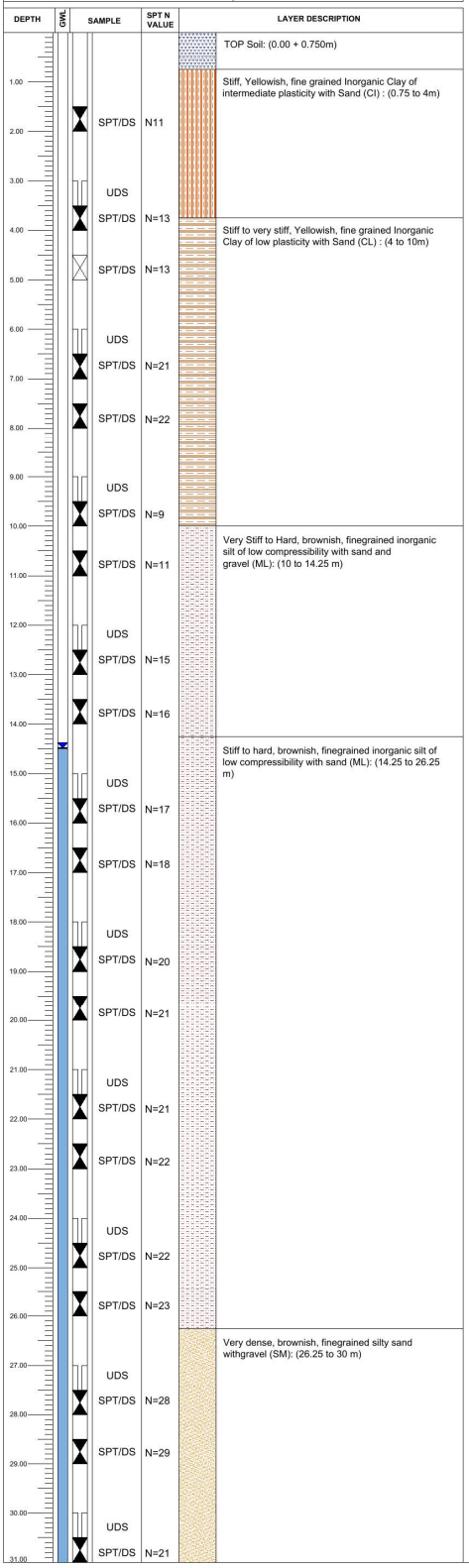
NAME OF WORK: GEOTECHNICAL INVESTIGATION WORK FOR PROPOSED EXTENSION METRO CORRIDORS OF AQUA LINE FROM NOIDA SECTOR-142 TO BOTANICAL GARDEN AND DEPOT STATION TO BORAKI MMTH (14.16 KM)

Stretch: Depot Station to Boraki MMTH (CH 0+000 km to 2+600 km)

BH ID : BH-8B | **Chainage** : 0+847 KM

Groundwater Level : 14.5 M | **Location** : Lat. 28.496073 Long. 77.557246



LEGENDS

Sample Type

- Split Spoon Sampler
- Shelby Tube (UDS)

General

- Groundwater Level

Soil

- Well Graded Gravel (GW)
- Poorly Graded Gravel (GP)
- Silty Gravel (GM)
- Clayey Gravel (GC)
- Well Graded Sand (SW)
- Poorly Graded Sand (SP)
- Silty Sand (SM)
- Clayey Sand (SC)
- Inorganic Silt of Low Compressibility (ML)
- Inorganic Silt of Intermediate Compressibility (MI)
- Inorganic Silt of High Compressibility (MH)
- Inorganic Clay of Low Compressibility (CL)
- Inorganic Clay of Intermediate Compressibility (CI)
- Inorganic Clay of High Compressibility (CH)
- Organic Soil of Low Compressibility (OL)
- Organic Soil of Intermediate Compressibility OI)
- Organic Soil of High Compressibility (OH)
- Peat (Pt)
- Top Soil (TS)

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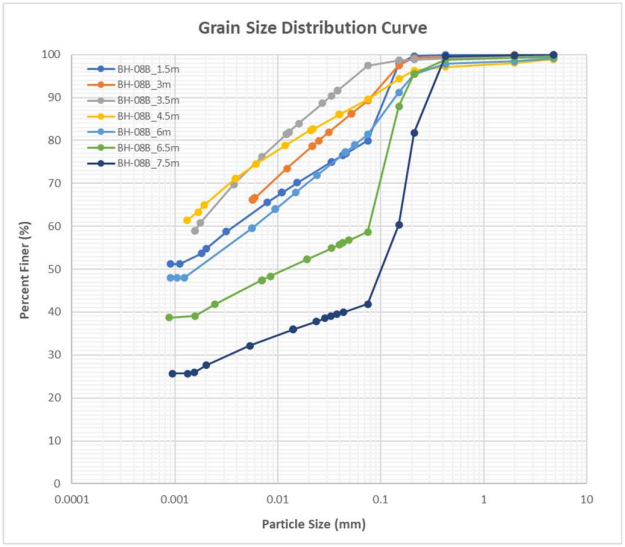
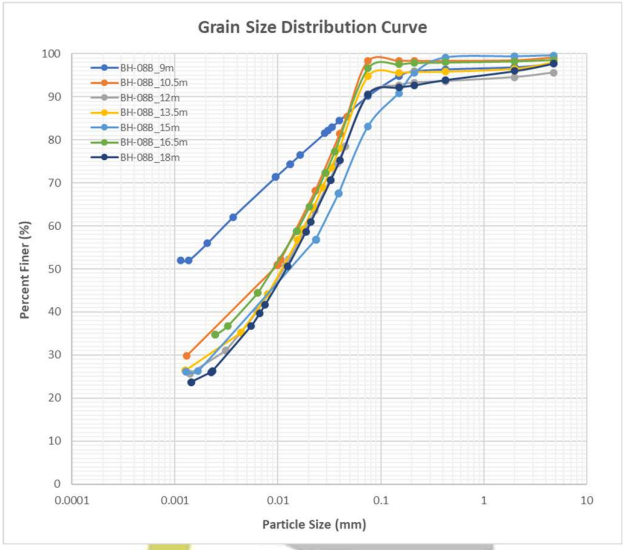
Quality we put forward

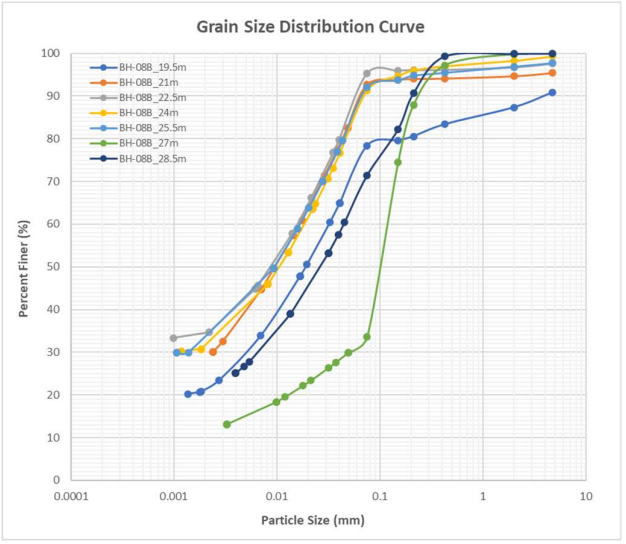
Project		Borehole Details		Drilling Details	
Name of Work:	Geotechnical Investigation work for Proposed Extension Metro Corridors of Aqua Line from Noida Sector-142 to Botanical Garden and Depot Station to Boraki MMTH (14.16 km) (E Tender No. NMRC/Civil/Geo. Inv./366/2025)	**BH ID:**	BH-08B	**Contractor:**	Goma Engineering & Consultancy
		Chainage [km]:	0+847	**Method of Drilling:**	Rotary Drilling
Client:	Noida Metro Rail Corporation (NMRC) Limited	**Depth [m]:**	30.00	**Start Date:**	05-12-2025
Stretch:	Depot Station to Boraki MMTH	**Elevation [m]:**	207.44	**End Date:**	06-12-2025
Project Code:	158_R0_DEST TO BOMM_0+000 km TO 2+586 km	**Water table Level [m]:**	14.50	**Location:**	Lat: 28°49'60.73", Long: 77°55'72.46"

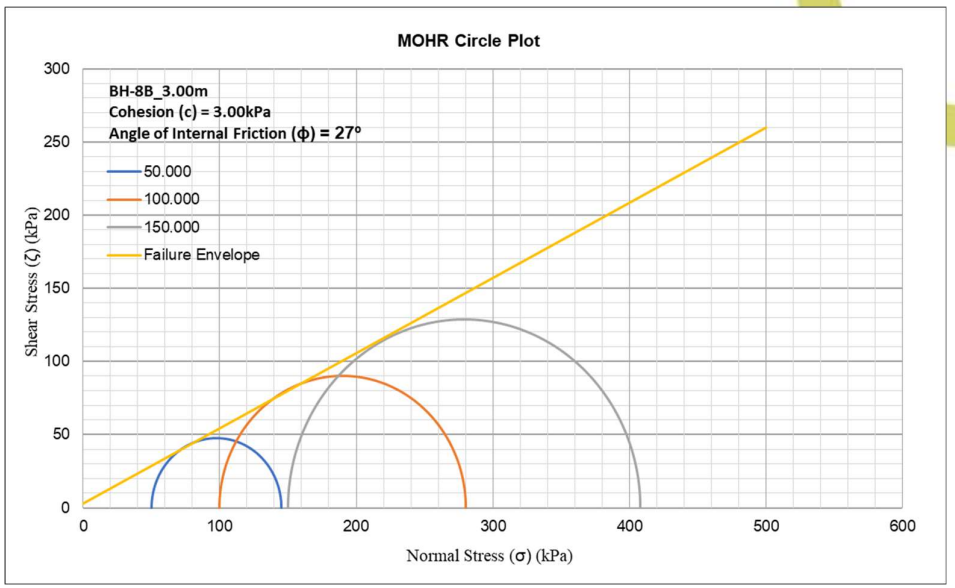
Depth [m]	Sample Type	Descriptions	SPT Test Results					Soil Particles				Atterberg Limits			Physical Characteristics				Direct Shear Test			Triaxial Comp Test			Consolidation Test		
			N1 (Seating Drive)	N2 (First Drive)	N3 (Second Drive)	Observed SPT	N (Correct N)	Gravel [%]	Sand [%]	Silt [%]	Clay [%]	Liquid Limit [%]	Plastic Limit [%]	Plasticity Index [%]	Moisture Content [%]	Bulk Density [gm/cm^3]	Dry Density [gm/cm^3]	Specific Gravity	Type	Cohesion [kg/cm^2]	Angle of Friction [°]	Type	Cohesion [kPa]	Angle of Friction [°]	Swelling Index	Consolidation Index	Preconsolidation Pressure [kg/cm^2]
0.00	DS	Top Soil	-	-	-	-	-	2.1	27.5	26.7	43.7	38	17	21	-	-	-	-	-	-	-	-	-	-	-	-	-
1.50	SPT/DS	Stiff, Yellowish, fine grained Inorganic Clay of intermediate plasticity with Sand (CI)	2	3	5	8	11	0.0	20.8	25.2	54.7	36	16	20	-	-	-	-	-	-	-	-	-	-	-	-	-
3.00	UDS							0.0	10.7	28.3	61.0	38	17	21	10.07	-	-	2.59	F	0.1	23	UU	3	27	-	-	-
3.50	SPT/DS		4	5	6	11	13	0.2	6.9	35.2	62.3	-	-	-	-	-	-	2.67	-	-	-	-	-	-	-	-	-
4.50	SPT/DS	Stiff to very stiff, Yellowish, fine grained Inorganic Clay of low plasticity with Sand (CL)	3	6	7	13	13	1.1	9.3	24.3	65.3	32	16	16	-	-	-	-	-	-	-	-	-	-	-	-	-
6.00	UDS							0.8	17.7	29.7	51.7	31	17	14	12.11	-	-	2.52	F	0.13	24	UU	2	28	-	-	-
6.50	SPT/DS		5	10	12	22	21	0.6	40.8	18.1	40.6	-	-	-	-	-	-	2.67	-	-	-	-	-	-	-	-	-
7.50	SPT/DS		6	11	13	24	22	0.0	58.1	14.3	27.6	29	15	14	-	-	-	-	-	-	-	-	-	-	-	-	-
9.00	UDS							2.3	7.6	34.5	55.7	28	16	12	24.06	-	-	2.47	F	0.06	29	-	-	-	-	-	-
9.50	SPT/DS		3	5	6	11	9	-																			
10.50	SPT/DS	Very Stiff to Hard, brownish, fine-grained inorganic silt of low compressibility with sand and gravel (ML)	4	6	8	14	11	0.8	0.9	64.0	34.3	27	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-
12.00	UDS							4.4	4.9	62.6	28.1	25	NP	NP	26.91	2.21	1.78	2.54	F	0.11	32	-	-	-	-	-	-
12.50	SPT/DS		6	9	11	20	15	-																			
13.50	SPT/DS		7	10	13	23	16	2.0	3.2	65.1	29.7	28	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-
15.00	UDS	Stiff to hard, brownish, fine-grained inorganic silt of low compressibility with sand (ML)						0.4	16.5	54.8	28.3	26	NP	NP	36.59	2.17	1.74	2.53	F	0.02	29	-	-	-	-	-	-
15.50	SPT/DS		5	12	17	29	17	-																			
16.50	SPT/DS		6	14	19	33	18	1.4	2.0	66.1	30.5	28	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-
18.00	UDS							2.3	7.2	65.1	25.4	29	NP	NP	18.06	-	-	2.43	F	0.07	32	-	-	-	-	-	-
18.50	SPT/DS		4	17	22	39	20	-																			
19.50	SPT/DS		7	20	24	44	21	9.2	12.5	57.0	21.4	26	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-
21.00	UDS							4.6	2.7	63.2	29.5	27	NP	NP	31.20	2.06	1.72	2.65	F	0.02	28	-	-	-	-	-	-
21.50	SPT/DS		9	22	23	45	21	-																			
22.50	SPT/DS		11	24	26	50	22	2.4	2.3	60.9	34.5	24	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-
24.00	UDS							0.8	7.9	59.7	31.6	28	NP	NP	24.48	-	-	2.62	F	0.06	31	-	-	-	-	-	-
24.50	SPT/DS		9	23	28	51	22	-																			
25.50	SPT/DS		13	25	30	55	23	2.3	5.7	58.3	33.7	23	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-
27.00	UDS	Very dense, brownish, fine-grained silty sand withgravel (SM)						0.0	66.5	20.9	12.6	24	NP	NP	22.92	-	-	2.50	-	-	-	-	-	-	-	-	-
27.50	SPT/DS		15	33	42	75	28	-																			
28.50	SPT/DS		17	38	43	81	29	0.0	28.6	47.8	23.6	25	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-
30.00	UDS							0.0	69.0	22.5	8.6	27	NP	NP	18.53	-	-	2.41	-	-	-	-	-	-	-	-	-
30.50	SPT/DS		12	21	33	54	21	-																			

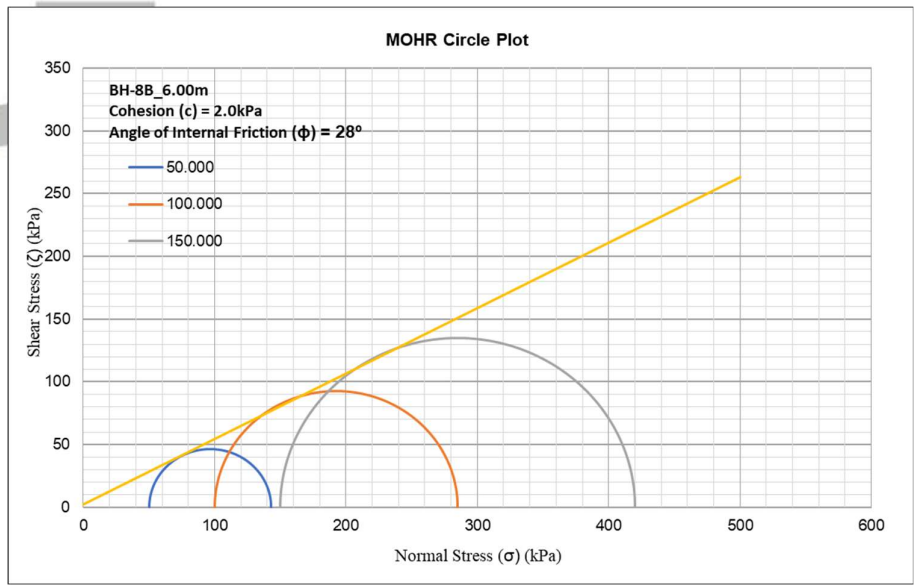
Notations: UDS = Undisturbed Sample, DS = Disturbed Sample, RC = Rock Core, F = Fast, S = Slow, UU = Unconsolidated Undrained Tri-axial compression Test, NP = Non Plastic.

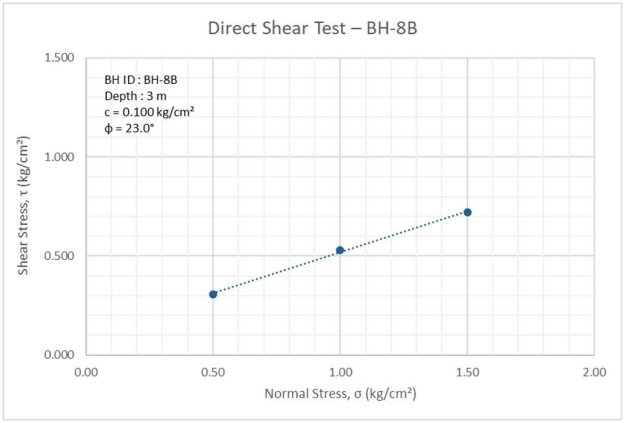

Grain Size Distribution Curve
BH-08B_1.5m
BH-08B_3m
BH-08B_3.5m
BH-08B_4.5m
BH-08B_6m
BH-08B_6.5m
BH-08B_7.5m
Percent Finer (%)
Particle Size (mm)

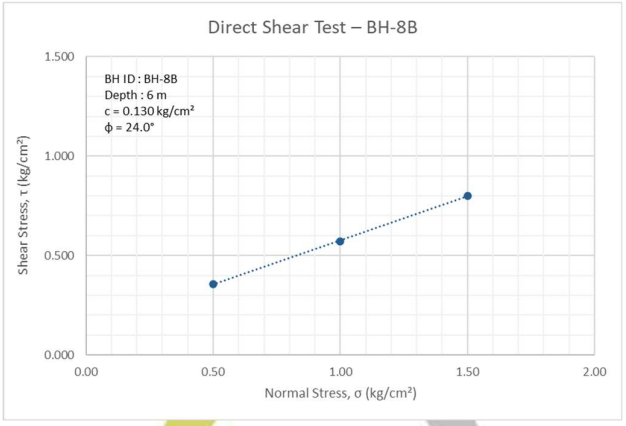

Grain Size Distribution Curve
BH-08B_9m
BH-08B_10.5m
BH-08B_12m
BH-08B_13.5m
BH-08B_15m
BH-08B_16.5m
BH-08B_18m
Percent Finer (%)
Particle Size (mm)

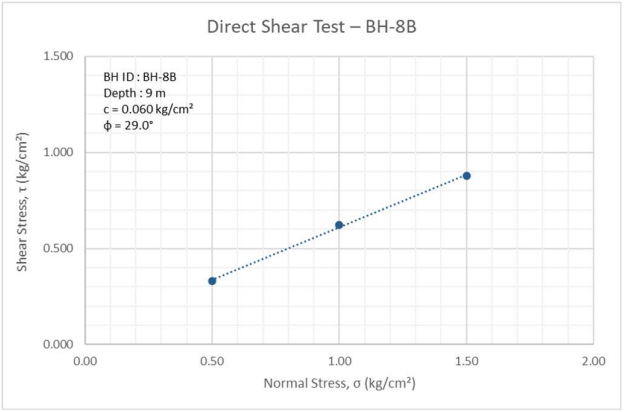

Grain Size Distribution Curve
BH-08B_19.5m
BH-08B_21m
BH-08B_22.5m
BH-08B_24m
BH-08B_25.5m
BH-08B_27m
BH-08B_28.5m
Percent Finer (%)
Particle Size (mm)

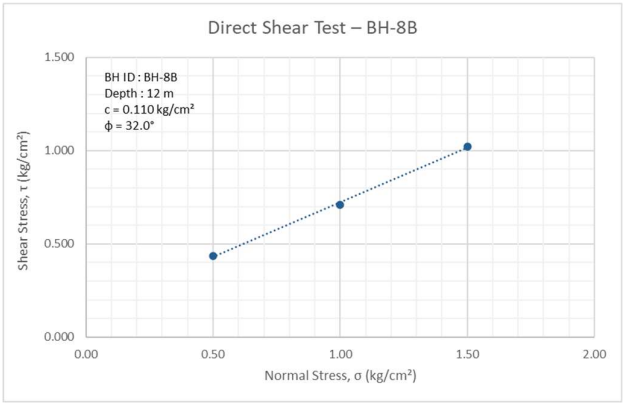

MOHR Circle Plot
BH-8B_3.00m
Cohesion (c) = 3.00kPa
Angle of Internal Friction (ϕ) = 27°
50.000
100.000
150.000
Failure Envelope
Shear Stress (ζ) (kPa)
Normal Stress (σ) (kPa)

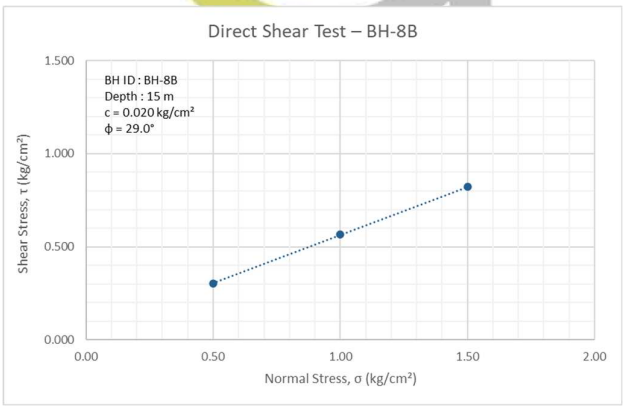

MOHR Circle Plot
BH-8B_6.00m
Cohesion (c) = 2.0kPa
Angle of Internal Friction (ϕ) = 28°
50.000
100.000
150.000
Shear Stress (ζ) (kPa)
Normal Stress (σ) (kPa)

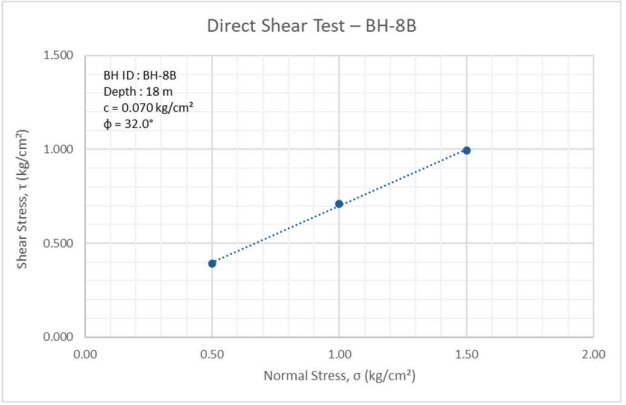

Direct Shear Test – BH-8B
BH ID : BH-8B
Depth : 3 m
c = 0.100 kg/cm²
ϕ = 23.0°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
0.000
0.500
1.000
1.500
0.00
0.50
1.00
1.50
2.00

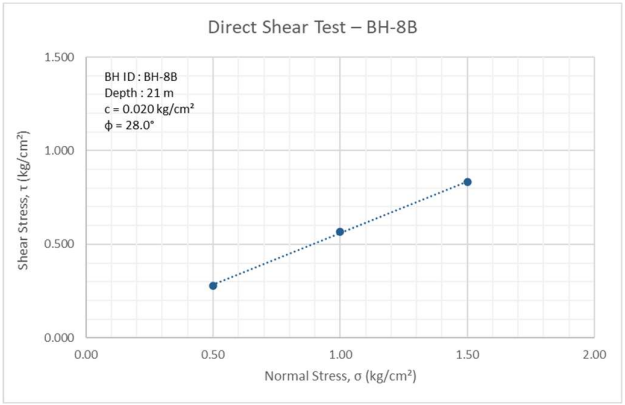

Direct Shear Test – BH-8B
BH ID : BH-8B
Depth : 6 m
c = 0.130 kg/cm²
ϕ = 24.0°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
0.000
0.500
1.000
1.500
0.00
0.50
1.00
1.50
2.00

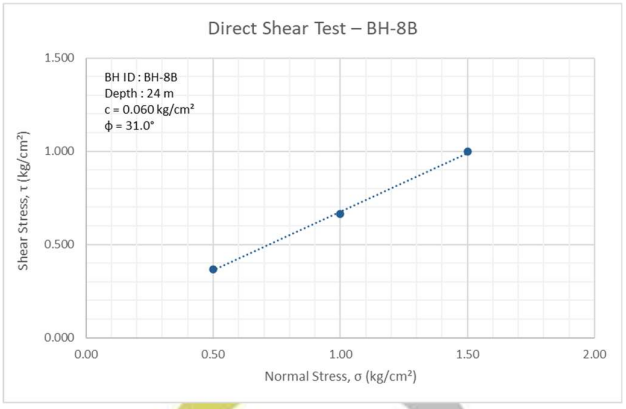

Direct Shear Test – BH-8B
BH ID : BH-8B
Depth : 9 m
c = 0.060 kg/cm²
ϕ = 29.0°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
0.000
0.500
1.000
1.500
0.00
0.50
1.00
1.50
2.00


Direct Shear Test – BH-8B
BH ID : BH-8B
Depth : 12 m
c = 0.110 kg/cm²
ϕ = 32.0°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
0.000
0.500
1.000
1.500
0.00
0.50
1.00
1.50
2.00


Direct Shear Test – BH-8B
BH ID : BH-8B
Depth : 15 m
c = 0.020 kg/cm²
ϕ = 29.0°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
0.000
0.500
1.000
1.500
0.00
0.50
1.00
1.50
2.00


Direct Shear Test – BH-8B
BH ID : BH-8B
Depth : 18 m
c = 0.070 kg/cm²
ϕ = 32.0°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
0.000
0.500
1.000
1.500
0.00
0.50
1.00
1.50
2.00


Direct Shear Test – BH-8B
BH ID : BH-8B
Depth : 21 m
c = 0.020 kg/cm²
ϕ = 28.0°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
1.500
1.000
0.500
0.000
0.00
0.50
1.00
1.50
2.00

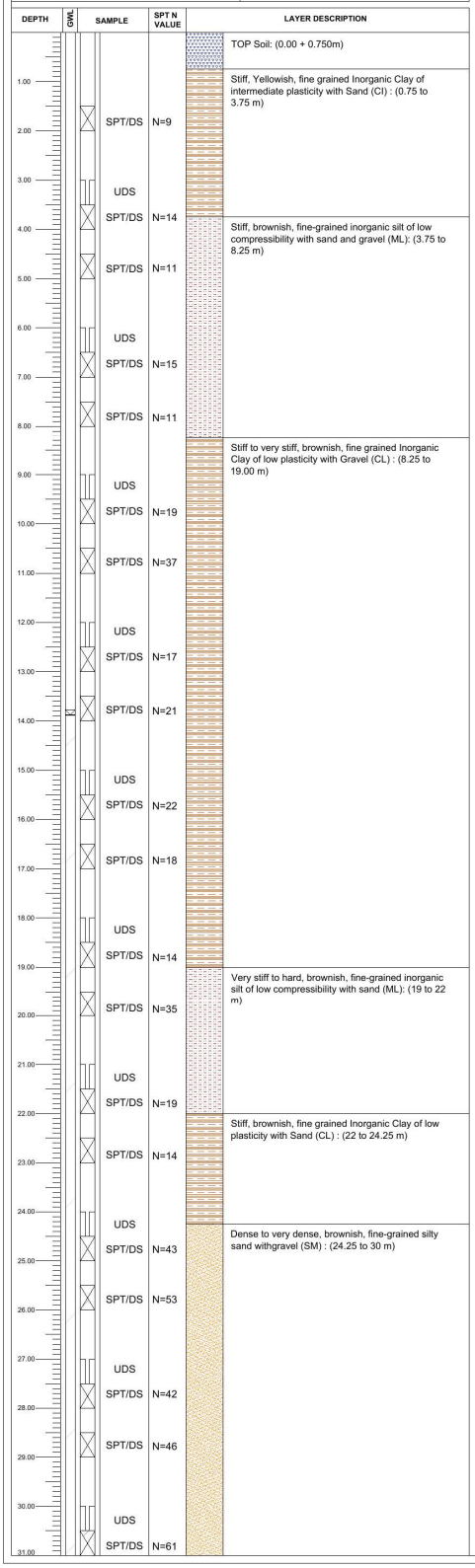

Direct Shear Test – BH-8B
BH ID : BH-8B
Depth : 24 m
c = 0.060 kg/cm²
ϕ = 31.0°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
1.500
1.000
0.500
0.000
0.00
0.50
1.00
1.50
2.00

NAME OF WORK: GEOTECHNICAL INVESTIGATION WORK FOR PROPOSED EXTENSION METRO CORRIDORS OF AQUA LINE FROM NOIDA SECTOR-142 TO BOTANICAL GARDEN AND DEPOT STATION TO BORAKI MMTH (14.16 KM)

Stretch: Depot Station to Boraki MMTH (CH 0+000 km to 2+600 km)

BH ID : BH-09 | **Chainage** : 0+802 KM

Groundwater Level : 13.77M | **Location** : Lat. 28.496133 Long. 77.556640



LEGENDS

Sample Type

- Split Spoon Sampler
- Shelby Tube (UDS)

General

- Groundwater Level

Soil

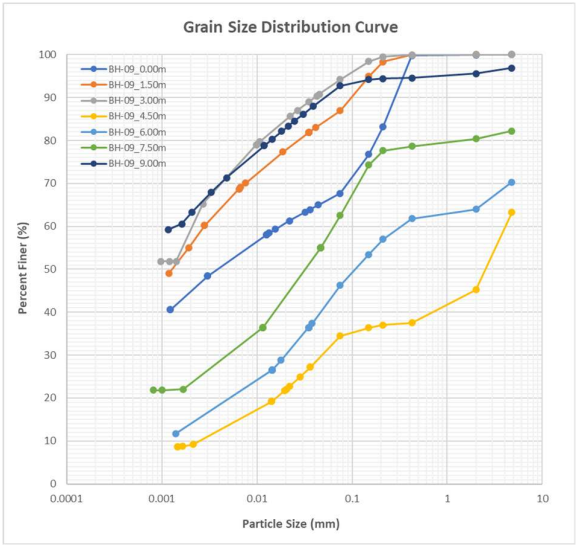
- Well Graded Gravel (GW)
- Poorly Graded Gravel (GP)
- Silty Gravel (GM)
- Clayey Gravel (GC)
- Well Graded Sand (SW)
- Poorly Graded Sand (SP)
- Silty Sand (SM)
- Clayey Sand (SC)
- Inorganic Silt of Low Compressibility (ML)
- Inorganic Silt of Intermediate Compressibility (MI)
- Inorganic Silt of High Compressibility (MH)
- Inorganic Clay of Low Compressibility (CL)
- Inorganic Clay of Intermediate Compressibility (CI)
- Inorganic Clay of High Compressibility (CH)
- Organic Soil of Low Compressibility (OL)
- Organic Soil of Intermediate Compressibility OI)
- Organic Soil of High Compressibility (OH)
- Peat (Pt)
- Top Soil (TS)

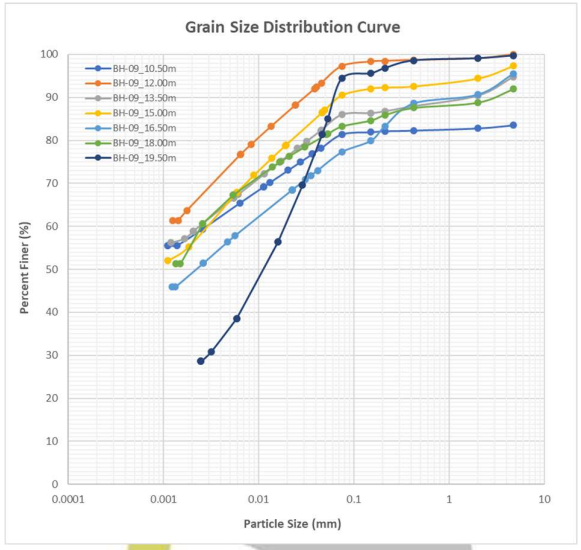
GOMA ENGINEERING AND CONSULTANCY
Quality we put forward

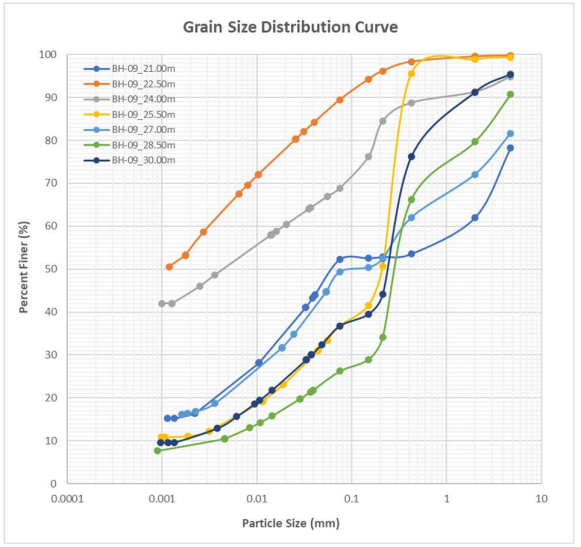
Project		Borehole Details		Drilling Details	
Name of Work:	Geotechnical Investigation work for Proposed Extension Metro Corridors of Aqua Line from Noida Sector-142 to Botanical Garden and Depot Station to Boraki MMTH (14.16 km) (E Tender No. NMRC/Civil/Geo. Inv./366/2025)	**BH ID:**	BH-09	**Contractor:**	Goma Engineering & Consultancy
		Chainage [km]:	0+802	**Method of Drilling:**	Rotary Drilling
Client:	Noida Metro Rail Corporation (NMRC) Limited	**Depth [m]:**	30.00	**Start Date:**	08-11-2025
Stretch:	Depot Station to Boraki MMTH	**Elevation [m]:**	206.45	**End Date:**	10-11-2025
Project Code:	158_R0_DEST TO BOMM_0+000 km TO 2+586 km	**Water table Level [m]:**	13.77	**Location:**	**Lat:** 28°29'45.77", **Long:** 77°33'24.08"

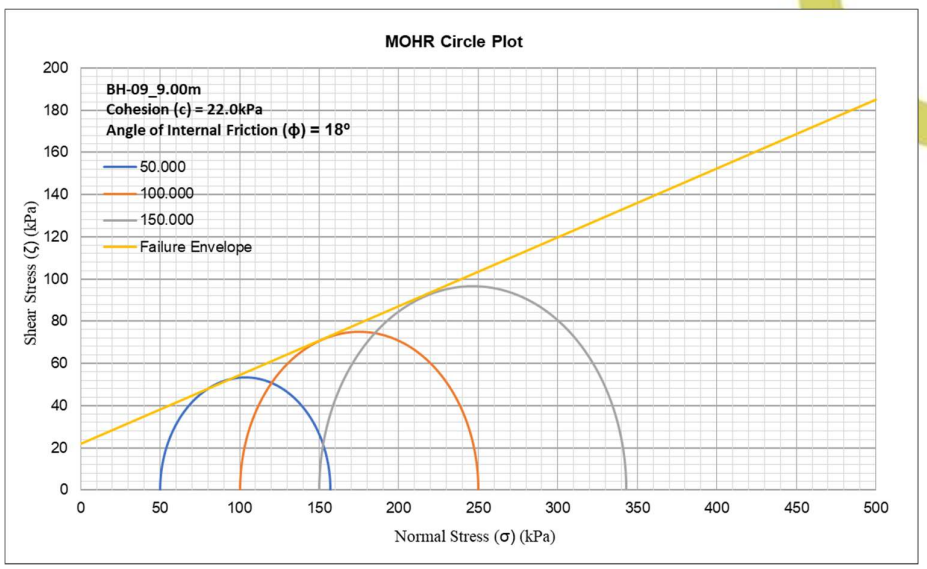
Depth [m]	Sample Type	Descriptions	SPT Test Results					Soil Particles				Atterberg Limits			Physical Characteristics				Direct Shear Test			Triaxial Comp Test			Consolidation Test		
			N1 (Seating Drive)	N2 (First Drive)	N3 (Second Drive)	Observed SPT	N (Correct N)	Gravel [%]	Sand [%]	Silt [%]	Clay [%]	Liquid Limit [%]	Plastic Limit [%]	Plasticity Index [%]	Moisture Content [%]	Bulk Density [gm/cm^3]	Dry Density [gm/cm^3]	Specific Gravity	Type	Cohesion [kg/cm^2]	Angle of Friction [°]	Cohesion [kPa]	Cohesion [kg/cm^2]	Angle of Friction [°]	Swelling Index	Consolidation Index	Preconsolidation Pressure [kg/cm^2]
0.00	DS	Top Soil	-	-	-	-	-	0.0	32.3	22.9	44.8	35	17	18	-	-	-	-	-	-	-	-	-	-	-	-	-
1.50	SPT/DS	Stiff, Yellowish, fine grained Inorganic Clay of intermediate plasticity with Sand (CI)	3	4	5	9	13	0.0	13.1	31.4	55.6	39	20	19	-	-	-	-	-	-	-	-	-	-	-	-	-
3.00	UDS							0.0	5.8	35.2	59.0	38	19	19	6.60	1.61	1.51	2.43	F	0.16	17	-	-	-	-	-	-
3.00	SPT/DS		5	6	8	14	15	-																			
4.50	SPT/DS	Stiff, brownish, fine-grained inorganic silt of low compressibility with sand and gravel (ML)	3	4	7	11	11	36.7	28.8	25.4	9.1	28	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-
6.00	UDS							29.7	24.1	32.3	13.9	31	NP	NP	14.58	1.52	1.33	2.59	F	0.05	24	-	-	-	-	-	-
6.50	SPT/DS		6	7	8	15	14	-																			
7.50	SPT/DS		5	5	6	11	10	17.8	19.7	39.2	23.3	27	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-
9.00	UDS	Very Stiff to Hard, brownish, fine-grained inorganic silt of low compressibility with sand and gravel (ML)						3.1	4.2	29.8	62.9	30	NP	NP	14.85	2.04	1.78	2.68	F	0.01	28	UU	22	18	0.029	0.073	2.549
9.50	SPT/DS		5	7	12	19	16	-																			
10.50	SPT/DS		9	16	21	37	30	16.4	2.1	23.6	57.8	28	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-
12.00	UDS							0.0	2.7	32.4	64.9	29	NP	NP	18.76	-	-	2.60	F	0.23	19	-	-	-	-	-	-
12.50	SPT/DS		6	8	9	17	13	-																			
13.50	SPT/DS		6	8	13	21	15	5.2	8.8	27.3	58.7	25	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-
15.00	UDS							2.7	6.8	34.4	56.2	27	NP	NP	18.32	2.19	1.86	2.41	F	0.01	29	UU	21	19	-	-	-
15.50	SPT/DS		6	9	13	22	15	-																			
16.50	SPT/DS	Stiff to very stiff, brownish, fine grained Inorganic Clay of low plasticity with Gravel (CL)	5	7	11	18	12	4.5	18.3	28.1	49.2	29	15	14	-	-	-	-	-	-	-	-	-	-	-	-	-
18.00	UDS							8.0	8.7	27.0	56.3	31	18	13	14.43	1.58	1.38	2.40	F	0.09	23	-	-	-	-	-	-
18.50	SPT/DS		4	6	8	14	9	-																			
19.50	SPT/DS	Very stiff to hard, brownish, fine-grained inorganic silt of low compressibility with sand (ML)	8	14	21	35	19	0.3	5.3	94.5	0.0	25	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-
21.00	UDS							21.8	25.9	36.2	16.2	25	NP	NP	21.30	1.75	1.44	2.51	F	0.04	23	-	-	-	-	-	-
21.50	SPT/DS		6	7	12	19	12	-																			
22.50	SPT/DS	Stiff, brownish, fine grained Inorganic Clay of low plasticity with Sand (CL)	3	6	8	14	9	0.2	10.3	34.7	54.8	30	16	14	-	-	-	-	-	-	-	-	-	-	-	-	-
24.00	UDS							5.2	26.0	24.2	44.7	29	15	14	20.24	1.68	1.39	2.41	F	0.17	20	-	-	-	-	-	-
24.50	SPT/DS	Dense to very dense, brownish, fine-grained silty sand withgravel (SM)	12	18	25	43	20	-																			
25.50	SPT/DS		13	21	32	53	23	0.6	62.6	25.6	11.2	27	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-
27.00	UDS							18.4	32.2	32.9	16.5	30	NP	NP	16.28	1.96	1.68	2.65	F	0.00	32	-	-	-	-	-	-
27.50	SPT/DS		10	17	25	42	19	-																			
28.50	SPT/DS		12	19	27	46	20	9.3	64.5	17.2	9.0	25	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-
30.00	UDS							4.5	58.7	25.9	10.9	26	NP	NP	23.20	-	-	2.67	-	-	-	-	-	-	-	-	-
30.50	SPT/DS		16	26	35	61	24	-																			

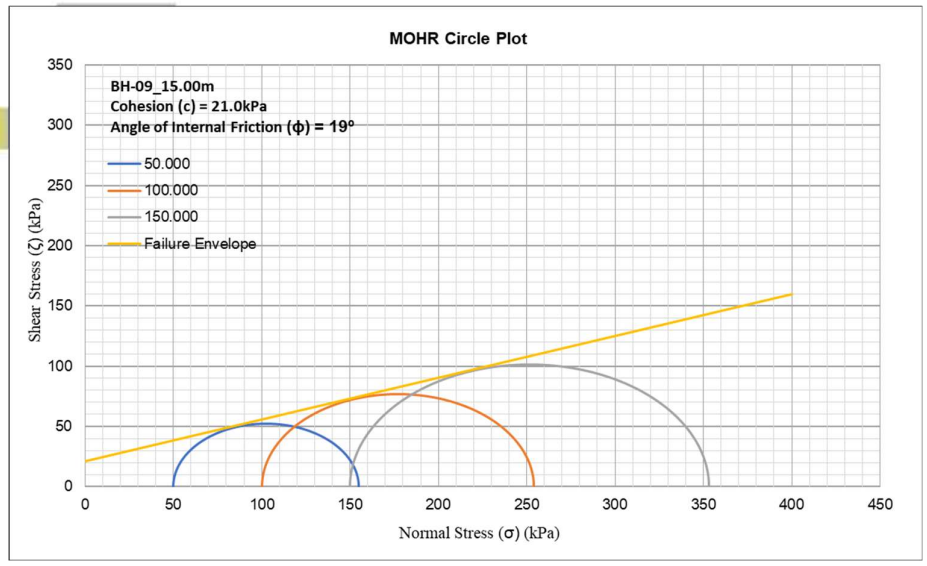
Notations: UDS = Undisturbed Sample, DS = Disturbed Sample, RC = Rock Core, F = Fast, S = Slow, UU = Unconsolidated Undrained Tri-axial compression Test, NP = Non Plastic.

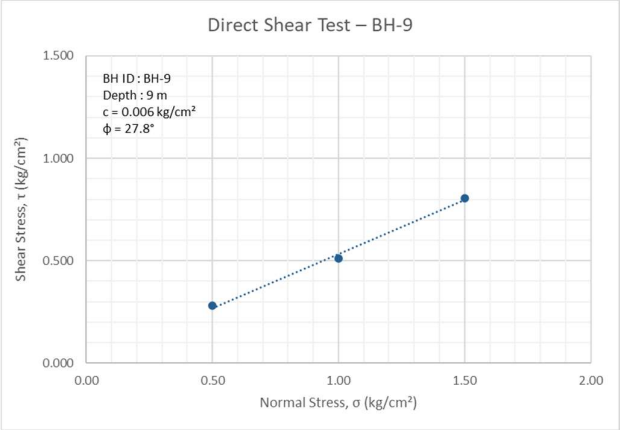

Grain Size Distribution Curve
BH-09_0.00m
BH-09_1.50m
BH-09_3.00m
BH-09_4.50m
BH-09_6.00m
BH-09_7.50m
BH-09_9.00m
Percent Finer (%)
Particle Size (mm)

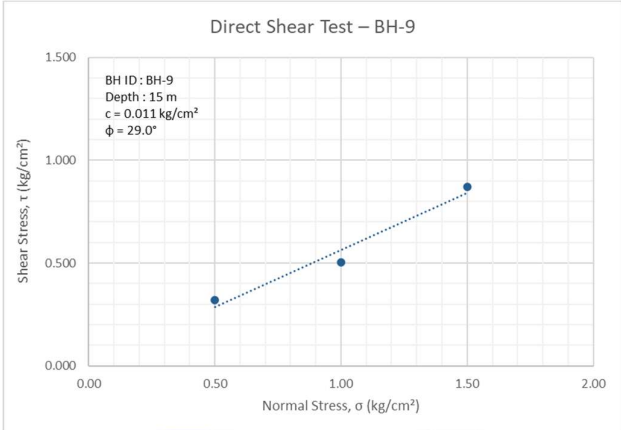

Grain Size Distribution Curve
BH-09_10.50m
BH-09_12.00m
BH-09_13.50m
BH-09_15.00m
BH-09_16.50m
BH-09_18.00m
BH-09_19.50m
Percent Finer (%)
Particle Size (mm)

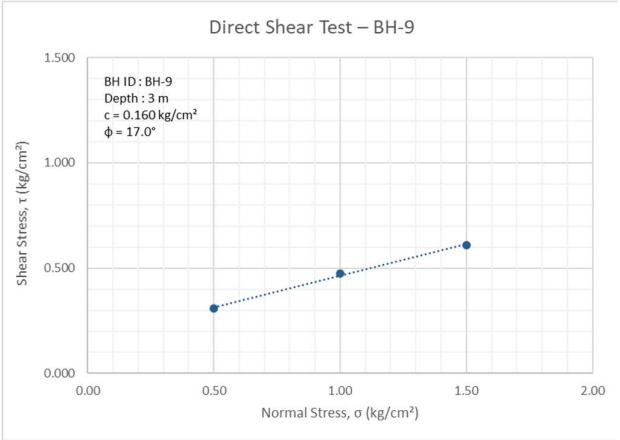

Grain Size Distribution Curve
BH-09_21.00m
BH-09_22.50m
BH-09_24.00m
BH-09_25.50m
BH-09_27.00m
BH-09_28.50m
BH-09_30.00m
Percent Finer (%)
Particle Size (mm)

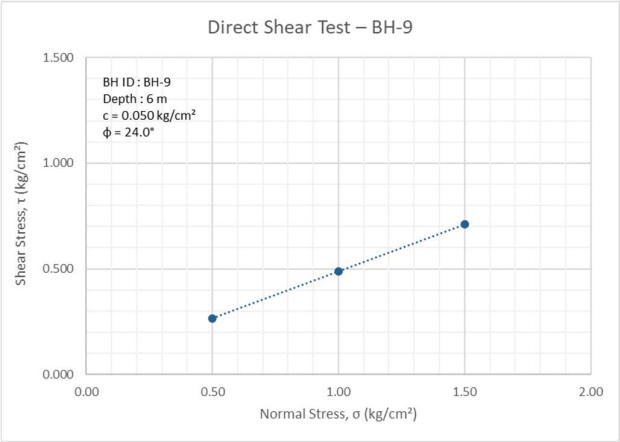

MOHR Circle Plot
BH-09_9.00m
Cohesion (c) = 22.0kPa
Angle of Internal Friction (ϕ) = 18°
50.000
100.000
150.000
Failure Envelope
Shear Stress (ζ) (kPa)
Normal Stress (σ) (kPa)

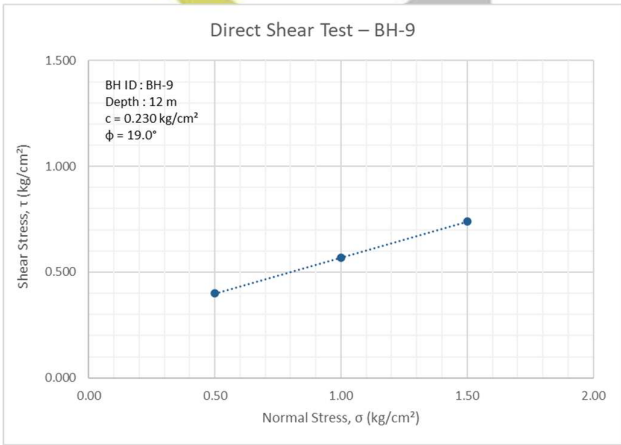

MOHR Circle Plot
BH-09_15.00m
Cohesion (c) = 21.0kPa
Angle of Internal Friction (ϕ) = 19°
50.000
100.000
150.000
Failure Envelope
Shear Stress (ζ) (kPa)
Normal Stress (σ) (kPa)

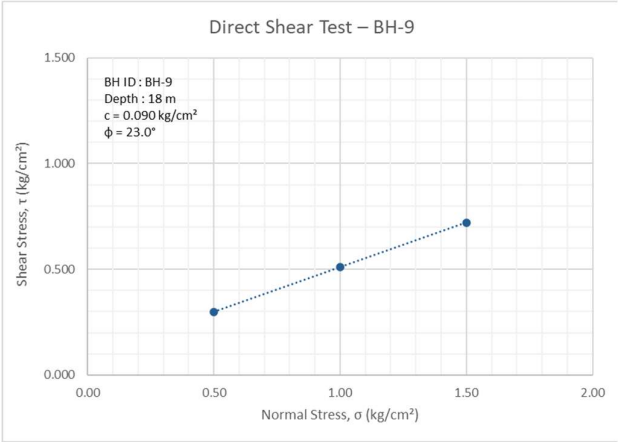

Direct Shear Test – BH-9
BH ID : BH-9
Depth : 9 m
c = 0.006 kg/cm²
ϕ = 27.8°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
0.000
0.500
1.000
1.500
0.00
0.50
1.00
1.50
2.00

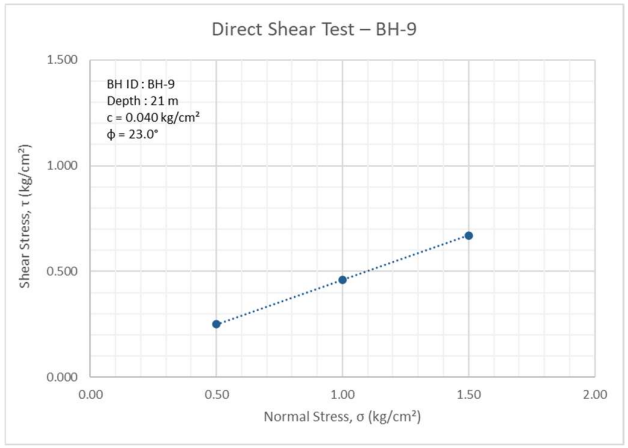

Direct Shear Test – BH-9
BH ID : BH-9
Depth : 15 m
c = 0.011 kg/cm²
ϕ = 29.0°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
0.000
0.500
1.000
1.500
0.00
0.50
1.00
1.50
2.00

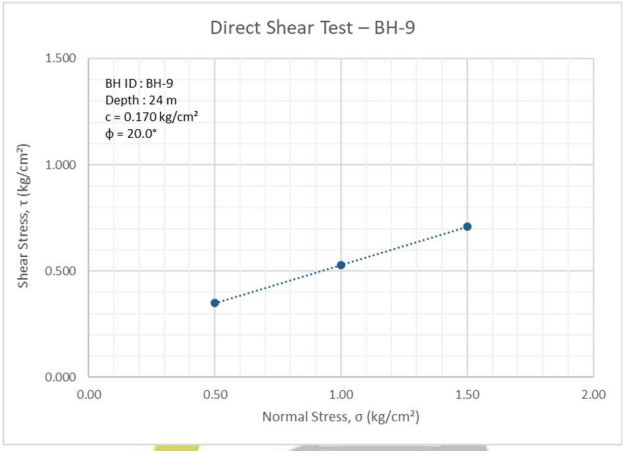

Direct Shear Test – BH-9
BH ID : BH-9
Depth : 3 m
c = 0.160 kg/cm²
ϕ = 17.0°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
0.000
0.500
1.000
1.500
0.00
0.50
1.00
1.50
2.00

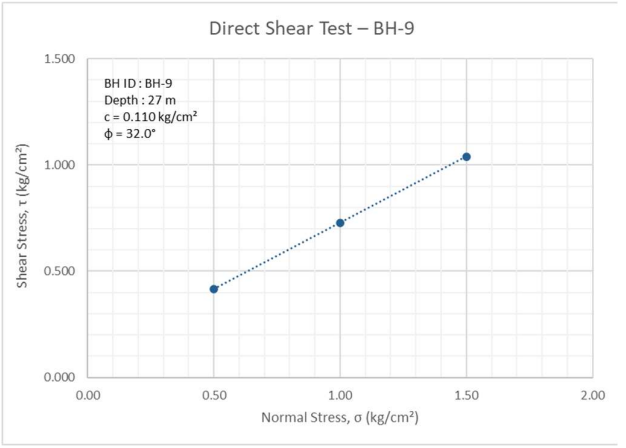

Direct Shear Test – BH-9
BH ID : BH-9
Depth : 6 m
c = 0.050 kg/cm²
ϕ = 24.0°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
0.000
0.500
1.000
1.500
0.00
0.50
1.00
1.50
2.00


Direct Shear Test – BH-9
BH ID : BH-9
Depth : 12 m
c = 0.230 kg/cm²
ϕ = 19.0°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
0.000
0.500
1.000
1.500
0.00
0.50
1.00
1.50
2.00


Direct Shear Test – BH-9
BH ID : BH-9
Depth : 18 m
c = 0.090 kg/cm²
ϕ = 23.0°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
0.000
0.500
1.000
1.500
0.00
0.50
1.00
1.50
2.00


Direct Shear Test – BH-9
BH ID : BH-9
Depth : 21 m
c = 0.040 kg/cm²
ϕ = 23.0°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
1.500
1.000
0.500
0.000
0.00
0.50
1.00
1.50
2.00


Direct Shear Test – BH-9
BH ID : BH-9
Depth : 24 m
c = 0.170 kg/cm²
ϕ = 20.0°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
1.500
1.000
0.500
0.000
0.00
0.50
1.00
1.50
2.00

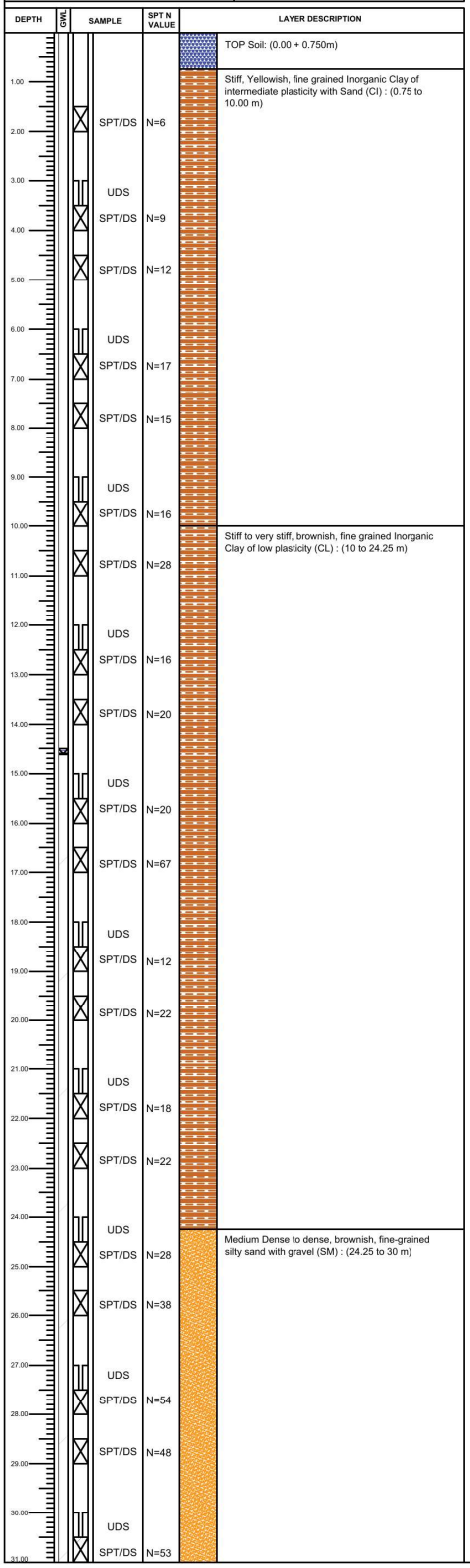

Direct Shear Test – BH-9
BH ID : BH-9
Depth : 27 m
c = 0.110 kg/cm²
ϕ = 32.0°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
1.500
1.000
0.500
0.000
0.00
0.50
1.00
1.50
2.00

NAME OF WORK: GEOTECHNICAL INVESTIGATION WORK FOR PROPOSED EXTENSION METRO CORRIDORS OF AQUA LINE FROM NOIDA SECTOR-142 TO BOTANICAL GARDEN AND DEPOT STATION TO BORAKI MMTH (14.16 KM)

Stretch: Depot Station to Boraki MMTH (CH 0+000 km to 2+600 km)

BH ID : BH-10 | **Chainage** : 0+907 KM

Groundwater Level : 14.50M | **Location** : Lat. 28.496682 Long. 77.557555



LEGENDS

Sample Type

- Split Spoon Sampler
- Shelby Tube (UDS)

General

- Groundwater Level

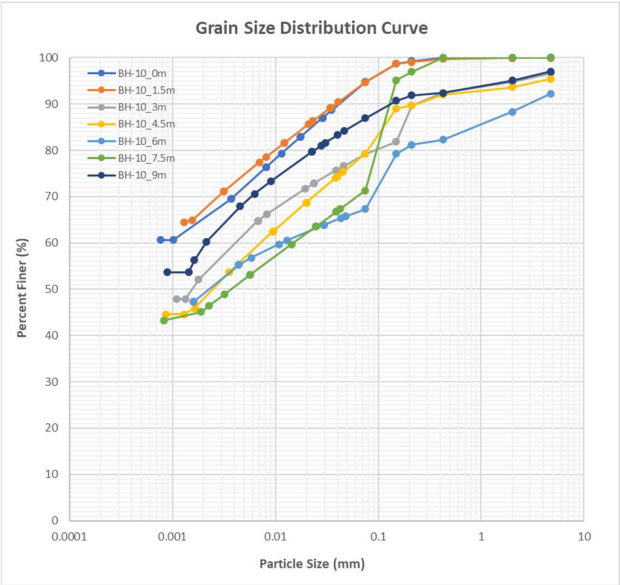
Soil

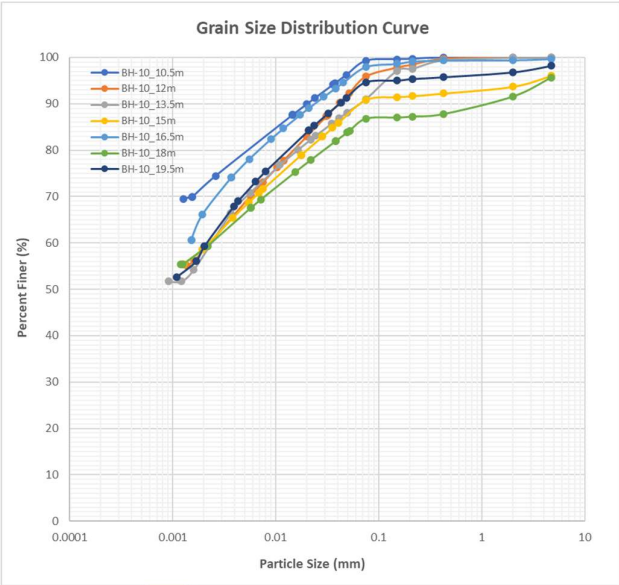
- Well Graded Gravel (GW)
- Poorly Graded Gravel (GP)
- Silty Gravel (GM)
- Clayey Gravel (GC)
- Well Graded Sand (SW)
- Poorly Graded Sand (SP)
- Silty Sand (SM)
- Clayey Sand (SC)
- Inorganic Silt of Low Compressibility (ML)
- Inorganic Silt of Intermediate Compressibility (MI)
- Inorganic Silt of High Compressibility (MH)
- Inorganic Clay of Low Compressibility (CL)
- Inorganic Clay of Intermediate Compressibility (CI)
- Inorganic Clay of High Compressibility (CH)
- Organic Soil of Low Compressibility (OL)
- Organic Soil of Intermediate Compressibility OI)
- Organic Soil of High Compressibility (OH)
- Peat (Pt)
- Top Soil (TS)

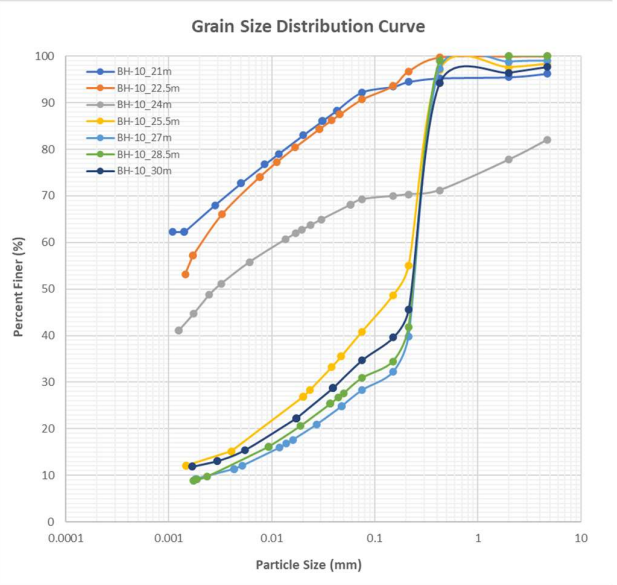
Project		Borehole Details		Drilling Details	
Name of Work:	Geotechnical Investigation work for Proposed Extension Metro Corridors of Aqua Line from Noida Sector-142 to Botanical Garden and Depot Station to Boraki MMTH (14.16 km) (E Tender No. NMRC/Civil/Geo. Inv./366/2025)	**BH ID:**	BH-10	**Contractor:**	Goma Engineering & Consultancy
		Chainage [km]:	0+907	**Method of Drilling:**	Rotary Drilling
Client:	Noida Metro Rail Corporation (NMRC) Limited	**Depth [m]:**	30.00	**Start Date:**	09-11-2025
Stretch:	Depot Station to Boraki MMTH	**Elevation [m]:**	207.15	**End Date:**	09-11-2025
Project Code:	158_R0_DEST TO BOMM_0+000 km TO 2+586 km	**Water table Level [m]:**	13.50	**Location:**	**Lat:** 28°29'47.54", **Long:** 77°33'27.16"

