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PROJECT

GEOTECHNICAL INVESTIGATION FOR THE PROPOSED CONSTRUCTION OF RESIDENTIAL DEVELOPMENT CONSISTING OF STILT PLUS ELEVEN UPPER FLOORS AT S NO. 310/2A3A, 2B1, 310/3B, 311/1A, 311/1B1 & 311/1B2, GANDHI NAGAR MAIN ROAD, PERUMBAKKAM VILLAGE, TAMBARAM TALUK, CHENGALPATTU DISTRICT

CLIENT

M/s URBANDO HOUSING LLP,
T-1, 3RD FLOOR, CHONA CENTRE,
45, NUNGAMBAKKAM, COLLEGE ROAD,
CHENNAI- 600 006

TITLE

GEOTECHNICAL INVESTIGATION REPORT

REPORT NO.: GT- 2737

DATE	REVISON	DESCRIPTION		AUTHORISED SIGNATORY
27/02/2024	0.0	SUBMISSION OF GEOTECHNICAL REPORT	SIGN	
			Date	27/02/2024
			DESIGNATION	MANAGING DIRECTOR
			NAME	DR. C.V.PRASAD

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REPORT TEXT

CHAPTER-1

INTRODUCTION

1.0 PROJECT INFORMATION MATRIX:

Nature of Project	: **RESIDENTIAL BUILDING**
Structure	: **STILT + 11 UPPER FLOORS**
Project Owner	: **M/s URBANDO HOUSING LLP**
Project Location	: **PERUMBAKKAM, CHENNAI**
Job Code	: **GT-2737**

1.1 SCOPE OF WORK:

1.1.1 FIELD WORK

- Conducting five 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 15.0m, SPT is conducted at every 1.5m depth interval
  - Further in the case of rock formation is encountered, NX size core drilling will be carried out and the recovery shall be checked at an interval of 1.5m or 1.0m intervals
- The depth of investigation is 15.0m or 16.5m below the existing ground level.
- Collection of disturbed soil samples at SPT location and undisturbed samples from the clayey strata with SPT-value greater than 2 to less than 15 if met within the investigation depth
- Collection of water samples if groundwater table met within the investigation depth

1.1.2 LABORATORY WORK:

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

1.2 STRUCTURE OF THE REPORT:

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

CHAPTER-2

INVESTIGATION METHODOLOGY & TEST RESULTS

2.0 PREAMBLE:

Five 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 2.5. The graphical representation of grainsize distribution curve for the representative samples in each bore is presented in Fig. 2.8 to 2.12.

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 2.5. The graphical representation of hydrometer analyses curve for the representative samples in each bore is presented in Fig. 2.13 to 2.19.

2.2.3 CHEMICAL ANALYSIS TESTS:

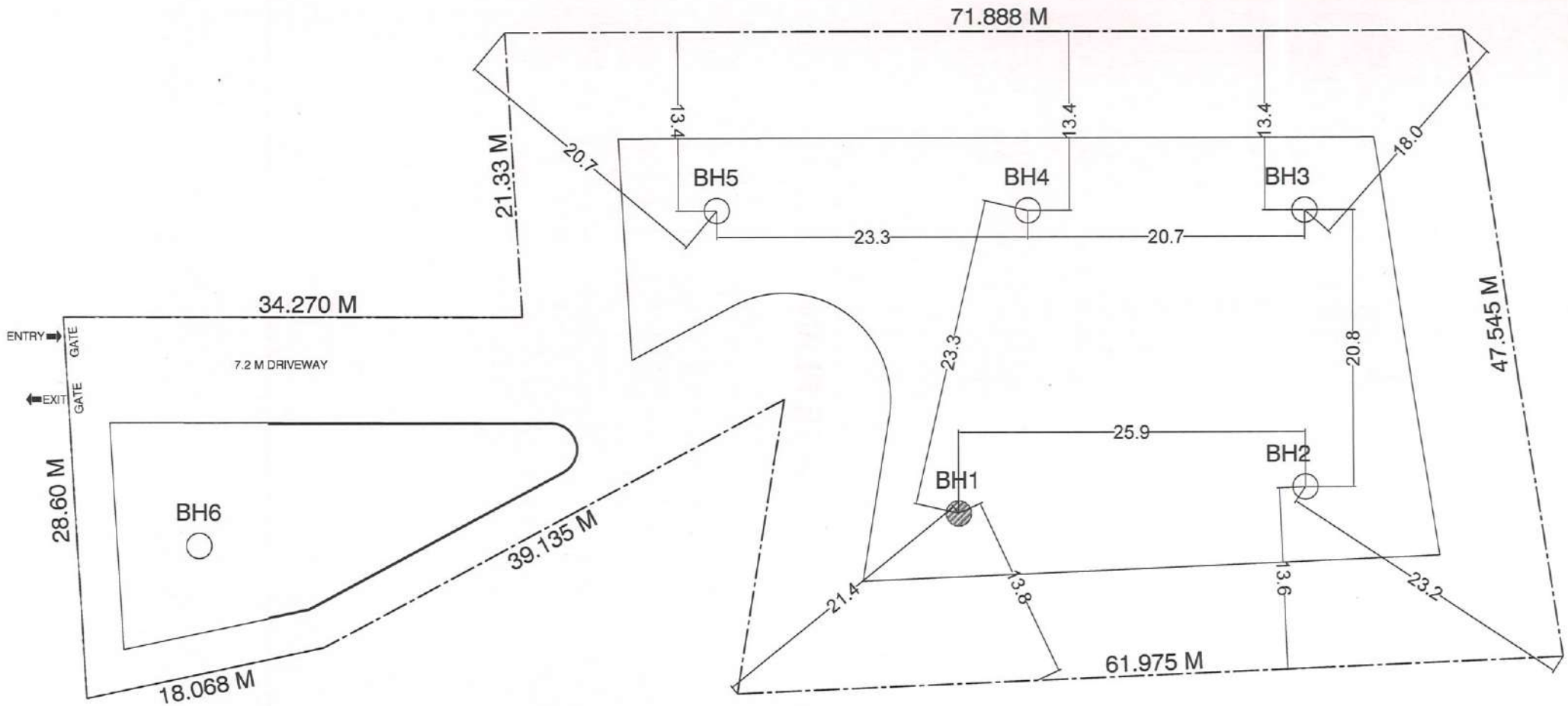
On representative soil and water samples chemical analysis tests were conducted to estimate pH, Chloride and Sulphates and these results are presented in Table - 2.7 to 2.9.

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 2.5.

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.2.6 & 2.7.

SITE PLAN



URBANDO

PROPOSED RESIDENTIAL DEVELOPMENT AT PERUMBAKKAM.

TYPICAL FLOOR PLAN

REVISED ON 02.11.2023

North
W
E
S

KAVIYA KUMAR
ARCHITECT

DATE :25.09.2023

SOIL PROFILES

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SITE INVESTIGATION RECORD

BORE HOLE No.	BH-01						
SHEET	1	OF	2				
PROJECT NAME	PROPOSED CONSTRUCTION OF A RESIDENTIAL BUILDING			DIA OF BORE HOLE	150mm ✓		
					NX ✓		
LOCATION	Perumbakkam, Chennai	MACHINE No.	CR-02	Free Fall Energy (%)	60	BORE START DATE	10/02/2024
STRUCTURE	Stilt + 11 Upper Floors	DRILLING METHOD	Rotary	CO-ORDINATES	N -	BORE END DATE	12/02/2024
JOB CODE	GT-2737	FLUSHING MEDIUM	Bentonite		E -	TOTAL DRILL DAYS	2

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	Blows/cm. 15-30	Blows/cm. 30-45	SPT Value: N80	SPT Value: N	Sample Details: Depth	No.	Type	RL (m)	Layer Data: Legend	No	Depth	Geotechnical Description
		09	27																
		To		SC	-	-													
		09	27				0	1	2	-	3	0.50	1	SS	-0.5				Grey Brown,Fine & Medium Sand Grains, **Clayey Sand With Brick Pieces & Constrcutional Debris Filled Up Soil**
		09	39									0.95							
1		To		SC	-	-													
		09	40				-	-	-	-	-	1.25	2	UDS	-1.25		L1	1.3	
		09	58																
		To		SC	-	-													
		10	00																
2							2	3	4	-	7	2.00	3	SS	-2.0				Grey,Moist,Fine & Medium Sand Grains Mixture With Gravel Traces,Medium Stiff,**Sandy Silty CLAY (CH)** Sandy Clay of High Plasticity
		10	14									2.45							
		To		SC	-	-													
		10	15																
3							10	12	17	-	29	3.00	4	SS	-3.0		L2	3.0	
		10	31									3.45							Brown,Grey Brown,Moist,Fine & Medium Sand Grains With Gravel Fractions,Medium Dense, **Disintegrated Rock-Grade W5 Rock/ Residual Soil (Clayey Sand)** Disintegrated Hypersthene Granitic Rock
		To		SC	-	-													
		10	33						10Cm Pene: for 40Blows										
4							12	23		-	>100	4.00	5	SS	-4.0		L3	4.0	
		10	48									4.40							
		To		SC	-	-													
		10	50						3Cm Penet for 30Blows										
5	10/02/2024						40	34		-	>100	5.00	6	SS	-5.0				Grey Brown,Brown,Fine to Coarse Sand Size Particles With Gravels Fraction,Very Dense,**Completely Weathered Rock-Grade W5 Rock Formation** Disintegrated Hypersthene Granitic Rock
		11	07									5.33							
		To		SC	-	-													
		11	09																
6							SPT-Hammer Rebounded			-	>100	6.00	-	WS	-6.0				
		11	24														L4	6.6	
		To		DB	10	0													
		12	32																Grey,Brown Grey,Medium to Coarse Grained Structure,Highly Fractured & Weathered,Discoloured,**Completely Weathered Rock-Grade W5 Rock Formation** Fractured Hypersthene Granitic Rock
7							-	-	-	-	-	7.50	7	CS	-7.5		L5	7.6	
		13	12																
8		To		DB	21	0													
		14	35																
9							-	-	-	-	-	9.00	8	CS	-9.0				Grey,Brown Grey,Medium to Coarse Grained Structure,Highly Fractured & Discolured,**Highly Weathered Rock-Grade W4 Rock Formation** Fractured Hypersthene Grantic Rock
		14	52																
		To		DB	21	0													
10		15	27																

CS - Core Sample	DS - Disturbed Sample	LOGGED	Susil	PROJECT SITE DETAILS	REMARKS
SS - Split Spoon Sample	SC - Soil Cutter	DATE	10/02/2024	GROUND LEVEL (m) 0.00	
UDS- Undisturbed Sample	TCB - Tungsten Carbide Bit	CHECKED	S. Dhanapal	WATER TABLE (m) 2.90	
WS - Wash Sample	DB - Diamond Bit	DATE	17/02/2024	CASING DEPTH (m) 0.00	

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SITE INVESTIGATION RECORD

BORE HOLE No.	BH-01						
SHEET	2	OF	2				
PROJECT NAME	PROPOSED CONSTRUCTION OF A RESIDENTIAL BUILDING					DIA OF BORE HOLE	150mm / NX ✓
LOCATION	Perumbakkam, Chennai	MACHINE No.	CR-02	Free Fall Energy (%)	60	BORE START DATE	10/02/2024
STRUCTURE	Stilt + 11 Upper Floors	DRILLING METHOD	Rotary	CO-ORDINATES	N -	BORE END DATE	12/02/2024
JOB CODE	GT-2737	FLUSHING MEDIUM	Bentonite		E -	TOTAL DRILL DAYS	2

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 Value: N80	SPT Value: N	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	10/02/2024	15	45	DB	23	0	-	-	-	-	-	10.50	9	CS	-10.5	+ + +			Grey,Brown Grey,Medium to Coarse Grained Structure,Highly Fractured & Discolured,**Highly Weathered Rock-Grade W4 Rock Formation** Fractured Hypersthene Grantic Rock
		To																	
		16	17																
12							-	-	-	-	-	12.00	10	CS	-12.0	+ + +	L6	12.0	
13	12/02/2024	09	18	DB	33	0										+ + +			Grey,Brown Grey,Medium to Coarse Grained Strcture,Highly Fractured & Discoloured @ Locations,**Moderately Weathered Rock-Grade W3 Rock Formation** Fractured Hypersthene Granitic Rock
		To																	
		11	02																
14							-	-	-	-	-	13.50	11	CS	-13.5				
		11	32																
		To		DB	42	8													
		12	48																
15							-	-	-	-	-	15.00	12	CS	-15.0	+ + +	L7	15.0	
16																			
17																			
18																			
19																			
20																			

CS - Core Sample	DS - Disturbed Sample	LOGGED	Susil	PROJECT SITE DETAILS		REMARKS
SS - Split Spoon Sample	SC - Soil Cutter	DATE	12/02/2024	GROUND LEVEL (m)	0.00	
UDS- Undisturbed Sample	TCB - Tungsten Carbide Bit	CHECKED	S. Dhanapal	WATER TABLE (m)	2.90	
WS - Wash Sample	DB - Diamond Bit	DATE	17/02/2024	CASING DEPTH (m)	0.00	

Borehole terminated at 15 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	2
DIA OF BORE HOLE	150mm ✓		
	NX ✓		

PROJECT NAME	PROPOSED CONSTRUCTION OF A RESIDENTIAL BUILDING					BORE START DATE	14/02/2024
LOCATION	Perumbakkam, Chennai	MACHINE No.	CR-08	Free Fall Energy (%)	60		
STRUCTURE	Stilt + 11 Upper Floors	DRILLING METHOD	Rotary	CO-ORDINATES	N -	BORE END DATE	15/02/2024
JOB CODE	GT-2737	FLUSHING MEDIUM	Bentonite		E -	TOTAL DRILL DAYS	2

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	Blows/cm. 15-30	Blows/cm. 30-45	SPT Value: N80	SPT Value: N	Sample Details: Depth	No.	Type	RL (m)	Layer Data: Legend	No	Depth	Geotechnical Description
0	14/02/2024	11	02	SC	-	-				-									
		To																	
		11	02				1	1	2	-	3	0.50	1	SS	-0.5				Grey, **Clayey Sand With Brick Pieces & Constructional Debris Filled Up Soil**
		11	21									0.95							
1		To		SC	-	-											L1	1.3	
		11	22				-	-	-	-	-	1.25	2	UDS	-1.25				
		12	01																
		To		SC	-	-													
2		12	02				4	6	9	-	15	2.00	3	SS	-2.0				Grey, Moist, Fine & Medium Sand Grains Mixture, Stiff, **Sandy Silty CLAY (CH)** Sandy Clay of High Plasticity
		12	17									2.45							
		To		SC	-	-													
		12	20																
3							24	11Cm Penet for 40Blows		-	>100	3.00	4	SS	-3.0				
		12	40									3.26							
		To		SC	-	-													
		12	43																Grey Brown, Yellow Shades, Moist, Fine & Medium Sand Grains With Gravels Sizes Weathered Particles, Very Dense, **Disintegrated Rock-Grade W5 Rock Formation/ Residual Soil** Disintegrated Hypersthene Granitic Rock
4							9Cm Penet for50Blows			-	>100	4.00	5	SS	-4.0				
		13	09									4.09							
		To		SC	-	-													
		14	00																
5							SPT Hammer Rebounded			-	>100	5.00	-	WS	-5.0		L3	5.0	
		14	22																
		To		DB	0	0													
		15	18																
6							-	-	-	-	-	6.00	-	WS	-6.0				
		15	34																
		To		DB	0	0													No Core Recovered Based on Wash Sample Observation **Completely Weathered Rock - Grade W5 Rock Formation** Fractured & Weathered Hypersthene Granitic Rock
7		16	39																
							-	-	-	-	-	7.50	-	WS	-7.5				
8		16	53																
		To		DB	0	0													
		17	50																
9							-	-	-	-	-	9.00	-	WS	-9.0		L4	9.0	
		09	38																Brown, Grey Brown, Medium to Coarse Grains Structure, Highly Fractured & Weathered, Highly Discoloured, **Highly Weathered Rock-Grade W4 Rock Formation** Fractured Hypersthene Granitic Rock
		To		DB	9	0													
10		10	19																

CS - Core Sample	DS - Disturbed Sample	LOGGED	Susil	PROJECT SITE DETAILS	REMARKS
SS - Split Spoon Sample	SC - Soil Cutter	DATE	14/02/2024	GROUND LEVEL (m) 0.00	
UDS- Undisturbed Sample	TCB - Tungsten Carbide Bit	CHECKED	S. Dhanapal	WATER TABLE (m) 1.80	
WS - Wash Sample	DB - Diamond Bit	DATE	17/02/2024	CASING DEPTH (m) 0.00	

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SITE INVESTIGATION RECORD

BORE HOLE No.	BH-02		
SHEET	2	OF	2
DIA OF BORE HOLE	150mm		
	NX		✓

PROJECT NAME	PROPOSED CONSTRUCTION OF A RESIDENTIAL BUILDING							BORE START DATE	14/02/2024
LOCATION	Perumbakkam, Chennai	MACHINE No.	CR-08	Free Fall Energy (%)	60			BORE END DATE	15/02/2024
STRUCTURE	Stilt + 11 Upper Floors	DRILLING METHOD	Rotary	CO-ORDINATES	N	-		TOTAL DRILL DAYS	2
JOB CODE	GT-2737	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 Value: N80	SPT Value: N	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	15/02/2024	10	45	DB	0	0	-	-	-	-	-	10.50	6	CS	-10.5	+ + +			
		To														+ + +			
		11	20													+ + +			
12							-	-	-	-	-	12.00	-	WS	-12.0	+ + +			Brown,Grey Brown,Medium to Coarse Grains Structure,Highly Fractured & Weathered, Highly Discoloured,**Highly Weathered Rock-Grade W4 Rock Formation**
		11	34													+ + +			
13		To		DB	5	0										+ + +			Fractured Hypersthene Granitic Rock
		12	29													+ + +			
							-	-	-	-	-	13.50	7	CS	-13.5	+ + +			
14																+ + +			
		12	44													+ + +			
		To		DB	10	0										+ + +			
		13	39													+ + +			
15							-	-	-	-	-	15.00	8	CS	-15.0	+ + +	L5	15.0	
16																			
17																			
18																			
19																			
20																			

CS - Core Sample	DS - Disturbed Sample	LOGGED	Susil	PROJECT SITE DETAILS		REMARKS
SS - Split Spoon Sample	SC - Soil Cutter	DATE	15/02/2024	GROUND LEVEL (m)	0.00	
UDS- Undisturbed Sample	TCB - Tungsten Carbide Bit	CHECKED	S. Dhanapal	WATER TABLE (m)	1.80	
WS - Wash Sample	DB - Diamond Bit	DATE	17/02/2024	CASING DEPTH (m)	0.00	

Borehole terminated at 15 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 2

PROJECT NAME	PROPOSED CONSTRUCTION OF A RESIDENTIAL BUILDING					DIA OF BORE HOLE	150mm ✓ NX ✓
LOCATION	Perumbakkam, Chennai	MACHINE No.	CR-02	Free Fall Energy (%)	60	BORE START DATE	12/02/2024
STRUCTURE	Stilt + 11 Upper Floors	DRILLING METHOD	Rotary	CO-ORDINATES	N -	BORE END DATE	14/02/2024
JOB CODE	GT-2737	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 Value: N80	SPT Value: N	Sample Details: Depth	No.	Type	RL (m)	Layer Data: Legend	No	Depth	Geotechnical Description
		12	52																
		To		SC	-	-													
		12	52				1	3	3	-	6	0.50	1	SS	-0.5				
		13	02									0.95							
1		To		SC	-	-													
		13	03				2	3	4	-	7	1.25	2	SS	-1.25				Grey,Moist,Fine & Medium Sand Grains Mixture,Sitff,**Sandy Silty CLAY (CH) & Sandy Silty CLAY (CI)** Sandy Clay of Medium & High Plasticity
		14	12									1.70							
		To		SC	-	-													
2		14	15				-	-	-	-	-	2.00	3	UDS	-2.0				
		14	26																
		To		SC	-	-													
		14	27																
3							5	5	9	-	14	3.00	4	SS	-3.0		L1	3.0	
		14	43									3.45							Brown,Moist,Poorly Graded,Fine & Medium Sand Grains With Gravel Fractions,Medium Dense,**Clayey Silty SAND (SC)** With Pieces of Rock/ Partly Disintegrated Rock Formation
		To		SC	-	-													
		14	45																
4							12Cm Penet for 40Blows			-	>100	4.00	5	SS	-4.0		L2	4.0	
		15	02									4.12				+ + +			
		To		SC	-	-										+ + +			
	12/02/2024	15	04													+ + +			Brown,Fine to Coarse Sand Size Particles With Gravel Fractions Weathered Formation,Very Dense, **Disintegrated Rock-Grade W5 Rock Formation/ Residual Soil** Disintegrated Hypersthene Granitic Rock
5							10Cm Penet for 40Blows			-	>100	5.00	-	WS	-5.0	+ + +			
		15	17									5.10				+ + +			
		To		SC	-	-										+ + +			
		15	19													+ + +			
6							SPT Hammer Rebounded			-	>100	6.00	-	WS	-6.0	+ + +	L3	6.0	
		15	34													+ + +			
		To		DB	0	0										+ + +			
		16	18													+ + +			
7																+ + +			
							-	-	-	-	-	7.50	-	WS	-7.5	+ + +			
																+ + +			
8		16	39													+ + +			No Core Recovered Representative Wash Sample Observed to be **Completely Weathered Rock**
		To		DB	0	0										+ + +			
		17	12													+ + +			
9																+ + +			
							-	-	-	-	-	9.00	-	WS	-9.0	+ + +			
																+ + +			
		17	21													+ + +			
		To		DB	0	0										+ + +			
10		18	18													+ + +			

CS - Core Sample	DS - Disturbed Sample	LOGGED	Susil	PROJECT SITE DETAILS	REMARKS
SS - Split Spoon Sample	SC - Soil Cutter	DATE	12/02/2024	GROUND LEVEL (m) 0.00	
UDS- Undisturbed Sample	TCB - Tungsten Carbide Bit	CHECKED	S. Dhanapal	WATER TABLE (m) 1.60	
WS - Wash Sample	DB - Diamond Bit	DATE	17/02/2024	CASING DEPTH (m) 0.00	

GEOMARINE
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SITE INVESTIGATION RECORD

BORE HOLE No.	BH-03	SHEET	2 OF 2				
PROJECT NAME	PROPOSED CONSTRUCTION OF A RESIDENTIAL BUILDING					DIA OF BORE HOLE	150mm / NX ✓
LOCATION	Perumbakkam, Chennai	MACHINE No.	CR-02	Free Fall Energy (%)	60	BORE START DATE	12/02/2024
STRUCTURE	Stilt + 11 Upper Floors	DRILLING METHOD	Rotary	CO-ORDINATES	N -	BORE END DATE	14/02/2024
JOB CODE	GT-2737	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 Value: N80	N	Sample Details: Depth	No.	Type	RL (m)	Layer Data: Legend	No	Depth	Geotechnical Description
10.5	12/02						-	-	-	-	-	10.50	-	WS	-10.5	+ + +	L4	10.5	No Core Recovered Representative Wash Sample Observed to be Completely Weathered Rock
11	13/02/2024	15 To 16	32 To 23	DB	4	0										+ + +			
12							-	-	-	-	-	12.00	6	CS	-12.0	+ + +			Brown,Grey Brown,Medium to Coarse Grains Structure,Highly Fractured & Weathered,Discoloured,**Highly Weathered Rock-Grade W4 Rock Formation** Fractured Hypersthene Granitic Rock
13		16 To 17	52 To 49	DB	5	0										+ + +			
13.5							-	-	-	-	-	13.50	7	CS	-13.5	+ + +			
14	14/02/2024	08 To 09	50 To 47	DB	12	0										+ + +			
15							-	-	-	-	-	15.00	8	CS	-15.0	+ + +	L5	15.0	
16		10 To 11	23 To 38	DB	20	0										+ + +			Grey,Brown Grey,Medium to Coarse Grains Structure,Highly Fractured,Discoloured @ Locations,**Moderately Weathered Rock-Grade W3 Rock Formation** Fractured Hypersthene Granitic Rock
16.5							-	-	-	-	-	16.50	9	CS	-16.5	+ + +	L6	16.5	
17																			
18																			
19																			
20																			

CS - Core Sample	DS - Disturbed Sample	LOGGED	Susil	PROJECT SITE DETAILS		REMARKS
SS - Split Spoon Sample	SC - Soil Cutter	DATE	13/02/2024	GROUND LEVEL (m)	0.00	
UDS- Undisturbed Sample	TCB - Tungsten Carbide Bit	CHECKED	S. Dhanapal	WATER TABLE (m)	1.60	
WS - Wash Sample	DB - Diamond Bit	DATE	17/02/2024	CASING DEPTH (m)	0.00	

