

**FABRICATION, INSTALLATION OF NEW PONTOON AND  
REPAIR AND MAINTENANCE OF EXISTING PONTOON FOR  
RORO/ROPAX FACILITY AT GHOGHA- GUJARAT**

(DPA/RORO/2024, Dated: \_/\_/2024)

**PART 3 – TECHNICAL DOCUMENTS**

**TENDER**

**FOR**

**FABRICATION, INSTALLATION OF NEW  
PONTOON AND REPAIR AND MAINTENANCE  
OF EXISTING PONTOON FOR RORO/ROPAX  
FACILITY AT GHOGHA- GUJARAT**

**VOLUME VII**

**FINAL REPORT- GEOTECHNICAL/SUB-SOIL  
INVESTIGATION AND RECCOMENDATION WORK  
FOR PROVIDING RO-RO TERMINAL AT GHOGHA,  
DIST. BHAVNAGAR, GUJARAT STATE  
(BH-9, BH-10 & BH-12)**



**DEENDAYAL PORT AUTHORITY  
ADMINISTRATIVE OFFICE BUILDING  
POST BOX NO. 50  
GANDHIDHAM (KUTCH)  
GUJARAT - 370201**

## **FINAL REPORT**

**GEOTECHNICAL/SUB-SOIL INVESTIGATION  
AND RECOMMENDATION WORK FOR  
PROVIDING RO-RO TERMINAL AT GHOGHA,  
DIST. BHAVNAGAR. GUJARAT STATE.  
(BH-9, BH-10 & BH-12)**

**JOB NO. : MK/75/09-12**

**MONTH & YEAR : SEPTEMBER, 2012**

**FORWARDED TO,  
ESSAR PROJECTS (INDIA) LIMITED.,  
DAHEJ.**

## **M. K. SOIL TESTING LABORATORY**

**FP NO.: 11/1,**

**OPP. GRAND BHAGWATI HOTEL,  
NEAR JAHNVI BUNGLOWS, BODAKDEV,  
AHMEDABAD – 380 054,**

**PHONE NO.: 09624097903**

**EMAIL : [mkslab@gmail.com](mailto:mkslab@gmail.com) / [info@mksoil.com](mailto:info@mksoil.com)**

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**[ 1] INTRODUCTION :**

**Essar Projects (India) Ltd., Dahej**, proposes Soil Investigation work for providing RO-RO terminal at Ghogha, Dist. Bhavnagar, Gujarat State.

The purpose of the investigations was to determine the sub soil stratification of the soil, geotechnical information & safe bearing capacity of the soil, so as to provide information that will assist the structural engineers in the design of the foundations and the relevant works.

The Job was carried out vide your work order no. 1271/S01/1500017814 on dated: 30/06/2012 under the guidance and supervision of the soil personnel of **M. K. Soil Testing Laboratory** and client's engineer.

**[ 2 ] FIELD WORK :**

**[2.1] Borehole:**

Three boreholes having 100mm dia were drilled using Rotary drilling method upto 40.00m depth below EGL.

The Locations of boreholes were decided with due consideration of Client/Consultant of the project.

The locations of the boreholes were shown in location plan in MK/75/09/LP.

**[ 2.2 ] Collection of Samples:**

Undisturbed soil samples were collected in the thin walled sampling tubes in accordance with IS: 2132-1981. Disturbed soil samples were collected for determining the index properties of the soil. The samples from spilt spoon sampling tubes were treated as disturbed soil samples.

**[ 2.3 ] Standard Penetration Test :**

The standard penetration tests were performed in accordance with IS: 2131:1981 using the standard split spoon sampler & 63.5 kg hammer at intervals as suggested by client.

**Location detail of borehole**

Borehole No	Northing	Easting	RL (m.)
BH-9	2399737.167	219983.8472	-1.15
BH-10	2399579.9133	220042.435	-2.00
BH-12	2399701.400	219726.220	1.22

**[ 3 ] LABORATORY WORK :**

The results of the laboratory tests performed on various soil/rock samples are presented in the form of Table No. 4/1 to 4/3 and drawing in bore log given in MK/75/09/DWG at the end of report.

**[ 4 ] SOIL STRATIFICATIONS :**

From the visual examination and laboratory testing of disturbed and undisturbed samples collected from boreholes the soil stratification at the location is described as under :

**[4.1] Borehole: BH - 9**

**Layer No. 1:**

0.00 to 0.20m – Soil gravel cobble mix layer.

**Layer No. 2:**

0.20 to 22.50m – Yellowish brown to blackish brown stiff to very stiff to hard silty clay having high plasticity (CH), SPT- N Value 16 to refusal.

**Layer No. 3:**

22.50 to 40.0m - Grayish silty clay having high plasticity (CH), SPT- N Value 48 to Refusal

**[4.2] Borehole: BH - 10**

**Layer No. 1:**

0.00 to 1.0m – Yellowish brown clayey sand with gravels having medium plasticity (SC)

**Layer No. 2:**

1.00 to 7.50m– Yellowish brown stiff to very stiff silty clay having high plasticity (CH), SPT- N Value 13 to 27

**Layer No. 3:**

7.50 to 40.00m- Yellowish brown to blackish brown to grayish brown clay having high plasticity (CH), SPT- N Value 32 to 65

**[4.3] Borehole: BH - 12**

**Layer No. 1:**

0.00 to 1.50m – Blackish brown non plastic gravelly silty sand (SM)

**Layer No. 2:**

1.50m to 4.0m– Yellowish brown very stiff silty clay having medium plasticity (CI), SPT- N Value 24

**Layer No. 3:**

4.00m to 7.50m- Yellowish brown stiff silty clay having high plasticity (CH) SPT- N Value 15

**Layer No. 4:**

7.50m to 8.0m- Yellowish brown hard silty clay having medium plasticity (CI), SPT- N Value 38

**Layer No. 5:**

8.00m to 16.0m- Yellowish brown to grayish black stiff to very stiff silty clay having high plasticity (CH), SPT- N Value 12 to 20

**Layer No. 7:**

16.0m to 40.0m- Yellowish brown to grayish black hard silty clay having high plasticity (CH) with top layer of silty clay having medium plasticity (CI), SPT- N Value 38 to Refusal (At 37.50m SPT – N value 18)



**[ 5 ] GROUND WATER TABLE :**

Ground water level was encountered 3.00m above EGL at BH-9 and 3.50m above EGL at BH-10 at the time of investigations. (September - 2012) During tide water level was @ 6.0m to 7.0m above EGL. At BH-12 location Ground water level was encountered at existing ground level increase upto @ 5.00m to 6.00m above EGL at time of tide at time of investigation. (October - 2012)

**[ 6 ] CONCLUSIONS & RECOMMENDATIONS:**

- (6.1) Offshore Investigation work for RO-RO ferry Terminal at Ghogha is observed to consist of clayey sand with gravels having medium plasticity followed by stiff to very stiff to hard clay having high plasticity and high to very high swelling natural upto termination depth 40.00m from EGL.
- (6.2) Ground water level was encountered 3.00m above EGL at BH-9 and 3.50m above EGL at BH-10 at the time of investigations. (September – 2012) During tide water level was @ 6.0m to 7.0m above EGL. At BH-12 location Ground water level was encountered at existing ground level increase upto @ 5.00m to 6.00m above EGL at time of tide at time of investigation. (October – 2012)
- (6.3) The chemical analysis of water sample shows parameters higher than permissible limit hence it is not suitable to use for construction work.
- (6.4) The chemical analysis of water and soil sample shows it falls in class III, hence necessary precaution should be taken as per IS: 456 : 2000 (table 4) for concrete exposed to sulphate attack.
- (6.5) The results of the laboratory tests are incorporated in the form of table at the later part of the report.

**For, M. K. SOIL TESTING LABORATORY**

**PREPARED BY**

**CHECKED BY**

**AUTHORISED SIGNATORY**

**Table No. 1**

**Observed & Corrected N-Values**

Bore Hole No.	Depth in (m)	Nos. of blow to drive sampler for penetration of			N-value for last 300 (mm)	Effective OBP Po (t/m²)	Correction Factor CN	Corrected N-value	
		0-150 (mm)	150-300 (mm)	300-450 (mm)				OBP	WT
BH-9	3.00	4	7	9	16	NOT APPLICABLE			
	6.00	7	9	15	24				
	9.00	6	11	18	29				
	12.00	9	14	21	35				
	15.00	10	17	25	42				
	18.00	8	15	21	36				
	21.00	50(13cm)	-	-	Refusal				
	24.00	16	22	29	51				
	27.00	14	21	27	48				
	30.00	11	21	31	52				
	33.00	10	24	54(10cm)	Refusal				
	36.00	17	26	50(9cm)	Refusal				
	40.00	17	38	54(9cm)	Refusal				

**Table No. 1**

**Observed & Corrected N-Values**

Bore Hole No.	Depth in (m)	Nos. of blow to drive sampler for penetration of			N-value for last 300 (mm)	Effective OBP Po (t/m²)	Correction Factor CN	Corrected N-value	
		0-150 (mm)	150-300 (mm)	300-450 (mm)				OBP	WT
BH-10	1.50	3	5	8	13	NOT APPLICABLE			
	3.00	3	6	10	16				
	4.50	6	8	14	22				
	7.50	7	10	17	27				
	10.50	9	12	20	32				
	13.50	10	15	22	37				
	16.00	10	25	31	56				
	19.50	13	22	33	55				
	22.50	9	16	20	36				
	25.50	10	17	23	40				
	28.50	8	16	18	34				
	31.50	10	17	26	43				
	34.50	13	22	31	53				
	37.50	6	24	30	54				
	40.00	11	21	44	65				

**Table No. 1**

**Observed & Corrected N-Values**

Bore Hole No.	Depth in (m)	Nos. of blow to drive sampler for penetration of			N-value for last 300 (mm)	Effective OBP Po (t/m²)	Correction Factor CN	Corrected N-value	
		0-150 (mm)	150-300 (mm)	300-450 (mm)				OBP	WT
BH-12	1.50	6	7	17	24	NOT APPLICABLE			
	4.50	4	7	8	15				
	7.50	7	18	20	38				
	10.50	3	8	12	20				
	13.50	4	4	8	12				
	16.50	16	44	51 (10cm)	Refusal				
	19.50	5	50 (10cm)	-	Refusal				
	22.50	4	17	41	58				
	25.50	7	23	47	70				
	28.50	9	14	24	38				
	31.50	10	28	46	74				
	34.50	11	24	34	58				
	37.50	4	4	14	18				
	38.50	12	42	50 (5cm)	Refusal				
	40.00	10	21	51 (11m)	Refusal				

Correction is not applied to cohesive soil.

OBP : Overburden Pressure

WT : Water Table

**Table No. 2****Chemical Analysis of Water**

<b>Bore Hole No.</b>	<b>pH</b>	<b>Chloride (mg/l)</b>	<b>Sulphate (mg/l)</b>	<b>TDS (mg/l)</b>
BH-9	7.82	17690	2015	25904
BH-12	7.76	14805	1752	20914

**Table No. 3****Chemical Analysis of soil**

<b>Bore Hole No.</b>	<b>Depth (m)</b>	<b>pH</b>	<b>Chloride (%)</b>	<b>Sulphate (%)</b>	<b>TDS (%)</b>
BH-10	1.50	8.32	0.598	0.1823	1.641
	3.00	8.51	0.6071	0.1544	1.389
BH-12	6.00	7.91	0.551	0.1603	1.44
	13.50	7.98	0.685	0.2017	1.815

**JOB NO. : MK/75/09-12 M.K. SOIL TESTING LABORATORY. AHMEDABAD – 380054****Table No: 4/1 SOIL CHARACTERISTICS FOR BOREHOLE NO. – BH – 9**

Sub: Geotechnical Investigation work for proposed EPC contract for providing RO-RO terminal at Ghogha, Tal: Ghogha,  
Dist: Bhavnagar, State: Gujarat.

