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GEO MARINE CONSULTANTS (P) LTD.,

11, 2nd Main Road, Kannappa Nagar Ext.

Kottivakkam, Chennai – 600 041.

Ph. No. 044 - 24481485 & 24480305.

drsvp@geomarineindia.com/geotech@geomarineindia.com

PROJECT

PROPOSED CONSTRUCTION OF HIGH RISE RESIDENTIAL BUILDING CONSISTS OF EXTENDED BASEMENT FLOOR + STILT FLOOR (PART) / GROUND FLOOR (PART) + 4 FLOORS (RESIDENTIAL WITH AMENITIES) + 5TH FLOOR TO 19TH FLOORS RESIDENTIAL – TOTALLY WITH 394 DWELLING UNITS AND OPEN SWIMMING POOL AT GROUND LEVEL COMPRISED IN SURVEY NO: 236/2, 237/3B, 237/4B, 238/1B, 238/2, 238/3, 239/1A2, 239/2A, 269B/1A1, 269B/1B, 270/1A1, 270/2A, 272/1B, 272/3A, 272/3B OF THIRUMUDIVAKKAM VILLAGE, KUNDRATHUR TALUK, KANCHEEPURAM DISTRICT WITHIN THE LIMITS OF KUNDRATHUR PANCHAYAT UNION.

CLIENT

M/s. CASAGRAND FRESH PVT. LTD.,

NEW NO. 111, OLD NO. 59,

NPL DEVI, LB ROAD, THIRUVANMIYUR,

CHENNAI – 600 041.

TITLE

GEOTECHNICAL INVESTIGATION REPORT

REPORT NO.: GT- 2640



DATE	REVISION	DESCRIPTION		AUTHORISED SIGNATORY
21/09/2023	0.0	SUBMISSION OF PRELIMINARY GEOTECHNICAL REPORT	SIGN	
20/04/2024	1.0	SUBMISSION OF FINAL GEOTECHNICAL REPORT	DATE OF FIRST SUBMISSION	21/09/2023
27/09/2024	2.0	INCORPORATION OF CORRECTION AS PER MAIL	DESIGNATION	MANAGING DIRECTOR
			NAME	DR. C.V. PRASAD

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CH. C. VEERAPATHI PRASAD
Regional Chief Engineer, Chennai-600015
Telephone No. 2741150-151
Mobile No. 94420 44444
E-mail: ch.veerapathi.prasad@tn.gov.in
ch.veerapathi.prasad@gmail.com

REPORT TEXT

INTRODUCTION

1.0 PROJECT INFORMATION MATRIX:

NATURE OF PROJECT	: PROPOSED RESIDENTIAL BUILDING
STRUCTURE	: ONE BASEMENT + STILT FLOOR (PART) / GROUND FLOOR (PART) + 19 UPPER FLOORS.
PROJECT OWNER	: M/s CASAGRAND FRESH PVT LTD.,
PROJECT LOCATION	: THIRUMUDIVAKKAM, CHENNAI
JOB CODE	: GT-2640

1.1 SCOPE OF WORK:

1.1.1 FIELD WORK:

- ❖ Conducting test 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 depth
 - Every 1.5m depth interval up to the termination depth
- ❖ The depth of investigation varies from 18.0m to 19.0m below the existing ground level.
- ❖ Collection of disturbed soil samples at SPT location and undisturbed samples from the clayey strata with SPT-value greater than 2 to less than 15 if met within the investigation depth.
- ❖ Collection of water samples if groundwater table met within the investigation depth.

1.1.2 LABORATORY WORK:

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

1.2 STRUCTURE OF THE REPORT:

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



INVESTIGATION METHODOLOGY & TEST RESULTS

2.0 PREAMBLE:

Ten 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 2.10. The graphical representation of grain size distribution curve for the representative samples in each bore is presented in Fig 2.13 to 2.21.

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 2.10. The graphical representation of hydrometer analyses curve for the representative samples in each bore is presented in Fig 2.22 to 2.43.

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 – 2.12 to 2.14.

2.3 SUMMARY:

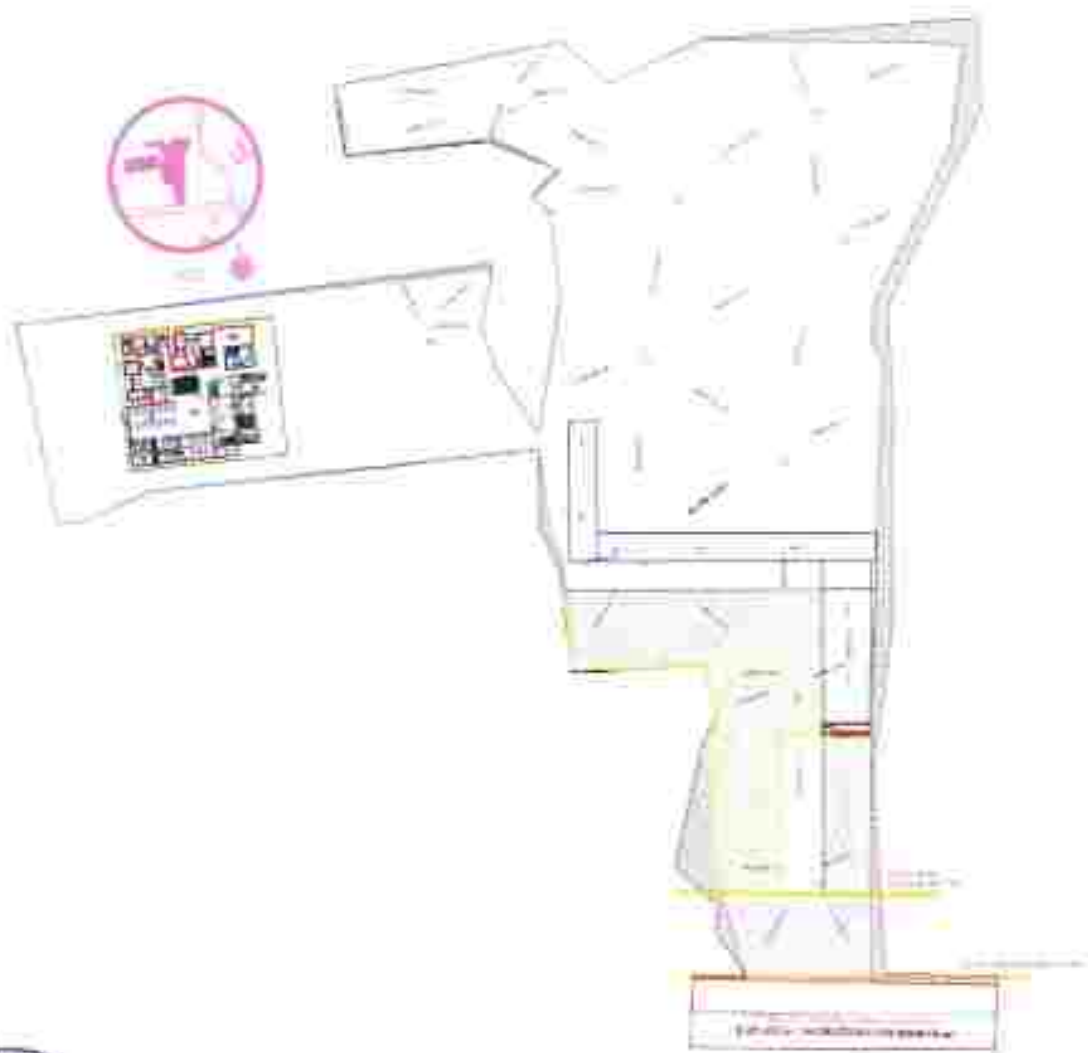
The locations of the field investigation boreholes are shown in site plan given in Fig.2.0. The average sub soil profiles encountered at each location along with their classification and engineering properties are presented in Figs.2.1 to 2.10. Further, the rock test results are presented in Table 2.11.



SITE PLAN



DIGI-VENKATA PRASAD
 Managing Director, Group Companies
 Digiventures Pvt. Ltd. 1001115, 1001116
 2, Marudhara Nagar, Hyderabad - 500008
 Tel: 7220740000, 9849111111, 4 Marudhara Nagar
 Chaitanyam, Tel: 9041111111, 4111111111
 7220740000, 9849111111, 4111111111



O.C. VENKATA PRASAD
 Registered Architect
 No. 1234
 15/11/2023

SOIL PROFILES



Dr. G. VEDARAJAN
Regional Director, Chennai, 600 011
Phone: 27511111
Fax: 27511111
E-mail: gvedarajan@geomarine.co.in
Website: www.geomarine.co.in

GEO MARINE Soil Investigation Consultants		SITE INVESTIGATION RECORD										BORE HOLE No.		BH-03				
PROJECT NAME		PROPOSED CONSTRUCTION OF A RESIDENTIAL BUILDING										DATE		16/03/2024				
LOCATION		Thirumalvaram, Chennai		Accession No.		CR-04		Total Well Capacity (m)		30		BORE START DATE		16/03/2024				
STRUCTURE		1 Basement + 50th (Part) / Ground (Part) + 15 Floors		DRILLING METHOD		Rotary		CO-ORDINATES		N		BORE END DATE		16/03/2024				
HOLE CODE		GT240		HOLEWELL METER		Borehole		1		-		TOTAL DRILL DEPTH		7				
Depth from B.O.L. (m)	Drilling progress per station		Type of Soil (IS: 1472)	Core Details		SPT Details				Sample Details				Layer Data				
	Hole	Time		Total core recovered (m)	R Q.D. %	Blowcount			SPT Value		Depth	No	Type	R.C. %	Layer	Z	Height	Geotechnical Description
						0-15	15-30	30-45	N60	N								
0	16/03/2024	00	TC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Filled Up Soil
1		01	Tu	-	-	-	-	-	8	1.25	1	SC	-1.25		1.2	1.25		Brown Moist Soft Fine Sandy (CL) Silty CLAY (CI) Silty Clay of Medium Plasticity
2		02	Tu	-	-	-	-	-	6	0.80	2	SC	-2.0		2.0	2.00		
3		03	Tu	-	-	-	-	-	10	0.80	3	SC	-3.0		3.0	3.00		Brown, Gray Brown, Moist Soft & Medium Silty CLAY (CH) Clay of High Plasticity
4		04	Tu	-	-	-	-	-	14	4.00	4	SC	-4.5		4.5	4.45		
5		05	Tu	-	-	-	-	-	23	5.00	5	SC	-5.5		5.5	5.45		Brown Moist Soft, Very Soft Clayey SILT (ML) With No Plasticity Clayey Silt of No Plasticity
6		06	Tu	-	-	-	-	-	27	8.00	6	SC	-6.5		6.5	6.45		
7		07	Tu	-	-	-	-	-	19	7.50	7	SC	-7.5		7.5	7.55		Gray to Black, Moist, Very Soft Silty CLAY (CH) Clay of High Plasticity
8		08	Tu	-	-	-	-	-	11	0.80	8	SC	-8.0		8.0	8.00		
9		09	Tu	-	-	-	-	-	11	0.80	9	SC	-9.0		9.0	9.00		
10		10	Tu	-	-	-	-	-	11	0.80	10	SC	-10.0		10.0	10.00		
11		11	Tu	-	-	-	-	-	11	0.80	11	SC	-11.0		11.0	11.00		
12		12	Tu	-	-	-	-	-	11	0.80	12	SC	-12.0		12.0	12.00		
13		13	Tu	-	-	-	-	-	11	0.80	13	SC	-13.0		13.0	13.00		
14		14	Tu	-	-	-	-	-	11	0.80	14	SC	-14.0		14.0	14.00		
15		15	Tu	-	-	-	-	-	11	0.80	15	SC	-15.0		15.0	15.00		
16		16	Tu	-	-	-	-	-	11	0.80	16	SC	-16.0		16.0	16.00		
17		17	Tu	-	-	-	-	-	11	0.80	17	SC	-17.0		17.0	17.00		
18		18	Tu	-	-	-	-	-	11	0.80	18	SC	-18.0		18.0	18.00		
19		19	Tu	-	-	-	-	-	11	0.80	19	SC	-19.0		19.0	19.00		
20		20	Tu	-	-	-	-	-	11	0.80	20	SC	-20.0		20.0	20.00		
21		21	Tu	-	-	-	-	-	11	0.80	21	SC	-21.0		21.0	21.00		
22		22	Tu	-	-	-	-	-	11	0.80	22	SC	-22.0		22.0	22.00		
23		23	Tu	-	-	-	-	-	11	0.80	23	SC	-23.0		23.0	23.00		
24		24	Tu	-	-	-	-	-	11	0.80	24	SC	-24.0		24.0	24.00		
25		25	Tu	-	-	-	-	-	11	0.80	25	SC	-25.0		25.0	25.00		
26		26	Tu	-	-	-	-	-	11	0.80	26	SC	-26.0		26.0	26.00		
27		27	Tu	-	-	-	-	-	11	0.80	27	SC	-27.0		27.0	27.00		
28		28	Tu	-	-	-	-	-	11	0.80	28	SC	-28.0		28.0	28.00		
29		29	Tu	-	-	-	-	-	11	0.80	29	SC	-29.0		29.0	29.00		
30		30	Tu	-	-	-	-	-	11	0.80	30	SC	-30.0		30.0	30.00		
31		31	Tu	-	-	-	-	-	11	0.80	31	SC	-31.0		31.0	31.00		
32		32	Tu	-	-	-	-	-	11	0.80	32	SC	-32.0		32.0	32.00		
33		33	Tu	-	-	-	-	-	11	0.80	33	SC	-33.0		33.0	33.00		
34		34	Tu	-	-	-	-	-	11	0.80	34	SC	-34.0		34.0	34.00		
35		35	Tu	-	-	-	-	-	11	0.80	35	SC	-35.0		35.0	35.00		
36		36	Tu	-	-	-	-	-	11	0.80	36	SC	-36.0		36.0	36.00		
37		37	Tu	-	-	-	-	-	11	0.80	37	SC	-37.0		37.0	37.00		
38		38	Tu	-	-	-	-	-	11	0.80	38	SC	-38.0		38.0	38.00		
39		39	Tu	-	-	-	-	-	11	0.80	39	SC	-39.0		39.0	39.00		
40		40	Tu	-	-	-	-	-	11	0.80	40	SC	-40.0		40.0	40.00		
41		41	Tu	-	-	-	-	-	11	0.80	41	SC	-41.0		41.0	41.00		
42		42	Tu	-	-	-	-	-	11	0.80	42	SC	-42.0		42.0	42.00		
43		43	Tu	-	-	-	-	-	11	0.80	43	SC	-43.0		43.0	43.00		
44		44	Tu	-	-	-	-	-	11	0.80	44	SC	-44.0		44.0	44.00		
45		45	Tu	-	-	-	-	-	11	0.80	45	SC	-45.0		45.0	45.00		
46		46	Tu	-	-	-	-	-	11	0.80	46	SC	-46.0		46.0	46.00		
47		47	Tu	-	-	-	-	-	11	0.80	47	SC	-47.0		47.0	47.00		
48		48	Tu	-	-	-	-	-	11	0.80	48	SC	-48.0		48.0	48.00		
49		49	Tu	-	-	-	-	-	11	0.80	49	SC	-49.0		49.0	49.00		
50		50	Tu	-	-	-	-	-	11	0.80	50	SC	-50.0		50.0	50.00		
51		51	Tu	-	-	-	-	-	11	0.80	51	SC	-51.0		51.0	51.00		
52		52	Tu	-	-	-	-	-	11	0.80	52	SC	-52.0		52.0	52.00		
53		53	Tu	-	-	-	-	-	11	0.80	53	SC	-53.0		53.0	53.00		
54		54	Tu	-	-	-	-	-	11	0.80	54	SC	-54.0		54.0	54.00		
55		55	Tu	-	-	-	-	-	11	0.80	55	SC	-55.0		55.0	55.00		
56		56	Tu	-	-	-	-	-	11	0.80	56	SC	-56.0		56.0	56.00		
57		57	Tu	-	-	-	-	-	11	0.80	57	SC	-57.0		57.0	57.00		
58		58	Tu	-	-	-	-	-	11	0.80	58	SC	-58.0		58.0	58.00		
59		59	Tu	-	-	-	-	-	11	0.80	59	SC	-59.0		59.0	59.00		
60		60	Tu	-	-	-	-	-	11	0.80	60	SC	-60.0		60.0	60.00		
61		61	Tu	-	-	-	-	-	11	0.80	61	SC	-61.0		61.0	61.00		
62		62	Tu	-	-	-	-	-	11	0.80	62	SC	-62.0		62.0	62.00		
63		63	Tu	-	-	-	-	-	11	0.80	63	SC	-63.0		63.0	63.00		
64		64	Tu	-	-	-	-	-	11	0.80	64	SC	-64.0		64.0	64.00		
65		65	Tu	-	-	-	-	-	11	0.80	65	SC	-65.0		65.0	65.00		
66		66	Tu	-	-	-	-	-	11	0.80	66	SC	-66.0		66.0	66.00		
67		67	Tu	-	-	-	-	-	11	0.80	67	SC	-67.0		67.0	67.00		
68		68	Tu	-	-	-	-	-	11	0.80	68	SC	-68.0		68.0	68.00		
69		69	Tu	-	-	-	-	-	11	0.80	69	SC	-69.0		69.0	69.00		
70		70	Tu	-	-	-	-	-	11	0.80	70	SC	-70.0		70.0	70.00		
71		71	Tu	-	-	-	-	-	11	0.80	71	SC	-71.0		71.0	71.00		
72		72	Tu	-	-	-	-	-	11	0.80	72	SC	-72.0		72.0	72.00		
73		73	Tu	-	-	-	-	-	11	0.80	73	SC	-73.0		73.0	73.00		
74		74	Tu	-	-	-	-	-	11	0.80	74	SC	-74.0		74.0	74.00		
75		75	Tu	-	-	-	-	-	11	0.80	75	SC	-75.0		75.0	75.00		
76		76	Tu	-	-	-	-	-	11	0.80	76	SC	-76.0		76.0	76.00		
77		77	Tu	-	-	-	-	-	11	0.80	77	SC	-77.0		77.0	77.00		
78		78	Tu	-	-	-	-	-	11	0.80	78	SC	-78.0		78.0	78.00		
79		79	Tu	-	-	-	-	-	11	0.80	79	SC	-79.0		79.0	7		

GEO MARINE		SITE INVESTIGATION RECORD						Bore Hole No		BH-03									
PROJECT NAME		PROPOSED CONSTRUCTION OF A RESIDENTIAL BUILDING						SHEET		2 OF 2									
LOCATION		Thirumudikavilam, Chennai		Machine No.		CR-04		Free Fall Energy (m)		50									
STRUCTURE		1 Basement + 8th (Part) / Ground (Part) + 10 Floors		Drilling Method		Rotary		SO-ORIENTED		N									
Bore Hole		GT200		Slurrying Medium		Bentonite		N		-									
Bore Start Date		16/03/2024		Bore End Date		16/03/2024		TOTAL DRILL DAYS		1									
Depth below E.O.L. (m)	Drilling progress per metre			Core Details		SPT Details			Sample Details			Layer Data							
	Time			Type of Drilling (W/C, S/C, C/C)	Take Core Number & H.O.D. No.	Blow Count			SPT Value			Depth	No.	Type	R.L. (m)	Log No.	No.	Depth	Geotechnical Description
	1st	2nd	3rd			15	30	45	N60	N									
11	12	50		SC	-	-	7	11	15	-	28	10.00	9	SC	-10.0				Grey to Black Mass, Very Silty Silty CLAY (CH) Clays of High Plasticity
12	14	21		SC	-	-	7	20	36	-	58	12.00	10	SC	-12.0				Offwhite Brown Shales, Mass, Fine & Medium Grained Silty Sand, Silty CLAY (CI) Residual Soil Feature. Disintegrated Hypersphere Granite Rock Formation
13	14	28		SC	-	-	100m Penetration 52 Blows			-	>100	14.00	11	WS	-14.0				
14	14	40		SC	-	-	SPT Hammer Retained			-	>100	16.00	12	WS	-16.0				
15	15	38		DB	0	0	-	-	-	-	-	17.00	13	WS	-17.0				No Sample Recovered. Completely Weathered Rock - Grade WS Formation
16	15	48		DB	0	0	-	-	-	-	-	18.00	14	WS	-18.0				Weathered Hypersphere Granite Rock
17	16	32		DB	0	0	-	-	-	-	-	19.00	15	WS	-19.0				
18																			
19																			
20																			

CS - Core Sample

SC - Split Spoon Sample

UCS - Unconsolidated Sample

WS - Water Sample

DB - Disturbed Sample

OC - Soil Cutter

TCB - Tensile Compression Test

DB - Diamond Bit

LOGGED

DATE

CHECKED

DATE

By

S. Shrinithi

16/03/2024

PROJECT SITE DETAILS

GROUND LEVEL (m)

WATER TABLE (m)

CASING DEPTH (m)

8.00

1.00

8.00

Borehole terminated at 19 m depth below E.O.L.

FIG.2.1 Sub Soil Profile at BH-03 Location

GEOMADINE		SITE INVESTIGATION RECORD										BORHOLE NO.		BH-04				
PROJECT NAME		PROPOSED CONSTRUCTION OF A RESIDENTIAL BUILDING										SHEET		3 OF 5				
LOCATION		Thiruvalluvar, Chennai		Block No.		CR-04		Free Fall Energy (J)		50		BORHOLE START DATE		01/03/2024				
STRUCTURE		1 Basement + 800 (Part) + Ground (Part) + 10 Floors		DRILLING METHOD		Rotary		CO-ORDINATES		N		BORHOLE END DATE		02/03/2024				
JOB CODE		GT240		DRILLING MEDIUM		Bentonite				S		TOTAL DRILL DAYS		2				
Height (m)	Drilling progress per metre		Type of Soil (SPT / TCB / CPT)	Core Details		SPT Details			Sample Details			Layer Data						
	Date	Time		Type of Soil (SPT / TCB / CPT)	Tube (mm)	Recovery (%)	N 0.0 N	Direction		SPT Value	Depth	No.	Type	No. (m)	Length	No.	Depth	Geotechnical Description
	1h	30m						1-10	10-30									
11	01/03/2024	16:38	SC															Black Clay Musty very soft Silty CLAY (CH) Clay of High Plasticity
12		16:41	SC															Brown, Green Brown Moist, Plastic, Graded Fine & Medium Sand Grains With Gravel, Dense & Very Dense Clayey Silty SAND (SC) With Gravels
13		17:21	SC															
14		17:38	SC															No Sample Recovered! Core Recovered Completely Weathered Rock - Grate WS Formation Weathered Hypersaline Granitic Rock
15	02/03/2024	18:28	SC															
16		19:00	SC															Brown Medium & Coarse Grain Gravelly Highly Fractured (Disintegrated) Highly Weathered Rock - Grate WS Rock Formation Fractured Hypersaline Granitic Rock Formation
17		19:23	SC															
18		19:32	SC															
19		19:57	SC															
20																		
21																		
22																		
23																		
24																		
25																		
26																		
27																		
28																		
29																		
30																		

CS - Core Sample

DS - Disturbed Sample

SS - Split Barrel Sample

UCS - Undisturbed Sample

WS - Water Sample

DB - Disturbed Sample

SC - Soil Cutter

TCB - Tongue Cutter Bit

CS - Standard Bit

LOGGED

DATE

CHECKED

DATE

Soil

30012024

S Tyasa

04/03/2024

PROJECT SITE DETAILS

GROUND LEVEL (m)

WATER TABLE (m)

CASING DEPTH (m)

Borehole terminated at 16 m depth below E.G.L

FIG.2.2 Sub Soil Profile at BH-04 Location

GEOMARINE		SITE INVESTIGATION RECORD										BORE HOLE No.		BH-05		
PROJECT NAME		PROPOSED CONSTRUCTION OF A RESIDENTIAL BUILDING										SHEET		1 OF 2		
LOCATION		Thirumudiyakkam, Chennai		MACHINE NO.		CH-08		True Fall String (m)		SS		DATE START DATE		02/03/2024		
STRUCTURE		1 Basement + 8th (Part) Ground (Part) + 10 Floors		DRILLING METHOD		Rotary		1D COORDINATES		N		DATE END DATE		04/03/2024		
JOB CODE		GT2445		FLUSHING METHOD		Bentonite		1D COORDINATES		E		TOTAL DRILL DAYS		2		
Depth (m)	Drilling progress per metre		Type of Soil (SC - 100% OBS.)	Time Taken (min)	R.O.D. (%)	SPT Details			Sample Details				Layer Data			
	Time					Blow Count			SPT Value		Type	PL (%)	Layer	No	Depth	Geotechnical Description
	To	From				15.30	15.30	15.30	N60	N						
14.00	14.00	14.00	SC	1	-	3	4	5	9	0.50	1	SS	-0.5	1.1	2.00	Brown Moist, Silty, Silty CLAY (CH) Clay of High Plasticity
14.15	14.15	14.15	SC	1	-	2	6	7	13	1.25	2	SS	-1.25			
14.30	14.30	14.30	SC	1	-	4	8	11	20	2.00	3	SS	-2.0			
15.00	15.00	15.00	SC	1	-	-	-	-	-	3.00	4	UDS	-3.0	1.2	3.00	Brown Moist, Very Silty, Silty CLAY (CH) Clay of High Plasticity
16.00	16.00	16.00	SC	1	-	2	4	6	10	4.00	5	SS	-4.0			
17.00	17.00	17.00	SC	1	-	6	11	16	27	5.50	6	SS	-5.0			
18.00	18.00	18.00	SC	1	-	2	10	18	28	6.00	7	SS	-6.0	1.3	7.50	Brown Grey Moist, Sand Grains Traces, Very Silty, Silty CLAY (CL) & Clayey SILT (ML) Clay & Silt of Low Plasticity
19.00	19.00	19.00	SC	1	-	6	10	14	24	7.50	8	SS	-7.5			
20.00	20.00	20.00	SC	1	-	2	10	16	20	8.00	9	SS	-8.0			
21.00	21.00	21.00	SC	1	-	-	-	-	-	9.45	-	-	-	1.4	7.50	Black Grey Moist, Sand Grains Traces, Very Silty & Hard, Silty CLAY (CH) Clay of High Plasticity
22.00	22.00	22.00	SC	1	-	-	-	-	-	-	-	-	-			
23.00	23.00	23.00	SC	1	-	-	-	-	-	-	-	-	-			

CS - Core Sample	DS - Disturbed Sample	LOGGED	Soil	PROJECT SITE DETAILS	
SS - Split Spoon Sample	SC - Soil Cube	DATE	02/03/2024	GROUND LEVEL (m)	5.00
UDS - Undisturbed Sample	TCE - Turgor Cell (m)	CHECKED	G. Sharma	WATER TABLE (m)	3.50
WS - Well Sample	DB - Diamond Bit	DATE	14/03/2024	CASING DEPTH (m)	0.00



Dr. C. VENKATA PRASAD
 Director & Managing Engineer (GATE)
 Registered as CTE/118/2005
 Director, Veerapandi Dr. B. V. Reddy
 14/10/2024
 14/10/2024

GEOMARINE		SITE INVESTIGATION RECORD						BORE HOLE No.		BH-05										
PROJECT NAME		PROPOSED CONSTRUCTION OF A RESIDENTIAL BUILDING						SHEET		2 OF 2										
LOCATION		Thiruvanchikkulam, Chennai		MACHINE No.		CR-04		Free Fall Energy (m)		50										
STRUCTURE		1 Basement + 8th (Part) Ground (Part) + 10 Floors		BAILING METHOD		Rotary		CO-ORDINATE		N										
JOB CODE		GT200		FLUIDING MEDIUM		Bentonite		S		-										
DATE		06/03/2024		TOTAL DRILL DAYS		2		BORE START DATE		02/03/2024										
BORE END DATE		04/03/2024		TOTAL DRILL DAYS		2														
Depth below E.G.L. (m)	Sampling progress per minute		Type of Soil No. (SPT / TCB / etc)	Core Details	SPT Details			Sample Details				Layer Data								
	Time	Rate			Total Time	Penetration %	H.O.D. %	Description			SPT VALUE	Depth	No.	Type	R.L. (m)	Tagging	No.	Depth	Geotechnical Description	
								15-15	15-30	30-45										N60
11	14	26	SC	-	-	10	10	21	-	31	10.00	10	SC	-10.5						
12	14	18									12.00	11	SC	-12.8						
13	15	24	SC	-	-	12	12	24	-	29	12.00	11	SC	-12.8						
14	15	27									12.43	9								
15	16	00	SC	-	-	13	13			9-100	14.00	12	SC	-14.3						
16	16	04									14.43	9								
17	15	34	CB	10	0						15.00	13	WB	-15.0						
18	16	37									16.00	14	CB	-16.8						
19	17	49	CB	13	15						17.00	15	CB	-17.3						
20																				
21																				
22																				
23																				
24																				
25																				
26																				
27																				
28																				
29																				
30																				

CB - Core Sample

SC - Soil Section Sample

TCB - Trench Core Sample

WB - Wash Sample

CB - Core Sample

SC - Soil Section Sample

TCB - Trench Core Sample

WB - Wash Sample

LOGGED

DATE

CHECKED

DATE

Soil

06/03/2024

G. Sharma

15/03/2024

PROJECT SITE DETAILS

GROUND LEVEL (m)

WATER TABLE (m)

CASING DEPTH (m)

REMARKS

Borehole terminated at 17 m depth below E.G.L.

FIG.2.3 Sub Soil Profile at BH-05 Location

U.C. VENKATA PRASAD

GEOMARINE THE EXPERT OF SUBSURFACE		SITE INVESTIGATION RECORD										BORE HOLE No.		BH-06				
PROJECT NAME		PROPOSED CONSTRUCTION OF A RESIDENTIAL BUILDING										SHEET		1 OF 2				
LOCATION		Thiruvananthapuram, Cheral		WATERED No.		CB-44		Free Fall Energy (m)		50		Bore Start Date		05/03/2024				
STRUCTURE		5 Basement + 8th (Part) + Ground (Part) + 10 Floors		DRILLING METHOD		Rotary		CO-ORDINATE		N		E		Bore End Date				
JOB CODE		STP06		FLUSHING METHOD		Bituminate		7		-		TOTAL DRILL DAYS		2				
Depth (m) & SPT (ft)	Drilling Sequence per Interval		Type of Soil (as per IS: 2720 (Part 26))	Core Details	SPT Details					Sample Details				Layer Data				
	Date	Time			Blow Count			SPT Value	Depth	No.	Type	R _L (m)	Interval	No.	Depth	Geotechnical Description		
		IN			OUT	15-15	15-45										45-45	N60
12-31	12-31	12-31	Te	SC	-	-	-	-	10	0.50	1	SC	-0.5	Brown/Grey Brown, Moist, Poorly Graded Fine & Medium Sand Grains Loose & Very Loose, Clayey Silty SAND (SC)	3.1	3.6		
12-32	12-32	12-32	Te	SC	-	-	-	-	10	0.50	1	SC	-0.5					
14-12	14-12	14-12	Te	SC	-	-	-	-	2	1.25	2	SC	-1.25					
14-17	14-17	14-17	Te	SC	-	-	-	-	11	1.70	3	SC	-1.70					
14-20	14-20	14-20	Te	SC	-	-	-	-	11	2.00	3	SC	-2.0	Grey Moss, Sand Grains, Trace Silty CLAY (CI) & Silty CLAY (CH) Clay of Medium & High Plasticity	3.7	4.7		
14-30	14-30	14-30	Te	SC	-	-	-	-	13	2.40	4	SC	-2.4					
16-47	16-47	16-47	Te	SC	-	-	-	-	13	3.00	4	SC	-3.0					
16-53	16-53	16-53	Te	SC	-	-	-	-	13	3.60	4	SC	-3.6					
18-12	18-12	18-12	Te	SC	-	-	-	-	31	4.00	5	SC	-4.0	Brown Moss, Poorly Graded, Fine & Medium Sand Grains, Dense & Medium Dense Silty SAND (SM)	5.1	7.6		
18-22	18-22	18-22	Te	SC	-	-	-	-	31	5.00	6	SC	-5.0					
18-26	18-26	18-26	Te	SC	-	-	-	-	25	5.45	5	SC	-5.45					
18-33	18-33	18-33	Te	SC	-	-	-	-	25	6.00	5	SC	-6.0					
18-45	18-45	18-45	Te	SC	-	-	-	-	20	6.45	5	SC	-6.45	Dark Grey, Moist Very Silty Silty CLAY (CH) Clay of High Plasticity				
18-48	18-48	18-48	Te	SC	-	-	-	-	20	7.50	5	SC	-7.5					
17-54	17-54	17-54	Te	SC	-	-	-	-	20	7.85	5	SC	-7.85					
17-12	17-12	17-12	Te	SC	-	-	-	-	18	9.00	3	SC	-9.0					
18-42	18-42	18-42	Te	SC	-	-	-	-	18	9.45	3	SC	-9.45					
19-48	19-48	19-48	Te	SC	-	-	-	-										

CS - Core Sample CS - Disturbed Sample LOGGED Soil

SS - Split Spoon Sample SC - Soil Cutter DATE 05/03/2024

UCS - Undisturbed Sample TCB - Torsion Cell Bulk CHECKED G.Sharma

RS - Ryan Sample TR - Torsion Cell DATE 12/03/2024

PROJECT SITE DETAILS

GROUND LEVEL (m) 0.00

WATER TABLE (m) 3.20

CASING DEPTH (m) 0.00

GEOMARINE		SITE INVESTIGATION RECORD						BORE HOLE NO.		BH-07										
PROJECT NAME		PROPOSED CONSTRUCTION OF A RESIDENTIAL BUILDING						SHEET		1 OF 2										
LOCATION		Thiruvalluvar, Chennai		Machine No.		CG-04		Free Fall Energy (%)		50										
STRUCTURE		1 Basement + 300 (Part) Ground (Part) + 10 Floors		DRILLING METHOD		Rotary		COORDINATES		N -										
Bore Code		GT2540		FLUIDING MEDIUM		Bentonite		TOTAL DRILL DEPTH		2										
Depth from C.G.L. (m)	Drilling progress per minute		Type of Penetration (SPT) (150/100)	Core Details	SPT Details			Sample Details				Layer Data								
	Time				Blows/m			SPT Value		Depth	No.	Type	R.L. (m)	Log No.	Ht.	Depth	Geotechnical Description			
	Min.	Sec.			0-15	15-30	30-45	N60	N											
14.50	To	50	-	-	1	2	4	-	8	0.30	1	30	-0.5	Brown, Moist, Medium, Silty Silty CLAY (CH) Clay of High Plasticity	3.1	1.20				
14.58																				
15.04	To	50	-	-	1	4	7	-	11	1.20	2	50	-1.20							
15.10																				
15.16	To	50	-	-	1	1	1	-	1	1.70				Brown, Silty, Clay of High Plasticity						
15.27																				
15.38	To	50	-	-	3	3	7	-	12	2.00	3	50	-2.0							
15.44																				
15.50	To	50	-	-	1	4	6	-	10	2.00	4	50	-3.0	Brown, Silty, Clay of High Plasticity						
16.02																				
16.12	To	50	-	-	1	3	6	-	11	4.00	5	50	-4.0							
16.11																				
16.24	To	50	-	-	-	-	-	-	-	5.50	6	100	-5.0	Brown, Silty, Clay of High Plasticity						
16.34																				
16.42	To	50	-	-	8	17	26	-	48	6.00	7	80	-6.0							
16.45																				
16.51	To	50	-	-	7	14	24	-	38	7.50	8	80	-7.5	Grey, Moist, Poorly Graded, Fine & Medium Sand Grains, Dumbo Silty SAND (SM)	6.3	7.00				
17.00																				
17.09	To	50	-	-	5	3	12	-	22	8.00	9	80	-8.0							
17.38																				
17.58	To	50	-	-						5.45				Grey, Black, Grey, Moist, Fine Sand, Medium to Hard & Very Silty CLAY (CH) & Silty CLAY (CL) Clay & Silty Clay of High & Low Plasticity						
18.38																				
18.58	To	50	-	-																
19.19																				

CS - Core Sample	DS - Disturbance Sample	LOGGED	Soil	PROJECT SITE DETAILS
SS - Soil Sample	SC - Soil Cutter	DATE	08/03/2024	GROUND LEVEL (m)
UCS - Undisturbed Sample	TCS - Tongue Cutter Bit	CHECKED	G.Sharma	WATER TABLE (m)
WS - Water Sample	CB - Cement Bit	DATE	14/03/2024	CANNED DEPTH (m)

Dr. C. V. PRASAD
 Registrar, Chennai
 Regd. No. 177/14/2023
 Chennai, Tamil Nadu
 11/02/2024
 11/02/2024
 11/02/2024

GEO MARINE		SITE INVESTIGATION RECORD										Bore Hole No.		BH-08	
PROJECT NAME		PROPOSED CONSTRUCTION OF A RESIDENTIAL BUILDING										DATE		1 OF 2	
LOCATION		Site/Plot/Block/Chennai		Borehole No.		CR-04		Free Fall Length (m)		60		DATE OF BORE HOLE		07/03/2024	
STRUCTURE		1 Basement + 300 (Part) / Ground (Part) + 10 Floor		DRILLING METHOD		Rotary		CORRECTION		N		DATE OF BORE		08/03/2024	
JOB CODE		GT2400		FLUID/NO. MEDIUM		Benign		CORRECTION		N		TOTAL DRILL DAYS		2	
Depth (m) (ft)	Drilling progress per hole		Core Details	SPT Details			Sample Details				Layer Data				
	Time			Block/No.			SPT Value		Type		Depth		Geotechnical Description		
	Fe	Se		0-10	15-30	30-45	N60	N	Depth	No.	Type	N (m)			
00	00	00	SC	-	-	-	11	0.00	1	SC	-0.0				Brown/Mud: Poorly Grained Fine & Medium Sand Drains Medium Dense/Clayey Silty SAND (SC)
00	00	00	SC	-	-	-	11	0.35	V						
00	00	00	SC	-	-	-	2	1.25	2	SC	-1.25				
00	00	00	SC	-	-	-	-	1.00	V						Grey Brown Clay: Most Fine & Medium Sand Grains Medium Very Soft Sandy Silty CLAY (SC) Sandy Clay of Medium Plasticity
00	00	00	SC	-	-	-	-	2.00	2	SC	-2.0				
00	00	00	SC	-	-	-	12	3.00	6	SC	-3.0				
00	00	00	SC	-	-	-	-	0.45	V						Grey Most Soft Silty CLAY (CH) Clay of High Plasticity
00	00	00	SC	-	-	-	8	4.00	5	SC	-4.0				
00	00	00	SC	-	-	-	18	5.00	8	SC	-5.0				
00	00	00	SC	-	-	-	10	6.00	7	SC	-6.0				Grey Black Clay: Most Very Soft Silty CLAY (CI) & Silty CLAY (CH) Clay of Medium & High Plasticity
00	00	00	SC	-	-	-	22	7.50	8	SC	-7.5				
00	00	00	SC	-	-	-	10	9.00	8	SC	-9.0				

Dr. G. VESNATA PRASAD
 Registered Geotechnical Engineer (GATE)
 No. 11/2014-2015
 Chennai
 09/11/2014

GEOMARINE		SITE INVESTIGATION RECORD						BORE HOLE No.		BH-08						
PROJECT NAME		PROPOSED CONSTRUCTION OF A RESIDENTIAL BUILDING						SHEET		1 OF 1						
LOCATION		Theruvu/Alappu Channel		ADDRESS No.		CB-04		Time / Altitude (m)		N2						
STRUCTURE		1 Basement + 5th (Part) / Ground (Part) + 10 Floors		DRILLING METHOD		Rotary		Co-ordinator		N						
JOB CODE		GT2640		FLOWING MEDIUM		Non-flowing		V		V						
BORE START DATE		07/03/2024		BORE END DATE		08/03/2024		TOTAL BORE DAYS		2						
Depth below E.G.L. (m)	Drilling progress per meter		Type of Coring (SC / TC / MC)	Coring Details	SPT Details			Sample Details				Layer Data				
	Time				Blow Count	SPT Value	Depth	No.	Type	No. per m	Length	No.	Length	Geotechnical Description		
	hr	min														
11	14	16	SC	-	12	14	21	-	35	10.00	10	SS	<10.5	1.4	10.5	Grey silty Clay/Mud. Very stiff silty CLAY (CI) & Silty CLAY (CH). Clay of Medium & High Plasticity.
12	14	27	SC	-	6	13	16	-	29	12.00	11	SS	<12.6	3.5	12.7	Grey silty Fine Sand. Medium to Sandy Silty CLAY (CI). Sandy Clay of Low Plasticity.
13	15	06	SC	-	26	27	28	-	55	14.00	12	SS	<14.0	5.5	14.5	Brown Mud. Poorly Graded Fine & Medium Sand Grains. Medium Dense & Very Dense Silty SAND (SM).
14	15	44	DR	0	0	-	-	-	-	14.45	13	WS	<15.0	-	-	No Sample Recovered/No Core Required. Completely Weathered Rock - Grade WS Formation. Weathered Hypersaline Granite Rock.
15	15	58	DR	0	0	-	-	-	-	15.00	14	WS	<16.0	-	-	
16	16	33	DR	0	0	-	-	-	-	16.00	15	WS	<17.0	-	-	
17	17	19	DR	0	0	-	-	-	-	17.00	16	WS	<18.0	-	-	
18	18	48	DR	0	0	-	-	-	-	18.50	17	WS	<19.0	-	-	

CS - Core Sample	DS - Disturbed Sample	LOGGED	Soil	PROJECT SITE DETAILS	
SS - SPT Sampler Sample	SC - Soil Classifier	DATE	08/03/2024	GROUND LEVEL (m)	0.00
US - Undisturbed Sample	TCR - Turbidity Correlation Ratio	CHECKED	G. Sharmila	WATER TABLE (m)	2.70
WS - Water Sample	DB - Damaged Bit	DATE	12/03/2024	CASING DEPTH (m)	0.00

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

FIG.2.6 Sub Soil Profile at BH-08 Location

GEO MARINE		SITE INVESTIGATION RECORD										BORE HOLE NO.		BH-09	
PROJECT NAME		PROPOSED CONSTRUCTION OF A RESIDENTIAL BUILDING										SHEET		# OF	
LOCATION		The United Nations, Chennai		Borehole No.		CR-04		Total SPT Blows (N)		66		BORE START DATE		12/03/2024	
STRUCTURE		1 Basement + 500 (Part) + Ground (Part) + 18 Floors		BELLING METHOD		Rotary		ED COORDINATES		N		BORE END DATE		12/03/2024	
JOB CODE		RT244		FLUORENCE MEDIUM		Bentonite				E		TOTAL BORE DAYS		2	
Depth (m) (EGL)	Drilling progress per meter		Core Details		SPT Details			Sample Details			Layer Data				
	Date	Time	Type of Core	Remarks	SPT Value			Depth	No.	Type	Length	No.	Length	Geotechnical Description	
					1-10	11-20	21-30								N60
10	11	47	SC	-	-	7	11	18	-	30	10.00	10	SS	-20.0	Only near-surface (2000mm) fine to medium sand grains, Very Dense Clayey Silty SAND (SC)
11	11	56	SC	-	-	-	-	-	-	-	10.00	-	-	-	Grey, Med-Hard, Silty CLAY (CH) Clay of High Plasticity
12	12	48	SC	-	-	150mm (max) for 400mm	-	-	>100	12.00	11	SS	-12.0	-	
13	12	38	SC	-	-	-	-	-	-	-	12.00	-	-	-	Grey Off-white, Med-Fine Grained Fair & Medium Sand Grains, Very Dense, Silty SAND (SM)
14	14	23	SC	-	-	150mm (max) for 400mm	-	-	>100	14.00	12	WS	-14.0	-	
15	14	46	SC	-	-	-	-	-	-	-	14.00	-	-	-	No Sample Recovered, No Core Recovered
16	14	56	SC	-	-	-	-	-	-	-	15.00	-	-	-	Completely Weathered Rock - Grade W5 Formation
17	15	27	SC	-	-	-	-	-	-	-	15.00	-	-	-	Weathered Hypersilicic Granite Rock
18	15	45	SC	-	-	-	-	-	-	-	16.00	-	-	-	
19	15	56	SC	-	-	-	-	-	-	-	17.00	-	-	-	Grey Off-white, Med-Fine Grained & Coarse Grains, Silty, Highly Fractured & Weathered, Highly Weathered Rock - Grade W4 Rock Formation
20	16	22	SC	-	-	-	-	-	-	-	18.00	-	-	-	Fractured Hypersilicic Granite Rock Formation
LOGGED		DATE		CHECKED		DATE		PROJECT SITE DETAILS		GROUND LEVEL (m)		0.40		REMARKS	
SPT Blows (N)		DATE		CHECKED		DATE		WATER TABLE (m)		1.75					
Casing Depth (m)		DATE		CHECKED		DATE		CASING DEPTH (m)		0.00					
Borehole terminated at 18 m depth below E.G.L															
FIG.2.7 Sub Soil Profile at BH-09 Location															

Borehole terminated at 18 m depth below E.G.L

FIG.2.7 Sub Soil Profile at BH-09 Location

GEO MARINE		SITE INVESTIGATION RECORD						Bore Hole No.		BH-10							
PROJECT NAME		PROPOSED CONSTRUCTION OF A RESIDENTIAL BUILDING						SHEET		1 OF 2							
LOCATION		Thiruvalluvar, Chennai		MACHINE No.		CR-44		Free Fall Energy (ft)		60							
STRUCTURE		1 Basement + 8th (Part) Ground (Part) + 10 Floors		DRILLING METHOD		Rotary		CO-ORDINATES		N 10 03 2024							
COR / JOB		GT344		FLUIDING MEDIUM		Borehole		1		2							
Depth (m) / SPT	Drilling progress per metre		Type of Soil (as per IS: 2720)	Total Core Recovery %	R.O.C. %	SPT Details			Sample Details				Layer Data		Geotechnical Description		
	Date	Time				Blow Count			Depth	No	Type	PL (m)	Length	No		Notes	
		10				30	0-15	15-30									30-45
11/03/2024	11	21	SC	-	-	3	4	3	-	5	0.30	1	00	-0.5	Brown Moist/Medium Dst Silty CLAY (CH) Clay of High Plasticity		
	11	53	SC	-	-	3	4	3	-	10	0.55	2	00	-1.20			
	11	11	SC	-	-	3	4	3	-	10	0.55	2	00	-1.20			
	11	12	SC	-	-	3	4	3	-	10	0.55	2	00	-1.20	Brown Moist/Medium Dst Silty CLAY (CH) Clay of High Plasticity		
	11	20	SC	-	-	3	4	3	-	10	0.55	2	00	-1.20			
	11	28	SC	-	-	3	4	3	-	10	0.55	2	00	-1.20			
	11	37	SC	-	-	3	4	3	-	10	0.55	2	00	-1.20	Brown Moist/Medium Dst Silty CLAY (CH) Clay of High Plasticity		
	11	41	SC	-	-	3	4	3	-	10	0.55	2	00	-1.20			
	11	50	SC	-	-	3	4	3	-	10	0.55	2	00	-1.20			
	12	06	SC	-	-	3	4	3	-	10	0.55	2	00	-1.20	Brown Moist/Medium Dst Silty CLAY (CH) Clay of High Plasticity		
	12	12	SC	-	-	3	4	3	-	10	0.55	2	00	-1.20			
	12	18	SC	-	-	3	4	3	-	10	0.55	2	00	-1.20			
	12	41	SC	-	-	3	4	3	-	10	0.55	2	00	-1.20	Brown Moist/Medium Dst Silty CLAY (CH) Clay of High Plasticity		
	12	48	SC	-	-	3	4	3	-	10	0.55	2	00	-1.20			
	14	12	SC	-	-	3	4	3	-	10	0.55	2	00	-1.20			
	14	27	SC	-	-	3	4	3	-	10	0.55	2	00	-1.20	Brown Moist/Medium Dst Silty CLAY (CH) Clay of High Plasticity		
	14	34	SC	-	-	3	4	3	-	10	0.55	2	00	-1.20			
	14	48	SC	-	-	3	4	3	-	10	0.55	2	00	-1.20			
	14	56	SC	-	-	3	4	3	-	10	0.55	2	00	-1.20	Brown Moist/Medium Dst Silty CLAY (CH) Clay of High Plasticity		
	15	06	SC	-	-	3	4	3	-	10	0.55	2	00	-1.20			
	15	23	SC	-	-	3	4	3	-	10	0.55	2	00	-1.20			

CC - Core Sample	CC - Shallow Sample	LOGGED	SURIL	PROJECT SITE DETAILS	REMARKS
SS - Soil Sample	SC - Soil Cutter	DAYS	11/03/2024	GROUND LEVEL (m)	4.40
UDS - Undisturbed Sample	TCB - Turbidity Cutoff	CHECKED	S.DHANAKAL	WATER TABLE (m)	4.40
WS - Well Sample	DB - Diamond Bit	DATE	21/03/2024	CASING DEPTH (m)	4.40

Dr. C. VENKATA
 Registered Geotechnical Engineer
 Registered for SITE INVESTIGATION
 Chennai, Tamil Nadu
 30/11/2018
 Chennai, Tamil Nadu
 Chennai, Tamil Nadu

GEOMARINE		SITE INVESTIGATION RECORD						Bore Hole No.		BH-10					
PROJECT NAME		PROPOSED CONSTRUCTION OF A RESIDENTIAL BUILDING						SHEET		2 OF 2					
LOCATION		Description		CRUD		Free Soil Sample (%)		Bore Start Date		11/03/2024					
STRUCTURE		Drilling Method		Rotary		CO-ORDINATES		Bore End Date		12/05/2024					
JOB CODE		GT200		Flushing Medium		Bentonite		TOTAL DRILLING		2					
Depth below E.G.L. (m)	Drilling progress per meter		Core Details		SPT Details			Sample Details			Layer Data				
	Date	Time	Type of Test (e.g. 100, 150, 200)	Total Core Recovered (%)	Blowcount			Depth	No.	Type	PL (m)	Geotechnical Description			
	10	40			0-10	10-30	30-45	N30	N						
11	10	51	30	1	1	8	11	14	-	25	10.50	10	30	-10.5	Black Grey Mass Very Df. Silty CLAY (CH) Class of High Plasticity
	16	12									10.55	V			
12	16	12	30	1	1	8	13	16	-	31	12.00	15	30	-12.0	Brown, Mass, Poorly Graded Fine & Medium Grains Sand Dense Clayey Silty SAND (SC)
	18	40									12.05	V			
13	18	40	30	1	1										Brown, Mass, Poorly Graded Fine & Medium Grains Sand Very Dense Silty SAND (SM)
	18	40									14.00	12	30	-14.0	
14	09	22	30	1	1	25	21				14.00	12	30	-14.0	Brown, Mass, Poorly Graded Fine & Medium Grains Sand Very Dense Silty SAND (SM)
	06	39									14.00	V			
15	12	10	30	1	1						16.00	13	103	-16.0	Brown, Mass, Poorly Graded Fine & Medium Grains Sand Very Dense Silty SAND (SM)
	12	10									16.00	V			
16	12	14	30	1	1						17.00	14	805	-17.0	Brown, Mass, Poorly Graded Fine & Medium Grains Sand Very Dense Silty SAND (SM)
	16	30									17.00	V			
17	17	38	00	1	1						18.00	15	W0	-18.0	Brown, Mass, Poorly Graded Fine & Medium Grains Sand Very Dense Silty SAND (SM)
	11	44									18.00	V			
18	12	58	00	1	1						19.00	16	CB	-19.0	Brown, Mass, Poorly Graded Fine & Medium Grains Sand Very Dense Silty SAND (SM)
	12	58									19.00	V			
19															Brown, Mass, Poorly Graded Fine & Medium Grains Sand Very Dense Silty SAND (SM)
20															Brown, Mass, Poorly Graded Fine & Medium Grains Sand Very Dense Silty SAND (SM)

CS - Core Sample	DS - Disturbed Sample	LOGGED	SUBS.	PROJECT SITE DETAILS	
ES - Soil Specimen Sample	EC - Soil Cutter	DATE	21/02/2024	GROUND LEVEL (m)	3.00
LS - Undisturbed Sample	TCS - Tongue Casts Bt	CHECKED	S.DHAWAPAL	WATER TABLE (m)	3.00
WS - Wash Sample	DS - Diamond Bit	DATE	21/02/2024	CASING DEPTH (m)	3.00

Borehole terminated at 19 m depth below E.G.L.

