REPORT ON

GEOTECHNICAL INVESTIGATION WORK FOR BOUNDARY WALL & SITE DEVELOPMENT FOR COMPRESSOR STATION FOR NORTH -EAST NATURAL GAS GRID PROJECT.

REPORT SUBMITTED TO

OVAL PROJECTS ENGINEERING PVT. LTD.

REPORT PREPARED BY:

RELIANT FOUNDATIONS PVT LTD

(An ISO 9001:2015 certified company)

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REPORT A REPORT ON GEOTECHNICAL INVESTIGATION WORK FOR BOUNDARY WALL & SITE DEVELOPMENT FOR COMPRESSOR STATION FOR NORTH -EAST NATURAL GAS GRID PROJECT.

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1. The work of soil Investigation was awarded to RELIANT FOUNDATIONS PVT. LTD.
Sun-Polo Colony, Byelane - Dipar Boro Path,Near Ayursundra Superspecialty Hospital , Ahomgaon , Garchuk Guwahati-781035.

2. Soil investigation work by making boreholes:

2.1 The field and laboratory investigations carried out by us to access the nature of sub-strata and to evaluate the soil parameters required for design of foundations proposed to be constructed for proposed construction.

2.2 Client's help is gratefully acknowledged in providing bore hole locations, close supervision and checking during boring, sampling, various testing operations and cooperation and guidance during finalization of report.

2.3 This report is based upon the results of field, laboratory tests conducted on selected soil samples collected from borehole locations.

3. SCOPE OF WORK:-

The scope of work provided to us for this project was limited to the following:-

3.1 Mobilizing necessary plant, equipments and personnel to the project site, setting up the equipment, carrying out the field investigations on land and demobilization on completion of work.

3.2 Making 150 mm nominal diameter bore holes at the site in all types of soil using suitable approved method of boring to be given at site by the Engineer-in-Charge. Refusal shall mean when SPT field 'N' value reaches 100 for 30 cm or less penetration of SPT sampler.

3.2.1 Conducting standard penetration tests in the bore holes at 1.50 m interval in depth as per specifications / instructions of Engineer-in-Charge.

3.2.2 Collecting undisturbed soil samples from bore holes at 3.0m interval or every change of strata, whichever is earlier as per specifications.

3.2.3 Collecting disturbed soil samples from bore hole at regular interval and at every identifiable change of strata to supplement the boring records.

3.2.4 Recording the depth of ground water table in all the bore hole if observed up to the depth of exploration during boring work as per specifications & withdrawing the casing pipe.

3.3 Conducting the following laboratory tests on selected disturbed / undisturbed soil samples collected from bore hole / test locations :-

(a) Bulk density and Moisture content
(b) Sieve analysis
(c) Hydrometer analysis
(d) Liquid limit & Plastic limits
(e) Specific gravity
(f) Shear test on undisturbed and remoulded saturated disturbed soil samples
(g) Determination of void ratio.

3.4 Preparation and submission of report in three copies.

4.0 FIELD INVESTIGATIONS:

4.1Necessary plant, equipment and personnel for conducting the requisite field work were mobilized to the site.

4.2 Bore hole was bored at this site using Auger and wash boring method as per **IS: 1892-1979.** Casing or Bentonite has been used as required to retain the bore hole. Depth of Bore holes were **30.50M** each.

4.3.1 **Standard penetration** tests were conducted in the above bore hole at every 1.50 m interval & at change of strata as per specifications / instructions of Engineer-in-Charge. The bore was cleaned up to the desired depths. Standard split spoon sampler attached to lower end of 'A' drill rods was driven in the bore holes by means of standard hammer of 63.5 Kg. falling freely from a height of 75 cm. The sampler was driven 45 cm as per specifications & the numbers of blows required for each 15 cm penetration were recorded. The numbers of blows for the first 15 cm penetration were not taken into account. This was considered as seating drive. The numbers of blows for next 30 cm penetration were designated as SPT 'N' value. Wherever the total penetration was less than 45 cm, the number of blows & the depth penetrated is incorporated in respective bore logs. Disturbed soil samples obtained from standard split spoon sampler for all the above standard penetration tests were collected in polythene bags of suitable size. These samples were properly sealed, labeled, recorded and carefully transported to the laboratory for testing.