W.T. Above G.L. (m) : 3.50  
Termination depth (m) : 40.00  
Co-Ordinate (m) : N=2399579.9133, E=220042.435  
Ground RL (m.) : -1.15m

Client: Essar Projects (India) Limited, Dahej

DEPTH (m)	SAMPLE TYPE	SPT - N Value	SPECIFIC GRAVITY	INSITU BULK UNIT WT (gm/cm <sup>3</sup> )	INSITU DRY UNIT WEIGHT (gm/cm <sup>3</sup> )	INSITU WATER CONTENT (%)	SIEVE ANALYSIS					LIQUID LIMIT (%)	PLASTICITY INDEX, IP (%)	I.S. CLASSIFICATION	TYPE OF SHEAR TEST	COHESION C, kg/cm <sup>2</sup>	ANGLE OF INT. FRICTION, $\phi$ (°)	COMPRESSION INDEX, C <sub>c</sub>	SHRINKAGE LIMIT (%)	FREE SWELL (%)	SWELLING PR. (kg/cm <sup>2</sup> )
							GRAVEL (%)	% SAND			SILT & CLAY (%)										
								COARSE	MED.	FINE											
0.00	DS	-	-	-	-	-	----- Soil, Gravel, cobbles mix layer -----														
1.50	UDS	-	2.69	1.70	1.43	19.0	-	-	-	1	-99-	84	44	CH	-	-	-	-	8.0	86	-
3.00	SPT	16	-	-	-	-	-	-	-	1	-99-	100	58	CH	-	-	-	-	-	-	-
4.50	UDS	-	2.70	1.78	1.48	20.5	-	-	-	1	-99-	96	56	CH	TUU	0.95	5.5	-	-	-	1.5
6.00	SPT	24	-	-	-	-	-	-	-	2	-98-	99	57	CH	-	-	-	-	7.0	100	-
7.50	UDS	-	2.71	1.96	1.56	25.5	-	-	-	1	-99-	72	27	CH	TUU	1.23	5	0.11	-	-	-
9.00	SPT	29	-	-	-	-	-	-	-	1	-99-	84	42	CH	-	-	-	-	-	-	-
10.50	UDS	-	-	2.01	1.59	26.2	-	-	-	1	-99-	73	33	CH	UCS	1.45	-	-	-	-	-
12.00	SPT	35	-	-	-	-	-	-	-	1	-99-	96	56	CH	-	-	-	-	-	-	-

**JOB NO. : MK/75/09-12 M.K. SOIL TESTING LABORATORY. AHMEDABAD – 380054**

**Table No: 4/1 SOIL CHARACTERISTICS FOR BOREHOLE NO. – BH – 9**

**Page No: 2**

DEPTH (m)	SAMPLE TYPE	SPT - N Value	SPECIFIC GRAVITY	INSITU BULK UNIT WT (gm/cm <sup>3</sup> )	INSITU DRY UNIT WEIGHT (gm/cm <sup>3</sup> )	INSITU WATER CONTENT (%)	SIEVE ANALYSIS					LIQUID LIMIT (%)	PLASTICITY INDEX, IP (%)	I.S. CLASSIFICATION	TYPE OF SHEAR TEST	COHESION C, kg/cm <sup>2</sup>	ANGLE OF INT. FRICTION, Φ ( ° )	COMPRESSION INDEX, C <sub>c</sub>	SHRINKAGE LIMIT (%)	FREE SWELL (%)	SWELLING PR. (kg/cm <sup>2</sup> )
							GRAVEL (%)	% SAND			SILT & CLAY (%)										
								COARSE	MED.	FINE											
13.50	UDS	-	-	2.05	1.65	23.8	-	-	-	1	-99-	97	52	CH	-	-	-	-	-	-	-
15.00	SPT	42	-	-	-	-	-	-	-	1	-99-	88	53	CH	-	-	-	-	-	-	-
16.50	UDS	-	-	2.07	1.66	24.6	-	-	-	1	-99-	67	37	CH	UCS	2.10	-	-	-	-	-
18.00	SPT	36	-	-	-	-	-	-	2	1	-97-	89	47	CH	-	-	-	-	-	-	-
19.50	UDS	-	-	2.10	1.68	25	2	1	1	2	-94-	84	49	CH	-	-	-	-	-	-	-
21.00	SPT	Ref.	-	-	-	-	-	-	-	3	-97-	93	51	Ch	-	-	-	-	-	-	-
22.50	UDS/ DS	-	-	-	-	-	-	-	-	1	-99-	56	26	CH	UCS*	1.70	-	-	-	-	-
24.00	SPT	51	-	-	-	-	-	-	-	2	-98-	97	55	CH	-	-	-	-	-	-	-
25.50	UDS/ DS	-	-	-	-	-	-	-	-	1	-99-	52	27	CH	-	-	-	-	-	-	-
27.00	SPT	48	-	-	-	-	-	-	-	1	-99-	82	50	CH	-	-	-	-	-	-	-



**JOB NO. : MK/75/09-12 M.K. SOIL TESTING LABORATORY. AHMEDABAD – 380054**

**Table No: 4/1 SOIL CHARACTERISTICS FOR BOREHOLE NO. – BH – 9**

**Page No: 3**

DEPTH (m)	SAMPLE TYPE	SPT - N Value	SPECIFIC GRAVITY	INSITU BULK UNIT WT (gm/cm <sup>3</sup> )	INSITU DRY UNIT WEIGHT (gm/cm <sup>3</sup> )	INSITU WATER CONTENT (%)	SIEVE ANALYSIS					LIQUID LIMIT (%)	PLASTICITY INDEX, IP (%)	I.S. CLASSIFICATION	TYPE OF SHEAR TEST	COHESION C, kg/cm <sup>2</sup>	ANGLE OF INT. FRICTION, Φ ( ° )	COMPRESSION INDEX, C <sub>c</sub>	SHRINKAGE LIMIT (%)	FREE SWELL (%)	SWELLING PR. (kg/cm <sup>2</sup> )
							GRAVEL (%)	% SAND			SILT & CLAY (%)										
								COARSE	MED.	FINE											
28.50	DS	-	-	-	-	-	-	-	-	1	-99-	74	34	CH	-	-	-	-	-	-	-
30.00	SPT	52	-	-	-	-	-	-	-	1	-99-	79	49	CH	UCS*	1.8	-	-	-	-	-
31.50	DS	-	-	-	-	-	-	-	-	1	-99-	81	46	CH	-	-	-	-	-	-	-
33.50	SPT	Ref.	-	-	-	-	-	-	-	1	-99-	89	49	CH	-	-	-	-	-	-	-
34.50	DS	-	-	-	-	-	-	-	-	1	-99-	92	42	CH	-	-	-	-	-	-	-
36.00	SPT	Ref.	-	-	-	-	-	-	-	2	-98-	77	47	CH	-	-	-	-	-	-	-
37.50	DS	-	-	-	-	-	-	-	-	1	-99-	52	50	CH	-	-	-	-	-	-	-
40.00	SPT	Ref.	-	-	-	-	-	-	-	1	-99-	74	44	CH	-	-	-	-	-	-	-

**JOB NO. : MK/75/09-12 M.K. SOIL TESTING LABORATORY. AHMEDABAD – 380054****Table No: 4/2 SOIL CHARACTERISTICS FOR BOREHOLE NO. – BH – 10**

Sub: Geotechnical Investigation work for proposed EPC contract for providing RO-RO terminal at Ghogha, Tal: Ghogha,  
Dist: Bhavnagar, State: Gujarat.

W.T. Above G.L. (m) : 3.50  
Termination depth (m) : 40.00  
Co-Ordinate (m) : N=2399579.9133, E=220042.435  
Ground RL (m.) : -2.00m

Client: Essar Projects (India) Limited, Dahej

DEPTH (m)	SAMPLE TYPE	SPT - N Value	SPECIFIC GRAVITY	INSITU BULK UNIT WT (gm/cm <sup>3</sup> )	INSITU DRY UNIT WEIGHT (gm/cm <sup>3</sup> )	INSITU WATER CONTENT (%)	SIEVE ANALYSIS					LIQUID LIMIT (%)	PLASTICITY INDEX, IP (%)	I.S. CLASSIFICATION	TYPE OF SHEAR TEST	COHESION C, kg/cm <sup>2</sup>	ANGLE OF INT. FRICTION, $\phi$ (°)	COMPRESSION INDEX, C <sub>c</sub>	SHRINKAGE LIMIT (%)	FREE SWELL (%)	SWELLING PR. (kg/cm <sup>2</sup> )
							GRAVEL (%)	% SAND			SILT & CLAY (%)										
								COARSE	MED.	FINE											
0.00	DS	-	-	-	-	-	6	10	36	8	-40-	47	22	SC	-	-	-	-	-	-	-
1.50	SPT	13	-	-	-	-	-	-	2	2	-96-	71	41	CH	-	-	-	-	-	62	-
3.00	SPT	16	-	-	-	-	-	1	8	2	-89-	78	48	CH	-	-	-	-	-	63	-
4.50	SPT	22	-	-	-	-	24	8	8	4	-56-	76	45	CH	-	-	-	-	-	-	-
6.00	UDS	-	2.70	2.06	1.64	25.7	-	-	1	14	-85-	90	60	CH	TUU	0.87	5	-	-	-	1.90
7.50	SPT	27	-	-	-	-	-	-	1	2	-97-	94	66	CH	-	-	-	-	-	-	-
9.00	UDS	-	2.69	2.14	1.67	28.6	-	-	-	-	-	-	-	TUU	1.06	5.5	0.082	-	-	-	-
10.50	SPT	32	-	-	-	-	-	-	1	1	-98-	78	50	CH	-	-	-	-	-	-	-
12.00	UDS	-	-	2.13	1.69	26.2	-	-	-	2	-98-	76	45	CH	-	-	-	-	-	-	-

**JOB NO. : MK/75/09-12 M.K. SOIL TESTING LABORATORY. AHMEDABAD – 380054**

**Table No: 4/ 2 SOIL CHARACTERISTICS FOR BOREHOLE NO. – BH – 10**

**Page No: 2**

DEPTH (m)	SAMPLE TYPE	SPT - N Value	SPECIFIC GRAVITY	INSITU BULK UNIT WT (gm/cm <sup>3</sup> )	INSITU DRY UNIT WEIGHT (gm/cm <sup>3</sup> )	INSITU WATER CONTENT (%)	SIEVE ANALYSIS					LIQUID LIMIT (%)	PLASTICITY INDEX, IP (%)	I.S. CLASSIFICATION	TYPE OF SHEAR TEST	COHESION C, kg/cm <sup>2</sup>	ANGLE OF INT. FRICTION, $\phi$ ( ° )	COMPRESSION INDEX, C <sub>c</sub>	SHRINKAGE LIMIT (%)	FREE SWELL (%)	SWELLING PR. (kg/cm <sup>2</sup> )
							GRAVEL (%)	% SAND			SILT & CLAY (%)										
								COARSE	MED.	FINE											
13.50	SPT	37	-	-	-	-	-	-	-	1	-99-	86	51	CH	-	-	-	-	-	-	-
15.00	UDS	-	2.69	2.11	1.70	24.3	-	-	-	2	-98-	82	48	CH	UCS	1.20	-	-	-	-	-
16.00	SPT	56	-	-	-	-	-	-	2	2	-96-	80	48	CH	-	-	-	-	-	-	-
18.00	DS	-	-	-	-	-	-	-	1	1	-98-	94	63	CH	TUU	1.40	2	-	-	-	-
19.50	SPT	55	-	-	-	-	6	2	4	8	-80-	51	29	CH	-	-	-	-	-	-	-
21.00	DS	-	-	-	-	-	-	-	-	2	-98-	73	45	CH	-	-	-	-	-	-	-
22.50	SPT	36	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
24.00	UDS	-	-	2.01	1.65	22.1	-	-	-	2	-98-	73	45	CH	TUU	1.7	5	-	-	-	-
25.50	SPT	40	-	-	-	-	-	-	-	1	-99-	68	37	CH	-	-	-	-	-	-	-