Borehole terminated at 16.5 m depth below E.G.L

FIG.2.3 Sub Soil Profile at BH-03 Location

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SITE INVESTIGATION RECORD

BORE HOLE No.	BH-04		
SHEET	1	OF	2
DIA OF BORE HOLE	150mm ✓		
	NX ✓		

PROJECT NAME	PROPOSED CONSTRUCTION OF A RESIDENTIAL BUILDING					BORE START DATE	12/02/2024
LOCATION	Perumbakkam, Chennai	MACHINE No.	CR-08	Free Fall Energy (%)	60		
STRUCTURE	Stilt + 11 Upper Floors	DRILLING METHOD	Rotary	CO-ORDINATES	N -	BORE END DATE	13/02/2024
JOB CODE	GT-2737	FLUSHING MEDIUM	Bentonite		E -	TOTAL DRILL DAYS	2

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	Blows/cm. 15-30	Blows/cm. 30-45	SPT Value: N80	SPT Value: N	Sample Details: Depth	No.	Type	RL (m)	Layer Data: Legend	No	Depth	Geotechnical Description
0	12/02/2024	09	25	SC	-	-													
		To																	
		09	25				0	1	2	-	3	0.50	1	SS	-0.5				Grey,Poorly Graded,Fine & Medium Sand Grains,Very Loose,**Clayey Silty SAND (SC)**
		11	00									0.95							
1		To		SC	-	-											L1	1.3	
		11	03				-	-	-	-	-	1.25	2	UDS	-1.25				
		11	14																
		To		SC	-	-													Grey,Brown Grey,Moist,Fine & Medium Sand Grains Mixure With Gravel Fractions,Medium Stiff,**Sandy Silty CLAY (CH)** Sandy Clay of High Plasticity
2		11	14				2	3	4	-	7	2.00	3	SS	-2.0				
		11	25									2.45							
		To		SC	-	-													
		11	26																
3							8	12	19	-	31	3.00	4	SS	-3.0		L2	3.0	
		11	38									3.45							
		To		SC	-	-													Brown,Moist,Poorly Graded,Fine to Coarse Sand Grains With Gravel Fractions,Dense & Very Dense, **Disintegrated Rock-Grade W5 Rock Formation/ Residual Soil** Disintegrated Hypersthene Granitic Rock
		11	39																
4							13	21	36	-	57	4.00	5	SS	-4.0				
		12	02									4.45							
		To		SC	-	-													
		12	05														L3	5.0	
5							SPT-Hammer Rebounded			-	>100	5.00	-	WS	-5.0				
		12	24																
		To		DB	0	0													
		12	58																
6							-	-	-	-	-	6.00	-	WS	-6.0				
		14	12																
		To		DB	0	0													
		15	23																No Core Recovered Representative Wash Sample Observed to be Completely Weathered Rock
7							-	-	-	-	-	7.50	-	WS	-7.5				
		15	48																
		To		DB	0	0													
		16	57																
8																			
9							-	-	-	-	-	9.00	-	WS	-9.0		L4	9.0	
		17	28																Grey,Grey Brown,Offwhite Shades, Medium to Coarse Grians Structure, Highly Fractured & Weathered,,**Highly Weathered Rock- Grade W4 Rock Formation**
		To		DB	8	0													
10		18	41																

CS - Core Sample	DS - Disturbed Sample	LOGGED	Susil	PROJECT SITE DETAILS	REMARKS
SS - Split Spoon Sample	SC - Soil Cutter	DATE	12/02/2024	GROUND LEVEL (m) 0.00	
UDS- Undisturbed Sample	TCB - Tungsten Carbide Bit	CHECKED	S. Dhanapal	WATER TABLE (m) 2.75	
WS - Wash Sample	DB - Diamond Bit	DATE	17/02/2024	CASING DEPTH (m) 0.00	

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SITE INVESTIGATION RECORD

BORE HOLE No.	BH-04		
SHEET	2	OF	2
DIA OF BORE HOLE	150mm		
	NX	✓	

PROJECT NAME	PROPOSED CONSTRUCTION OF A RESIDENTIAL BUILDING					BORE START DATE	12/02/2024
LOCATION	Perumbakkam, Chennai	MACHINE No.	CR-08	Free Fall Energy (%)	60		
STRUCTURE	Stilt + 11 Upper Floors	DRILLING METHOD	Rotary	CO-ORDINATES	N -	BORE END DATE	13/02/2024
JOB CODE	GT-2737	FLUSHING MEDIUM	Bentonite		E -	TOTAL DRILL DAYS	2

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	Blows/cm. 15-30	Blows/cm. 30-45	SPT Value: N80	SPT Value: N	Sample Details: Depth	No.	Type	RL (m)	Layer Data: Legend	No	Depth	Geotechnical Description
11	12/02	09	32																
		To		DB	12	0	-	-	-	-	-	10.50	6	CS	-10.5				
		10	52																
12							-	-	-	-	-	12.00	-	CS	-12.0				Grey,Grey Brown,Offwhite Shades,Medium to Coarse Grians Structure,Highly Fractured & Weathered,Discoloured,**Highly Weathered Rock- Grade W4 Rock Formation**
		11	38																
13	13/02/2024	To		DB	13	0													Fractured Hypersthene Granitic Rock
		12	52																
							-	-	-	-	-	13.50	7	CS	-13.5				
14		13	12																
		To		DB	19	0													
		15	21																
15							-	-	-	-	-	15.00	8	CS	-15.0		L5	15.0	
16																			
17																			
18																			
19																			
20																			

CS - Core Sample	DS - Disturbed Sample	LOGGED	Susil	PROJECT SITE DETAILS		REMARKS
SS - Split Spoon Sample	SC - Soil Cutter	DATE	13/02/2024	GROUND LEVEL (m)	0.00	
UDS- Undisturbed Sample	TCB - Tungsten Carbide Bit	CHECKED	S. Dhanapal	WATER TABLE (m)	2.75	
WS - Wash Sample	DB - Diamond Bit	DATE	17/02/2024	CASING DEPTH (m)	0.00	

Borehole terminated at 15 m depth below E.G.L

FIG.2.4 Sub Soil Profile at BH-04 Location

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SITE INVESTIGATION RECORD

BORE HOLE No.	BH-05						
SHEET	1	OF	2				
PROJECT NAME	PROPOSED CONSTRUCTION OF A RESIDENTIAL BUILDING					DIA OF BORE HOLE	150mm ✓ / NX ✓
LOCATION	Perumbakkam, Chennai	MACHINE No.	CR-08	Free Fall Energy (%)	60	BORE START DATE	09/02/2024
STRUCTURE	Stilt + 11 Upper Floors	DRILLING METHOD	Rotary	CO-ORDINATES	N -	BORE END DATE	10/02/2024
JOB CODE	GT-2737	FLUSHING MEDIUM	Bentonite		E -	TOTAL DRILL DAYS	2

Depth below E.G.L. (m)	Drilling progress per metre: Date	Time: Hr.	Time: Min.	Type of Drill Bit (SC / TCB / DB)	Core Details: Total Core Recovery %	Core Details: R.Q.D %	SPT Details: Blows/cm. 0-15	15-30	30-45	SPT Value: N80	SPT Value: N	Sample Details: Depth	No.	Type	RL (m)	Layer Data: Legend	No	Depth	Geotechnical Description
0		10	58																
		To		SC	-	-													
		10	58				2	3	4	-	7	0.50	-	*SS	-0.5				
		11	10									0.95							
1		To		SC	-	-													
		11	10				1	1	3	-	4	1.25	1	SS	-1.25				Grey,Brown Grey,Moist,Fine & Medium Sand Grains Mixture With Gravel Fractions,Soft & Medium Stiff,**Sandy Silty CLAY (CH)**
		11	27									1.70							
		To		SC	-	-													
2		11	29				-	-	-	-	-	2.00	2	UDS	-2.0				sandy Clay of High Plasticity
		11	43																
		To		SC	-	-													
		11	44																
3							10	15	21	-	36	3.00	3	SS	-3.0		L1	3.0	
		12	00									3.45				+ + +			Brown,Offwhite Shades,Moist,Poorly Graded,Fine & Medium Sand Grains With Gravels Weathered Formation,
		To		SC	-	-										+ + +			Dense,**Disintegrated Rock-Grade W5 Rock Formation/ Residual Soil**
		12	03													+ + +			
4							19	13Cm Penet for 40Blows		-	>100	4.00	4	SS	-4.0	+ + +	L2	4.0	
		12	20									4.28				+ + +			
		To		SC	-	-										+ + +			Brown,Grey Brown,Fine & Medium Sand Grains Size & Gravel Size Weathered Particles,Very Dense,**Disintegrated Rock-Grade W5 Rock Formation/Residual Soil**
		12	23													+ + +			
5	09/02/2024						15Cm Penet for 50Blows			-	>100	5.00	5	SS	-5.0	+ + +			
		12	34									5.15				+ + +			
		To		SC	-	-										+ + +			Disintegrated Hypersthene Granitic Rock
		12	36													+ + +			
6							SPT Hammer Rebounded			-	>100	6.00	-	WS	-6.0	+ + +	L3	6.0	
		13	09													+ + +			
		To		DB	0	0										+ + +			
		13	40													+ + +			
7																+ + +			
							-	-	-	-	-	7.50	-	WS	-7.5	+ + +			
																+ + +			No Core Recovered
8		14	52													+ + +			Representative Wash Sample Observed to be Completely Weathered Rock
		To		DB	0	0										+ + +			
		15	30													+ + +			
9							-	-	-	-	-	9.00	-	WS	-9.0	+ + +			
																+ + +			
		16	04													+ + +			
		To		DB	0	0										+ + +			
10		17	12													+ + +			

CS - Core Sample	DS - Disturbed Sample	LOGGED	Susil	PROJECT SITE DETAILS	REMARKS
SS - Split Spoon Sample	SC - Soil Cutter	DATE	09/02/2024	GROUND LEVEL (m) 0.00	
UDS- Undisturbed Sample	TCB - Tungsten Carbide Bit	CHECKED	S. Dhanapal	WATER TABLE (m) 3.20	(*SS)-SAMPLE FAILED
WS - Wash Sample	DB - Diamond Bit	DATE	17/05/2023	CASING DEPTH (m) 0.00	

GEOMARINE
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SITE INVESTIGATION RECORD

BORE HOLE No.	BH-05						
SHEET	2	OF	2				
PROJECT NAME	PROPOSED CONSTRUCTION OF A RESIDENTIAL BUILDING			DIA OF BORE HOLE	150mm		
					NX	✓	
LOCATION	Perumbakkam, Chennai	MACHINE No.	CR-08	Free Fall Energy (%)	60	BORE START DATE	09/02/2024
STRUCTURE	Stilt + 11 Upper Floors	DRILLING METHOD	Rotary	CO-ORDINATES	N -	BORE END DATE	10/02/2024
JOB CODE	GT-2737	FLUSHING MEDIUM	Bentonite		E -	TOTAL DRILL DAYS	2

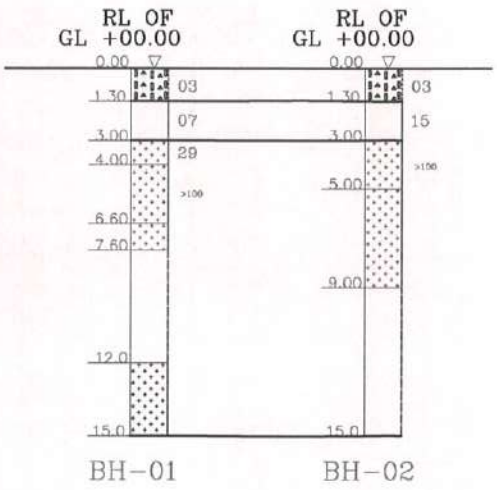
Depth below E.G.L. (m)	Drilling progress per metre: Date	Time: Hr.	Time: Min.	Type of Drill Bit (SC / TCB / DB)	Core Details: Total Core Recovery %	Core Details: R.Q.D %	SPT Details: Blows/cm. 0-15	Blows/cm. 15-30	Blows/cm. 30-45	SPT Value: N80	SPT Value: N	Sample Details: Depth	No.	Type	RL (m)	Legend	Layer Data: No	Depth	Geotechnical Description
10												10.50	-	WS	-10.5	+ + + + + + + + +	L4	10.5	No Core Recovered Representative Wash Sample Observed to be Completely Weathered Rock
11	10/02/2024	17	32	DB	9	0	-	-	-	-	-					+ + + + + + + + +			
		To														+ + + + + + + + +			
12		18	24									12.00	7	CS	-12.0	+ + + + + + + + +			Grey,Brown Grey,Medium to Coarse Grains Structure,Highly Fractured & Weathered,Discoloured,**Highly Weathered Rock-Grade W4 Rock Formation** Fractured Hypersthene Granitic Rock
		08	50													+ + + + + + + + +			
13		To		DB	4	0										+ + + + + + + + +			
		09	45									13.50	8	CS	-13.5	+ + + + + + + + +	L5	13.5	
14	10/02/2024	10	02													+ + + + + + + + +			
		To		DB	35	0										+ + + + + + + + +			
15		10	54				-	-	-	-	-	15.00	9	CS	-15.0	+ + + + + + + + +			Grey,Brown Grey,Medium to Coarse Grains Structure,Fractured & Weathered,Discoloured @ Locations,**Moderately Weathered Rock-Grade W3 Rock Formation** Fractured Hypersthene Granitic Rock
		11	22													+ + + + + + + + +			
16		To		DB	47	9										+ + + + + + + + +			
		12	48									16.50	10	CS	-16.5	+ + + + + + + + +	L6	16.5	
17																			
18																			
19																			
20																			

CS - Core Sample	DS - Disturbed Sample	LOGGED	Susil	PROJECT SITE DETAILS	REMARKS
SS - Split Spoon Sample	SC - Soil Cutter	DATE	10/02/2024	GROUND LEVEL (m) 0.00	
UDS- Undisturbed Sample	TCB - Tungsten Carbide Bit	CHECKED	S. Dhanapal	WATER TABLE (m) 3.20	
WS - Wash Sample	DB - Diamond Bit	DATE	17/05/2023	CASING DEPTH (m) 0.00	

Borehole terminated at 16.5 m depth below E.G.L

FIG.2.5 Sub Soil Profile at BH-05 Location

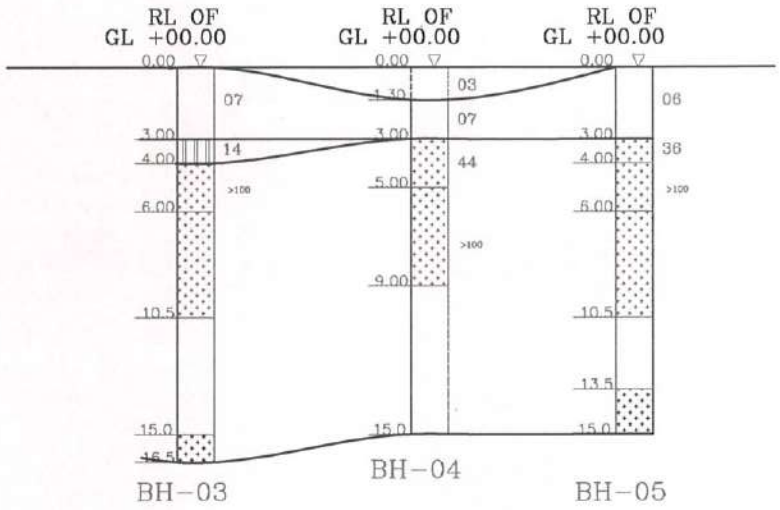
CROSS SECTION PROFILE



LEGEND

- CLAYEY SILTY SAND (SC)
- Silty Clay (CH)
- Highly to Moderately Weathered Rock & Moderately Weathered Rock
- Residual Soil,Residual Soil to Completely Weathered & Completely Weathered Rock
- Completely to Highly Weathered Rock & Highly Weathered Rock

FIG.No.2.6 CROSS SECTIONAL VARIATION OF SUB SOIL PROFILE THROUGH BH-01 & 02



LEGEND

- CLAYEY SILTY SAND (SC)
- Silty Clay (CH)
- SILTY SAND (SM)
- Residual Soil,Residual Soil to Completely Weathered & Completely Weathered Rock
- Completely to Highly Weathered Rock & Highly Weathered Rock
- Highly to Moderately Weathered Rock & Moderately Weathered Rock