4.3.2 **Undisturbed** soil samples were collected from the bore hole at every 3.00 m interval in depth & at change of strata as per sampling specifications. These sampling tubes after retrieval from the bore hole was properly waxed and sealed at both ends. These were carefully labeled and transported to the laboratory for testing. Undisturbed soil samples wherever slipped during lifting, were duly marked in the field bore logs as well as in the soil profile.

4.3.3 **Disturbed soil** samples were also collected from the bore hole at suitable depths/intervals to supplement the boring records. These samples were collected in polythene bags of suitable size. These samples were properly sealed, labeled, recorded & carefully transported to the laboratory for testing.

4.3.4 The depth of ground water table was checked / measured in all bore holes.

4.3.5 **Summary of bore holes:-**

Sl. No	Borehole number	Depth of borehole (M)	Depth of water table (M)
1	BH17	30.50	0.14 (Above)

5.0 LABORATORY INVESTIGATIONS:

5.1 The following laboratory tests were conducted on selected soil samples recovered from bore hole / test locations: -

(a) Bulk density and Moisture content

(b) Sieve analysis

(c) Hydrometer analysis

(d) Liquid limit & Plastic limits

(e) Specific gravity

(f) Shear test on remolded and saturated disturbed soil samples

(g) Determination of void ratio..

All the above laboratory tests were carried out as per relevant Indian Standards. All the soil samples were identified and classified as per IS: 1498-1970.

6.0 FINDING OF GEOTECHNICAL INVESTIGATION:

The study of bore logs/results of laboratory and other field tests are tabulated through different tables as annexure.

7.0 CALCULATION OF BEARING CAPACITY

A. Calculation of Net Safe Bearing Capacity based on shear Criteria

IS: 6403-1981 recommends the following equation to calculate the net Safe Bearing Capacity ' q_s' based on Hansen's Bearing Capacity analysis:

$$q_s=1/F \{CNc\, S_c\, d_c\, I_c + q\,(N_q - 1)\, S_q\, d_q\, i_q + 0.5\,\gamma\, B\, N_\gamma\, S_\gamma\, d_\gamma\, i_\gamma \times R_w\}$$

Where, C = Cohesion of soil.

γ = Saturated Density of soil

B = Width of footing = 2.0 m (assumed)

R_w = Water table correction factor depending upon position of water table with respect to founding level

Q = Effective surcharge at footing level = γ D (D = depth of footing)

N_c, Nq , N_γ = Bearing capacity factor

S_c, S_q ,S_γ = Shape factor

d_c, d_q, d_γ = depth factor

i_c, i_q , i_γ = inclination factors

F = Factor of safety =2.5

B) **Calculation of safe bearing pressure based on tolerable settlement.**

The safe bearing pressure is to be found out from the elastic settlement consideration and is found from the following equation given I.S. 8009 (part-1) 1976

$$S_f = S_{oed} = (H_t/ 1+e_o)\, C_c \log_{10} (po + \Delta p)/ p_o$$

S_f= Final settlement in mm

S_{oed} = Settlement computed from one dimensional test

H_t = Thickness of soil layer in m

e_o = Initial void ratio at mid height of of layer

C_c = Compression Index

Po = Initial effective pressure at mid height of layer

Δp = pressure increment

For the computation of settlement of foundation founded at certain depth, a correction should be applied to the calculated S_f in the form of a depth factor to be read from

Fig: 12 of I.S. 8009 (part-1) 1976.

Corrected settlement $S_{fd} = S_f$ x depth factor

Depth factor is dependent on the following

i. D= Depth of footing ii. L= Length of footing iii. B= Width of footing

For granular soil settlement is calculated from the *method Based on Dynamic PetutrationTest as per IS 8009-Part-I, 1976, reaffirmed 1998*

— Settlement of a footing of width *B* under unit **intensity** of pressure resting on dry cohesion less deposit with known standard **penetration** resistance value N, (determined according to IS: 2131- 1963t), may be read from Fig. 9 (*IS 8009-Part-I)* . The settlement under any other pressure may be **computed by** assuming that the settlement is proportional to the intensity of pressure.

8.0Pile load capacity (compression)

Ultimate bearing capacity in compression, Q_U from IS: 2911(Part-I/ Sec 2)-2010

$Qu = Q_P + Q_s$

= End bearing resistance + Frictional resistance of pile in sand and clay.

