		To																
24		11	03	SC	-	-												
25							14	20	45	65	25.00	16	SS	-25.0				
											25.45							
		11	49															
26		To																
		12	05	SC	-	-												
27																L9	27.0	
							7cm Penet for 55 Blows			>100	27.50	17	SS	-27.5				
											27.57							
28																		
		14	15															Grey,Moist,Fissile,Hard,Fine Grains Argillaceous,SHALE Shale of Gondwana formation
		To																
29		14	30	SC	-	-												
30							SPT-Hammer Rebound			>100	30.00	-	WS	-30.0				

CS - Core Sample	DS - Disturbed Sample	LOGGED	K. Loganthan	PROJECT SITE DETAILS		REMARKS
SS - Split Spoon Sample	SC - Soil Cutter	DATE	11/10/2022	GROUND LEVEL (m)	0.00	
UDS- Undisturbed Sample	TCB - Tungsten Carbide Bit	CHECKED	S. Dhanapal	WATER TABLE (m)	0.80	WS - No Penetration
WS - Wash Sample	DB - Diamond Bit	DATE	21/10/2022	CASING DEPTH (m)	0.00	

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SITE INVESTIGATION RECORD

BORE HOLE No.	BH-01						
SHEET	4	OF	4				
PROJECT NAME	PROPOSED CONSTRUCTION OF A RESIDENTIAL BUILDING			DIA OF BORE HOLE	150mm	✓	
					NX	✓	
LOCATION	Koyambedu, Chennai	MACHINE No.	-	CHAINAGE (m)	-	BORE START DATE	08/10/2022
STRUCTURE	Extended 2 Basement + Stilt + 18 Floors	DRILLING METHOD	Rotary	CO-ORDINATES	N -	BORE END DATE	12/10/2022
JOB CODE	GT-2453	FLUSHING MEDIUM	Bentonite		E -	TOTAL DRILL DAYS	4

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	Sample Details: RL (m)	Layer Data: Legend	Layer Data: No.	Layer Data: Depth	Geotechnical Description
31	11/10/2022	15	30	DB	-	-												Grey,Moist,Fissile,Hard,Fine Grains Argillaceous,SHALE Shale of Gondwana formation
		To																
		16	58															
32	12/10/2022	09	30	DB	2	0	SPT Hammer Rebound			>100	32.00	18	CS	-32.0		L10	32.0	
		To																
		11	30															
33																		
34																		
35																		
36																		
37																		
38																		
39																		
40																		

CS - Core Sample	DS - Disturbed Sample	LOGGED	K. Loganthan	PROJECT SITE DETAILS		REMARKS
SS - Split Spoon Sample	SC - Soil Cutter	DATE	11/10/2022	GROUND LEVEL (m)	0.00	
UDS- Undisturbed Sample	TCB - Tungsten Carbide Bit	CHECKED	S. Dhanapal	WATER TABLE (m)	0.80	
WS - Wash Sample	DB - Diamond Bit	DATE	21/10/2022	CASING DEPTH (m)	0.00	

Borehole terminated at 32 m depth below E.G.L

FIG.2.1 Sub Soil Profile at BH-01 Location

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SITE INVESTIGATION RECORD

BORE HOLE No.	BH-02						
SHEET	1	OF	4				
PROJECT NAME	PROPOSED CONSTRUCTION OF A RESIDENTIAL BUILDING			DIA OF BORE HOLE	150mm	✓	
					NX		
LOCATION	Koyembedu, Chennai	MACHINE No.	CR-08	CHAINAGE (m)	-	BORE START DATE	13/10/2022
STRUCTURE	Extended 2 Basement + Stilt + 10 Floors	DRILLING METHOD	Rotary	CO-ORDINATES	N -	BORE END DATE	15/10/2022
JOB CODE	GT-2453	FLUSHING MEDIUM	Bentonite		E -	TOTAL DRILL DAYS	3

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 'N' Value	Sample Details: Depth	No.	Type	RL (m)	Legend	No	Depth	Geotechnical Description
1	13/10/2022	09	39 To 09 40	SC	-	-	6	5	2	7	0.50	1	SS	-0.5				
		09	40 To 09 56				4	3	4	7	1.25	2	SS	-1.3				Filled Up Building Debris & Sand Mix
2		09	56 To 09 57	SC	-	-					1.70							
		09	57 To 10 35				7	7	9	16	2.00	3	SS	-2.0		L1	2.0	
		10	35 To 10 34	SC	-	-					2.45							Filled Up Building Debris & Sand Mix
3		10	34 To 10 59				3	5	6	11	3.00	-	*SS	-3.0		L2	3.0	
		10	59 To 11 02	SC	-	-					3.45							
4		11	02 To 11 33				2	5	6	11	4.00	4	SS	-4.0				
		11	33 To 11 35	SC	-	-					4.45							
							-	-	-	-	4.50	5	UDS	-4.5				Brown,Brown Grey,Moist,Stiff,Silty CLAY (CH) Clays of High Plasticity
5		11	35 To 12 42				3	6	8	14	5.00	-	*SS	-5.0				
		12	42 To 12 45	SC	-	-					5.45							
6		12	45 To 14 14				8	10	12	22	6.00	6	SS	-6.0		L3	6.0	
		14	14 To 14 15	SC	-	-					6.45							
7		14	15 To 14 47				1	1	2	3	7.50	7	SS	-7.5		L4	7.5	Grey,Moist,Very Stiff,Fine Grains Sand Mix,Sandy Silty CLAY (CL) of Low Plasticity
		14	47 To 14 49	SC	-	-					7.95							
8																		Grey,Moist,Soft,Silty CLAY (CH) of High Plasticity
9		14	49 To 16 47				4	4	3	7	9.00	8	SS	-9.0		L5	9.0	
		16	47 To 16 49	SC	-	-					9.45							Grey,Moist,Medium Stiff,Silty CLAY (CH) Of High Plasticity
10																		

CS - Core Sample	DS - Disturbed Sample	LOGGED	K. Loganathan	PROJECT SITE DETAILS	REMARKS
SS - Split Spoon Sample	SC - Soil Cutter	DATE	13/10/2022	GROUND LEVEL (m) 0.00	
UDS- Undisturbed Sample	TCB - Tungsten Carbide Bit	CHECKED	Aravindhan	WATER TABLE (m) 1.00	* Sample Failed
WS - Wash Sample	DB - Diamond Bit	DATE	31/10/2022	CASING DEPTH (m) 0.00	

GEO MARINE CONSULTANTS PVT. LTD. Chennai-41

GEOMARINE
THE SPIRIT OF ENGINEERING

SITE INVESTIGATION RECORD

BORE HOLE No.	BH-02						
SHEET	2	OF	4				
PROJECT NAME	PROPOSED CONSTRUCTION OF A RESIDENTIAL BUILDING			DIA OF BORE HOLE	150mm	✓	
					NX		
LOCATION	Koyambedu, Chennai	MACHINE No.	CR-05	CHAINAGE (m)	-	BORE START DATE	13/10/2022
STRUCTURE	Extended 2 Basement + Stilt + 18 Floors	DRILLING METHOD	Rotary	CO-ORDINATES	N -	BORE END DATE	15/10/2022
JOB CODE	GT-2453	FLUSHING MEDIUM	Bentonite		E -	TOTAL DRILL DAYS	3

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	Sample Details: RL (m)	Layer Data: Legend	Layer Data: No	Layer Data: Depth	Geotechnical Description
11	13/10/2022	17	06	SC	-	-	1	1	3	4	10.50 / 10.95	9	SS	-10.5		L6	10.5	Grey,Moist,Medium Stiff,Silty CLAY (CH) Of High Plasticity
		To 17	08															
12							1	2	2	4	12.00 / 12.45	10	SS	-12.0				Grey,Moist,Soft,Silty CLAY (CH & Cl) of Medium & High Plasticity
13		09	32	SC	-	-												
		To 09	35															
14							5	10	15	25	14.00 / 14.45	11	SS	-14.0		L7	14.0	
15		10	08	SC	-	-												
		To 10	14															
16	14/10/2022						5	10	16	26	16.00 / 16.45	12	SS	-16.0				
17		10	48	SC	-	-												Brown Grey,Moist,Very Stiff,Sub Fissile,Silty CLAY (CH) Clay of High Plasticity
		To 10	56															
18							8	12	16	28	18.00 / 18.45	13	SS	-18.0				
19		12	00	SC	-	-												
		To 12	09															
20							12	27	28	55	20.00 / 20.45	14	SS	-20.0		L8	20.0	Brown Grey,Moist,Poorly Graded,Fine & Medium Grains Sands,Very Dense, Clayey Silty SAND (SC)

CS - Core Sample	DS - Disturbed Sample	LOGGED	K. Loganathan	PROJECT SITE DETAILS		REMARKS	
SS - Split Spoon Sample	SC - Soil Cutter	DATE	14/10/2022	GROUND LEVEL (m)	0.00		
UDS - Undisturbed Sample	TCB - Tungsten Carbide Bit	CHECKED	Aravindhan	WATER TABLE (m)	1.00		
WS - Wash Sample	DB - Diamond Bit	DATE	31/10/2022	CASING DEPTH (m)	0.00		

GEOMARINE CONSULTANTS PVT. LTD. Chennai-41

GEOMARINE
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SITE INVESTIGATION RECORD

BORE HOLE No. **BH-02**
SHEET 3 OF 4

PROJECT NAME	PROPOSED CONSTRUCTION OF A RESIDENTIAL BUILDING					DIA OF BORE HOLE	150mm ✓ / NX
LOCATION	Koyembedu, Chennai	MACHINE No.	CR-06	CHAINAGE (m)	-	BORE START DATE	13/10/2022
STRUCTURE	Extended 2 Basement + Stilt + 18 Floors	DRILLING METHOD	Rotary	CO-ORDINATES	N -	BORE END DATE	15/10/2022
JOB CODE	GT-2453	FLUSHING MEDIUM	Bentonite		E -	TOTAL DRILL DAYS	3

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: 15-30	SPT: 30-45	SPT 'N' Value	Sample Details: Depth	No.	Type	RL (m)	Layer Data: Legend	No	Depth	Geotechnical Description
21	14/10/2022	14	24	SC	-	-												
		To																
		14	30															
22																		Brown Grey,Moist,Poorly Graded,Fine & Medium Grains Sands,Very Dense, Clayey Silty SAND (SC)
							10	16	23	39	22.50	15	SS	-22.5		L9	22.5	
23											22.95							
		15	18															
		To		SC	-	-												Grey Brown,Moist,Hard,Silty CLAY (CI)/ Fissile Silty CLAY of Medium Plasticity
24		15	21															
25							15	27	38	65	25.00	16	SS	-25.0		L10	25.0	
											25.45							
		16	14															Brown Grey,Moist,Poorly Graded,Fine & Medium Grains Sands,Very Dense, Silty SAND (SM) With Binder
26		To		SC	-	-												
		16	25													L11	26.5	
27																		
							6Cm Penet for 52 Blows			>100	27.50	17	SS	-27.5				
28											27.56							
	15/10/2022	09	32															Grey,Moist,Fissile,Hard,Fine Grains Argillaceous,SHALE Shale of Gondwana formation
29		To		SC	-	-												
		09	44															
30							8Cm Penet for 65 Blows			>100	30.00	18	SS	-30.0				
											30.08							

CS - Core Sample	DS - Disturbed Sample	LOGGED	K. Loganathan	PROJECT SITE DETAILS		REMARKS
SS - Split Spoon Sample	SC - Soil Cutter	DATE	15/10/2022	GROUND LEVEL (m)	0.00	
UDS- Undisturbed Sample	TCB - Tungsten Carbide Bit	CHECKED	Aravindhan	WATER TABLE (m)	1.00	
WS - Wash Sample	DB - Diamond Bit	DATE	31/10/2022	CASING DEPTH (m)	0.00	

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GEOMARINE
THE SPIRIT OF ENGINEERING

SITE INVESTIGATION RECORD

BORE HOLE No.	BH-02						
SHEET	4	OF	4				
PROJECT NAME	PROPOSED CONSTRUCTION OF A RESIDENTIAL BUILDING			DIA OF BORE HOLE	150mm	✓	
					NX		
LOCATION	Koyembedu, Chennai	MACHINE No.	CR-06	CHAINAGE (m)	-	BORE START DATE	13/10/2022
STRUCTURE	Extended 2 Basement + Stilt + 10 Floors	DRILLING METHOD	Rotary	CO-ORDINATES	N -	BORE END DATE	15/10/2022
JOB CODE	GT-2453	FLUSHING MEDIUM	Bentonite		E -	TOTAL DRILL DAYS	3

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	Sample Details: RL (m)	Layer Data: Legend	Layer Data: No	Layer Data: Depth	Geotechnical Description
31	15/10/2022	10	32	SC	-	-												
		To																
32		10	45															
33							7Cm Penet for 55 Blows			>100	32.50 / 32.57	19	SS	-32.5				Grey,Moist,Fissile,Hard,Fine Grains Argillaceous,SHALE Shale of Gondwana formation
		11	58	SC	-	-												
34		To																
		12	33															
35							SPT Hammer Rebound			>100	35.00	-	WS	-35.0		L12	35.0	
36																		
37																		
38																		
39																		
40																		

CS - Core Sample	DS - Disturbed Sample	LOGGED	K. Loganathan	PROJECT SITE DETAILS		REMARKS
SS - Split Spoon Sample	SC - Soil Cutter	DATE	15/10/2022	GROUND LEVEL (m)	0.00	WS - No Penetration
UDS- Undisturbed Sample	TCB - Tungsten Carbide Bit	CHECKED	Aravindhan	WATER TABLE (m)	1.00	
WS - Wash Sample	DB - Diamond Bit	DATE	31/10/2022	CASING DEPTH (m)	0.00	

Borehole terminated at 35 m depth below E.G.L

FIG.2.2 Sub Soil Profile at BH-02 Location

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SITE INVESTIGATION RECORD

BORE HOLE No.	BH-03						
SHEET	1	OF	4				
PROJECT NAME	PROPOSED CONSTRUCTION OF A RESIDENTIAL BUILDING					DIA OF BORE HOLE	150mm ✓ NX ✓
LOCATION	Koyambedu, Chennai	MACHINE No.	-	CHAINAGE (m)	-	BORE START DATE	17/10/2022
STRUCTURE	Extended 2 Basement + Stilt + 16 Floors	DRILLING METHOD	Rotary	CO-ORDINATES	N -	BORE END DATE	19/10/2022
JOB CODE	GT-2453	FLUSHING MEDIUM	Bentonite		E -	TOTAL DRILL DAYS	3

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	Sample Details: RL (m)	Layer Data: Legend	Layer Data: No	Layer Data: Depth	Geotechnical Description
0	17/10/2022	11	23	SC	-	-	17	27	15	42	1.00	1	SS	-1.0				
		To									1.45							
		11	24															Filled Up Building Debris & Sand Mix
1		11	36				4	2	3	5	1.00	2	SS	-1.0		L1	1.0	
		To		SC	-	-					1.45							
		11	40															Filled Up Building Debris & Sand Mix
2		12	10				1	3	7	10	2.00	3	SS	-2.0		L2	2.0	
		To		SC	-	-					2.45							
		12	12															
3		12	27				3	5	10	15	3.00	4	SS	-3.0				
		To		SC	-	-					3.45							Grey Brown,Moist,Stiff,Silty CLAY (Cl) of Medium Plasticity
		12	30															
4		12	51				-	-	-	-	4.00	5	UDS	-4.0				
		To		SC	-	-												
		12	53													L3	5.0	
5		14	12				5	8	19	27	5.00	6	SS	-5.0				
		To		SC	-	-					5.45							Grey,Moist,Very Stiff,Silty CLAY (Cl) of Medium Plasticity
		14	14													L4	6.0	
6		14	28				5	7	8	15	6.00	7	SS	-6.0				
		To		SC	-	-					6.45							
		14	31															Grey,Moist,Fine Grains Sand Mix, Medium Dense,Sandy SILT (ML) With Little to No Plasticity
7							2	3	4	7	7.50	8	SS	-7.5		L5	7.5	
		14	52								7.95							
		To		SC	-	-												
		14	54															
8																		
9							-	-	-	-	9.00	9	UDS	-9.0				Grey,Moist,Medium Stiff,Silty CLAY (CH) of High Plasticity
		15	25															
		To		SC	-	-												
10		15	27															

CS - Core Sample	DS - Disturbed Sample	LOGGED	K. Loganathan	PROJECT SITE DETAILS	REMARKS
SS - Split Spoon Sample	SC - Soil Cutter	DATE	17/10/2022	GROUND LEVEL (m) 0.00	
UDS - Undisturbed Sample	TCB - Tungsten Carbide Bit	CHECKED	Aravindhan	WATER TABLE (m) 1.00	
WS - Wash Sample	DB - Diamond Bit	DATE	31/10/2022	CASING DEPTH (m) 0.00	

GEO MARINE CONSULTANTS PVT. LTD. Chennai

GEOMARINE
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SITE INVESTIGATION RECORD

BORE HOLE No.	BH-03						
SHEET	2	OF	4				
PROJECT NAME	PROPOSED CONSTRUCTION OF A RESIDENTIAL BUILDING			DIA OF BORE HOLE	150mm	✓	
					NX		
LOCATION	Koyambedu, Chennai	MACHINE No.	-	CHAINAGE (m)	-	BORE START DATE	17/10/2022
STRUCTURE	Extended 2 Basement + Stilt + 18 Floors	DRILLING METHOD	Rotary	CO-ORDINATES	N -	BORE END DATE	19/10/2022
JOB CODE	GT-2453	FLUSHING MEDIUM	Bentonite		E -	TOTAL DRILL DAYS	3

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	Sample Details: RL (m)	Layer Data: Legend	Layer Data: No	Layer Data: Depth	Layer Data: Geotechnical Description
11	17/10/2022	15	54	SC	-	-	2	2	3	5	10.50	10	SS	-10.5				
		To									10.95							
		15	55															
12							1	2	3	5	12.00	11	SS	-12.0				Grey,Moist,Medium Stiff,Silty CLAY (CH & CI) of High Plasticity
											12.45							
		16	21															
13		To		SC	-	-												
		16	23															
14							5	9	16	25	14.00	12	SS	-14.0		L6	14.0	
											14.45							
		09	48															
15		To		SC	-	-												Green Grey,Moist,Very Stiff,Sub Fissile, Silty CLAY (CI) of Medium Plasticity
		09	54															
16							10	19	31	50	16.00	13	SS	-16.0		L8	16.0	
											16.45							
		10	34															
17	18/10/2022	To		SC	-	-												
		10	40															
18							11	15	29	44	18.00	14	SS	-18.0				Brown Grey,Moist,Hard,Sub Fissile, Silty CLAY (CH) Clay of High Plasticity
											18.45							
		11	35															
19		To		SC	-	-												
		11	40															
20							12	16	18	34	20.00	15	SS	-20.0		L9	20.0	
											20.45							Grey Brown,Moist,Poorly Graded,Fine & Medium Grains Sands,Dense, Clayey Silty SAND (SC)

CS - Core Sample	DS - Disturbed Sample	LOGGED	K. Loganathan	PROJECT SITE DETAILS		REMARKS	
SS - Split Spoon Sample	SC - Soil Cutter	DATE	18/10/2022	GROUND LEVEL (m)	0.00		
UDS- Undisturbed Sample	TCB - Tungsten Carbide Bit	CHECKED	Aravindhan	WATER TABLE (m)	1.00		
WS - Wash Sample	DB - Diamond Bit	DATE	31/10/2022	CASING DEPTH (m)	0.00		

GEOMARINE
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SITE INVESTIGATION RECORD

BORE HOLE No.	BH-03						
SHEET	3	OF	4				
PROJECT NAME	PROPOSED CONSTRUCTION OF A RESIDENTIAL BUILDING			DIA OF BORE HOLE	150mm	✓	
					NX		
LOCATION	Koyembedu, Chennai	MACHINE No.	-	CHAINAGE (m)	-	BORE START DATE	17/10/2022
STRUCTURE	Extended 2 Basement + Stilt + 16 Floors	DRILLING METHOD	Rotary	CO-ORDINATES	N -	BORE END DATE	19/10/2022
JOB CODE	GT-2453	FLUSHING MEDIUM	Bentonite		E -	TOTAL DRILL DAYS	3

Depth below E.G.L. (m)	Drilling progress per metre: Date	Time: Hr.	Time: Min.	Type of Drill Bit (SC / TC3 / 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	Sample Details: RL (m)	Layer Data: Legend	Layer Data: No	Layer Data: Depth	Geotechnical Description
21	18/10/2022	12	35	SC	-	-												
		To																
		12	38															
22							12	23	29	52	22.50	16	SS	-22.5		L10	22.5	Grey Brown,Moist,Poorly Graded,Fine & Medium Grains Sands,Dense, Clayey Silty SAND (SC)
											22.95							
23		14	10	SC	-	-												
		To																
24		14	17															
25							16	25	39	65	25.00	17	SS	-25.0				Grey Brown,Moist,Poorly Graded,Fine & Medium Grains Sands,Very Dense, Clayey Silty SAND (SC)
											25.45							
26		15	18	SC	-	-										L11	26.5	
		To																
		15	30															
27							7cm penet for 65 blows			>100	27.50	18	SS	-27.5				Grey,Moist,Fissile,Hard,Fine Grains Argillaceous,SHALE Shale of Gondwana formation
											27.57							
28	19/10/2022	09	40	SC	-	-												
		To																
29		09	50															
30							6cm penet for 87 blows			>100	30.00	19	SS	-30.0				
											30.06							

CS - Core Sample	DS - Disturbed Sample	LOGGED	K. Loganathan	PROJECT SITE DETAILS		REMARKS	
SS - Split Spoon Sample	SC - Soil Cutter	DATE	19/10/2022	GROUND LEVEL (m)	0.00		
UDS - Undisturbed Sample	TCB - Tungsten Carbide Bit	CHECKED	Aravindhan	WATER TABLE (m)	1.00		
WS - Wash Sample	DB - Diamond Bit	DATE	31/10/2022	CASING DEPTH (m)	0.00		

GEOMARINE
THE SPIRIT OF ENGINEERING

SITE INVESTIGATION RECORD

BORE HOLE No.	BH-03						
SHEET	4	OF	4				
PROJECT NAME	PROPOSED CONSTRUCTION OF A RESIDENTIAL BUILDING			DIA OF BORE HOLE	150mm	✓	
					NX		
LOCATION	Koyembedu, Chennai	MACHINE No.	-	CHAINAGE (m)	-	BORE START DATE	17/10/2022
STRUCTURE	Extended 2 Basement + Stilt + 18 Floors	DRILLING METHOD	Rotary	CO-ORDINATES	N -	BORE END DATE	19/10/2022
JOB CODE	GT-2453	FLUSHING MEDIUM	Bentonite		E -	TOTAL DRILL DAYS	3

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	Sample Details: RL (m)	Layer Data: Legend	Layer Data: No.	Layer Data: Depth	Layer Data: Geotechnical Description
31	19/10/2022	10	40	SC	-	-												
		To																
32		10	55															
							4cm penet for 52 blows			>100	32.50 / 32.54	-	WS	-32.5				Grey,Moist,Fissile,Hard,Fine Grains Argillaceous,SHALE Shale of Gondwana formation
33																		
		11	45															
34		To		SC	-	-												
		12	07															
35							SPT-Hammer Rebound			>100	35.00	-	WS	-35.0		L12	35.0	
36																		
37																		
38																		
39																		
40																		

CS - Core Sample	DS - Disturbed Sample	LOGGED	K. Loganathan	PROJECT SITE DETAILS		REMARKS
SS - Split Spoon Sample	SC - Soil Cutter	DATE	19/10/2022	GROUND LEVEL (m)	0.00	WS - No Penetration
UDS - Undisturbed Sample	TCB - Tungsten Carbide Bit	CHECKED	Aravindhan	WATER TABLE (m)	1.00	
WS - Wash Sample	DB - Diamond Bit	DATE	31/10/2022	CASING DEPTH (m)	0.00	