FIG.No.2.7 CROSS SECTIONAL VARIATION OF SUB SOIL PROFILE THROUGH BH-03 TO 05

GRAIN SIZE DISTRIBUTION CURVE

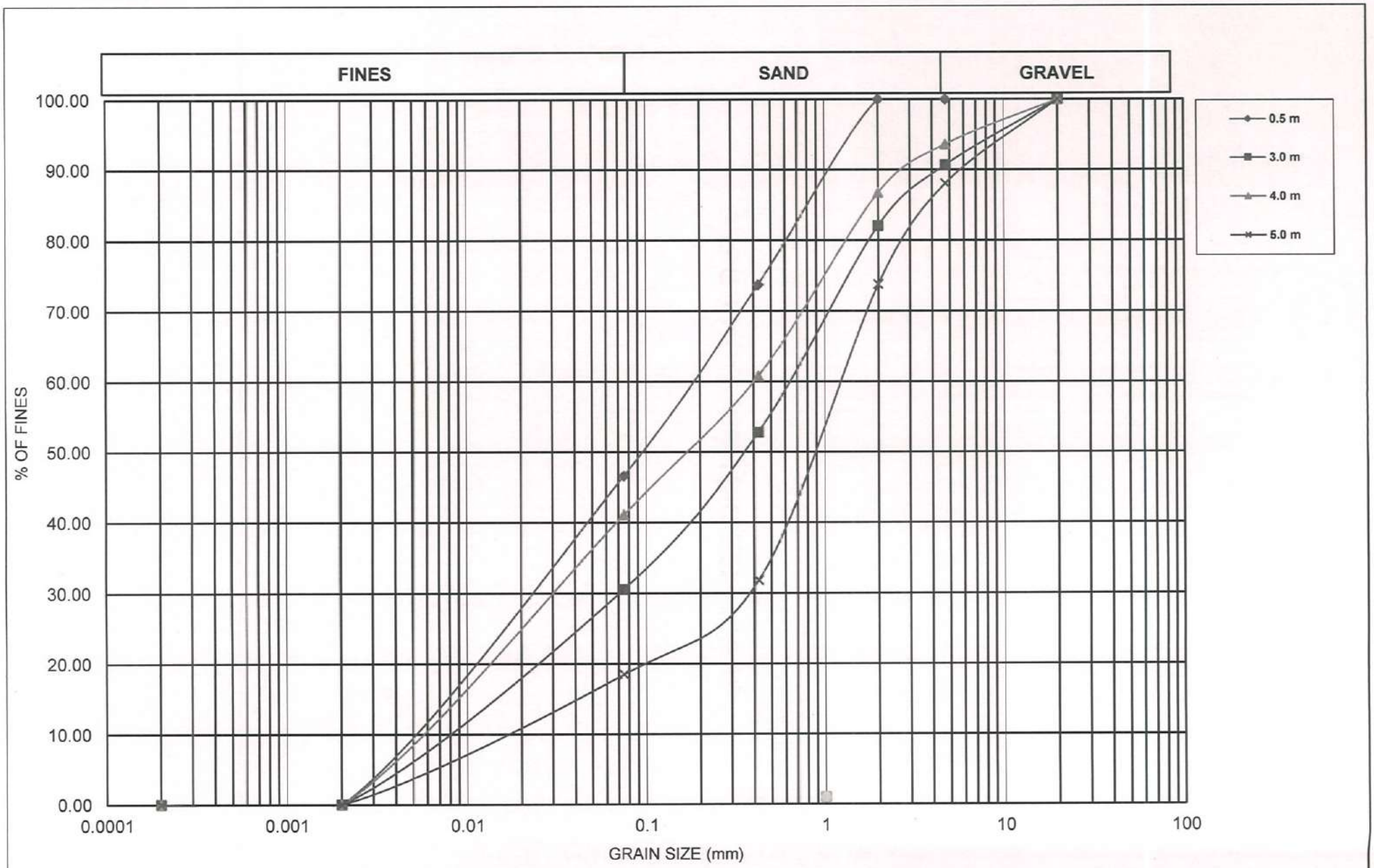


Fig. 2.8 GRAIN SIZE DISTRIBUTION CURVE - BH-01

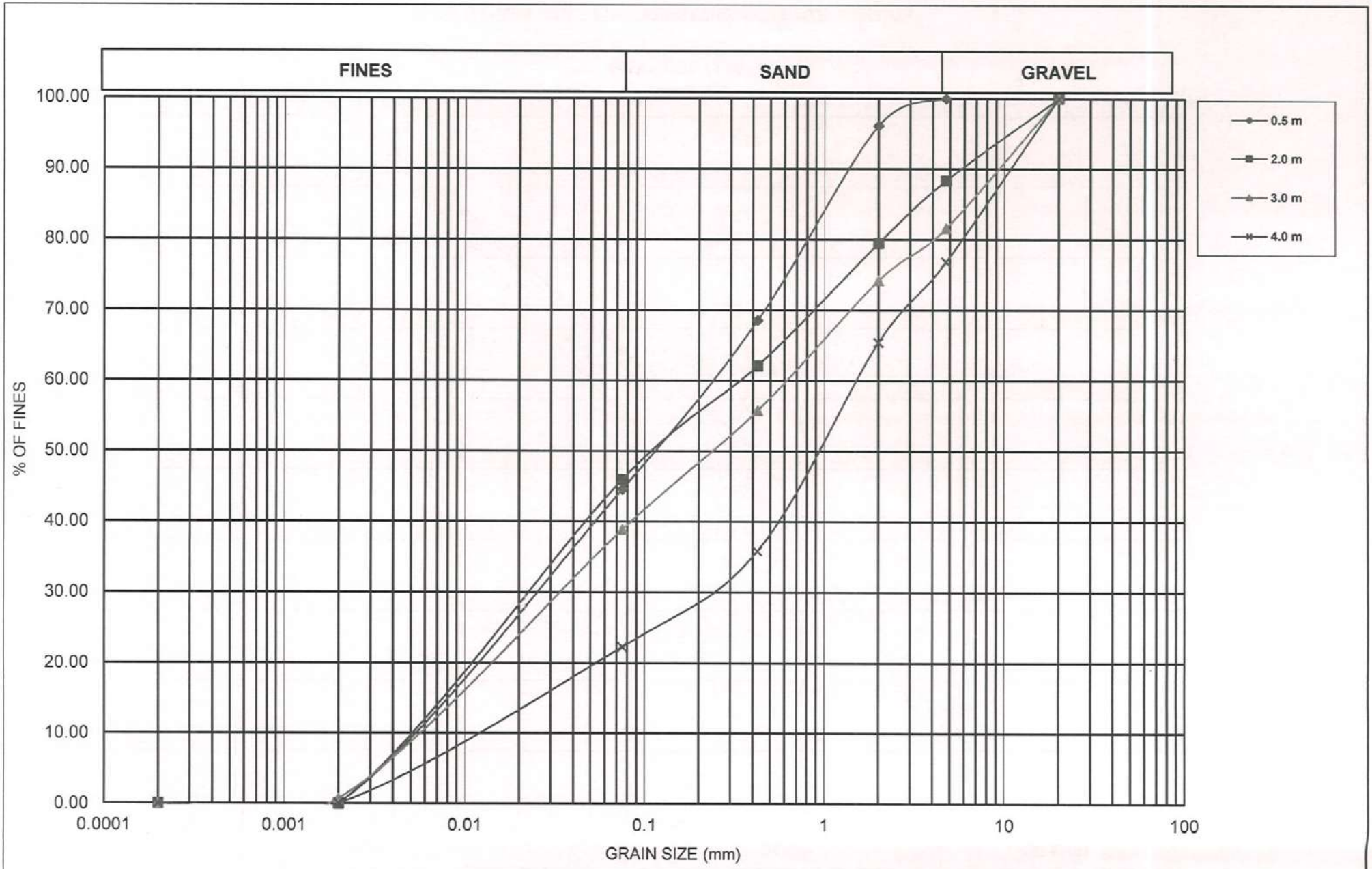


Fig. 2.9 GRAIN SIZE DISTRIBUTION CURVE - BH-02

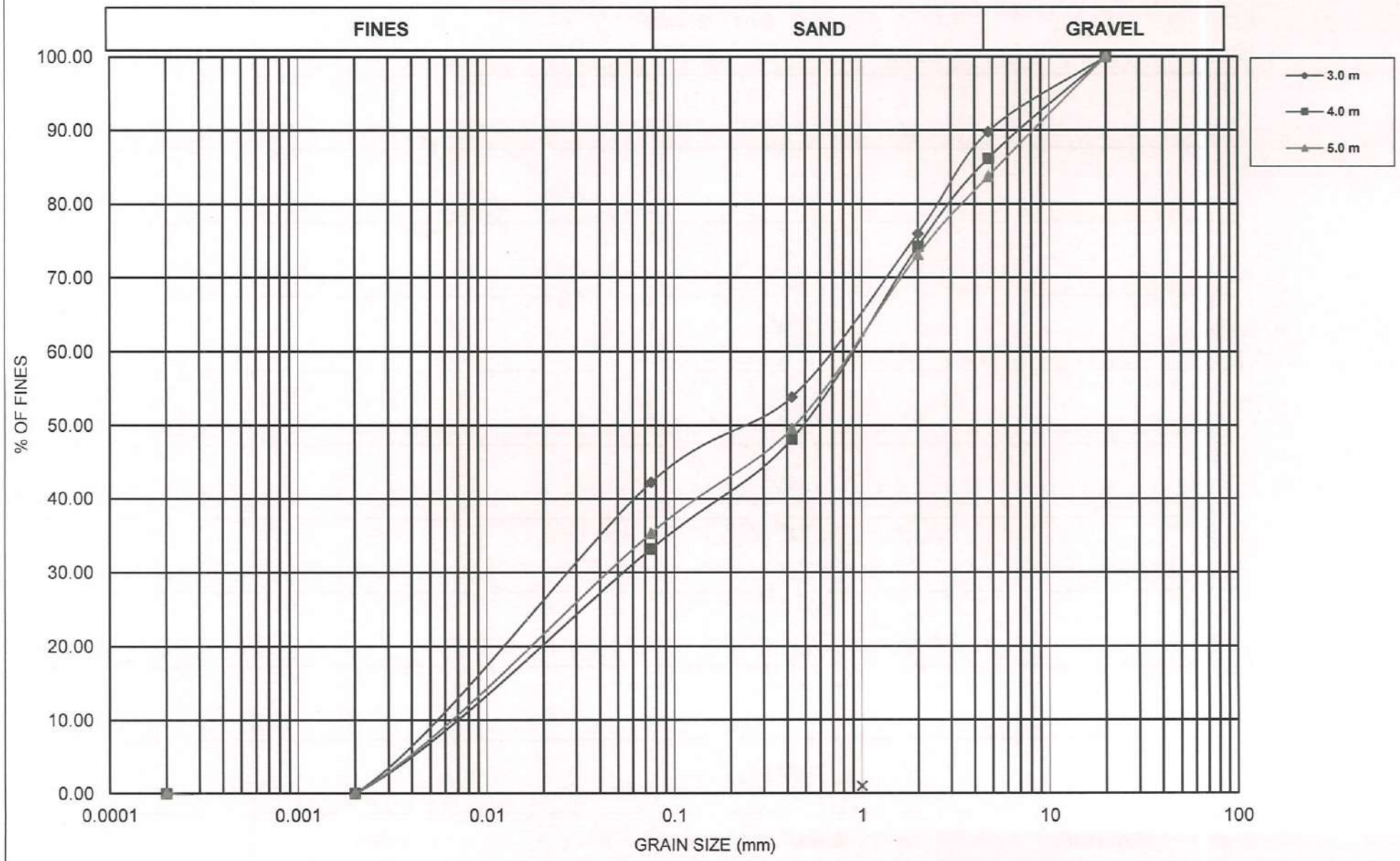


Fig. 2.10 GRAIN SIZE DISTRIBUTION CURVE - BH-03

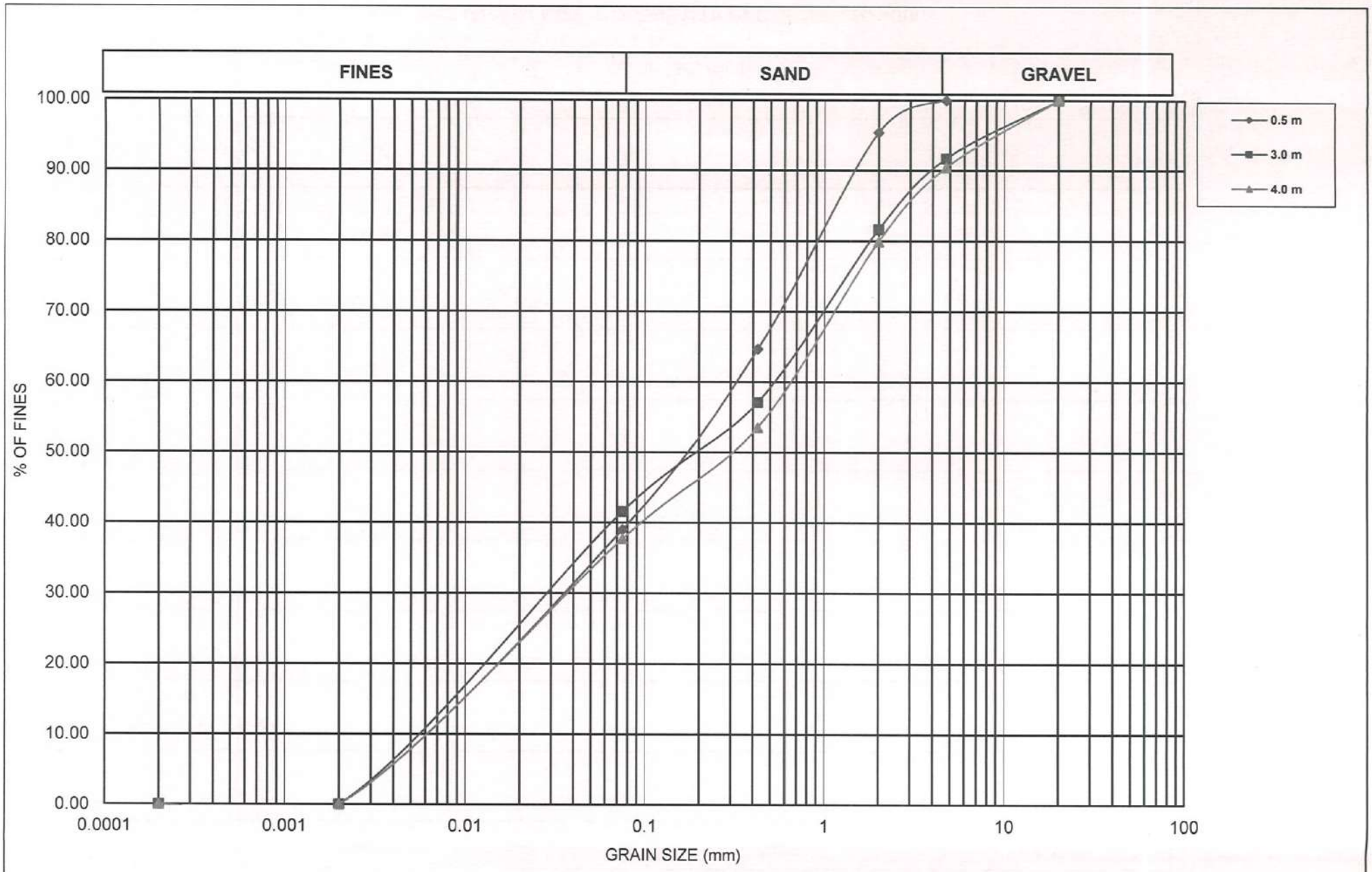


Fig. 2.11 GRAIN SIZE DISTRIBUTION CURVE - BH-04

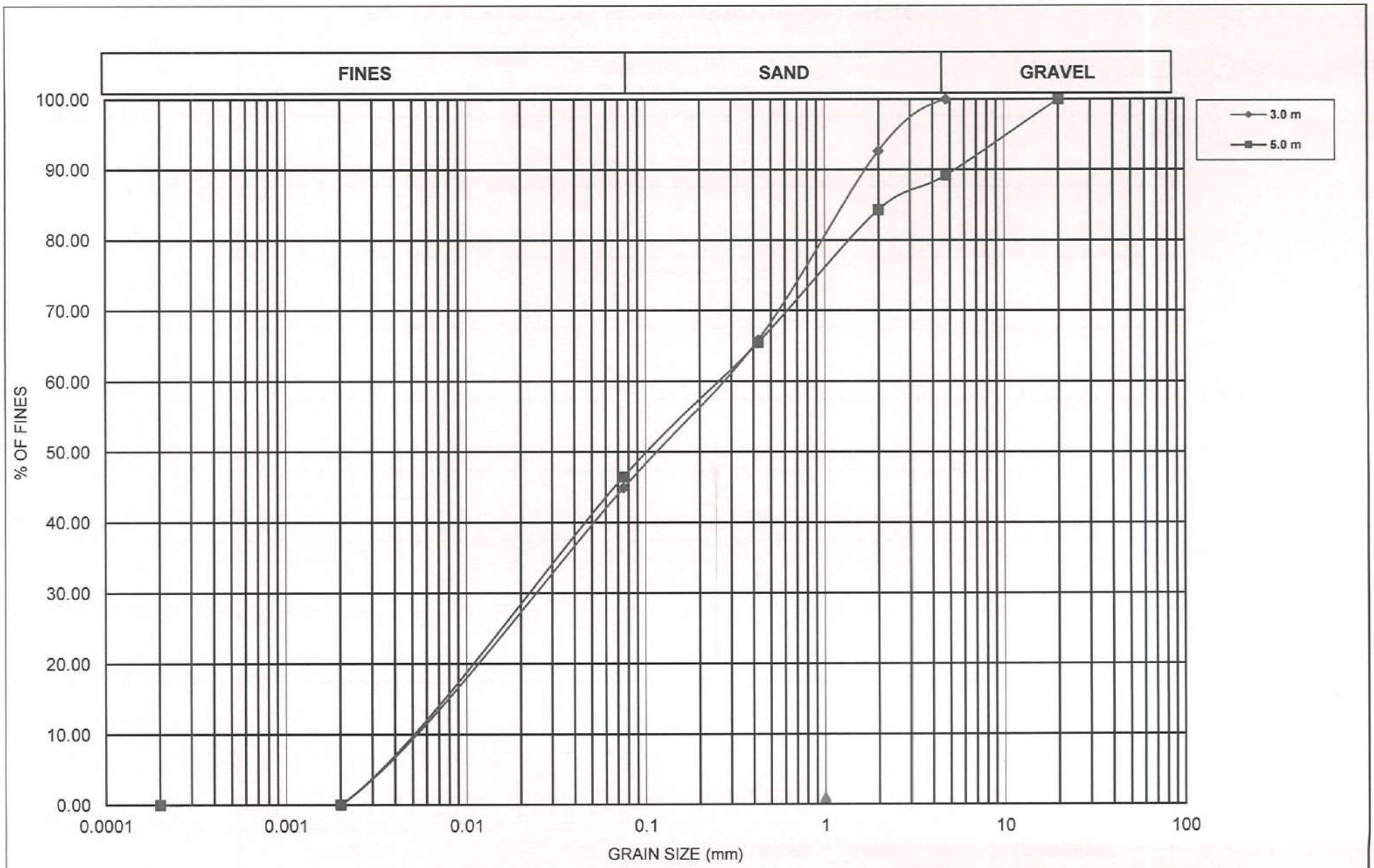


Fig. 2.12 GRAIN SIZE DISTRIBUTION CURVE - BH-05

HYDROMETER ANALYSIS CURVE

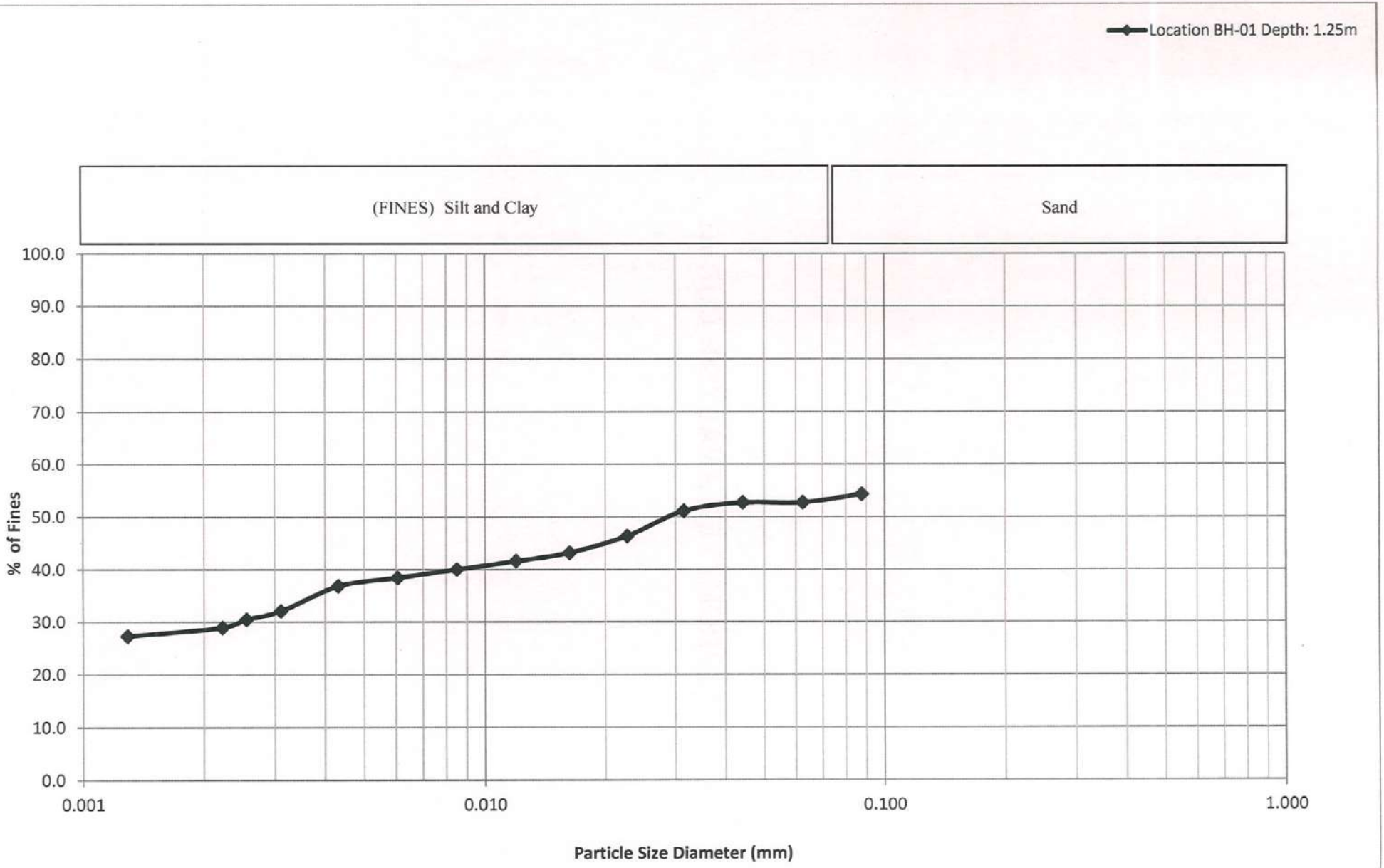


Fig 2.13 Hydrometer Analysis Master Curve

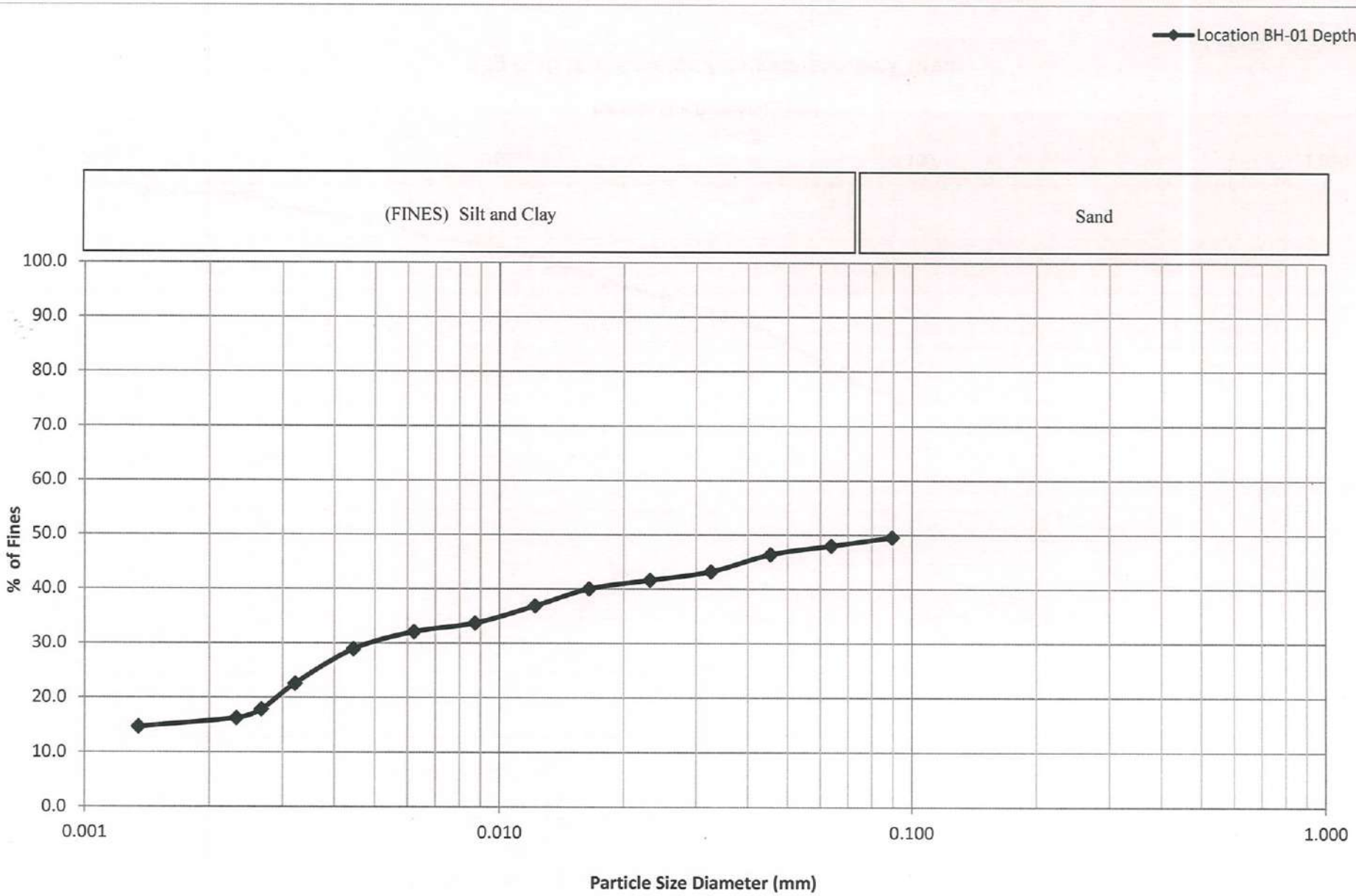


Fig 2.14 Hydrometer Analysis Master Curve

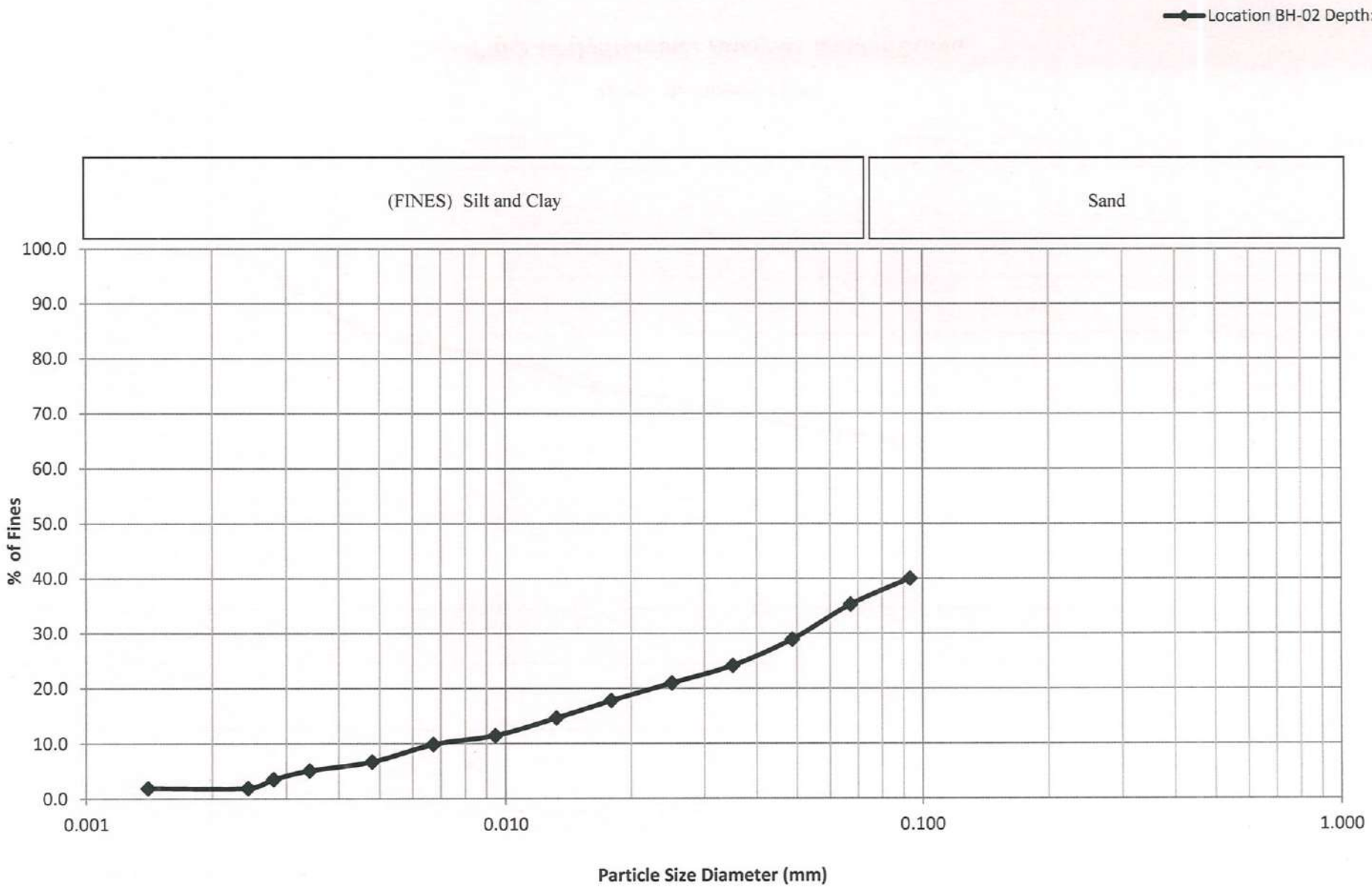


Fig 2.15 Hydrometer Analysis Master Curve

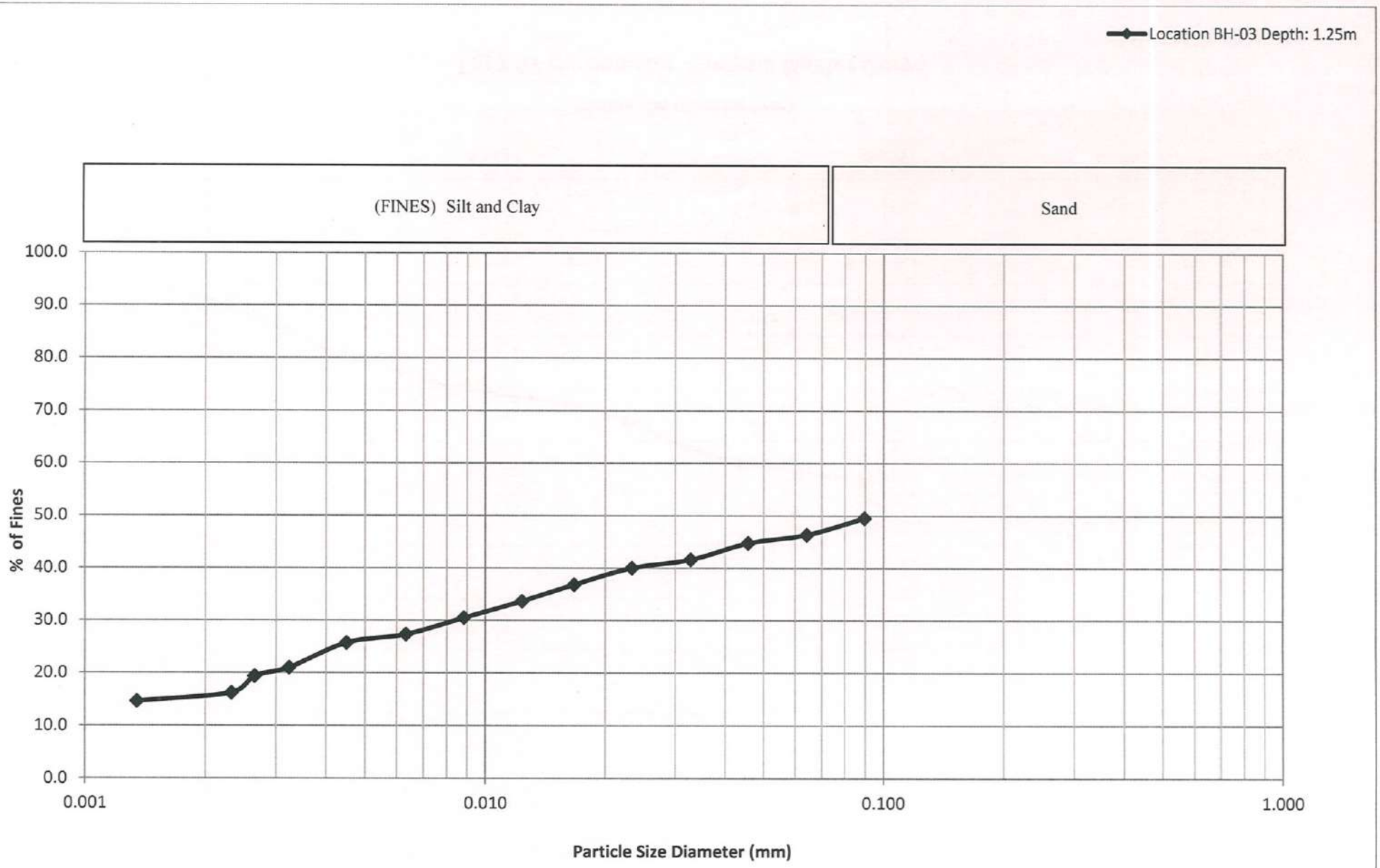


Fig 2.16 Hydrometer Analysis Master Curve

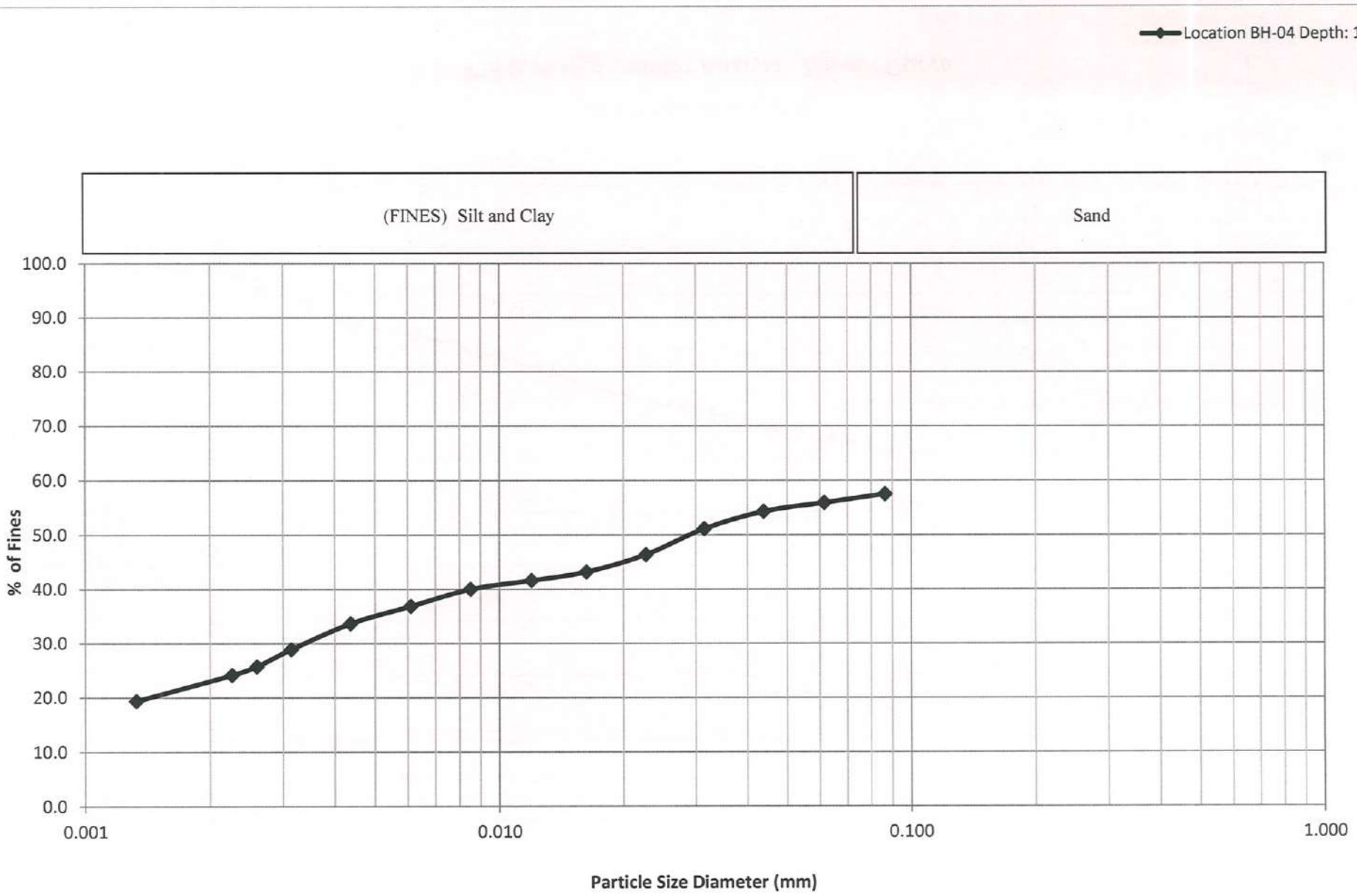


Fig 2.17 Hydrometer Analysis Master Curve

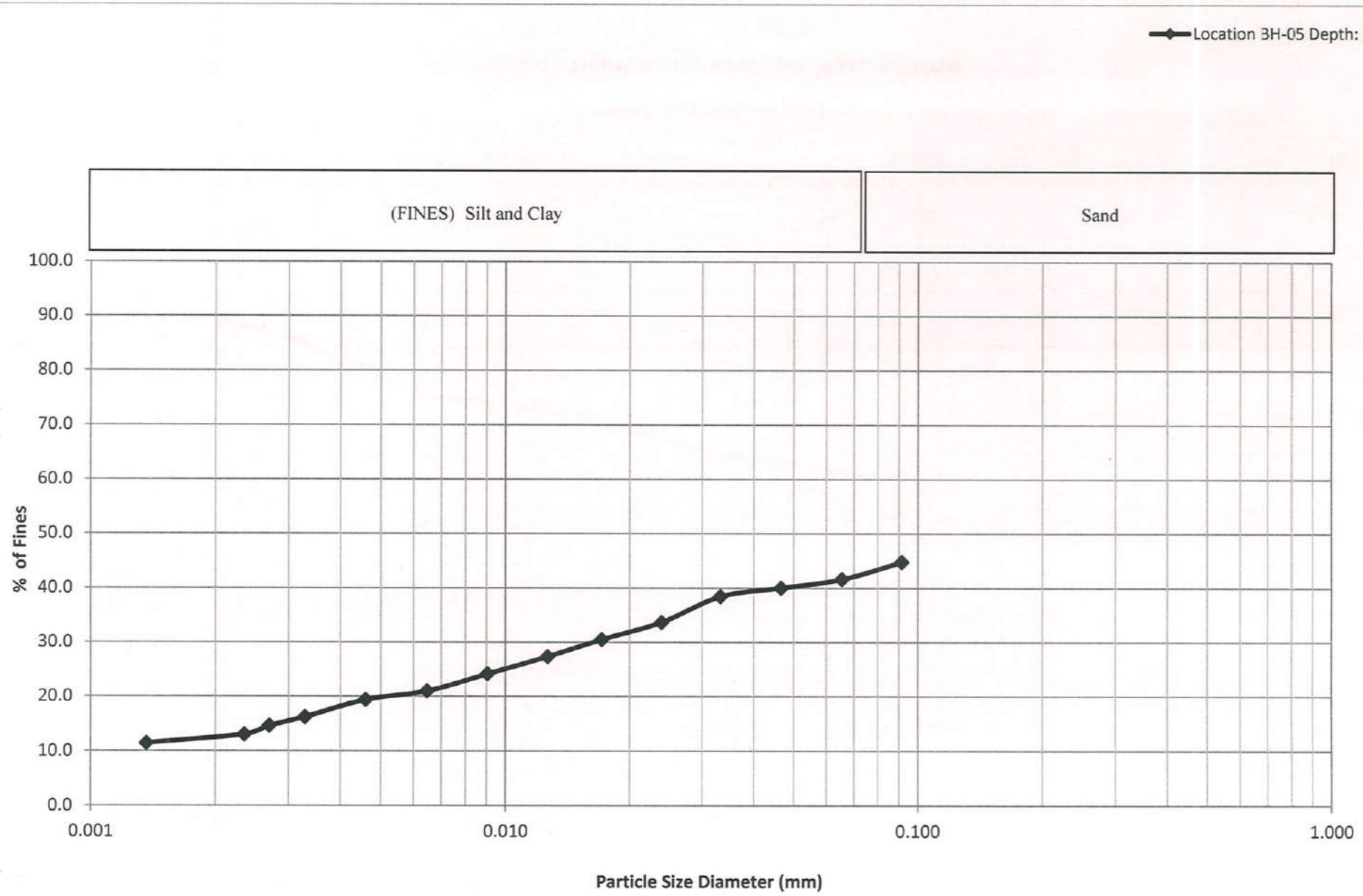


Fig 2.18 Hydrometer Analysis Master Curve

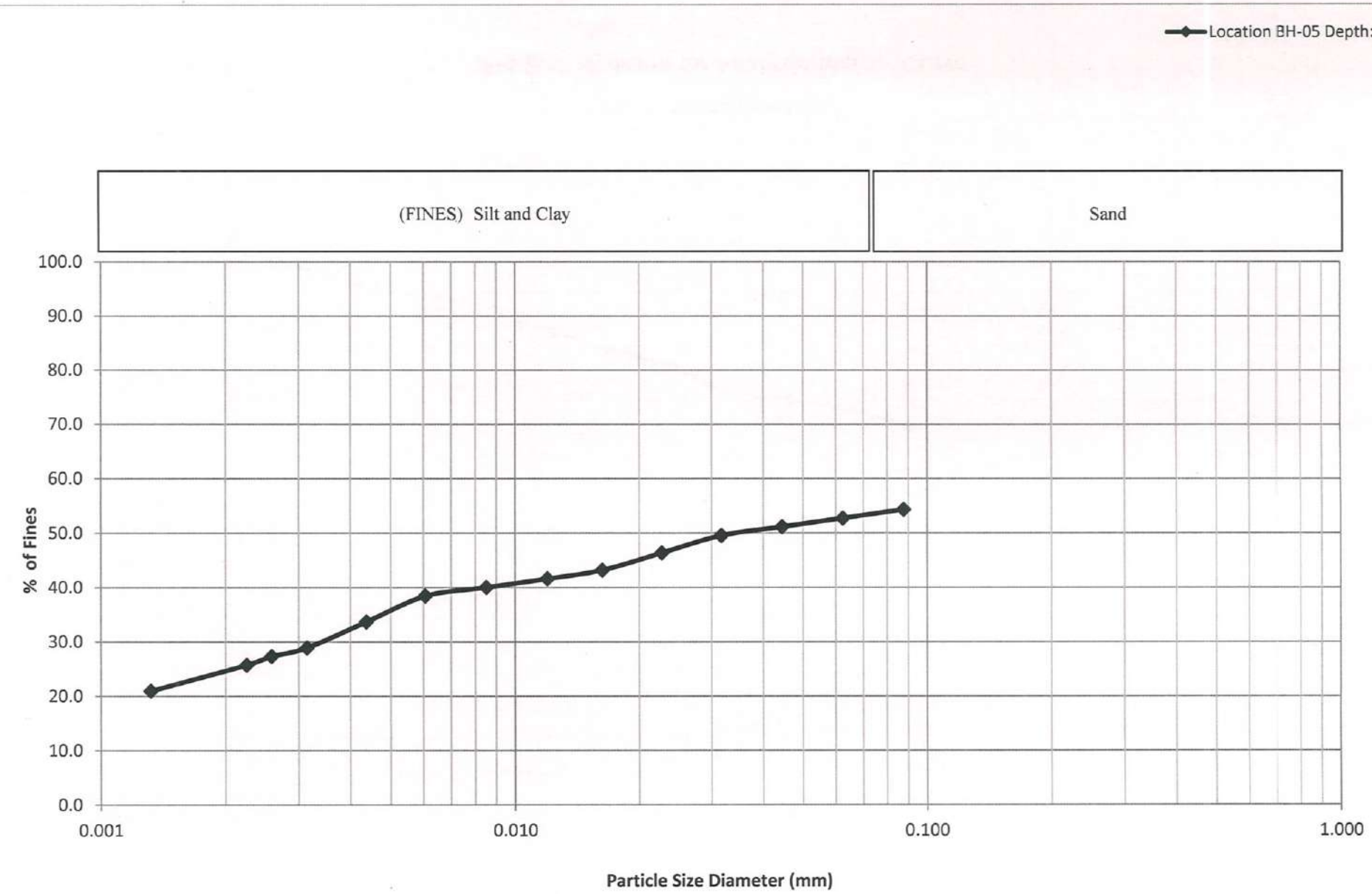


Fig 2.19 Hydrometer Analysis Master Curve

LABORATORY TEST RESULTS

GEOMARINE
THE SPIRIT OF ENGINEERING
Phone No.: 044-24481485, 044-24480305

LABORATORY TEST REPORT

GEOMARINE CONSULTANTS PVT LTD- TESTING LABORATORY

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

ULR NO.	:	TC114102400000433F	SAMPLE IDENTIFICATION NUME	:	GMC/0224/823
REPORT ISSUED TO	:	M/s URBANDO HOUSING LLP	TEST REPORT NUMBER	:	GT-2737
DISCIPLINE/GROUP	:	MECHANICAL / SOIL AND ROCK	SAMPLE RECEIPT DATE	:	12/02/2024
SAMPLE DESCRIPTION	:	CLAY AND SOIL	PERIOD OF TESTING	:	14/02/2024 to 21/02/2024
SAMPLE CONDITION	:	SATISFACTORY	REPORT ISSUE DATE	:	27/02/2024
TEST METHOD	:	BUREAU OF INDIAN STANDARDS	NO. OF PAGES	:	One

TABLE-2.1 LABORATORY CLASSIFICATION OF SOIL SAMPLES FROM BH-01

Sampling Depth (m)	"N" Value	Type of Sample	Moisture Content (%) AS PER IS 2720 (P-II) - 1973, RA-2015	LIQUID LIMIT (%) AS PER IS 2720 (P-V) - 1985, RA-2015	PLASTIC LIMIT (%) AS PER IS 2720 (P-V) - 1985, RA-2015	Plasticity Index (I_p= LL-PL)	SHRINKAGE LIMIT (%) AS PER IS 2720 (P-VI) - 1972, RA-2011	FREE SWELL INDEX (%) AS PER IS 2720 (P-XL) - 1977, RA-2011	SPECIFIC GRAVITY AS PER IS 2720 (P-III, SEC-1) - 1980, RA-2010	GRAIN SIZE ANALYSIS AS PER IS 2720 (P-IV) - 1985, RA-2015						DIRECT SHEAR TEST IS 2720 PART 13:1986 (RA 2016)		Uniformity Co-Efficient $C_U=D_{60}/D_{10}$	Co-Efficient of Curvature $C_c=D_{30}^2/(D_{10}xD_{60})$	Consistancy	Relative Density	IS-Notation		
										Gravel (%)	Coarse (%)	Medium (%)	Fine (%)	Silt (%)	Clay (%)	Cohesion (kg/cm^2)	ϕ (Degrees)					Fine Grain Soils	Gravely Soils	Sandy Soils
0.5	3	SPT	23	74	19	55	11.8	240	-	0.0	0.0	26.3	27.2	46.6		-	-	-	-	-	V.Loose	-	-	SC
1.25	-	UDS	28	118	31	88	-	283	2.51	5.6	3.3	17.3	15.5	41.5	16.8	-	-	-	-	-	-	CH	-	-
2.0	7	SPT	25	103	24	79	12.5	336	-	-	-	-	-	83.8	16.2	-	-	-	-	M.Stiff	-	CH	-	-
3.0	29	SPT	16	Little/No Plasticity				25	-	9.4	8.6	29.3	22.2	30.6		-	-	-	-	-	M.Dense	Disintegrated Rock/ Residual Soil		
4.0	>100	SPT	24	Test Not Applicable/No Plasticity						6.4	6.9	26.0	19.7	41.1		-	-	-	-	-	V.Dense	Completely to Highly Weathered Rock		
5.0	>100	SPT	18							12.0	14.3	42.0	13.3	18.5		-	-	-	-	-	V.Dense			
6.0	>100	DS	-							35.4	41.0	20.6	1.6	1.4		-	-	-	-	-	V.Dense			

** END OF REPORT**

Terms and Conditions

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(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
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LABORATORY TEST REPORT

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REPORT ISSUED TO	:	M/s URBANDO HOUSING LLP	TEST REPORT NUMBER	:	GT-2737
DISCIPLINE/GROUP	:	MECHANICAL / SOIL AND ROCK	SAMPLE RECEIPT DATE	:	19/02/2024
SAMPLE DESCRIPTION	:	CLAY AND SOIL	PERIOD OF TESTING	:	19/02/2024 to 26/02/2024
SAMPLE CONDITION	:	SATISFACTORY	REPORT ISSUE DATE	:	27/02/2024
TEST METHOD	:	BUREAU OF INDIAN STANDARDS	NO. OF PAGES	:	One