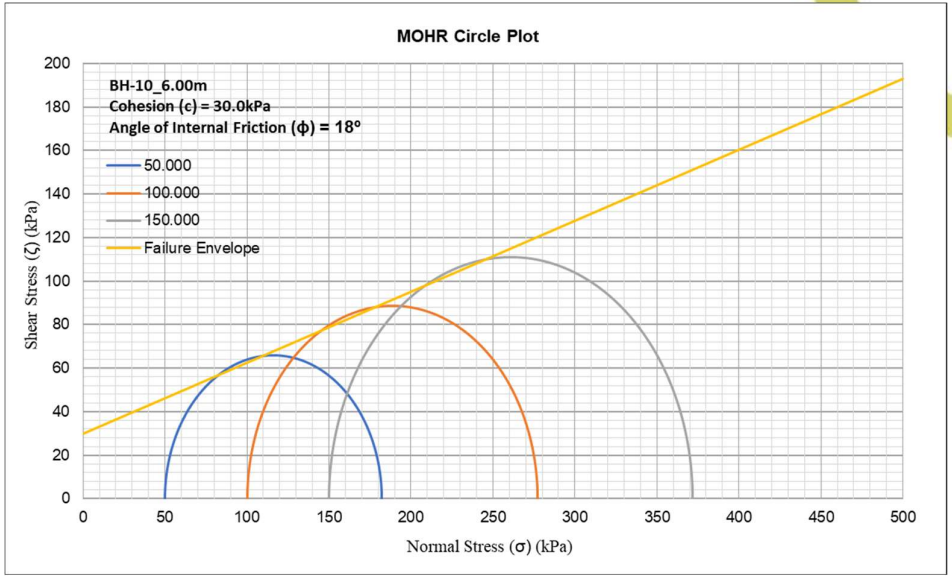
Depth [m]	Sample Type	Descriptions	SPT Test Results					Soil Particles				Atterberg Limits			Physical Characteristics				Direct Shear Test			Triaxial Comp Test			Consolidation Test		
			N1 (Seating Drive)	N2 (First Drive)	N3 (Second Drive)	Observed SPT	N (Correct N)	Gravel [%]	Sand [%]	Silt [%]	Clay [%]	Liquid Limit [%]	Plastic Limit [%]	Plasticity Index [%]	Moisture Content [%]	Bulk Density [gm/cm^3]	Dry Density [gm/cm^3]	Specific Gravity	Type	Cohesion [kg/cm^2]	Angle of Friction [°]	Type	Cohesion [kPa]	Angle of Friction [°]	Swelling Index	Consolidation Index	Preconsolidation Pressure [kg/cm^2]
0.00	DS	Top Soil	-	-	-	-	-	0.0	5.2	29.6	65.3	36	18	18	-	-	-	-	-	-	-	-	-	-	-	-	-
1.50	SPT/DS	Stiff, Yellowish, fine grained Inorganic Clay of intermediate plasticity with Sand (CI)	2	3	3	6	8	0.1	5.2	27.6	67.1	35	17	18	-	-	-	-	-	-	-	-	-	-	-	-	-
3.00	UDS		-					3.3	17.5	26.1	53.1	35	18	17	18.55	1.48	1.24	2.39	F	0.21	17	-	-	-	-	-	-
3.00	SPT/DS		3	4	5	9	10	-																			
4.50	SPT/DS		4	5	7	12	12	4.5	16.1	31.5	47.8	38	19	19	-	-	-	-	-	-	-	-	-	-	-	-	-
6.00	UDS	Stiff, Yellowish, fine grained Inorganic Clay of low plasticity with Sand (CL)	-					7.8	24.9	18.3	49.0	33	17	16	18.17	2.07	1.75	2.61	F	0.02	32	UU	30	18	-	-	-
6.50	SPT/DS		5	8	9	17	16	-																			
7.50	SPT/DS		5	7	8	15	14	0.0	28.7	25.9	45.5	29	16	13	-	-	-	-	-	-	-	-	-	-	-	-	-
9.00	UDS		-					2.9	10.1	27.7	59.2	29	15	14	22.78	1.98	1.61	2.52	F	0.04	33	UU	31	17	0.014	0.089	1.631
9.50	SPT/DS		5	7	9	16	14	-																			
10.50	SPT/DS	Stiff to very stiff, brownish, fine grained Inorganic Clay of low plasticity (CL)	4	8	20	28	23	0.0	0.7	27.2	72.1	30	15	15	-	-	-	-	-	-	-	-	-	-	-	-	-
12.00	UDS		-					0.0	4.1	37.4	58.5	29	14	15	20.97	-	-	2.55	-	-	-	-	-	-	-	-	-
12.50	SPT/DS		6	7	9	16	12	-																			
13.50	SPT/DS		7	9	11	20	14	0.0	9.0	33.5	57.6	31	17	14	-	-	-	-	-	-	-	-	-	-	-	-	-
15.00	UDS		-					3.9	5.2	32.0	58.9	31	18	13	23.50	1.73	1.35	2.46	F	0.18	22	-	-	-	-	-	-
15.50	SPT/DS		5	9	11	20	14	-																			
16.50	SPT/DS		12	31	36	67	30	0.3	1.7	31.5	66.5	33	18	15	-	-	-	-	-	-	-	-	-	-	-	-	-
18.00	UDS		-					4.4	8.9	28.0	58.8	35	19	16	21.60	-	-	2.52	F	0.21	19	-	-	-	-	-	-
18.50	SPT/DS		3	5	7	12	8	-																			
19.50	SPT/DS		4	9	13	22	14	1.8	3.5	35.7	59.0	29	14	15	-	-	-	-	-	-	-	-	-	-	-	-	-
21.00	UDS		-					3.8	4.0	27.1	65.2	30	16	14	18.39	1.72	1.45	2.61	-	-	-	-	-	-	-	-	-
21.50	SPT/DS		5	8	10	18	11	-																			
22.50	SPT/DS		4	9	13	22	13	0.0	9.3	31.5	59.3	30	16	14	-	-	-	-	-	-	-	-	-	-	-	-	-
24.00	UDS		-					18.0	12.8	22.9	46.3	29	14	15	17.60	1.85	1.57	2.56	F	0.19	21	-	-	-	-	-	-
24.50	SPT/DS	Medium Dense to dense, brownish, fine-grained silty sand with gravel (SM)	6	11	17	28	16	-																			
25.50	SPT/DS		8	16	22	38	19	1.7	57.5	27.8	13.0	27	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-
27.00	UDS		-					1.0	70.8	18.8	9.5	30	NP	NP	15.95	2.03	1.75	2.52	F	0.03	30	-	-	-	-	-	-
27.50	SPT/DS		14	24	30	54	23	-																			
28.50	SPT/DS		12	21	27	48	21	0.0	69.1	21.6	9.3	28	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-
30.00	UDS		-					2.3	63.0	22.5	12.2	27	NP	NP	16.29	1.95	1.68	2.57	F	0.02	31	-	-	-	-	-	-
30.50	SPT/DS		13	22	31	53	22	-																			

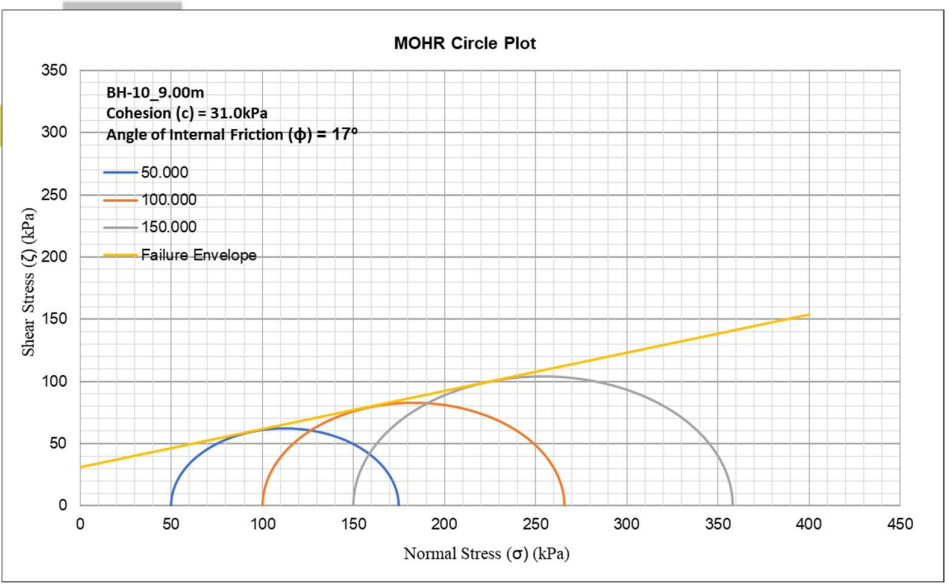
Notations: UDS = Undisturbed Sample, DS = Disturbed Sample, RC = Rock Core, F = Fast, S = Slow, UU = Unconsolidated Undrained Tri-axial compression Test, NP = Non Plastic.

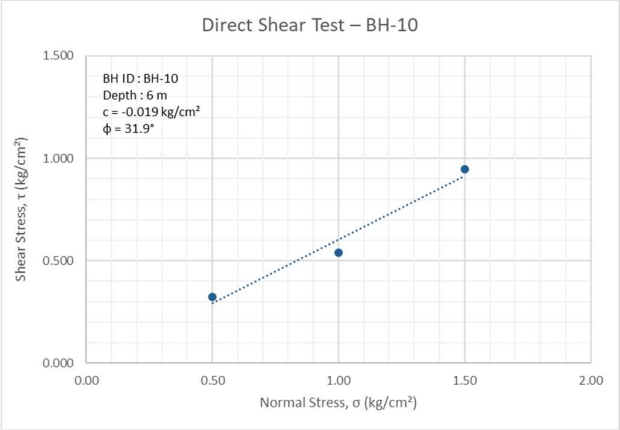

Grain Size Distribution Curve
BH-10_0m
BH-10_1.5m
BH-10_3m
BH-10_4.5m
BH-10_6m
BH-10_7.5m
BH-10_9m
Percent Finer (%)
Particle Size (mm)

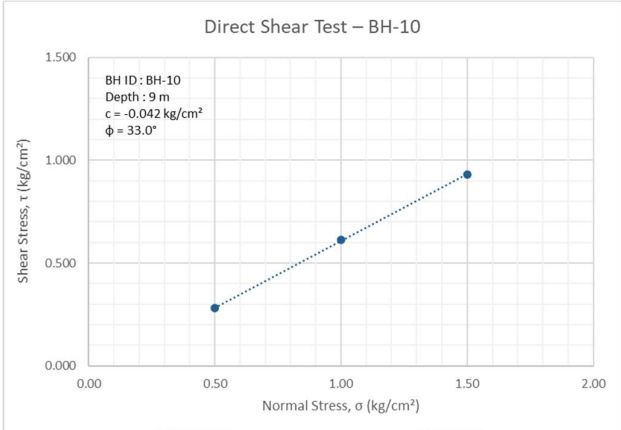

Grain Size Distribution Curve
BH-10_10.5m
BH-10_12m
BH-10_13.5m
BH-10_15m
BH-10_16.5m
BH-10_18m
BH-10_19.5m
Percent Finer (%)
Particle Size (mm)

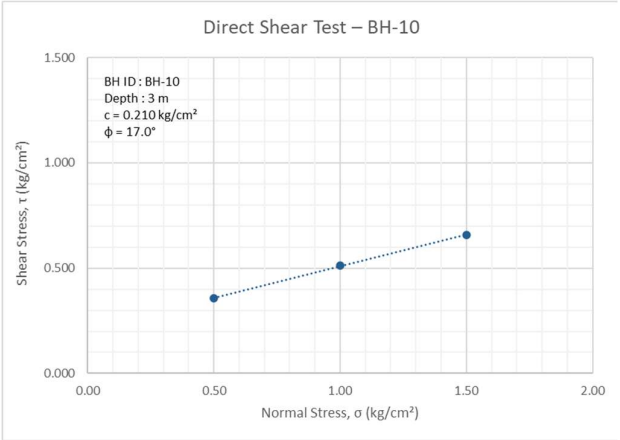

Grain Size Distribution Curve
BH-10_21m
BH-10_22.5m
BH-10_24m
BH-10_25.5m
BH-10_27m
BH-10_28.5m
BH-10_30m
Percent Finer (%)
Particle Size (mm)

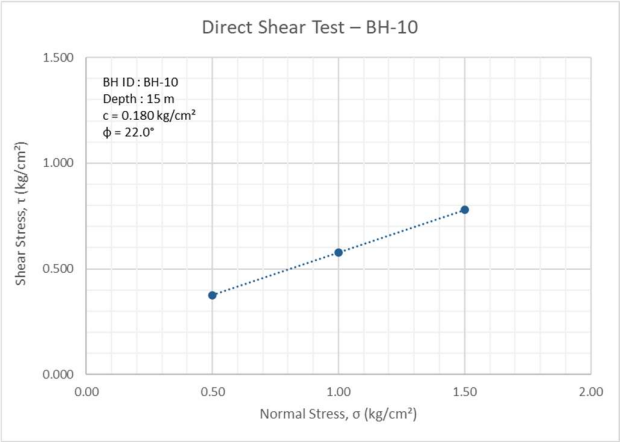

MOHR Circle Plot
BH-10_6.00m
Cohesion (c) = 30.0kPa
Angle of Internal Friction (ϕ) = 18°
50.000
100.000
150.000
Failure Envelope
Shear Stress (ζ) (kPa)
Normal Stress (σ) (kPa)

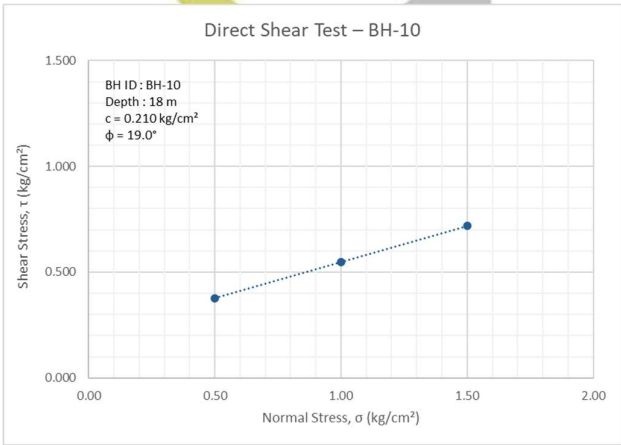

MOHR Circle Plot
BH-10_9.00m
Cohesion (c) = 31.0kPa
Angle of Internal Friction (ϕ) = 17°
50.000
100.000
150.000
Failure Envelope
Shear Stress (ζ) (kPa)
Normal Stress (σ) (kPa)

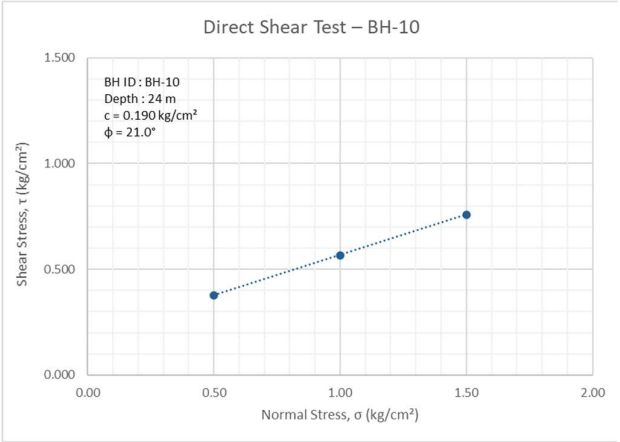

Direct Shear Test – BH-10
BH ID : BH-10
Depth : 6 m
c = -0.019 kg/cm²
ϕ = 31.9°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
0.000
0.500
1.000
1.500
0.00
0.50
1.00
1.50
2.00

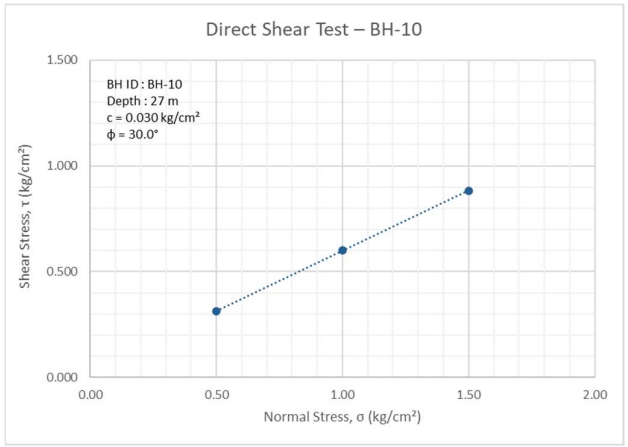

Direct Shear Test – BH-10
BH ID : BH-10
Depth : 9 m
c = -0.042 kg/cm²
ϕ = 33.0°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
0.000
0.500
1.000
1.500
0.00
0.50
1.00
1.50
2.00

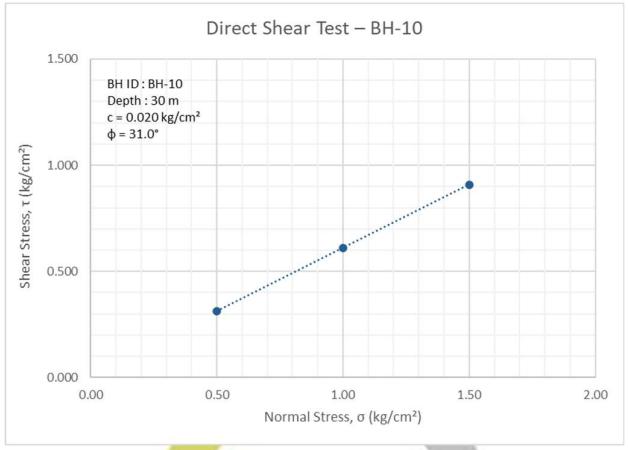

Direct Shear Test – BH-10
BH ID : BH-10
Depth : 3 m
c = 0.210 kg/cm²
ϕ = 17.0°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
0.000
0.500
1.000
1.500
0.00
0.50
1.00
1.50
2.00


Direct Shear Test – BH-10
BH ID : BH-10
Depth : 15 m
c = 0.180 kg/cm²
ϕ = 22.0°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
0.000
0.500
1.000
1.500
0.00
0.50
1.00
1.50
2.00


Direct Shear Test – BH-10
BH ID : BH-10
Depth : 18 m
c = 0.210 kg/cm²
ϕ = 19.0°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
0.000
0.500
1.000
1.500
0.00
0.50
1.00
1.50
2.00


Direct Shear Test – BH-10
BH ID : BH-10
Depth : 24 m
c = 0.190 kg/cm²
ϕ = 21.0°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
0.000
0.500
1.000
1.500
0.00
0.50
1.00
1.50
2.00


Direct Shear Test – BH-10
BH ID : BH-10
Depth : 27 m
c = 0.030 kg/cm²
ϕ = 30.0°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
1.500
1.000
0.500
0.000
0.00
0.50
1.00
1.50
2.00

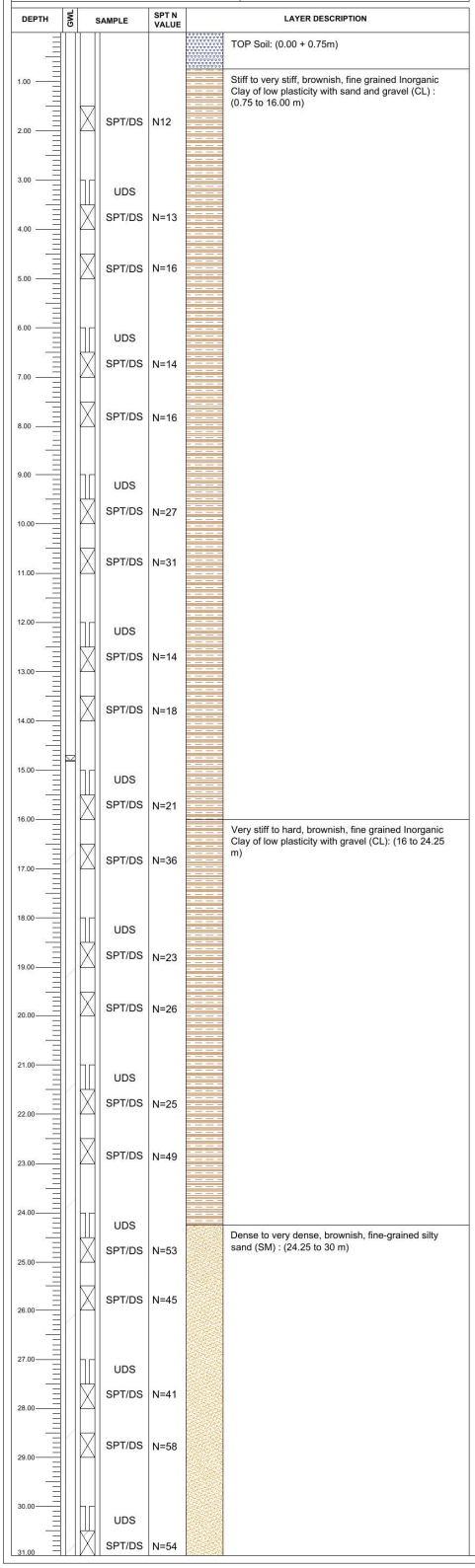

Direct Shear Test – BH-10
BH ID : BH-10
Depth : 30 m
c = 0.020 kg/cm²
ϕ = 31.0°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
1.500
1.000
0.500
0.000
0.00
0.50
1.00
1.50
2.00

NAME OF WORK: GEOTECHNICAL INVESTIGATION WORK FOR PROPOSED EXTENSION METRO CORRIDORS OF AQUA LINE FROM NOIDA SECTOR-142 TO BOTANICAL GARDEN AND DEPOT STATION TO BORAKI MMTH (14.16 KM)

Stretch: Depot Station to Boraki MMTH (CH 0+000 km to 2+600 km)

BH ID : BH-11 | **Chainage** : 1+004 KM

Groundwater Level : 14.70 M | **Location** : Lat. 28.497129 Long. 77.558403



LEGENDS

Sample Type

- Split Spoon Sampler
- Shelby Tube (UDS)

General

- Groundwater Level

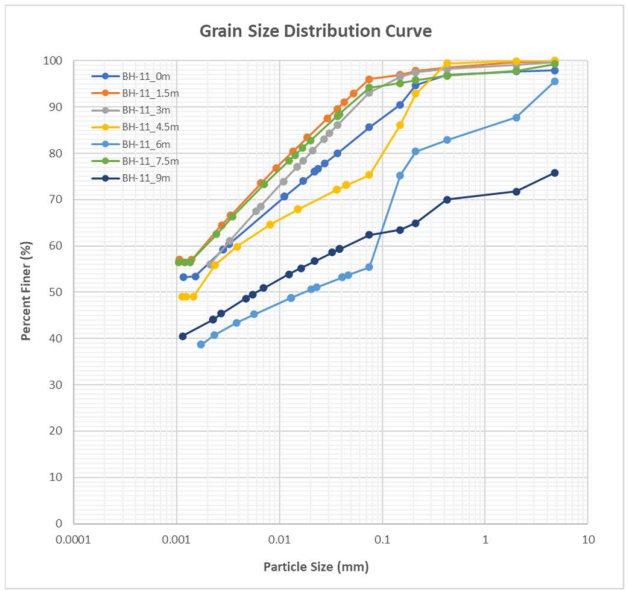
Soil

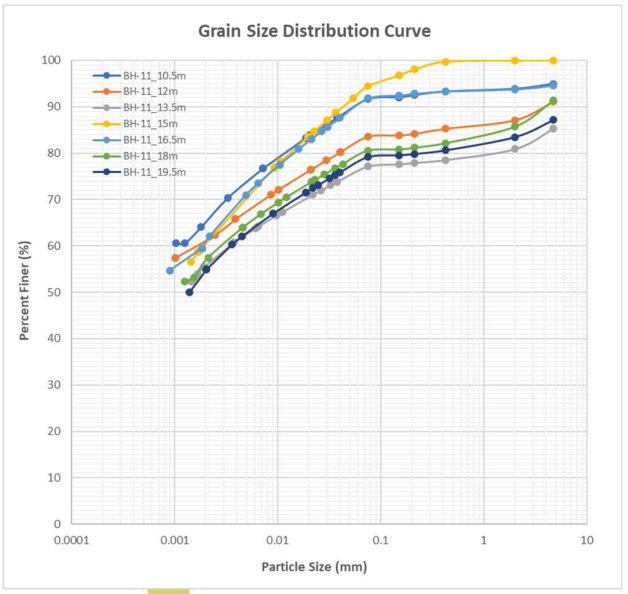
- Well Graded Gravel (GW)
- Poorly Graded Gravel (GP)
- Silty Gravel (GM)
- Clayey Gravel (GC)
- Well Graded Sand (SW)
- Poorly Graded Sand (SP)
- Silty Sand (SM)
- Clayey Sand (SC)
- Inorganic Silt of Low Compressibility (ML)
- Inorganic Silt of Intermediate Compressibility (MI)
- Inorganic Silt of High Compressibility (MH)
- Inorganic Clay of Low Compressibility (CL)
- Inorganic Clay of Intermediate Compressibility (CI)
- Inorganic Clay of High Compressibility (CH)
- Organic Soil of Low Compressibility (OL)
- Organic Soil of Intermediate Compressibility OI)
- Organic Soil of High Compressibility (OH)
- Peat (Pt)
- Top Soil (TS)

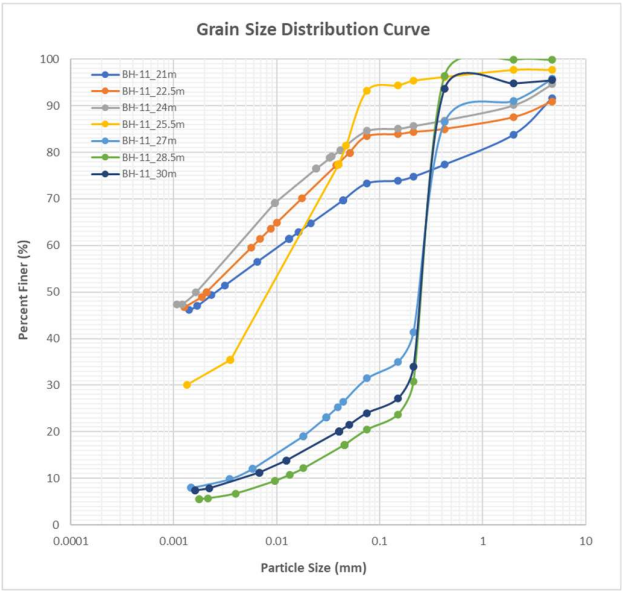
Project		Borehole Details		Drilling Details	
Name of Work:	Geotechnical Investigation work for Proposed Extension Metro Corridors of Aqua Line from Noida Sector-142 to Botanical Garden and Depot Station to Boraki MMTH (14.16 km) (E Tender No. NMRC/Civil/Geo. Inv./366/2025)	**BH ID:**	BH-11	**Contractor:**	Goma Engineering & Consultancy
		Chainage [km]:	1+004	**Method of Drilling:**	Rotary Drilling
Client:	Noida Metro Rail Corporation (NMRC) Limited	**Depth [m]:**	30.00	**Start Date:**	10-11-2025
Stretch:	Depot Station to Boraki MMTH	**Elevation [m]:**	207.09	**End Date:**	12-11-2025
Project Code:	158_R0_DEST TO BOMM_0+000 km TO 2+586 km	**Water table Level [m]:**	14.70	**Location:**	**Lat:** 28°29'49.31", **Long:** 77°33'30.24"

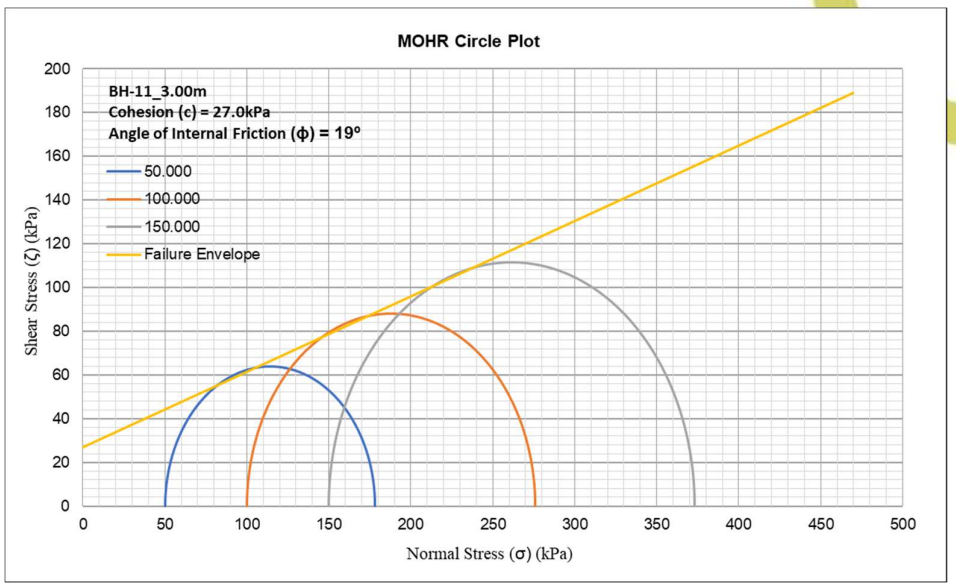
Depth [m]	Sample Type	Descriptions	SPT Test Results					Soil Particles				Atterberg Limits			Physical Characteristics				Direct Shear Test			Triaxial Comp Test			Consolidation Test		
			N1 (Seating Drive)	N2 (First Drive)	N3 (Second Drive)	Observed SPT	N (Correct N)	Gravel [%]	Sand [%]	Silt [%]	Clay [%]	Liquid Limit [%]	Plastic Limit [%]	Plasticity Index [%]	Moisture Content [%]	Bulk Density [gm/cm^3]	Dry Density [gm/cm^3]	Specific Gravity	Type	Cohesion [kg/cm^2]	Angle of Friction [°]	Cohesion [kPa]	Cohesion [kg/cm^2]	Angle of Friction [°]	Swelling Index	Consolidation Index	Preconsolidation Pressure [kg/cm^2]
0.00	DS	Top Soil	-	-	-	-	-	2.1	12.3	29.7	55.9	34	17	17	-	-	-	-	-	-	-	-	-	-	-	-	-
1.50	SPT/DS	Stiff, brownish, fine grained Inorganic Clay of low plasticity with sand and gravel (CL)	4	5	7	12	17	0.1	3.8	35.2	60.9	33	15	18	-	-	-	-	-	-	-	-	-	-	-	-	-
3.00	UDS		-					0.4	6.5	31.3	61.8	30	16	14	17.81	1.91	1.62	2.58	F	0.15	25	UU	27	19	0.019	0.1	0.815
3.00	SPT/DS		6	6	7	13	14	-																			
4.50	SPT/DS		5	7	9	16	16	0	24.685	21.9	53.4	32	18	14	-	-	-	-	-	-	-	-	-	-	-	-	-
6.00	UDS		-					4.5	40.2	15.7	39.7	33	17	16	18.32	1.93	1.63	2.46	F	0.13	28	UU	29	18	-	-	-
6.50	SPT/DS		4	6	8	14	13	-																			
7.50	SPT/DS	Stiff to very stiff, brownish, fine grained Inorganic Clay of low plasticity with sand and gravel (CL)	4	7	9	16	15	0.8	5.0	33.8	60.5	29	15	13	-	-	-	-	-	-	-	-	-	-	-	-	-
9.00	UDS		-					24.2	13.4	19.0	43.4	33	17	16	17.30	1.78	1.52	2.45	F	0.18	22	-	-	-	-	-	-
9.50	SPT/DS		8	12	15	27	23	-																			
10.50	SPT/DS		7	10	21	31	25	5.0	3.3	26.5	65.2	30	16	14	-	-	-	-	-	-	-	-	-	-	-	-	-
12.00	UDS		-					8.9	7.5	22.4	61.2	30	15	15	18.62	1.89	1.59	2.65	-	-	-	-	-	-	-	-	-
12.50	SPT/DS		4	6	8	14	11	-																			
13.50	SPT/DS		5	8	10	18	13	14.7	8.1	21.4	55.7	30	14	16	-	-	-	-	-	-	-	-	-	-	-	-	-
15.00	UDS		-					0.0	5.6	33.9	60.5	29	16	13	19.31	-	-	2.60	F	0.21	19	-	-	-	-	-	-
15.50	SPT/DS		6	9	12	21	14	-																			
16.50	SPT/DS	Very stiff to hard, brownish, fine grained Inorganic Clay of low plasticity with gravel (CL)	8	15	21	36	19	5.4	2.8	31.0	60.8	33	16	17	-	-	-	-	-	-	-	-	-	-	-	-	-
18.00	UDS		-					8.6	10.8	23.9	56.7	32	16	16	21.23	-	-	2.56	-	-	-	-	-	-	-	-	-
18.50	SPT/DS		8	10	13	23	15	-																			
19.50	SPT/DS		9	12	14	26	16	12.9	8.0	24.4	54.8	30	15	15	-	-	-	-	-	-	-	-	-	-	-	-	-
21.00	UDS		-					8.3	18.3	25.1	48.2	30	15	15	20.83	1.84	1.52	2.43	F	0.2	23	-	-	-	-	-	-
21.50	SPT/DS		5	10	15	25	15	-																			
22.50	SPT/DS		10	21	28	49	22	9.1	7.5	33.9	49.6	31	17	14	-	-	-	-	-	-	-	-	-	-	-	-	-
24.00	UDS		-					5.3	10.1	32.6	52.0	32	14	18	26.71	1.94	1.53	2.40	-	-	-	-	-	-	-	-	-
24.50	SPT/DS	Dense to very dense, brownish, fine-grained silty sand (SM)	14	22	31	53	23	-																			
25.50	SPT/DS		12	19	26	45	20	2.3	4.4	61.0	32.3	26	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-
27.00	UDS		-					4.2	64.4	22.8	8.6	24	NP	NP	20.00	2.08	1.74	2.48	F	0.07	29	-	-	-	-	-	-
27.50	SPT/DS		7	17	24	41	19	-																			
28.50	SPT/DS		15	25	33	58	23	0.1	79.5	14.8	5.6	29	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-
30.00	UDS		-					4.5	71.5	16.3	7.7	27	NP	NP	21.39	2.10	1.73	2.52	F	0.05	31	-	-	-	-	-	-
30.50	SPT/DS		13	22	32	54	21	-																			

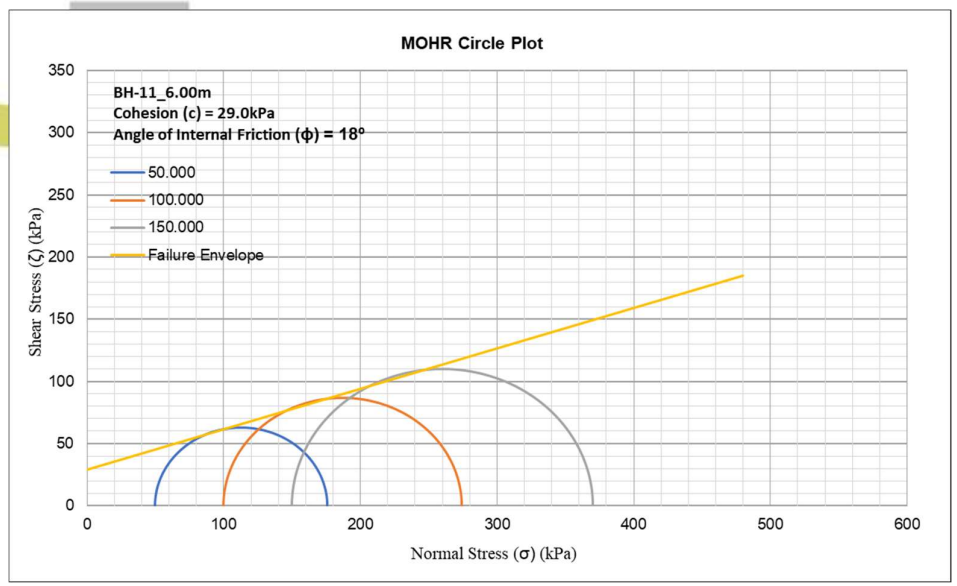
Notations: UDS = Undisturbed Sample, DS = Disturbed Sample, RC = Rock Core, F = Fast, S = Slow, UU = Unconsolidated Undrained Tri-axial compression Test, NP = Non Plastic.

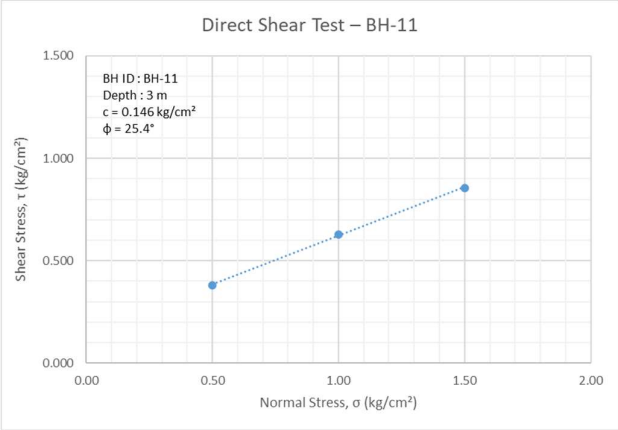

Grain Size Distribution Curve
BH-11_0m
BH-11_1.5m
BH-11_3m
BH-11_4.5m
BH-11_6m
BH-11_7.5m
BH-11_9m
Percent Finer (%)
Particle Size (mm)

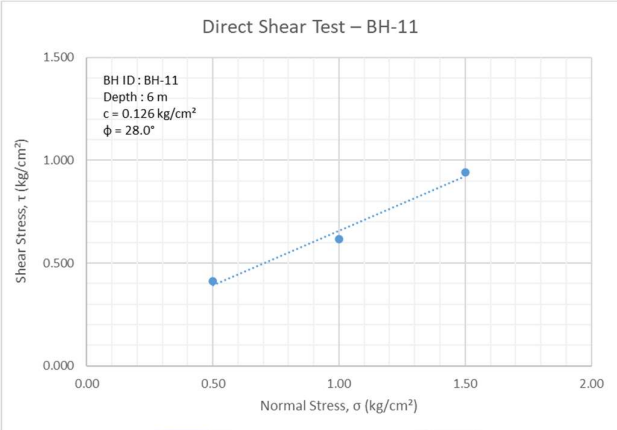

Grain Size Distribution Curve
BH-11_10.5m
BH-11_12m
BH-11_13.5m
BH-11_15m
BH-11_16.5m
BH-11_18m
BH-11_19.5m
Percent Finer (%)
Particle Size (mm)

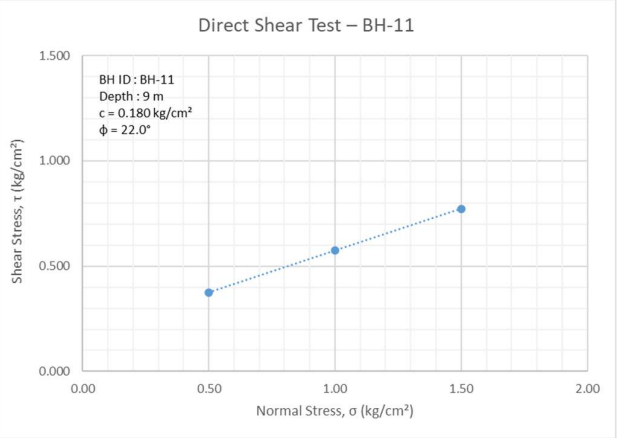

Grain Size Distribution Curve
BH-11_21m
BH-11_22.5m
BH-11_24m
BH-11_25.5m
BH-11_27m
BH-11_28.5m
BH-11_30m
Percent Finer (%)
Particle Size (mm)

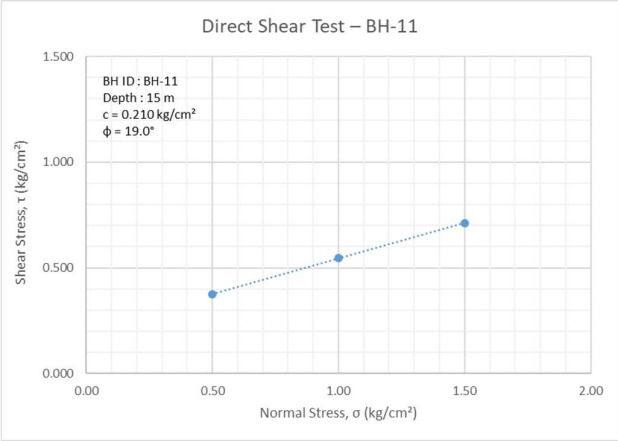

MOHR Circle Plot
BH-11_3.00m
Cohesion (c) = 27.0kPa
Angle of Internal Friction (ϕ) = 19°
50.000
100.000
150.000
Failure Envelope
Shear Stress (ζ) (kPa)
Normal Stress (σ) (kPa)

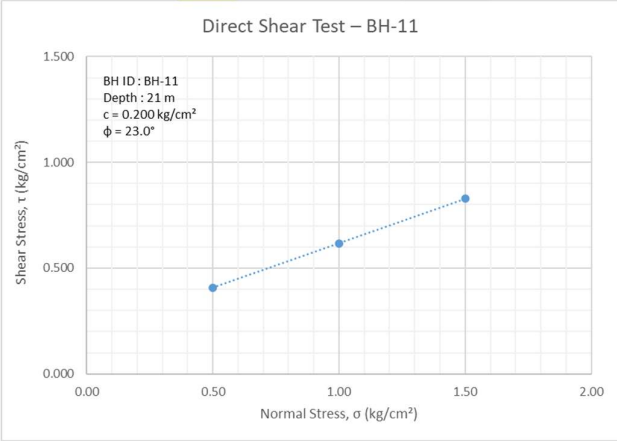

MOHR Circle Plot
BH-11_6.00m
Cohesion (c) = 29.0kPa
Angle of Internal Friction (ϕ) = 18°
50.000
100.000
150.000
Failure Envelope
Shear Stress (ζ) (kPa)
Normal Stress (σ) (kPa)

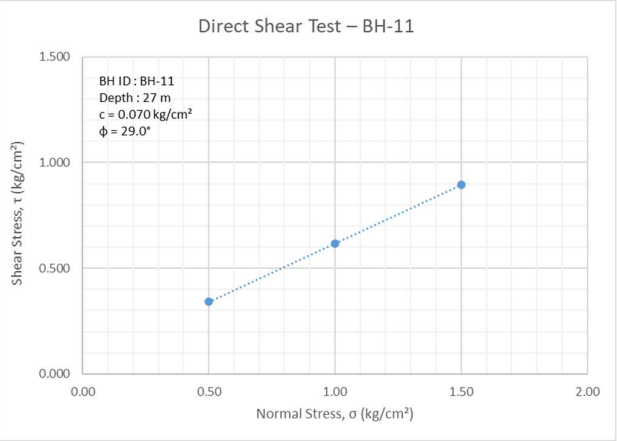

Direct Shear Test – BH-11
BH ID : BH-11
Depth : 3 m
c = 0.146 kg/cm²
ϕ = 25.4°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
1.500
1.000
0.500
0.000
0.00
0.50
1.00
1.50
2.00

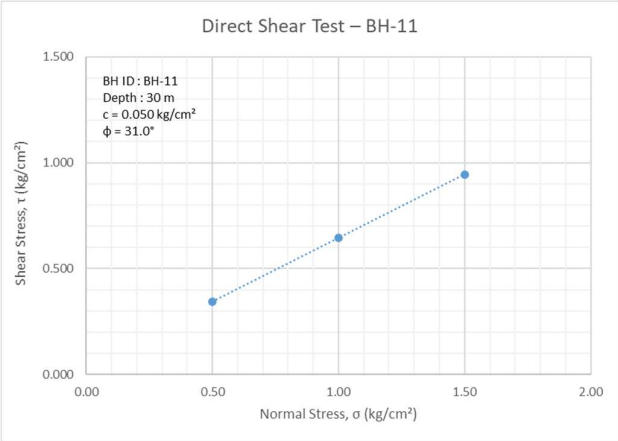

Direct Shear Test – BH-11
BH ID : BH-11
Depth : 6 m
c = 0.126 kg/cm²
ϕ = 28.0°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
1.500
1.000
0.500
0.000
0.00
0.50
1.00
1.50
2.00


Direct Shear Test – BH-11
BH ID : BH-11
Depth : 9 m
c = 0.180 kg/cm²
ϕ = 22.0°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
1.500
1.000
0.500
0.000
0.00
0.50
1.00
1.50
2.00

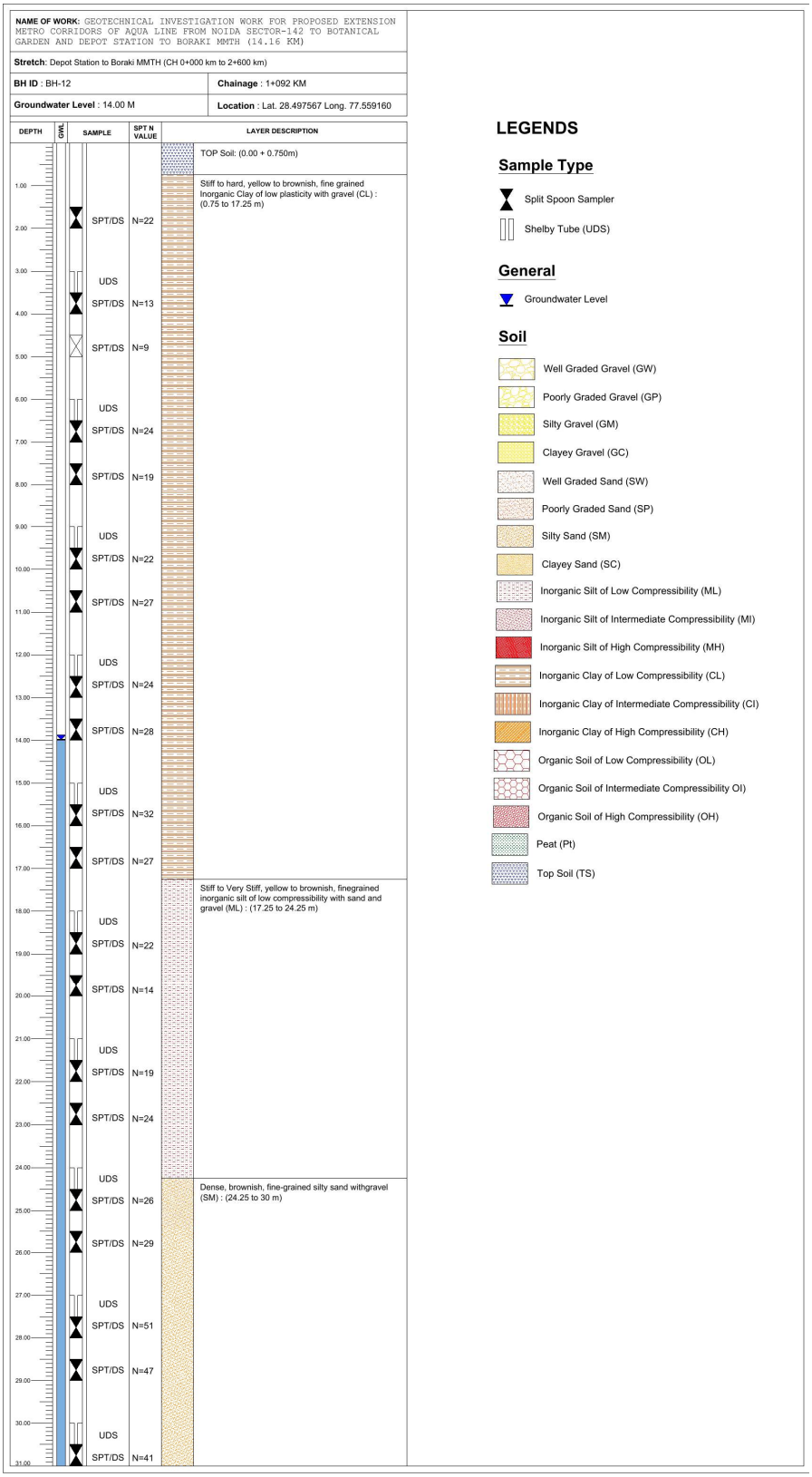

Direct Shear Test – BH-11
BH ID : BH-11
Depth : 15 m
c = 0.210 kg/cm²
ϕ = 19.0°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
1.500
1.000
0.500
0.000
0.00
0.50
1.00
1.50
2.00


Direct Shear Test – BH-11
BH ID : BH-11
Depth : 21 m
c = 0.200 kg/cm²
ϕ = 23.0°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
1.500
1.000
0.500
0.000
0.00
0.50
1.00
1.50
2.00


Direct Shear Test – BH-11
BH ID : BH-11
Depth : 27 m
c = 0.070 kg/cm²
ϕ = 29.0°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
1.500
1.000
0.500
0.000
0.00
0.50
1.00
1.50
2.00


Direct Shear Test – BH-11
BH ID : BH-11
Depth : 30 m
c = 0.050 kg/cm²
ϕ = 31.0°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
1.500
1.000
0.500
0.000
0.00
0.50
1.00
1.50
2.00

C.2. Zone 2: CH: 1+004 km to 1+925 km (BH-12 to BH-21)

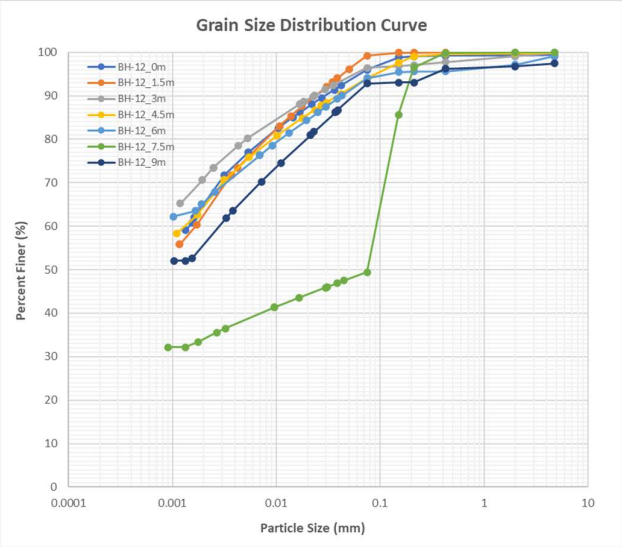


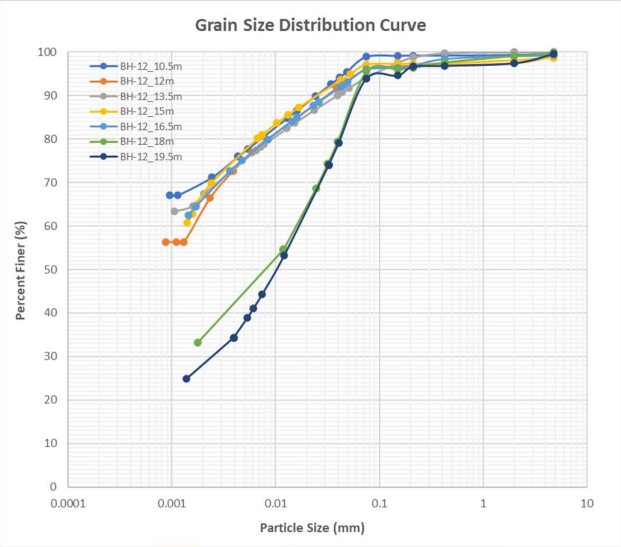
GOMA ENGINEERING AND CONSULTANCY
Quality we put forward

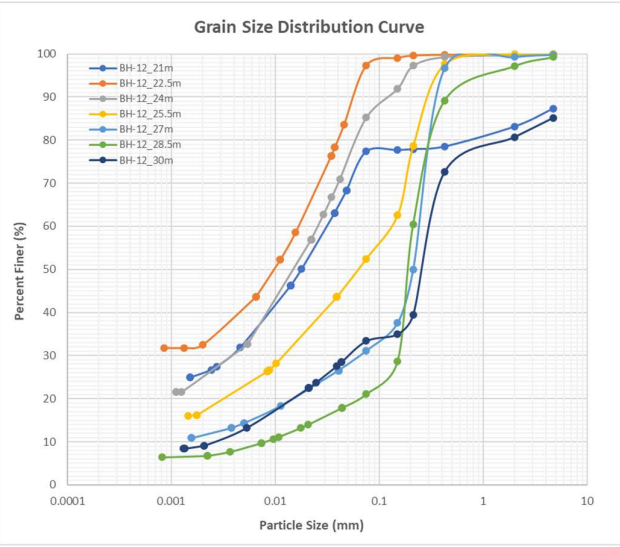
Project		Borehole Details		Drilling Details	
Name of Work:	Geotechnical Investigation work for Proposed Extension Metro Corridors of Aqua Line from Noida Sector-142 to Botanical Garden and Depot Station to Boraki MMTH (14.16 km).	**BH ID:**	BH-12	**Contractor:**	Goma Engineering & Consultancy
		Chainage [km]:	1+092	**Method of Drilling:**	Rotary Drilling
Client:	Noida Metro Rail Corporation (NMRC) Limited	**Depth [m]:**	30.00	**Start Date:**	20-11-2025
Stretch:	Depot Station to Boraki MMTH	**Elevation [m]:**	206.76	**End Date:**	22-11-2025
Project Code:	158_R0_DEST TO BOMM_0+031 km TO 2+586 km	**Water table Level [m]:**	14.00	**Location:**	**Lat:** 28.497567, **Long:** 77.559160

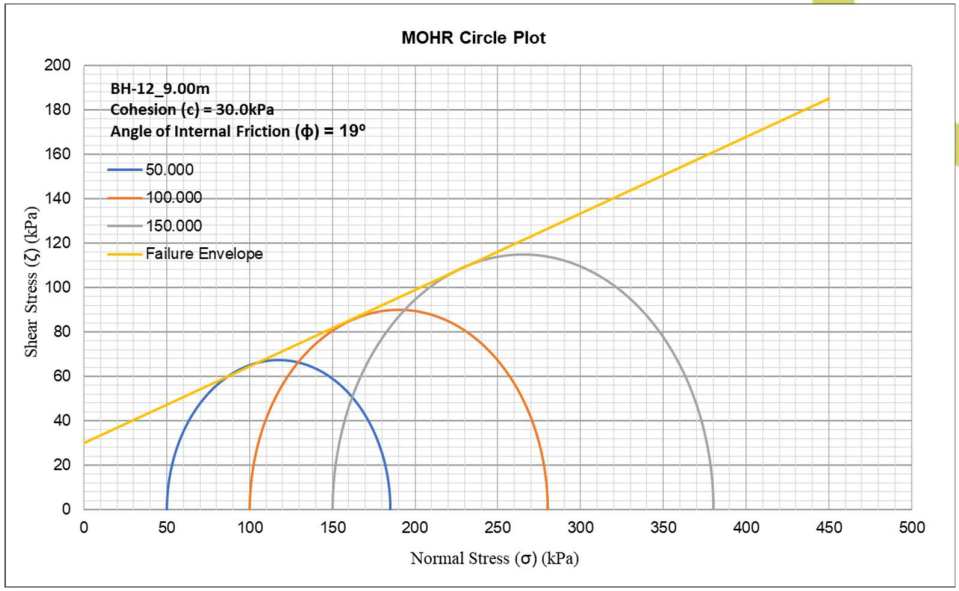
Depth [m]	Sample Type	Descriptions	SPT Test Results					Soil Particles				Atterberg Limits			Physical Characteristics				Direct Shear Test			Triaxial Comp Test			Consolidation Test				
			N1 (Seating Drive)	N2 (First Drive)	N3 (Second Drive)	Observed SPT	N (Correct N)	Gravel [%]	Sand [%]	Silt [%]	Clay [%]	Liquid Limit [%]	Plastic Limit [%]	Plasticity Index [%]	Moisture Content [%]	Bulk Density [gm/cm^3]	Dry Density [gm/cm^3]	Specific Gravity	Type	Cohesion [kg/cm^2]	Angle of Friction [^{o}]	Type	Cohesion [kPa]	Angle of Friction [^{o}]	Compression Index (Cc)	Coefficient of Volume Compressibility (Mv) [cm^2/kg]	Coefficient of Consolidation (Cv) [cm^2/sec]	Over Consolidation Ratio (OCR)	Preconsolidation Pressure [kg/cm^2]
0.00	DS	Top Soil	-	-	-	-	-	0.6	3.4	30.9	65.1	33	17	16	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1.50	SPT/DS	Stiff to hard, yellow to brownish, fine grained Inorganic Clay of low plasticity with gravel (CL)	5	10	12	22	31	0.0	0.8	36.6	62.6	30	16	14	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
3.00	UDS							0.2	3.3	25.5	70.9	32	18	14	19.38	1.82	1.53	2.60	F	0.02	25	-	-	-	-	-	-	-	-
3.50	SPT/DS		5	6	7	13	14	-																					
4.50	SPT/DS		3	4	5	9	9	0.2	5.9	29.4	64.5	34	18	16	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
6.00	UDS							0.9	5.0	28.5	65.5	30	15	15	16.83	1.68	1.44	2.42	F	0.02	26	-	-	-	-	-	-	-	-
6.50	SPT/DS		7	10	14	24	23	-																					
7.50	SPT/DS		5	8	11	19	17	0.0	50.6	15.4	34.0	36	17	19	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
9.00	UDS							2.6	4.6	37.0	55.8	31	17	14	14.41	2.02	1.77	2.64	F	0.07	31	UU	30	19	0.09	5.85E-03	1.00E-02	0.89	1.63
9.50	SPT/DS		5	10	12	22	19	-																					
10.50	SPT/DS		5	12	15	22	27	0.3	0.8	32.3	63.7	32	15	17	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
12.00	UDS							0.9	3.1	27.0	67.2	30	16	14	19.65	1.93	1.62	2.56	F	0.11	19	UU	28	21	-	-	-	-	-
12.50	SPT/DS		6	10	14	24	18	-																					
13.50	SPT/DS		7	13	15	28	20	0.0	5.8	29.7	66.3	31	17	14	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
15.00	UDS							1.3	1.6	60.9	34.6	33	17	16	22.49	1.77	1.45	2.55	F	0.13	22	-	-	-	-	-	-	-	-
15.50	SPT/DS		8	15	17	32	18	-																					
16.50	SPT/DS		9	10	17	27	17	0.8	5.2	65.7	28.3	30	15	15	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
18.00	UDS	Stiff to Very Stiff, yellow to brownish, finegrained inorganic silt of low compressibility with sand and gravel (ML)						0.2	4.3	51.4	26.0	28	NP	NP	18.49	1.72	1.45	2.54	F	0.26	26	-	-	-	-	-	-	-	-
18.50	SPT/DS		6	9	13	22	14	-																					
19.50	SPT/DS		5	6	8	14	9	0.5	5.6	61.4	32.5	24	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
21.00	UDS							12.7	9.9	60.1	25.1	25	NP	NP	22.68	1.70	1.36	2.43	F	0.19	22	-	-	-	-	-	-	-	-
21.50	SPT/DS		6	8	11	19	12	-																					
22.50	SPT/DS		7	10	14	24	15	0.0	2.7	35.4	17.1	26	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
24.00	UDS							0.1	14.7	19.6	11.5	26	NP	NP	23.06	1.82	1.48	2.69	F	0.06	28	-	-	-	-	-	-	-	-
24.50	SPT/DS	Dense, brownish, fine-grained silty sand with gravel (SM)	7	11	15	26	15	-																					
25.50	SPT/DS		7	12	17	29	16	0.0	47.5	14.4	6.7	25	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
27.00	DS							0.2	68.7	24.3	9.0	28	NP	NP	-	-	-	2.69	-	-	-	-	-	-	-	-	-	-	-
27.50	SPT/DS		11	22	29	51	22	-																					
28.50	SPT/DS		10	20	27	47	20	15.3	48.6	36.1		21	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
30.00	UDS							14.8	51.8	33.4		24	NP	NP	17.73	1.89	1.61	2.36	F	0.16	32	-	-	-	-	-	-	-	-
30.50	SPT/DS		10	17	24	41	18	-																					

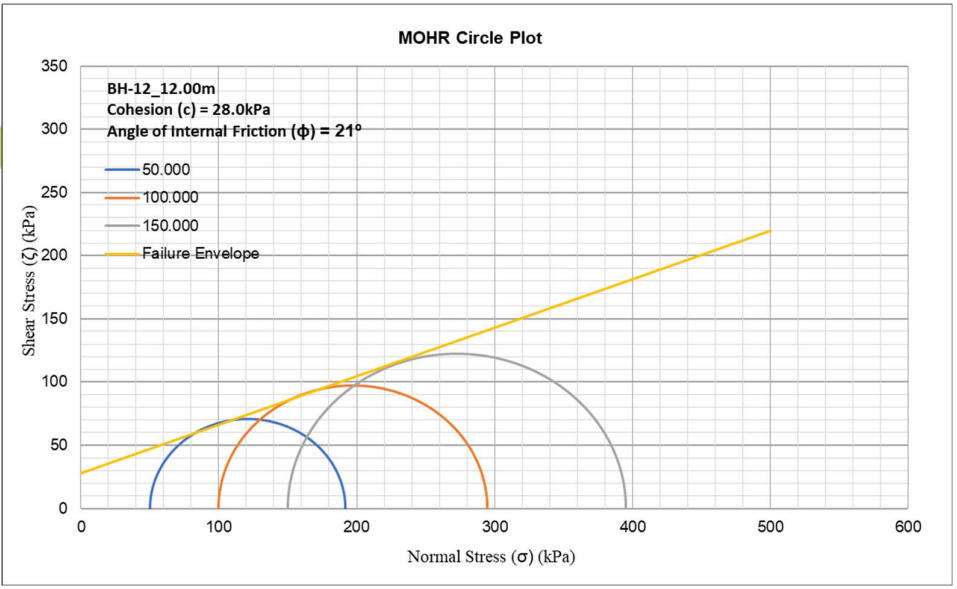
Notations: UDS = Undisturbed Sample, DS = Disturbed Sample, RC = Rock Core, F = Fast, S = Slow, UU = Unconsolidated Undrained Tri-axial compression Test.