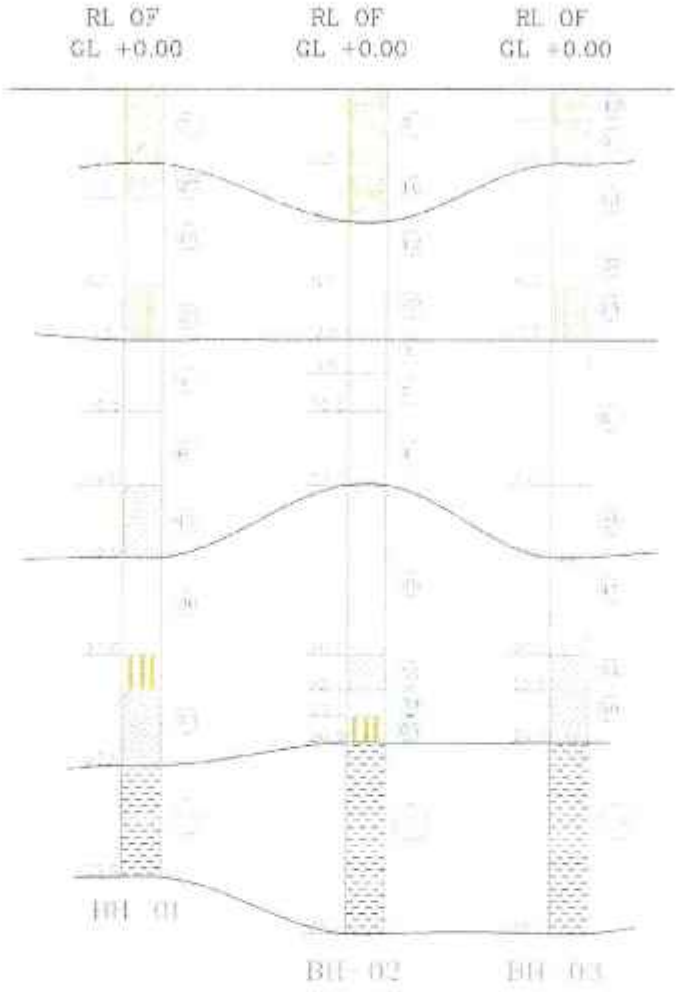
Borehole terminated at 35 m depth below E.G.L

FIG.2.3 Sub Soil Profile at BH-03 Location

GEOMARINE CONSULTANTS PVT. LTD. Chennai

CROSS SECTION PROFILE

GEO MAP CONSULTANTS PVT. LTD. Chennai-41



LEGEND

SILTY CLAY (CI)	CLAYEY SILTY SAND (SC)
SILTY SAND (SM)	SILTY CLAY (CH)
SANDY SILTY CLAY (CL)	FILLEDUP SOIL
Clayey Sandy SILT (MI)	SHALE(CH)