FIG.2.8 Sub Soil Profile at BH-10 Location

Dr. C. VENKATA PRASAD

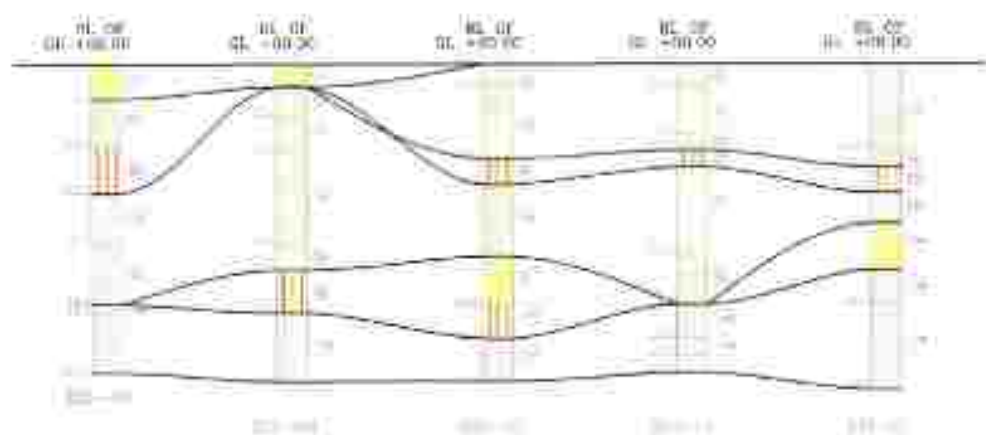
GEO-MARINE THE ART OF INVESTIGATION		SITE INVESTIGATION RECORD										Bore Hole No. BH-11		
PROJECT NAME		PROPOSED CONSTRUCTION OF A RESIDENTIAL BUILDING										SHEET 1 OF 3		
LOCATION		ADDRESS No.		CR. No.		Free Fall Energy (%)		NO		Bore Start Date		14/03/2024		
STRUCTURE		1 Basement + 5th (Part) / Ground (Part) + 10 Floors		DRILLING METHOD		Rotary		CC-DRILLING		Bore End Date		15/03/2024		
JOB CODE		GT2041		FLUWING METHOD		Rotameter		1		TOTAL DRILL DEPTH		3		
Depth from F.S.L. (m)	Drilling Progress per meter		Core Details		SPT Details				Sample Details				Layer Data	
	Time (Hr)	Time (Min)	Type of Soil (SC, MC, CC)	Time (Min)	No. of Blows	Blow Count			SPT Value	Depth (m)	No.	Type	No. of Samples	Geotechnical Description
						15-15	15-30	30-45						
1	11:22	22	SC	-	-	1	3	4	7	0.30	1	SC	-0.5	Brown, Moist, Medium Silty CLAY (CH) Clay of High Plasticity
2	11:34	34	SC	-	-	3	4	9	10	0.35	2	SC	-1.25	
3	11:47	47	SC	-	-	3	6	7	12	0.45	3	SC	-2.0	Brown Moist, Silty CLAY (CH) Clay of High Plasticity
4	12:00	00	SC	-	-	2	5	8	8	0.30	4	SC	-3.0	
5	12:12	12	SC	-	-	4	8	10	22	0.45	5	SC	-4.0	Brown Moist, Very Silty CLAY (CI) With Sand, Moisture Lean Clay of Medium Plasticity
6	12:24	24	SC	-	-	11	16	21	37	0.50	6	SC	-5.0	
7	12:47	47	SC	-	-	22	12	16	28	0.45	7	SC	-6.0	Brown, Moist, Poorly Grained, Fine & Medium Grained Sands, Dense, Silty SAND (SM)
8	14:10	10	SC	-	-	-	-	-	-	7.50	8	SC	-7.5	
9	14:31	31	SC	-	-	8	10	15	25	0.30	9	SC	-8.0	Black, Grey, Moist, Very Silty CLAY (CH) & Silty CLAY (CI) Clay of High & Medium Plasticity
10	15:43	43	SC	-	-	-	-	-	-	0.45	-	-	-	

CC - Core Sample	SC - Disturbed Sample	LOGGED	SUSA	PROJECT SITE DETAILS
SC - Split Spoon Sample	SC - Soil Cutter	DATE	14/03/2024	GROUND LEVEL (m)
UDS - Undisturbed Sample	UDS - Tension Corrosion	CHECKED	S. D. NARAYAN	WATER TABLE (m)
WS - Water Sample	WS - Ground Water	DATE	14/03/2024	CASING DEPTH (m)

CROSS SECTION PROFILE



D.C. VENKATA PRASAD
Director, Marine Conservation
Department of Fisheries
Government of Karnataka
1st Floor, 1st Main Road, Kuvempu Nagar, Bangalore
Phone: 080-2654428/28118
Email: dcvenkata@karnataka.gov.in



D. J. VENKAT
 Director
 SANTANA PVT. LTD.
 100, 101, 102, 103, 104, 105, 106, 107, 108, 109, 110, 111, 112, 113, 114, 115, 116, 117, 118, 119, 120, 121, 122, 123, 124, 125, 126, 127, 128, 129, 130, 131, 132, 133, 134, 135, 136, 137, 138, 139, 140, 141, 142, 143, 144, 145, 146, 147, 148, 149, 150, 151, 152, 153, 154, 155, 156, 157, 158, 159, 160, 161, 162, 163, 164, 165, 166, 167, 168, 169, 170, 171, 172, 173, 174, 175, 176, 177, 178, 179, 180, 181, 182, 183, 184, 185, 186, 187, 188, 189, 190, 191, 192, 193, 194, 195, 196, 197, 198, 199, 200, 201, 202, 203, 204, 205, 206, 207, 208, 209, 210, 211, 212, 213, 214, 215, 216, 217, 218, 219, 220, 221, 222, 223, 224, 225, 226, 227, 228, 229, 230, 231, 232, 233, 234, 235, 236, 237, 238, 239, 240, 241, 242, 243, 244, 245, 246, 247, 248, 249, 250, 251, 252, 253, 254, 255, 256, 257, 258, 259, 260, 261, 262, 263, 264, 265, 266, 267, 268, 269, 270, 271, 272, 273, 274, 275, 276, 277, 278, 279, 280, 281, 282, 283, 284, 285, 286, 287, 288, 289, 290, 291, 292, 293, 294, 295, 296, 297, 298, 299, 300, 301, 302, 303, 304, 305, 306, 307, 308, 309, 310, 311, 312, 313, 314, 315, 316, 317, 318, 319, 320, 321, 322, 323, 324, 325, 326, 327, 328, 329, 330, 331, 332, 333, 334, 335, 336, 337, 338, 339, 340, 341, 342, 343, 344, 345, 346, 347, 348, 349, 350, 351, 352, 353, 354, 355, 356, 357, 358, 359, 360, 361, 362, 363, 364, 365, 366, 367, 368, 369, 370, 371, 372, 373, 374, 375, 376, 377, 378, 379, 380, 381, 382, 383, 384, 385, 386, 387, 388, 389, 390, 391, 392, 393, 394, 395, 396, 397, 398, 399, 400, 401, 402, 403, 404, 405, 406, 407, 408, 409, 410, 411, 412, 413, 414, 415, 416, 417, 418, 419, 420, 421, 422, 423, 424, 425, 426, 427, 428, 429, 430, 431, 432, 433, 434, 435, 436, 437, 438, 439, 440, 441, 442, 443, 444, 445, 446, 447, 448, 449, 450, 451, 452, 453, 454, 455, 456, 457, 458, 459, 460, 461, 462, 463, 464, 465, 466, 467, 468, 469, 470, 471, 472, 473, 474, 475, 476, 477, 478, 479, 480, 481, 482, 483, 484, 485, 486, 487, 488, 489, 490, 491, 492, 493, 494, 495, 496, 497, 498, 499, 500, 501, 502, 503, 504, 505, 506, 507, 508, 509, 510, 511, 512, 513, 514, 515, 516, 517, 518, 519, 520, 521, 522, 523, 524, 525, 526, 527, 528, 529, 530, 531, 532, 533, 534, 535, 536, 537, 538, 539, 540, 541, 542, 543, 544, 545, 546, 547, 548, 549, 550, 551, 552, 553, 554, 555, 556, 557, 558, 559, 560, 561, 562, 563, 564, 565, 566, 567, 568, 569, 570, 571, 572, 573, 574, 575, 576, 577, 578, 579, 580, 581, 582, 583, 584, 585, 586, 587, 588, 589, 590, 591, 592, 593, 594, 595, 596, 597, 598, 599, 600, 601, 602, 603, 604, 605, 606, 607, 608, 609, 610, 611, 612, 613, 614, 615, 616, 617, 618, 619, 620, 621, 622, 623, 624, 625, 626, 627, 628, 629, 630, 631, 632, 633, 634, 635, 636, 637, 638, 639, 640, 641, 642, 643, 644, 645, 646, 647, 648, 649, 650, 651, 652, 653, 654, 655, 656, 657, 658, 659, 660, 661, 662, 663, 664, 665, 666, 667, 668, 669, 670, 671, 672, 673, 674, 675, 676, 677, 678, 679, 680, 681, 682, 683, 684, 685, 686, 687, 688, 689, 690, 691, 692, 693, 694, 695, 696, 697, 698, 699, 700, 701, 702, 703, 704, 705, 706, 707, 708, 709, 710, 711, 712, 713, 714, 715, 716, 717, 718, 719, 720, 721, 722, 723, 724, 725, 726, 727, 728, 729, 730, 731, 732, 733, 734, 735, 736, 737, 738, 739, 740, 741, 742, 743, 744, 745, 746, 747, 748, 749, 750, 751, 752, 753, 754, 755, 756, 757, 758, 759, 760, 761, 762, 763, 764, 765, 766, 767, 768, 769, 770, 771, 772, 773, 774, 775, 776, 777, 778, 779, 780, 781, 782, 783, 784, 785, 786, 787, 788, 789, 790, 791, 792, 793, 794, 795, 796, 797, 798, 799, 800, 801, 802, 803, 804, 805, 806, 807, 808, 809, 810, 811, 812, 813, 814, 815, 816, 817, 818, 819, 820, 821, 822, 823, 824, 825, 826, 827, 828, 829, 830, 831, 832, 833, 834, 835, 836, 837, 838, 839, 840, 841, 842, 843, 844, 845, 846, 847, 848, 849, 850, 851, 852, 853, 854, 855, 856, 857, 858, 859, 860, 861, 862, 863, 864, 865, 866, 867, 868, 869, 870, 871, 872, 873, 874, 875, 876, 877, 878, 879, 880, 881, 882, 883, 884, 885, 886, 887, 888, 889, 890, 891, 892, 893, 894, 895, 896, 897, 898, 899, 900, 901, 902, 903, 904, 905, 906, 907, 908, 909, 910, 911, 912, 913, 914, 915, 916, 917, 918, 919, 920, 921, 922, 923, 924, 925, 926, 927, 928, 929, 930, 931, 932, 933, 934, 935, 936, 937, 938, 939, 940, 941, 942, 943, 944, 945, 946, 947, 948, 949, 950, 951, 952, 953, 954, 955, 956, 957, 958, 959, 960, 961, 962, 963, 964, 965, 966, 967, 968, 969, 970, 971, 972, 973, 974, 975, 976, 977, 978, 979, 980, 981, 982, 983, 984, 985, 986, 987, 988, 989, 990, 991, 992, 993, 994, 995, 996, 997, 998, 999, 1000.

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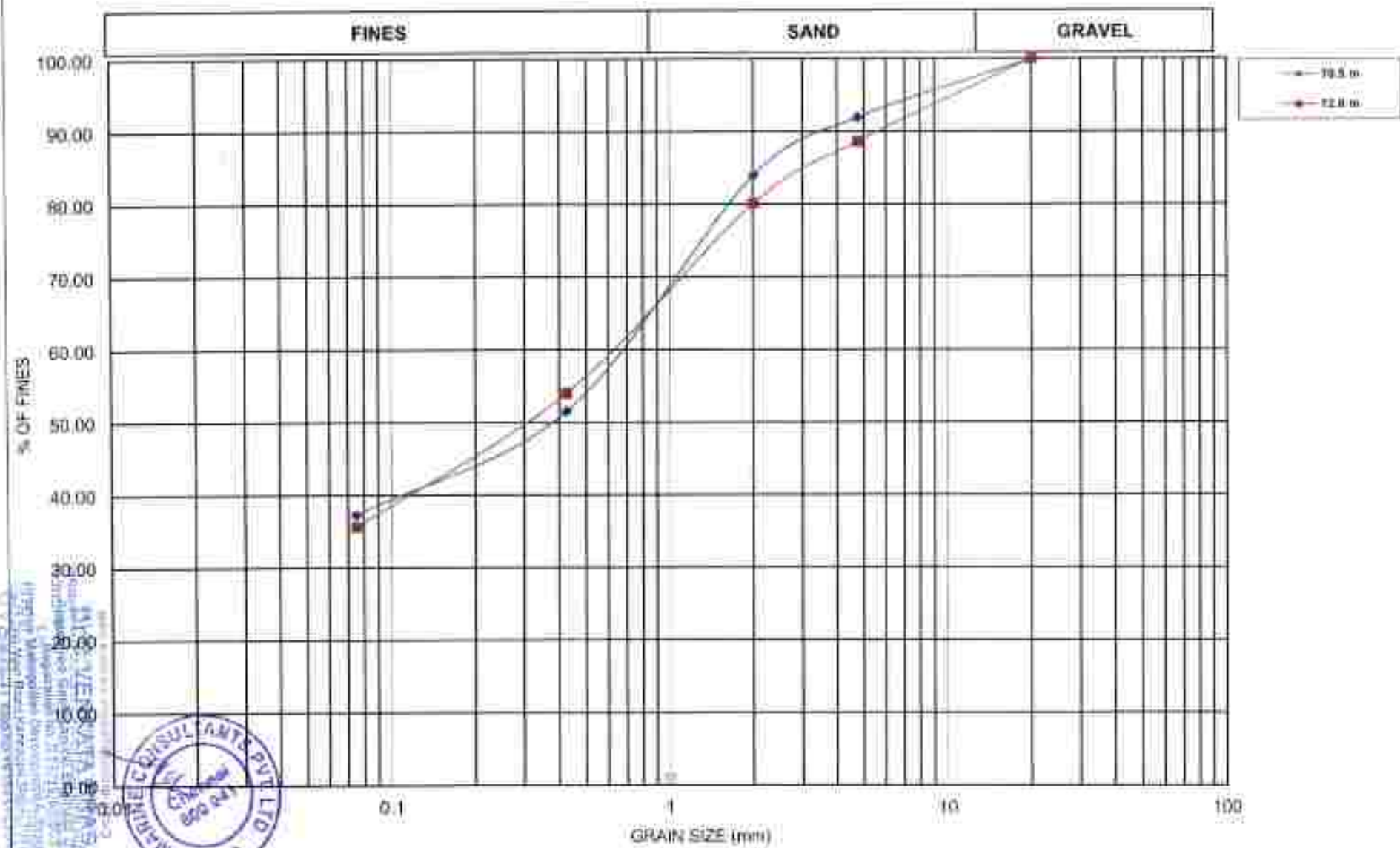


Fig. 2.13 GRAIN SIZE DISTRIBUTION CURVE - BH-04

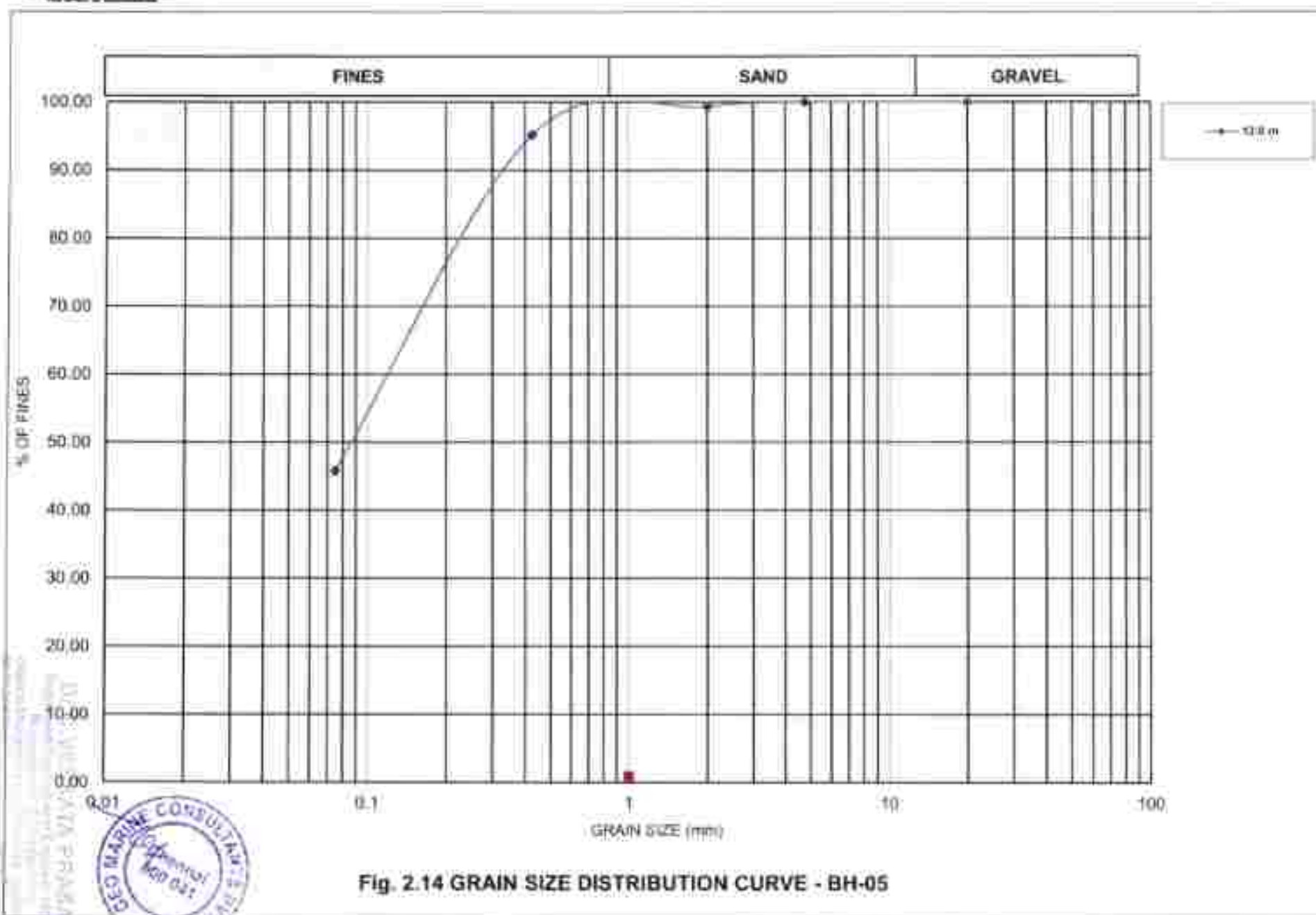


Fig. 2.14 GRAIN SIZE DISTRIBUTION CURVE - BH-05

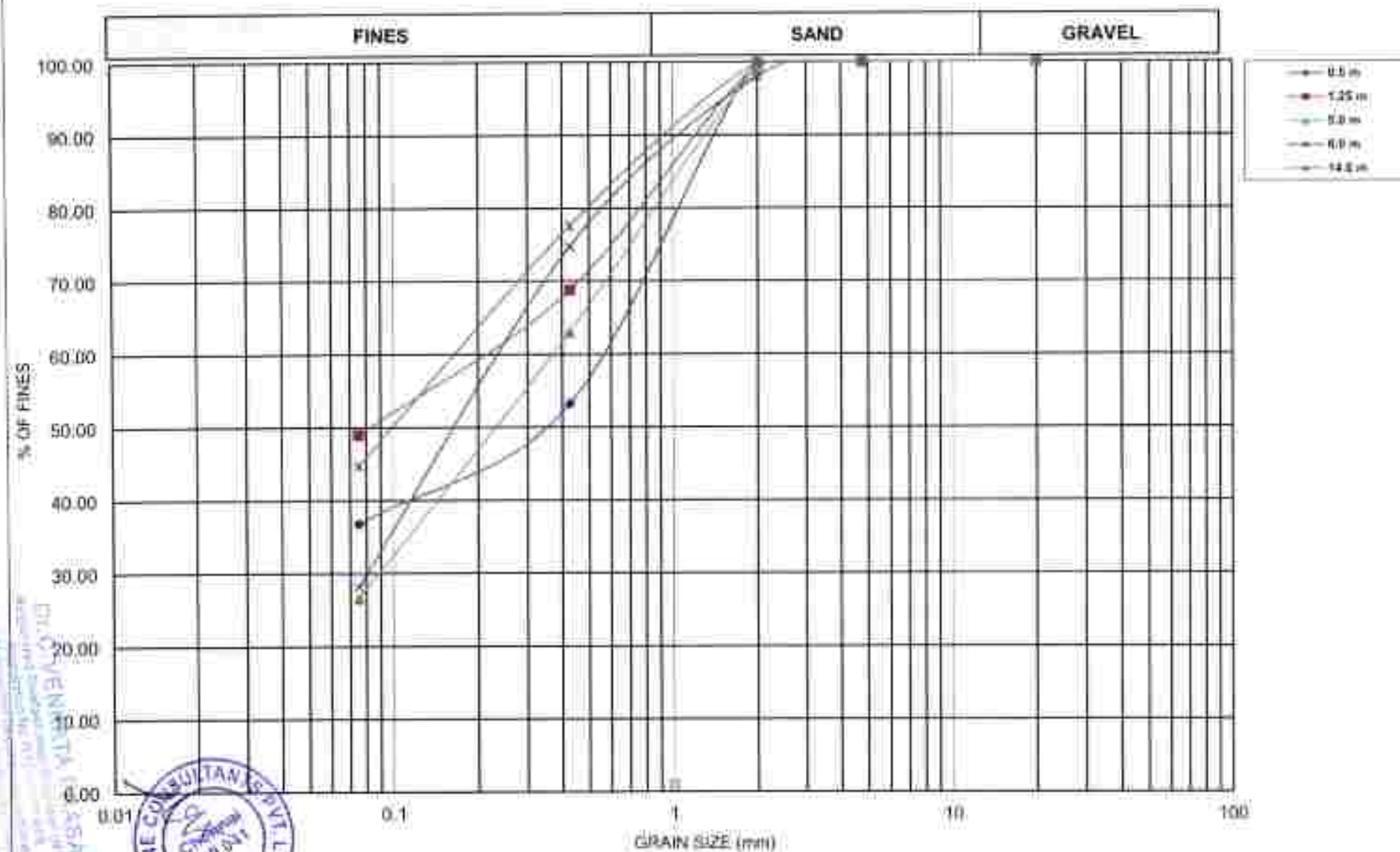


Fig. 2.15 GRAIN SIZE DISTRIBUTION CURVE - BH-06

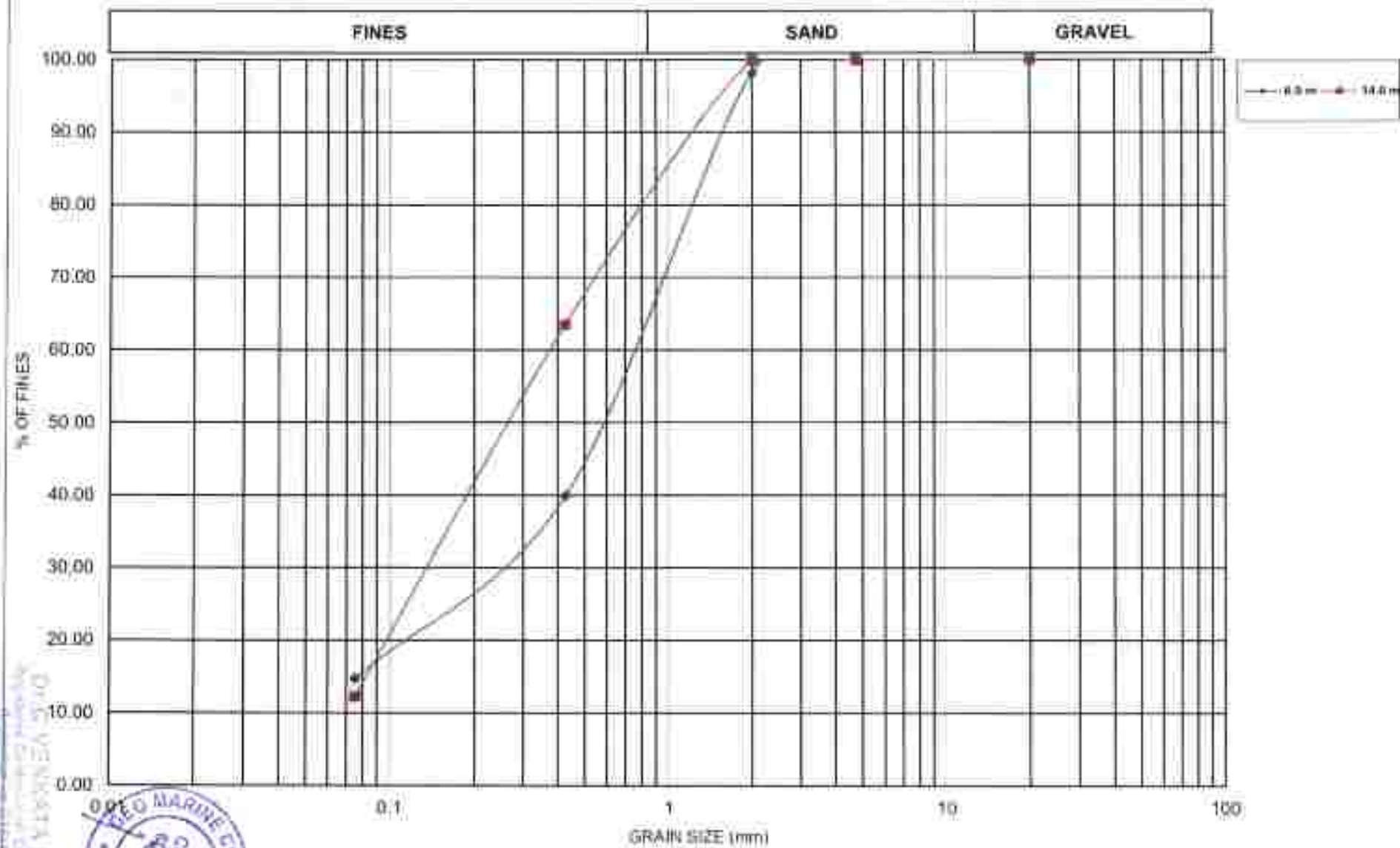


Fig. 2.16 GRAIN SIZE DISTRIBUTION CURVE - BH-07

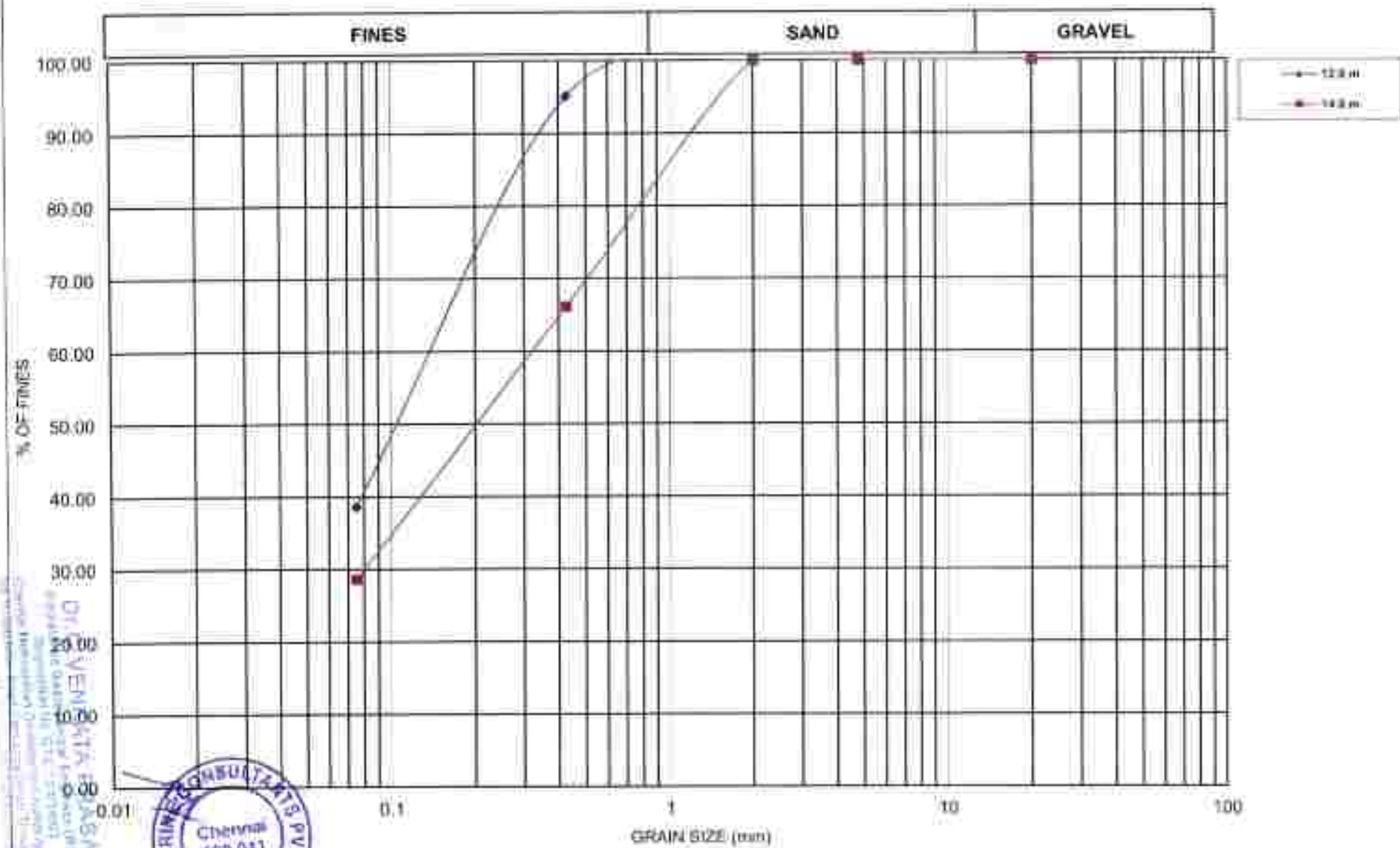


Fig. 2.17 GRAIN SIZE DISTRIBUTION CURVE - BH-08

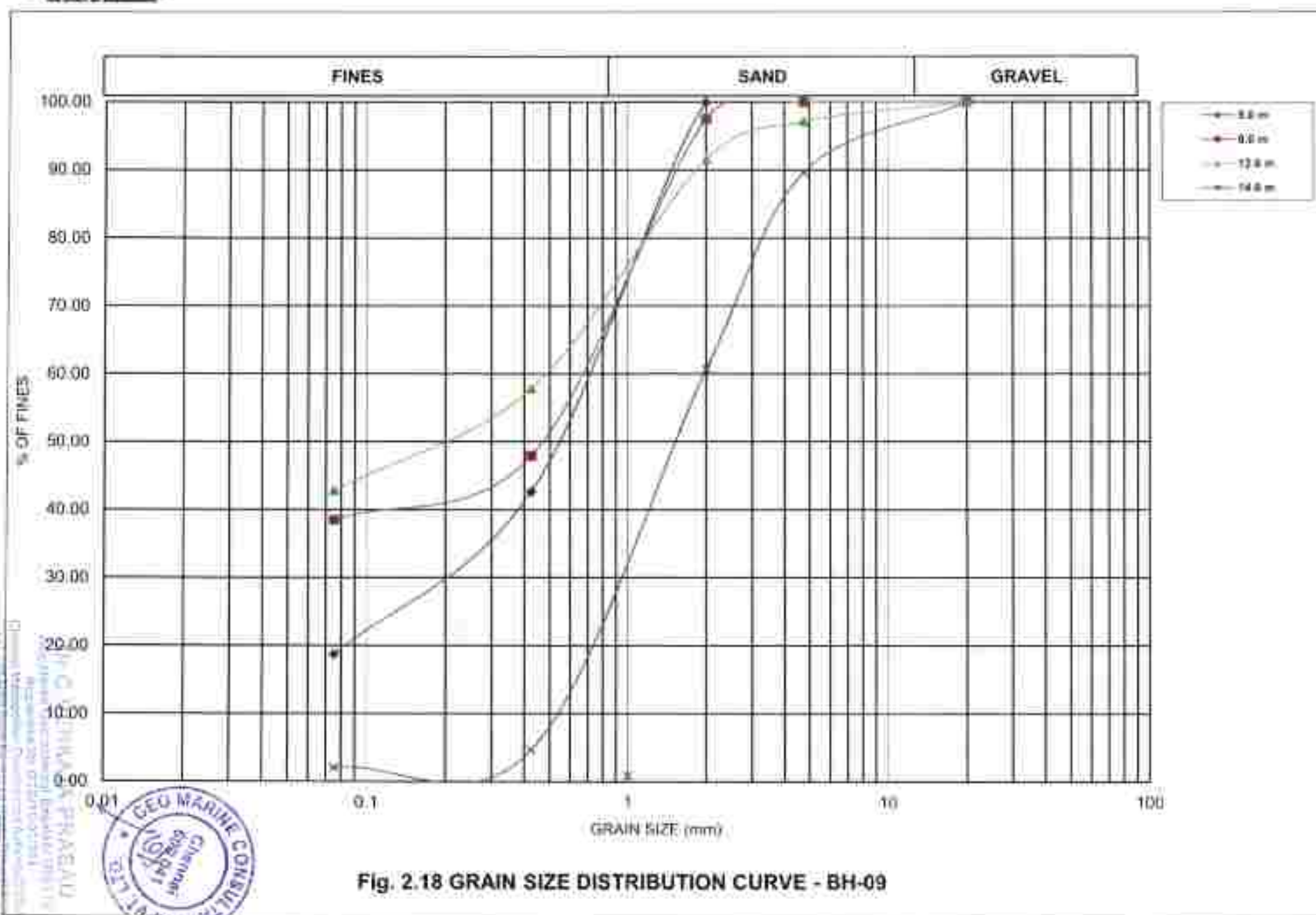


Fig. 2.18 GRAIN SIZE DISTRIBUTION CURVE - BH-09

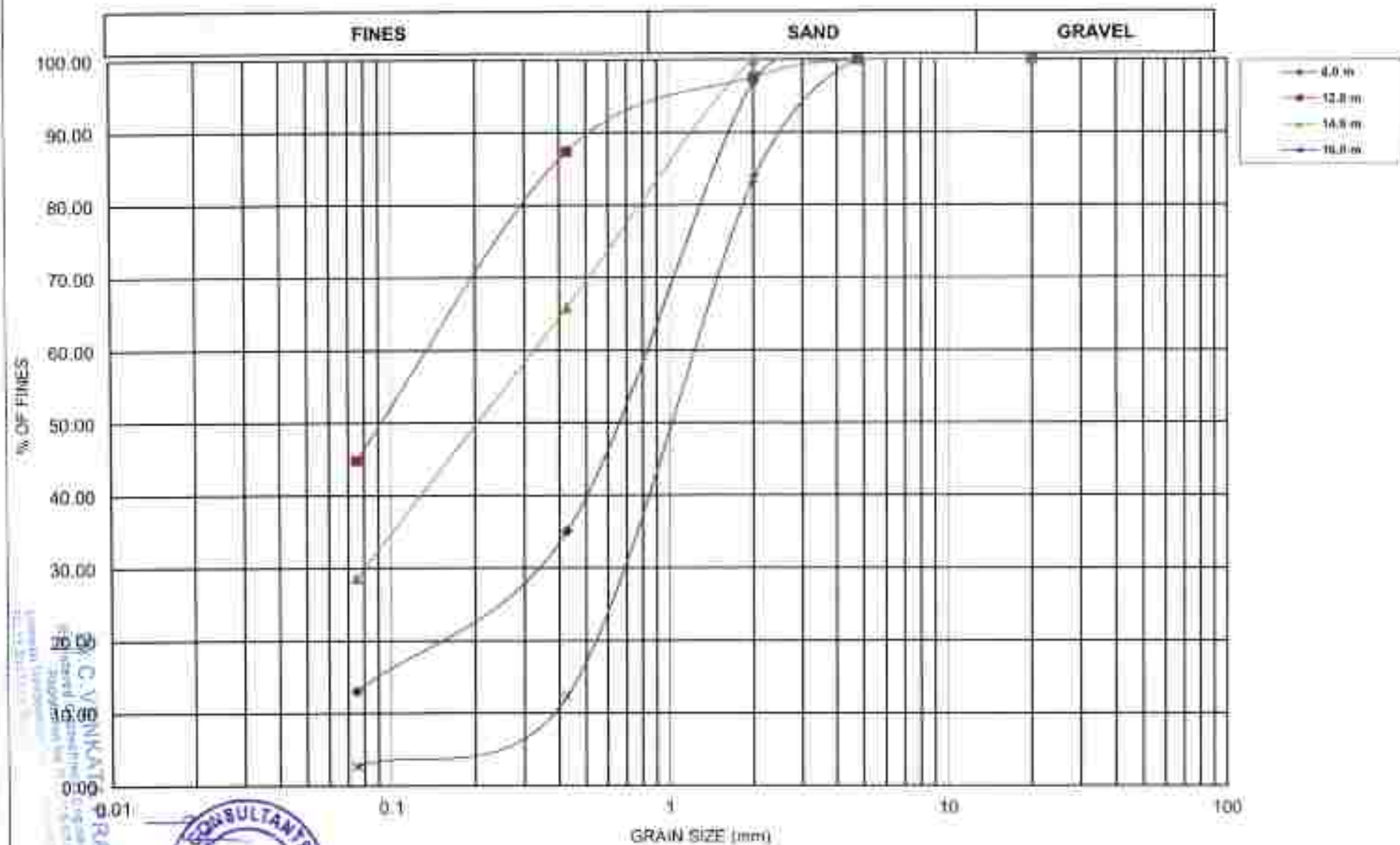


Fig. 2.19 GRAIN SIZE DISTRIBUTION CURVE - BH-10

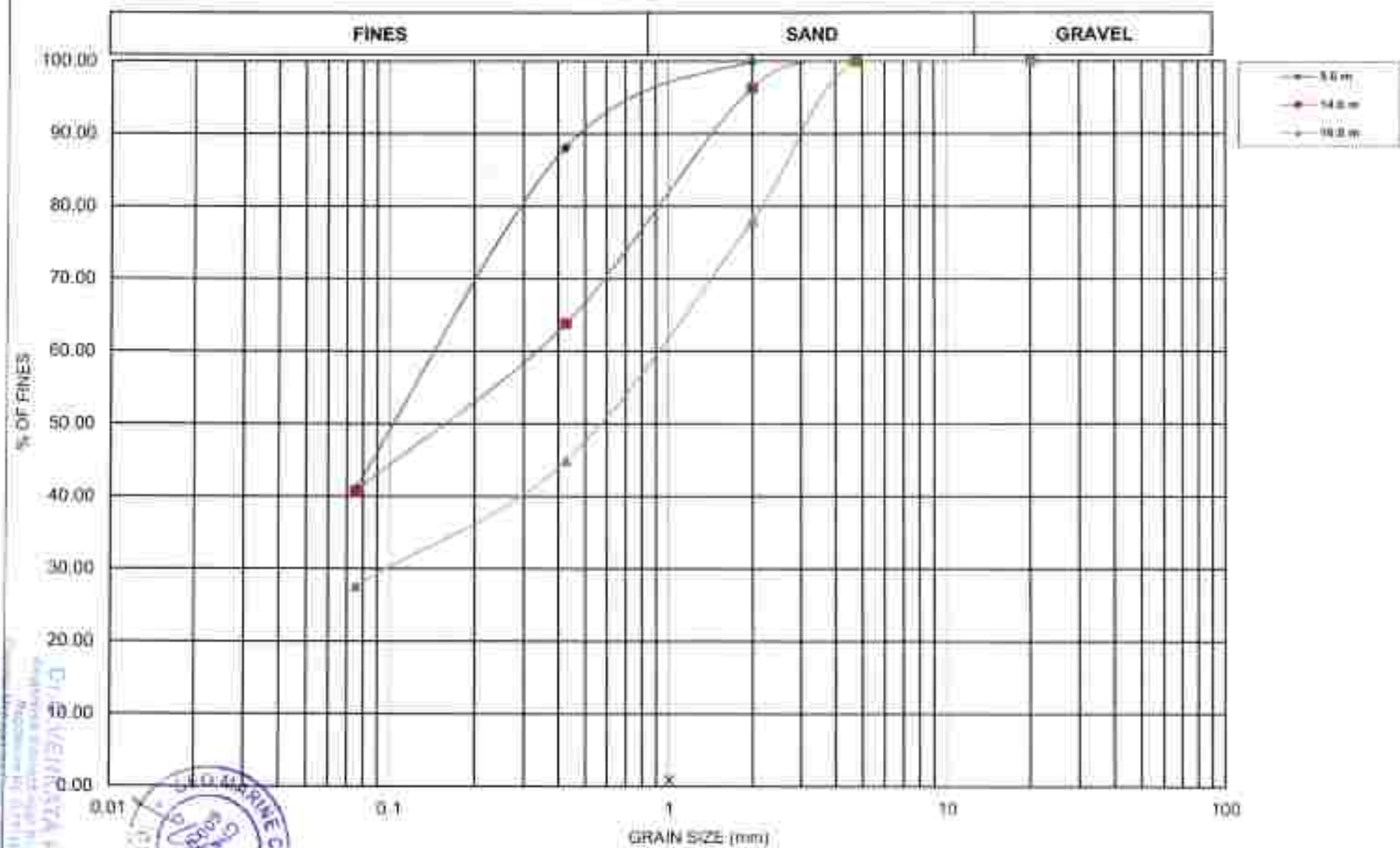
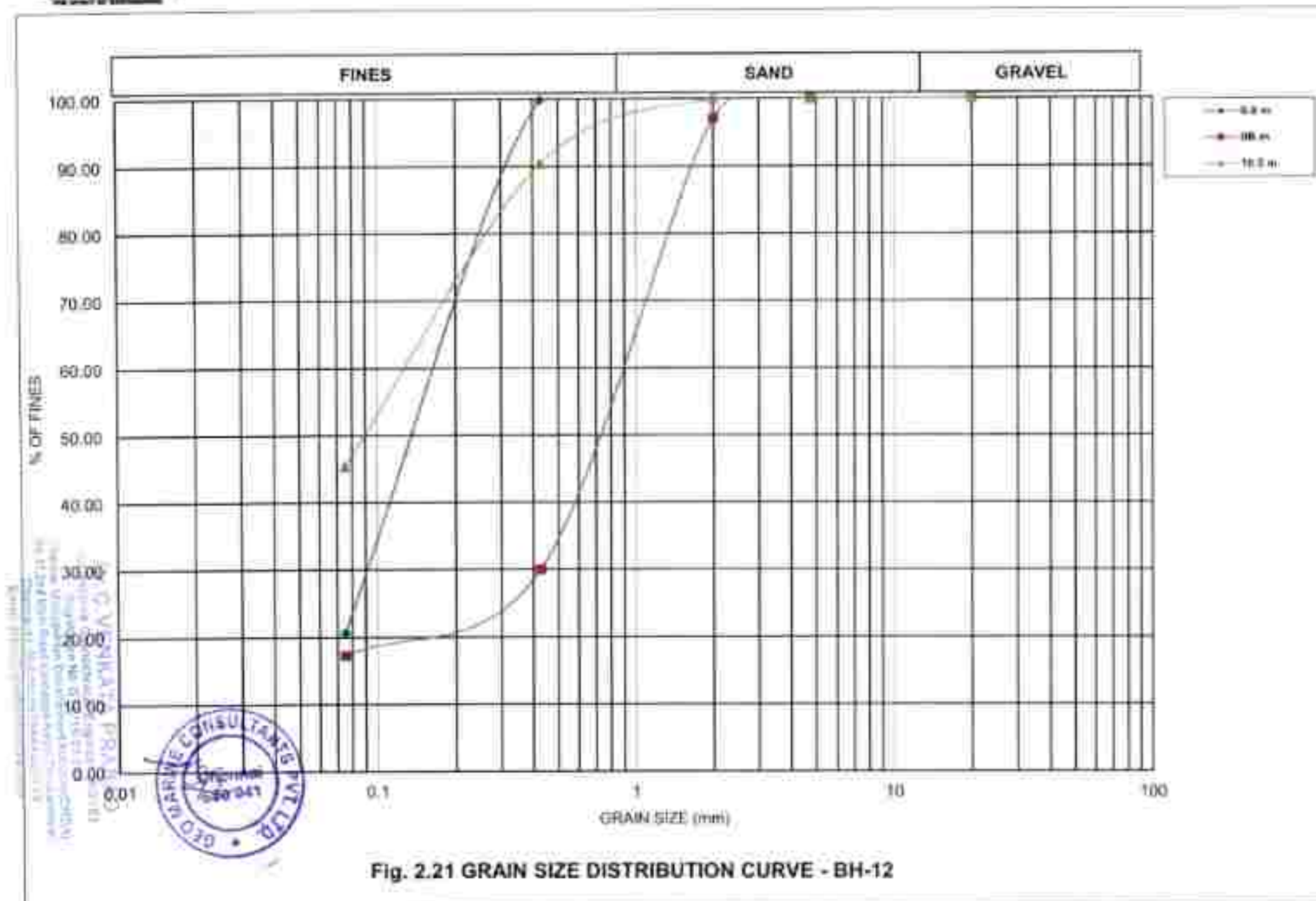


Fig. 2.20 GRAIN SIZE DISTRIBUTION CURVE - BH-11



HYDROMETER ANALYSIS CURVE



Dr. C. VENKATA PRASAD
Assistant Professor & Head of Department
Department of Civil Engineering
Gandhi Mahaveer Engineering College
Narasimha Rao Road, Nampally, Hyderabad-500004
Contact: 9440124400, 9440124401
Email: prasad@vsnl.net

