

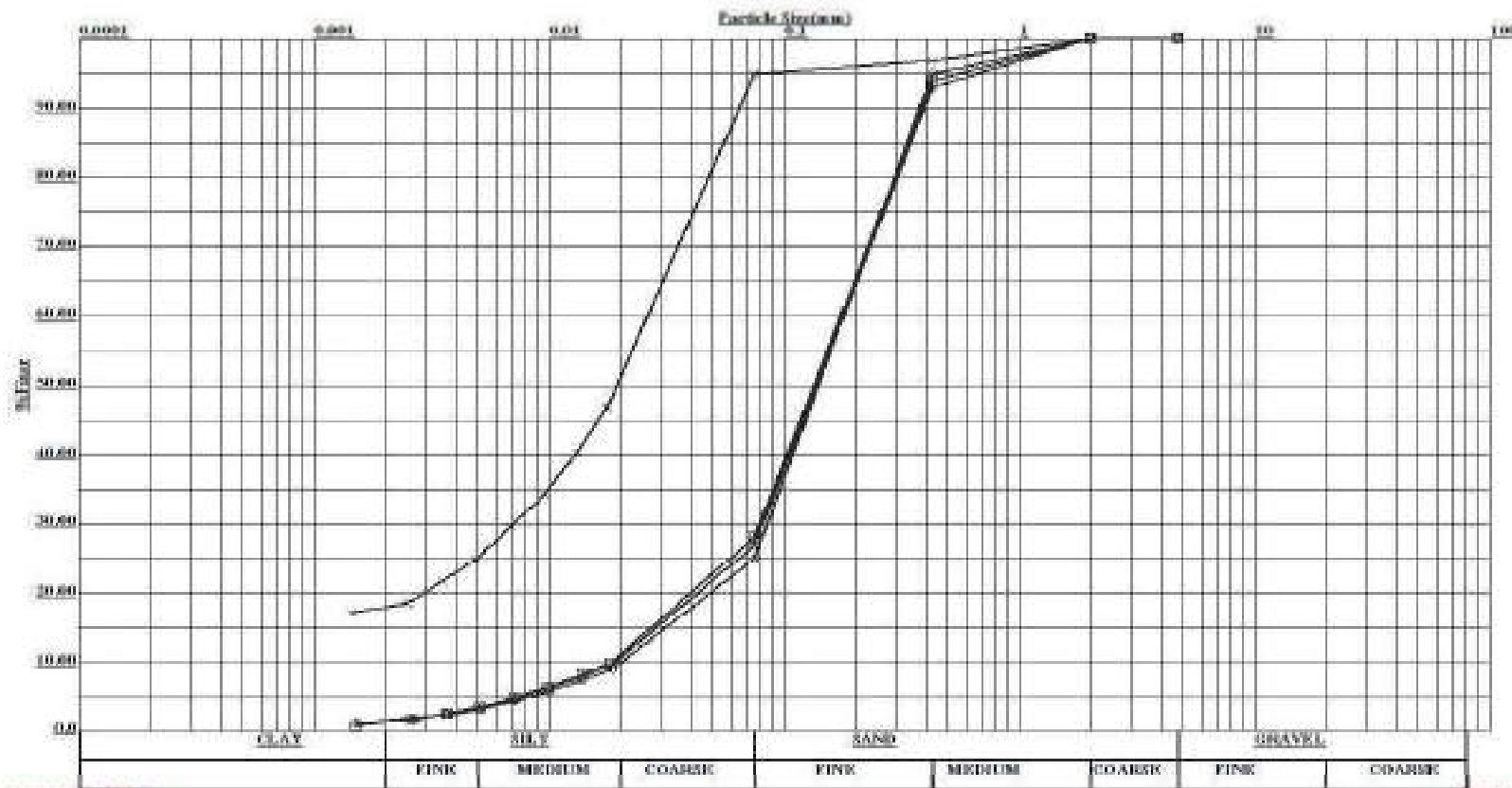
PROJECT: Final location survey for New B.G Railway line projects (770.00 km.) and Final location survey for construction of Doubling/Third line/ 3rd & 4th line (252.00 km.) of North Eastern Railway (Total 1022.00 km)

BRIDGE NO. - 14

BOREHOLE NO. - 03

SECTION:CHITAUNI TO MADHUBANI

GRAIN SIZE ANALYSIS



Symbol	Depth, m	Soil Description	Gravel	Sand	Silt	Clay	C_u	C_c
			(%)	(%)	(%)	(%)		
×	0.0	LOOSE LITE BROWN LOW PLASTICITY CLAY (CL)	0.00	5.00	77.00	18.00	-	-
○	1.5	LOOSE TO DENSE LITE GREY SILTY SAND (SM)	0.00	75.00	23.00	2.00	8.85	2.00
□	3.0		0.00	72.00	27.00	1.00	9.53	1.97
◇	6.0		0.00	73.00	25.00	2.00	9.44	1.95



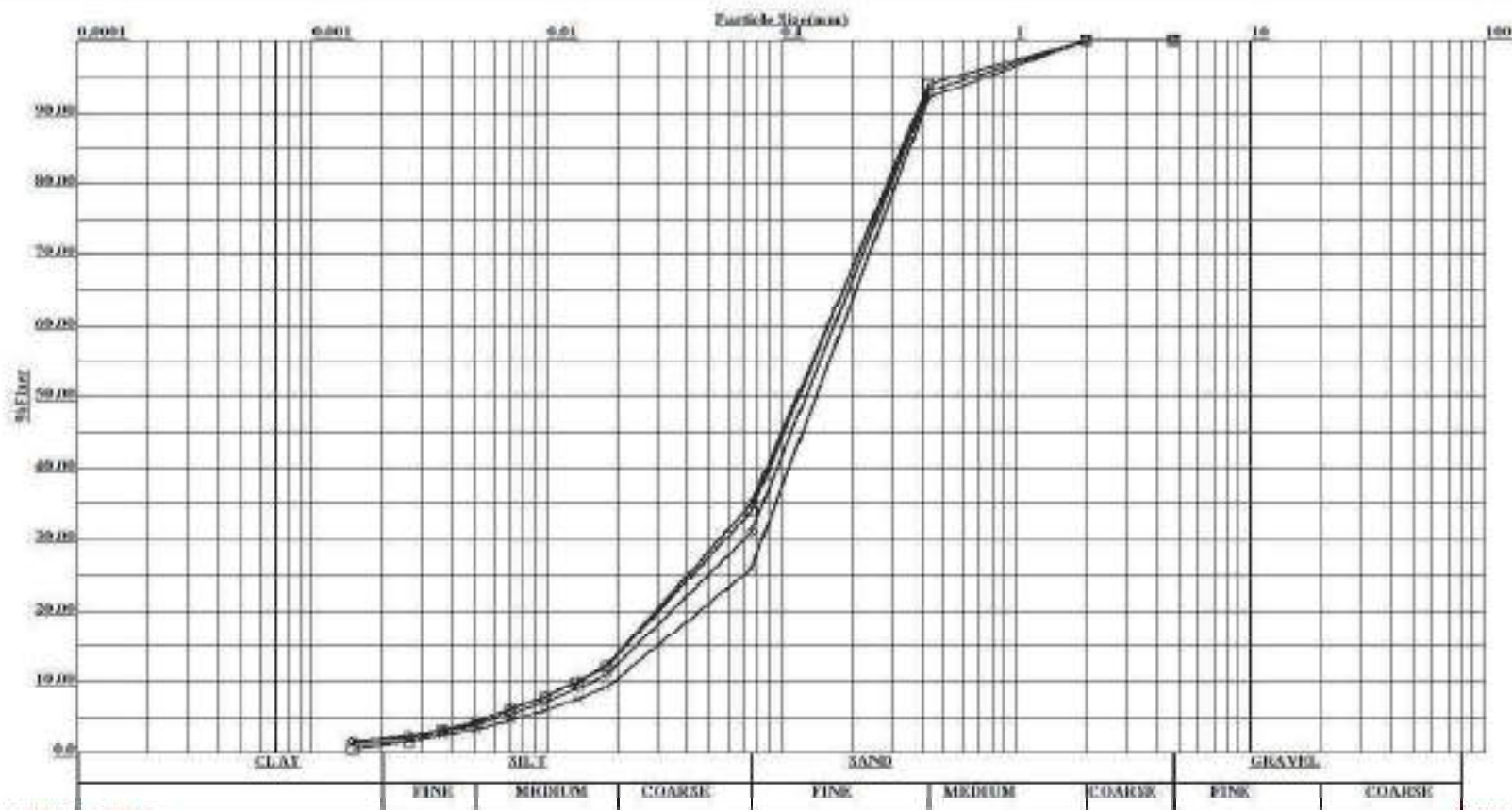
PROJECT: Final location survey for New B.G Railway line projects (770.00 km.) and Final location survey for construction of Doubling/Third line/ 3rd & 4th line (252.00 km.) of North Eastern Railway (Total 1022.00 km)

BRIDGE NO. - 14

BOREHOLE NO. - 03

SECTION:CHITAUNI TO MADHUBANI

GRAIN SIZE ANALYSIS



Symbol	Depth, m	Soil Description	Gravel	Sand	Silt	Clay	C _u	C _c
			(%)	(%)	(%)	(%)		
×	9.0	LOOSE TO DENSE LITE GREY SILTY SAND (SM)	0.00	74.00	25.00	1.00	9.45	1.95
○	12.0		0.00	69.00	29.00	2.00	10.77	1.84
□	15.0		0.00	66.00	33.00	1.00	11.53	1.53
◇	18.0		0.00	65.00	33.00	2.00	11.97	1.43



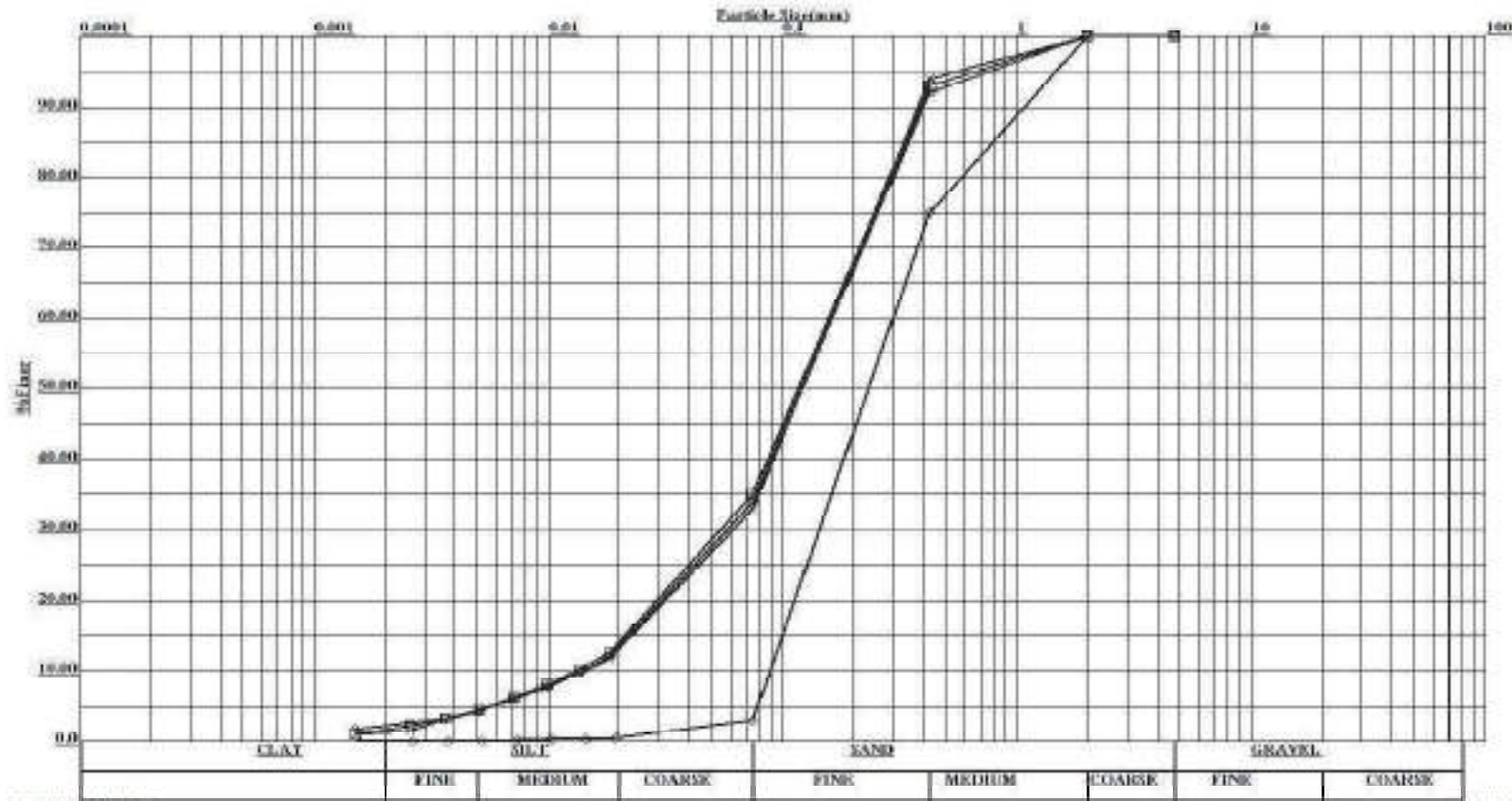
PROJECT: Final location survey for New B.G Railway line projects (770.00 km.) and Final location survey for construction of Doubling/Third line/ 3rd & 4th line (252.00 km.) of North Eastern Railway (Total 1022.00 km)

BRIDGE NO. - 14

BOREHOLE NO. - 03

SECTION:CHITAUNI TO MADHUBANI

GRAIN SIZE ANALYSIS



Symbol	Depth, m	Soil Description	Gravel	Sand	Silt	Clay	C_u	C_c
			(%)	(%)	(%)	(%)		
x	21.0	LOOSE TO DENSE LITE GREY SILTY SAND (SM)	0.00	67.00	32.00	1.00	11.26	1.63
○	24.0		0.00	66.00	32.00	2.00	11.83	1.49
□	27.0		0.00	65.00	33.00	2.00	11.97	1.43
◇	30.0	MEDIUM DENSE TO VERY DENSE DARK GREY POORLY GRADED SAND (SP)	0.00	97.00	3.00	0.00	3.34	0.79

Symbol	Depth, m	Soil Description	Gravel	Sand	Silt	Clay	C _u	C _c
			(%)	(%)	(%)	(%)		
×	33.0	MEDIUM DENSE TO VERY DENSE DARK GREY POORLY GRADED SAND (SP)	0.00	96.00	4.00	0.00	3.23	0.79
○	36.0		0.00	97.00	3.00	0.00	3.04	0.80
□	38.5		0.00	96.00	4.00	0.00	3.04	0.80

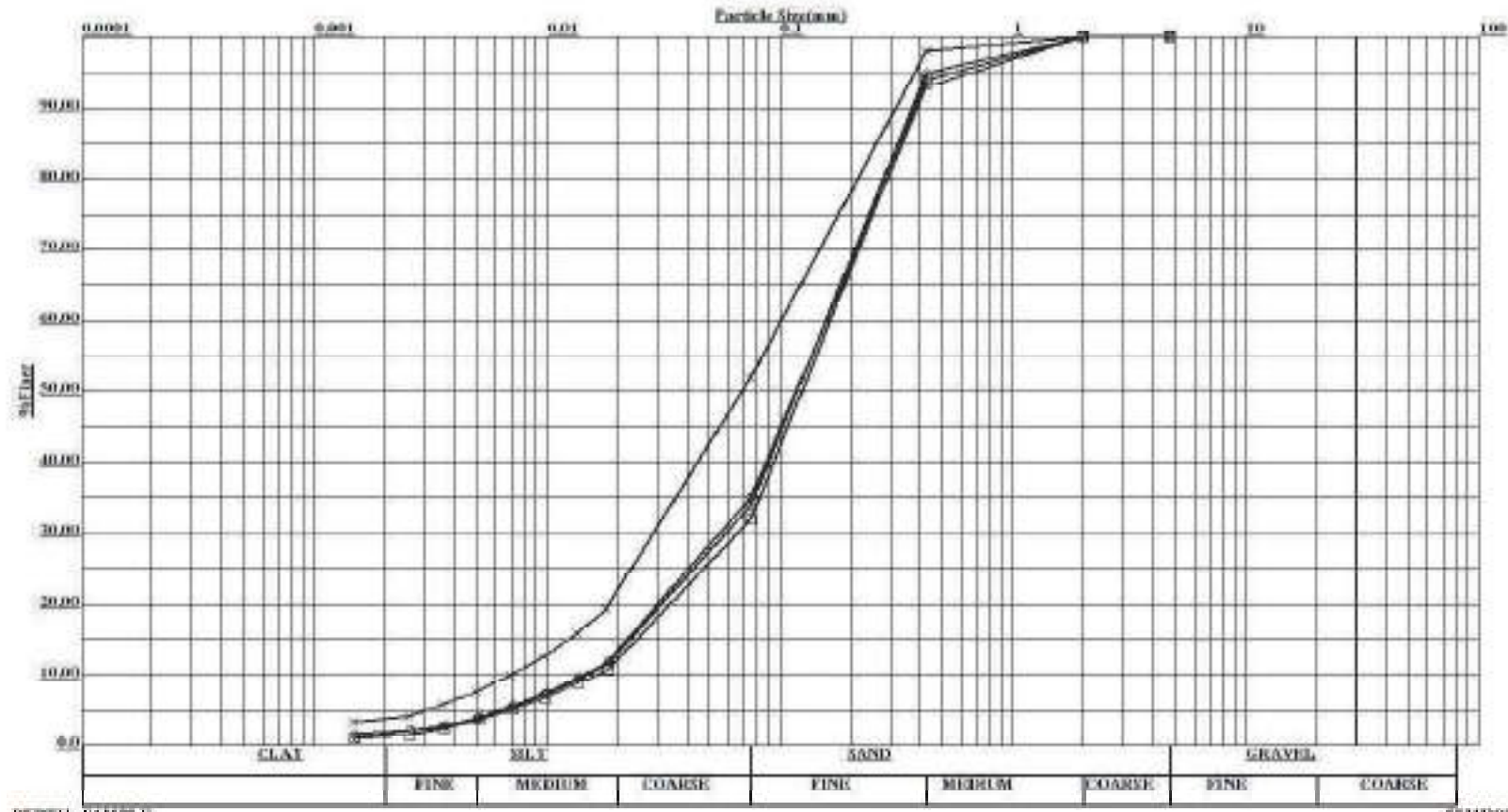


PROJECT: Final location survey for New B.G Railway line projects (770.00 km.) and Final location survey for construction of Doubling/Third line/ 3rd & 4th line (252.00 km.) of North Eastern Railway (Total 1022.00 km)

BRIDGE NO. - 14
SECTION:CHITAUNI TO MADHUBANI

BOREHOLE NO. - 04

GRAIN SIZE ANALYSIS



Symbol	Depth, m	Soil Description	Gravel	Sand	Silt	Clay	C_u	C_c
			(%)	(%)	(%)	(%)		
x	0.0	LITE BROWN SANDY SILT (ML)	0.00	48.00	48.00	4.00	14.65	1.18
O	1.5	LOOSE TO MEDIUM DENSE LITE GREY SILTY SAND (SM)	0.00	65.00	33.00	2.00	11.02	1.34
□	3.0		0.00	68.00	31.00	1.00	10.13	1.62
◇	6.0		0.00	66.00	32.00	2.00	10.53	1.45