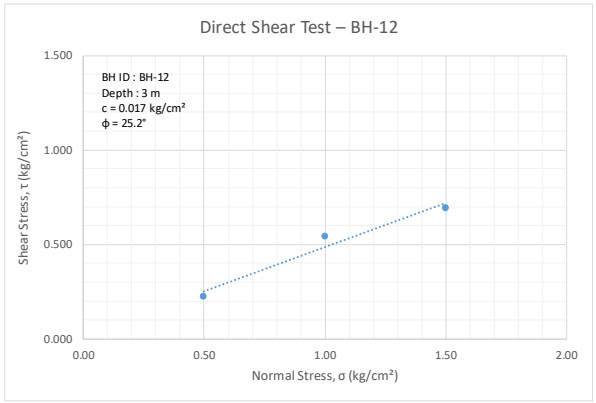

Grain Size Distribution Curve
BH-12_0m
BH-12_1.5m
BH-12_3m
BH-12_4.5m
BH-12_6m
BH-12_7.5m
BH-12_9m
Percent Finer (%)
Particle Size (mm)

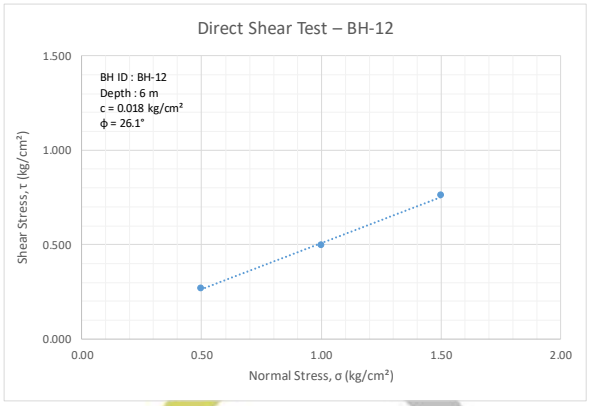

Grain Size Distribution Curve
BH-12_10.5m
BH-12_12m
BH-12_13.5m
BH-12_15m
BH-12_16.5m
BH-12_18m
BH-12_19.5m
Percent Finer (%)
Particle Size (mm)

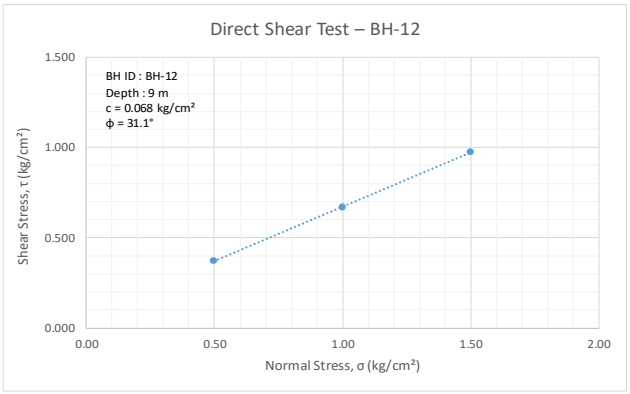

Grain Size Distribution Curve
BH-12_21m
BH-12_22.5m
BH-12_24m
BH-12_25.5m
BH-12_27m
BH-12_28.5m
BH-12_30m
Percent Finer (%)
Particle Size (mm)

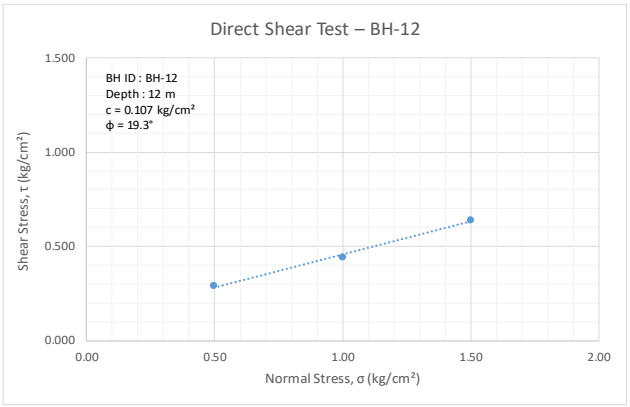

MOHR Circle Plot
BH-12_9.00m
Cohesion (c) = 30.0kPa
Angle of Internal Friction (ϕ) = 19°
50.000
100.000
150.000
Failure Envelope
Shear Stress (ζ) (kPa)
Normal Stress (σ) (kPa)

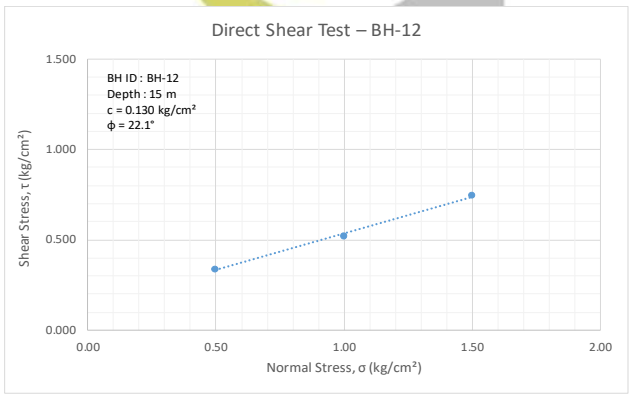

MOHR Circle Plot
BH-12_12.00m
Cohesion (c) = 28.0kPa
Angle of Internal Friction (ϕ) = 21°
50.000
100.000
150.000
Failure Envelope
Shear Stress (ζ) (kPa)
Normal Stress (σ) (kPa)

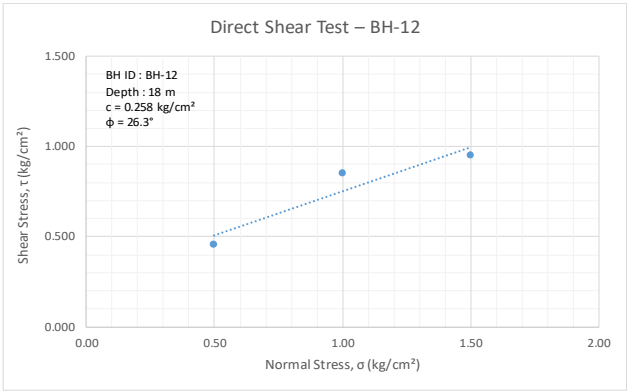

Direct Shear Test – BH-12
BH ID : BH-12
Depth : 3 m
c = 0.017 kg/cm²
ϕ = 25.2°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
1.500
1.000
0.500
0.000
0.00
0.50
1.00
1.50
2.00

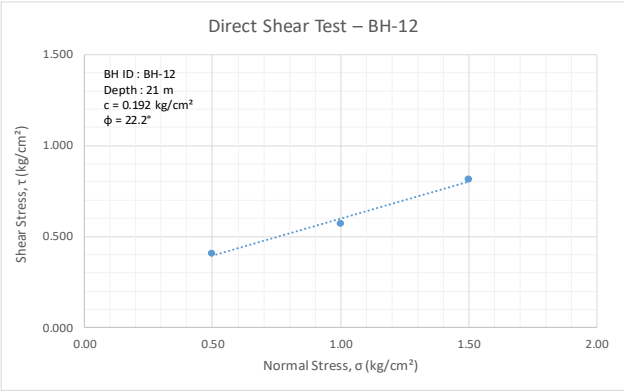

Direct Shear Test – BH-12
BH ID : BH-12
Depth : 6 m
c = 0.018 kg/cm²
ϕ = 26.1°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
1.500
1.000
0.500
0.000
0.00
0.50
1.00
1.50
2.00

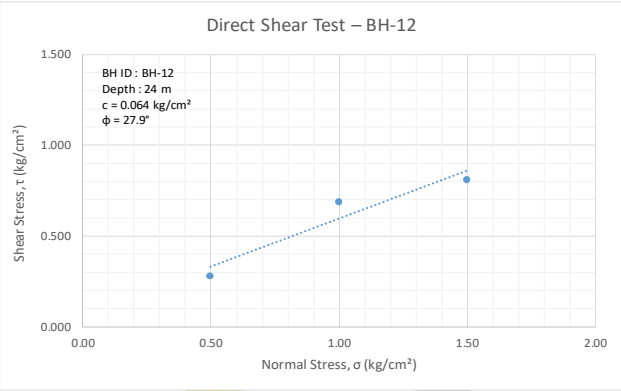

Direct Shear Test – BH-12
BH ID : BH-12
Depth : 9 m
c = 0.068 kg/cm²
ϕ = 31.1°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
1.500
1.000
0.500
0.000
0.00
0.50
1.00
1.50
2.00

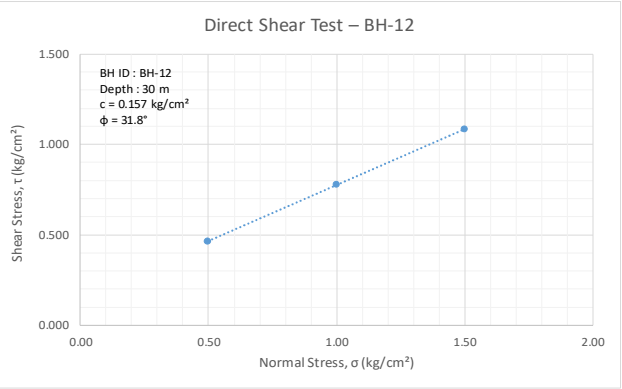

Direct Shear Test – BH-12
BH ID : BH-12
Depth : 12 m
c = 0.107 kg/cm²
ϕ = 19.3°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
1.500
1.000
0.500
0.000
0.00
0.50
1.00
1.50
2.00


Direct Shear Test – BH-12
BH ID : BH-12
Depth : 15 m
c = 0.130 kg/cm²
ϕ = 22.1°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
1.500
1.000
0.500
0.000
0.00
0.50
1.00
1.50
2.00


Direct Shear Test – BH-12
BH ID : BH-12
Depth : 18 m
c = 0.258 kg/cm²
ϕ = 26.3°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
1.500
1.000
0.500
0.000
0.00
0.50
1.00
1.50
2.00


Direct Shear Test – BH-12
BH ID : BH-12
Depth : 21 m
c = 0.192 kg/cm²
ϕ = 22.2°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
1.500
1.000
0.500
0.000
0.00
0.50
1.00
1.50
2.00


Direct Shear Test – BH-12
BH ID : BH-12
Depth : 24 m
c = 0.064 kg/cm²
ϕ = 27.9°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
1.500
1.000
0.500
0.000
0.00
0.50
1.00
1.50
2.00

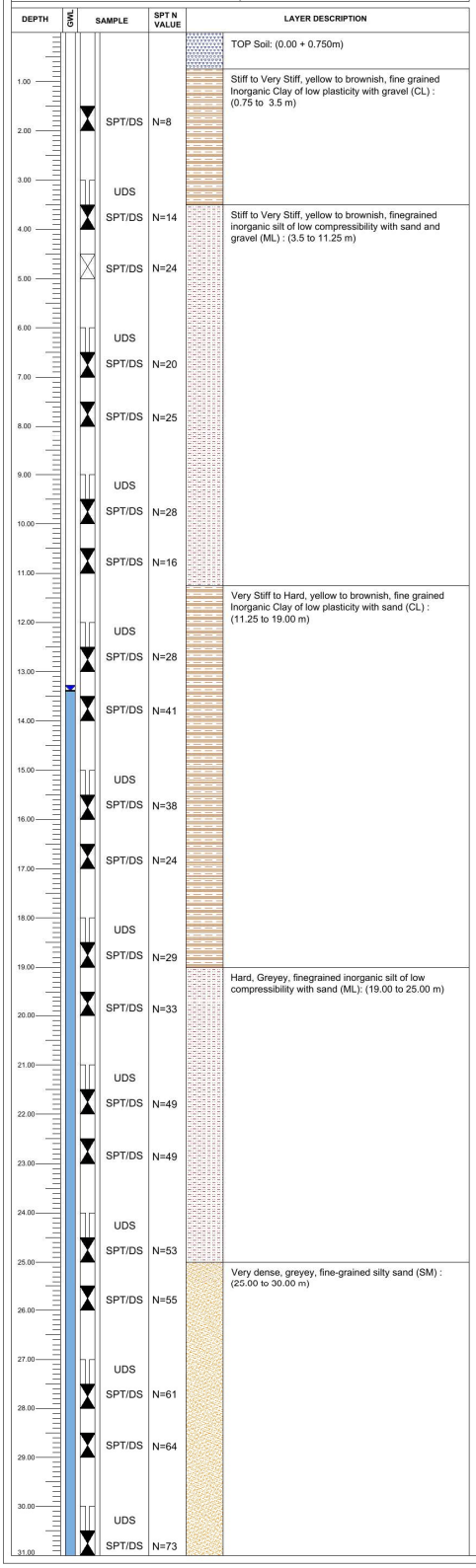

Direct Shear Test – BH-12
BH ID : BH-12
Depth : 30 m
c = 0.157 kg/cm²
ϕ = 31.8°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
1.500
1.000
0.500
0.000
0.00
0.50
1.00
1.50
2.00

NAME OF WORK: GEOTECHNICAL INVESTIGATION WORK FOR PROPOSED EXTENSION METRO CORRIDORS OF AQUA LINE FROM NOIDA SECTOR-142 TO BOTANICAL GARDEN AND DEPOT STATION TO BORAKI MMTH (14.16 KM)

Stretch: Depot Station to Boraki MMTH (CH 0+000 km to 2+600 km)

BH ID : BH-13 | **Chainage** : 1+214 KM

Groundwater Level : 13.40 M | **Location** : Lat. 28.498284 Long. 77.560110



LEGENDS

Sample Type

- Split Spoon Sampler
- Shelby Tube (UDS)

General

- Groundwater Level

Soil

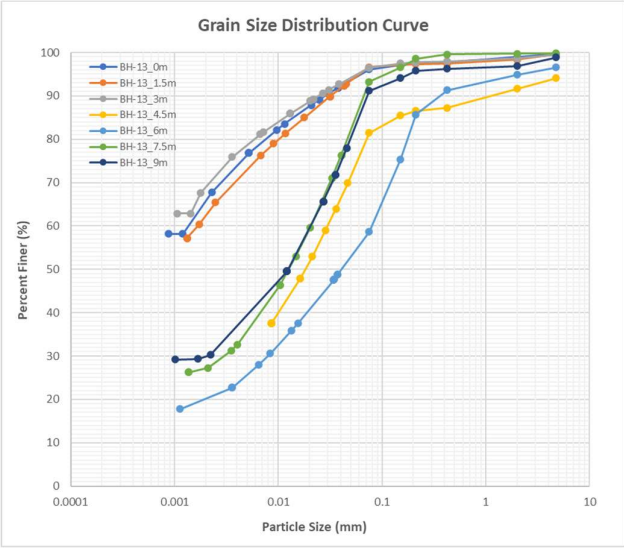
- Well Graded Gravel (GW)
- Poorly Graded Gravel (GP)
- Silty Gravel (GM)
- Clayey Gravel (GC)
- Well Graded Sand (SW)
- Poorly Graded Sand (SP)
- Silty Sand (SM)
- Clayey Sand (SC)
- Inorganic Silt of Low Compressibility (ML)
- Inorganic Silt of Intermediate Compressibility (MI)
- Inorganic Silt of High Compressibility (MH)
- Inorganic Clay of Low Compressibility (CL)
- Inorganic Clay of Intermediate Compressibility (CI)
- Inorganic Clay of High Compressibility (CH)
- Organic Soil of Low Compressibility (OL)
- Organic Soil of Intermediate Compressibility OI)
- Organic Soil of High Compressibility (OH)
- Peat (Pt)
- Top Soil (TS)

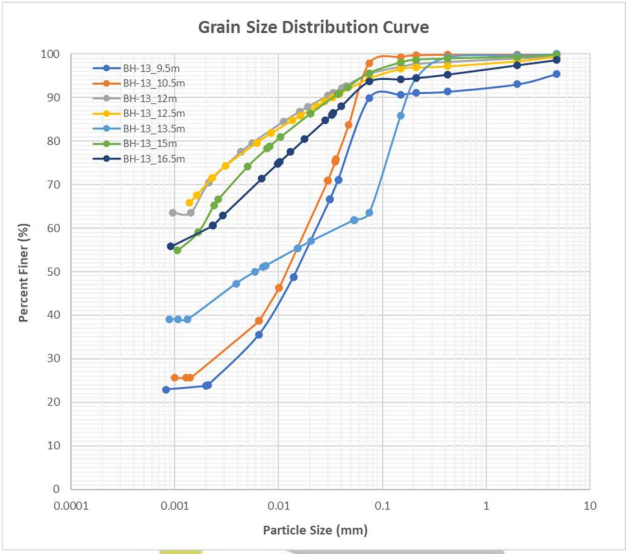
GOMA ENGINEERING AND CONSULTANCY
Quality we put forward

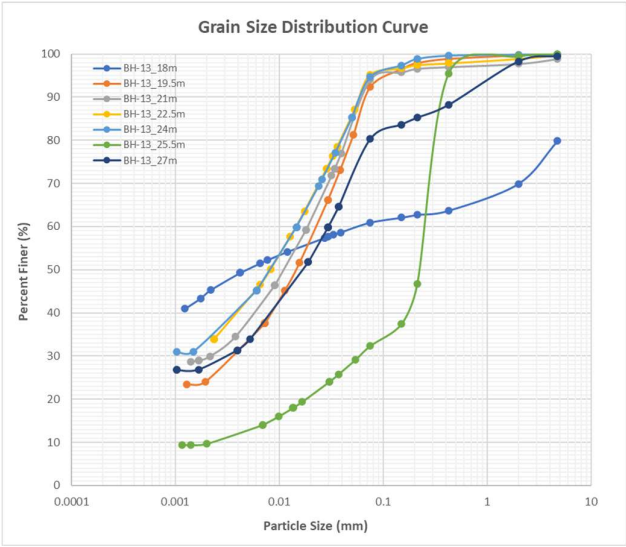
Project		Borehole Details		Drilling Details	
Name of Work:	Geotechnical Investigation work for Proposed Extension Metro Corridors of Aqua Line from Noida Sector-142 to Botanical Garden and Depot Station to Boraki MMTH (14.16 km).	**BH ID:**	BH-13	**Contractor:**	Goma Engineering & Consultancy
		Chainage [km]:	1+214	**Method of Drilling:**	Rotary Drilling
Client:	Noida Metro Rail Corporation (NMRC) Limited	**Depth [m]:**	30.00	**Start Date:**	19-11-2025
Stretch:	Depot Station to Boraki MMTH	**Elevation [m]:**	206.32	**End Date:**	27-12-2025
Project Code:	158_R0_DEST TO BOMM_0+031 km TO 2+586 km	**Water table Level [m]:**	13.40	**Location:**	**Lat:** 28.498284, **Long:** 77.560110

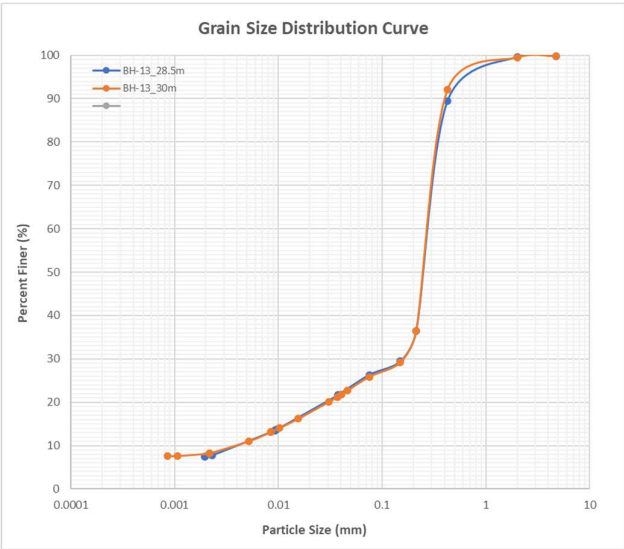
Depth [m]	Sample Type	Descriptions	SPT Test Results					Soil Particles				Atterberg Limits			Physical Characteristics				Direct Shear Test			Triaxial Comp Test			Consolidation Test				
			N1 (Seating Drive)	N2 (First Drive)	N3 (Second Drive)	Observed SPT	N (Correct N)	Gravel [%]	Sand [%]	Silt [%]	Clay [%]	Liquid Limit [%]	Plastic Limit [%]	Plasticity Index [%]	Moisture Content [%]	Bulk Density [gm/cm^3]	Dry Density [gm/cm^3]	Specific Gravity	Type	Cohesion [kg/cm^2]	Angle of Friction [°]	Type	Cohesion [kPa]	Angle of Friction [°]	Compression Index (Cc)	Coefficient of Volume Compressibility (Mv) [cm^2/kg]	Coefficient of Consolidation (Cv) [cm^2/sec]	Over Consolidation Ratio (OCR)	Preconsolidation Pressure [kg/cm^2]
0.00	DS	Top Soil	-	-	-	-	-	0.7	3.5	30.4	65.8	30	15	15	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1.50	SPT/DS	Stiff to Very Stiff, yellow to brownish, fine grained Inorganic Clay of low plasticity with gravel (CL)	3	3	5	8	11	0.4	2.9	34.3	62.4	33	17	16	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
3.00	UDS							0.5	3.0	27.6	68.9	32	18	14	17.70	1.57	1.34	2.60	F	0.06	26	-	-	-	-	-	-	-	-
3.50	SPT/DS		4	6	8	14	15	-																					
4.50	SPT/DS	Stiff to Very Stiff, yellow to brownish, finegrained inorganic silt of low compressibility with sand and gravel (ML)	9	11	13	24	24	5.9	12.6	81.5	0.0	28	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
6.00	UDS							3.5	37.9	38.4	20.2	30	NP	NP	23.28	1.71	1.40	2.41	F	0.09	26	-	-	-	-	-	-	-	-
6.50	SPT/DS		6	9	11	20	19	-																					
7.50	SPT/DS		7	11	14	25	23	0.2	6.6	66.1	27.2	26	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
9.00	UDS							1.2	7.7	61.3	29.9	29	NP	NP	19.22	1.89	1.58	2.54	F	0.05	27	UU	12	25	-	-	-	-	-
9.50	SPT/DS		8	12	16	28	24	4.6	5.4	66.2	23.8	28	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
10.50	SPT/DS		5	6	10	16	13	0.0	2.0	69.3	28.6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
12.00	DS	Very Stiff to Hard, yellow to brownish, fine grained Inorganic Clay of low plasticity with sand (CL)						0.6	5.0	25.9	69.5	29	15	14	18.60	-	-	2.49	F	0.20	23	-	-	-	-	-	-	-	-
12.50	SPT/DS		6	11	17	28	21	-																					
13.50	SPT/DS		7	20	21	41	22	0.0	36.4	21.4	42.2	31	17	14	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
15.00	UDS							0.2	4.1	33.4	62.2	32	17	15	12.26	2.01	1.79	2.63	F	0.15	25	UU	10	26	0.08	5.34E-03	6.23E-03	0.54	1.632
15.50	SPT/DS		12	18	20	38	21	-																					
16.50	SPT/DS		7	10	14	24	16	1.4	4.8	33.9	59.9	33	18	15	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
18.00	UDS							20.2	18.9	16.4	44.5	30	16	14	19.66	1.68	1.40	2.58	F	0.05	28	-	-	-	-	-	-	-	-
18.50	SPT/DS		11	13	16	29	17	-																					
19.50	SPT/DS	Hard, Greyey, finegrained inorganic silt of low compressibility with sand (ML)	10	15	18	33	18	0.1	7.5	24.3	68.1	24	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
21.00	UDS							1.2	4.8	29.6	64.4	25	NP	NP	23.40	1.98	1.60	2.40	F	0.00	28	-	-	-	-	-	-	-	-
21.50	SPT/DS		18	22	27	49	23	-																					
22.50	SPT/DS		11	21	28	49	23	0.2	4.5	0.0	95.2	23	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
24.00	DS							0.0	5.3	34.0	60.6	26	NP	NP	-	-	-	2.67	F	0.08	27	-	-	-	-	-	-	-	-
24.50	SPT/DS		18	21	32	53	23	-																					
25.50	SPT/DS	Very dense, greyey, fine-grained silty sand (SM)	18	26	29	55	24	0.0	67.7	9.7	22.7	22	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
27.00	UDS							0.5	19.3	27.8	52.5	28	NP	NP	21.40	2.16	1.78	2.57	F	0.03	33	-	-	-	-	-	-	-	-
27.50	SPT/DS		22	28	33	61	25	-																					
28.50	SPT/DS		18	26	38	64	25	0.2	73.5	7.4	18.9	23	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
30.00	DS							0.2	74.0	8.1	17.8	24	NP	NP	-	-	-	2.53	-	-	-	-	-	-	-	-	-	-	-
30.50	SPT/DS		18	30	43	73	27	-																					

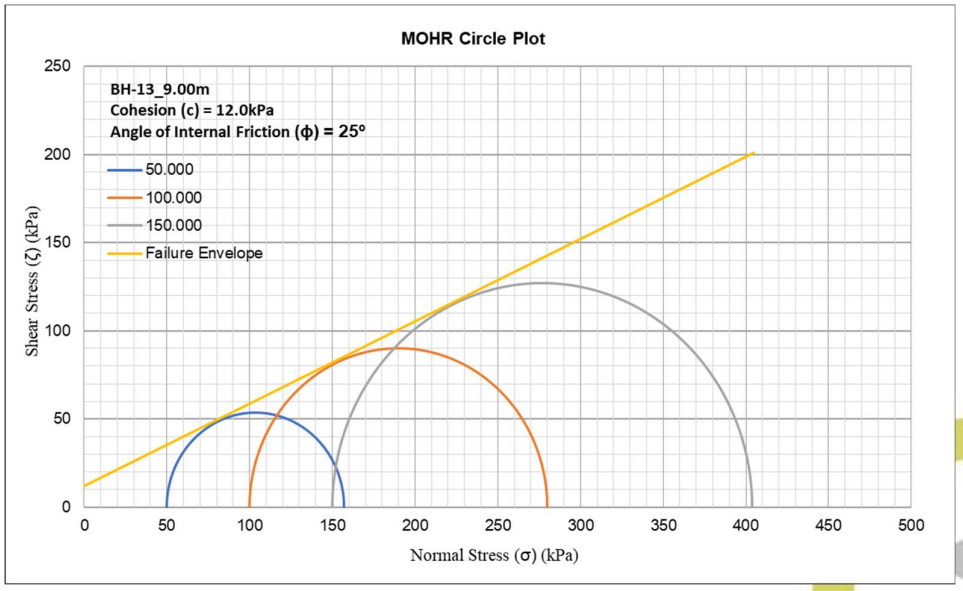
Notations: UDS = Undisturbed Sample, DS = Disturbed Sample, RC = Rock Core, F = Fast, S = Slow, UU = Unconsolidated Undrained Tri-axial compression Test, NP = Non Plastic.

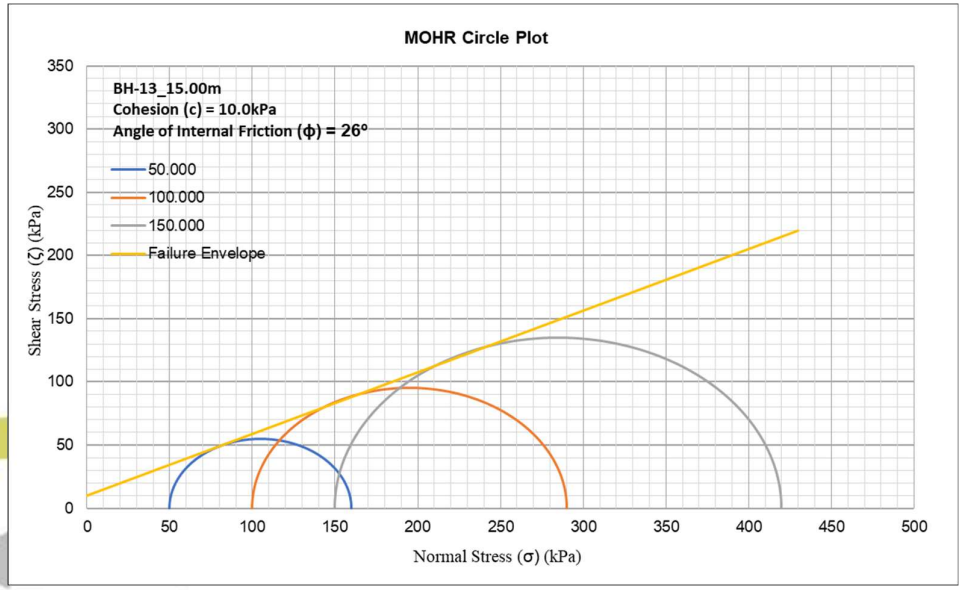

Grain Size Distribution Curve
BH-13_0m
BH-13_1.5m
BH-13_3m
BH-13_4.5m
BH-13_6m
BH-13_7.5m
BH-13_9m
Percent Finer (%)
Particle Size (mm)

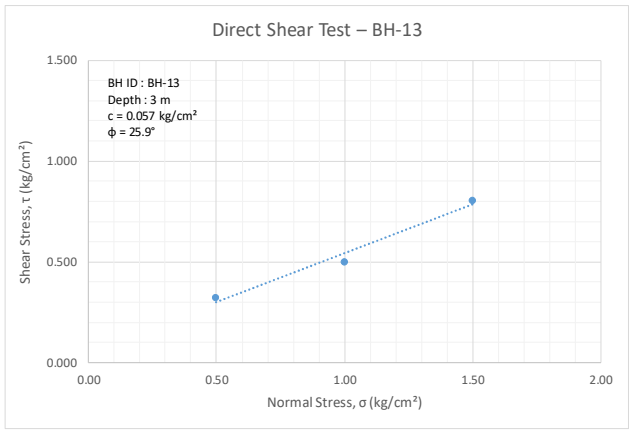

Grain Size Distribution Curve
BH-13_9.5m
BH-13_10.5m
BH-13_12m
BH-13_12.5m
BH-13_13.5m
BH-13_15m
BH-13_16.5m
Percent Finer (%)
Particle Size (mm)

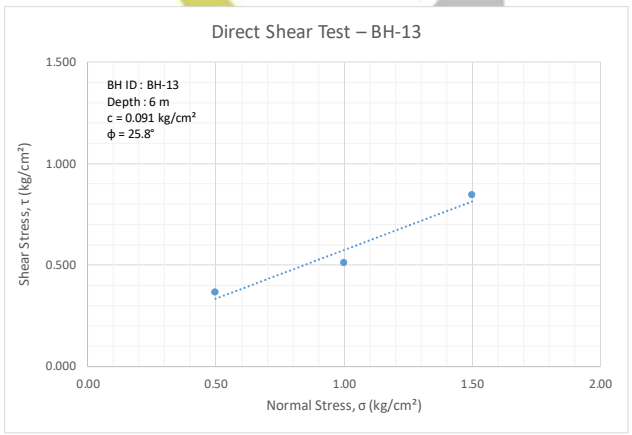

Grain Size Distribution Curve
BH-13_18m
BH-13_19.5m
BH-13_21m
BH-13_22.5m
BH-13_24m
BH-13_25.5m
BH-13_27m
Percent Finer (%)
Particle Size (mm)

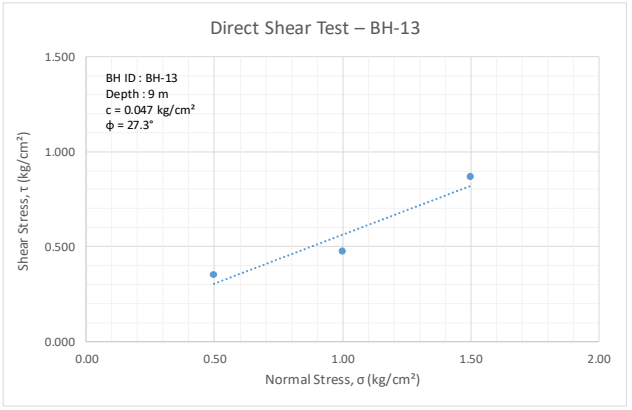

Grain Size Distribution Curve
BH-13_28.5m
BH-13_30m
Percent Finer (%)
Particle Size (mm)

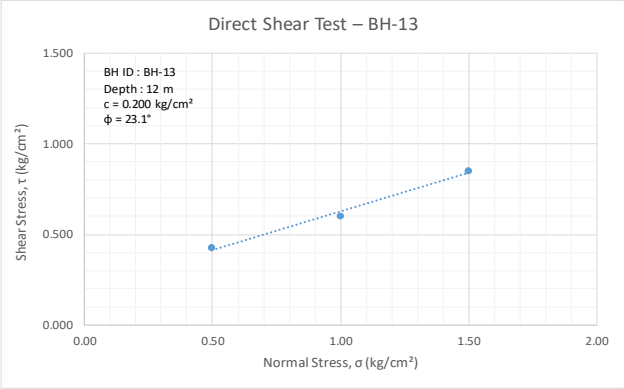

MOHR Circle Plot
BH-13_9.00m
Cohesion (c) = 12.0kPa
Angle of Internal Friction (ϕ) = 25°
50.000
100.000
150.000
Failure Envelope
Shear Stress (ζ) (kPa)
Normal Stress (σ) (kPa)

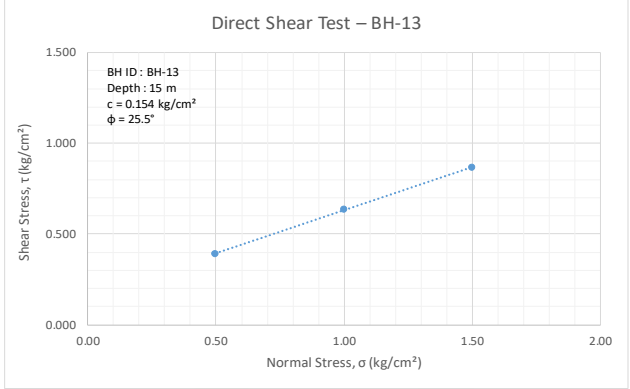

MOHR Circle Plot
BH-13_15.00m
Cohesion (c) = 10.0kPa
Angle of Internal Friction (ϕ) = 26°
50.000
100.000
150.000
Failure Envelope
Shear Stress (ζ) (kPa)
Normal Stress (σ) (kPa)

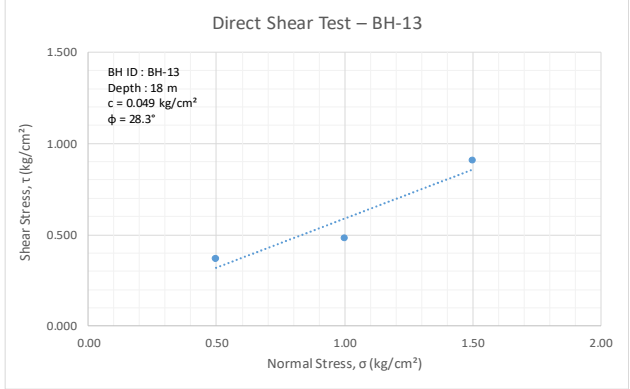

Direct Shear Test – BH-13
BH ID : BH-13
Depth : 3 m
c = 0.057 kg/cm²
ϕ = 25.9°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)

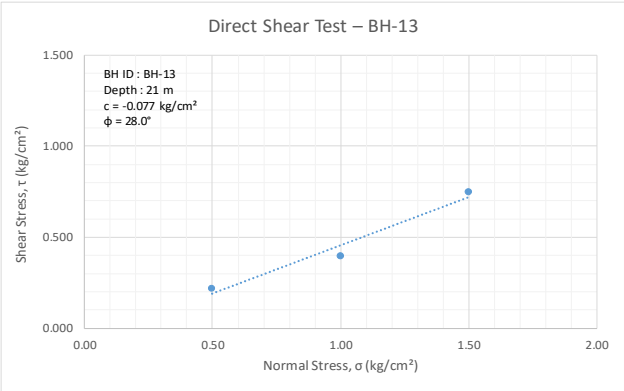

Direct Shear Test – BH-13
BH ID : BH-13
Depth : 6 m
c = 0.091 kg/cm²
ϕ = 25.8°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)

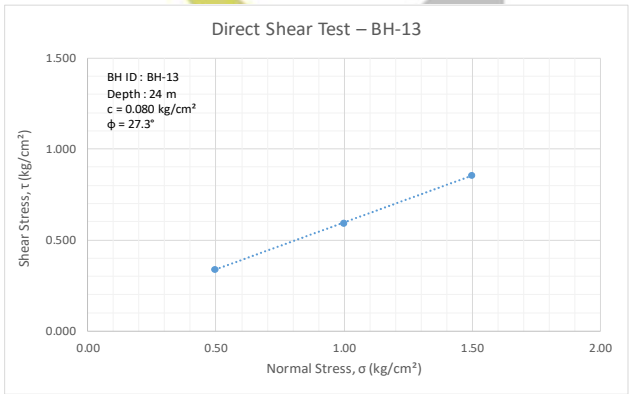

Direct Shear Test – BH-13
BH ID : BH-13
Depth : 9 m
c = 0.047 kg/cm²
ϕ = 27.3°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)

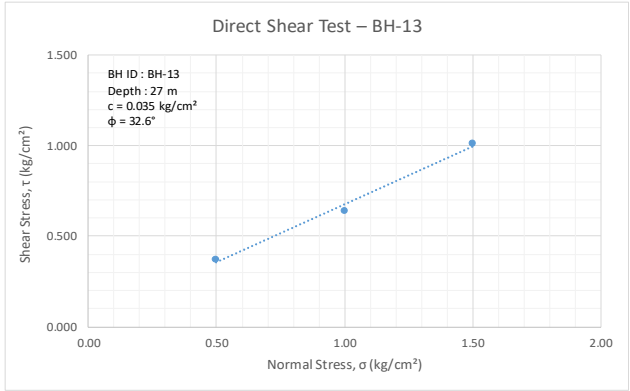

Direct Shear Test – BH-13
BH ID : BH-13
Depth : 12 m
c = 0.200 kg/cm²
ϕ = 23.1°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
0.000
0.500
1.000
1.500
0.00
0.50
1.00
1.50
2.00


Direct Shear Test – BH-13
BH ID : BH-13
Depth : 15 m
c = 0.154 kg/cm²
ϕ = 25.5°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
0.000
0.500
1.000
1.500
0.00
0.50
1.00
1.50
2.00


Direct Shear Test – BH-13
BH ID : BH-13
Depth : 18 m
c = 0.049 kg/cm²
ϕ = 28.3°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
0.000
0.500
1.000
1.500
0.00
0.50
1.00
1.50
2.00


Direct Shear Test – BH-13
BH ID : BH-13
Depth : 21 m
c = -0.077 kg/cm²
ϕ = 28.0°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
0.000
0.500
1.000
1.500
0.00
0.50
1.00
1.50
2.00

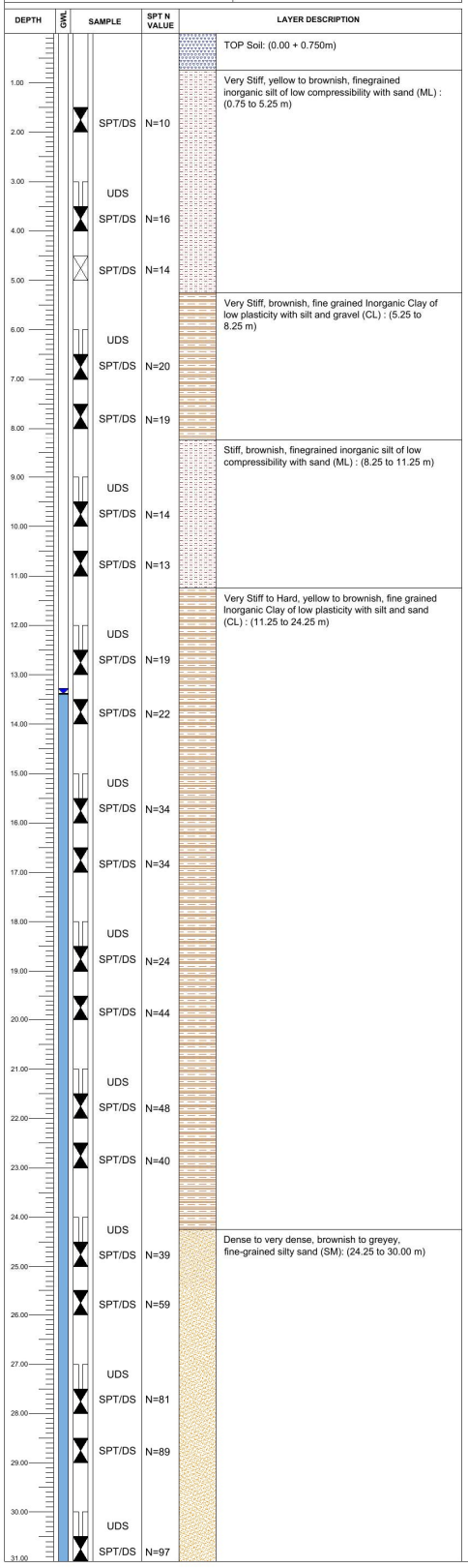

Direct Shear Test – BH-13
BH ID : BH-13
Depth : 24 m
c = 0.080 kg/cm²
ϕ = 27.3°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
0.000
0.500
1.000
1.500
0.00
0.50
1.00
1.50
2.00


Direct Shear Test – BH-13
BH ID : BH-13
Depth : 27 m
c = 0.035 kg/cm²
ϕ = 32.6°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
0.000
0.500
1.000
1.500
0.00
0.50
1.00
1.50
2.00

NAME OF WORK: GEOTECHNICAL INVESTIGATION WORK FOR PROPOSED EXTENSION METRO CORRIDORS OF AQUA LINE FROM NOIDA SECTOR-142 TO BOTANICAL GARDEN AND DEPOT STATION TO BORAKI MMTH (14.16 KM)

Stretch: Depot Station to Boraki MMTH (CH 0+000 km to 2+600 km)

BH ID : BH-14	**Chainage** : 1+293 KM
Groundwater Level : 13.40 M	**Location** : Lat. 28.498549 Long. 77.560884



LEGENDS

Sample Type

- Split Spoon Sampler
- Shelby Tube (UDS)

General

- Groundwater Level

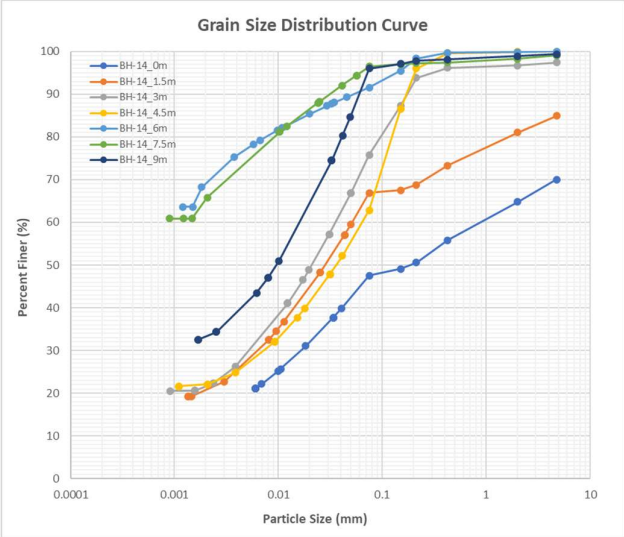
Soil

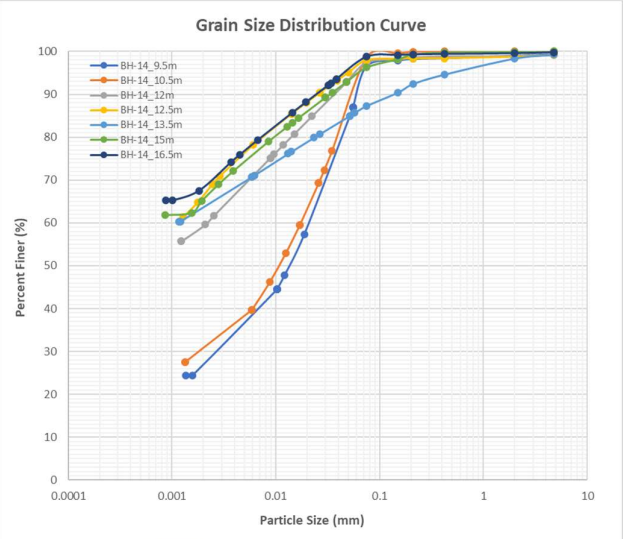
- Well Graded Gravel (GW)
- Poorly Graded Gravel (GP)
- Silty Gravel (GM)
- Clayey Gravel (GC)
- Well Graded Sand (SW)
- Poorly Graded Sand (SP)
- Silty Sand (SM)
- Clayey Sand (SC)
- Inorganic Silt of Low Compressibility (ML)
- Inorganic Silt of Intermediate Compressibility (MI)
- Inorganic Silt of High Compressibility (MH)
- Inorganic Clay of Low Compressibility (CL)
- Inorganic Clay of Intermediate Compressibility (CI)
- Inorganic Clay of High Compressibility (CH)
- Organic Soil of Low Compressibility (OL)
- Organic Soil of Intermediate Compressibility OI)
- Organic Soil of High Compressibility (OH)
- Peat (Pt)
- Top Soil (TS)

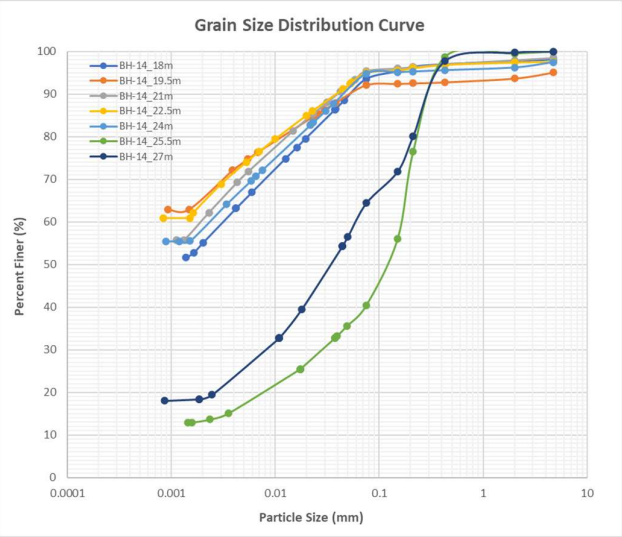
Project		Borehole Details		Drilling Details	
Name of Work:	Geotechnical Investigation work for Proposed Extension Metro Corridors of Aqua Line from Noida Sector-142 to Botanical Garden and Depot Station to Boraki MMTH (14.16 km).	**BH ID:**	BH-14	**Contractor:**	Goma Engineering & Consultancy
		Chainage [km]:	1+293	**Method of Drilling:**	Rotary Drilling
Client:	Noida Metro Rail Corporation (NMRC) Limited	**Depth [m]:**	30.00	**Start Date:**	21-11-2025
Stretch:	Depot Station to Boraki MMTH	**Elevation [m]:**	206.13	**End Date:**	24-11-2025
Project Code:	158_R0_DEST TO BOMM_0+031 km TO 2+586 km	**Water table Level [m]:**	13.40	**Location:**	**Lat:** 28.498549, **Long:** 77.560884

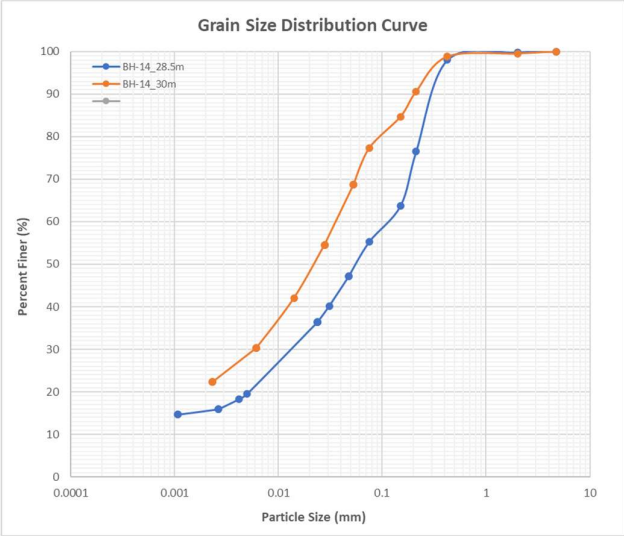
Depth [m]	Sample Type	Descriptions	SPT Test Results					Soil Particles				Atterberg Limits			Physical Characteristics				Direct Shear Test			Triaxial Comp Test			Consolidation Test				
			N1 (Seating Drive)	N2 (First Drive)	N3 (Second Drive)	Observed SPT	N (Correct N)	Gravel [%]	Sand [%]	Silt [%]	Clay [%]	Liquid Limit [%]	Plastic Limit [%]	Plasticity Index [%]	Moisture Content [%]	Bulk Density [gm/cm^3]	Dry Density [gm/cm^3]	Specific Gravity	Type	Cohesion [kg/cm^2]	Angle of Friction [°]	Type	Cohesion [kPa]	Angle of Friction [°]	Compression Index (Cc)	Coefficient of Volume Compressibility (Mv) [cm^2/kg]	Coefficient of Consolidation (Cv) [cm^2/sec]	Over Consolidation Ratio (OCR)	Preconsolidation Pressure [kg/cm^2]
0.00	DS	Top Soil	-	-	-	-	-	30.0	22.5	47.5		32	17	15	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1.50	SPT/DS	Very Stiff, yellow to brownish, finegrained inorganic silt of low compressibility with sand (ML)	3	4	6	10	14	15.1	18.0	46.1	20.8	26	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
3.00	UDS							2.5	21.7	54.2	21.6	27	NP	NP	18.89	1.65	1.40	2.37	F	0.08	21	-	-	-	-	-	-	-	-
3.50	SPT/DS		4	7	9	16	18	-																					
4.50	SPT/DS		4	6	8	14	14	0.0	37.1	40.8	22.1	27	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
6.00	UDS	Very Stiff, brownish, fine grained Inorganic Clay of low plasticity with silt and gravel (CL)						0.0	8.4	22.4	69.1	34	17	17	19.30	1.73	1.45	2.56	F	0.13	19	-	-	-	-	-	-	-	-
6.50	SPT/DS		8	10	10	20	19	-																					
7.50	SPT/DS		5	7	12	19	17	0.9	2.6	31.1	65.3	31	17	14	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
9.00	UDS	Stiff, brownish, finegrained inorganic silt of low compressibility with sand (ML)						0.7	3.4	62.7	33.3	27.0	NP	NP	20.65	1.95	1.62	2.61	F	0.07	26	UU	16	22	-	-	-	-	-
9.50	SPT/DS		5	7	7	14	12	0.6	2.8	69.6	27.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
10.50	SPT/DS		3	5	8	13	11	0.0	1.4	67.8	30.8	24	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
12.00	UDS	Very Stiff to Hard, yellow to brownish, fine grained Inorganic Clay of low plasticity with silt and sand (CL)						0.8	1.8	38.2	59.2	30	16	14	22.63	2.05	1.67	2.65	F	0.15	25	UU	12	25	0.066	4.02E-03	1.40E-03	0.68	1.683
12.50	SPT/DS		4	8	11	19	14	0.9	1.2	31.6	66.4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
13.50	SPT/DS		7	9	13	22	15	0.7	12.0	23.6	63.7	34	18	16	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
15.00	DS							0.0	3.7	30.8	65.5	33	16	17	18.70	-	-	2.48	F	0.09	27	-	-	-	-	-	-	-	-
15.50	SPT/DS		6	13	21	34	19	-																					
16.50	SPT/DS		8	14	20	34	19	0.2	1.0	30.4	68.4	32	17	15	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
18.00	UDS							1.9	4.6	38.6	55.0	30	15	15	17.18	1.85	1.58	2.62	F	0.03	26	-	-	-	-	-	-	-	-
18.50	SPT/DS		6	11	13	24	15	-																					
19.50	SPT/DS		8	20	24	44	22	4.9	2.9	26.4	65.8	30	16	14	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
21.00	UDS							1.5	3.1	34.8	60.6	32	18	14	23.42	1.89	1.53	2.58	F	0.00	31	-	-	-	-	-	-	-	-
21.50	SPT/DS		11	23	25	48	22	-																					
22.50	SPT/DS		7	18	22	40	20	2.4	2.5	30.6	64.4	31	15	16	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
24.00	UDS							2.5	2.7	36.3	58.5	31	16	15	24.33	2.03	1.63	2.40	F	0.01	30	-	-	-	-	-	-	-	-
24.50	SPT/DS	Dense to very dense, brownish to greyey, fine-grained silty sand (SM)	7	16	23	39	19	-																					
25.50	SPT/DS		9	22	37	59	25	0.1	59.5	27.1	13.3	25	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
27.00	DS							0.0	35.6	45.8	18.6	28	NP	NP	21.53	-	-	2.69	F	0.00	31	-	-	-	-	-	-	-	-
27.50	SPT/DS		17	38	43	81	31	-																					
28.50	SPT/DS		22	41	48	89	32	0.0	44.7	39.8	15.5	26	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
30.00	DS							0.0	22.7	77.3	0.0	25	NP	NP	20.56	-	-	2.46	F	0.00	33	-	-	-	-	-	-	-	-
30.50	SPT/DS		27	46	51	97	34	-																					

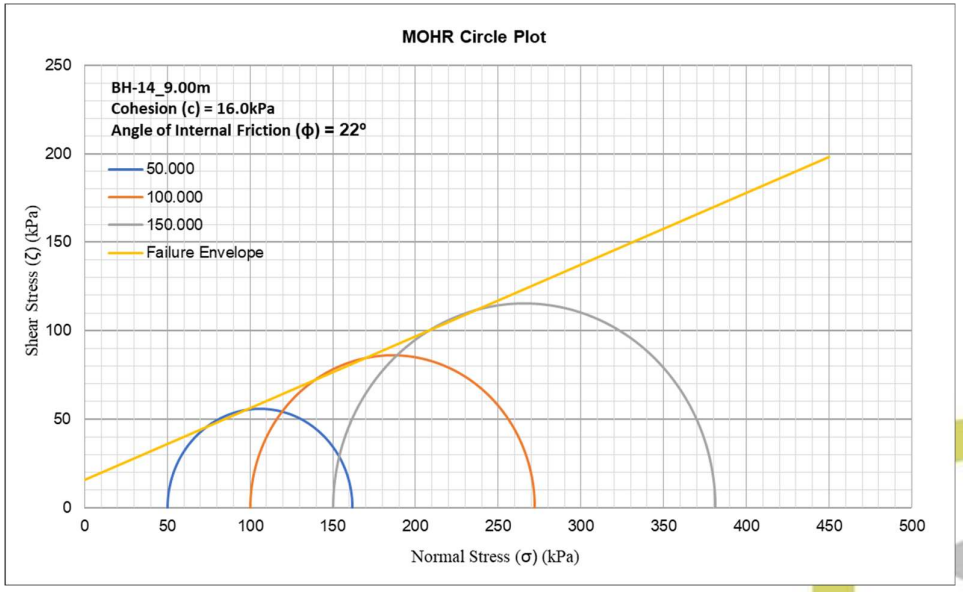
Notations: UDS = Undisturbed Sample, DS = Disturbed Sample, RC = Rock Core, F = Fast, S = Slow, UU = Unconsolidated Undrained Tri-axial compression Test.