Location BH-03 Depth: 7.50m

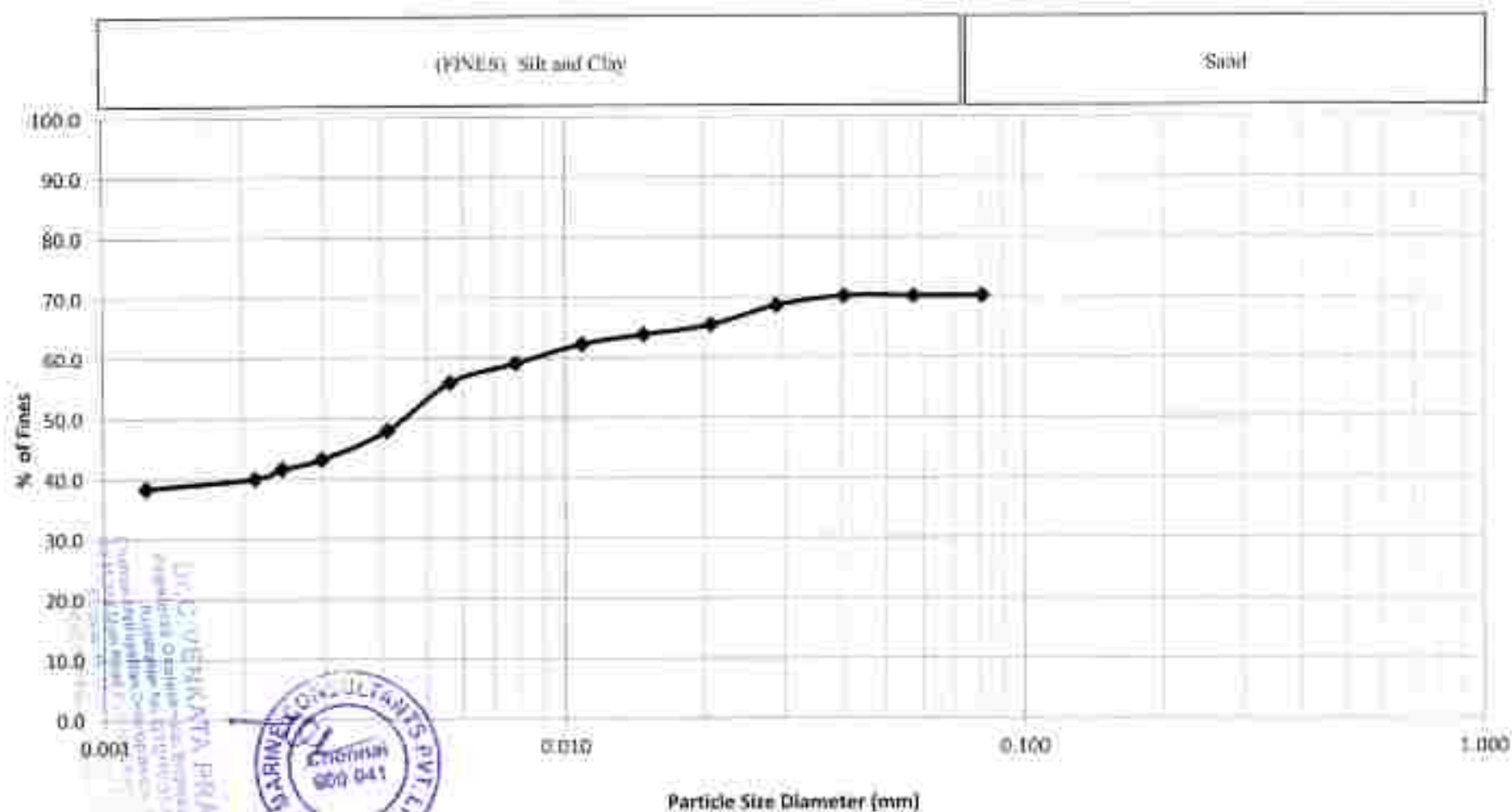


Fig 2.22 Hydrometer Analysis Master Curve

Location: B11-04 Depth: 2.00m

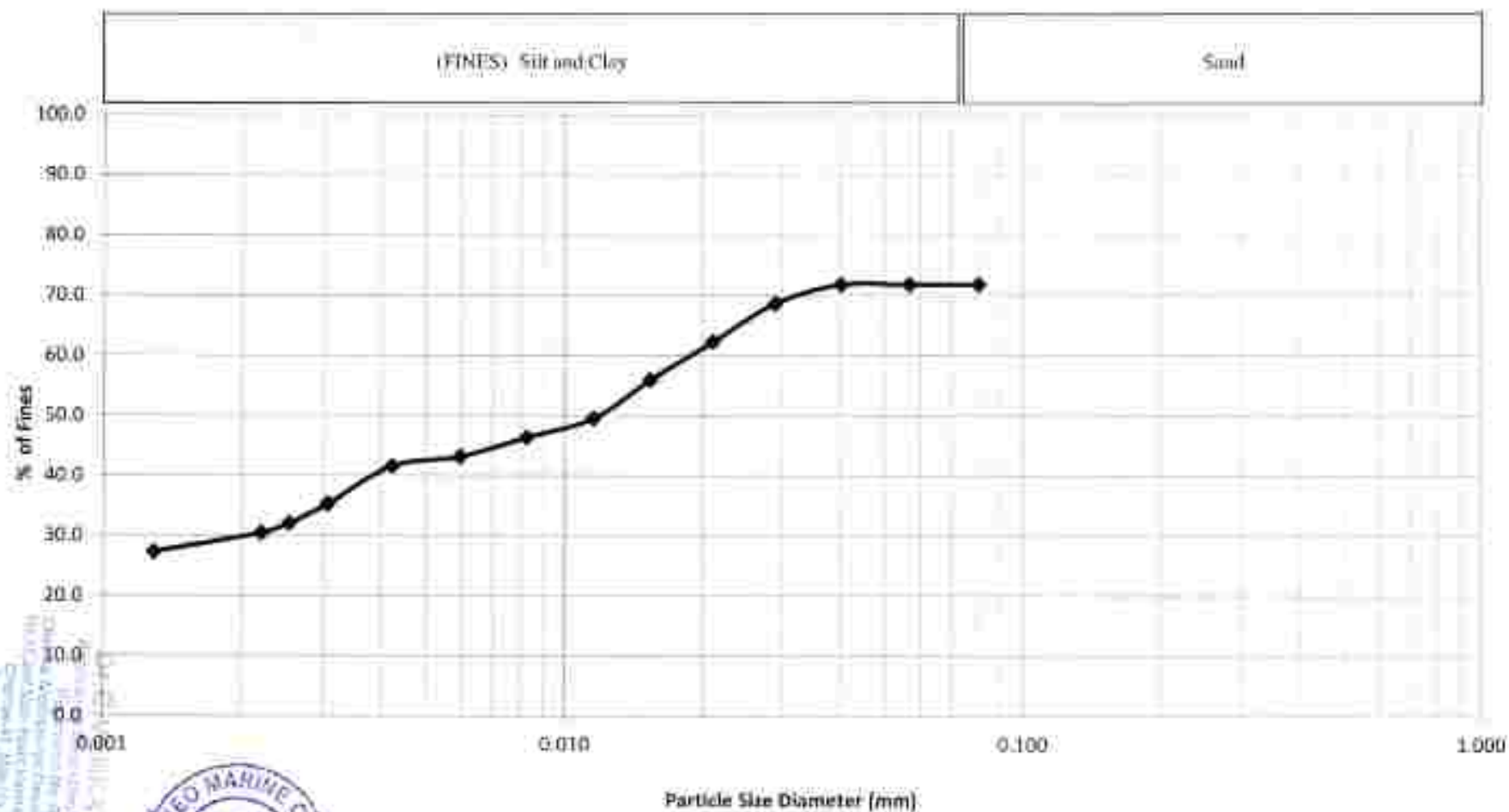


Fig 2.23 Hydrometer Analysis Master Curve



Location BH-04 Depth: 4.00m

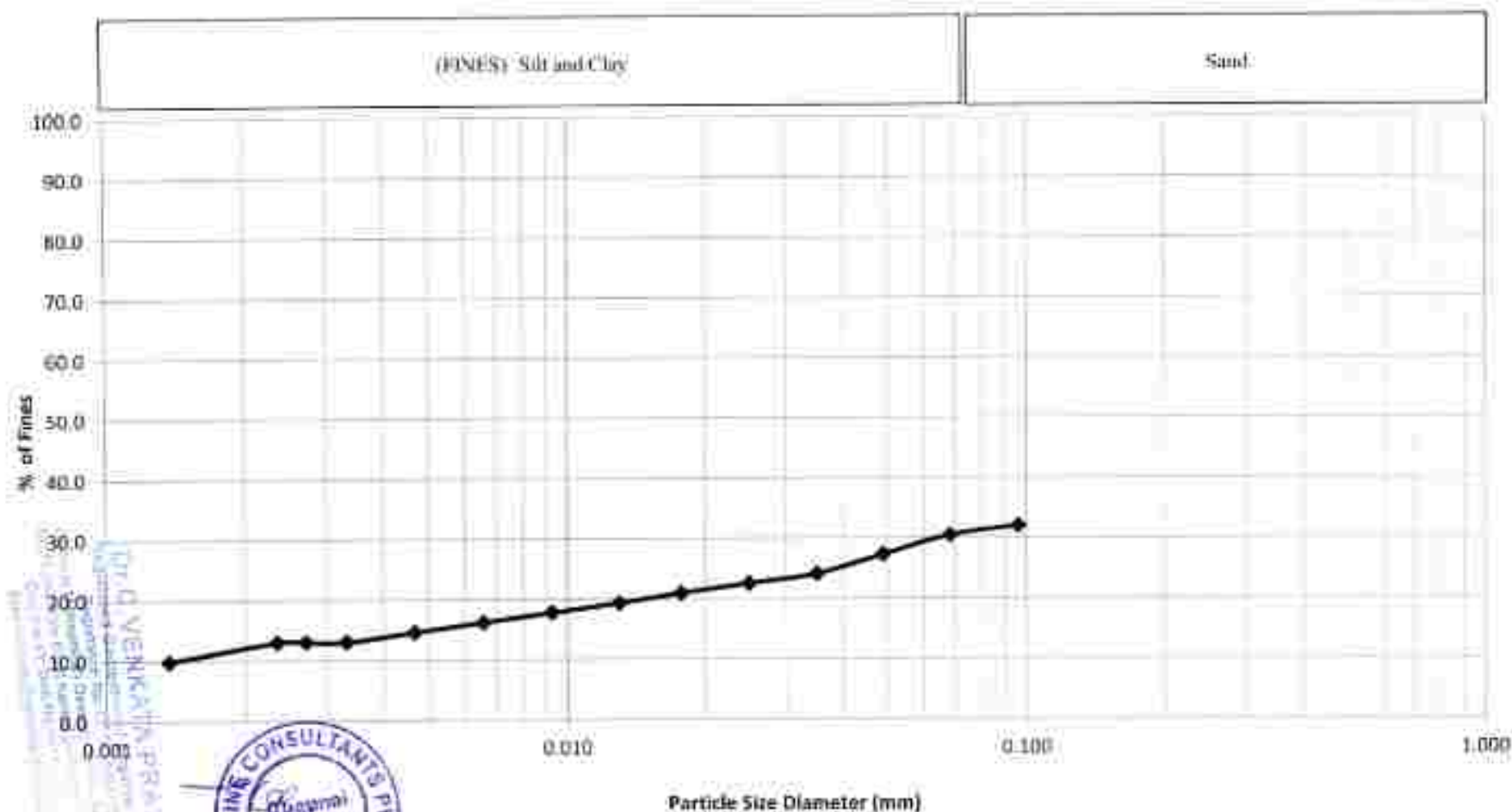


Fig 2.24 Hydrometer Analysis Master Curve

Location BH-04 Depth: 7.50m

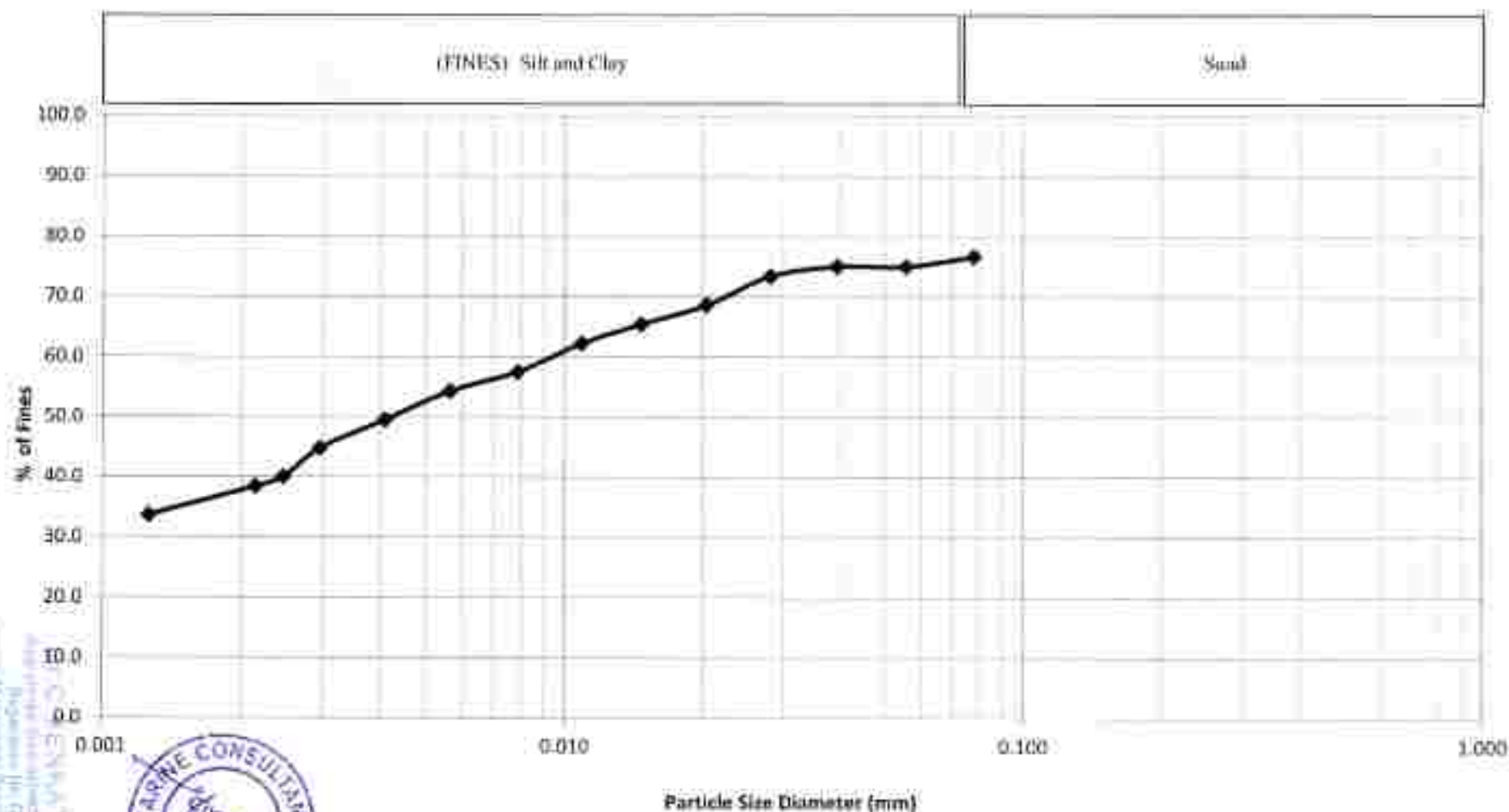


Fig 2.25 Hydrometer Analysis Master Curve

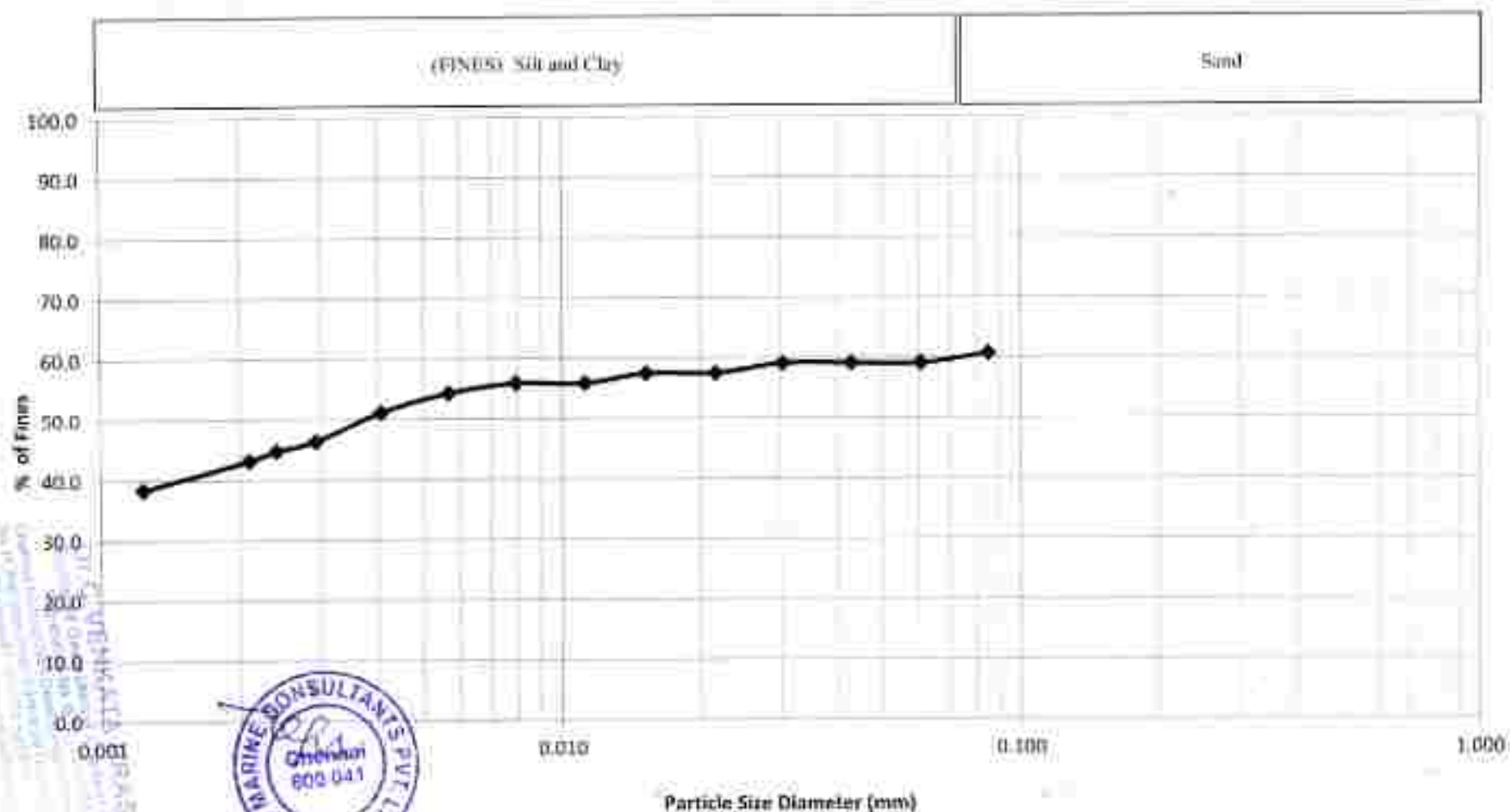


Fig 2.26 Hydrometer Analysis Master Curve

Location RH-05 Depth: 4.00m

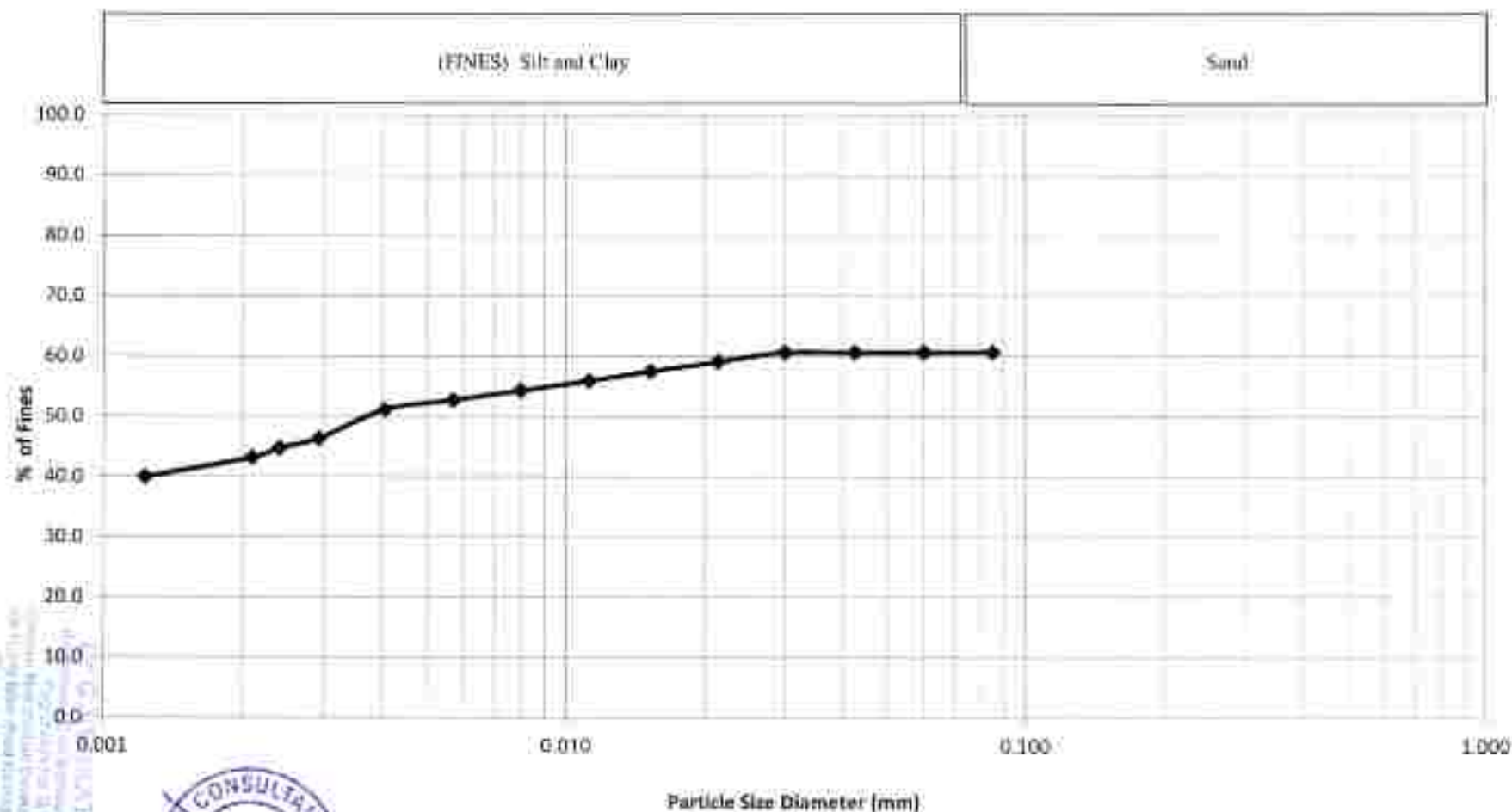


Fig 2.27 Hydrometer Analysis Master Curve

Location: BH-05 Depth: 7.50m

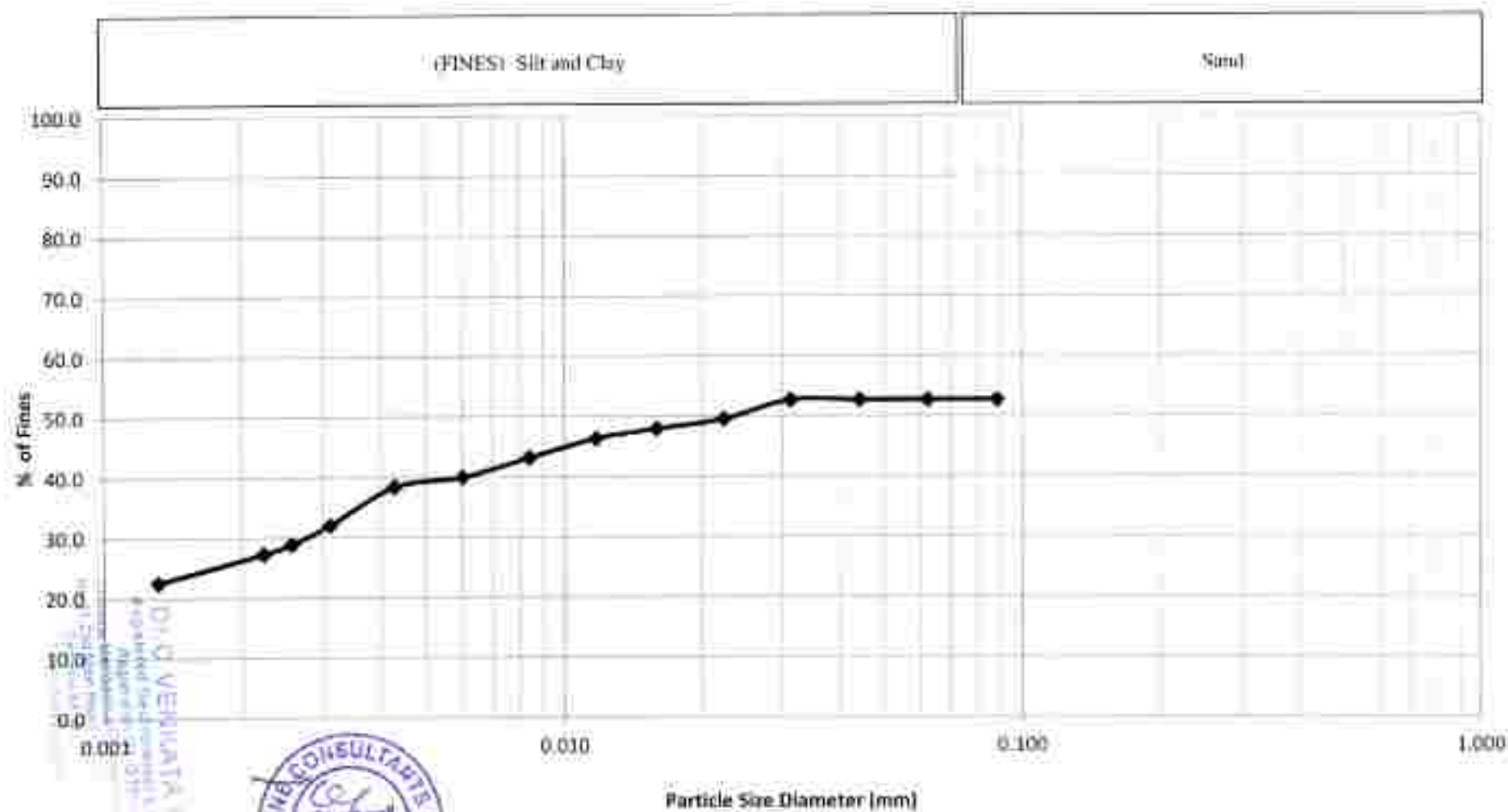


Fig 2.28 Hydrometer Analysis Master Curve

Location: BH-05 Depth: 4.00m

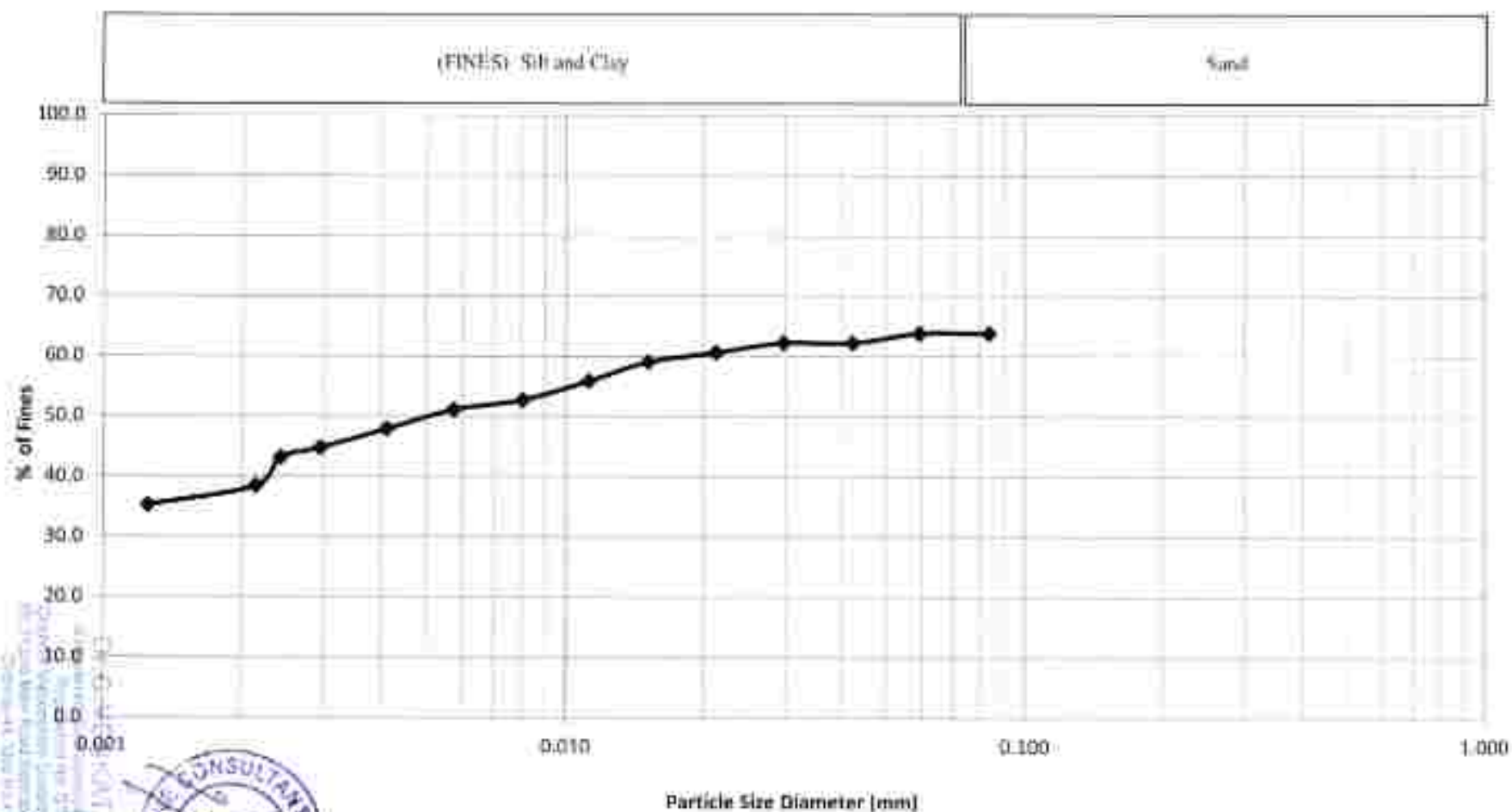


Fig 2.29 Hydrometer Analysis Master Curve

Location BH-00 Depth: 7.50m

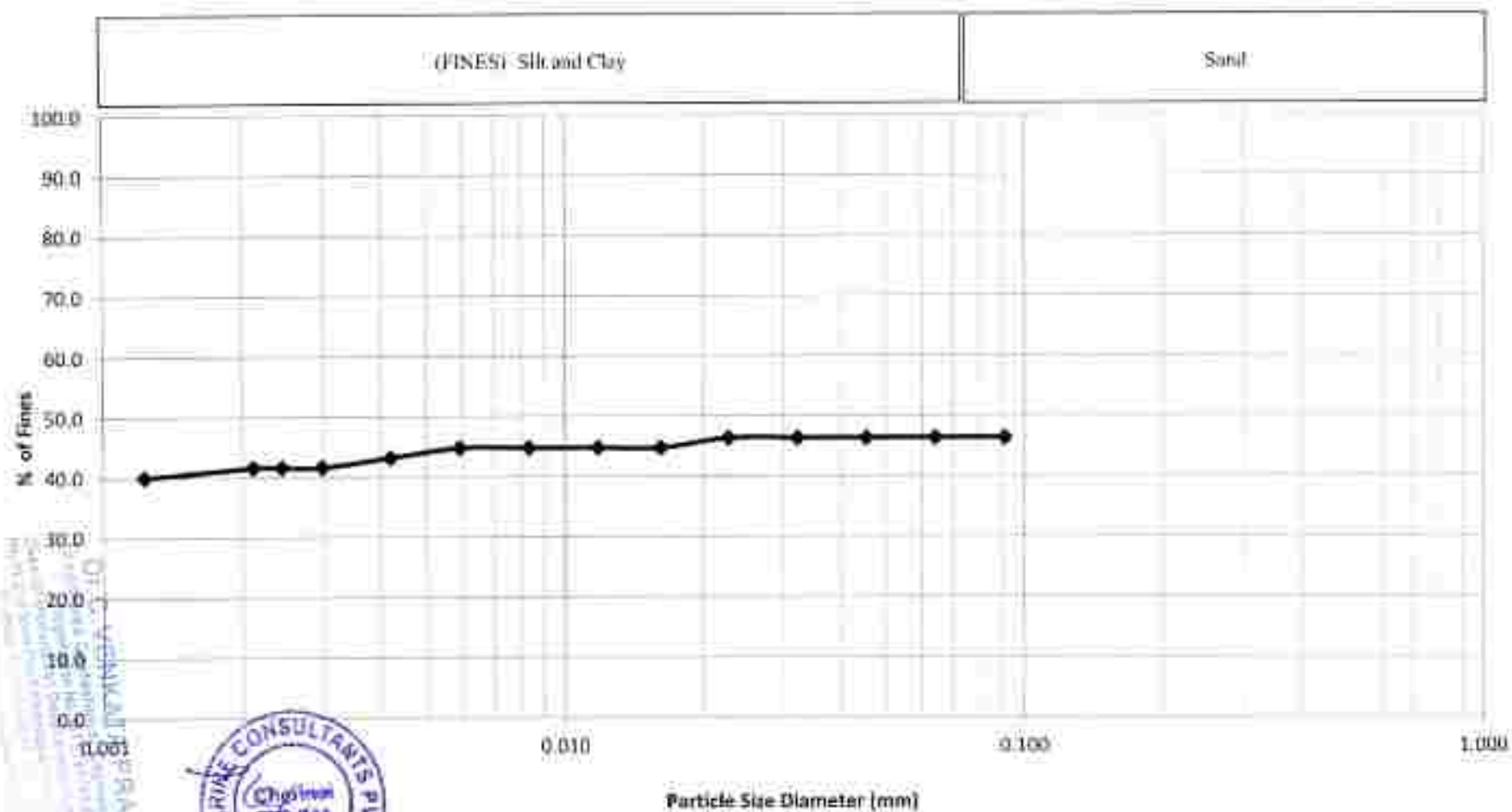


Fig 2.30 Hydrometer Analysis Master Curve



Location BH-07 Depth: 3.00m

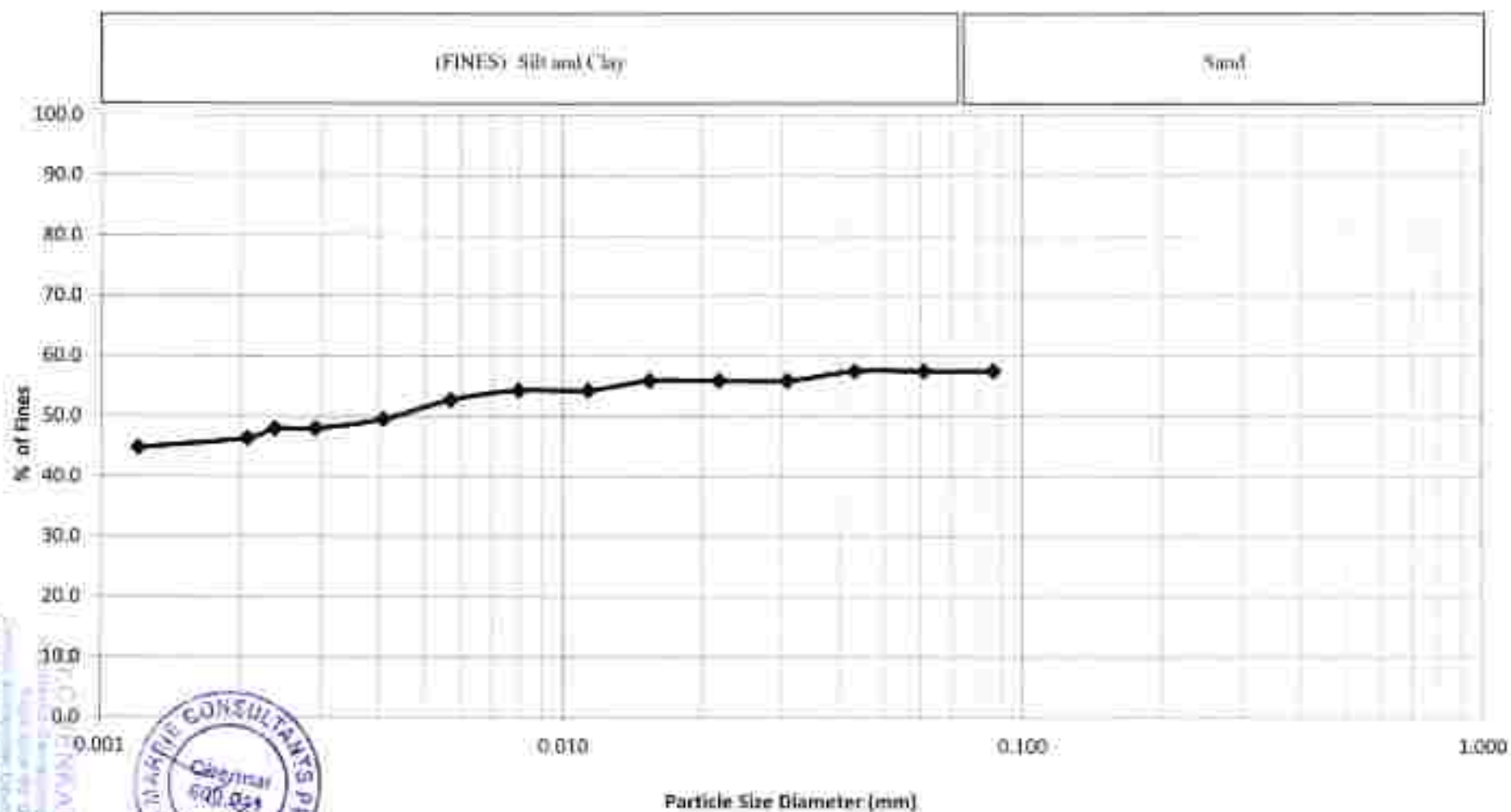


Fig 2.31 Hydrometer Analysis Master Curve

Location BH-07 Depth: 7.50m

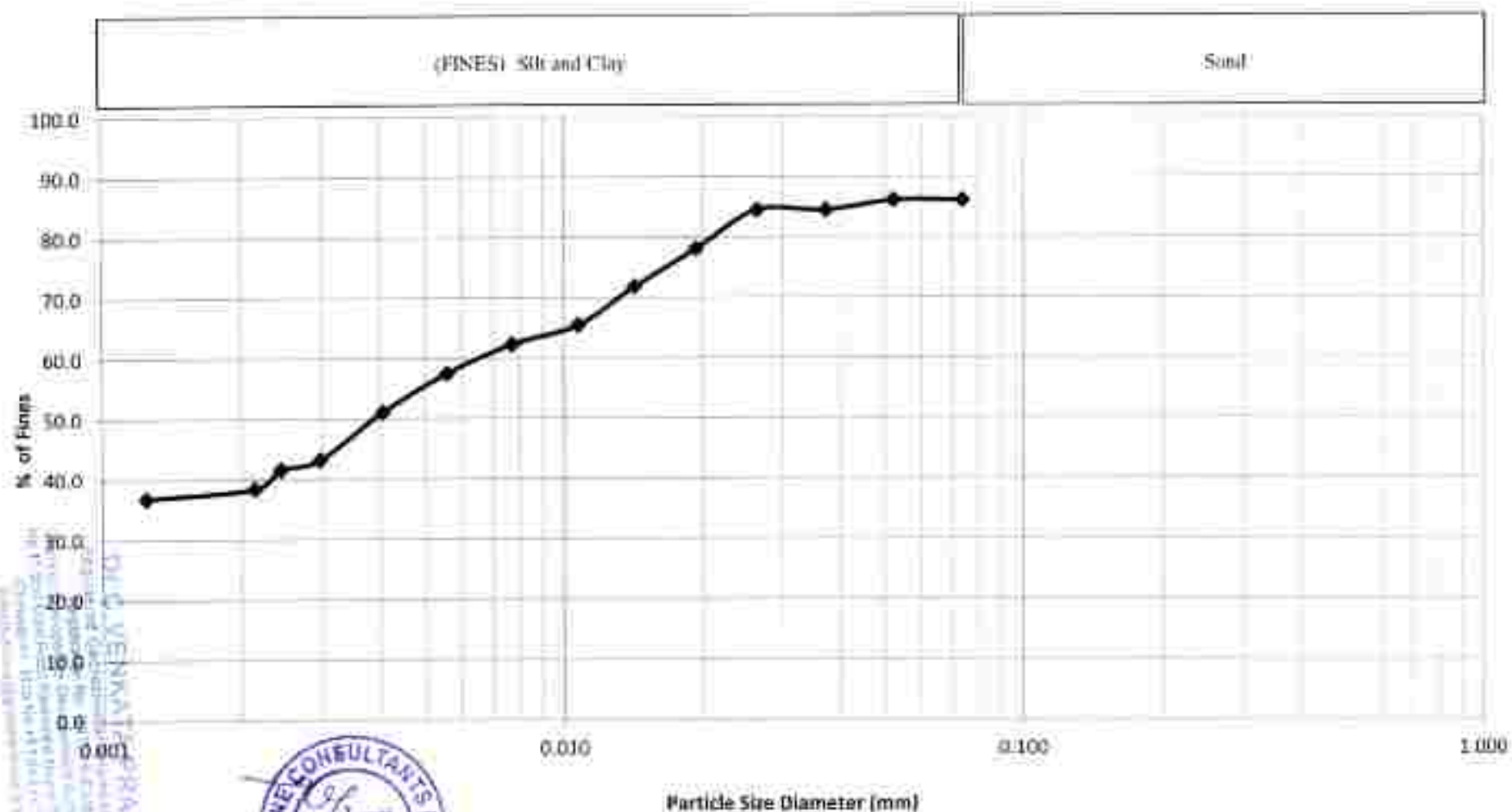


Fig 2.32 Hydrometer Analysis Master Curve



Location: BH-08 Depth: 7.00m

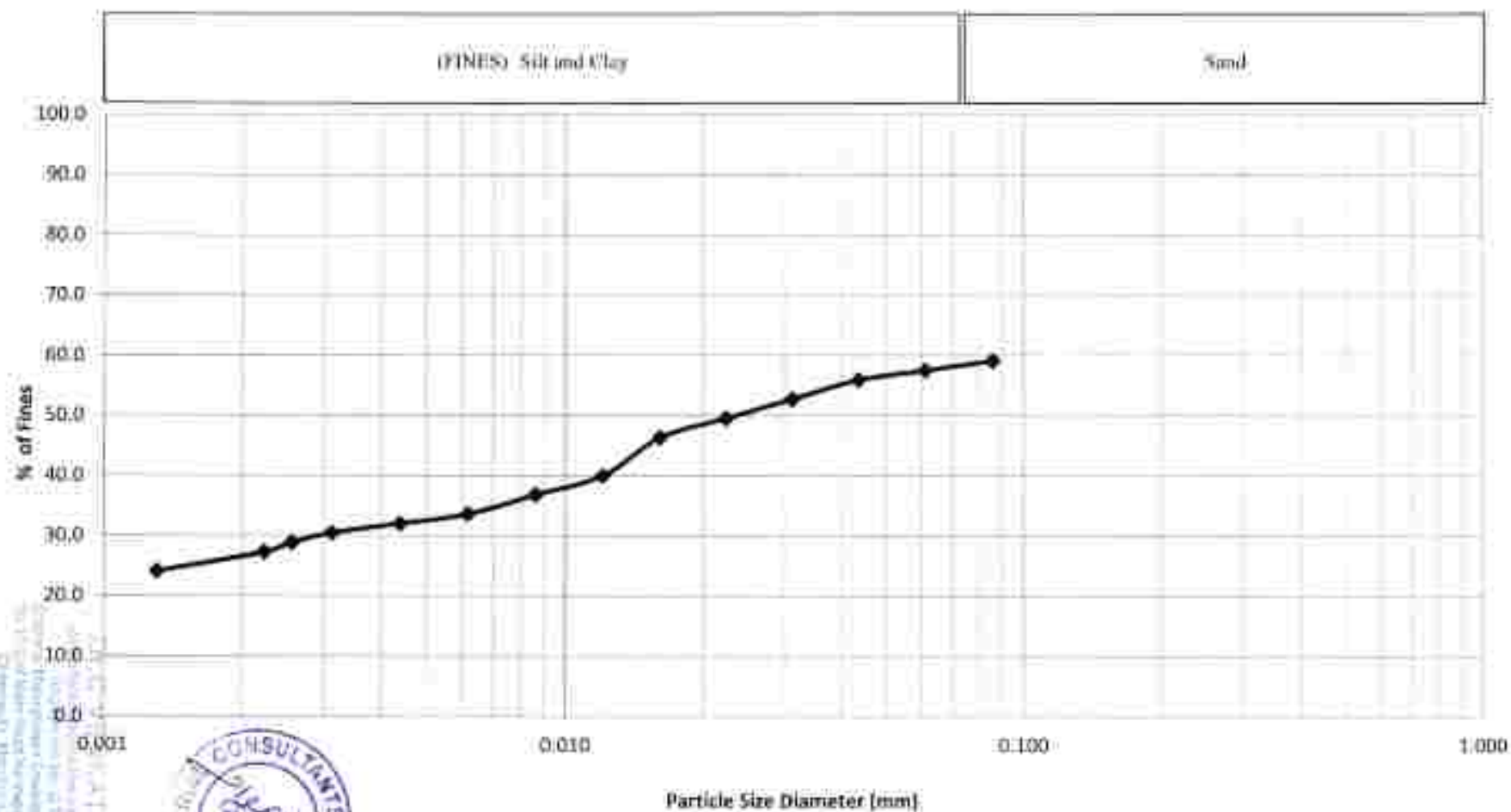


Fig 2.33 Hydrometer Analysis Master Curve



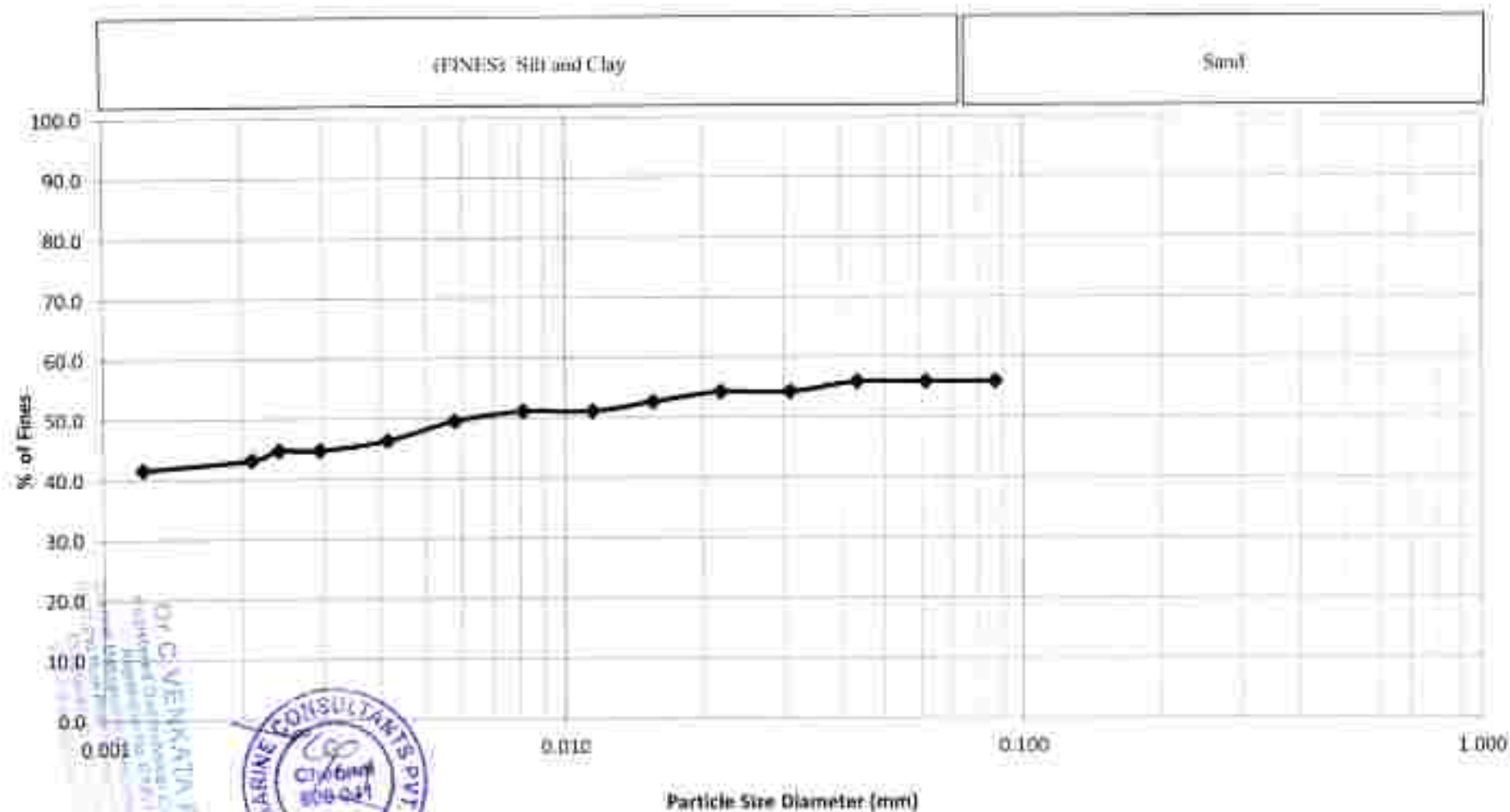


Fig 2.34 Hydrometer Analysis Master Curve

Location: BH-09 Depth: 2.00m

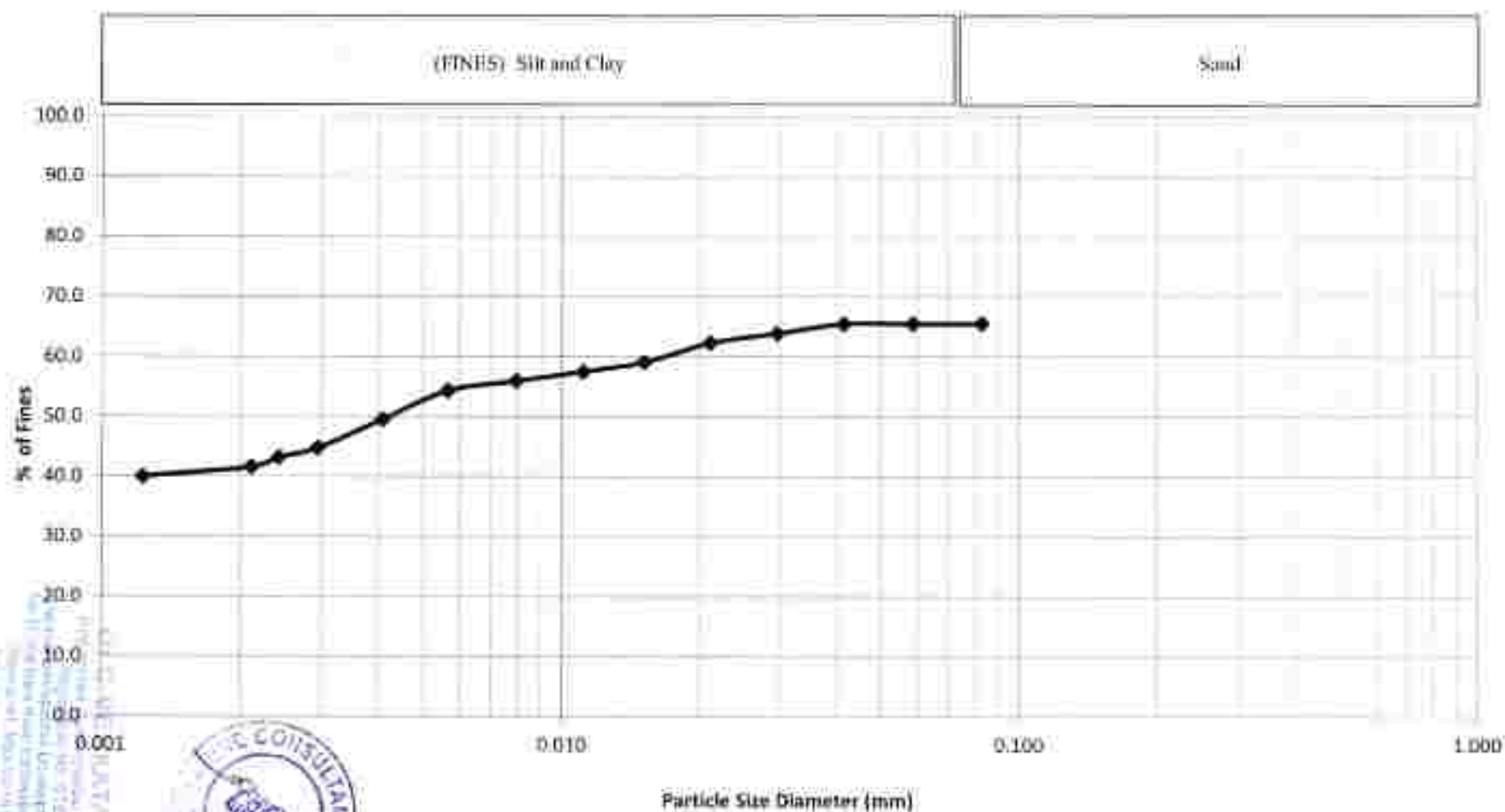


Fig 2.35 Hydrometer Analysis Master Curve

Location BH-09 Depth: 10.50m

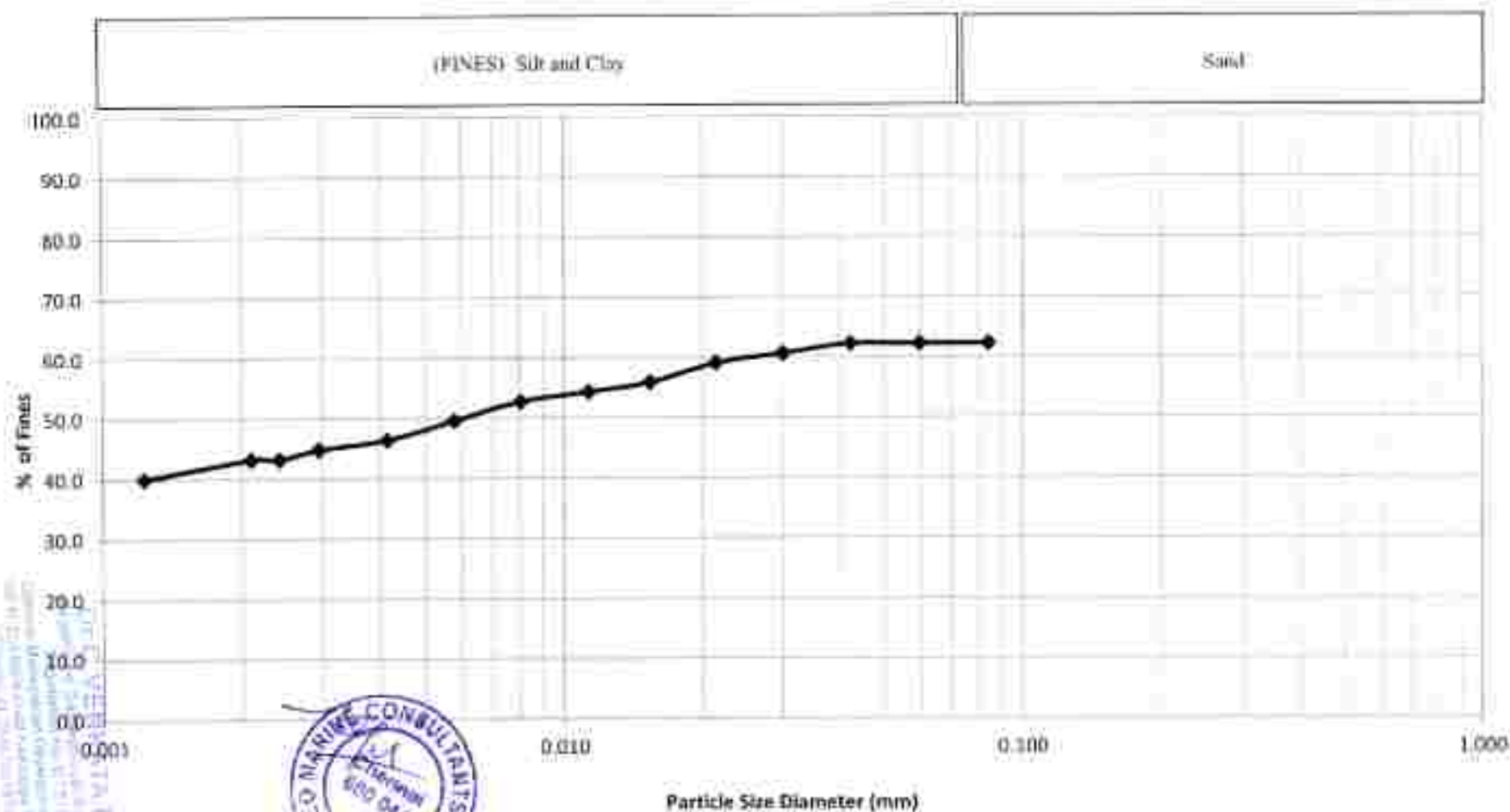


Fig 2.36 Hydrometer Analysis Master Curve

Location BH-10 Depth: 10.00m

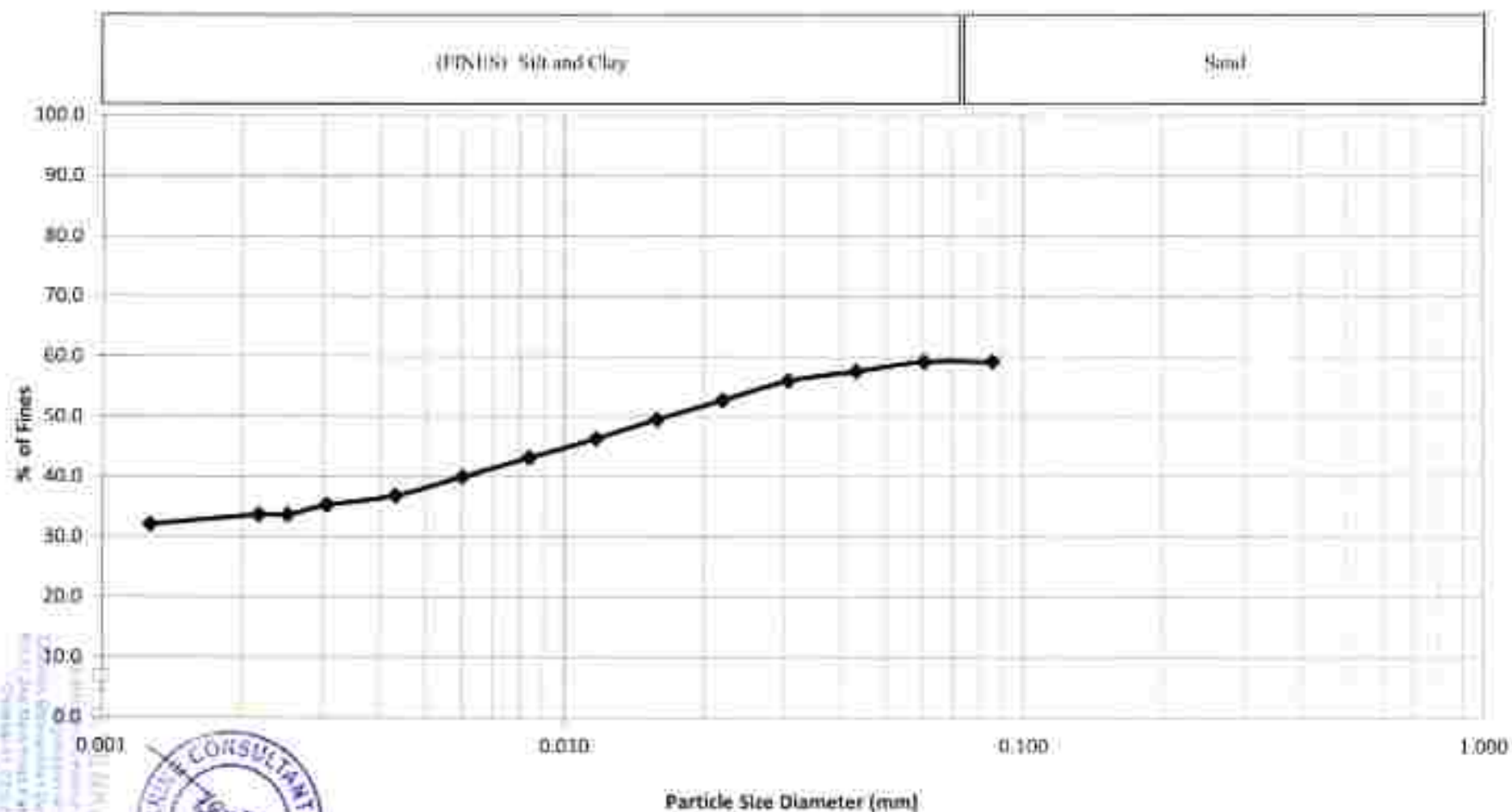


Fig 2.37 Hydrometer Analysis Master Curve



Location BH-11 Depth: 2.00m

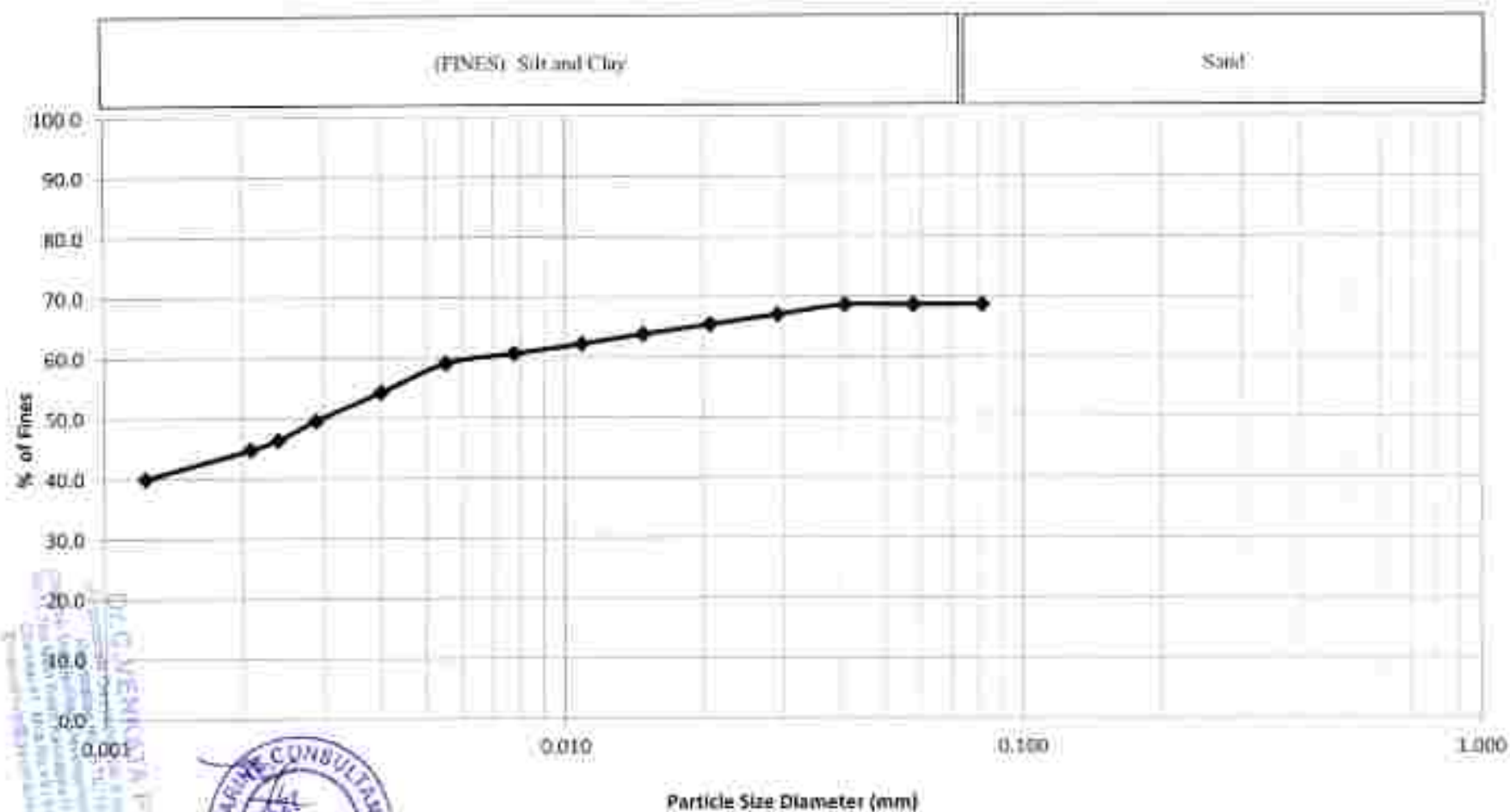


Fig 2.38 Hydrometer Analysis Master Curve

Location: BH-11 Depth: 10.50m

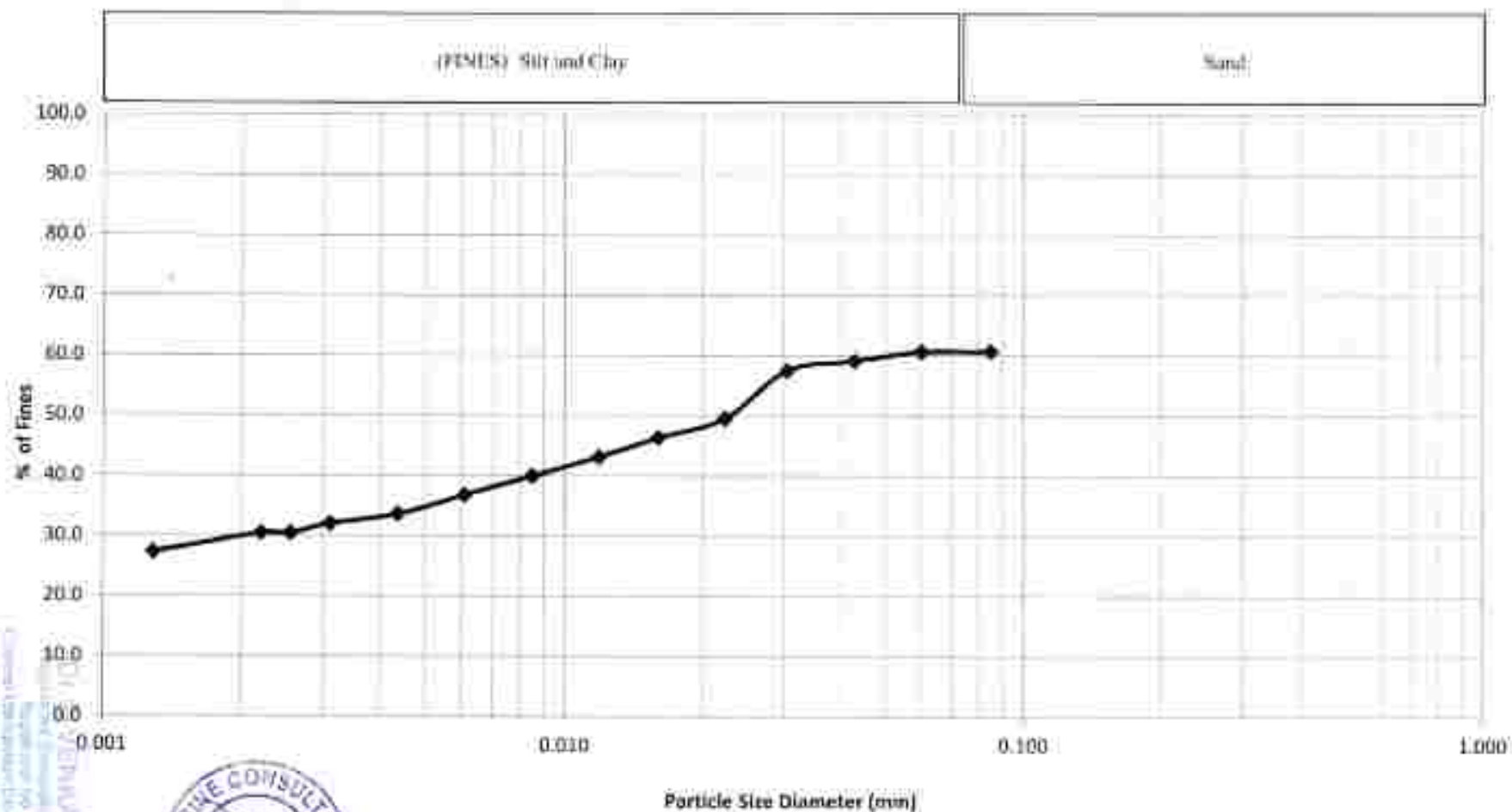


Fig 2.39 Hydrometer Analysis Master Curve



Location BH-12 Depth: 0.50m

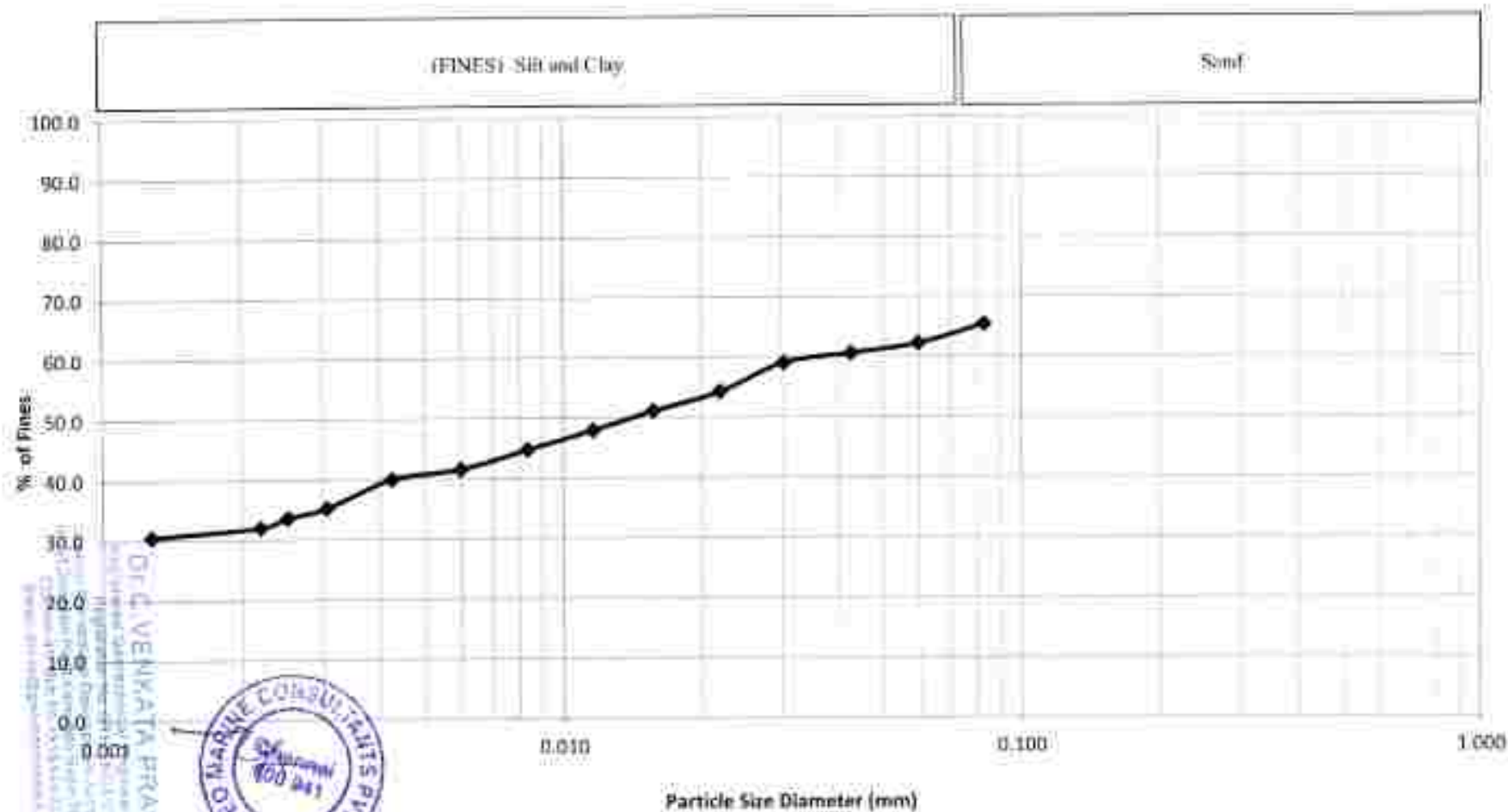


Fig 2.40 Hydrometer Analysis Master Curve

Location 9H-12 Depth: 2.00m

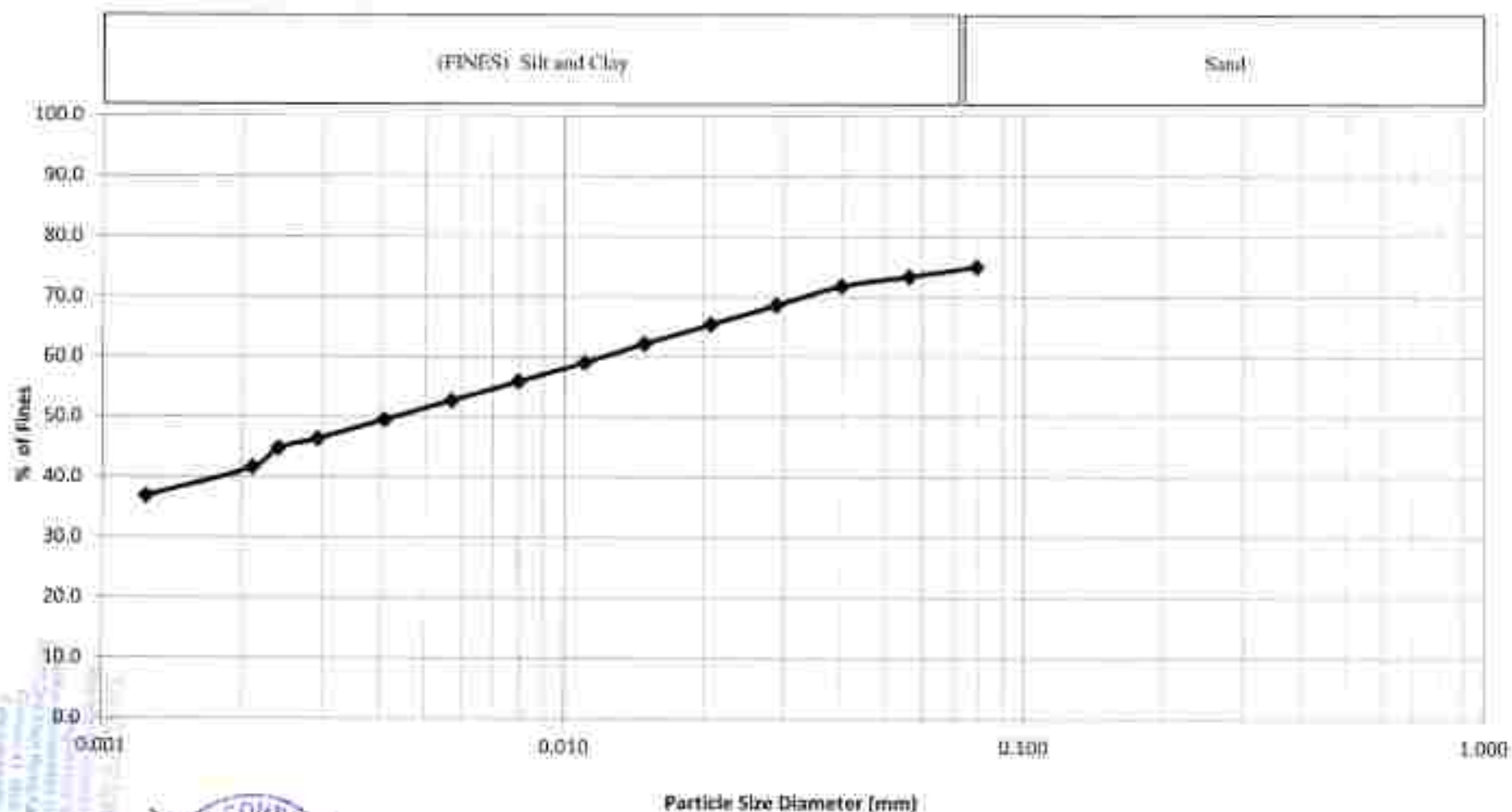


Fig 2.41 Hydrometer Analysis Master Curve



Location: BH-12 Depth: 3.00m

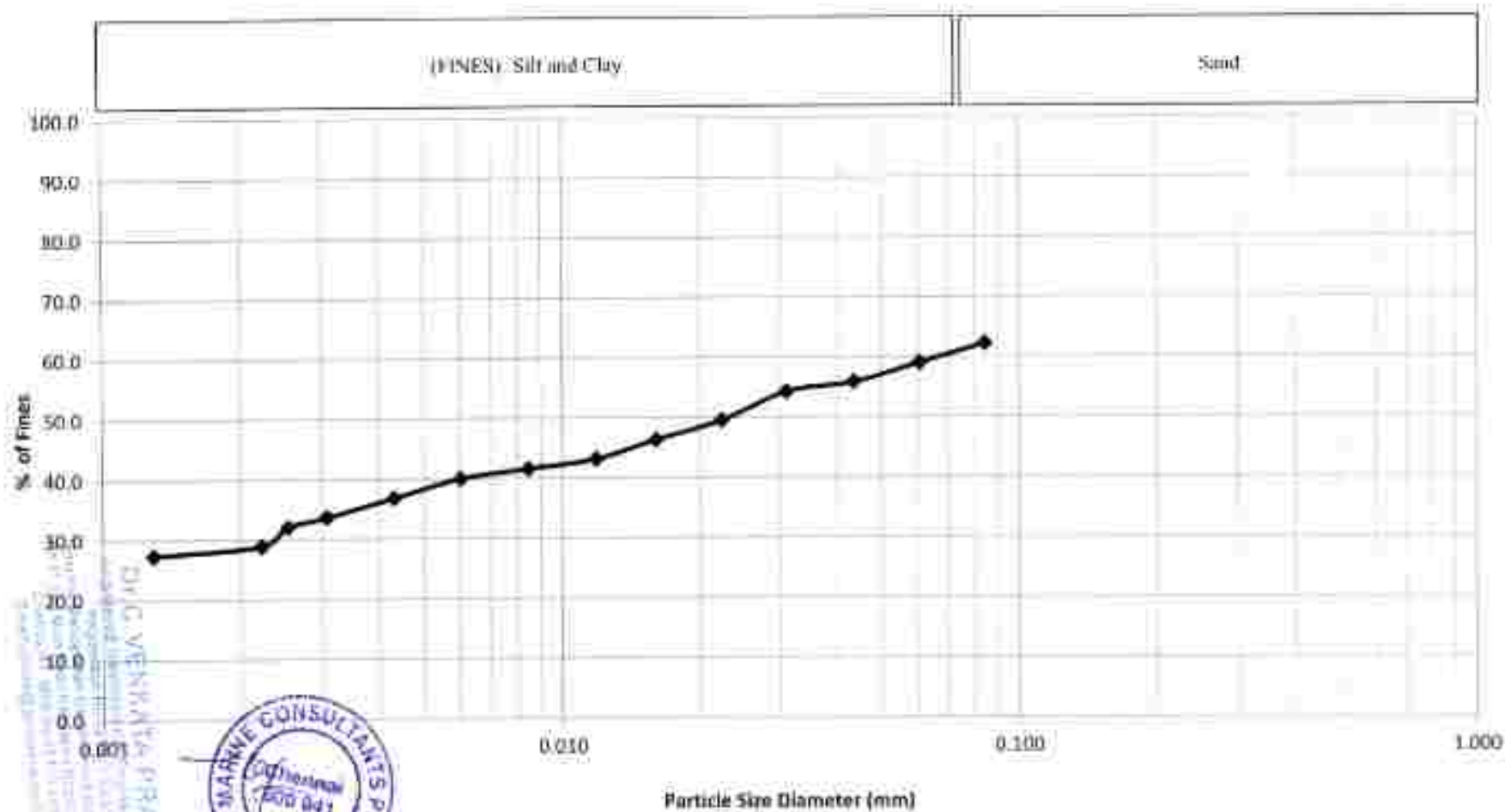


Fig 2.42 Hydrometer Analysis Master Curve

Location (BH-12 Depth) 0.00m

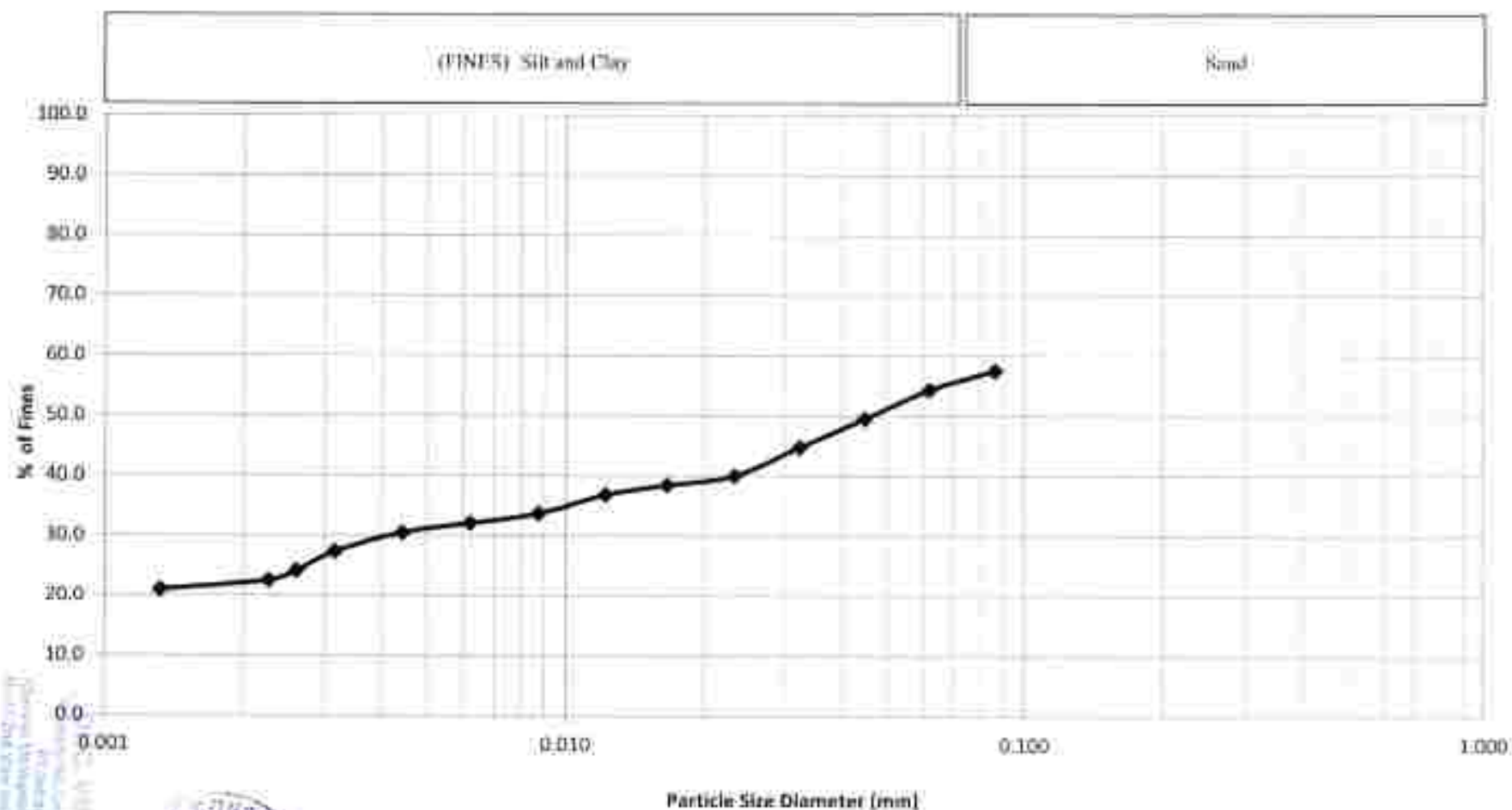


Fig 2.43 Hydrometer Analysis Master Curve



LABORATORY TEST RESULTS



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



DISCIPLINE/GROUP
 SAMPLE DESCRIPTION
 SAMPLE CONDITION
 TEST METHOD
 ULR NUMBER
 NAME AND ADDRESS OF THE
 CUSTOMER

MECHANICAL / SOIL AND ROCK
 CLAY AND SOIL
 SATISFACTORY
 BUREAU OF INDIAN STANDARDS
 TO 114102300000-132F

M/s. CASAGRAND FRESH PVT. LTD., THIRUVANMIYUR, CHENNAI

SAMPLE IDENTIFICATION NUMBER: (SMTL/SS/77000324/BH03/01-14)
 TEST REPORT NUMBER: GMC 730
 SAMPLE RECEIPT DATE: 19/03/2024
 PERIOD OF TESTING: 21/03/2024 to 18/04/2024
 SAMPLE SOURCE: CUSTOMER SUPPLIED
 REPORT DATE: 20/04/2024
 PAGE NO.: 01

TABLE 2.1 TEST RESULTS FOR SOIL SAMPLES FROM BH-03

SAMPLE NUMBER	DEPTH (m)	WATER CONTENT (%) AS PER IS 2720 (P-V) - 1973, RA-2020	LIQUID LIMIT (%) AS PER IS 2720 (P-V) - 1985, RA-2020	PLASTIC LIMIT (%) AS PER IS 2720 (P-V) - 1985, RA-2020	PLASTICITY INDEX (I _p = LL-PL)	SHRINKAGE LIMIT (%) AS PER IS 2720 (P-V) - 1972, RA-2021	FREE SWELL INDEX (%) AS PER IS 2720 (P-V) - 1977, RA-2021	SPECIFIC GRAVITY AS PER IS 2720 (P-V), SEC.1) : 1989, RA-2021	GRAIN SIZE ANALYSIS AS PER IS 2720 (P-V) - 1985 (RA/2020)				DIRECT SHEAR TEST IS 2720 PART 13, 1986 (RA 2021)		Uniformity Co-efficient $C_u = D_{60}/D_{10}$	Co-efficient of Curvature $C_c = D_{40}^2 / (D_{10} \times D_{60})$		
									Gravel (%) (# 75mm)	Sand (%)			Silt (%)	Clay (%)			Cohesion (kg/cm ²)	ϕ (Degrees)
										Coarse (# 4.75 mm)	Medium (# 425 mm)	Fine (# 60mm)						
1.0	1.3	35	49	21	28	10	23	-	0.0	1.3	1.8	14.9	82.2	-	-	-		
2.0	2.0	35	62	26	36	-	11	-	-	-	-	-	100.0	-	-	-		
3.0	3.0	35	79	32	43	-	43	2.53	-	-	-	-	100.0	-	-	-		
4.0	4.0	35	62	26	36	12	58	-	-	-	-	-	100.0	-	-	-		
5.0	5.0	20	Non Plastic Silt						0.0	0.0	0.3	7.5	92.2	-	-	-		
6.0	6.0	21	51	22	29	11	21	-	-	-	-	-	100.0	-	-	-		
7.0	7.5	32	70	33	37	-	11	-	-	-	-	-	60.0 42.0	-	-	-		
8.0	10.5	21	61	23	38	-	50	-	-	-	-	-	100.0	-	-	-		
9.0	12.0	17	47	24	24	14	45	-	5.3	2.6	19.0	20.2	58.2	-	-	-		
10.0	14.0	-	-	-	-	-	-	-	-	-	-	-	100.0	-	-	-		
11.0	16.0	Sample Failed. Wash Sample Collected for Compression						-	3.2	24.3	65.6	5.0	1.9	-	-	-	-	
12.0	17.0							-	6.9	20.5	68.8	3.0	1.3	-	-	-	-	-
13.0	18.0							-	4.7	24.3	65.7	3.4	1.6	-	-	-	-	-
14.0	19.0							-	11.3	35.1	51.5	1.5	0.0	-	-	-	-	-

END OF REPORT

Terms and Conditions

- (1) The test results furnished corresponds to the sample received.
- (2) The tested sample will not be retained for more than 45 days from the date of issue of test report except in the cases as required by the applicable regulations.
- (3) Any correction in the reports invalidates the reports.
- (4) BTL - Bore Hole

REVIEWED BY
 (TECHNICAL MANAGER)



VENKATA PRAEAD
 Technical Consultant (HOD)
 Registered as GEM/19/2020
 Accredited Development Authority (CDA)
 11/11 Main Road, Kannapa Nagar, Thiruvananthapuram
 Chennai-600041. Mobile: +91 94441 00189
 Email: info@geomarine.co.in

AUTHORISED BY
 (QUALITY MANAGER)

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



DISCIPLINE/GROUP
 SAMPLE DESCRIPTION
 SAMPLE CONDITION
 TEST METHOD
 ULR NUMBER
 NAME AND ADDRESS OF THE
 CUSTOMER

MECHANICAL / SOIL AND ROCK
 CLAY AND SOIL
 SATISFACTORY
 BUREAU OF INDIAN STANDARDS
 TC114102300000132F
 M/s. CASAORAND FRESH PVT. LTD., THIRUVANMIYUR, CHENNAI

SAMPLE IDENTIFICATION NUMBER: GMITL/SS/730/0324/BH04(01-14)
 TEST REPORT NUMBER: GMC 730
 SAMPLE RECEIPT DATE: 06/03/2024
 PERIOD OF TESTING: 07/03/2024 to 15/03/2024
 SAMPLE SOURCE: CUSTOMER SUPPLIED
 REPORT DATE: 21/04/2024
 PAGE NO.: 01

TABLE 2.2 TEST RESULTS FOR SOIL SAMPLES FROM BH-04

SAMPLE NUMBER	DEPTH (m)	WATER CONTENT (%) AS PER IS 2720 (P-IV) - 1973, RA-2020	LIQUID LIMIT (%) AS PER IS 2720 (P-V) - 1985, RA-2020	PLASTIC LIMIT (%) AS PER IS 2720 (P-V) - 1985, RA-2020	PLASTICITY INDEX (I _p = LL-PL)	SHRINKAGE LIMIT (%) AS PER IS 2720 (P-VI) - 1972, RA-2021	FREE SWELL INDEX (%) AS PER IS 2720 (P-XL) - 1977, RA-2021	SPECIFIC GRAVITY AS PER IS 2720 (P-III), SEC-1) - 1980, RA-2021	GRAIN SIZE ANALYSIS AS PER IS 2720 (P-IV) - 1985 (RA-2020)				DIRECT SHEAR TEST IS 2720 PART 13:1985 (RA 2021)		Uniformity Coefficient C _u =D ₆₀ /D ₃₀	Co-Efficient of Curvature C _c =D ₃₀ ² /D ₁₀ x D ₆₀		
									Gravel (%) (# 75mm)	Sand (%)			Silt (%)	Clay (%)			Cohesion (kg/cm ²)	φ (Degrees)
										Coarse (# 4.75 mm)	Medium (# 4.75 - 75mm)	Fine (# 75mm)						
1.0	0.5	30	59	28	31	8	6	-	-	-	-	100.0	-	-	-	-		
2.0	1.3	24	61	26	34	-	0	-	-	-	-	100.0	-	-	-	-		
3.0	2.9	19	63	23	40	10	6	-	-	-	-	69.3 30.5	-	-	-	-		
4.0	3.8	32	74	29	45	-	31	-	-	-	-	100.0	-	-	-	-		
5.0	4.0	19	32	17	14	-	27	-	0.0	0.0	0.1	4.5	83.1 12.4	-	-	-	-	
6.0	5.0	-	-	-	-	-	-	2.01	0.0	0.0	8.8	63.4	29.7	-	-	-	-	
7.0	6.0	Little/No Plasticity					30	-	0.0	0.8	27.4	34.0	37.3	-	-	-	-	
8.0	7.5	18	59	23	36	-	27	-	-	-	-	-	61.6 38.4	-	-	-	-	
9.0	9.0	24	58	26	32	-	27	-	-	-	-	-	100.0	-	-	-	-	