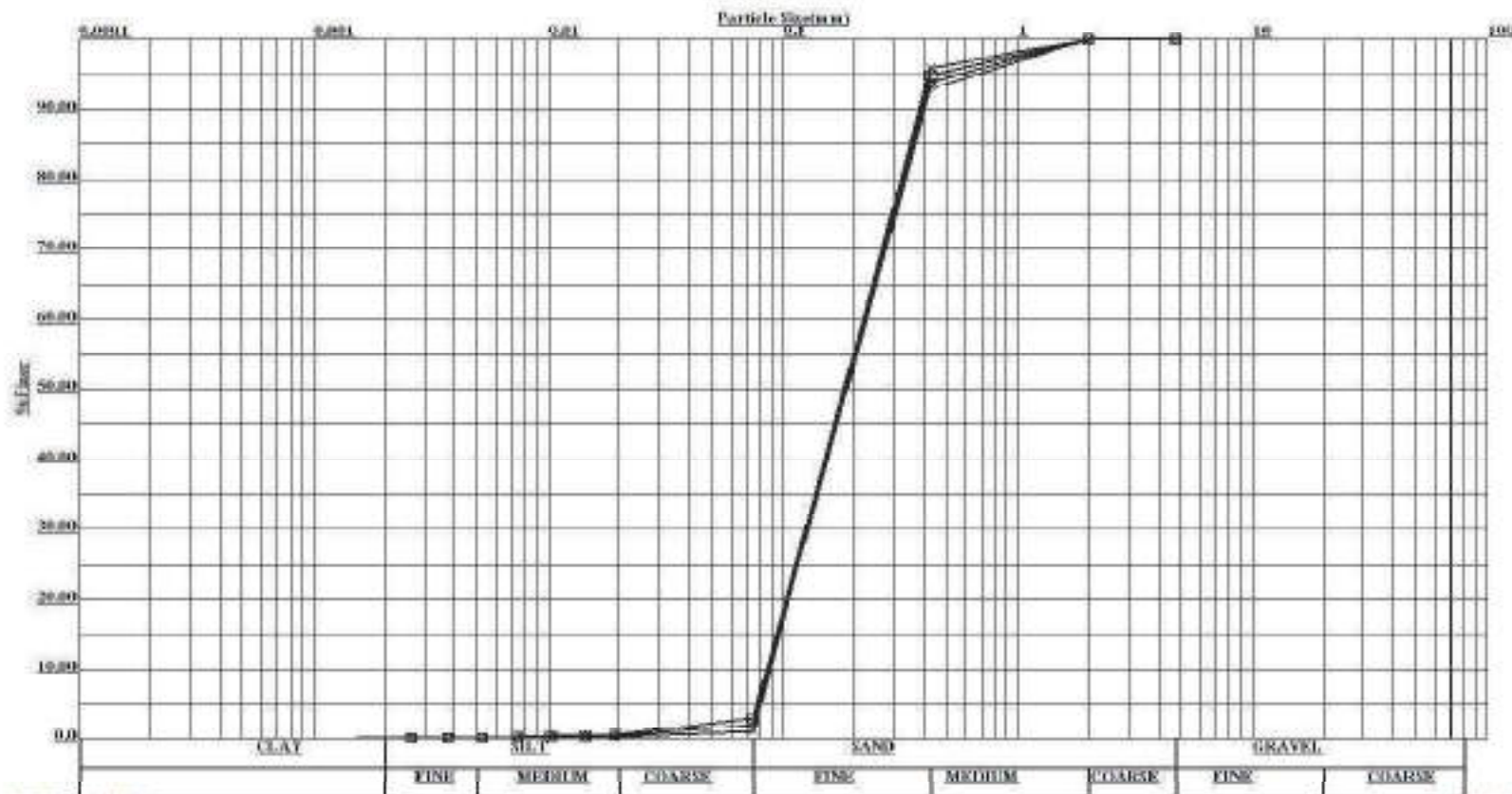
PROJECT: Final location survey for New B.G Railway line projects (770.00 km.) and Final location survey for construction of Doubling/Third line/ 3rd & 4th line (252.00 km.) of North Eastern Railway (Total 1022.00 km)

BRIDGE NO. - 14

BOREHOLE NO. - 04

SECTION:CHITAUNI TO MADHUBANI

GRAIN SIZE ANALYSIS



Symbol	Depth, m	Soil Description	Gravel	Sand	Silt	Clay	C_u	C_c
			(%)	(%)	(%)	(%)		
×	9.0	MEDIUM DENSE TO VERY DENSE DARK GREY POORLY GRADED SAND (SP)	0.00	99.00	1.00	0.00	2.49	0.83
○	12.0		0.00	98.00	2.00	0.00	2.57	0.83
□	15.0		0.00	97.00	3.00	0.00	2.57	0.83
◇	18.0		0.00	98.00	2.00	0.00	2.59	0.83



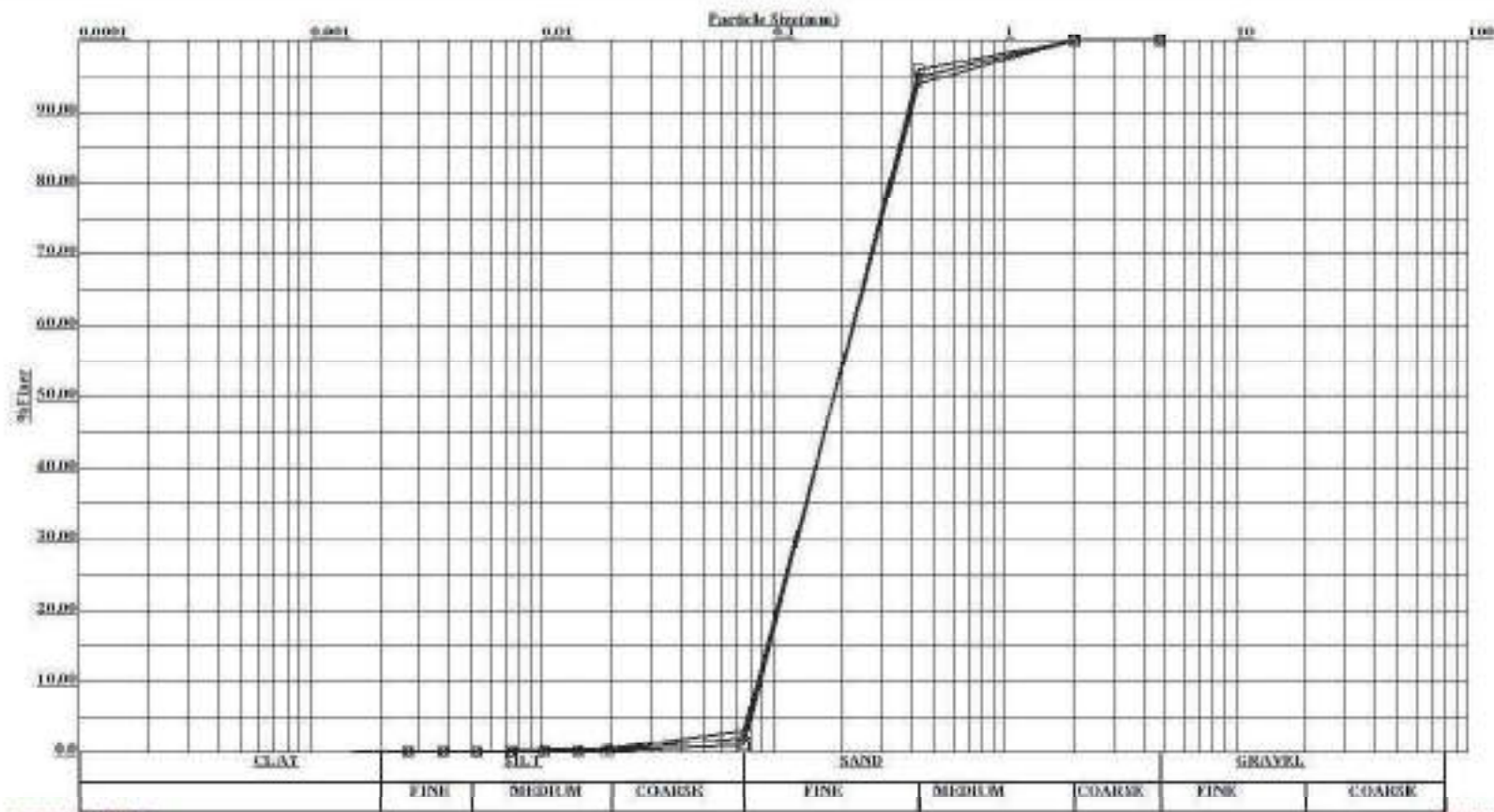
PROJECT: Final location survey for New B.G Railway line projects (770.00 km.) and Final location survey for construction of Doubling/Third line/ 3rd & 4th line (252.00 km.) of North Eastern Railway (Total 1022.00 km)

BRIDGE NO. - 14

BOREHOLE NO. - 04

SECTION:CHITAUNI TO MADHUBANI

GRAIN SIZE ANALYSIS



Symbol	Depth, m	Soil Description	Gravel	Sand	Silt	Clay	C _u	C _c
			(%)	(%)	(%)	(%)		
×	21.0	MEDIUM DENSE TO VERY DENSE DARK GREY POORLY GRADED SAND (SP)	0.00	97.00	3.00	0.00	2.59	0.83
○	24.0		0.00	98.00	2.00	0.00	2.54	0.83
□	27.0		0.00	99.00	1.00	0.00	2.49	0.83
◇	30.0		0.00	98.00	2.00	0.00	2.54	0.83



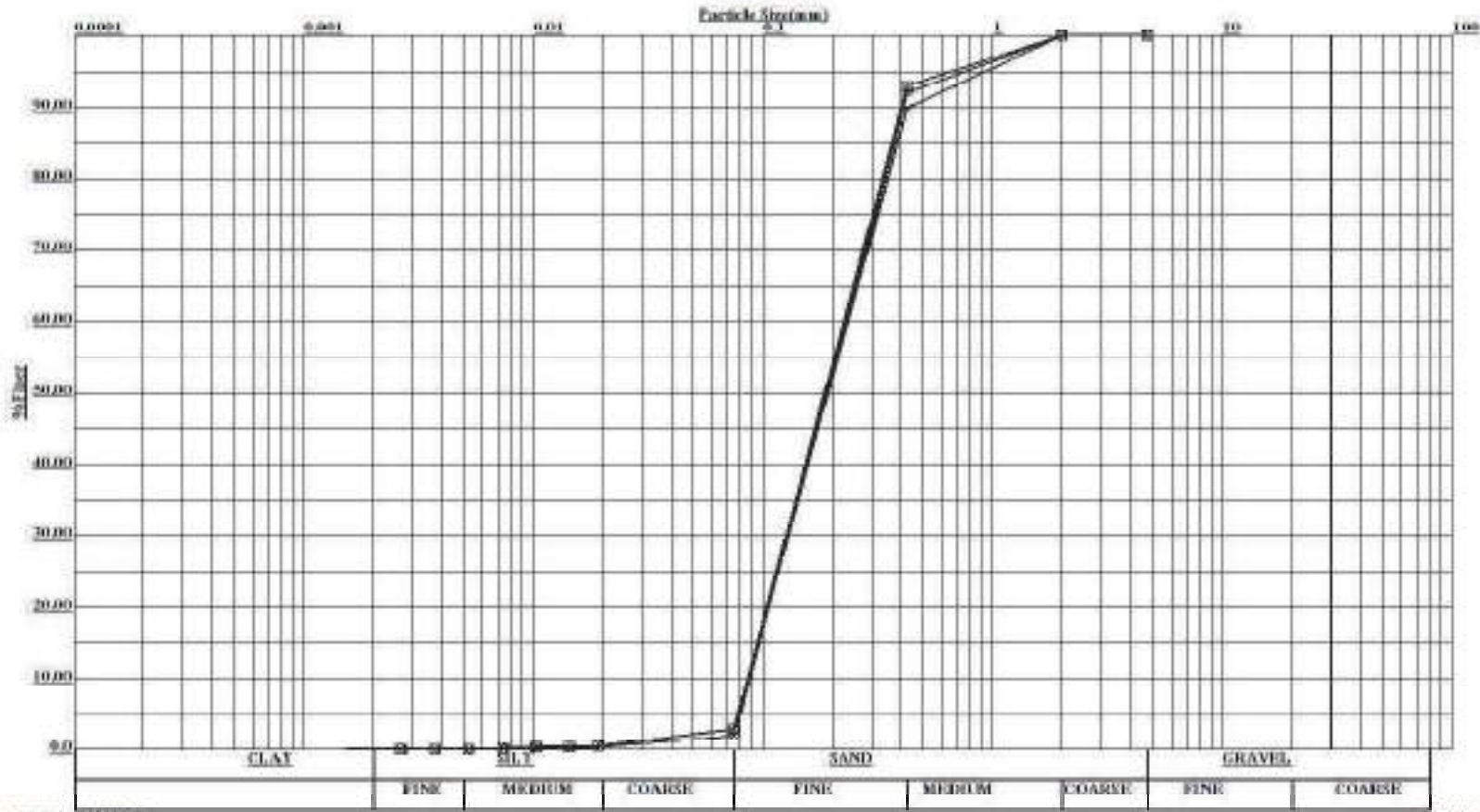
PROJECT: Final location survey for New B.G Railway line projects (770.00 km.) and Final location survey for construction of Doubling/Third line/ 3rd & 4th line (252.00 km.) of North Eastern Railway (Total 1022.00 km)

BRIDGE NO. - 14

BOREHOLE NO. - 04

SECTION:CHITAUNI TO MADHUBANI

GRAIN SIZE ANALYSIS



Symbol	Depth, m	Soil Description	Gravel (%)	Sand (%)	Silt (%)	Clay (%)	C_u	C_c
×	33.0	MEDIUM DENSE TO VERY DENSE DARK GREY POORLY GRADED SAND (SP)	0.00	97.00	3.00	0.00	2.71	0.82
○	36.0		0.00	98.00	2.00	0.00	2.62	0.82
□	39.0		0.00	97.00	3.00	0.00	2.62	0.82



COMPUTATION OF WEIGHTED MEAN DIAMETER OF PARTICLES AND SILT FACTOR

Project: Final location survey for New B.G Railway line projects (770.00 km.) and Final location survey for construction of Doubling/Third line/ 3rd & 4th line (252.00 km.) of North Eastern Railway (Total 1022.00 km)

Sl.No.	Borehole No.	BRIDGE NO - 14		BOREHOLE NO-01										Section : CHITAUNI - MADHUBANI											
		Depth (m)		Description of the Soil Strata	IS Classification	Percentage Retained							Mean Particle Size (mm)							Sandy Strata		Clayey Soil			
		From	To			5.60 to 4.00	4.00 to 2.80	2.80 to 1.00	1.00 to 0.425	0.425 to 0.180	0.180 to 0.075	0.075 to 0	4.8	3.4	1.9	0.7125	0.3025	0.1275	0.0375	Mean Particle Size (dm)	Silt Factor in the layer= 1.76 x sqrt(dm)	Average Cohesion Intercept - c (kg/cm²)	Average Angle of Internal Friction (°)	F	Silt Factor = $\frac{K_{sf}c}{F \times (1 + \sqrt{c})}$
1	BH-01	1.50	1.95	SILTY SAND	SM	0.0	0.0	0.0	6.0	38.0	24.0	32.0	0.00	0.00	0.00	4.28	11.50	3.06	1.200	0.200	0.788	-	-	-	-
2		3.00	3.45	SILTY SAND	SM	0.0	0.0	2.0	6.0	35.0	22.0	35.0	0.00	0.00	3.80	4.28	10.59	2.81	1.313	0.228	0.840	-	-	-	-
3		6.00	6.45	SILTY SAND	SM	0.0	0.0	0.0	5.0	43.0	18.0	34.0	0.00	0.00	0.00	3.56	13.01	2.30	1.275	0.201	0.790	-	-	-	-
4		12.00	12.45	SILTY SAND	SM	0.0	0.0	0.0	7.0	36.0	22.0	35.0	0.00	0.00	0.00	4.99	10.89	2.81	1.313	0.200	0.787	-	-	-	-
5		15.00	15.45	SILTY SAND	SM	0.0	0.0	0.0	6.0	37.0	23.0	34.0	0.00	0.00	0.00	4.28	11.19	2.93	1.275	0.197	0.781	-	-	-	-
6		18.00	18.45	POORLY GRADED SAND	SP	0.0	0.0	1.0	4.0	69.0	24.0	2.0	0.00	0.00	1.90	2.85	20.87	3.06	0.075	0.288	0.944	-	-	-	-



COMPUTATION OF WEIGHTED MEAN DIAMETER OF PARTICLES AND SILT FACTOR

Project: Final location survey for New B.G Railway line projects (770.00 km.) and Final location survey for construction of Doubling/Third line/ 3rd & 4th line (252.00 km.) of North Eastern Railway (Total 1022.00 km)

Sl.No.	Borehole No.	BRIDGE NO- 14		BOREHOLE NO-02									Section : CHITAUNI - MADHUBANI												
		Depth (m)		Description of the Soil Strata	IS Classification	Percentage Retained							Mean Particle Size (mm)							Sandy Strata		Clayey Soil			
		From	To			5.60 to 4.00	4.00 to 2.80	2.80 to 1.00	1.00 to 0.425	0.425 to 0.180	0.180 to 0.075	0.075 to 0	4.8	3.4	1.9	0.7125	0.3025	0.1275	0.0375	Mean Particle Size (dm)	Silt Factor in the layer= 1.76 x sqrt(dm)	Average Cohesion Intercept - c (kg/cm ²)	Average Angle of Internal Friction (°)	F	Silt Factor = $\frac{K_{sf}c}{F \times (1 + \sqrt{c})}$
1	BH-02	1.50	1.95	SILTY SAND	SM	0.0	0.0	0.0	6.0	35.0	24.0	35.0	0.00	0.00	0.00	4.28	10.59	3.06	1.313	0.192	0.772	-	-	-	-
2		3.00	3.45	SILTY SAND	SM	0.0	0.0	0.0	7.0	42.0	18.0	33.0	0.00	0.00	0.00	4.99	12.71	2.30	1.238	0.212	0.811	-	-	-	-
3		6.00	6.45	SILTY SAND	SM	0.0	0.0	1.0	5.0	37.0	23.0	34.0	0.00	0.00	1.90	3.56	11.19	2.93	1.275	0.209	0.804	-	-	-	-
4		9.00	9.45	POORLY GRADED SAND	SP	0.0	0.0	0.0	33.0	46.0	18.0	3.0	0.00	0.00	0.00	23.51	13.92	2.30	0.113	0.398	1.111	-	-	-	-
5		15.00	15.45	POORLY GRADED SAND	SP	0.0	0.0	1.0	18.0	54.0	24.0	3.0	0.00	0.00	1.90	12.83	16.34	3.06	0.113	0.342	1.030	-	-	-	-
6		18.00	18.45	POORLY GRADED SAND	SP	0.0	0.0	0.0	14.0	52.0	30.0	4.0	0.00	0.00	0.00	9.98	15.73	3.83	0.150	0.297	0.959	-	-	-	-



COMPUTATION OF WEIGHTED MEAN DIAMETER OF PARTICLES AND SILT FACTOR

Project: Final location survey for New B.G Railway line projects (770.00 km.) and Final location survey for construction of Doubling/Third line/ 3rd & 4th line (252.00 km.) of North Eastern Railway (Total 1022.00 km)