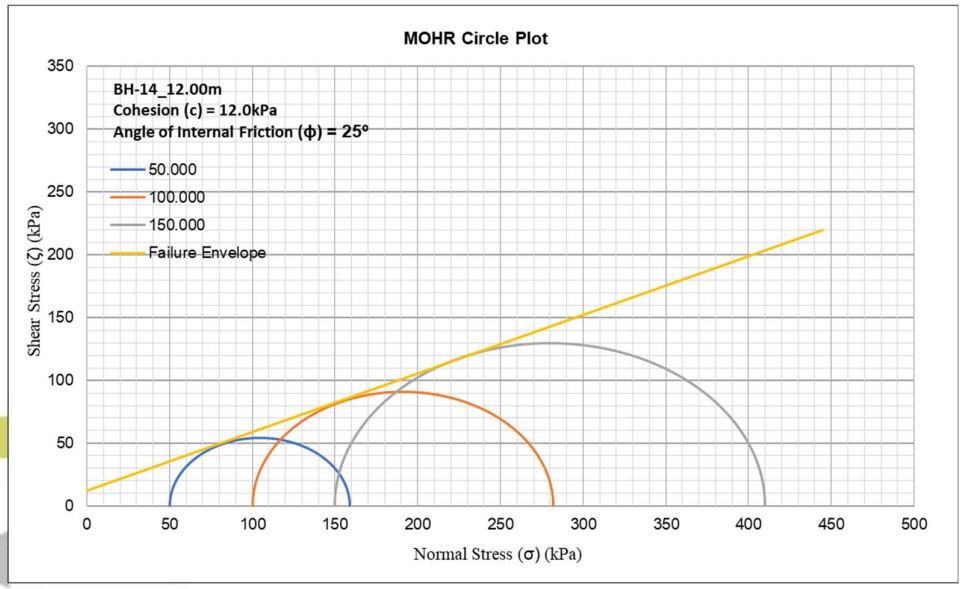

Grain Size Distribution Curve
BH-14_0m
BH-14_1.5m
BH-14_3m
BH-14_4.5m
BH-14_6m
BH-14_7.5m
BH-14_9m
Percent Finer (%)
Particle Size (mm)

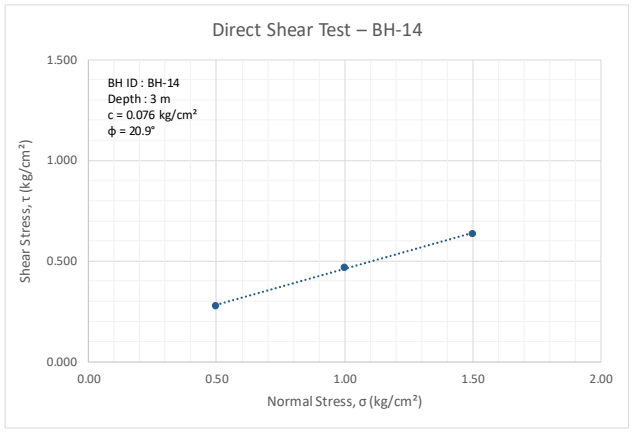

Grain Size Distribution Curve
BH-14_9.5m
BH-14_10.5m
BH-14_12m
BH-14_12.5m
BH-14_13.5m
BH-14_15m
BH-14_16.5m
Percent Finer (%)
Particle Size (mm)

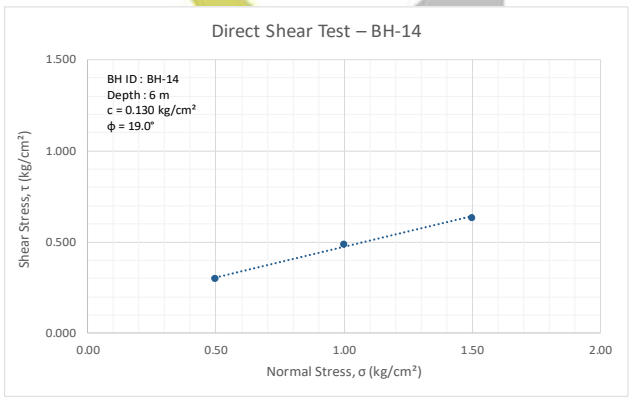

Grain Size Distribution Curve
BH-14_18m
BH-14_19.5m
BH-14_21m
BH-14_22.5m
BH-14_24m
BH-14_25.5m
BH-14_27m
Percent Finer (%)
Particle Size (mm)

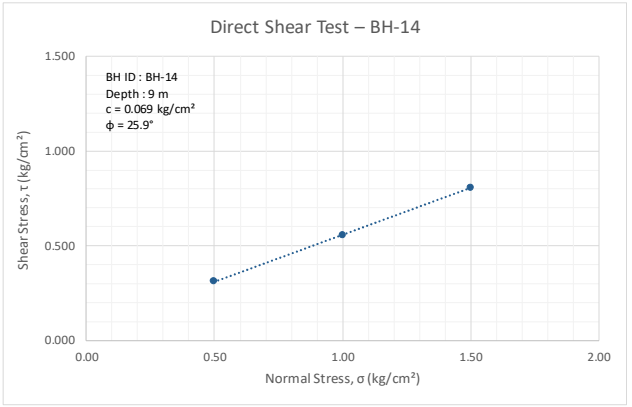

Grain Size Distribution Curve
BH-14_28.5m
BH-14_30m
Percent Finer (%)
Particle Size (mm)

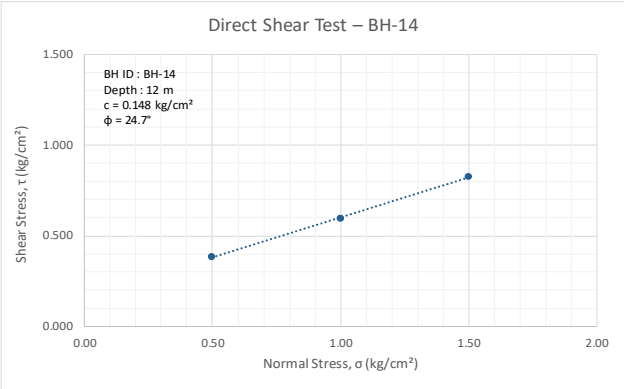

MOHR Circle Plot
BH-14_9.00m
Cohesion (c) = 16.0kPa
Angle of Internal Friction (ϕ) = 22°
50.000
100.000
150.000
Failure Envelope
Shear Stress (ζ) (kPa)
Normal Stress (σ) (kPa)

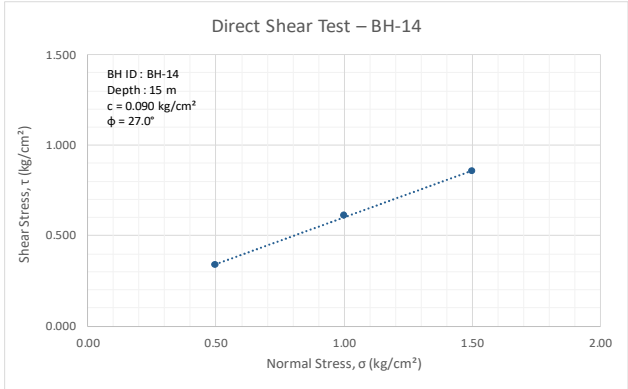

MOHR Circle Plot
BH-14_12.00m
Cohesion (c) = 12.0kPa
Angle of Internal Friction (ϕ) = 25°
50.000
100.000
150.000
Failure Envelope
Shear Stress (ζ) (kPa)
Normal Stress (σ) (kPa)

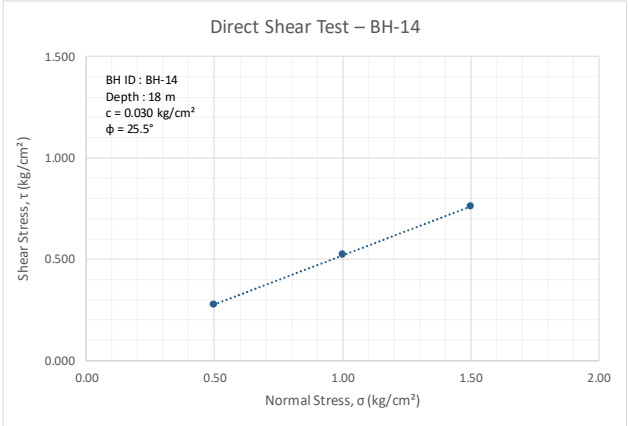

Direct Shear Test – BH-14
BH ID : BH-14
Depth : 3 m
c = 0.076 kg/cm²
ϕ = 20.9°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)

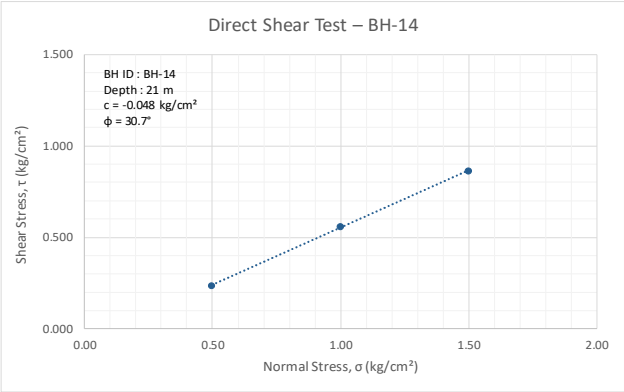

Direct Shear Test – BH-14
BH ID : BH-14
Depth : 6 m
c = 0.130 kg/cm²
ϕ = 19.0°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)

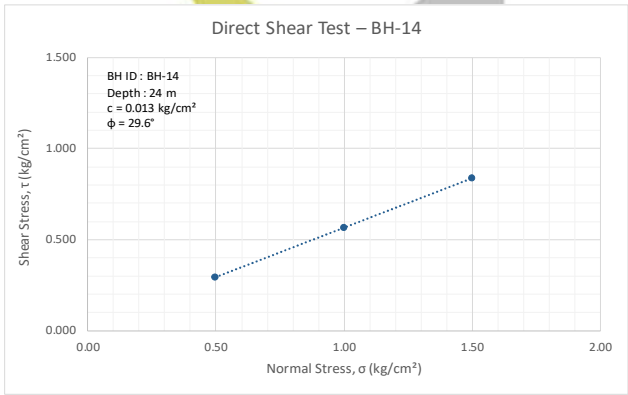

Direct Shear Test – BH-14
BH ID : BH-14
Depth : 9 m
c = 0.069 kg/cm²
ϕ = 25.9°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)

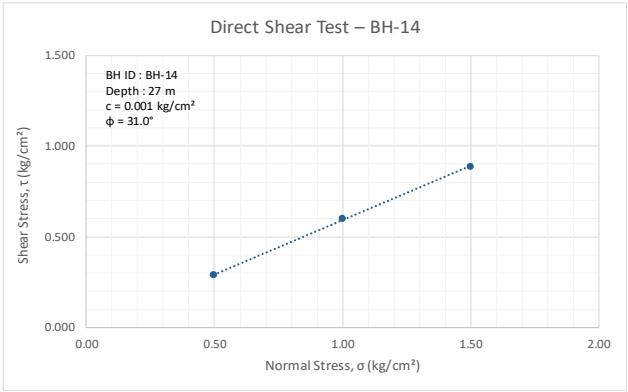

Direct Shear Test – BH-14
BH ID : BH-14
Depth : 12 m
c = 0.148 kg/cm²
ϕ = 24.7°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
0.000
0.500
1.000
1.500
0.00
0.50
1.00
1.50
2.00

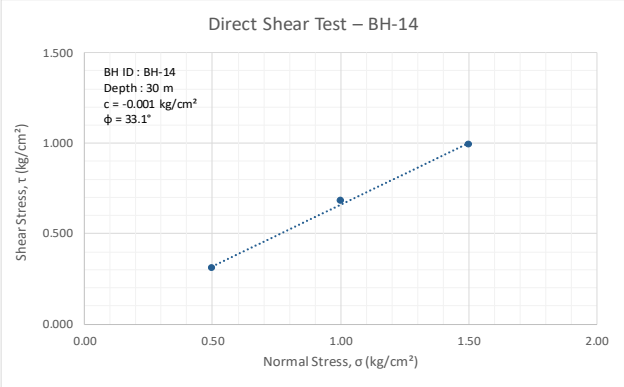

Direct Shear Test – BH-14
BH ID : BH-14
Depth : 15 m
c = 0.090 kg/cm²
ϕ = 27.0°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
0.000
0.500
1.000
1.500
0.00
0.50
1.00
1.50
2.00


Direct Shear Test – BH-14
BH ID : BH-14
Depth : 18 m
c = 0.030 kg/cm²
ϕ = 25.5°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
0.000
0.500
1.000
1.500
0.00
0.50
1.00
1.50
2.00


Direct Shear Test – BH-14
BH ID : BH-14
Depth : 21 m
c = -0.048 kg/cm²
ϕ = 30.7°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
0.000
0.500
1.000
1.500
0.00
0.50
1.00
1.50
2.00


Direct Shear Test – BH-14
BH ID : BH-14
Depth : 24 m
c = 0.013 kg/cm²
ϕ = 29.6°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
0.000
0.500
1.000
1.500
0.00
0.50
1.00
1.50
2.00


Direct Shear Test – BH-14
BH ID : BH-14
Depth : 27 m
c = 0.001 kg/cm²
ϕ = 31.0°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
0.000
0.500
1.000
1.500
0.00
0.50
1.00
1.50
2.00


Direct Shear Test – BH-14
BH ID : BH-14
Depth : 30 m
c = -0.001 kg/cm²
ϕ = 33.1°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
1.500
1.000
0.500
0.000
0.00
0.50
1.00
1.50
2.00

NAME OF WORK: GEOTECHNICAL INVESTIGATION WORK FOR PROPOSED EXTENSION METRO CORRIDORS OF AQUA LINE FROM NOIDA SECTOR-142 TO BOTANICAL GARDEN AND DEPOT STATION TO BORAKI MMTH (14.16 KM)

Stretch: Depot Station to Boraki MMTH (CH 0+000 km to 2+600 km)

BH ID : BH-15 | **Chainage** : 1+392 KM

Groundwater Level : 13.80 M | **Location** : Lat. 28.499135 Long. 77.561661

DEPTH	GWL	SAMPLE	SPT N VALUE	LAYER DESCRIPTION
0.00				TOP Soil: (0.00 + 0.750m)
1.00				Stiff, yellow to brownish, fine-grained inorganic silt of low compressibility with sand (ML) : (0.75 to 3.75 m)
2.00		SPT/DS	N=9	
3.00		UDS		
		SPT/DS	N=14	
4.00				Stiff to very stiff, brownish, fine-grained inorganic clay of low plasticity with gravel (CL) : (3.75 to 7.00 m)
5.00		SPT/DS	N=16	
6.00		UDS		
7.00		SPT/DS	N=20	
		SPT/DS	N=20	Stiff to hard, brownish, fine-grained inorganic silt of low compressibility with clay and gravel (ML) : (7.00 to 13.00 m)
8.00				
9.00		UDS		
10.00		SPT/DS	N=18	
11.00		SPT/DS	N=16	
12.00		UDS		
13.00		SPT/DS	N=31	
14.00	▼	SPT/DS	N=37	Hard, yellow to brownish, fine-grained inorganic clay of low plasticity with silt and gravel (CL) : (13.00 to 23.25 m)
15.00		UDS		
16.00		SPT/DS	N=41	
17.00		SPT/DS	N=14	
18.00		UDS		
19.00		SPT/DS	N=27	
20.00		SPT/DS	N=25	
21.00		UDS		
22.00		SPT/DS	N=32	
23.00		SPT/DS	N=42	
24.00		UDS		Hard, brownish, fine grained inorganic silt of low compressibility with sand (ML) or Very dense, brownish to greyey, fine-grained silty sand (SM) : (23.25 to 30.00 m)
25.00		SPT/DS	N=48	
26.00		SPT/DS	N=57	
27.00		UDS		
28.00		SPT/DS	N=76	
29.00		SPT/DS	N=91	
30.00		UDS		
31.00		SPT/DS	N=71	

LEGENDS

Sample Type

- Split Spoon Sampler
- Shelby Tube (UDS)

General

- Groundwater Level

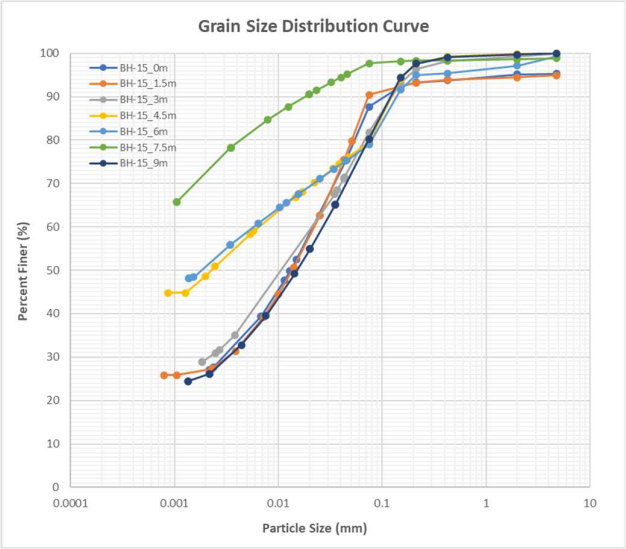
Soil

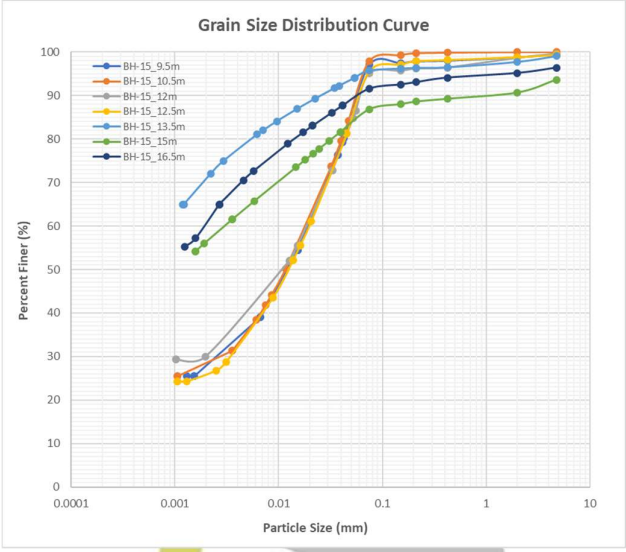
- Well Graded Gravel (GW)
- Poorly Graded Gravel (GP)
- Silty Gravel (GM)
- Clayey Gravel (GC)
- Well Graded Sand (SW)
- Poorly Graded Sand (SP)
- Silty Sand (SM)
- Clayey Sand (SC)
- Inorganic Silt of Low Compressibility (ML)
- Inorganic Silt of Intermediate Compressibility (MI)
- Inorganic Silt of High Compressibility (MH)
- Inorganic Clay of Low Compressibility (CL)
- Inorganic Clay of Intermediate Compressibility (CI)
- Inorganic Clay of High Compressibility (CH)
- Organic Soil of Low Compressibility (OL)
- Organic Soil of Intermediate Compressibility OI)
- Organic Soil of High Compressibility (OH)
- Peat (Pt)
- Top Soil (TS)

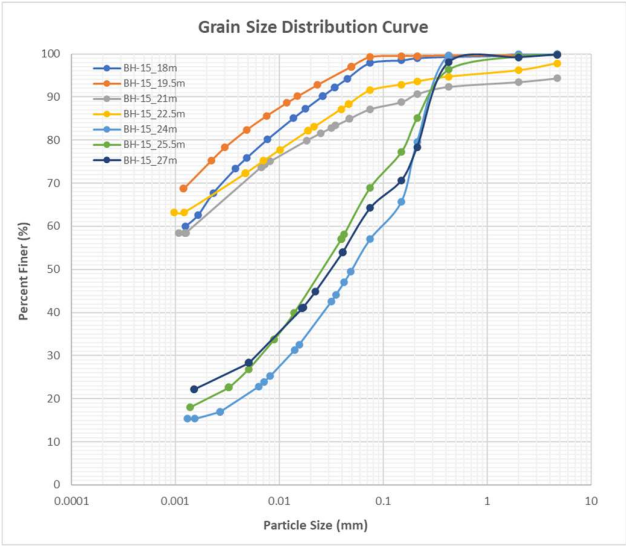
Project		Borehole Details		Drilling Details	
Name of Work:	Geotechnical Investigation work for Proposed Extension Metro Corridors of Aqua Line from Noida Sector-142 to Botanical Garden and Depot Station to Boraki MMTH (14.16 km).	**BH ID:**	BH-15	**Contractor:**	Goma Engineering & Consultancy
		Chainage [km]:	1+392	**Method of Drilling:**	Rotary Drilling
Client:	Noida Metro Rail Corporation (NMRC) Limited	**Depth [m]:**	30.00	**Start Date:**	25-11-2025
Stretch:	Depot Station to Boraki MMTH	**Elevation [m]:**	205.64	**End Date:**	27-11-2025
Project Code:	158_R0_DEST TO BOMM_0+031 km TO 2+586 km	**Water table Level [m]:**	13.80	**Location:**	**Lat:** 28.499135 **Long:** 77.561661

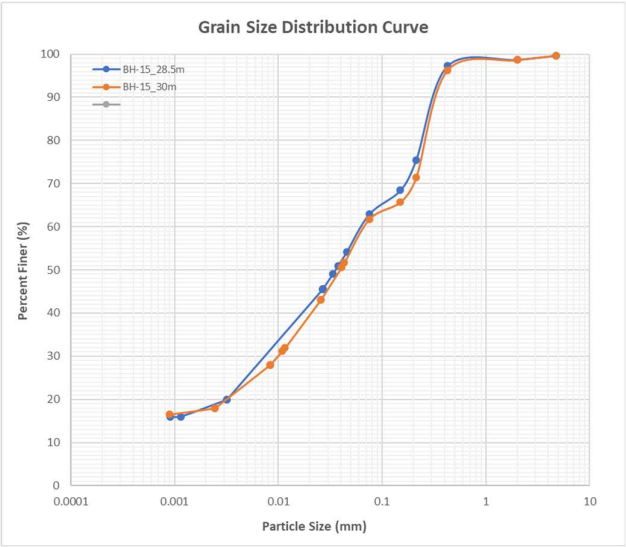
Depth [m]	Sample Type	Descriptions	SPT Test Results					Soil Particles				Atterberg Limits			Physical Characteristics				Direct Shear Test			Triaxial Comp Test			Consolidation Test				
			N1 (Seating Drive)	N2 (First Drive)	N3 (Second Drive)	Observed SPT	N (Correct N)	Gravel [%]	Sand [%]	Silt [%]	Clay [%]	Liquid Limit [%]	Plastic Limit [%]	Plasticity Index [%]	Moisture Content [%]	Bulk Density [gm/cm^3]	Dry Density [gm/cm^3]	Specific Gravity	Type	Cohesion [kg/cm^2]	Angle of Friction [^{o}]	Type	Cohesion [kPa]	Angle of Friction [^{o}]	Compression Index (Cc)	Coefficient of Volume Compressibility (Mv) [cm^2/kg]	Coefficient of Consolidation (Cv) [cm^2/sec]	Over Consolidation Ratio (OCR)	Preconsolidation Pressure [kg/cm^2]
0.00	DS	Top Soil	-	-	-	-	-	4.7	7.7	87.7	0.0	33	19	14	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1.50	SPT/DS	Stiff, yellow to brownish, finegrained inorganic silt of low compressibility with sand (ML)	2	4	5	9	13	5.1	4.5	63.4	27.0	24	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
3.00	UDS							0.2	18.0	52.4	29.4	27	NP	NP	11.53	1.60	1.40	2.42	F	0.14	19	-	-	-	-	-	-	-	-
3.00	SPT/DS		4	7	7	14	15	-																					
4.50	SPT/DS	Stiff to very stiff, brownish, fine grained Inorganic Clay of low plasticity with gravel (CL)	5	7	9	16	16	0.0	20.5	30.8	48.7	31	17	14	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
6.00	UDS							-	-	28.0	50.9	33	18	15	18.30	2.03	1.72	2.5	F	0.18	22	UU	29	14	-	-	-	-	-
6.50	SPT/DS		7	9	11	20	19	-																					
7.50	SPT/DS	Stiff to hard, brownish, finegrained inorganic silt of low compressibility with clay and gravel (ML)	6	10	10	20	18	0.0	19.7	25.3	72.4	24	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
9.00	UDS							0.0	19.7	54.4	25.9	26	NP	NP	17.90	1.75	1.48	2.44	F	0.11	25	-	-	-	-	-	-	-	-
9.50	SPT/DS		6	8	10	18	15	0.5	2.4	69.1	28.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
10.50	SPT/DS		4	7	9	16	13	0.0	2.1	69.4	28.5	26	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
12.00	UDS							0.4	4.5	65.0	30.1	27	NP	NP	24.83	2.11	1.69	2.64	F	0.10	26	UU	31	12	0.081	5.04E-03	9.53E-03	0.68	1.733
12.50	SPT/DS		7	14	17	31	23	0.6	3.7	69.7	25.9	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
13.50	SPT/DS	Hard, yellow to brownish, fine grained Inorganic Clay of low plasticity with silt and gravel (CL)	6	16	21	37	27	1.0	3.3	25.0	70.8	32	17	15	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
15.00	DS							6.4	6.8	30.5	56.4	31	17	14	19.92	-	-	2.59	F	0.19	25	-	-	-	-	-	-	-	-
15.50	SPT/DS		11	18	23	41	22	-																					
16.50	SPT/DS		4	6	8	14	9	3.6	4.8	30.9	60.7	30	15	15	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
18.00	UDS							0.1	2.0	32.5	65.5	34	18	16	21.33	1.82	1.50	2.36	F	0.26	25	-	-	-	-	-	-	-	-
18.50	SPT/DS		5	12	15	27	16	-																					
19.50	SPT/DS		7	11	14	25	15	0.0	0.7	25.1	74.2	33	18	15	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
21.00	UDS							5.7	7.2	24.5	62.7	35	17	18	25.37	2.23	1.78	2.60	F	0.13	29	-	-	-	-	-	-	-	-
21.50	SPT/DS		8	13	19	32	17	-																					
22.50	SPT/DS		7	20	22	42	20	2.2	6.3	25.0	66.6	29	14	15	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
24.00	UDS	Hard, brownish, finegrained inorganic silt of low compressibility with sand (ML) or Very dense, brownish to greyey, fine-grained silty sand (SM)						0.0	43.0	40.9	16.1	26	NP	NP	25.89	2.11	1.68	2.40	F	0.00	29	-	-	-	-	-	-	-	-
24.50	SPT/DS		9	23	25	48	22	-																					
25.50	SPT/DS		11	26	31	57	24	0.2	30.8	49.0	20.0	23	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
27.00	DS							0.2	35.6	40.7	23.6	25	NP	NP	20.72	-	-	2.62	F	0.00	31	-	-	-	-	-	-	-	-
27.50	SPT/DS		17	34	42	76	29	-																					
28.50	SPT/DS		18	40	51	91	33	0.3	36.8	44.8	18.1	25	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
30.00	DS							0.3	37.9	44.1	17.6	27	NP	NP	-	-	-	2.57	-	-	-	-	-	-	-	-	-	-	-
30.50	SPT/DS		16	27	44	71	26	-																					

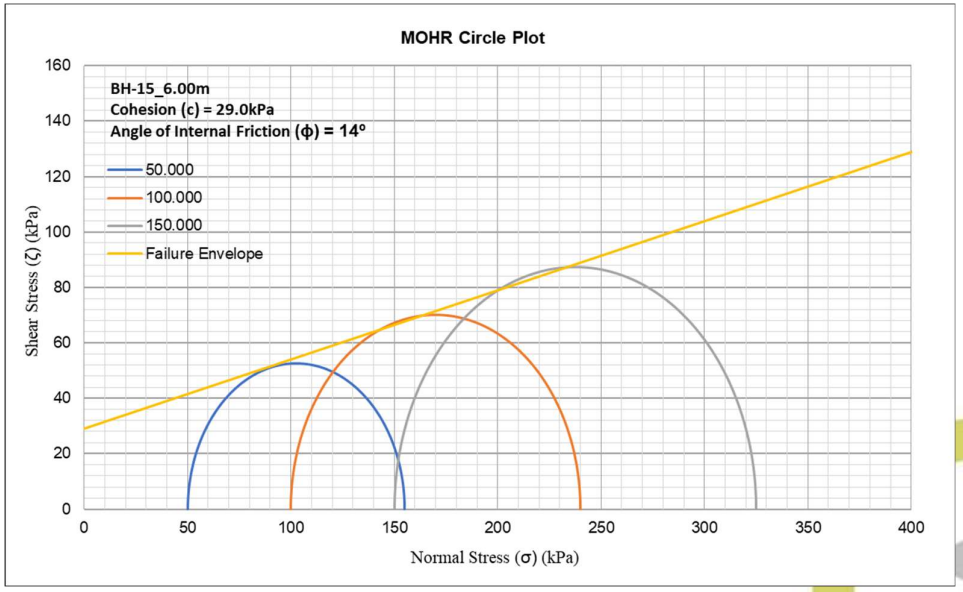
Notations: UDS = Undisturbed Sample, DS = Disturbed Sample, RC = Rock Core, F = Fast, S = Slow, UU = Unconsolidated Undrained Tri-axial compression Test.

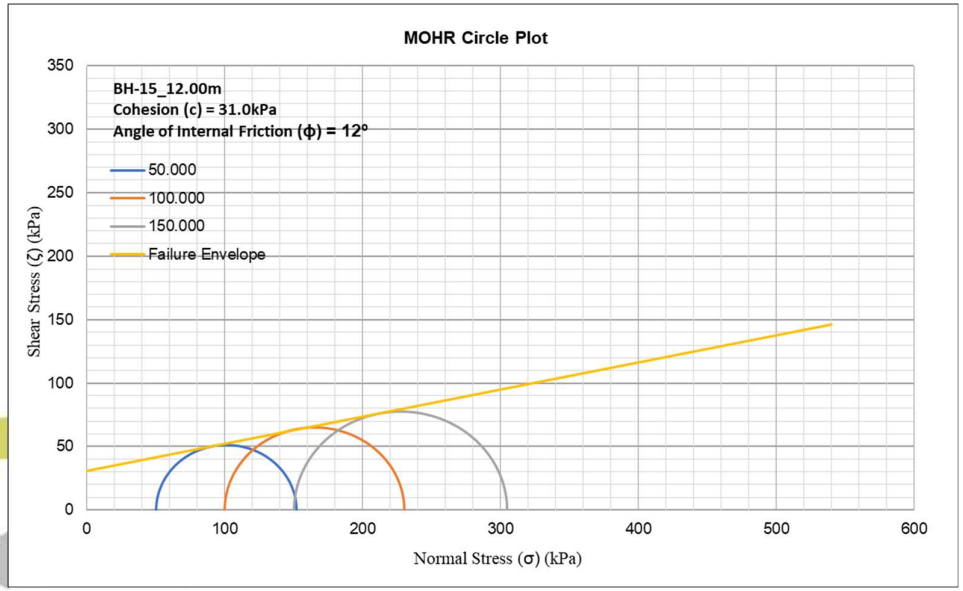

Grain Size Distribution Curve
BH-15_0m
BH-15_1.5m
BH-15_3m
BH-15_4.5m
BH-15_6m
BH-15_7.5m
BH-15_9m
Percent Finer (%)
Particle Size (mm)

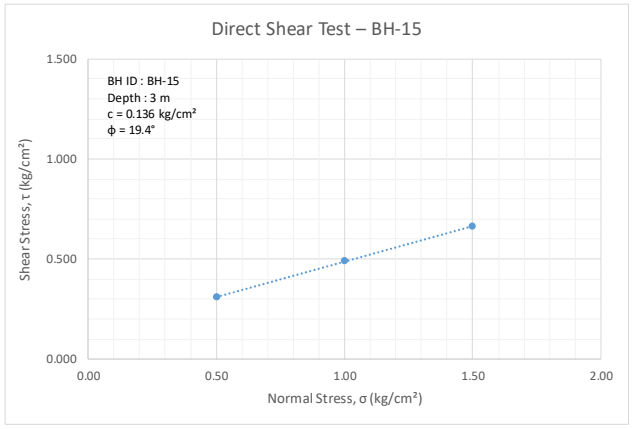

Grain Size Distribution Curve
BH-15_9.5m
BH-15_10.5m
BH-15_12m
BH-15_12.5m
BH-15_13.5m
BH-15_15m
BH-15_16.5m
Percent Finer (%)
Particle Size (mm)

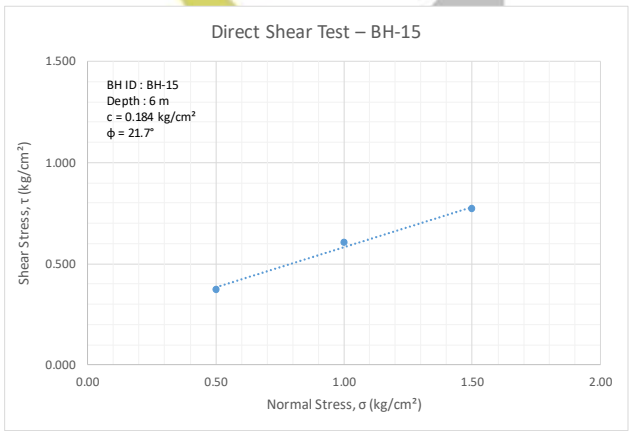

Grain Size Distribution Curve
BH-15_18m
BH-15_19.5m
BH-15_21m
BH-15_22.5m
BH-15_24m
BH-15_25.5m
BH-15_27m
Percent Finer (%)
Particle Size (mm)

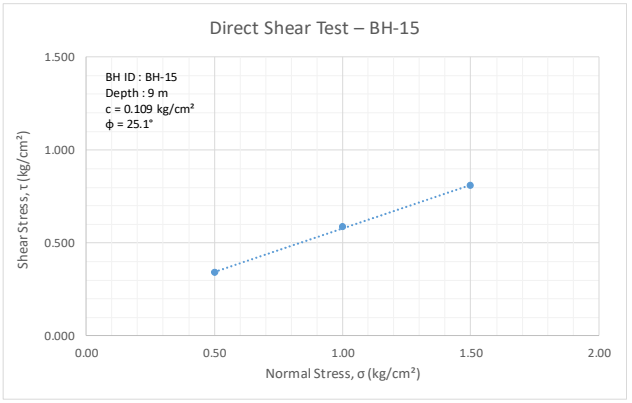

Grain Size Distribution Curve
BH-15_28.5m
BH-15_30m
Percent Finer (%)
Particle Size (mm)

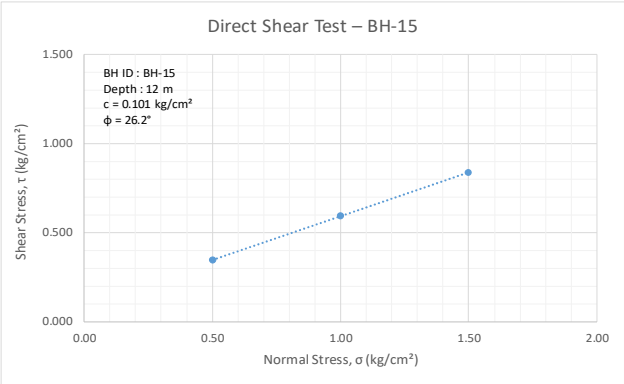

MOHR Circle Plot
BH-15_6.00m
Cohesion (c) = 29.0kPa
Angle of Internal Friction (ϕ) = 14°
50.000
100.000
150.000
Failure Envelope
Shear Stress (ζ) (kPa)
Normal Stress (σ) (kPa)

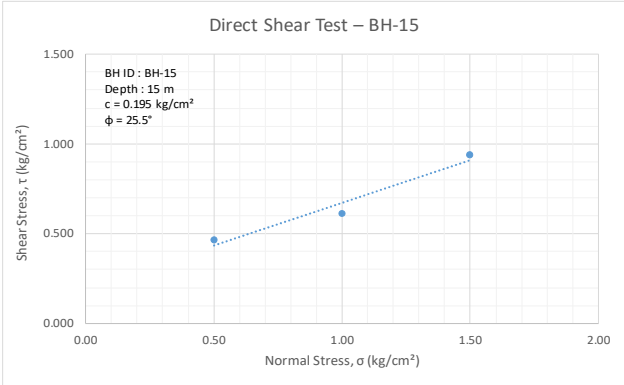

MOHR Circle Plot
BH-15_12.00m
Cohesion (c) = 31.0kPa
Angle of Internal Friction (ϕ) = 12°
50.000
100.000
150.000
Failure Envelope
Shear Stress (ζ) (kPa)
Normal Stress (σ) (kPa)

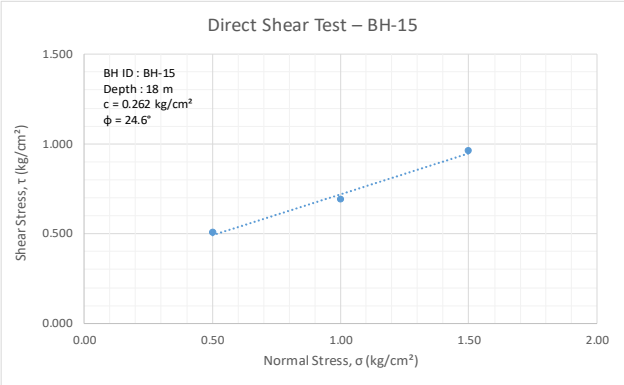

Direct Shear Test – BH-15
BH ID : BH-15
Depth : 3 m
c = 0.136 kg/cm²
ϕ = 19.4°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)

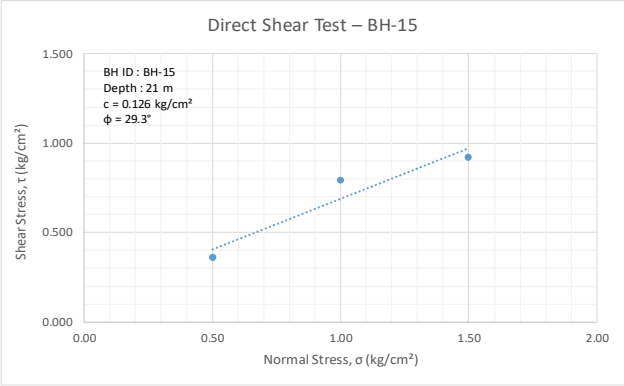

Direct Shear Test – BH-15
BH ID : BH-15
Depth : 6 m
c = 0.184 kg/cm²
ϕ = 21.7°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)

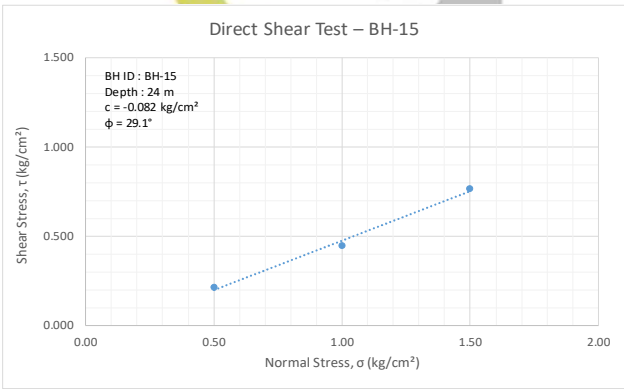

Direct Shear Test – BH-15
BH ID : BH-15
Depth : 9 m
c = 0.109 kg/cm²
ϕ = 25.1°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)

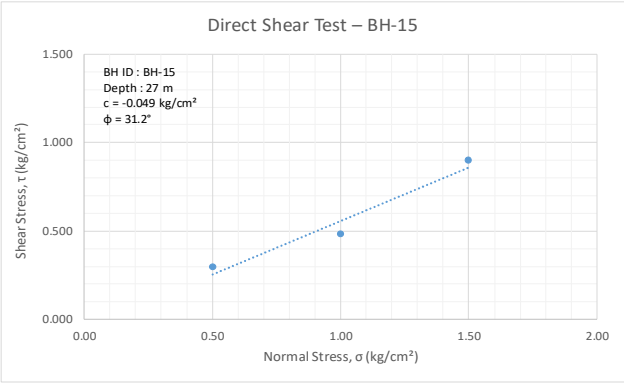

Direct Shear Test – BH-15
BH ID : BH-15
Depth : 12 m
c = 0.101 kg/cm²
ϕ = 26.2°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
0.000
0.500
1.000
1.500
0.00
0.50
1.00
1.50
2.00


Direct Shear Test – BH-15
BH ID : BH-15
Depth : 15 m
c = 0.195 kg/cm²
ϕ = 25.5°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
0.000
0.500
1.000
1.500
0.00
0.50
1.00
1.50
2.00


Direct Shear Test – BH-15
BH ID : BH-15
Depth : 18 m
c = 0.262 kg/cm²
ϕ = 24.6°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
0.000
0.500
1.000
1.500
0.00
0.50
1.00
1.50
2.00


Direct Shear Test – BH-15
BH ID : BH-15
Depth : 21 m
c = 0.126 kg/cm²
ϕ = 29.3°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
0.000
0.500
1.000
1.500
0.00
0.50
1.00
1.50
2.00


Direct Shear Test – BH-15
BH ID : BH-15
Depth : 24 m
c = -0.082 kg/cm²
ϕ = 29.1°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
0.000
0.500
1.000
1.500
0.00
0.50
1.00
1.50
2.00

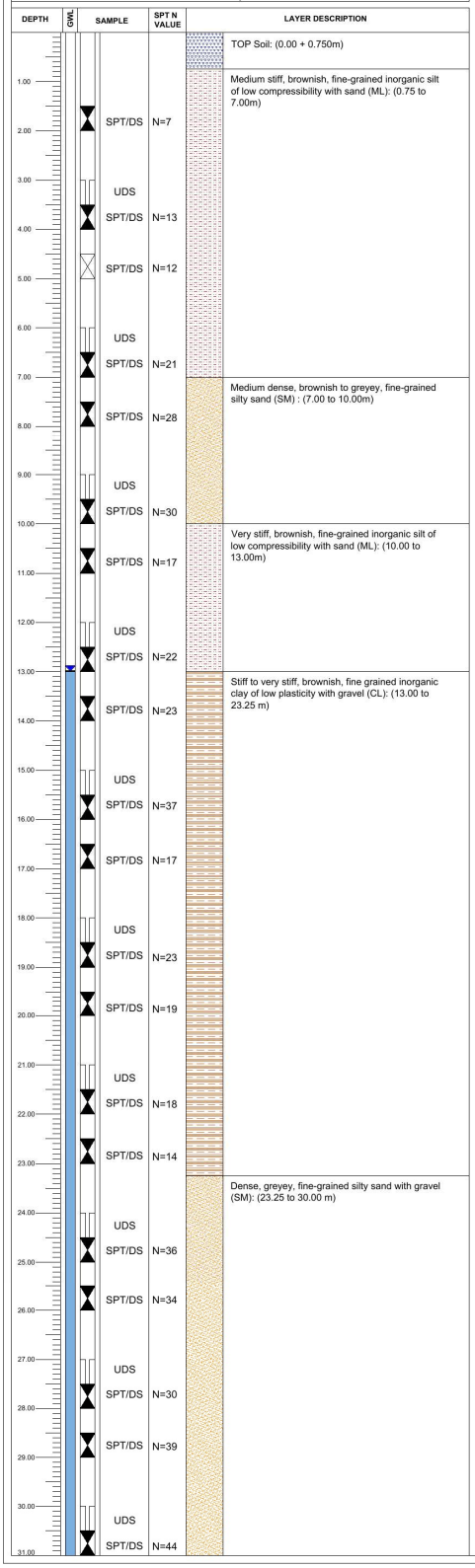

Direct Shear Test – BH-15
BH ID : BH-15
Depth : 27 m
c = -0.049 kg/cm²
ϕ = 31.2°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
0.000
0.500
1.000
1.500
0.00
0.50
1.00
1.50
2.00

NAME OF WORK: GEOTECHNICAL INVESTIGATION WORK FOR PROPOSED EXTENSION METRO CORRIDORS OF AQUA LINE FROM NOIDA SECTOR-142 TO BOTANICAL GARDEN AND DEPOT STATION TO BORAKI MMTH (14.16 KM)

Stretch: Depot Station to Boraki MMTH (CH 0+000 km to 2+600 km)

BH ID : BH-16 | **Chainage** : 1+487 KM

Groundwater Level : 13.00 M | **Location** : Lat. 28.499733 Long. 77.562394



LEGENDS

Sample Type

- Split Spoon Sampler
- Shelby Tube (UDS)

General

- Groundwater Level

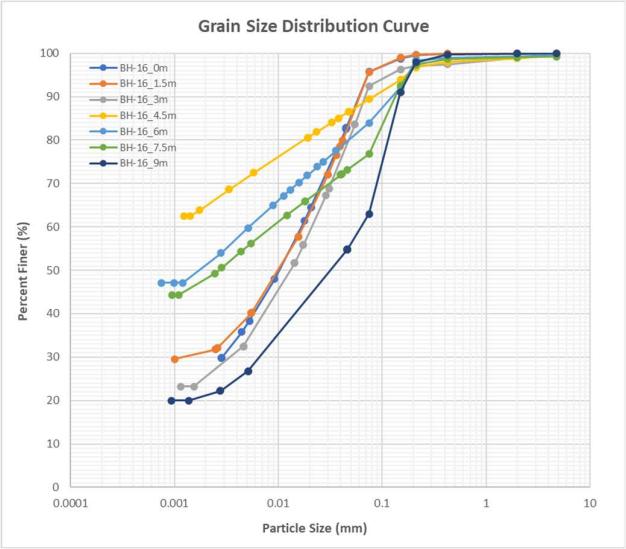
Soil

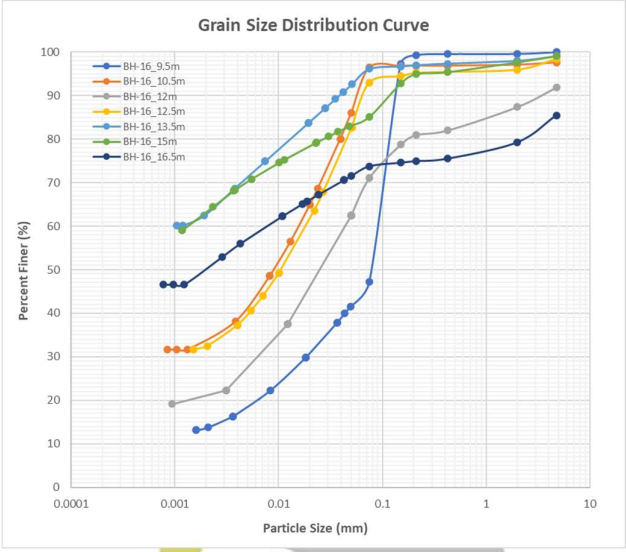
- Well Graded Gravel (GW)
- Poorly Graded Gravel (GP)
- Silty Gravel (GM)
- Clayey Gravel (GC)
- Well Graded Sand (SW)
- Poorly Graded Sand (SP)
- Silty Sand (SM)
- Clayey Sand (SC)
- Inorganic Silt of Low Compressibility (ML)
- Inorganic Silt of Intermediate Compressibility (MI)
- Inorganic Silt of High Compressibility (MH)
- Inorganic Clay of Low Compressibility (CL)
- Inorganic Clay of Intermediate Compressibility (CI)
- Inorganic Clay of High Compressibility (CH)
- Organic Soil of Low Compressibility (OL)
- Organic Soil of Intermediate Compressibility OI)
- Organic Soil of High Compressibility (OH)
- Peat (Pt)
- Top Soil (TS)

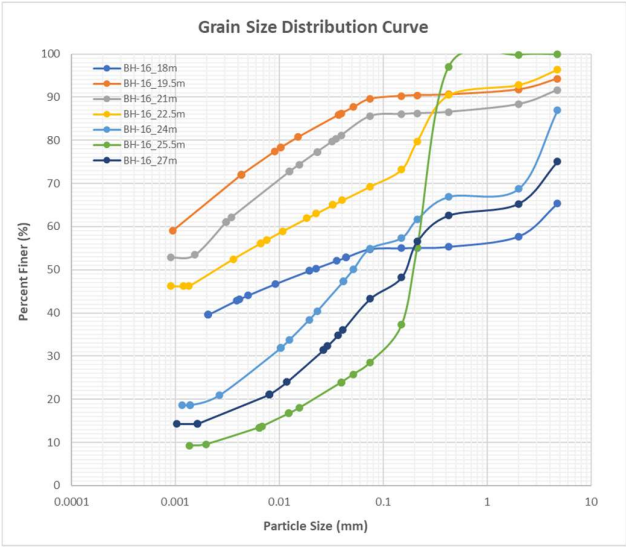
Project		Borehole Details		Drilling Details	
Name of Work:	Geotechnical Investigation work for Proposed Extension Metro Corridors of Aqua Line from Noida Sector-142 to Botanical Garden and Depot Station to Boraki MMTH (14.16 km).	**BH ID:**	BH-16	**Contractor:**	Goma Engineering & Consultancy
		Chainage [km]:	1+487	**Method of Drilling:**	Rotary Drilling
Client:	Noida Metro Rail Corporation (NMRC) Limited	**Depth [m]:**	30.00	**Start Date:**	23-11-2025
Stretch:	Depot Station to Boraki MMTH	**Elevation [m]:**	205.19	**End Date:**	25-11-2025
Project Code:	158_R0_DEST TO BOMM_0+031 km TO 2+586 km	**Water table Level [m]:**	13.00	**Location:**	**Lat:** 28.499733 **Long:** 77.562394

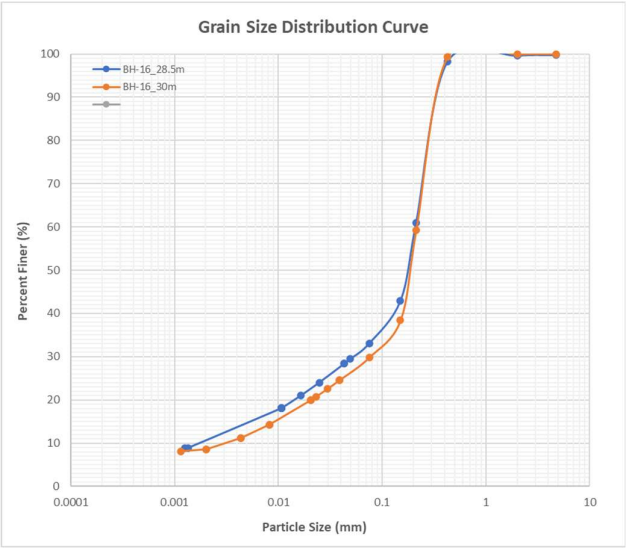
Depth [m]	Sample Type	Descriptions	SPT Test Results					Soil Particles				Atterberg Limits			Physical Characteristics				Direct Shear Test			Triaxial Comp Test			Consolidation Test				
			N1 (Seating Drive)	N2 (First Drive)	N3 (Second Drive)	Observed SPT	N (Correct N)	Gravel [%]	Sand [%]	Silt [%]	Clay [%]	Liquid Limit [%]	Plastic Limit [%]	Plasticity Index [%]	Moisture Content [%]	Bulk Density [gm/cm^3]	Dry Density [gm/cm^3]	Specific Gravity	Type	Cohesion [kg/cm^2]	Angle of Friction [°]	Type	Cohesion [kPa]	Angle of Friction [°]	Compression Index (Cc)	Coefficient of Volume Compressibility (Mv) [cm^2/kg]	Coefficient of Consolidation (Cv) [cm^2/sec]	Over Consolidation Ratio (OCR)	Preconsolidation Pressure [kg/cm^2]
0.00	DS	Top Soil	-	-	-	-	-	0.0	4.2	95.8	0.0	31	18	13	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1.50	SPT/DS	Medium stiff, brownish, finegrained inorganic silt of low compressibility with sand (ML)	2	3	4	7	10	0.0	4.3	64.4	31.2	27	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
3.00	UDS							0.1	7.5	67.0	25.4	26	NP	NP	29.89	1.66	1.28	2.40	F	0.11	20	-	-	-	-	-	-	-	-
3.00	SPT/DS		4	5	8	13	14	-											-										
4.50	SPT/DS		2	4	8	12	12	0.4	10.2	24.7	64.8	24	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
6.00	UDS							0.2	15.9	32.7	51.2	25	NP	NP	23.25	1.93	1.57	2.56	F	0.14	24	UU	25	18	-	-	-	-	-
6.50	SPT/DS		6	9	12	21	20	0.8	22.4	76.8		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
7.50	SPT/DS	Medium dense, brownish to greyey, fine-grained silty sand (SM)	8	12	16	28	26	0.0	37.0	28.8	48.0	21	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
9.00	DS							0.0	52.7	41.8	21.2	25	NP	NP	25.76	-	-	2.41	F	0.08	27	-	-	-	-	-	-	-	-
9.50	SPT/DS		7	13	17	30	26	1.2	51.5	33.6	13.7	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
10.50	SPT/DS	Very stiff, brownish, finegrained inorganic silt of low compressibility with sand (ML)	6	8	9	17	14	2.4	1.2	62.2	34.2	26	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
12.00	DS							8.1	20.7	50.0	21.1	27	NP	NP	21.70	-	-	2.71	F	0.19	26	-	-	-	-	-	-	-	-
12.50	SPT/DS		6	9	13	22	17	1.6	5.4	60.6	32.4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
13.50	SPT/DS	Stiff to very stiff, brownish, fine grained Inorganic Clay of low plasticity with gravel (CL)	6	9	14	23	16	1.6	5.4	33.3	62.8	29	15	14	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
15.00	UDS							0.9	13.9	21.9	63.3	31	17	14	20.60	2.11	1.75	2.65	F	0.15	27	UU	30	17	0.124	7.87E-03	7.44E-04	0.83	2.55
15.50	SPT/DS		9	16	21	37	20	0.9	13.9	85.1		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
16.50	SPT/DS		5	7	10	17	12	14.5	11.7	23.5	50.3	28	14	14	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
18.00	UDS							34.7	10.5	54.8	0.0	31	16	15	18.54	1.75	1.47	2.47	F	0.2	29	-	-	-	-	-	-	-	-
18.50	SPT/DS		7	9	14	23	15	-											-										
19.50	SPT/DS		5	8	11	19	12	5.8	4.6	24.2	65.4	30	16	14	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
21.00	DS							8.4	6.0	29.3	56.3	26	NP	NP	17.90	-	-	2.48	-	-	-	-	-	-	-	-	-	-	-
21.50	SPT/DS		4	7	11	18	11	-											-										
22.50	SPT/DS		4	6	8	14	9	3.6	27.1	20.6	48.7	30	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
24.00	UDS	Dense, greyey, fine-grained silty sand with gravel (SM)						13.1	32.0	35.0	19.9	27	NP	NP	17.16	1.82	1.55	2.59	F	0.11	38	-	-	-	-	-	-	-	-
24.50	SPT/DS		9	14	22	36	18	-											-										
25.50	SPT/DS		10	13	21	34	18	0.0	71.4	19.0	9.6	26	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
27.00	UDS							25.0	31.7	28.1	15.2	23	NP	NP	19.50	2.08	1.74	2.44	F	0.15	28	-	-	-	-	-	-	-	-
27.50	SPT/DS		8	12	18	30	16	-											-										
28.50	SPT/DS		10	16	23	39	19	0.2	66.8	22.4	10.6	25	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
30.00	DS							0.0	70.2	21.2	8.6	24	NP	NP	23.92	-	-	2.58	F	0	34	-	-	-	-	-	-	-	-
30.50	SPT/DS		11	18	26	44	19	-											-										

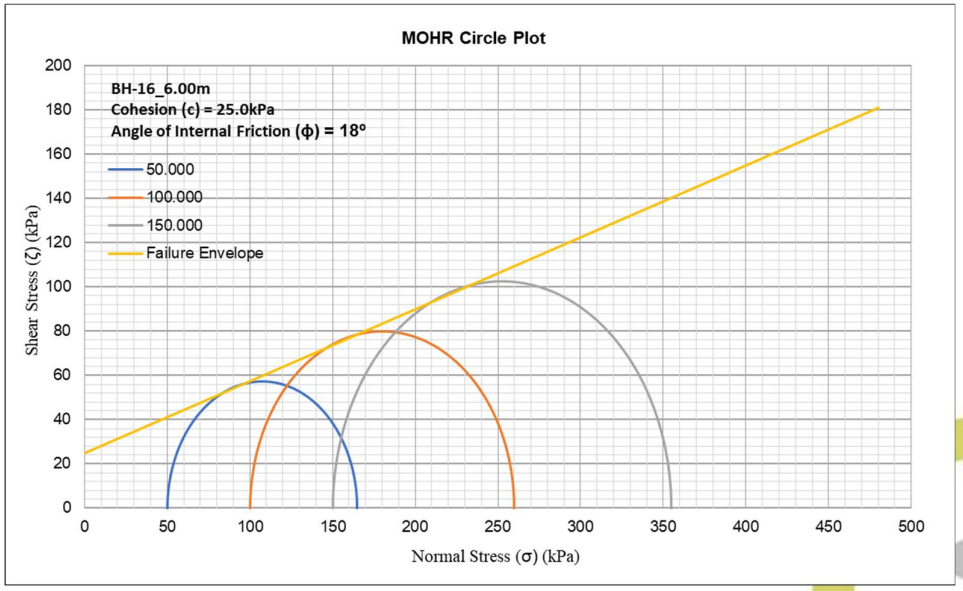
Notations: UDS = Undisturbed Sample, DS = Disturbed Sample, RC = Rock Core, F = Fast, S = Slow, UU = Unconsolidated Undrained Tri-axial compression Test.

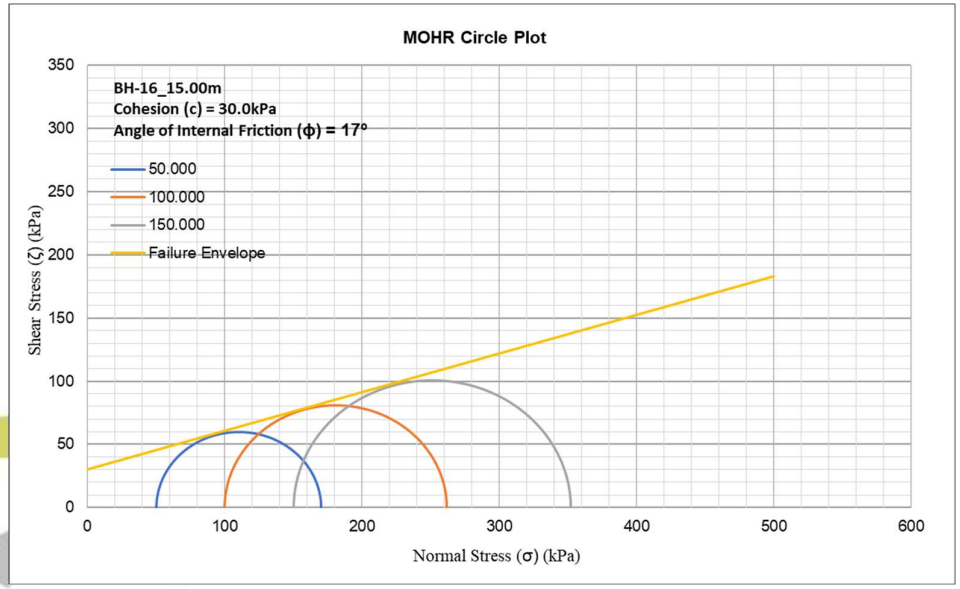

Grain Size Distribution Curve
BH-16_0m
BH-16_1.5m
BH-16_3m
BH-16_4.5m
BH-16_6m
BH-16_7.5m
BH-16_9m
Percent Finer (%)
Particle Size (mm)

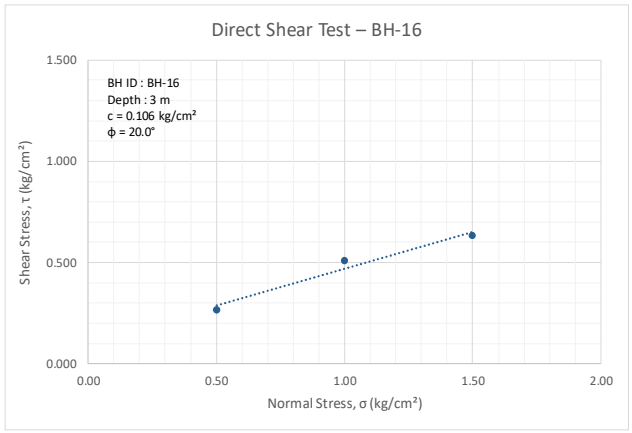

Grain Size Distribution Curve
BH-16_9.5m
BH-16_10.5m
BH-16_12m
BH-16_12.5m
BH-16_13.5m
BH-16_15m
BH-16_16.5m
Percent Finer (%)
Particle Size (mm)

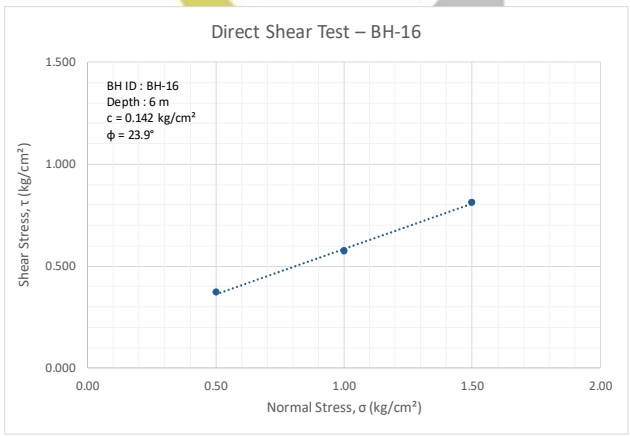

Grain Size Distribution Curve
BH-16_18m
BH-16_19.5m
BH-16_21m
BH-16_22.5m
BH-16_24m
BH-16_25.5m
BH-16_27m
Percent Finer (%)
Particle Size (mm)

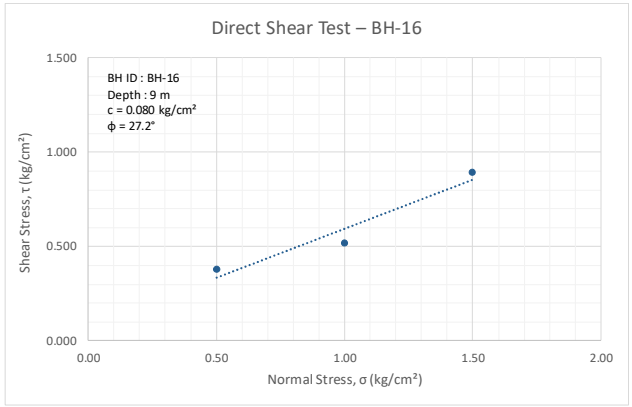

Grain Size Distribution Curve
BH-16_28.5m
BH-16_30m
Percent Finer (%)
Particle Size (mm)

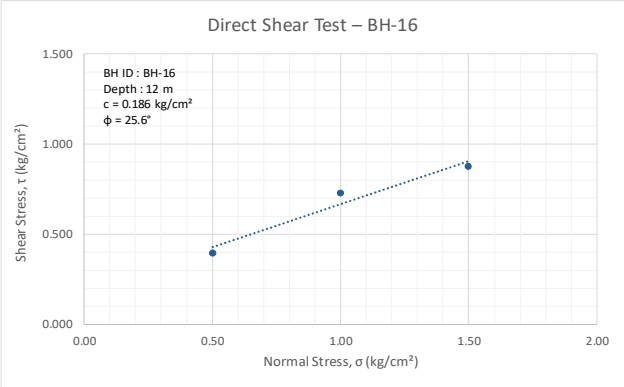

MOHR Circle Plot
BH-16_6.00m
Cohesion (c) = 25.0kPa
Angle of Internal Friction (ϕ) = 18°
50.000
100.000
150.000
Failure Envelope
Shear Stress (ζ) (kPa)
Normal Stress (σ) (kPa)

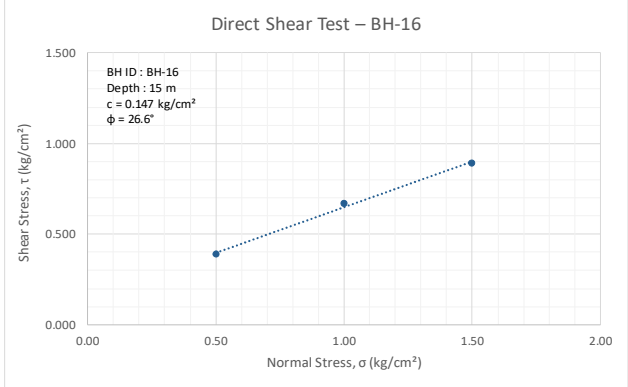

MOHR Circle Plot
BH-16_15.00m
Cohesion (c) = 30.0kPa
Angle of Internal Friction (ϕ) = 17°
50.000
100.000
150.000
Failure Envelope
Shear Stress (ζ) (kPa)
Normal Stress (σ) (kPa)

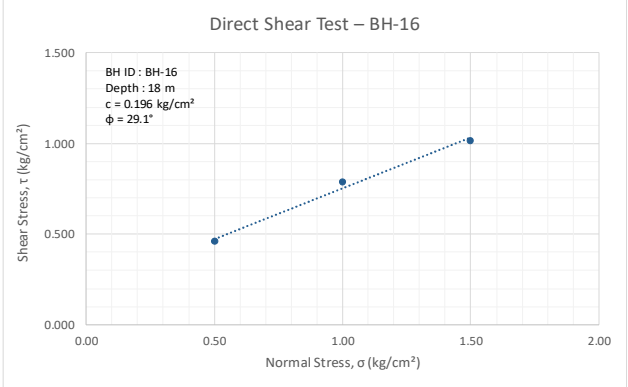

Direct Shear Test – BH-16
BH ID : BH-16
Depth : 3 m
c = 0.106 kg/cm²
ϕ = 20.0°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)

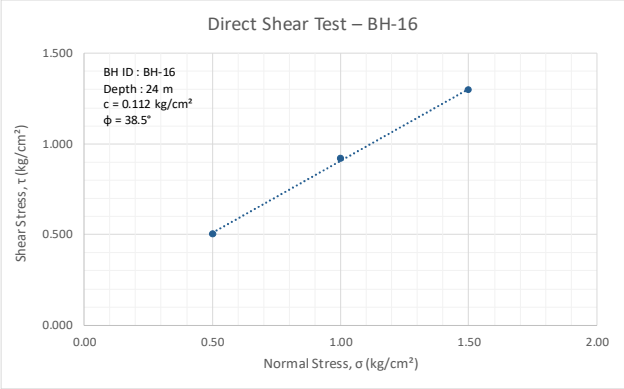

Direct Shear Test – BH-16
BH ID : BH-16
Depth : 6 m
c = 0.142 kg/cm²
ϕ = 23.9°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)

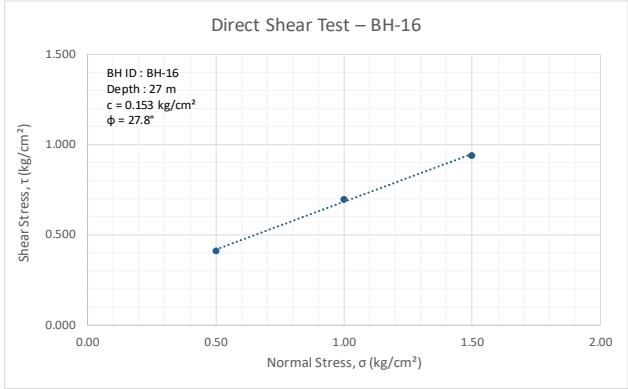

Direct Shear Test – BH-16
BH ID : BH-16
Depth : 9 m
c = 0.080 kg/cm²
ϕ = 27.2°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)

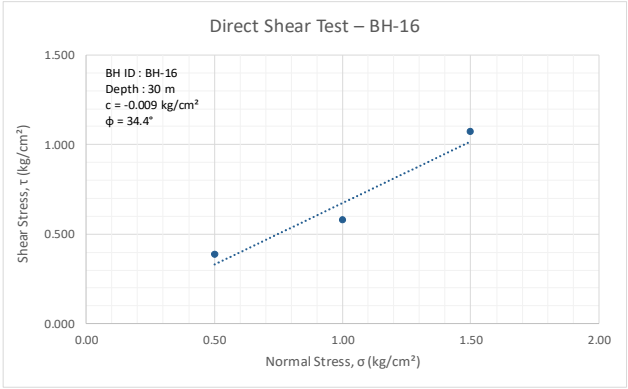

Direct Shear Test – BH-16
BH ID : BH-16
Depth : 12 m
c = 0.186 kg/cm²
ϕ = 25.6°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
0.000
0.500
1.000
1.500
0.00
0.50
1.00
1.50
2.00