10.0	10.5	14	37	19	18	-	15	-	6.0	6.0	32.4	14.3	37.3	-	-	-	-	
11.0	12.0	17	29	18	11	10	13	-	11.3	8.5	26.1	18.4	35.7	-	-	-	-	
12.0	13.0	Sample Failed & Wash Sample Collected for Observation							0.0	19.2	66.2	10.9	2.8	-	-	-	-	
13.0	14.0								6.5	24.0	59.5	6.3	3.8	-	-	-	-	-
14.0	15.0								2.3	13.1	71.4	7.3	5.4	-	-	-	-	-

PAGE OF REPORT

Terms and Conditions

- The test results furnished corresponds to the sample received.
- The test samples will not be retained for more than 45 days from the date of test.
- Any correction in the reports shall be made at the request of the client.
- Any other condition shall be as per the standard.

REVIEWED BY
 (TECHNICAL MANAGER)



Dr. C. VENKATA PRASAD
 HONORARY Chartered Engineer (DrCE)
 Registration No. G.T.L/1492/03
 Council Registration No. G.T.L/1492/03
 11/11/2018 Main Road, Kannapa Nagar, Chennai-600041
 Contact: 98401 10002 or 918014121137
 Email: info@geomarine.co.in

AUTHORISED BY
 (QUALITY MANAGER)

LABORATORY TEST REPORT

GEO MARINE CONSULTANTS PVT LTD- TESTING LABORATORY
NO.11 2ND MAIN ROAD, KANNAPA NAGAR, CHENNAI-600041DISCIPLINE/GROUP
SAMPLE DESCRIPTION
SAMPLE CONDITIONTEST METHOD
ULR NUMBERNAME AND ADDRESS OF THE
CUSTOMERMECHANICAL / SOIL AND ROCK
CLAY AND SOIL
SATISFACTORY
BUREAU OF INDIAN STANDARDS
TC114100300000 U32F

M/s. CASAOKAND FRESH PVT. LTD., THIRUVANMIYUR, CHENNAI

SAMPLE IDENTIFICATION NUMBER: (SMT/US-2730/003401-0050(1-13))

TEST REPORT NUMBER: GMC 730

SAMPLE RECEIPT DATE: 06/03/2024

PERIOD OF TESTING: 07/03/2024 to 15/03/2024

SAMPLE SOURCE: CUSTOMER SUPPLIED

REPORT DATE: 28/04/2024

PAGE NO.: 01

TABLE 2.3 TEST RESULTS FOR SOIL SAMPLES FROM BH-05

SAMPLE NUMBER	DEPTH (m)	WATER CONTENT (%) AS PER IS 2720 (P-4) - 1973, RA-2020	LIQUID LIMIT (%) AS PER IS 2720 (P-V) - 1985, RA-2020	PLASTIC LIMIT (%) AS PER IS 2720 (P-V) - 1985, RA-2020	PLASTICITY INDEX ($I_p = LL - PL$)	SHRINKAGE LIMIT (%) AS PER IS 2720 (P-V) - 1972, RA-2021	FREE SWELL INDEX (%) AS PER IS 2720 (P-V) - 1977, RA-2021	SPECIFIC GRAVITY AS PER IS 2720 (P-8), SEC-1) - 1980, RA-2021	GRAIN SIZE ANALYSIS AS PER IS 2720 (P-V) - 1985 (RA-2020)				DIRECT SHEAR TEST IS 2720 PART 11:1986 (RA- 2021)		Uniformity Co-Efficient $C_u = D_{60}/D_{30}$	Co-Efficient of Curvature $C_c = D_{30}^2/(D_{60} \times D_{10})$
									Gravel (%) ($\geq 75\mu m$)	Sand (%)			Silt (%)	Clay (%)	Cohesion (kg/cm^2)	ϕ (Degree)
										Coarse ($\geq 4.75 \text{ mm}$)	Medium (0.425 mm)	Fine ($< 0.075 \text{ mm}$)				
1.0	0.5	23	55	18	37	8	8	-	0.0	0.0	0.0	0.0	93.1	-	-	-
2.0	1.3	30	65	22	33	-	8	-	-	-	-	-	100.0	-	-	-
3.0	2.0	26	65	29	37	-	12	-	-	-	-	-	100.0	-	-	-
4.0	3.0	30	71	32	39	-	31	2.53	0.0	0.0	0.1	0.0	56.3	42.8	-	-
5.0	4.0	41	77	32	45	-	40	-	-	-	-	-	56.8	43.2	-	-
6.0	5.0	17	28	20	8	-	9	-	0.0	0.0	0.0	2.0	97.2	-	-	-
7.0	6.0	30	22	Lithoflu Plasticity			20	-	0.0	0.0	8.3	15.6	76.1	-	-	-
8.0	7.5	26	60	30	30	10	27	2.54	-	-	-	-	72.7	27.3	-	-
9.0	9.0	18	55	30	25	-	46	-	0.0	0.0	20.2	16.3	100.0	-	-	-
10.0	10.5	8	67	27	40	-	27	-	-	-	-	-	100.0	-	-	-
11.0	12.0	27	60	27	33	-	27	-	0.0	0.6	16.7	8.3	74.0	-	-	-
12.0	14.0	17	22	18	4	17	11	-	0.0	0.7	4.1	46.4	45.8	-	-	-
13.0	15.0	Sample Failed, Wet Sample Collected for Observation							1.2	3.0	68.1	22.1	4.9	-	-	-

* END OF REPORT *

Terms and Conditions

- (1) The test results furnished (corresponds to the sample received)
 (2) The tested sample will not be retained for more than 45 days from the date of issue of test report unless in the case as required by the applicable regulations.
 (3) Any correction in this report invalidates the report.
 (4) BIR - 2001 Note

REVIEWED BY
(TECHNICAL MANAGER)AUTHORISED BY
(QUALITY MANAGER)

D/D NERUNTA PRASAD
 45 Lakshmi Chokkum, Eng Vast North
 Madhavaram, CHENNAI-600041
 Phone: 9441345130, 9442448130
 Email: info@geomarineconsultants.com

LABORATORY TEST REPORT
GEO MARINE CONSULTANTS PVT LTD- TESTING LABORATORY
NO.11 2nd MAIN ROAD, KANNAPA NAGAR, CHENNAI-600041



DISCIPLINE/GROUP
 SAMPLE DESCRIPTION
 SAMPLE CONDITION
 TEST METHOD
 ULR NUMBER
 NAME AND ADDRESS OF THE
 CUSTOMER

MECHANICAL / SOIL AND ROCK
 CLAY AND SOIL
 SATISFACTORY
 BUREAU OF INDIAN STANDARDS
 TC114:1023000/00132F
 M/s. CASAGRANDE FRESH PVT. LTD., THIRUVANMIYUR, CHENNAI

SAMPLE IDENTIFICATION NUMBER: GMTL557300324/BH06(01-12)
 TEST REPORT NUMBER: GMC 730
 SAMPLE RECEIPT DATE: 09/03/2024
 PERIOD OF TESTING: 21/03/2024 to 18/04/2024
 SAMPLE SOURCE: CUSTOMER SUPPLIED
 REPORT DATE: 30/04/2024
 PAGE NO.: 01

TABLE 2.4 TEST RESULTS FOR SOIL SAMPLES FROM BH-06

SAMPLE NUMBER	DEPTH (m)	WATER CONTENT (%) AS PER IS 2720 (P-4) - 1973, RA-2020	LIQUID LIMIT (%) AS PER IS 2720 (P-V) - 1985, RA-2020	PLASTIC LIMIT (%) AS PER IS 2720 (P-V) - 1985, RA-2020	PLASTICITY INDEX ($I_p = LL - PL$)	SHRINKAGE LIMIT (%) AS PER IS 2720 (P-X) - 1973, RA-2021	FREE SWELL INDEX (%) AS PER IS 2720 (P-XL) - 1977, RA-2021	SPECIFIC GRAVITY AS PER IS 2720 (P-JL, SEC-1) - 1988, RA-2021	GRAIN SIZE ANALYSIS AS PER IS 2720 (P-IV) - 1985 (RA:2020)					DIRECT SHEAR TEST IS 2720 PART 13-1988 (RA 2021)		Uniformity Co-efficient $C_u = D_{60}/D_{10}$	Co-efficient of Curvature $C_c = D_{30}^2 / (D_{10} \times D_{60})$	
									Gravel (%) ($\geq 75mm$)	Sand (%)			Silt (%)	Clay (%)	Cohesion (kN/m^2)			ϕ (Degrees)
										Coarse ($\geq 4.75 mm$)	Medium ($4.75 - 4.75 mm$)	Fine ($< 4.75 mm$)						
1.0	0.5	21	46	24	24	12	14	-	0.0	0.0	48.6	16.4	30.6	-	-	-	-	
2.0	1.3	22	50	25	25	13	31	-	0.0	0.4	30.6	19.6	49.0	-	-	-	-	
3.0	2.0	25	44	21	23	13	7	-	0.0	0.0	3.6	6.4	88.1	-	-	-	-	
4.0	3.0	33	79	33	46	-	40	-	-	-	-	-	100.0	-	-	-	-	
5.0	4.0	33	79	33	46	-	33	2.52	0.0	0.0	1.3	1.1	65.2	37.5	-	-	-	
6.0	5.0	22	-	-	-	-	-	2.63	0.0	1.2	35.7	36.5	26.6	-	-	-	-	
7.0	6.0	13	-	-	-	-	8	-	0.0	2.0	23.3	46.4	28.2	-	-	-	-	
8.0	7.5	25	93	38	53	-	100	-	-	-	-	-	56.4	41.8	-	-	-	
9.0	9.0	24	61	36	25	-	33	-	-	-	-	-	100.0	-	-	-	-	
10.0	10.5	14	33	16	17	-	25	-	0.0	1.8	1.8	27.3	68.1	-	-	-	-	
11.0	12.0	19	28	21	7	-	30	-	0.0	0.0	3.3	32.5	64.2	-	-	-	-	
12.0	14.0	15	30	18	12	-	8	-	0.0	0.0	22.4	32.8	44.8	-	-	-	-	

** END OF REPORT **

Terms and Conditions

- (1) The test results furnished correspond to the sample received.
- (2) The issued certificate will not be retained for more than 60 days from the date of issue of test report except in the cases as required by the applicable regulations.
- (3) Any correction in the reports invalidates the reports.
- (4) BH - Blank file

REVIEWED BY
 (TECHNICAL MANAGER)



DIG. VEERKATA PRASAD
 Assistant Engineer (GEO)
 Inspector for G.T. (G.T. 100)
 Chennai District Development Authority (CDDA)
 No. 11, 2nd Main Road, Kannapa Nagar, Chennai-600041
 Chennai-600041, Tamil Nadu - 600041
 Phone: 044-6660080, 66600100

AUTHORISED BY
 (QUALITY MANAGER)

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



DISCIPLINE/GROUP
 SAMPLE DESCRIPTION
 SAMPLE CONDITION
 TEST METHOD
 ULR NUMBER
 NAME AND ADDRESS OF THE
 CUSTOMER

MECHANICAL / SOIL AND ROCK
 CLAY AND SOIL
 SATISFACTORY
 BUREAU OF INDIAN STANDARDS
 IS:11416:2000/0133F

M/s. CASAGRAND FRESH PVT. LTD., THIRUVANMIYUR, CHENNAI

SAMPLE IDENTIFICATION NUMBER: GML/ISS/730/324/SH407/01-16
 TEST REPORT NUMBER: GRIC 720
 SAMPLE RECEIPT DATE: 12/03/2024
 PERIOD OF TESTING: 21/03/2024 to 18/04/2024
 SAMPLE SOURCE: CUSTOMER SUPPLIED
 REPORT DATE: 20/04/2024
 PAGE NO.: 01