$Qu = [Ap \{(c\ Nc\}]$ or $Ap [1/2\ D\ \gamma\ N\gamma + P_D\ Nq)] + \Sigma\ K\ P_{Di}\ \tan\delta\ A_{Si} + \alpha\ Ca\ As + Ap\ Nc\ Cp$

$Q_P = [Ap\ Nc\ Cp]$ or $Ap [1/2\ D\ \gamma\ N\gamma + P_D\ Nq)]$

$Q_s = Q_{sc} + Q_{ss}$

$Q_{ss} = \Sigma\ K\ P_{Di} \tan\delta\ A_{Si}$

$Q_{sc} = \alpha\ Ca\ As$

Q_{pc} = End bearing resistance in clay = Ap Nc Cp

$Qsafe = Q_U/FOS = Q_U/2.5$

Where

Ap = Cross sectional area of pile toe in cm^2.

Nγ, Nq = bearing capacity factors depending upon the angle of internal friction

α = Adhesion factor (refer Fig 2, Annex-B, IS: 2911(Part-I/ Sec 2)-2010)

K = earth pressure coefficient Value lies between 1-1.5) Note 3 , Cl B-1 , Annex-B , IS: 2911(Part-I/ Sec 2)-2010)

δ = Angle of wall friction may be taken equal to the friction angle of the soil around the pile stem.

As = Circumferential area of pile stem = Πx l x d

l = Length of embedment.

d = Diameter of the pile.

Pile load capacity (uplift)

Ultimate uplift capacity Q_{Uf} = Skin friction + Self weight of pile

$= Q_s + Q_{self\ wt}$

8. RECOMMENDATION OF FOUNDATION:

After obtaining the laboratory test results of the samples collected from the field and analyzing the subsoil parameters in a very careful manner, the net safe bearing capacities of isolated footing foundation at different depths are calculated and shown below.

Table1:- SAFE BEARING CAPACITIES OF FOOTING FOUNDATIONS:-

Location	Depth of footing from EGL (M)	Footing size (M^2)	Net Safe Bearing Capacities (Metric Ton /Sqm.)
BH 17	2.00	2.0×2.0	11.28
	2.50	2.0×2.0	11.96
	3.00	2.0×2.0	12.63

RCC Pile Foundation: -

The load carrying capacities of bored cast in situ uniform diameter piles of 10.0M to 30.0M length with pile diameters 50cm, 60cm and 75cm. respectively are calculated and shown in Table2.

Table2: Safe Load carrying capacity of bored cast in situ uniform diameter pile

Pile Stem Dia. (cm)	Length of Pile from E.G.L. (m)	Pile Cutoff Length (m)	Recommended Safe Load Carrying Capacity (tone)		Safe load on pile in lateral (Metric ton)
			Compression	Uplift	
50	10.00	1	36.48	10.50	6.23
60		1	51.18	13.17	8.97
75		1	76.01	17.52	14.02
50	12.00	1	41.80	14.89	6.23
60		1	60.05	18.58	8.97
75		1	91.77	24.55	14.02
50	14.00	1	48.33	20.15	6.23
60		1	67.89	25.02	8.97
75		1	106.42	32.87	14.02
50	16.00	1	49.19	31.79	6.23
60		1	66.34	42.56	8.97
75		1	79.08	55.05	14.02
50	18.00	1	54.12	35.89	6.23
60		1	72.25	47.63	8.97
75		1	86.47	61.65	14.02
50	20.00	1	59.04	40.00	6.23
60		1	78.16	52.70	8.97
75		1	93.86	68.26	14.02
50	22.00	1	63.97	44.11	6.23
60		1	84.07	57.77	8.97
75		1	101.25	74.86	14.02
50	24.00	1	68.90	48.21	6.23
60		1	89.98	62.84	8.97
75		1	108.63	81.46	14.02

Pile Stem Dia. (cm)	Length of Pile from E.G.L. (m)	Pile Cutoff Length (m)	Recommended Safe Load Carrying Capacity (tone)		Safe load on pile in lateral (Metric ton)
			Compression	Uplift	
50	26.00	1	73.82	52.32	6.23
60		1	95.89	67.91	8.97
75		1	116.02	88.06	14.02
50	28.00	1	78.75	56.43	6.23
60		1	101.80	72.98	8.97
75		1	123.41	94.67	14.02
50	30.00	1	83.67	60.54	6.23
60		1	107.71	78.05	8.97
75		1	130.80	101.27	14.02