BRIDGE NO.- 14				BOREHOLE NO-03								Section : CHITAUNI - MADHUBANI														
Sl.No.	Borehole No.	Depth (m)		Description of the Soil Strata	IS Classification	Percentage Retained							Mean Particle Size (mm)							Sandy Strata		Clayey Soil				
		From	To			5.60 to 4.00	4.00 to 2.80	2.80 to 1.00	1.00 to 0.425	0.425 to 0.180	0.180 to 0.075	0.075 to 0	4.8	3.4	1.9	0.7125	0.3025	0.1275	0.0375	Mean Particle Size (dm)	Silt Factor in the layer= 1.76 x sqrt(dm)	Average Cohesion Intercept - c (kg/cm²)	Average Angle of Internal Friction (°)	F	Silt Factor = Ksf / (F x (1 + sqrt(c)))	
1	BH-03	1.50	1.95	SILTY SAND	SM	0.0	0.0	0.0	5.0	49.0	21.0	25.0	0.00	0.00	0.00	3.56	14.82	2.68	0.938	0.220	0.826	-	-	-	-	
2		3.00	3.45	SILTY SAND	SM	0.0	0.0	0.0	6.0	43.0	23.0	28.0	0.00	0.00	0.00	4.28	13.01	2.93	1.050	0.213	0.812	-	-	-	-	
3		6.00	6.45	SILTY SAND	SM	0.0	0.0	2.0	6.0	46.0	19.0	27.0	0.00	0.00	3.80	4.28	13.92	2.42	1.013	0.254	0.887	-	-	-	-	
4		12.00	12.45	SILTY SAND	SM	0.0	0.0	0.0	7.0	38.0	24.0	31.0	0.00	0.00	0.00	4.99	11.50	3.06	1.163	0.207	0.801	-	-	-	-	
5		15.00	15.45	SILTY SAND	SM	0.0	0.0	1.0	5.0	40.0	20.0	34.0	0.00	0.00	1.90	3.56	12.10	2.55	1.275	0.214	0.814	-	-	-	-	
6		18.00	18.45	SILTY SAND	SM	0.0	0.0	0.0	7.0	36.0	22.0	35.0	0.00	0.00	0.00	4.99	10.89	2.81	1.313	0.200	0.787	-	-	-	-	



COMPUTATION OF WEIGHTED MEAN DIAMETER OF PARTICLES AND SILT FACTOR

Project: Final location survey for New B.G Railway line projects (770.00 km.) and Final location survey for construction of Doubling/Third line/ 3rd & 4th line (252.00 km.) of North Eastern Railway (Total 1022.00 km)

BRIDGE NO.- 14		BOREHOLE NO-04											Section : CHITAUNI-MADHUBANI													
Sl.No.	Borehole No.	Depth (m)		Description of the Soil Strata	IS Classification	Percentage Retained							Mean Particle Size (mm)							Sandy Strata		Clayey Soil				
		From	To			5.60 to 4.00	4.00 to 2.80	2.80 to 1.00	1.00 to 0.425	0.425 to 0.180	0.180 to 0.075	0.075 to 0	4.8	3.4	1.9	0.7125	0.3025	0.1275	0.0375	Mean Particle Size (dm)	Silt Factor in the layer= 1.76 x sqrt(dm)	Average Cohesion Intercept - c (kg/cm ²)	Average Angle of Internal Friction (°)	F	Silt Factor = $\frac{K_{sf}c}{F \times (1 + \sqrt{c})}$	
1	BH-04	1.50	1.95	SILTY SAND	SM	0.0	0.0	0.0	7.0	36.0	22.0	35.0	0.00	0.00	0.00	4.99	10.89	2.81	1.313	0.200	0.787	-	-	-	-	
2		3.00	3.45	SILTY SAND	SM	0.0	0.0	1.0	5.0	44.0	18.0	32.0	0.00	0.00	1.90	3.56	13.31	2.30	1.200	0.223	0.831	-	-	-	-	
3		6.00	6.45	SILTY SAND	SM	0.0	0.0	0.0	6.0	41.0	19.0	34.0	0.00	0.00	0.00	4.28	12.40	2.42	1.275	0.204	0.794	-	-	-	-	
4		9.00	9.45	POORLY GRADED SAND	SP	0.0	0.0	0.0	4.0	68.0	27.0	1.0	0.00	0.00	0.00	2.85	20.57	3.44	0.038	0.269	0.913	-	-	-	-	
5		15.00	15.45	POORLY GRADED SAND	SP	0.0	0.0	2.0	5.0	61.0	29.0	3.0	0.00	0.00	3.80	3.56	18.45	3.70	0.113	0.296	0.958	-	-	-	-	
6		18.00	18.45	POORLY GRADED SAND	SP	0.0	0.0	1.0	6.0	66.0	25.0	2.0	0.00	0.00	1.90	4.28	19.97	3.19	0.075	0.294	0.954	-	-	-	-	



NORTH EASTERN RAILWAY

FINAL LOCATION SURVEY FOR NEW B.G RAILWAY LINE PROJECTS (770.00 KM.) AND FINAL LOCATION SURVEY FOR CONSTRUCTION OF DOUBLING/THIRD LINE/ 3RD & 4TH LINE (252.00 KM.) OF NORTH EASTERN RAILWAY (TOTAL 1022.00 KM)

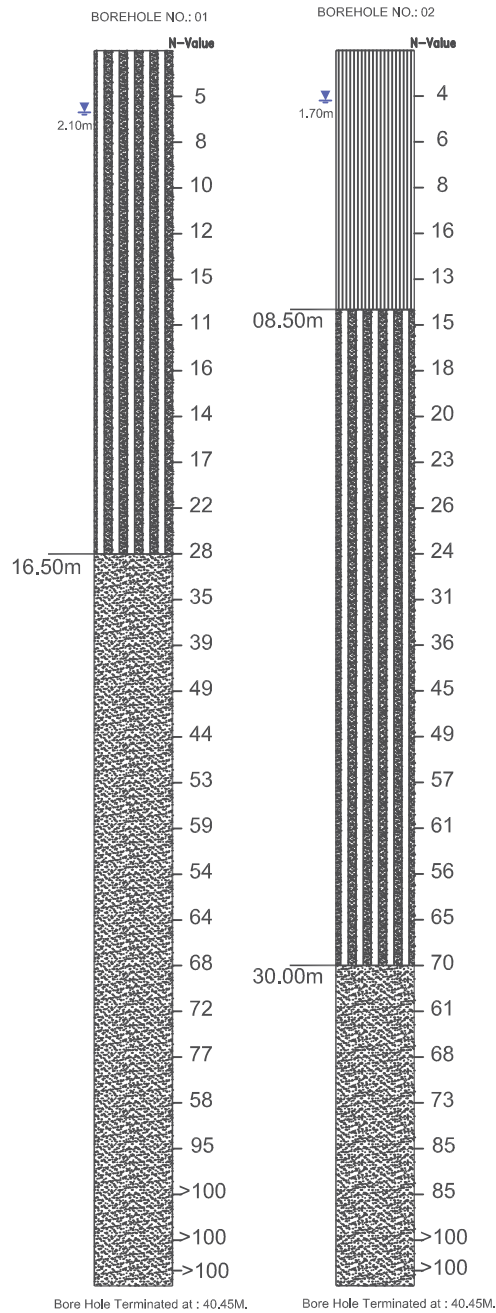
SECTION: CHITAUNI-MADHUBANI

Chainage	Br. No	Type of Crossing	Type of Bridge	Borehole No.	Easting (m)	Northing (m)	Reduced Level (m)
11269.753	16	WATERWAY	MAJOR-BRIDGE	BH-01	201149	2999175	107.65
				BH-02	201149	2999163	108.12

SUBMITTED BY:



BOREHOLE PROFILE
SECTION: CHITAUNI TO MADHUBANI
BRIDGE NO.: 16



LEGENDS

SANDY-SILT (ML)


SILTY SAND (SM)

POORLY GRADED SAND (SP)

Ground Water Table



Project: Final location survey for New B.G Railway line projects (770.00 km.) and Final location survey for construction of Doubling/Third line/ 3rd & 4th line (252.00 km.) of North Eastern Railway (Total 1022.00 km)

BRIDGE NO:16 BOREHOLE NO. BH- 1				GWT: 2.10 m		DATE STARTED : 01-01-2025		 aarvee associates architects engineers & consultants pvt. ltd.																										
						DATE COMPLETED : 03-01-2025																												
FIELD TEST RESULTS										LABORATORY TEST RESULTS																								
ELEVATION IN METERS	DEPTH IN METERS BELOW REFERENCE	NATURE OF SAMPLING	SAMPLE REFERENCE NO.	LEVEL OF WATER TABLE / L.W.L	SPT TEST RESULTS					SYMBOLIC REPRESENTATION	DESCRIPTION OF SOIL WITH U.S. CLASSIFICATION	TYPE OF TEST CONDUCTED IN THE LABORATORY	GRAIN SIZE ANALYSIS				LIQUID LIMIT (%)	PLASTIC LIMIT (%)	PLASTICITY INDEX (%)	BULK DENSITY (gm /cc)	DRY DENSITY (gm/cc)	MOISTURE CONTENT (%)	FREESWELL INDEX (%)	SPECIFIC GRAVITY	SUBMERGED DENSITY (gm /cc)	SHEAR STRENGTH CHARACTERISTICS		CONSOLIDATION CHARACTERISTICS	Chemical Analysis Result					
					DEPTH IN METERS	NO. OF BLOWS	PENETRATION (CM)	N VALUE (Recorded)	N VALUE (Corrected)				GRAVEL (%)	SAND (%)	SILT (%)	CLAY (%)										Cohesion Cc (kg/cm ²)	Angle of friction (Degrees)		Compression Index(I _{cc})	pH	Chloride, %	Sulphate, %	pH	Chloride, mg/l
-1.00	1.0	DS	1		0.00	1.00	DS	-	-	-		LOOSE MEDIUM DENSE LITE GREY SILTY SAND (SM)	--	0.00	68.00	30.00	2.00	NON-PLASTIC		-	-	-	2.53	-	-	-	-	7.01	0.04	NIL	-	-	-	
	2.0	SPT	1		1.50	1.95	5	30	5	7			--	0.00	67.00	31.00	2.00	NON-PLASTIC		-	-	-	2.54	-	-	-	-	7.04	0.02	NIL	-	-	-	
	3.0	DS	2		2.50	2.80		UDS SLIPPED					--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	7.10	0.03	NIL	--	--	--	
	4.0	SPT	2		3.00	3.45	8	30	8	12			--	0.00	65.00	33.00	2.00	NON-PLASTIC		-	-	-	2.55	-	-	-	-	--	--	--	--	--	--	
-5.00	5.0	SPT	3		4.50	4.95	10	30	10	13			--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	
	6.0	DS	3		5.50	5.80		UDS SLIPPED					--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	
	7.0	SPT	4		6.00	6.45	12	30	12	15			--	0.00	66.00	31.00	3.00	NON-PLASTIC		-	-	-	2.56	-	-	-	-	--	--	--	--	--	--	
	8.0	SPT	5		7.50	7.95	15	30	15	16			--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	
	9.0	DS	4		8.50	8.80		UDS SLIPPED					--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
-10.00	10.0	SPT	6		9.00	9.45	11	30	11	12			--	0.00	66.00	32.00	2.00	NON-PLASTIC		-	-	-	-	-	-	-	-	--	--	--	--	--	--	
	11.0	SPT	7	10.50	10.95	16	30	16	16	--			--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	
	12.0	DS	5	11.50	11.80		UDS SLIPPED			--			--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	
	13.0	SPT	8	12.00	12.45	14	30	14	13	--			0.00	68.00	31.00	1.00	NON-PLASTIC		-	-	-	-	-	-	-	-	--	--	--	--	--	--		
	14.0	SPT	9	13.50	13.95	17	30	17	15	--			--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	
-15.00	15.0	DS	6	14.50	14.80		UDS SLIPPED			--			--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	
	16.0	SPT	10	15.00	15.45	22	30	22	17	--			0.00	65.00	33.00	2.00	NON-PLASTIC		-	-	-	2.56	-	-	-	-	--	--	--	--	--	--		
	17.0	SPT	11	16.50	16.95	28	30	28	19	--			0.00	97.00	3.00	0.00	NON-PLASTIC		-	-	-	2.55	--	--	--	--	--	--	--	--	--	--	--	
	18.0	DS	7	17.50	17.80		UDS SLIPPED			--			--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	
	19.0	SPT	12	18.00	18.45	35	30	35	22	--			0.00	96.00	4.00	0.00	NON-PLASTIC		-	-	-	2.54	-	--	--	--	--	--	--	--	--	--	--	
-20.00	20.0	SPT	13	19.50	19.95	39	30	39	23	--			--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	
	21.0	DS	8	20.50	20.80		UDS SLIPPED			--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--			
	22.0	SPT	14	21.00	21.45	49	30	49	26	--	0.00	97.00	3.00	0.00	NON-PLASTIC		-	-	-	2.56	-	--	--	--	--	--	--	--	--	--	--			
	23.0	SPT	15	22.50	22.95	44	30	44	24	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--			
	24.0	DS	9	23.50	23.80		UDS SLIPPED			--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--			
-25.00	25.0	SPT	16	24.00	24.45	53	30	53	26	--	0.00	96.00	4.00	0.00	NON-PLASTIC		-	-	-	-	-	--	--	--	--	--	--	--	--	--	--			
	26.0	SPT	17	25.50	25.95	59	30	59	28	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--			
	27.0	DS	10	26.50	26.80		UDS SLIPPED			--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--			
	28.0	SPT	18	27.00	27.45	54	30	54	25	--	0.00	97.00	3.00	0.00	NON-PLASTIC		-	-	-	2.55	-	--	--	--	--	--	--	--	--	--	--			
	29.0	SPT	19	28.50	28.95	64	30	64	28	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--			
-30.00	30.0	DS	11	29.50	29.80		UDS SLIPPED			--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--			
	31.0	SPT	20	30.00	30.45	68	30	68	29	--	0.00	96.00	4.00	0.00	NON-PLASTIC		-	-	-	2.56	-	--	--	--	--	--	--	--	--	--	--			
	32.0	SPT	21	31.50	31.95	72	30	72	29	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--			
	33.0	DS	12	32.50	32.80		UDS SLIPPED			--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--			
	34.0	SPT	22	33.00	33.45	77	30	77	30	--	0.00	97.00	3.00	0.00	NON-PLASTIC		-	-	-	2.57	-	--	--	--	--	--	--	--	--	--	--			
-35.00	35.0	SPT	23	34.50	34.95	58	30	58	24	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--			
	36.0	DS	13	35.50	35.80		UDS SLIPPED			--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--			
	37.0	SPT	24	36.00	36.45	95	30	95	34	--	0.00	96.00	4.00	0.00	NON-PLASTIC		-	-	-	2.56	-	--	--	--	--	--	--	--	--	--	--			
	38.0	SPT	25	37.50	37.95	50	1	>100	>100	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--			
	39.0	DS	14	38.50	38.80		UDS SLIPPED			--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--			
	40.0	SPT	26	39.00	39.45	50	1	>100	>100	--	0.00	97.00	3.00	0.00	NON-PLASTIC		-	-	-	-	-	--	--	--	--	--	--	--	--	--	--			
-40.00	41.0	SPT	27	40.00	40.45	50	1	>100	>100	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--			
CLASSIFICATION OF SOIL AS PER IS : 1498 ABBREVIATION USED : DS = DISTURBED SAMPLE, SPT = STANDARD PENETRATION TEST, UDS = UNDISTURBED SAMPLE, DST = DIRECT SHEAR TEST, UC : UNCONFINED COMPRESSION TEST * UCS BASED ON POINT LOAD TEST										Project:Final location survey for New B.G Railway line projects (770.00 km.) and Final location survey for construction of Doubling/Third line/ 3rd & 4th line (252.00 km.) of North Eastern Railway (Total 1022.00 km) SECTION: CHITAUNI-MADHUBANI																								