Direct Shear Test – BH-16
BH ID : BH-16
Depth : 15 m
c = 0.147 kg/cm²
ϕ = 26.6°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
0.000
0.500
1.000
1.500
0.00
0.50
1.00
1.50
2.00


Direct Shear Test – BH-16
BH ID : BH-16
Depth : 18 m
c = 0.196 kg/cm²
ϕ = 29.1°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
0.000
0.500
1.000
1.500
0.00
0.50
1.00
1.50
2.00


Direct Shear Test – BH-16
BH ID : BH-16
Depth : 24 m
c = 0.112 kg/cm²
ϕ = 38.5°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
0.000
0.500
1.000
1.500
0.00
0.50
1.00
1.50
2.00


Direct Shear Test – BH-16
BH ID : BH-16
Depth : 27 m
c = 0.153 kg/cm²
ϕ = 27.8°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
0.000
0.500
1.000
1.500
0.00
0.50
1.00
1.50
2.00

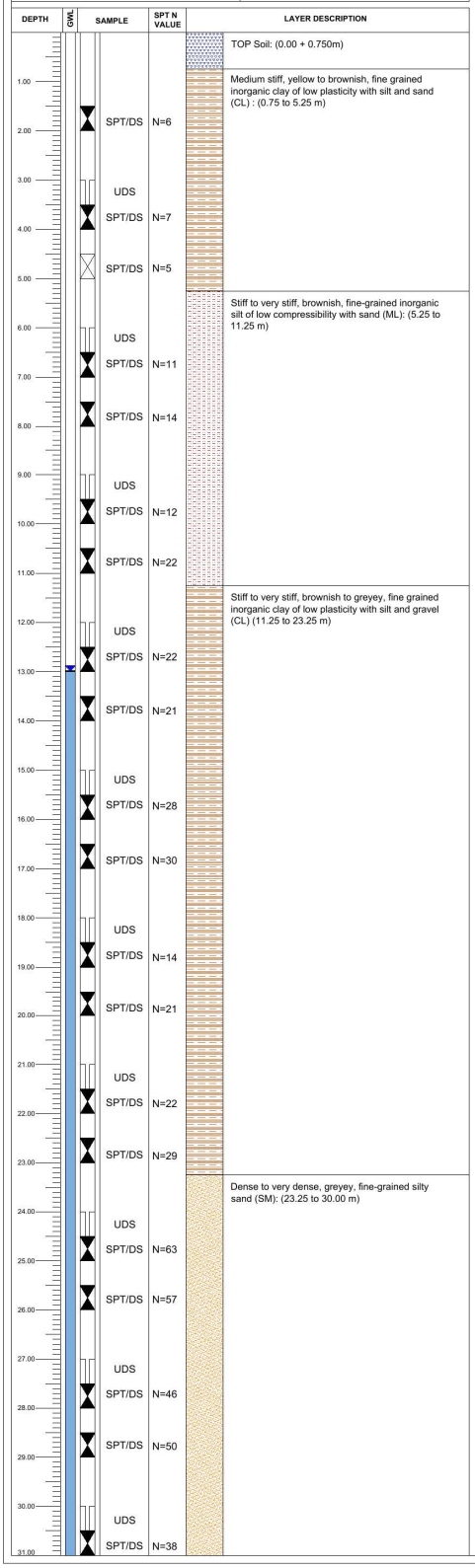

Direct Shear Test – BH-16
BH ID : BH-16
Depth : 30 m
c = -0.009 kg/cm²
ϕ = 34.4°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
0.000
0.500
1.000
1.500
0.00
0.50
1.00
1.50
2.00

NAME OF WORK: GEOTECHNICAL INVESTIGATION WORK FOR PROPOSED EXTENSION METRO CORRIDORS OF AQUA LINE FROM NOIDA SECTOR-142 TO BOTANICAL GARDEN AND DEPOT STATION TO BORAKI MMTH (14.16 KM)

Stretch: Depot Station to Boraki MMTH (CH 0+000 km to 2+600 km)

BH ID : BH-17 | **Chainage** : 1+587 KM

Groundwater Level : 13.00 M | **Location** : Lat. 28.500627 Long. 77.562682



LEGENDS

Sample Type

- Split Spoon Sampler
- Shelby Tube (UDS)

General

- Groundwater Level

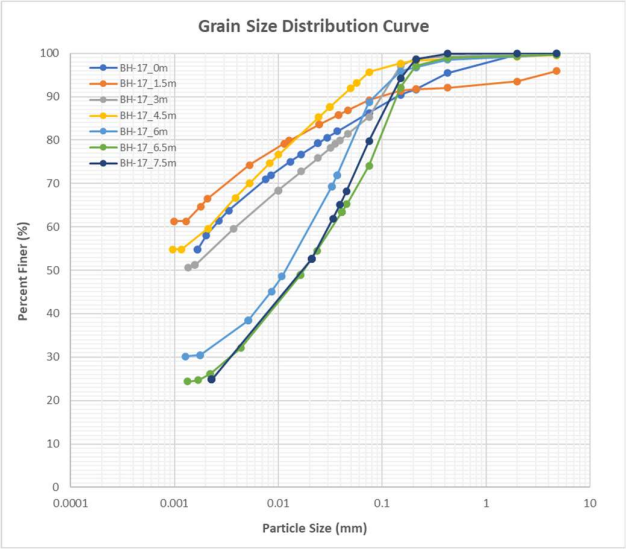
Soil

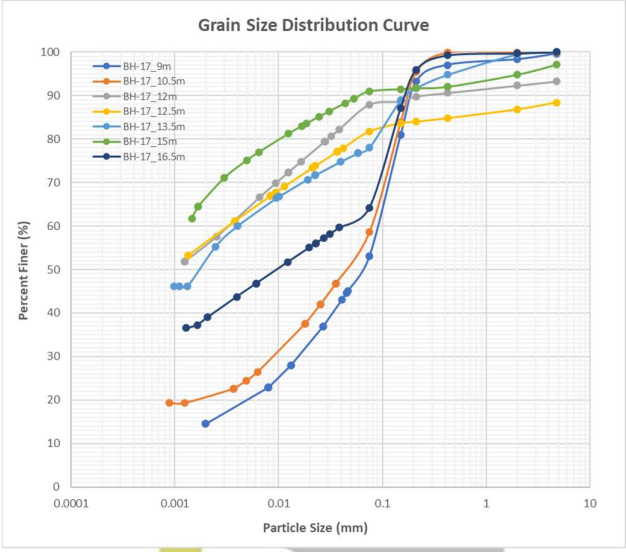
- Well Graded Gravel (GW)
- Poorly Graded Gravel (GP)
- Silty Gravel (GM)
- Clayey Gravel (GC)
- Well Graded Sand (SW)
- Poorly Graded Sand (SP)
- Silty Sand (SM)
- Clayey Sand (SC)
- Inorganic Silt of Low Compressibility (ML)
- Inorganic Silt of Intermediate Compressibility (MI)
- Inorganic Silt of High Compressibility (MH)
- Inorganic Clay of Low Compressibility (CL)
- Inorganic Clay of Intermediate Compressibility (CI)
- Inorganic Clay of High Compressibility (CH)
- Organic Soil of Low Compressibility (OL)
- Organic Soil of Intermediate Compressibility OI)
- Organic Soil of High Compressibility (OH)
- Peat (Pt)
- Top Soil (TS)

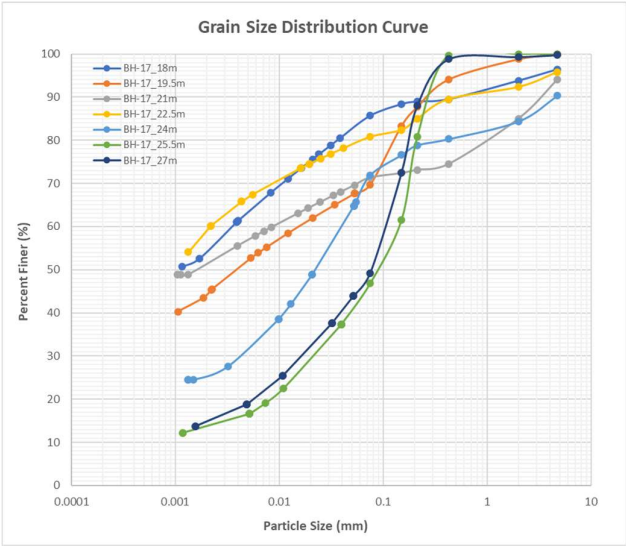
Project		Borehole Details		Drilling Details	
Name of Work:	Geotechnical Investigation work for Proposed Extension Metro Corridors of Aqua Line from Noida Sector-142 to Botanical Garden and Depot Station to Boraki MMTH (14.16 km).	**BH ID:**	BH-17	**Contractor:**	Goma Engineering & Consultancy
		Chainage [km]:	1+587	**Method of Drilling:**	Rotary Drilling
Client:	Noida Metro Rail Corporation (NMRC) Limited	**Depth [m]:**	30.00	**Start Date:**	26-11-2025
Stretch:	Depot Station to Boraki MMTH	**Elevation [m]:**	205.36	**End Date:**	29-11-2025
Project Code:	158_R0_DEST TO BOMM_0+031 km TO 2+586 km	**Water table Level [m]:**	13.00	**Location:**	**Lat:** 28.500627 **Long:** 77.562682

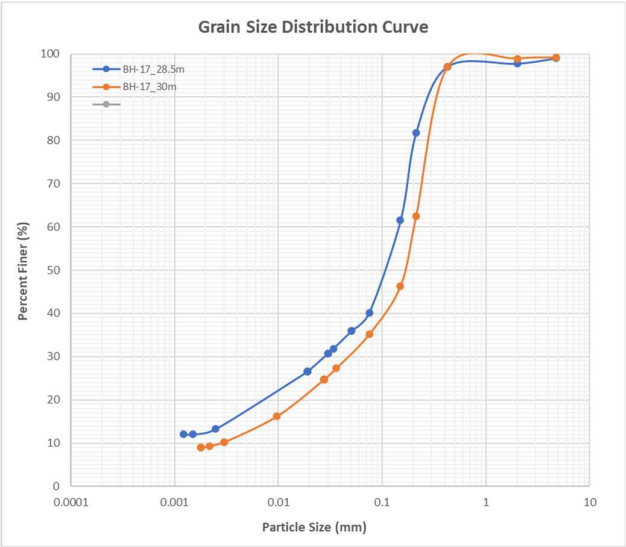
Depth [m]	Sample Type	Descriptions	SPT Test Results					Soil Particles				Atterberg Limits			Physical Characteristics				Direct Shear Test			Triaxial Comp Test			Consolidation Test				
			N1 (Seating Drive)	N2 (First Drive)	N3 (Second Drive)	Observed SPT	N (Correct N)	Gravel [%]	Sand [%]	Silt [%]	Clay [%]	Liquid Limit [%]	Plastic Limit [%]	Plasticity Index [%]	Moisture Content [%]	Bulk Density [gm/cm^3]	Dry Density [gm/cm^3]	Specific Gravity	Type	Cohesion [kg/cm^2]	Angle of Friction [^{o}]	Type	Cohesion [kPa]	Angle of Friction [^{o}]	Compression Index (Cc)	Coefficient of Volume Compressibility (Mv) [cm^2/kg]	Coefficient of Consolidation (Cv) [cm^2/sec]	Over Consolidation Ratio (OCR)	Preconsolidation Pressure [kg/cm^2]
0.00	DS	Top Soil	-	-	-	-	-	0.0	13.8	28.4	57.8	32	17	15	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1.50	SPT/DS	Medium stiff, yellow to brownish, fine grained Inorganic Clay of Intermediate plasticity with silt and sand (CI)	2	2	4	6	8	4.1	6.8	23.1	66.0	38	20	18	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
3.00	UDS							0.0	14.7	31.8	53.5	39	19	20	19.60	1.60	1.34	2.68	F	0.24	18	-	-	-	-	-	-	-	-
3.50	SPT/DS		3	3	4	7	8	-																					
4.50	SPT/DS		2	2	3	5	5	0.5	3.8	36.5	59.2	34	17	17	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
6.00	UDS	Stiff to very stiff, brownish, finegrained inorganic silt of low compressibility with sand (ML)						0.2	11.1	57.4	31.3	28.0	NP	NP	18.30	1.95	1.65	2.61	F	0.15	23	UU	25.00	14	-	-	-	-	-
6.50	SPT/DS		4	5	6	11	10	0.3	25.6	74.1		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
7.50	SPT/DS		4	6	8	14	13	0.0	25.9	48.4	25.6	24	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
9.00	DS							0.4	46.5	53.1		26	NP	NP	17.80	-	-	2.59	-	-	-	-	-	-	-	-	-	-	-
9.50	SPT/DS		4	5	7	12	10	-																					
10.50	SPT/DS		5	9	13	22	18	0.1	41.3	37.9	20.8	26	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
12.00	UDS	Stiff to very stiff, brownish to grayey, fine grained Inorganic Clay of low plasticity with silt and gravel (CL)						6.8	5.3	32.3	55.7	29	15	14	17.10	1.94	1.66	2.65	F	0.18	23	UU	27	13	0.083	4.96E-03	6.95E-04	0.97	2.29
12.50	SPT/DS		5	8	14	22	17	11.6	6.7	25.4	56.3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
13.50	SPT/DS		5	8	13	21	15	0.0	22.0	25.8	52.3	31	18	13	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
15.00	UDS							2.9	6.1	24.5	66.5	33	17	16	26.41	1.78	1.41	2.66	F	0.12	22	-	-	-	-	-	-	-	-
15.50	SPT/DS		7	11	17	28	17	-																					
16.50	SPT/DS		6	9	21	30	18	0.0	35.8	25.4	38.8	32	17	15	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
18.00	DS							3.6	10.7	31.5	54.2	30	15	15	21.82	-	-	2.63	F	0.18	23	-	-	-	-	-	-	-	-
18.50	SPT/DS		6	6	8	14	9	-																					
19.50	SPT/DS		6	8	13	21	14	0.1	30.2	25.4	44.2	30	15	15	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
21.00	UDS							5.9	22.7	20.0	51.4	32	16	16	23.88	1.82	1.47	2.64	F	0.25	27	-	-	-	-	-	-	-	-
21.50	SPT/DS		7	9	13	22	14	-																					
22.50	SPT/DS		8	13	16	29	16	4.2	15.0	21.7	59.1	29	14	15	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
24.00	UDS	Dense to very dense, greyey, fine-grained silty sand (SM)						9.7	18.4	46.3	25.7	26	NP	NP	15.28	2.01	1.75	2.63	F	0.15	27	-	-	-	-	-	-	-	-
24.50	SPT/DS		12	26	37	63	26	-																					
25.50	SPT/DS		14	22	35	57	24	0.0	53.2	33.1	13.7	26	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
27.00	DS							0.2	50.5	34.4	14.8	29	NP	NP	23.80	-	-	2.65	F	0.04	31	-	-	-	-	-	-	-	-
27.50	SPT/DS		10	19	27	46	21	-																					
28.50	SPT/DS		11	22	28	50	22	1.1	58.8	27.4	12.8	24	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
30.00	DS							0.9	64.0	26.0	9.2	27	NP	NP	21.83	-	-	2.64	F	0.21	27	-	-	-	-	-	-	-	-
30.50	SPT/DS		10	16	22	38	18	-																					

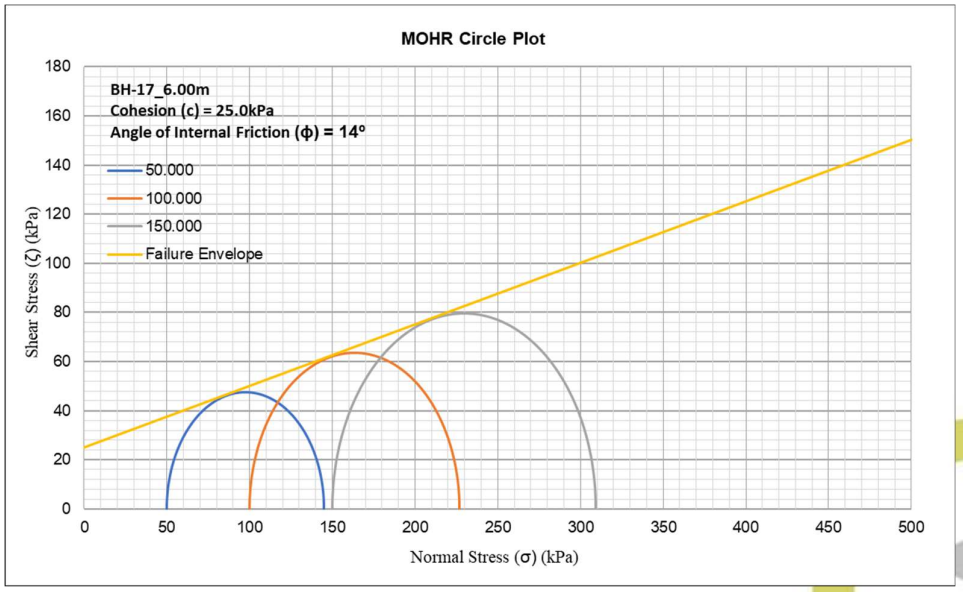
Notations: UDS = Undisturbed Sample, DS = Disturbed Sample, RC = Rock Core, F = Fast, S = Slow, UU = Unconsolidated Undrained Tri-axial compression Test.

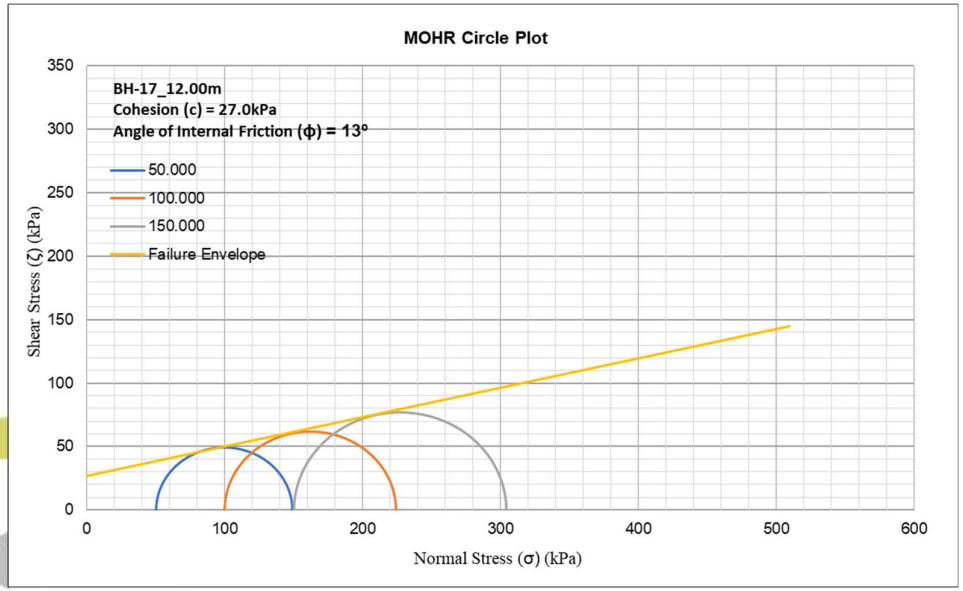

Grain Size Distribution Curve
BH-17_0m
BH-17_1.5m
BH-17_3m
BH-17_4.5m
BH-17_6m
BH-17_6.5m
BH-17_7.5m
Percent Finer (%)
Particle Size (mm)

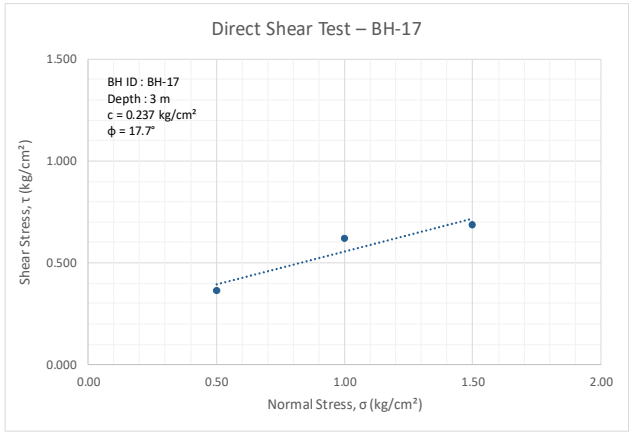

Grain Size Distribution Curve
BH-17_9m
BH-17_10.5m
BH-17_12m
BH-17_12.5m
BH-17_13.5m
BH-17_15m
BH-17_16.5m
Percent Finer (%)
Particle Size (mm)

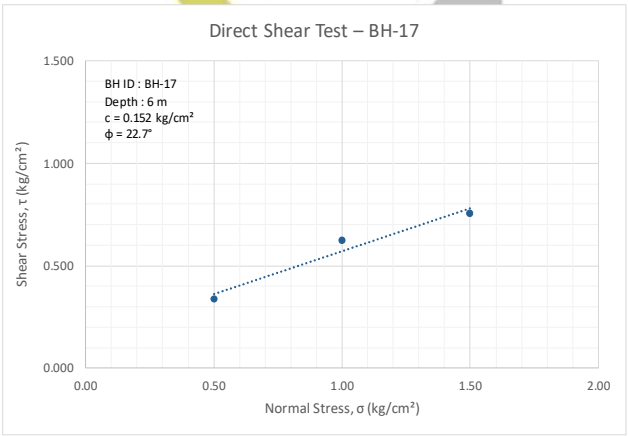

Grain Size Distribution Curve
BH-17_18m
BH-17_19.5m
BH-17_21m
BH-17_22.5m
BH-17_24m
BH-17_25.5m
BH-17_27m
Percent Finer (%)
Particle Size (mm)

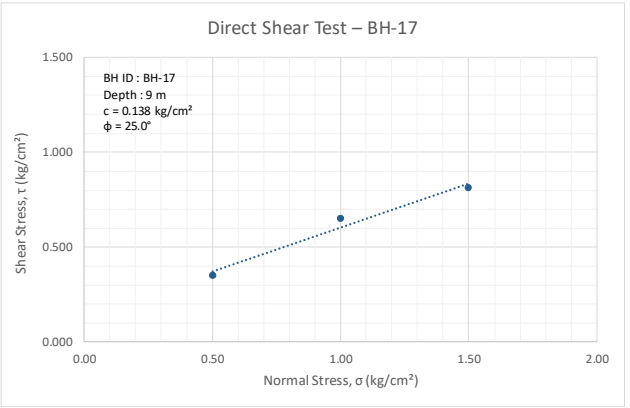

Grain Size Distribution Curve
BH-17_28.5m
BH-17_30m
Percent Finer (%)
Particle Size (mm)

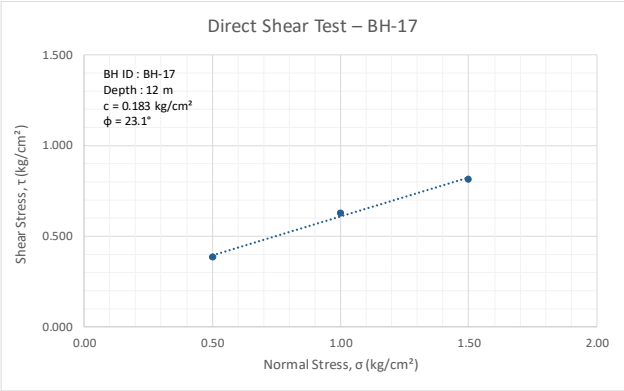

MOHR Circle Plot
BH-17_6.00m
Cohesion (c) = 25.0kPa
Angle of Internal Friction (ϕ) = 14°
50.000
100.000
150.000
Failure Envelope
Shear Stress (ζ) (kPa)
Normal Stress (σ) (kPa)

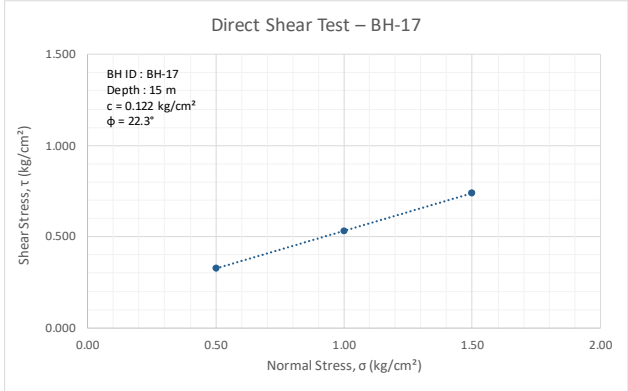

MOHR Circle Plot
BH-17_12.00m
Cohesion (c) = 27.0kPa
Angle of Internal Friction (ϕ) = 13°
50.000
100.000
150.000
Failure Envelope
Shear Stress (ζ) (kPa)
Normal Stress (σ) (kPa)

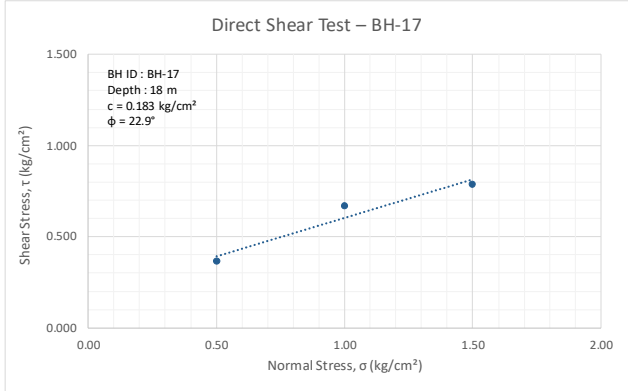

Direct Shear Test – BH-17
BH ID : BH-17
Depth : 3 m
c = 0.237 kg/cm²
ϕ = 17.7°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)

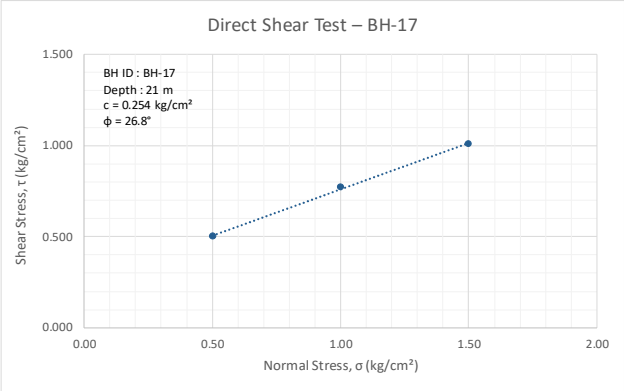

Direct Shear Test – BH-17
BH ID : BH-17
Depth : 6 m
c = 0.152 kg/cm²
ϕ = 22.7°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)

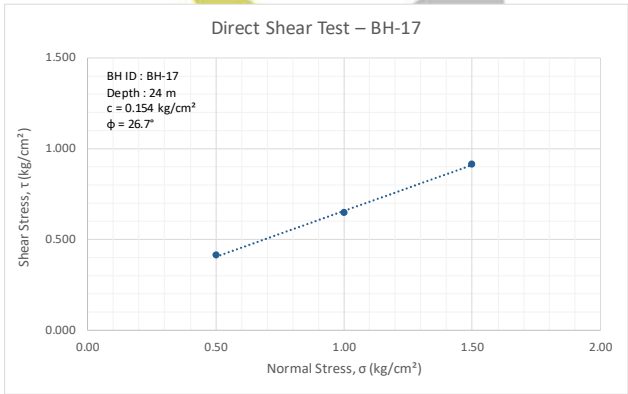

Direct Shear Test – BH-17
BH ID : BH-17
Depth : 9 m
c = 0.138 kg/cm²
ϕ = 25.0°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)

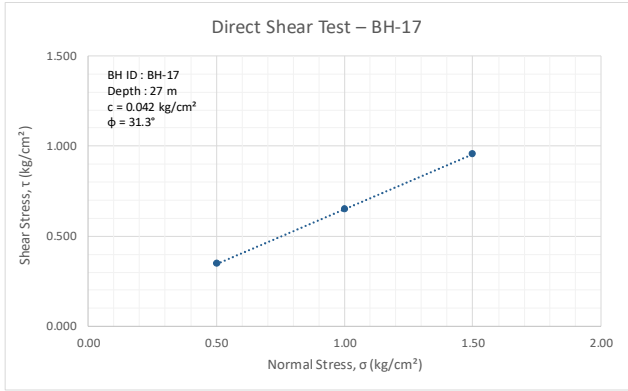

Direct Shear Test – BH-17
BH ID : BH-17
Depth : 12 m
c = 0.183 kg/cm²
ϕ = 23.1°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
1.500
1.000
0.500
0.000
0.00
0.50
1.00
1.50
2.00

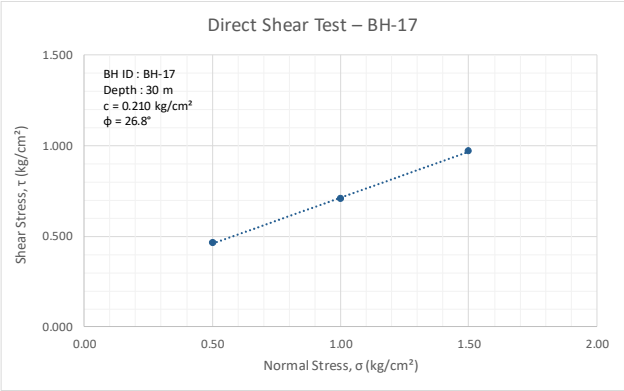

Direct Shear Test – BH-17
BH ID : BH-17
Depth : 15 m
c = 0.122 kg/cm²
ϕ = 22.3°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
1.500
1.000
0.500
0.000
0.00
0.50
1.00
1.50
2.00


Direct Shear Test – BH-17
BH ID : BH-17
Depth : 18 m
c = 0.183 kg/cm²
ϕ = 22.9°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
1.500
1.000
0.500
0.000
0.00
0.50
1.00
1.50
2.00


Direct Shear Test – BH-17
BH ID : BH-17
Depth : 21 m
c = 0.254 kg/cm²
ϕ = 26.8°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
1.500
1.000
0.500
0.000
0.00
0.50
1.00
1.50
2.00


Direct Shear Test – BH-17
BH ID : BH-17
Depth : 24 m
c = 0.154 kg/cm²
ϕ = 26.7°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
1.500
1.000
0.500
0.000
0.00
0.50
1.00
1.50
2.00


Direct Shear Test – BH-17
BH ID : BH-17
Depth : 27 m
c = 0.042 kg/cm²
ϕ = 31.3°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
1.500
1.000
0.500
0.000
0.00
0.50
1.00
1.50
2.00

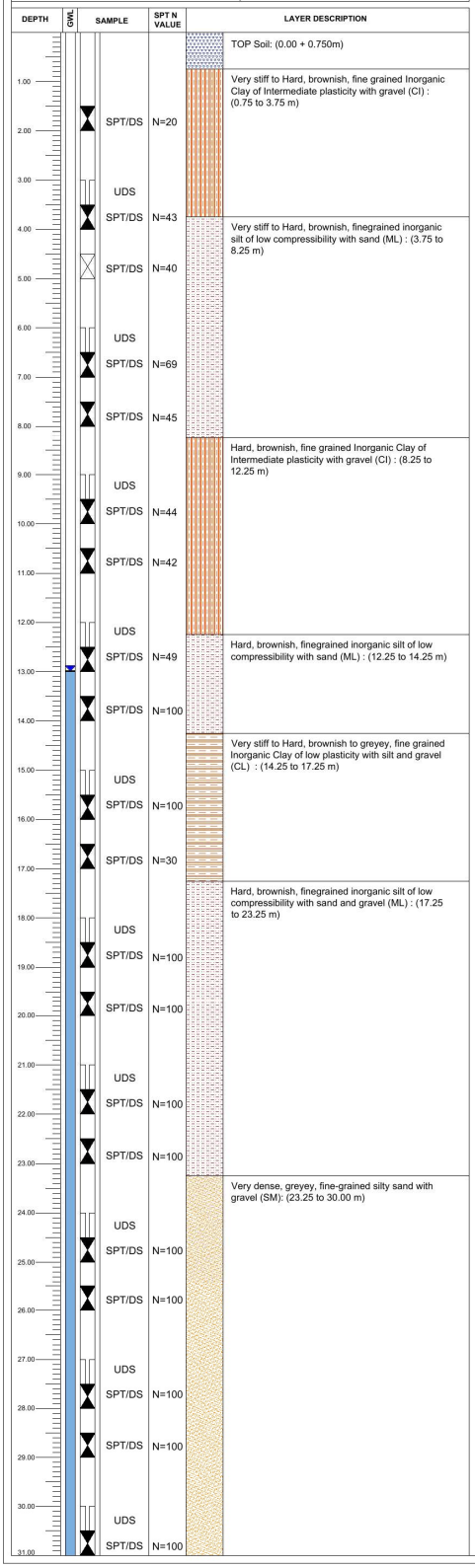

Direct Shear Test – BH-17
BH ID : BH-17
Depth : 30 m
c = 0.210 kg/cm²
ϕ = 26.8°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
1.500
1.000
0.500
0.000
0.00
0.50
1.00
1.50
2.00

NAME OF WORK: GEOTECHNICAL INVESTIGATION WORK FOR PROPOSED EXTENSION METRO CORRIDORS OF AQUA LINE FROM NOIDA SECTOR-142 TO BOTANICAL GARDEN AND DEPOT STATION TO BORAKI MMTH (14.16 KM)

Stretch: Depot Station to Boraki MMTH (CH 0+000 km to 2+600 km)

BH ID : BH-20 | **Chainage** : 1+869 KM

Groundwater Level : 13.00 M | **Location** : Lat. 28.503221 Long. 77.562402



LEGENDS

Sample Type

- Split Spoon Sampler
- Shelby Tube (UDS)

General

- Groundwater Level

Soil

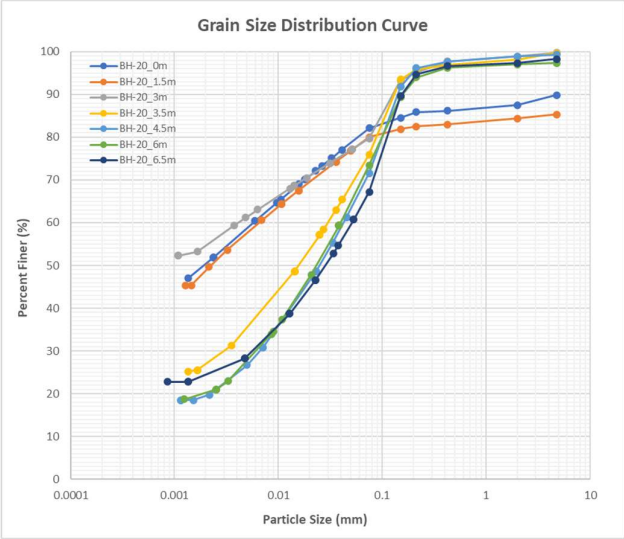
- Well Graded Gravel (GW)
- Poorly Graded Gravel (GP)
- Silty Gravel (GM)
- Clayey Gravel (GC)
- Well Graded Sand (SW)
- Poorly Graded Sand (SP)
- Silty Sand (SM)
- Clayey Sand (SC)
- Inorganic Silt of Low Compressibility (ML)
- Inorganic Silt of Intermediate Compressibility (MI)
- Inorganic Silt of High Compressibility (MH)
- Inorganic Clay of Low Compressibility (CL)
- Inorganic Clay of Intermediate Compressibility (CI)
- Inorganic Clay of High Compressibility (CH)
- Organic Soil of Low Compressibility (OL)
- Organic Soil of Intermediate Compressibility OI)
- Organic Soil of High Compressibility (OH)
- Peat (Pt)
- Top Soil (TS)

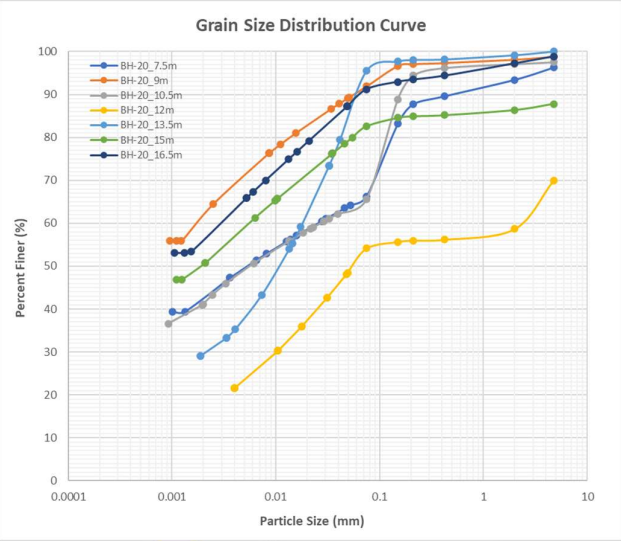
GOMA ENGINEERING AND CONSULTANCY
Quality we put forward

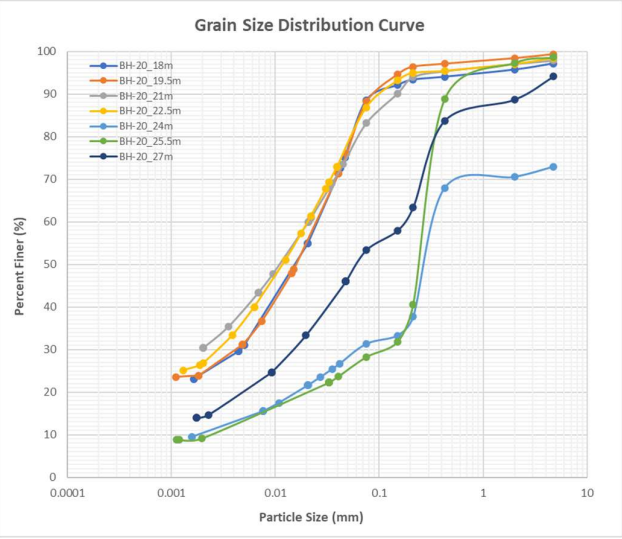
Project		Borehole Details		Drilling Details	
Name of Work:	Geotechnical Investigation work for Proposed Extension Metro Corridors of Aqua Line from Noida Sector-142 to Botanical Garden and Depot Station to Boraki MMTH (14.16 km).	**BH ID:**	BH-20	**Contractor:**	Goma Engineering & Consultancy
		Chainage [km]:	1+869	**Method of Drilling:**	Rotary Drilling
Client:	Noida Metro Rail Corporation (NMRC) Limited	**Depth [m]:**	30.00	**Start Date:**	30-11-2025
Stretch:	Depot Station to Boraki MMTH	**Elevation [m]:**	206.25	**End Date:**	01-12-2025
Project Code:	158_R0_DEST TO BOMM_0+031 km TO 2+586 km	**Water table Level [m]:**	13.00	**Location:**	**Lat:** 28.503221 **Long:** 77.562402

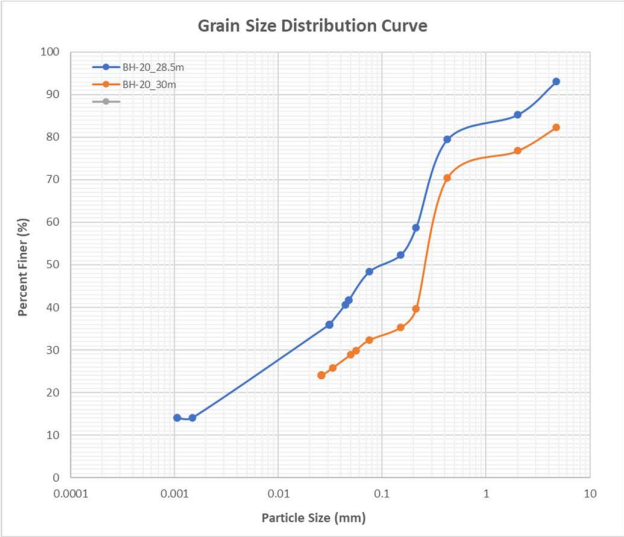
Depth [m]	Sample Type	Descriptions	SPT Test Results					Soil Particles				Atterberg Limits			Physical Characteristics				Direct Shear Test			Triaxial Comp Test			Consolidation Test				
			N1 (Seating Drive)	N2 (First Drive)	N3 (Second Drive)	Observed SPT	N (Correct N)	Gravel [%]	Sand [%]	Silt [%]	Clay [%]	Liquid Limit [%]	Plastic Limit [%]	Plasticity Index [%]	Moisture Content [%]	Bulk Density [gm/cm^3]	Dry Density [gm/cm^3]	Specific Gravity	Type	Cohesion [kg/cm^2]	Angle of Friction [^{o}]	Type	Cohesion [kPa]	Angle of Friction [^{o}]	Compression Index (Cc)	Coefficient of Volume Compressibility (Mv) [cm^2/kg]	Coefficient of Consolidation (Cv) [cm^2/sec]	Over Consolidation Ratio (OCR)	Preconsolidation Pressure [kg/cm^2]
0.00	DS	Top Soil	-	-	-	-	-	10.2	7.8	31.7	50.4	38	20	18	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1.50	SPT/DS	Very stiff to Hard, brownish, fine grained Inorganic Clay of Intermediate plasticity with gravel (CI)	4	8	12	20	28	14.6	5.3	31.2	48.8	40	22	18	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
3.00	UDS							0.3	20.1	25.1	54.6	36	19	17	18.30	1.98	1.61	2.66	F	0.12	27	UU	10	26	-	-	-	-	-
3.00	SPT/DS		15	20	23	43	47	0.3	23.7	49.0	26.9	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
4.50	SPT/DS	Very stiff to Hard, brownish, finegrained inorganic silt of low compressibility with sand (ML)	16	18	22	40	41	0.7	27.8	52.1	19.5	26	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
6.00	UDS							2.6	23.9	53.2	20.2	**25**	NP	NP	10.50	1.89	1.72	2.64	F	0.00	33	UU	9.00	27	0.056	3.50E-03	6.78E-04	0.71	0.82
6.50	SPT/DS		30	30	39	69	65	1.7	31.1	42.7	24.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
7.50	SPT/DS		12	21	24	45	41	3.7	30.0	23.6	42.7	27	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
9.00	UDS	Hard, brownish, fine grained Inorganic Clay of Intermediate plasticity with gravel (CI)						1.2	6.9	30.1	61.8	37	17	20	18.84	1.80	1.52	2.70	F	0.12	27	-	-	-	-	-	-	-	-
9.50	SPT/DS		18	20	24	44	38	-																					
10.50	SPT/DS		17	19	23	42	34	2.4	32.0	24.4	41.2	38	19	19	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
12.00	DS							30.1	15.8	54.1		36	18	18	13.99	-	-	2.68	F	0.22	25	-	-	-	-	-	-	-	-
12.50	SPT/DS	Hard, brownish, finegrained inorganic silt of low compressibility with sand (ML)	19	23	26	49	37	-																					
13.50	SPT/DS		38	50/12cm	-	100	43	0.0	4.4	66.0	29.6	27	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
15.00	UDS	Very stiff to Hard, brownish to grayey, fine grained Inorganic Clay of low plasticity with silt and gravel (CL)						12.2	5.2	32.2	50.4	32	17	15	20.93	1.96	1.62	2.60	F	0.13	31	-	-	-	-	-	-	-	-
15.50	SPT/DS		50	50/13cm	-	100	42	-																					
16.50	SPT/DS		7	14	16	30	18	1.2	7.6	35.1	56.1	30	17	13	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
18.00	UDS	Hard, brownish, finegrained inorganic silt of low compressibility with sand and gravel (ML)						2.8	8.6	64.2	24.4	27	NP	NP	19.64	1.85	1.54	2.65	F	0.00	32	-	-	-	-	-	-	-	-
18.50	SPT/DS		50	50/9cm	-	100	40	-																					
19.50	SPT/DS		40	50/8cm	-	100	40	0.7	11.1	63.6	24.6	25	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
21.00	UDS							2.1	14.7	83.2		24	NP	NP	21.32	2.11	1.74	2.51	-	-	-	-	-	-	-	-	-	-	-
21.50	SPT/DS		35	50/10cm	-	100	39	-																					
22.50	SPT/DS		50	50/5cm	-	100	38	1.6	11.5	60.2	26.7	26	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
24.00	DS	Very dense, greyey, fine-grained silty sand with gravel (SM)						27.1	41.6	20.9	10.4	25	NP	NP	17.62	-	-	2.67	F	0.00	32	-	-	-	-	-	-	-	-
24.50	SPT/DS		50	50/3cm	-	100	37	-																					
25.50	SPT/DS		50	50/2cm	-	100	37	1.3	70.4	19.0	9.2	24	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
27.00	DS							5.8	40.8	39.1	14.3	26	NP	NP	18.21	-	-	2.54	F	0.01	30	-	-	-	-	-	-	-	-
27.50	SPT/DS		50	50/4cm	-	100	36	-																					
28.50	SPT/DS		50	50/5cm	-	100	35	6.9	44.7	32.2	16.2	27	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
30.00	DS							17.7	50.0	32.3		28	NP	NP	19.30	-	-	2.57	-	-	-	-	-	-	-	-	-	-	-
30.50	SPT/DS		50	50/12cm	-	100	34	-																					

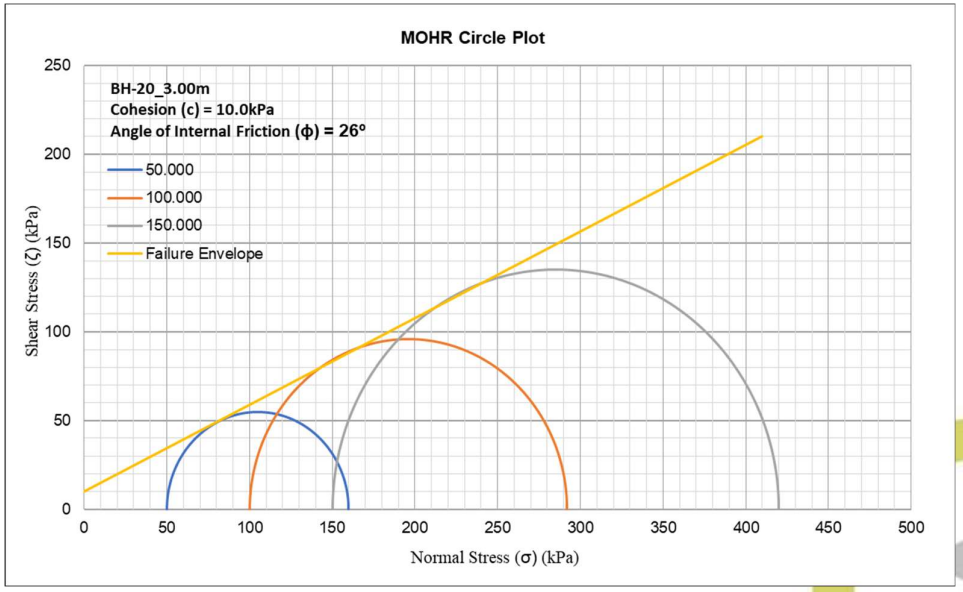
Notations: UDS = Undisturbed Sample, DS = Disturbed Sample, RC = Rock Core, F = Fast, S = Slow, UU = Unconsolidated Undrained Tri-axial compression Test.

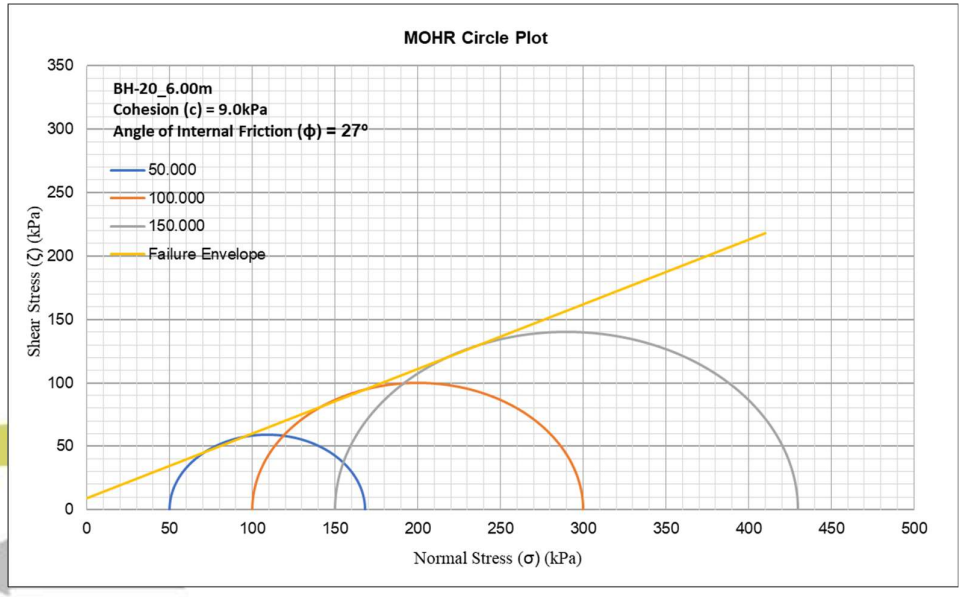

Grain Size Distribution Curve
BH-20_0m
BH-20_1.5m
BH-20_3m
BH-20_3.5m
BH-20_4.5m
BH-20_6m
BH-20_6.5m
Percent Finer (%)
Particle Size (mm)

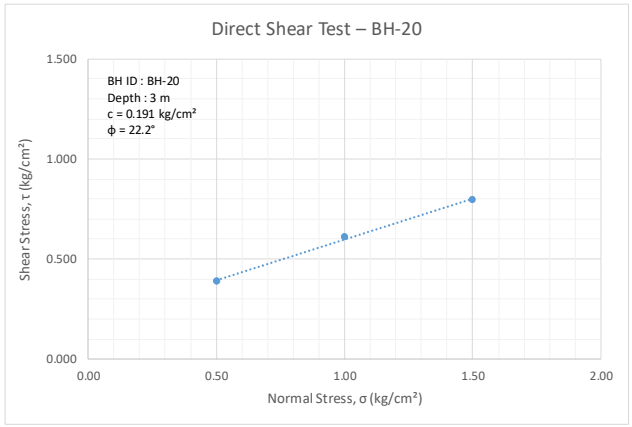

Grain Size Distribution Curve
BH-20_7.5m
BH-20_9m
BH-20_10.5m
BH-20_12m
BH-20_13.5m
BH-20_15m
BH-20_16.5m
Percent Finer (%)
Particle Size (mm)

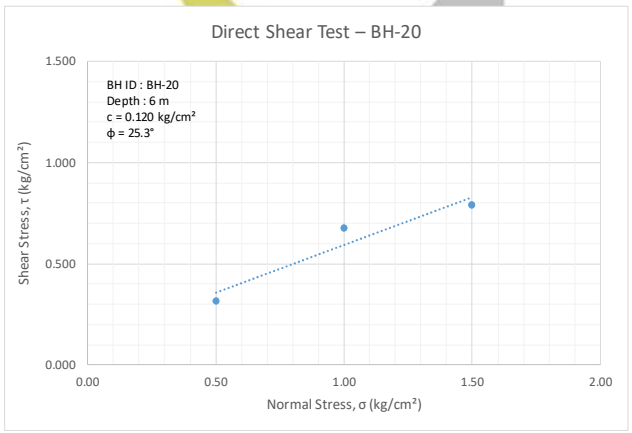

Grain Size Distribution Curve
BH-20_18m
BH-20_19.5m
BH-20_21m
BH-20_22.5m
BH-20_24m
BH-20_25.5m
BH-20_27m
Percent Finer (%)
Particle Size (mm)

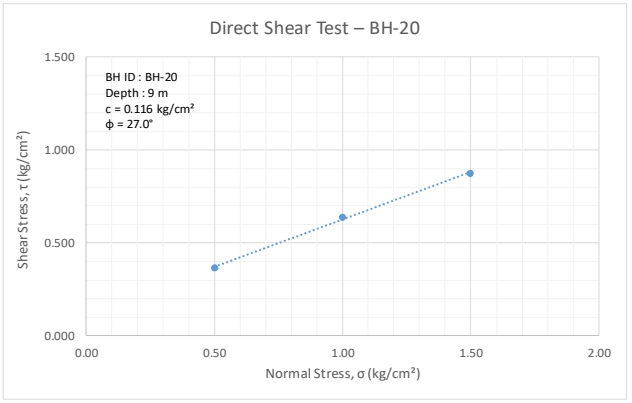

Grain Size Distribution Curve
BH-20_28.5m
BH-20_30m
Percent Finer (%)
Particle Size (mm)

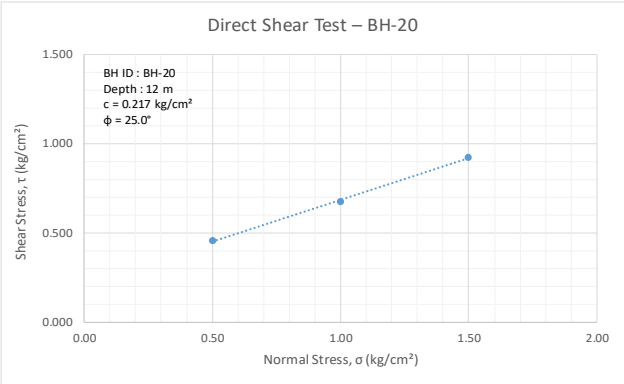

MOHR Circle Plot
BH-20_3.00m
Cohesion (c) = 10.0kPa
Angle of Internal Friction (ϕ) = 26°
50.000
100.000
150.000
Failure Envelope
Shear Stress (ζ) (kPa)
Normal Stress (σ) (kPa)

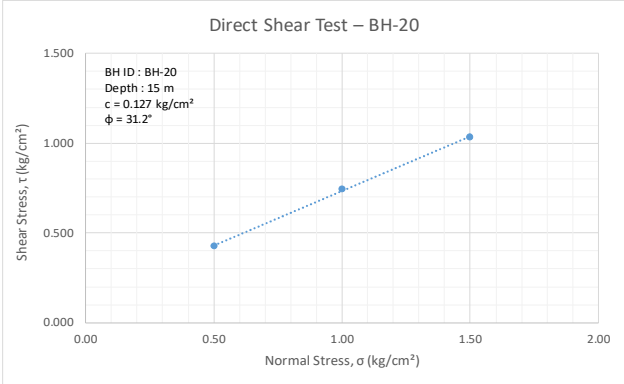

MOHR Circle Plot
BH-20_6.00m
Cohesion (c) = 9.0kPa
Angle of Internal Friction (ϕ) = 27°
50.000
100.000
150.000
Failure Envelope
Shear Stress (ζ) (kPa)
Normal Stress (σ) (kPa)

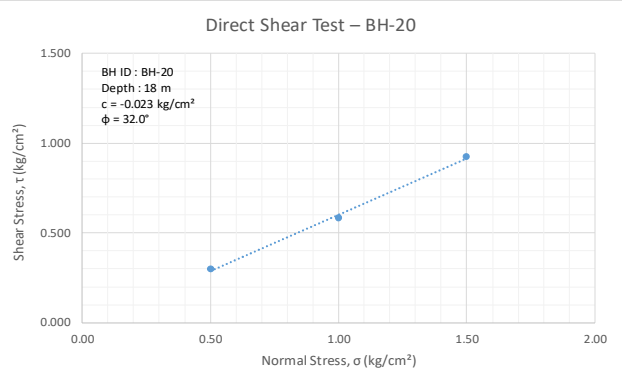

Direct Shear Test – BH-20
BH ID : BH-20
Depth : 3 m
c = 0.191 kg/cm²
ϕ = 22.2°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)

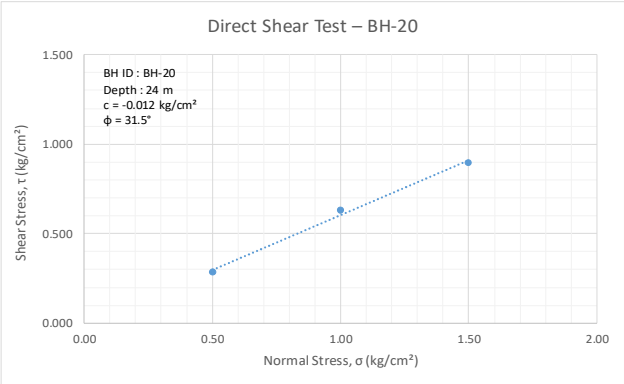

Direct Shear Test – BH-20
BH ID : BH-20
Depth : 6 m
c = 0.120 kg/cm²
ϕ = 25.3°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)

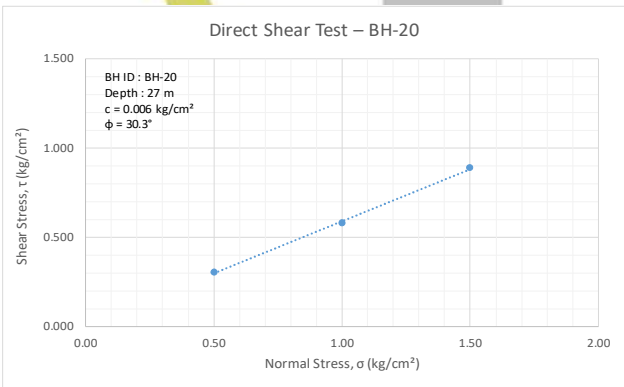

Direct Shear Test – BH-20
BH ID : BH-20
Depth : 9 m
c = 0.116 kg/cm²
ϕ = 27.0°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)


Direct Shear Test – BH-20
BH ID : BH-20
Depth : 12 m
c = 0.217 kg/cm²
ϕ = 25.0°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
1.500
1.000
0.500
0.000
0.00
0.50
1.00
1.50
2.00


Direct Shear Test – BH-20
BH ID : BH-20
Depth : 15 m
c = 0.127 kg/cm²
ϕ = 31.2°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
1.500
1.000
0.500
0.000
0.00
0.50
1.00
1.50
2.00


Direct Shear Test – BH-20
BH ID : BH-20
Depth : 18 m
c = -0.023 kg/cm²
ϕ = 32.0°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
1.500
1.000
0.500
0.000
0.00
0.50
1.00
1.50
2.00


Direct Shear Test – BH-20
BH ID : BH-20
Depth : 24 m
c = -0.012 kg/cm²
ϕ = 31.5°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
1.500
1.000
0.500
0.000
0.00
0.50
1.00
1.50
2.00

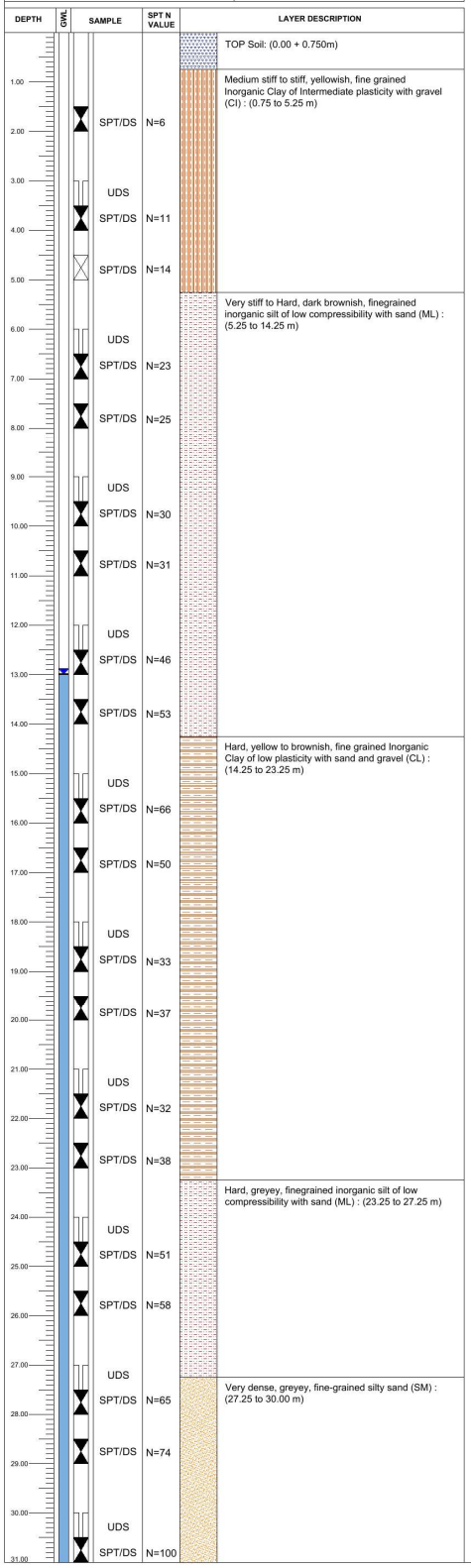

Direct Shear Test – BH-20
BH ID : BH-20
Depth : 27 m
c = 0.006 kg/cm²
ϕ = 30.3°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
1.500
1.000
0.500
0.000
0.00
0.50
1.00
1.50
2.00

NAME OF WORK: GEOTECHNICAL INVESTIGATION WORK FOR PROPOSED EXTENSION METRO CORRIDORS OF AQUA LINE FROM NOIDA SECTOR-142 TO BOTANICAL GARDEN AND DEPOT STATION TO BORAKI MMTH (14.16 KM)

Stretch: Depot Station to Boraki MMTH (CH 0+000 km to 2+600 km)

BH ID : BH-21 | **Chainage** : 1+925 KM

Groundwater Level : 13.00 M | **Location** : Lat. 28.503452 Long. 77.561412



LEGENDS

Sample Type

- Split Spoon Sampler
- Shelby Tube (UDS)