10.0 CONCLUSION: Safe bearing capacities of soil as well as pile load capacities are shown in above Tables.

ANNEX -I : Caculation of Net safe bearing capacity (Shear Criteria)

Depth of foundn , Df = **2.0** m

Width(B)M= 2	**Length L =** 2

Soil parameter

Cohesion, C= **0.45** kg/scm= 4.5 t/sqm

Saturated density , γ (Metric ton/m3) = **1.85**

Submerged density , γ (Metric ton/m3) = **1.85**

Angle of internal friction,Ø(deg)= 8 , shear condition Local

Angle of shearing resistance for local failure = $\emptyset_m = \tan^{-1} 2/3 \tan\emptyset$

		Bearing capacity factor		
Ø	8	Nc	Nq	Nγ
Ø m	5	6.49	1.57	0.45

Shape, Depth and inclination factor

Shape factor		**Depth factor**		**Inclination factor**		Water table corection factor
Sc=	1.3	dc=	1.22	ic=	1	
Sq=	1.2	dq=	1	iq=	1	W' = 0.5
Sγ =	0.8	dγ =	1	iγ =	1	

Ultimate bearing capacity (qd) (Local shear Condition)

q_d= {2/3 c Nc sc dc ic } + {γ D (Nq – 1)sq dq iq } + {0.5 γ B Nγ sγ dγ iγ W' }

q_d = {0.67x 4.5 x 6.49 x 1.3 x 1.22 x 1 }

.+ { 1.85 x 2 x (1.57 .- 1) x 1.2 x 1 x 1 }

.+ { 0.5 x 1.85 x 2 x 0.45 x 0.8 x 1 x 1 x 0.5 }

q_d = 30.98 .+ 2.5308 .+ 0.333 .= 33.85 Metric tonne/sqm

Net Safe bearing capacity , q_{ns} .= q_d /F = 33.85 Metric tonne/sqm / 3

F= factor of safety = 3.0

q_{ns} =	11.28 Metric tonne/sqm
q_{ns} =	110.6 KN/sqm

CALCULATION OF PILE LOAD CAPACITY

Pile Length .(M)	28.000	If Liquified strata than liquified level	No
Pile cutoff Length (m)	2.000	Pile Terminating level	
Angle of Internal Friction at Pile Tip (Degree)	Ø	0	
Cohesion at Pile tip (t/m2)	c	14.8	

Bearing Capacity Factor			
Nc	Nq	Ny	
9	0.00	0.00	0

Ultimate pile capacity , Qu = QP + Qs = { Ap Nc Cp + Ap (1/2 D γ Nγ + PD Nq} +{ Sum (K PDi tan d Asi) + alpha x Ca As }
Qp = End bearing resistnce , Qs = Frictional resistsnce

1.0 Pile dia (m) = 0.5

Depth from	Depth to	Length below cutoff (m)	Thickness of sand layer	Li	C, T/m2	alpha	Pile dia D, m	Circumferential area As, m2	K	phi	Y (metric ton/m3)	Ysub (metric ton/m3)	po' ton/m2	Qs, Tonne	Qp, Tonne	Qu, Tonne	Qsafe in copression , Metric Tonne	Q safe Uplift, Metric Tonne
0.00	2.00			2.00	Ignored						0.0							
2.00	9.60			7.60	5.23	0.42	0.50	11.94		0	1.78	0.78	5.93	26.22				
9.60	15.60		6.00	6.00			0.50	9.42	1.00	39	2.00	1.00	8.93	68.14				
15.60	28.00			12.40	14.00	0.28	0.50	19.48		0	2.12	1.12	13.89	76.35				
15D =	7.50	26.00	12.40	7.50			0.50			0	2.12	1.12	14.33	170.72	26.15	196.87	78.75	56.43

2.0 Pile dia (m) = 0.6

Depth from	Depth to	Length below cutoff (m)	Thickness of sand layer	Li	C, T/m2	alpha	Pile dia D, m	Circumferential area As, m2	K	phi	Y (metric ton/m3)	Ysub (metric ton/m3)	po' ton/m2	Qs, Tonne	Qp, Tonne	Qu, Tonne	Qsafe in copression , Metric Tonne	Q safe Uplift, Metric Tonne
0.00	2.00			2.00	Ignored						0.0							
2.00	9.60			7.60	5.23	0.58	0.60	14.33		0	1.78	0.78	5.93	43.46				
9.60	15.60		6.00	6.00			0.60	11.31	1.00	39	2.00	1.00	8.93	81.77				
15.60	28.00			12.40	14.00	0.28	0.60	23.37		0	2.12	1.12	13.89	91.62				
15D =	9.00	26.00	12.40	9.00			0.60			0	2.12	1.12	16.01	216.85	37.66	254.51	101.80	72.98