TABLE 2.5 TEST RESULTS FOR SOIL SAMPLES FROM BH-07

SAMPLE NUMBER	DEPTH (m)	WATER CONTENT (%) AS PER IS 2720 (P-4) - 1973, RA-2020	LIQUID LIMIT (%) AS PER IS 2720 (P-V) - 1985, RA-2020	PLASTIC LIMIT (%) AS PER IS 2720 (P-V) - 1985, RA-2020	PLASTICITY INDEX ($I_p = LL - PL$)	SHRINKAGE LIMIT (%) AS PER IS 2720 (P-VI) - 1972, RA-2021	FREE SWELL INDEX (%) AS PER IS 2720 (P-XL) - 1977, RA-2021	SPECIFIC GRAVITY AS PER IS 2720 (P-III) SEC-1 - 1986, RA-2021	GRAIN SIZE ANALYSIS AS PER IS 2720 (P-IV) - 1985 (RA-2020)					DIRECT SHEAR TEST IS 3726 PART 13:1985 (RA 2021)		Uniformity Co-efficient $C_u = D_{60}/D_{10}$	Coefficient of Curvature $C_c = D_{30}^2/(D_{10} \times D_{60})$	
									Gravel (%) ($d > 75\mu m$)	Sand (%)			Silt (%)	Clay (%)	Cohesion (kN/m ²)			ϕ (degrees)
										Coarse ($d > 4.75$ mm)	Medium ($d < 4.75$ mm)	Fine ($d < 2.5$ mm)						
1.0	0.5	33	55	25	28	-	28	-	-	-	-	-	100.0	-	-	-		
2.0	1.3	28	56	26	30	11	20	-	-	-	-	-	100.0	-	-	-		
3.0	2.8	31	65	36	35	-	25	2.52	-	-	-	-	100.0	-	-	-		
4.0	3.8	37	63	33	30	-	39	-	-	-	-	-	53.6 46.4	-	-	-		
5.0	4.0	35	64	34	29	-	53	-	-	-	-	-	100.0	-	-	-		
6.0	5.0	47	67	34	33	-	44	2.51	0.0	2.1	0.0	0.7	96.4	-	-	-		
7.0	6.0	56	-	-	-	-	-	-	0.0	1.8	59.3	25.2	14.8	-	-	-		
8.0	7.5	29	57	30	27	11	12	-	-	-	-	-	61.6 38.4	-	-	-		
9.0	9.0	18	58	18	40	-	38	2.53	-	-	-	-	100.0	-	-	-		
10.0	10.5	14	68	19	50	-	27	-	-	-	-	-	100.0	-	-	-		
11.0	12.0	13	21	14	17	-	7	-	0.0	0.0	3.9	20.9	63.2	-	-	-		
12.0	14.0	15	Little to Plasticity					-	0.0	0.0	36.5	51.2	12.3	-	-	-		
13.0	15.0	Sample Failed. Wash Sample Collected for Observation							0.0	0.0	55.8	17.5	6.1	-	-	-		
14.0	16.0								0.0	0.7	54.5	26.8	4.3	-	-	-		
15.0	17.0								0.0	0.8	60.3	26.6	2.7	-	-	-		
16.0	18.0								0.0	7.2	52.8	26.1	4.9	-	-	-		

* END OF REPORT *

Terms and Conditions

- The test results furnished correspond to the sample received.
- The tested sample will not be retained for more than 45 days from the date of test report unless advised in the case as required by the applicable regulatory.
- Any correction in the reports invalidates the reports.
- 99% = Best Price

REVIEWED BY:
 (TECHNICAL MANAGER)



DIG VERNATA KRISHNA
 Assistant Commercial Engineer (P&T)
 Registration No: 61172/2018
 Chennai
 044 34961146/044 34962000
 044 34961146/044 34962000
 044 34961146/044 34962000

AUTHORISED BY
 (QUALITY MANAGER)

LABORATORY TEST REPORT
GEO MARINE CONSULTANTS PVT LTD- TESTING LABORATORY
NO.11 2nd MAIN ROAD, KANNAPA NAGAR, CHENNAI-600041



DISCIPLINE/GROUP
 SAMPLE DESCRIPTION
 SAMPLE CONDITION
 TEST METHOD
 ULR NUMBER
 NAME AND ADDRESS OF THE
 CUSTOMER

MECHANICAL / SOIL AND ROCK
 CLAY AND SOIL
 SATISFACTORY
 BUREAU OF INDIAN STANDARDS
 IS 11410/2000/00132F

M/s. CASAORAND FRESH PVT. LTD., THIRUVANMIYUR, CHENNAI

SAMPLE IDENTIFICATION NUMBER: GML/ISS/7300224/01/08(01-18)
 TEST REPORT NUMBER: GML 730
 SAMPLE RECEIPT DATE: 08/03/2024
 PERIOD OF TESTING: 21/03/2024 to 18/04/2024
 SAMPLE SOURCE: CUSTOMER SUPPLIED
 REPORT DATE: 28/04/2024
 PAGE NO: 01

TABLE 2.6 TEST RESULTS FOR SOIL SAMPLES FROM BH-06

SAMPLE NUMBER	DEPTH (m)	WATER CONTENT (%) AS PER IS 2720 (P-4) - 1973, RA-2020	LIQUID LIMIT (%) AS PER IS 2720 (P-4) - 1985, RA-2020	PLASTIC LIMIT (%) AS PER IS 2720 (P-4) - 1985, RA-2020	PLASTICITY INDEX ($I_p = LL - PL$)	SHRINKAGE LIMIT (%) AS PER IS 2720 (P-4) - 1972, RA-2021	FREE SWELL INDEX (%) AS PER IS 2720 (P-4), - 1977, RA-2021	SPECIFIC GRAVITY AS PER IS 2720 (P-4), SEC-1) - 1980, RA-2021	GRAIN SIZE ANALYSIS AS PER IS 2720 (P-4) - 1965 (RA-2020)					DIRECT SHEAR TEST IS 2720 PART 13:1980 (RA 2021)		Uniformity Co-Efficient $C_u = D_{60}/D_{10}$	Co-Efficient of Curvature $C_c = D_{30}^2/(D_{10} \times D_{60})$	
									Gravel (%) ($\geq 75\mu m$)	Sand (%)			Silt (%)	Clay (%)	Cohesion (kg/cm^2)			ϕ ($^\circ$ in kg/cm^2)
										Coarse ($\geq 4.75 \text{ mm}$)	Medium (4.75 mm to 0.075 mm)	Fine (0.075 mm to 0.0075 mm)						
1.0	0.5	26	34	15	19	-	7	-	0.0	0.0	47.5	26.5	26.0	-	-	-		
2.0	1.3	38	42	16	26	12	45	-	0.0	0.0	20.1	30.8	53.0	-	-	-		
3.0	2.8	35	36	15	21	-	23	2.34	0.0	0.3	4.0	18.7	37.1	21.5	-	-		
4.0	3.0	35	53	21	32	-	62	-	-	-	-	-	35.8	43.2	-	-		
5.0	4.0	35	62	28	33	-	35	2.52	-	-	-	-	100.0	-	-	-		
6.0	5.0	18	40	21	19	20	7	-	-	-	-	-	100.0	-	-	-		
7.0	6.0	15	44	16	28	15	7	-	0.0	0.0	1.0	0.0	82.4	-	-	-		
8.0	7.5	26	77	36	41	-	24	-	-	-	-	-	100.0	-	-	-		
9.0	9.0	17	67	23	44	-	18	-	-	-	-	-	100.0	-	-	-		
10.0	10.5	14	54	14	20	-	27	-	0.0	0.0	5.7	30.8	62.6	-	-	-		
11.0	12.0	17	Little's Plasticity				6	-	0.0	0.0	4.0	50.5	35.7	-	-	-		
12.0	14.0	10					6	-	0.0	0.0	01.8	37.5	28.7	-	-	-		
13.0	15.0	Sample Failed. Wash Sample Collected for Observation							0.0	17.7	57.7	11.2	4.4	-	-	-		
14.0	16.0								10.1	24.0	52.1	5.5	1.5	-	-	-		
15.0	17.0								19.7	28.0	44.7	4.5	3.1	-	-	-		
16.0	18.5								0.0	1.0	71.5	25.8	2.0	-	-	-		

"END OF REPORT"

Terms and Conditions

- (1) The test results furnished correspond to the sample received.
- (2) The tested sample will not be returned for more than 48 hours after the test.
- (3) Any correction to the report invalidates the report.
- (4) Soil is Store only.

REVIEWED BY
 (TECHNICAL MANAGER)



KANNAKA PRASAD
 GEOTECHNICAL ENGINEER
 REGISTRATION NO. 2101/2018
 11, 2nd Main Road, Kannapa Nagar, Chennai-600041
 044-24401062, 244-24401091
 Email: kprasad@geomarine.co.in

AUTHORISED BY
 (QUALITY MANAGER)

LABORATORY TEST REPORT

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



TC-1948

DISCIPLINE/GROUP
SAMPLE DESCRIPTION
SAMPLE CONDITION
TEST METHOD
ULR NUMBER
NAME AND ADDRESS OF THE
CUSTOMER

MECHANICAL / SOIL AND ROCK
CLAY AND SOIL
SATISFACTORY
BUREAU OF INDIAN STANDARDS
TC114102300000132F
M/s. CASAGRAND FRESH PVT. LTD., THIRUVANMIYUR, CHENNAI

SAMPLE IDENTIFICATION NUMBER: GM1153073003343840601-14
TEST REPORT NUMBER: GMC 730
SAMPLE RECEIPT DATE: 15/03/2024
PERIOD OF TESTING: 21/03/2024 to 18/04/2024
SAMPLE SOURCE: CUSTOMER SUPPLIED
REPORT DATE: 26/04/2024
PAGE NO.: 01

TABLE 2.7 TEST RESULTS FOR SOIL SAMPLES FROM BH-09

SAMPLE NUMBER	DEPTH (m)	WATER CONTENT (%) AS PER IS 2720 (P-IV) - 1973, RA-2020	LIQUID LIMIT (%) AS PER IS 2720 (P-V) - 1985, RA-2020	PLASTIC LIMIT (%) AS PER IS 2720 (P-V) - 1985, RA-2020	PLASTICITY INDEX ($I_p = LL - PL$)	SHRINKAGE LIMIT (%) AS PER IS 2720 (P-VII) - 1972, RA-2021	FREE SWELL INDEX (%) AS PER IS 2720 (P-XL) - 1977, RA-2021	SPECIFIC GRAVITY AS PER IS 2720 (P-III, SEC-1) - 1980, RA-2021	GRAIN SIZE ANALYSIS AS PER IS 2720 (P-IV) - 1985 (RA-2020)				DIRECT SHEAR TEST IS 2720 PART 13:1986 (RA 2021)		Uniformity Co-Efficient $C_u = d_{60}/d_{30}$	Co-Efficient of Curvature $C_c = d_{30}^2 / (d_{10} \times d_{60})$		
									Gravel (%) (d_{75})	Sand (%)			Silt (%)	Clay (%)			Cohesion (kN/m^2)	ϕ (Degrees)
										Coarse ($d_{4.75}$)	Medium ($d_{0.425}$)	Fine ($d_{0.075}$)						
1.0	0.5	28	62	20	42	-	19	-	0.0	0.6	1.5	7.9	90.9	-	-	-		
2.0	1.3	26	55	21	34	-	8	2.53	-	-	-	-	100.0	-	-	-		
3.0	2.8	26	75	27	48	-	40	-	-	-	-	-	58.4	41.6	-	-		
4.0	3.0	30	77	26	51	-	43	-	-	-	-	-	100.0	-	-	-		
5.0	4.8	18	39	18	21	14	15	-	0.0	0.0	0.1	8.6	91.3	-	-	-		
6.0	5.0	22	-	-	-	-	-	-	0.0	0.0	37.3	23.9	18.8	-	-	-		
7.0	6.8	18	43	18	25	13	8	-	0.0	0.0	12.2	20.3	57.5	-	-	-		
8.0	7.5	33	68	37	30	-	16	2.53	0.0	0.0	6.3	6.4	90.3	-	-	-		
9.0	9.0	16	50	18	32	8	14	-	0.0	2.5	48.6	1.4	38.8	-	-	-		
10.0	10.5	18	65	22	43	11	58	-	-	-	-	-	58.8	41.2	-	-		
11.0	12.8	12	-	-	-	-	-	-	2.8	3.8	32.7	15.9	42.9	-	-	-		
12.0	14.0	10	-	-	-	-	-	-	10.4	28.9	58.1	2.6	2.1	-	-	-		
13.0	15.8	-	-	-	-	-	-	-	8.7	18.4	62.6	3.9	2.4	-	-	-		
14.0	16.0	-	-	-	-	-	-	-	9.2	22.9	58.3	5.7	3.6	-	-	-		

END OF REPORT

Terms and Conditions:

- The test results furnished corresponds to the samples retained.
- The tested samples will not be retained for more than 45 days from the date of issue of test report except in the cases as required by the applicable regulations.
- Any correction in this report involving the results.
- BSI is Best Price.

REVIEWED BY:
(TECHNICAL MANAGER)



DR. VEENITA PRAEAL
2nd Floor, 11/2 Main Road, Kannapa Nagar, Chennai-600041
Phone: 044-4961485, 044-4960080
Chennai, Tamil Nadu - 600041
Email: info@geomarine.com, sales@geomarine.com
Website: www.geomarine.com

AUTHORISED BY:
(QUALITY MANAGER)

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



DISCIPLINE/GROUP
 SAMPLE DESCRIPTION
 SAMPLE CONDITION
 TEST METHOD
 ULR NUMBER
 NAME AND ADDRESS OF THE CUSTOMER

MECHANICAL / SOIL AND ROCK
 CLAY AND SOIL
 SATISFACTORY
 BUREAU OF INDIAN STANDARDS
 TC114102300000132F
 M/s. CASAGRAND FRESH PVT. LTD., THIRUVANMIYUR, CHENNAI

SAMPLE IDENTIFICATION NUMBER: GMTL/S/S/720/0324/BH10(01-15)
 TEST REPORT NUMBER: GMC 735
 SAMPLE RECEIPT DATE: 19/03/2024
 PERIOD OF TESTING: 21/03/2024 to 19/04/2024
 SAMPLE SOURCE: CUSTOMER SUPPLIED
 REPORT DATE: 20/04/2024
 PAGE NO: 01

TABLE - 2.8 TEST RESULTS FOR SOIL SAMPLES FROM BH-10

SAMPLE NUMBER	DEPTH (m)	WATER CONTENT (%) AS PER IS 2720 (P-IV) - 1973, RA-2020	LIQUID LIMIT (%) AS PER IS 2720 (P-VI) - 1985, RA-2020	PLASTIC LIMIT (%) AS PER IS 2720 (P-VI) - 1985, RA-2020	PLASTICITY INDEX ($I_p = LL - PL$)	SHRINKAGE LIMIT (%) AS PER IS 2720 (P-VI) - 1972, RA-2021	FREE SWELL INDEX (%) AS PER IS 2720 (P-XI) - 1977, RA-2021	SPECIFIC GRAVITY AS PER IS 2720 (P-II), SEC-1) - 1980, RA-2021	GRAIN SIZE ANALYSIS - AS PER IS 2720 (P-IV) - 1985 (RA-2020)					DIRECT SHEAR TEST IS 2720 PART 13:1966 (RA 2021)		Uniformity Co-efficient $C_u = D_{60}/D_{30}$	Co-efficient of Curvature $C_c = D_{30}^2/(D_{10} \times D_{60})$	
									Gravel (%) ($\geq 75\mu m$)	Sand (%)			Silt (%)	Clay (%)	Cohesion (kg/cm^2)			ϕ (Degrees)
										Coarse ($\geq 2\text{mm}$)	Medium ($\geq 425\mu m$)	Fine ($\geq 0.075\text{mm}$)						
1.0	0.5	23	64	21	43	-	13	2.52	-	-	-	-	100.0	-	-	-	-	
2.0	1.3	26	56	26	36	-	11	-	0.0	0.0	0.0	2.0	97.1	-	-	-	-	
3.0	2.0	35	71	26	42	-	25	-	-	-	-	-	100.0	-	-	-	-	
4.0	3.0	38	84	29	55	-	64	2.52	-	-	-	-	100.0	-	-	-	-	
5.0	4.0	30	81	31	50	-	44	-	-	-	-	-	100.0	-	-	-	-	
6.0	5.0	22	67	24	43	9	36	-	0.0	0.0	22.5	27.5	90.0	-	-	-	-	
7.0	6.0	27	-	-	-	-	-	-	0.0	3.0	61.9	22.0	13.1	-	-	-	-	
8.0	7.5	31	82	33	49	-	44	-	-	-	-	-	100.0	-	-	-	-	
9.0	8.0	32	74	33	51	-	100	2.53	3.2	3.7	18.7	3.7	72.7	-	-	-	-	
10.0	10.5	20	53	20	33	10	48	-	-	-	-	-	50.4	33.9	-	-	-	
11.0	12.0	20	35	17	19	-	33	-	0.0	2.4	10.7	42.5	44.8	-	-	-	-	
12.0	14.0	17	Little/No Plasticity					30	-	0.0	0.0	34.1	37.3	28.8	-	-	-	
13.0	16.0	15	-	-	-	-	-	-	0.0	18.4	71.2	9.6	2.8	-	-	-	-	
14.0	17.0	-	-	-	-	-	-	-	9.8	7.6	70.1	12.8	0.0	-	-	-	-	
15.0	19.0	-	-	-	-	-	-	-	0.0	8.6	28.0	12.1	1.2	-	-	-	-	

END OF REPORT

Terms and Conditions

- (1) The test results furnished corresponds to the sample received.
- (2) The tested sample will not be returned for more than 30 days from the date of test.
- (3) Any correction in the reports invalidates the report.
- (4) RPT - Site Visit

REVIEWED BY
 (TECHNICAL MANAGER)



D.R. VENKATA PRASAD
 Assistant Geotechnical Engineer (SGT)
 Registration No. 215/19/SGT/2021
 Chennai 600 041
 11/2/21/2021

AUTHORISED BY
 (QUALITY MANAGER)

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



DISCIPLINE/GROUP
 SAMPLE DESCRIPTION
 SAMPLE CONDITION
 TEST METHOD
 ULK NUMBER
 NAME AND ADDRESS OF THE
 CUSTOMER

MECHANICAL / SOIL AND ROCK
 CLAY AND SOIL
 SATISFACTORY
 BUREAU OF INDIAN STANDARDS
 IS 114102300000132F

M/s. CASAGRAND FRESH PVT. LTD., THIRUVANMIYUR, CHENNAI

SAMPLE IDENTIFICATION NUMBER: GMT/IS/736/0024BH11(01-13)
 TEST REPORT NUMBER: GMC-736
 SAMPLE RECEIPT DATE: 19/03/2024
 PERIOD OF TESTING: 21/03/2024 to 19/04/2024
 SAMPLE SOURCE: CUSTOMER SUPPLIED
 REPORT DATE: 20/04/2024
 PAGE NO.: 01

TABLE 2.9 TEST RESULTS FOR SOIL SAMPLES FROM BH-11

SAMPLE NUMBER	DEPTH (m)	WATER CONTENT (%) AS PER IS 2720 (P-4) 1973, RA-2020	LIQUID LIMIT (%) AS PER IS 2720 (P-V) 1985, RA-2020	PLASTIC LIMIT (%) AS PER IS 2720 (P-V) 1985, RA-2020	PLASTICITY INDEX ($I_p = LL - PL$)	SHRINKAGE LIMIT (%) AS PER IS 2720 (P-V) 1972, RA-2021	FREE SWELL INDEX (%) AS PER IS 2720 (P-XL) 1977, RA-2021	SPECIFIC GRAVITY AS PER IS 2720 (P-10, SEC-1) - 1986, RA-2021	GRAIN SIZE ANALYSIS: AS PER IS 2720 (P-3V) - 1985 (RA-2020)					DIRECT SHEAR TEST IS 2720 PART 13:1986 (RA 2021)		Uniformity Co-Efficient $C_u = D_{60}/D_{30}$	Co-Efficient of Curvature $C_c = D_{30}^2 / (D_{60} \times D_{10})$	
									Gravel (%) ($\geq 75\mu m$)	Sand (%)			Silt (%)	Clay (%)	Cohesion (kN/m^2)			ϕ (Degrees)
										Coarse ($\geq 4.75 mm$)	Medium ($4.75 - 60\mu m$)	Fine ($60 - 75\mu m$)						
1.0	0.5	32	64	28	36	10	36	-	0.0	0.0	0.0	1.4	98.0	-	-	-	-	
2.0	1.3	30	59	25	34	10	26	2.54	0.0	0.0	0.0	12.9	86.0	-	-	-	-	
3.0	2.0	39	70	31	48	-	43	-	-	-	-	-	100.0	44.0	-	-	-	
4.0	3.0	37	81	29	54	8	67	-	-	-	-	-	100.0	-	-	-	-	
5.0	4.0	17	44	18	26	15	15	-	0.0	0.0	0.9	16.2	82.8	-	-	-	-	
6.0	5.0	22	-	-	-	-	0	-	0.0	0.0	11.8	47.1	41.1	-	-	-	-	
7.0	6.0	17	40	20	20	13	7	-	0.0	0.0	22.5	18.9	62.6	-	-	-	-	
8.0	9.0	19	61	25	37	-	56	-	-	-	-	-	100.0	-	-	-	-	
9.0	10.5	24	69	35	40	-	50	-	-	-	-	-	100.0	30.5	-	-	-	
10.0	12.0	13	27	10	11	-	22	-	0.0	0.0	9.0	37.2	53.7	-	-	-	-	
11.0	14.0	10	32	18	14	-	8	-	0.0	3.6	32.5	23.1	40.7	-	-	-	-	
12.0	16.0	15	-	-	-	-	-	-	0.0	21.6	33.2	17.3	27.6	-	-	-	-	
13.0	17.0	-	-	-	-	-	-	-	0.0	24.8	68.2	5.5	1.8	-	-	-	-	

END OF REPORT

Terms and Conditions

- (1) The test reports furnished corresponds to the sample received.
 (2) The tested sample will not be retained for more than 45 days from the date of issue of test report except by the order as required by the applicable regulations.
 (3) Any correction in the reports available for reports.
 (4) BH - 6000 041

REVIEWED BY
 (TECHNICAL MANAGER)



DR. C. VENKATA PRASAD
 Sr. Manager, Technical Engineering (S&T)
 Registered No. 2729422021
 14, Jawahar Road, Chokkikulam, Chennai-600 041
 Phone: 044-24462285, 24462287
 Email: info@geomarine.in

AUTHORISED BY
 (QUALITY MANAGER)

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



ULR NO.	TCT14102380000132F	SAMPLE IDENTIFICATION NUMBER	CHCK025730
REPORT ISSUED TO	M/s. CASAQRAND FRESH PVT. LTD.	TEST REPORT NUMBER	GT-2648
DISCIPLINE/GROUP	MECHANICAL (SOIL AND ROCK)	SAMPLE RECEIPT DATE	01/09/2023
SAMPLE DESCRIPTION	CLAY AND SOIL	PERIOD OF TESTING	01/09/2023 to 11/09/2023
SAMPLE CONDITION	SATISFACTORY	REPORT ISSUE DATE	20/09/2023
TEST METHOD	BUREAU OF INDIAN STANDARDS	NO. OF PAGES	One

Table-2.10 Laboratory Classification of Soil Samples from BH-12

Sampling Depth (m)	"N" Value	Type of Sample	Moisture Content (%) AS PER IS 2720 (P-8) - 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-W) - 1972, RA-2011	FREE SWELL INDEX (%) AS PER IS 2720 (P-XL) - 1977, RA-2011	SPECIFIC GRAVITY AS PER IS 2720 (P-38, SEC-1) - 1980, RA-2010	GRAIN SIZE ANALYSIS AS PER IS 2720 (P-IV) - 1985, RA-2015						DIRECT SHEAR TEST IS 2720 PART 11:1986 (RA- 2016)		Uniformity Co-Efficient $C_u = D_{60}/D_{10}$	Coefficient of Curvature $C_c = D_{30}^2 / (D_{10} \times D_{60})$	Consistency	Relative Density	IS-Notation		
										Gravel (%)	Coarse (%)	Medium (%)	Fine (%)	Silt (%)	Clay (%)	Cohesion (kg/cm ²)	ϕ (Degree)					fine Grain soils	Gravelly Soils	Sandy Soils
0.5	12	SPT	33	79	28	51	14	15	-	-	-	-	-	87.5	12.5				Stiff	-	CH	-	-	
1.25	13	SPT	31	48	26	22	14	36	-	-	-	-	-	100.0					Stiff	-	CI	-	-	
2.0	-	UCS	39	87	34	53	12	44	2.60	-	-	-	-	58.4	41.6				-	-	CH	-	-	
3.9	12	SPT	24	30	19	20	-	27	-	-	-	-	-	71.1	28.9				Stiff	-	CI	-	-	
4.0	15	SPT	22	31	20	11	15	38	-	-	-	-	-	77.6	22.4				Stiff	-	CI	-	-	
6.0	31	SPT	16	42	21	21	15	-	-	6.3	0.6	1.0	13.9	78.7					Hard	-	CI	-	-	
6.0	27	SPT	41	-	-	-	-	0	-	0.0	0.0	0.3	79.1	20.7					-	M.Dense	-	-	GM	
7.5	30	SPT	21	55	28	27	-	83	-	-	-	-	-	100.0					V Stiff	-	CH	-	-	
9.4	28	SPT	19	60	23	43	-	16	-	0.0	0.0	14.3	30.4	75.3					V Stiff	-	CH	-	-	
10	28	SPT	14	-	-	-	-	-	-	0.0	2.9	67.1	12.1	17.3					-	M.Dense	-	-	SM	
10.5	>100	SPT	10	90	16	74	13	21	-	0.0	0.0	0.6	45.0	45.4					-	V Dense	-	-	SC	
12.0	>100	SPT	29	80	19	69	-	10	-	0.0	0.0	19.2	35.8	45.0					-	V Dense	-	-	Disintegrated to Weathered Granitic Rock	
14.0	>100	OS	No SPT Penetration/Wash Sample Collected							-	7.4	25.7	57.2	0.6	0.0				-	V Dense	-	-		

** END OF REPORT **

Terms and Conditions

- The report furnished corresponds to the sample received.
- The tested samples 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.
- Geomarine Consultants Pvt Ltd reports in accordance to the reports.

AU-0
Authorized Signatory
A. VINOTH
 (Technical Manager)



TABLE 2.12 RESULT OF CHEMICAL TEST ON WATER

URL NO	TC114182300000134F	SAMPLE SOURCE	CUSTOMER SUPPLIED
DISCIPLINE/GROUP	CHEMICAL - WATER	SAMPLE ID	OMTL/WS/730/0324/BH01 to BH-12
SAMPLE DESCRIPTION	GROUND WATER	REPORT NUMBER	GMC 730
SAMPLE CONDITION	SATISFACTORY	RECEIVED DATE	18/03/2024
TEST METHOD	AS PER BIS	TEST PERIOD	23/03/2024
NO. OF PAGES	1 OF 1	ISSUE OF REPORT	20/04/2024
REPORT ISSUED TO	M/s CASAGRANO FRESH PVT LTD.		

S.NO.	SAMPLE NUMBER	SAMPLE REFERENCE	WATER			
			DEPTH OF SAMPLE (m)	pH AS PER IS 3025 (P-XI) - 2022	SULPHATES (mg/l) AS PER APHA 24th Edn. 2023 4500	CHLORIDES (mg/l) AS PER IS 3025(P-XXXI)-1988, RA-2019
1.0	1.0	BH-03	2.90	7.4	231.1	341.5
2.0	1.0	BH-04	1.20	7.5	244.3	233.2
3.0	1.0	BH-05	3.50	7.6	265.6	379.6
4.0	1.0	BH-06	3.20	7.8	253.6	280.5
5.0	1.0	BH-07	3.80	7.6	272.9	182.9
6.0	1.0	BH-08	3.70	7.6	261.1	522.9
7.0	1.0	BH-09	3.70	7.7	258.6	522.9
8.0	1.0	BH-10	3.60	7.7	258.6	439.0
9.0	1.0	BH-11	3.75	7.7	258.6	400.9
9.0	1.0	BH-12	3.20	7.2	337.8	223.4

**** END OF REPORT****

REVIEWED BY


(TECHNICAL MANAGER)

APPROVED BY


(QUALITY MANAGER)

Note:

- (1) The test results furnished are accurate 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 cases as required by the applicable regulations.
- (3) Any correction to the results invalidates the reports.

TABLE 2.13 RESULT OF CHEMICAL TEST ON SOIL

URL NO : TC114102300000135F SAMPLE SOURCE : CUSTOMER SUPPLIED
DISCIPLINE/GROUP : CHEMICAL-SOIL AND ROCK SAMPLE ID : OMTL/SS/730/0324/BH01 to BH-12
SAMPLE DESCRIPTION : SOIL REPORT NUMBER : GMC 730
SAMPLE CONDITION : SATISFACTORY RECEIVED DATE : 19/03/2024
TEST METHOD : AS PER BIS TEST PERIOD : 23/03/2024
NO. OF PAGES : 1 OF 1 ISSUE OF REPORT : 20/04/2024
REPORT ISSUED TO : M/s CASAGRANDE FRESH PVT LTD.,

S.NO.	SAMPLE NUMBER	SAMPLE REFERENCE	SOIL (2:1)	
			DEPTH OF SAMPLE (m)	pH AS PER IS 2720 (P-XXV)-1987
1.0	5.0	BH-03	5.00	7.49
2.0	3.0	BH-04	2.00	7.53
3.0	2.0	BH-05	1.25	7.53
4.0	6.0	BH-06	5.00	7.53
5.0	7.0	BH-07	5.00	7.53
6.0	2.0	BH-08	1.25	7.53
7.0	6.0	BH-09	5.00	7.53
8.0	12.0	BH-10	14.00	7.53
9.0	6.0	BH-11	5.00	7.93
10.0	-	BH-12	3.00	7.04

**** END OF REPORT ****

REVIEWED BY


(TECHNICAL MANAGER)

APPROVED BY


(QUALITY MANAGER)

Note:

- (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 issued in this case as required by the regulatory regulations.
- (3) Any correction in the reports invalidates the reports.

TABLE 2.14 RESULT OF CHEMICAL TEST ON SOIL

DISCIPLINE/GROUP	CHEMICAL-SOIL AND ROCK	SAMPLE SOURCE	CUSTOMER SUPPLIED
SAMPLE DESCRIPTION	SOIL	SAMPLE ID	GMTL/SS/730/0324/BH01 to BH-12
SAMPLE CONDITION	SATISFACTORY	REPORT NUMBER	GMC 730
TEST METHOD	AS PER BIS	RECEIVED DATE	19/03/2024
NO. OF PAGES	1 OF 1	TEST PERIOD	23/03/2024
REPORT ISSUED TO	M/s CASAGRAND FRESH PVT LTD.	ISSUE OF REPORT	20/04/2024

S.NO.	SAMPLE NUMBER	SAMPLE REFERENCE	SOIL (2:1)		
			DEPTH OF SAMPLE (m)	SULPHATES (mg/l) AS PER APHA 23rd Edn.2017- 4500	CHLORIDES (mg/l) AS PER (S-3025P-30001) - 1988. RA-2010
1.0	5.0	BH-03	5.00	23.0	13.7
2.0	3.0	BH-04	2.00	22.9	96.0
3.0	2.0	BH-05	1.25	24.0	62.5
4.0	6.0	BH-06	5.00	22.2	12.2
5.0	7.0	BH-07	0.00	25.3	21.3
6.0	2.0	BH-08	1.25	23.9	12.2
7.0	6.0	BH-09	5.00	23.0	27.4
8.0	12.0	BH-10	14.00	25.2	27.4
9.0	6.0	BH-11	5.00	23.2	15.3
10.0	-	BH-12	3.00	48.3	19.4

**** END OF REPORT ****

REVIEWED BY

(TECHNICAL MANAGER)

APPROVED BY

(QUALITY MANAGER)

Note:

- The test results furnished correspond to the sample received
- The tested sample will not be retained for more than 30 days from the date of issue of test report subject to the case as referred to the applicable regulations
- Any correction in the report is indicated in the reports



Dr. G. VENKATARAMAN
Registered Professional Engineer (Civil)
Registration No. 315/11-121943
Chennai, Madras 600 028, Cauvery Nagar, Thiruvallur
Rd. 11, 2nd Main Road, Poonamallee, Chennai-600 049, Madras
Email: gvenka@geomarineconsultants.com

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:

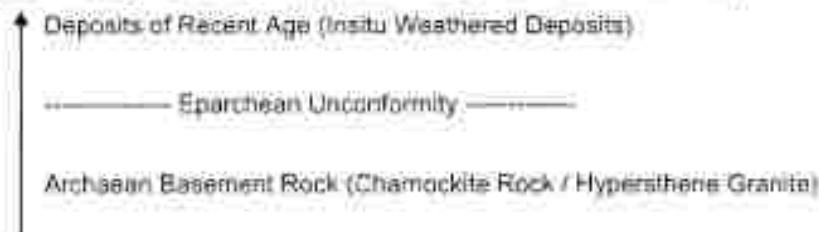
Chennai district is underlain by various geological formations from ancient Archaean to the Recent Alluvium. The geological formations of the district can be grouped into three units, namely

- 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.

3.3 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)



In the present investigation site, the formation beyond 2.0m/3.0m is rock formation of different degree of weathering varying from Grade-VI Residual Soil to Moderately Weathered Rock Grade-III Weathering up to the investigation depth of maximum 8.0m below the existing ground level.

3.4 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, 1946, 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-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/m ³	Shear Parameters	
	Top B.G.L.	Bottom B.G.L.	Thickness							(C _u) kPa	(φ) Deg.
1.0	0.00	1.25	1.25	Filled Up							
2.0	1.25	2.00	0.75	Sandy Clay	Brown	8	-	Medium Stiff	16.5	53	-
3.0	2.00	5.00	3.00	Silty Clay	Brown	10	-	Stiff	17.5	67	-
4.0	5.00	6.00	1.00	Clayey Silt	Brown	23	-	Very Stiff	20.5	153	-
5.0	6.00	12.00	6.00	Silty Clay	Grey to Black	24	-	Very Stiff	20.5	160	-
6.0	12.00	15.00	3.00	Sandy Clay	Off-white	58	-	Hard	22	387	-
7.0	15.00	19.00	4.00	Completely Weathered Rock	-	CRR - 0% & 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/m ³	Shear Parameters	
	Top BGL	Bottom BGL	Thickness							(C _u) kPa	(φ) Deg.
1.0	0.00	1.25	1.25	Silty Clay	Grey Brown	9	-	Stiff	17	60	-
2.0	1.25	3.00	1.75	Silty Clay	Brown	18	-	Very Stiff	20	120	-
3.0	3.00	5.00	2.00	Silty Clay	Brown	9	-	Stiff	17	60	-
4.0	5.00	7.00	2.00	Silty Sand	Brown	42	Dense	-	20	-	39.2
5.0	7.00	10.30	3.50	Silty Clay	Black Grey	24	-	Very Stiff	20.5	160	-
6.0	10.50	13.00	2.50	Clayey Sand	Brown	49	Dense	-	20	-	40.775
7.0	13.00	15.00	2.00	Completely Weathered Rock	-	CRR - 0% & RQD 0%					
8.0	15.00	16.00	1.00	Highly Weathered Rock	Brown	CRR - 14% & 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/m ³	Shear Parameters	
	Top BGL	Bottom BGL	Thickness							(C _u) kPa	(φ) Deg.
1.0	0.00	2.00	2.00	Silty Clay	Brown	11	-	Stiff	18	73	-
2.0	2.00	3.00	1.00	Silty Clay	Brown	20	-	Very Stiff	20	133	-
3.0	3.00	5.00	2.00	Silty Clay	Grey	10	-	Stiff	17.5	67	-
4.0	5.00	7.50	2.50	Silty Clay	Brown Grey	28	-	Very Stiff	20.5	187	-
5.0	7.50	14.00	6.50	Silty Clay	Black Grey	26	-	Very Stiff	20.5	173	-
6.0	14.00	15.00	1.00	Disintegrated Rock	Grey	>100	Very Dense	-	21	-	42.5
7.0	15.00	17.00	2.00	Highly Weathered Rock	Grey	CRR - 15% to 19% & RQD 0% to 15%					

REFERENCE BORE HOLE				BH-06	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	2.00	2.00	Clayey Sand	Brown	7	Loose	-	14.5	-	29.4
2.0	2.00	4.70	2.70	Silty Clay	Brown	12	-	Stiff	18.5	80	-
3.0	4.70	7.00	2.30	Silty Sand	Brown	29	Medium Dense	-	19	-	35.7
4.0	7.00	10.50	3.50	Silty Clay	Black Grey	18	-	Very Stiff	20	120	-
5.0	10.50	14.00	3.50	Sandy Clay	Brown	29	-	Very Stiff	20.5	193	-
6.0	14.00	14.50	0.50	Disintegrated Rock	Brown	>100	Very Dense	-	21	-	42.5
7.0	14.50	18.00	3.50	Completely Weathered Rock	Grey	CRR - 0% to 3% & RQD 0%					

REFERENCE BORE HOLE				BH-07	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	1.25	1.25	Silty Clay	Brown	6	-	Medium Stiff	15.5	40	-
2.0	1.25	6.00	4.75	Silty Clay	Brown Grey	11	-	Stiff	18	73	-
3.0	6.00	7.50	1.50	Silty Sand	Grey	46	Dense	-	20	-	40.1
4.0	7.50	14.00	6.50	Silty Clay	Grey	34	-	Hard	21	227	-
5.0	14.00	15.00	1.00	Silty Sand	Grey Brown	43	Dense	-	20	-	39.425
6.0	15.00	18.00	3.00	Completely Weathered Rock	-	CRR - 0% & RQD 0%					
7.0	18.00	19.00	1.00	Highly Weathered Rock	Brown	CRR - 16% & RQD 0%					

REFERENCE BORE HOLE				BH-08	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 _v) kPa	(φ) Deg.
1.0	0.00	1.25	1.25	Clayey Sand	Brown	11	Medium Dense	-	15.5	-	30.3
2.0	1.25	3.00	1.75	Sandy Clay	Grey	3	-	Soft	14	20	-
3.0	3.00	5.00	2.00	Silty Clay	Grey	10	-	Stiff	17.5	67	-
4.0	5.00	10.50	5.50	Silty Clay	Grey	19	-	Very Stiff	20	127	-
5.0	10.50	12.00	1.50	Sandy Clay	Grey	35	-	Hard	21	233	-
6.0	12.00	14.50	2.50	Silty Sand	Brown	42	Dense	-	20	-	39.2
7.0	14.50	18.50	4.00	Completely Weathered Rock	-	CRR - 0% & RQD 0%					

REFERENCE BORE HOLE				BH-09	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 _v) kPa	(φ) Deg.
1.0	0.00	2.00	2.00	Silty Clay	Grey Brown	11	-	Stiff	18	73	-
2.0	2.00	3.00	1.00	Silty Clay	Brown	3	-	Soft	14	20	-
3.0	3.00	4.00	1.00	Silty Clay	Brown	10	-	Stiff	17.5	67	-
4.0	4.00	5.00	1.00	Silty Clay	Brown	19	-	Very Stiff	20	127	-
5.0	5.00	6.00	1.00	Silty Sand	Brown	35	Dense	-	19.5	-	37.375
6.0	6.00	9.00	3.00	Sandy Clay	Brown	42	-	Hard	21	280	-
7.0	9.00	10.50	1.50	Clayey Sand	Grey	42	Dense	-	20	-	39.2
8.0	10.50	12.00	1.50	Silty Clay	Grey	42	-	Hard	21	280	-
9.0	12.00	14.00	2.00	Silty Sand	Grey	42	Dense	-	20	-	39.2
10.0	14.00	16.00	2.00	Completely Weathered Rock	-	CRR - 0% & RQD 0%					
11.0	16.00	18.00	2.00	Highly Weathered Rock	Grey	CRR - 21% to 32% & RQD 0% to 20%					

REFERENCE BORE HOLE				BH-10	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	1.25	1.25	Silty Clay	Brown	11	-	Stiff	16	73	-
2.0	1.25	5.50	4.25	Silty Clay	Brown	3	-	Soft	14	20	-
3.0	5.50	7.00	1.50	Silty Sand	Brown	10	Loose	-	15	-	30
4.0	7.00	11.20	4.20	Silty Clay	Black Grey	19	-	Very Stiff	20	127	-
5.0	11.20	14.00	2.80	Clayey Sand	Brown	35	Dense	-	19.5	-	37.375
6.0	14.00	16.00	2.00	Silty Sand	Brown	42	Dense	-	20	-	39.2
7.0	16.00	19.00	3.00	Completely Weathered Rock	Brown	CRR - 0% to 3% & RQD 0%					

REFERENCE BORE HOLE				BH-11	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	1.25	1.25	Silty Clay	Brown	7	-	Medium Stiff	16	47	-
2.0	1.25	4.00	2.75	Silty Clay	Brown	10	-	Stiff	17.5	67	-
3.0	4.00	5.00	1.00	Silty Clay	Brown	27	-	Very Stiff	20.5	180	-
4.0	5.00	6.00	1.00	Silty Sand	Brown	37	Dense	-	19.5	-	37.925
5.0	6.00	11.00	5.00	Silty Clay	Black Grey	27	-	Very Stiff	20.5	180	-
6.0	11.00	14.00	3.00	Sandy Clay	Brown	35	-	Hard	21	233	-
7.0	14.00	16.00	2.00	Disintegrated Rock	Green	>100	Very Dense	-	21	-	42.5
8.0	16.00	17.00	1.00	Completely Weathered Rock	Off-white	CRR - 0% & RQD 0%					
9.0	17.00	18.00	1.00	Highly Weathered Rock	Off-white	CRR - 32% & RQD 0%					

REFERENCE BORE HOLE				BH-12	Ref R.L. of G.L. (m):			0.00			
Layer No.	Layer Thk. (m)			Type of Strata	Colour	Ave. Design SPT	Relative Density	Consistency	(f) kN/m ²	Shear Parameters	
	Top BGL	Bottom BGL	Thickness							(C _u) kPa	(ϕ) Deg.
1.0	0.00	5.00	5.00	Silty Clay	Brown Gray Brown	13	-	Stiff	19	87	-
2.0	5.00	6.00	1.00	Silty Clay	Brown Gray Brown	31	-	Hard	21	207	-
3.0	6.00	7.50	1.50	Silty Sand	Brown Gray	27	Medium Dense	-	19	-	35.1
4.0	7.50	9.30	1.80	Silty Clay	Gray	25	-	Very Stiff	20.5	193	-
5.0	9.30	12.00	2.70	Clayey Sand	Gray Brown	>100	Very Dense	-	21	-	42.5
6.0	12.00	14.00	2.00	Residual Soil	Yellow Gray	>100	Very Dense	-	21	-	42.5
7.0	14.00	19.00	5.00	Highly Weathered Rock	Gray, Brown Gray	CRR = 7% to 19% & RQD 0%					

O.C. VENKATA PRASAD
Engineer (Geotechnical Engineering) (M)



LIQUEFACTION EVALUATION**4.0 PHENOMENA:**

Liquefaction has historically been used in conjunction with a variety of phenomena that involve soil deformations caused by monotonic, transient, or repeated disturbance of saturated cohesion-less soils under un-drained conditions. The generation of excess pore water pressure under un-drained loading conditions is a hallmark of all liquefaction phenomena. When saturated cohesion-less soils subjected to rapid loading resulting in undrained conditions undergo densification generates excess pore pressures and decreases effective stresses, eventually leading to excess deformation failures, commonly known as liquefaction. Liquefaction phenomena that result from this process is generally divided in two main groups, flow liquefaction and cyclic mobility. Both flow liquefaction and cyclic mobility are very important and any evaluation of liquefaction hazards should carefully consider both.

4.1 LIQUEFACTION SUSCEPTIBILITY:

Not all soils susceptible to liquefaction; consequently, the first step in a liquefaction hazard evaluation is the evaluation of liquefaction susceptibility. There are several criteria by which liquefaction susceptibility can be judged, and some are different for flow liquefaction and cyclic mobility. These include Historical, Geologic, Compositional, and State Criteria (Initial stress state before liquefaction).

Of the above four criteria, except the state criteria, the other three provide a qualitative evaluation of the liquefaction susceptibility of a deposit. The state criteria provide an analytical approach to quantify the liquefaction susceptibility with respect to the stress-strain response of the deposit against the environmental loading conditions.

The evaluation of liquefaction susceptibility based on state criteria is an independent and involved elaborate laboratory monotonic and cyclic loading testing programme and this is beyond the scope of present investigation. However, the liquefaction susceptibility pertinent to the present site sub surface characteristics are qualitatively outlined in the following sections. Further, based on the published correlation with respect to the corrected SPT-values, an attempt is made to provide a basic and guideline analysis on the liquefaction potential pertinent to ZONE-III earthquake coefficient.

4.2 QUALITATIVE APPROACH:**4.2.1 HISTORICAL CRITERIA:**

Historically, the present site location never documented any post-earthquake generated soil flows or local liquefaction related effects.

4.2.2 GEOLOGIC CRITERIA:

Geologic process that sort soils into uniform grain size distribution and deposit them in loose states produce soil deposits with high liquefaction susceptibility. Similarly, the older geological formations are less susceptible to liquefaction compared to the recent deposits like Fluvial, Colluvium and Aeolian deposits.

FORMATION CHARACTERISTICS:

The sub soil formation in the project location consists of the following succession:

0.0m to 5.0m	Stiff & Medium Stiff, Silty Clay
5.0m to 6.0m/7.5m	Medium Dense to Dense, Silty Sand
6.0m/7.5m to 13.0m/14.0m	Very Stiff to Hard, Silty Clay With layers of Dense & Very Dense, Clayey Silty Sand @ Locations
13.0m/14.0m to 19.0m	Completely to Highly Weathered Rock Formation

4.2.3 COMPOSITION CRITERIA:

Since liquefaction requires the development of excess pore pressure, liquefaction susceptibility is influenced by the compositional characteristics that influence volume change behaviour. These characteristics include particle size, shape and gradation. No specific Indian Standards are available to arrive at the potential particle size that chiefly contributes to the liquefaction. Further, well graded soils are less susceptible to liquefaction than poorly graded soils. Similarly rounded particles are more susceptible than angular particles as they tend to density.

In general, the composition of particles that is susceptible to liquefaction is encountered in loose state of deposition in alluvial and fluvial environment.

4.3 QUANTITATIVE APPROACH:**4.3.1 FLOW LIQUEFACTION:**

Flow liquefaction can occur, when the shear stress required for static equilibrium of a soil mass (the static shear stress) is greater than the shear strength of the soil in its liquefied state. Flow liquefaction can occur either under monotonic or under cyclic loading conditions. In this failure, the cyclic stresses bring the soil to an unstable state at which its strength drops sufficiently to allow the static stresses to produce the flow. The flow liquefaction is characterised by sudden nature of occurrence and speed of occurrence.

The cyclic mobility can develop when the static shear stress is smaller than the steady-state shear strength and can occur in both loose and dense soils. A combination of static and cyclic loading generally produces cyclic mobility. However, no cyclic testing programme is carried out as it is beyond the scope of present investigation.

In the absence of cyclic testing programme a basic analysis based on the published data using in situ test results (SPT) is presented below to characterize the Liquefaction Resistance of the sub surface deposits encountered in the present site.

Further, as a first order of approximation and in the absence of rigours testing programme focusing on liquefaction steady, it is pressured that the clayey strata are non-susceptible to liquefaction and analysis is limited to sandy strata.


D. G. VENKATA PRASAD
 Registered Geotechnical Engineer (No. 171)
 Registered No. 171-1330-001
 Chennai, Tamil Nadu, India
 Tel: 044-26541111, 26541112, 26541113
 Fax: 044-26541114, 26541115
 Email: info@geomarine.co.in, sales@geomarine.co.in

4.3.1.1 LIQUEFACTION RESISTANCE CHARACTERIZATION USING IN SITU TEST

RESULTS:

(Ref: "GEOTECHNICAL EARTHQUAKE ENGINEERING" by Steven L. Kramer, University of Washington, Prentice-Hall International Series in Civil Engineering and Engineering Mechanics, 2005; Page 77-381)

Seed et al (1975) developed a relationship between cyclic stress ratios (CSR) causing liquefaction and corrected SPT-values (N_{160}) for silty sands in $M=7.5$ earthquakes. Further a magnitude correction factor for cyclic stress approach for different earthquake magnitudes is also developed.

The above relationships are reproduced in Figs.4-1 and Table-4.1. Based on this method, for the present site, the following approach is adopted to arrive at Liquefaction Resistance Characterization of the sub surface deposits encountered in the present site.

Step-1: Using the Zone Factor (Z), Importance Factor (I), Response reduction factor and Average response acceleration coefficient (S_w/g) pertinent to Zone-II, the design horizontal and vertical seismic coefficients are estimated as per IS:1893.

Step-2: Using the design seismic coefficient, compute the design seismic shear, for corresponding to effective vertical stress (cyclic shear stress) due to overburden is computed.

Step-3: Using the average corrected design SPT-value arrive at the design angle of shearing resistance compute the effective shear strength (static strength).

Step-4: Arrive at the CSR value of the deposit by dividing the cyclic shear stress with the effective shear strength.