**Table No: 4/2 SOIL CHARACTERISTICS FOR BOREHOLE NO. – BH – 10**

**Page No: 3**

DEPTH (m)	SAMPLE TYPE	SPT - N Value	SPECIFIC GRAVITY	INSITU BULK UNIT WT (gm/cm <sup>3</sup> )	INSITU DRY UNIT WEIGHT (gm/cm <sup>3</sup> )	INSITU WATER CONTENT (%)	SIEVE ANALYSIS					LIQUID LIMIT (%)	PLASTICITY INDEX, IP (%)	I.S. CLASSIFICATION	TYPE OF SHEAR TEST	COHESION C, kg/cm <sup>2</sup>	ANGLE OF INT. FRICTION, $\phi$ ( ° )	COMPRESSION INDEX, C <sub>c</sub>	SHRINKAGE LIMIT (%)	FREE SWELL (%)	SWELLING PR. (kg/cm <sup>2</sup> )
							GRAVEL (%)	% SAND			SILT & CLAY (%)										
								COARSE	MED.	FINE											
27.00	DS	-	-	-	-	-	-	-	-	2	-98-	76	50	CH	-	-	-	-	-	-	-
28.50	SPT	34	-	-	-	-	-	-	2	4	-94-	63	38	CH	-	-	-	-	-	-	-
30.00	UDS	-	-	1.93	1.75	10.5	-	-	2	3	-95-	80	49	CH	TUU	1.82	2	-	-	-	-
31.50	SPT	43	-	-	-	-	-	-	-	3	-97-	92	61	CH	-	-	-	-	-	-	-
33.00	DS	-	-	-	-	-	-	-	-	1	-99-	106	72	CH	-	-	-	-	-	-	-
34.50	SPT	53	-	-	-	-	-	-	-	2	-98-	83	53	CH	-	-	-	-	-	-	-
36.00	DS	-	-	-	-	-	-	-	-	1	-99-	93	61	CH	-	-	-	-	-	-	-
37.50	SPT	54	-	-	-	-	-	-	-	1	-99-	55	31	CH	-	-	-	-	-	-	-
39.00	DS	-	-	-	-	-	-	-	-	2	-98-	99	62	CH	-	-	-	-	-	-	-
40.00	SPT	65	-	-	-	-	-	-	1	2	-97-	52	29	CH	-	-	-	-	-	-	-

**JOB NO. : MK/75/09-12 M.K. SOIL TESTING LABORATORY. AHMEDABAD – 380054****Table No: 4/3 SOIL CHARACTERISTICS FOR BOREHOLE NO. – BH – 12**

Sub: Geotechnical Investigation work for proposed EPC contract for providing RO-RO terminal at Ghogha, Tal: Ghogha,  
Dist: Bhavnagar, State: Gujarat.

W.T. Above G.L. (m) : 0.00  
Termination depth (m) : 40.00  
Co-Ordinate (m) : N=2399701.400, E=219726.220  
Ground RL (m.) : 1.22m

Client: Essar Projects (India) Limited, Dahej

DEPTH (m)	SAMPLE TYPE	SPT - N Value	SPECIFIC GRAVITY	INSITU BULK UNIT WT (gm/cm <sup>3</sup> )	INSITU DRY UNIT WEIGHT (gm/cm <sup>3</sup> )	INSITU WATER CONTENT (%)	SIEVE ANALYSIS					LIQUID LIMIT (%)	PLASTICITY INDEX, IP (%)	I.S. CLASSIFICATION	TYPE OF SHEAR TEST	COHESION C, kg/cm <sup>2</sup>	ANGLE OF INT. FRICTION, Φ ( ° )	COMPRESSION INDEX, C <sub>c</sub>	SHRINKAGE LIMIT (%)	FREE SWELL (%)	SWELLING PR. (kg/cm <sup>2</sup> )
							GRAVEL (%)	% SAND			SILT & CLAY (%)										
								COARSE	MED.	FINE											
0.00	DS	-	-	-	-	-	29	6	36	17	-12-	NP	-	SM	-	-	-	-	-	-	-
1.50	SPT	24	-	-	-	-	-	-	5	14	-81-	38	22	CI	-	-	-	-	11.2	32	-
3.00	UDS	-	2.67	1.82	1.57	16.0	6	4	8	6	-76-	40	24	CI	TUU	0.82	8	-	-	35	-
4.50	SPT	15	-	-	-	-	-	-	1	4	-95-	59	30	CH	-	-	-	-	-	60	-
6.00	UDS	-	2.70	1.99	1.60	24.5	-	-	-	1	-99-	77	50	CH	UCS	0.90	-	-	7.00	68	1.95
7.50	SPT	38	-	-	-	-	-	-	-	15	-85-	43	16	CI	-	-	-	-	-	-	-
9.00	UDS	-	-	2.08	1.60	30.0	-	-	-	1	-99-	89	60	CH	TUU	0.95	6.5	-	-	-	-
10.50	SPT	20	-	-	-	-	-	-	-	1	-99-	82	51	CH	-	-	-	-	-	-	-
12.0	UDS	-	-	1.85	1.44	28.5	-	-	-	1	-99-	82	56	CH	TUU	0.75	4	-	-	-	-

**JOB NO. : MK/75/09-12 M.K. SOIL TESTING LABORATORY. AHMEDABAD – 380054**

**Table No: 4/3 SOIL CHARACTERISTICS FOR BOREHOLE NO. – BH – 12**

**Page No: 2**

DEPTH (m)	SAMPLE TYPE	SPT - N Value	SPECIFIC GRAVITY	INSITU BULK UNIT WT (gm/cm <sup>3</sup> )	INSITU DRY UNIT WEIGHT (gm/cm <sup>3</sup> )	INSITU WATER CONTENT (%)	SIEVE ANALYSIS					LIQUID LIMIT (%)	PLASTICITY INDEX, IP (%)	I.S. CLASSIFICATION	TYPE OF SHEAR TEST	COHESION C, kg/cm <sup>2</sup>	ANGLE OF INT. FRICTION, Φ ( ° )	COMPRESSION INDEX, Cc	SHRINKAGE LIMIT (%)	FREE SWELL (%)	SWELLING PR. (kg/cm <sup>2</sup> )
							GRAVEL (%)	% SAND			SILT & CLAY (%)										
								COARSE	MED.	FINE											
13.50	SPT	12	-	-	-	-	-	-	-	1	-90-	69	44	CH	-	-	-	-	-	-	-
15.00	UDS	-	-	1.92	1.51	26.8	-	-	-	1	-99-	70	43	CH	-	-	-	-	-	-	-
16.50	SPT	REF	2.66	-	-	-	-	-	6	30	-64-	46	25	CI	-	-	-	-	-	-	-
18.00	DS	-	-	-	-	-	18	4	4	5	-69-	56	31	CH	-	-	-	-	-	-	-
19.50	SPT	REF	-	-	-	-	6	5	4	2	-83-	59	33	CH	-	-	-	-	-	-	-
21.00	UDS / DS	-	-	-	-	-	-	-	-	2	-98-	74	49	CH	UCS*	1.4	-	-	-	-	-
22.50	SPT	58	-	-	-	-	-	-	-	4	-96-	64	42	CH	-	-	-	-	-	-	-
24.0	UDS / DS	-	-	-	-	-	-	-	-	3	-97-	80	49	CH	-	-	-	-	-	-	-
25.0	SPT	70	-	-	-	-	-	-	-	12	-88-	63	41	CH	-	-	-	-	-	-	-
27.0	UDS	-	-	2.00	1.54	29.5	-	-	-	3	-97-	79	52	CH	TUU	1.25	2				

**JOB NO. : MK/75/09-12 M.K. SOIL TESTING LABORATORY. AHMEDABAD – 380054**

**Table No: 4/3 SOIL CHARACTERISTICS FOR BOREHOLE NO. – BH – 12**

**Page No: 3**

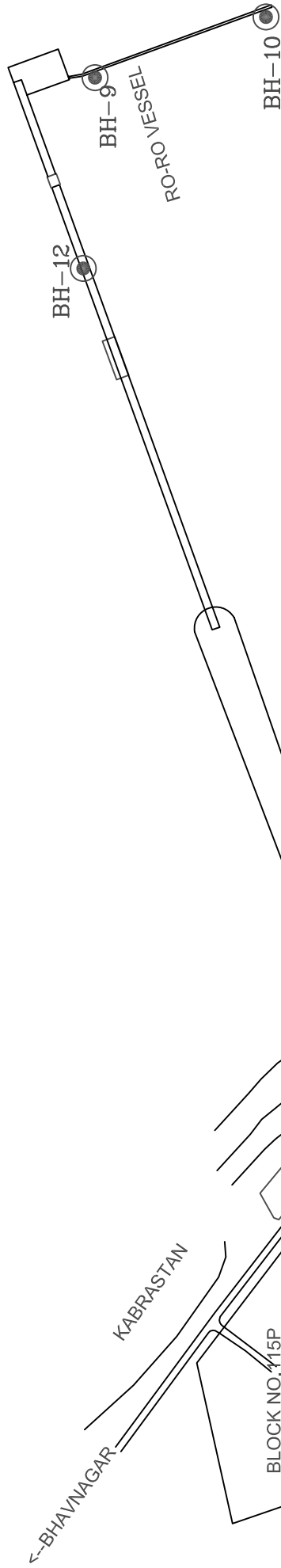
DEPTH (m)	SAMPLE TYPE	SPT - N Value	SPECIFIC GRAVITY	INSITU BULK UNIT WT (gm/cm <sup>3</sup> )	INSITU DRY UNIT WEIGHT (gm/cm <sup>3</sup> )	INSITU WATER CONTENT (%)	SIEVE ANALYSIS					LIQUID LIMIT (%)	PLASTICITY INDEX, IP (%)	I.S. CLASSIFICATION	TYPE OF SHEAR TEST	COHESION C, kg/cm <sup>2</sup>	ANGLE OF INT. FRICTION, Φ ( ° )	COMPRESSION INDEX, C <sub>c</sub>	SHRINKAGE LIMIT (%)	FREE SWELL (%)	SWELLING PR. (kg/cm <sup>2</sup> )
							GRAVEL (%)	% SAND			SILT & CLAY (%)										
								COARSE	MED.	FINE											
28.50	SPT	38	-	-	-	-	-	-	-	2	-98-	69	43	CH	-	-	-	-	-	-	-
30.0	UDS	-	-	2.05	1.57	30.2	-	-	-	2	-98-	78	52	CH	UCS	1.5	-	-	-	-	-
31.50	SPT	74	-	-	-	-	-	-	-	1	-99-	78	51	CH	-	-	-	-	-	-	-
33.0	DS	-	-	-	-	-	-	-	-	2	-98-	82	54	CH	-	-	-	-	-	-	-
34.50	SPT	58	-	-	-	-	-	-	-	2	-98-	84	54	CH	-	-	-	-	-	-	-
36.0	DS	-	-	-	-	-	-	-	2	2	-96-	78	50	CH	-	-	-	-	-	-	-
37.50	SPT	18	-	-	-	-	-	2	1	12	-85-	46	26	CI	-	-	-	-	-	-	-
38.50	SPT	REF	-	-	-	-	-	-	-	10	-90-	57	37	CH	-	-	-	-	-	-	-
40.0	SPT	REF	-	-	-	-	-	-	2	5	-93-	56	39	CH	-	-	-	-	-	-	-


**ABBREVIATIONS**

DS	Disturbed Soil Sample
UDS	Undisturbed Soil Sample
SPT	Standard Penetration Test
TUU	Triaxial unconfined undrain shear test
UCS	Unconfined consolidated shear test
*	Remoulded
SBC	Safe Bearing Capacity
NP	Non Plastic
LL	Liquid Limit
PL	Plastic Limits
PI	Plasticity Index
SC	Clayey Sand
SM	Silty Sand
CH	Silty clay having high plasticity
CI	Silty clay having medium plasticity