3.0 Pile dia (m) = 0.75

Depth from	Depth to	Length below cutoff (m)	Thickness of sand layer	Li	C, T/m2	alpha	Pile dia D, m	Circumferential area As, m2	K	phi	Y (metric ton/m3)	Ysub (metric ton/m3)	po' ton/m2	Qs, Tonne	Qp, Tonne	Qu, Tonne	Qsafe in copression , Metric Tonne	Q safe Uplift, Metric Tonne
0.00	2.00			2.00	Ignored						0.0							
2.00	9.60			7.60	5.23	0.58	0.75	17.91		0	1.78	0.78	5.93	54.32				
9.60	15.60		6.00	6.00			0.75	14.14	1.00	39	2.00	1.00	8.93	102.21				
15.60	28.00			12.40	14.00	0.28	0.75	29.22		0	2.12	1.12	13.89	114.53				
15D =	11.25	26.00	12.40	11.25			0.75			0	2.12	1.12	18.53	271.06	37.47	308.53	123.41	94.67

Annexure-II

Settlement Analysis as per IS 8003-1976

Total settlement , St = Si+Sc

St= Total settlement , Si= Immediate (elastic) settlement , Sc = Primary consolidation settlement

$Si = pB(1-\mu^2)I/Es$ $\qquad$ Sc = Soed = (Ht/ 1+eo) Cc log10 (po + Δp)/ po

p = Load intensity , B = Width of foundation , μ = Poissons ratio

I = Influence factor , Es = Modulus of elasticity of soil

Ht = Thickness of soil layer , eo = Initial void ratio at mid height of of layer

Cc = Compression Index , Po = Initial effective pressure at mid height of layer

Δp = Average pressure increment due to foundation loading

1. Settlement of clay strata

A. Calculation of Immediate settlement (Si)

Depth of foundation Df (M) =	3
LENGTH (L) in m =	2
BREATH (B) in m =	2
L/B=	1
INFLUNCE FACTOR (If)=	1.12
Load intensity (t/m^2)=	12.63

E (t/m^2)=	1320
μ=	0.5

Settlement (m), Si =	0.016075
Settlement (mm), Si =	16.07455

B.Calculation of Primary consolidation settlement= Sc

Cc=	0.11
eo=	0.65
H (m)=	4
field density (t/m^3)=	1.68
P=	8.4
ΔP = (at H/2 m depth)	3.1575
Settlement Sc (m)=	0.03696
Settlement Sc (mm)=	36.956

Total settlement Sc = A+B = 53.030

Correction factors

i	Depth correction factor from Fig 12 of IS -8009 Pt1. C.F=	0.65
ii	Rigidity factor (for raft foundation) cl 9.5.2	0.800
iii	λ= (Pore pressure correction factor, Cl9.2.3 of IS 8009, Pt1)	0.8

L/B=	1.00		
D/√(LB)=	1.50	√(LB) / D=	0.67

Total Corrected settlement , Sc = 34.46979 mm <40MM Safe

Ref : Appendix-C (cl 6.5.2) of IS 2911 (Part 1/Sec. 2) – 2010

Stiffness factor $R = \sqrt[4]{\frac{EI}{KB}}$ for clay soil

$T = \sqrt[5]{\frac{EI}{\eta h}}$ for sandy soil

E = Modulus of Elasticity of pile material= $5000\sqrt{f_{ck}}$

E = 25×10^6 KN/m^2 for concrete for f_{ck} = 25 N/mm^2

I = Moment of Inertia = $\pi D^4/64$

B= D = diameter of pile

Deflection of pile

$$y = \frac{H(e+Zf)x1000}{12\,EI}$$

H= lateral load in KN

y = deflection of pile head in mm

e = cantilever length above ground/ bed

E= Modulus of elasticity in KN/m^2

I = Moment of Inertia in m^4

Z_f= Depth of point of fixity in m

Calculation Details (Clay)