GEO MATRIX CONSULTANTS PVT. LTD. * Chennai-41

GRAIN SIZE DISTRIBUTION CURVE

GEO MARINE

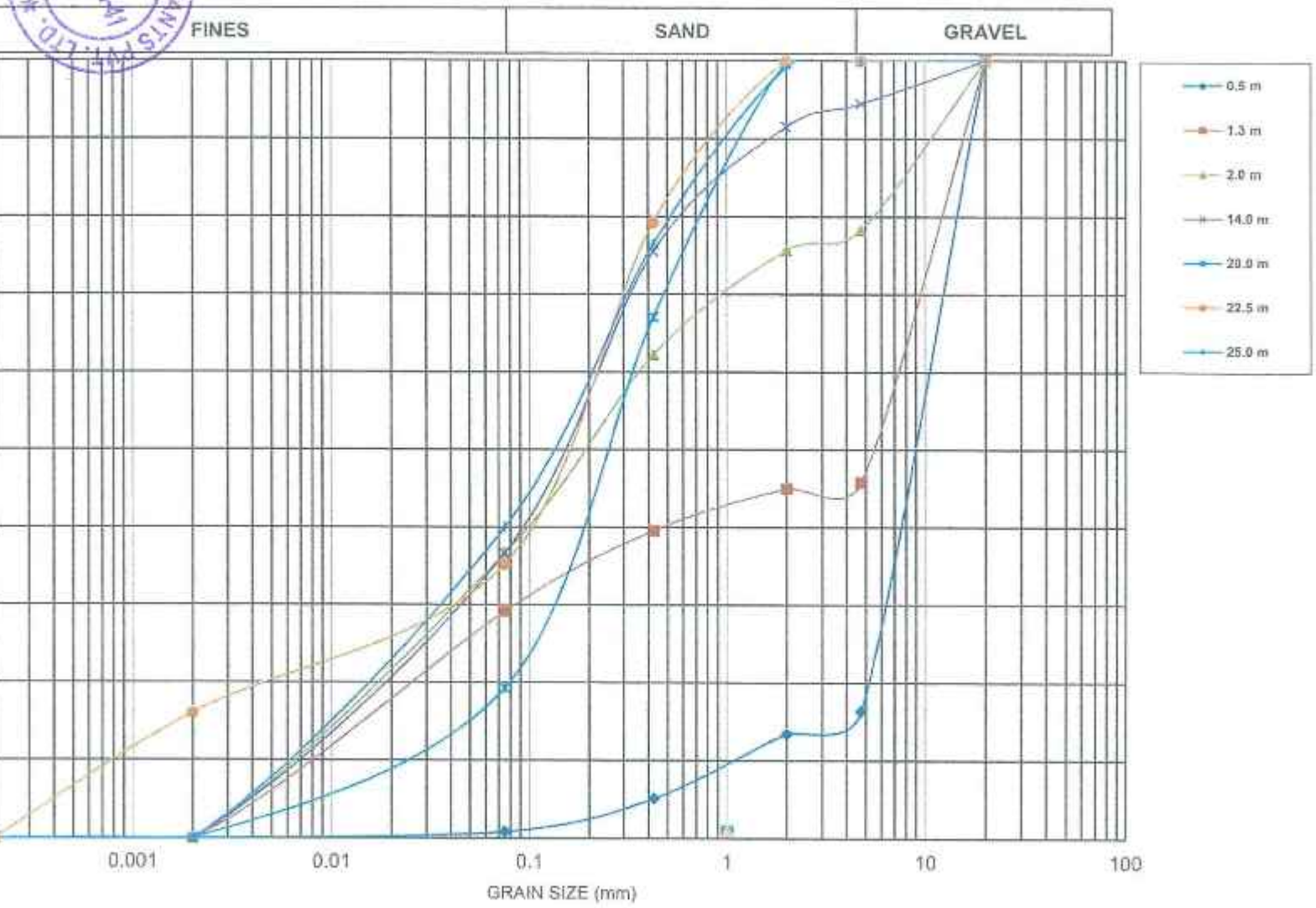


Fig. 2.5 GRAIN SIZE DISTRIBUTION CURVE - BH-01

GEO MARINE

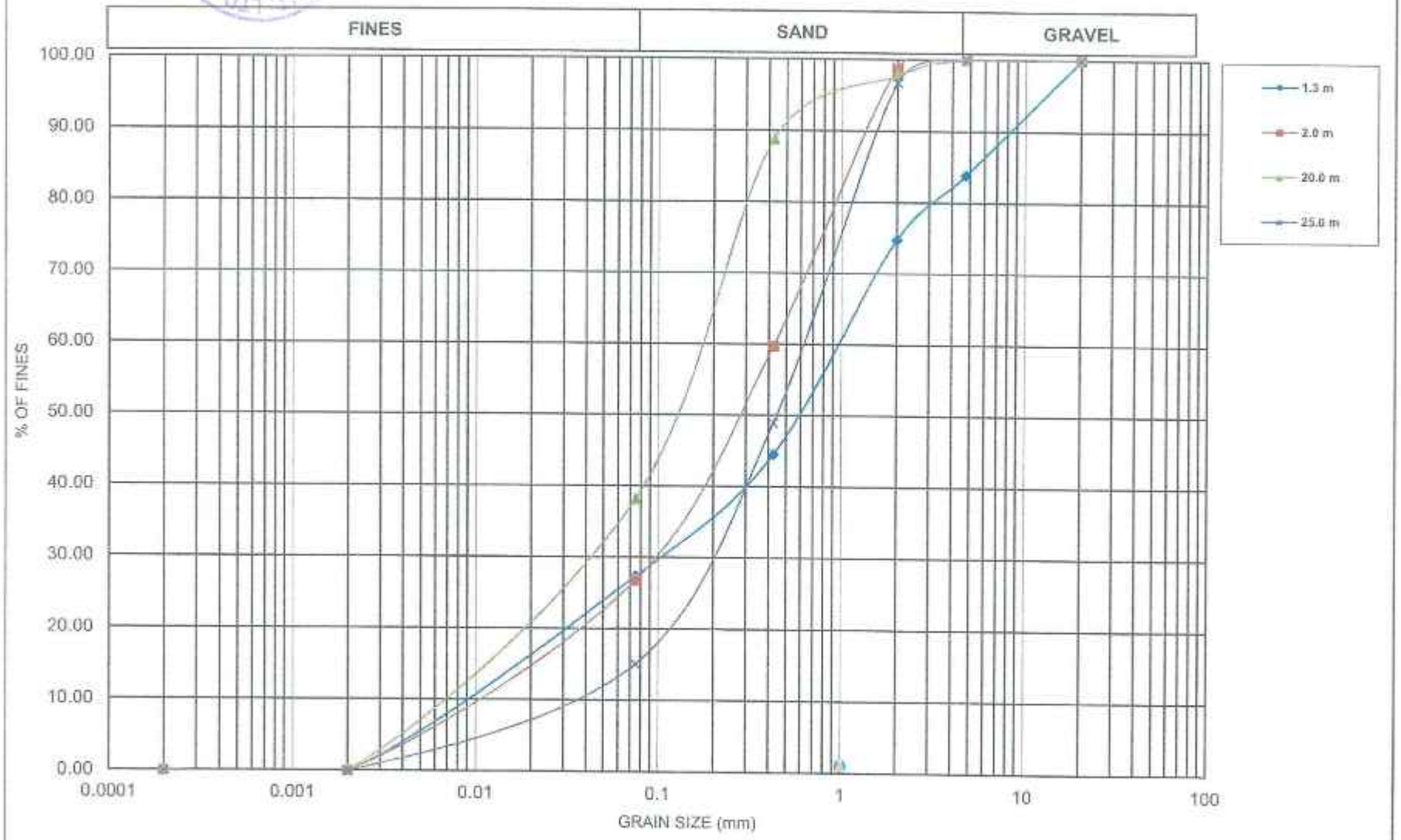


Fig. 2.6 GRAIN SIZE DISTRIBUTION CURVE - BH-02

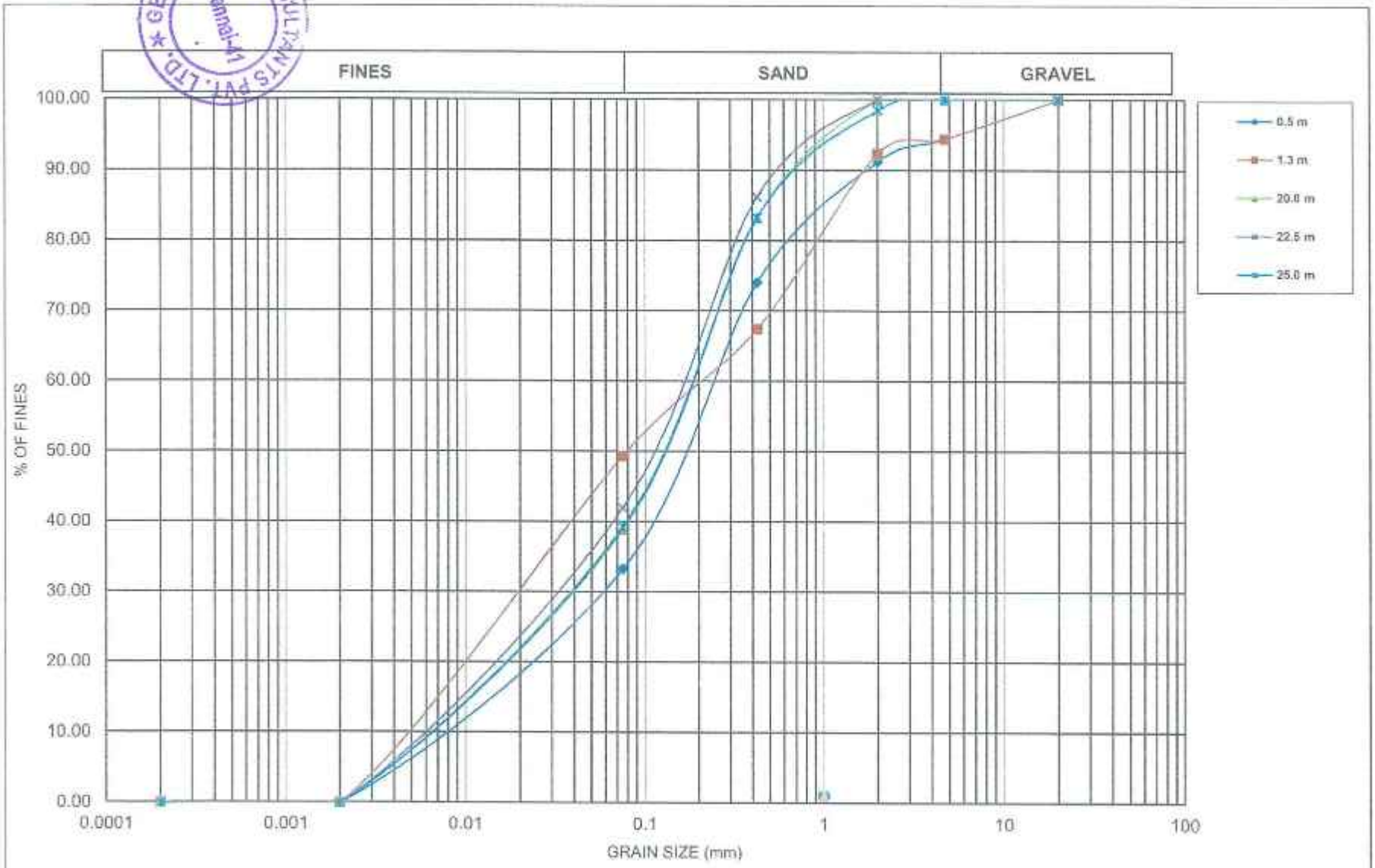


Fig. 2.7 GRAIN SIZE DISTRIBUTION CURVE - BH-03

HYDROMETER ANALYSIS CURVE

GEO MARINE CONSULTANTS PVT. LTD. Chennai-41

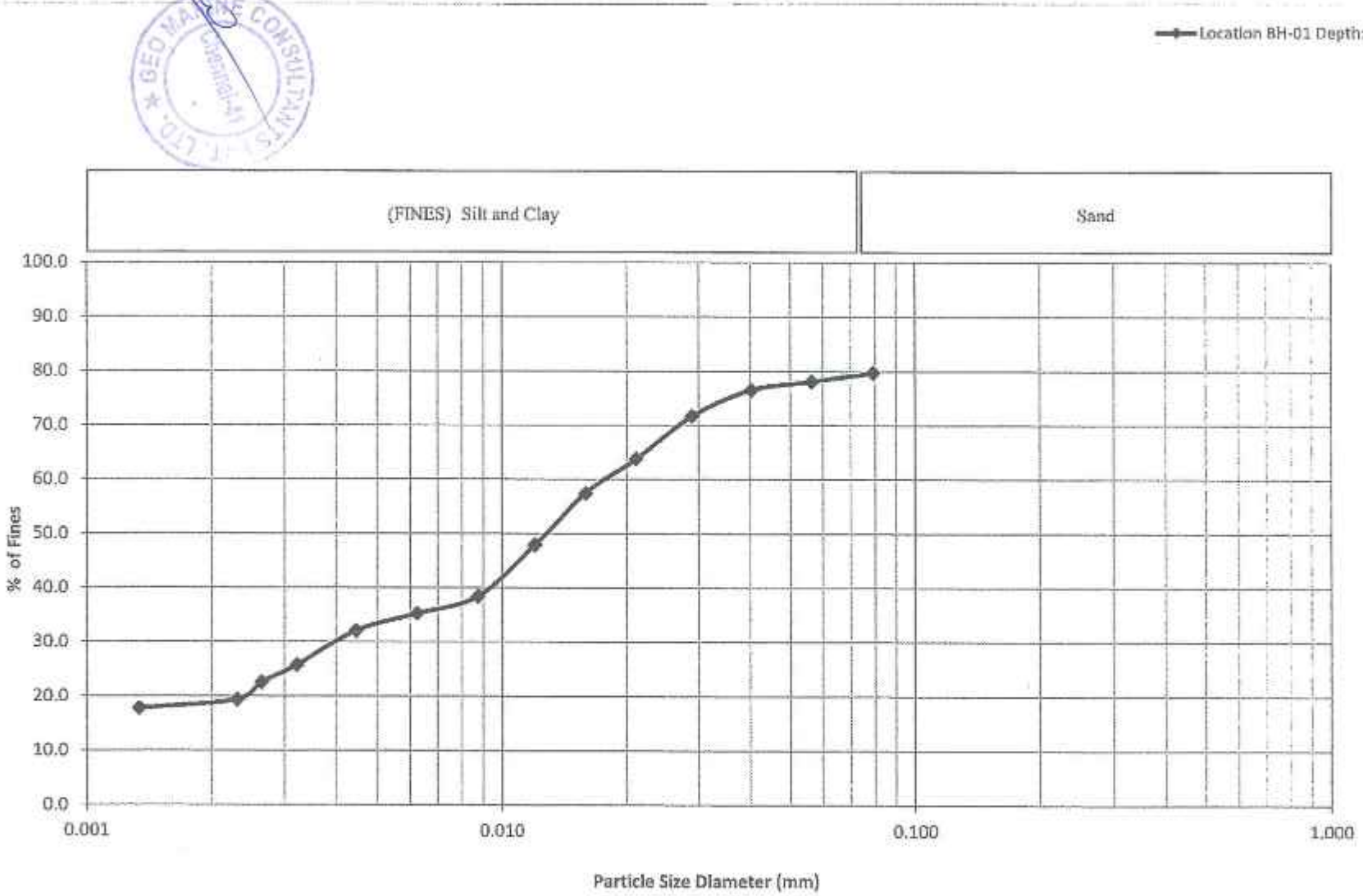


Fig 2.8 Hydrometer Analysis Master Curve

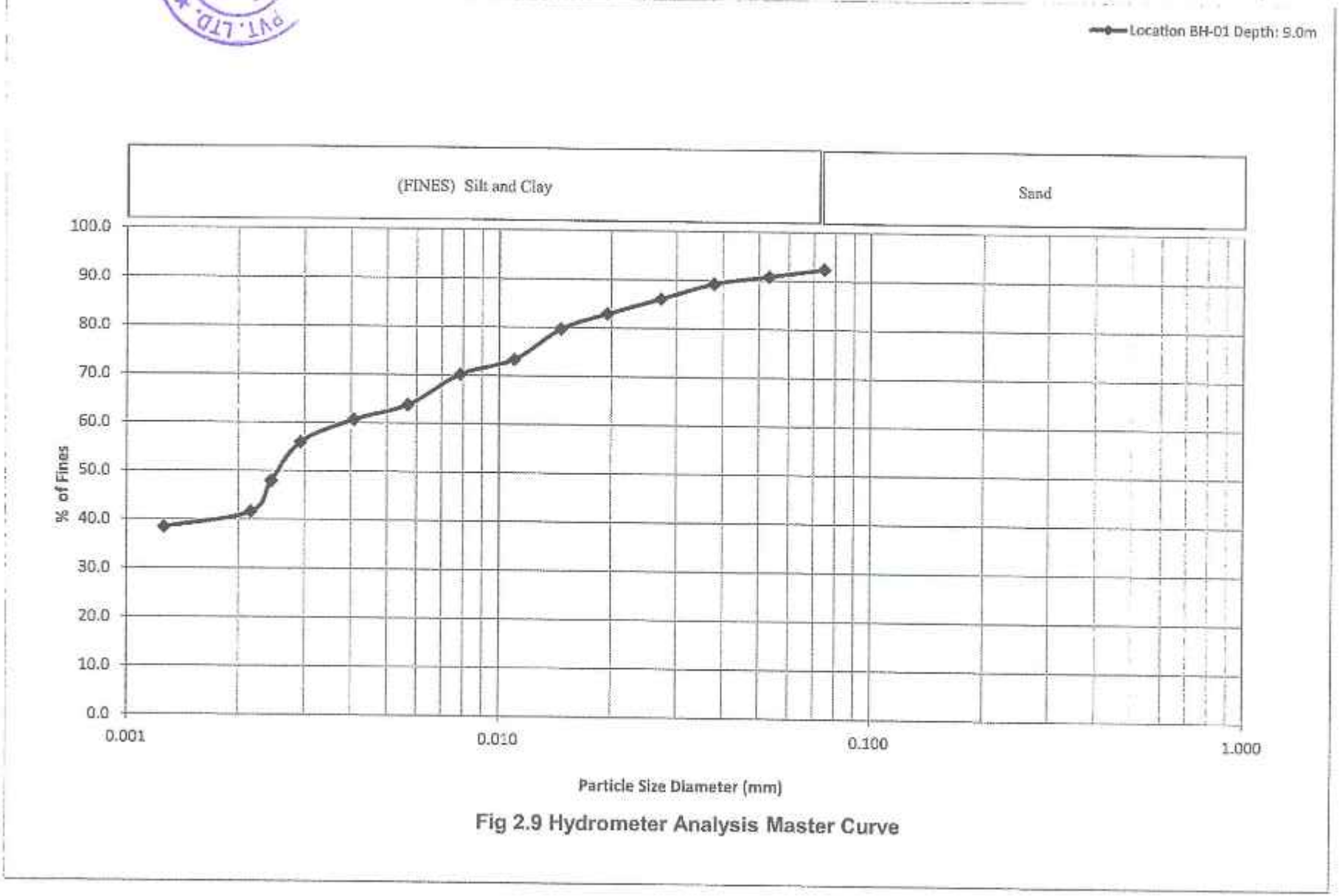


Fig 2.9 Hydrometer Analysis Master Curve

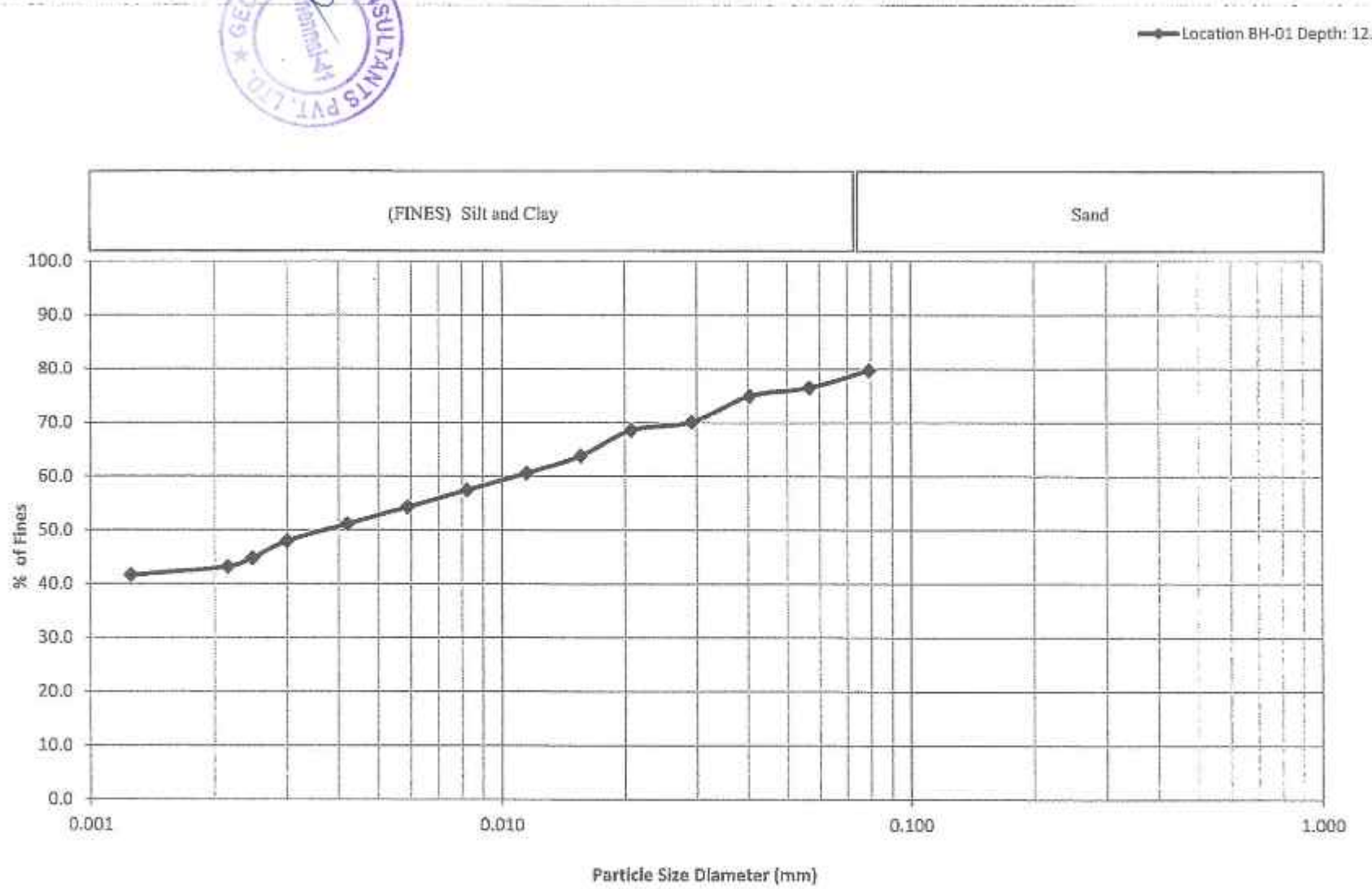


Fig 2.10 Hydrometer Analysis Master Curve

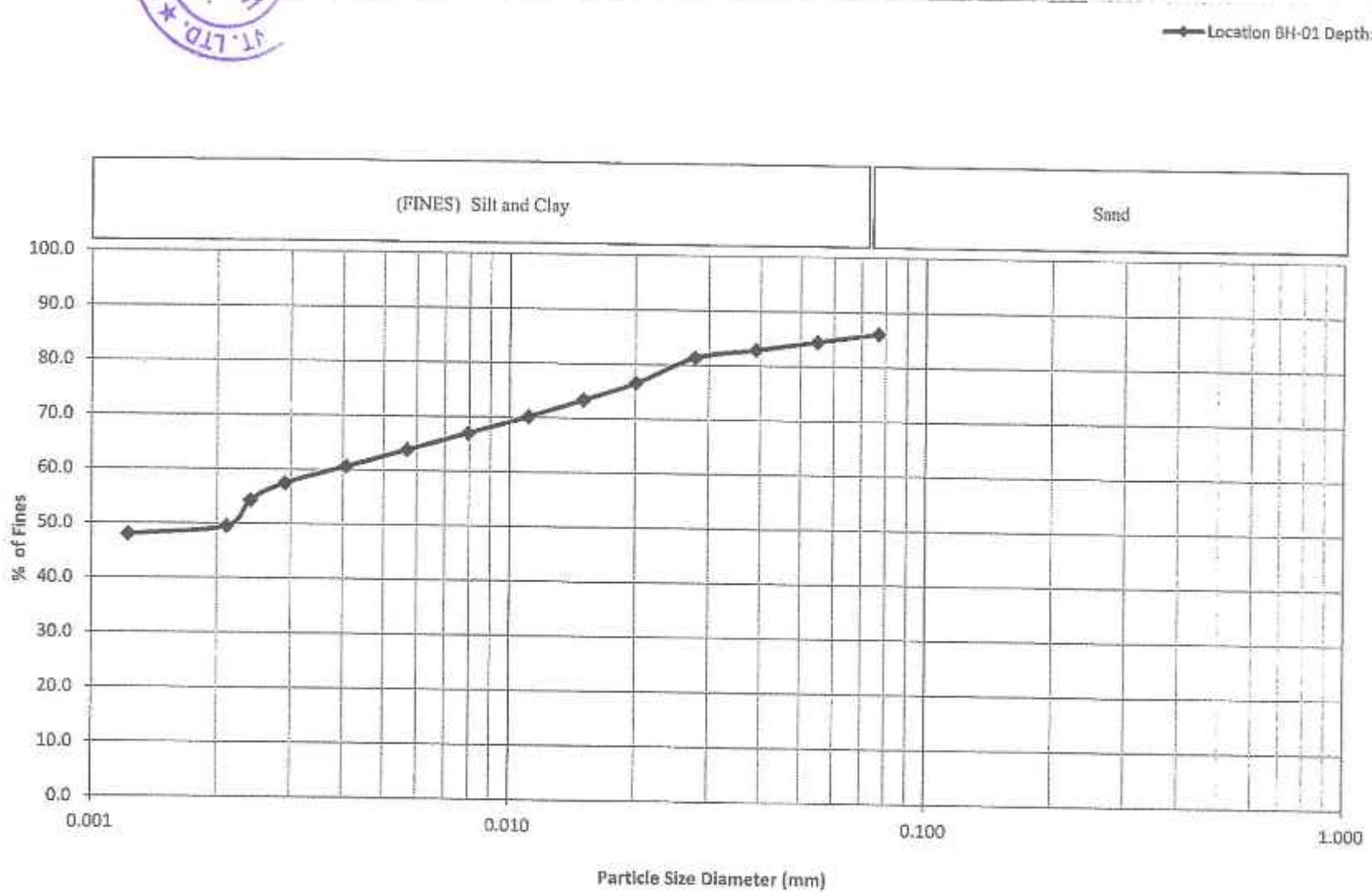


Fig 2.11 Hydrometer Analysis Master Curve

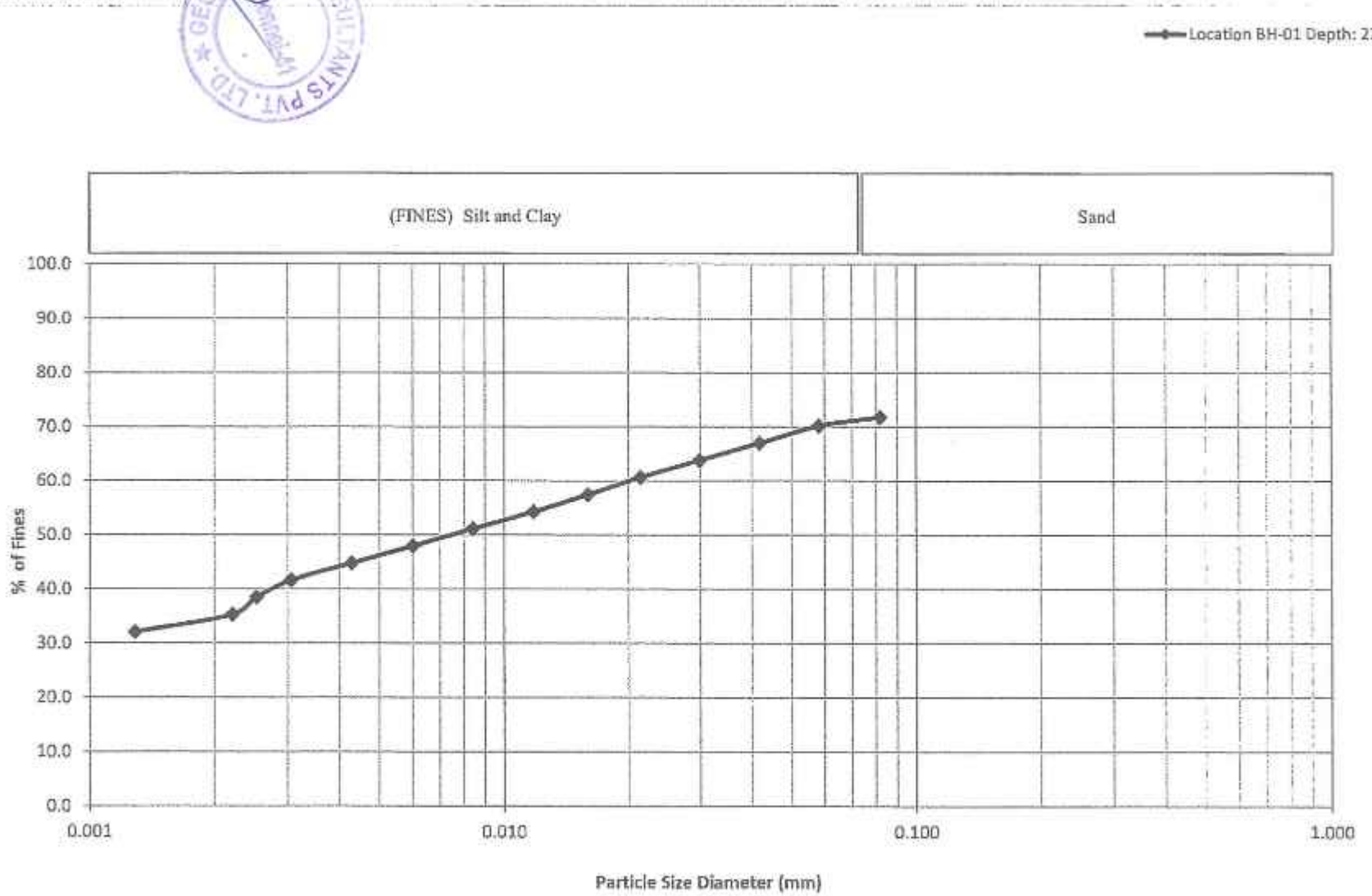


Fig 2.12 Hydrometer Analysis Master Curve

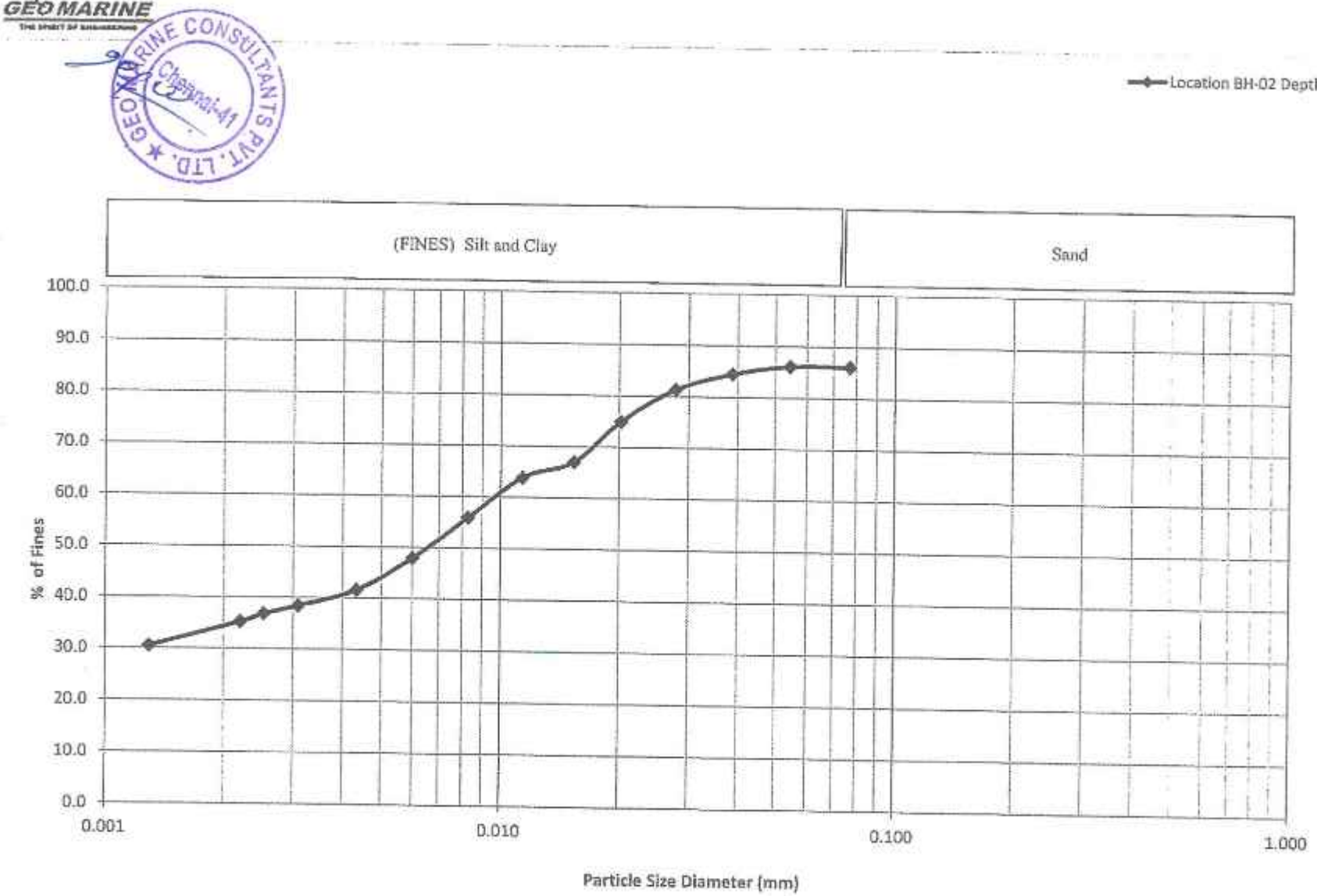


Fig 2.13 Hydrometer Analysis Master Curve

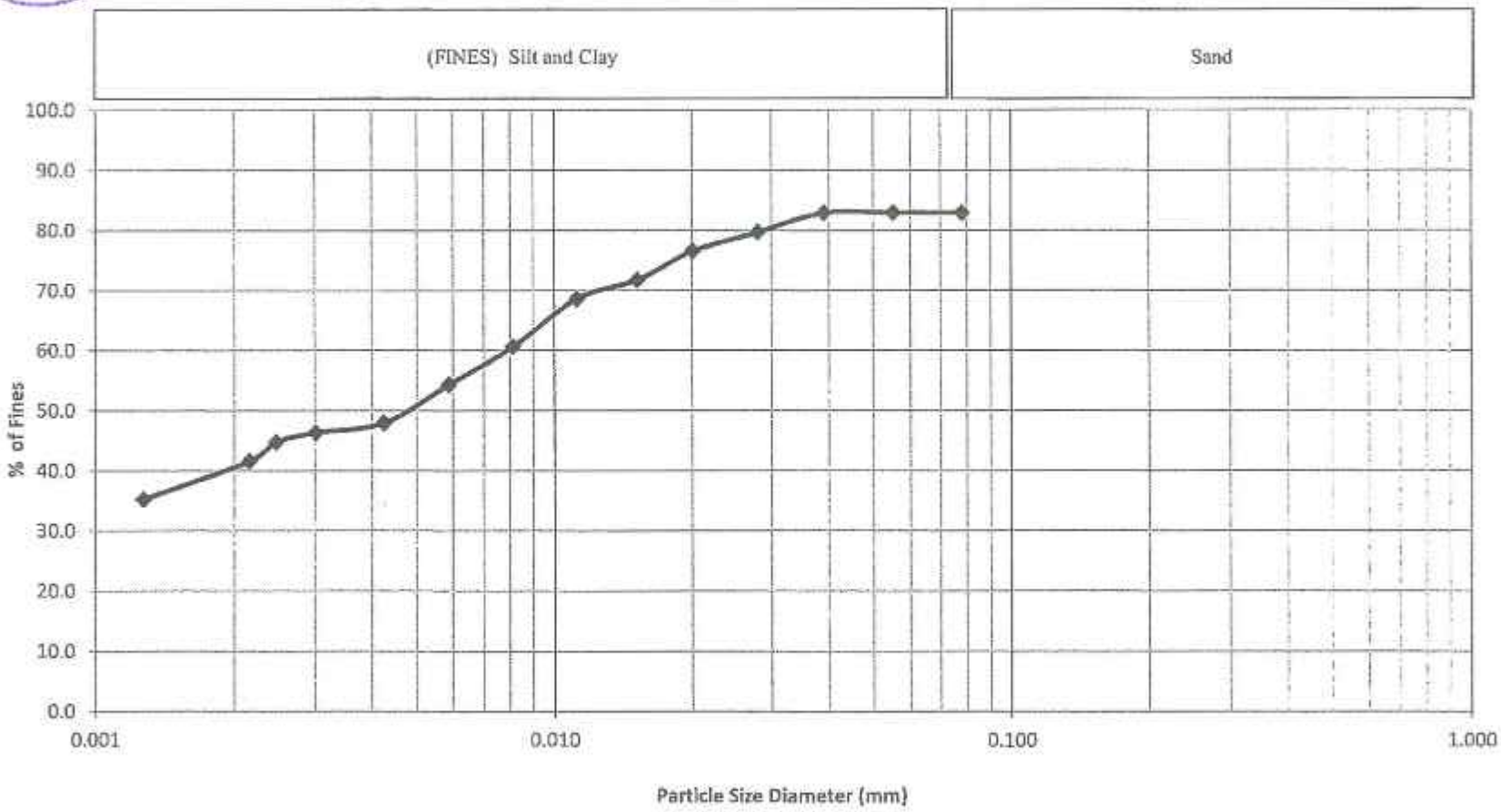


Fig 2.14 Hydrometer Analysis Master Curve

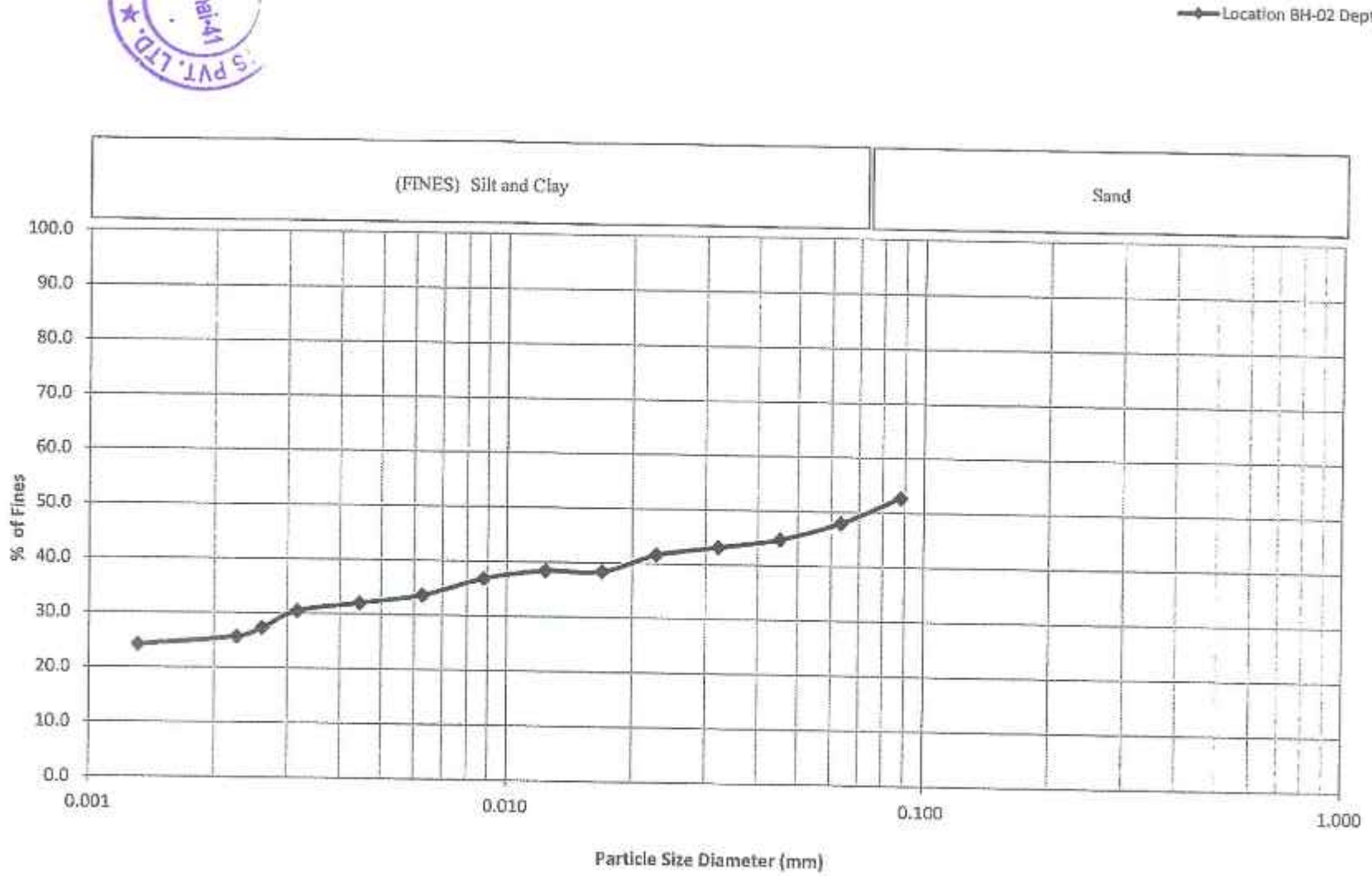


Fig 2.15 Hydrometer Analysis Master Curve

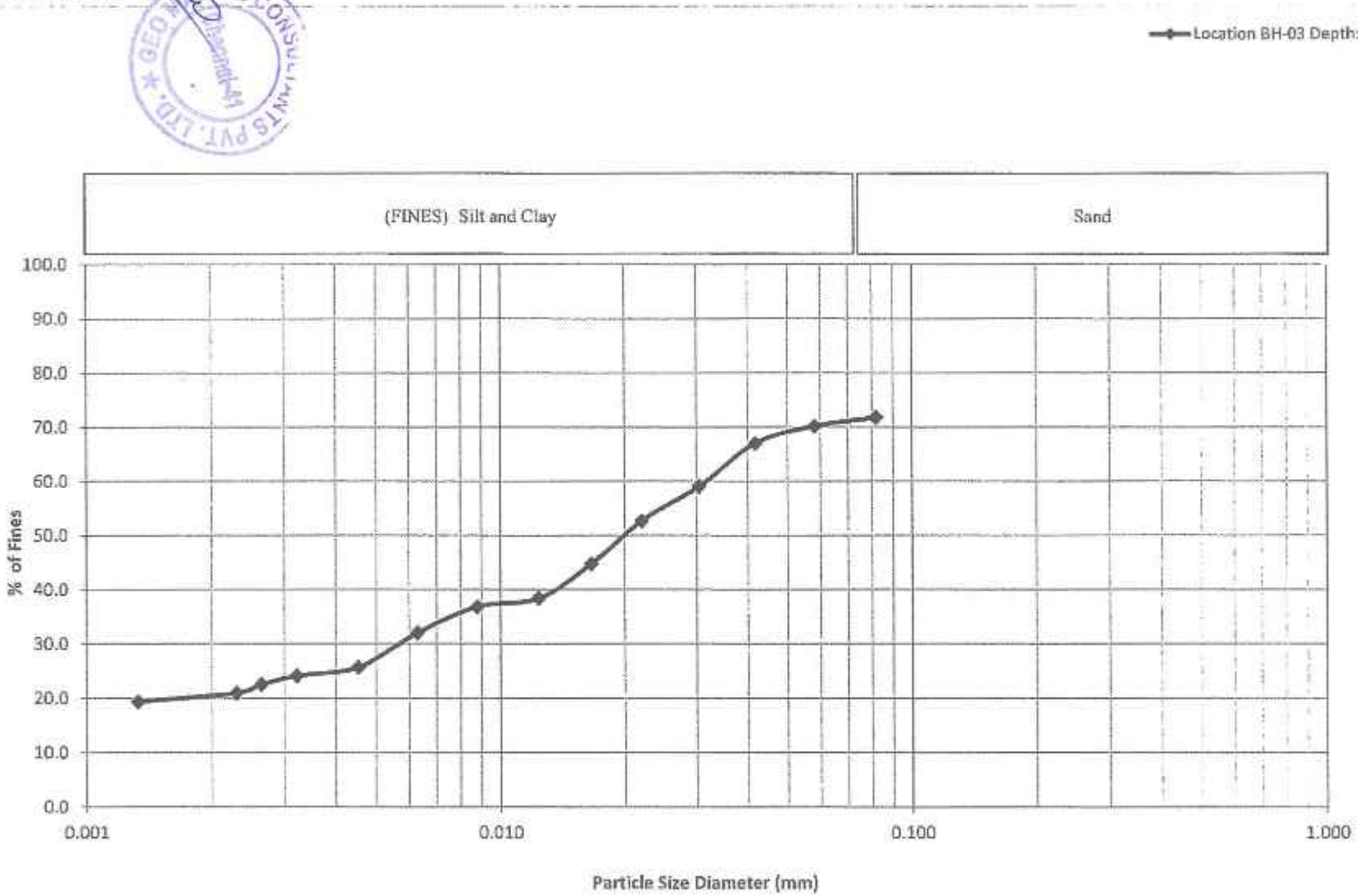


Fig 2.16 Hydrometer Analysis Master Curve

GEO MARINE CONSULTANTS PVT. LTD. Chennai-41

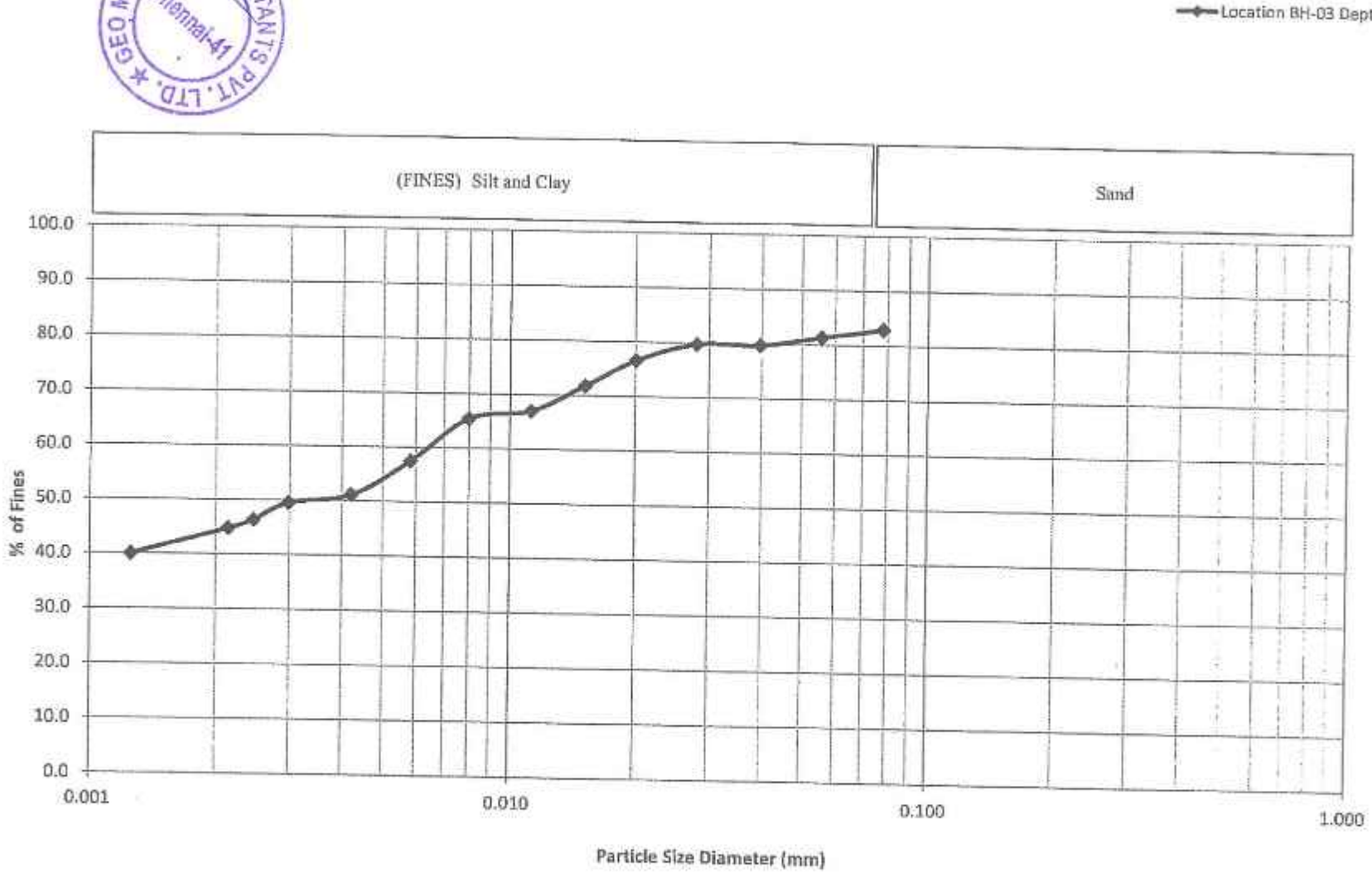


Fig 2.17 Hydrometer Analysis Master Curve

GEO MARINE CONSULTANTS PVT. LTD. Chennai-41

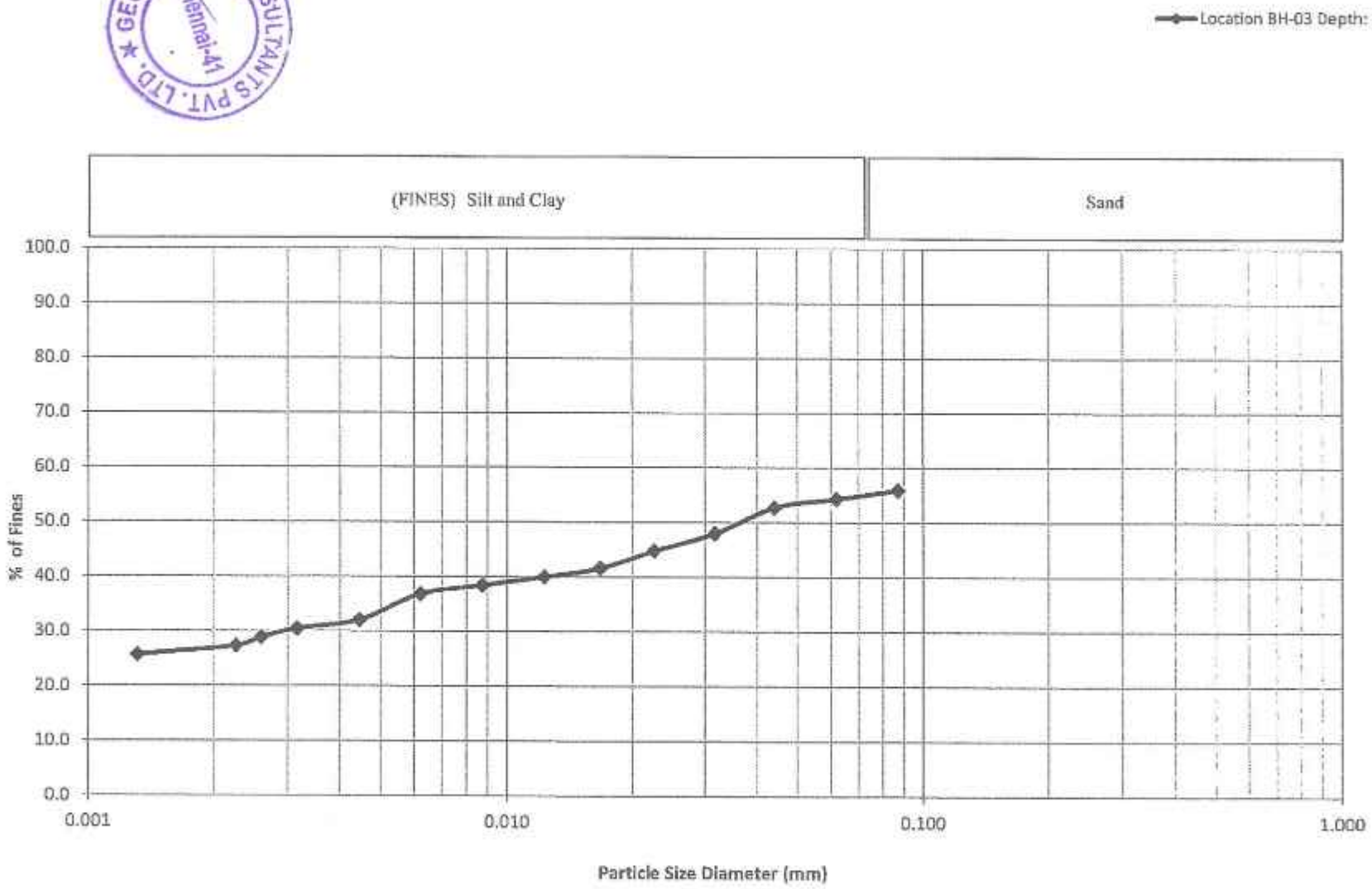


Fig 2.18 Hydrometer Analysis Master Curve

LABORATORY TEST RESULTS



GEOMARINE
Phone No.: 044-24481485, 044-24460805

LABORATORY TEST REPORT

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

Name & Address of the Customer	:	M/s APPASWAMY REAL ESTATES (P) LTD	Customer Reference	:	By Email
Sample Description	:	Soil Sample	Period of Testing	:	28/10/2022 to 01/11/2022
Source of Sample	:	Customer Supplied- Borehole No. BH-01	Sample Identification Number	:	SS/GMC/102022/550/BH01
Sample Condition	:	Satisfactory	Test Report No.	:	GT-2453/BH-01
Test Method	:	As per Bureau of Indian Standards	Report Date	:	16/11/2022
Sample Receipt Date	:	14/10/2022	Test Report Pages	:	One Page

Table-2.1 Laboratory Classification of Soil Samples from BH-01

Sample Depth (m)	SPT - "N" Value	Type of Sample	Fine Grained (FG)										Specific Gravity AS PER IS 2720 (P-III, SEC-1) - 1980, RA-2010	Coarse Grained (CG)													
			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)	Consistency Index (I_c=LL-NMC/I_p)	SHRINKAGE LIMIT (%) AS PER IS 2720 (P-VI) - 1972, RA-2011	FREE SWELL INDEX (%) AS PER IS 2720 (P-XL) - 1977, RA-2011	Consistency	Position With Respect to A-Aline	IS:Notation		GRAIN SIZE ANALYSIS AS PER IS 2720 (P-IV) - 1985, RA-2015						D_{10} (mm)	D_{30}(mm)	D_{60} (mm)	Uniformity Co-Efficient $C_u=D_{60}/D_{10}$	Co-Efficient of Curvature $C_c=D_{30}^2/(D_{10}xD_{60})$	Relative Density	IS-Notation	
														Gravel (%)	Coarse (%)	Medium (%)	Fine (%)	Silt (%)	Clay (%)							Gravel	Sand
0.5	Filled Up Soil													83.6	2.9	8.4	4.3	0.9		-	-	-	-	-	V.Dense	GP	<50%
1.3	7	SS	42.9	-	-	-	-	-	-	CG>50%	-	-	-	54.1	0.8	5.4	10.4	29.2		-	-	-	-	-	Loose	GM	<50%
2.8	27	SS	31.4	-	-	-	-	-	-	CG>50%	-	-	-	21.6	2.6	13.4	25.6	36.7		-	-	-	-	-	M.Dense	<50%	SM
3.0	11	SS	26.5	45.0	25.5	19.5	0.8	-	30.8	Stiff	Above	CI	-	-	-	-	-	80.6	19.4	-	-	-	-	-	FG>50%	FG>50%	FG>50%
4.0	15	SS	21.2	37.6	16.3	21.3	0.8	15.0	6.7	Stiff	Above	CI	2.50	-	-	-	-	100.0		-	-	-	-	-	FG>50%	FG>50%	FG>50%
5.0	22	SS	19.3	37.1	19.5	17.6	1.0	16.7	7.7	V.Stiff	Above	CI	-	0.0	0.0	1.2	37.6	61.2		-	-	-	-	-	FG>50%	FG>50%	FG>50%
6.0	23	SS	26.5	Little to Non Plastic Silt					-7.1	-	-	ML	-	0.0	0.0	1.0	45.4	53.6		-	-	-	-	-	FG>50%	FG>50%	FG>50%
7.5	4	SS	43.2	58.9	25.8	33.1	0.5	-	10.5	Soft	Above	CH	2.53	-	-	-	-	100.0		-	-	-	-	-	FG>50%	FG>50%	FG>50%
9.0	3	SS	52.1	61.2	28.6	32.6	0.3	-	-15.0	Soft	Above	CH	-	-	-	-	-	58.4	41.6	-	-	-	-	-	FG>50%	FG>50%	FG>50%
10.5	6	SS	31.6	43.0	21.2	21.8	0.5	-	-	M.Stiff	Above	CI	-	-	-	-	-	100.0		-	-	-	-	-	FG>50%	FG>50%	FG>50%
12.0	6	SS	28.4	40.2	20.3	19.9	0.6	-	36.4	M.Stiff	Above	CI	-	-	-	-	-	56.8	43.2	-	-	-	-	-	FG>50%	FG>50%	FG>50%
14.0	17	SS	18.9	39.6	16.2	23.4	0.9	17.6	28.6	CG>50%	Above	-	-	5.5	3.0	16.0	36.8	36.7		-	-	-	-	-	M.Dense	<50%	SC
16.0	37	SS	26.7	77.5	28.7	48.8	1.0	-	85.7	Hard	Above	CH	-	-	-	-	-	100.0		-	-	-	-	-	FG>50%	FG>50%	FG>50%
18.0	35	SS	39.1	114.1	40.3	73.9	1.0	-	53.8	Hard	Above	CH	-	-	-	-	-	50.5	49.5	-	-	-	-	-	FG>50%	FG>50%	FG>50%
20.0	>100	SS	-	-	-	-	-	-	-	CG>50%	-	-	-	0.0	0.2	32.7	47.7	19.4		-	-	-	-	-	V.Dense	<50%	SM
22.5	55	SS	15.8	29.7	12.9	16.8	0.8	-	50.0	CG>50%	Above	-	-	0.0	0.0	20.7	33.6	29.6	16.1	-	-	-	-	-	V.Dense	<50%	SC
25.0	65	SS	-	44.1	17.2	27.0	-	15.1	20.0	CG>50%	Above	-	-	0.0	0.8	22.7	36.4	40.1		-	-	-	-	-	V.Dense	<50%	SC

** 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 cases as required by the applicable regulations.

(3) Any correction in this reports invalidates the reports

Authorised Signatory

A. VINOTH
(Technical Manager)

GEOMARINE

Phone No.: 044-24481485, 044-24480305

LABORATORY TEST REPORT

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

GEO MARINE CONSULTANTS PVT. LTD. ★ Chennai-41

Name & Address of the Customer	:	M/s APPASWAMY REAL ESTATES (P) LTD	Customer Reference	: By Email
Sample Description	:	Soil Sample	Period of Testing	: 08/11/2022 to 12/11/2022
Source of Sample	:	Customer Supplied- Borehole No. BH-02	Sample Identification Number	: SS/GMC/102022/550/BH02
Sample Condition	:	Satisfactory	Test Report No.	: GT-2453/BH-02
Test Method	:	As per Bureau of Indian Standards	Report Date	: 16/11/2022
Sample Receipt Date	:	20/10/2022	Test Report Pages	: One Page

Table-2.1 Laboratory Classification of Soil Samples from BH-01

Sample Depth (m)	SPT- "N" Value	Type of Sample	Fine Grained (FG)										Coarse Grained (CG)																
			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)	Consistency Index (I_c=LL-MC/I_p)	SHRINKAGE LIMIT (%) AS PER IS 2720 (P-VI) - 1972, RA-2011	FREE SWELL INDEX (%) AS PER IS 2720 (P-XL) - 1977, RA-2011	Consistency	Position With Respect to A-Line	IS:Notation	SPECIFIC GRAVITY AS PER IS 2720 (P-III, SEC-1) - 1980, RA-2016	GRAIN SIZE ANALYSIS AS PER IS 2720 (P-IV) - 1985, RA-2015						D_{10} (mm)	D_{30}(mm)	D_{60} (mm)	Uniformity Co-Efficient $C_U=D_{60}/D_{10}$	Co-Efficient of Curvature $C_c=D_{30}^2/(D_{10}xD_{60})$	Relative Density	IS-Notation	