Step-4: Based on the CSR- N_{60} relation from Fig.4.1 and using the magnitude correction factor corresponding to Zone-II ($M=6$), the probable liquefaction/no-liquefaction characterization is arrived at and the details are given below:

Table 9-2 Magnitude Correction Factors for Cyclic Stress Approach

Magnitude, M	$CSR_M/CSR_{M=7.5}$
$5\frac{1}{8}$	1.50
6	1.32
$6\frac{1}{2}$	1.13
$7\frac{1}{2}$	1.00
$8\frac{1}{4}$	0.80

TABLE-4.1 MAGNITUDE CORRECTION FACTORS FOR CYCLIC STRESS APPROACH

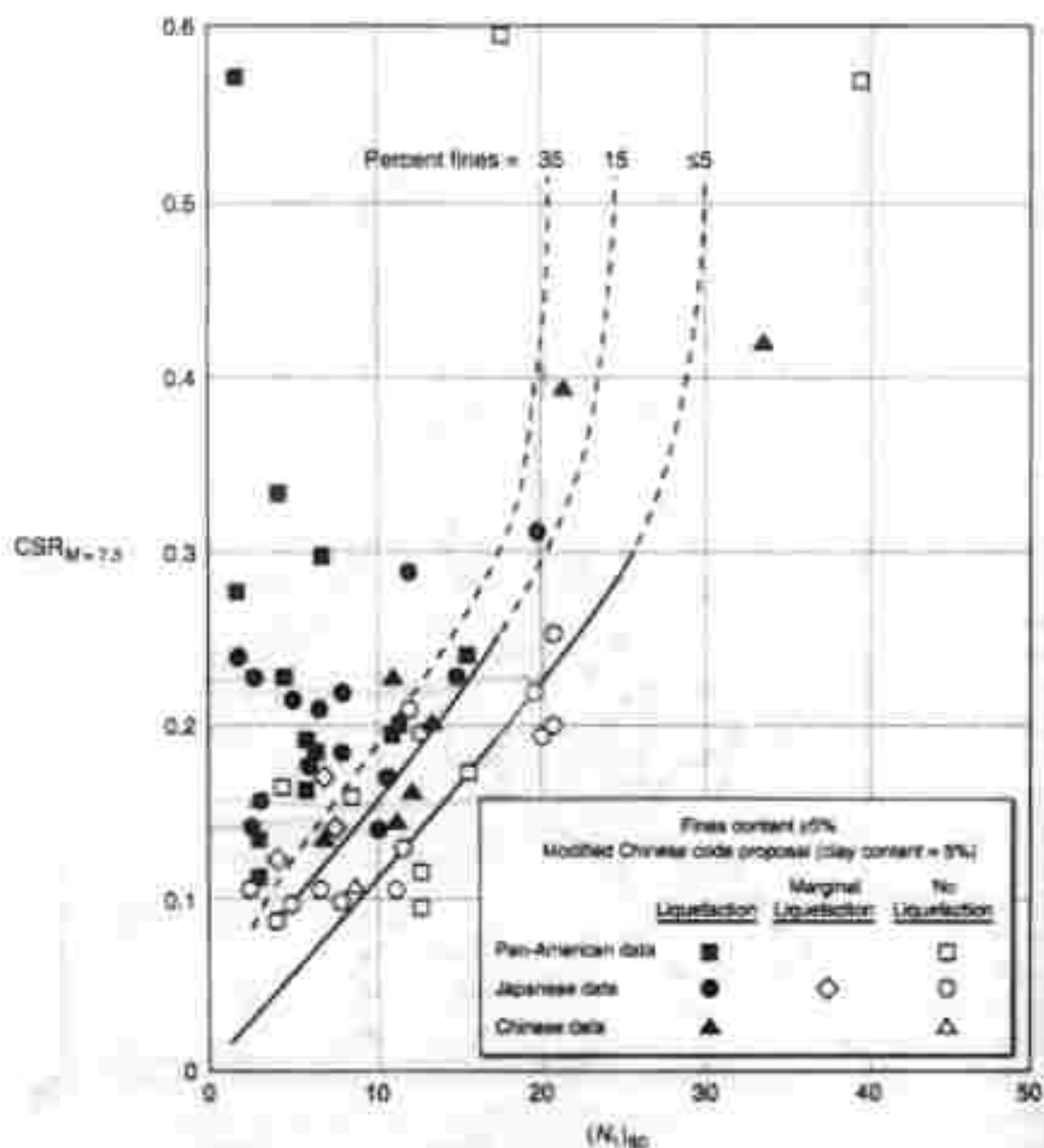


Figure 9.31 Relationship between cyclic stress ratios causing liquefaction and $(N_1)_{60}$ values for silty sands in $M = 7.5$ earthquakes. (After Seed et al. (1975). Influence of SPT procedures in soil liquefaction resistance evaluations, *Journal of Geotechnical Engineering*, Vol. 111, No. 12. Reprinted by permission of ASCE.)

FIG 4.1: RELATIONSHIP BETWEEN CYCLIC STRESS RATIOS OF LIQUEFACTION

Dr. G. VENKATA PRASAD

Practising Geotechnical Engineer (R.G.T.)

Registration No. 578/RS/05/0004

Geotechnical Engineering & Surveying

80/11-12, 1st Floor, 2nd Cross Street, Anna Nagar

Chennai-600 041, Tamil Nadu, India

Phone: 9840400000, 9840400001

Website: www.gvpconsultants.com



4.4 SUSCEPTIBILITY TO LIQUEFACTION:

- Liquefaction is a phenomenon occurs in sand and silts having relative density loose to very loose formation. Further the phenomenon can occurs in soft to very soft, clays of low plastic nature. The low plastic nature indirectly infers the predominant percentage of silt size particle which are highly susceptible to liquefaction.

In the project site no silt and sand with relative density having neither very loose nor very soft to soft low plastic clay strata exists within the investigation depth.

- ❖ *The present project site falls in Seismic Zone-III, as per IS 1893 (Part-I).*
- ❖ *In the project site, the sub soil formation is not susceptible to liquefaction as per Zone-III seismic intensity.*
- ❖ *The liquefaction analysis is presented in Annexure-II*



FOUNDATION SYSTEM



FOUNDATION SYSTEM

5.0 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.

5.1 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 one basement and twenty upper floors. For this kind of structure, the column loads could vary between 7500 kN to 12000 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.

5.2 SUB SOIL STRATIGRAPHY:

The sub soil stratification of the project location is:

0.0m to 5.0m	Stiff & Medium Stiff, Silty Clay
5.0m to 6.0m/7.5m	Medium Dense to Dense, Silty Sand
6.0m/7.5m to 13.0m/14.0m	Very Stiff to Hard, Silty Clay With layers of Dense & Very Dense, Clayey Silty Sand @ Locations.
13.0m/14.0m to 19.0m	Completely to Highly Weathered Rock Formation

5.3 FOUNDATION SYSTEM:

The proposed high-rise building consists of one basement and the depth of basement is informed as 3.5m below the existing ground level. Hence taking into consideration of assumed raft thickness of 0.5m and the adjacent road level, the overall depth of foundation excavation could about 3.5m below the existing ground level.

5.3.1 OPTION-I (OPEN FOUNDATION SYSTEM):

In case of shallow foundation is adopted, the bearing stratum exists beyond 3.5m for the proposed structure. R.C.C Raft shall be located over a well compacted layer of sand-gravel (1:1) mix/ quarry dust of 450mm thickness. The sand gravel (1:1) mix/ quarry dust shall be compacted in a non-compacted layer thickness not exceeding 150mm using 10-ton roller. The recommended allowable net safe bearing pressure for the design of raft shall be 200 kPa.

In the present case, in order to restrict the consolidation/ creep settlement within the permissible limit as per IS 1904 the recommended allowable net safe bearing pressure is restricted to 200 kPa.

The recommended modulus of subgrade reaction for the design of raft foundation shall be 30,000 kN/m².

Typical computation is presented in the Annexure-I.

5.3.1.1 EXCAVATION:

For basement excavation, vertical cut can be adopted even from the existing ground level. However, it is ideal to carry out excavation with a minimum slope of 2-Vertical: 1-Horizontal.

To prevent surface erosion, it is ideal to cover the surface of the exposed slopes with 1000micron LDPE sheet suitably anchored at top and toe with either sand bags or 100mm thick P.C.C. of M10 grade with minimum 1.0m width.

In order to prevent the surface water entering the excavation zone during the showers it is ideal to construct a shallow ditch 1.0m away from the periphery of the excavation line (at existing ground level around the excavation plan area) and train the water away from the excavation zone. This will prevent the surface water entering the excavation zone and prevent the erosion of the excavation face.

5.3.1.2 EXCAVATION GROUND WATER LOWERING:

Based on the relative permeability characteristics of the sub soil within the excavation zone, ground water lowering can be carried out by conventional collection pit pumping system with water training shallow ditches connecting the collection pit at the bottom of excavation.

5.3.1.3 DESIGN OF BASEMENT SLAB FOR UPLIFT:

In the present project location, the top 6.0m being impermeable stratum, the design of lower basement slab shall exclude the uplift design consideration.

5.3.2 OPTION-II (PILE FOUNDATION SYSTEM):

In case the recommended bearing capacity is not sufficient, alternate to open foundation adopt either bored cast insitu piles or driven casing cast insitu piles.

- ❖ In case of bored cast insitu piles, the piles can be installed by drilling with direct mud circulation technique (Bored Cast Insitu Piles).
- ❖ In case of driven casing cast insitu piles, the pile depth may vary from 14.0m to 16.0m from the existing ground level. For driven piles, it is recommended to establish the set criteria from the pile vendor and submit the same to geotechnical consultants before execution.

Table 5.1 presents the recommended safe load carrying capacity of piles in compression, tension and lateral for different diameters is worked out as per IS 2911-Part-I-Section-2.

Typical computations are presented in the Annexure-I.

In the present case, the pile load carrying capacities are computed based on below criteria:

The bearing stratum is modelled as sand and the load carrying capacities are computed by conventional method as per IS 2911-Part1/ Sec2 Annex-B (Cl. B1).

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

Sl.No	Reference Bore hole No.	Length of Pile below E.G.L	Assumed Length of Cut-Off Below E.G.L	Length of Pile below Cut-off	Dia.of Pile in (mm)	SAFE LOAD CARRYING CAPACITY (kN)		
						Vertical Load Carrying Capacity	Pull Out Capacity	Lateral Load Carrying Capacity
1.0	B/I-01	19.0	3.5	15.50	500	1400	500	85
2.0					550	1700	550	90
3.0					600	2000	600	100
4.0					650	2400	650	110
5.0					750	2800	750	120
6.0					800	3200	800	130

RECOMMENDED SAFE LOAD CARRYING CAPACITIES OF DRIVEN CASING 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	B/I-03	15.0	3.5	11.50	500	1000	350	85
2.0					550	1200	400	90
3.0					600	1450	450	100

NOTE ON BORED PILES:

- ❖ For installation of piles, it is recommended to use rotary drilling rigs with a minimum torque capacity of 180 N-m.
- ❖ Based on the lateral variation in weathered rock formation, the length of the pile may vary between 17.0m to 18.0m below the existing ground level.
- ❖ The theoretical load carrying capacities of the piles shall be confirmed with pile load test protocol as per IS 2911 part 3 and adopt the least of two for the design and construction of pile foundation. As per IS 2911 part 3 testing protocol, it is mandatory to reconfirm the design load during execution and adhere to the same protocol to validate the design load carrying capacities.
- ❖ All the testing program shall be the responsibility of the project management consultant in consultation with project structural consultants. However, the strata verification as per geotechnical report shall be carried out by a competent geotechnical consultant at the site. In case of any observation that needs clarification, submit the same samples to M/s Geomarine Consultants Pvt Ltd., in the presence of observer for confirmation.

RECOMMENDATIONS



Dr. C. VENKATA PRASAD
Registered Geotechnical Engineer (GOTC)
Registration No. 078713 QS 009
Central Metropolitan Development Authority (CMDA)
No. 11, 2nd Main Road, Kumbakonam, Tamil Nadu
Contact: 94421 15250 / 94794 14025 / 944
Email: dr.c.vprasad@geomarineconsultants.com

RECOMMENDATIONS

6.0 RECOMMENDATION FOR FOUNDATION SYSTEM:

6.1 OPTION-I (OPEN FOUNDATION SYSTEM):

- ❖ For the kind of sub soil conditions, the foundation system as described in Chapter-5, Section 5.3.1 can be adopted.
- ❖ For the proposed construction, R.C.C Raft can be provided with the bottom of foundation located at a minimum depth of 3.5m from the existing ground level.
- ❖ For a depth of 3.5m and beyond the recommended allowable safe bearing pressure for R.C.C Raft can be 200 kPa.
- ❖ For lowering the ground water/dewatering conventional open pit dewatering system with peripheral trenches can be adopted.
- ❖ For basement excavation, the excavation method as discussed in Section 5.3.1.1, Chapter-5.0 can be adopted.

6.2 OPTION-II (PILE FOUNDATION SYSTEM):

- ❖ In case of shallow foundation is not feasible, pile foundation can be adopted. For the kind of proposed construction and the project location, either Driven, Casing Cast In situ or 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-5.1 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.
- ❖ Installation of working pile shall follow the completion of initial load test only.

6.2.1 CONSTRUCTION METHOD STATEMENT OF BORED PILE FOUNDATION:

- ❖ 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.
- ❖ 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 free 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.



6.3 GENERAL RECOMMENDATION:

- ❖ The chemical analysis results of soil and water is presented in Table 2.12 to 2.14. The structural consultant shall consider the results its guidelines for arming cement and steel for the proposed project.
- ❖ Excavated earth is not suitable for backfilling purposes.
- ❖ The present project site fall in seismic zone-III as per IS 1893-P-I (2016) and based on the liquefaction analysis the sub soil formation exists at site is non-liquefiable considering the zone-III seismic intensity.

AUTHORISED SIGNATORY
DR. C. V. PRASAD**GEOMARINE CONSULTANTS PRIVATE LIMITED**

D.C.VENKATA PRASAD
Registered Geotechnical Engineer (RSE)
Registration No: ST/18/04/003
Current Registration Development Authority (CDA)
No.11 2nd Main Road Karamba Nagar, Thiruvallur,
Chennai-61. 405. Tel: +91 44 2261100.
Email: info@geomarineconsultants.com

ANNEXURE-I



Dr.C VENKATA PRASAD
Registered Civil Structural Engineer (RCE)
Registration No. GTB/1602/2021
Chartered Professional Development Authority (CPDA)
1st & 2nd Main Road, Bangalore, India, 560001
Phone-41: 9448442211
Email-41: venkatasr@gmail.com

TYPICAL BEARING CAPACITY COMPUTATIONS FOR SHALLOW FOUNDATION

1.0 COMPUTATION OF BEARING CAPACITY AS PER IS:6403

1.1 Geometrical Data :

Shape of the Foundation : Square
Depth of Embedment below the lowest basement floor "D_f" (m) : 0.5
Depth of basement floor below E.G.L. "D_b" (m) : 2.0
Depth of Foundation Below E.G.L. "D_f" (m) : 2.50
Breadth of Footing "B" (m) : 10.0
Length of Footing "L" (m) : 10.0
L/B : 1.00
Inclination of Vertical Load with the vertical (α) : 0.00

1.2 Soil Data :

Type of Effective Bearing Strata : Clay
Type of Shear Failure : General
SPT "N" of the Bearing Strata : 11
Undrained Shear Strength (C_u) : 73

1.3 Design Parameters:

Dry Density of Soil above the foundation depth (γ_{sat}) : 18 kN/m³
Water Table Correction Factor (w_c) : 0.50
Effective overburden pressure at foundation level (σ) : 4.00 kN/m²
Bearing Capacity Factors
 $N_c = 5.14$
 $N_q = -$
 $N_{\gamma} = -$
Shape Factors
 $S_c = 1.30$
 $S_q = -$
 $S_{\gamma} = -$
Depth Factors
 $D_c = 1.07$
 $D_q = -$
 $D_{\gamma} = -$
Inclination Factor
 $i_c = 1.00$
 $i_q = -$
 $i_{\gamma} = -$

1.4 Ultimate Bearing Capacity (Q_u) :

$Q_u = C_u \cdot N_c \cdot S_c \cdot D_c \cdot i_c = 324.21$ kPa

1.5 Safe Bearing Capacity (Q_{safe}) :

Factor of Safety (F.S.) : 2.50
Q_{safe} : 209.73 kPa
Say Q_{des} : 200 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) = $\frac{q(B(1-\mu^2))}{E_s}$
q = bearing pressure : 200.00 kPa
Poisson's Ratio (μ) : 0.25
Modulus of Elasticity (E_s) (Ref. Joseph E. Bowles, 1996, page 310, Table 5.9, Japanese design standards)
Modulus of Elasticity (E_s) : 46566.87
Size of footing considered for maximum settlement (m) : 10.00
Influence factor : 0.96
Rigidity Factor : 0.80
Depth Factor : 0.74
Elastic Settlement (S_i) : 22.80 mm

3.0 Computation of Settlement as per IS:8009-Part I

3.1 Compression Parameters:

Average Compression Index (C_c)	0.32
Average Initial Void Ratio (e_0)	0.89
Stress history factor (λ)	0.70

3.2 Geometrical Data:

Depth to top of compressible layer below E.G.L.	4.00 m
Depth to bottom of compressible layer below E.G.L.	5.00 m
Depth to top of compressible layer below the foundation level Z1	0.50
Depth to bottom of compressible layer below the foundation level Z2	1.50
Thickness of compressible soil only influenced by stress bulb (ΔH)	1.00

3.3 Stress Computations:

Effective overburden pressure at the middle of the compressible layer (P_0)	36.00 kPa
B/Z1	20.00
L/Z1	20.00
B/Z2	6.67
L/Z2	6.67
Stress Reduction Factor (f_d)	0.99
Additional stress due to the superstructure construction ($\Delta p = Q_{\text{max}} \gamma_{\text{column}}$)	198.00 kPa

3.4 Settlement Computations:

Consolidation Settlement ($S_c = C_c \cdot 1 \cdot \Delta H \cdot \log((P_0 + \Delta p)/P_0) / (1 + e_0)$)	54.89 mm
Rigidity Factor	0.80
Corrected Settlement ($S_{c,r}$)	75.91 mm
Total Settlement	58.51 mm
	<100 mm



D. C. VENKATA PRASAD
Registered Professional Engineer (P.E.)
Registration No: 01511561423
Chemical Engineering Development Authority (CADA)
16/11-2nd Main Road, Kalyanapur, Bengaluru-560042
Contact No: 9448444444, 9448444444
Email: dcv@geomarineconsultants.com

ESTIMATION OF SAFE LOAD CARRYING CAPACITY OF BORED CAST-IN-SITU PILES																	
Type of Pile				Bored		Diameter of Pile				Length of Pile below G.L. (m)			10.0		As Per IS:2911-4 (P.4.5.3)-2013		
Reference Bore Hole				BH-03						500 mm		Surcharge Pressure		0		kPa	
Layer No.	Layer Thk. (m)			Type of Strata	Ave. SPT	Soil Parameters		Effective Overburden Pressure (kPa)			Adhesion Factor (t)	Earth Pressure Coefficient (K)	Skin Friction (Q _s) kN				
	Top B.L.	Bot. B.L.	Thickness			At Layer	Ave. Value Layer	ICJ kPa	At Top	At Bot. of Layer						At Mid. of Layer	
1.0	0.0	2.5	2.5	Cut-Off Level													
2.0	2.5	5.0	2.5	Silty Clay	14	19.5	19.5	93	-	0.0	14.3	14.3	14.3	0.5	-	q' ₁	103.0
3.0	5.0	6.6	1.6	Silty Clay	23	20.5	20.5	153	-	14.3	24.8	19.5	19.5	0.3	-	q' ₁	72.1
4.0	6.6	12.0	5.4	Silty Clay	24	20.5	20.5	160	-	24.8	87.8	56.3	56.3	0.3	-	q' ₁	432.4
5.0	12.0	15.0	3.0	Sandy Clay	50	21.0	20.8	323	-	87.8	120.8	104.3	104.3	0.3	-	q' ₁	408.5
6.0	15.0	19.0	4.0	Weathered Rock	50	20.5	20.8	-	41.0	120.8	162.8	141.8	141.8	-	1.5	q' ₁	1101.3
Summation of Positive Skin Resistance (kN)										Q _s =		2196.81					
Summation of Negative Skin Resistance (kN)										-Q _s =		0.00					
Computation of End Bearing Resistance																	
Bearing Stratum		Weathered Rock		SPT	q	C _u	N ₆₀	N ₁₆₀	Eff. Ht. of Overburden H H								
				60	41.50	-	157.31	-	Effective Overburden Pressure: 77.25 kPa ¹								
										End Bearing Resistance (kN) Q _u =		2380.05					
Skin Resistance in Clay Layer is 1/3 of (C _u + 2s)								Ultimate Load Carrying Capacity (Q _u)		Q _u = Q _s + Q _u (kN)		4582.86					
Skin Resistance in Sand Layer is 1/3 of (q' + Kσ' _v)								Safe Load Carrying Capacity (Q _u)		Q _u /2.5 (kN)		1833.14					
End Bearing Resistance in Clay Layer is 1/3 of (C _u + 2s)								Allowable Safe Load Carrying Capacity		Q _u /2.5 (kN)		1833.14					
End Bearing Resistance in Sand Layer is 1/3 of (q' + Kσ' _v)								Allowable Safe Pull out Capacity		Q _u /2.5 (kN)		732.27					
Where																	
C _u = Undrained Shear Strength of Clay						K = Conf. Earth Pressure at Rest						q' = q _u of Pile					
s = Angle of Shearing Resistance						σ' _v = Effective Overburden Pressure at middle of Layer						α = Adhesion Factor					
N ₆₀ = Bearing Capacity Factor = 3						N ₁₆₀ = Bearing Capacity Factor, Ref. Fig. 1 of IS Code Reference above						γ = Unit weight of Soil					
Q _u = Effective Overburden Pressure at pile tip = Effective weight of overburden (kPa) x 1.0																	



D.R. VENKATARAMAN
 Registered Geotechnical Engineer (No. 180115)
 Registration No. 27818/2013
 Chennai Metro Engineering & Construction Pvt. Ltd.
 10/11, 2nd Main Road, Rajapet, Chennai - 600017
 Contact No. 9840304411 / 9840304412
 Email: info@geomarine.com

ESTIMATION OF SAFE LOAD CARRYING CAPACITY OF DRIVEN CASING CAST-IN-SITU PILES																				
Type of Pile				Driven		Diameter of Pile			Length of Pile below G.L. (m)			15.0		As Per IS:2911 (PA-3-2)-2010						
Reference Bore Hole				BH-03					500	mm	Surcharge Pressure		0		kPa					
Layer No.	Layer Thk. (m)			Type of Strata	Avg. SPT	(q) kN/m ²		Shear Parameters		Effective Overburden Pressure (kPa)			Adhesion Factor (t)	Earth Pressure Coefficient (K)	Skin Friction (Q _s) kN					
	Top R.L.	Bot. R.L.	Thickness			of Layer	Ave. upto Layer	(C _u) kPa	(φ) Deg.	At top of Layer	At Bot. of Layer	At Mid of Layer								
1.0	0.0	3.5	3.5	Cut-Off Layer																
2.0	3.5	5.0	1.5	Silty Clay	14	18.5	18.5	90	-	0.0	14.3	7.1	0.4	-	qf	-	87.7			
3.0	5.0	6.0	1.0	Silty Clay	23	25.5	20.0	150	-	14.3	24.8	19.5	0.3	-	qf	-	72.1			
4.0	6.0	12.0	6.0	Silty Clay	24	20.0	20.0	160	-	24.8	57.8	56.3	0.3	-	qf	-	403.4			
5.0	12.0	14.0	2.0	Sandy Clay	60	22.0	21.3	400	-	87.8	111.8	99.8	0.2	-	qf	-	314.2			
6.0	14.0	15.0	1.0	Disintegrated Rock	100	21.0	21.5	-	35	111.8	122.5	117.3	-	2.0	qf	-	267.6			
Summation of Positive Skin Resistance (kN) Q _s =																1214.08				
Summation of Negative Skin Resistance (kN) Q _{ns} =																0.00				
Computation of End Bearing Resistance																				
Bearing Stratum		Disintegrated Rock		SPT	q	C _u	N ₆₀	N ₆₀	Eff. H. of Overburden		B	m								
				100	35.00	-	82.50	-	Effective Overburden Pressure		79.13	kN/m ²		End Bearing Resistance (kN) Q _{np} =					1274.36	
Skin Resistance in Clay Layer is (kN/m ² /m)										Ultimate Load Carrying Capacity (Q _{ult})				Q _{ult} =Q _s +Q _{np} (kN)		2488.44				
Skin Resistance in Sand Layer is (kN/m ² /m) (kPa)										Safe Load Carrying Capacity (Q _{safe})				Q _s /2.5 (kN)		995.38				
End Bearing Resistance in Clay Layer is (kN/m ² /m)										Allowable Safe Load Carrying Capacity				Q _{safe} (kN)		995.38				
End Bearing Resistance in Sand Layer is (kN/m ² /m)										Allowable Safe Load Carrying Capacity				Q _{safe} / 0.75 (kN)		404.70				
Where:																				
Q _s =Unsurpassed Skin Strength of Clay				K=Coef. Earth Pressure at Rest				k=Coef. of Pile												
q=Angle of Bearing Resistance				q=Effective Overburden Pressure at middle of Layer				α=Adhesion Factor												
N ₆₀ =Bearing Capacity Factor = 0				N ₆₀ =Bearing Capacity Factor, Ref. Fig 1 of III, Code Referred above				C _u =Thickness of Layer												
IS 800 Effective Overburden Pressure at the soil surface needs to be considered X 1.1-1.5																				

Q_{np} = Effective Overburden Pressure at pile tip (Effective Weight of overburden X 1.33)



G.P. VENKATA PRASAD

Head Office: Chennai-600 086, Eng. Ann. (P&T)
Registered No. 6131 (MCT 1963)
Branch: Minimization Development Authority (MCA),
No. 11, Day Walk Road, Palamuru, Nagar, Chennai-600 041. Also Phone: 81544 6037/85
E-mail: office@geomarinepld.com

ESTIMATION OF SAFE LOAD CARRYING CAPACITY OF DRIVEN CASING CAST-IN-SITU PILES																	
Type of Pile		Driven		Diameter of Pile			Length of Pile below G.L. (m)		13.1		As Per IS-2911-(P4/S-2)-2010						
Reference Bore Hole		ICH-14					500	mm	Surcharge Pressure		0		kPa				
Layer No.	Layer Thk. (m)			Type of Strata	Ave. SPT	(f) kN/m ²		Shear Parameters		Effective Overburden Pressure (kPa)			Adhesion Factor (α)	Earth Pressure Coefficient (K)	Skin Friction (Q _s) kN		
	Top R.L.	Bot. R.L.	Thickness			of Layer	Ave. upto Layer	(C) kPa	(φ) Deg	At top of Layer	At Bot. of Layer	At Mid. of Layer					
1.0	0.0	3.5	3.5	Cut-Off Level													
2.0	3.5	5.0	1.5	Silly Clay	8	17.0	17.0	00	-	0.0	10.5	5.3	2.4	-	0.7	55.5	
3.0	5.0	7.0	2.0	Silly Sand	42	20.0	18.5	-	38	10.5	30.5	20.5	-	2.0	0.7	100.6	
4.0	7.0	10.5	3.5	Silly Clay	24	28.5	20.5	150	-	30.5	67.2	48.9	0.2	-	0.7	283.0	
5.0	10.5	13.0	2.5	Clayey Sand	53	20.5	20.5	-	38	67.3	63.5	80.4	-	2.0	0.7	485.2	
6.0	13.0	15.0	2.0	Weathered Rock	100	21.0	20.5	-	40	83.5	115.5	104.5	-	2.0	0.7	550.0	
Summation of Positive Skin Resistance (kN)															Q _p	1465.25	
Summation of Negative Skin Resistance (kN)															-Q _n	0.00	
Computation of End Bearing Resistance																	
Bearing Stratum		Weathered Rock		SPT	q	C _u	N ₆₀	N ₁	Eff. Ht. of Overburden		q	γ					
				100	40.00	-	120.34	-	Effective Overburden Pressure		70.50	kN/m ²					
End Bearing Resistance (kN)															Q _p	1674.09	
Skin Resistance in Clay Layer is $\alpha \times C_u \times Q_u$								Ultimate Load Carrying Capacity (Q _u)				Q _u = Q _s + Q _p (kN)		3139.34			
Skin Resistance in Sand Layer is $\alpha \times C_u \times Q_u$								Safe Load Carrying Capacity (Q _u)				Q _u /2.5 (kN)		1255.74			
End Bearing Resistance in Clay Layer is $\alpha \times C_u \times Q_u$								Allowable Safe Load Carrying Capacity				Q _u (kN)		1255.74			
End Bearing Resistance in Sand Layer is $\alpha \times C_u \times Q_u$								Allowable Safe Pull out Capacity				Q _u = Q _s (kN)		485.62			
Notes:																	
1. Unweathered layer strength of Clay					2. End Earth Pressure in Clay					3. Dia. of Pile							
4. Angle of Shearing Resistance					5. Effective Overburden Pressure at middle of Layer					6. Adhesion Factor							
7. Allowable Capacity Factor = 2					8. Bearing Capacity Factor, Ref. Fig. 1 of IS Code Reference above					9. Termination (if any)							
10. α = Effective Overburden Pressure at pile tip / Effective Weight of Overburden X 0.75																	


Dr. C. VENKATARAMAN
 Regional Director
 Regional Office, Chennai
 Chennai Branch Office, Chennai
 11, 200 Main Road, Chennai - 600 001
 Chennai - 600 001
 Chennai - 600 001

ESTIMATION OF SAFE LOAD CARRYING CAPACITY OF DRIVEN CASING CAST-IN-SITU PILES																					
Type of Pile		Driven		Diameter of Pile		Length of Pile below G.L. (m)			U.S.		As Per IS:2911 (P.1.5-3)-2010										
Reference Bore Hole		BH-05				100	mm	Surcharge Pressure		σ	kPa										
Layer No.	Layer Thk. (m)			Type of Strata	Avg. SPT	[1] kN/m ²		Shear Parameters		Effective Overburden Pressure (kPa)			Adhesion Factor (%)	Earth Pressure Coefficient (K)	Skin Friction (Q _s) kN						
	Top, B.L.	Bot. B.L.	Thickness			of Layer	Ave. upper Layer	(C) kPa	(φ) Deg.	At top of Layer	At Bot. of Layer	At Mid of Layer									
1.0	0.0	3.6	3.6																		
C/L-Off Layer																					
2.0	3.6	5.0	1.4	Silty Clay	12	17.5	17.5	87	-	5.5	11.3	5.6	0.4	-	0	+	63.1				
3.0	5.0	7.8	2.8	Silty Clay	25	20.5	19.0	187	-	11.3	37.5	24.4	0.3	-	0	+	183.6				
4.0	7.8	14.0	6.2	Silty Clay	25	20.5	20.5	173	-	27.3	105.8	71.6	0.3	-	0	+	529.9				
5.0	14.0	18.0	4.0	Dismembered Rock	100	21.0	20.8	-	38	105.8	116.8	111.3	-	2.0	0	+	273.1				
Summation of Positive Skin Resistance (kN) ΣQ_s																1049.70					
Summation of Negative Skin Resistance (kN) $-\Sigma Q_n$																0.00					
Computation of End Bearing Resistance																					
Bearing Stratum		Weathered Rock		SPT	q_c	N_6	N_6	E _{1/2} of Overburden		Σ	m										
				50-40.06	-	120.54	-	Effective Overburden Pressure		70.78	480mm										
End Bearing Resistance (kN) Q_{pb}																1685.77					
Skin Resistance in Clay Layer is $\sqrt{CFDC}/4$																Ultimate Load Carrying Capacity (Q_{ult})		$Q_u = Q_s + Q_{pb}$ (kN)		2735.47	
Skin Resistance in Sand Layer is $\sqrt{CFDC}/4$ (kN/m ²)																Safe Load Carrying Capacity (Q_{safe})		$Q_u/2.5$ (kN)		1092.19	
End Bearing Resistance in Clay Layer is $\sqrt{CFDC}/4$																Allowable Safe Load Carrying Capacity		Q_{allow} (kN)		1092.19	
End Bearing Resistance in Sand Layer is $\sqrt{CFDC}/4$																Allowable Safe Pull out Capacity		Q_{allow} (kN)		319.80	
Where																					
Compressive Shear Strength of Clay				kPa Conf. Earth Pressure at Test				kPa Conf. of Top													
Average of Bearing Resistance				kPa Netting Overburden Pressure at Middle of Layer				kPa Adhesion Factor													
N_6 Bearing Capacity Factor = 8				N = Bearing Capacity Factor, Ref. Fig. 1 of IS Code Refered above				TA Thickness of Layer													
Q is the Effective Overburden Pressure at pile tip (Effective weight of overburden $\times 1.5 \times 10$)																					



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ESTIMATION OF SAFE LOAD CARRYING CAPACITY OF DRIVEN CASING CAST-IN-SITU PILES																									
Type of Pile				Driven		Diameter of Pile			Length of Pile below G.L. (m)			15.0		As Per IS:2911-(P4,S-2)-2010											
Reference Bore Hole				BH-00					500		mm	Burcharge Pressure		0		kPa									
Layer No.	Layer Thk. (m)			Type of Stratum	Avg. SPT	(γ) kN/m ³		Shear Parameters		Effective Overburden Pressure (kPa)			Adhesion Factor (t)	Earth Pressure Coefficient (K)	Skin Friction (Q) kN										
	Top R.L.	Bot. R.L.	Thickness			of Layer	Ave. upto Layer	(C) kPa	(φ) Deg	At top of Layer	At Bot. of Layer	At Mid. of Layer													
1.0	0.0	3.5	3.5	Cut-Off Layer																					
2.0	3.5	4.7	1.2	Silty Clay	13	19.0	19.0	87	-	0.0	10.8	5.4	0.4	-	47	±	65.6								
3.0	4.7	7.0	2.3	Silty Clay	29	20.5	19.6	103	-	10.8	35.0	22.9	0.3	-	47	±	174.2								
4.0	7.0	10.5	3.5	Silty Clay	18	20.0	20.3	100	-	35.0	70.0	52.5	0.3	-	47	±	197.9								
5.0	10.5	14.0	3.5	Sandy Clay	29	20.5	20.3	103	-	70.0	106.7	88.3	0.3	-	47	±	265.3								
6.0	14.0	14.5	0.5	Disintegrated Rock	100	21.0	20.8	-	38	106.7	112.2	100.5	-	2.0	47	±	134.3								
7.0	14.5	15.0	0.5	Weathered Rock	100	21.0	21.0	-	40	112.2	117.7	115.0	-	2.0	47	±	151.5								
Summation of Positive Skin Resistance (kN) Q _s =																	888.94								
Summation of Negative Skin Resistance (kN) -Q _s =																	0.00								
Computation of End Bearing Resistance																									
Bearing Stratum		Weathered Rock		SPT	q _c	N ₆₀	(N ₆₀)	GRMT of Overburden		11		m													
				100	40.00	-	120.94	-	Effective Overburden Pressure = 112.25				kN/m ²												
End Bearing Resistance (kN) Q _b =																	1850.63								
Skin Resistance in Clay Layer is 47 kN/m ²																	2739.57								
Ultimate Load Carrying Capacity (Q _{ult})																	2739.57								
Safe Load Carrying Capacity (Q _{safe})																	1119.83								
Allowable Safe Load Carrying Capacity																	1119.83								
Allowable Safe Pull out Capacity																	329.65								
Q _{allow} - Q _s (kN)																	329.65								
(Notes)																									
C= Cohesion																	q= Effective Overburden Pressure at middle of Layer	q= Effective Overburden Pressure at middle of Layer	q= Effective Overburden Pressure at middle of Layer	q= Effective Overburden Pressure at middle of Layer	q= Effective Overburden Pressure at middle of Layer	q= Effective Overburden Pressure at middle of Layer	q= Effective Overburden Pressure at middle of Layer	q= Effective Overburden Pressure at middle of Layer	q= Effective Overburden Pressure at middle of Layer
φ= Angle of Shearing Resistance																	K= Bearing Capacity Factor (Ref. Fig 1 of IS: 2911-2010)	K= Bearing Capacity Factor (Ref. Fig 1 of IS: 2911-2010)	K= Bearing Capacity Factor (Ref. Fig 1 of IS: 2911-2010)	K= Bearing Capacity Factor (Ref. Fig 1 of IS: 2911-2010)	K= Bearing Capacity Factor (Ref. Fig 1 of IS: 2911-2010)	K= Bearing Capacity Factor (Ref. Fig 1 of IS: 2911-2010)	K= Bearing Capacity Factor (Ref. Fig 1 of IS: 2911-2010)	K= Bearing Capacity Factor (Ref. Fig 1 of IS: 2911-2010)	
N ₆₀ = Bearing Capacity Factor = 3																	t= Adhesion Factor	t= Adhesion Factor	t= Adhesion Factor	t= Adhesion Factor	t= Adhesion Factor	t= Adhesion Factor	t= Adhesion Factor	t= Adhesion Factor	
q= Effective Overburden Pressure at middle of Layer																	γ= Unit Weight of Soil	γ= Unit Weight of Soil	γ= Unit Weight of Soil	γ= Unit Weight of Soil	γ= Unit Weight of Soil	γ= Unit Weight of Soil	γ= Unit Weight of Soil	γ= Unit Weight of Soil	



DR. G. VENKATARAMAN
 Director / Geotechnical Engineer (P&T)
 Registration No: 12129 / 2010
 Member, Indian Geotechnical Society
 Member, Indian Society for Soil Mechanics
 Member, Indian Society for Foundation Engineering
 Member, Indian Society for Earthquake Engineering
 Member, Indian Society for Geotechnical Engineering
 Member, Indian Society for Foundation Engineering
 Member, Indian Society for Earthquake Engineering
 Member, Indian Society for Geotechnical Engineering

ESTIMATION OF SAFE LOAD CARRYING CAPACITY OF DRIVEN CASING CAST-IN-SITU PILES																		
Type of Pile				Driven		Diameter of Pile			Length of Pile below G.L. (m)				As Per IS:2911 (P4,5-Q)-2010					
Reference Bore Hole				BH-07					SDO		Surcharge Pressure		0		kPa			
Layer No.	Layer Thick. (m)			Type of Strata	Avg SPT	(1) kN/m ²		Shear Parameters		Effective Overburden Pressure (kPa)			Adhesion Factor (k)	Bolt Pressure Coefficient (K)	Skin Friction (Q _s) kN			
	Top A.L.	Bot. A.L.	Thickness			of Layer	Avg. Upper Layer	(C) kPa	(ϕ) Deg.	At top of Layer	At Bot. of Layer	At Mid. of Layer						
1.0	0.0	3.5	3.5	Cut-Off Level														
2.0	3.5	8.0	4.5	Silty Clay	11	18.0	18.0	72	-	0.5	28.0	10.0	0.4	-	q'	-	114.7	
3.0	8.0	7.5	1.5	Silty Sand	48	20.0	19.0	-	38	30.0	35.0	27.5	-	2.0	q'	-	101.2	
4.0	7.5	14.0	6.5	Silty Clay	34	21.0	20.5	227	-	35.0	106.3	70.6	0.3	-	q'	-	372.4	
5.0	14.0	15.0	1.0	Silty Sand	43	20.0	20.0	-	38	106.0	110.0	111.5	-	2.0	q'	-	273.7	
Summation of Positive Skin Resistance (kN) Q _s																	1069.02	
Summation of Negative Skin Resistance (kN) -Q _s																	0.00	
Computation of End Bearing Resistance																		
Bearing Stratum		Weathered Rock		SPT	q	C	N ₆₀	N ₁₆₀	EP Pt. of Overburden		E							
				100	40.00	-	120.64	-	Effective Overburden Pressure		21.25 kN/m ²							
End Bearing Resistance (kN) Q _p																	1481.30	
Skin Resistance in Clay Layer is 1077.70 kN								Ultimate Load Carrying Capacity (Q _u)				Q _u = Q _s + Q _p (kN)						2760.32
Skin Resistance in Sand Layer is 1077.70 kN								Safe Load Carrying Capacity (Q _u)				Q _u /2.5 (kN)						1104.37
End Bearing Resistance in Clay Layer is 1077.70 kN								Allowable Safe Load Carrying Capacity				Q _u / 2.5 (kN)						1104.37
End Bearing Resistance in Sand Layer is 1077.70 kN								Allowable Safe Pull out Capacity				Q _u / 2.5 (kN)						556.34
Where:																		
Correction Factor (C ₁)				K ₁ Coef. Earth Pressure at Rest				q ₀ Effective Overburden Pressure at middle of Layer				e ₀ Coef. of Pile						
e ₀ Angle of Skewing Resistance				q ₀ Effective Overburden Pressure at middle of Layer				K ₂ Bearing Capacity Factor, Ref. Fig. 1 of IS Code National alone				e ₀ Adhesion Factor						
K ₂ Bearing Capacity Factor				K ₂ Bearing Capacity Factor, Ref. Fig. 1 of IS Code National alone				T ₀ Thickness of Layer										
Q _u is Effective Overburden Pressure at job (IS Code Effective height of overburden, h ₀ = 10)																		

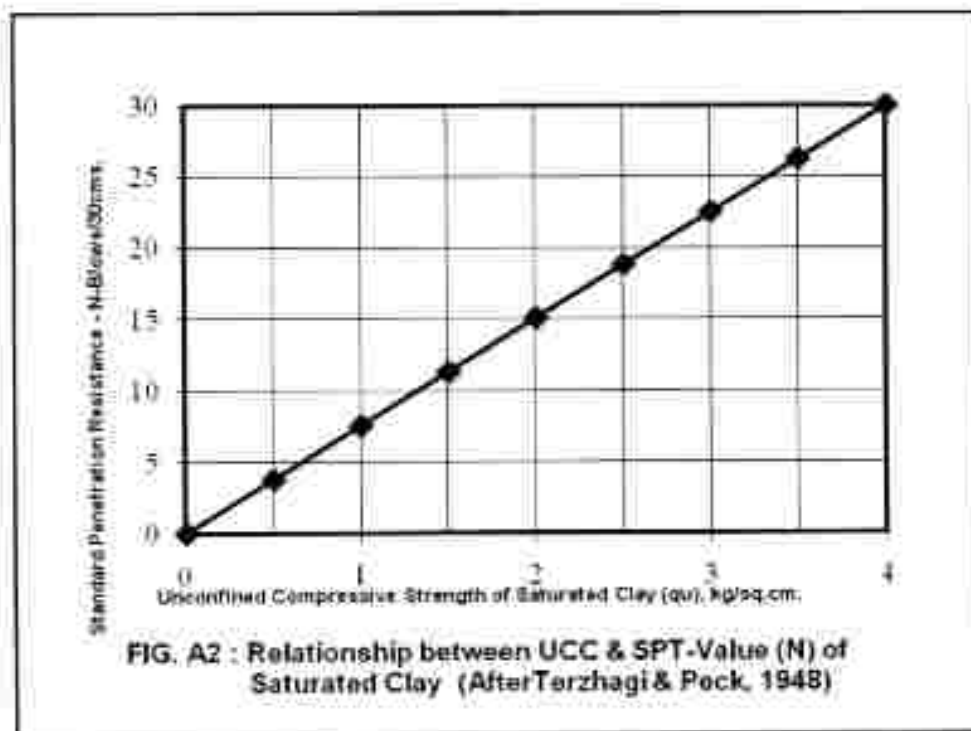
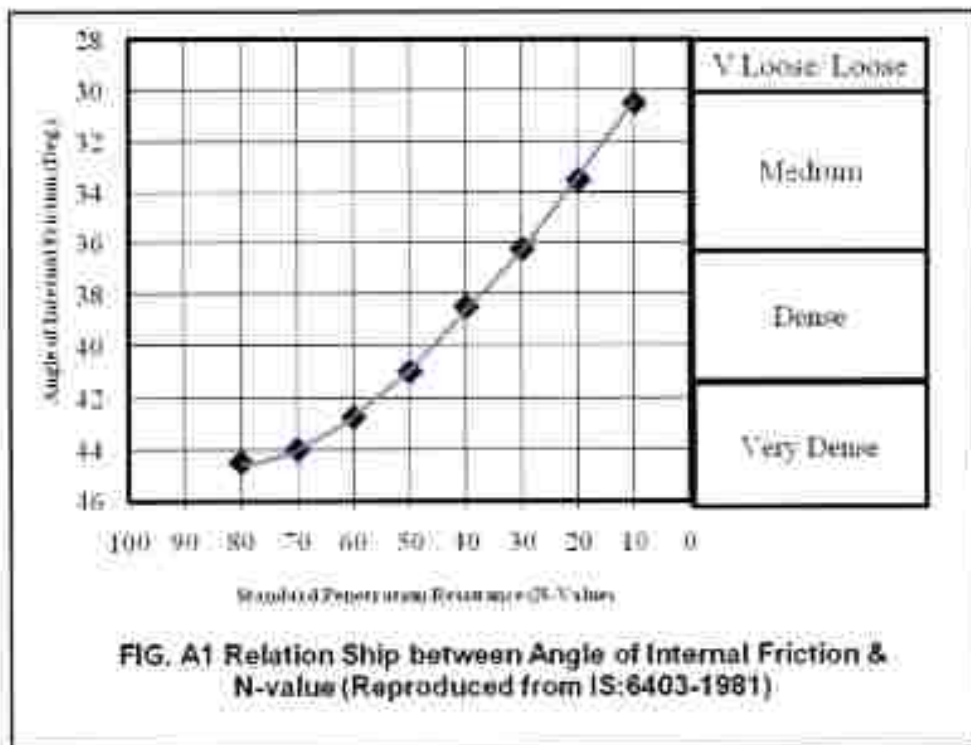


DR. P. S. PRASAD
 All India Engineering (CET) Regd.
 Civil Engineering Consultant, PUNE & CO.
 111, Durgam Chaudhary Nagar, Hyderabad
 Channel: 600 941
 Email: prasad@geomarineconsultants.com

ESTIMATION OF SAFE LOAD CARRYING CAPACITY OF DRIVEN CASING CAST-IN-SITU PILES																	
Type of Pile				Driven		Diameter of Pile			Length of Pile below G.L. (m)			10.0		As Per IS:2911-4P-5-2-2010			
Reference Bore Hole				BH-10					100	mm	Surcharge Pressure		0	kPa			
Layer No.	Layer Thk. (m)			Type of Strata	Avg. SPT	(c) kN/m ²		Shear Parameters		Effective Overburden Pressure (kPa)			Adhesion Factor (a)	Earth Pressure Coefficient (K)	Skin Friction (Q _s) kN		
	Top	M.L.	Bot.			of Layer	Ave. depth Layer	(C) kPa	(φ) Deg.	At top of Layer	At Bot. of Layer	At Mid. of Layer					
1.0	0.0	3.5	3.5	Cut-Off Level													
2.0	5.5	5.5	2.0	Silty Clay	18	20.0	20.0	120	-	0.0	20.0	10.0	0.3	-	q _f	113.1	
3.0	5.5	7.0	1.5	Silty Sand	41	20.0	20.0	-	38	20.0	35.0	27.5	-	2.0	q _f	101.3	
4.0	7.0	11.2	4.2	Silty Clay	24	20.5	20.3	160	-	35.9	75.1	57.1	0.3	-	q _f	315.7	
5.0	11.2	14.0	2.8	Clayey Sand	31	19.5	20.0	-	36	75.1	105.7	92.4	-	2.0	q _f	585.3	
6.0	14.0	18.0	2.0	Silty Sand	100	21.0	20.5	-	36	105.7	127.7	116.7	-	2.0	q _f	552.7	
Estimation of Positive Skin Resistance (kN) : Q _s =																1680.20	
Summation of Negative Skin Resistance (kN) : -Q _s =																0.00	
Computation of End Bearing Resistance																	
Bearing Stratum		Weathered Rock		SPT	f	C _u	N ₆₀	N ₁₀₀	Effective Overburden Pressure			11	m				
				100	40.00	-	120.94	-	Effective Overburden Pressure : 75.75 kN/m ²			End Bearing Resistance (kN) : Q _u =					
																1758.76	
Skin Resistance in Clay layers is 10% of Q _u									Ultimate Load Carrying Capacity (Q _{ult})				Q _u = Q _s + Q _u (kN)				3459.02
Skin Resistance in Sand Layer is 10% of Q _u (Terzaghi)									Safe Load Carrying Capacity (Q _{ult})				Q _u /2.5 (kN)				1383.61
End Bearing Resistance in Clay Layer is 10% of Q _u									Allowable Safe Load Carrying Capacity				Q _{ult} /2.5 (kN)				1383.61
End Bearing Resistance in Sand Layer is 10% of Q _u									Allowable Safe Pull out Capacity				Q _{ult} /2.5 (kN)				553.42
Where																	
C _u = Undrained Shear Strength of Clay					f = Cast. Earth Pressure at Rest					a = 10 kPa							
N ₆₀ = Standard Penetration Resistance					Q _u = Effective Overburden Pressure at middle of Layer					K = Adhesion Factor							
N ₁₀₀ = Bearing Capacity Factor at 100 mm					N ₆₀ = Bearing Capacity Factor, Ref. Fig. 1 of IS Code referred above					T = Thickness of Layer							
Q _u = Effective Overburden Pressure at 200 mm effective depth of overburden (K = 1.0)																	



Dr. C. VENKATARAMAN
 Sr. Engineer, Geotechnical Engineering (Soil)
 Registration No. 27011/01/02
 Address: 5th Floor, 5th Floor, 5th Floor, 5th Floor, 5th Floor
 Phone: 044-26544444, 044-26544444, 044-26544444
 Email: info@geomarine.com, info@geomarine.com



ANNEXURE-II



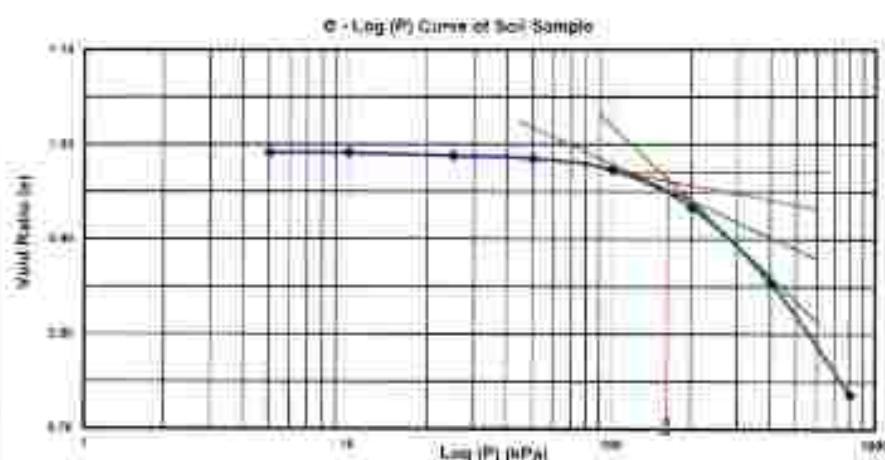
DIG. VENKATA PRASAD
Registered Geotechnical Engineer (RGTG)
Registration No. GTT/18042008
Office: Vignapada Development Scheme, CMC-2
1st Floor, 80/1 West Marimada Road, Bangalore
District-55. Bldg. No. 80/1-444/2001/01
E-mail: info@geomarine.com

CONSOLIDATION TEST GRAPH



CONSOLIDATION TEST AS PER IS 2720-Part-15 : 1980 (RA 2021)			
SUR NO	TC11410/2024/0001	SAMPLE SOURCE	CUSTOMER SUPPLIED
REPORT ISSUED TO	M/s. CASAGRANO FRESH PVT. LTD., THIRUVANMIYUR, CHENNAI	SAMPLE IDENTIFICATION NUMBER	GMTCUDG7300324000000000
DISCIPLINE/GROUP	MECHANICAL SOIL AND ROCK	TEST REPORT NUMBER	GMC 730
SAMPLE DESCRIPTION	SOIL	SAMPLE RECEIPT DATE	08/03/2024
SAMPLE CONDITION	SATISFACTORY	PERIOD OF TESTING	08/03/2024 to 14/03/2024
TEST METHOD	BUREAU OF INDIAN STANDARDS	REPORT ISSUE DATE	20/04/2024
BORE HOLE NUMBER	SH-05	NO. OF PAGES	ONE
DEPTH OF SAMPLE, m	1.05		

BEFORE TEST		AFTER TEST	
Mass of consolidation ring, mm	86	Mass of the consolidation ring + Sample, g	205.74
Mass of consolidation ring, mm	28	Mass of sample, g	177.34
Mass of consolidation ring, g	104.13	Dry Mass, g	71.82
Mass of consolidation ring + Sample, g	208.41	Specific Gravity	2.65
Mass of sample, g	99.60	Height of soil, mm	10.00
Ring (oil weight) mm	12.5	Dry Unit Weight, kN/m ³	12.6
INITIAL MOISTURE CONTENT OF SAMPLE		FINAL MOISTURE CONTENT OF SAMPLE	
Can No.	A1	Can No.	A1
Mass of can, g	7.14	Mass of soil, g	30.60
Can + Wet mass, g	17.22	Can + Wet mass, g	105.25
Can + Dry mass, g	14.86	Can + Dry mass, g	115.49
Initial Moisture Content, %	25.1	Final Moisture Content, %	34.50



Results:

Natural Moisture Content	26
Initial Void Ratio	0.95
Final Consolidation Pressure	100
Compression Index	0.30

END OF REPORT

Terms and Conditions

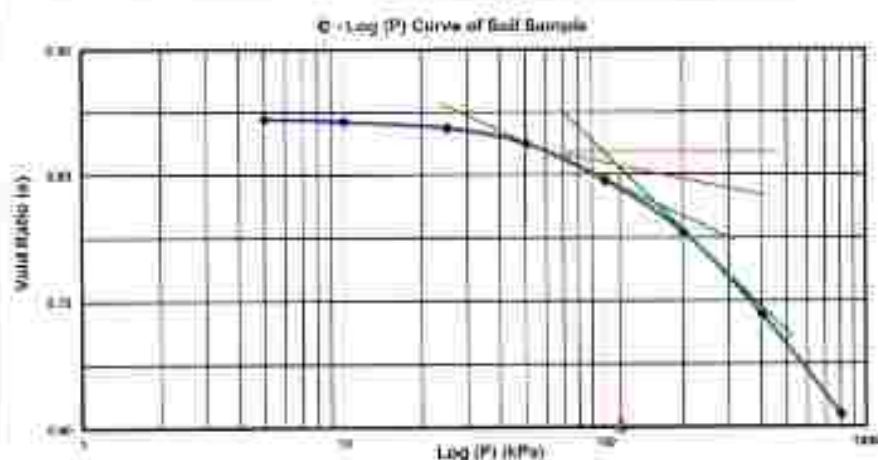
- The test results furnished correspond to the sample received.
- The stored sample will not be retained for more than 45 days from the date of issue of test report except in the case as required by the applicable regulations.
- Any correction in this report invalidates the report.