BRIDGE NO:16
BOREHOLE NO. BH- 2



GWT: 1.70 m

DATE STARTED : 04-01-2025

DATE COMPLETED : 05-01-2025



CONSOLIDATED LOGS INCLUDING LABORATORY TEST RESULTS OF SOIL

FIELD TEST RESULTS										LABORATORY TEST RESULTS																									
ELEVATION IN METERS	DEPTH IN METERS BELOW REFERENCE	NATURE OF SAMPLING	SAMPLE REFERENCE NO.	LEVEL OF WATER TABLE / L.W.L	SPT TEST RESULTS					SYMBOLIC REPRESENTATION	DESCRIPTION OF SOIL WITH I.S. CLASSIFICATION	TYPE OF TEST CONDUCTED IN THE LABORATORY	GRAIN SIZE ANALYSIS				LIQUID LIMIT (%)	PLASTIC LIMIT (%)	PLASTICITY INDEX (%)	BULK DENSITY (gm/cc)	DRY DENSITY (gm/cc)	MOISTURE CONTENT (%)	FREESWELL INDEX (%)	SPECIFIC GRAVITY	SUBMERGED DENSITY (gm/cc)	SHEAR STRENGTH CHARACTERISTICS		CONSOLIDATION CHARACTERISTICS	Chemical Analysis Result						
					DEPTH IN METERS	NO. OF BLOWS	PENETRATION (CM)	N VALUE (Recorded)	N VALUE (Corrected)				GRAVEL (%)	SAND (%)	SILT (%)	CLAY (%)										Cohesion C, (kg/cm ²)	Angle of friction (Degrees)		Compression Index(Cc)	pH	Chloride, %	Sulphate, %	pH	Chloride, mg/l	Sulphate, mg/l
-1.00	1.0	DS	1		0.00	1.00	DS	-	-		LOOSE MEDIUM DENSE LITE BROWN SANDY SILT (ML)	--	0.00	45.00	51.00	4.00	NON-PLASTIC				-	-	-		-	--	--	--	7.10	0.03	NIL	--	--	--	
	2.0	SPT	1		1.50	1.95	4	30	4			6	--	0.00	36.00	61.00	3.00	NON-PLASTIC				-	-	-	2.52	-	--	--	--	7.16	0.02	NIL	--	--	--
	3.0	DS	2		2.50	2.80	UDS SLIPPED					--	--	--	--	--					--	--	--	--	--	--	7.18	0.02	NIL	--	--	--			
	4.0	SPT	2		3.00	3.45	6	30	6			9	--	0.00	35.00	61.00	4.00	NON-PLASTIC				-	-	-	2.53	--	--	--	--	--	--	--	--	--	
-5.00	5.0	SPT	3		4.50	4.95	8	30	8			11	--	--	--	--	--					--	--	--	--	--	--	--	--	--	--	--	--	--	
	6.0	DS	3		5.50	5.80	UDS SLIPPED					--	--	--	--	--					--	--	--	--	--	--	--	--	--	--	--	--	--		
	7.0	SPT	4		6.00	6.45	16	30	16			17	--	0.00	34.00	63.00	3.00	NON-PLASTIC				-	-	-	2.54	-	--	--	--	--	--	--	--	--	
	8.0	SPT	5		7.50	7.95	13	30	13			15	--	--	--	--	--					--	--	--	--	--	--	--	--	--	--	--	--	--	
	9.0	DS	4		8.50	8.80	UDS SLIPPED					--	--	--	--	--					--	--	--	--	--	--	--	--	--	--	--	--	--		
-10.00	10.0	SPT	6		9.00	9.45	15	30	15			15	--	0.00	68.00	30.00	2.00	NON-PLASTIC				-	-	-	-	-	--	--	--	--	--	--	--	--	
	11.0	SPT	7		10.50	10.95	18	30	18			17	--	--	--	--	--					--	--	--	--	--	--	--	--	--	--	--	--	--	
	12.0	DS	5		11.50	11.80	UDS SLIPPED					--	--	--	--	--					--	--	--	--	--	--	--	--	--	--	--	--	--		
	13.0	SPT	8		12.00	12.45	20	30	20			17	--	0.00	67.00	32.00	1.00	NON-PLASTIC				-	-	-	-	-	--	--	--	--	--	--	--	--	
	14.0	SPT	9		13.50	13.95	23	30	23			18	--	--	--	--	--					-	-	-	--	--	--	--	--	--	--	--	--	--	
-15.00	15.0	DS	6		14.50	14.80	UDS SLIPPED					--	--	--	--	--					--	--	--	--	--	--	--	--	--	--	--	--	--		
	16.0	SPT	10		15.00	15.45	26	30	26			19	--	0.00	66.00	32.00	2.00	NON-PLASTIC				-	-	-	2.55	--	--	--	--	--	--	--	--	--	
	17.0	SPT	11		16.50	16.95	24	30	24			18	--	--	--	--	--					-	-	-	--	--	--	--	--	--	--	--	--	--	
	18.0	DS	7		17.50	17.80	UDS SLIPPED					--	--	--	--	--					--	--	--	--	--	--	--	--	--	--	--	--	--		
	19.0	SPT	12		18.00	18.45	31	30	31			20	--	0.00	65.00	34.00	1.00	NON-PLASTIC				-	-	-	2.54	-	--	--	--	--	--	--	--	--	
-20.00	20.0	SPT	13		19.50	19.95	36	30	36			22	--	--	--	--	--					--	--	--	--	--	--	--	--	--	--	--	--	--	--
	21.0	DS	8		20.50	20.80	UDS SLIPPED					--	--	--	--	--					--	--	--	--	--	--	--	--	--	--	--	--	--		
	22.0	SPT	14		21.00	21.45	45	30	45			24	--	0.00	67.00	31.00	2.00	NON-PLASTIC				-	-	-	-	-	--	--	--	--	--	--	--	--	
	23.0	SPT	15		22.50	22.95	49	30	49			25	--	--	--	--	--					--	--	--	--	--	--	--	--	--	--	--	--	--	
	24.0	DS	9		23.50	23.80	UDS SLIPPED					--	--	--	--	--					--	--	--	--	--	--	--	--	--	--	--	--	--		
-25.00	25.0	SPT	16		24.00	24.45	57	30	57			28	--	0.00	64.00	35.00	1.00	NON-PLASTIC				-	-	-	-	-	--	--	--	--	--	--	--	--	
	26.0	SPT	17		25.50	25.95	61	30	61			28	--	--	--	--	--					--	--	--	--	--	--	--	--	--	--	--	--	--	
	27.0	DS	10		26.50	26.80	UDS SLIPPED					--	--	--	--	--					--	--	--	--	--	--	--	--	--	--	--	--	--		
	28.0	SPT	18		27.00	27.45	56	30	56			26	--	0.00	65.00	33.00	2.00	NON-PLASTIC				-	-	-	2.55	--	--	--	--	--	--	--	--	--	
	29.0	SPT	19		28.50	28.95	65	30	65			29	--	--	--	--	--					--	--	--	--	--	--	--	--	--	--	--	--	--	
-30.00	30.0	DS	11		29.50	29.80	UDS SLIPPED					--	--	--	--	--					--	--	--	--	--	--	--	--	--	--	--	--	--		
	31.0	SPT	20		30.00	30.45	70	30	70			29	--	0.00	97.00	3.00	0.00	NON-PLASTIC				-	-	-	2.60	-	--	--	--	--	--	--	--	--	
	32.0	SPT	21		31.50	31.95	61	30	61			26	--	--	--	--	--					--	--	--	--	--	--	--	--	--	--	--	--	--	
	33.0	DS	12		32.50	32.80	UDS SLIPPED					--	--	--	--	--					--	--	--	--	--	--	--	--	--	--	--	--	--		
-35.00	34.0	SPT	22		33.00	33.45	68	30	68			28	--	0.00	96.00	4.00	0.00	NON-PLASTIC				-	-	-	-	-	--	--	--	--	--	--	--	--	
	35.0	SPT	23		34.50	34.95	73	30	73			29	--	--	--	--	--					--	--	--	--	--	--	--	--	--	--	--	--	--	
	36.0	DS	13		35.50	35.80	UDS SLIPPED					--	--	--	--	--					--	--	--	--	--	--	--	--	--	--	--	--	--		
	37.0	SPT	24		36.00	36.45	85	30	85			31	--	0.00	97.00	3.00	0.00	NON-PLASTIC				-	-	-	2.56	--	--	--	--	--	--	--	--	--	
	38.0	SPT	25		37.50	37.95	85	30	85			31	--	--	--	--	--					--	--	--	--	--	--	--	--	--	--	--	--	--	
	39.0	DS	14		38.50	38.80	UDS SLIPPED					--	--	--	--	--					--	--	--	--	--	--	--	--	--	--	--	--	--		
	40.0	SPT	26		39.00	39.45	50	1	>100			>100	--	0.00	96.00	4.00	0.00	NON-PLASTIC				-	-	-	-	-	--	--	--	--	--	--	--	--	
-40.00	41.0	SPT	27		40.00	40.45	50	1	>100			>100	--	--	--	--	--					-	-	-	-	-	--	--	--	--	--	--	--	--	

CLASSIFICATION OF SOIL AS PER IS : 1498
ABBREVIATION USED :
DS = DISTURBED SAMPLE , SPT = STANDARD PENETRATION TEST, UDS = UNDISTURBED SAMPLE, DST = DIRECT SHEAR TEST,
UC : UNCONFINED COMPRESSION TEST UU : UNCONSOLIDATED UNDRAINED TRIAXIAL TEST
* UCS BASED ON POINT LOAD TEST

Project:Final location survey for New B.G Railway line projects (770.00 km.) and Final location survey for construction of Doubling/Third line/ 3rd & 4th line (252.00 km.) of North Eastern Railway (Total 1022.00 km)

SECTION: CHITAUNI-MADHUBANI

CALCULATIONS FOR CORRECTED SPT (N) VALUES

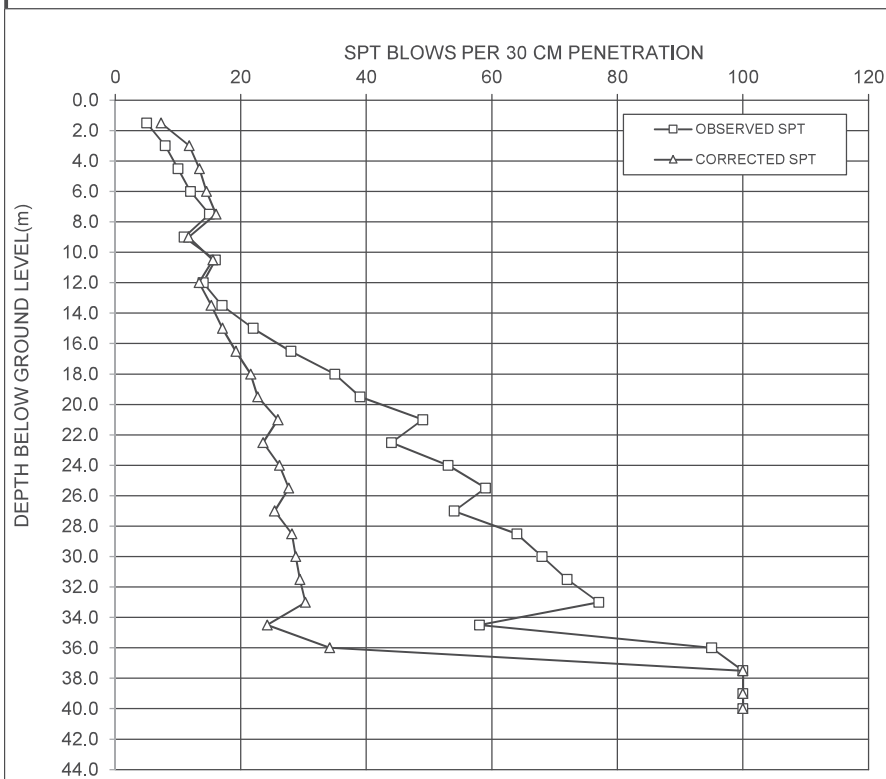
Project: Final location survey for New B.G Railway line projects (770.00 km.) and Final location survey for construction of Doubling/Third line/ 3rd & 4th line (252.00 km.) of North Eastern Railway (Total 1022.00 km)

BOREHOLE NO. BH- 1

WATER TABLE-2.10 m

DEPTH OF SAMPLE	TYPE OF SOIL	OBSERVED SPT 'N' VALUE	CORRECTED SPT (N') VALUE (FOR OVERBURDEN)	FINAL CORRECTED VALUE AFTER DILATANCY CORRECTION (N'')
1.50	Non Plastic	5	7	7
3.00	Non Plastic	8	12	12
4.50	Non Plastic	10	13	13
6.00	Non Plastic	12	15	15
7.50	Non Plastic	15	17	16
9.00	Non Plastic	11	12	12
10.50	Non Plastic	16	16	16
12.00	Non Plastic	14	13	13
13.50	Non Plastic	17	16	15
15.00	Non Plastic	22	19	17
16.50	Non Plastic	28	23	19
18.00	Non Plastic	35	28	22
19.50	Non Plastic	39	30	23
21.00	Non Plastic	49	37	26
22.50	Non Plastic	44	32	24
24.00	Non Plastic	53	37	26
25.50	Non Plastic	59	40	28
27.00	Non Plastic	54	36	25
28.50	Non Plastic	64	41	28
30.00	Non Plastic	68	43	29
31.50	Non Plastic	72	44	29
33.00	Non Plastic	77	46	30
34.50	Non Plastic	58	33	24
36.00	Non Plastic	95	53	34
37.50	Non Plastic	100	100	100
39.00	Non Plastic	100	100	100
40.00	Non Plastic	100	100	100

* SPT value restricted to 300.



CALCULATIONS FOR CORRECTED SPT (N) VALUES

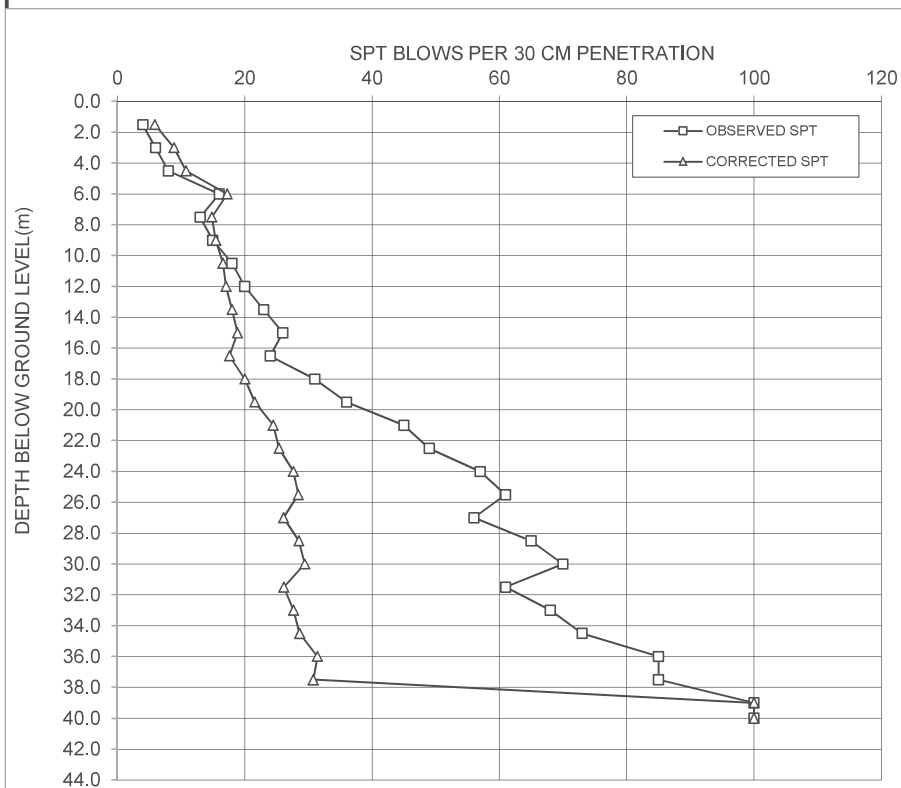
Project: Final location survey for New B.G Railway line projects (770.00 km.) and Final location survey for construction of Doubling/Third line/ 3rd & 4th line (252.00 km.) of North Eastern Railway (Total 1022.00 km)

BOREHOLE NO. BH- 2

WATER TABLE-1.70 m

DEPTH OF SAMPLE	TYPE OF SOIL	OBSERVED SPT 'N' VALUE	CORRECTED SPT (N') VALUE (FOR OVERBURDEN)	FINAL CORRECTED VALUE AFTER DILATANCY CORRECTION (N'')
1.50	Non Plastic	4	6	6
3.00	Non Plastic	6	9	9
4.50	Non Plastic	8	11	11
6.00	Non Plastic	16	19	17
7.50	Non Plastic	13	15	15
9.00	Non Plastic	15	16	15
10.50	Non Plastic	18	18	17
12.00	Non Plastic	20	19	17
13.50	Non Plastic	23	21	18
15.00	Non Plastic	26	23	19
16.50	Non Plastic	24	20	18
18.00	Non Plastic	31	25	20
19.50	Non Plastic	36	28	22
21.00	Non Plastic	45	34	24
22.50	Non Plastic	49	36	25
24.00	Non Plastic	57	40	28
25.50	Non Plastic	61	42	28
27.00	Non Plastic	56	37	26
28.50	Non Plastic	65	42	29
30.00	Non Plastic	70	44	29
31.50	Non Plastic	61	37	26
33.00	Non Plastic	68	40	28
34.50	Non Plastic	73	42	29
36.00	Non Plastic	85	48	31
37.50	Non Plastic	85	47	31
39.00	Non Plastic	100	100	100
40.00	Non Plastic	100	100	100

* SPT value restricted to 300.



Typical Computation of Liquefaction Potential as per IRC:SP: 114 / IS: 1893

Project: Final location survey for New B.G Railway line projects (770.00 km.) and Final location survey for construction of Doubling/Third line/ 3rd & 4th line (252.00 km.) of North Eastern Railway (Total 1022.00 km)

BRIDGE NO:16

BOREHOLE NO.

BH-01

SECTION: CHITAUUNI-MADHUBANI

Water table assumed for Calculation: 0.00 m

Depth below EGL, m	Type of Strata	Observed SPT Value	Saturated density (t/m^3)	Submerged Density (t/m^3)	Fine Content (%)	Earthquake Zone	Peak ground acceleration a_{\max}/g	Earth quake magnitude (Mw)	Stress reduction coefficient (rd)	Total overburden pressure (σ_o), t/m^2	Effective overburden (σ'_o), t/m^2	Cyclic Stress ratio (CSR)	C_N	CE or CHT	CH or CHW	CB or CBD	CR or CRL	CS or CSS	SPT corrected (N_1) ₆₀	α	β	(N_1) _{60cs}	$CRR_{N=7.5}$	Relative Density, Dr%	f	K_c	K_u	MSF	CRR	FOS	Conclusion
1.50	SM	5	1.65	0.65	33	IV	0.24	7.00	0.99	2.48	0.98	0.39	1.70	1.33	1.000	1.05	0.75	1.00	8.90	4.88	1.18	15.38	0.16	18.17	0.91	1.00	1.00	1.19	0.20	0.50	Liquefiable
3.00	SM	8	1.92	0.92	35	IV	0.24	7.00	0.98	4.95	1.95	0.39	1.70	1.33	1.000	1.05	0.85	1.00	16.14	5.00	1.20	24.37	0.28	33.82	0.83	1.00	1.00	1.19	0.33	0.86	Liquefiable
4.50	SM	10	1.92	0.92	35	IV	0.24	7.00	0.97	7.83	3.33	0.35	1.70	1.33	1.000	1.05	0.95	1.00	22.55	5.00	1.20	32.06	NA	48.25	0.76	1.00	1.00	1.19	NA	>1.0	Non Liquefiable
6.00	SM	12	2.01	1.01	34	IV	0.24	7.00	0.95	10.71	4.71	0.34	1.46	1.33	1.000	1.05	0.95	1.00	23.20	4.93	1.19	32.50	NA	49.69	0.75	1.00	1.00	1.19	NA	>1.0	Non Liquefiable
7.50	SM	15	2.01	1.01	34	IV	0.24	7.00	0.94	13.73	6.23	0.32	1.27	1.33	1.000	1.05	0.95	1.00	25.22	4.93	1.19	34.90	NA	54.25	0.73	1.00	1.00	1.19	NA	>1.0	Non Liquefiable
9.00	SM	11	2.02	1.02	34	IV	0.24	7.00	0.93	16.74	7.74	0.31	1.14	1.33	1.000	1.05	1	1.00	17.46	4.93	1.19	25.68	0.31	36.79	0.82	1.00	1.00	1.19	0.36	1.16	Non Liquefiable
10.50	SM	16	2.02	1.02	34	IV	0.24	7.00	0.89	19.77	9.27	0.30	1.04	1.33	1.000	1.05	1	1.00	23.21	4.93	1.19	32.51	NA	49.72	0.75	1.00	1.00	1.19	NA	>1.0	Non Liquefiable
12.00	SM	14	2.04	1.04	32	IV	0.24	7.00	0.85	22.80	10.80	0.28	0.96	1.33	1.000	1.05	1	1.00	18.81	4.83	1.17	26.86	0.33	39.83	0.80	0.98	1.00	1.19	0.39	1.40	Non Liquefiable
13.50	SM	17	2.04	1.04	32	IV	0.24	7.00	0.81	25.86	12.36	0.27	0.90	1.33	1.000	1.05	1	1.00	21.35	4.83	1.17	29.83	0.46	45.55	0.77	0.95	1.00	1.19	0.52	1.95	Non Liquefiable
15.00	SM	22	2.05	1.05	35	IV	0.24	7.00	0.77	28.92	13.92	0.25	0.85	1.33	1.000	1.05	1	1.00	26.04	5.00	1.20	36.25	NA	56.09	0.72	0.91	1.00	1.19	NA	>1.0	Non Liquefiable
16.50	SP	28	2.04	1.04	3	IV	0.24	7.00	0.73	32.00	15.50	0.24	0.80	1.33	1.000	1.05	1	1.00	31.41	0.00	1.00	31.41	NA	66.41	0.67	0.86	1.00	1.19	NA	>1.0	Non Liquefiable
18.00	SP	35	2.03	1.03	4	IV	0.24	7.00	0.69	35.06	17.06	0.22	0.77	1.33	1.000	1.05	1	1.00	37.43	0.00	1.00	37.43	NA	72.43	0.64	0.82	1.00	1.19	NA	>1.0	Non Liquefiable
19.50	SP	39	2.03	1.03	4	IV	0.24	7.00	0.65	38.10	18.60	0.21	0.73	1.33	1.000	1.05	1	1.00	39.93	0.00	1.00	39.93	NA	74.93	0.63	0.79	1.00	1.19	NA	>1.0	Non Liquefiable
21.00	SP	49	2.04	1.04	3	IV	0.24	7.00	0.61	41.15	20.15	0.20	0.70	1.33	1.000	1.05	1	1.00	48.21	0.00	1.00	48.21	NA	83.21	0.58	0.75	1.00	1.19	NA	>1.0	Non Liquefiable
22.50	SP	44	2.04	1.04	3	IV	0.24	7.00	0.57	44.21	21.71	0.18	0.68	1.33	1.000	1.05	1	1.00	41.71	0.00	1.00	41.71	NA	76.71	0.62	0.74	1.00	1.19	NA	>1.0	Non Liquefiable

Note: Values of all Parameters are as per IRC:SP: 114 / IS 1893: 2016

 C_E or C_{HT} (Correction for hammer energy ratio) = $ER/60$, ER for Rope and pulley System = 80 % , Hence $C_E = 80/60 = 1.33$
 C_H or C_{HW} (Correction for hammer) = 1.00

 Borehole Diameter = 150 mm , Hence C_B or C_{BD} (Correction for Borehole diameter), = 1.05

 C_S or C_{SS} (Correction for Standard sampler) = 1.00

 K_o Correction for high overburden stress (for effective overburden pressure > 10 T/m²)

 K_u Correction for static shear stress is required only for sloping ground

Typical Computation of Liquefaction Potential as per IRC:SP: 114 / IS: 1893

Project: Final location survey for New B.G Railway line projects (770.00 km.) and Final location survey for construction of Doubling/Third line/ 3rd & 4th line (252.00 km.) of North Eastern Railway (Total 1022.00 km)

BRIDGE NO: 16

BOREHOLE NO.