TABLE-2.2 LABORATORY CLASSIFICATION OF SOIL SAMPLES FROM BH-02

Sampling Depth (m)	"N" Value	Type of Sample	Moisture Content (%) AS PER IS 2720 (P-II) - 1973, RA-2015	LIQUID LIMIT (%) AS PER IS 2720 (P-V) - 1985, RA-2015	PLASTIC LIMIT (%) AS PER IS 2720 (P-V) - 1985, RA-2015	Plasticity Index (I_P= LL-PL)	SHRINKAGE LIMIT (%) AS PER IS 2720 (P-VI) - 1972, RA-2011	FREE SWELL INDEX (%) AS PER IS 2720 (P-XL) - 1977, RA-2011	SPECIFIC GRAVITY AS PER IS 2720 (P-III, SEC-1) - 1980, RA-2010	GRAIN SIZE ANALYSIS AS PER IS 2720 (P-IV) - 1985, RA-2015						DIRECT SHEAR TEST IS 2720 PART 13:1986 (RA 2016)		Uniformity Co-Efficient $C_U=D_{60}/D_{10}$	Co-Efficient of Curvature $C_c=D_{30}^2/(D_{10}xD_{60})$	Consistancy	Relative Density	IS-Notation		
										Gravel (%)	Coarse (%)	Medium (%)	Fine (%)	Silt (%)	Clay (%)	Cohesion (kg/cm^2)	ϕ (Degrees)					Fine Grain Soils	Gravely Soils	Sandy Soils
0.5	3	SPT	23	25	16	10	-	25	-	0.0	3.9	27.6	23.9	44.6		-	-	-	-	-	V.Loose	-	-	SC
2.0	15	SPT	15	78	26	52	-	214	-	11.7	8.9	17.4	16.1	46.0		-	-	-	-	-	M.Dense	-	-	SC
3.0	>100	SPT	25	32	20	12	-	33	-	18.3	7.5	18.4	16.4	38.6	0.7	-	-	-	-	-	V.Dense	Disintegrated Rock/ Residual Soil		
4.0	>100	SPT	20	Test No Applicable						23.2	11.4	29.6	13.5	22.3		-	-	-	-	-	V.Dense	Completely to Highly Weathered Rock		
5.0	>100	DS	Test Not Applicable/No Plasticity							4.2	19.3	59.8	12.6	4.1		-	-	-	-	-	V.Dense			
6.0	>100	DS								9.3	28.0	55.0	5.9	1.8		-	-	-	-	-	V.Dense			
7.5	-	DS								7.7	28.1	58.5	5.0	0.7		-	-	-	-	-	V.Dense			
9.0	-	DS								27.0	27.5	41.7	2.5	1.3		-	-	-	-	-	V.Dense			
10.5 to 12	-	DS								30.7	27.5	39.4	2.5	0.0		-	-	-	-	-	V.Dense			

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LABORATORY TEST REPORT

GEOMARINE CONSULTANTS PVT LTD- TESTING LABORATORY
NO.11 2nd MAIN ROAD, KANNAPA NAGAR, CHENNAI-600041

ULR NO.	:	TC114102400000433F	SAMPLE IDENTIFICATION NUME	:	GMC/0224/823
REPORT ISSUED TO	:	M/s URBANDO HOUSING LLP	TEST REPORT NUMBER	:	GT-2737
DISCIPLINE/GROUP	:	MECHANICAL / SOIL AND ROCK	SAMPLE RECEIPT DATE	:	19/02/2024
SAMPLE DESCRIPTION	:	CLAY AND SOIL	PERIOD OF TESTING	:	19/02/2024 to 26/02/2024
SAMPLE CONDITION	:	SATISFACTORY	REPORT ISSUE DATE	:	27/02/2024
TEST METHOD	:	BUREAU OF INDIAN STANDARDS	NO. OF PAGES	:	One

TABLE-2.3 LABORATORY CLASSIFICATION OF SOIL SAMPLES FROM BH-03

Sampling Depth (m)	"N" Value	Type of Sample	Moisture Content (%) AS PER IS 2720 (P-II) - 1973, RA-2015	LIQUID LIMIT (%) AS PER IS 2720 (P-V) - 1985, RA-2015	PLASTIC LIMIT (%) AS PER IS 2720 (P-V) - 1985, RA-2015	Plasticity Index (I_P= LL-PL)	SHRINKAGE LIMIT (%) AS PER IS 2720 (P-VI) - 1972, RA-2011	FREE SWELL INDEX (%) AS PER IS 2720 (P-XL) - 1977, RA-2011	SPECIFIC GRAVITY AS PER IS 2720 (P-III, SEC-1) - 1980, RA-2010	GRAIN SIZE ANALYSIS AS PER IS 2720 (P-IV) - 1985, RA-2015						DIRECT SHEAR TEST IS 2720 PART 13:1986 (RA 2016)		Uniformity Co-Efficient $C_U=D_{60}/D_{10}$	Co-Efficient of Curvature $C_c=D_{30}^2/(D_{10}xD_{60})$	Consistancy	Relative Density	IS-Notation		
										Gravel (%)	Coarse (%)	Medium (%)	Fine (%)	Silt (%)	Clay (%)	Cohesion (kg/cm^2)	ϕ (Degrees)					Fine Grain Soils	Gravely Soils	Sandy Soils
0.5	6	SPT	28	40	21	19	-	75	-	0.0	0.0	17.2	22.0	60.9		-	-	-	-	M.Stiff	-	CI	-	-
1.25	7	SPT	37	71	23	48	-	217	-	0.0	1.8	14.7	22.0	51.6	9.9	-	-	-	-	M.Stiff	-	CH	-	-
3.0	14	SPT	23	71	25	46	-	309	-	10.2	13.8	22.1	11.7	42.2		-	-	-	-	-	M.Dense	-	-	SC
4.0	>100	SPT	20	28	19	10	-	0	-	13.8	11.9	26.1	14.9	33.2		-	-	-	-	-	V.Dense	Disintegrated Rock/ Residual Soil		
5.0	>100	SPT	18	31	19	12	-	58	-	16.3	10.6	23.6	14.2	35.3		-	-	-	-	-	V.Dense			
6.0	>100	DS	Test Not Applicable/No Plasticity							23.5	34.6	40.2	1.8	0.0		-	-	-	-	-	V.Dense	Completely to Highly Weathered Rock		
7.5	-	DS								16.1	23.6	56.3	4.0	0.0		-	-	-	-	-	V.Dense			
9.0	-	DS								0.0	0.5	78.7	19.6	1.1		-	-	-	-	-	V.Dense			
10.5	-	DS								0.0	0.0	78.0	16.3	5.7		-	-	-	-	-	V.Dense			

** END OF REPORT**

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Authorised Signatory
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LABORATORY TEST REPORT