GEO MARINE CONSULTANTS PVT. LTD.
Authorized Signatory
Geotechnical Engineer (REGD)
Registration No. 0761822023
Geotechnical Engineering Authority (TCEA)
No. 1/2021, Pined Karappal Nagar, Thiruvananthapuram
(Technical Manager)
Phone No: +91 9449422186
Email: info@geomarineconsultants.com

CONSOLIDATION TEST AS PER IS 2720-Part-15 : 1965 (RA 2021)			
ULN NO.	TC114102020132F	SAMPLE SOURCE	CUSTOMER SUPPLIED
REPORT ISSUED TO	M/s. CASARAND FRESH PVT. LTD., THIRUVANMIYUR, CHENNAI	SAMPLE IDENTIFICATION NUMBER	CHTL/SDS/TH0124RPH000
DISCIPLINE/GROUP	MECHANICAL/SOL AND ROCK	TEST REPORT NUMBER	2020-730
SAMPLE DESCRIPTION	SOIL	SAMPLE RECEIPT DATE	25/05/2024
SAMPLE CONDITION	SATISFACTORY	PERIOD OF TESTING	13/05/2024 to 21/05/2024
TEST METHOD	BUREAU OF INDIAN STANDARDS	REPORT ISSUE DATE	20/04/2024
BORE HOLE NUMBER	SH-08	NO. OF PAGES	ONE
DEPTH OF SAMPLE (m)	4.00m		

BEFORE TEST		AFTER TEST	
Diameter of consolidation ring, mm	60	Area of the consolidation ring + Sample, cm^2	254.4
Height of consolidation ring, mm	25	Area of sample, cm^2	180.78
Area of consolidation ring, cm^2	150.12	Dry Mass, g	77.38
Area of consolidation ring + sample, cm^2	250.28	Wet to Dry Ratio	2.02
Mass of sample, g	102.14	Height of sample, mm	14.60
Blank test weight, mm	17.8	Dry test weight, mm	12.9
INITIAL MOISTURE CONTENT OF SAMPLE		FINAL MOISTURE CONTENT OF SAMPLE	
Can No.	204	Can No.	16
Mass of can, g	5.55	Mass of can, g	45.77
Can + Wet mass, g	40.95	Can + Wet mass, g	146.3
Can + Dry mass, g	14.8	Can + Dry mass, g	122.00
Initial Moisture Content, %	63.7	Final Moisture Content, %	50.75



Results:

Natural Moisture Content	33
Wet Unit Weight	0.844
Pre Consolidation Pressure	114
Compression Index	0.264

*** END OF REPORT ***

Errors and Comments

- (1) The test results furnished correspond to the sample tested.
- (2) The tested sample will not be retained for more than 45 days from the date of receipt of test report except in the case envisaged by the respective regulatory.
- (3) Any correction in the results invalidates the reports.



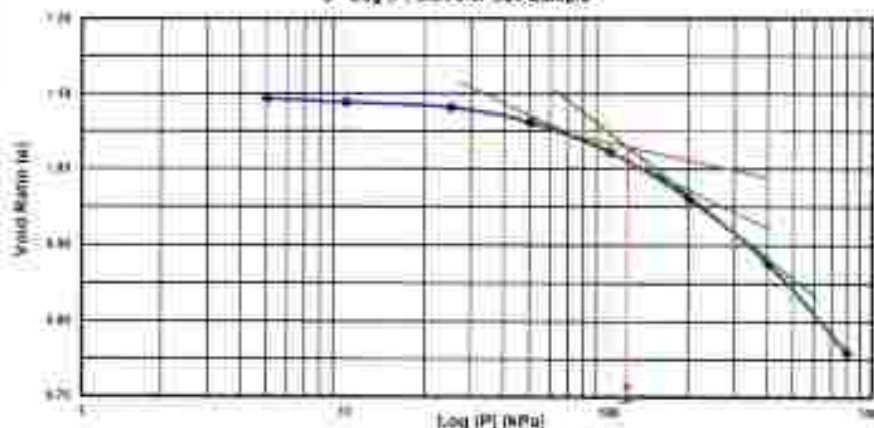
CH. S. PRASAD
Authorized Signatory
Registered Geotechnical Engineer (RGT1)
Registration No. 17031 (Chennai)
V.V. JAYATH
Chief Executive Officer
GC&C CONSULTANTS PVT. LTD.
12, Main Road, Annamalai Nagar, Chennai - 600088, Tamil Nadu, India
Phone: 044-24803315 | Email: info@gccconsultants.com

CONSOLIDATION TEST AS PER IS 2726-Part-15 : 1965 (RA 2021)

SILB NO	TO11418CD000133P	SAMPLE SOURCE	CUSTOMER SUPPLIED
REPORT ISSUED TO	M/s. CASAJHAND FRESH PVT. LTD., THIRUVANMIYUR, CHENNAI	SAMPLE IDENTIFICATION NUMBER	GMTLUGS33P0024WBH000
DISCIPLINE GROUP	MECHANICAL SOIL AND ROCK	TEST REPORT NUMBER	GMC 130
SAMPLE DESCRIPTION	SOIL	SAMPLE RECEIPT DATE	08/03/2024
SAMPLE CONDITION	SATISFACTORY	PERIOD OF TESTING	15/03/2024 to 21/03/2024
TEST METHOD	BUREAU OF INDIAN STANDARDS	REPORT ISSUE DATE	20/04/2024
BORE HOLE NUMBER	BH-08	NO. OF PAGES	ONE
DEPTH OF SAMPLE, m	2.08		

BEFORE TEST		AFTER TEST	
Diameter of consolidation ring, mm	50	Mass of the consolidation ring + Sample, g	207.58
Height of consolidation ring, mm	20	Mass of sample, g	50.99
Mass of consolidation ring, g	100.05	Dry Mass, g	48.55
Mass of consolidation ring + sample, g	254.37	Specific Gravity	2.74
Mass of sample, g	58.05	Height of Solid, mm	2.38
Bulk Unit weight, kN/m ³	17.4	Dry Unit Weight, kN/m ³	13.5
INITIAL MOISTURE CONTENT OF SAMPLE		FINAL MOISTURE CONTENT OF SAMPLE	
Can No.	A1	Can No.	41
Mass of Can, g	7.02	Mass of Can, g	45.08
Can + Wet mass, g	26.7	Can + Wet mass, g	138.8
Can + Dry mass, g	23.40	Can + Dry mass, g	113.05
Initial Moisture Content, %	64.8	Final Moisture Content, %	36.27

G - Log (P) Curve of Soil Sample



Results

Natural Dry Unit Weight	17.4
Initial Unit Weight	1.081
Pre Consolidation Pressure	114
Compression Index	0.191

END OF REPORT

Terms and Conditions

- (1) The test results furnished corresponds to the sample received
- (2) The tested sample will not be returned for more than 45 days from the date of issue of test report, except in the case as required by the test following clause 44.4 CD 1.83
- (3) Any correction in this report indicates the typographical error

Authorized Signatory

D. G. VENKATA PRASAD

Registered Geotechnical Engineer (No. 14714)

Registration No. GTEN/015/2013

City: Chennai, State: Tamil Nadu, Country: India

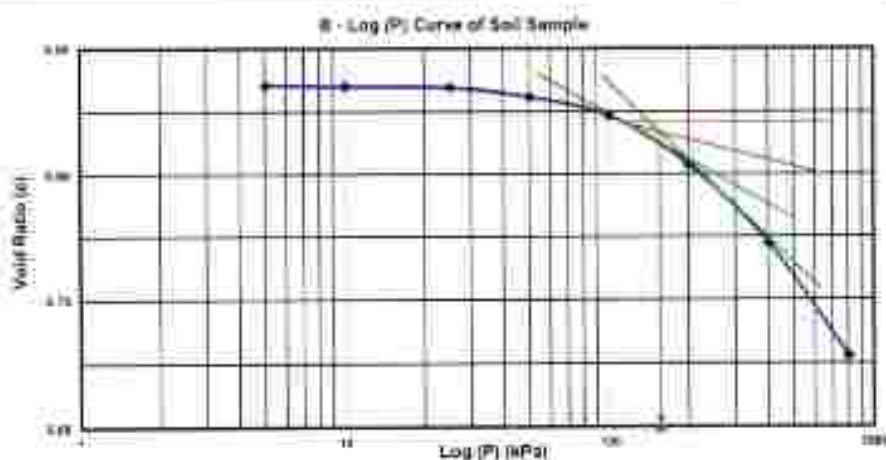
No. 11, 2nd Main Road, Kannara Nagar, Thiruvanniyur

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CONSOLIDATION TEST AS PER IS 2720-Part-15 : 1985 (RA 2021)			
SLE NO	TD1410030000130	SAMPLE SOURCE	CUSTOMER SUPPLY
REPORT ISSUED TO	M/s. CASAGRAN FRESH PVT. LTD., THIRUVANMIYUR, CHENNAI	SAMPLE IDENTIFICATION NUMBER	SM1506100024700000
DISCIPLINE/GROUP	MECHANICAL/SOL AND ROCK	TEST REPORT NUMBER	GMC 730
SAMPLE DESCRIPTION	SOIL	SAMPLE RECEIPT DATE	15/03/2024
SAMPLE CONDITION	SATISFACTORY	PERIOD OF TESTING	18/03/2024 to 27/03/2024
TEST METHOD	BUREAU OF INDIAN STANDARDS	REPORT ISSUE DATE	20/04/2024
BORE HOLE NUMBER	BH-09	NO. OF PAGES	ONE
DEPTH OF SAMPLE (m)	7.30		

BEFORE TEST		AFTER TEST	
Diameter of consolidation ring, mm	50	Diam of the consolidation ring + Sample, g	247.16
Height of consolidation ring, mm	20	Mass of sample, g	60.03
Mass of consolidation ring, g	100.28	Dry Mass, g	30.54
Mass of consolidation ring + Sample, g	298.7	Specific Gravity	2.52
Mass of sample, g	97.75	Height of Sample, mm	11.66
Bulk Unit weight, kN/m ³	17.5	Dry Unit Weight, kN/m ³	10.2
INITIAL MOISTURE CONTENT OF SAMPLE		FINAL MOISTURE CONTENT OF SAMPLE	
Can No.	W34	Can No.	035
Mass of can, g	6.77	Mass of can, g	45.46
Can + Wet mass, g	25.54	Can + Wet mass, g	150.2
Can + Dry mass, g	21.54	Can + Dry mass, g	148.1
Initial Moisture Content, %	33.2	Water Moisture Content, %	26.07



● 2010年10月10日

Apprenticeship Content	20
Initial Test Date	08/01
Fee Collection Process	10/01
Commencement Date	01/20

—END OF REPORT—

Terms and Conditions

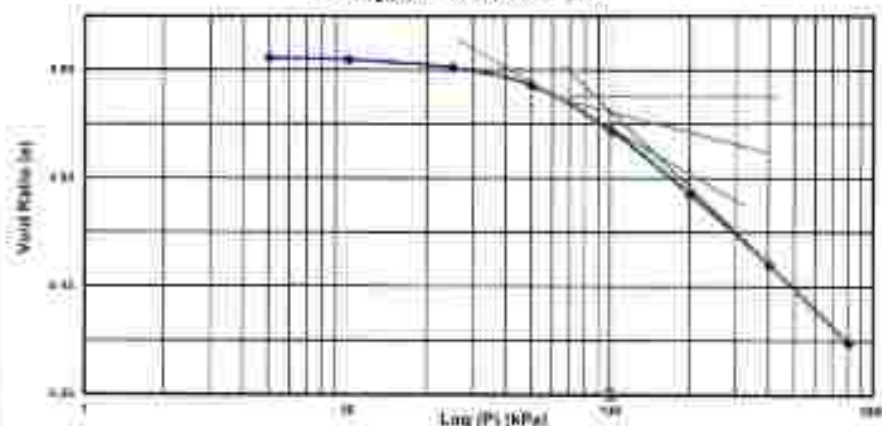
- (2) The test results furnished hereafter are the sample received

QTC MENKATA PRAS
Authorized Signatory
Regional Representative, Eastern
Region
QTC
Chennai
Technical Manager

CONSOLIDATION TEST AS PER IS 2720-Part-10 : 1965 (RA 2021)			
ULN NO	TC11410230000102F	SAMPLE SOURCE	CUSTOMER SUPPLIED
REPORT ISSUED TO	M/s. CASAGRAND FRESH PVT. LTD., THIRUVANMIYUR, CHENNAI	SAMPLE IDENTIFICATION NUMBER	GMC/LJEST/2023/000102F
DISCIPLINE/GROUP	MECHANICAL SOIL AND ROCK	TEST REPORT NUMBER	GMC 736
SAMPLE DESCRIPTION	SOIL	SAMPLE RECEIPT DATE	15/03/2024
SAMPLE CONDITION	SATISFACTORY	PERIOD OF TESTING	15/03/2024 to 27/03/2024
TEST METHOD	BUREAU OF INDIA STANDARDS	REPORT ISSUE DATE	27/03/2024
BORE HOLE NUMBER	BH-43	NO. OF PAGES	ONE
DEPTH OF SAMPLE (m)	0.00M		

BEFORE TEST		AFTER TEST	
Mass of consolidation ring, mg	81	Mass of the consolidation ring + Sample, g	271.54
Weight of consolidation ring, mm	25	Mass of sample, g	192.7
Mass of consolidation ring, g	184.54	Dry Mass, g	48.06
Mass of consolidation ring + Sample, g	265.54	Moisture Content, %	75.23
Mass of sample, g	180.72	Height of Sample, mm	12.34
Bulk Unit weight, kN/m ³	18.1	Dry Unit Weight, kN/m ³	16.8
INITIAL MOISTURE CONTENT OF SAMPLE		FINAL MOISTURE CONTENT OF SAMPLE	
Can No.	X/27	Can No.	A210
Mass of can, g	7.26	Mass of can, g	42.75
Can + Wet mass, g	21.74	Can + Wet mass, g	181.08
Can + Dry mass, g	18.28	Can + Dry mass, g	148.52
Initial Moisture Content, %	21.5	Final Moisture Content, %	19.88

• e - Log(P) Curve of Soil Sample



Results:

Natural Moisture Content	75.23
Initial Void Ratio	0.951
The Consolidation Pressure	100
Compression Index	0.207

"END OF REPORT"

Terms and Conditions

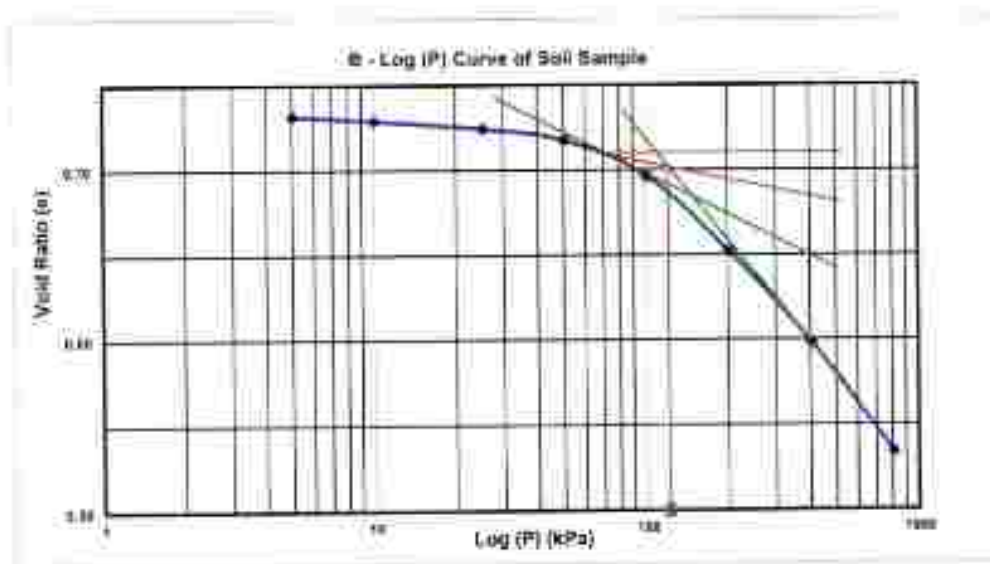
- The test results furnished corresponds to the sample received.
- The weight sample will not be returned for more than 45 days from the date of issue of test report except in the case as required by the customer's representative. (Not T/N) without.
- Any correction in this report is available on request.



Authorized Signatory

G. VENKATA PRASAD
A. S. N. O. T. H.
(Technical Manager)
Geotechnical Engineer (G.O.T.E.)
Specialized in Geotechnical Engineering (G.O.T.E.)
Contact: 011-26111111 / 011-26111112
Email: gvp@geomarineconsultants.com

CONSOLIDATION TEST AS PER IS 2726-Part-15 : 1963 (RA 2021)					
Name & Address of the Customer: M/s. CASAGRAN FRESH PVT. LTD.					
Sample Description:	Soil	Sample Identification Number:	CS4C/0803/730		
Source of Sample:	Customer-Supplied	Period of Testing:	04/09/2023		
Sample Condition:	Satisfactory	Report Date:	21/09/2023		
Test Method:	As per Bureau of Indian Standards	Test Report No.:	GT-2840		
Sample Receipt Date:	01/09/2023	Test Report Pages:	One Page		
Bore Hole Number:	BF-12	Depth of Sample m:	1.0		
Before Test			After Test		
Diameter of consolidation ring	60	mm	Mass of the consolidated ring + Sample	236.50	g
Height of consolidation ring	20	mm	Mass of sample	103.58	g
Mass of consolidation ring	136.48	g	Dry Mass	97.7	g
Mass of consolidation ring + sample	239.21	g	Specific Gravity	2.85	g
Mass of sample	102.78	g	Height of Solids	11.38	mm
Bulk Unit weight	18.03	kN/m ³	Dry Unit Weight	14.2	kN/m ³
Initial Moisture Content of sample			Final Moisture Content of sample		
Can No.	8.1		Can No.	8.1	
Mass of can	5.88	g	Mass of can	57.75	g
Can + Wet mass	25.47	g	Can + Wet mass	141.48	g
Can + Dry mass	20.83	g	Can + Dry mass	136.34	g
Initial Moisture Content	28.6	%	Final Moisture Content	25.63	%



Results

Final Moisture Content	25.63%
Initial Void Ratio	0.73
Pre Consolidation Pressure	120 kPa
Compression Index	0.778



ANNEXURE-III



DR. C. VENKATA PRASAD
Chartered Accountant (Firm No. 15011)
Registration No. 15011/000002
Chartered Accountants' Association of India
10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61, 62, 63, 64, 65, 66, 67, 68, 69, 70, 71, 72, 73, 74, 75, 76, 77, 78, 79, 80, 81, 82, 83, 84, 85, 86, 87, 88, 89, 90, 91, 92, 93, 94, 95, 96, 97, 98, 99, 100
Chennai-41 Mob. No. +91 98444 44444
Email: drcp@drvenkatas.com

GEO MARINE		SITE INVESTIGATION RECORD										BORE HOLE NO. C3	
PROJECT NAME		CASA GRANT										PAGE NO. 01	
LOCATION		WATERWAY		CR. No.		DRAINAGE No.		BUREAU		BUREAU			
VILLAGE		DISTRICT		STATE		COUNTRY		BUREAU		BUREAU			
JOB CODE		TYPING METHOD		BUREAU		COUNTRY		BUREAU		BUREAU			
Depth below S.L. (m)	Drilling progress per meter		Type of Soil	Core Depth	Core No.	SPT Results			Sample Results			Log Description	
	Time	Rate				Blows	Penetration	Moisture	Specific Gravity	Soil Type			
Time	Rate	Blows	Penetration	Moisture	Specific Gravity	Soil Type	Soil Type	Soil Type	Soil Type	Soil Type	Soil Type	Soil Type	
0.00	09	42	SC	2	4	4	8	1.5	01	SS		Filling material.	
0.00	09	45	SC	2	3	3	6	2.0	02	SS		loose, Brownish, fine sand mix with clay.	
1.00	10	20	SC	2	4	6	10	3.0	03	SS		Medium stiff, Brownish silty clay.	
1.00	10	24	SC	2	4	6	10	3.0	03	SS		Stiff, Greyish Brown, silty clay.	
1.00	10	27	SC	2	4	6	10	3.0	03	SS		Stiff, Greyish Brown, silty clay.	
1.00	10	31	SC	2	4	6	10	3.0	03	SS		Stiff, Greyish Brown, silty clay.	
1.00	10	41	SC	2	4	6	10	3.0	03	SS		Stiff, Greyish Brown, silty clay.	
1.00	10	45	SC	2	4	6	10	3.0	03	SS		Stiff, Greyish Brown, silty clay.	
1.00	11	00	SC	4	8	15	23	5.0	05	SS		Medium dense, Brownish fine sand.	
1.00	11	04	SC	4	8	15	23	5.0	05	SS		Medium dense, Brownish fine sand.	
1.00	11	15	SC	5	10	17	27	6.0	06	SS		very stiff, Blackish grey, clay mixed with sand.	
1.00	11	17	SC	5	10	17	27	6.0	06	SS		very stiff, Blackish grey, clay mixed with sand.	
1.00	11	27	SC	5	8	11	19	4.0	07	SS		very stiff, Blackish grey, clay.	
1.00	11	31	SC	5	8	11	19	4.0	07	SS		very stiff, Blackish grey, clay.	
1.00	11	52	SC	-	-	-	-	4.0	08	UDS		UNDISTURBED SAMPLE	
1.00	12	03	SC	-	-	-	-	4.0	08	UDS		UNDISTURBED SAMPLE	

CS - Core Sample	DS - Disturbed Sample	SUPERVISOR NAME	DATE
SS - Soil Sample	SC - Soil Cutter	SIGNATURE	15/03/2024
TS - Test Sample	TSB - Test Sample	DATE	
WS - Wash Sample	WSB - Wash Sample	CUSTOMER IN CHARGE	

GROWMARINE		SITE INVESTIGATION RECORD				CORE HOLE No		03	
PROJECT NAME		CASA GIRARD				PAGE No		02	
LOCATION		ADDRESS No		CD No		DRAWING No		DATE OF BORE HOLE	
PROJECT No		PROJECT ADDRESS		PROJECT No		CD No		DATE OF BORE HOLE	
DATE OF BORE HOLE		PROJECT ADDRESS		PROJECT No		CD No		DATE OF BORE HOLE	
14/03		12 22		4 11 15 26		10 50 mts		09 SS	
12 34		SC						very stiff, Blackish grey. clay.	
14/03		12 50		12 22 36 58		200 mts		10 SS	
12 54		SC						very dense, whitish Residual soil.	
14/03		14 21		1200 5200		1400 mts		11 WS	
14 28		SC						very dense, Greyish, completely weathered rock.	
14/03		14 14		Hammer rebound		600 mts		12 WS	
14 57		SC						Very dense, Brownish, completely weathered rock	
14/03		15 14		DB 0 0		700 mts		13 WS	
15 28		DB 0 0						very weak, Brownish, completely weathered rock	
14/03		15 40		DB 0 0		800 mts		14 WS	
16 02		DB 0 0						very weak, Brownish, completely weathered rock.	
14/03		16 24		DB 0 0		900 mts		15 WS	
16 52		DB 0 0						very weak, Brownish, completely weathered rock	
BORE HOLE TERMINATED AT 19:00m									
CD - Core Sample		DB - Disturbed Sample		SUPERVISOR NAME		SIGNATURE		PROJECT SITE OFFICE	
UC - Soil Sample		UC - Soil Sample		SIGNATURE		DATE		GROUND LEVEL (m)	
UCB - Undisturbed Sample		UCB - Undisturbed Sample		SIGNATURE		DATE		WATER TABLE (m)	
WS - Water Sample		DB - Diamond Bit		CLIENT IN CHARGE		DATE		CUTTING SPEED (mm)	

GEO MARINE THE OFFICE OF SUBMERGENCE		SITE INVESTIGATION RECORD										BORE HOLE NO.		04	
PROJECT NAME		CASA GRANDE										PAGE No.		01	
LOCATION		WATERWAY NO.		CR-04		STANDARD USE		BORE START DATE		01/03/2024		BORE END DATE		02/03/2024	
FACILITY		BUILDING METHOD		Access		COLLIMINATION		TOTAL BORE END DATE		02					
USE CODE		FLUORESCENCE METHOD		Access		COLLIMINATION									
Depth below RL (m)	Sampling Program			Type of Soil (SC / SS / MC)	Core Depth (m)	SPT Data				Sample Data			User Data		Geotechnical Description
	Time	No.	Rate			Blow Count			SPT 'N' Value	Depth (m)	No.	Type	Depth (m)		
						1st	2nd	3rd							
01/03	11	21	SC		1	4	5	9	0.50	01	SS		Stiff, Greyish Brown, Silty clay.		
01/03	11	22	SC		2	7	10	17	1.25	02	SS		very stiff, Brownish, Silty clay.		
01/03	11	20	SC		4	8	10	18	2.00	03	SS		very stiff, Brownish, Silty clay.		
01/03	11	47	SC		3	4	5	8	3.00	04	SS		Stiff, Brownish, Silty clay.		
01/03	12	03	SC		-	-	-	48	4.00	05	UDS		UNDISTURBED SAMPLE		
01/03	12	26	SC		14	16	17	33	5.00	06	SS		Dense, Brownish, fine sand.		
01/03	12	47	SC		16	23	24	50	6.00	07	SS		Dense, Brownish, fine sand.		
01/03	14	21	SC		9	13	16	29	7.50	08	SS		Sand to clay strata change very stiff, Blackish grey, clay.		
01/03	14	46	SC		4	8	10	18	9.00	09	SS		very stiff, Blackish grey, clay.		
01/03	15	15	SC												
01/03	15	18	SC												



CS - Core Sample	DS - Disturbed Sample	SUPERVISOR NAME	SUSI
CS - Split-Spin Sample	SC - Soil Cutter	SIGNATURE	[Signature]
UITS - Undisturbed Sample	TIR - Tension Core Bit	DATE	01/03/2024
MC - Wash Sample	DB - Diamond Bit	CLIENT IN-CHARGE	

GEO MARINE		SITE INVESTIGATION RECORD										BORE HOLE NO.		06	
PROJECT NAME		CASA GRAND										PAGE NO.		02	
LOCATION		WELLING NO.		18-06		CHARTERED BY				DATE OF BORE HOLE		02/03/2024			
STRUCTURE		DRAWING NO.		None		CO-DRAWING NO.		4		DATE OF DRAWING		02/03/2024			
USE TYPE		FLOORING METHOD		None		CO-DRAWING NO.		5		DATE OF DRAWING		02			
Depth below 1st floor (m)	Drilling Log			Type of Soil	Test Results		SPT Results			Sample Results			Remarks		
	Time	Time			No. of Blows	SPT Value	No.	Type							
		Start	End												
01/03	16	04	07	SC	18	22	27	49	10.50	10	SC	Hard, white and green mix, sandy clay with rock particles.			
01/03	16	35	41	SC	31	32	44	106	12.00	11	SC	Very dense, white and Brown mix, clay with sand mix			
01/03	17	21	24	SC	Hammer rebound			106	12	WS	13.00	Rock & khal, very weak, Brownish, completely to highly weathered rock			
01/03	09	25	48	DB	0	0	Hammer rebound			14.00	13	WS	very weak, Brownish, completely to highly weathered rock.		
01/03	10	00	23	DB	0	0				15.00	14	WS	very weak, Brownish, completely to highly weathered rock.		
01/03	10	32	11 07	DB	14	0				16.00	15		Very weak to weak, greyish brown, weathered rock.		
BORE HOLE TERMINATED AT 16.00 mts.															



TS - Core Sample	DS - Disturbed Sample	SUPERVISOR NAME	S. S. S.	PROJECT SITE DETAILS
TS - Soil Specimen Sample	SC - Soil Cutler	SIGNATURE	S. S. S.	
UCS - Undisturbed Sample	TCS - Tongue and Groove	DATE	02/03/2024	
MS - Moist Sample	ES - Elevation	CLIENT IN CHARGE		

GEO MARINE		SITE INVESTIGATION RECORD				BORE HOLE No.		05					
PROJECT NAME		CASE GRAND				PAGE No.		01					
LOCATION		Borehole No.		CR-04		DATE OF BORE HOLE		12/03/2014					
STRUCTURE		Drilling Method		Handy		DATE OF ONLY		04/03/2014					
USE CODE		Flaming Medium		Borehole		TOTAL BORE HOLE DAYS		02					
Depth (m)	Soil Sample		Type of Soil (SC)	Soil Color	Soil Moisture (%)	SPT Details				Sample Details			Layer Data
	Depth (m)	Time (min)				Blows	Blows	Blows	Blows	Blows	Blows	Blows	
01/03	14	04	SC			3	4	5	9	0.50 mts	01	SS	Stiff, Brownish, silty clay.
02/03	14	06	SC			2	6	7	13	1.25 mts	02	SS	Stiff, Greyish, silty clay.
03/03	14	36	SC			4	9	11	20	2.00 mts	03	SS	Very stiff, Greyish, silty clay.
04/03	15	09	SC			-	-	-	50	3.00 mts	04	UDS	UNDISTURBED SAMPLE
05/03	16	30	SC			2	4	6	10	4.00 mts	05	SS	Stiff, Greyish, clay.
06/03	16	12	SC			6	11	16	27	5.00 mts	06	SS	Medium dense, Brownish grey, clayey fine sand.
07/03	10	30	SC			7	10	18	28	6.00 mts	07	SS	Medium dense, Brownish grey, fine sand with clay mix.
08/03	11	05	SC			8	10	14	24	7.50 mts	08	SS	Sand → clay very stiff, Blackish grey, clay.
09/03	11	44	SC			5	10	10	20	9.00 mts	09	SS	very stiff, Blackish grey, clay mixed with sand.



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CS - Core Sample	DS - Disturbed Sample	SUPERVISOR NAME	PROJECT SITE OFFICE
LS - Soil Sample	SC - Soil Color	ENGINEER	GROUND LEVEL (m)
UDS - Undisturbed Sample	TCS - Tongue and Groove	DATE	WATER TABLE (m)
MS - Wash Sample	OS - Diamond Bit	CURTAIN CHARGE	CUTTING DEPTH (m)

GEO MARINE		SITE INVESTIGATION RECORD										BORE HOLE No.		05		
PROJECT NAME		02-04										PAGE No.		02		
LOCATION		CHANDLER LAG										DIA OF BORE HOLE		25mm		
ESTIMATE		CHANDLER LAG										BORE HOLE DATE		05/02/2024		
JOB CODE		CHANDLER LAG										BORE HOLE DATE		04/02/2024		
ESTIMATE		CHANDLER LAG										TOTAL BORE HOLE		02		
Depth (m)	Sampling program per hole			Type of Soil or Rock	Core Sample No.	Core Sample No.	SPT Results				SPT Results			Soil Type	Soil Description	
	No.	m	m				Blow Count				SPT Value	Depth	No.			Type
							4-10	10-15	15-20	20-30						
12	34	34	SC				10	10	21	31	10.50	10	SS	Hard, Blackish grey, clay.		
14	29	32	SC				7	11	15	29	12.00	11	SS	Very stiff, Blackish grey, Sandy clay.		
15	24	27	SC				13	15	10	14.00	12	SS	Very dense, Greyish, fine sand.			
16	00	04	SC							5.00	13	WS	Weak, Brownish, completely to highly weathered rock.			
16	34	51	AB	19	0					8.00	14	CS	Weak to moderately strong, greyish, partially weathered rock.			
17	12	48	DB	15	15					11.00	15	CS	Moderately strong, greyish, partially weathered rock.			
BORE HOLE TERMINATED AT 17.00mts																



ES - Core Sample	ES - Struck Sample	SUPERVISOR'S NAME	SUGIL	PROJECT SITE DETAILS	ENGINEER'S NAME
ES - Split Sample	ES - Split Sample	SIGNATURE	SUGIL	ARCHIVED LEVEL LINE	ENGINEER'S NAME
ES - Undisturbed Sample	ES - Undisturbed Sample	DATE	04/02/2024	WATER TABLE LINE	ENGINEER'S NAME
ES - Water Sample	ES - Water Sample	CUSTOMER IN CHARGE		CRACK DEPTH LINE	ENGINEER'S NAME

GOMARINE		SITE INVESTIGATION RECORD										BORE HOLE NO.		06	
PROJECT NAME		Case Grand										PAGE NO.		01	
LOCATION		Thiruvandhavur										DATE OF BORE HOLE		05/03/2024	
PRODUCTION		SRI LANKA										DATE OF SITE		06/05/2024	
JOB CODE		SRI LANKA										DATE OF SITE		02	
Depth (m)	Soil Sample			Soil Type	SPT Results			SPT Value	Soil Description			Remarks	Soil Description		
	Top	Bottom	Soil Type		Blow Count	Soil Type	Soil Description		Soil Description						
12.51	12.51	12.53	SC	5	5	5	10	0.50 mts	01	SS			loose, Brownish, clayey, Sand mixed with clay.		
14.12	14.12	14.17	SC	1	1	2	3	1.25 mts	02	SS			very loose, Brownish, Sand mixed with clay.		
14.25	14.25	14.32	SC	6	6	6	11	2.00 mts	03	SS			Medium Dense, Brownish, Grey, Sand mixed with clay.		
14.47	14.47	14.50	SC	2	5	8	13	3.00 mts	04	SS			Stiff, Greyish, silty clay.		
15.07	15.07	15.12	SC	-	-	-	39	4.00 mts	05	USS			UNDISTURBED SAMPLE		
15.22	15.22	15.26	SC	5	10	21	31	5.00 mts	06	SS			clay → sand Dense, Brownish, Fine sand.		
15.56	15.56	15.61	SC	10	11	15	26	6.00 mts	07	SS			Medium dense, Brownish, Fine sand.		
16.35	16.35	16.46	SC	7	9	11	20	7.00 mts	08	SS			Sand → clay Very stiff, Blackish grey, clay.		
17.04	17.04	17.12	SC	3	7	9	16	9.00 mts	09	SS			Very stiff, Blackish grey, clay.		

CS - Core Sample	US - Undisturbed Sample	SURVEYOR NAME	SUSIL
SS - Split Sample	SC - Soil Core	SIGNATURE	[Signature]
USS - Undisturbed Sample	TCB - Tensar Carbon Bit	DATE	05/08/2024
NS - Wash Sample	DB - Diamond Bit	CHECK IN CHARGE	[Signature]

GEO MARINE		SITE INVESTIGATION RECORD										BORE HOLE NO.		06	
PROJECT NAME												PAGE NO.		02	
LOCATION												DIA OF BORE HOLE		130mm	
STRUCTURE												BORE START DATE		05/03/2014	
BORE CODE												BORE END DATE		06/03/2014	
												TOTAL DRILLING DAYS		01	
Depth (m)	Coring program and notes			Type of Soil (Ref. Table 1)	Soil Description	SPT Values				SPT Blow			Soil Type	Geotechnical Description	
	Date	Time				No. of Blows	Blow No.	Blow No.	Blow No.	SPT Blows	Soil	No.			Type
		h	m												
06/03	09	42	49	SC		9	14	19	33	10.50	10	SS	Hard, Grayish, silty clay mixed with sand. clay → sand		
06/03	10	14	26	SC		9	11	14	25	12.00	11	SS	Medium dense, Brownish, silty fine sand.		
06/03	10	56	09	SC	from 0.6m					14.00	12	SS	Very dense, Brownish, silty fine sand.		
06/03	11	32	00	DB	2	0				15.00	13	CS	Very weak, Brownish, Highly weathered rock.		
06/03	12	22	14	DB	3	0				16.00	14	CS	Very weak, whitish, Highly weathered rock.		
06/03	14	06	44	DB	0	0				17.00	15	WS	Very weak, Brownish, completely weathered rock.		
06/03	15	12	35	DB	0	0				18.00	16	WS	Very weak, Brownish, completely weathered rock.		
BORE HOLE TERMINATED AT 18.00 mts															

CS - Core Sample	DB - Disturbed Sample	SUPERVISOR NAME	Amal	PROJECT SITE DETAILS
SI - Split Spoon Sample	SC - Soil Cutter	SIGNATURE	Amal	ADDRESS/PHONE
UCS - Unconfined Compressive Strength	TCB - Tongue and Groove Bit	DATE	06/03/2014	WATER MARKING
WS - Wash Sample	DB - Disturbed Bit	CLIENT SIGNATURE		ENGINEERING

GEO MARINE		SITE INVESTIGATION RECORD				BORE HOLE NO.		07				
PROJECT NAME		LOCATION				PAGE NO.		01				
STRUCTURE		MACHINE NO.				DATE OF BORE HOLE		05/03/2024				
BORE HOLE		BORING METHOD				BORING DATE		05/03/2024				
FLUIDING MEDIUM		BORING DEPTH				TOTAL BORING DAYS		02				
Depth (m)	Core Sample		Type of Soil (SI)	Core Length (m)	SPT Details				Sample Details			Geotechnical Description
	SI	SI			SI	SI	SI	SI	SI	SI		
0.00	14	55	SC	1	2	4	6	20-50	01	SS	Medium stiff, Brownish grey, Silty clay.	
0.00	14	58	SC	2	4	7	11	10-25	02	SS	Medium stiff, Brownish grey, Silty clay.	
0.00	15	04	SC	3	5	7	12	200	03	SS	Stiff, Greyish, Silty clay.	
0.00	15	18	SC	1	4	6	10	300	04	SS	Stiff, Greyish to Brown, Silty clay.	
0.00	15	27	SC	1	5	6	11	400	05	SS	Stiff, Greyish, clay.	
0.00	15	38	SC	-	-	-	44	500	06	DO	UNDISTURBED SAMPLE	
0.00	15	44	SC	5	17	29	46	600	07	SS	Dense, Greyish, fine sand.	
0.00	15	52	SC	7	14	24	38	750	08	SS	Sand → clay	
0.00	16	02	SC	5	9	13	22	900	09	SS	Hard, Greyish black, clay.	
0.00	16	11	SC								Very stiff, Greyish black, clay.	
0.00	16	24	SC									
0.00	16	34	SC									
0.00	16	42	SC									
0.00	16	51	SC									
0.00	17	03	SC									
0.00	09	24	SC									
0.00	09	38	SC									

(C) - Core Sample	(SC) - Disturbed Sample	SUPERVISOR NAME	Supil
(SS) - Soil Sample	(SE) - Soil Cutter	DATE	05/03/2024
(UD) - Undisturbed Sample	(TC) - Tongsten Certificate	CLIENT IN CHARGE	
(WS) - Wash Sample	(DS) - Disturbed Sample		

[illegible]

GEO MARINE		SITE INVESTIGATION RECORD										BORE HOLE No.		05	
PROJECT NAME		Case Ground										Bore Hole No.		01	
LOCATION		INSTRUMENT NO.		CORRECTION		DATE		TIME		DATE		TIME			
COLLECTOR		DRILLING METHOD		NO. OF SAMPLES		DATE		TIME		DATE		TIME			
JOB CODE		DRILLING METHOD		NO. OF SAMPLES		DATE		TIME		DATE		TIME			
Depth (m)	Soil Sample			Soil Type	SPT Results			Sample Data			Depth (m)	Geotechnical Description			
	Core	Soil	Water		Blow	Penetration	Soil	Moisture	Soil	Moisture					
07/09	09	32	SC	2	7	4	11	0.50	01	SS		Medium dense, Brownish, coarse sand mix with clay			
07/09	09	36	SC	1	1	1	2	1.25	02	SS		Very soft, Greyish and Brown, clay mix with sand			
07/09	09	52	SC	-	-	-	35	2.00	03	UTS		UNDISTURBED SAMPLE			
07/10	10	10	SC	2	5	7	12	3.00	04	SS		Stiff, Greyish, Silty clay.			
07/10	10	14	SC	2	3	5	8	4.00	05	SS		Stiff, Greyish, Silty clay.			
07/10	10	49	SC	4	7	11	18	5.00	06	SS		Very stiff, Greyish Silty clay.			
07/11	11	13	SC	7	9	7	16	6.00	07	SS		Very stiff, Greyish, Silty clay.			
07/11	11	32	SC	5	9	13	22	7.50	08	SS		Very stiff, Greyish, clay.			
07/12	12	24	SC	5	7	11	18	9.00	09	SS		Very stiff, Greyish, clay.			



Core Sample	Disturbed Sample	SUPERVISOR NAME	DATE
Soil Sample	Soil Sample	SIGNATURE	DATE
Undisturbed Sample	Undisturbed Sample	CLIENT IN-CHARGE	DATE
Water Sample	Water Sample		

[illegible]

GEO MARINE		SITE INVESTIGATION RECORD						BORE-HOLE No.		09				
PROJECT NAME		Core Ground						PAGE No.		01				
LOCATION		WACHINE No.		CR-04		CHARGE No.		DATE OF BORE HOLE		12/03/2024				
STRUCTURE		DRILLING METHOD		Rotary		Drill Operator		BORE DATE		12/03/2024				
JOB CODE		FLUIDING METHOD		Mudstone		Drill Operator		TOTAL BORE HOLE		02				
Depth (m)	Drilling Progress			Soil Type	Core Sample		SPT Results				Soil Description			Remarks
	Time	In	Out		Total Core Recovery %	No. of	Blow Count			SPT Value	Depth (m)	Soil Type	Soil Description	
							1	2	3					
11/03	15	04	15	06	SC		1	2	8	10	0.50 mts	01	SS	Stiff, greyish brown, clay.
12/03	15	12	15	22	SC		3	3	5	8	1.25 mts	02	SS	Stiff, Brownish, clay mixed with sand.
13/03	15	36	15	44	SC		8	7	10	17	2.00 mts	03	SS	Very stiff, Brownish, clay.
14/03	15	52	15	59	SC		2	5	6	11	3.00 mts	04	SS	Stiff, Brownish, clay.
15/03	16	04	16	15	SC		4	9	12	21	4.00 mts	05	SS	Medium dense, Brownish, fine sand.
16/03	16	24	16	33	SC		15	18	21	39	5.00 mts	06	SS	Dense, Brownish, fine sand.
17/03	16	46	16	53	SC		5	8	14	23	6.00 mts	07	SS	Medium dense, Brownish grey, sand mixed with clay.
18/03	09	49	09	58	SC		-	12cm	60	7.50 mts	08	UDS	UNDISTURBED SAMPLE	
19/03	10	23	10	41	SC		11	21	34	55	9.00 mts	09	SS	Very dense, greyish, coarse sand mixed with clay.

CS - Core Sample	DS - Disturbed Sample	SLIPSTICK NAME	SLIPSTICK No.
SS - Split Spoon Sample	SC - Soil Cutter	SIGNATURE	12/03/2024
UDS - Undisturbed Sample	TCB - Triaxial Cell Sample	DATE	
WS - Wash Sample	DB - Disturbed Soil	CLIENT IN CHARGE	



GEO MARINE THE QUALITY OF INVESTIGATION															BORE HOLE No.		09	
SITE INVESTIGATION RECORD															PAGE No.		02	
PROJECT NAME															120mm		✓	
LOCATION															120mm			
COLLECTION															BURN POINT DATE		12/01/2024	
COLLECTOR															BURN DATE		13/02/2024	
COLLECTOR															TOTAL BURNING DATE		02	
From 1000 to 1000	Boring depth (m)		Type of soil (1-10)	Soil color	Soil texture	Soil moisture	SPT (blows)				Soil strength			Soil description				
	Top	Bottom					1	2	3	4	5	6	7					
12/01	10	58	SC				7	11	19	30	10	10	SC	Hard, Greyish clay.				
13/01	11	47	SC										SS	Clay → sand				
13/01	11	59	SC										SS	Very dense, whitish, coarse sand with clay.				
13/01	12	16	SC										WS	Very weak, Brownish, completely weathered rock.				
13/01	12	35	SC										WS	Very weak, Greyish, completely weathered rock.				
13/01	14	23	DB	0	0								WS	Very weak, Greyish, completely weathered rock.				
13/01	14	46	DB	0	0								WS	Very weak, Greyish, completely weathered rock.				
13/01	14	58	DB	0	0								WS	Very weak, Greyish, completely weathered rock.				
13/01	15	24	DB	21	0								SS	Weak, Greyish white, weathered rock.				
13/01	15	45	DB	21	0								SS	Weak, Greyish white, weathered rock.				
13/01	16	30	DB	32	20								CS	Weak to moderately strong, Greyish white, weathered rock.				
13/01	17	22	DB	32	20								CS	Weak to moderately strong, Greyish white, weathered rock.				
BORE HOLE TERMINATED AT 18.00 m/s																		

13 - Core Sample

14 - Split Sample

15 - Undisturbed Sample

16 - Rock Sample

17 - Disturbed Sample

18 - Soil Cutter

19 - Fracture Core (10)

20 - Diamond Bit

SUPERVISOR NAME

SIGNATURE

DATE

CLIENT IN CHARGE

PROJECT SITE DETAILS

GROUND LEVEL DATE

WATER TABLE DATE

CAUSING DEPTH

13/02/2024

13/02/2024

13/02/2024

13/02/2024

[illegible]

GEO MARINE		SITE INVESTIGATION RECORD										BORE HOLE NO. 10	
PROJECT NAME		LOCATION										PAGE NO. 02	
PROJECT NAME		BUREAU NO. 10-04										DATE OF BORE HOLE	
LOCATION		DRILLING METHOD										DATE START DATE	
STRUCTURE		CORRECTION										DATE END DATE	
ICE CODE		SAMPLING METHOD										TOTAL DRILLING DATE	
Depth (m)	Time		Type of Soil	Type of Sample	SPT Results				Penetration (mm)	No.	Test	Remarks	
	Start	End			Blow	Blow	Blow	Blow					Blow
10.00	15:06	15:23	SC		6	11	14	25	10.50	10	SS	Very stiff, Blackish grey, clay.	
11.00	16:51	16:12	SC		9	13	18	31	200	11	SS	clay to sand Dense, Brownish, fine silty sand	
12.00	16:38	16:49	SC		23	31	60	None	1400	12	SS	Very dense, Brownish, fine sand.	
13.00	09:22	09:39	SC		Hammer Rebound				1600	13	WS	Very weak, Brownish grey completely weathered rock.	
14.00	10:02	10:24	DB	0 0					1700	14	WS	very weak, Brownish grey completely weathered rock	
15.00	10:33	11:26	DB	0 0					1800	15	WS	Very weak, Brownish grey completely weathered rock.	
16.00	11:44	12:39	DB	3 0					1900	16	CS	Weak, Greyish, weathered rock.	
BORE HOLE TERMINATED AT 1900 mts.													