													Gravel (%)	Coarse (%)	Medium (%)	Fine (%)	Silt (%)	Clay (%)							Gravel	Sand
0.5	7	SS	13.8	35.8	18.4	17.4	1.3	16.1	-15.4	-	Above	CI	-	0.0	2.7	14.7	24.7	57.9		-	-	-	-	-	FG>50%	FG>50%	FG>50%
1.3	7	SS	21.8	-	-	-	-	-	-7.7	CG>50%	-	-	-	10.1	9.1	30.2	17.2	27.4		-	-	-	-	-	Loose	<50%	SM
2.0	16	SS	16.5	-	-	-	-	-	0.0	CG>50%	-	-	2.62	0.0	1.2	38.0	33.0	26.8		-	-	-	-	-	M.Dense	<50%	SM
3.0	11	*SS	Sample Failed																										
4.0	11	SS	35.7	63.5	28.8	34.7	0.8	13.2	63.8	Stiff	Above	CH	-	-	-	-	-	64.8	35.2	-	-	-	-	-	FG>50%	FG>50%	FG>50%
5.0	14	*SS	Sample Failed																										
6.0	22	SS	14.2	24.5	14.6	9.5	1.0	16.6	15.4	V.Stiff	Above	CL	-	0.0	0.0	0.6	32.3	67.1		-	-	-	-	-	FG>50%	FG>50%	FG>50%
7.5	3	SS	52.7	84.6	31.3	33.3	0.4	11.3	-	Soft	Above	CH	-	-	-	-	-	58.4	41.6	-	-	-	-	-	FG>50%	FG>50%	FG>50%
9.0	7	SS	35.2	50.0	21.4	28.7	0.5	13.0	-	M.Stiff	Above	CH	2.81	0.0	0.0	12.7	20.8	66.5		-	-	-	-	-	FG>50%	FG>50%	FG>50%
10.5	4	SS	62.9	76.7	32.4	44.3	0.3	10.5	50.0	Soft	Above	CH	-	-	-	-	-	100.0		-	-	-	-	-	FG>50%	FG>50%	FG>50%
12.0	4	SS	38.2	48.4	21.4	26.0	0.4	14.0	13.3	Soft	Above	CI	-	-	-	-	-	84.3	15.7	-	-	-	-	-	FG>50%	FG>50%	FG>50%
14.0	25	SS	28.4	53.2	21.0	31.2	1.0	13.6	81.8	V.Stiff	Above	CH	-	-	-	-	-	100.0		-	-	-	-	-	FG>50%	FG>50%	FG>50%
16.0	26	SS	30.4	82.7	30.6	51.9	1.0	9.5	14.3	V.Stiff	Above	CH	-	-	-	-	-	100.0		-	-	-	-	-	FG>50%	FG>50%	FG>50%
18.0	28	SS	37.7	124.9	37.6	86.8	1.0	8.0	21.4	V.Stiff	Above	CH	-	-	-	-	-	100.0		-	-	-	-	-	FG>50%	FG>50%	FG>50%
20.0	55	SS	18.9	29.9	16.5	13.4	0.8	16.0	6.3	CG>50%	Above	-	-	0.0	2.2	8.9	50.6	38.2		-	-	-	-	-	V.Dense	<50%	SC
22.5	39	SS	15.5	36.7	15.6	21.1	1.0	17.2	20.0	Hard	Above	CI	Sand Lenses					100.0		-	-	-	-	-	FG>50%	FG>50%	FG>50%
25.0	65	SS	16.8	Clay Binder					8.3	CG>50%	-	-	-	0.0	3.3	47.7	33.9	15.1		-	-	-	-	-	V.Dense	<50%	SM
27.5	>100	SS	22.5	Pieces of Fissile Clay/ SHALE Formation					25.0	-	-	-	-	-	-	-	-	100.0		-	-	-	-	-	FG>50%	FG>50%	FG>50%
30.0	>100	SS	20.9						23.1	-	-	-	-	-	-	-	-	100.0		-	-	-	-	-	FG>50%	FG>50%	FG>50%
32.5	>100	SS	22.7						7.1	-	Above	ML	-	-	-	-	-	100.0		-	-	-	-	-	FG>50%	FG>50%	FG>50%

** 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)

GEOMARINE

Phone No.: 044-24481485, 044-24480305

LABORATORY TEST REPORT

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

Name & Address of the Customer	:	M/s APPASWAMY REAL ESTATES (P) LTD	Customer Reference	:	By Email
Sample Description	:	Soil Sample	Period of Testing	:	08/11/2022 to 12/11/2022
Source of Sample	:	Customer Supplied- Borehole No. BH-03	Sample Identification Number	:	SS/GMC/102022/550/BH03
Sample Condition	:	Satisfactory	Test Report No.	:	GT-2453/BH-03
Test Method	:	As per Bureau of Indian Standards	Report Date	:	16/11/2022
Sample Receipt Date	:	20/10/2022	Test Report Pages	:	One Page

Table-2.3 Laboratory Classification of Soil Samples from BH-03

Sample Depth (m)	SPT- "N" Value	Type of Sample	Fine Grained (FG)										Coarse Grained (CG)														
			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)	Consistency Index (I_c=LL-NMC/I_p)	SHRINKAGE LIMIT (%) AS PER IS 2720 (P-VI) - 1972, RA-2011	FREE SWELL INDEX (%) AS PER IS 2720 (P-XL) 1977, RA-2011	Consistency	Position With Respect to A-Line	IS:Notation	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						D_{10} (mm)	D_{30}(mm)	D_{60} (mm)	Uniformity Co-Efficient $C_u=D_{60}/D_{10}$	Co-Efficient of Curvature $C_c=D_{30}^2/(D_{10}xD_{60})$	Relative Density	IS-Notation	
													Gravel (%)	Coarse (%)	Medium (%)	Fine (%)	Silt (%)	Clay (%)							Gravel	Sand
0.5	42	SS	16.3	36.1	16.6	9.6	1.0	16.0	8.3	CG>50%	Above	-	-	5.6	3.2	17.1	40.8	33.3		-	-	-	-	-	Dense	<50%	SC
1.3	5	SS	25.7	28.6	16.5	12.1	0.2	-	7.7	CG>50%	Above	-	-	5.5	2.1	24.9	18.1	49.4		-	-	-	-	-	Loose	<50%	SC
2.0	10	SS	19.8	38.5	17.6	20.9	0.9	15.6	7.1	Stiff	Above	CI	-	0.0	0.0	15.0	28.7	56.4		-	-	-	-	-	FG>50%	FG>50%	FG>50%
3.0	15	SS	28.1	47.0	27.0	20.0	0.9	14.5	-	Stiff	Above	CI	-	-	-	-	-	79.1	20.9	-	-	-	-	-	FG>50%	FG>50%	FG>50%
5.0	27	SS	20.0	45.2	20.7	24.5	1.0	13.8	-	V.Stiff	Above	CI	-	0.0	0.0	7.5	26.0	66.5		-	-	-	-	-	FG>50%	FG>50%	FG>50%
6.0	15	SS	31.3	Little to Non Plastic Silt								ML	-	0.0	0.0	0.7	40.5	58.8		-	-	-	-	-	FG>50%	FG>50%	FG>50%
7.5	7	SS	48.5	89.0	31.5	57.5	0.6	-	-	M.Stiff	Above	CH	-	-	-	-	-	55.2	44.8	-	-	-	-	-	FG>50%	FG>50%	FG>50%
10.5	5	SS	58.5	88.2	31.0	58.2	0.6	9.5	59.2	M.Stiff	Above	CH	-	-	-	-	-	100.0		-	-	-	-	-	FG>50%	FG>50%	FG>50%
12.0	5	SS	31.0	49.7	22.6	27.1	0.7	13.7	38.5	M.Stiff	Above	CI	2.52	0.0	3.3	14.2	30.0	52.5		-	-	-	-	-	FG>50%	FG>50%	FG>50%
14.0	25	SS	17.2	38.4	19.0	19.4	1.1	14.5	41.7	V.Stiff	Above	CI	-	-	-	-	-	72.7	27.3	-	-	-	-	-	FG>50%	FG>50%	FG>50%
16.0	50	SS	32.7	100.8	35.4	65.4	1.0	8.5	66.7	Hard	Above	CH	-	18.3	5.1	8.0	10.3	58.2		-	-	-	-	-	FG>50%	FG>50%	FG>50%
18.0	44	SS	34.3	106.8	34.6	71.2	1.0	9.0	-	Hard	Above	CH	2.50	0.0	0.0	3.4	5.8	90.8		-	-	-	-	-	FG>50%	FG>50%	FG>50%
20.0	34	SS	22.6	41.5	16.8	24.7	0.6	18.3	18.2	CG>50%	Above	-	2.58	0.0	0.0	16.8	44.3	38.9		-	-	-	-	-	Dense	<50%	SC
22.5	52	SS	16.7	31.5	16.6	14.9	1.0	19.5	27.3	CG>50%	Above	-	-	0.0	0.0	13.8	44.2	42.0		-	-	-	-	-	V.Dense	<50%	SC
25.0	85	SS	15.7	27.2	15.3	11.9	1.0	17.6	0.0	CG>50%	Above	-	-	0.0	1.5	15.2	44.0	39.3		-	-	-	-	-	V.Dense	<50%	SC
27.5	>100	SS	22.9	42.3	29.3	13.0	1.5	-	7.7	Hard	Below	MI	-	-	-	-	-	100.0		-	-	-	-	-	FG>50%	FG>50%	FG>50%
30.0	>100	SS	18.9	Fissile Clay/Shale					16.7	-	-	-	-	-	-	-	-	100.0		-	-	-	-	-	FG>50%	FG>50%	FG>50%

** END OF REPORT**

Terms and Conditions

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

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

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Authorised Signatory

A. VINOTH
(Technical Manager)

GEOMARINE
Phone No.: 044-24480305

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

Table 2.4 Result of Chemical Test

Sample Identification Number: SS/GMC/102022/550 **Customer Reference:** By Email

Source of Sample: Customer Supplied **Period of Testing:** 09/11/2022 to 11/11/2022