GEOMARINE CONSULTANTS PVT LTD- TESTING LABORATORY
NO.11 2nd MAIN ROAD, KANNAPA NAGAR, CHENNAI-600041

ULR NO.	:	TC114102400000433F	SAMPLE IDENTIFICATION NUME	:	GMC/0224/823
REPORT ISSUED TO	:	M/s URBANDO HOUSING LLP	TEST REPORT NUMBER	:	GT-2737
DISCIPLINE/GROUP	:	MECHANICAL / SOIL AND ROCK	SAMPLE RECEIPT DATE	:	12/02/2024
SAMPLE DESCRIPTION	:	CLAY AND SOIL	PERIOD OF TESTING	:	14/02/2024 to 21/02/2024
SAMPLE CONDITION	:	SATISFACTORY	REPORT ISSUE DATE	:	27/02/2024
TEST METHOD	:	BUREAU OF INDIAN STANDARDS	NO. OF PAGES	:	One

TABLE-2.4 LABORATORY CLASSIFICATION OF SOIL SAMPLES FROM BH-04

Sampling Depth (m)	"N" Value	Type of Sample	Moisture Content (%) AS PER IS 2720 (P-II) - 1973, RA-2015	LIQUID LIMIT (%) AS PER IS 2720 (P-V) - 1985, RA-2015	PLASTIC LIMIT (%) AS PER IS 2720 (P-V) - 1985, RA-2015	Plasticity Index (I_P= LL-PL)	SHRINKAGE LIMIT (%) AS PER IS 2720 (P-VI) - 1972, RA-2011	FREE SWELL INDEX (%) AS PER IS 2720 (P-XL) - 1977, RA-2011	SPECIFIC GRAVITY AS PER IS 2720 (P-III, SEC-1) - 1980, RA-2010	GRAIN SIZE ANALYSIS AS PER IS 2720 (P-IV) - 1985, RA-2015						DIRECT SHEAR TEST IS 2720 PART 13:1986 (RA 2016)		Uniformity Co-Efficient $C_U=D_{60}/D_{10}$	Co-Efficient of Curvature $C_c=D_{30}^2/(D_{10}xD_{60})$	Consistancy	Relative Density	IS-Notation		
										Gravel (%)	Coarse (%)	Medium (%)	Fine (%)	Silt (%)	Clay (%)	Cohesion (kg/cm²)	ϕ (Degrees)					Fine Grain Soils	Gravely Soils	Sandy Soils
0.5	3	SPT	14	24	No Plasticity			9	-	0.0	4.6	30.7	25.7	39.0		-	-	-	-	-	V.Loose	-	-	SM
1.25	-	UDS	30	104	27	77	-	167	2.52	4.3	3.1	7.5	11.7	56.4	17.0	-	-	-	-	-	-	CH	-	-
2.0	7	SPT	36	115	27	88	-	217	-	0.0	3.3	9.4	10.4	76.9		-	-	-	-	M.Stiff	-	CH	-	-
3.0	31	SPT	24	37	22	15	24.4	45	-	8.3	10.1	24.5	15.5	41.6		-	-	-	-	-	Dense	Disintegrated Rock/ Residual Soil		
4.0	57	SPT	26	45	22	23	21.6	54	-	9.6	10.5	26.4	15.9	37.7		-	-	-	-	-	V.Dense			
5.0	>100	DS	Test Not Applicable/No Plasticity							44.9	28.0	20.8	3.3	3.1		-	-	-	-	-	V.Dense	Completely to Highly Weathered Rock		
6.0	-	DS								38.3	31.9	23.8	3.6	2.4		-	-	-	-	-	V.Dense			
7.5	-	DS								70.9	13.6	13.0	1.6	0.9		-	-	-	-	-	V.Dense			
9.0	-	DS								7.2	25.8	53.3	11.9	1.8		-	-	-	-	-	V.Dense			

** END OF REPORT**

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LABORATORY TEST REPORT

GEOMARINE CONSULTANTS PVT LTD- TESTING LABORATORY

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

ULR NO.	:	TC114102400000433F	SAMPLE IDENTIFICATION NUME	:	GMC/0224/823
REPORT ISSUED TO	:	M/s URBANDO HOUSING LLP	TEST REPORT NUMBER	:	GT-2737
DISCIPLINE/GROUP	:	MECHANICAL / SOIL AND ROCK	SAMPLE RECEIPT DATE	:	12/02/2024
SAMPLE DESCRIPTION	:	CLAY AND SOIL	PERIOD OF TESTING	:	14/02/2024 to 21/02/2024
SAMPLE CONDITION	:	SATISFACTORY	REPORT ISSUE DATE	:	27/02/2024
TEST METHOD	:	BUREAU OF INDIAN STANDARDS	NO. OF PAGES	:	One

TABLE-2.5 LABORATORY CLASSIFICATION OF SOIL SAMPLES FROM BH-05

Sampling Depth (m)	"N" Value	Type of Sample	Moisture Content (%) AS PER IS 2720 (P-II) - 1973, RA-2015	LIQUID LIMIT (%) AS PER IS 2720 (P-V) - 1985, RA-2015	PLASTIC LIMIT (%) AS PER IS 2720 (P-V) - 1985, RA-2015	Plasticity Index (I_p= LL-PL)	SHRINKAGE LIMIT (%) AS PER IS 2720 (P-VI) - 1972, RA-2011	FREE SWELL INDEX (%) AS PER IS 2720 (P-XL) - 1977, RA-2011	SPECIFIC GRAVITY AS PER IS 2720 (P-III, SEC-1) - 1980, RA-2010	GRAIN SIZE ANALYSIS AS PER IS 2720 (P-IV) - 1985, RA-2015						DIRECT SHEAR TEST IS 2720 PART 13:1986 (RA 2016)		Uniformity Co-Efficient $C_U=D_{60}/D_{10}$	Co-Efficient of Curvature $C_c=D_{30}^2/(D_{10}xD_{60})$	Consistancy	Relative Density	IS-Notation		
										Gravel (%)	Coarse (%)	Medium (%)	Fine (%)	Silt (%)	Clay (%)	Cohesion (kg/cm²)	ϕ (Degrees)					Fine Grain Soils	Gravely Soils	Sandy Soils
0.5	7	SPT	Sample Failed																					
1.25	4	SPT	28	72	21	51	-	170	-	-	-	-	-	87.0	13.0	-	-	-	-	Soft	-	CH	-	-
2.0	-	UDS	38	138	31	107	-	325	2.51	6.2	2.1	12.7	14.8	47.7	16.5	-	-	-	-	-	-	CH	-	-
3.0	36	SPT	25	63	23	39	25.3	117	-	0.0	7.4	26.8	20.9	44.9		-	-	-	-	-	Dense	Disintegrated Rock/ Residual Soil		
4.0	>100	SPT	29	59	25	33	21.1	92	-	0.0	2.7	10.9	19.6	66.9		-	-	-	-	Hard	-			
5.0	>100	SPT	21	Little/No Plasticity				8.3	-	10.8	4.9	18.8	19.0	46.5		-	-	-	-	-	V.Dense			
6.0	>100	DS	Test Not Applicable/No Plasticity							73.0	18.1	6.7	2.2	0.0		-	-	-	-	-	V.Dense	Completely to Highly Weathered Rock		
7.5	-	DS								24.4	23.3	46.7	4.4	1.1		-	-	-	-	-	V.Dense			
9.0	-	DS								17.1	24.0	51.7	6.3	0.9		-	-	-	-	-	V.Dense			
10.5	-	DS								2.8	17.3	60.0	17.5	2.4		-	-	-	-	-	V.Dense			

** END OF REPORT**

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LABORATORY TEST REPORT
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NO.11 2nd MAIN ROAD, KANNAPA NAGAR EXTN,
KOTTIVAKKAM, CHENNAI

TC-11410

TABLE 2.7 RESULT OF CHEMICAL TEST ON WATER

URL NO	:TC114102400000431F	SAMPLE SOURCE	:CUSTOMER SUPPLIED
DISCIPLINE/GROUP	:CHEMICAL - WATER	SAMPLE ID	:GMC/0224/823
SAMPLE DESCRIPTION	:GROUND WATER	REPORT NUMBER	:GT-2737
SAMPLE CONDITION	:SATISFACTORY	RECEIVED DATE	:16/02/2024
TEST METHOD	:AS PER BIS	TEST PERIOD	:17/02/2024
NO. OF PAGES	:1 Of 1	ISSUE OF REPORT	:27/02/2024
REPORT ISSUED TO	:M/s URBANDO HOUSING LLP		

S.NO.	SAMPLE REFERENCE	WATER			
		DEPTH OF SAMPLE (m)	pH AS PER IS 3025 (P-XI) - 2022	SULPHATES (mg/l) AS PER APHA 23rd Edn.2017-4500	CHLORIDES (mg/l) AS PER IS 3025(P-XXXII) - 1988, RA-2019
1.0	BH-01	2.90	7.9	341.8	896.9
2.0	BH-02	1.80	8.0	387.6	1558.9
3.0	BH-03	1.60	7.9	393.1	1547.5
4.0	BH-04	2.75	7.9	292.4	490.8
5.0	BH-05	3.20	7.8	341.9	841.4

** END OF REPORT**

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A. VINOTH
(Technical Manager)

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

TC-11410

TABLE 2.8 RESULT OF CHEMICAL TEST ON SOIL

URL NO	:TC114102400000432F	SAMPLE SOURCE	:CUSTOMER SUPPLIED
DISCIPLINE/GROUP	:CHEMICAL-SOIL AND ROCK	SAMPLE ID	:GMC/0224/823
SAMPLE DESCRIPTION	:SOIL	REPORT NUMBER	:GT-2737
SAMPLE CONDITION	:SATISFACTORY	RECEIVED DATE	:16/02/2024
TEST METHOD	:AS PER BIS	TEST PERIOD	:17/02/2024
NO. OF PAGES	:1 Of 1	ISSUE OF REPORT	:27/02/2024
REPORT ISSUED TO	:M/s URBANDO HOUSING LLP		

S.NO.	SAMPLE REFERENCE	SOIL (2:1)	
		DEPTH OF SAMPLE (m)	pH AS PER IS 2720 (P-XXVI) - 1987
1.0	BH-01	2.00	7.64
2.0	BH-02	2.00	7.65
3.0	BH-03	3.00	7.72
4.0	BH-04	2.00	7.74
5.0	BH-05	4.00	7.73

** 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

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Phone No.: 044-24480305

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

TABLE 2.9 RESULT OF CHEMICAL TEST ON SOIL

		SAMPLE SOURCE	:CUSTOMER SUPPLIED
DISCIPLINE/GROUP	:CHEMICAL-SOIL AND ROCK	SAMPLE ID	:GMC/0224/823
SAMPLE DESCRIPTION	:SOIL	REPORT NUMBER	:GT-2737
SAMPLE CONDITION	:SATISFACTORY	RECEIVED DATE	:16/02/2024
TEST METHOD	:AS PER BIS	TEST PERIOD	:17/02/2024
NO. OF PAGES	:1 Of 1	ISSUE OF REPORT	:27/02/2024
REPORT ISSUED TO	:M/s URBANDO HOUSING LLP		

S.NO.	SAMPLE REFERENCE	SOIL (2:1)		
		DEPTH OF SAMPLE (m)	SULPHATES (mg/l) AS PER APHA 23rd Edn.2017-4500	CHLORIDES (mg/l) AS PER IS 3025(P-XXXII) - 1988, RA-2019
1.0	BH-01	2.00	35.9	76.6
2.0	BH-02	2.00	36.4	35.9
3.0	BH-03	3.00	33.4	32.6
4.0	BH-04	2.00	35.0	76.6
5.0	BH-05	4.00	28.6	45.7

** END OF REPORT**

Authorised Signatory
A. VINOTH
(Technical Manager)

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(3) Any correction in this reports invalidates the reports

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.

3.4 GEOLOGICAL ORDER OF THE STUDY AREA:

The stratigraphy of the study area can be classified as recent formation which is underlain by basement rock of meta-igneous origin (Hypersthene Granite/ Charnockite rock)

Deposits of Recent Age

---------- Eparchean Unconformity ----------

Archaean Basement Rock (Charnockite Rock / Hypersthene Granite)

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/m^3	Shear Parameters	
	Top BGL	Bottom BGL	Thickness							(C_u) kPa	(ϕ) Deg.
1.0	0.00	1.30	1.30	Filled Up	Grey Brown	3	Very Loose	-	13	-	20
2.0	1.30	3.00	1.70	Silty Clay	Grey	7	-	Medium Stiff	16	47	-
3.0	3.00	4.00	1.00	Residual Soil	Brown, Grey Brown	29	Medium Dense	-	19	-	36
4.0	4.00	6.60	2.60	Completely Weathered Rock	Grey Brown	>100	Very Dense	-	21	-	43
5.0	6.60	7.60	1.00	Completely Weathered Rock	Greyish Brown	CRR = 10%, RQD = 0%					
6.0	7.60	12.00	4.40	Highly Weathered Rock	Grey, Grey Brown	CRR = 21%,21% & 23%, RQD = 0%					
7.0	12.00	15.00	3.00	Moderately Weathered Rock	Grey, Grey Brown	CRR = 33% & 42%, RQD = 0% & 8%					

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	1.25	1.25	Filled Up	-	3	Very Loose	-	13	-	20
2.0	1.25	3.00	1.75	Clayey Silty Sand	Grey	15	Medium Dense	-	17.5	-	32
3.0	3.00	5.00	2.00	Residual Soil	Grey Brown	>100	Very Dense	-	21	-	43
4.0	5.00	9.00	4.00	Completely Weathered Rock	Grey	>100	Very Dense	-	21	-	43
5.0	9.00	15.00	6.00	Highly Weathered Rock	Grey, Grey Brown	CRR = 9%,0%, 5% & 10%, RQD = 0%					

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	3.00	3.00	Sandy Silty Clay	Grey	7	-	Medium Stiff	16	47	-
2.0	3.00	4.00	1.00	Clayey Silty Sand	Brown	14	Medium Dense	-	17	-	31
3.0	4.00	6.00	2.00	Residual Soil	Brown	>100	Very Dense	-	21	-	43
4.0	6.00	10.50	4.50	Completely Weathered Rock	Grey	>100	Very Dense	-	21	-	43
5.0	10.50	15.00	4.50	Highly Weathered Rock	Brown, Grey Brown	CRR = 4%,5%, & 12%, RQD = 0%					
6.0	15.00	16.50	1.50	Moderately Weathered Rock	Grey, Brown Grey	CRR = 29%, RQD = 0%					

REFERENCE BORE HOLE					BH-04	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	1.25	1.25	Silty Sand	Grey	3	Very Loose	-	13	-	20
2.0	1.25	3.00	1.75	Silty Clay	Grey, Brown Grey	7	-	Medium Stiff	16	47	-
3.0	3.00	5.00	2.00	Residual Soil	Brown	44	Dense	-	20	-	40
4.0	5.00	9.00	4.00	Completely Weathered Rock	Grey	>100	Very Dense	-	21	-	43
5.0	9.00	15.00	6.00	Highly Weathered Rock	Grey, Grey Brown	CRR = 8%,12%, 13% & 19%, RQD = 0%					

REFERENCE BORE HOLE					BH-05	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	Silty Clay	Grey, Brown Grey	6	-	Medium Stiff	15.5	40	-
2.0	3.00	4.00	1.00	Residual Soil	Brown, Off-white	36	Dense	-	19.5	-	38
3.0	4.00	6.00	2.00	Residual Soil	Brown, Grey Brown	>100	Very Dense	-	21	-	43
4.0	6.00	10.50	4.50	Completely Weathered Rock	Grey	>100	Very Dense	-	21	-	43
5.0	10.50	13.50	3.00	Highly Weathered Rock	Grey, Brown Grey	CRR = 9% & 4%, RQD = 0%					
6.0	13.50	16.50	3.00	Moderately Weathered Rock	Grey, Brown Grey	CRR = 35% & 47%, RQD = 0% & 9%					

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 stilt and eleven upper floors, and is meant for residential use. For this kind of structure, the column loads could vary between 3500 kN to 5000 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:

The sub soil in the project location consists of:

Layer-I	0.0m to 3.0m	Medium Stiff & Soft, Silty Clay (Filling of 1.0m Approx thickness using Debris & Soil)
Layer-II	3.0m to 4.0m	Medium Dense & Dense, Clayey Sand/Residual Soil
Layer-III	4.0m to 5.0m/6.0m	Very Dense, Residual Soil- Grade W5 Rock
Layer-IV	5m/6m to 6m/7.5m/9m	Very Dense, Grade W5/W4, Completely to Highly Weathered Rock
Layer-V	9.0m to 15.0m/16.5m	Highly Weathered to Moderately Weathered Rock Formation, Grade W4/W3 Rock

4.3 FOUNDATION SYSTEM:

4.3.1 OPTION-I (ISOLATED COLUMN FOOTING)

In case of shallow foundation is adopted, adopt isolated column footing located at a depth of 3.5m below the existing ground level. The isolated column footing shall be placed over a well compacted layer of Granular Sub Base (GSB)/ Hill Earth.

Table 4.1 presents the allowable net safe bearing pressure for different sizes of footings. In the present case, the overall depth of foundation excavation is 3.5m below the existing ground level.

Typical computation is presented in the Annexure-I

TABLE-4.1 RECOMMENDED ALLOWABLE SAFE BEARING PRESSURE							
S.No.	REFERENCE BOREHOLE (m)	DEPTH OF FOUNDATION EXCAVATION BELOW EGL (m)	THICKNESS OF SOIL REPLACEMENT (m)	SHAPE OF FOUNDATION	SIZE OF FOOTING (m x m)	RECOMMENDED ALLOWABLE NET SAFE BEARING PRESSURE (kPa)	ELASTIC SETTLEMENT (mm)
1.0	BH-03	3.50	0.3 - 0.6	Isolated Column Footing	1.0 x 1.0	400	1.38
					2.0 x 2.0	500	4.14
					3.0 x 3.0	600	6.22
					4.0 x 4.0	600	8.29
					5.0 x 5.0	600	10.36

NOTE:

- ***The formation experiences slushy condition in the presence of water. Hence, adopt ground water lowering system of short boreholes taken to a depth of 5.0m below the existing ground level along the periphery of the plan boundary with a spacing of 10m c/c and provide a minimum of 300mm to a maximum of 600mm Granular Sub Base (GSB)/ Hill Earth layer depending on the local variation.***
- ***Formation of slush shall not be construed as weak bearing strata and the same shall be removed before laying the GSB/ Hill Earth layer.***

4.3.2 OPTION-II (PILE FOUNDATION SYSTEM)

Alternate to shallow foundation system, pile foundation taken to a depth of 8.0m below the existing ground level can be adopted.

The piles can be installed by drilling with direct mud circulation technique *(Bored Cast Insitu Piles)* and the provisional safe load carrying capacity of bored cast insitu piles taken to a depth of 8.0m below the existing ground level in compression, tension and lateral for different diameters is worked out as per IS 2911-Part-I-Section-2 and are presented in Table-4.2.

Typical computations are presented in Annexure-I.

TABLE: - 4.2 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
1.0	BH-01 to BH-05	8.0	1.0	7.00	450	900	600	40
2.0					500	1200	700	45
3.0					600	1600	800	50
4.0					750	2100	900	65
5.0					800	2500	1000	70
6.0					900	3000	1200	80

NOTE:

In the present drilling technology do not adopt tractor mounted drill rigs. Adopt hydraulic drill rigs with minimum torque of 180 N-m.

RECOMMENDATIONS

CHAPTER-5

RECOMMENDATIONS

5.1 RECOMMENDATION FOR OPEN FOUNDATION:

- In case of isolated column footing is adopted, open foundation system is feasible.
- Adopt isolated footing over a well compacted layer of Granular Sub Base (GSB) or Hill Earth. The Thickness of the granular sub base (GSB) or hill earth shall vary between 300mm to 600mm depending on the lateral variation.
- Table 4.1 presents the recommended allowable net safe bearing pressure for different sizes of the footing.

5.2 RECOMMENDATION FOR PILE FOUNDATIONS:

- In case of shallow foundation is not feasible, pile foundation can be adopted. In the present site 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-4.2 can be adopted as provisional design loads, as the load carrying capacity of piles is not only depends upon the sub soil properties, but also depends on the care and experience of installation 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.

2.1 CONSTRUCTION METHOD STATEMENT OF PILE FOUNDATION:

- For the bored cast in situ piles, a guide casing of suitable length can be adopted
- The mud used shall be made out of sodium bentonite with minimum frees swell index of more than 300% and liquid limit more than 100%. The silt content in bentonite shall not more than 5%.

The mud was prepared using sodium bentonite with a density of 1.10 to 1.15 g/cc.

5.3 GENERAL RECOMMENDATIONS:

- The present project site falls in seismic zone-III as per IS 1893-P-I
- The excavated earth is not suitable for backfilling.
- The chlorides content in ground water is higher than the permissible limit of 500 mg/l as per IS 456 Table 1.0.
- However, the chlorides content in soil- water extract is lesser than the permissible limit of 500 mg/l as per IS 456 Table 1.0.
- The sulphate content in ground water is within the permissible limit of 400 mg/l except at one location, as per IS 456 Table 1.0. However, the sulphate content in soil-water extract is less than the permissible limit. Hence, corresponding to the sulphate content in 2:1 Water-Soil extract and ground water use Table: 4.0 of IS 456 for minimum cement content and maximum water cement ratio.

On behalf of CMDA MSB Panel the Geotechnical Investigation Report is Generally reviewed.

Superintending Engineer, P.W.D.,
Planning and Designs Circle,
Chepauk, Chennai-5.