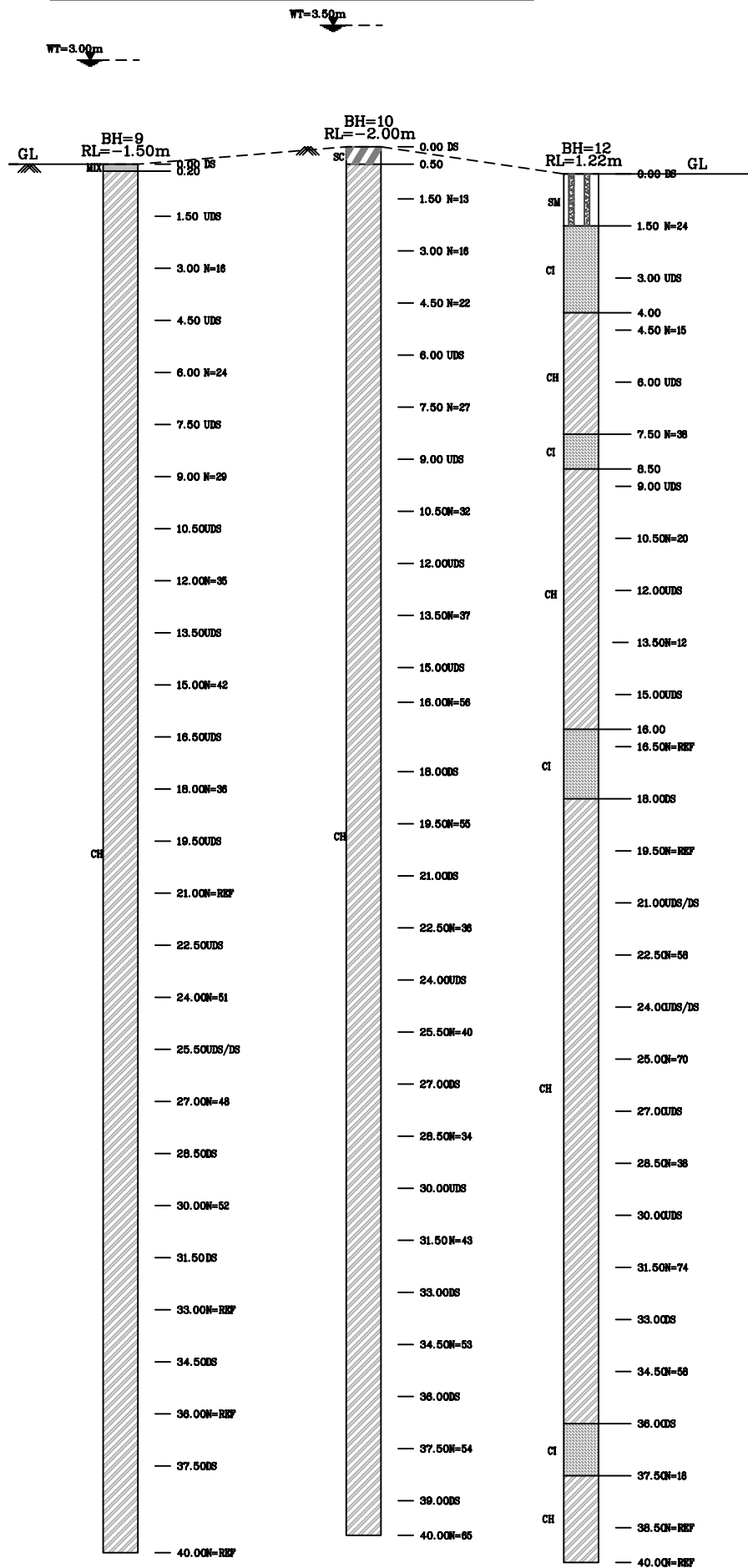


# LOCATION PLAN



CLIENT:-	ESSAR PROJECTS (INDIA) LIMITED DAHEJ		
PROJECT:-	GEOTECHNICAL/SUB-SOIL INVESTIGATIONS WORK FOR PROPOSED EPC CONTRACT FOR PROVIDING RO-RO TERMINAL AT GHOGHA, TAL: GHOGHA, DIST: BHAVNAGAR, STATE: GUJARAT.		
DRAWN BY:-	 <b>M. K. Soil Testing Laboratory</b> FP NO.: 11/1 OPP. GRAND BHAGWATI HOTEL, NEAR JAHNVI BUNGLOWS, BODAKDEV, AHMEDABAD - 380 054 PHONE NO.: 09624097903 Email: mkslab@gmail.com info@mksoil.com		
JOB. NO.:-	MK/75-9-12	PAGE. NO.:-	1
		SCALE:- NOT TO SCALE	

# CROSS SECTIONAL DETAILS OF BOREHOLES



## LEGEND

SC	=	CLAYEY SAND
SM	=	SILTY SAND
CI	=	SILTY CLAY HAVING MEDIUM PLASTICITY
CH	=	SILTY CLAY HAVING HIGH PLASTICITY
φ	=	ANGLE OF INTERNAL FRICTION (DEGREES)
c	=	COHESION (kg/cm <sup>2</sup> )
DS	=	DISTURBED SAMPLE
UDS	=	UNDISTURBED SAMPLE
DST	=	DIRECT SHEAR TEST
N	=	S.P.T. VALUE
SPT	=	STANDARD PENETRATION TEST
GL	=	GROUND LEVEL
WT	=	WATER TABLE

CLIENT:-

ESSAR PROJECTS (INDIA) LIMITED  
DAHEJ

PROJECT:-

GEOTECHNICAL/SUB-SOIL INVESTIGATIONS WORK FOR PROPOSED EPC CONTRACT FOR PROVIDING RD-50 TERMINAL AT GHOGHA, TAL: GHOGHA, DIST: BHAVNAGAR, STATE GUJARAT.

DRAWN BY:-



M. K. Soil Testing Laboratory

FP NO.: 11/1  
OPP. GRAND BHAGWATI HOTEL,  
NEAR JAHNVI BUNGLOWS, BODAKDEV,  
AHMEDABAD-380 054,  
PHONE NO.: 09824097903  
Email: mksoil@gmail.com  
info@mksoil.com


JOB. NO.: MK/75-9-12

PAGE. NO.: 2

SCALE: NOT TO SCALE

**CLIENT=** ESSAR PROJECTS (INDIA) LIMITED, DAHEJ


G.W.T. ABOVE EXISTING G.L. (m)	3.00
TERMINATION DEPTH (m)	40.00
JOB NO.	MK/75-9-12

DEPTH (m)	TYPE OF SAMPLE	SPT - NO. OF BLOWS			SPT: N-VALUE	SOIL CLASSIFICATION	LEGEND	VISUAL DESCRIPTION	LAYER THICKNESS (m)	FOR ROCK	
		0-15cm	15-30cm	30-45cm						% CORE RECOVERY	% R.Q.D.
0.00	DS	-	-	-	-	MIX	BLACKISH BROWN COLOUR MIX LAYER	0.20	39.8		
1.50	UDS	-	-	-	-		YELLOWISH BROWN COLOUR SILTY CLAY HAVING HIGH PLASTICITY				
3.00	SPT	4	7	9	16						
4.50	UDS	-	-	-	-						
6.00	SPT	4	9	15	24						
7.50	UDS	-	-	-	-						
9.00	SPT	6	11	18	29						
10.50	UDS	-	-	-	-		CH				
12.00	SPT	9	14	21	35			BLACKISH BROWN COLOUR			
13.50	UDS	-	-	-	-						
15.00	SPT	10	17	25	42						
16.50	UDS	-	-	-	-						
18.00	SPT	8	15	21	36						
19.50	UDS	-	-	-	-						
20.00	-				-			20.0			

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**CLIENT=** ESSAR PROJECTS (INDIA) LIMITED, DAHEJ


G.W.T. ABOVE EXISTING G.L. (m)	3.00
TERMINATION DEPTH (m)	40.00
JOB NO.	MK/75-9-12

DEPTH (m)	TYPE OF SAMPLE	SPT - NO. OF BLOWS			SPT: N-VALUE	SOIL CLASSIFICATION	LEGEND	VISUAL DESCRIPTION	LAYER THICKNESS (m)	FOR ROCK	
		0-15cm	15-30cm	30-45cm						% CORE RECOVERY	% R.Q.D.
21.00	SPT	50 (13CM)	-	-	REF	CH		BLACKISH BROWN COLOUR SILTY CLAY WITH HIGH PLASTICITY	39.8		
22.50	UDS	-	-	-	-			GREYISH BROWN COLOUR			
24.00	SPT	16	22	29	51						
25.50	UDS	-	-	-	-						
27.00	SPT	14	21	27	48						
28.50	DS	-	-	-	-						
30.00	SPT	11	21	31	52						
31.50	DS	-	-	-	-						
33.00	SPT	10	24	54 (10 cm)	REF						
34.50	DS	-	-	-	-						
36.00	SPT	17	26	50 (9 cm)	REF						
37.50	DS	-	-	-	-						
40.00	SPT	17	26	54 (9 cm)	REF						

P-4

**CLIENT=** ESSAR PROJECTS (INDIA) LIMITED, DAHEJ


G.W.T. ABOVE EXISTING G.L. (m)	3.50
TERMINATION DEPTH (m)	40.00
JOB NO.	MK/75-9-12

DEPTH (m)	TYPE OF SAMPLE	SPT - NO. OF BLOWS			SPT: N-VALUE	SOIL CLASSIFICATION	LEGEND	VISUAL DESCRIPTION	LAYER THICKNESS (m)	FOR ROCK	
		0-15cm	15-30cm	30-45cm						% CORE RECOVERY	% R.Q.D.
0.00	DS	-	-	-	-	SC		BLACKISH BROWN COLOUR SILTY CLAY WITH YELLOWISH BROWN COLOUR SILTY CLAY HAVING HIGH PLASTICITY	0.50		
1.50	SPT	3	5	8	13	CH					
3.00	SPT	3	6	10	16						
4.50	SPT	6	8	14	22						
6.00	UDS	-	-	-	-						
7.50	SPT	7	10	17	27						
9.00	UDS	-	-	-	-						
10.50	SPT	9	12	20	32						
12.00	UDS	-	-	-	-						
13.50	SPT	10	15	22	37						
15.00	UDS	-	-	-	-						
16.00	SPT	10	25	31	56						
18.00	DS	-	-	-	-						
19.50	SPT	13	22	33	55						
20.00	-				-						

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**CLIENT=** ESSAR PROJECTS (INDIA) LIMITED, DAHEJ

G.W.T. ABOVE EXISTING G.L. (m)	3.50
TERMINATION DEPTH (m)	40.00
JOB NO.	MK/75-9-12

DEPTH (m)	TYPE OF SAMPLE	SPT - NO. OF BLOWS			SPT: N-VALUE	SOIL CLASSIFICATION	LEGEND	VISUAL DESCRIPTION	LAYER THICKNESS (m)	FOR ROCK	
		0-15cm	15-30cm	30-45cm						% CORE RECOVERY	% R.Q.D.
21.00	DS	-	-	-	-	CH		BLACKISH BROWN COLOUR SILTY CLAY WITH HIGH PLASTICITY	39.5		
22.50	SPT	9	16	20	36						
24.00	UDS	-	-	-	-						
25.50	SPT	10	17	23	40						
27.00	DS	-	-	-	-						
28.50	SPT	8	16	18	34						
30.00	UDS	-	-	-	-						
31.50	SPT	10	17	26	43						
33.00	DS	-	-	-	-						
34.50	SPT	13	22	31	53						
36.00	DS	-	-	-	-						
37.50	SPT	6	24	30	54						
39.00	DS	-	-	-	-						
40.00	SPT	11	21	44	65						

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**PROJECT=** GEOTECHNICAL/SUB-SOIL INVESTIGATIONS WORK FOR PROPOSED EPC CONTRACT FOR PROVIDING RO-RO TERMINAL AT GHOGHA, TAL: GHOGHA, DIST:BHAVNAGAR, STATE:GUJARAT.