Sample Condition: Satisfactory **Report Date:** 16/11/2022

Sample Description: Watert and Soil **Test Report No.:** GT-2453

Sample Receipt Date: 20/10/2022 **Test Report Pages:** One Page

S No.	SAMPLE REFERENCE NO	Water				SOIL		
		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	DEPTH OF SAMPLE (m)	pH AS PER IS 2720 (P-XXVI) - 1987, RA-2021	SULPHATES (mg/kg) AS PER IS 2720 (P-XXVII) - 1977, RA-2020
1.0	BH-01	0.80	7.02	160.1	230.6	2.00	6.77	161.6
2.0	BH-02	1.00	6.75	112.6	219.8	1.25	7.23	96.4
3.0	BH-03	1.00	6.99	131.6	177.8	3.00	7.21	91.2

** 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

Table-2.5 Results of Chemical Test for Chloride in Soil Sample			
SL No.	Bore HoleNo.	Soil (2:1)	
		Depth of Sample (m)	Chlorides (mg/kg)
1.0	BH-01	2.00	122.6
2.0	BH-02	1.25	89.3
3.0	BH-03	3.00	85.2

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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							(C_u) kPa	(φ) Deg.
1.0	0.00	2.50	2.50	Filled Up	-	-	-	-	-	-	-
2.0	2.50	6.00	3.50	Silty Clay	Grey Brown	16	-	Very Stiff	20	107	-
3.0	6.00	7.50	1.50	Sandy Silt	Grey	23	Medium Dense	-	18.5	-	33.9
4.0	7.50	10.50	3.00	Silty Clay	Grey	4	-	Soft	14.5	27	-
5.0	10.50	14.00	3.50	Silty Clay	Grey	6	-	Medium Stiff	15.5	40	-
6.0	14.00	16.00	2.00	Clayey Silty Sand	Pale Grey	17	Medium Dense	-	18	-	32.1
7.0	16.00	20.00	4.00	Silty Clay	Brown Grey	36	-	Hard	21	240	-
8.0	20.00	27.00	7.00	Clayey Silty Sand	Brown Grey	60	Very Dense	-	20.5	-	42.5
9.0	27.00	32.00	5.00	Shale	Grey	>100	-	Hard	22	400	-

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GEOMARINE

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							(C$_u$) kPa	(ϕ) Deg.
1.0	0.00	3.00	3.00	Filled Up	-	-	-	-	-	-	-
2.0	3.00	6.00	3.00	Silty Clay	Brown	12	-	Stiff	18.5	80	-
3.0	6.00	7.50	1.50	Sandy Silty Clay	Grey	22	-	Very Stiff	20.5	147	-
4.0	7.50	9.00	1.50	Silty Clay	Grey	3	-	Soft	14	20	-
5.0	9.00	10.50	1.50	Silty Clay	Grey	7	-	Medium Stiff	16	47	-
6.0	10.50	14.00	3.50	Silty Clay	Grey	4	-	Soft	14.5	27	-
7.0	14.00	20.00	6.00	Silty Clay	Brown	26	-	Very Stiff	20.5	173	-
8.0	20.00	22.50	2.50	Clayey Silty Sand	Brown Grey	55	Very Dense	-	20.5	-	41.75
9.0	22.50	25.00	2.50	Silty Clay	Grey Brown	39	-	Hard	21	260	-
10.0	25.00	26.50	1.50	Silty Sand	Brown Grey	65	Very Dense	-	21	-	42.5
11.0	26.50	35.00	8.50	Shale	Grey	>100	-	Hard	22	400	-

REFERENCE BORE HOLE					BH-03	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							(C$_u$) kPa	(ϕ) Deg.
1.0	0.00	2.00	2.00	Filled Up	-	-	-	-	-	-	-
2.0	2.00	5.00	3.00	Silty Clay	Grey Brown	13	-	Stiff	19	87	-
3.0	5.00	6.00	1.00	Silty Clay	Grey	27	-	Very Stiff	20.5	180	-
4.0	6.00	7.50	1.50	Sandy Silt	Grey	15	Medium Dense	-	17.5	-	31.5
5.0	7.50	14.00	6.50	Silty Clay	Grey	6	-	Medium Stiff	15.5	40	-
6.0	14.00	16.00	2.00	Silty Clay	Green Grey	25	-	Very Stiff	20.5	167	-
7.0	16.00	20.00	4.00	Silty Clay	Brown Grey	47	-	Hard	21	313	-
8.0	20.00	22.50	2.50	Clayey Silty Sand	Grey Brown	34	Dense	-	19.5	-	37.1
9.0	22.50	26.50	4.00	Clayey Silty Sand	Grey Brown	59	Very Dense	-	20.5	-	42.35
10.0	26.50	35.00	8.50	Shale	Grey	>100	-	Hard	22	400	-

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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 extended two basement floors and eighteen upper floors, and is meant for residential occupancy. For this kind of structure, the column loads could vary between 6000 kN to 8000 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 SUB SOIL STRATIFICATION:

Geological variation of the soil in the project site is classified based on the physical properties & insitu strength characteristics. The generalised sub soil stratification is given below:

Strata-I , 0.0m to 3.0m, Predominantly Filled Soil (Matrix of Soil with Building debris)

Strata-II, 3.0m to 7.0m, Stiff & Very Stiff, Silty Clay of Medium to High Plasticity & Lenses of Clayey Silt

Strata-III, 7.0m to 14.0m, Medium Stiff, Silty Clay of High & Medium Plasticity

Strata-IV, 14.0m to 20.0m, Very Stiff & Hard, Silty Clay of High Plasticity

Strata-V, 20.0m to 27.0m, Very Dense, Clayey Sand & @ locations Hard, Silty Clay

Strata-VI, Beyond 27.0m, Hard, Fissile Clay/ Shale formation of Gondwana Age (Soft Shale Formation)

4.3 FOUNDATION SYSTEM:

It is proposed to construct extended two basement floor and assuming depth of one basement floor of 3.5m, the overall depth of foundation could be about 9.0m from the existing ground level.

For the kind of proposed construction, adopt pile foundation due to very weak sub soil conditions. The length of pile is 28m from existing ground level with cut-off at 9.0m. The pile capacity do not change even if cut-off increased to 10.0m.

The piles can be installed by drilling with direct mud circulation technique (Bored Cast Insitu Piles) and Table 4.1 presents the allowable safe load carrying capacity of bored cast insitu piles in vertical, tension & lateral for different diameter and the computations are worked out as per IS 2911-Part I, Section-2.

Typical computations are presented in Annexure-I.

TABLE:- 5.1 RECOMMENDED SAFE LOAD CARRYING CAPACITIES OF BORED CAST-IN SITU PILES

Sl.No	Reference Bore hole No.	Length of Pile below E.G.L	Assumed Length of Cut-Off Below E.G.L	Length of Pile below Cut-off	Dia.of Pile in (mm)	SAFE LOAD CARRYING CAPACITY (kN)		
						Vertical Load Carrying Capacity	Pull Out Capacity	Lateral Load Carrying Capacity
1	BH-02	28.0	9.0	19.00	500	1200	600	32
2					550	1300	650	35
3					600	1500	750	38
4					650	1700	800	41
5					750	2000	900	45
6					800	2300	1000	50
7					900	2700	1100	55

4.4 SHORING SYSTEM:

In present project site, the set back distance till the retaining wall is 3.0m. No open excavation meets the slope stability requirement with available setback of 3.0m. Provide secant piles or contiguous piles or diaphragm wall based on the relative economics.

The construction of retaining wall depends on the shoring system chosen from above three as discussed below:

- In case of either contiguous pile and secant piles, adopt shoring as back shuttering and construct the retaining wall
- In case of diaphragm wall, evaluate the need of skin wall depending upon the quality of diaphragm wall.

Since the design of shoring is beyond the scope the same is not presented. However, as no set back is available any one of the design approaches for shoring is mandatory.

- Design shoring system as cantilever system.
- Adopt partial top down with internal strutting wherever required.

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4.5 DEWATERING/ GROUND WATER LOWERING DESIGN:

In case of contiguous piles, provide dewatering bore wells on four sides outside the excavation zone. Also, provide contingency planning for local pit dewatering within the excavation zone while carrying out excavation.

In case of secant piles/ diaphragm wall provide four borewells within the excavation zone coupled with contingency plan for local pit dewatering.

Note: In any case the depth of bore well is 15.0m only.

(Do not exceed the depth of bore well beyond 15.0m.)

4.6 EXCAVATION:

After the installation of the shoring and borewells carryout excavation using conventional excavators.

Note: The scope of execution shall include shoring, dewatering and excavation scheme

4.7 UPLIFT DESIGN:

In present case, excavation needs permanent shoring. Further the strata below the lower basement are predominantly medium to high plastic clay. Taking into cognizance of both beneficial effect off shoring system and thick clay layer below the basement slab no uplift pressure acts on the basement slab.

RECOMMENDATIONS

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CHAPTER-5

RECOMMENDATIONS

5.1 RECOMMENDATION FOR DEEP PILE FOUNDATION SYSTEM:

- For the kind of proposed structure and sub soil condition deep pile foundation is the suitable foundation to adopt. In the present case, Bored **Cast in situ piles** are recommended as the suitable foundation system.
- The allowable safe load carrying capacities of different diameters of piles as given in Table-4.1.can be adopted as provisional design loads, as the load carrying capacity of piles not only depends upon the sub soil properties, but also depends on the care and experience of installation of piles.
- The theoretical load carrying estimates of piles shall be confirmed by conducting pile loads tests as per the guide lines laid down in IS: 2911-Part-IV.
- The boring shall be carried out using direct mud circulation prepared out of sodium bentonite.
- After reaching the borehole termination depth, the borehole shall be cleaned using mud circulation for a minimum period of 30min or till the return mud is relatively clear of soil particles.
- After ensuring the borehole is clean, the tremie pipe shall be lowered and concreting can be done.

5.1.1 CONSTRUCTION METHOD STATEMENT OF PILE FOUNDATION:

- The mud used shall be made out of sodium bentonite with minimum free swell index of more than 300% and liquid limit more than 100%. The silt content in bentonite shall not be more than 5%.
- The mud should be prepared using sodium bentonite with a density of range 1.03 g/cc to 1.10 g/cc. However, while flushing before concreting the density should not be more than 1.12 g/cc.

5.2 RECOMMENDATIONS FOR EXCAVATION:

- As discussed in Chapter-4.0, Section 4.4 it is recommended to adopt shoring system of diaphragm wall or contiguous pile for excavation.

5.3 GENERAL RECOMMENDATION:

- 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 Clause 2.0 for minimum cement content and maximum water cement ratio. Hence ordinary Portland cement can be used.

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- *Before excavation is started a workshop shall be conducted including the Owner, Architect, Structural Engineer, Geotechnical Engineer and Execution agency to ensure the proposal given by the contractor is workable and safe.*
- *Before construction activities are initiated, a scientific due-diligence of the condition of the neighbouring structures shall be carried out and authenticated. This is required to ensure that no undue claims or interpretations are made by the neighbourhood that the construction activities cause damages to their structures*

AUTHORISED SIGNATORY

Chennai-41

DR. C. V. PRASAD

GEOMARINE CONSULTANTS PRIVATE LIMITED

ANNEXURE-I



GEO MARINE

ESTIMATION OF SAFE LOAD CARRYING CAPACITY OF BORED CAST-INSITU PILES

Type of Pile	Bored	Diameter of Pile			Length of Pile below G.L. (m)	28.0	As Per IS:2911-(P-I,S-2)-2010
Reference Bore Hole	BH-01		500	mm	Surcharge Pressure	0	kPa

Layer No.	Layer Thk. (m) Top, R.L.	Bot. R.L.	Thickness	Type of Strata	Ave. SPT	(γ) kN/m³ of Layer	Ave. upto Layer	Shear Parameters (C_u) kPa	(ϕ) Deg.	Effective Overburden Pressure (kPa) At top of Layer	At Bot. of Layer	At Mid. of Layer	Adhesion Factor (α)	Earth Pressure Coefficient (k)	Skin Friction (Q_f) kN		
1.0	0.0	9.0	9.0	Cut-Off Level													
2.0	9.0	14.0	5.0	Silty Clay	5	15.0	15.0	33	-	0.0	25.0	12.5	1.0	-	qf	2	259.2
3.0	14.0	16.0	2.0	Clayey Sand	17	18.0	16.5	-	32.1	25.0	41.0	33.0	-	1.1	qf	3	71.9
4.0	16.0	20.0	4.0	Silty Clay	36	21.0	19.5	240	-	41.0	85.0	63.0	0.3	-	qf	4	392.1
5.0	20.0	27.0	7.0	Silty Sand	50	20.5	20.8	-	41.0	85.0	158.5	121.8	-	1.5	qf	5	1745.6
6.0	27.0	28.0	1.0	Shale	100	22.0	21.3	400	-	158.5	170.5	164.5	0.3	-	qf	6	163.4

Summation of Positive Skin Resitance (kN) Q_f= 2632.15

Summation of Negative Skin Resistance (kN) -Qf= 0.00

Computation of End Bearing Resistance

		SPT	ϕ	C_u	N_q	N_c			
Bearing Stratum	Shale	100	-	500	-	9	Eff.Ht.of Overburden	8	m
							Effective Overburden Pressure	64.50	kN/m²

End Bearing Resistance (kN) Q_p= 883.57

Skin Resistance in Clay Layer is $\pi*d*T_i*C_u*\alpha$

Skin Resistance in Sand Layer is $\pi*d*T_i*q*K*\tan(\phi)$

End Bearing Resistance in Clay Layer is $\pi*d^2/4*C_u/N_c$

End Bearing Resistance in Sand Layer is $\pi*d^2/4*Q'*N_q$

Ultimate Load Carrying Capacity (Q_{ult})	$Q_u=Q_f+Q_f+Q_p$ (kN)	3515.72
Safe Load Carrying Capacity (Q_{safe})	$Q_u/2.5$ (kN)	1406.29
Allowable Safe Load Carrying Capacity	$Q_{A\text{-}safe}$ (kN)	1406.29
Allowable Safe Pull out Capacity	$Q_{A\text{-}pull}$: Qf/3 (kN)	877.38

Where

Cu=Undrained Shear Strength of Clay
K=Coef. Earth Pressure at Rest
d=Dia. Of Pile
ϕ=Angle of Shearing Resitance
q=Effective Overburden Pressure at middle of Layer
α=Adhession Factor
N_q=Bearing Capacity Factor = 0
N_q=Bearing Capacity Factor, Ref. Fig.1 of IS: Code Referred above
T_i=Thickness of Layer
Q (i.e) Effective Overburden Pressure at pile tip=Effective height of overburden X (=10)

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GEO MARINE

ESTIMATION OF SAFE LOAD CARRYING CAPACITY OF BORED CAST-INSITU PILES

Type of Pile	Bored	Diameter of Pile		Length of Pile below G.L. (m)	28.0	As Per IS:2911-(P-I,S-2)-2010
Reference Bore Hole	BH-02		500 mm	Surcharge Pressure	0	kPa

Layer No.	Layer Thk. (m) Top. R.L.	Bot. R.L.	Thickness	Type of Strata	Ave. SPT	(γ) kN/m³ of Layer	Ave. upto Layer	Shear Parameters (C_u) kPa	(ϕ) Deg.	Effective Overburden Pressure (kPa) At top of Layer	At Bot. of Layer	At Mid. of Layer	Adhesion Factor (α)	Earth Pressure Coefficient (K)	Skin Friction (Q_f) kN		
1.0	0.0	9.0	9.0	Cut-Off Level													
2.0	9.0	14.0	5.0	Silty Clay	5	15.0	15.0	33	-	0.0	25.0	12.5	1.0	-	qf	2	259.2
3.0	14.0	20.0	6.0	Silty Clay	26	20.5	17.8	173	-	25.0	88.0	56.5	0.3	-	qf	3	489.1
4.0	20.0	22.5	2.5	Clayey Sand	50	20.5	20.5	-	41.0	88.0	114.3	101.1	-	1.5	qf	4	517.8
5.0	22.5	25.0	2.5	Silty Clay	39	21.0	20.8	260	-	114.3	141.8	128.0	0.3	-	qf	5	265.5
6.0	25.0	26.5	1.5	Silty Sand	50	20.5	20.8	-	41.0	141.8	157.5	149.6	-	1.5	qf	6	459.7
7.0	26.5	28.0	1.5	Shale	100	22.0	21.3	400	-	157.5	175.5	166.5	0.3	-	qf	7	245.0

Summation of Positive Skin Resitance (kN) Q_f= 2236.38

Summation of Negative Skin Resistance (kN) -Qf= 0.00

Computation of End Bearing Resistance

		SPT	ϕ	C_u	N_q	N_c			
Bearing Stratum	Shale	100	-	500	-	9	Eff.Ht.of Overburden	8	m
							Effective Overburden Pressure	70.00	kN/m²

End Bearing Resistance (kN) Q_p= 883.57

Skin Resistance in Clay Layer is $\pi*d*T_i*C_u*\alpha$

Skin Resistance in Sand Layer is $\pi*d*T_i*Q*K*Tan(\phi)$

End Bearing Resistance in Clay Layer is $\pi*d^2/4*C_u*N_c$

End Bearing Resistance in Sand Layer is $\pi*d^2/4*Q*N_q$

Where

Cu=Undrained Shear Strength of Clay

ϕ=Angle of Shearing Resistance

N_c=Bearing Capacity Factor = 9

Q (i.e) Effective Overburden Pressure at pile tip=Effective height of overburden X (=10)

K=Coef. Earth Pressure at Rest

q=Effective Overburden Pressure at middle of Layer

N_q=Bearing Capacity Factor, Ref. Fig.1 of IS: Code Referred above

Ultimate Load Carrying Capacity (Q_{ult})	$Q_u=Q_f+Q_f+Q_p$ (kN)	3119.96
Safe Load Carrying Capacity (Q_{safe})	$Q_u/2.5$ (kN)	1247.98
Allowable Safe Load Carrying Capacity	Q_{A-safe} (kN)	1247.98
Allowable Safe Pull out Capacity	Q_{A-pull}: Qf/3 (kN)	745.46

d=Dia. Of Pile

α=Achesion Factor

T_i=Thickness of Layer

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GEOMARINE

ESTIMATION OF SAFE LOAD CARRYING CAPACITY OF BORED CAST-INSITU PILES

Type of Pile	Bored	Diameter of Pile			Length of Pile below G.L. (m)	26.0	As Per IS:2911-(P-I,S-2)-2010	
Reference Bore Hole	BH-03		500	mm	Surcharge Pressure	0	kPa	

Layer No.	Layer Thk. (m) Top. R.L.	Bot. R.L.	Thickness	Type of Strata	Ave. SPT	(γ) kN/m³ of Layer	Ave. upto Layer	Shear Parameters (C_u) kPa	(ϕ) Deg.	Effective Overburden Pressure (kPa) At top of Layer	At Bot. of Layer	At Mid. of Layer	Adhesion Factor (α)	Earth Pressure Coefficient (k)	Skin Friction (Q_s) kN		
1.0	0.0	9.0	9.0	Cut-Off Level													
2.0	9.0	14.0	5.0	Silty Clay	5	15.0	15.0	33	-	0.0	25.0	12.5	1.0	-	qf	2	259.2
3.0	14.0	16.0	2.0	Silty Clay	25	20.5	17.8	167	-	25.0	46.0	35.5	0.3	-	qf	3	157.4
4.0	16.0	20.0	4.0	Silty Clay	47	21.0	20.8	313	-	46.0	90.0	68.0	0.3	-	qf	4	511.3
5.0	20.0	22.5	2.5	Clayey Sand	34	19.5	20.3	-	37.1	90.0	113.8	101.9	-	1.4	qf	5	411.4
6.0	22.5	26.5	4.0	Clayey Sand	50	20.5	20.0	-	41.0	113.8	155.8	134.8	-	1.5	qf	6	1104.0
7.0	26.5	28.0	1.5	Shale	100	22.0	21.3	400	-	155.8	173.8	164.8	0.3	-	qf	7	245.0

Summation of Positive Skin Resitance (kN) Q_f= 2688.28

Summation of Negative Skin Resistance (kN) -Qf= 0.00

Computation of End Bearing Resistance

		SPT	ϕ	C_u	N_q	N_c			
Bearing Stratum	Shale	100	-	500	-	9	Eff.Ht.of Overburden	8	m
							Effective Overburden Pressure	68.75	kN/m²

End Bearing Resistance (kN) Q_p= 883.57

Skin Resistance in Clay Layer is π*d*T_i*C_u*α	Ultimate Load Carrying Capacity ($Q_{u(c)}$)	$Q_u=Q_s-Q_f+Q_p$ (kN) 3571.66
Skin Resistance in Sand Layer is π*d*T_i*q_i*K*Tan(ϕ)	Safe Load Carrying Capacity (Q_{safe})	Q_u/2.5 (kN) 1428.74
End Bearing Resistance in Clay Layer is π*d^2/4*C_u*N_c	Allowable Safe Load Carrying Capacity	$Q_{A.safe}$ (kN) 1428.74
End Bearing Resistance in Sand Layer is π*d^2/4*Q*N_q	Allowable Safe Pull out Capacity	$Q_{A.pull}$: Qf/3 (kN) 896.09

Where

Cu=Undrained Shear Strength of Clay
ϕ=Angle of Shearing Resistance
N_c=Bearing Capacity Factor = 9
K=Coef. Earth Pressure at Rest
q_i=Effective Overburden Pressure at middle of Layer
N_q=Bearing Capacity Factor, Ref. Fig.1 of IS: Code Referred above
Q (i.e) Effective Overburden Pressure at pile tip=Effective height of overburden X (γ-10)
d=Dia. Of Pile
α=Adhesion Factor
T_i=Thickness of Layer

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GEOMARINE

LATERAL LOAD CARRYING CAPACITY OF BORED CAST- SITU PILES

Reference Bore Hole : BH-02

1.0 Geometrical Data

Type of Pile Head Considered	Fixed	
Diameter of Pile (d) :	0.50	m
Free standing Length of Pile (e) :	0	m
Length of Pile below E.G.L (Le) :	28.0	m
Cut-Off Level From E.G.L :	9.0	
Length of Pile below Cut-Off Level (Le) :	19.0	m
Grade of Concrete (M) :	25	MN/m^2
Young's Modulus of Concrete (E) :	25000000	kN/m^2
Momemnt of Inertia (I) :	0.003068	m^4

2.0 Determination of Depth of Fixity

Type of Soil Strata :	Clay	
Ground Water Condition :	Submerged	
Design SPT "N" Value :	5	
K=((k1/1.5)*(0.3/B))		

(n can be read as h in the above and below equation in case of Sand)

K1= :	12000	kN/m^3
K= :	4800	kN/m^4
R= :	2.38	m
L1/R :	0.00	
Lf/R :	2.20	
Depth of Fixity below Cut off (z_f) :	5.23	m

3.0 Determincation of Lateral Load and Moment Carrying Capacity for 0.005 m Lateral Deflection:

Allowable Lateral Deflection (Y) :	0.005	m
Lateral Load Carrying Capacity (H)= Y*12EI/(e+zf)^3 :	32.15	kN
Recommended Design Lateral Load carrying Capacity :	**32**	**kN**
Fixed End Moment, $M_F=H(e+z_f)/2$	84	
Reduction Factor (L_1/T) :	0.67	m
Actual Moment (Fixed End Moment/Reduction Factor), M_F	**56**	kN-m

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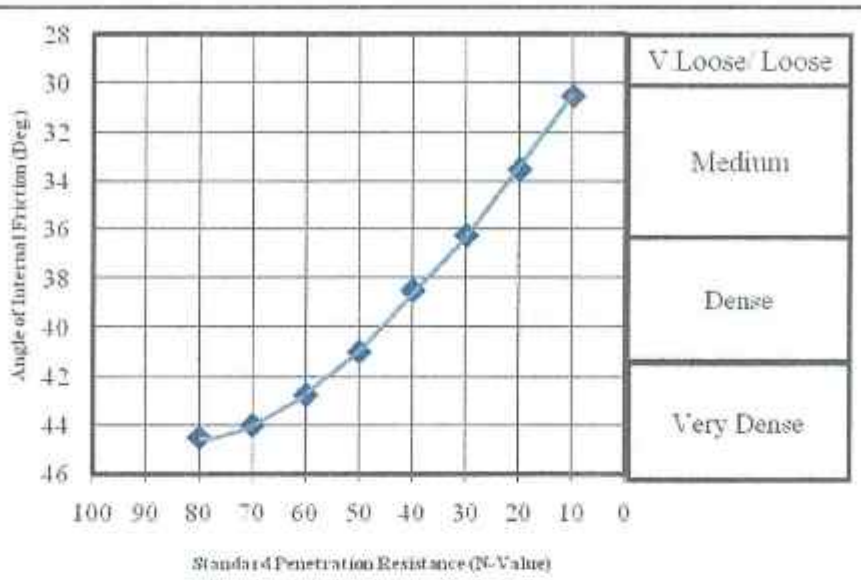


FIG. A1 Relation Ship between Angle of Internal Friction & N-value (Reproduced from IS:6403-1981)