AUTHORISED SIGNATORY

DR. C. V. PRASAD
GEOMARINE CONSULTANTS PRIVATE LIMITED

ANNEXURE-I

GEOMARINE

TYPICAL BEARING CAPACITY COMPUTATIONS FOR SHALLOW FOUNDATION

1.0 COMPUTATION OF BEARING CAPACITY AS PER IS:6403

Ref. BH-03

1.1 Geometrical Data :

Shape of the Foundation	Square
Depth of Foundation Below E.G.L"Df" (m)	2.90
Thickness of soil replacement (m)	0.60
Total Depth of Foundation (m)	3.50
Breadth"B" (m)	1.00
Length"L" (m)	1.00
L/B	1.00
Inclination of Vertical Load with the Vertical (a)	0.00
Thickness of Fill (m)	0.00

1.2 Soil Data :

Type of Effective Bearing Strata :	Clayey Sand/ Disintegrated Rock
Average SPT"N" of the bearing stratum:	57.00
Design SPT N Value of the Bearing Stratum:	30.00
Type of Shear Failure:	General
Angle of Shearing Resistance	36.00

1.3 Design Parameters:

Bulk Density of Soil above the foundation depth (γ_{bulk})	18.00
Water Table Correction Factor (w')	0.50
Effective Overburden pressure at foundation level including the thickness of fill (q)	28.00
Bearing Capacity Factors:	
N_c =	N/A
N_q =	39.48
N_g =	60.31
Shape Factors:	
S_c =	-
S_q =	1.20
S_g =	0.80
Depth Factors :	
D_c =	-
D_q =	1.05
D_g =	1.05
Inclination Factor:	
I_c =	1.00
I_q =	1.00
I_g =	1.00

1.4 Ultimate Bearing Capacity (Qu) :

Qu=q*(Nq-1)*Sq*Dq*Iq + 0.5*B*g*Ng*Sg*Dg*Ig*w' 1579.39 kPa

(g should be read as gama)

1.5 Safe Bearing Capacity (Qsafe) :

Factor of Safety (F.S.) :	2.50	
Qsafe :	632	kPa
Say Q_{safe}	**400**	**kPa**

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

The immediate elastic settlement (S_i)=	$qB(1-m^2)*I/E_s$
q= bearing pressure	400.00 kPa
Poission's Ratio (μ)	0.30
Modulus of Elasticity (E_s)(Ref. Joseph E Bowels,1996,page316,Table5.6, Japanese design standards)	
Modulus of Elasticity (E_s)	148200
Size of footing considered for maximum settlement(m)	1.00
Influence factor:	0.95
Rigidity Factor:	0.80
Depth Factor:	0.74
Elastic Settlement (DH_i)	1.38 mm
	<50mm

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

Type of Pile	Bored	Diameter of Pile			Length of Pile From Natural Ground Level (m)	8.0	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 Below N.G.L	Bottom Below N.G.L	Thickness	Type of Strata	Ave. SPT	(γ) kN/m³ of Layer	(γ) kN/m³ Ave. upto Layer	Shear Parameters (C_u) kPa	Shear Parameters (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	1.0	1.0	Cut-Off Level													
2.0	1.0	3.0	2.0	Silty Clay	7	16.0	16.0	47	-	0.0	12.0	6.0	0.9	-	qf	2	132.9
3.0	3.0	4.0	1.0	Clayey Sand	14	17.0	16.5	-	31	12.0	19.0	15.5	-	1.1	qf	3	15.6

Summation of Positive Skin Resitance (kN)	Q_f=	148.53
Summation of Negative Skin Resistance (kN)	-Qf=	0.00
Safe Positive Skin Friction for Vertical Load Load Carrying Capacity (kN) (Q_f/2.5)	Q_{sf}=	59.41
Safe Positive Skin Friction for Pull Out Capacity (kN) (Q_f/3)	Q_{spf}=	49.51

COMPUTATION OF ROCK SOCKET CAPACITY, IS 2911 (PART 1/SEC 2):2010, ANNEX-B, B-8

Type of Strata:	Disintegrated Rock
Diameter of the Pile (D):	0.50 m
Shear Strength of Rock in the Socketed Length (Grade-F, Ref Figure-3, Page No. 13, IS 2911/1/2-2010) (Cu_2):"N" Value=50	300 kPa
(Recommended Value as per IS 2911 (Part 1/Sec 2), Annex-B, B-8), α:	0.90 "
Socket Length into the rock (L):	2.00
Factor of Safety, as per IS 2911 (Part 1/Sec 2), Annex B-8 (F_s):	3.00
Safe Socketing Capacity (QSoc= $Cu_2\alpha\pi DL/Fs$):	283 kN
Type of Strata:	Completely/Highly Weathered Rock
Diameter of the Pile (D):	0.50 m
Shear Strength of Rock in the Socketed Length (Grade-D, Ref Figure-3, Page No. 13, IS 2911/1/2-2010) (Cu_2):"N" Value=100 (Adopted Grade-E for the Design)	700 kPa
(Recommended Value as per IS 2911 (Part 1/Sec 2), Annex-B, B-8), α:	0.90 "
Socket Length into the rock (L):	2.00
Factor of Safety, as per IS 2911 (Part 1/Sec 2), Annex B-8 (F_s):	3.00
Safe Socketing Capacity (QSoc= $Cu_2\alpha\pi DL/Fs$):	660 kN

COMPUTATION OF END BEARING RESISTANCE, IS 2911 (PART 1/SEC 2):2010, ANNEX-B, B-8

Type of Strata:	Completely/Highly Weathered Rock
Diameter of the Pile (D):	0.50 m
Shear Strength of Rock below Pile Base (Grade-D, Ref Figure-3, Page No. 13, IS 2911/1/2-2010) (Cu1):"N" Value=80 (Adopted Grade-E for the Design)	700 kPa
Bearing Capacity Factor (Nc), Ref B-8, Page No.13, IS 2911/1/2-2010:	9.00 "
Cross Sectional Area of Pile Toe (A_p):	0.20
Factor of Safety, as per IS 2911 (Part 1/Sec 2), Annex B-8 (F_s):	3.00
Safe End Bearing Capacity ($Q_{End}=C_{u1}N_cA_p/F_s$):	412 kN
Self Weight of Pile (P_{SW}):	23.86 kN
Allowable Vertical Load Carrying Capacity (Q_{AV}):	**1414 kN**
Allowable Pull Out Capacity (Q_{AP}):	**1016 kN**

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=Effecitve Overburden Pressure at middle of Layer
N_q=Bearing Capacity Factor, Ref. Fig.1 of IS: Code Referred above
d=Dia. Of Pile
α=Adhesion Factor
T_i=Thickness of Layer

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

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LATERAL LOAD CARRYING CAPACITY OF BORED CAST- SITU PILES

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)	:	13.0	m
Cut-Off Level From E.G.L	:	1.0	
Length of Pile below Cut-Off Level (Le)	:	12.0	m
Grade of Concrete (M)	:	30	MN/m^2
Young's Modulus of Concrete (E)	:	27386128	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	:	7	
K=((k1/1.5)*(0.3/B))			
(n can be read as h in the above and below equation in case of Sand)			
K1=	:	18000	kN/m^3
K=	:	7200	kN/m^4
R=	:	2.20	m
L1/R	:	0.00	
Lf/R	:	2.20	
Depth of Fixity below Cut off (z_f)	:	4.84	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	:	45	kN
Recommended Design Lateral Load carrying Capacity	:	**45**	**kN**
Fixed End Moment, $M_F=H(e+z_f)/2$		108	
Reduction Factor (L_1/T)	:	0.67	m
Actual Moment (Fixed End Moment/Reduction Factor), M_F		**72**	kN-m

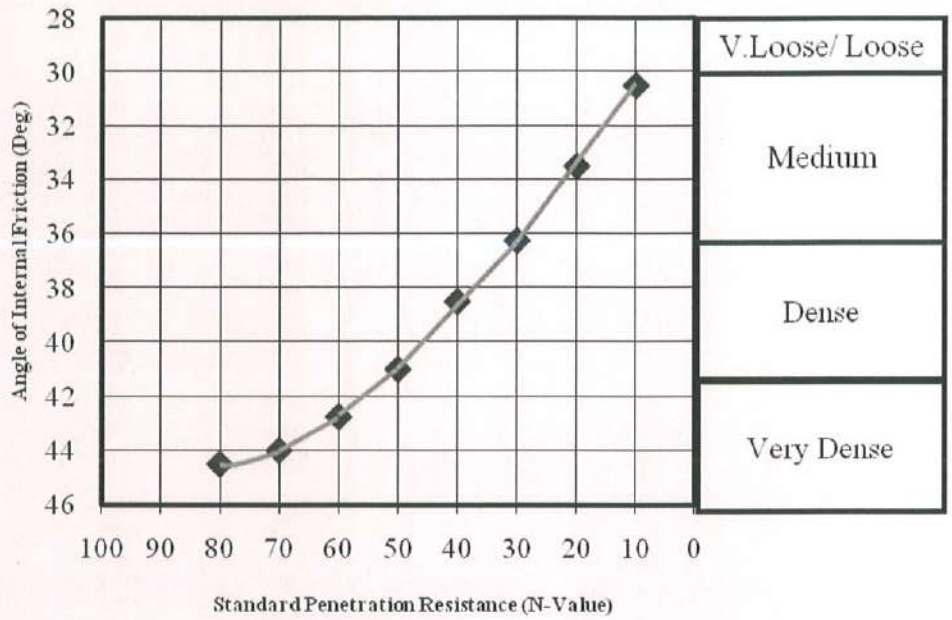


FIG. A1 Relation Ship between Angle of Internal Friction & N-value (Reproduced from IS:6403-1981)

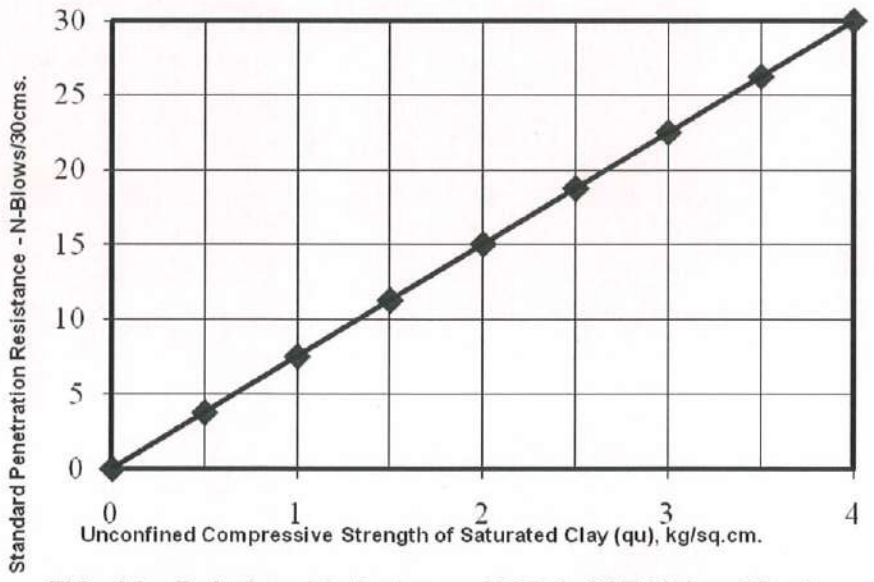


FIG. A2 : Relationship between UCC & SPT-Value (N) of Saturated Clay (AfterTerzhagi & Peck, 1948)

ANNEXURE-II

CONSOLIDATION TEST GRAPH

GEOMARINE
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Phone No.: 044-24480305

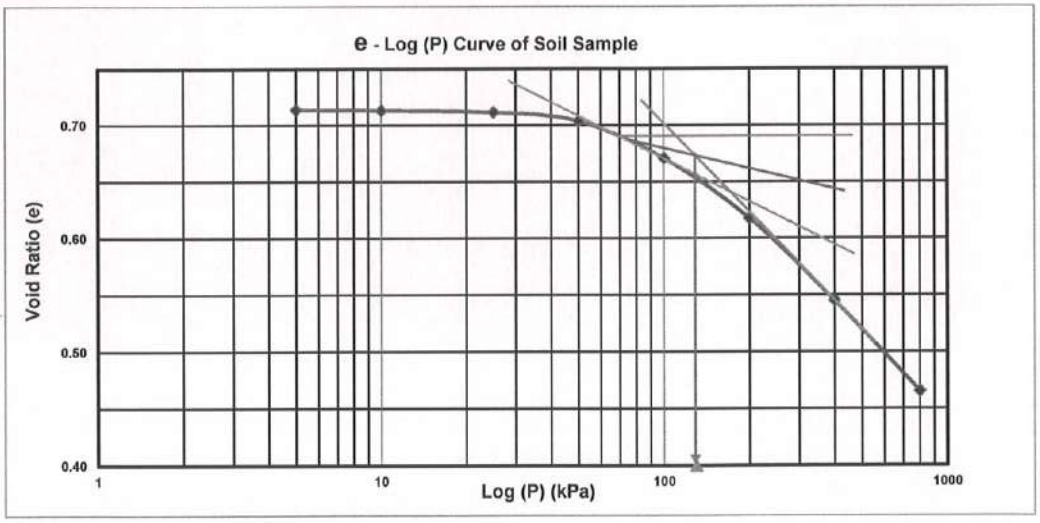
LABORATORY TEST REPORT
GEOMARINE CONSULTANTS PVT LTD- GEOTECHNICAL LABORATORY
NO.11 2nd MAIN ROAD, KANNAPA NAGAR EXTN,
KOTTIVAKKAM, CHENNAI

TC-11410

CONSOLIDATION TEST AS PER IS 2720-Part-15 : 1965 (RA 2021)

ULR NO	:	TC114102400000433F	SAMPLE SOURCE	:	CUSTOMER SUPPLIED
REPORT ISSUED TO	:	M/s URBANDO HOUSING LLP	SAMPLE IDENTIFICATION NUMBER	:	GMC/0224/823
DISCIPLINE/GROUP	:	MECHANICAL/SOIL AND ROCK	TEST REPORT NUMBER	:	GT-2737
SAMPLE DESCRIPTION	:	SOIL	SAMPLE RECEIPT DATE	:	12/02/2024
SAMPLE CONDITION	:	SATISFACTORY	PERIOD OF TESTING	:	14/02/2024 to 22/02/2024
TEST METHOD	:	BUREAU OF INDIAN STANDARDS	REPORT ISSUE DATE	:	27/02/2024
BORE HOLE NUMBER	:	BH-01	NO. OF PAGES	:	ONE
DEPTH OF SAMPLE,m	:	3.00			

BEFORE TEST		AFTER TEST	
Diameter of consolidation ring, mm	60	Mass of the consolidation ring + Sample, g	239.72
Height of consolidation ring, mm	20	Mass of sample, g	104.28
Mass of consolidation ring, g	135.44	Dry Mass, g	82.79
Mass of consolidation ring + sample, g	242.23	Specific Gravity	2.51
Mass of sample, g	106.79	Height of Solids, mm	11.67
Bulk Unit weight, kN/m3	18.5	Dry Unit Weight, kN/m3	14.7
INITIAL MOISTURE CONTENT OF SAMPLE		**FINAL MOISTURE CONTENT OF SAMPLE**	
Can No	A1	Can No	A1
Mass of can, g	7.32	Mass of can, g	44.1
Can + Wet mass, g	22.53	Can + Wet mass, g	148.47
Can + Dry mass, g	19.22	Can + Dry mass, g	126.89
Initial Moisture Content, %	27.8	Initial Moisture Content, %	26.07



Results :

Natural Moisture Content	28
Initial Void Ratio	0.714
Pre Consolidation Pressure	130
Compression Index	0.265

** END OF REPORT**

Authorised Signatory

A. VINOTH
(Technical Manager)

Terms and Conditions

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(3) Any correction in this reports invalidates the reports

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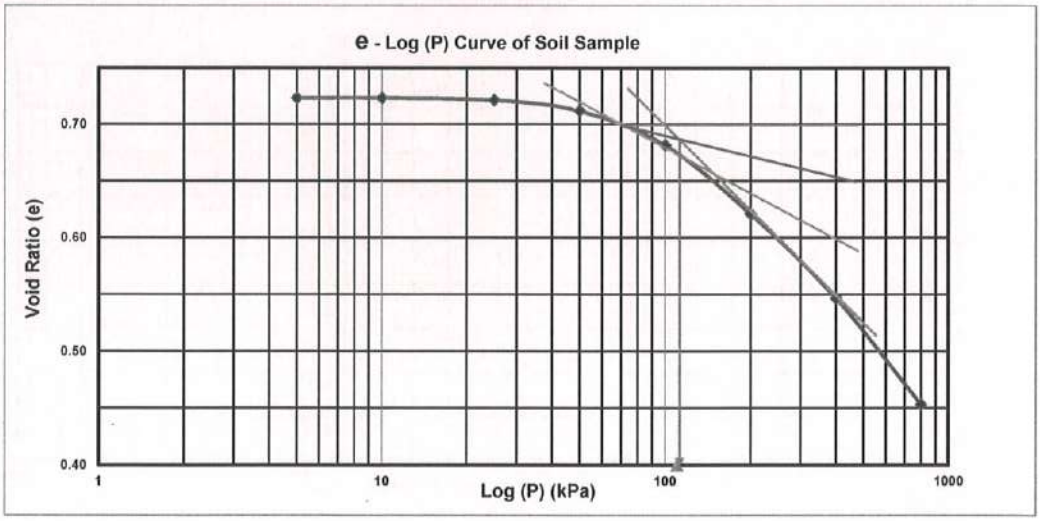
LABORATORY TEST REPORT
GEOMARINE CONSULTANTS PVT LTD- GEOTECHNICAL LABORATORY
NO.11 2nd MAIN ROAD, KANNAPA NAGAR EXTN,
KOTTIVAKKAM, CHENNAI

TC-11410

CONSOLIDATION TEST AS PER IS 2720-Part-15 : 1965 (RA 2021)

ULR NO	:	TC114102400000433F	SAMPLE SOURCE	:	CUSTOMER SUPPLIED
REPORT ISSUED TO	:	M/s URBANDO HOUSING LLP	SAMPLE IDENTIFICATION NUMBER	:	GMC/0224/823
DISCIPLINE/GROUP	:	MECHANICAL/SOIL AND ROCK	TEST REPORT NUMBER	:	GT-2737
SAMPLE DESCRIPTION	:	SOIL	SAMPLE RECEIPT DATE	:	16/02/2024
SAMPLE CONDITION	:	SATISFACTORY	PERIOD OF TESTING	:	19/02/2024 to 27/02/2024
TEST METHOD	:	BUREAU OF INDIAN STANDARDS	REPORT ISSUE DATE	:	27/02/2024
BORE HOLE NUMBER	:	BH-03	NO. OF PAGES	:	ONE
DEPTH OF SAMPLE,m	:	3.00			

BEFORE TEST		AFTER TEST	
Diameter of consolidation ring, mm	60	Mass of the consolidation ring + Sample, g	282.21
Height of consolidation ring, mm	20	Mass of sample, g	147.37
Mass of consolidation ring, g	134.84	Dry Mass, g	82.65
Mass of consolidation ring + sample, g	241.29	Specific Gravity	2.52
Mass of sample, g	106.45	Height of Solids, mm	11.61
Bulk Unit weight, kN/m3	18.5	Dry Unit Weight, kN/m3	14.5
INITIAL MOISTURE CONTENT OF SAMPLE		**FINAL MOISTURE CONTENT OF SAMPLE**	
Can No	A1	Can No	A1
Mass of can, g	7.12	Mass of can, g	40.88
Can + Wet mass, g	30.43	Can + Wet mass, g	146.31
Can + Dry mass, g	27.18	Can + Dry mass, g	123.53
Initial Moisture Content, %	16.2	Initial Moisture Content, %	27.56



Results :

Natural Moisture Content	16
Initial Void Ratio	0.723
Pre Consolidation Pressure	110
Compression Index	0.311

** END OF REPORT**

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(Technical Manager)

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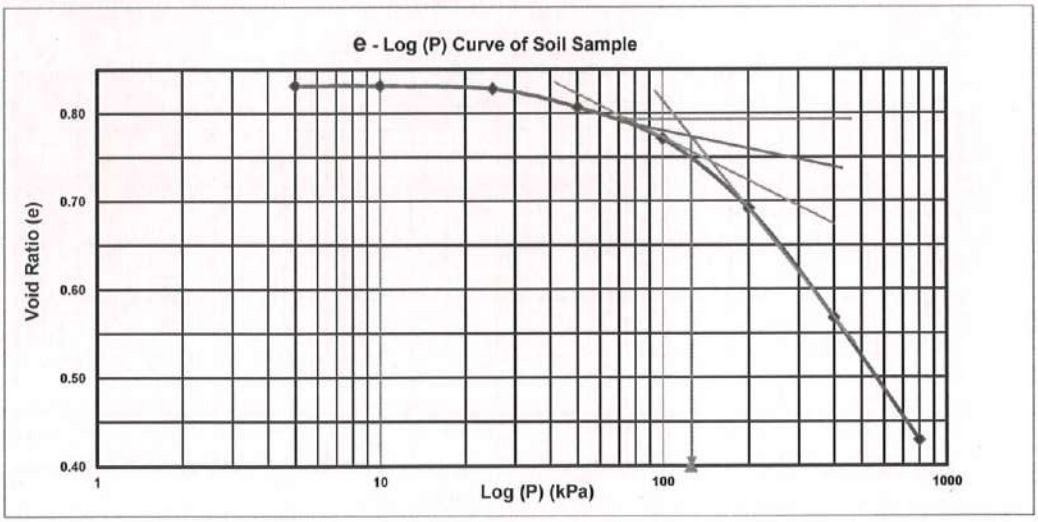
LABORATORY TEST REPORT
GEOMARINE CONSULTANTS PVT LTD- GEOTECHNICAL LABORATORY
NO.11 2nd MAIN ROAD, KANNAPA NAGAR EXTN,
KOTTIVAKKAM, CHENNAI

TC-11410

CONSOLIDATION TEST AS PER IS 2720-Part-15 : 1965 (RA 2021)

ULR NO	:	TC114102400000433F	SAMPLE SOURCE	:	CUSTOMER SUPPLIED
REPORT ISSUED TO	:	M/s URBANDO HOUSING LLP	SAMPLE IDENTIFICATION NUMBER	:	GMC/0224/823
DISCIPLINE/GROUP	:	MECHANICAL/SOIL AND ROCK	TEST REPORT NUMBER	:	GT-2737
SAMPLE DESCRIPTION	:	SOIL	SAMPLE RECEIPT DATE	:	12/02/2024
SAMPLE CONDITION	:	SATISFACTORY	PERIOD OF TESTING	:	14/02/2024 to 22/02/2024
TEST METHOD	:	BUREAU OF INDIAN STANDARDS	REPORT ISSUE DATE	:	27/02/2024
BORE HOLE NUMBER	:	BH-04	NO. OF PAGES	:	ONE
DEPTH OF SAMPLE,m	:	1.25			

BEFORE TEST		AFTER TEST	
Diameter of consolidation ring, mm	60	Mass of the consolidation ring + Sample, g	233.26
Height of consolidation ring, mm	20	Mass of sample, g	95.1
Mass of consolidation ring, g	138.16	Dry Mass, g	77.77
Mass of consolidation ring + sample, g	242.86	Specific Gravity	2.52
Mass of sample, g	104.7	Height of Solids, mm	10.92
Bulk Unit weight, kN/m3	18.2	Dry Unit Weight, kN/m3	14.8
INITIAL MOISTURE CONTENT OF SAMPLE		**FINAL MOISTURE CONTENT OF SAMPLE**	
Can No	A1	Can No	A1
Mass of can, g	6.76	Mass of can, g	42.14
Can + Wet mass, g	21.17	Can + Wet mass, g	137.54
Can + Dry mass, g	17.18	Can + Dry mass, g	119.91
Initial Moisture Content, %	38.3	Initial Moisture Content, %	22.67



Results :

Natural Moisture Content	38
Initial Void Ratio	0.831
Pre Consolidation Pressure	125
Compression Index	0.459

** END OF REPORT**

Authorised Signatory

A. VINOTH
(Technical Manager)

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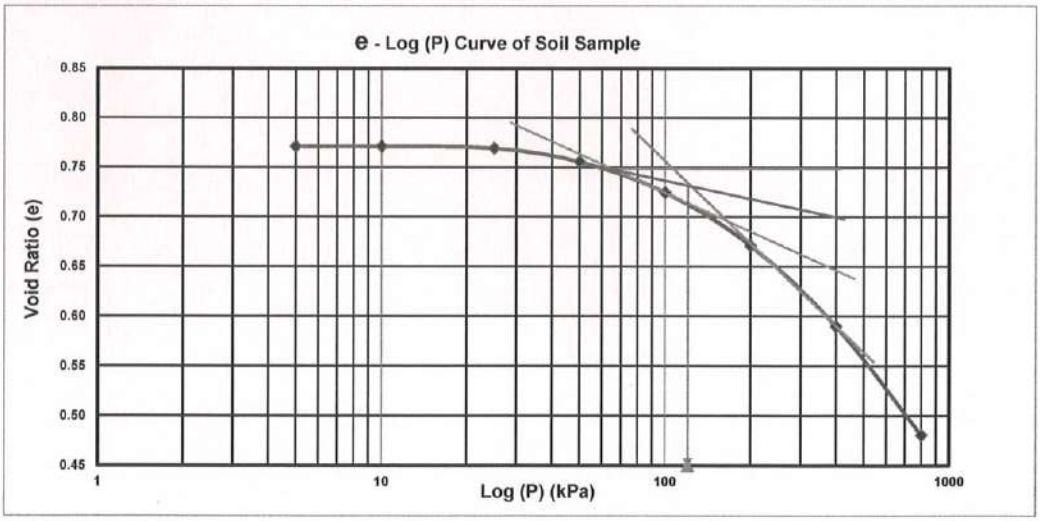
LABORATORY TEST REPORT
GEOMARINE CONSULTANTS PVT LTD- GEOTECHNICAL LABORATORY
NO.11 2nd MAIN ROAD, KANNAPA NAGAR EXTN,
KOTTIVAKKAM, CHENNAI

TC-11410

CONSOLIDATION TEST AS PER IS 2720-Part-15 : 1965 (RA 2021)

ULR NO	:	TC114102400000433F	SAMPLE SOURCE	:	CUSTOMER SUPPLIED
REPORT ISSUED TO	:	M/s URBANDO HOUSING LLP	SAMPLE IDENTIFICATION NUMBER	:	GMC/0224/823
DISCIPLINE/GROUP	:	MECHANICAL/SOIL AND ROCK	TEST REPORT NUMBER	:	GT-2737
SAMPLE DESCRIPTION	:	SOIL	SAMPLE RECEIPT DATE	:	12/02/2024
SAMPLE CONDITION	:	SATISFACTORY	PERIOD OF TESTING	:	14/02/2024 to 22/02/2024
TEST METHOD	:	BUREAU OF INDIAN STANDARDS	REPORT ISSUE DATE	:	27/02/2024
BORE HOLE NUMBER	:	BH-05	NO. OF PAGES	:	ONE
DEPTH OF SAMPLE,m	:	2.00			

BEFORE TEST		AFTER TEST	
Diameter of consolidation ring, mm	60	Mass of the consolidation ring + Sample, g	235.73
Height of consolidation ring, mm	20	Mass of sample, g	101.13
Mass of consolidation ring, g	134.6	Dry Mass, g	80.11
Mass of consolidation ring + sample, g	239.2	Specific Gravity	2.51
Mass of sample, g	104.6	Height of Solids, mm	11.29
Bulk Unit weight, kN/m3	18.2	Dry Unit Weight, kN/m3	14.3
INITIAL MOISTURE CONTENT OF SAMPLE		**FINAL MOISTURE CONTENT OF SAMPLE**	
Can No	A1	Can No	A1
Mass of can, g	6.22	Mass of can, g	43.99
Can + Wet mass, g	28.04	Can + Wet mass, g	145.52
Can + Dry mass, g	21.99	Can + Dry mass, g	124.1
Initial Moisture Content, %	38.4	Initial Moisture Content, %	26.74