**CLIENT=** ESSAR PROJECTS (INDIA) LIMITED, DAHEJ

METHOD OF BORING	ROTARY
DIA. OF BORE	100 mm
BORE HOLE NO.	BH=12



G.W.T. BELOW EXISTING G.L. (m)	0.00
TERMINATION DEPTH (m)	40.00
JOB NO.	MK/75-9-12

## BORELOG

DEPTH (m)	TYPE OF SAMPLE	SPT - NO. OF BLOWS			SPT: N-VALUE	SOIL CLASSIFICATION	LEGEND	VISUAL DESCRIPTION	LAYER THICKNESS (m)	FOR ROCK	
		0-15cm	15-30cm	30-45cm						% CORE RECOVERY	% R.Q.D.
0.00	DS	-	-	-	-	SM		BLACKISH BROWN COLOUR SILTY SAND	1.50		
1.50	SPT	6	7	17	24						
3.00	UDS				-	CI		YELLOWISH BROWN COLOUR SILTY CLAY HAVING MEDIUM PLASTICITY	2.50		
4.50	SPT	4	7	8	15	CH		YELLOWISH BROWN COLOUR SILTY CLAY WITH HIGH PLASTICITY	3.50		
6.00	UDS	-	-	-	-						
7.50	SPT	7	18	20	38	CI		YELLOWISH BROWN COLOUR SILTY CLAY HAVING MEDIUM PLASTICITY	1.00		
9.00	UDS	-	-	-	-	CH		YELLOWISH BROWN COLOUR SILTY CLAY WITH HIGH PLASTICITY	7.50		
10.50	SPT	3	8	12	20						
12.00	UDS	-	-	-	-						
13.50	SPT	4	4	8	12						
15.00	UDS	-	-	-	-						
16.00	SPT	16	44	51	REF (10cm)	CI		YELLOWISH BROWN COLOUR SILTY CLAY HAVING MEDIUM PLASTICITY	2.00		
18.00	UDS/DS	-	-	-	-	CI		YELLOWISH BROWN COLOUR SILTY CLAY WITH HIGH PLASTICITY	2.00		
19.50	SPT	5	50 (10cm)	-	REF						
20.00	-				-						

**CLIENT=** ESSAR PROJECTS (INDIA) LIMITED, DAHEJ

G.W.T. BELOW EXISTING G.L. (m)	0.00
TERMINATION DEPTH (m)	40.00
JOB NO.	MK/75-9-12

DEPTH (m)	TYPE OF SAMPLE	SPT - NO. OF BLOWS			SPT: N-VALUE	SOIL CLASSIFICATION	LEGEND	VISUAL DESCRIPTION	LAYER THICKNESS (m)	FOR ROCK	
		0-15cm	15-30cm	30-45cm						% CORE RECOVERY	% R.Q.D.
21.00	UDS	-	-	-	-	CH		GREYISH BROWN COLOUR SILTY CLAY WITH HIGH PLASTICITY	16.00		
22.50	SPT	4	17	41	58						
24.00	UDS	-	-	-	-						
25.50	SPT	7	23	47	70						
27.00	UDS	-	-	-	-						
28.50	SPT	9	14	24	38						
30.00	UDS	-	-	-	-						
31.50	SPT	10	28	46	74						
33.00	UDS/DS	-	-	-	-						
34.50	SPT	11	24	34	58						
36.00	DS	-	-	-	-						
37.50	SPT	4	4	14	18						
38.50	SPT	12	42	50 (5cm)	REF	CH		GREYISH BROWN COLOUR SILTY CLAY WITH HIGH PLASTICITY	2.50		
40.00	SPT	10	21	51 (11cm)	REF						

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**SECTION:-**

**PROJECT:-**

GEOTECHNICAL/SUB-SOIL INVESTIGATIONS WORK FOR PROPOSED EPC  
CONTRACT FOR PROVIDING RO-RO TERMINAL AT GHOGHA, TAL: GHOGHA,  
DIST: BHAVNAGAR, STATE: GUJARAT.

JOB NO.:-

MK/75/9/12

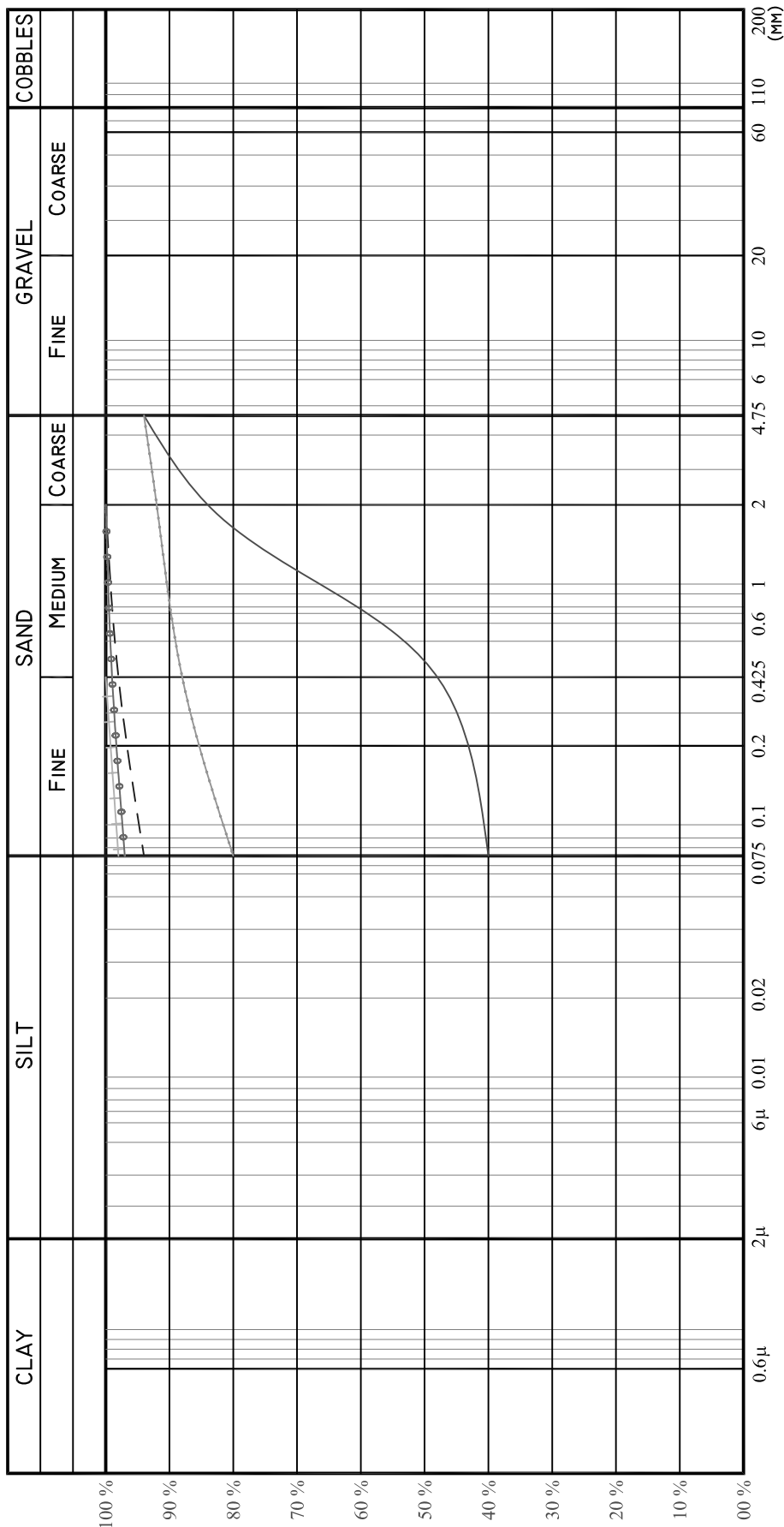
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**SECTION:-**

## GRAIN SIZE DISTRIBUTION

[illegible]

**PROJECT:-**

GEOTECHNICAL/SUB-SOIL INVESTIGATIONS WORK FOR PROPOSED EPC  
CONTRACT FOR PROVIDING RO-RO TERMINAL AT GHOGHA, TAL: GHOGHA,  
DIST: BHAVNAGAR, STATE: GUJARAT.

JOB NO.:-

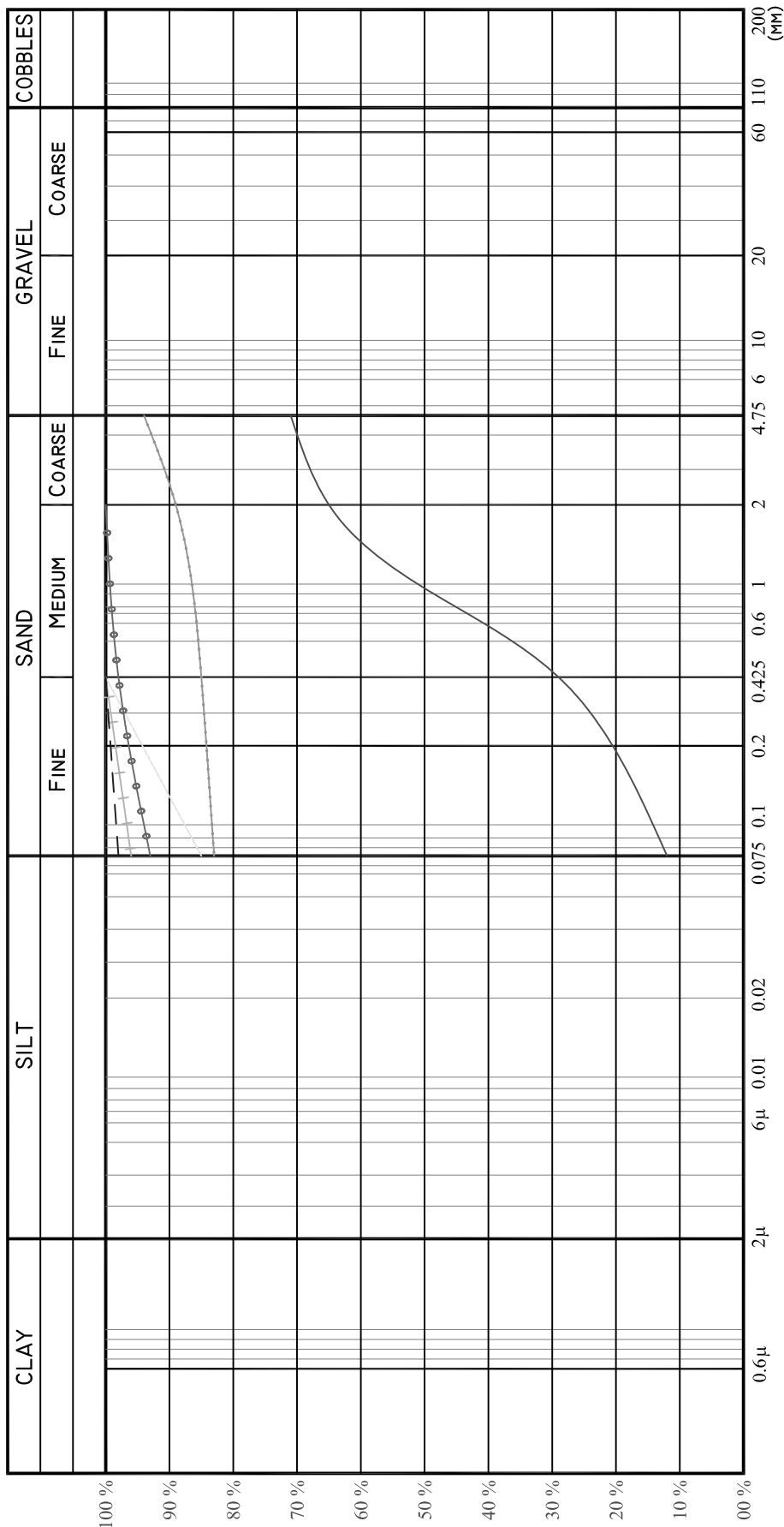
MK/75/9/12

PAGE NO.:-

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**SECTION:-**

## GRAIN SIZE DISTRIBUTION

[illegible]

**PROJECT:-**

GEOTECHNICAL/SUB-SOIL INVESTIGATIONS WORK FOR PROPOSED EPC  
CONTRACT FOR PROVIDING RO-RO TERMINAL AT GHOGHA, TAL: GHOGHA,  
DIST: BHAVNAGAR, STATE: GUJARAT.