BH-02

SECTION: CHITAUUNI-MADHUBANI

Water table assumed for Calculation: 0.00 m

Depth below EGL, m	Type of Strata	Observed SPT Value	Saturated density (t/m^3)	Submerged Density (t/m^3)	Fine Content (%)	Earthquake Zone	Peak ground acceleration a_{max}/g	Earth quake magnitude (Mw)	Stress reduction coefficient (rd)	Total overburden pressure (σ_o), t/m^2	Effective overburden (σ'_o), t/m^2	Cyclic Stress ratio (CSR)	C_N	CE or CHT	CH or CHW	CB or CBD	CR or CRL	CS or CSS	SPT corrected (N_1) ₆₀	α	β	(N_1) _{16cs}	$CRR_{N=7.5}$	Relative Density, Dr%	f	K_c	K_u	MSF	CRR	FOS	Conclusion
1.50	ML	4	1.58	0.58	64	IV	0.24	7.00	0.99	2.37	0.87	0.42	1.70	1.33	1.000	1.05	0.75	1.00	7.12	5.00	1.20	13.55	0.15	NA	NA	1.00	1.00	1.19	0.17	>1.0	Non Liquefiable
3.00	ML	6	1.95	0.95	65	IV	0.24	7.00	0.98	4.74	1.74	0.42	1.70	1.33	1.000	1.05	0.85	1.00	12.11	5.00	1.20	19.53	0.21	NA	NA	1.00	1.00	1.19	0.25	>1.0	Non Liquefiable
4.50	ML	8	1.95	0.95	65	IV	0.24	7.00	0.97	7.67	3.17	0.36	1.70	1.33	1.000	1.05	0.95	1.00	18.04	5.00	1.20	26.65	0.33	NA	NA	1.00	1.00	1.19	0.39	>1.0	Non Liquefiable
6.00	ML	16	2.02	1.02	66	IV	0.24	7.00	0.95	10.59	4.59	0.34	1.48	1.33	1.000	1.05	0.95	1.00	31.33	5.00	1.20	42.60	NA	NA	NA	1.00	1.00	1.19	NA	>1.0	Non Liquefiable
7.50	ML	13	2.02	1.02	66	IV	0.24	7.00	0.94	13.62	6.12	0.33	1.28	1.33	1.000	1.05	0.95	1.00	22.05	5.00	1.20	31.46	NA	NA	NA	1.00	1.00	1.19	NA	>1.0	Non Liquefiable
9.00	SM	15	2.04	1.04	32	IV	0.24	7.00	0.93	16.65	7.65	0.32	1.14	1.33	1.000	1.05	1	1.00	23.95	4.83	1.17	32.87	NA	51.39	0.74	1.00	1.00	1.19	NA	>1.0	Non Liquefiable
10.50	SM	18	2.04	1.04	32	IV	0.24	7.00	0.89	19.71	9.21	0.30	1.04	1.33	1.000	1.05	1	1.00	26.19	4.83	1.17	35.50	NA	56.43	0.72	1.00	1.00	1.19	NA	>1.0	Non Liquefiable
12.00	SM	20	2.05	1.05	33	IV	0.24	7.00	0.85	22.77	10.77	0.28	0.96	1.33	1.000	1.05	1	1.00	26.91	4.88	1.18	36.63	NA	58.05	0.71	0.98	1.00	1.19	NA	>1.0	Non Liquefiable
13.50	SM	23	2.05	1.05	33	IV	0.24	7.00	0.81	25.85	12.35	0.27	0.90	1.33	1.000	1.05	1	1.00	28.91	4.88	1.18	38.98	NA	62.54	0.69	0.94	1.00	1.19	NA	>1.0	Non Liquefiable
15.00	SM	26	2.04	1.04	34	IV	0.24	7.00	0.77	28.92	13.92	0.25	0.85	1.33	1.000	1.05	1	1.00	30.77	4.93	1.19	41.50	NA	65.77	0.67	0.90	1.00	1.19	NA	>1.0	Non Liquefiable
16.50	SM	24	2.04	1.04	34	IV	0.24	7.00	0.73	31.98	15.48	0.24	0.80	1.33	1.000	1.05	1	1.00	26.94	4.93	1.19	36.94	NA	58.11	0.71	0.88	1.00	1.19	NA	>1.0	Non Liquefiable
18.00	SM	31	2.03	1.03	35	IV	0.24	7.00	0.69	35.04	17.04	0.22	0.77	1.33	1.000	1.05	1	1.00	33.16	5.00	1.20	44.80	NA	68.16	0.66	0.83	1.00	1.19	NA	>1.0	Non Liquefiable
19.50	SM	36	2.03	1.03	35	IV	0.24	7.00	0.65	38.09	18.59	0.21	0.73	1.33	1.000	1.05	1	1.00	36.88	5.00	1.20	49.25	NA	71.88	0.64	0.80	1.00	1.19	NA	>1.0	Non Liquefiable
21.00	SM	45	2.04	1.04	33	IV	0.24	7.00	0.61	41.13	20.13	0.20	0.70	1.33	1.000	1.05	1	1.00	44.29	4.88	1.18	57.13	NA	79.29	0.60	0.76	1.00	1.19	NA	>1.0	Non Liquefiable
22.50	SM	49	2.04	1.04	33	IV	0.24	7.00	0.57	44.19	21.69	0.18	0.68	1.33	1.000	1.05	1	1.00	46.46	4.88	1.18	59.69	NA	81.46	0.59	0.73	1.00	1.19	NA	>1.0	Non Liquefiable

Note: Values of all Parameters are as per IRC:SP: 114 / IS 1893: 2016

C_E or C_{HT} (Correction for hammer energy ratio) = $ER/60$, ER for Rope and pully System = 80 % , Hence $C_E = 80/60 = 1.33$

C_H or C_{HW} (Correction for hammer) = 1.00

Borehole Diameter = 150 mm , Hence C_B or C_{BD} (Correction for Borehole diameter), = 1.05

C_S or C_{SS} (Correction for Standard sampler) = 1.00

K_o Correction for high overburden stress (for effective oberburden pressure > 10 T/m²) ..

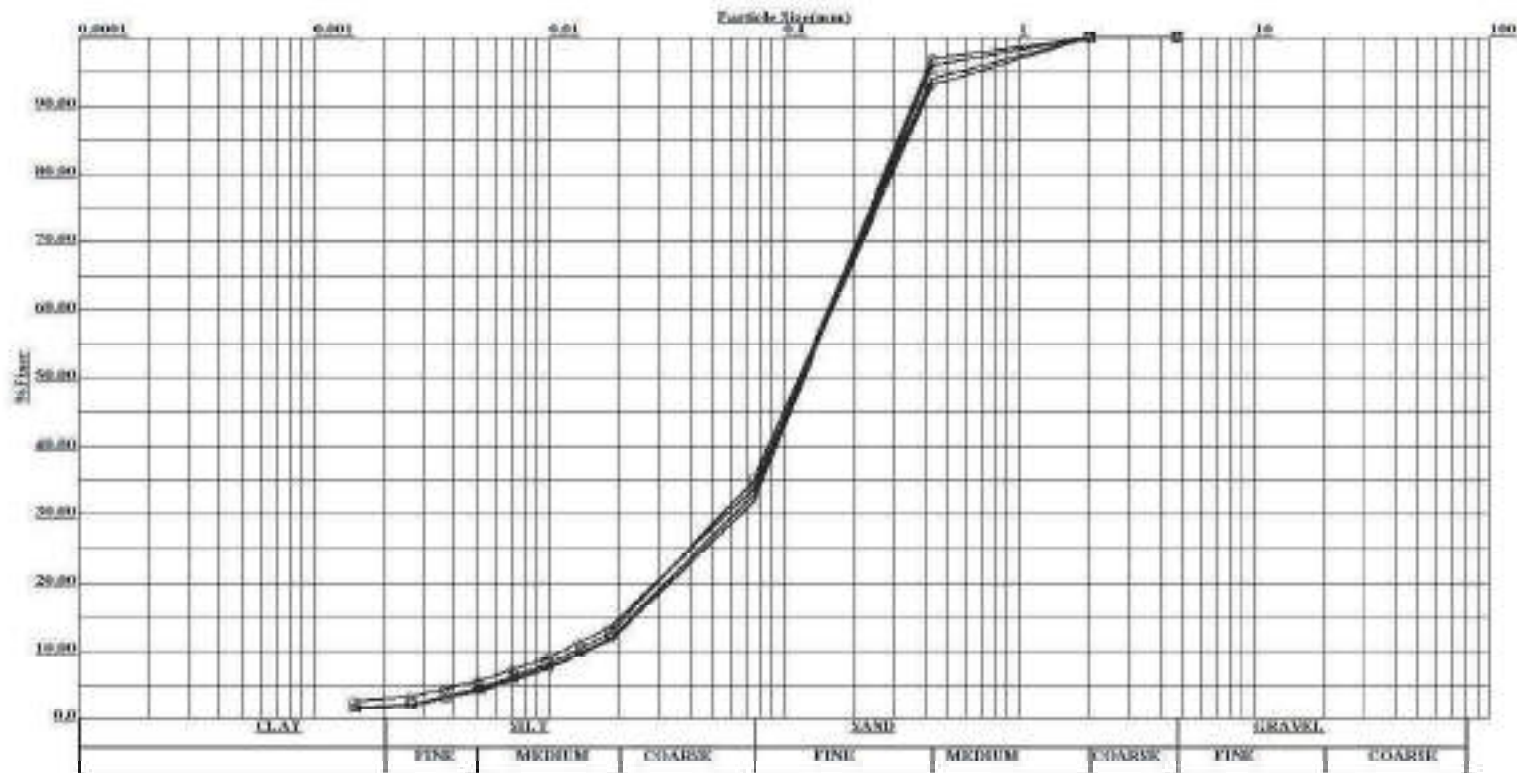
K_u Correction for static shear stress is required only for sloping ground

PROJECT: Final location survey for New B.G Railway line projects (770.00 km.) and Final location survey for construction of Doubling/Third line/ 3rd & 4th line (252.00 km.) of North Eastern Railway (Total 1022.00 km)

BRIDGE NO. - 16
SECTION:CHITAUNI-MADHUBANI

BOREHOLE NO. -BH-01

GRAIN SIZE ANALYSIS



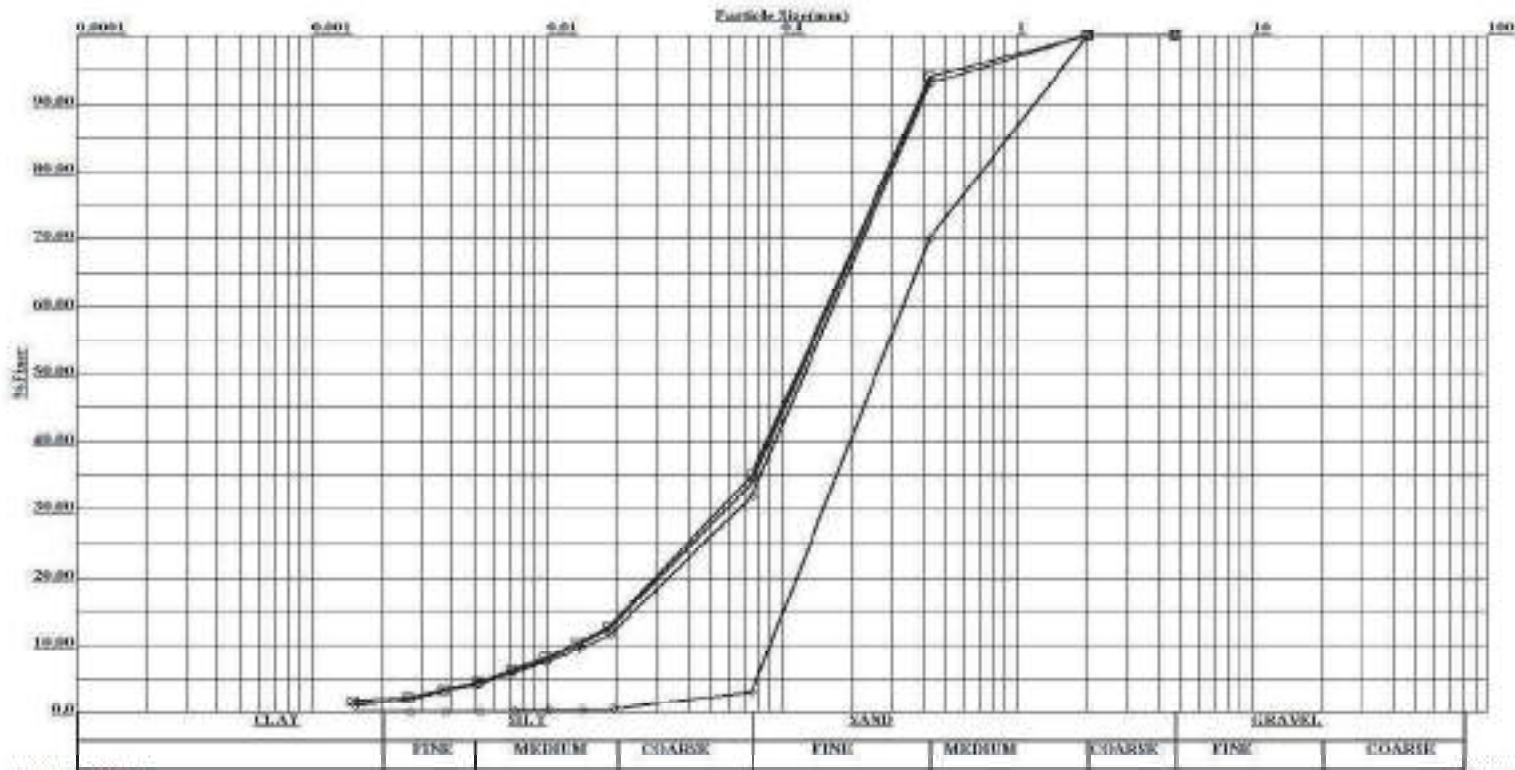
Symbol	Depth, m	Soil Description	Gravel	Sand	Silt	Clay	C _u	C _c
			(%)	(%)	(%)	(%)		
×	0.0	LOOSE MEDIUM DENSE LITE GREY SILTY SAND (SM)	0.00	68.00	30.00	2.00	10.71	1.79
○	1.5		0.00	67.00	31.00	2.00	10.87	1.69
□	3.0		0.00	65.00	33.00	2.00	11.83	1.45
◇	6.0		0.00	66.00	31.00	3.00	13.91	1.74

PROJECT: Final location survey for New B.G Railway line projects (770.00 km.) and Final location survey for construction of Doubling/Third line/ 3rd & 4th line (252.00 km.) of North Eastern Railway (Total 1022.00 km)

BRIDGE NO. - 16
SECTION:CHITAUNI-MADHUBANI

BOREHOLE NO. -BH-01

GRAIN SIZE ANALYSIS



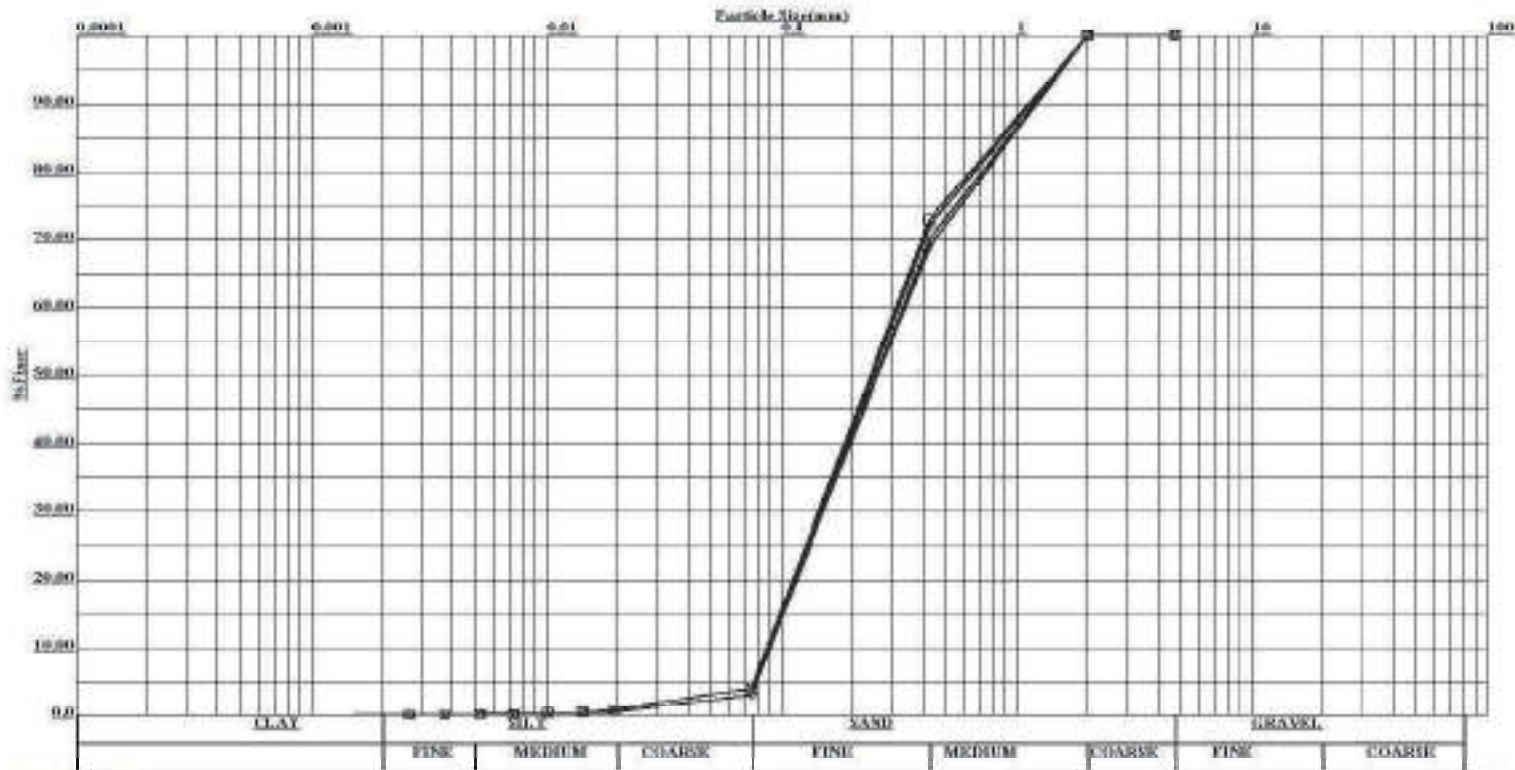
Symbol	Depth, m	Soil Description	Gravel	Sand	Silt	Clay	C_u	C_c
			(%)	(%)	(%)	(%)		
×	9.0	LOOSE MEDIUM DENSE LITE GREY SILTY SAND (SM)	0.00	66.00	32.00	2.00	11.53	1.53
○	12.0		0.00	68.00	31.00	1.00	11.11	1.72
□	15.0		0.00	65.00	33.00	2.00	11.82	1.45
◇	16.5	MEDIUM DENSE TO VERY DENSE DARK GREY POORLY GRADED SAND (SP)	0.00	97.00	3.00	0.00	3.65	0.77