Results :

Natural Moisture Content	38
Initial Void Ratio	0.771
Pre Consolidation Pressure	120
Compression Index	0.362

** END OF REPORT**

Authorised Signatory

A. VINOTH
(Technical Manager)

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ANNEXURE-III

GEOMARINE
THE SPIRIT OF ENGINEERING

SITE INVESTIGATION RECORD

BORE HOLE No. BH-01
PAGE No. 01
DIA OF BORE HOLE 150mm → 100mm

PROJECT NAME: URBANDO
LOCATION: Perumbakkam | MACHINE No.: CR-02 | CHAINAGE (m):
STRUCTURE: | DRILLING METHOD: Rotary | CO-ORDINATES: N
JOB CODE: | FLUSHING MEDIUM: Bentonite | E

BORE START DATE: 10/02/2024
BORE END DATE: 12/02/2024
TOTAL DRILLING DAYS: 02

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	10/02	9	27	SC			0	1	2	3	0.50 mts	01	SS		Soft, Greyish, Sandy clay with filled up material.
		9	27												
	10/02	9	39	SC			—	—	—	20	1.25 mts	02	UDS		UNDISTURBED SAMPLE
		9	40												
2	10/02	9	58	SC			2	3	4	7	2.00 mts	03	SS		Medium stiff, Greyish, Sandy silty clay.
		10	00												
3	10/02	10	14	SC			10	12	17	29	3.00 mts	04	SS		Medium dense, Brownish, residual soil with rock Particles.
		10	15												
4	10/02	10	31	SC			12	23	10cm / 40blks	N>100	4.00 mts	05	SS		Very dense, Greyish Brown, residual soil with rock particles.
		10	33												
5	10/02	10	48	SC			40	34	3cm / 3blks	N>100	5.00 mts	06	SS		Very dense, Brownish, residual soil with rock particles
		10	50												
6	10/02	11	07	SC			Hammer rebound			N>100	6.00 mts	07	WS		Very weak, Brownish, Highly to Completely weathered rock.
		11	09												
7															
8	10/02	11	24	DB	10	0					7.50 mts	08	CS		Weak to moderately strong Brownish, partially weathered rock.
		12	32												
9	10/02	13	12	DB	21	0					9.00 mts	09	CS		moderately weak to Strong Brownish greyish, partially fractured rock.
		14	35												
0															

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

SUPERVISOR NAME
SIGNATURE
DATE
CLIENT IN-CHARGE

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

GEOMARINE
THE SPIRIT OF ENGINEERING

SITE INVESTIGATION RECORD

BORE HOLE No. 01
PAGE No. 2

PROJECT NAME	URBANDO					DIA OF BORE HOLE	150mm / 100mm
LOCATION	Perumbakkam	MACHINE No.	CR-02	CHAINAGE (m)		BORE START DATE	10/02/2024
STRUCTURE		DRILLING METHOD	Rotary	CO-ORDINATES	N	BORE END DATE	12/02/2024
JOB CODE		FLUSHING MEDIUM	Bentonite		E	TOTAL DRILLING DAYS	02

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	10/02	14	52	DB	21	0					10.50 mts	10	CS		moderately strong to strong Brownish grey, Partially weathered rock.
		15	27												
2	10/02	15	45	DB	23	0					12.00 mts	11	CS		Weak to moderately strong, Greyish brown, Partially weathered rock.
		16	17												
3															
4	12/02	09	18	DB	33	0					13.50 mts	12	CS		Moderately strong to strong, Brownish grey, Partially weathered Hard rock.
		11	02												
5	12/02	11	32	DB	42	8					15.00 mts	13	CS		Strong to very strong, Brownish grey, partially weathered hard rock.
		12	48												
6															Bore hole terminated at 15.00 mts
7															
8															
9															
0															

CS - Core Sample	DS - Disturbed Sample	SUPERVISOR NAME	Susi	PROJECT SITE DETAILS	
SS - Split Spoon Sample	SC - Soil Cutter	SIGNATURE	Susi	GROUND LEVEL (m)	
UDS-Undisturbed Sample	TCB - Tungsten Carbide Bit	DATE	12/02/2024	WATER TABLE (m)	
WS - Wash Sample	DB - Diamond Bit	CLIENT IN-CHARGE		CASING DEPTH (m)	

GEOMARINE
THE SPIRIT OF ENGINEERING

SITE INVESTIGATION RECORD

BORE HOLE No. 02
PAGE No. 01
DIA OF BORE HOLE 150mm ~ / 100mm

PROJECT NAME	URBANDO					BORE START DATE	14/02/2024
LOCATION	Perumbakkam	MACHINE No.	CR-08	CHAINAGE (m)		BORE END DATE	15/02/2024
STRUCTURE		DRILLING METHOD	Rotary	CO-ORDINATES	N	TOTAL DRILLING DAYS	2
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
0	14/02	11	02	SC			1	1	2	3	0.50 mts	01	SS		Soft, Greyish, Sandy clay with filling materials.
1		11	02												
	14/02	11	21	SC			-	-	-	19	1.025 mts	02	UDS		UNDISTURBED SAMPLE
		11	22												
2	14/02	12	01	SC			4	6	9	15	2.00 mts	03	SS		Stiff, Greyish, Sandy clay with rock particles.
		12	02												
3	14/02	12	17	SC			24	11cm / 40blks		N>100	3.00 mts	04	SS		Very dense, Brownish, Sand with ~~rock~~ weathered rock.
		12	20												
4	14/02	12	40	SC			9cm / 50blk			N>100	4.00 mts	05	SS		very dense, Brownish, Highly weathered rock.
		12	43												
5	14/02	13	09	SC			Hammer Rebound			N>100	5.00 mts	06	WS		very dense, Brownish, Highly weathered rock.
		14	00												
6	14/02	14	22	DB	0	0					6.00 mts	07	WS	W	Weak, Brownish, Highly weathered rock.
		15	18												
7															
8	14/02	15	34	DB	0	0					7.50 mts	08	WS		very weak, Brownish, Highly weathered rock.
		16	39												
9															
	14/02	16	53	DB	0	0					9.00 mts	09	WS		very weak, Brownish, Highly to Completely weathered rock.
0		17	50												

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: Sasi
SIGNATURE:
DATE: 14/02/2024
CLIENT IN-CHARGE:

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

GEOMARINE
THE SPIRIT OF ENGINEERING

SITE INVESTIGATION RECORD

BORE HOLE No.	02
PAGE No.	2
DIA OF BORE HOLE	150mm ✓ / 100mm
BORE START DATE	14/02/2024
BORE END DATE	15/02/2024
TOTAL DRILLING DAYS	2

PROJECT NAME	URBANDO						
LOCATION	PERUMBAKKAM	MACHINE No.	CR-08	CHAINAGE (m)			
STRUCTURE		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	15/02/2024	9	38	DB	9%	0%					10.50	10	CS		Weak, Brownish and greyish, Highly weathered Rock
		10	19												
2		10	45	DB	0%	0%					12.00	11	WS		Brownish, Completely weathered Rock
		11	20												
3		11	34	DB	5%	0%					13.50	12	CS		Weak, Greyish Mix Brownish Highly weathered Rock.
		12	29												
4															
5		12	44	DB	10%	0%					15.00	13	CS		weak, Greyish Mix Brownish Highly weathered Rock.
		1	39												
6															
					Bore Terminate at 15.00 m depth.										
7															
8															
9															
0															

CS - Core Sample	DS - Disturbed Sample	SUPERVISOR NAME	R. Kuppalakannan	PROJECT SITE DETAILS	
SS - Split Spoon Sample	SC - Soil Cutter	SIGNATURE	R. G	GROUND LEVEL (m)	
UDS-Undisturbed Sample	TCB - Tungsten Carbide Bit	DATE	15/02/2024	WATER TABLE (m)	
WS - Wash Sample	DB - Diamond Bit	CLIENT IN-CHARGE		CASING DEPTH (m)	

GEOMARINE
THE SPIRIT OF ENGINEERING

SITE INVESTIGATION RECORD

BORE HOLE No.	03
PAGE No.	01
DIA OF BORE HOLE	150mm / 100mm — 1
BORE START DATE	12/02/2024
BORE END DATE	14/02/2024
TOTAL DRILLING DAYS	03

PROJECT NAME	URBANDO						
LOCATION	PERUMBAKKAM	MACHINE No.	CR-02	CHAINAGE (m)			
STRUCTURE		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	15-30	30-45	SPT 'N' Value	Sample Details: Depth	No.	Type	Layer Data: Depth (m)	Geotechnical Description
0	12/02	12	52	SC											
		12	52				1	3	3	6	0.50 mts	01	SS		Medium stiff, Greyish, Sandy clay.
1	12/02	13	02	SC											
		13	03				2	3	4	(7)	1.25 mts	02	SS		Medium stiff, Greyish, Sandy clay.
2	12/02	14	12	SC									UDS		
		14	15				-	-	-	35	2.00 mts	03	SS		UNDISTURBED SAMPLE
3	12/02	14	26	SC											
		14	27				5	5	9	14	3.00 mts	04	SS		Medium dense, Brownish, Sand with rock particles
4	12/02	14	43	SC			12cm								
		14	45				40blc			N>100	4.00 mts	05	SS		Very dense, Brownish, Sand with rock particles.
5	12/02	15	02	SC			10cm								
		15	04				40blc			N>100	5.00 mts	06	WS		very weak, Brownish, Highly to Completely weathered rock.
6	12/02	15	17	SC			HAMMER								
		15	19				REBOUND			N>100	6.00 mts	07	WS		very weak, Brownish, Highly to Completely weathered rock.
7															
8	12/02	15	34	DB	0	0					7.50 mts	08	WS		very weak, Brownish, Highly to completely weathered rock.
		16	18												
9	12/02	16	39	DB	0	0									
		17	12								9.00 mts	09	WS		Very weak, Brownish, Highly to completely weathered rock.
0															

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

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

GEOMARINE
THE SPIRIT OF ENGINEERING

SITE INVESTIGATION RECORD

BORE HOLE No.	03
PAGE No.	02
DIA OF BORE HOLE	150mm / 100mm
BORE START DATE	12/02/2024
BORE END DATE	14/02/2024
TOTAL DRILLING DAYS	03

PROJECT NAME	URBANDO						
LOCATION	PERUMBAKKAM	MACHINE No.	CR-02	CHAINAGE (m)			
STRUCTURE		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	12/02	17	21	DB	0	0					10.50 mts	10	WS		Very weak, Brownish, Highly to completely weathered rock.
		18	18												
2	13/02	15	32	DB	4	0					12.00 mts	11	CS		Weak, Brownish, Highly weathered rock.
		16	23												
3	13/02	16	52	DB	5	0					13.50 mts	12	CS		Weak, Brownish, Highly weathered rock.
4		17	49												
5	14/02	08	50	DB	12	0					15.00 mts	13	CS		Weak to moderately strong, slightly weathered rock.
		09	47												
6															
7	14/02	10	23	DB	29	0					16.50 mts	14	CS		Moderately strong to strong, Brownish Grey, Slightly weathered Hard rock.
		11	38												
8															
				BORE HOLE TERMINATED AT											16.50 mts
9															
0															

CS - Core Sample	DS - Disturbed Sample	SUPERVISOR NAME	SUST L	PROJECT SITE DETAILS	
SS - Split Spoon Sample	SC - Soil Cutter	SIGNATURE	SUST L	GROUND LEVEL (m)	
UDS-Undisturbed Sample	TCB - Tungsten Carbide Bit	DATE	14/02/2024	WATER TABLE (m)	
WS - Wash Sample	DB - Diamond Bit	CLIENT IN-CHARGE		CASING DEPTH (m)	

GEOMARINE
THE SPIRIT OF ENGINEERING

SITE INVESTIGATION RECORD

BORE HOLE No.	04
PAGE No.	01
DIA OF BORE HOLE	150mm / 100mm
BORE START DATE	12/02/2024
BORE END DATE	13/02/2024
TOTAL DRILLING DAYS	02

PROJECT NAME	URBANDO						
LOCATION	PERUMBAKKAM	MACHINE No.	CR-08	CHAINAGE (m)			
STRUCTURE		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	12/02	09	25	SC			0	1	2	3	0.50 mts	01	SS		Greyish, Soft, Sandy clay.
		09	25												
	12/02	11	00	SC			–	–	–	19	1.25 mts	02	UDS		UNDISTURBED SAMPLE
		11	03												
2	12/02	11	14	SC			2	3	4	7	2.00 mts	03	SS		Medium stiff, Greyish, Sandy Silty Clay.
		11	14												
3	12/02	11	25	SC			8	12	19	31	3.00 mts	04	SS		Brownish, Dense, Highly weathered rock mixed with clay.
		11	26												
4	12/02	11	38	SC			13	21	36	57	4.00 mts	05	SS		Very dense, Brownish, Highly weathered rock.
		11	39												
5	12/02	12	02	SC			Hammer rebound			N>100	5.00 mts	06	WS		Very dense, Brownish, Highly to Completely weathered rock.
		12	05												
6	12/02	12	24	DB	0	0					6.00 mts	07	WS		Very weak, Brownish, Highly to Completely weathered rock.
		12	58												
7	12/02	14	12	DB	0	0					7.50 mts	08	WS		Very weak, Brownish, Highly to Completely weathered rock.
8		15	23												
9	12/02	15	48	DB	0	0					9.00 mts	09	WS		Very weak, Brownish, Highly to Completely weathered rock.
		16	57												
0															

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

GEOMARINE
THE SPIRIT OF ENGINEERING

SITE INVESTIGATION RECORD

BORE HOLE No.	04
PAGE No.	02
DIA OF BORE HOLE	150mm ✓ / 100mm
BORE START DATE	12/02/2024
BORE END DATE	13/02/2024
TOTAL DRILLING DAYS	02

PROJECT NAME	URBANDO						
LOCATION	PERUMBAKKAM	MACHINE No.	CR-08	CHAINAGE (m)			
STRUCTURE		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	12/02	17	28	DB	8	0					10.50 mts	10	CS		very weak, Brownish, Highly weathered rock.
		18	41												
2	13/02	09	32	DB	12	0					12.00 mts	11	CS		Weak, Brownish, Highly weathered rock.
		10	52												
3															
4	13/02	11	38	DB	13	0					13.50 mts	12	CS		Weak, Whitish brown, Highly weathered rock.
		12	52												
5	13/02	13	12	DB	19	0					15.00 mts	13	CS		Weak to strong, Brownish grey, partially weathered hard rock.
		15	21												
6															
7															
8															Bore hole terminated at 15.00mts
9															
0															

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

GEOMARINE
THE SPIRIT OF ENGINEERING

SITE INVESTIGATION RECORD

BORE HOLE No.	05
PAGE No.	01
DIA OF BORE HOLE	150mm ✓ / 100mm
BORE START DATE	09/02/2024
BORE END DATE	10/02/2024
TOTAL DRILLING DAYS	02

PROJECT NAME	URBANDO						
LOCATION	PERUMBAKKAM	MACHINE No.	CR-08	CHAINAGE (m)			
STRUCTURE		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
0	09/02	10	58	SC			2	3	4	7	0.50 mts	01	SS		SAMPLE SLIPPED
		10	58												
1	09/02	11	10	SC			1	1	3	4	1.25 mts	02	SS		Soft, Greyish, Sandy silty clay.
		11	10												
2	09/02	11	27	SC			–	–	–	25	2.00 mts	03	UDS		UNDISTURBED SAMPLE
		11	29												
3	09/02	11	43	SC			10	15	21	36	3.00 mts	04	SS		Dense, whitish brown, Sand with gravels
		11	44												
4	09/02	12	00	SC			19	13cm / 40blows	–	N>100	4.00 mts	05	SS		Very dense, Brownish, clay and residual soil.
		12	03												
5	09/02	12	20	SC			15cm / 50blows	–	–	N>100	5.00 mts	06	SS		Very dense, Greyish brown, residual soil mixed with clay and rock particles.
		12	23												
6	09/02	12	34	SC			Hammer rebound			N>100	6.00 mts	07	US		Very dense, Brownish, Highly to completely weathered rock.
		12	36												
7	09/02	13	09	DB	0	0					7.50 mts	08	WS		Very weak, Brownish, Highly to completely weathered rock.
		13	40												
8	09/02	14	52	DB	0	0					9.00 mts	09	WS		Very weak, Brownish, Highly to completely weathered rock.
		15	30												
9	09/02	16	04	DB	0	0					10.50 mts	10	WS		Weak, Brownish grey, Highly weathered rock.
		17	12												
10															

CS - Core Sample	DS - Disturbed Sample	SUPERVISOR NAME	Susil	PROJECT SITE DETAILS	
SS - Split Spoon Sample	SC - Soil Cutter	SIGNATURE	Susil	GROUND LEVEL (m)	
UDS - Undisturbed Sample	TCB - Tungsten Carbide Bit	DATE	09/02/2024	WATER TABLE (m)	
WS - Wash Sample	DB - Diamond Bit	CLIENT IN-CHARGE		CASING DEPTH (m)	

GEOMARINE
THE SPIRIT OF ENGINEERING

SITE INVESTIGATION RECORD

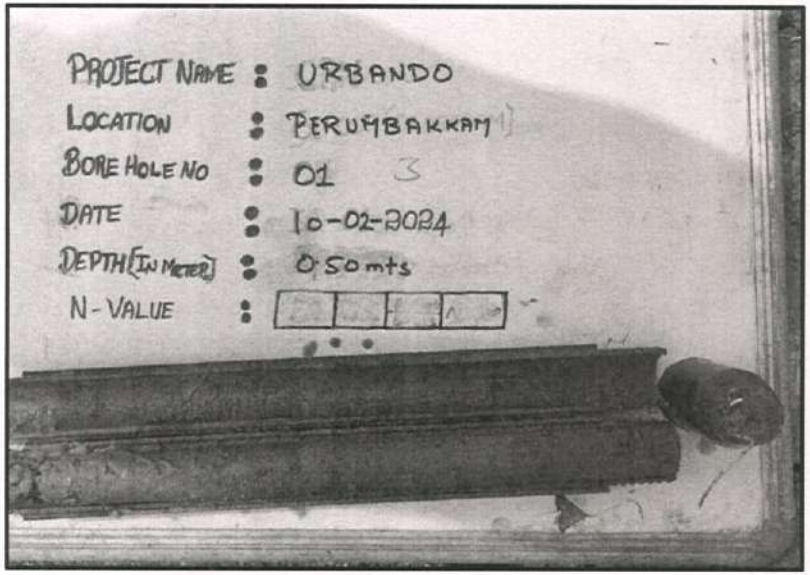
BORE HOLE No. 05
PAGE No. 02

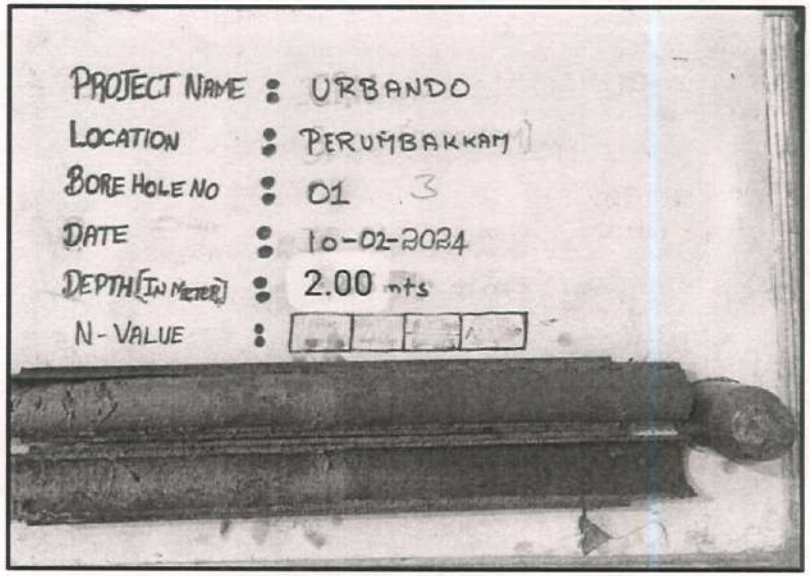
PROJECT NAME	URBANDO					DIA OF BORE HOLE	150mm 1 / 100mm
LOCATION	Perumbakkam	MACHINE No.	MR-08	CHAINAGE (m)		BORE START DATE	09/02/2024
STRUCTURE		DRILLING METHOD	Rotary	CO-ORDINATES	N	BORE END DATE	10/02/2024
JOB CODE		FLUSHING MEDIUM	Bentonite		E	TOTAL DRILLING DAYS	02

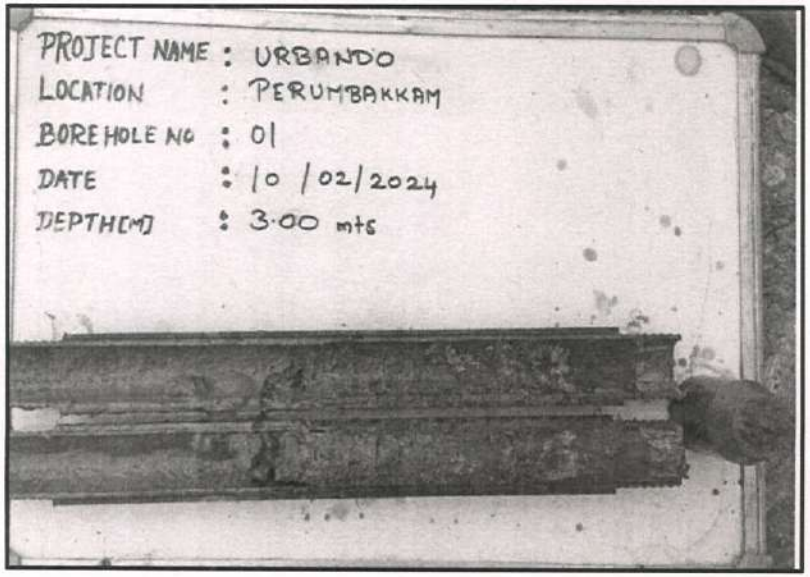
Depth below E.G.L. (m)	Drilling progress per metre: Date	Time: Hr.	Time: Min	Type of Drill Bit (SC / TCB / DB)	Core Details: Total Core Recovery %	Core Details: R.Q.D %	SPT Details: Blows/cm. 0-15	SPT Details: Blows/cm. 15-30	SPT Details: Blows/cm. 30-45	SPT 'N' Value	Sample Details: Depth	Sample Details: No.	Sample Details: Type	Layer Data: Depth (m)	Layer Data: Geotechnical Description
2	09/02	17	32	DB	9	0					12.00 mts	11	CS		Weak, Brownish, Highly weathered rock.
		18	24												
4	10/02	8	50	DB	4	0					13.50 mts	12	CS		Weak, Brownish, Highly weathered rock.
		9	45												
5	10/02	10	02	DB	35	0					15.00 mts	13	CS		Moderately weak to strong, Brownish to greyish, weathered rock to moderately hard rock.
		10	54												
7	10/02	11	22	DB	47	9					16.50 mts	14	CS		Moderately strong to Strong, Greyish, moderately weathered hard rock.
		12	48												
8															BORE HOLE TERMINATED AT 16.50 mts

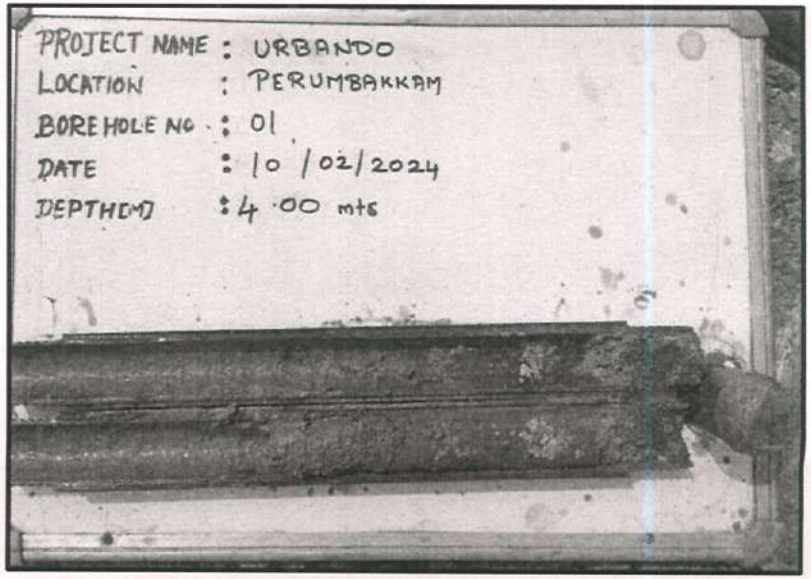
CS - Core Sample	DS - Disturbed Sample	SUPERVISOR NAME	Susi	PROJECT SITE DETAILS	
SS - Split Spoon Sample	SC - Soil Cutter	SIGNATURE		GROUND LEVEL (m)	
UDS-Undisturbed Sample	TCB - Tungsten Carbide Bit	DATE	10/02/2024	WATER TABLE (m)	
WS - Wash Sample	DB - Diamond Bit	CLIENT IN-CHARGE		CASING DEPTH (m)	