JOB NO.:-

MK/75/9/12

PAGE NO.:-

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## CONSOLIDATION GRAPH

CLIENT:—

ESSAR PROJECTS (INDIA) LIMITED  
DAHEJ

PROJECT:— GEOTECHNICAL/SUB-SOIL INVESTIGATIONS WORK FOR PROPOSED EPC  
CONTRACT FOR PROVIDING RO-RO TERMINAL AT GHOGHA, TAL: GHOGHA,  
DIST: BHAVNAGAR, STATE: GUJARAT.

JOB. NO:—

MK/75-9-12

LOCATION:—

BH-9

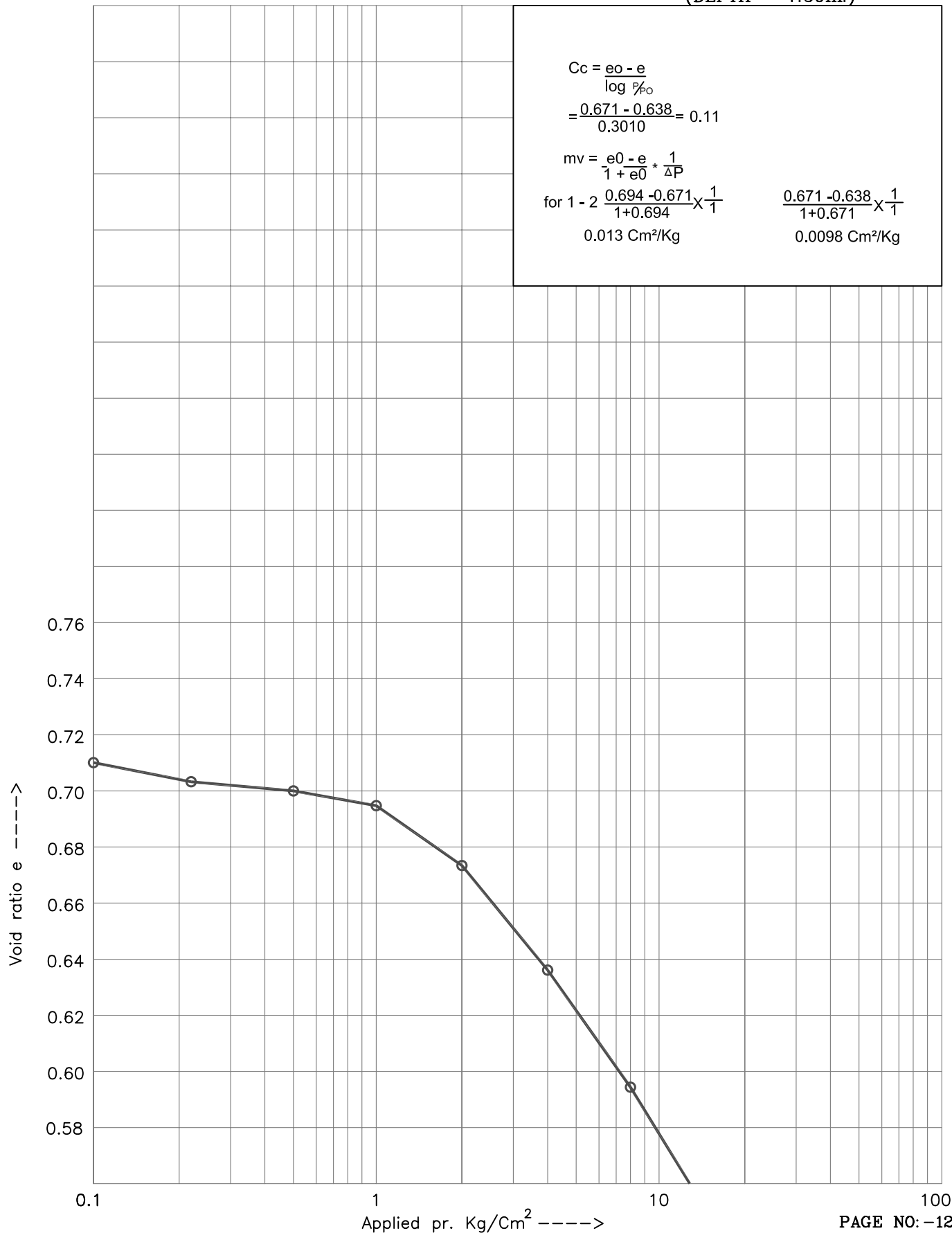
(DEPTH = 7.50m.)

$$C_c = \frac{e_0 - e}{\log \frac{P}{P_0}}$$
$$= \frac{0.671 - 0.638}{0.3010} = 0.11$$

$$mv = \frac{e_0 - e}{1 + e_0} \times \frac{1}{\Delta P}$$

for 1 - 2  $\frac{0.694 - 0.671}{1 + 0.694} \times \frac{1}{1}$   $\frac{0.671 - 0.638}{1 + 0.671} \times \frac{1}{1}$

0.013 Cm<sup>2</sup>/Kg 0.0098 Cm<sup>2</sup>/Kg





## CONSOLIDATION GRAPH

CLIENT:—

ESSAR PROJECTS (INDIA) LIMITED  
DAHEJ

PROJECT:— GEOTECHNICAL/SUB-SOIL INVESTIGATIONS WORK FOR PROPOSED EPC  
CONTRACT FOR PROVIDING RO-RO TERMINAL AT GHOGHA, TAL: GHOGHA,  
DIST: BHAVNAGAR, STATE: GUJARAT.

JOB. NO:—

MK/75-9-12

LOCATION:—

BH-10

(DEPTH = 9.00m.)

$$Cc = \frac{e_0 - e}{\log \frac{p_0}{p_1}}$$

$$Cc = \frac{e_0 - e}{0.3000} = 0.082$$

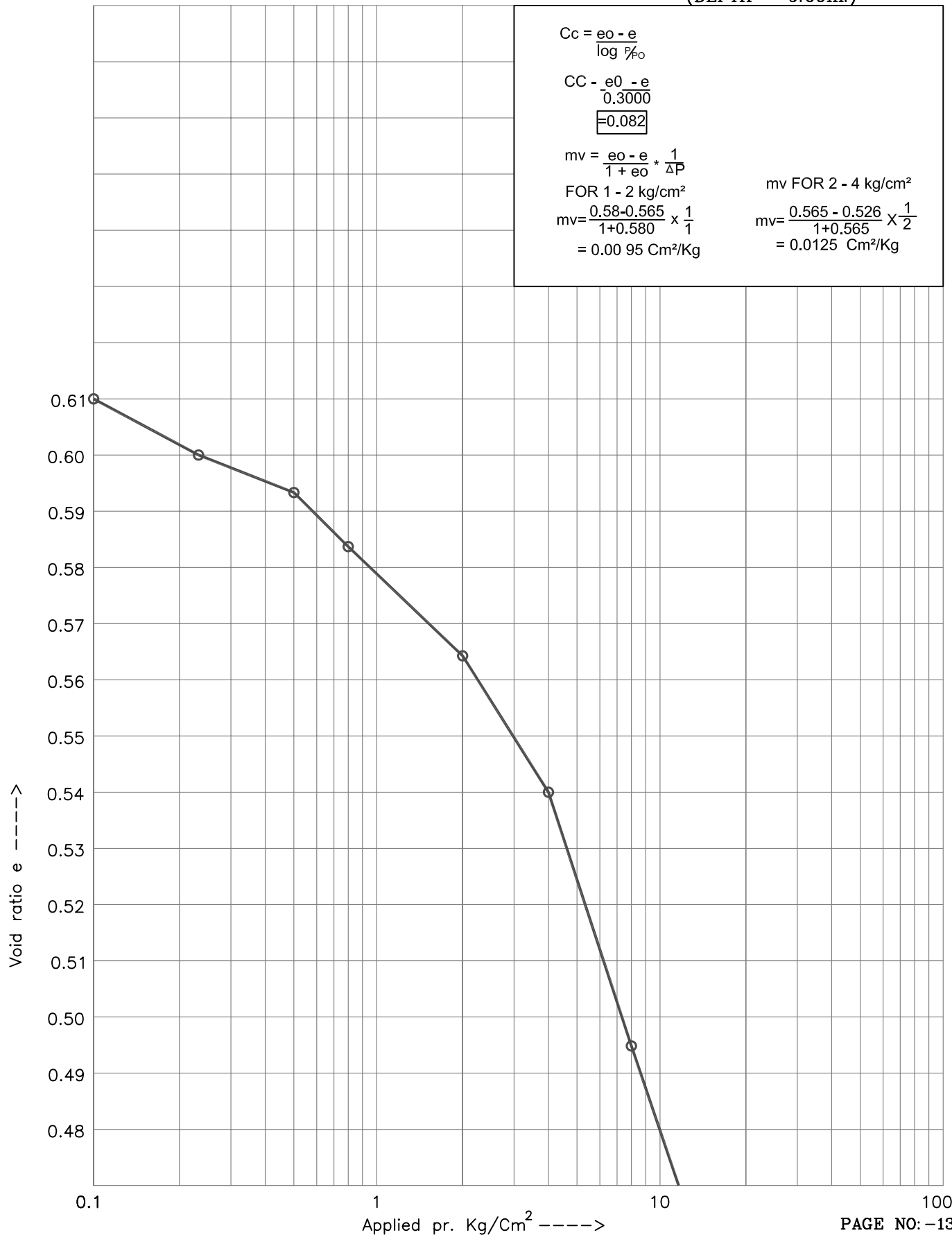
$$mv = \frac{e_0 - e}{1 + e_0} \times \frac{1}{\Delta P}$$

FOR 1 - 2 kg/cm<sup>2</sup>

$$mv = \frac{0.58 - 0.565}{1 + 0.580} \times \frac{1}{1} = 0.0095 \text{ Cm}^2/\text{Kg}$$

mv FOR 2 - 4 kg/cm<sup>2</sup>

$$mv = \frac{0.565 - 0.526}{1 + 0.565} \times \frac{1}{2} = 0.0125 \text{ Cm}^2/\text{Kg}$$