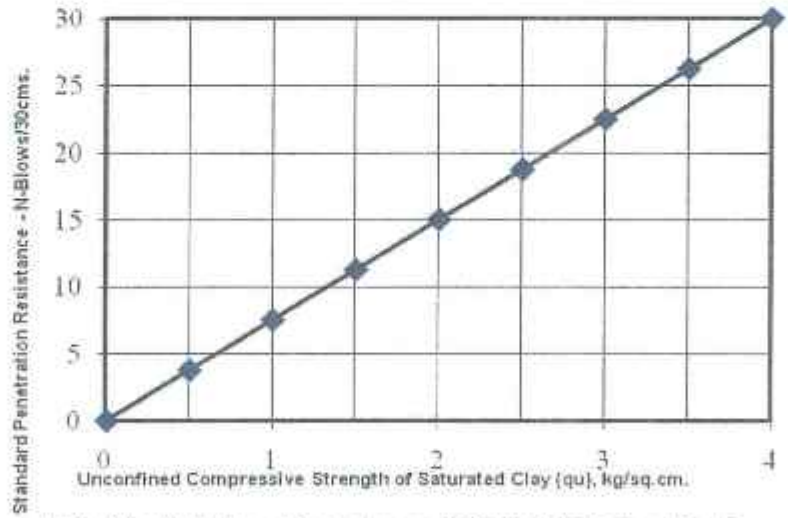


FIG. A2 : Relationship between UCC & SPT-Value (N) of Saturated Clay (AfterTerzhagi & Peck, 1948)

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ANNEXURE-II



ANNEXURE-III



GEOMARINE
THE SPIRIT OF ENGINEERING

SITE INVESTIGATION RECORD

BORE HOLE No. 01
PAGE No. 01

PROJECT NAME: APPASWAMY REAL ESTATE, KOVANMEDU
DIA OF BORE HOLE: 150mm 4, 100mm
LOCATION:
MACHINE No.: CR-06
CHAINAGE (m):
BORE START DATE: 08/10/2022
STRUCTURE:
DRILLING METHOD: Rotary
CO-ORDINATES: N, E
BORE END DATE: 12/10/2022
JOB CODE:
FLUSHING MEDIUM: Bentonite
TOTAL DRILLING DAYS: 3

Depth below G.L. (m)	Drilling progress per metre: Date	Time: Hr.	Time: Min.	Type of Drilling SPT / TCB / DB	Core Details: Total Core Recovery %	Core Details: R.Q.D %	SPT Details: Blows/cm. 0-15	15-30	30-45	SPT 'N' Value	Sample Details: Depth	No.	Type	Layer Data: Depth (m)	Geotechnical Description
											0.50	1	DS		Filled up soil. Building materials
1	08	3	20	DB											
		3	28	SC			3	3	4	7	1.25	2	SS		Filled up soil - Sand, clay with Building materials
		3	40												
2		3	42	SC			15	14	13	27	2.00	3	SS		Filled up soil Sand with Building materials
	10	3	58												
		4	00	SC			2	4	7	11	3.00	4	SS		Greyish Brown stiff silty clay
3		4	21												
	2022	4	24	SC			5	6	9	15	4.00	5	SS		Brownish stiff Sandy silty clay
4		4	49												
		4	51	SC			7	12	10	22	5.00	6	SS		Brownish Medium Dense clayey Sandy silt
5		9	52												
	10	9	53	SC			7	13	10	23	6.00	7	SS		Greyish medium Dense Sandy silt
6															
		10	15												
7		10	16	SC			2	2	2	4	7.50	8	SS		Greyish Soft silty clay
	10														
8		10	50												
		10	52	SC			1	1	2	3	9.00	9	SS		Greyish Soft silty clay
9	2022														
		11	28												
		11	30	SC			2	2	4	6	10.50	10	SS		Greyish medium stiff silty

CS - Core Sample
SS - Split Spoon Sample
UDS-Undisturbed Sample
WS - Wash Sample

DS - Disturbed Sample
SC - Soil Cutter
TCB - Tungsten Carbide Bit
DB - Diamond Bit

SUPERVISOR NAME: M. Loganathan
SIGNATURE:
DATE: 10/10/2022
CLIENT IN-CHARGE:

PROJECT SITE DETAILS
GROUND LEVEL (m): G.L
WATER TABLE (m): 0.50 M
CASING DEPTH (m):

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GEOMARINE
THE SPIRIT OF ENGINEERING

SITE INVESTIGATION RECORD

BORE HOLE No.	01
PAGE No.	02
DIA OF BORE HOLE	150mm 4 / 100mm
BORE START DATE	08/10/2022
BORE END DATE	12/10/2022
TOTAL DRILLING DAYS	3

PROJECT NAME	APPALSWAMY REAL ESTATE - KOVAMBEDU				
LOCATION		MACHINE No.	CR-06	DRAINAGE (m)	
STRUCTURE	2B+ST+TF	DRILLING METHOD	Rotary	CO-ORDINATES	N
JOB CODE		FLUSHING MEDIUM	Bentonite		E

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: 15-30	SPT Details: 30-45	SPT 'N' Value	Sample Details: Depth	Sample Details: No.	Sample Details: Type	Layer Data: Depth (m)	Geotechnical Description
1		11	45												
		11	50												
2	10			SC			0	3	3	6	12.00	11	SS		Greyish medium stiff Sandy clay
3		12	14												
		12	18												
4				SC			2	5	12	17	14.00	12	SS		Light Grey very stiff Sandy clay with Lime. pebbles
5	10	2	18												
		2	21												
6				SC			7	12	25	37	16.00	13	SS		Brownish Grey Hard Compacted clay (Sandy) with shale patches
7		3	06												
		3	20												
8				SC			12	15	20	35	18.00	14	SS		Brownish Grey Hard Compacted clay with shale patches
9		4	09												
		4	20												
10				SC			20	52	10cm 51 blows HR NV 100		20.00	15	SS		Brownish Grey very dense silty fine to m-coarse sand

CS - Core Sample	DS - Disturbed Sample	SUPERVISOR NAME	M. Loganathan	PROJECT SITE DETAILS	
SS - Split Spoon Sample	SC - Soil Cutter	SIGNATURE		GROUND LEVEL (m)	4.L +0.25
UDS-Undisturbed Sample	TCB - Tungsten Carbide Bit	DATE	10/10/2022	WATER TABLE (m)	0.50M
WS - Wash Sample	DB - Diamond Bit	CLIENT IN-CHARGE		CASING DEPTH (m)	—

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GEOMARINE
THE SPIRIT OF ENGINEERING

SITE INVESTIGATION RECORD

BORE HOLE No.	01
PAGE No.	03
DIA OF BORE HOLE	150mm 4 / 100mm
BORE START DATE	08/10/2022
BORE END DATE	11/10/2022
TOTAL DRILLING DAYS	3

PROJECT NAME: APPASWAMY REAL ESTATE . KOVAMBEDU
LOCATION:
STRUCTURE: 28+ SUB +17F
JOB CODE:
MACHINE No.: CR-06
DRILLING METHOD: Rotary
FLUSHING MEDIUM: Bentonite
CHAINAGE (m):
CO-ORDINATES: N / E

Depth below E.G.L (m)	Drilling progress per metre: Date	Time: Hr.	Time: Min	Type of Core Barrel (SC / DC)	Core Details: Total Core Recovery %	Core Details: R.Q.D %	SPT Details: Blows/cm. 0-15	15-30	30-45	SPT 'N' Value	Sample Details: Depth	No.	Type	Layer Data: Depths (m)	Geotechnical Description
1		9	30												due to Rain.
		9	38												
2	11			SC			14	23	32	55	22.50	16	SS		yellowish Brown Dense Silty fine to m. coarse sand with clay binders.
3		10	54												
4		11	03												
5	10			SC			14	20	45	65	25.00	17	SS		Greyish Brown very Hard Compacted clay with Sand pockets
6		11	49												
		12	06											27m	
7															
8				SC			7cm/55b HR			N>100	27.50	18	SS		Greyish very Hard Shale
9	2022	2	15												
		2	30												
10				SC			Hammer Refusal N>100/Rock				30.00	19	WS		Greyish very Hard Shale.

CS - Core Sample
SS - Split Spoon Sample
UDS - Undisturbed Sample
WS - Wash Sample
DS - Disturbed Sample
SC - Soil Cutter
TCB - Tungsten Carbide Bit
DB - Diamond Bit

SUPERVISOR NAME: M. Loganathan
SIGNATURE: 14:10 PM
DATE: 11/10/2022
CLIENT IN-CHARGE:

PROJECT SITE DETAILS

GROUND LEVEL (m)	G.L
WATER TABLE (m)	0.50 M
CASING DEPTH (m)	—

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GEOMARINE
THE SPIRIT OF ENGINEERING

SITE INVESTIGATION RECORD

BORE HOLE No.	01
PAGE No.	04
DIA OF BORE HOLE	150mm: 4 / 100mm:
BORE START DATE	8/10/2022
BORE END DATE	11/10/2022
TOTAL DRILLING DAYS	3

PROJECT NAME: APPASWAMY REAL ESTATE – KOVAMBEDU

LOCATION:

STRUCTURE: 2B+SUB+17F

JOB CODE:

MACHINE No.: CR'06

DRILLING METHOD: Rotary

FLUSHING MEDIUM: Bentonite

CHAINAGE (m):

CO-ORDINATES: N: E:

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: 15-30	SPT Details: 30-45	SPT 'N' Value	Sample Details: Depth	Sample Details: No.	Sample Details: Type	Layer Data: Depth (m)	Geotechnical Description
0	11/10/2022	3	30	DB											
		4	58												
1	12/10	9	30												
		11	30	DB											
2	13/10				27%	Hammer Rebound 42 blows/cm at 42 cm					32.00	20	C/WS		Greyish very hard shale
3															Bore hole Terminated at 32 m Depth Below EGL
4															
5															
6															
7															
8															
9															
10															

CS - Core Sample
SS - Split Spoon Sample
UDS-Undisturbed Sample
WS - Wash Sample

DS - Disturbed Sample
SC - Soil Cutter
TCB - Tungsten Carbide Bit
DB - Diamond Bit

SUPERVISOR NAME: K. Loganathan
SIGNATURE:
DATE: 12/10/2022
CLIENT IN-CHARGE:

PROJECT SITE DETAILS

GROUND LEVEL (m)	+6
WATER TABLE (m)	0.80 M
CASING DEPTH (m)	

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SITE INVESTIGATION RECORD

BORE HOLE No. 02
PAGE No. 01

PROJECT NAME: APPASWAMY - KOVAMBEDU
LOCATION:
STRUCTURE: 28 + Stilt + 17F
JOB CODE:
MACHINE No.: CR-06
DRILLING METHOD: Rotary
FLUSHING MEDIUM: Bentonite
CHAINAGE (m):
CO-ORDINATES: N / E
DIA OF BORE HOLE: 150mm / 100mm: 150mm
BORE START DATE: 13/10/2022
BORE END DATE: 15/10/2022
TOTAL DRILLING DAYS: 3

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)	Layer Data: Geotechnical Description
0		9	39	SC			6	5	2	7	0.50	1	SS	Filled up	Filled up Soil
1		9	40	SC			4	3	4	7	1.25	2	SS		Brownish Medium Dense Sandy clay with Bricks pieces
	13	9	56												Brownish Medium Dense Clayey Sand with Boulders
2		9	57	SC			7	7	9	16	2.00	3	SS		
		10	33												Brownish Medium Dense Silty fine to M. coarse Sand with clay
2.0m Water Loss		10	34												
3				SC			3	5	6	11	2.00	4	SS		Sample Failed - Brownish clay.
		10	59												
due to Rain		11	02	SC			2	5	6	11	4.00	5	SS		Brownish Grey Stiff Silty clay
4	10	11	33				-	-	-	-	4.50	6	UDS		UDS Sample
		11	35												
5				SC			3	6	8	14	5.00	7	DS		Sample Failed
		12	42												
6		12	45	SC			8	10	12	22	6.00	8	SS		Greyish Medium Dense Silty fine Sand
		2	14												
7		2	15												
				SC			1	1	2	3	7.00	9	SS		Greyish Soft silty Clay
		2	47												
8	2022	2	47												
9				SC			4	4	3	7	9.00	10	SS		Greyish Medium Stiff Silty clay with Sand pockets
		4	47												
10		4	49												
				SC			1	1	3	4	10.50	11	SS		Greyish Soft Silty Clay

CS - Core Sample
SS - Split Spoon Sample
UDS - Undisturbed Sample
WS - Wash Sample
DS - Disturbed Sample
SC - Soil Cutter
TCB - Tungsten Carbide Bit
DB - Diamond Bit

SUPERVISOR NAME: M. Loganathan
SIGNATURE:
DATE: 13/10/2022
CLIENT IN-CHARGE:

PROJECT SITE DETAILS
GROUND LEVEL (m): EL
WATER TABLE (m): 1.00m
CASING DEPTH (m):

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SITE INVESTIGATION RECORD

BORE HOLE No. 02
PAGE No. 02
DIA OF BORE HOLE 150mm 4
100mm
BORE START DATE 13/10/2022
BORE END DATE 15/10/2022
TOTAL DRILLING DAYS 3

PROJECT NAME: Appasuramy Koyambedu
LOCATION:
STRUCTURE: 20+386.4+417.F
JOB CODE:
MACHINE No.: CR-06
DRILLING METHOD: Rotary
FLUSHING MEDIUM: Bentonite
CHAINAGE (m):
CO-ORDINATES: N, E

Depth below G.L. (m)	Drilling progress per metre: Date	Time: Hrs.	Time: Mins.	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
0	13														
1	10	5	06												
	22	5	08												
2				SC			1	2	2	4	2.00	12	SS		Greyish Soft Silty clay
3		9	32												
		9	35												
4	14			SC			5	10	15	25	4.00	13	SS		Greyish very stiff Sandy clay
5		10	05												
		10	14												
6				SC			5	10	16	26	6.00	14	SS		Brownish Grey very stiff Compacted clay
7		10	48												
	10	10	56												
8				SC			8	12	16	28	8.00	15	SS		Brownish Grey very stiff Compacted clay
9															
	12.00														
	12.09														
10				SC			12	29	28	57	20.00	16	SS		Brownish Grey Dense Silty M-coarse & fine sand with clay particles.

CS - Core Sample
SS - Split Spoon Sample
UDS-Undisturbed Sample
WS - Wash Sample

DS - Disturbed Sample
SC - Soil Cutter
TCB - Tungsten Carbide Bit
DB - Diamond Bit

SUPERVISOR NAME: M. Gopinathan
SIGNATURE:
DATE: 14/10/2022
CLIENT IN-CHARGE:

PROJECT SITE DETAILS
GROUND LEVEL (m): GL
WATER TABLE (m): 1.0M
CASING DEPTH (m):

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THE SPIRIT OF ENGINEERING

SITE INVESTIGATION RECORD

BORE HOLE No.	02
PAGE No.	03
DIA OF BORE HOLE	150mm / 100mm: 5
BORE START DATE	13/10/2022
BORE END DATE	15/10/2022
TOTAL DRILLING DAYS	3

PROJECT NAME: APPASWAMY - KOVAMBEDU
LOCATION:
STRUCTURE: 2B+S+17F
JOB CODE:
MACHINE No.: CR-06
DRILLING METHOD: Rotary
FLUSHING MEDIUM: Bentonite
CHAINAGE (m):
CO-ORDINATES: N: E:

Depth below E.G.L. (m)	Drilling progress per metre: Date	Time: Hr.	Time: Min	Type of Drill Bit (SC / TCB / DW)	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	14	2	24												
		2	30												
2				SC			10	16	23	39	22.50	17	SS		Greyish Brown Dense Silty Sand with clay binders
3		3	18												
	10	3	21												
4															
5				SC			15	27	98	65	25.00	18	SS		Greyish Brown very Dense Silty fine to medium Sand with clay patches
	50cm	4	14											26.0	
		4	25												
7				SC			6cm/ 52 blow				27.50	19	SS		Greyish very Hard Shale.
8	15						HA NO:100								
	10														
9		9	32												
	2022	5	44												
0				SC			6cm/ 65 blow				30.00	20	SS		Greyish very Hard Shale.

CS - Core Sample	DS - Disturbed Sample	SUPERVISOR NAME	B. Gopinatha
SS - Split Spoon Sample	SC - Soil Cutter	SIGNATURE	
UDS-Undisturbed Sample	TCB - Tungsten Carbide Bit	DATE	15/10/2022
WS - Wash Sample	DB - Diamond Bit	CLIENT IN-CHARGE	

PROJECT SITE DETAILS	
GROUND LEVEL (m)	G.L
WATER TABLE (m)	1.00 bgl
CASING DEPTH (m)	—

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GEOMARINE
THE SPIRIT OF ENGINEERING

SITE INVESTIGATION RECORD

BORE HOLE No.	02
PAGE No.	04
DIA OF BORE HOLE	150mm ✓ / 100mm
BORE START DATE	13/10/2022
BORE END DATE	15/10/2022
TOTAL DRILLING DAYS	3

PROJECT NAME: ADDASWAMY-KOVAMBEDU

LOCATION:

MACHINE No.: CR-06

CHAINAGE (m):

STRUCTURE: 2B+S+17F

DRILLING METHOD: Rotary

CO-ORDINATES: N

JOB CODE:

FLUSHING MEDIUM: Bentonite

E

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		10	32												
		10	65												
2				SC			7 cm/55 b			HR N 7/100	32-33	21	SS		Greyish very Hard Shale
3															
		11	58												
4		12	33												
5				SC			Hammer Rebound			NO/Penetration	35-08	22	WS		Greyish very Hard Shale.
6	Borehole Terminated at 35.0m Depth below ground level.														
7															
8															
9															
10															

CS - Core Sample
SS - Split Spoon Sample
UDS - Undisturbed Sample
WS - Wash Sample

DS - Disturbed Sample
SC - Soil Cutter
TCB - Tungsten Carbide Bit
DB - Diamond Bit

SUPERVISOR NAME: K. Loganathan
SIGNATURE:
DATE: 15/10/2022
CLIENT IN-CHARGE:

PROJECT SITE DETAILS

GROUND LEVEL (m)	
WATER TABLE (m)	1.00 m
CASING DEPTH (m)	

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SITE INVESTIGATION RECORD

BORE HOLE No.	03
PAGE No.	01
DIA OF BORE HOLE	150mm: 4 / 100mm:
BORE START DATE	17/10/2022
BORE END DATE	19/10/2022
TOTAL DRILLING DAYS	3

PROJECT NAME: ADDAIWAMY - Korambedu
LOCATION:
STRUCTURE: 2B+S+17F
JOB CODE:
MACHINE No.: CR-06
DRILLING METHOD: Rotary
FLUSHING MEDIUM: Bentonite
CHAINAGE (m):
CO-ORDINATES: N / E

Depth below G.L. (m)	Drilling progress per metre: Date	Time: Hr.	Time: Min	Type of Core Bit (SC / TCB / DS)	Core Details: Total Core Recovery %	Core Details: R.Q.D %	SPT Details: Blows/cm. 0-15	15-30	30-45	SPT 'N' Value	Sample Details: Depth	No.	Type	Layer Data: Depth (m)	Geotechnical Description
1	17	11	23	SC			17	27	15	42	0.50	1	SS	0.50	Filled up Soil (Sand, Bricks & clay) Greyish Brown Dense silty Sand with Clay and Bricks pieces
		11	24												
		11	36				4	2	3	5	1.25	2	SS		Greyish Brown medium STIFF Clay with Sand and Pebble & Rock pieces.
2		11	40	SC			1	3	7	10	2.00	3	SS		
		12	10												Blackish Grey FIRM Sandy Clay
		12	12												
3				SC			3	5	10	15	3.00	4	SS		Greyish Brown STIFF silty Clay
		12	27												
		12	30												
4	/			SC			45cm / 47 blows				4.00	5	UDS		← UDS sample —
		12	51												
		12	53												
5				SC			5	8	19	27	5.00	6	SS		Greyish very STIFF silty Clay with Sand pockets
	10	2	12												
		2	14												
6				SC			5	7	8	15	6.00	7	SS		Greyish Medium Dense Sandy Silt (Fine grain)
		2	29												
7		2	31												
	/														
				SC			2	3	4	7	7.50	8	SS		Greyish Black Medium STIFF silty Clay
8	2022	2	52												
		2	54												
9				SC			45cm / 21 blows				9.00	9	UDS		— UDS Sample —
		3	25												
10		3	27												
				SC			2	2	3	5	10.50	10	SS		Greyish Medium STIFF Silty Clay

US - Undisturbed Sample	DS - Disturbed Sample	SUPERVISOR NAME	M. Loganathan	PROJECT SITE DETAILS	
SS - Split Spoon Sample	SC - Soil Cutter	SIGNATURE	M. Loganathan	GROUND LEVEL (m)	GL
UDS - Undisturbed Sample	TCB - Tungsten Carbide Bit	DATE	17/10/2022	WATER TABLE (m)	1.00
WS - Wash Sample	DB - Diamond Bit	CLIENT IN-CHARGE		CASING DEPTH (m)	—

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SITE INVESTIGATION RECORD

BORE HOLE No.	03		
PAGE No.	02		
DIA OF BORE HOLE	150mm	4	
	100mm		
BORE START DATE	17/10/2022		
BORE END DATE	19/10/2022		
TOTAL DRILLING DAYS	3		

PROJECT NAME	Appakudal - Koyambedu						
LOCATION		MACHINE No.	CR-06	CHAINAGE (m)			
STRUCTURE	2B+S+MP	DRILLING METHOD	Rotary	CO-ORDINATES	N		
JOB CODE		FLUSHING MEDIUM	Bentonite		E		

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)	Layer Data: Geotechnical Description
1	17	3	54												
		3	55												
2				SC			1	2	3	5	12.00	11	SS		Greenish medium stiff silty clay with sea shell
	10														
3		4	21												
	20/22	4	23												
4				SC			5	9	16	25	14.00	12	SS		Greenish very stiff sandy clay with lime pebbles.
5	18	9	48												
		9	54												
6				SC			10	19	21	40	16.00	13	SS		Greenish Grey Hard compacted clay with Lime and Shale pieces
7	10	10	34												
		10	40												
8				SC			11	15	29	44	18.00	14	SS		Greenish Grey Hard Compacted clay with Lime and Shale pieces
9	23	12	35												
		11	40												
10				SC			12	16	18	34	20.00	15	SS		Greenish Brown Dense Silty fine Sand with Clay pockets

CS - Core Sample	DS - Disturbed Sample	SUPERVISOR NAME	K. Gopinath	PROJECT SITE DETAILS	
SS - Split Spoon Sample	SC - Soil Cutter	SIGNATURE		GROUND LEVEL (m)	GL
UDS - Undisturbed Sample	TCB - Tungsten Carbide Bit	DATE	18/10/2022	WATER TABLE (m)	-0.80m
WS - Wash Sample	DB - Diamond Bit	CLIENT IN-CHARGE		CASING DEPTH (m)	—

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SITE INVESTIGATION RECORD

BORE HOLE No.	03		
PAGE No.	03		
DIA OF BORE HOLE	150mm	4	
	100mm		
BORE START DATE	17/10/2022		
BORE END DATE	19/10/2022		
TOTAL DRILLING DAYS	3		

PROJECT NAME: ADDAKULAMY - KOVANDADU
LOCATION:
STRUCTURE: 2B+S+17F
JOB CODE:
MACHINE No.: CR-04
DRILLING METHOD: Rotary
FLUSHING MEDIUM: Bentonite
CHAINAGE (m):
CO-ORDINATES: N, E

Depth below E.G.L. (m)	Drilling progress per metre: Drop	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 'N' Value	Sample Details: Depth	No.	Type	Layer Data: Depth (m)	Geotechnical Description
1	18	12	35												
		12	38												
2				SC			12	23	29	52	22.50	16	SS		Greyish Brown Dense Silty Sand with clay binders
3		2	10												
		2	17												
4	10														
5				SC			16	26	39	65	25.00	17	SS		Greyish Brown very Dense Silty fine sand with clay pockets
6	22													26.50	
		3	18												
		3	30												
7				SC			7 cm/65 blows				27.50	18	SS		Greyish very Hard Shale.
8	19						HR N>100								
	1	9	40												
9		9	50												
	10														
10	22			SC			6 cm/67 blows				30.00	19	SS		Greyish very Hard Shale.
							HR N>100								

CS - Core Sample	DS - Disturbed Sample	SUPERVISOR NAME	M. Loganathan
SS - Split Spoon Sample	SC - Soil Cutter	SIGNATURE	
UDS - Undisturbed Sample	TCB - Tungsten Carbide Bit	DATE	19/10/2022
WS - Wash Sample	DB - Diamond Bit	CLIENT IN-CHARGE	