GEO MARINE
THE SPIRIT OF ENGINEERING

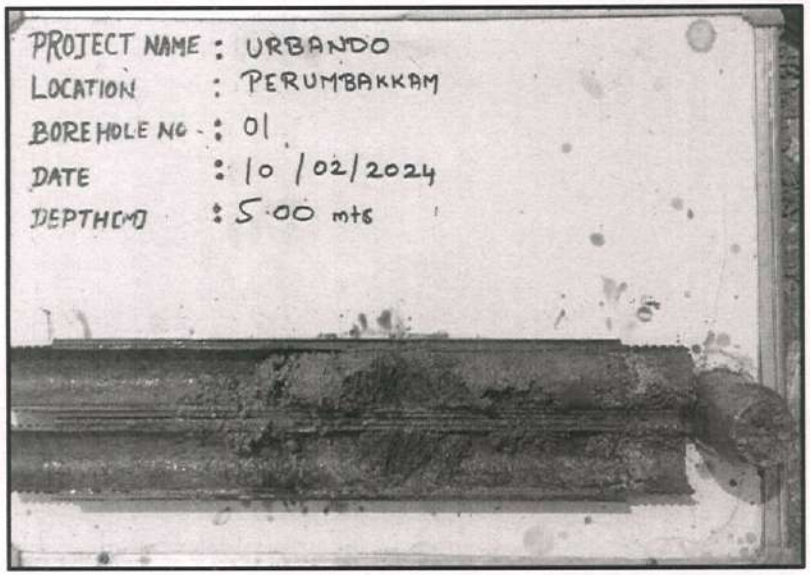


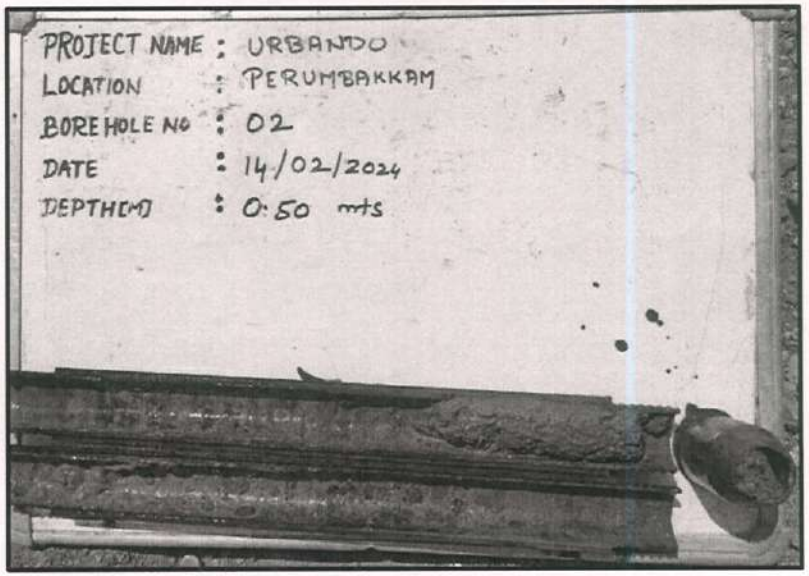


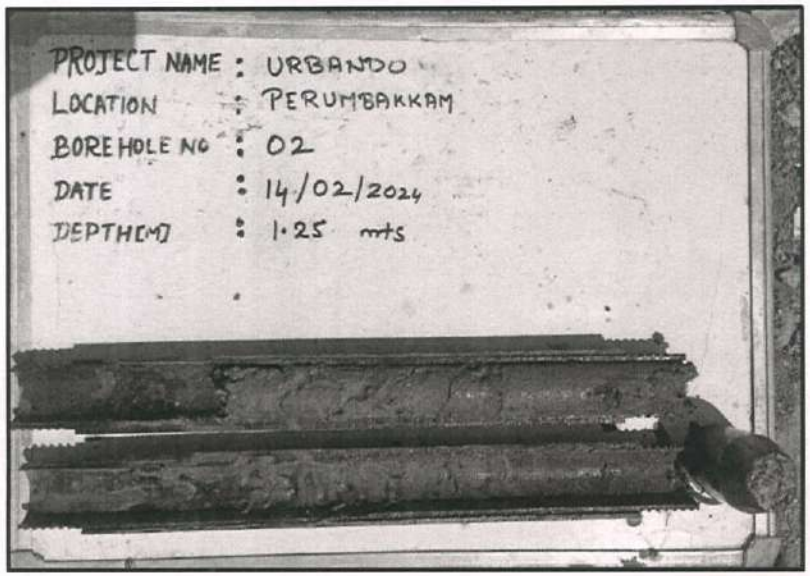


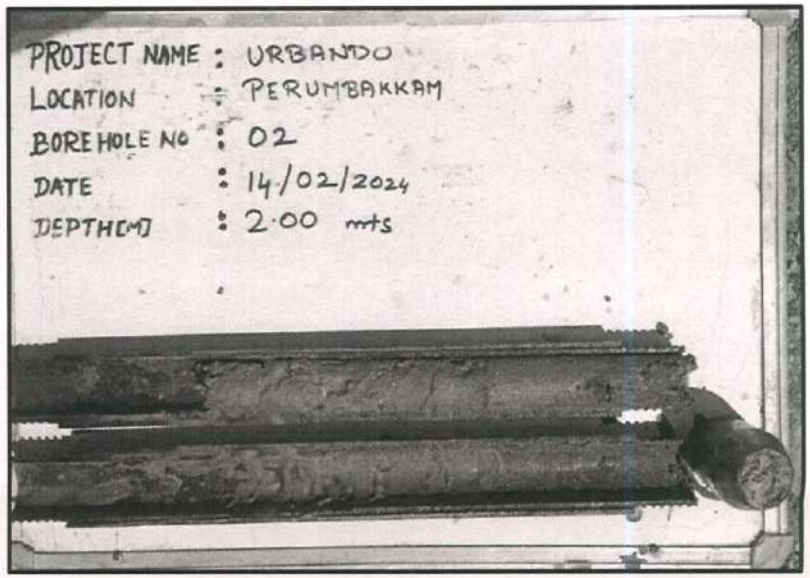


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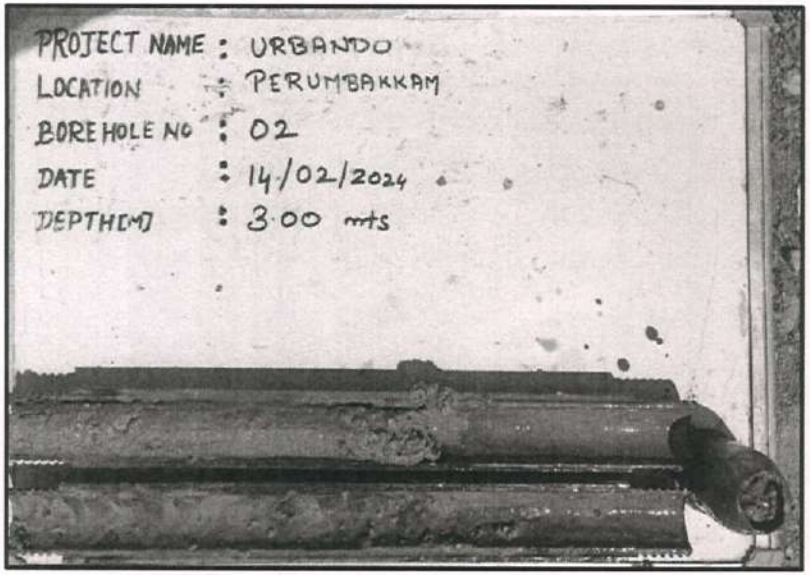


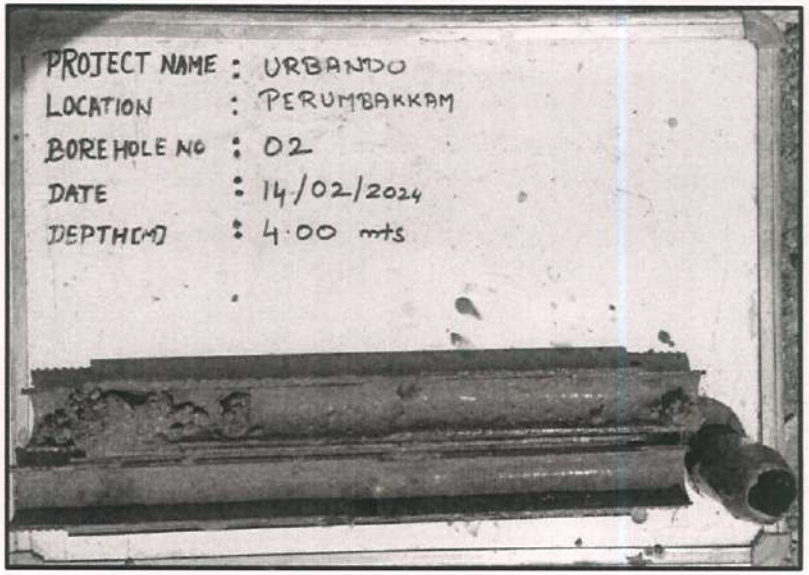




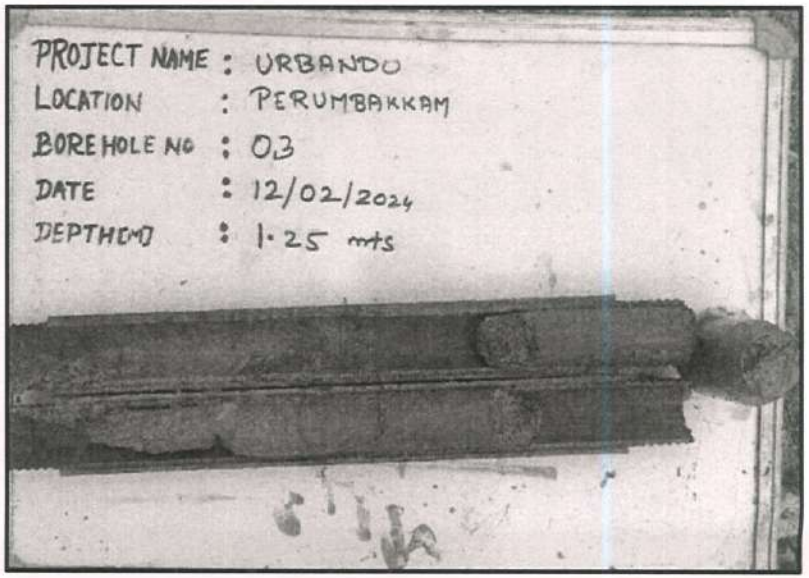


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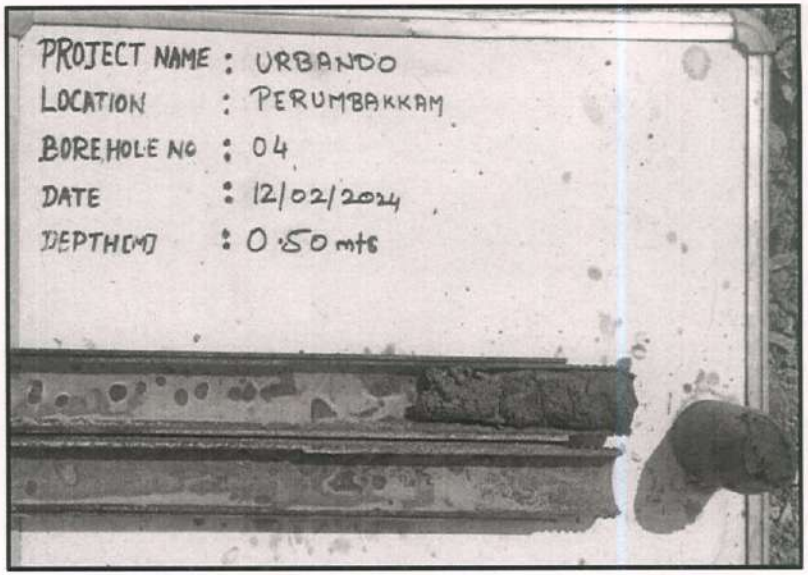


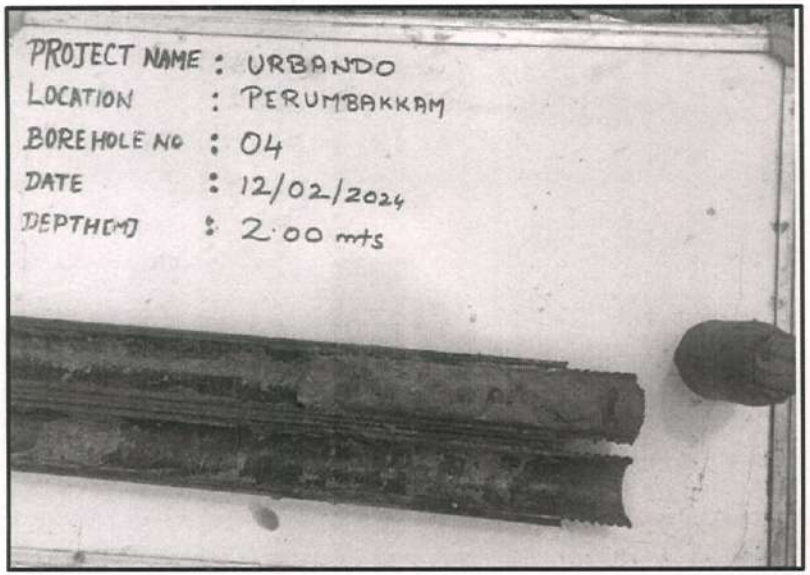


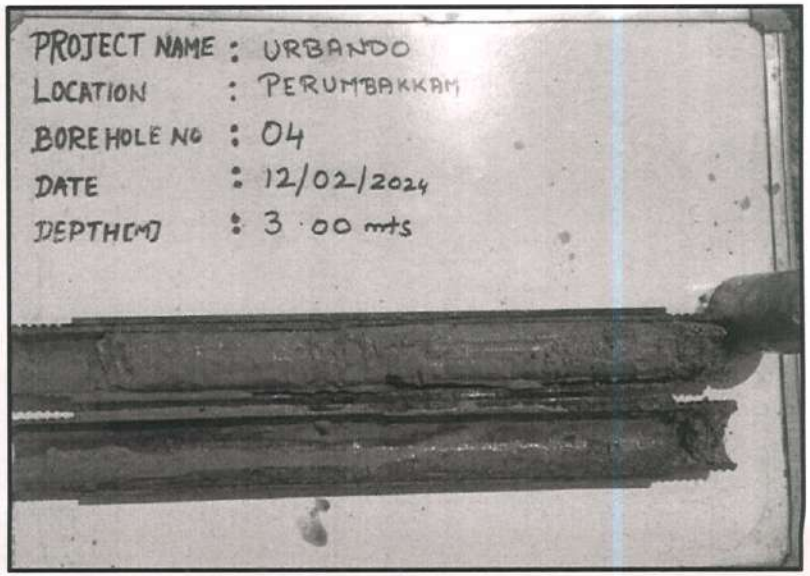


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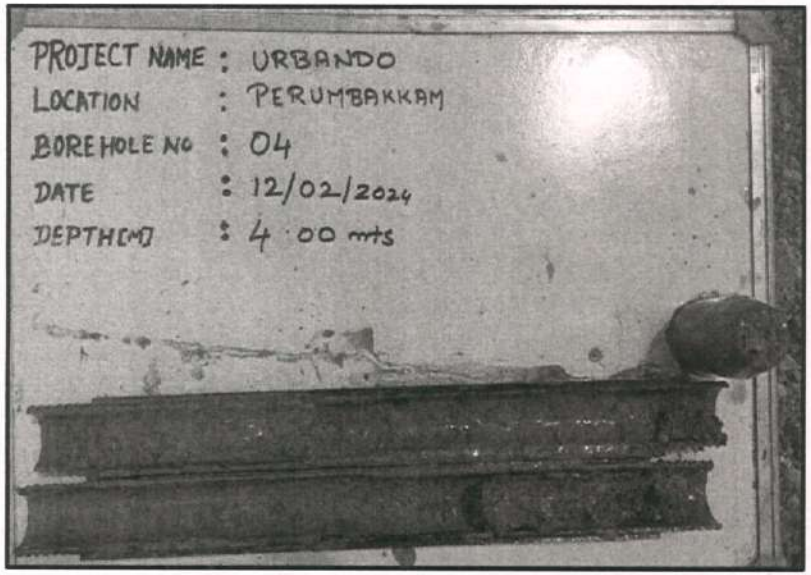


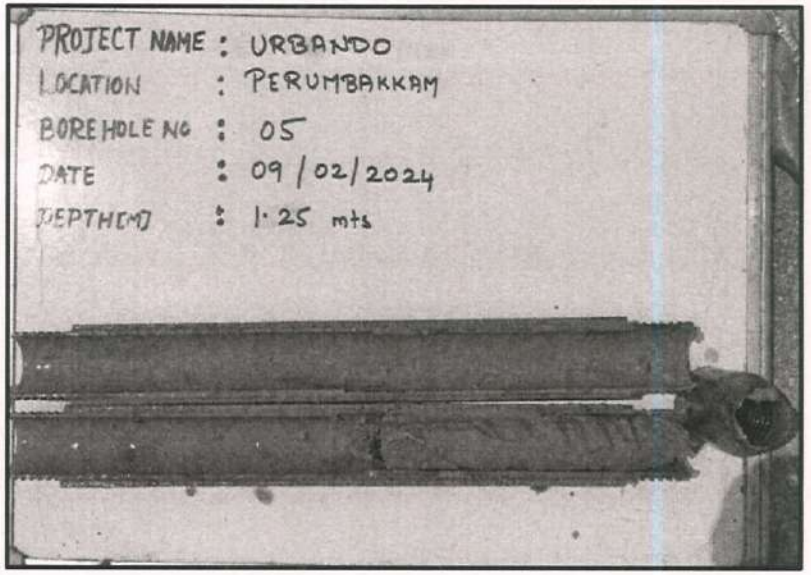


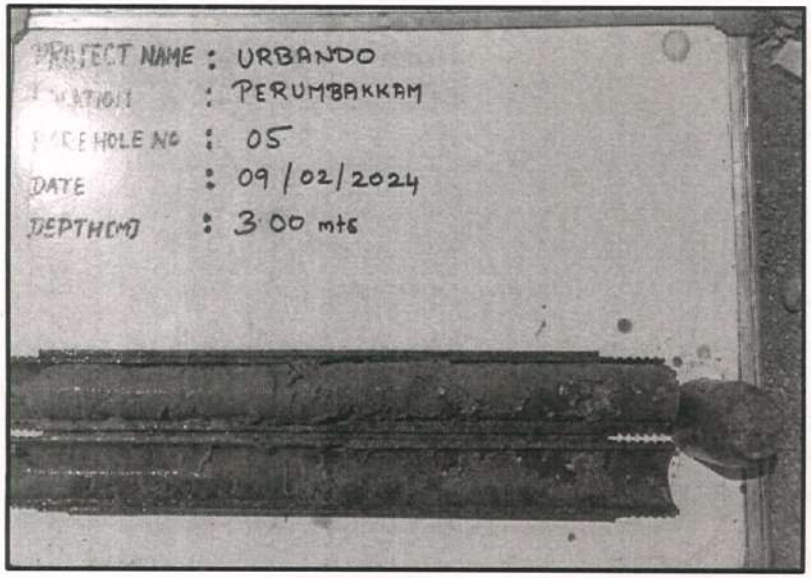


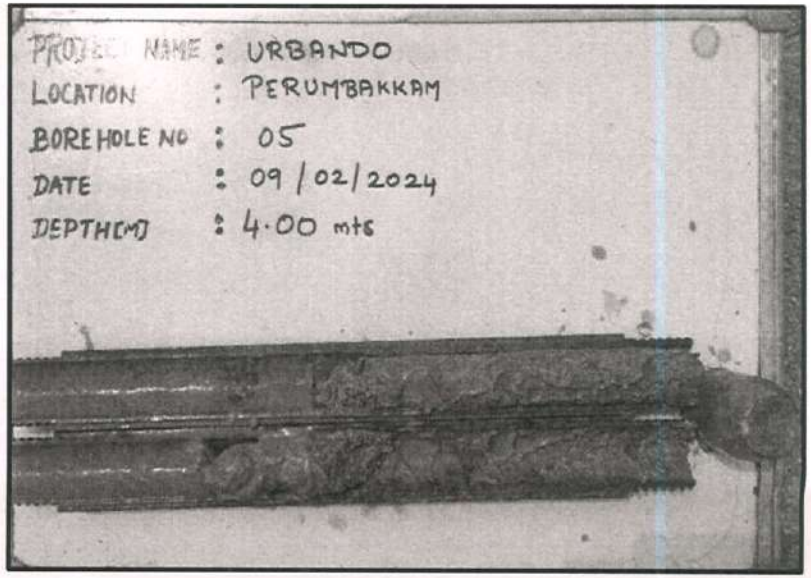


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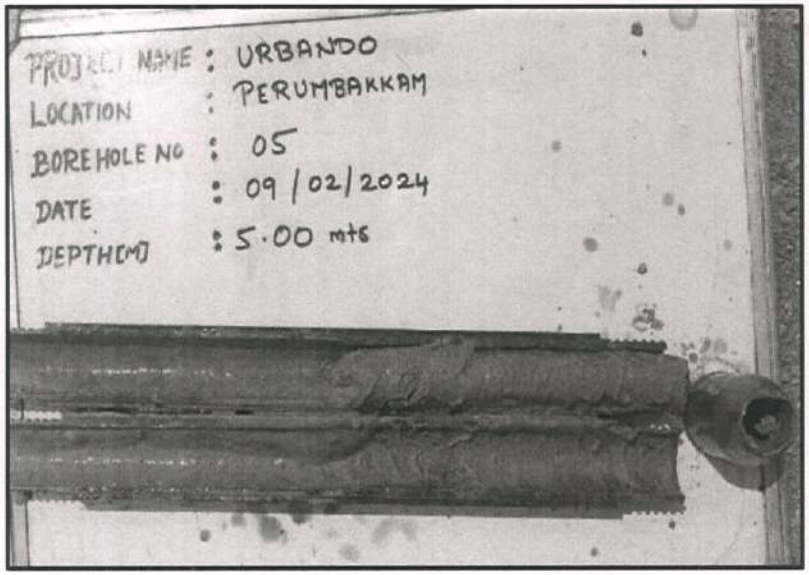








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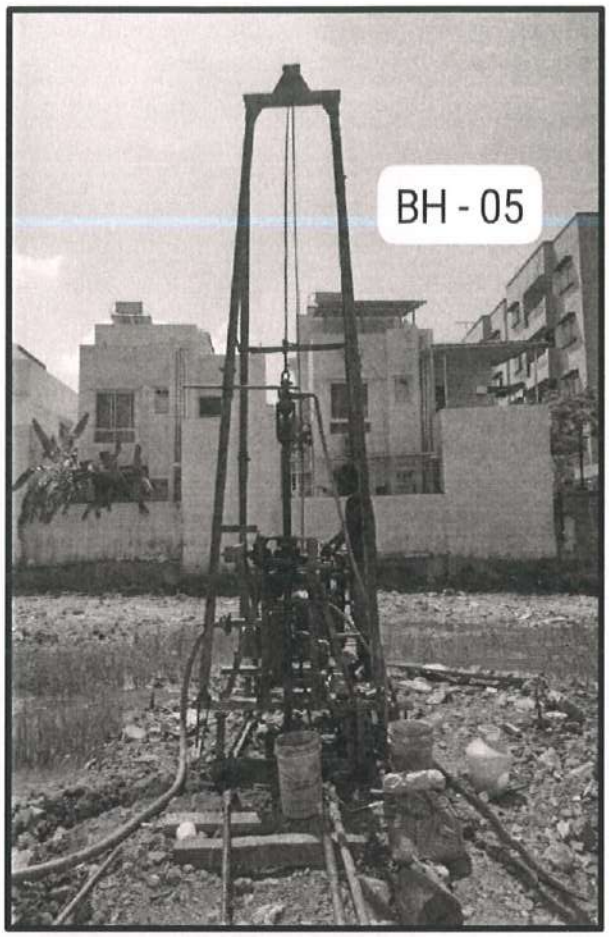



BH - 01


BH - 02


BH - 03


BH - 04


BH - 05

Our services go beyond

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.

Smarter Tools, Stronger Decisions

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

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