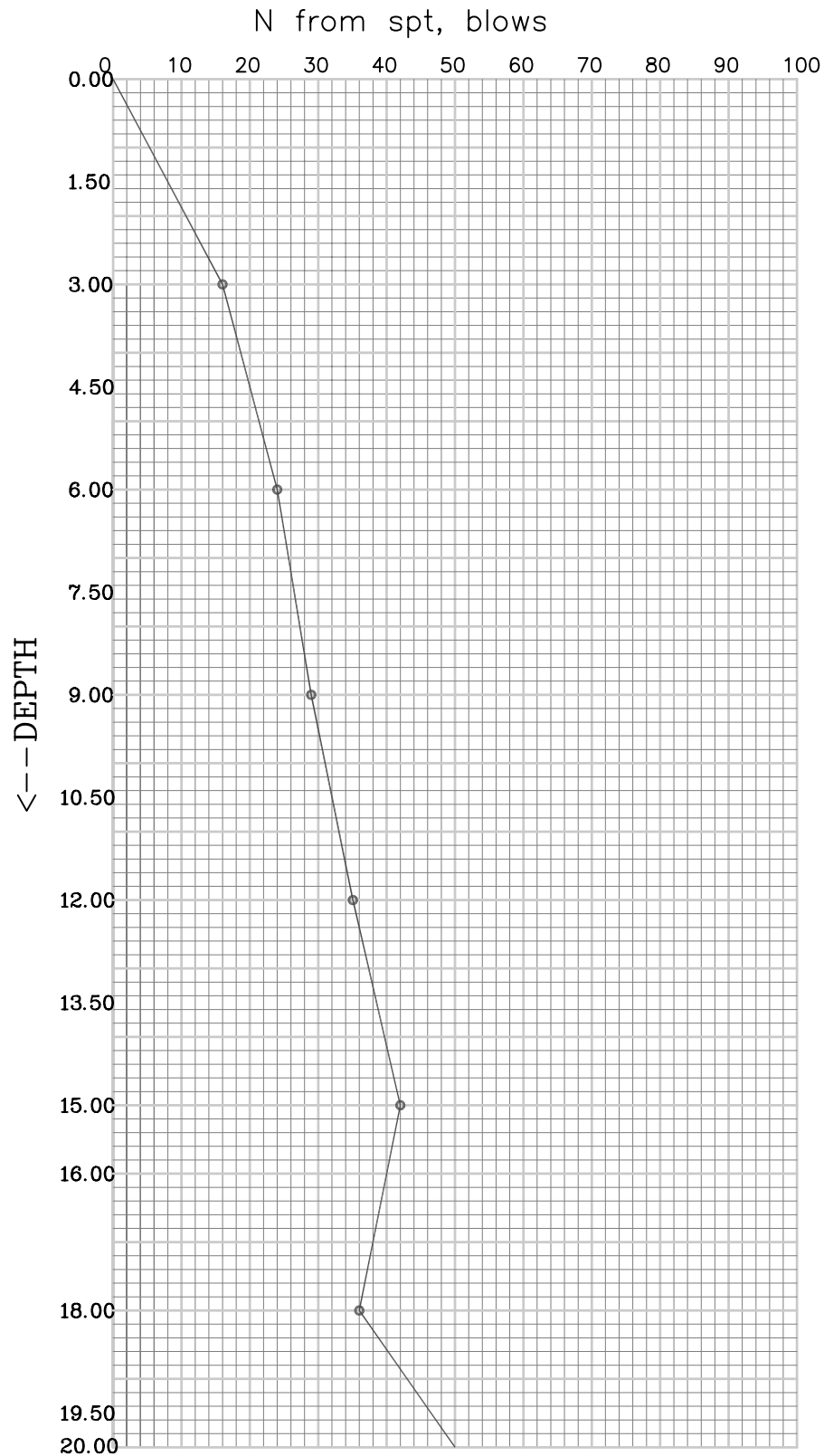


## SPT VS DEPTH GRAPH

BORE HOLE NO. : BH-9

METHOD OF BORING	ROTARY
DIA. OF BORE	150 mm

G.W.T. ABOVE EXISTING G.L. (m)	3.00
TERMINATION DEPTH (m)	40.00



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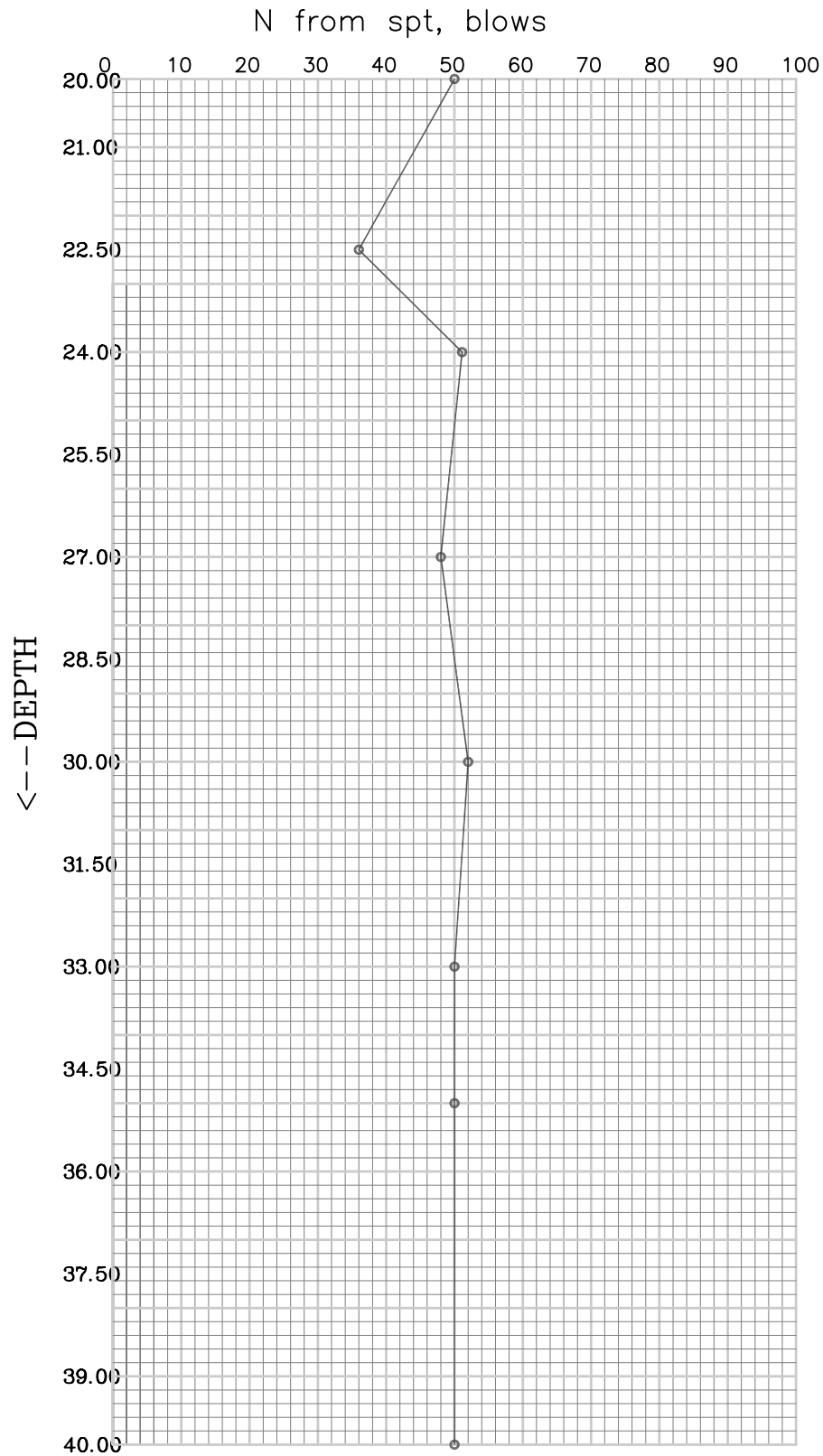
PROJECT :

EPC CONTRACT FOR PROVIDING RO-RO TERMINAL  
AT GHOGHA, TAL: GHOGHA, DIST: BHAVNAGAR, STATE: GUJARAT.

**SPT VS DEPTH GRAPH**  
**BORE HOLE NO. : BH-9 Contd.**

METHOD OF BORING	ROTARY
DIA. OF BORE	150 mm

G.W.T. ABOVE EXISTING G.L. (m)	3.00
TERMINATION DEPTH (m)	40.00



M. K. SOIL TESTING LABORATORY, AHMEDABAD

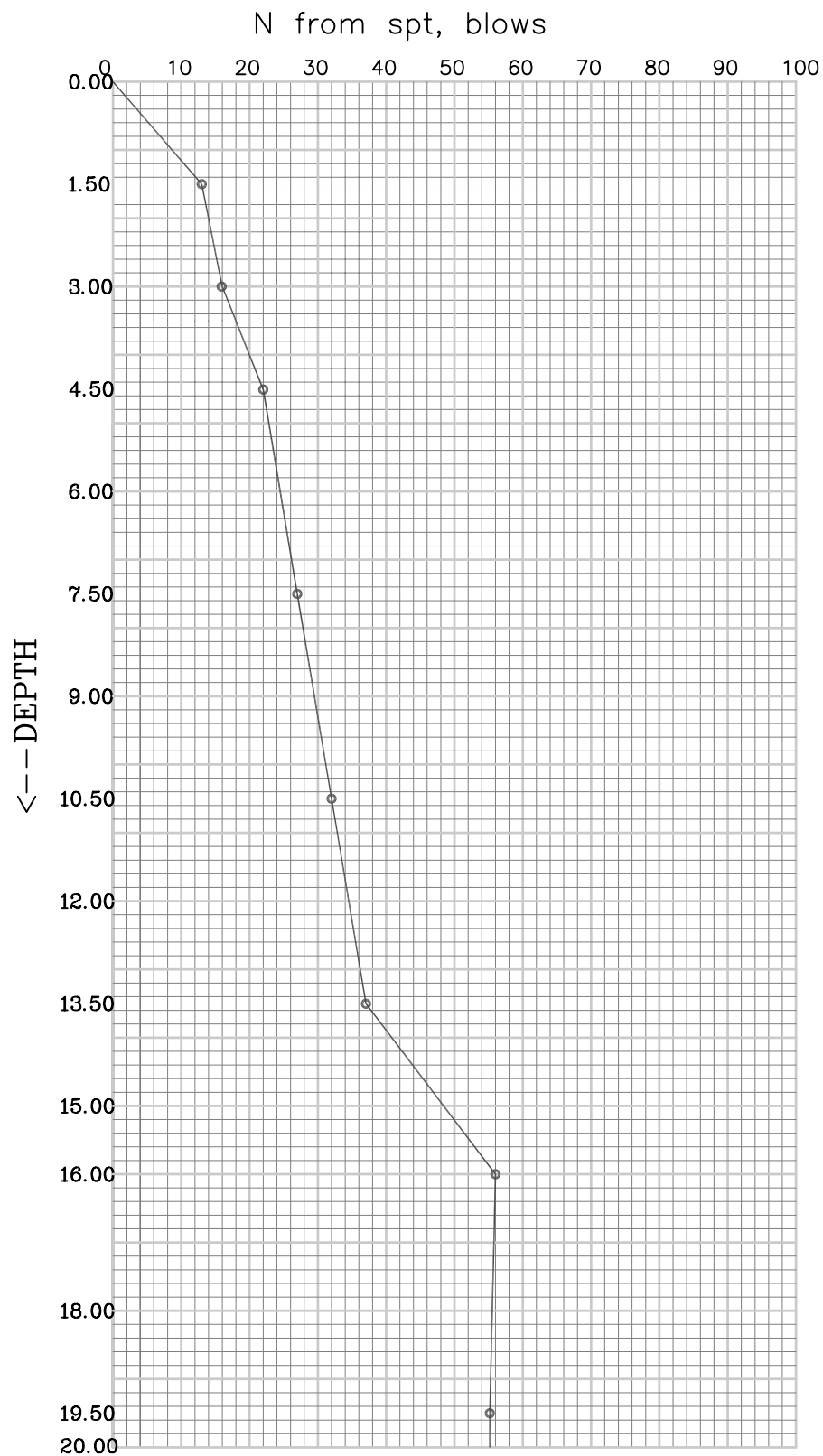
PROJECT :  
EPC CONTRACT FOR PROVIDING RO-RO TERMINAL  
AT GHOGHA, TAL: GHOGHA, DIST: BHAVNAGAR, STATE: GUJARAT.

## SPT VS DEPTH GRAPH

BORE HOLE NO. : BH-10

METHOD OF BORING	ROTARY
DIA. OF BORE	150 mm

G.W.T. ABOVE EXISTING G.L. (m)	3.50
TERMINATION DEPTH (m)	40.00



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PROJECT :

EPC CONTRACT FOR PROVIDING RO-RO TERMINAL  
AT GHOGHA, TAL: GHOGHA, DIST: BHAVNAGAR, STATE: GUJARAT.