		fck=	25	N/mm2	
		E=	25000000	KN/m2	
1	Pile dia	B=D(m)	0.50		
2	Pile Length	L(m)	10.00		
3	Pile Length (soft soil)	L1(m)	0.00		
					for Cohesive soil
5	k1= Modulus of subgrade reaction		19800.00	KN/m3	(medium stiff)
6	K = k1x0.3/(1.5 xB)		7920.00		
7	I= Moment of inertia		0.00	m4	
8	E = Modulus of elasticity		25000000	KN/m2	
9	R		2.10		
10	L1/R		0.00		
11	2R		4.20		L=12 > 2R
12	3.5R				
13	Lf/R		2.00		
14	Lf		4.20		
15	e (m)	eccentricity	0.00		
16		(Length of fixity)	6.68		
17	y=(Permissible deflection mm)		5.00		
18	**H = lateral load capacity**		**62.30**	**KN =**	**6.23** **Ton**

Ref : Appendix-C (cl 6.5.2) of IS 2911 (Part 1/Sec. 2) – 2010

Stiffness factor $R = \sqrt[4]{\frac{EI}{KB}}$ for clay soil

$T = \sqrt[5]{\frac{EI}{\eta h}}$ for sandy soil

E = Modulus of Elasticity of pile material= $5000\sqrt{f_{ck}}$

E = 25×10^6 KN/m^2 for concrete for f_{ck} = 25 N/mm^2

I = Moment of Inertia = $\pi D^4/64$

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$$y = \frac{H(e+Zf)x1000}{12\,EI}$$

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y = deflection of pile head in mm

e = cantilever length above ground/ bed

E= Modulus of elasticity in KN/m^2

I = Moment of Inertia in m^4

Z_f= Depth of point of fixity in m

Calculation Details (Clay)

		fck=	25	N/mm2	
		E=	25000000	KN/m2	
1	Pile dia	B=D(m)	0.60		
2	Pile Length	L(m)	10.00		
3	Pile Length (soft soil)	L1(m)	0.00		
					for Cohesive soil
5	k1= Modulus (		19800.00	KN/m3	(medium stiff)
6	K = k1x0.3/(1.5 xB)		6600.00		
7	I= Moment of inertia		0.01	m4	
8	E = Modulus of elasticity		25000000	KN/m2	
9	R		2.52		
10	L1/R		0.00		
11	2R		5.03		L=12 > 2R
12	3.5R				
13	Lf/R		2.00		
14	Lf		5.03		
15	e (m)	eccentricity	0.00		
16		(Length of fixity)	6.68		
17	y=(Permissible deflection mm)		6.00		
18	**H = lateral load capacity**		**89.71**	**KN =**	**8.97** **Ton**

Ref : Appendix-C (cl 6.5.2) of IS 2911 (Part 1/Sec. 2) – 2010

Stiffness factor $R = \sqrt[4]{\frac{EI}{KB}}$ for clay soil

$T = \sqrt[5]{\frac{EI}{\eta h}}$ for sandy soil

E = Modulus of Elasticity of pile material= $5000\sqrt{f_{ck}}$

E = $25x10^6$ KN/m^2 for concrete for f_{ck} = 25 N/mm^2

I = Moment of Inertia = $\pi D^4/64$

B= D = diameter of pile

Deflection of pile

$$y = \frac{H(e+Zf)x1000}{12\,EI}$$

H= lateral load in KN

y = deflection of pile head in mm

e = cantilever length above ground/ bed

E= Modulus of elasticity in KN/m^2

I = Moment of Inertia in m^4

Z_f = Depth of point of fixity in m

Calculation Details (Clay)

		fck=	25	N/mm2	
		E=	25000000	KN/m2	
1	Pile dia	B=D(m)	0.75		
2	Pile Length	L(m)	10.00		
3	Pile Length (soft soil)	L1(m)	0.00		
					for Cohesive soil
5	k1= Modulus of subgrade reaction		19800.00	KN/m3	(medium stiff)
6	K = k1x0.3/(1.5 xB)		5280.00		
7	I= Moment of inertia		0.02	m4	
8	E = Modulus of elasticity		25000000	KN/m2	
9	R		3.15		
10	L1/R		0.00		
11	2R		6.29		L=12 > 2R
12	3.5R				
13	Lf/R		2.00		
14	Lf		6.29		
15	e (m)	eccentricity	0.00		
16		(Length of fixity)	6.68		
17	y=(Permissible deflection mm)		7.50		
18	**H = lateral load capacity**		**140.17**	**KN =**	**14.02** **Ton**