General

- Groundwater Level

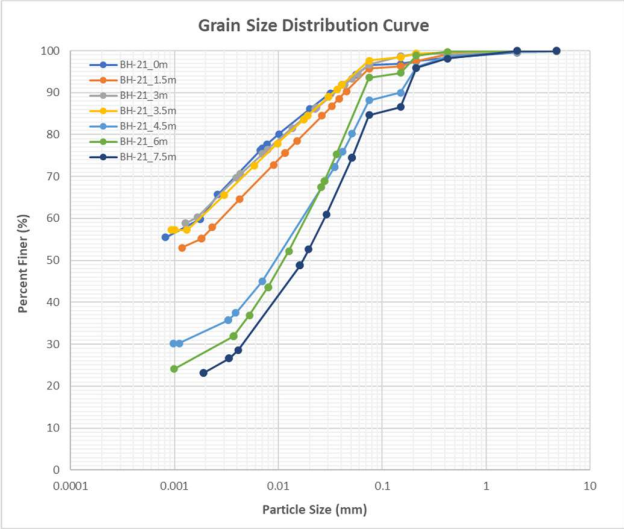
Soil

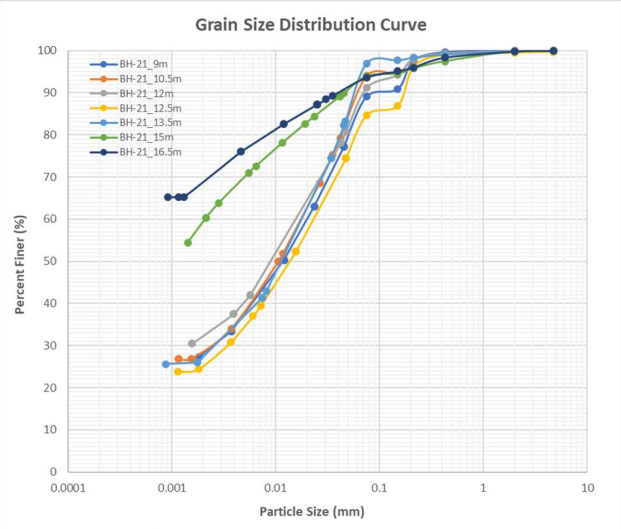
- Well Graded Gravel (GW)
- Poorly Graded Gravel (GP)
- Silty Gravel (GM)
- Clayey Gravel (GC)
- Well Graded Sand (SW)
- Poorly Graded Sand (SP)
- Silty Sand (SM)
- Clayey Sand (SC)
- Inorganic Silt of Low Compressibility (ML)
- Inorganic Silt of Intermediate Compressibility (MI)
- Inorganic Silt of High Compressibility (MH)
- Inorganic Clay of Low Compressibility (CL)
- Inorganic Clay of Intermediate Compressibility (CI)
- Inorganic Clay of High Compressibility (CH)
- Organic Soil of Low Compressibility (OL)
- Organic Soil of Intermediate Compressibility OI)
- Organic Soil of High Compressibility (OH)
- Peat (Pt)
- Top Soil (TS)

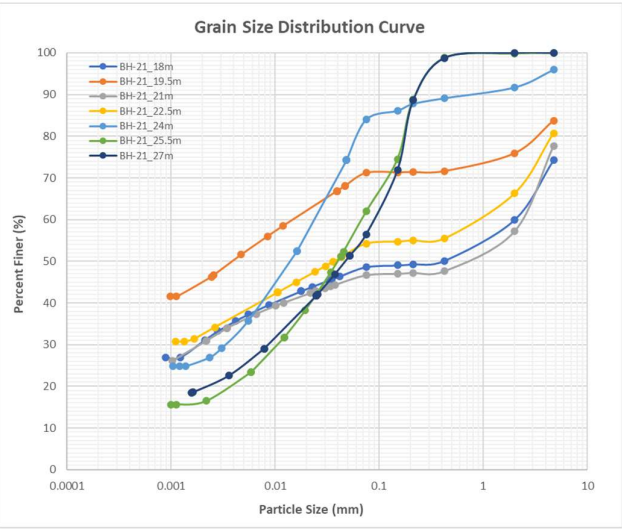
Project		Borehole Details		Drilling Details	
Name of Work:	Geotechnical Investigation work for Proposed Extension Metro Corridors of Aqua Line from Noida Sector-142 to Botanical Garden and Depot Station to Boraki MMTH (14.16 km).	**BH ID:**	BH-21	**Contractor:**	Goma Engineering & Consultancy
		Chainage [km]:	1+925	**Method of Drilling:**	Rotary Drilling
Client:	Noida Metro Rail Corporation (NMRC) Limited	**Depth [m]:**	30.00	**Start Date:**	03-12-2025
Stretch:	Depot Station to Boraki MMTH	**Elevation [m]:**	206.16	**End Date:**	05-12-2025
Project Code:	158_R0_DEST TO BOMM_0+031 km TO 2+586 km	**Water table Level [m]:**	13.00	**Location:**	**Lat:** 28.503452 **Long:** 77.561412

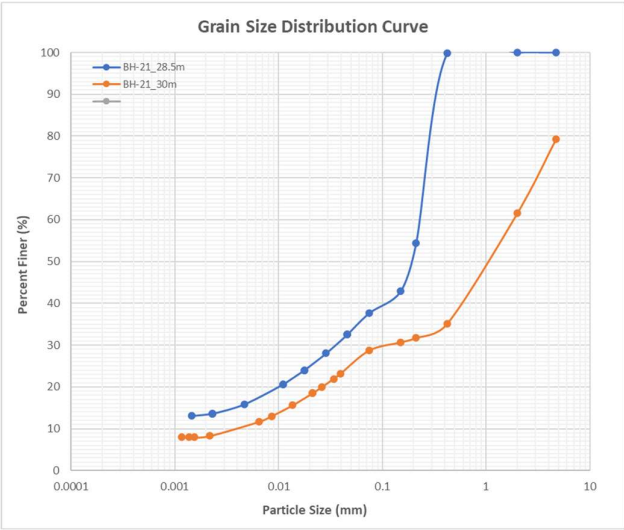
Depth [m]	Sample Type	Descriptions	SPT Test Results					Soil Particles				Atterberg Limits			Physical Characteristics				Direct Shear Test			Triaxial Comp Test			Consolidation Test				
			N1 (Seating Drive)	N2 (First Drive)	N3 (Second Drive)	Observed SPT	N (Correct N)	Gravel [%]	Sand [%]	Silt [%]	Clay [%]	Liquid Limit [%]	Plastic Limit [%]	Plasticity Index [%]	Moisture Content [%]	Bulk Density [gm/cm^3]	Dry Density [gm/cm^3]	Specific Gravity	Type	Cohesion [kg/cm^2]	Angle of Friction [°]	Type	Cohesion [kPa]	Angle of Friction [°]	Compression Index (Cc)	Coefficient of Volume Compressibility (Mv) [cm^2/kg]	Coefficient of Consolidation (Cv) [cm^2/sec]	Over Consolidation Ratio (OCR)	Preconsolidation Pressure [kg/cm^2]
0.00	DS	Top Soil	-	-	-	-	-	0.0	3.5	34.8	61.7	37	22	15	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1.50	SPT/DS	Medium stiff to stiff, yellowish, fine grained Inorganic Clay of Intermediate plasticity with gravel (CI)	2	3	3	6	8	0.2	4.1	39.4	56.3	36	20	16	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
3.00	UDS							0.2	3.1	34.3	62.3	40	21	19	11.00	1.89	1.71	2.65	F	0.11	24	UU	6	27	0.065	4.05E-03	1.30E-03	1.43	0.82
3.00	SPT/DS		4	5	6	11	12	0.0	2.4	36.1	61.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
4.50	SPT/DS		5	6	8	14	14	0.0	11.8	55.0	33.2	34	18	16	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
6.00	DS	Very stiff to Hard, dark brownish, finegrained inorganic silt of low compressibility with sand (ML)						0.0	6.4	65.3	28.3	27	NP	NP	17.22	-	-	2.64	F	0.06	25	-	-	-	-	-	-	-	-	-
6.50	SPT/DS		7	10	13	23	22	-																					
7.50	SPT/DS		8	11	14	25	23	0.0	15.4	61.2	23.5	25	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
9.00	DS							0.0	10.9	61.0	28.1	24	NP	NP	16.33	-	-	2.62	F	0.06	27	-	-	-	-	-	-	-	-	-
9.50	SPT/DS		7	13	17	30	26	-																					
10.50	SPT/DS		10	12	19	31	25	0.0	6.0	65.0	29.0	24	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
12.00	UDS							0.0	8.8	58.8	32.3	27	NP	NP	17.80	1.89	1.60	2.61	F	0.03	29	UU	5	28	-	-	-	-	-
12.50	SPT/DS		11	19	27	46	35	0.3	15.0	59.4	25.3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
13.50	SPT/DS		13	21	32	53	27	0.0	3.0	69.7	27.3	24	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
15.00	UDS	Hard, yellow to brownish, fine grained Inorganic Clay of low plasticity with sand and gravel (CL)						0.0	6.1	34.5	59.4	30	14	16	18.21	2.01	1.70	2.47	F	0.16	26	-	-	-	-	-	-	-	-	-
15.50	SPT/DS		10	29	37	66	31	-																					
16.50	SPT/DS		13	21	29	50	25	0.0	6.4	24.8	68.9	31	16	15	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
18.00	UDS							25.8	25.6	17.9	30.7	33	16	17	16.35	1.83	1.58	2.64	F	0.12	27	-	-	-	-	-	-	-	-	-
18.50	SPT/DS		11	15	18	33	18	-																					
19.50	SPT/DS		11	16	21	37	20	16.3	12.5	26.2	45.0	32	18	14	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
21.00	UDS							22.3	31.1	16.3	30.4	34	16	18	17.49	1.80	1.53	2.66	F	0.16	28	-	-	-	-	-	-	-	-	-
21.50	SPT/DS		10	14	18	32	18	-																					
22.50	SPT/DS		12	16	22	38	19	19.3	26.5	21.7	32.5	30	17	13	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
24.00	UDS	Hard, greyey, finegrained inorganic silt of low compressibility with sand (ML)						4.0	11.9	57.8	26.3	28	NP	NP	20.76	1.92	1.59	2.55	F	0.08	31	-	-	-	-	-	-	-	-	-
24.50	SPT/DS		13	21	30	51	23	-																					
25.50	SPT/DS		12	25	33	58	25	0.0	38.1	45.6	16.4	24	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
27.00	DS							0.0	43.5	36.9	19.6	26	NP	NP	23.72	-	-	2.49	F	0.02	31	-	-	-	-	-	-	-	-	-
27.50	SPT/DS	Very dense, greyey, fine-grained silty sand (SM)	15	27	38	65	26	-																					
28.50	SPT/DS		16	30	41	71	28	0.0	62.3	24.2	13.5	27	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
30.00	DS							20.7	50.6	20.6	8.2	25	NP	NP	22.20	-	-	2.67	-	-	-	-	-	-	-	-	-	-	-	-
30.50	SPT/DS		40	50/12cm	-	100	35	-																					

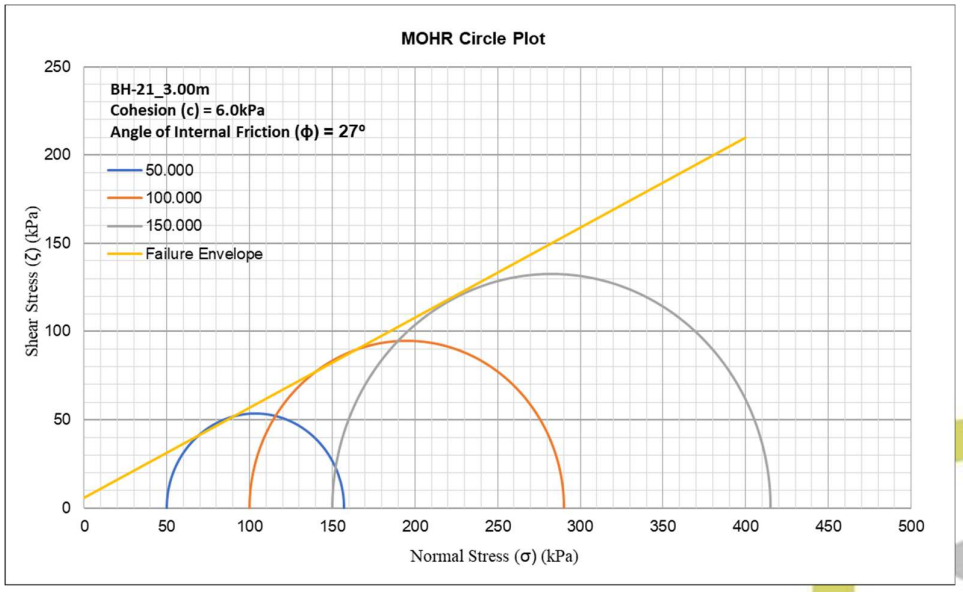
Notations: UDS = Undisturbed Sample, DS = Disturbed Sample, RC = Rock Core, F = Fast, S = Slow, UU = Unconsolidated Undrained Tri-axial compression Test.

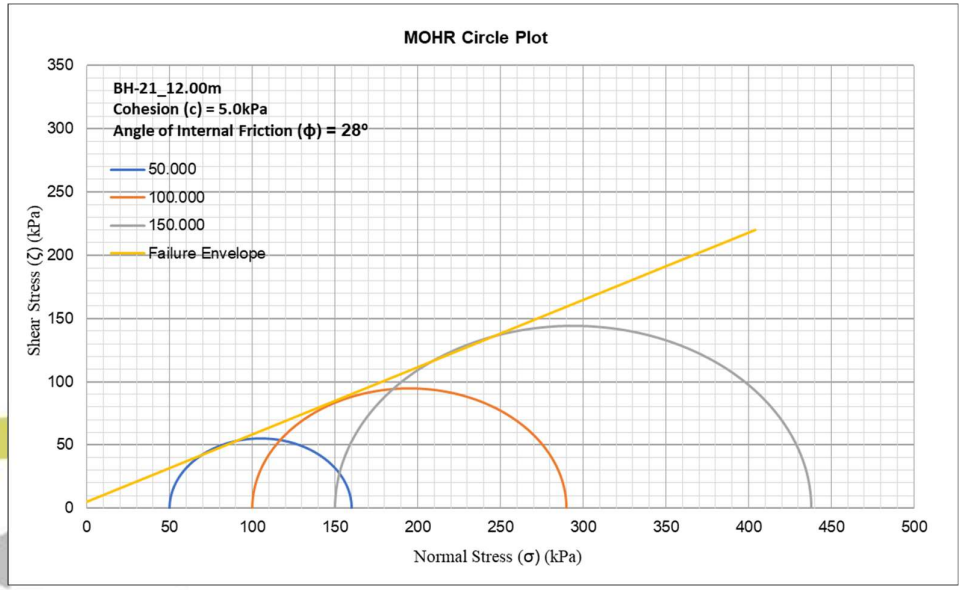

Grain Size Distribution Curve
BH-21_0m
BH-21_1.5m
BH-21_3m
BH-21_3.5m
BH-21_4.5m
BH-21_6m
BH-21_7.5m
Percent Finer (%)
Particle Size (mm)

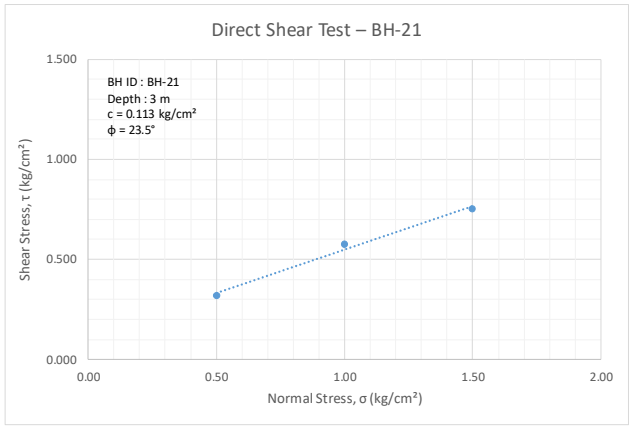

Grain Size Distribution Curve
BH-21_9m
BH-21_10.5m
BH-21_12m
BH-21_12.5m
BH-21_13.5m
BH-21_15m
BH-21_16.5m
Percent Finer (%)
Particle Size (mm)

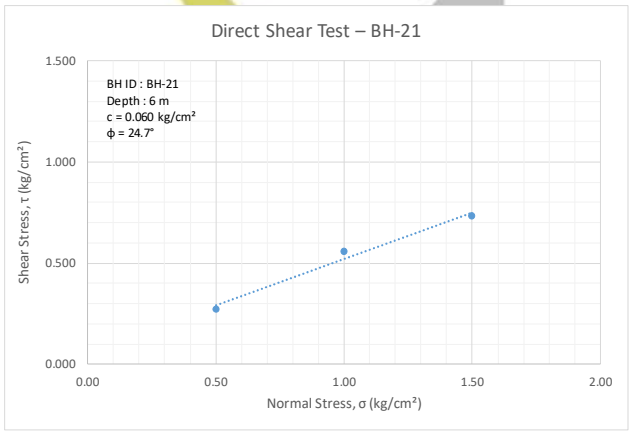

Grain Size Distribution Curve
BH-21_18m
BH-21_19.5m
BH-21_21m
BH-21_22.5m
BH-21_24m
BH-21_25.5m
BH-21_27m
Percent Finer (%)
Particle Size (mm)

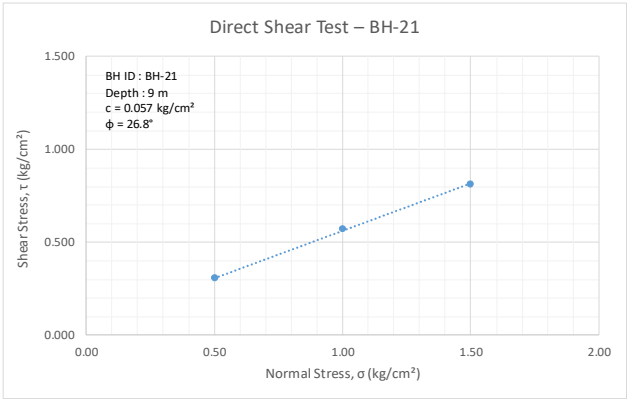

Grain Size Distribution Curve
BH-21_28.5m
BH-21_30m
Percent Finer (%)
Particle Size (mm)

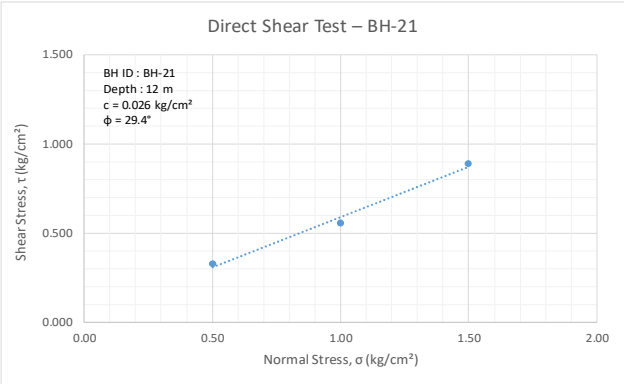

MOHR Circle Plot
BH-21_3.00m
Cohesion (c) = 6.0kPa
Angle of Internal Friction (ϕ) = 27°
50.000
100.000
150.000
Failure Envelope
Shear Stress (ζ) (kPa)
Normal Stress (σ) (kPa)

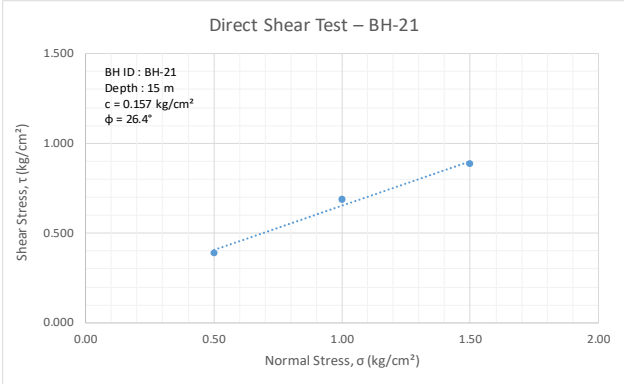

MOHR Circle Plot
BH-21_12.00m
Cohesion (c) = 5.0kPa
Angle of Internal Friction (ϕ) = 28°
50.000
100.000
150.000
Failure Envelope
Shear Stress (ζ) (kPa)
Normal Stress (σ) (kPa)

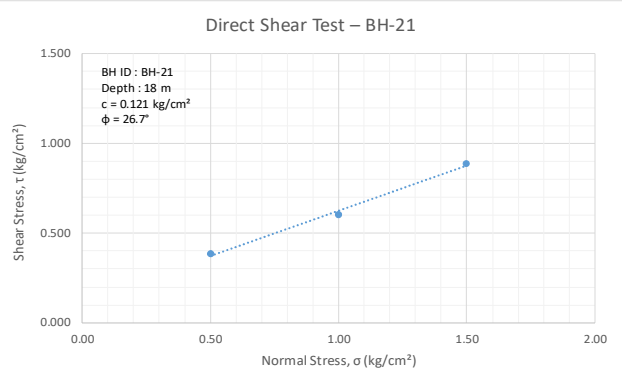

Direct Shear Test – BH-21
BH ID : BH-21
Depth : 3 m
c = 0.113 kg/cm²
ϕ = 23.5°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)

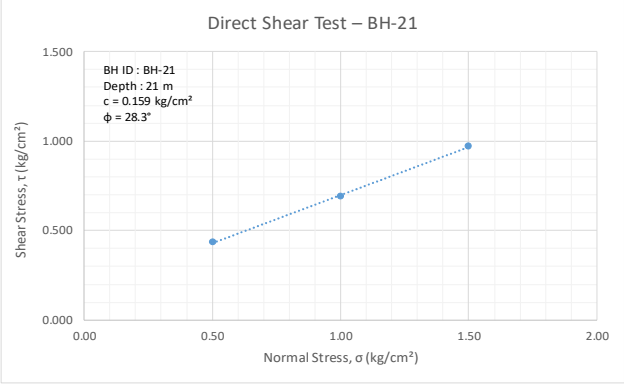

Direct Shear Test – BH-21
BH ID : BH-21
Depth : 6 m
c = 0.060 kg/cm²
ϕ = 24.7°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)

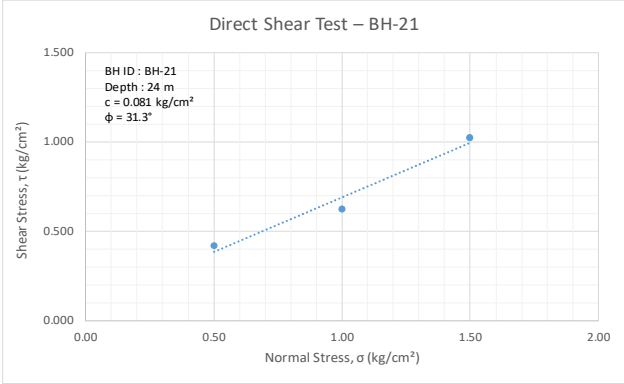

Direct Shear Test – BH-21
BH ID : BH-21
Depth : 9 m
c = 0.057 kg/cm²
ϕ = 26.8°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)

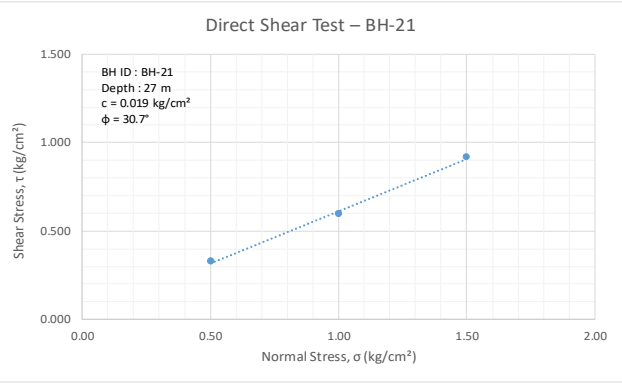

Direct Shear Test – BH-21
BH ID : BH-21
Depth : 12 m
c = 0.026 kg/cm²
ϕ = 29.4°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
0.000
0.500
1.000
1.500
0.00
0.50
1.00
1.50
2.00


Direct Shear Test – BH-21
BH ID : BH-21
Depth : 15 m
c = 0.157 kg/cm²
ϕ = 26.4°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
0.000
0.500
1.000
1.500
0.00
0.50
1.00
1.50
2.00

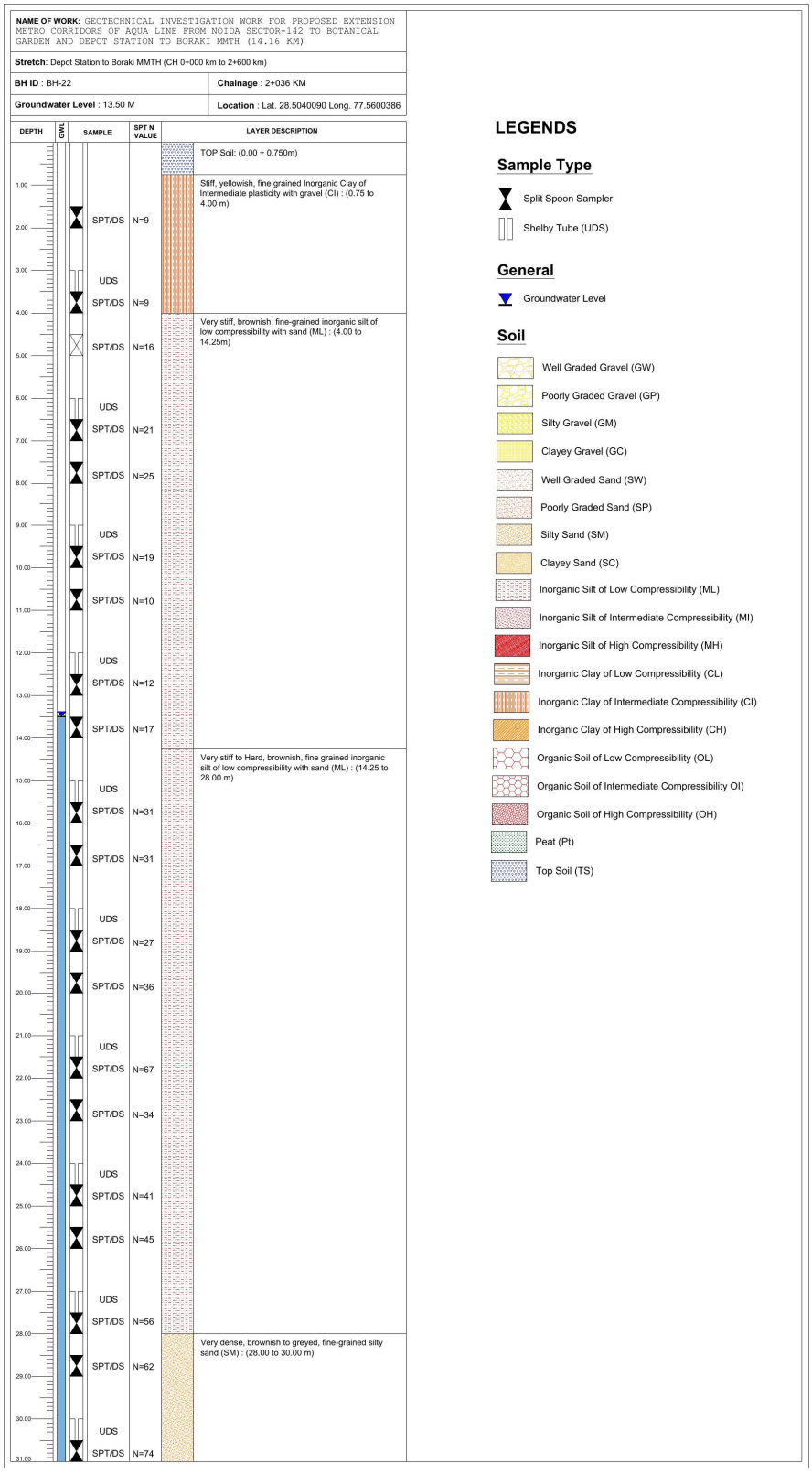

Direct Shear Test – BH-21
BH ID : BH-21
Depth : 18 m
c = 0.121 kg/cm²
ϕ = 26.7°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
0.000
0.500
1.000
1.500
0.00
0.50
1.00
1.50
2.00


Direct Shear Test – BH-21
BH ID : BH-21
Depth : 21 m
c = 0.159 kg/cm²
ϕ = 28.3°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
0.000
0.500
1.000
1.500
0.00
0.50
1.00
1.50
2.00


Direct Shear Test – BH-21
BH ID : BH-21
Depth : 24 m
c = 0.081 kg/cm²
ϕ = 31.3°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
0.000
0.500
1.000
1.500
0.00
0.50
1.00
1.50
2.00


Direct Shear Test – BH-21
BH ID : BH-21
Depth : 27 m
c = 0.019 kg/cm²
ϕ = 30.7°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
0.000
0.500
1.000
1.500
0.00
0.50
1.00
1.50
2.00

C.3. Zone 3: CH: 1+925 km to 2+586 km (BH-22 to BH-27)

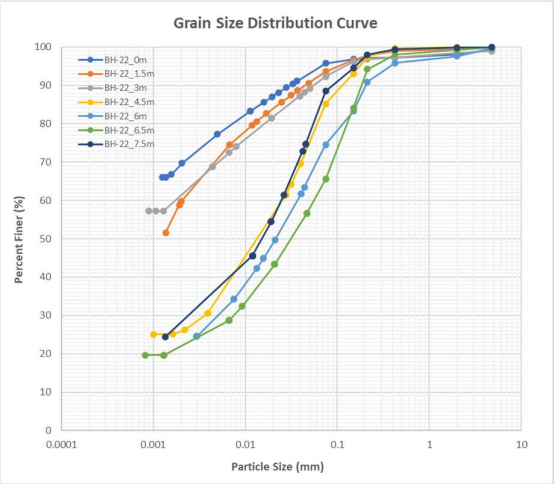


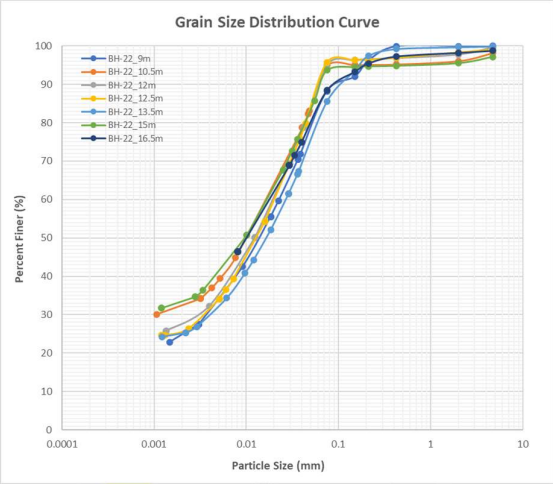
GOMA ENGINEERING AND CONSULTANCY
Quality we put forward

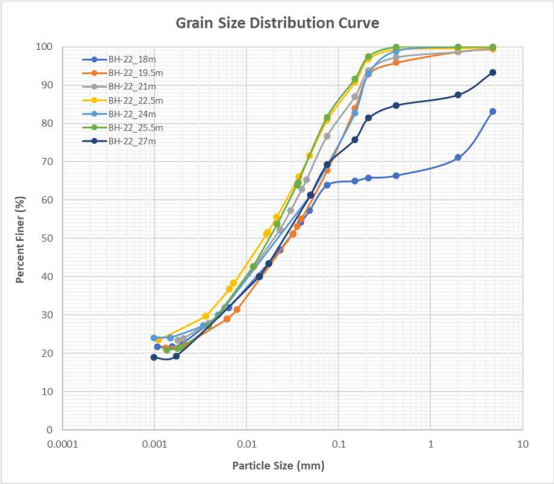
Project		Borehole Details		Drilling Details	
Name of Work:	Geotechnical Investigation work for Proposed Extension Metro Corridors of Aqua Line from Noida Sector-142 to Botanical Garden and Depot Station to Boraki MMTH (14.16 km).	**BH ID:**	BH-22	**Contractor:**	Goma Engineering & Consultancy
		Chainage [km]:	2+036	**Method of Drilling:**	Rotary Drilling
Client:	Noida Metro Rail Corporation (NMRC) Limited	**Depth [m]:**	30.00	**Start Date:**	30-11-2025
Stretch:	Depot Station to Boraki MMTH	**Elevation [m]:**	207.06	**End Date:**	02-12-2025
Project Code:	158_R3_DEST TO BOMM_2+000 km TO 2+600 km	**Water table Level [m]:**	13.50	**Location:**	**Lat:** 28.5040090 **Long:** 77.56003862

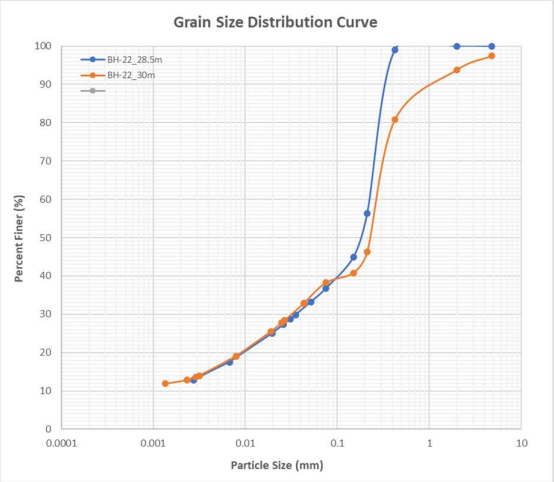
Depth [m]	Sample Type	Descriptions	SPT Test Results					Soil Particles				Atterberg Limits			Physical Characteristics				Direct Shear Test			Triaxial Comp Test			Consolidation Test				
			N1 (Seating Drive)	N2 (First Drive)	N3 (Second Drive)	Observed SPT	N (Correct N)	Gravel [%]	Sand [%]	Silt [%]	Clay [%]	Liquid Limit [%]	Plastic Limit [%]	Plasticity Index [%]	Moisture Content [%]	Bulk Density [gm/cm^3]	Dry Density [gm/cm^3]	Specific Gravity	Type	Cohesion [kg/cm^2]	Angle of Friction [°]	Type	Cohesion [kPa]	Angle of Friction [°]	Compression Index (Cc)	Coefficient of Volume Compressibility (Mv) [cm^2/kg]	Coefficient of Consolidation (Cv) [cm^2/sec]	Over Consolidation Ratio (OCR)	Preconsolidation Pressure [kg/cm^2]
0.00	DS	Top Soil	-	-	-	-	-	0.7	3.5	26.3	69.4	40	20	20	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1.50	SPT/DS	Stiff, yellowish, fine grained Inorganic Clay of Intermediate plasticity with gravel (CI)	2	4	5	9	13	0.0	6.4	34.0	59.6	38	19	19	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
3.00	UDS							1.1	6.6	31.0	61.3	39	21	18	13.60	1.60	1.41	2.55	F	0.12	26	-	-	-	-	-	-	-	-
3.50	SPT/DS		3	4	5	9	10	-																					
4.50	SPT/DS	Very stiff, brownish, fine-grained inorganic silt of low compressibility with sand (ML)	6	7	9	16	16	0.0	14.8	59.3	25.9	26	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
6.00	UDS							0.3	8.4	63.3	11.2	25	NP	NP	15.40	2.02	1.75	2.71	F	0.10	27	UU	6	26	-	-	-	-	-
6.50	SPT/DS		5	9	12	21	20	0.2	34.3	43.5	22.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
7.50	SPT/DS		7	10	15	25	23	0.0	11.5	60.3	28.2	27	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
9.00	DS							0.0	11.8	63.5	24.8	28	NP	NP	26.26	-	-	2.67	F	0.12	29	-	-	-	-	-	-	-	-
9.50	SPT/DS		4	8	11	19	16	-																					
10.50	SPT/DS		3	4	6	10	8	1.8	3.3	62.4	32.5	24	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
12.00	UDS							0.4	4.5	66.9	28.2	26	NP	NP	14.69	2.10	1.83	2.65	F	0.13	25	UU	4	27	0.134	9.12E-02	1.31E-02	0.85	2.14
12.50	SPT/DS		4	5	7	12	9	1.0	3.3	69.9	25.9	26	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
13.50	SPT/DS		5	7	10	17	12	0.2	14.2	60.5	25.1	25	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
15.00	UDS	Very stiff to Hard, brownish, fine grained inorganic silt of low compressibility with sand (ML)						2.8	3.5	60.1	33.5	29	NP	NP	17.40	1.83	1.56	2.60	F	0.08	28	-	-	-	-	-	-	-	-
15.50	SPT/DS		9	13	18	31	18	-																					
16.50	SPT/DS		8	14	17	31	18	1.3	10.3	88.5		26	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
18.00	UDS							16.8	19.3	41.2	22.7	27	NP	NP	16.43	1.78	1.53	2.68	F	0.06	28	-	-	-	-	-	-	-	-
18.50	SPT/DS		7	12	15	27	16	-																					
19.50	SPT/DS		10	15	21	36	19	0.5	31.7	45.8	22.0	24	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
21.00	DS							0.3	23.0	52.9	23.8	26	NP	NP	21.49	-	-	2.64	F	0.11	27	-	-	-	-	-	-	-	-
21.50	SPT/DS		13	29	38	67	29	-																					
22.50	SPT/DS		8	14	20	34	18	0.2	18.9	54.3	26.6	25	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
24.00	DS							0.0	30.9	43.9	25.2	28	NP	NP	19.40	-	-	2.65	F	0.04	30	-	-	-	-	-	-	-	-
24.50	SPT/DS		9	17	24	41	20	-																					
25.50	SPT/DS		12	18	27	45	21	0.0	18.3	59.8	21.8	26	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
27.00	UDS							6.6	24.1	48.4	20.8	27	NP	NP	22.83	2.06	1.83	2.66	F	0.03	31	-	-	-	-	-	-	-	-
27.50	SPT/DS		15	24	32	56	24	-																					
28.50	SPT/DS	Very dense, brownish to greyed, fine-grained silty sand (SM)	18	28	34	62	25	0.0	63.3	36.7		24	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
30.00	DS							2.6	59.2	25.7	12.5	25	NP	NP	23.79	-	-	2.64	-	-	-	-	-	-	-	-	-	-	-
30.50	SPT/DS		15	34	40	74	28	-																					

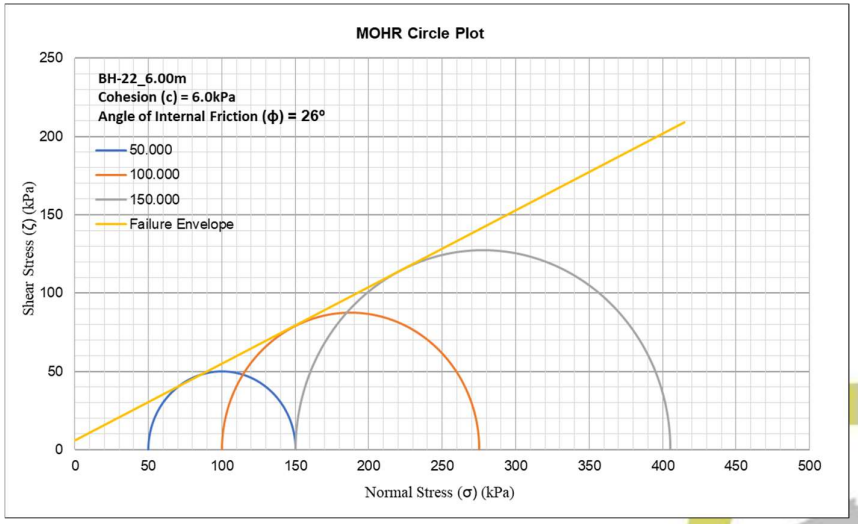
Notations: UDS = Undisturbed Sample, DS = Disturbed Sample, RC = Rock Core, F = Fast, NP = Non-Plastic, S = Slow, UU = Unconsolidated Undrained Tri-axial compression Test.

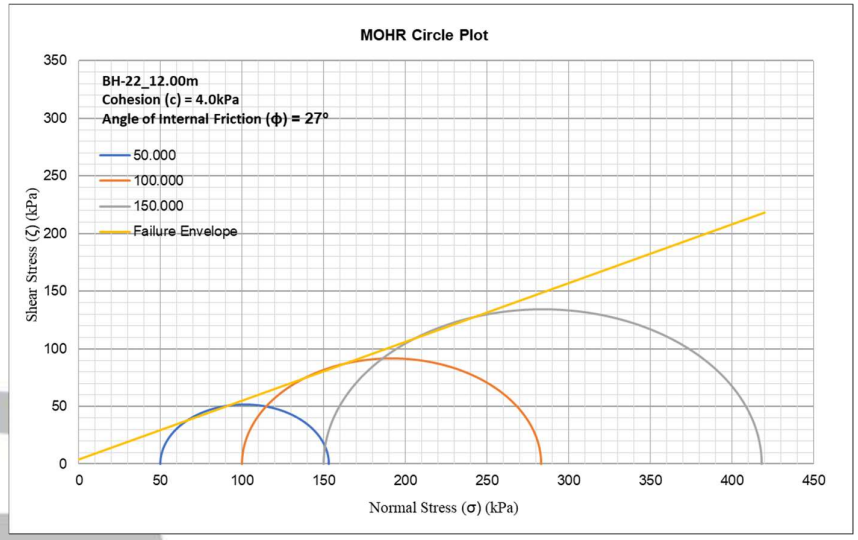

Grain Size Distribution Curve
BH-22_0m
BH-22_1.5m
BH-22_3m
BH-22_4.5m
BH-22_6m
BH-22_6.5m
BH-22_7.5m
Percent Finer (%)
Particle Size (mm)

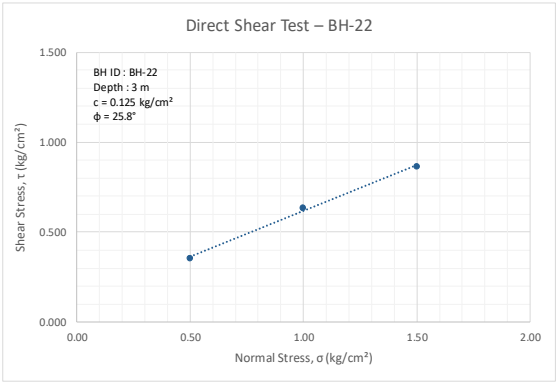

Grain Size Distribution Curve
BH-22_9m
BH-22_10.5m
BH-22_12m
BH-22_12.5m
BH-22_13.5m
BH-22_15m
BH-22_16.5m
Percent Finer (%)
Particle Size (mm)

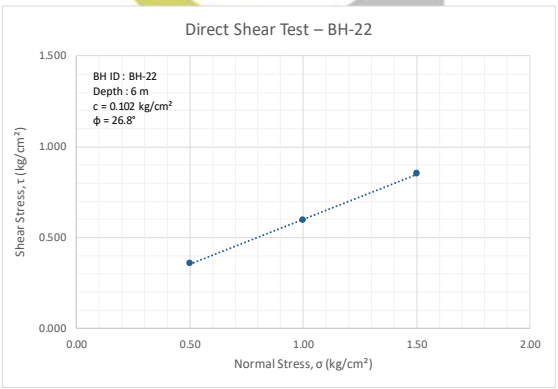

Grain Size Distribution Curve
BH-22_18m
BH-22_19.5m
BH-22_21m
BH-22_22.5m
BH-22_24m
BH-22_25.5m
BH-22_27m
Percent Finer (%)
Particle Size (mm)

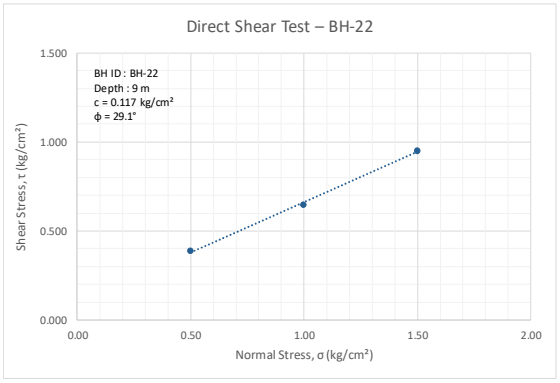

Grain Size Distribution Curve
BH-22_28.5m
BH-22_30m
Percent Finer (%)
Particle Size (mm)

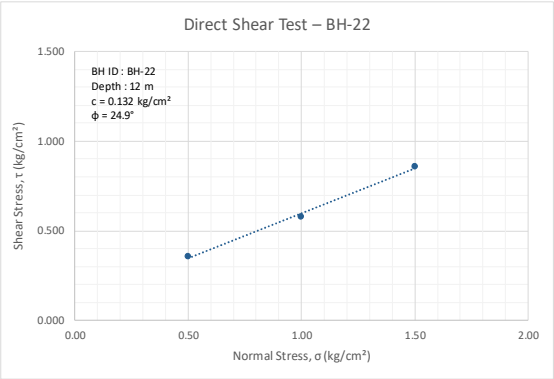

MOHR Circle Plot
BH-22_6.00m
Cohesion (c) = 6.0kPa
Angle of Internal Friction (ϕ) = 26°
50.000
100.000
150.000
Failure Envelope
Shear Stress (ζ) (kPa)
Normal Stress (σ) (kPa)

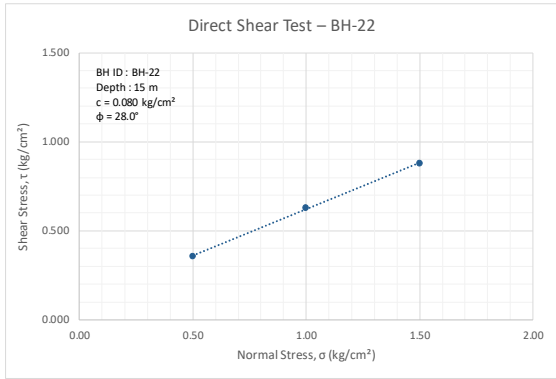

MOHR Circle Plot
BH-22_12.00m
Cohesion (c) = 4.0kPa
Angle of Internal Friction (ϕ) = 27°
50.000
100.000
150.000
Failure Envelope
Shear Stress (ζ) (kPa)
Normal Stress (σ) (kPa)

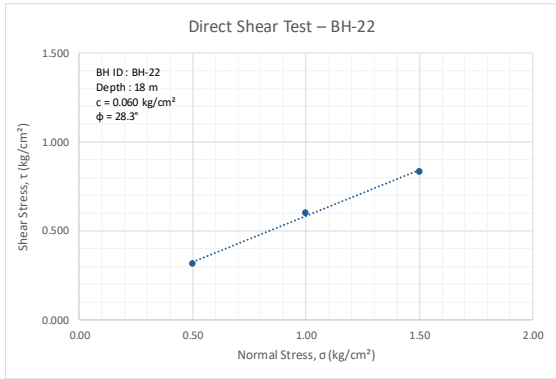

Direct Shear Test – BH-22
BH ID : BH-22
Depth : 3 m
c = 0.125 kg/cm²
ϕ = 25.8°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)

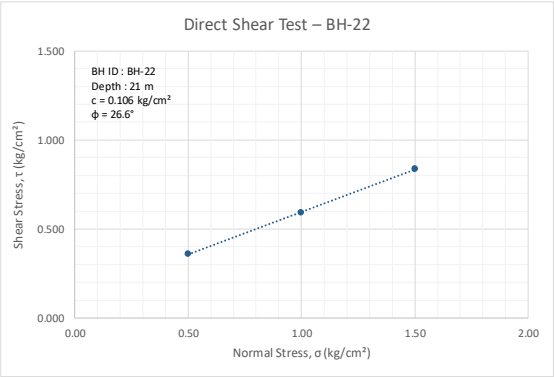

Direct Shear Test – BH-22
BH ID : BH-22
Depth : 6 m
c = 0.102 kg/cm²
ϕ = 26.8°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)

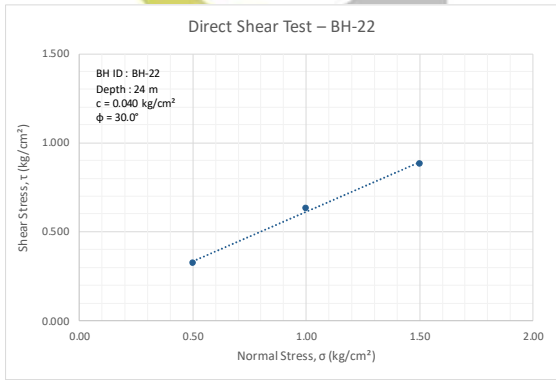

Direct Shear Test – BH-22
BH ID : BH-22
Depth : 9 m
c = 0.117 kg/cm²
ϕ = 29.1°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)

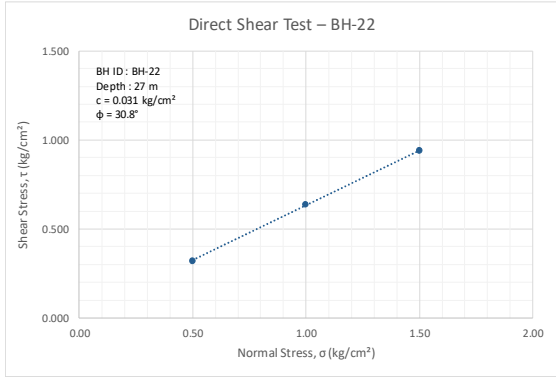

Direct Shear Test – BH-22
BH ID : BH-22
Depth : 12 m
c = 0.132 kg/cm²
ϕ = 24.9°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
1.500
1.000
0.500
0.000
0.00
0.50
1.00
1.50
2.00


Direct Shear Test – BH-22
BH ID : BH-22
Depth : 15 m
c = 0.080 kg/cm²
ϕ = 28.0°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
1.500
1.000
0.500
0.000
0.00
0.50
1.00
1.50
2.00


Direct Shear Test – BH-22
BH ID : BH-22
Depth : 18 m
c = 0.060 kg/cm²
ϕ = 28.3°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
1.500
1.000
0.500
0.000
0.00
0.50
1.00
1.50
2.00


Direct Shear Test – BH-22
BH ID : BH-22
Depth : 21 m
c = 0.106 kg/cm²
ϕ = 26.6°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
1.500
1.000
0.500
0.000
0.00
0.50
1.00
1.50
2.00


Direct Shear Test – BH-22
BH ID : BH-22
Depth : 24 m
c = 0.040 kg/cm²
ϕ = 30.0°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
1.500
1.000
0.500
0.000
0.00
0.50
1.00
1.50
2.00

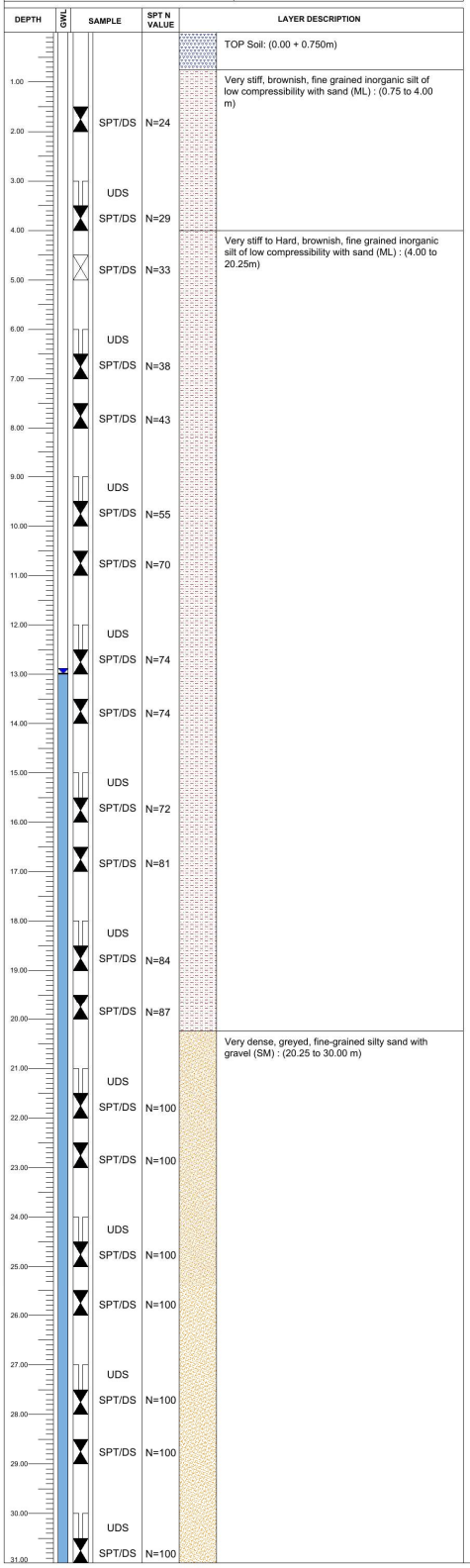

Direct Shear Test – BH-22
BH ID : BH-22
Depth : 27 m
c = 0.031 kg/cm²
ϕ = 30.8°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
1.500
1.000
0.500
0.000
0.00
0.50
1.00
1.50
2.00

NAME OF WORK: GEOTECHNICAL INVESTIGATION WORK FOR PROPOSED EXTENSION METRO CORRIDORS OF AQUA LINE FROM NOIDA SECTOR-142 TO BOTANICAL GARDEN AND DEPOT STATION TO BORAKI MMTH (14.16 KM)

Stretch: Depot Station to Boraki MMTH (CH 0+000 km to 2+600 km)

BH ID : BH-23 | **Chainage** : 2+116 KM

Groundwater Level : 13.00 M | **Location** : Lat. 28.5054190 Long. 77.5602030



LEGENDS

Sample Type

- Split Spoon Sampler
- Shelby Tube (UDS)

General

- Groundwater Level

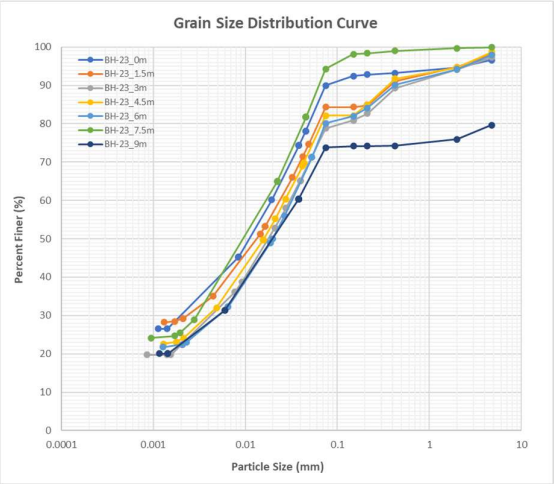
Soil

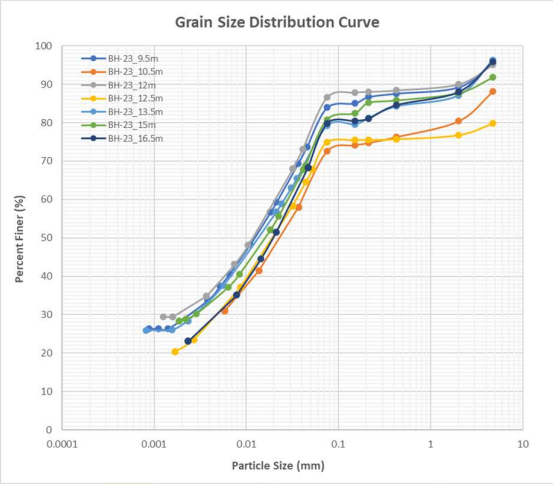
- Well Graded Gravel (GW)
- Poorly Graded Gravel (GP)
- Silty Gravel (GM)
- Clayey Gravel (GC)
- Well Graded Sand (SW)
- Poorly Graded Sand (SP)
- Silty Sand (SM)
- Clayey Sand (SC)
- Inorganic Silt of Low Compressibility (ML)
- Inorganic Silt of Intermediate Compressibility (MI)
- Inorganic Silt of High Compressibility (MH)
- Inorganic Clay of Low Compressibility (CL)
- Inorganic Clay of Intermediate Compressibility (CI)
- Inorganic Clay of High Compressibility (CH)
- Organic Soil of Low Compressibility (OL)
- Organic Soil of Intermediate Compressibility OI)
- Organic Soil of High Compressibility (OH)
- Peat (Pt)
- Top Soil (TS)

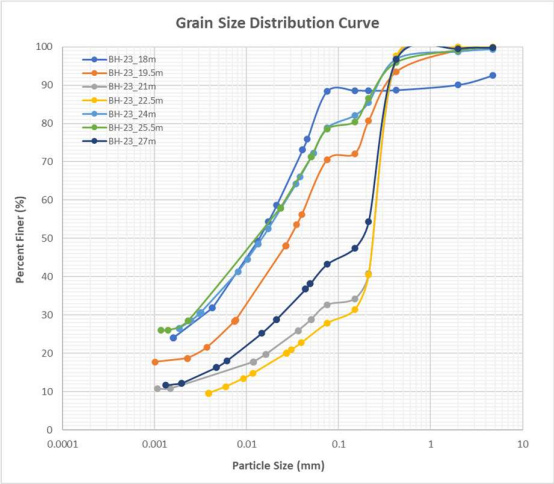
Project		Borehole Details		Drilling Details	
Name of Work:	Geotechnical Investigation work for Proposed Extension Metro Corridors of Aqua Line from Noida Sector-142 to Botanical Garden and Depot Station to Boraki MMTH (14.16 km).	**BH ID:**	BH-23	**Contractor:**	Goma Engineering & Consultancy
		Chainage [km]:	2+116	**Method of Drilling:**	Rotary Drilling
Client:	Noida Metro Rail Corporation (NMRC) Limited	**Depth [m]:**	30.00	**Start Date:**	02-12-2025
Stretch:	Depot Station to Boraki MMTH	**Elevation [m]:**	205.26	**End Date:**	04-12-2025
Project Code:	158_R3_DEST TO BOMM_2+000 km TO 2+600 km	**Water table Level [m]:**	13.00	**Location:**	**Lat:** 28.5054190 **Long:** 77.5616740

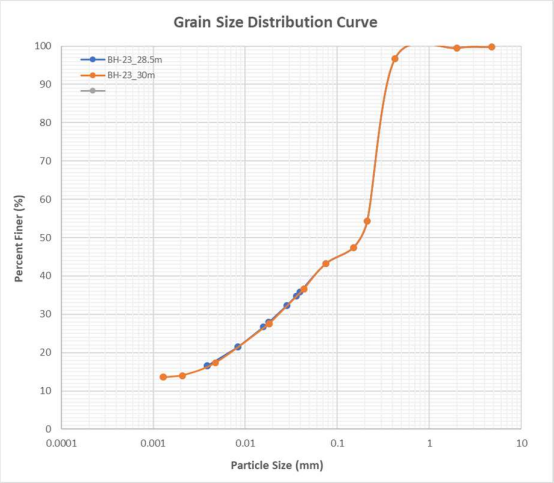
Depth [m]	Sample Type	Descriptions	SPT Test Results					Soil Particles				Atterberg Limits			Physical Characteristics				Direct Shear Test			Triaxial Comp Test			Consolidation Test				
			N1 (Seating Drive)	N2 (First Drive)	N3 (Second Drive)	Observed SPT	N (Correct N)	Gravel [%]	Sand [%]	Silt [%]	Clay [%]	Liquid Limit [%]	Plastic Limit [%]	Plasticity Index [%]	Moisture Content [%]	Bulk Density [gm/cm^3]	Dry Density [gm/cm^3]	Specific Gravity	Type	Cohesion [kg/cm^2]	Angle of Friction [^{o}]	Type	Cohesion [kPa]	Angle of Friction [^{o}]	Compression Index (Cc)	Coefficient of Volume Compressibility (Mv) [cm^2/kg]	Coefficient of Consolidation (Cv) [cm^2/sec]	Over Consolidation Ratio (OCR)	Preconsolidation Pressure [kg/cm^2]
0.00	DS	Top Soil	-	-	-	-	-	20.8	8.6	52.0	18.7	36	18	18	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1.50	SPT/DS	Very stiff, brownish, fine grained inorganic silt of low compressibility with sand (ML)	7	10	14	24	34	3.4	23.2	50.9	22.6	27	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
3.00	UDS							17.4	16.2	44.0	22.4	28	NP	NP	21.60	1.79	1.47	2.70	F	0.06	27	-	-	-	-	-	-	-	-
3.50	SPT/DS		10	13	16	29	32	-																					
4.50	SPT/DS		11	14	19	33	34	0.0	53.7	29.5	16.9	25	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
6.00	UDS							0.0	51.78	32.6	15.6	27	NP	NP	23.69	1.83	1.48	2.67	F	0.10	28	-	-	-	-	-	-	-	-
6.50	SPT/DS		13	16	22	38	36	-																					
7.50	SPT/DS		17	19	24	43	39	0.0	60.0	27.3	12.7	28	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
9.00	UDS							0.0	33.8	47.7	18.5	26	NP	NP	21.60	1.91	1.58	2.66	F	0.04	29	UU	5	27	-	-	-	-	-
9.50	SPT/DS		18	25	30	55	47	0.0	36.8	63.2		-																	
10.50	SPT/DS		21	29	41	70	57	0.7	3.2	62.3	33.7	23	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
12.00	UDS	Very stiff to Hard, brownish, fine grained inorganic silt of low compressibility with sand (ML)						1.0	7.1	61.6	30.4	25	NP	NP	24.00	1.90	1.54	2.64	F	0.08	30	UU	3	28	0.135	7.89E-03	3.91E-04	0.97	2.24
12.50	SPT/DS		22	31	43	74	56	0.0	11.6	70.5	17.9	-																	
13.50	SPT/DS		24	32	42	74	34	1.7	35.9	43.4	19.0	24	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
15.00	UDS							22.5	9.5	55.4	13.2	26	NP	NP	20.72	1.85	1.53	2.65	F	0.22	32	-	-	-	-	-	-	-	-
15.50	SPT/DS		28	33	39	72	33	-																					
16.50	SPT/DS		31	37	44	81	35	5.9	7.7	55.2	31.2	22	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
18.00	UDS							1.1	11.9	60.2	26.8	28	NP	NP	23.36	2.26	1.83	2.62	F	0.09	31	-	-	-	-	-	-	-	-
18.50	SPT/DS		34	39	45	84	35	-																					
19.50	SPT/DS		36	40	47	87	36	3.3	17.4	54.5	24.8	27	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
21.00	DS	Very dense, greyed, fine-grained silty sand with gravel (SM)						1.0	73.3	25.8		25	NP	NP	18.90	-	-	2.68	F	0.00	32	-	-	-	-	-	-	-	-
21.50	SPT/DS		35	44	50/13cm	100	39	-																					
22.50	SPT/DS		37	47	50/11cm	100	38	0.1	42.0	36.8	21.1	26	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
24.00	DS							6.0	49.1	29.2	15.7	27	NP	NP	19.40	-	-	2.61	F	0.00	31	-	-	-	-	-	-	-	-
24.50	SPT/DS		20	43	50/09cm	100	38	-																					
25.50	SPT/DS		29	47	50/07cm	100	37	6.8	48.5	44.7		24	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
27.00	UDS							0.0	60.1	26.5	13.4	25	NP	NP	17.01	1.96	1.68	2.68	F	0.05	32	-	-	-	-	-	-	-	-
27.50	SPT/DS		29	47	50/07cm	100	36	-																					
28.50	SPT/DS		27	48	50/06cm	100	36	11.5	15.1	47.3	26.0	26	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
30.00	UDS							8.7	20.0	46.1	25.2	29	NP	NP	23.73	2.09	1.69	2.66	F	0.01	32	-	-	-	-	-	-	-	-
30.50	SPT/DS		30	49	50/06cm	100	35	-																					

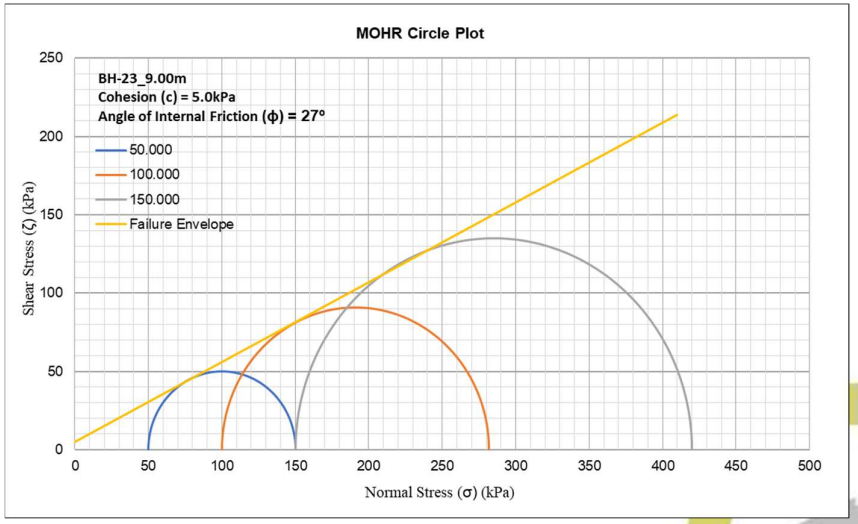
Notations: UDS = Undisturbed Sample, DS = Disturbed Sample, RC = Rock Core, F = Fast, NP = Non-Plastic, S = Slow, UU = Unconsolidated Undrained Tri-axial compression Test.