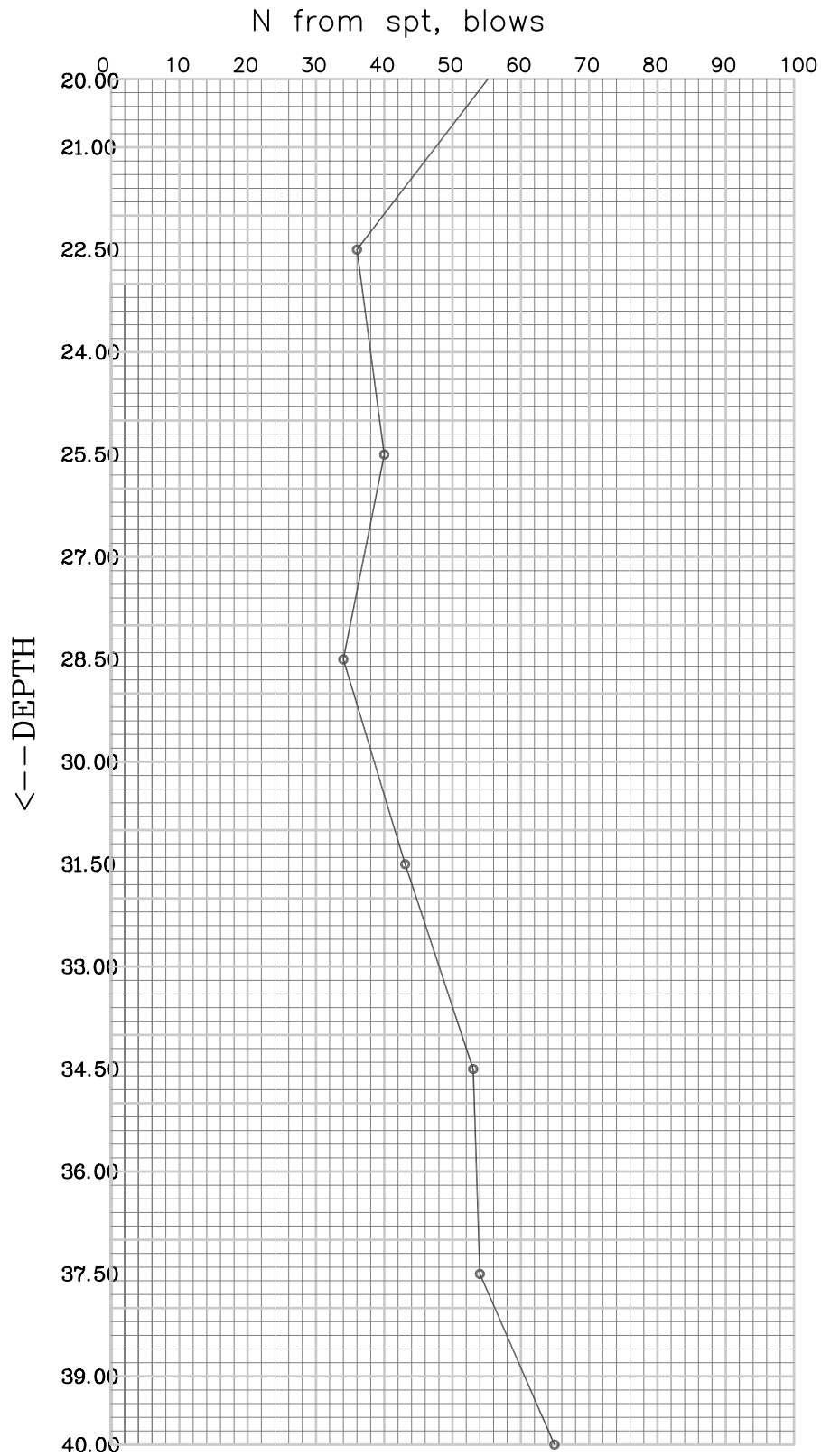


### SPT VS DEPTH GRAPH

BORE HOLE NO. : BH-10 Contd.

METHOD OF BORING	ROTARY
DIA. OF BORE	150 mm

G.W.T. ABOVE EXISTING G.L. (m)	3.50
TERMINATION DEPTH (m)	40.00



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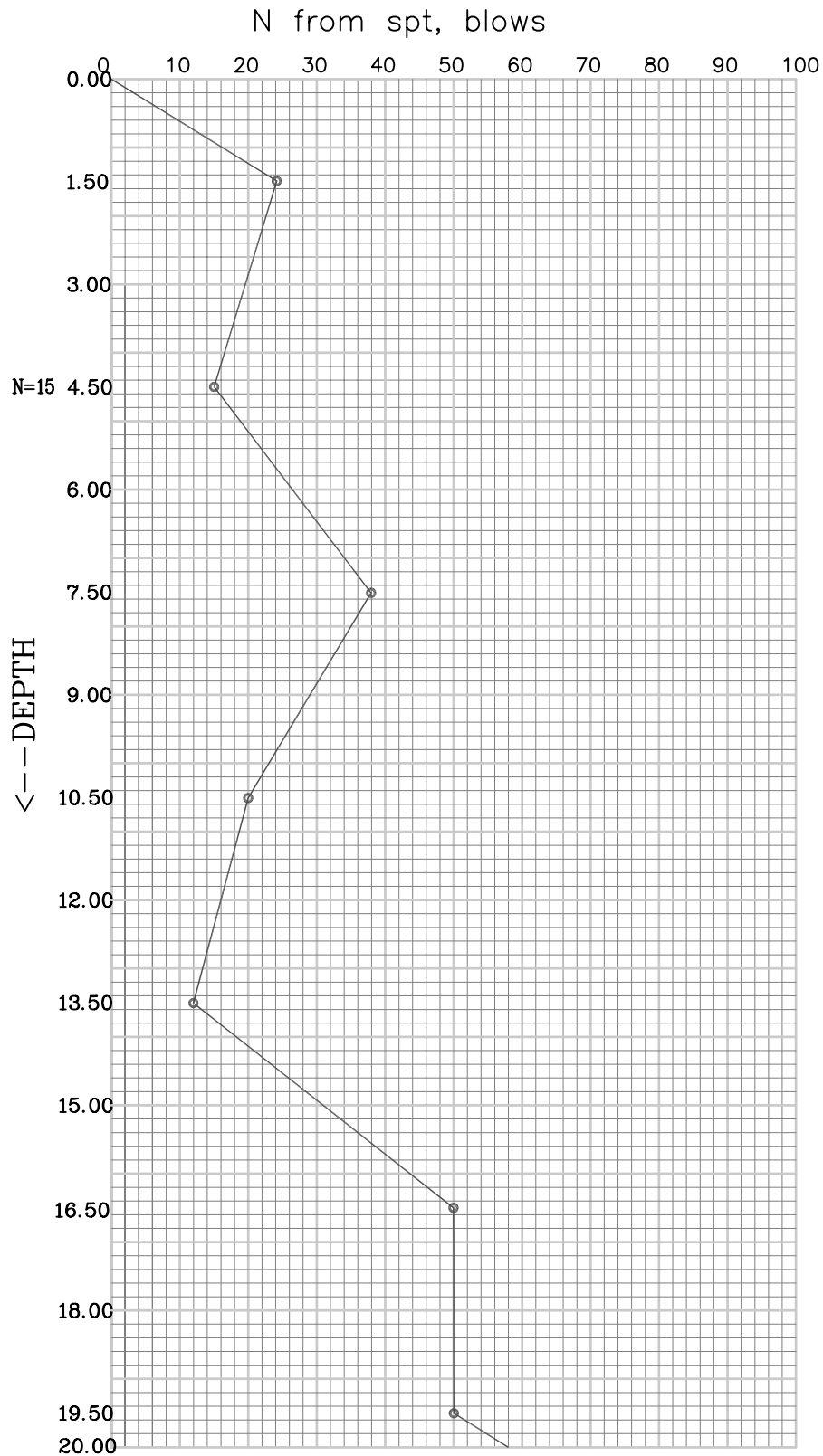
PROJECT :  
EPC CONTRACT FOR PROVIDING RO-RO TERMINAL  
AT GHOGHA, TAL: GHOGHA, DIST: BHAVNAGAR, STATE: GUJARAT.

## SPT VS DEPTH GRAPH

BORE HOLE NO. : BH-12

METHOD OF BORING	ROTARY
DIA. OF BORE	100 mm

G.W.T. ABOVE EXISTING G.L. (m)	0.00
TERMINATION DEPTH (m)	40.00



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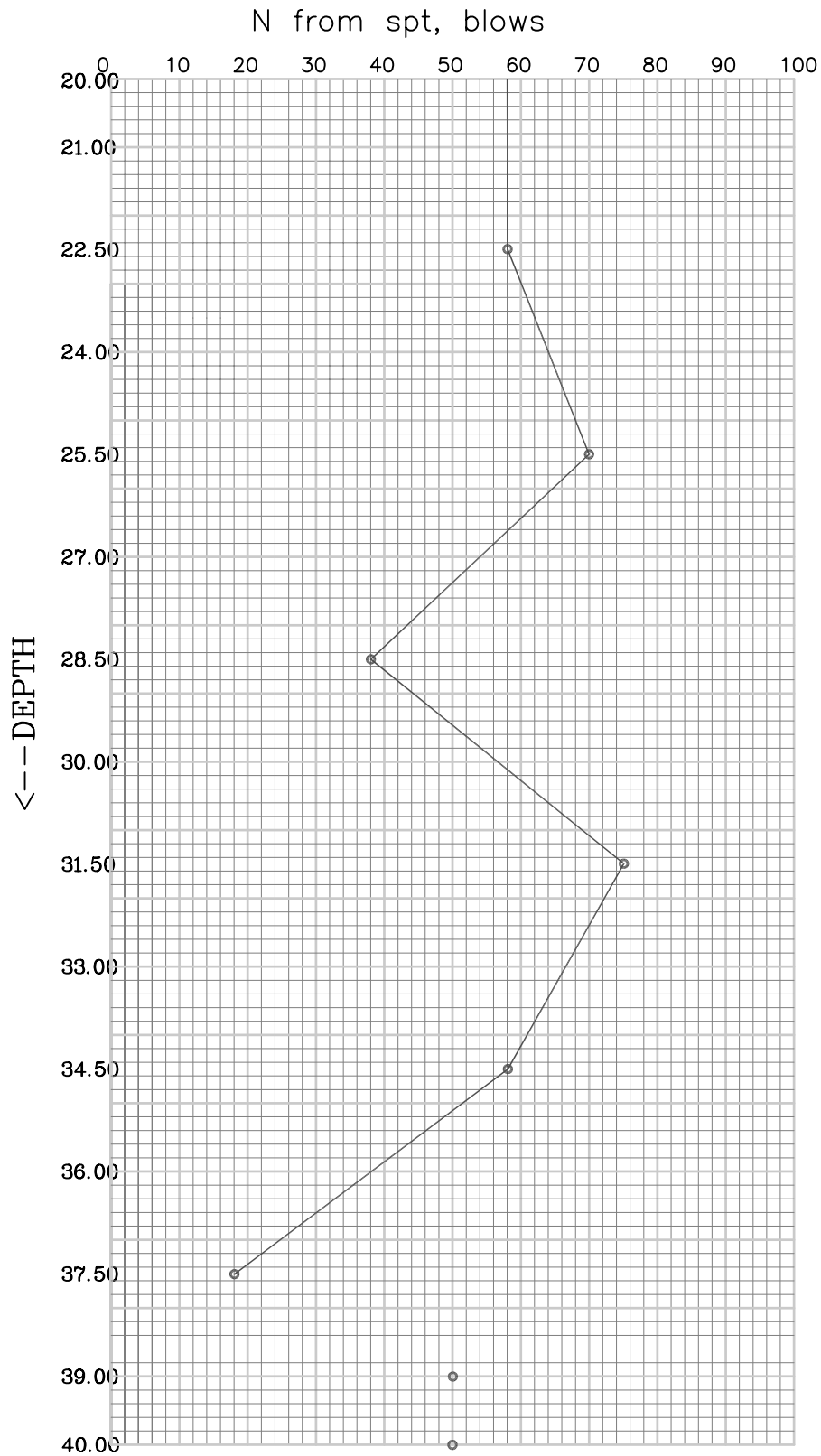
PROJECT :

EPC CONTRACT FOR PROVIDING RO-RO TERMINAL  
AT GHOGHA, TAL: GHOGHA, DIST: BHAVNAGAR, STATE: GUJARAT.

**SPT VS DEPTH GRAPH**  
**BORE HOLE NO. : BH-12Contd.**

METHOD OF BORING	ROTARY
DIA. OF BORE	100 mm

G.W.T. ABOVE EXISTING G.L. (m)	0.00
TERMINATION DEPTH (m)	40.00



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