PROJECT: Final location survey for New B.G Railway line projects (770.00 km.) and Final location survey for construction of Doubling/Third line/ 3rd & 4th line (252.00 km.) of North Eastern Railway (Total 1022.00 km)

BRIDGE NO. - 16
SECTION:CHITAUNI-MADHUBANI

BOREHOLE NO. -BH-01

GRAIN SIZE ANALYSIS



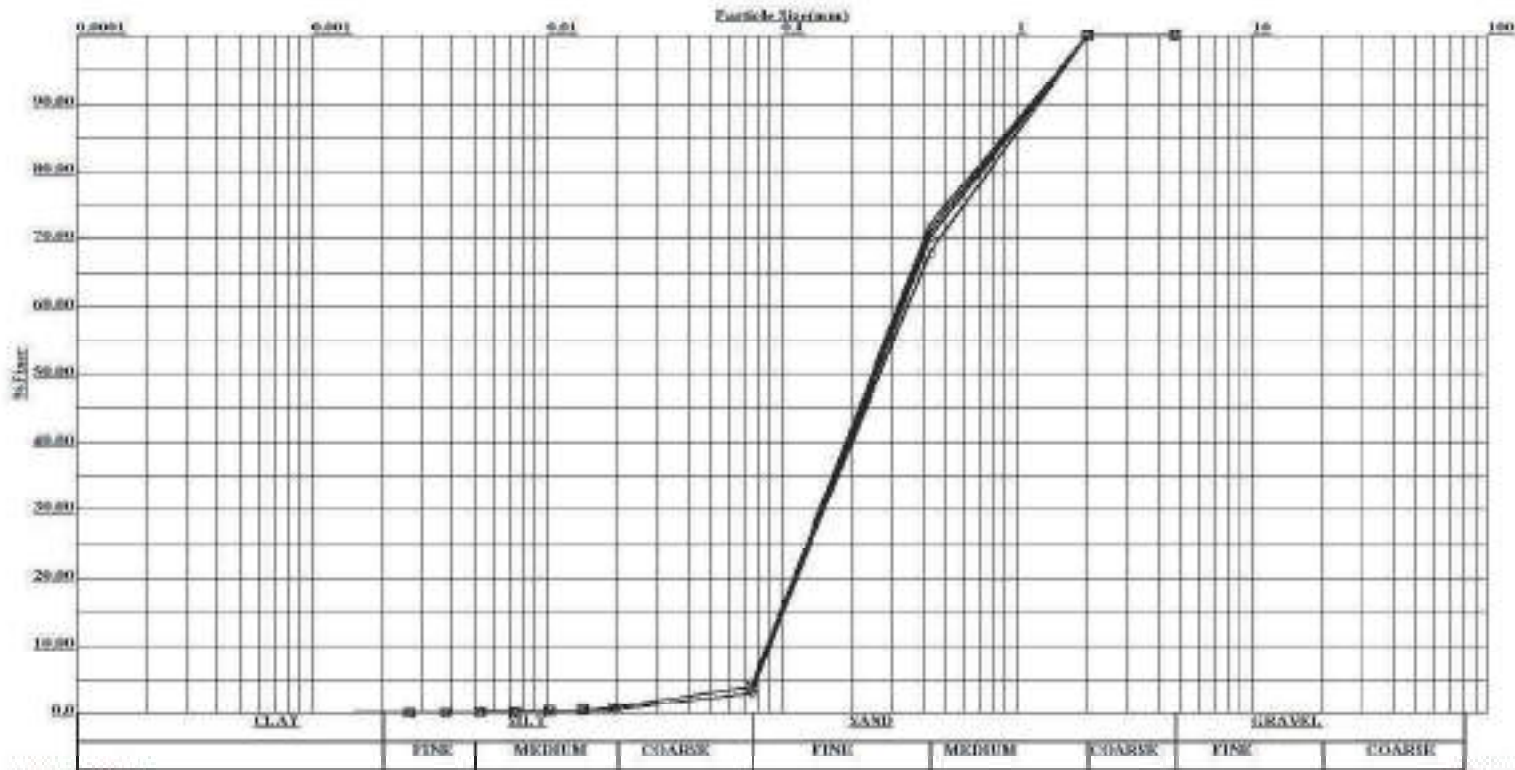
Symbol	Depth, m	Soil Description	Gravel	Sand	Silt	Clay	C_u	C_c
			(%)	(%)	(%)	(%)		
×	18.0	MEDIUM DENSE TO VERY DENSE DARK GREY POORLY GRADED SAND (SP)	0.00	96.00	4.00	0.00	3.80	0.77
○	21.0		0.00	97.00	3.00	0.00	3.51	0.78
□	24.0		0.00	96.00	4.00	0.00	3.51	0.78
◇	27.0		0.00	97.00	3.00	0.00	3.65	0.77

PROJECT: Final location survey for New B.G Railway line projects (770.00 km.) and Final location survey for construction of Doubling/Third line/ 3rd & 4th line (252.00 km.) of North Eastern Railway (Total 1022.00 km)

BRIDGE NO. - 16
SECTION:CHITAUNI-MADHUBANI

BOREHOLE NO. -BH-01

GRAIN SIZE ANALYSIS



Symbol	Depth, m	Soil Description	Gravel	Sand	Silt	Clay	C_u	C_c
			(%)	(%)	(%)	(%)		
×	30.0	MEDIUM DENSE TO VERY DENSE DARK GREY POORLY GRADED SAND (SP)	0.00	96.00	4.00	0.00	3.58	0.77
○	33.0		0.00	97.00	3.00	0.00	3.65	0.77
□	36.0		0.00	96.00	4.00	0.00	3.88	0.76
◇	39.0		0.00	97.00	3.00	0.00	3.85	0.77

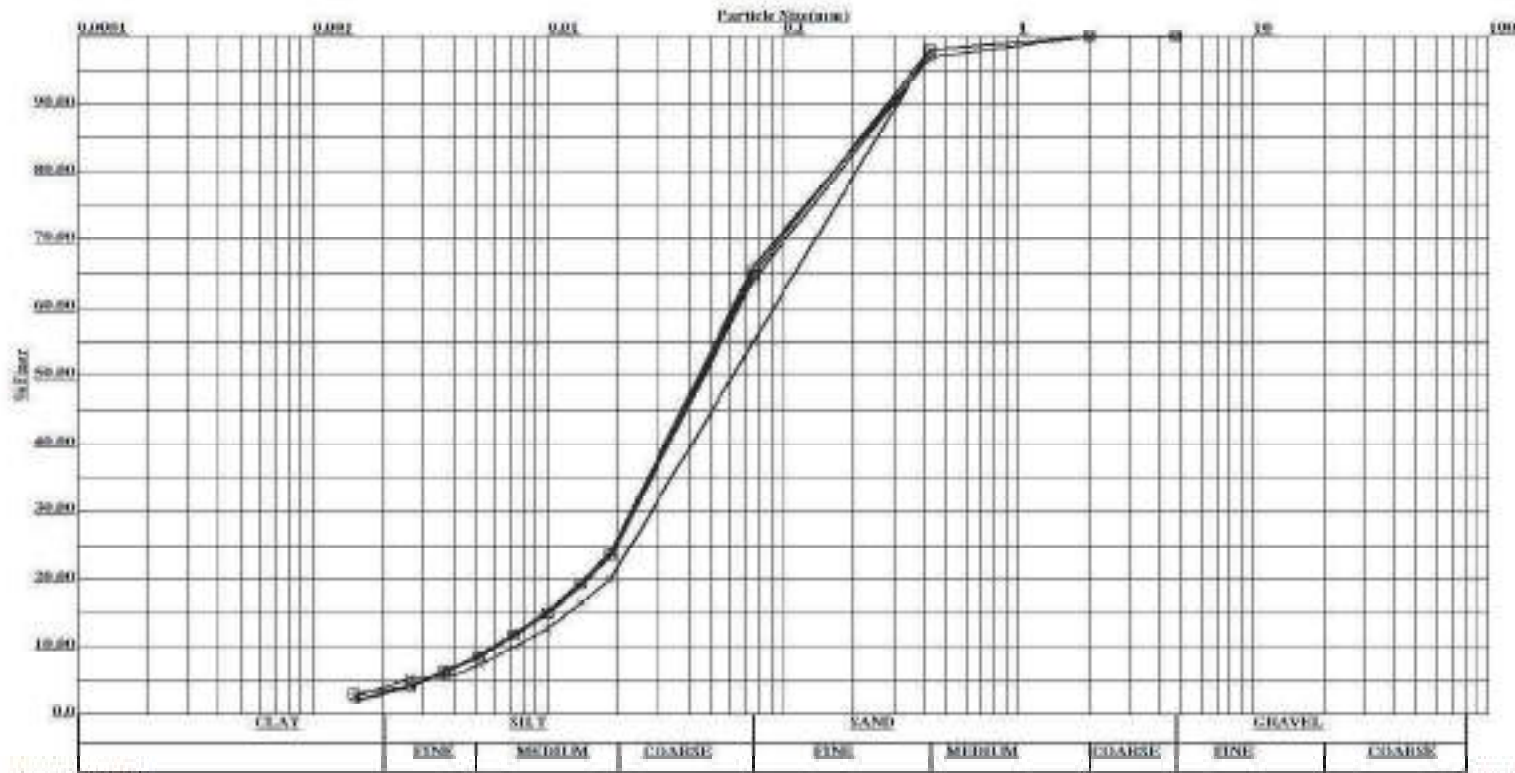


PROJECT: Final location survey for New B.G Railway line projects (770.00 km.) and Final location survey for construction of Doubling/Third line/ 3rd & 4th line (252.00 km.) of North Eastern Railway (Total 1022.00 km)

BRIDGE NO. - 16
SECTION:CHITAUNI-MADHUBANI

BOREHOLE NO.-BH-02

GRAIN SIZE ANALYSIS



Symbol	Depth, m	Soil Description	Gravel	Sand	Silt	Clay	C _u	C _c
			(%)	(%)	(%)	(%)		
×	0.0	LOOSE MEDIUM DENSE LITE BROWN SANDY SILT (ML)	0.00	45.00	51.00	4.00	12.66	1.16
○	1.5		0.00	36.00	61.00	3.00	10.72	1.38
□	3.0		0.00	35.00	61.00	4.00	10.56	1.40
◇	6.0		0.00	34.00	63.00	3.00	10.41	1.42

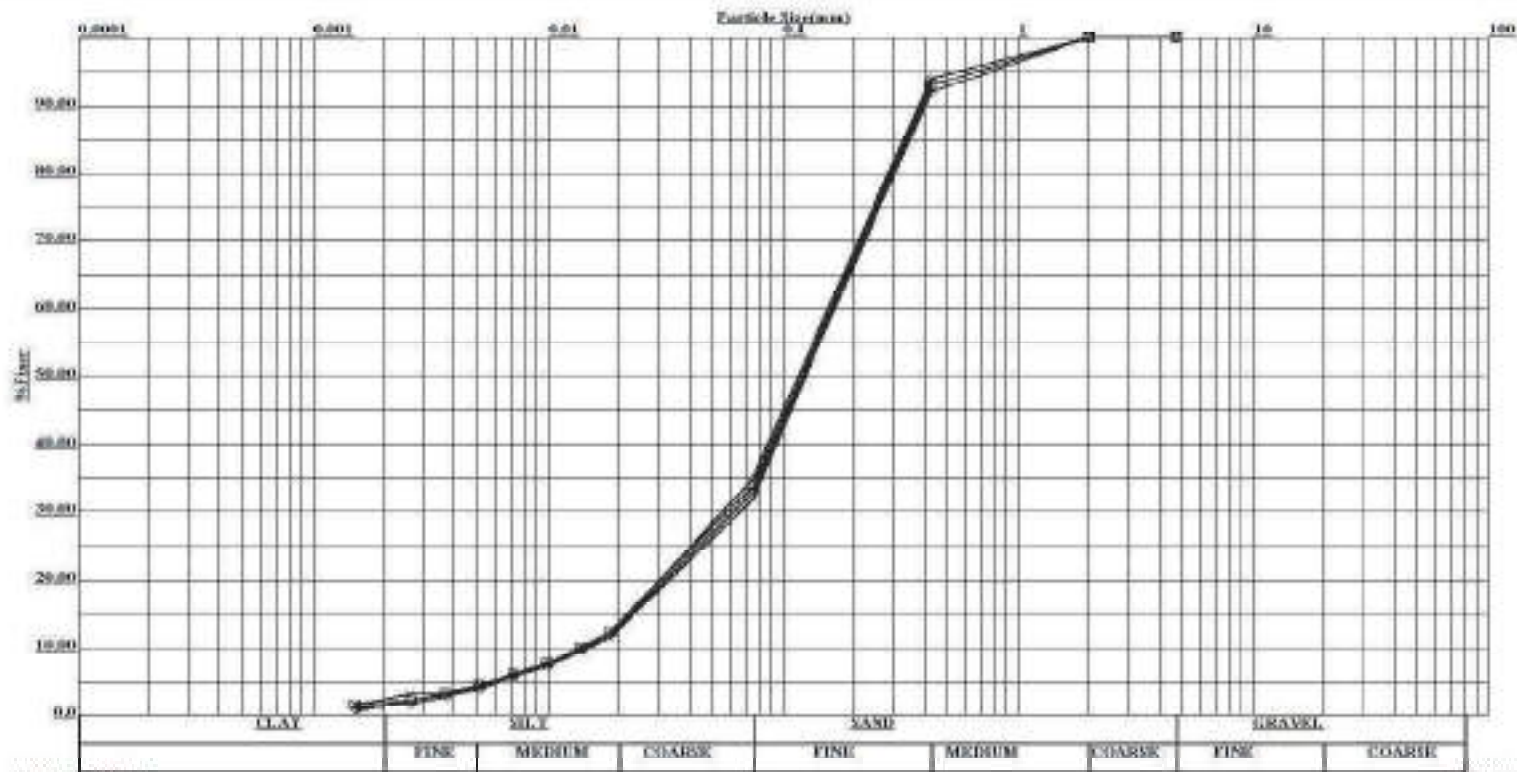


PROJECT: Final location survey for New B.G Railway line projects (770.00 km.) and Final location survey for construction of Doubling/Third line/ 3rd & 4th line (252.00 km.) of North Eastern Railway (Total 1022.00 km)

BRIDGE NO. - 16
SECTION:CHITAUNI-MADHUBANI

BOREHOLE NO.-BH-02

GRAIN SIZE ANALYSIS



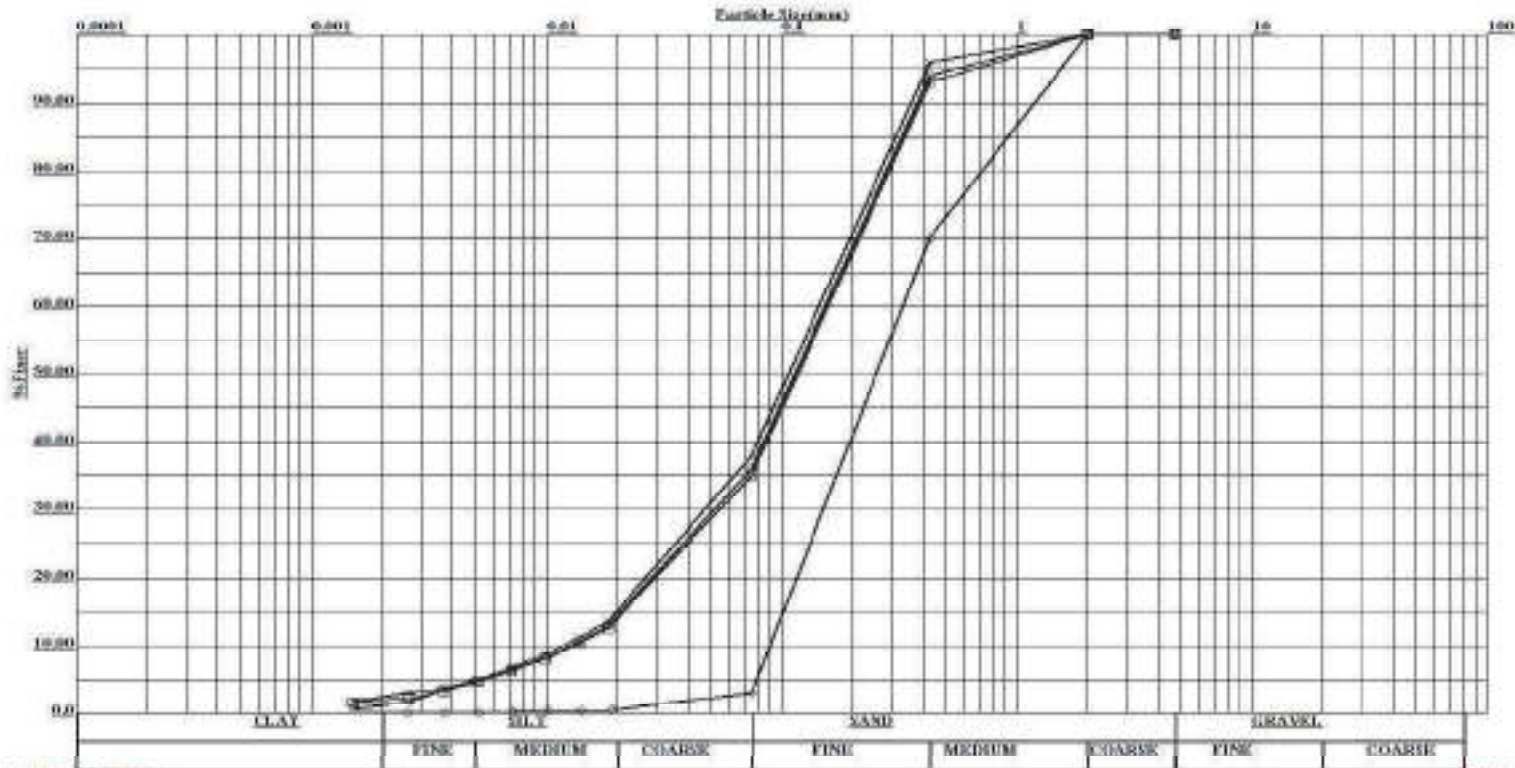
Symbol	Depth, m	Soil Description	Gravel	Sand	Silt	Clay	C_u	C_c
			(%)	(%)	(%)	(%)		
×	9.0	MEDIUM DENSE TO VERY DENSE LITE GREY SILTY SAND (SM)	0.00	68.00	30.00	2.00	10.97	1.74
○	12.0		0.00	67.00	32.00	1.00	11.56	1.59
□	15.0		0.00	66.00	32.00	2.00	11.68	1.51
◇	18.0		0.00	65.00	34.00	1.00	10.88	1.36