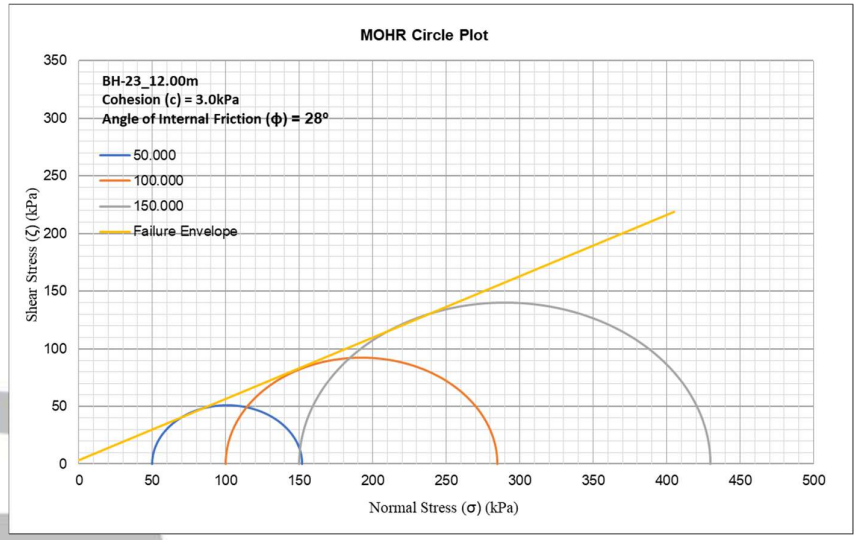

Grain Size Distribution Curve
BH-23_0m
BH-23_1.5m
BH-23_3m
BH-23_4.5m
BH-23_6m
BH-23_7.5m
BH-23_9m
Percent Finer (%)
Particle Size (mm)

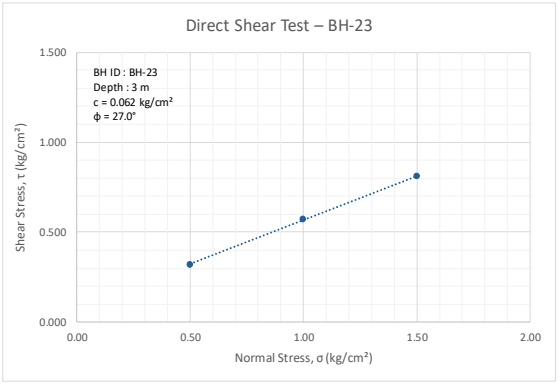

Grain Size Distribution Curve
BH-23_9.5m
BH-23_10.5m
BH-23_12m
BH-23_12.5m
BH-23_13.5m
BH-23_15m
BH-23_16.5m
Percent Finer (%)
Particle Size (mm)

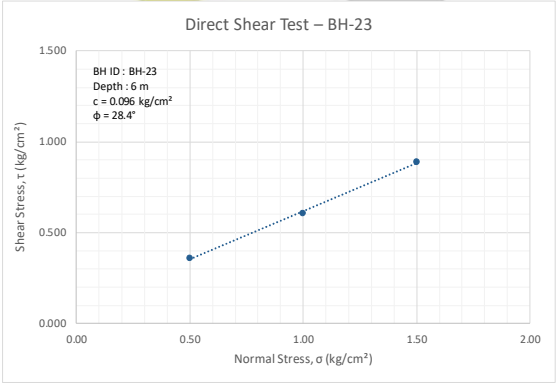

Grain Size Distribution Curve
BH-23_18m
BH-23_19.5m
BH-23_21m
BH-23_22.5m
BH-23_24m
BH-23_25.5m
BH-23_27m
Percent Finer (%)
Particle Size (mm)

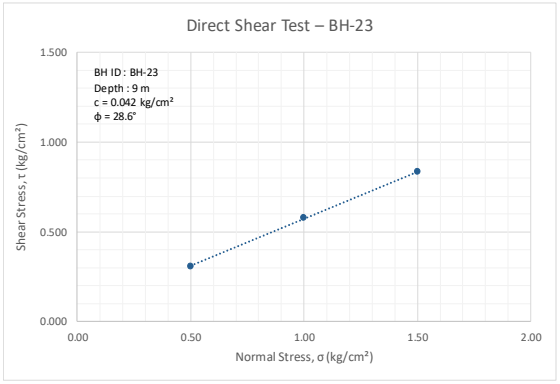

Grain Size Distribution Curve
BH-23_28.5m
BH-23_30m
Percent Finer (%)
Particle Size (mm)

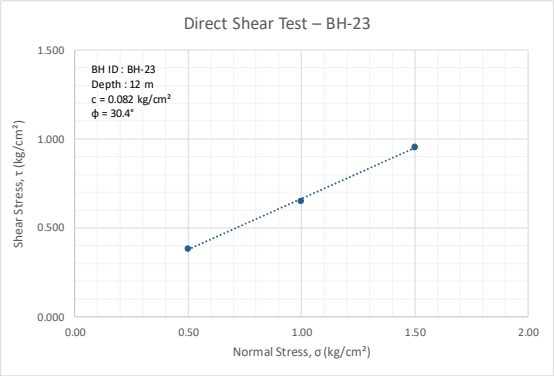

MOHR Circle Plot
BH-23_9.00m
Cohesion (c) = 5.0kPa
Angle of Internal Friction (ϕ) = 27°
50.000
100.000
150.000
Failure Envelope
Shear Stress (ζ) (kPa)
Normal Stress (σ) (kPa)

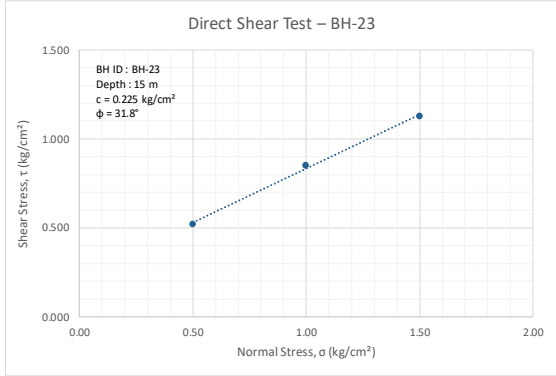

MOHR Circle Plot
BH-23_12.00m
Cohesion (c) = 3.0kPa
Angle of Internal Friction (ϕ) = 28°
50.000
100.000
150.000
Failure Envelope
Shear Stress (ζ) (kPa)
Normal Stress (σ) (kPa)

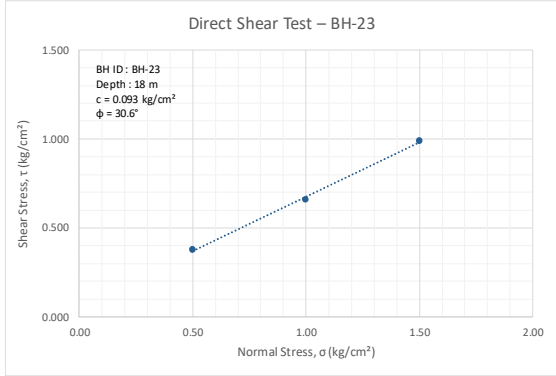

Direct Shear Test – BH-23
BH ID : BH-23
Depth : 3 m
c = 0.062 kg/cm²
ϕ = 27.0°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)

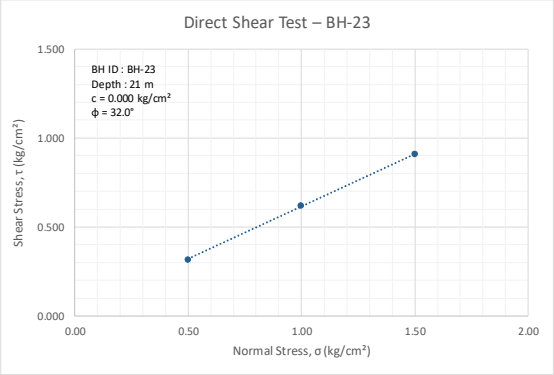

Direct Shear Test – BH-23
BH ID : BH-23
Depth : 6 m
c = 0.096 kg/cm²
ϕ = 28.4°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)

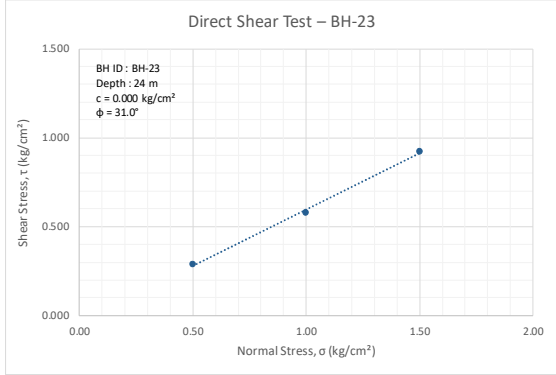

Direct Shear Test – BH-23
BH ID : BH-23
Depth : 9 m
c = 0.042 kg/cm²
ϕ = 28.6°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)

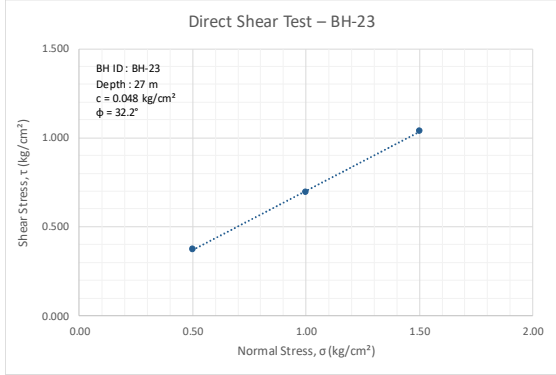

Direct Shear Test – BH-23
BH ID : BH-23
Depth : 12 m
c = 0.082 kg/cm²
ϕ = 30.4°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
1.500
1.000
0.500
0.000
0.00
0.50
1.00
1.50
2.00

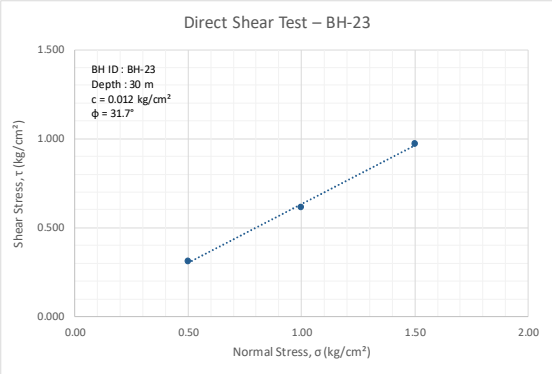

Direct Shear Test – BH-23
BH ID : BH-23
Depth : 15 m
c = 0.225 kg/cm²
ϕ = 31.8°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
1.500
1.000
0.500
0.000
0.00
0.50
1.00
1.50
2.00


Direct Shear Test – BH-23
BH ID : BH-23
Depth : 18 m
c = 0.093 kg/cm²
ϕ = 30.6°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
1.500
1.000
0.500
0.000
0.00
0.50
1.00
1.50
2.00


Direct Shear Test – BH-23
BH ID : BH-23
Depth : 21 m
c = 0.000 kg/cm²
ϕ = 32.0°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
1.500
1.000
0.500
0.000
0.00
0.50
1.00
1.50
2.00


Direct Shear Test – BH-23
BH ID : BH-23
Depth : 24 m
c = 0.000 kg/cm²
ϕ = 31.0°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
1.500
1.000
0.500
0.000
0.00
0.50
1.00
1.50
2.00

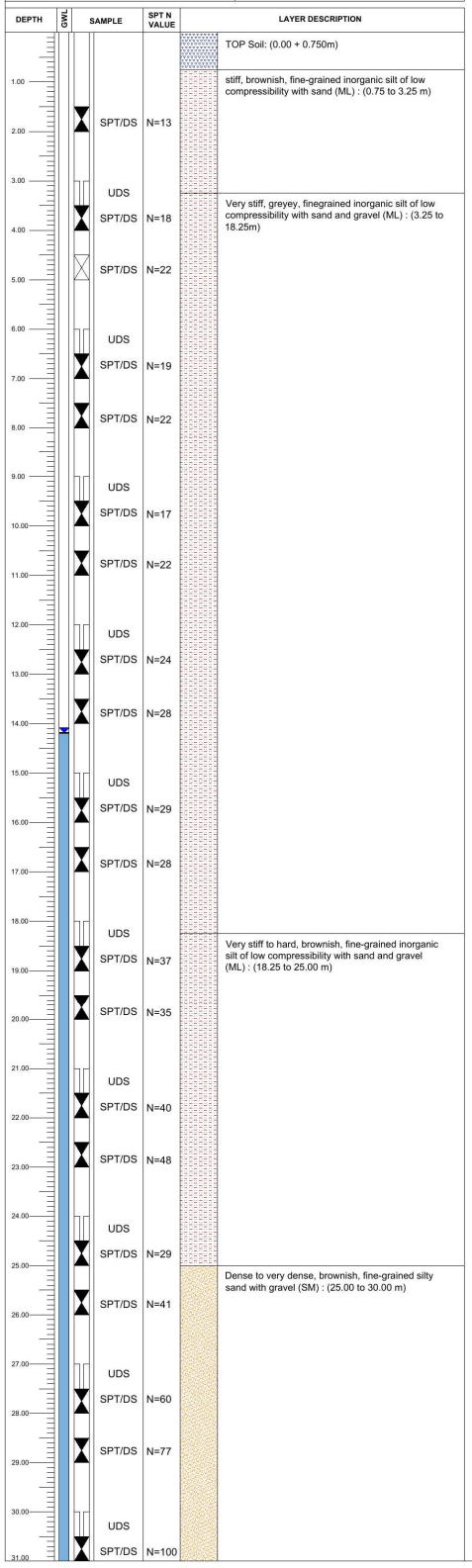

Direct Shear Test – BH-23
BH ID : BH-23
Depth : 27 m
c = 0.048 kg/cm²
ϕ = 32.2°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
1.500
1.000
0.500
0.000
0.00
0.50
1.00
1.50
2.00


Direct Shear Test – BH-23
BH ID : BH-23
Depth : 30 m
c = 0.012 kg/cm²
ϕ = 31.7°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
1.500
1.000
0.500
0.000
0.00
0.50
1.00
1.50
2.00

NAME OF WORK: GEOTECHNICAL INVESTIGATION WORK FOR PROPOSED EXTENSION METRO CORRIDORS OF AQUA LINE FROM NOIDA SECTOR-142 TO BOTANICAL GARDEN AND DEPOT STATION TO BORAKI MMTH (14.16 KM)

Stretch: Depot Station to Boraki MMTH (CH 0+000 km to 2+600 km)

BH ID : BH-23A	**Chainage** : - 2+257
Groundwater Level : 14.20 M	**Location** : Lat. 28.5065980 Long. 77.5609360



LEGENDS

Sample Type

- Split Spoon Sampler
- Shelby Tube (UDS)

General

- Groundwater Level

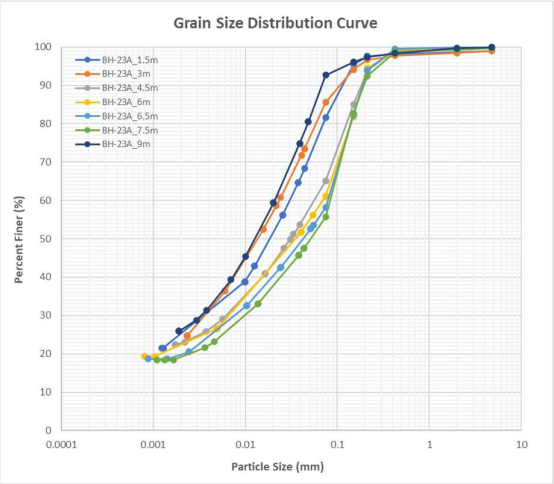
Soil

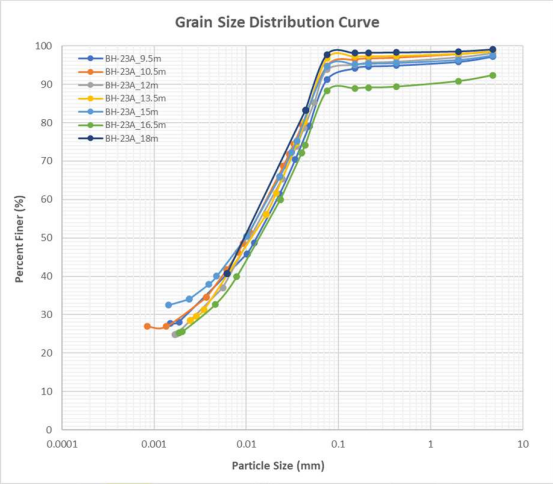
- Well Graded Gravel (GW)
- Poorly Graded Gravel (GP)
- Silty Gravel (GM)
- Clayey Gravel (GC)
- Well Graded Sand (SW)
- Poorly Graded Sand (SP)
- Silty Sand (SM)
- Clayey Sand (SC)
- Inorganic Silt of Low Compressibility (ML)
- Inorganic Silt of Intermediate Compressibility (MI)
- Inorganic Silt of High Compressibility (MH)
- Inorganic Clay of Low Compressibility (CL)
- Inorganic Clay of Intermediate Compressibility (CI)
- Inorganic Clay of High Compressibility (CH)
- Organic Soil of Low Compressibility (OL)
- Organic Soil of Intermediate Compressibility OI)
- Organic Soil of High Compressibility (OH)
- Peat (Pt)
- Top Soil (TS)

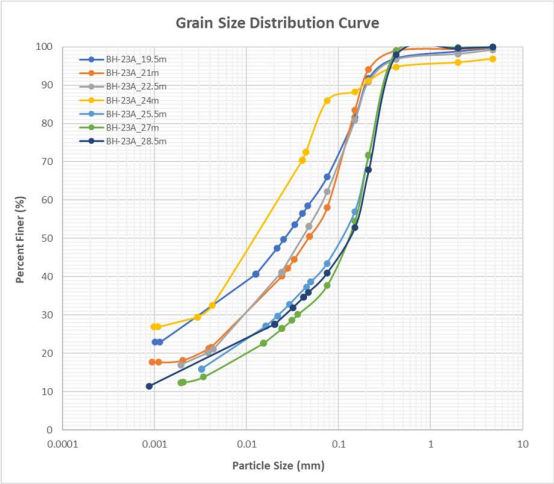
Project		Borehole Details		Drilling Details	
Name of Work:	Geotechnical Investigation work for Proposed Extension Metro Corridors of Aqua Line from Noida Sector-142 to Botanical Garden and Depot Station to Boraki MMTH (14.16 km).	**BH ID:**	BH-23A	**Contractor:**	Goma Engineering & Consultancy
		Chainage [km]:	2+257	**Method of Drilling:**	Rotary Drilling
Client:	Noida Metro Rail Corporation (NMRC) Limited	**Depth [m]:**	30.00	**Start Date:**	02-12-2025
Stretch:	Depot Station to Boraki MMTH	**Elevation [m]:**	206.94	**End Date:**	03-12-2025
Project Code:	158_R3_DEST TO BOMM_2+000 km TO 2+600 km	**Water table Level [m]:**	14.20	**Location:**	**Lat:** 28.5065980 **Long:** 77.5609360

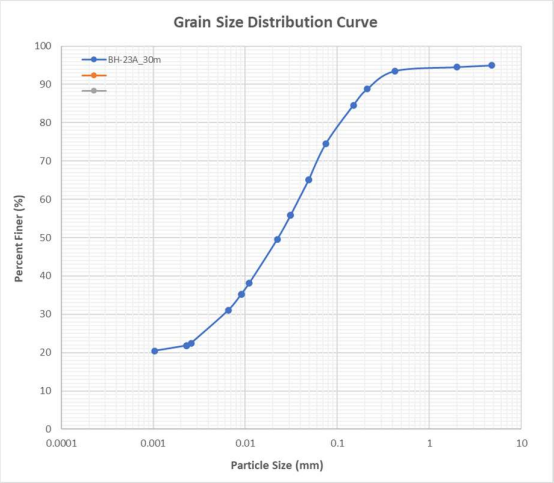
Depth [m]	Sample Type	Descriptions	SPT Test Results					Soil Particles				Atterberg Limits			Physical Characteristics				Direct Shear Test			Triaxial Comp Test			Consolidation Test				
			N1 (Seating Drive)	N2 (First Drive)	N3 (Second Drive)	Observed SPT	N (Correct N)	Gravel [%]	Sand [%]	Silt [%]	Clay [%]	Liquid Limit [%]	Plastic Limit [%]	Plasticity Index [%]	Moisture Content [%]	Bulk Density [gm/cm^3]	Dry Density [gm/cm^3]	Specific Gravity	Type	Cohesion [kg/cm^2]	Angle of Friction [°]	Type	Cohesion [kPa]	Angle of Friction [°]	Compression Index (Cc)	Coefficient of Volume Compressibility (Mv) [cm^2/kg]	Coefficient of Consolidation (Cv) [cm^2/sec]	Over Consolidation Ratio (OCR)	Preconsolidation Pressure [kg/cm^2]
0.00	DS	Top Soil	-	-	-	-	-	1.0	17.5	81.5		35	17	18	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1.50	SPT/DS	stiff, brownish, fine-grained inorganic silt of low compressibility with sand (ML)	4	6	7	13	18	1.0	17.5	56.2	25.3	27	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
3.00	UDS							1.0	13.5	64.3	21.2	26	NP	NP	20.57	1.67	1.38	2.56	F	0.11	30	-	-	-	-	-	-	-	-	-
3.50	SPT/DS	Very stiff, greyey, finegrained inorganic silt of low compressibility with sand and gravel (ML)	5	8	10	18	20	-																					
4.50	SPT/DS		7	9	13	22	22	0.1	34.9	42.3	22.8	25	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
6.00	UDS							0.2	38.7	38.8	22.4	28	NP	NP	26.09	2.27	1.75	2.59	F	0.11	26	UU	17	21	-	-	-	-	-	-
6.50	SPT/DS		4	8	11	19	18	0.0	41.9	38.3	19.8	27	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
7.50	SPT/DS		5	10	12	22	20	0.3	44.0	36.5	19.2	26	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
9.00	UDS							0.1	7.3	66.5	26.2	23	NP	NP	20.13	1.91	1.59	2.60	F	0.16	25	UU	15	23	0.099	-	0.0011	0.866	1.33	
9.50	SPT/DS		3	7	10	17	15	2.8	5.9	62.4	28.9	29	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
10.50	SPT/DS		5	9	13	22	18	1.4	3.7	64.9	29.9	25	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
12.00	DS							1.9	4.3	67.5	26.3	27	NP	NP	22.61	-	-	2.58	F	0.06	29	-	-	-	-	-	-	-	-	-
12.50	SPT/DS		8	10	14	24	18	-																						
13.50	SPT/DS		7	12	16	28	18	1.3	1.8	78.1	18.5	24	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
15.00	DS							2.5	2.9	61.1	33.5	26	NP	NP	25.35	-	-	2.58	F	0.05	29	-	-	-	-	-	-	-	-	-
15.50	SPT/DS		5	14	15	29	18	-																						
16.50	SPT/DS		6	11	17	28	17	7.6	4.0	62.8	25.5	22	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
18.00	DS							0.9	1.3	72.2	25.6	25	NP	NP	30.42	-	-	2.40	F	0.00	37	-	-	-	-	-	-	-	-	-
18.50	SPT/DS	Very stiff to hard, brownish, fine-grained inorganic silt of low compressibility with sand and gravel (ML)	11	16	21	37	20	-																						
19.50	SPT/DS		11	16	19	35	19	0.3	33.6	39.1	27.0	27	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
21.00	DS							0.2	41.8	39.9	18.1	28	NP	NP	25.02	-	-	2.42	F	0.02	29	-	-	-	-	-	-	-	-	-
21.50	SPT/DS		13	18	22	40	20	-																						
22.50	SPT/DS		12	23	25	48	22	0.8	37.1	45.0	17.2	25	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
24.00	UDS							3.1	10.9	57.5	28.5	27	NP	NP	25.30	1.92	1.53	2.62	F	0.00	32	-	-	-	-	-	-	-	-	-
24.50	SPT/DS		6	13	16	29	16	-																						
25.50	SPT/DS	Dense to very dense, brownish, fine-grained silty sand with gravel (SM)	8	17	24	41	20	0.1	56.4	31.3	12.2	27	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
27.00	DS							0.0	62.2	25.4	12.3	25	NP	NP	23.33	-	-	2.44	F	0.00	31	-	-	-	-	-	-	-	-	-
27.50	SPT/DS		14	25	35	60	25	-																						
28.50	SPT/DS		18	34	43	77	29	0.0	59.0	25.3	15.7	24	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
30.00	DS							5.1	21.0	52.9	21.6	29	NP	NP	17.25	-	-	2.59	-	-	-	-	-	-	-	-	-	-	-	-
30.50	SPT/DS		16	43	50/7cm	100	35	-																						

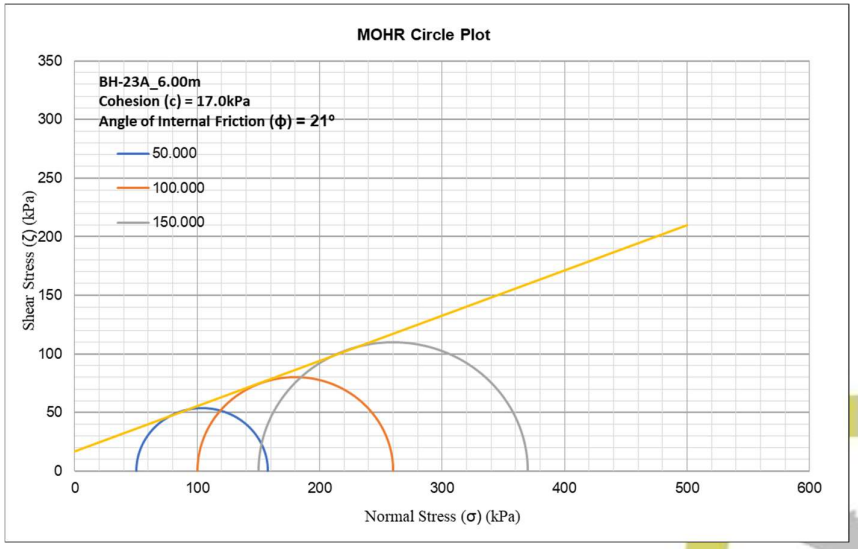
Notations: UDS = Undisturbed Sample, DS = Disturbed Sample, RC = Rock Core, F = Fast, NP = Non-Plastic, S = Slow, UU = Unconsolidated Undrained Tri-axial compression Test.

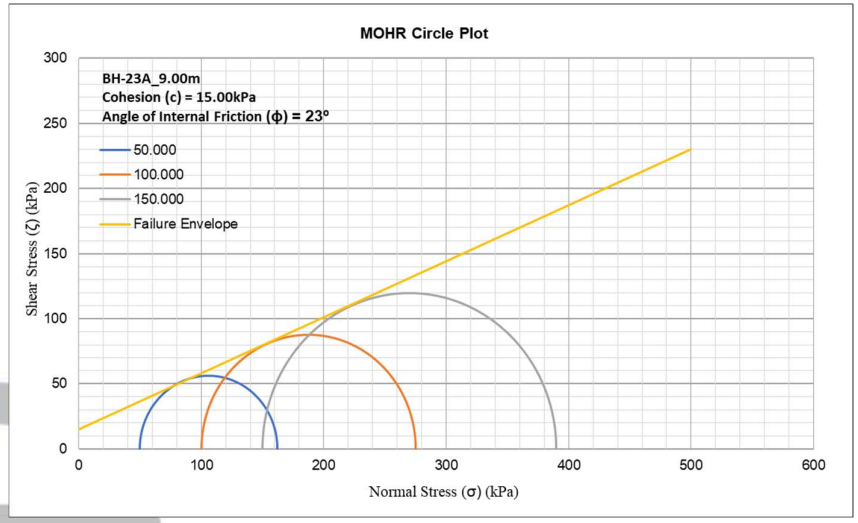

Grain Size Distribution Curve
BH-23A_1.5m
BH-23A_3m
BH-23A_4.5m
BH-23A_6m
BH-23A_6.5m
BH-23A_7.5m
BH-23A_9m
Percent Finer (%)
Particle Size (mm)

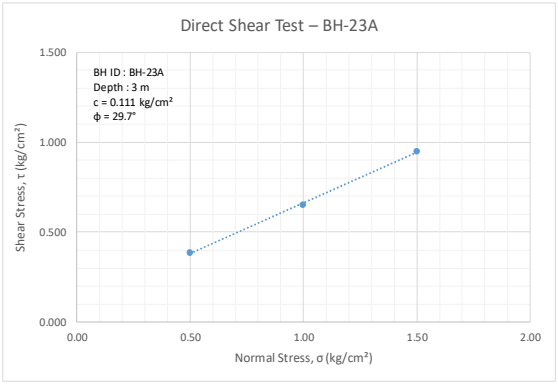

Grain Size Distribution Curve
BH-23A_9.5m
BH-23A_10.5m
BH-23A_12m
BH-23A_13.5m
BH-23A_15m
BH-23A_16.5m
BH-23A_18m
Percent Finer (%)
Particle Size (mm)

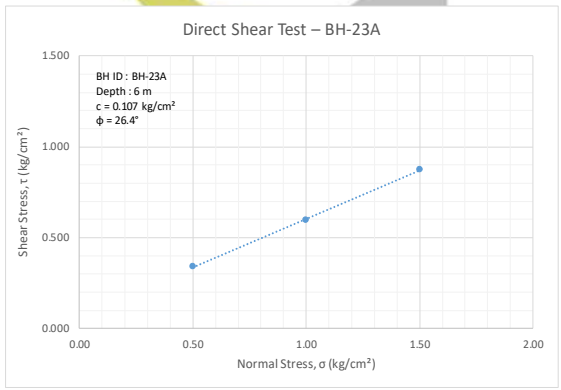

Grain Size Distribution Curve
BH-23A_19.5m
BH-23A_21m
BH-23A_22.5m
BH-23A_24m
BH-23A_25.5m
BH-23A_27m
BH-23A_28.5m
Percent Finer (%)
Particle Size (mm)

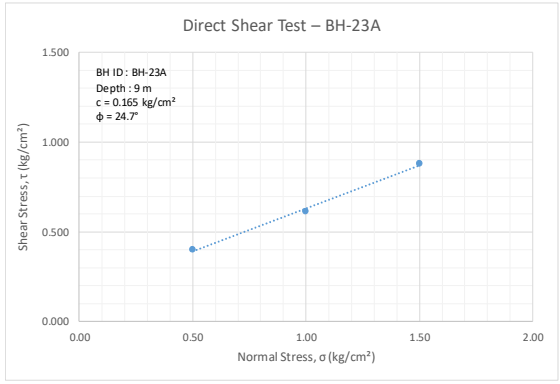

Grain Size Distribution Curve
BH-23A_30m
Percent Finer (%)
Particle Size (mm)

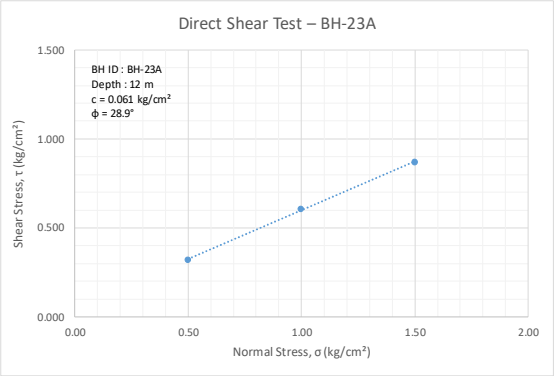

MOHR Circle Plot
BH-23A_6.00m
Cohesion (c) = 17.0kPa
Angle of Internal Friction (ϕ) = 21°
50.000
100.000
150.000
Shear Stress (ζ) (kPa)
Normal Stress (σ) (kPa)

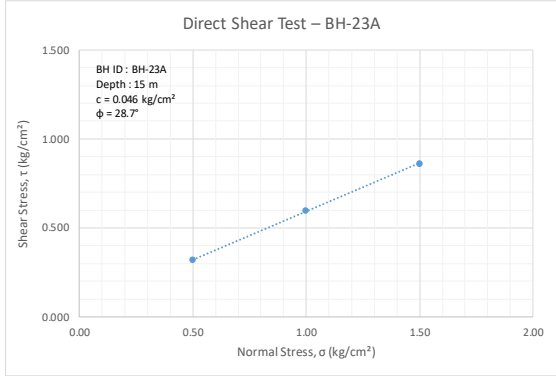

MOHR Circle Plot
BH-23A_9.00m
Cohesion (c) = 15.00kPa
Angle of Internal Friction (ϕ) = 23°
50.000
100.000
150.000
Failure Envelope
Shear Stress (ζ) (kPa)
Normal Stress (σ) (kPa)

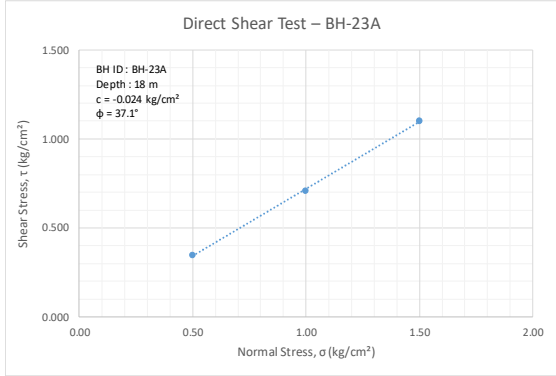

Direct Shear Test – BH-23A
BH ID : BH-23A
Depth : 3 m
c = 0.111 kg/cm²
ϕ = 29.7°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)

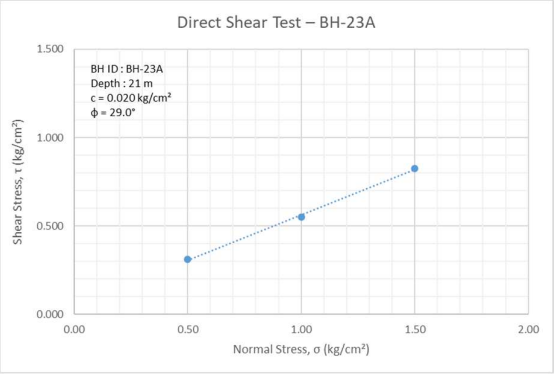

Direct Shear Test – BH-23A
BH ID : BH-23A
Depth : 6 m
c = 0.107 kg/cm²
ϕ = 26.4°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)

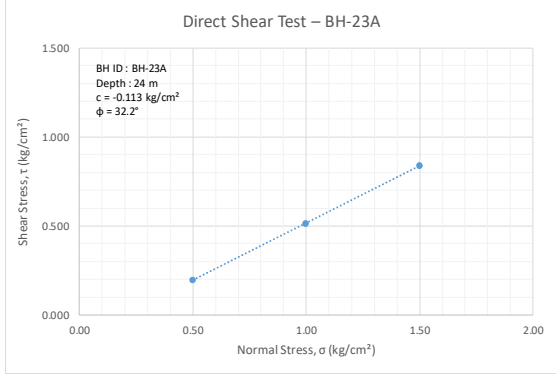

Direct Shear Test – BH-23A
BH ID : BH-23A
Depth : 9 m
c = 0.165 kg/cm²
ϕ = 24.7°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)

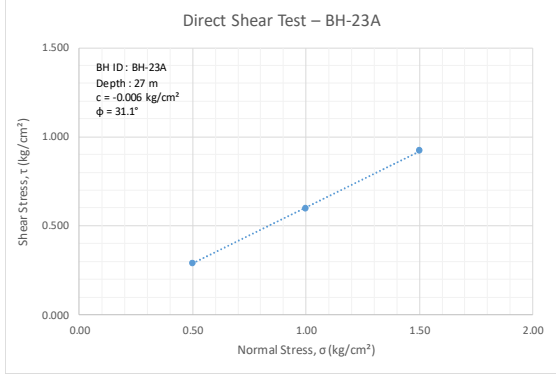

Direct Shear Test – BH-23A
BH ID : BH-23A
Depth : 12 m
c = 0.061 kg/cm²
ϕ = 28.9°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)


Direct Shear Test – BH-23A
BH ID : BH-23A
Depth : 15 m
c = 0.046 kg/cm²
ϕ = 28.7°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)


Direct Shear Test – BH-23A
BH ID : BH-23A
Depth : 18 m
c = -0.024 kg/cm²
ϕ = 37.1°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)


Direct Shear Test – BH-23A
BH ID : BH-23A
Depth : 21 m
c = 0.020 kg/cm²
ϕ = 29.0°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)

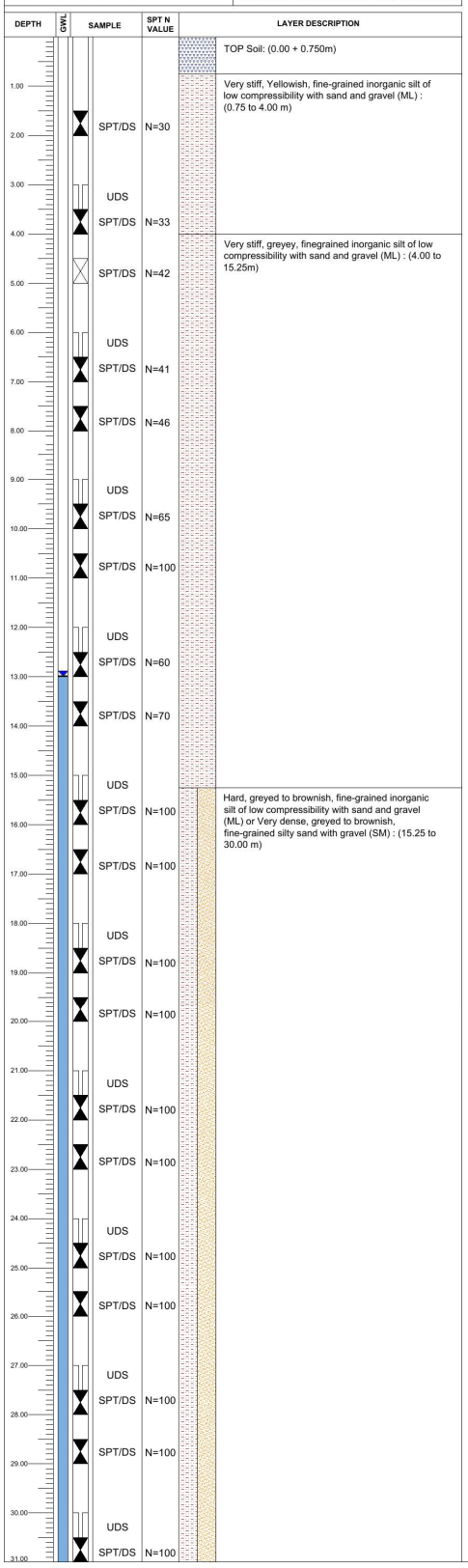

Direct Shear Test – BH-23A
BH ID : BH-23A
Depth : 24 m
c = -0.113 kg/cm²
ϕ = 32.2°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)


Direct Shear Test – BH-23A
BH ID : BH-23A
Depth : 27 m
c = -0.006 kg/cm²
ϕ = 31.1°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)

NAME OF WORK: GEOTECHNICAL INVESTIGATION WORK FOR PROPOSED EXTENSION METRO CORRIDORS OF AQUA LINE FROM NOIDA SECTOR-142 TO BOTANICAL GARDEN AND DEPOT STATION TO BORAKI MMTH (14.16 KM)

Stretch: Depot Station to Boraki MMTH (CH 0+000 km to 2+600 km)

BH ID : BH-23B	**Chainage** : - 2+190
Groundwater Level : 13.00 M	**Location** : Lat. 28.5060360 Long. 77.5612790



LEGENDS

Sample Type

- Split Spoon Sampler
- Shelby Tube (UDS)

General

- Groundwater Level

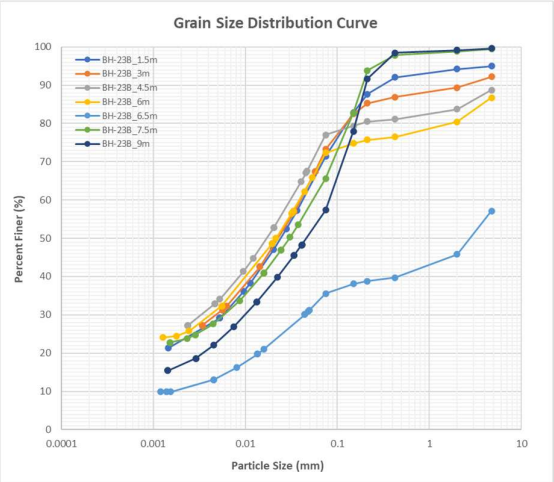
Soil

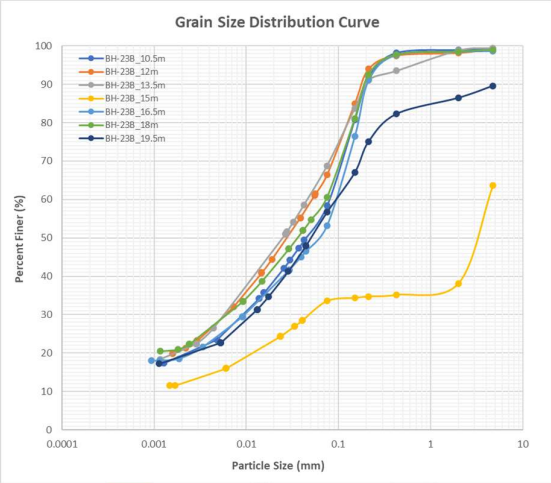
- Well Graded Gravel (GW)
- Poorly Graded Gravel (GP)
- Silty Gravel (GM)
- Clayey Gravel (GC)
- Well Graded Sand (SW)
- Poorly Graded Sand (SP)
- Silty Sand (SM)
- Clayey Sand (SC)
- Inorganic Silt of Low Compressibility (ML)
- Inorganic Silt of Intermediate Compressibility (MI)
- Inorganic Silt of High Compressibility (MH)
- Inorganic Clay of Low Compressibility (CL)
- Inorganic Clay of Intermediate Compressibility (CI)
- Inorganic Clay of High Compressibility (CH)
- Organic Soil of Low Compressibility (OL)
- Organic Soil of Intermediate Compressibility OI)
- Organic Soil of High Compressibility (OH)
- Peat (Pt)
- Top Soil (TS)

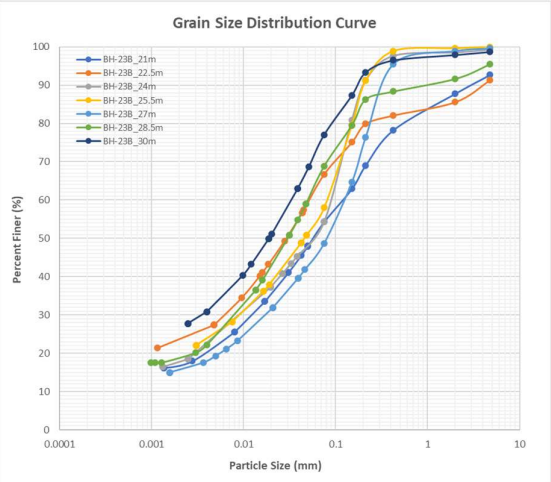
Project		Borehole Details		Drilling Details	
Name of Work:	Geotechnical Investigation work for Proposed Extension Metro Corridors of Aqua Line from Noida Sector-142 to Botanical Garden and Depot Station to Boraki MMTH (14.16 km).	**BH ID:**	BH-23B	**Contractor:**	Goma Engineering & Consultancy
		Chainage [km]:	2+190	**Method of Drilling:**	Rotary Drilling
Client:	Noida Metro Rail Corporation (NMRC) Limited	**Depth [m]:**	30.00	**Start Date:**	02-12-2025
Stretch:	Depot Station to Boraki MMTH	**Elevation [m]:**	206.28	**End Date:**	05-12-2025
Project Code:	158_R3_DEST TO BOMM_2+000 km TO 2+600 km	**Water table Level [m]:**	13.00	**Location:**	**Lat:** 28.5060360 **Long:** 77.5612790

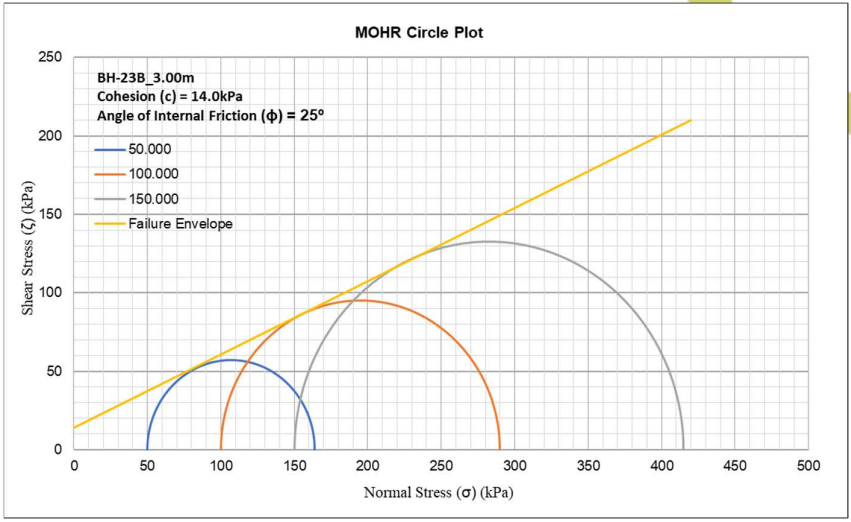
Depth [m]	Sample Type	Descriptions	SPT Test Results					Soil Particles				Atterberg Limits			Physical Characteristics				Direct Shear Test			Triaxial Comp Test			Consolidation Test				
			N1 (Seating Drive)	N2 (First Drive)	N3 (Second Drive)	Observed SPT	N (Correct N)	Gravel [%]	Sand [%]	Silt [%]	Clay [%]	Liquid Limit [%]	Plastic Limit [%]	Plasticity Index [%]	Moisture Content [%]	Bulk Density [gm/cm^3]	Dry Density [gm/cm^3]	Specific Gravity	Type	Cohesion [kg/cm^2]	Angle of Friction [°]	Type	Cohesion [kPa]	Angle of Friction [°]	Compression Index (Cc)	Coefficient of Volume Compressibility (Mv) [cm^2/kg]	Coefficient of Consolidation (Cv) [cm^2/sec]	Over Consolidation Ratio (OCR)	Preconsolidation Pressure [kg/cm^2]
0.00	DS	Top Soil	-	-	-	-	-	6.6	38.4	55.0		37	18	19	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1.50	SPT/DS	Very stiff, Yellowish, fine-grained inorganic silt of low compressibility with sand and gravel (ML)	7	12	18	30	42	5.0	23.6	48.2	23.2	28	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
3.00	UDS							7.8	18.9	55.2	18.1	26	NP	NP	13.12	1.89	1.67	2.65	F	0.05	28	UU	14	25	-	-	-	-	-
3.50	SPT/DS		11	14	19	33	36	-																					
4.50	SPT/DS	Hard, yellow to brownish, fine-grained inorganic silt of low compressibility with sand and gravel (ML) or Dense to very dense, yellow to brownish, fine-grained silty sand with gravel (SM)	15	20	22	42	43	11.2	11.8	58.1	18.9	26	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
6.00	UDS							13.3	14.4	47.4	24.9	25	NP	NP	10.73	1.98	1.79	2.64	F	0.06	30	UU	16	23	0.096	-	0.0011	0.80	1.22
6.50	SPT/DS		10	18	23	41	39	42.9	21.6	24.9	10.7	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
7.50	SPT/DS		12	19	27	46	42	0.5	33.9	42.2	23.4	27	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
9.00	UDS							0.4	42.3	40.4	16.9	29	NP	NP	25.59	1.91	1.52	2.59	F	0.00	31	-	-	-	-	-	-	-	-
9.50	SPT/DS		22	28	37	65	55	-																					
10.50	SPT/DS		38	42	50/10cm	100	82	0.8	40.9	38.9	19.5	24	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
12.00	DS							0.8	32.7	45.6	20.9	27	NP	NP	24.18	-	-	2.63	F	0.07	32	-	-	-	-	-	-	-	-
12.50	SPT/DS		25	28	32	60	45	-																					
13.50	SPT/DS		22	32	38	70	33	0.5	30.6	48.1	20.8	26	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
15.00	DS							36.3	30.1	21.4	12.2	26	NP	NP	15.12	-	-	2.66	F	0.02	31	-	-	-	-	-	-	-	-
15.50	SPT/DS	Hard, greyed to brownish, fine-grained inorganic silt of low compressibility with sand and gravel (ML) or Very dense, greyed to brownish, fine-grained silty sand with gravel (SM)	42	50/11cm	-	100	42	-																					
16.50	SPT/DS		31	35	50/05cm	100	42	1.3	45.5	34.2	18.9	25	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
18.00	DS							1.0	38.4	39.2	21.4	24	NP	NP	22.64	-	-	2.55	F	0.00	33	-	-	-	-	-	-	-	-
18.50	SPT/DS		35	36	50/04cm	100	41	-																					
19.50	SPT/DS		42	50/07cm	-	100	40	10.4	32.9	37.4	19.2	24	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
21.00	UDS							7.3	38.3	37.2	17.1	28	NP	NP	23.77	1.98	1.60	2.45	F	0.00	31	-	-	-	-	-	-	-	-
21.50	SPT/DS		44	50/11cm	-	100	39	-																					
22.50	SPT/DS		16	50/13cm	-	100	38	8.7	24.5	43.0	23.7	22	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
24.00	UDS							0.7	45.0	36.5	17.8	29	NP	NP	20.64	1.96	1.63	2.47	F	0.00	31	-	-	-	-	-	-	-	-
24.50	SPT/DS		40	42	50/12cm	100	38	-																					
25.50	SPT/DS		38	44	50/10cm	100	37	0.0	42.0	46.4	11.6	27	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
27.00	UDS							0.4	50.9	33.0	15.7	27	NP	NP	20.99	2.05	1.70	2.54	F	0.01	30	-	-	-	-	-	-	-	-
27.50	SPT/DS		35	40	50/13cm	100	36	-																					
28.50	SPT/DS		38	46	50/12cm	100	36	4.6	26.8	50.0	18.9	25	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
30.00	UDS							1.3	21.6	54.6	22.5	26	NP	NP	22.00	2.18	1.80	2.44	F	0.18	28	-	-	-	-	-	-	-	-
30.50	SPT/DS		49	50/07cm	-	100	35	-																					

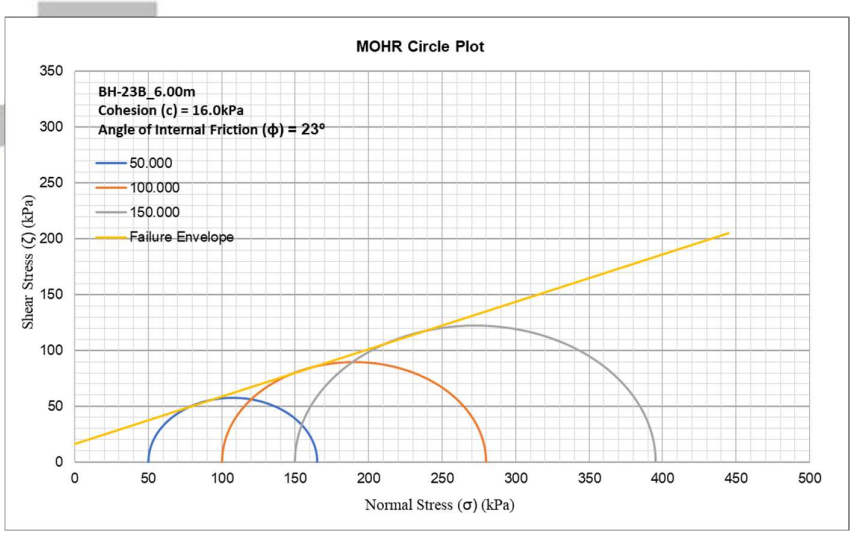
Notations: UDS = Undisturbed Sample, DS = Disturbed Sample, RC = Rock Core, F = Fast, NP = Non-Plastic, S = Slow, UU = Unconsolidated Undrained Tri-axial compression Test.