PROJECT SITE DETAILS	
GROUND LEVEL (m)	GL
WATER TABLE (m)	1.00 m
CASING DEPTH (m)	

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SITE INVESTIGATION RECORD

BORE HOLE No.	03
PAGE No.	04
DIA OF BORE HOLE	150mm: 4 / 100mm:
BORE START DATE	19/10/2022
BORE END DATE	19/10/2022
TOTAL DRILLING DAYS	3

PROJECT NAME	APPASWAMY - KOVAMBEDU						
LOCATION		MACHINE No.	CR-06	CHAINAGE (m)		CO-ORDINATES	N:
STRUCTURE	28+57+17F	DRILLING METHOD	Rotary				E:
JOB CODE		FLUSHING MEDIUM	Bentonite				

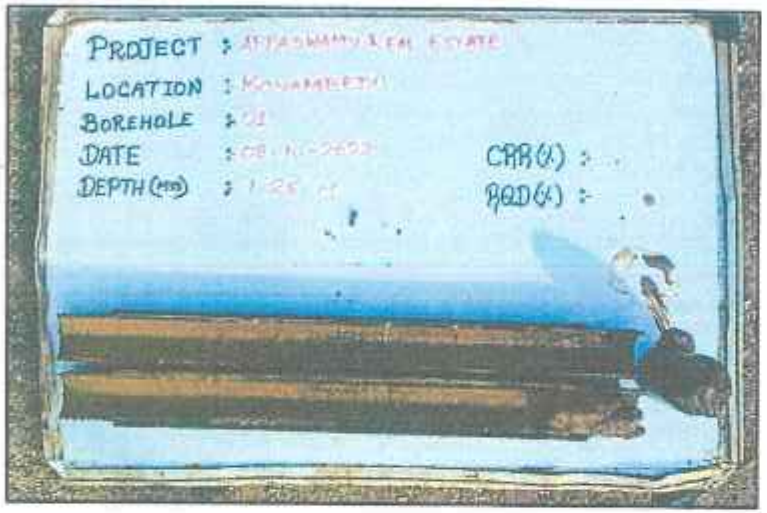
Depth below E.G.L (m)	Drilling progress per metre: Date	Time: Hr.	Time: Min	Type of Drill Bit (SC / TCB / DB)	Core Details: Total Core Recovery %	Core Details: R.Q.D %	SPT Details: Blows/cm. 0-15	SPT Details: Blows/cm. 15-30	SPT Details: Blows/cm. 30-45	SPT 'N' Value	Sample Details: Depth	Sample Details: No.	Sample Details: Type	Layer Data: Depth (m)	Geotechnical Description
1	19	10	40												
2		10	55												
3	/			SC			4cm / 52 b				2.50	20	WS		Greyish very Hard Shale
	20						HR N>100								
4		11	45												
5	/	12	07												
	2022			SC			Hammer Rebo				5.00	21	WS		Greyish very Hard Shale
							ND/Point N>10								
6	Borehole Terminated at 3.45mm Depth below in GL.														
7															
8															
9															
10															

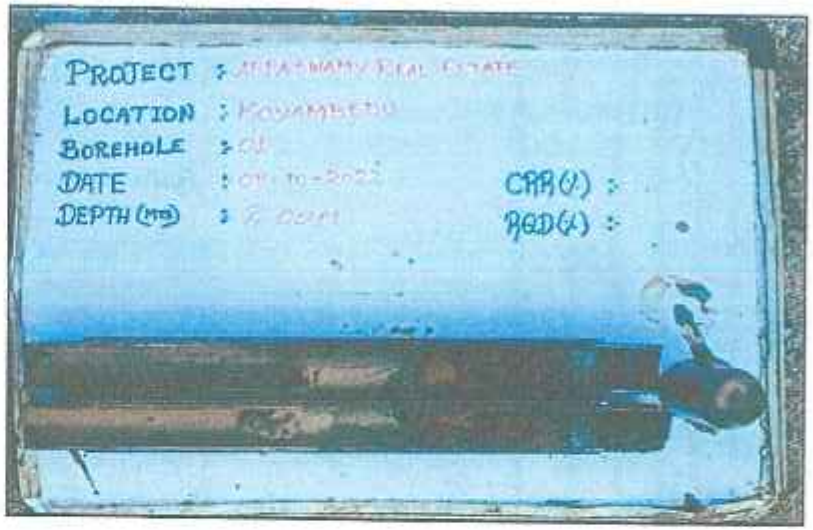
				PROJECT SITE DETAILS	
CS - Core Sample	DS - Disturbed Sample	SUPERVISOR NAME	M. Loganathan	GROUND LEVEL (m)	GL
SS - Split Spoon Sample	SC - Soil Cutter	SIGNATURE		WATER TABLE (m)	1.00 m
UDS - Undisturbed Sample	TCB - Tungsten Carbide Bit	DATE	19/10/2022	CASING DEPTH (m)	—
WS - Wash Sample	DB - Diamond Bit	CLIENT IN-CHARGE			

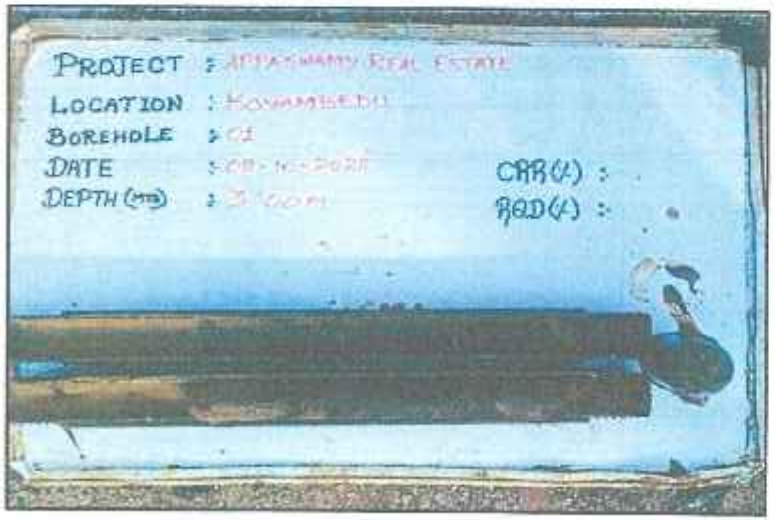
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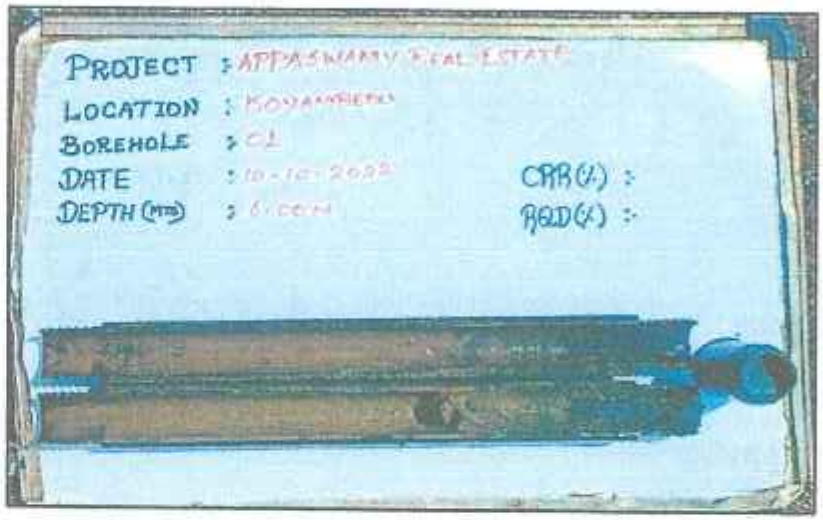


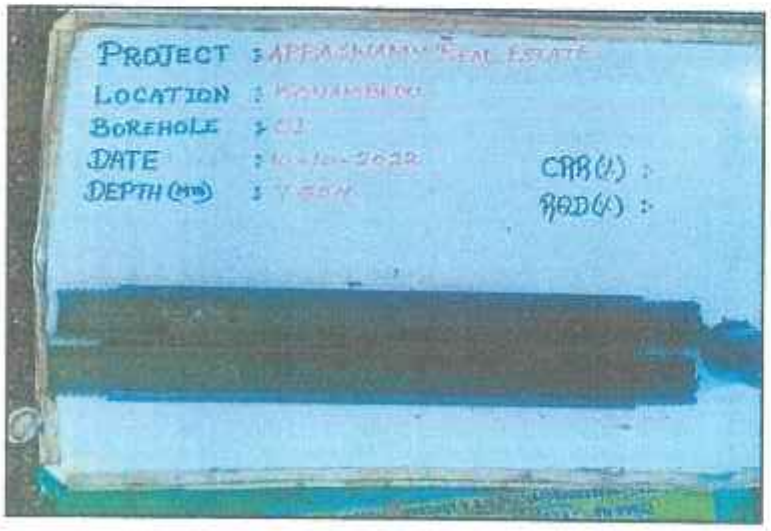


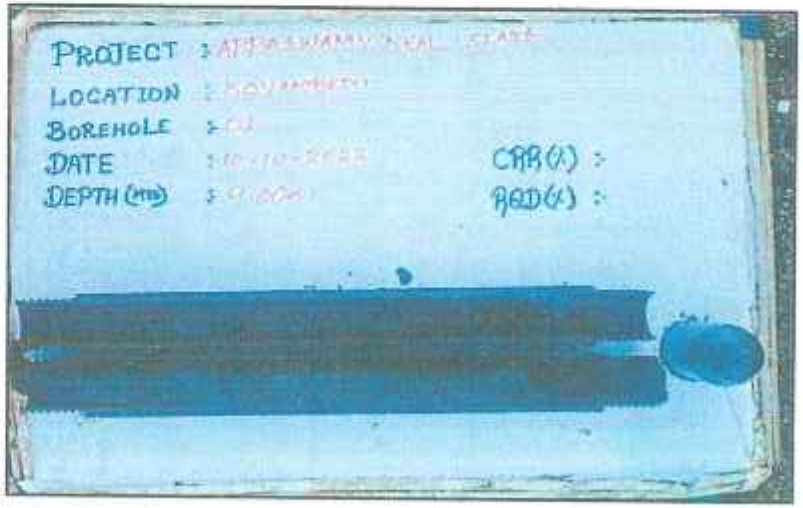


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PROJECT : APPASWAMY REAL ESTATE
LOCATION : KOVAMBEDU
BOREHOLE : C1
DATE : 08-10-2022
DEPTH (mts) : 5.00M
CRR (%) :
RQD (%) :

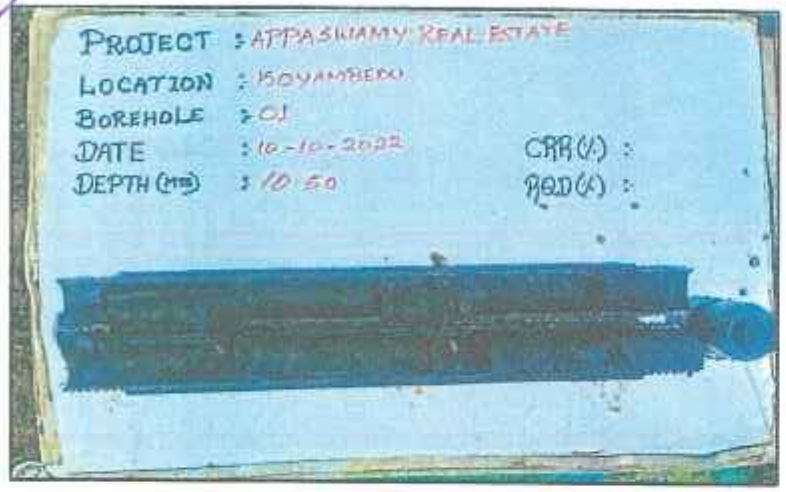

PROJECT : APPASWAMY REAL ESTATE
LOCATION : KOVAMBEDU
BOREHOLE : C1
DATE : 10-10-2022
DEPTH (mts) : 6.00M
CRR (%) :
RQD (%) :

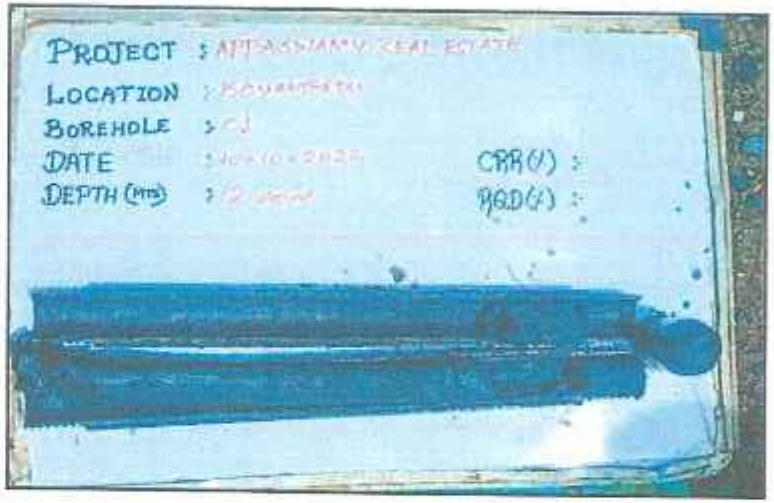

PROJECT : APPASWAMY REAL ESTATE
LOCATION : KOVAMBEDU
BOREHOLE : C2
DATE : 10-10-2022
DEPTH (mts) : 7.00M
CRR (%) :
RQD (%) :

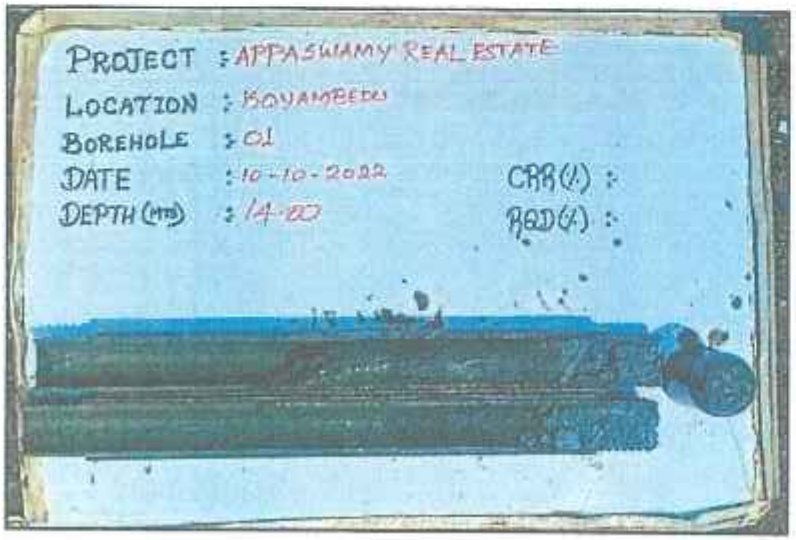

PROJECT : APPASWAMY REAL ESTATE
LOCATION : KOVAMBEDU
BOREHOLE : C3
DATE : 10-10-2022
DEPTH (mts) : 6.00M
CRR (%) :
RQD (%) :

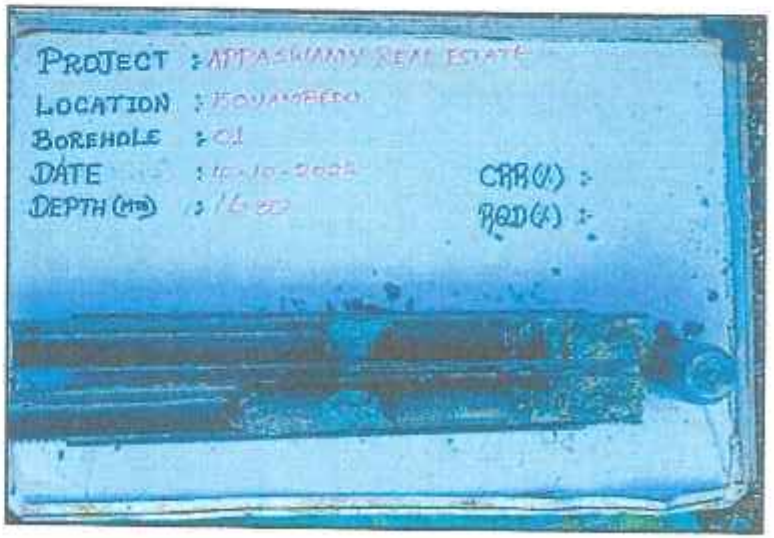
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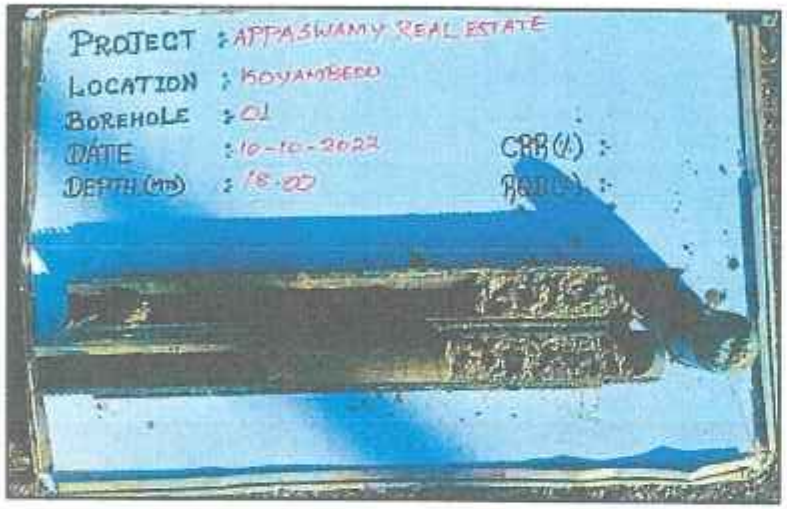


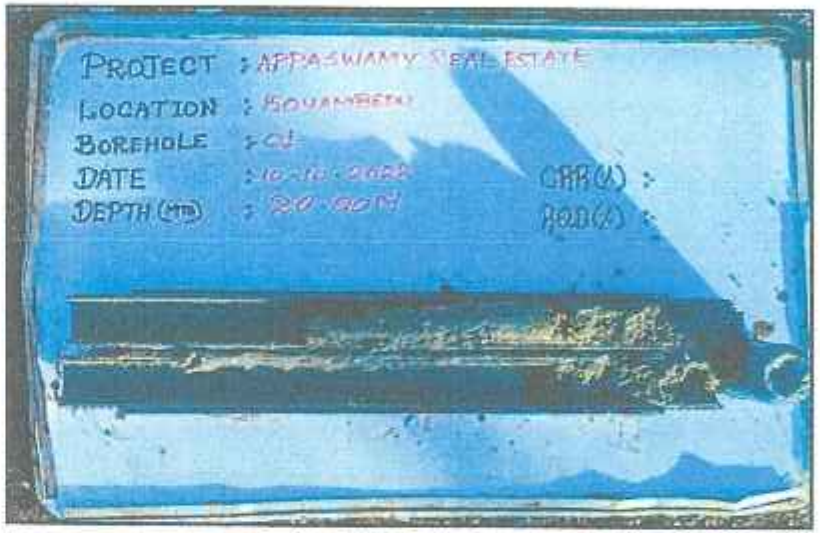


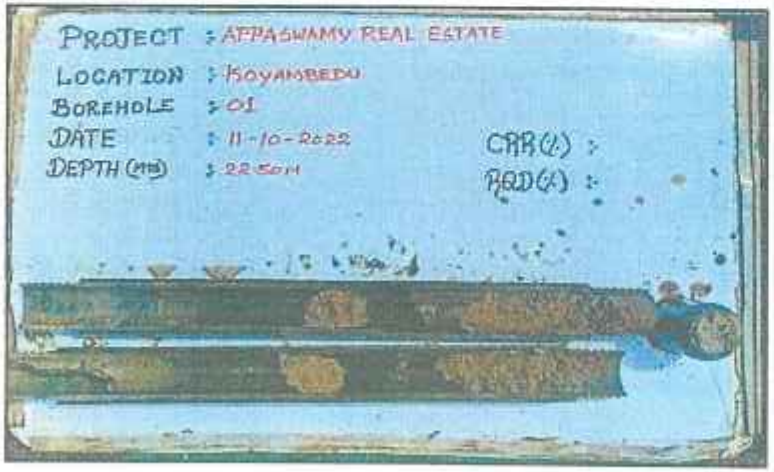


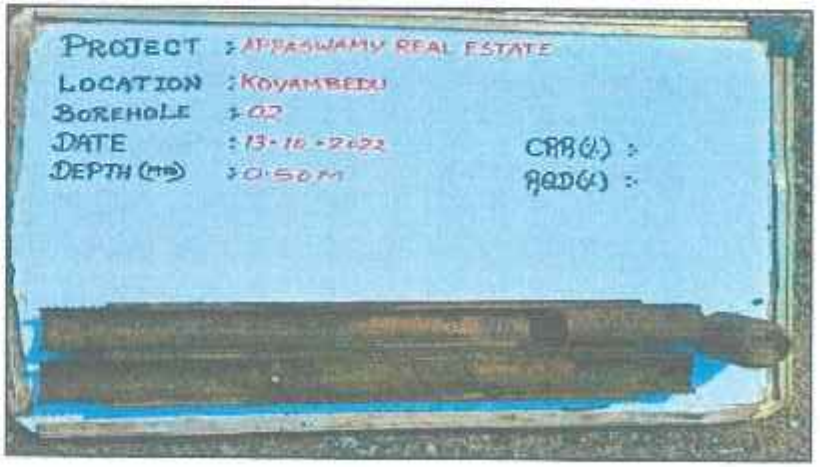
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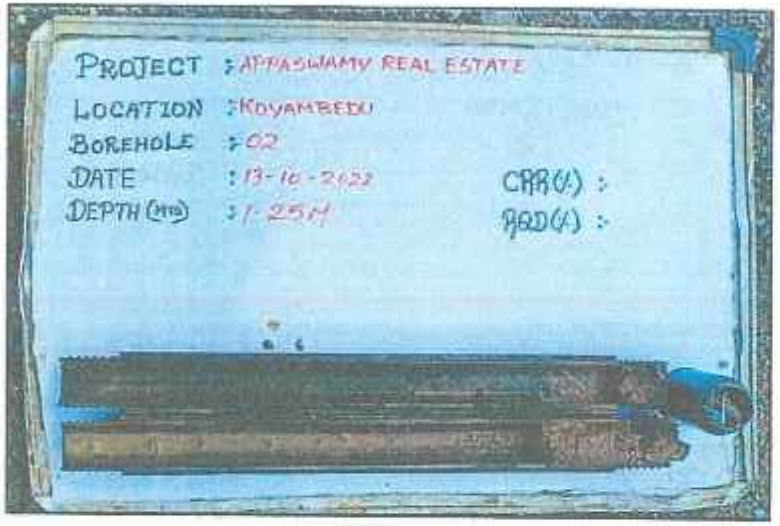