PROJECT: Final location survey for New B.G Railway line projects (770.00 km.) and Final location survey for construction of Doubling/Third line/ 3rd & 4th line (252.00 km.) of North Eastern Railway (Total 1022.00 km)

BRIDGE NO. - 16
SECTION:CHITAUNI-MADHUBANI

BOREHOLE NO.-BH-02

GRAIN SIZE ANALYSIS



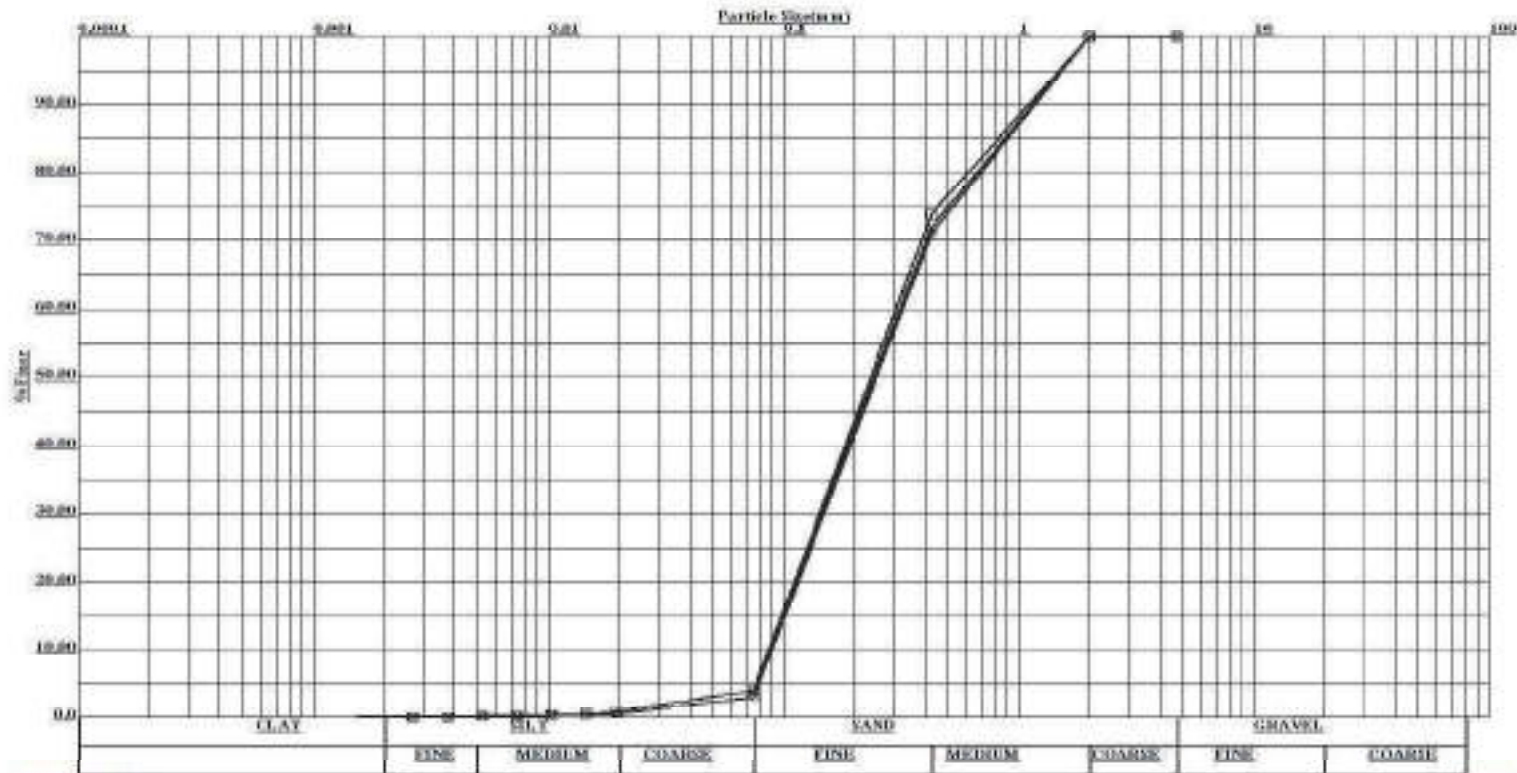
Symbol	Depth, m	Soil Description	Gravel	Sand	Silt	Clay	C_u	C_c
			(%)	(%)	(%)	(%)		
×	21.0	MEDIUM DENSE TO VERY DENSE LITE GREY SILTY SAND (SM)	0.00	62.00	36.00	2.00	12.26	1.31
○	24.0		0.00	64.00	35.00	1.00	12.09	1.39
□	27.0		0.00	65.00	33.00	2.00	11.98	1.44
◇	30.0		0.00	97.00	3.00	0.00	3.65	0.77

PROJECT: Final location survey for New B.G Railway line projects (770.00 km.) and Final location survey for construction of Doubling/Third line/ 3rd & 4th line (252.00 km.) of North Eastern Railway (Total 1022.00 km)

BRIDGE NO. - 16
SECTION:CHITAUNI-MADHUBANI

BOREHOLE NO.-BH-02

GRAIN SIZE ANALYSIS



Symbol	Depth, m	Soil Description	Gravel	Sand	Silt	Clay	C_u	C_c
			(%)	(%)	(%)	(%)		
×	33.0	DENSE TO VERY DENSE DARK GREY POORLY GRADED SAND (SP)	0.00	96.00	4.00	0.00	3.58	0.77
○	36.0		0.00	97.00	3.00	0.00	3.58	0.77
□	39.0		0.00	96.00	4.00	0.00	3.45	0.78



COMPUTATION OF WEIGHTED MEAN DIAMETER OF PARTICLES AND SILT FACTOR

Project: Final location survey for New B.G Railway line projects (770.00 km.) and Final location survey for construction of Doubling/Third line/ 3rd & 4th line (252.00 km.) of North Eastern Railway (Total 1022.00 km)

BRIDGE NO.-16				BOREHOLE NO-BH-01										Section : CHITAUNI-MADHUBANI												
Sl.No.	Borehole No.	Depth (m)		Description of the Soil Strata	IS Classification	Percentage Retained							Mean Particle Size (mm)							Sandy Strata		Clayey Soil				
		From	To			5.60 to 4.00	4.00 to 2.80	2.80 to 1.00	1.00 to 0.425	0.425 to 0.180	0.180 to 0.075	0.075 to 0	4.8	3.4	1.9	0.7125	0.3025	0.1275	0.0375	Mean Particle Size (dm)	Silt Factor in the layer= 1.76 x sqrt(dm)	Average Cohesion Intercept - c (kg/sqcm)	Average Angle of Internal Friction (°)	F	Silt Factor = $\frac{K_{sf}c}{F \times (1 + \sqrt{c})}$	
																									Silt Factor	
1	BH-01	0.00	1.00	SILTY SAND	SM	0.0	0.0	0.0	4.0	40.0	24.0	32.0	0.00	0.00	0.00	2.85	12.10	3.06	1.200	0.192	0.771	-	-	-	-	
2		1.50	1.95	SILTY SAND	SM	0.0	0.0	0.0	3.0	42.0	22.0	33.0	0.00	0.00	0.00	2.14	12.71	2.81	1.238	0.189	0.765	-	-	-	-	
3		6.00	6.45	SILTY SAND	SM	0.0	0.0	1.0	6.0	35.0	24.0	34.0	0.00	0.00	1.90	4.28	10.59	3.06	1.275	0.211	0.808	-	-	-	-	
4		12.00	12.45	SILTY SAND	SM	0.0	0.0	0.0	7.0	36.0	25.0	32.0	0.00	0.00	0.00	4.99	10.89	3.19	1.200	0.203	0.792	-	-	-	-	
4		16.50	16.95	POORLY GRADED SAND	SP	0.0	0.0	0.0	30.0	51.0	16.0	3.0	0.00	0.00	0.00	21.38	15.43	2.04	0.113	0.390	1.098	-	-	-	-	
5		18.00	18.45	POORLY GRADED SAND	SP	0.0	0.0	1.0	31.0	50.0	14.0	4.0	0.00	0.00	1.90	22.09	15.13	1.79	0.150	0.410	1.128	-	-	-	-	



COMPUTATION OF WEIGHTED MEAN DIAMETER OF PARTICLES AND SILT FACTOR

Project: Final location survey for New B.G Railway line projects (770.00 km.) and Final location survey for construction of Doubling/Third line/ 3rd & 4th line (252.00 km.) of North Eastern Railway (Total 1022.00 km)

BRIDGE NO.-16

BOREHOLE NO-BH-02

Section : CHITAUNI TO MADHUBANI

Sl.No.	Borehole No.	Depth (m)		Description of the Soil Strata	IS Classification	Percentage Retained							Mean Particle Size (mm)							Sandy Strata		Clayey Soil				
		From	To			5.60 to 4.00	4.00 to 2.80	2.80 to 1.00	1.00 to 0.425	0.425 to 0.180	0.180 to 0.075	0.075 to 0	4.8	3.4	1.9	0.7125	0.3025	0.1275	0.0375	Mean Particle Size (dm)	Silt Factor in the layer= 1.76 x sqrt(dm)	Average Cohesion Intercept - c (t/sqm)	Average Angle of Internal Friction (°)	F	Silt Factor = $\frac{K_{sfc}}{F \times (1 + \sqrt{c/10})}$	
																									Silt Factor	
1	BH-02	0.00	1.00	SANDY SILT	ML	0.0	0.0	0.0	2.0	28.0	15.0	55.0	0.00	0.00	0.00	1.43	8.47	1.91	2.063	0.139	0.655	-	-	-	-	-
2		3.00	3.45	SANDY SILT	ML	0.0	0.0	0.0	3.0	21.0	12.0	64.0	0.00	0.00	0.00	2.14	6.35	1.53	2.400	0.124	0.620	-	-	-	-	-
3		6.00	6.45	SILTY SAND	SM	0.0	0.0	1.0	6.0	35.0	24.0	34.0	0.00	0.00	1.90	4.28	10.59	3.06	1.275	0.211	0.808	-	-	-	-	-
4		12.00	12.45	SILTY SAND	SM	0.0	0.0	0.0	8.0	36.0	23.0	33.0	0.00	0.00	0.00	5.70	10.89	2.93	1.238	0.208	0.802	-	-	-	-	-
4		15.00	15.45	SILTY SAND	SM	0.0	0.0	0.0	7.0	37.0	22.0	34.0	0.00	0.00	0.00	4.99	11.19	2.81	1.275	0.203	0.792	-	-	-	-	-
5		18.00	18.45	SILTY SAND	SM	0.0	0.0	0.0	6.0	38.0	21.0	35.0	0.00	0.00	0.00	4.28	11.50	2.68	1.313	0.198	0.782	-	-	-	-	-



NORTH EASTERN RAILWAY

FINAL LOCATION SURVEY FOR NEW B.G RAILWAY LINE PROJECTS (770.00 KM.) AND FINAL LOCATION SURVEY FOR CONSTRUCTION OF DOUBLING/THIRD LINE/ 3RD & 4TH LINE (252.00 KM.) OF NORTH EASTERN RAILWAY (TOTAL 1022.00 KM)

SECTION: CHITAUNI-MADHUBANI

Chainage	Br. No	Type of Crossing	Type of Bridge	Borehole No.	Easting (m)	Northing (m)	Reduced Level (m)
12375.000	19	WATERWAY	MINOR	BH-01	201068	2998073	110.70

SUBMITTED BY:

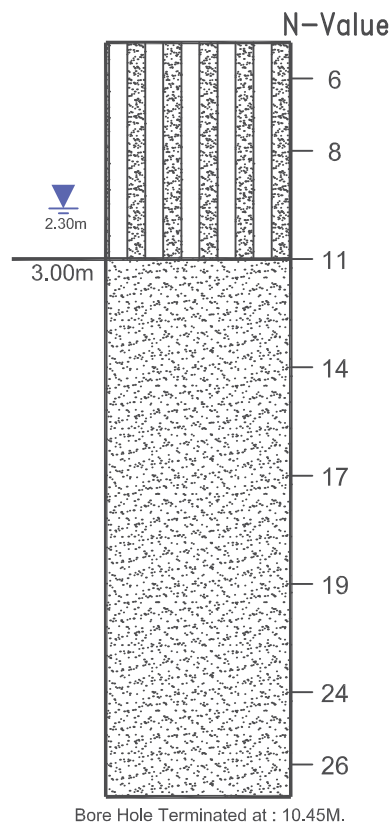


BOREHOLE PROFILE

SECTION: CHITAUNI - MADHUBANI

BRIDGE NO.- 19

BOREHOLE NO.: BH- 01



Bore Hole Terminated at : 10.45M.

LEGENDS



Silty Sand (SM)




Poorly Graded Sand (SP)



Ground Water Table



Project: FINAL LOCATION SURVEY FOR NEW B.G RAILWAY LINE PROJECTS (770.00 KM.) AND FINAL LOCATION SURVEY FOR CONSTRUCTION OF DOUBLING/THIRD LINE/ 3RD & 4TH LINE (252.00 KM.) OF NORTH EASTERN RAILWAY (TOTAL 1022.00 KM)

BRIDGE NO. 19										DATE STARTED :		23/01/2025																							
BOREHOLE NO. BH- 01										GWT: 2.30 m		DATE COMPLETED :												23/01/2025											
FIELD TEST RESULTS										LABORATORY TEST RESULTS																									
ELEVATION IN METERS	DEPTH IN METERS BELOW REFERENCE	NATURE OF SAMPLING	SAMPLE REFERENCE NO.	LEVEL OF WATER TABLE / LWL	SPT TEST RESULTS					SYMBOLIC REPRESENTATION	DESCRIPTION OF SOIL WITH I.S. CLASSIFICATION	TYPE OF TEST CONDUCTED IN THE LABORATORY	GRAIN SIZE ANALYSIS				LIQUID LIMIT (%)	PLASTIC LIMIT (%)	PLASTICITY INDEX (%)	BULK DENSITY (gm/cc)	DRY DENSITY (gm/cc)	MOISTURE CONTENT (%)	FREESWELL INDEX (%)	SPECIFIC GRAVITY	SUBMERGED DENSITY (gm/cc)	SHEAR STRENGTH CHARACTERISTICS		CONSOLIDATION CHARACTERISTICS	Chemical Analysis Result						
					DEPTH IN METERS	NO. OF BLOWS	PENETRATION (CM)	N VALUE (Recorded)	N VALUE (Corrected)				GRAVEL (%)	SAND (%)	SILT (%)	CLAY (%)										Cohesion, C _v (kg/cm ²)	Angle of friction (Degrees)		Compression Index (Cc)	pH	Chloride, %	Sulphate, %	pH	Chloride, mg/l	Sulphate, mg/l
-0.50	0.5	DS	1	2.30 m	0.00	0.50	DS	-	-	-	MEDIUM DENSE, LITE GREY, SILTY SAND (SM)	-	0	75	24	1	NON-PLASTIC		-	-	-	-	-	-	-	-	-	-	-	7.31	0.01	NIL	-	-	-
	1.0	SPT	1		0.50	0.95	6	30	6	11		-	0	72	26	2	NON-PLASTIC		-	-	-	2.54	-	-	-	-	-	-	-	7.36	0.02	NIL	-	-	-
	2.0	SPT	2		1.50	1.95	8	30	8	12		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	7.40	0.03	NIL	-	-	-	
-3.00	3.0	DS	1		2.50	2.80	UDS SLIPPED						-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	4.0	SPT	3		3.00	3.45	11	30	11	16			-	0	96	4	0	NON-PLASTIC		-	-	-	2.56	-	-	-	-	-	-	-	-	-	-	-	-
	5.0	SPT	4		4.50	4.95	14	30	14	17			-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
-6.00	6.0	DS	2		5.50	5.80	UDS SLIPPED						-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	7.0	SPT	5		6.00	6.45	17	30	17	18			-	0	97	3	0	NON-PLASTIC		-	-	-	2.55	-	-	-	-	-	-	-	-	-	-	-	-
	8.0	SPT	6		7.50	7.95	19	30	19	18			-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
-9.00	9.0	DS	3		8.50	8.80	UDS SLIPPED						-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	10.0	SPT	7		9.00	9.45	24	30	24	21			-	0	96	4	0	NON-PLASTIC		-	-	-	2.60	-	-	-	-	-	-	-	-	-	-	-	-
	11.0	SPT	8		10.00	10.45	26	30	26	21			-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
CLASSIFICATION OF SOIL AS PER IS : 1498 ABBREVIATION USED : DS = DISTURBED SAMPLE , SPT = STANDARD PENETRATION TEST, UDS = UNDISTURBED SAMPLE, DST = DIRECT SHEAR TEST, UC : UNCONFINED COMPRESSION TEST UU : UNCONSOLIDATED UNDRAINED TRIAXIAL TEST * UCS BASED ON POINT LOAD TEST												Project: Final location survey for New B.G Railway line projects (770.00 km.) and Final location survey for construction of Doubling/Third line/ 3rd & 4th line (252.00 km.) of North Eastern Railway (Total 1022.00 km)																							
												SECTION: CHITAUNI-MADHUBANI																							

CALCULATIONS FOR CORRECTED SPT (N) VALUES

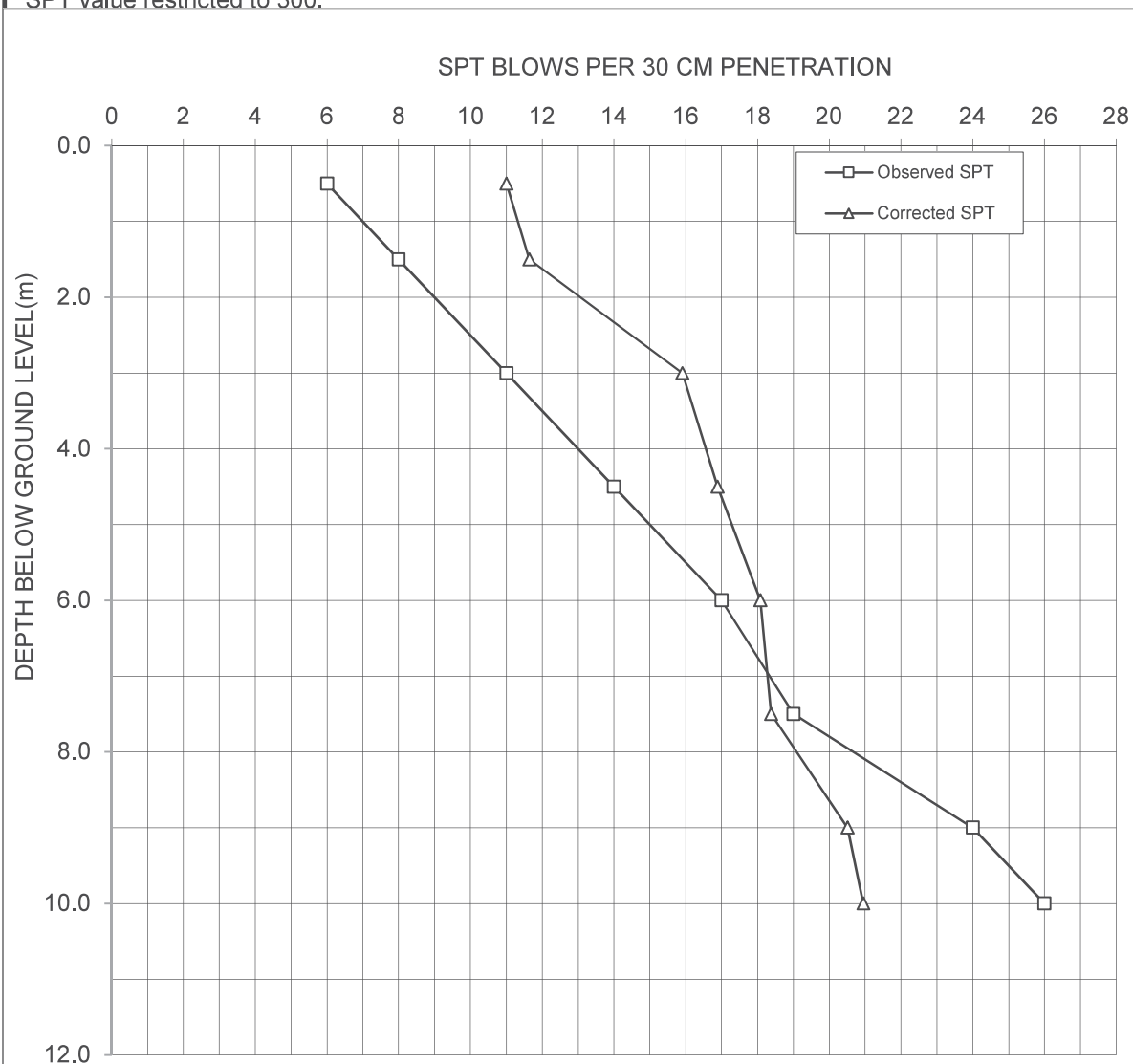
Project: Final location survey for New B.G Railway line projects (770.00 km.) and Final location survey for construction of Doubling/Third line/ 3rd & 4th line (252.00 km.) of North Eastern Railway (Total 1022.00 km)

BOREHOLE NO. BH- 01

WATER TABLE :- 2.30 m

DEPTH OF SAMPLE	TYPE OF SOIL	OBSERVED SPT 'N' VALUE	CORRECTED SPT (N') VALUE (FOR OVERBURDEN)	FINAL CORRECTED VALUE AFTER DILATANCY CORRECTION (N'')
0.50	Non Plastic	6	11	11
1.50	Non Plastic	8	12	12
3.00	Non Plastic	11	17	16
4.50	Non Plastic	14	19	17
6.00	Non Plastic	17	21	18
7.50	Non Plastic	19	22	18
9.00	Non Plastic	24	26	21
10.00	Non Plastic	26	27	21

* SPT value restricted to 300.