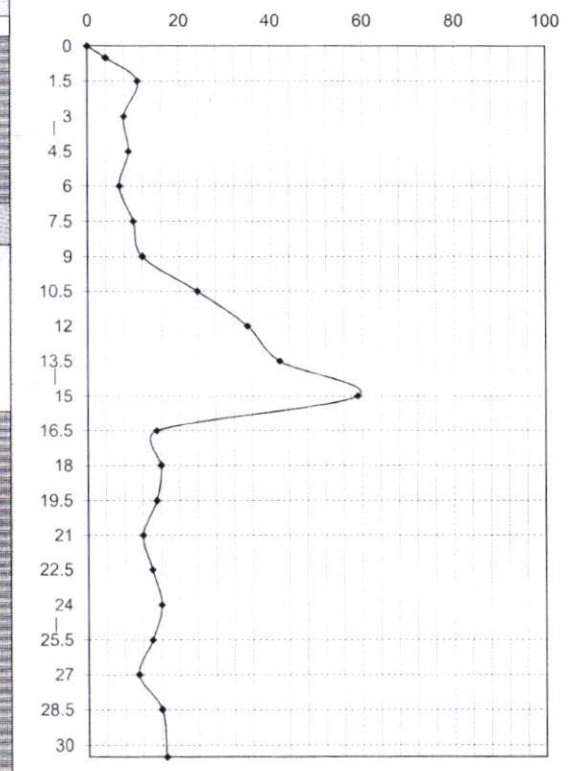
Name of Project :GEO-TECHNICAL INVESTIGATION WORK FOR PROPOSED CONSTRUCTION OF BOUNDARY WALL, NEGG PIPE LINE AT BARPALAHA, BEZERA ASSAM

BORE LOG CHART

BORE HOLE NO: 17 | DATE OF STARTING: 11-06-2022 | DATE OF COMPLETION: 11-06-2022 | GROUND WATER LEVEL Above 0.14 from EGL | AUGER & WASH BORING

DEPTH (M)	TYPE OF SAMPLE	SPT 15 CM	15 CM	15 CM	N-Value	VISUAL DESCRIPTION OF SOIL	LOG
0.50-0.95	P	1	2	2	4	Grayish Silty Clay.	
1	U					1.30M	
1.5-1.95	P	3	5	6	11	Grayish Fine SAND.	
2	D					2.00M	
2.00-2.90						Grayish SANDY clay 2.90M	
3.0-3.45	P	2	3	5	8	Grayish SILTY CLAY	
3.5	U						
4.5-4.95	P	3	4	5	9		
5	U						
6.0-6.45	P	3	4	3	7		
6.5	U						
7.5-7.95	P	4	4	6	10		
8	D					7.80M	
9.0-9.45	P	4	5	7	12	Grayish SANDY clay	
9.5	U					9.60M	
10.5-10.95	P	8	10	14	24	Grayish Fine To Medium SAND.	
11	D						
12.0-12.45	P	13	16	19	35		
12.5	D						
13.5-13.95	P	18	20	22	42		
14	D						
15.0-15.45	P	23	27	32	59		
15.5	D					15.60M	
16.5-16.95	P	6	7	8	15	Grayish SILTY CLAY	
17	U						
18.0-18.45	P	7	7	9	16		
18.5	U						
19.50-19.95	P	6	7	8	15		
20	U						
21.0-21.45	P	6	6	6	12		
21.5	U						
22.5-22.95	P	5	8	6	14		
23	U						
24.0-24.45	P	7	7	9	16		
24.5	U						
25.5-25.95	P	8	6	8	14		
26	U						
27.0-27.45	P	7	6	5	11		
27.5	U						
28.5-28.95	P	6	8	8	16		
29	U						
30.0-30.45	P	7	9	8	17		
30.5	U					30.50M	

GRAPHICAL REPRESENTATION OF N-Value



U: UNDISTURBED SAMPLE:: D: DISTURBED SAMPLE:: P: STANDARD PENETRATION TEST::

EGL: EXISTING GROUND LEVEL R:REFUSAL;N>100::