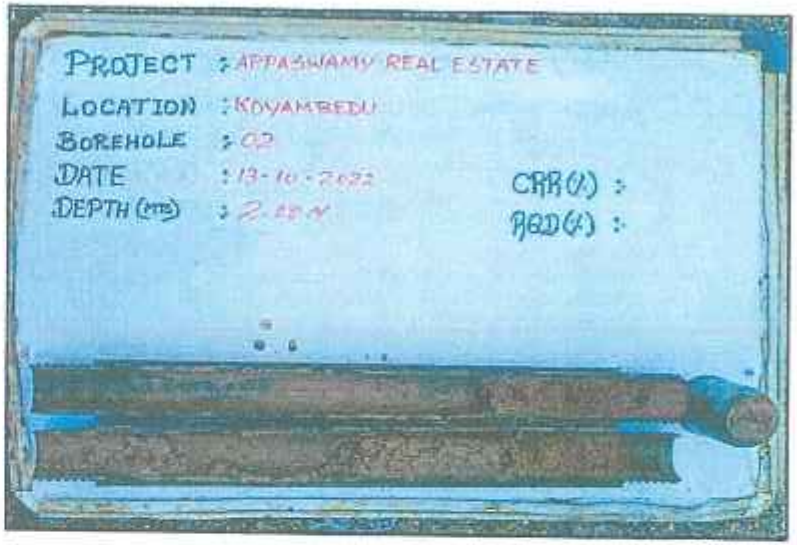


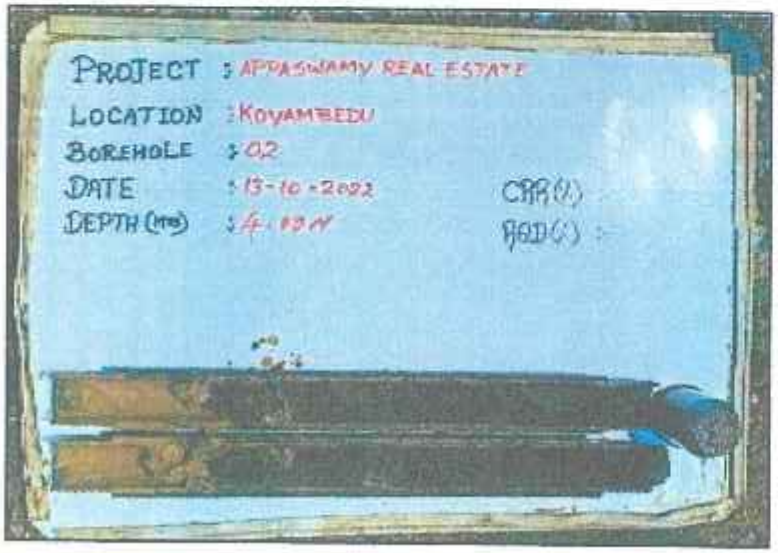


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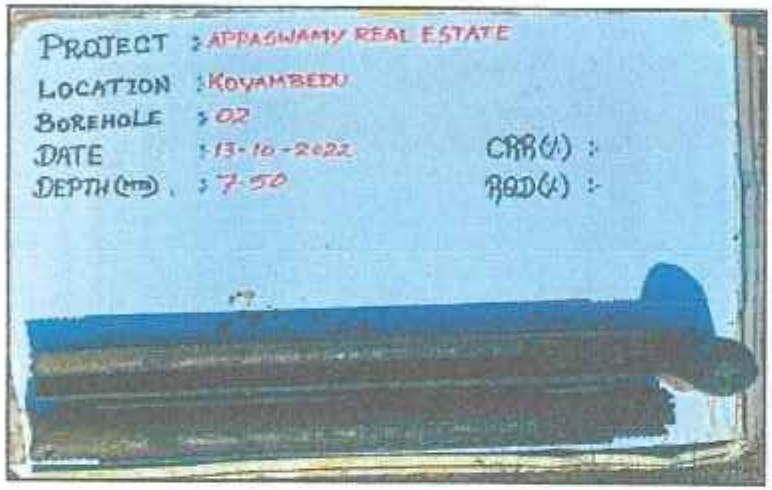


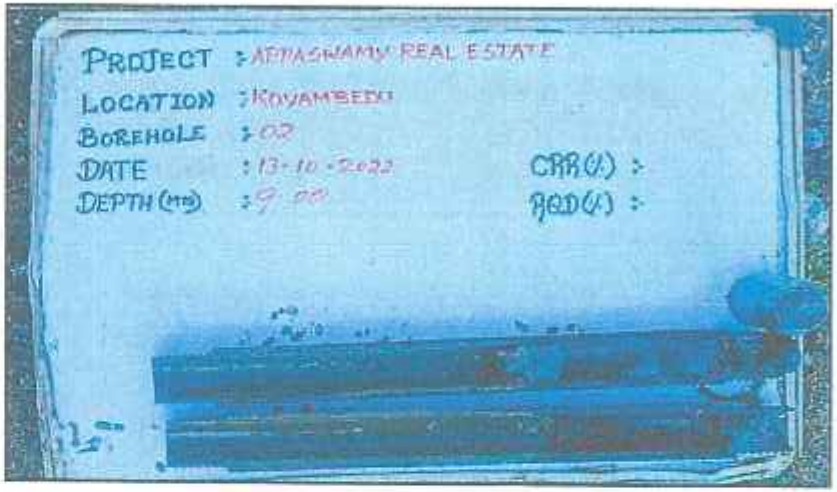


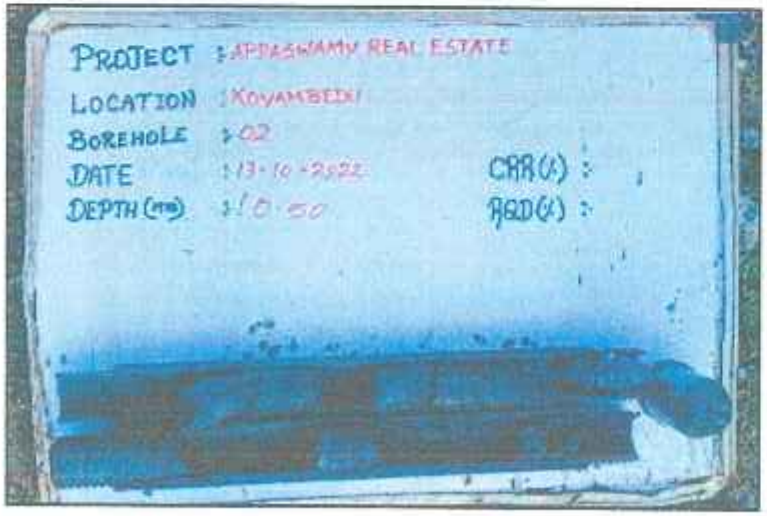


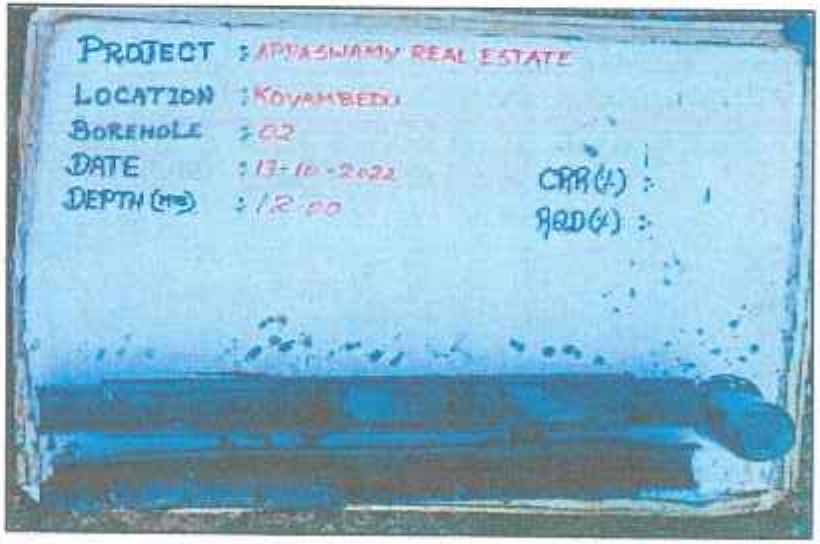
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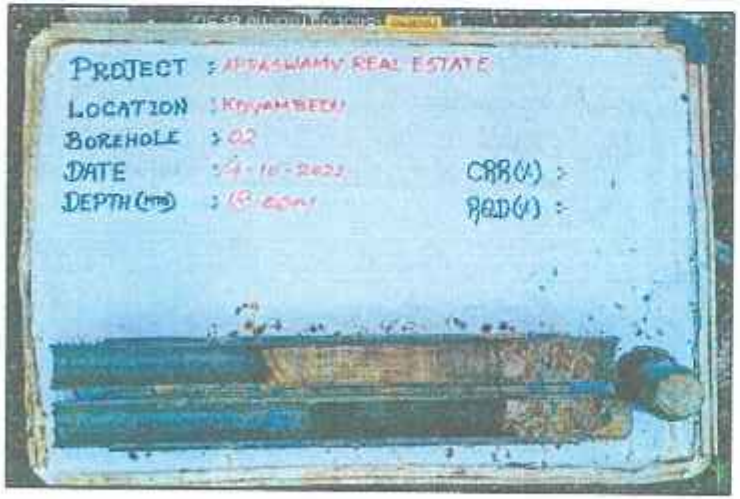


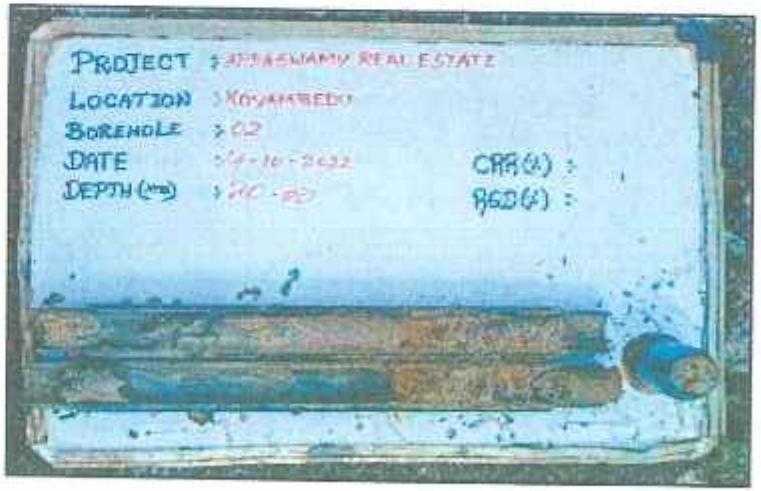
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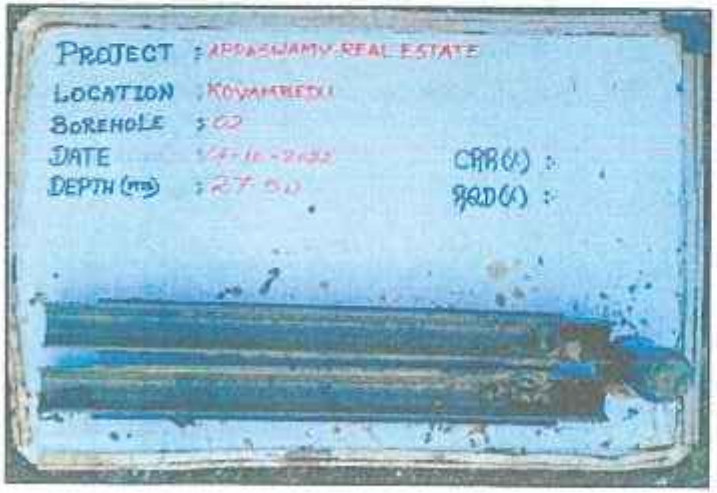


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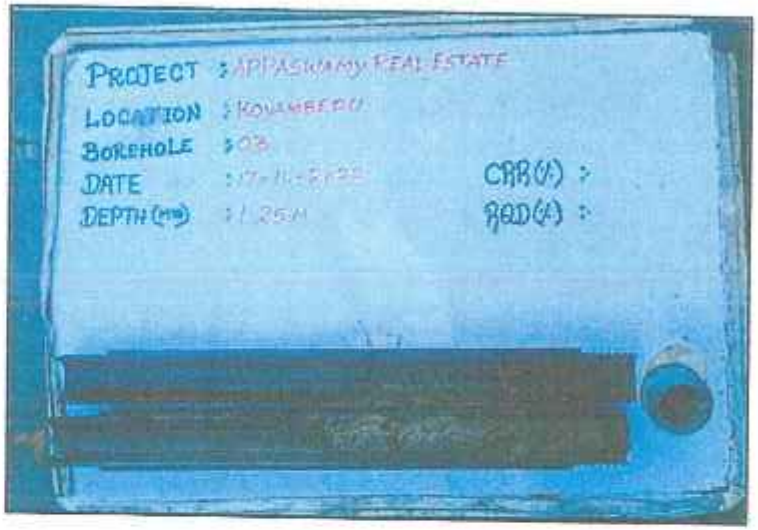


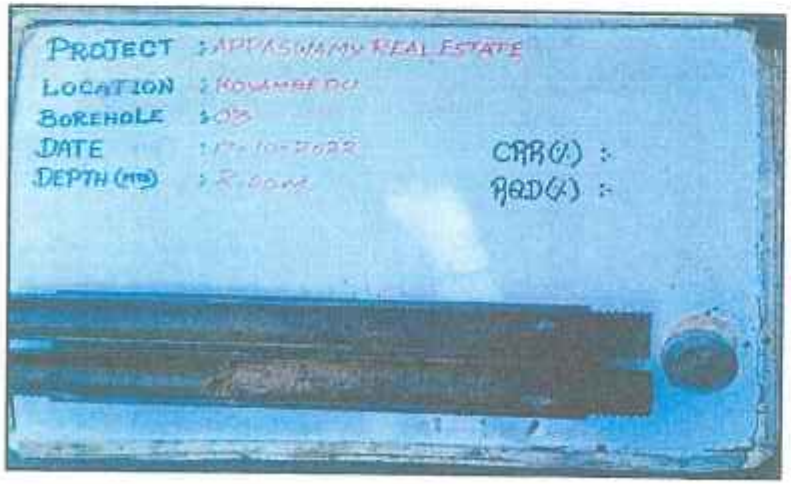


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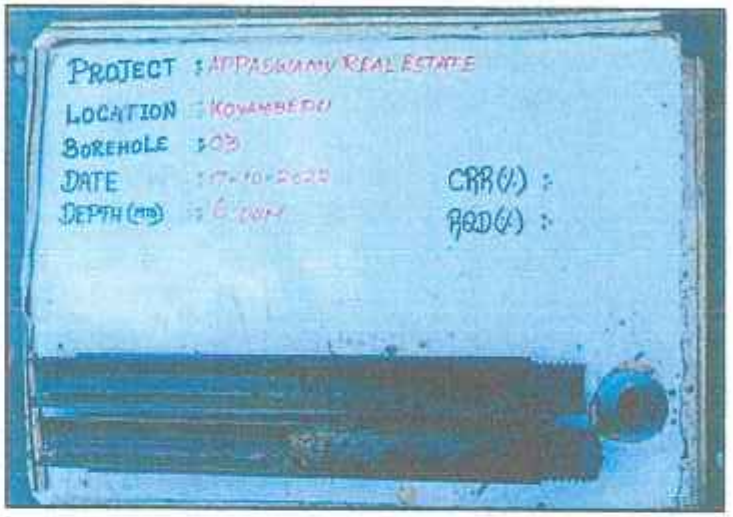




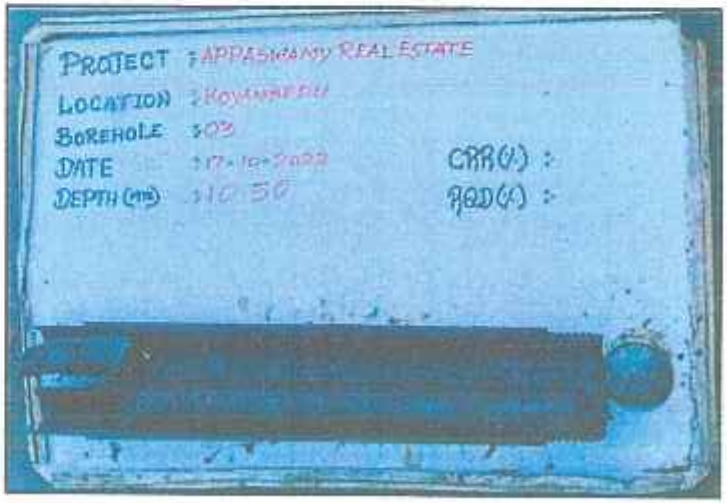
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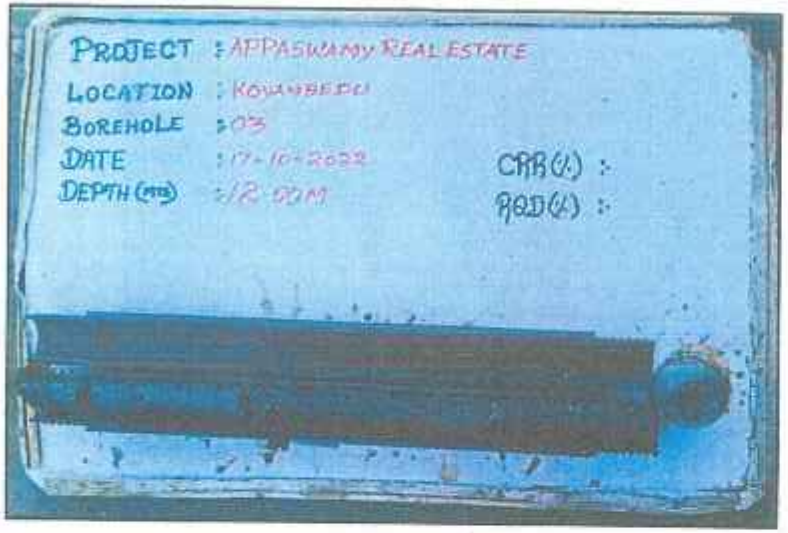


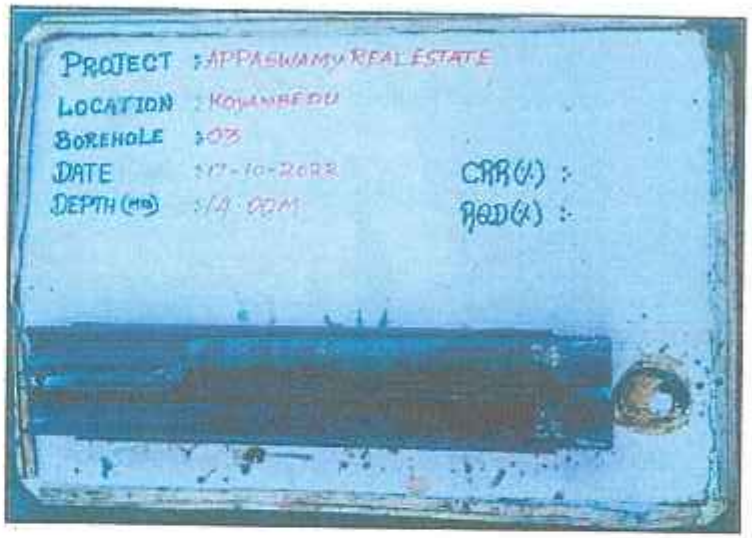


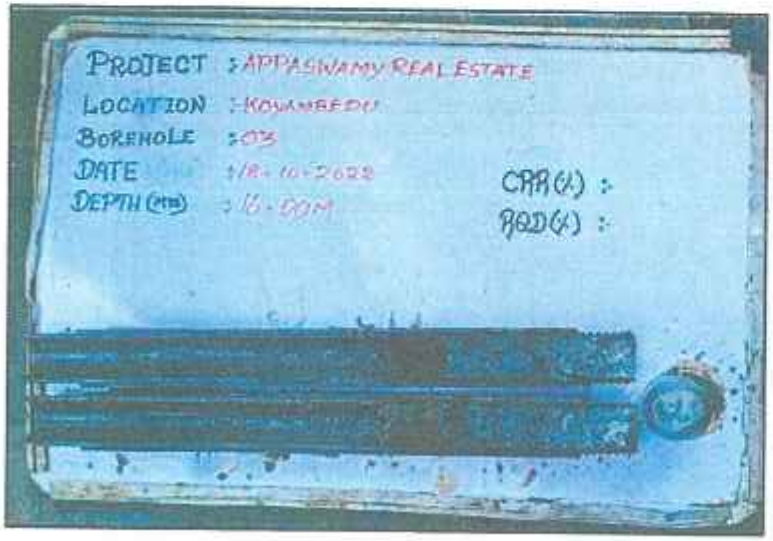


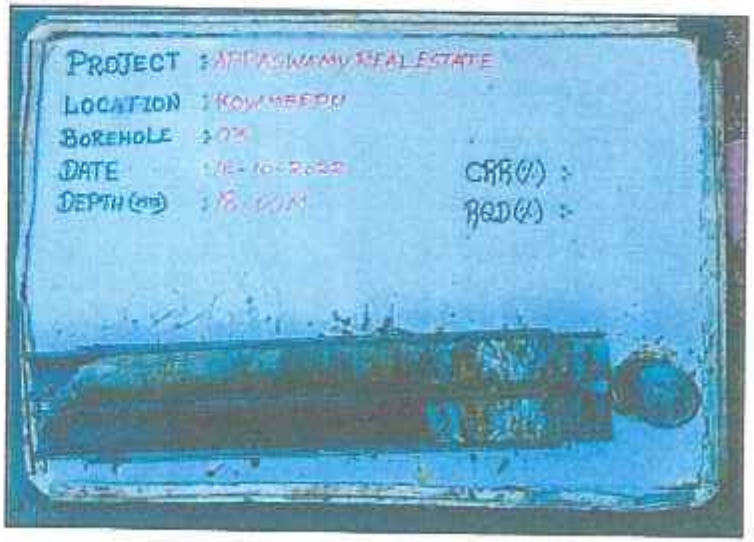
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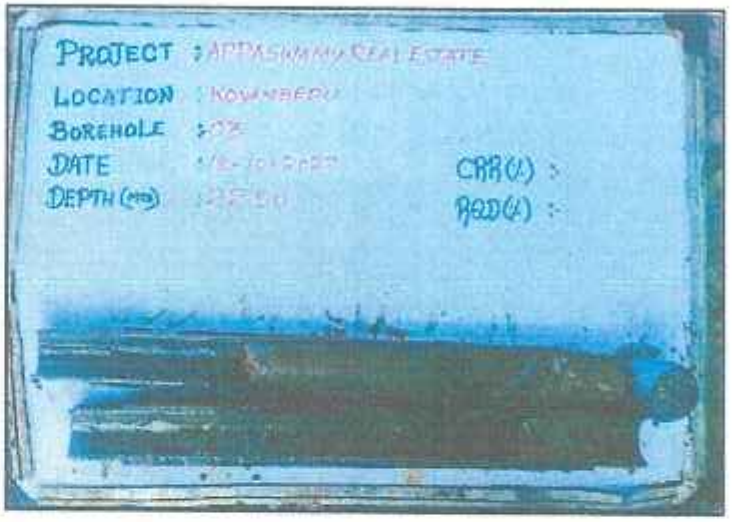


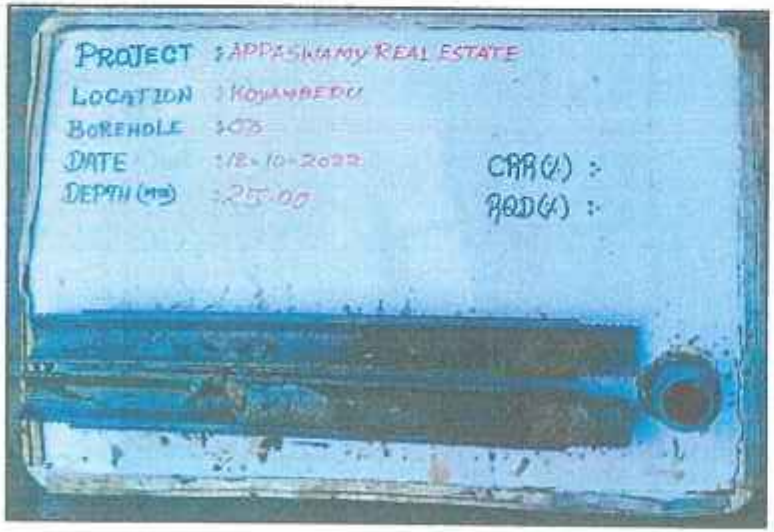


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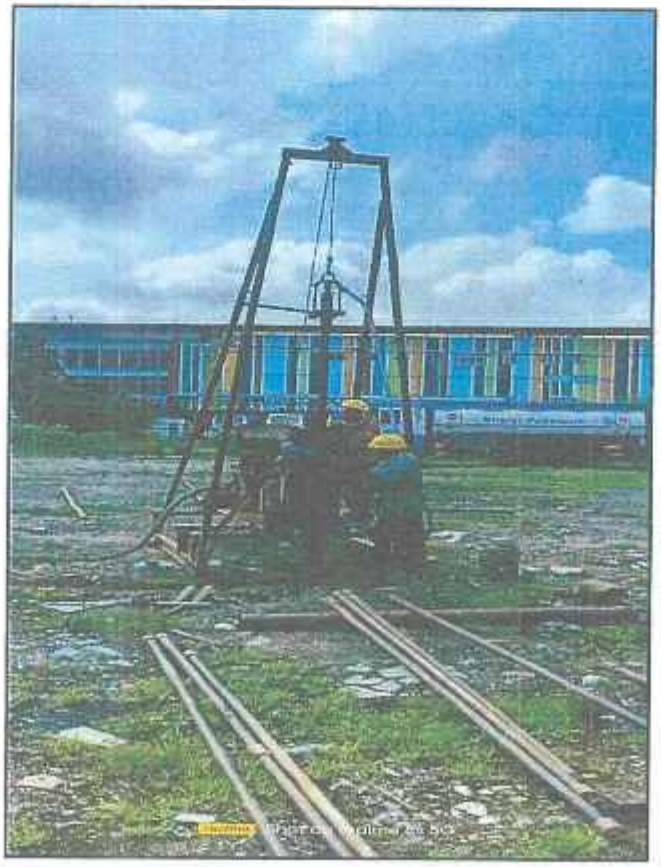






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our services doesn't just end there

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

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