Typical Computation of Liquefaction Potential as per IRC:SP: 114 / IS: 1893

Project: Final location survey for New B.G Railway line projects (770.00 km.) and Final location survey for construction of Doubling/Third line/ 3rd & 4th line (252.00 km.) of North Eastern Railway (Total 1022.00 km)

BRIDGE NO: 19

BOREHOLE NO.

BH-01

SECTION: CHITAUNI-MADHUBANI

Water table assumed for Calculation: 0.00 m

Depth below EGL, m	Type of Strata	Observed SPT Value	Saturated density (t/m^3)	Submerged Density (t/m^3)	Fine Content (%)	Earthquake Zone	Peak ground acceleration a_{max}/g	Earth quake magnitude (Mw)	Stress reduction coefficient (rd)	Total overburden pressure (σ_o), t/m^2	Effective overburden (σ'_o), t/m^2	Cyclic Stress ratio (CSR)	C_N	CE or CHT	CH or CHW	CB or CBD	CR or CRL	CS or CSS	SPT corrected (N_1) ₆₀	α	β	(N_1) _{60cs}	$CRR_M = 7.5$	Relative Density, Dr%	f	K_σ	K_α	MSF	CRR	FOS	Conclusion
0.50	SM	6	1.72	0.72	28	IV	0.24	7.00	1.00	0.86	0.36	0.37	1.70	1.33	1.000	1.05	0.75	1.00	10.68	4.56	1.14	16.72	0.18	21.54	0.89	1.00	1.00	1.19	0.21	0.57	Liquefiable
1.50	SM	8	1.72	0.72	28	IV	0.24	7.00	0.99	2.58	1.08	0.37	1.70	1.33	1.000	1.05	0.75	1.00	14.24	4.56	1.14	20.77	0.23	29.55	0.85	1.00	1.00	1.19	0.27	0.73	Liquefiable
3.00	SP	11	2.01	1.01	4	IV	0.24	7.00	0.98	5.16	2.16	0.36	1.70	1.33	1.000	1.05	0.85	1.00	22.20	0.00	1.00	22.20	0.24	47.44	0.76	1.00	1.00	1.19	0.29	0.80	Liquefiable
4.50	SP	14	2.01	1.01	4	IV	0.24	7.00	0.97	8.18	3.68	0.34	1.65	1.33	1.000	1.05	0.95	1.00	30.64	0.00	1.00	30.64	NA	65.64	0.67	1.00	1.00	1.19	NA	>1.0	Non Liquefiable
6.00	SP	17	2.02	1.02	3	IV	0.24	7.00	0.95	11.19	5.19	0.32	1.39	1.33	1.000	1.05	0.95	1.00	31.31	0.00	1.00	31.31	NA	66.31	0.67	1.00	1.00	1.19	NA	>1.0	Non Liquefiable
7.50	SP	19	2.02	1.02	3	IV	0.24	7.00	0.94	14.22	6.72	0.31	1.22	1.33	1.000	1.05	0.95	1.00	30.75	0.00	1.00	30.75	NA	65.75	0.67	1.00	1.00	1.19	NA	>1.0	Non Liquefiable
9.00	SP	24	2.03	1.03	4	IV	0.24	7.00	0.93	17.25	8.25	0.30	1.10	1.33	1.000	1.05	1	1.00	36.90	0.00	1.00	36.90	NA	71.90	0.64	1.00	1.00	1.19	NA	>1.0	Non Liquefiable
10.00	SP	26	2.03	1.03	4	IV	0.24	7.00	0.91	19.28	9.28	0.29	1.04	1.33	1.000	1.05	1	1.00	37.69	0.00	1.00	37.69	NA	72.69	0.64	1.00	1.00	1.19	NA	>1.0	Non Liquefiable

Note: Values of all Parameters are as per IRC:SP: 114 / IS 1893: 2016

C_E or C_{HT} (Correction for hammer energy ratio) = $ER/60$, ER for Rope and pully System = 80 % , Hence $C_E = 80/60 = 1.33$

C_H or C_{HW} (Correction for hammer) = 1.00

Borehole Diameter = 150 mm , Hence C_B or C_{BD} (Correction for Borehole diameter), = 1.05

C_s or C_{ss} (Correction for Standard sampler) = 1.00

K_σ Correction for high overburden stress (for effective oberburden pressure>10 T/m2)

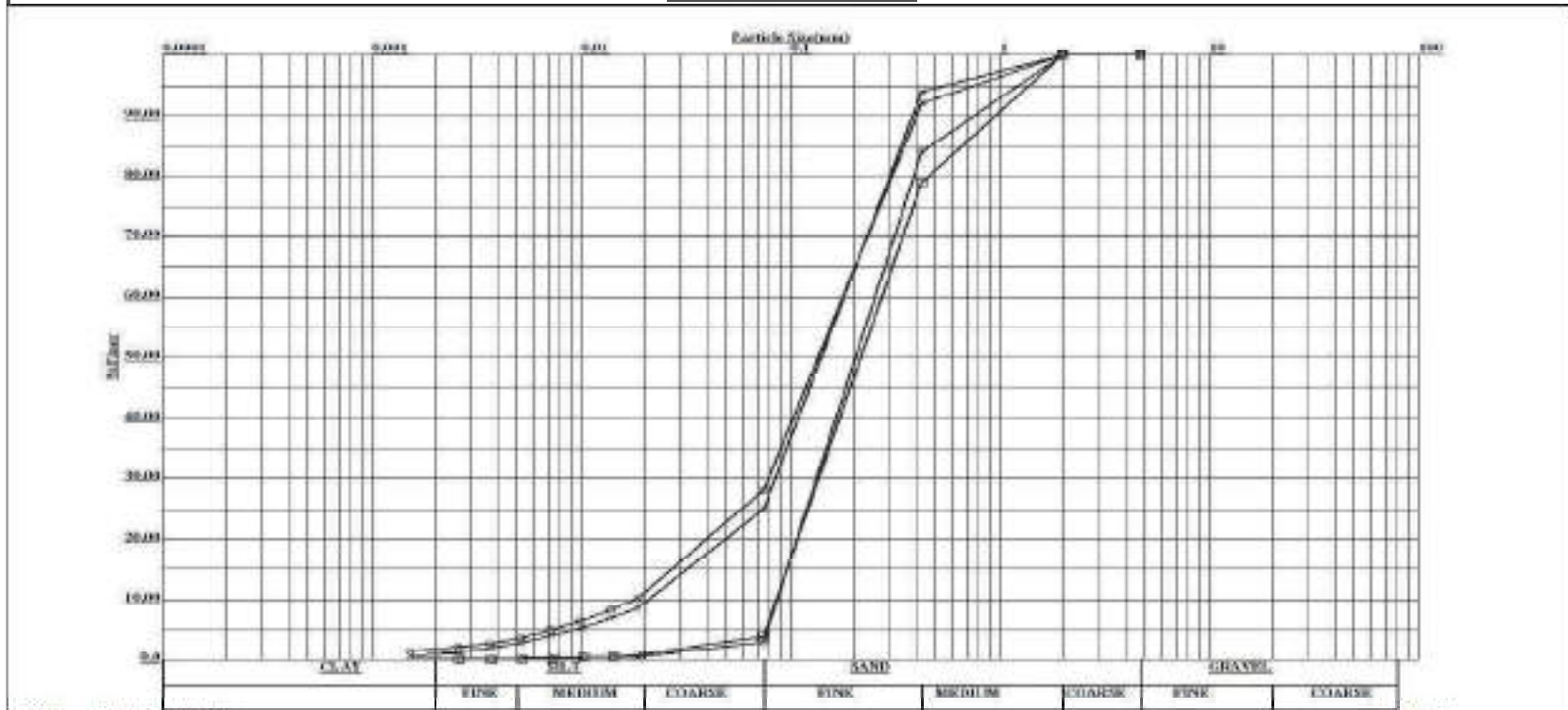
K_α Correction for static shear stress is required only for sloping ground

PROJECT: Final location survey for New B.G Railway line projects (770.00 km.) and Final location survey for construction of Doubling/Third line/ 3rd & 4th line (252.00 km.) of North Eastern Railway (Total 1022.00 km)

BRIDGE NO. - 19
SECTION:CHITAUNI TO MADHUBANI

BOREHOLE NO. - 01

GRAIN SIZE ANALYSIS



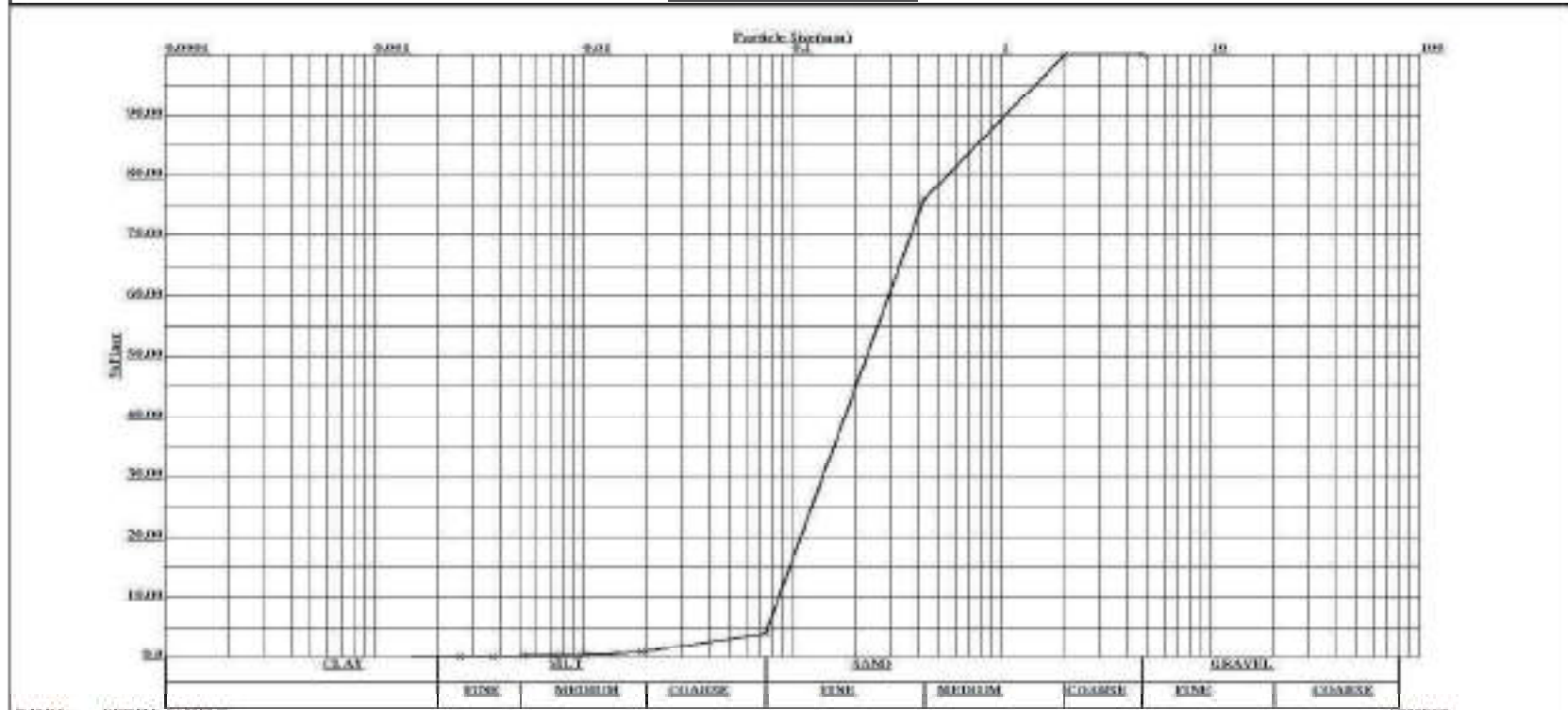
Symbol	Depth, m	Soil Description	Gravel	Sand	Silt	Clay	C_u	C_c
			(%)	(%)	(%)	(%)		
x	0.0	MEDIUM DENSE, LITE GREY, SILTY SAND (SM)	0.00	75.00	24.00	1.00	8.62	1.91
○	0.5		0.00	72.00	26.00	2.00	9.79	1.93
□	3.0	MEDIUM DENSE, LITE GREY, POORLY GRADED SAND (SP)	0.00	96.00	4.00	0.00	3.18	0.79
◇	6.0		0.00	97.00	3.00	0.00	2.92	0.81

PROJECT: Final location survey for New B.G Railway line projects (770.00 km.) and Final location survey for construction of Doubling/Third line/ 3rd & 4th line (252.00 km.) of North Eastern Railway (Total 1022.00 km)

BRIDGE NO. - 19
SECTION:CHITAUNI TO MADHUBANI

BOREHOLE NO. - 01

GRAIN SIZE ANALYSIS



Symbol	Depth, m	Soil Description	Gravel	Sand	Silt	Clay	C_u	C_c
			(%)	(%)	(%)	(%)		
x	9.0	MEDIUM DENSE, LITE GREY,POORLY GRADED SAND (SP)	0.00	96.00	4.00	0.00	3.34	0.79

COMPUTATION OF WEIGHTED MEAN DIAMETER OF PARTICLES AND SILT FACTOR

Project: Final location survey for New B.G Railway line projects (770.00 km.) and Final location survey for construction of Doubling/Third line/ 3rd & 4th line (252.00 km.) of North Eastern Railway (Total 1022.00 km)

BRIDGE NO. 19

BOREHOLE NO- 1

Section : CHITAUNI - MADHUBANI

Sl.No.	Borehole No.	Depth (m)		Description of the Soil Strata	IS Classification	Percentage Retained							Mean Particle Size (mm)							Sandy Strata		Clayey Soil			
		From	To			5,60 to 4,00	4,00 to 2,80	2,80 to 1,00	1,00 to 0,425	0,425 to 0,180	0,180 to 0,075	0,075 to 0	4,8	3,4	1,9	0,7125	0,3025	0,1275	0,0375	Mean Particle Size (dm)	Silt Factor in the layer= 1.76 x sqrt(dm)	Average Cohesion Intercept - c (kg/sqcm)	Average Angle of Internal Friction (°)	F	Silt Factor = K _{sf} c = F x (1 + sqrt(c))
1	BH-1	0.50	0.95	SILTY SAND	SM	0.0	0.0	0.0	7.0	40.0	25.0	28.0	0.00	0.00	0.00	4.99	12.10	3.19	1.050	0.213	0.813	-	-	-	-
2		3.00	3.45	POORLY GRADED SAND	SP	0.0	0.0	0.0	21.0	55.0	20.0	4.0	0.00	0.00	0.00	14.96	16.64	2.55	0.150	0.343	1.031	-	-	-	-
3		6.00	6.45	POORLY GRADED SAND	SP	0.0	0.0	0.0	16.0	53.0	28.0	3.0	0.00	0.00	0.00	11.40	16.03	3.57	0.113	0.311	0.982	-	-	-	-



NORTH EASTERN RAILWAY

FINAL LOCATION SURVEY FOR NEW B.G RAILWAY LINE PROJECTS (770.00 KM.) AND FINAL LOCATION SURVEY FOR CONSTRUCTION OF DOUBLING/THIRD LINE/ 3RD & 4TH LINE (252.00 KM.) OF NORTH EASTERN RAILWAY (TOTAL 1022.00 KM)

SECTION: CHITAUNI-MADHUBANI

Chainage	Br. No	Type of Crossing	Type of Bridge	Borehole No.	Easting (m)	Northing (m)	Reduced Level (m)
13390.333	20	WATERWAY	MINOR	BH-01	201767	2997415	108.62

SUBMITTED BY:

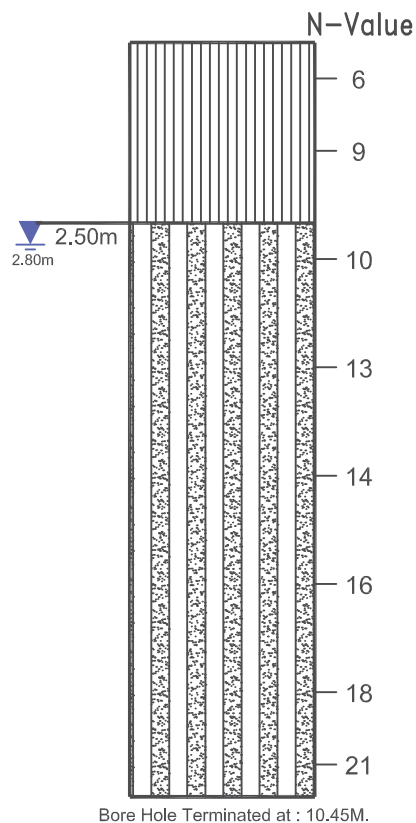


BOREHOLE PROFILE

SECTION: CHITAUNI - MADHUBANI

BRIDGE NO.- 20

BOREHOLE NO.: BH- 01



LEGENDS



Sandy Silt (ML)



Silty Sand (SM)



Ground Water Table



Project: FINAL LOCATION SURVEY FOR NEW B.G RAILWAY LINE PROJECTS (770.00 KM.) AND FINAL LOCATION SURVEY FOR CONSTRUCTION OF DOUBLING/THIRD LINE/ 3RD & 4TH LINE (252.00 KM.) OF NORTH EASTERN RAILWAY (TOTAL 1022.00 KM)