CS - Core Sample	DB - Disturbed Sample	SUPERVISOR NAME	PROJECT INTENT
SS - Soil Sample	SC - Soil Cuttings	SIGNATURE	GROUND LEVEL (m)
UCS - Undisturbed Sample	TS - Test Results	DATE	WATER TABLE (m)
WS - Water Sample	TS - Test Results	CUSTOMER IN CHARGE	CASING DEPTH (m)

110/002
110/015

GEO MARINE		SITE INVESTIGATION RECORD										BORE HOLE NO.		11	
PROJECT NAME		CASA GRAND										PAGE NO.		01	
LOCATION		ADDRESS		DISTRICT		CITY		STATE		COUNTRY		DATE		14/03/2014	
PROJECT NO.		SHEET NO.		SHEET NO.		SHEET NO.		SHEET NO.		SHEET NO.		DATE		15/03/2014	
JOB CODE		FLIGHT NO.		FLIGHT NO.		FLIGHT NO.		FLIGHT NO.		FLIGHT NO.		TOTAL SHEET NO.		02	
Depth (m)	Soil Type	Soil Color		Soil Texture		Soil Structure		Soil Density		Soil Moisture		Soil Temperature		Soil Description	
		Moist	Dry	Clay	Sand	Gravel	Silt	Clay	Moist	Dry	Moist	Dry	Moist	Dry	Soil Description
11.23	SC	11	23	1	3	4	7	0.50	01	SS				Medium stiff, Brownish, silty clay	
11.24	SC	11	24	3	4	6	10	1.35	02	SS				loose, Brownish, fine sand mixed with clay	
11.35	SC	11	35	3	6	7	13	2.90	03	SS				Stiff, Brownish, silty clay	
11.47	SC	11	47	2	3	5	8	2.50	04	SS				Stiff, Brownish, silty clay	
11.58	SC	11	58	4	8	19	27	4.00	05	SS				Medium dense, Brownish, fine sand mixed with clay	
12.01	SC	12	01	11	16	21	37	5.90	06	SS				Dense, Brownish, fine sand	
12.12	SC	12	12	22	12	16	28	6.00	07	SS				Very stiff, Blackish grey-brown, clay mixed with sand	
12.16	SC	12	16	-	-	-	-	10.00	08	UDS				UNDISTURBED SAMPLE	
12.30	SC	12	30	8	10	15	25	9.00	09	SS				Very stiff, Blackish grey, clay	
12.34	SC	12	34												
12.40	SC	12	40												
12.52	SC	12	52												
14.18	SC	14	18												
14.31	SC	14	31												
14.52	SC	14	52												
15.02	SC	15	02												

CS - Core Sample	DS - Disturbed Sample	SUPERVISOR NAME	PROJECT SITE DETAIL
ES - Earth Sample	SC - Soil Core	SIGNATURE	GROUND LEVEL (m)
UDS - Undisturbed Sample	TCS - Tension Control Sample	DATE	WATER TABLE (m)
MS - Moist Sample	DS - Disturbed Sample	CLIENT IN CHARGE	EXCAVATION DEPTH (m)

GOMARINE GEOTECHNICAL ENGINEERING										SITE INVESTIGATION RECORD								BORE HOLE NO.		11											
																		PAGE NO.		03											
PROJECT NAME										CASA GRAND										DIA OF BORE HOLE		EDM / ODM	/								
LOCATION										WATERING IN				CR-04				DRAINAGE IN				Bore Start Date		16/03/2014							
STRUCTURE										DRILLING METHOD				Sentry				CO-ORDINATE				N									
JOB CODE										FLUSHING MEDIUM				Benzoite				TOTAL DRILLING DATE				QZ									
Soil Sample & Log										Core Details				SPT Details				Sampler Details				Log Data									
Drilling Method per metre										Type				Rock Type				SPT Value				Depth				Geotechnical Description					
Date										No.				Mo.				Year				Length (m)									
14/03										15 31				SC				7 11 16 27				10.50 mts				10 SS				very stiff, Blackish grey, clay.	
15/03										15 43																				clay → sand	
14/03										16 16				SC				11 16 19 35				12.00 mts				11 SS				dense, Brownish, fine sand.	
15/03										16 27																					
15/03										10 02				SC				24 35				14.00 mts				12 SS				very dense, Greenish white, Residual soil	
15/03										10 22																					
15/03										10 44				SC				Finer Sols				16.00 mts				13 SS				very dense, white, Residual soil.	
15/03										11 02																					
15/03										11 20				DR 0 0				Hammer rebound				17.00 mts				14 WS				very weak, Brownish, Completely weathered rock.	
15/03										11 36																					
15/03										12 03				DB 32 0								18.00 mts				15 CS				Weak, whitish grey, weathered rock.	
15/03										12 41																					
BORE HOLE TERMINATED AT 18.00m																															



CS - Core Sample	DS - Disturbed Sample	SUPERVISOR NAME	SUPV
CS - Split Specimen Sample	IC - Soil Cutter	SIGNATURE	Rubel
UDS - Undisturbed Sample	TGB - Tongue and Groove Bit	DATE	15/03/2014
WS - Wash Sample	DB - Discused To	CORRECT-IN-CHARGE	

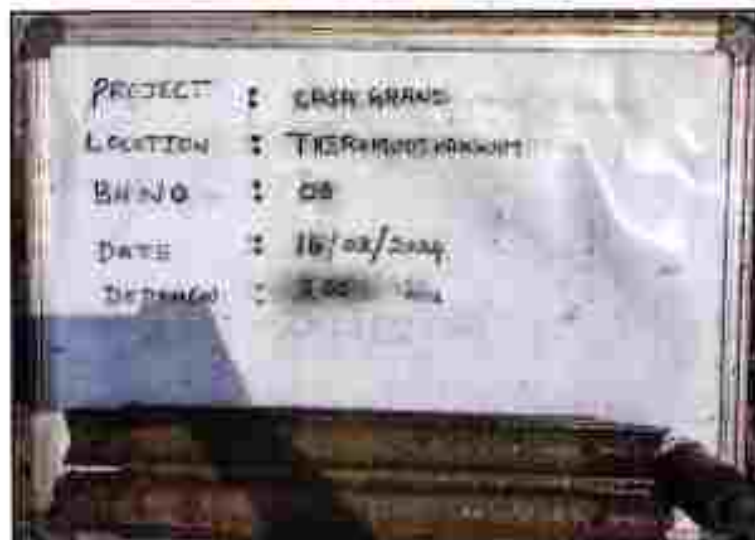
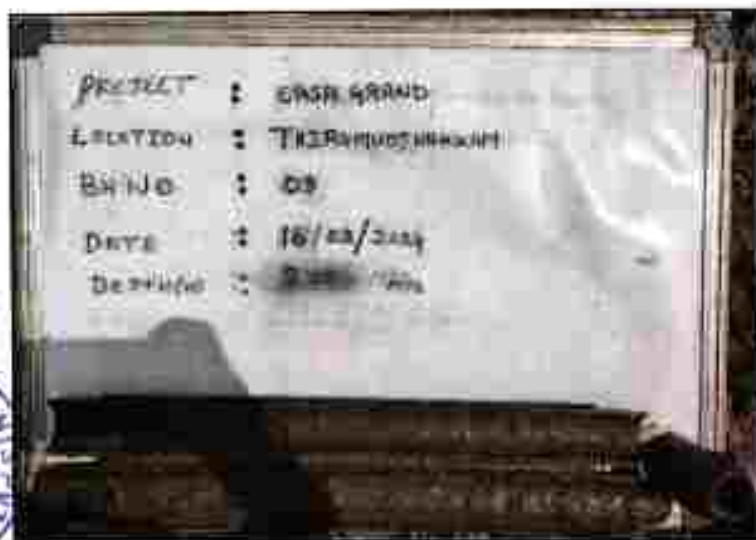
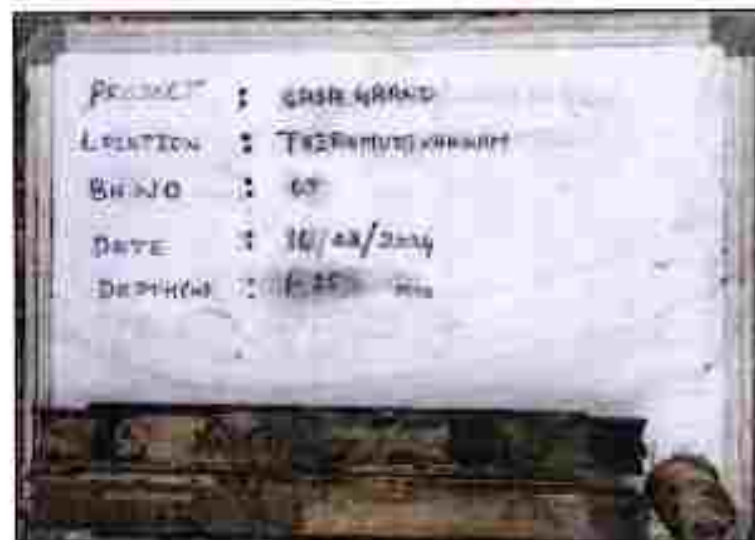
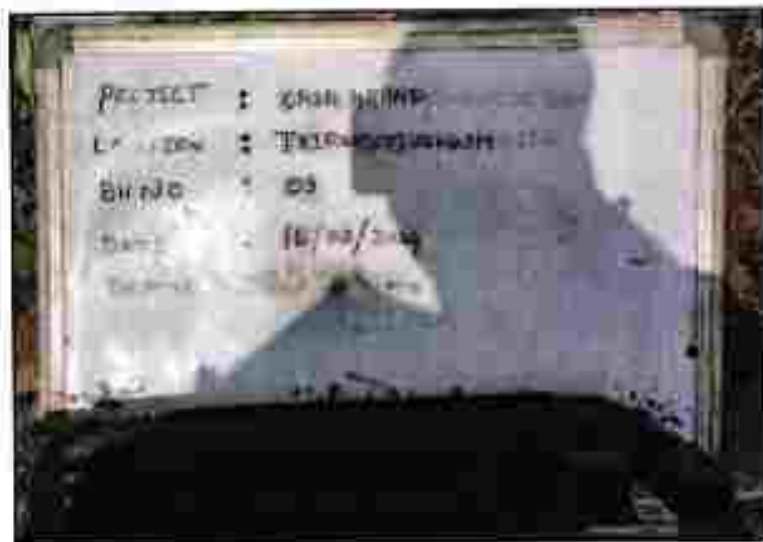
PROJECT IDENTIFICATION NO.	
GROUND LEVEL (m)	
WATER TABLE (m)	
CASING DEPTH (m)	

GEO MARINE		SITE INVESTIGATION RECORD										BORE HOLE No. 12	
PROJECT NAME		CASA GRAND THIRUMUDIVAKKAM										PAGE No. 01	
LOCATION		ADDRESS No. 22-A		WARD No. 10		TOWN No. 1		DISTRICT No. 1		STATE No. 1			
STRUCTURE		BUILDING METHOD		FOUNDATION		COLLECTOR'S No. 1		DATE OF INVESTIGATION		DATE OF REPORT			
BORE LOG		Borehole No. 12		Borehole Depth		Borehole Diameter		Borehole Type		Borehole Status			
Depth (m)	Time	Soil Type	Soil Color	Soil Texture	Soil Hardness	Soil Moisture	Soil Temperature	Soil pH	Soil SPT	Soil No.	Soil Type	Soil Description	
													Soil SPT
10.20	10.21	SC							5	5	7	12.050 1 SS	Brownish SHH Silty clay
10.24	10.30	SC							5	5	9	13.225 2 SS	Greenish Brown stiff silty clay
10.34	10.37	SC							30cm / 50cm	2.00	3	UDS	Brownish Grey silty clay
10.52	10.52	SC							4	7	8	15.300 4 SS	Brownish Grey stiff silty clay
11.02	11.06	SC							5	6	9	15.400 5 SS	Greenish Brown SHH Silty clay
11.16	11.20	SC							5	9	22	31.500 6 SS	Brownish Dense Sandy Silt
11.34	11.34	SC							13	13	4	27.600 7 SS	Brownish Grey medium Dense Silty fine sand
11.49	11.51	SC							8	12	18	30.750 8 SS	Greenish very SHH Silty clay
12.14	12.08	SC							20	13	15	28.800 9 SS	Brownish Grey very SHH Silty clay with sand patches
12.32	12.32	SC							11	52	10	10.50 10 SS	Greenish Brown very Dense silty clay

CI - Core Sample	DI - Disturbed Sample	EX - Excavation	PROJECT SITE DETAILS	
SI - Split Spoon Sample	SC - Soil Cutter	SIGNATURE	GROUND LEVEL (m)	
UDS - Undisturbed Sample	TD - Triaxial Compression Test	DATE	WATER TABLE (m)	
WS - Wash Sample	DS - Diamond Bit	CLIENT IN CHARGE	CASING DEPTH (m)	

GEO MARINE
 Registered Office
 10/11, 2nd Floor, Vellore
 Chennai-600 017
 Tel: 044-26111111
 Email: info@geomarine.co.in

GEO MARINE THE SPIRIT OF INVESTIGATION		SITE INVESTIGATION RECORD										BORE HOLE No. 12	
PROJECT NAME												PAGE No. 03	
LOCATION		WELLING NO. 12-04		WELLING DATE		WELLING DATE		WELLING DATE		WELLING DATE		WELLING DATE	
WELLING NO.		WELLING METHOD		WELLING DATE		WELLING DATE		WELLING DATE		WELLING DATE		WELLING DATE	
WELLING NO.		WELLING METHOD		WELLING DATE		WELLING DATE		WELLING DATE		WELLING DATE		WELLING DATE	
WELLING NO.		WELLING METHOD		WELLING DATE		WELLING DATE		WELLING DATE		WELLING DATE		WELLING DATE	
Depth from surface (m)	Time		Type of soil / rock	Color	Texture	SPT	SPT	SPT	SPT	SPT	SPT	SPT	SPT
	hr	min											
1	12:58	1:00	SL			30	100	12:00	11	SS			Yellowish Grey very fine Residual Soil
2	2:28	2:38	SL			14	100	12:00	12	NS			Greyish Brown very weak Completely Weathered Rock
3	3:01	3:25	DB	11/01		15	100	13:00	13	CS			Greyish Brown weak Highly Weathered Rock
4	3:42	4:01	DB	7/01		15	100	14:00	14	CS			Greyish Brown very weak Completely Weathered Rock
5	4:38	5:15	DB	15/01		18	100	15:00	15	CS			Brownish Grey weak Highly Weathered Rock
6	10:18	11:39	DB	12/01		24	100	16:00	16	CS			Brownish Grey weak Highly Weathered Rock
Data hole terminated at 19:00m Depth below in GL													
CS - Core Sample	SL - Split Spoon Sample	DB - Disturbed Sample	DB - Disturbed Sample	SUPERVISOR NAME	12-04-04				12-04-04				
SL - Split Spoon Sample	DB - Disturbed Sample	DB - Disturbed Sample	DB - Disturbed Sample	SIGNATURE	12-04-04				12-04-04				
DB - Disturbed Sample	DB - Disturbed Sample	DB - Disturbed Sample	DB - Disturbed Sample	DATE	08/09/2023				08/09/2023				
DB - Disturbed Sample	DB - Disturbed Sample	DB - Disturbed Sample	DB - Disturbed Sample	CLIENT IN CHARGE									





PROJECT : KADDA GRAND
LOCATION : TIRUPATTUR MANDAL
BH NO : 03
DATE : 16/03/2024
DESIGN : 13000 mm

PROJECT : KADDA GRAND
LOCATION : TIRUPATTUR MANDAL
BH NO : 03
DATE : 01/03/2024
DESIGN : 0500 mm

PROJECT : KADDA GRAND
LOCATION : TIRUPATTUR MANDAL
BH NO : 03
DATE : 16/03/2024
DESIGN : 13000 mm

PROJECT : KADDA GRAND
LOCATION : TIRUPATTUR MANDAL
BH NO : 03
DATE : 01/03/2024
DESIGN : 0500 mm

Dr. C. VENKATA PRASAD
Regional Technical Director
Hyderabad, 500 041
E-mail: dr.c.v.prasad@geomarine.com
10, 12, 2nd Floor, Trade Centre, 1st Stage, 1st Cross,
Chaitanya, 500 041, Hyderabad, India
Tel: 080-26000000, Fax: 080-26000001





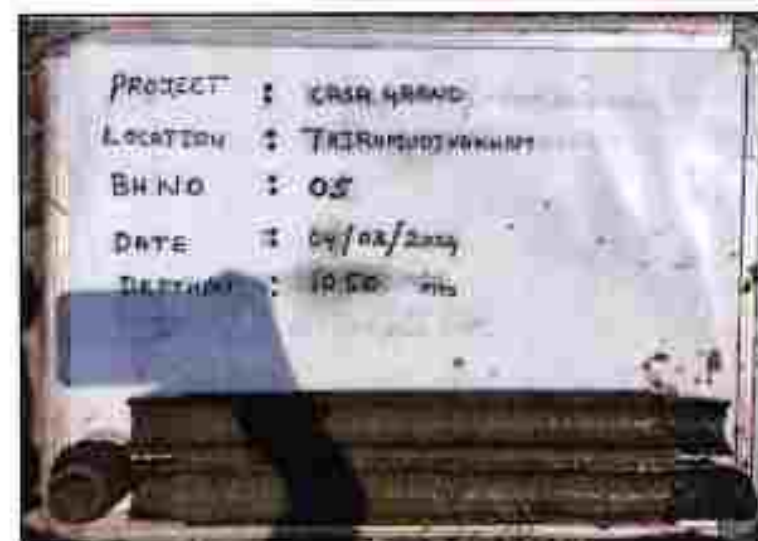


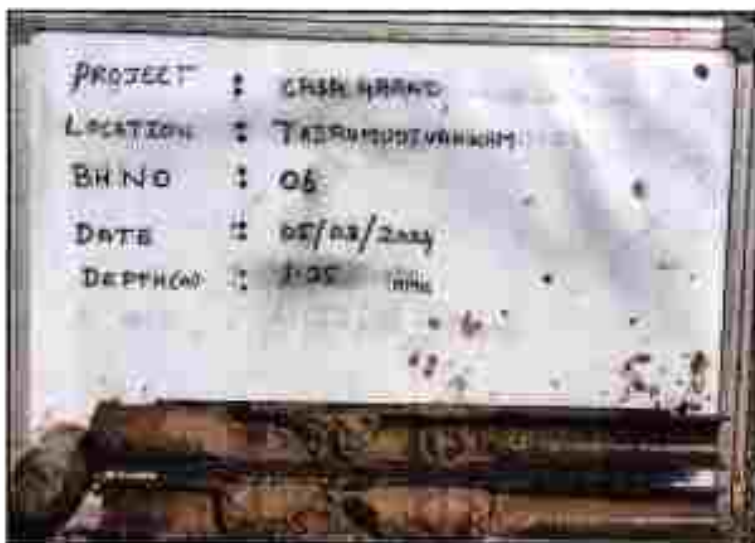
PROJECT : CASH GRAND
LOCATION : TERNBURY MOUNTAIN
BH NO : 05
DATE : 02/02/2024
DEPTH : 1200 m

PROJECT : CASH GRAND
LOCATION : TERNBURY MOUNTAIN
BH NO : 05
DATE : 02/02/2024
DEPTH : 1200 m

PROJECT : CASH GRAND
LOCATION : TERNBURY MOUNTAIN
BH NO : 05
DATE : 02/02/2024
DEPTH : 1200 m

PROJECT : CASH GRAND
LOCATION : TERNBURY MOUNTAIN
BH NO : 05
DATE : 02/02/2024
DEPTH : 1200 m





PROJECT :	CMSR BRAND
LOCATION :	THIRUPURAI MURUKK
BH NO :	06
DATE :	05/03/2024
DEPTH :	2.00 m

PROJECT :	CMSR BRAND
LOCATION :	THIRUPURAI MURUKK
BH NO :	06
DATE :	05/03/2024
DEPTH :	5.00 m

PROJECT :	CMSR BRAND
LOCATION :	THIRUPURAI MURUKK
BH NO :	06
DATE :	05/03/2024
DEPTH :	2.00 m

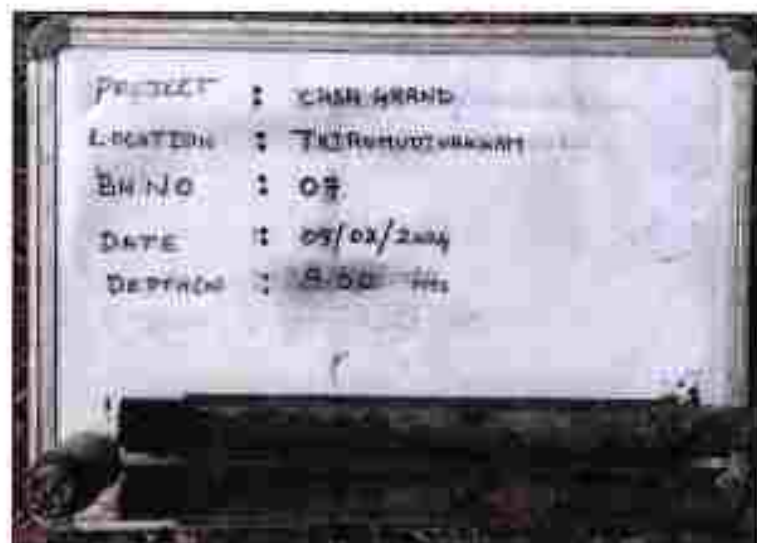
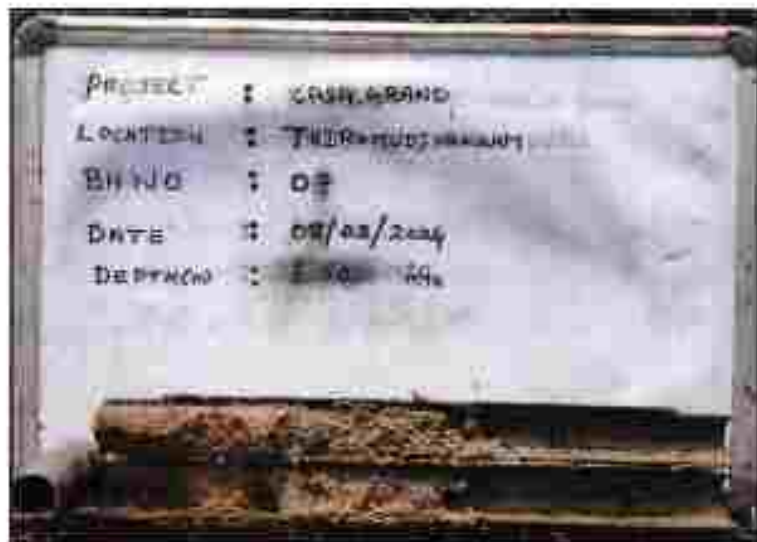
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LOCATION :	THIRUPURAI MURUKK
BH NO :	06
DATE :	05/03/2024
DEPTH :	6.00 m

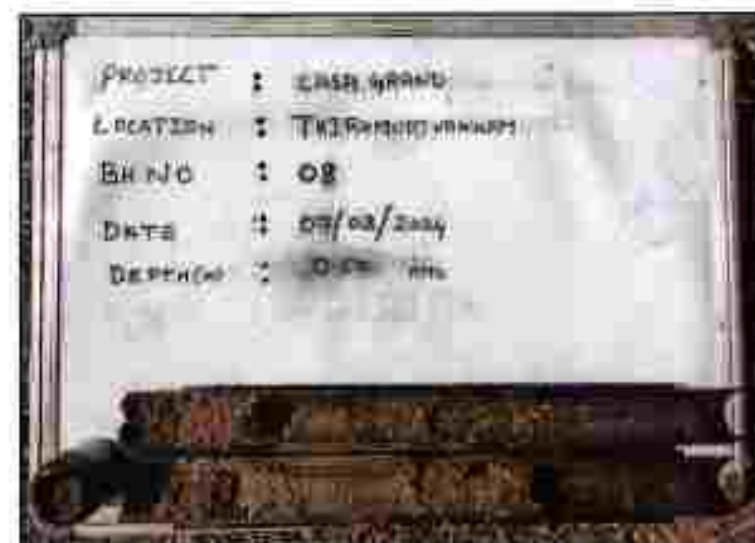
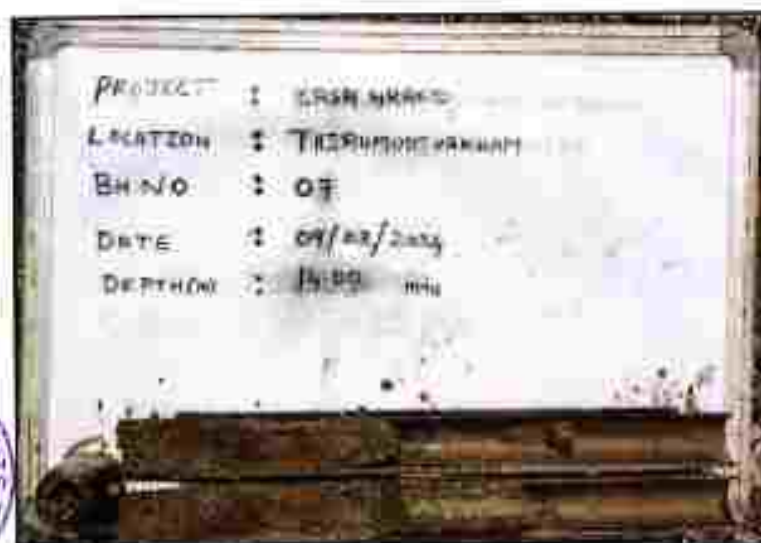
Dr. C. VENKATA PRASAD
 Registered Geotechnical Engineer (GATE)
 Registration No. 078/1102500
 Central Geotechnical Development Authority (CGDA)
 11/2nd Main Road, Kalyan Nagar, Thiruvananthapuram
 Contact: At: 0471-2544442/2544443
 Email: gca@cgda.gov.in

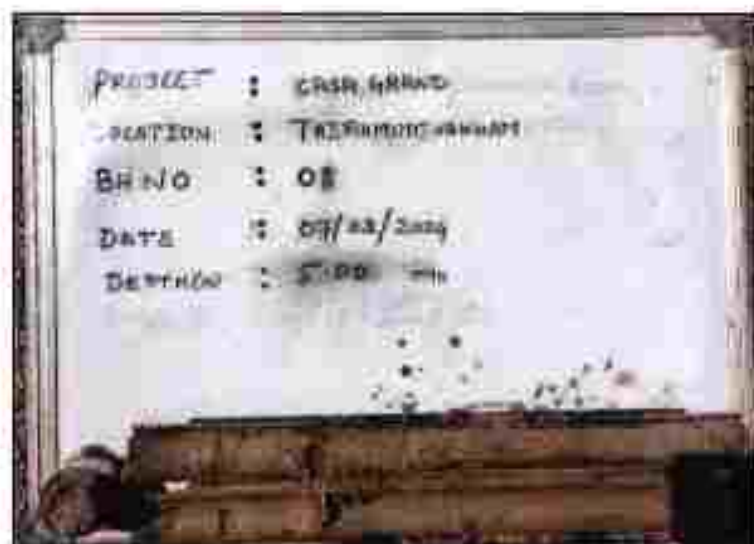
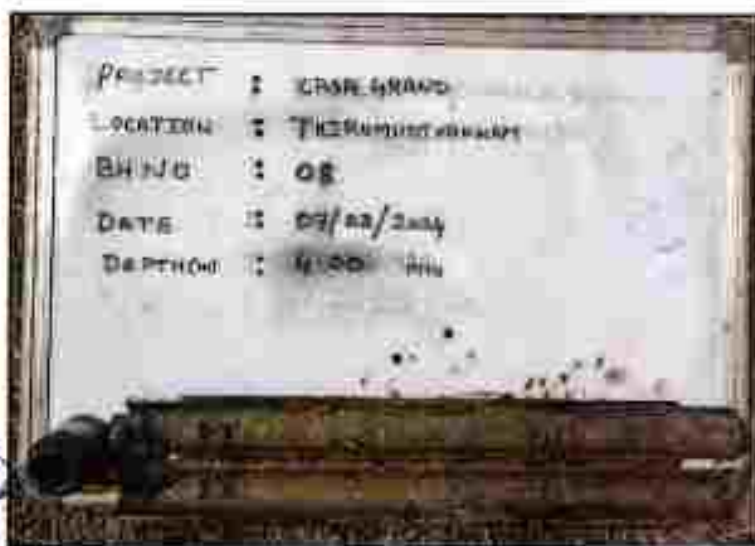
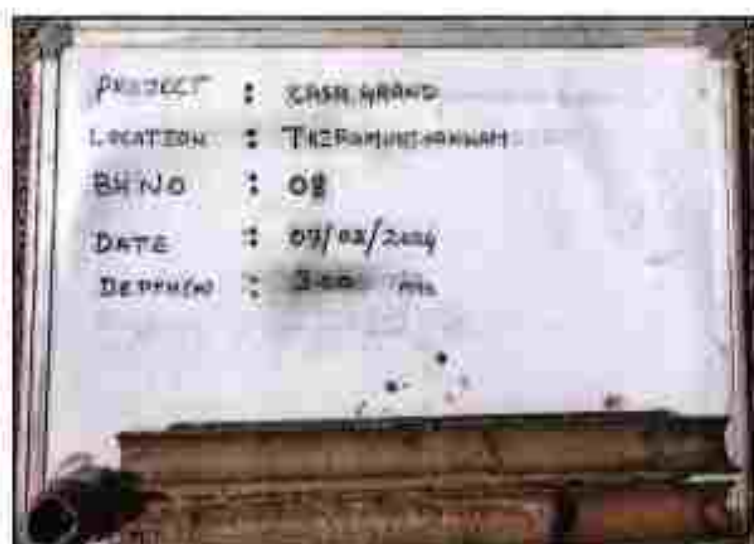












PROJECT : KASHI APPROACH
LOCATION : TIRUPURMANGALAM
BN NO : 08
DATE : 07/03/2024
DEPT(N) : 3000 hrs

PROJECT : KASHI APPROACH
LOCATION : TIRUPURMANGALAM
BN NO : 08
DATE : 07/03/2024
DEPT(N) : 3000 hrs

PROJECT : KASHI APPROACH
LOCATION : TIRUPURMANGALAM
BN NO : 08
DATE : 07/03/2024
DEPT(N) : 3000 hrs

PROJECT : KASHI APPROACH
LOCATION : TIRUPURMANGALAM
BN NO : 08
DATE : 07/03/2024
DEPT(N) : 3000 hrs

PROJECT : CASH GRANT

LOCATION : TIRUPATI

BH No : 08

DATE : 07/03/2024

Devised : 12.00 hrs

PROJECT : CRSN GRAND:

LOCATION : The Request View only

BH No : 08

DATE : 07/02/2014

Dis. Prev. Cont. : 14.00

PROJECT # 08-960-0000

LOCATION : The Rotten Steins

BH NO : 09

DATE : 12/02/2014

$$D_{\text{eff}}(a) = 0.50 \text{ m}^2/\text{s}$$

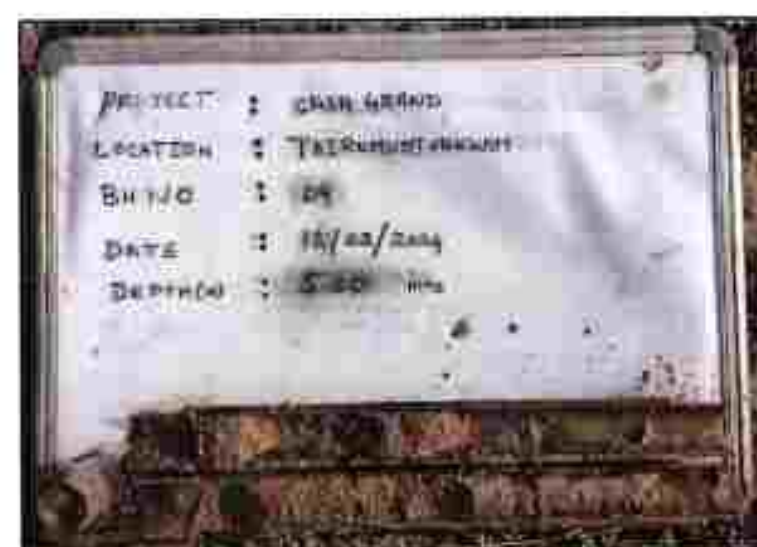
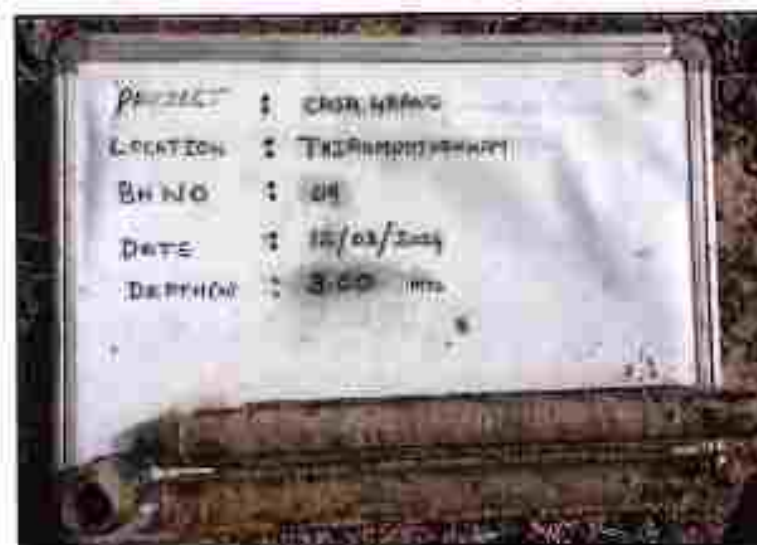
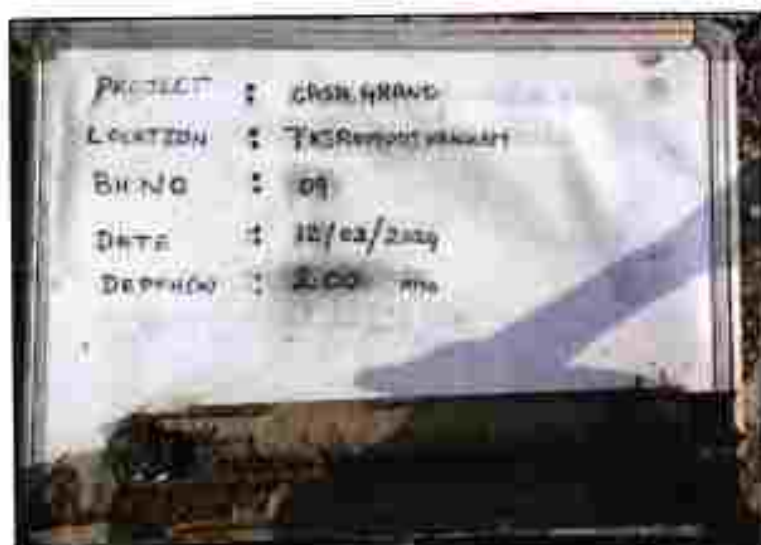
PROJECT : CASH BRAND

LOCATION : THIRUTHUVARUR

SH NO : 25

DATE : 12/03/2004

DEPARTMENT OF THE ARMY



Project : CHS-SPANDU
Location : TIRUPATI
BH NO : 09
DATE : 18/03/2024
Depth : 1000 m

Project : CHS-SPANDU
Location : TIRUPATI
BH NO : 09
DATE : 18/03/2024
Depth : 7.50 m

Project : CHS-SPANDU
Location : TIRUPATI
BH NO : 09
DATE : 18/03/2024
Depth : 1000 m

Project : CHS-SPANDU
Location : TIRUPATI
BH NO : 09
DATE : 18/03/2024
Depth : 1000 m

PROJECT : CASH WARRANT
LOCATION : TRIUMPH SUBURBAN
BU/NO : 09
DATE : 12/03/2004
DEPT/EN : 12/08 HHS

PRIORITY : LOW PRIORITY
 LOCATION : THERMIST ROOM-01
 BR NO : 30
 DATE : 11/03/2009
 DETECTOR : 0-20 mm

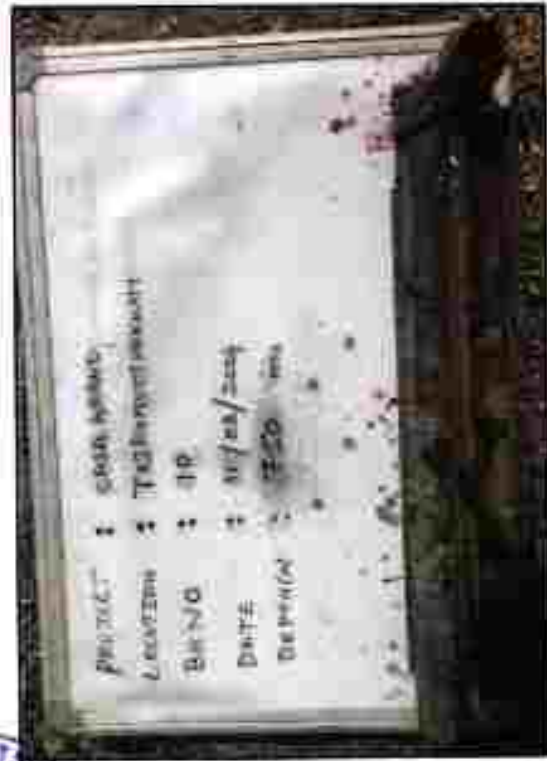
PROJECT : CHAFFIN HILLS
LOCATION : TALLAHASSEE, FLORIDA
BRNO : 00
DATE : 11/02/2004
DISTRIB : 1250

PROJECT : CASH GRANT
 LOCATION : TAILORHUTSHEATH
 BU NO : 00
 DATE : 11/23/2013
 DURATION : 200 hrs





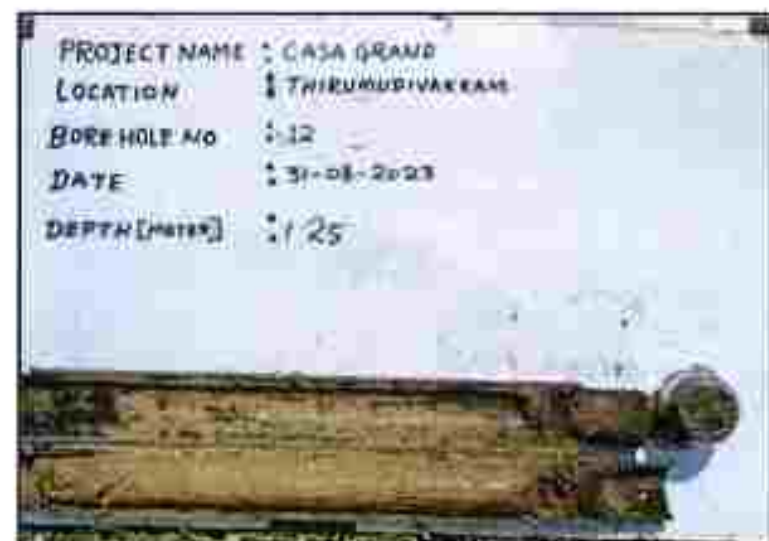
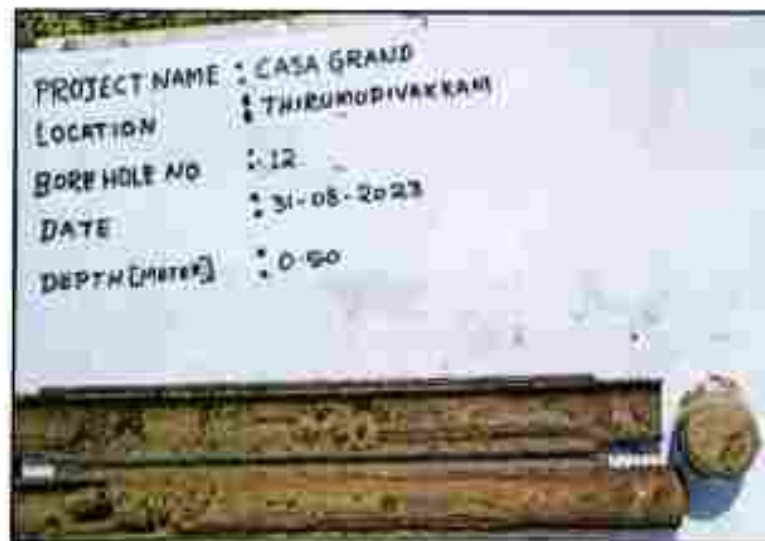
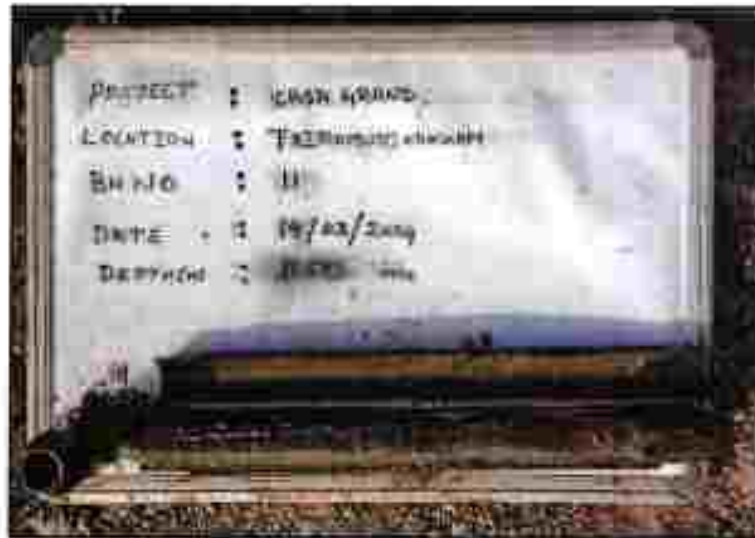
Dr. P. S. PRASAD
Principal Geologist
Geological
Survey of India (GSI)
Chennai
600 007







Dr. G. VENKATA PRASAD
 Director, Geospatial Engineering & IT
 Hyderabad, Tel. 011-26111111
 Chennai, Madurai, Dindigul, Kanyakumari
 1st Floor, Main Road, Kanyakumari, Kanyakumari
 Chennai-41, Madurai-41, Dindigul-41
 Email: drg@geospatialengineering.com





PROJECT NAME : CASA GRAND
LOCATION : THIRUMUDIVAKKAM
BOREHOLE NO : 12
DATE : 31-08-2023
DEPTH (METER) : 3.00



PROJECT NAME : CASA GRAND
LOCATION : THIRUMUDIVAKKAM
BOREHOLE NO : 12
DATE : 31-08-2023
DEPTH (METER) : 4.00



PROJECT NAME : CASA GRAND
LOCATION : THIRUMUDIVAKKAM
BOREHOLE NO : 12
DATE : 31-08-2023
DEPTH (METER) : 5.00



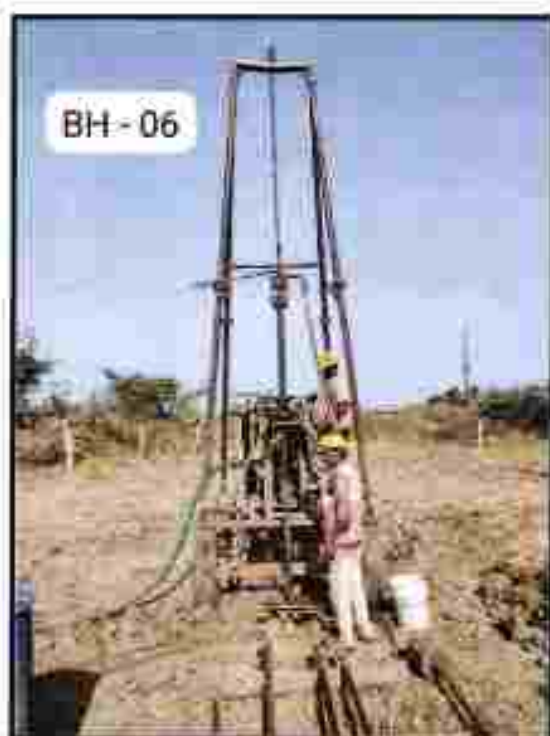
PROJECT NAME : CASA GRAND
LOCATION : THIRUMUDIVAKKAM
BOREHOLE NO : 12
DATE : 31-08-2023
DEPTH (METER) : 6.00







DR. A. PRASAD
Geotechnical Engineer (GATEWAY)
GATEWAY CONSULTANTS
Geotechnical Engineer (GATEWAY)
10/01/2017
10/01/2017



PRASAD

Equipment 18-0191

1998, 1999, 2000, 2001, 2002, 2003, 2004, 2005, 2006, 2007, 2008, 2009, 2010, 2011, 2012, 2013, 2014, 2015, 2016, 2017, 2018, 2019, 2020, 2021, 2022, 2023, 2024, 2025, 2026, 2027, 2028, 2029, 2030, 2031, 2032, 2033, 2034, 2035, 2036, 2037, 2038, 2039, 2040, 2041, 2042, 2043, 2044, 2045, 2046, 2047, 2048, 2049, 2050, 2051, 2052, 2053, 2054, 2055, 2056, 2057, 2058, 2059, 2060, 2061, 2062, 2063, 2064, 2065, 2066, 2067, 2068, 2069, 2070, 2071, 2072, 2073, 2074, 2075, 2076, 2077, 2078, 2079, 2080, 2081, 2082, 2083, 2084, 2085, 2086, 2087, 2088, 2089, 2090, 2091, 2092, 2093, 2094, 2095, 2096, 2097, 2098, 2099, 2100, 2101, 2102, 2103, 2104, 2105, 2106, 2107, 2108, 2109, 2110, 2111, 2112, 2113, 2114, 2115, 2116, 2117, 2118, 2119, 2120, 2121, 2122, 2123, 2124, 2125, 2126, 2127, 2128, 2129, 2130, 2131, 2132, 2133, 2134, 2135, 2136, 2137, 2138, 2139, 2140, 2141, 2142, 2143, 2144, 2145, 2146, 2147, 2148, 2149, 2150, 2151, 2152, 2153, 2154, 2155, 2156, 2157, 2158, 2159, 2160, 2161, 2162, 2163, 2164, 2165, 2166, 2167, 2168, 2169, 2170, 2171, 2172, 2173, 2174, 2175, 2176, 2177, 2178, 2179, 2180, 2181, 2182, 2183, 2184, 2185, 2186, 2187, 2188, 2189, 2190, 2191, 2192, 2193, 2194, 2195, 2196, 2197, 2198, 2199, 2200, 2201, 2202, 2203, 2204, 2205, 2206, 2207, 2208, 2209, 2210, 2211, 2212, 2213, 2214, 2215, 2216, 2217, 2218, 2219, 2220, 2221, 2222, 2223, 2224, 2225, 2226, 2227, 2228, 2229, 2230, 2231, 2232, 2233, 2234, 2235, 2236, 2237, 2238, 2239, 2240, 2241, 2242, 2243, 2244, 2245, 2246, 2247, 2248, 2249, 2250, 2251, 2252, 2253, 2254, 2255, 2256, 2257, 2258, 2259, 2260, 2261, 2262, 2263, 2264, 2265, 2266, 2267, 2268, 2269, 2270, 2271, 2272, 2273, 2274, 2275, 2276, 2277, 2278, 2279, 2280, 2281, 2282, 2283, 2284, 2285, 2286, 2287, 2288, 2289, 2290, 2291, 2292, 2293, 2294, 2295, 2296, 2297, 2298, 2299, 2300, 2301, 2302, 2303, 2304, 2305, 2306, 2307, 2308, 2309, 2310, 2311, 2312, 2313, 2314, 2315, 2316, 2317, 2318, 2319, 2320, 2321, 2322, 2323, 2324, 2325, 2326, 2327, 2328, 2329, 2330, 2331, 2332, 2333, 2334, 2335, 2336, 2337, 2338, 2339, 2340, 2341, 2342, 2343, 2344, 2345, 2346, 2347, 2348, 2349, 2350, 2351, 2352, 2353, 2354, 2355, 2356, 2357, 2358, 2359, 2360, 2361, 2362, 2363, 2364, 2365, 2366, 2367, 2368, 2369, 2370, 2371, 2372, 2373, 2374, 2375, 2376, 2377, 2378, 2379, 2380, 2381, 2382, 2383, 2384, 2385, 2386, 2387, 2388, 2389, 2390, 2391, 2392, 2393, 2394, 2395, 2396, 2397, 2398, 2399, 2400, 2401, 2402, 2403, 2404, 2405, 2406, 2407, 2408, 2409, 2410, 2411, 2412, 2413, 2414, 2415, 2416, 2417, 2418, 2419, 2420, 2421, 2422, 2423, 2424, 2425, 2426, 2427, 2428, 2429, 2430, 2431, 2432, 2433, 2434, 2435, 2436, 2437, 2438, 2439, 2440, 2441, 2442, 2443, 2444, 2445, 2446, 2447, 2448, 2449, 2450, 2451, 2452, 2453, 2454, 2455, 2456, 2457, 2458, 2459, 2460, 2461, 2462, 2463, 2464, 2465, 2466, 2467, 2468, 2469, 2470, 2471, 2472, 2473, 2474, 2475, 2476, 2477, 2478, 2479, 2480, 2481, 2482, 2483, 2484, 2485, 2486, 2487, 2488, 2489, 2490, 2491, 2492, 2493, 2494, 2495, 2496, 2497, 2498, 2499, 2500, 2501, 2502, 2503, 2504, 2505, 2506, 2507, 2508, 2509, 2510, 2511, 2512, 2513, 2514, 2515, 2516, 2517, 2518, 2519, 2520, 2521, 2522, 2523, 2524, 2525, 2526, 2527, 2528, 2529, 2530, 2531, 2532, 2533, 2534, 2535, 2536, 2537, 2538, 2539, 2540, 2541, 2542, 2543, 2544, 2545, 2546, 2547, 2548, 2549, 2550, 2551, 2552, 2553, 2554, 2555, 2556, 2557, 2558, 2559, 2560, 2561, 2562, 2563, 2564, 2565, 2566, 2567, 2568, 2569, 2570, 2571, 2572, 2573, 2574, 2575, 2576, 2577, 2578, 2579, 2580, 2581, 2582, 2583, 2584, 2585, 2586, 2587, 2588, 2589, 2590, 2591, 2592, 2593, 2594, 2595, 2596, 2597, 2598, 2599, 2600, 2601, 2602, 2603, 2604, 2605, 2606, 2607, 2608, 2609, 2610, 2611, 2612, 2613, 2614, 2615, 2616, 2617, 2618, 2619, 2620, 2621, 2622, 2623, 2624, 2625, 2626, 2627, 2628, 2629, 2630, 2631, 2632, 2633, 2634, 2635, 2636, 2637, 2638, 2639, 2640, 2641, 2642, 2643, 2644, 2645, 2646, 2647, 2648, 2649, 2650, 2651, 2652, 2653, 2654, 2655, 2656, 2657, 2658, 2659, 2660, 2661, 2662, 2663, 2664, 2665, 2666, 2667, 2668, 2669, 2670, 2671, 2672, 2673, 2674, 2675, 2676, 2677, 2678, 2679, 26

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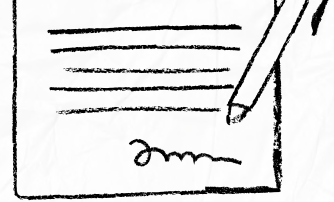
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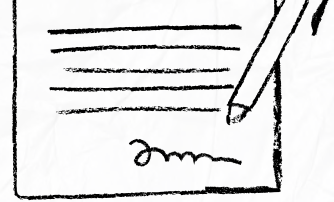
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