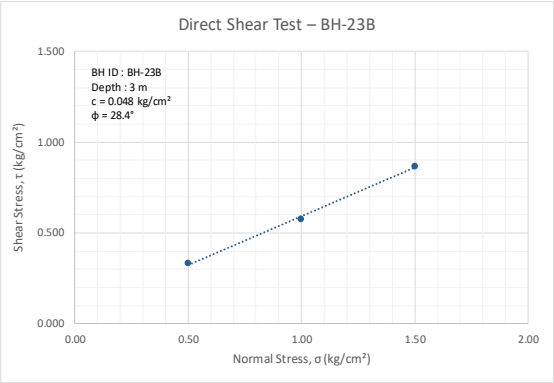

Grain Size Distribution Curve
BH-23B_1.5m
BH-23B_3m
BH-23B_4.5m
BH-23B_6m
BH-23B_6.5m
BH-23B_7.5m
BH-23B_9m
Percent Finer (%)
Particle Size (mm)

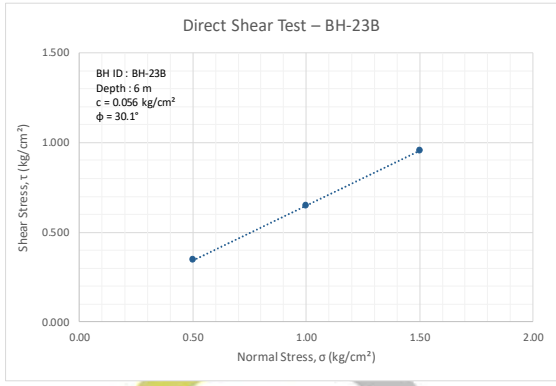

Grain Size Distribution Curve
BH-23B_10.5m
BH-23B_12m
BH-23B_13.5m
BH-23B_15m
BH-23B_16.5m
BH-23B_18m
BH-23B_19.5m
Percent Finer (%)
Particle Size (mm)

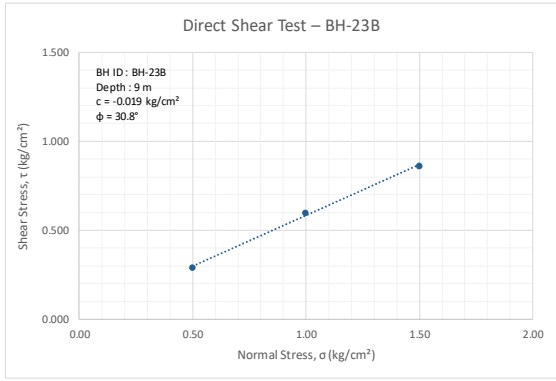

Grain Size Distribution Curve
BH-23B_21m
BH-23B_22.5m
BH-23B_24m
BH-23B_25.5m
BH-23B_27m
BH-23B_28.5m
BH-23B_30m
Percent Finer (%)
Particle Size (mm)

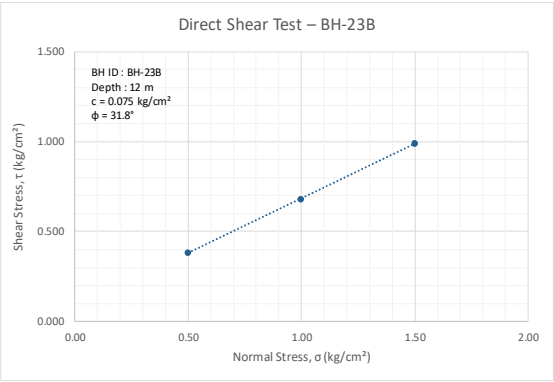

MOHR Circle Plot
BH-23B_3.00m
Cohesion (c) = 14.0kPa
Angle of Internal Friction (ϕ) = 25°
50.000
100.000
150.000
Failure Envelope
Shear Stress (ζ) (kPa)
Normal Stress (σ) (kPa)

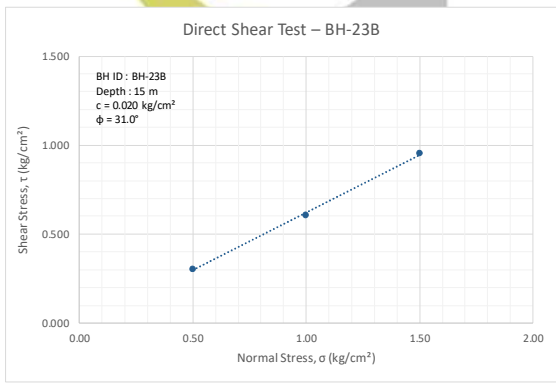

MOHR Circle Plot
BH-23B_6.00m
Cohesion (c) = 16.0kPa
Angle of Internal Friction (ϕ) = 23°
50.000
100.000
150.000
Failure Envelope
Shear Stress (ζ) (kPa)
Normal Stress (σ) (kPa)

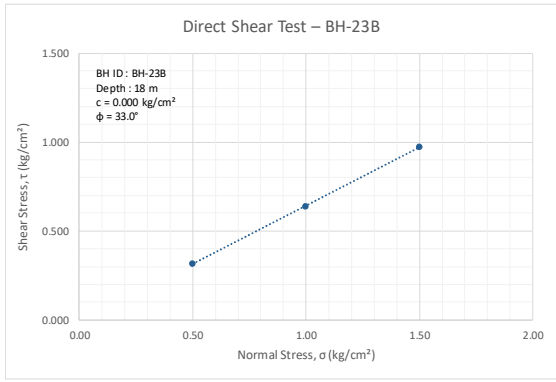

Direct Shear Test – BH-23B
BH ID : BH-23B
Depth : 3 m
c = 0.048 kg/cm²
ϕ = 28.4°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
0.000
0.500
1.000
1.500
0.00
0.50
1.00
1.50
2.00

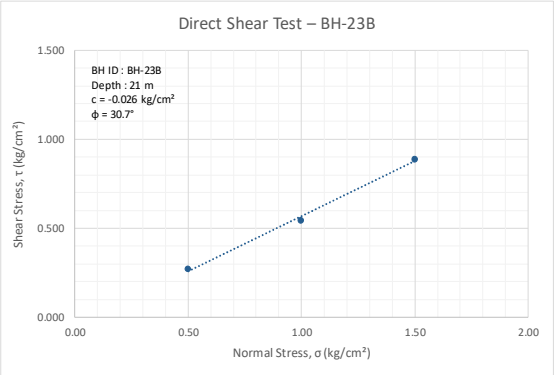

Direct Shear Test – BH-23B
BH ID : BH-23B
Depth : 6 m
c = 0.056 kg/cm²
ϕ = 30.1°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
0.000
0.500
1.000
1.500
0.00
0.50
1.00
1.50
2.00

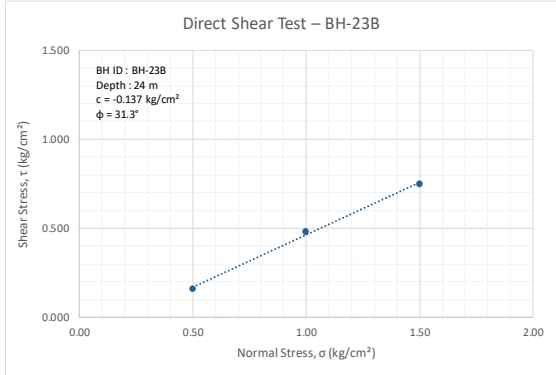

Direct Shear Test – BH-23B
BH ID : BH-23B
Depth : 9 m
c = -0.019 kg/cm²
ϕ = 30.8°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
0.000
0.500
1.000
1.500
0.00
0.50
1.00
1.50
2.00

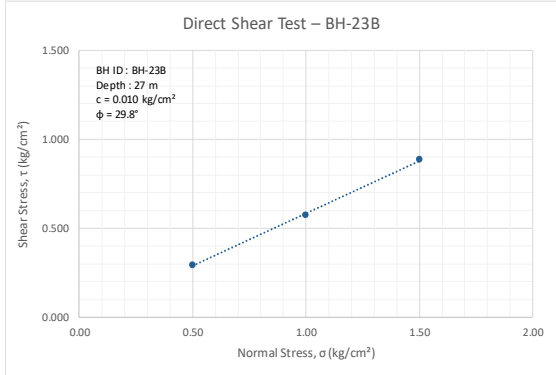

Direct Shear Test – BH-23B
BH ID : BH-23B
Depth : 12 m
c = 0.075 kg/cm²
ϕ = 31.8°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
0.000
0.500
1.000
1.500
0.00
0.50
1.00
1.50
2.00

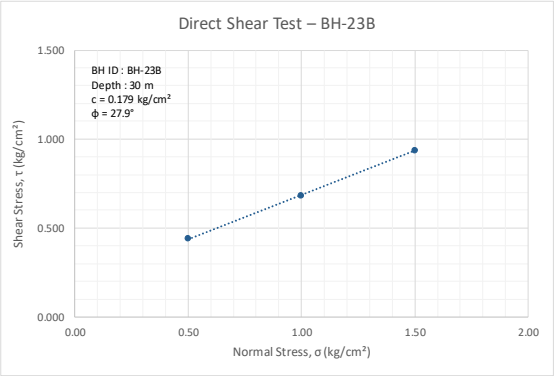

Direct Shear Test – BH-23B
BH ID : BH-23B
Depth : 15 m
c = 0.020 kg/cm²
ϕ = 31.0°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
0.000
0.500
1.000
1.500
0.00
0.50
1.00
1.50
2.00


Direct Shear Test – BH-23B
BH ID : BH-23B
Depth : 18 m
c = 0.000 kg/cm²
ϕ = 33.0°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
0.000
0.500
1.000
1.500
0.00
0.50
1.00
1.50
2.00


Direct Shear Test – BH-23B
BH ID : BH-23B
Depth : 21 m
c = -0.026 kg/cm²
ϕ = 30.7°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
1.500
1.000
0.500
0.000
0.00
0.50
1.00
1.50
2.00


Direct Shear Test – BH-23B
BH ID : BH-23B
Depth : 24 m
c = -0.137 kg/cm²
ϕ = 31.3°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
1.500
1.000
0.500
0.000
0.00
0.50
1.00
1.50
2.00


Direct Shear Test – BH-23B
BH ID : BH-23B
Depth : 27 m
c = 0.010 kg/cm²
ϕ = 29.8°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
1.500
1.000
0.500
0.000
0.00
0.50
1.00
1.50
2.00

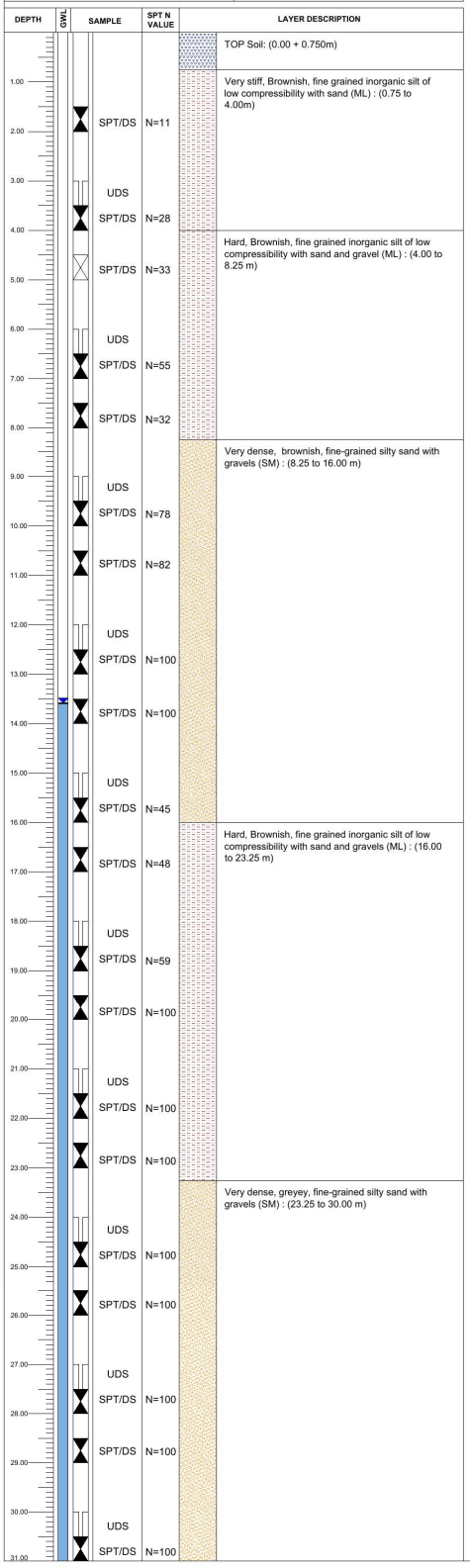

Direct Shear Test – BH-23B
BH ID : BH-23B
Depth : 30 m
c = 0.179 kg/cm²
ϕ = 27.9°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
1.500
1.000
0.500
0.000
0.00
0.50
1.00
1.50
2.00

NAME OF WORK: GEOTECHNICAL INVESTIGATION WORK FOR PROPOSED EXTENSION METRO CORRIDORS OF AQUA LINE FROM NOIDA SECTOR-142 TO BOTANICAL GARDEN AND DEPOT STATION TO BORAKI MMTH (14.16 KM)

Stretch: Depot Station to Boraki MMTH (CH 0+000 km to 2+600 km)

BH ID : BH-24 | **Chainage** : 2+338 KM

Groundwater Level : 13.60 M | **Location** : Lat. 28.5070590 Long. 77.5602030



LEGENDS

Sample Type

- Split Spoon Sampler
- Shelby Tube (UDS)

General

- Groundwater Level

Soil

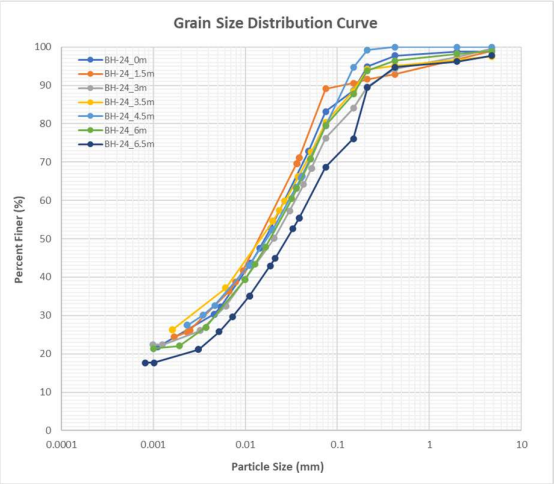
- Well Graded Gravel (GW)
- Poorly Graded Gravel (GP)
- Silty Gravel (GM)
- Clayey Gravel (GC)
- Well Graded Sand (SW)
- Poorly Graded Sand (SP)
- Silty Sand (SM)
- Clayey Sand (SC)
- Inorganic Silt of Low Compressibility (ML)
- Inorganic Silt of Intermediate Compressibility (MI)
- Inorganic Silt of High Compressibility (MH)
- Inorganic Clay of Low Compressibility (CL)
- Inorganic Clay of Intermediate Compressibility (CI)
- Inorganic Clay of High Compressibility (CH)
- Organic Soil of Low Compressibility (OL)
- Organic Soil of Intermediate Compressibility OI)
- Organic Soil of High Compressibility (OH)
- Peat (Pt)
- Top Soil (TS)

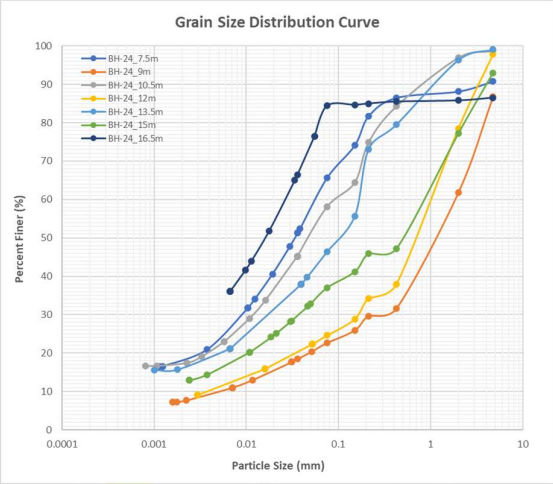
GOMA ENGINEERING AND CONSULTANCY
Quality we put forward

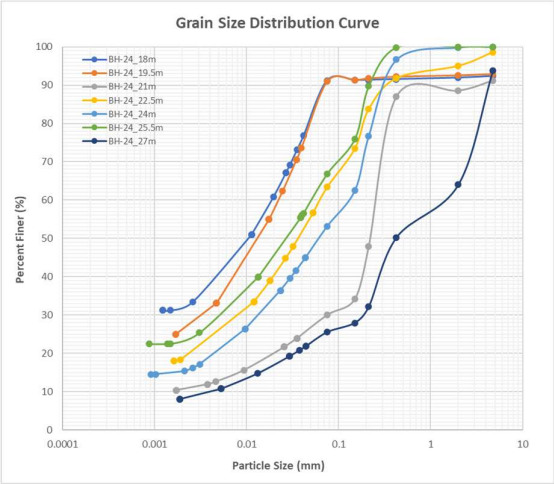
Project		Borehole Details		Drilling Details	
Name of Work:	Geotechnical Investigation work for Proposed Extension Metro Corridors of Aqua Line from Noida Sector-142 to Botanical Garden and Depot Station to Boraki MMTH (14.16 km).	**BH ID:**	BH-24	**Contractor:**	Goma Engineering & Consultancy
		Chainage [km]:	2+338	**Method of Drilling:**	Rotary Drilling
Client:	Noida Metro Rail Corporation (NMRC) Limited	**Depth [m]:**	30.00	**Start Date:**	02-12-2025
Stretch:	Depot Station to Boraki MMTH	**Elevation [m]:**	206.45	**End Date:**	03-12-2025
Project Code:	158_R3_DEST TO BOMM_2+000 km TO 2+600 km	**Water table Level [m]:**	13.60	**Location:**	**Lat:** 28.5070590 **Long:** 77.5602030

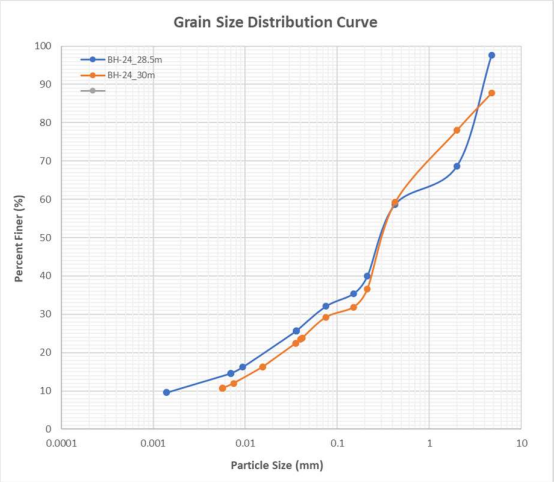
Depth [m]	Sample Type	Descriptions	SPT Test Results					Soil Particles				Atterberg Limits			Physical Characteristics				Direct Shear Test			Triaxial Comp Test			Consolidation Test				
			N1 (Seating Drive)	N2 (First Drive)	N3 (Second Drive)	Observed SPT	N (Correct N)	Gravel [%]	Sand [%]	Silt [%]	Clay [%]	Liquid Limit [%]	Plastic Limit [%]	Plasticity Index [%]	Moisture Content [%]	Bulk Density [gm/cm^3]	Dry Density [gm/cm^3]	Specific Gravity	Type	Cohesion [kg/cm^2]	Angle of Friction [°]	Type	Cohesion [kPa]	Angle of Friction [°]	Compression Index (Cc)	Coefficient of Volume Compressibility (Mv) [cm^2/kg]	Coefficient of Consolidation (Cv) [cm^2/sec]	Over Consolidation Ratio (OCR)	Preconsolidation Pressure [kg/cm^2]
0.00	DS	Top Soil	-	-	-	-	-	1.1	15.7	57.9	25.3	28	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1.50	SPT/DS	Very stiff, Brownish, fine grained inorganic silt of low compressibility with sand (ML)	5	5	6	11	15	1.1	9.8	64.1	25.1	28	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
3.00	UDS							0.5	23.3	52.0	24.2	29	NP	NP	14.80	1.82	1.59	2.65	F	0.02	28	UU	3	28	0.09	-	0.0011	0.533	0.82
3.50	SPT/DS		10	12	16	28	31	2.5	17.2	52.3	28.0	-																	
4.50	SPT/DS	Hard, Brownish, fine grained inorganic silt of low compressibility with sand and gravel (ML)	12	14	19	33	34	0.0	20.6	53.0	26.4	24	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
6.00	UDS							1.1	19.4	57.2	22.3	26	NP	NP	16.99	2.06	1.76	2.64	F	0.02	30	UU	5	27	-	-	-	-	-
6.50	SPT/DS		22	25	30	55	52	2.3	29.1	48.9	19.8	-																	
7.50	SPT/DS		8	12	20	32	29	9.2	25.1	47.2	18.5	27	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
9.00	DS	Very dense, brownish, fine-grained silty sand with gravels (SM)						13.2	64.1	15.2	7.5	25	NP	NP	11.29	-	-	2.69	F	0.01	28	-	-	-	-	-	-	-	-	-
9.50	SPT/DS		20	33	45	78	67	-																					
10.50	SPT/DS		22	34	48	82	67	1.3	40.6	40.8	17.3	26	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
12.00	DS							2.2	73.2	17.0	7.6	25	NP	NP	12.70	-	-	2.67	F	0.00	32	-	-	-	-	-	-	-	-	-
12.50	SPT/DS		35	50	50/08cm	100	75	-																					
13.50	SPT/DS		34	50/12cm	-	100	44	1.0	52.7	30.2	16.1	24	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
15.00	DS							7.0	56.0	28.7	8.3	28	NP	NP	10.10	-	-	2.46	F	0.21	22	-	-	-	-	-	-	-	-	-
15.50	SPT/DS		16	20	25	45	23	-																					
16.50	SPT/DS	Hard, Brownish, fine grained inorganic silt of low compressibility with sand and gravels (ML)	15	22	26	48	24	13.5	2.1	69.0	15.4	27	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
18.00	UDS							7.6	1.1	58.8	32.4	27	NP	NP	27.83	1.90	1.48	2.56	F	0.00	31	-	-	-	-	-	-	-	-	-
18.50	SPT/DS		18	26	33	59	27	-																					
19.50	SPT/DS		30	50/13cm	-	100	40	7.1	1.9	64.7	26.3	26	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
21.00	DS							8.8	61.2	19.3	10.7	25	NP	NP	20.35	-	-	2.58	F	0.00	32	-	-	-	-	-	-	-	-	-
21.50	SPT/DS		56	50/11cm	-	100	39	-																					
22.50	SPT/DS		44	50/10cm	-	100	38	1.4	35.3	44.6	18.7	24	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
24.00	DS	Very dense, greyey, fine-grained silty sand with gravels (SM)						0.0	46.9	37.9	15.3	26	NP	NP	26.29	-	-	2.53	F	0.03	30	-	-	-	-	-	-	-	-	-
24.50	SPT/DS		50	50/10cm	-	100	38	-																					
25.50	SPT/DS		50	50/08cm	-	100	37	0.0	33.1	43.2	23.6	26	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
27.00	DS							6.2	68.3	17.3	8.2	27	NP	NP	9.84	-	-	2.42	F	0.00	33	-	-	-	-	-	-	-	-	-
27.50	SPT/DS		16	36	50/10cm	100	36	-																					
28.50	SPT/DS		28	50/10cm	-	100	36	2.4	65.5	21.4	10.7	25	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
30.00	DS							12.3	58.5	29.2		28	NP	NP	13.47	-	-	2.69	F	0.00	34	-	-	-	-	-	-	-	-	-
30.50	SPT/DS		35	50/08cm	-	100	35	-																					

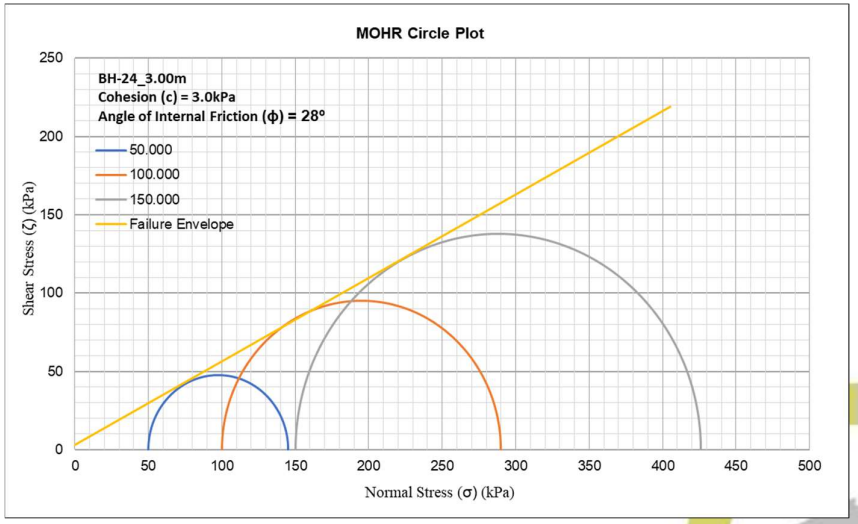
Notations: UDS = Undisturbed Sample, DS = Disturbed Sample, RC = Rock Core, F = Fast, NP = Non-Plastic, S = Slow, UU = Unconsolidated Undrained Tri-axial compression Test.

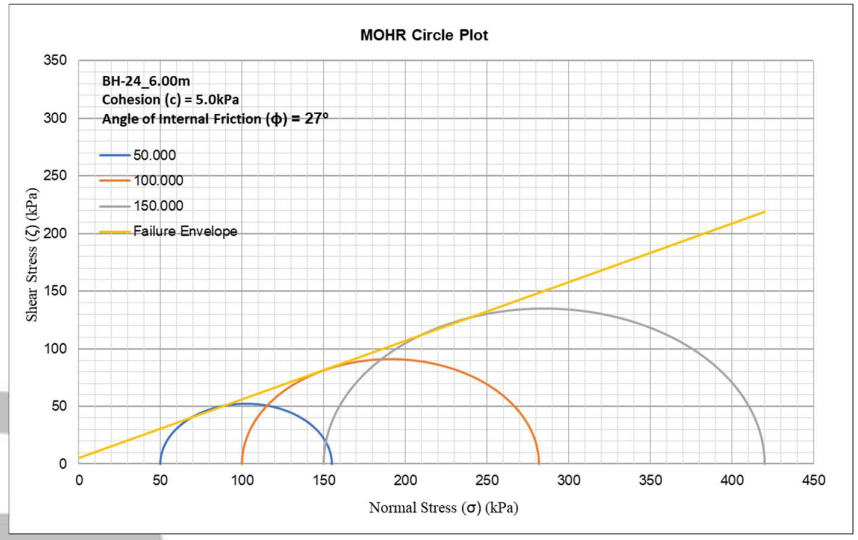

Grain Size Distribution Curve
BH-24_0m
BH-24_1.5m
BH-24_3m
BH-24_3.5m
BH-24_4.5m
BH-24_6m
BH-24_6.5m
Percent Finer (%)
Particle Size (mm)

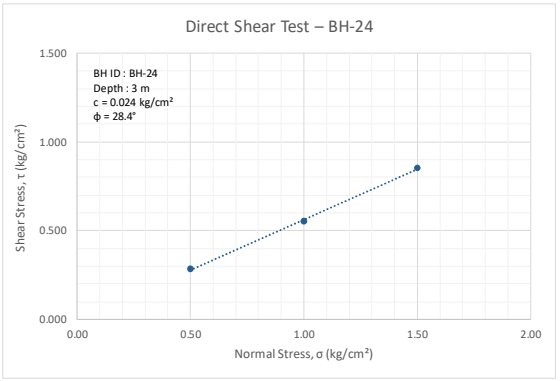

Grain Size Distribution Curve
BH-24_7.5m
BH-24_9m
BH-24_10.5m
BH-24_12m
BH-24_13.5m
BH-24_15m
BH-24_16.5m
Percent Finer (%)
Particle Size (mm)

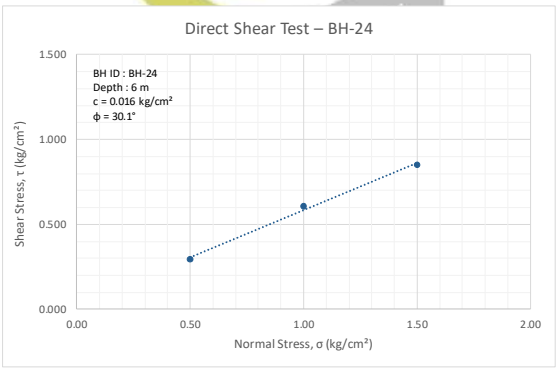

Grain Size Distribution Curve
BH-24_18m
BH-24_19.5m
BH-24_21m
BH-24_22.5m
BH-24_24m
BH-24_25.5m
BH-24_27m
Percent Finer (%)
Particle Size (mm)

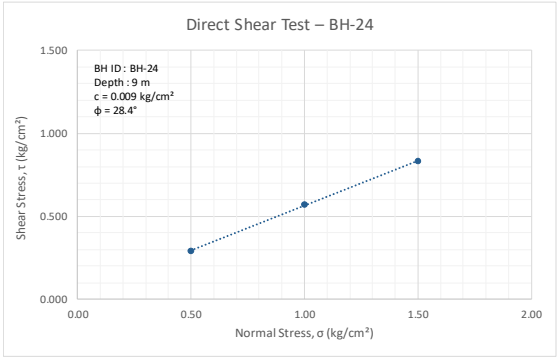

Grain Size Distribution Curve
BH-24_28.5m
BH-24_30m
Percent Finer (%)
Particle Size (mm)

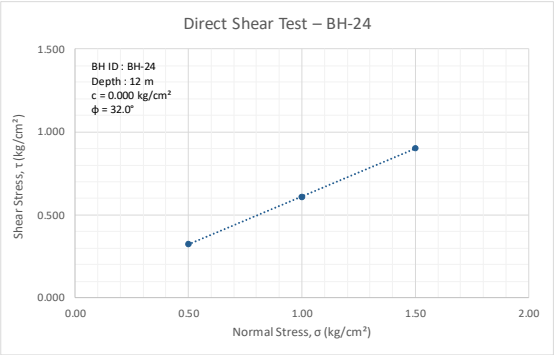

MOHR Circle Plot
BH-24_3.00m
Cohesion (c) = 3.0kPa
Angle of Internal Friction (ϕ) = 28°
50.000
100.000
150.000
Failure Envelope
Shear Stress (ζ) (kPa)
Normal Stress (σ) (kPa)

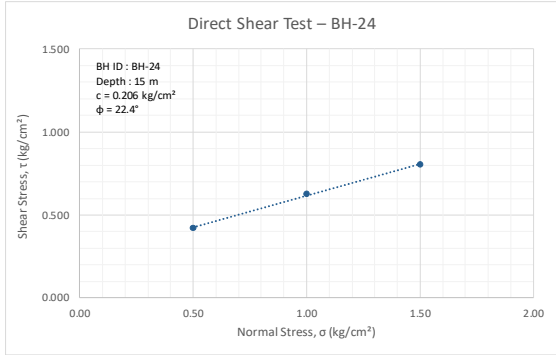

MOHR Circle Plot
BH-24_6.00m
Cohesion (c) = 5.0kPa
Angle of Internal Friction (ϕ) = 27°
50.000
100.000
150.000
Failure Envelope
Shear Stress (ζ) (kPa)
Normal Stress (σ) (kPa)

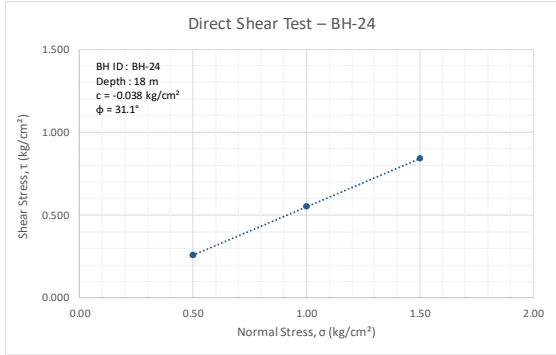

Direct Shear Test – BH-24
BH ID : BH-24
Depth : 3 m
c = 0.024 kg/cm²
ϕ = 28.4°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)

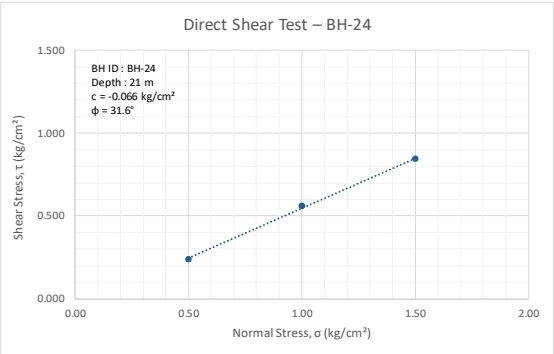

Direct Shear Test – BH-24
BH ID : BH-24
Depth : 6 m
c = 0.016 kg/cm²
ϕ = 30.1°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)

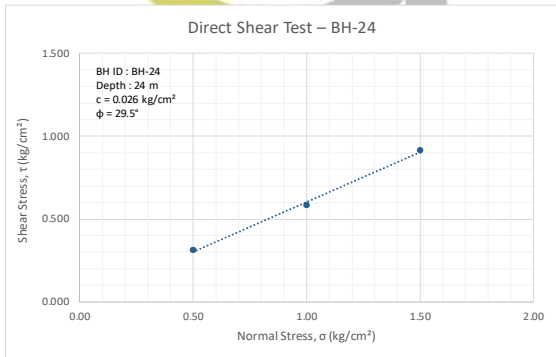

Direct Shear Test – BH-24
BH ID : BH-24
Depth : 9 m
c = 0.009 kg/cm²
ϕ = 28.4°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)

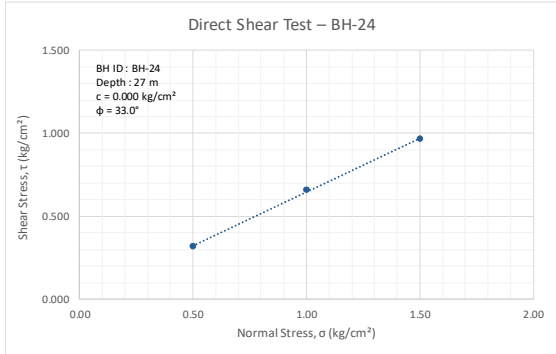

Direct Shear Test – BH-24
BH ID : BH-24
Depth : 12 m
c = 0.000 kg/cm²
ϕ = 32.0°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
1.500
1.000
0.500
0.000
0.00
0.50
1.00
1.50
2.00

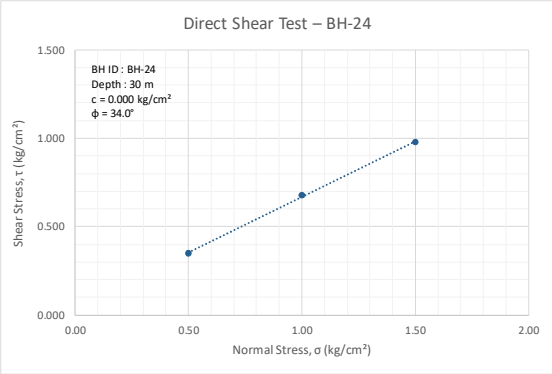

Direct Shear Test – BH-24
BH ID : BH-24
Depth : 15 m
c = 0.206 kg/cm²
ϕ = 22.4°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
1.500
1.000
0.500
0.000
0.00
0.50
1.00
1.50
2.00


Direct Shear Test – BH-24
BH ID : BH-24
Depth : 18 m
c = -0.038 kg/cm²
ϕ = 31.1°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
1.500
1.000
0.500
0.000
0.00
0.50
1.00
1.50
2.00


Direct Shear Test – BH-24
BH ID : BH-24
Depth : 21 m
c = -0.066 kg/cm²
ϕ = 31.6°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
1.500
1.000
0.500
0.000
0.00
0.50
1.00
1.50
2.00


Direct Shear Test – BH-24
BH ID : BH-24
Depth : 24 m
c = 0.026 kg/cm²
ϕ = 29.5°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
1.500
1.000
0.500
0.000
0.00
0.50
1.00
1.50
2.00

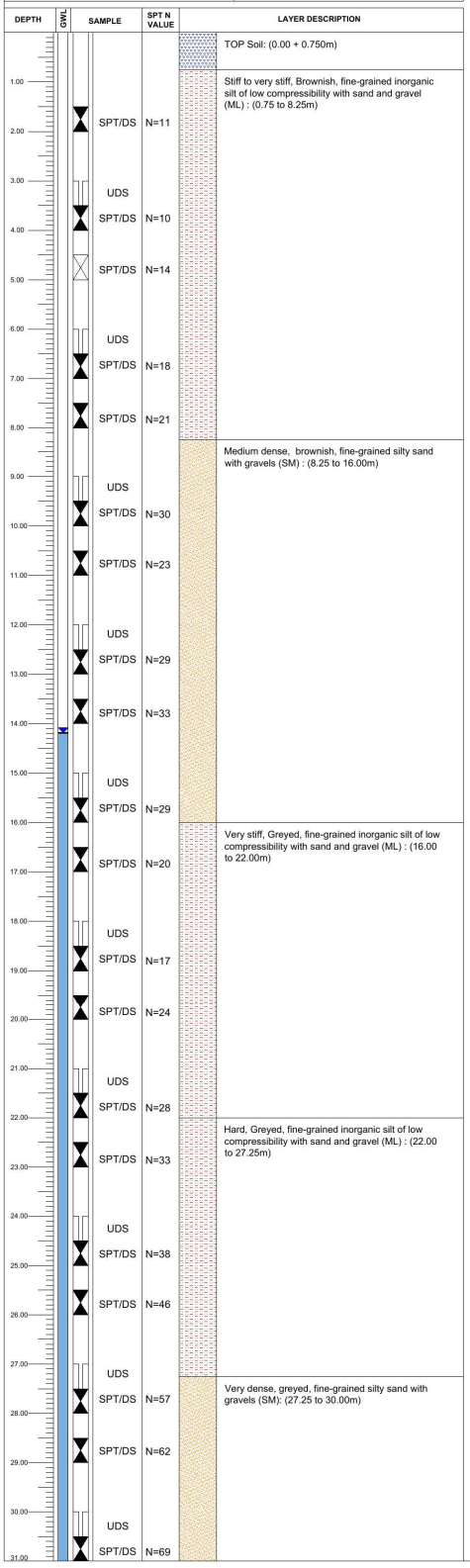

Direct Shear Test – BH-24
BH ID : BH-24
Depth : 27 m
c = 0.000 kg/cm²
ϕ = 33.0°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
1.500
1.000
0.500
0.000
0.00
0.50
1.00
1.50
2.00


Direct Shear Test – BH-24
BH ID : BH-24
Depth : 30 m
c = 0.000 kg/cm²
ϕ = 34.0°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
1.500
1.000
0.500
0.000
0.00
0.50
1.00
1.50
2.00

NAME OF WORK: GEOTECHNICAL INVESTIGATION WORK FOR PROPOSED EXTENSION METRO CORRIDORS OF AQUA LINE FROM NOIDA SECTOR-142 TO BOTANICAL GARDEN AND DEPOT STATION TO BORAKI MMTH (14.16 KM)

Stretch: Depot Station to Boraki MMTH (CH 0+000 km to 2+600 km)

BH ID : BH-25	**Chainage** : 2+404 KM
Groundwater Level : 14.20 M	**Location** : Lat. 28.5073080 Long. 77.5594560



LEGENDS

Sample Type

- Split Spoon Sampler
- Shelby Tube (UDS)

General

- Groundwater Level

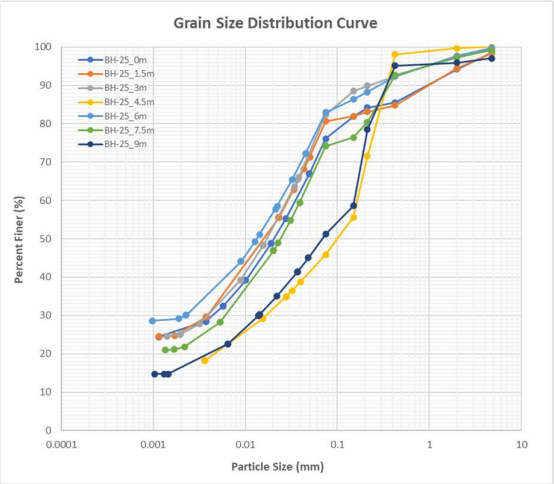
Soil

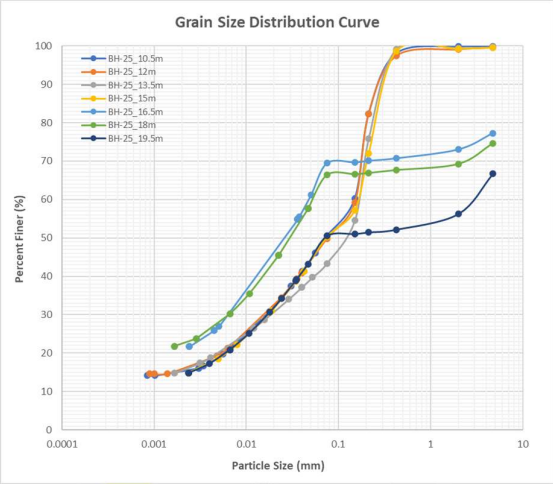
- Well Graded Gravel (GW)
- Poorly Graded Gravel (GP)
- Silty Gravel (GM)
- Clayey Gravel (GC)
- Well Graded Sand (SW)
- Poorly Graded Sand (SP)
- Silty Sand (SM)
- Clayey Sand (SC)
- Inorganic Silt of Low Compressibility (ML)
- Inorganic Silt of Intermediate Compressibility (MI)
- Inorganic Silt of High Compressibility (MH)
- Inorganic Clay of Low Compressibility (CL)
- Inorganic Clay of Intermediate Compressibility (CI)
- Inorganic Clay of High Compressibility (CH)
- Organic Soil of Low Compressibility (OL)
- Organic Soil of Intermediate Compressibility OI)
- Organic Soil of High Compressibility (OH)
- Peat (Pt)
- Top Soil (TS)

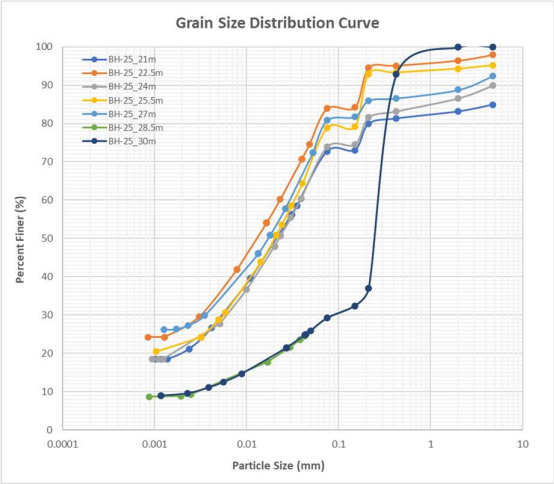
Project		Borehole Details		Drilling Details	
Name of Work:	Geotechnical Investigation work for Proposed Extension Metro Corridors of Aqua Line from Noida Sector-142 to Botanical Garden and Depot Station to Boraki MMTH (14.16 km).	**BH ID:**	BH-25	**Contractor:**	Goma Engineering & Consultancy
		Chainage [km]:	2+404	**Method of Drilling:**	Rotary Drilling
Client:	Noida Metro Rail Corporation (NMRC) Limited	**Depth [m]:**	30.00	**Start Date:**	28-11-2025
Stretch:	Depot Station to Boraki MMTH	**Elevation [m]:**	206	**End Date:**	06-12-2025
Project Code:	158_R3_DEST TO BOMM_2+000 km TO 2+600 km	**Water table Level [m]:**	14.20	**Location:**	**Lat:** 28.5073080 **Long:** 77.5594560

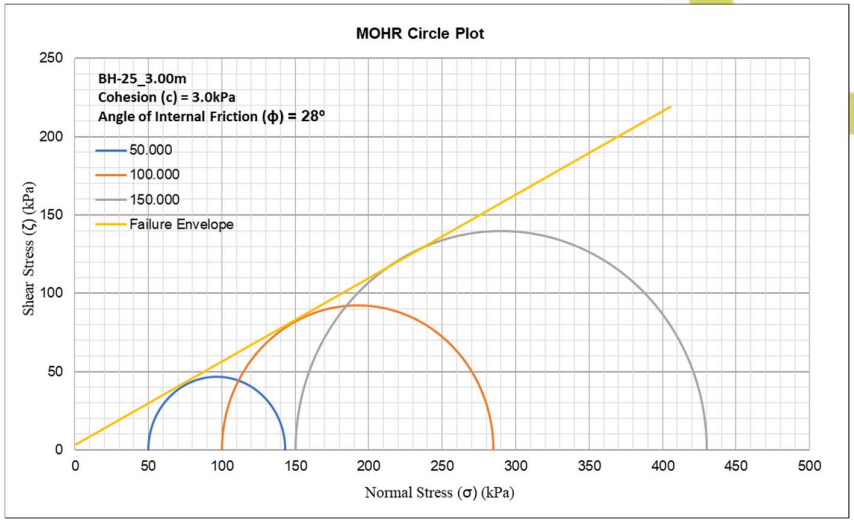
Depth [m]	Sample Type	Descriptions	SPT Test Results					Soil Particles				Atterberg Limits			Physical Characteristics				Direct Shear Test			Triaxial Comp Test			Consolidation Test				
			N1 (Seating Drive)	N2 (First Drive)	N3 (Second Drive)	Observed SPT	N (Correct N)	Gravel [%]	Sand [%]	Silt [%]	Clay [%]	Liquid Limit [%]	Plastic Limit [%]	Plasticity Index [%]	Moisture Content [%]	Bulk Density [gm/cm^3]	Dry Density [gm/cm^3]	Specific Gravity	Type	Cohesion [kg/cm^2]	Angle of Friction [^{o}]	Type	Cohesion [kPa]	Angle of Friction [^{o}]	Compression Index (Cc)	Coefficient of Volume Compressibility (Mv) [cm^2/kg]	Coefficient of Consolidation (Cv) [cm^2/sec]	Over Consolidation Ratio (OCR)	Preconsolidation Pressure [kg/cm^2]
0.00	DS	Top Soil	-	-	-	-	-	0.2	31.5	49.7	26.4	30	16	14	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1.50	SPT/DS	Stiff to very stiff, Brownish, fine-grained inorganic silt of low compressibility with sand and gravel (ML)	4	5	6	11	15	1.6	17.8	54.9	25.7	25	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
3.00	UDS							1.0	16.7	57.1	25.2	24	NP	NP	20.27	1.74	1.45	2.59	F	0.09	24	UU	3	28	-	-	-	-	-
3.50	SPT/DS		4	5	5	10	11	-																					
4.50	SPT/DS		5	6	8	14	14	0.0	54.1	26.5	19.4	26	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
6.00	UDS							0.3	16.8	53.5	29.4	27	NP	NP	20.70	1.79	1.48	2.64	F	0.11	25	UU	6	27	0.142	-	0.0011	0.667	1.02
6.50	SPT/DS		6	7	11	18	17	-																					
7.50	SPT/DS		7	8	13	21	19	0.8	25.1	52.6	21.6	26	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
9.00	DS	Medium dense, brownish, fine-grained silty sand with gravels (SM)						3.0	45.9	34.8	16.4	25	NP	NP	-	-	-	-	F	0.05	17	-	-	-	-	-	-	-	-	-
9.50	SPT/DS		9	11	19	30	26	-																					
10.50	SPT/DS		7	9	14	23	19	0.1	49.3	35.3	15.3	25	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
12.00	UDS							0.4	49.7	33.9	16.0	27	NP	NP	19.77	1.68	1.40	2.70	F	0.17	26	-	-	-	-	-	-	-	-	-
12.50	SPT/DS		10	12	17	29	22	-																					
13.50	SPT/DS		9	15	18	33	19	0.3	56.3	27.9	15.5	26	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
15.00	UDS							0.5	49.3	36.7	13.5	27	NP	NP	22.58	1.85	1.51	2.67	F	0.09	30	-	-	-	-	-	-	-	-	-
15.50	SPT/DS		9	12	17	29	18	-																					
16.50	SPT/DS	Very stiff, Greyed, fine-grained inorganic silt of low compressibility with sand and gravel (ML)	7	9	11	20	14	22.7	7.8	51.2	18.2	28	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
18.00	DS							3.6	20.9	44.0	22.4	29	NP	NP	19.42	-	-	2.58	F	0.07	24	-	-	-	-	-	-	-	-	-
18.50	SPT/DS		4	7	10	17	11	-																					
19.50	SPT/DS		8	11	13	24	15	33.3	16.2	34.9	15.6	27	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
21.00	UDS							15.1	12.2	52.4	20.3	29	NP	NP	26.89	2.05	1.62	2.54	F	0.15	25	-	-	-	-	-	-	-	-	-
21.50	SPT/DS		10	12	16	28	16	-																					
22.50	SPT/DS	Hard, Greyed, fine-grained inorganic silt of low compressibility with sand and gravel (ML)	9	14	19	33	18	2.1	14.0	56.9	27.0	26	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
24.00	UDS							10.1	16.0	52.3	21.6	26	NP	NP	23.13	1.91	1.50	2.68	F	0.00	34	-	-	-	-	-	-	-	-	-
24.50	SPT/DS		11	17	21	38	19	-																					
25.50	SPT/DS		13	21	25	46	21	4.8	16.4	56.2	22.7	28	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
27.00	DS							7.6	11.5	54.1	26.8	28	NP	NP	17.35	-	-	2.67	F	0.06	29	-	-	-	-	-	-	-	-	-
27.50	SPT/DS	Very dense, greyed, fine-grained silty sand with gravels (SM)	14	26	31	57	24	-																					
28.50	SPT/DS		16	28	34	62	25	0.0	70.8	20.3	8.9	26	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
30.00	DS							4.8	66.0	19.8	9.4	27	NP	NP	17.65	-	-	2.65	F	0.00	33	-	-	-	-	-	-	-	-	-
30.50	SPT/DS		14	32	37	69	26	-																					

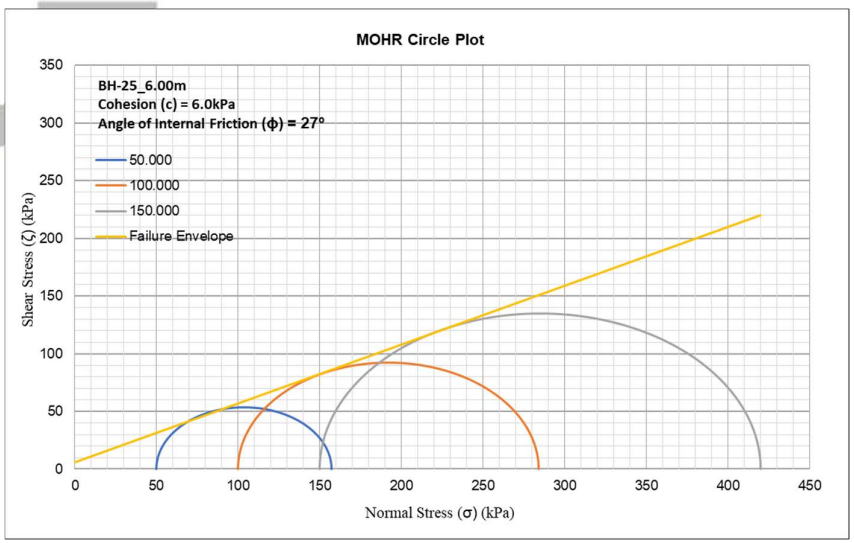
Notations: UDS = Undisturbed Sample, DS = Disturbed Sample, RC = Rock Core, F = Fast, NP = Non-Plastic, S = Slow, UU = Unconsolidated Undrained Tri-axial compression Test.

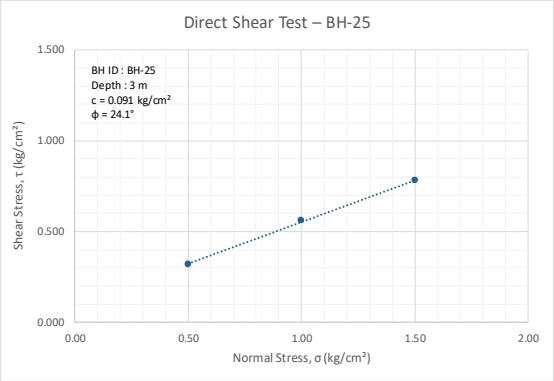

Grain Size Distribution Curve
BH-25_0m
BH-25_1.5m
BH-25_3m
BH-25_4.5m
BH-25_6m
BH-25_7.5m
BH-25_9m
Percent Finer (%)
Particle Size (mm)

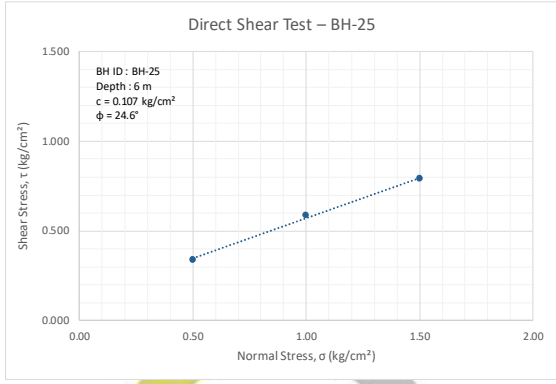

Grain Size Distribution Curve
BH-25_10.5m
BH-25_12m
BH-25_13.5m
BH-25_15m
BH-25_16.5m
BH-25_18m
BH-25_19.5m
Percent Finer (%)
Particle Size (mm)

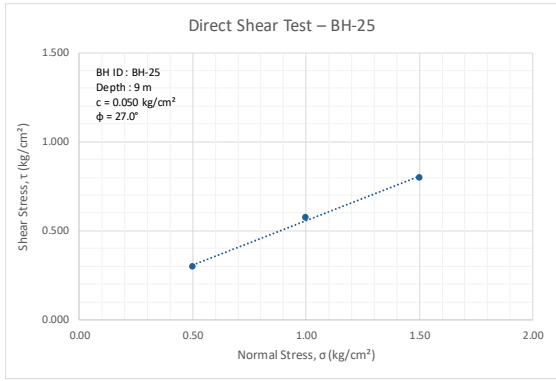

Grain Size Distribution Curve
BH-25_21m
BH-25_22.5m
BH-25_24m
BH-25_25.5m
BH-25_27m
BH-25_28.5m
BH-25_30m
Percent Finer (%)
Particle Size (mm)

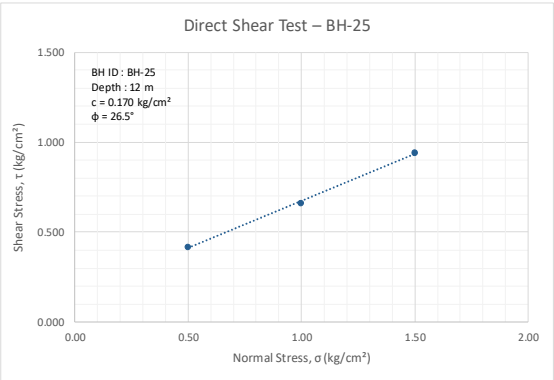

MOHR Circle Plot
BH-25_3.00m
Cohesion (c) = 3.0kPa
Angle of Internal Friction (ϕ) = 28°
50.000
100.000
150.000
Failure Envelope
Shear Stress (ζ) (kPa)
Normal Stress (σ) (kPa)

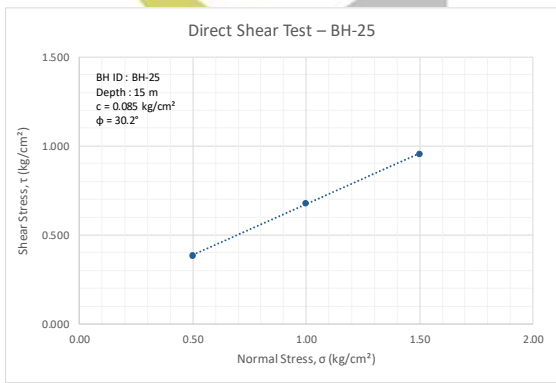

MOHR Circle Plot
BH-25_6.00m
Cohesion (c) = 6.0kPa
Angle of Internal Friction (ϕ) = 27°
50.000
100.000
150.000
Failure Envelope
Shear Stress (ζ) (kPa)
Normal Stress (σ) (kPa)

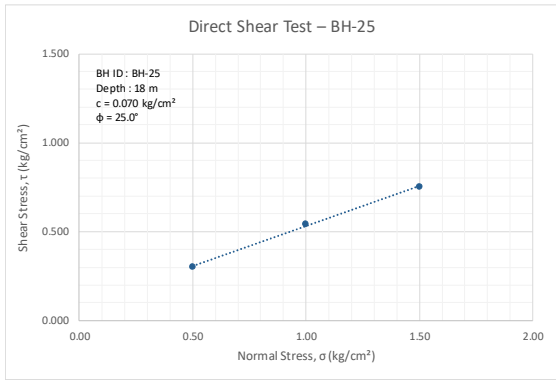

Direct Shear Test – BH-25
BH ID : BH-25
Depth : 3 m
c = 0.091 kg/cm²
ϕ = 24.1°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
0.000
0.500
1.000
1.500
0.00
0.50
1.00
1.50
2.00

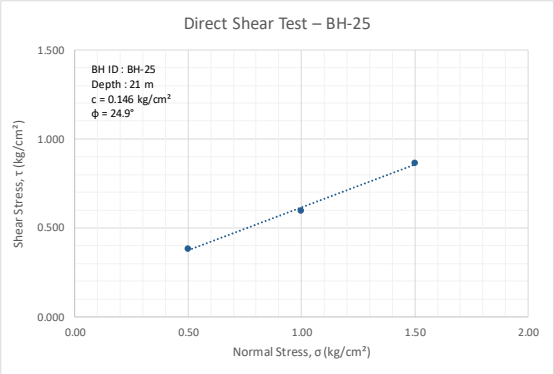

Direct Shear Test – BH-25
BH ID : BH-25
Depth : 6 m
c = 0.107 kg/cm²
ϕ = 24.6°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
0.000
0.500
1.000
1.500
0.00
0.50
1.00
1.50
2.00

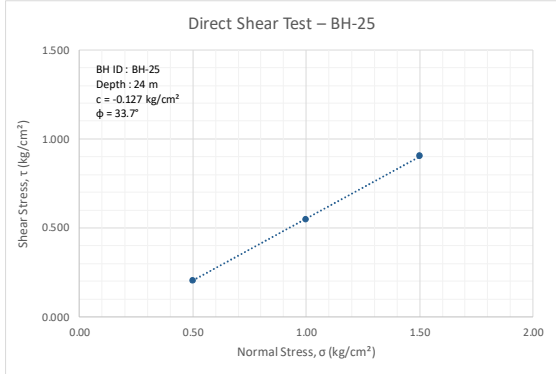

Direct Shear Test – BH-25
BH ID : BH-25
Depth : 9 m
c = 0.050 kg/cm²
ϕ = 27.0°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
0.000
0.500
1.000
1.500
0.00
0.50
1.00
1.50
2.00

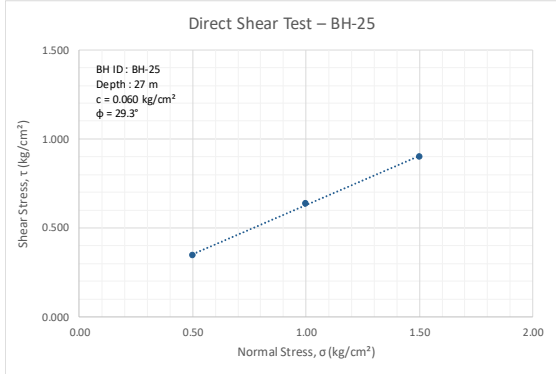

Direct Shear Test – BH-25
BH ID : BH-25
Depth : 12 m
c = 0.170 kg/cm²
ϕ = 26.5°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
0.000
0.500
1.000
1.500
0.00
0.50
1.00
1.50
2.00

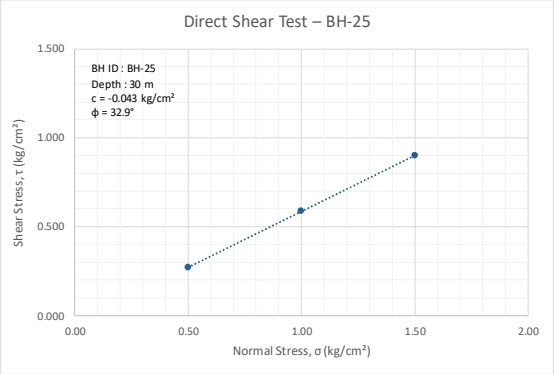

Direct Shear Test – BH-25
BH ID : BH-25
Depth : 15 m
c = 0.085 kg/cm²
ϕ = 30.2°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
0.000
0.500
1.000
1.500
0.00
0.50
1.00
1.50
2.00


Direct Shear Test – BH-25
BH ID : BH-25
Depth : 18 m
c = 0.070 kg/cm²
ϕ = 25.0°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
0.000
0.500
1.000
1.500
0.00
0.50
1.00
1.50
2.00


Direct Shear Test – BH-25
BH ID : BH-25
Depth : 21 m
c = 0.146 kg/cm²
ϕ = 24.9°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
1.500
1.000
0.500
0.000
0.00
0.50
1.00
1.50
2.00


Direct Shear Test – BH-25
BH ID : BH-25
Depth : 24 m
c = -0.127 kg/cm²
ϕ = 33.7°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
1.500
1.000
0.500
0.000
0.00
0.50
1.00
1.50
2.00

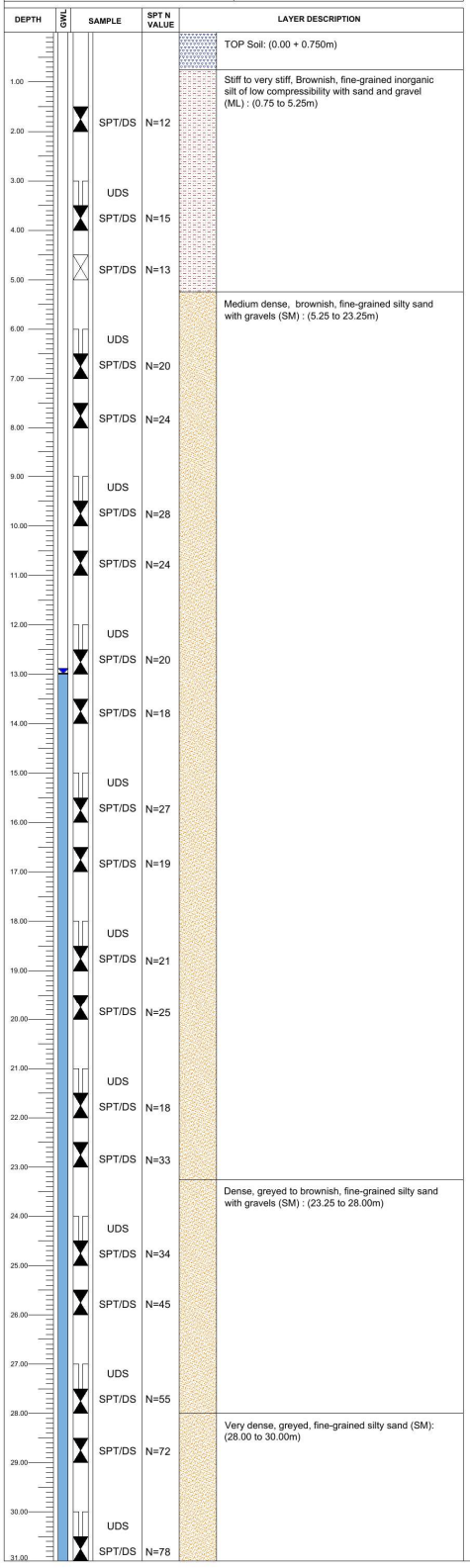

Direct Shear Test – BH-25
BH ID : BH-25
Depth : 27 m
c = 0.060 kg/cm²
ϕ = 29.3°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
1.500
1.000
0.500
0.000
0.00
0.50
1.00
1.50
2.00


Direct Shear Test – BH-25
BH ID : BH-25
Depth : 30 m
c = -0.043 kg/cm²
ϕ = 32.9°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
1.500
1.000
0.500
0.000
0.00
0.50
1.00
1.50
2.00

NAME OF WORK: GEOTECHNICAL INVESTIGATION WORK FOR PROPOSED EXTENSION METRO CORRIDORS OF AQUA LINE FROM NOIDA SECTOR-142 TO BOTANICAL GARDEN AND DEPOT STATION TO BORAKI MMTH (14.16 KM)

Stretch: Depot Station to Boraki MMTH (CH 0+000 km to 2+600 km)

BH ID : BH-26	**Chainage** : 2+532 KM
Groundwater Level : 13.00 M	**Location** : Lat. 28.5081900 Long. 77.5586080



LEGENDS

Sample Type

- Split Spoon Sampler
- Shelby Tube (UDS)

General

- Groundwater Level

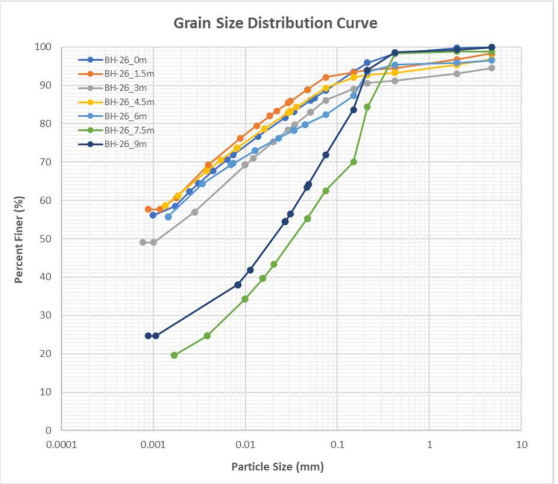
Soil

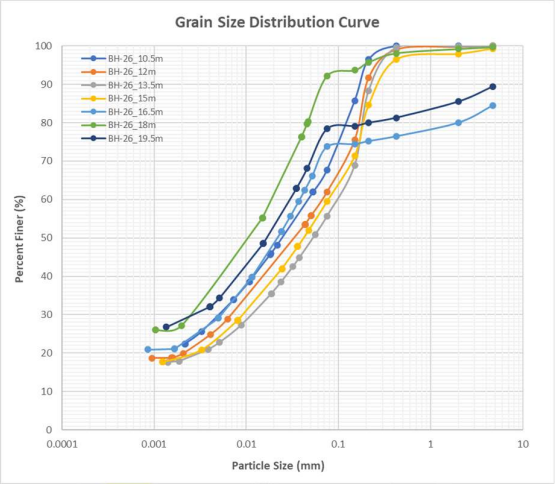
- Well Graded Gravel (GW)
- Poorly Graded Gravel (GP)
- Silty Gravel (GM)
- Clayey Gravel (GC)
- Well Graded Sand (SW)
- Poorly Graded Sand (SP)
- Silty Sand (SM)
- Clayey Sand (SC)
- Inorganic Silt of Low Compressibility (ML)
- Inorganic Silt of Intermediate Compressibility (MI)
- Inorganic Silt of High Compressibility (MH)
- Inorganic Clay of Low Compressibility (CL)
- Inorganic Clay of Intermediate Compressibility (CI)
- Inorganic Clay of High Compressibility (CH)
- Organic Soil of Low Compressibility (OL)
- Organic Soil of Intermediate Compressibility OI)
- Organic Soil of High Compressibility (OH)
- Peat (Pt)
- Top Soil (TS)

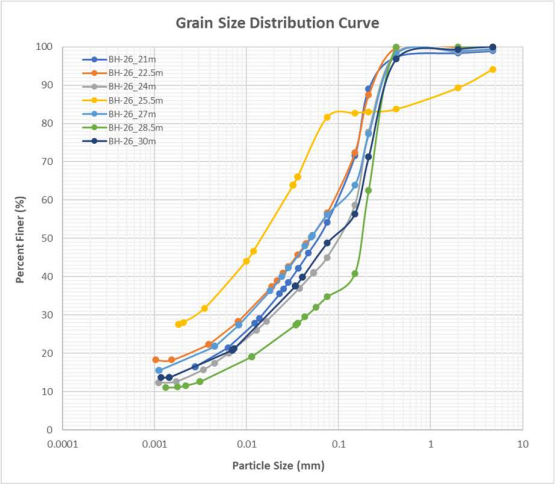
Project		Borehole Details		Drilling Details	
Name of Work:	Geotechnical Investigation work for Proposed Extension Metro Corridors of Aqua Line from Noida Sector-142 to Botanical Garden and Depot Station to Boraki MMTH (14.16 km).	**BH ID:**	BH-26	**Contractor:**	Goma Engineering & Consultancy
		Chainage [km]:	2+532	**Method of Drilling:**	Rotary Drilling
Client:	Noida Metro Rail Corporation (NMRC) Limited	**Depth [m]:**	30.00	**Start Date:**	28-11-2025
Stretch:	Depot Station to Boraki MMTH	**Elevation [m]:**	206.04	**End Date:**	30-11-2025
Project Code:	158_R3_DEST TO BOMM_2+000 km TO 2+600 km	**Water table Level [m]:**	13.00	**Location:**	**Lat:** 28.5081900 **Long:** 77.5586080

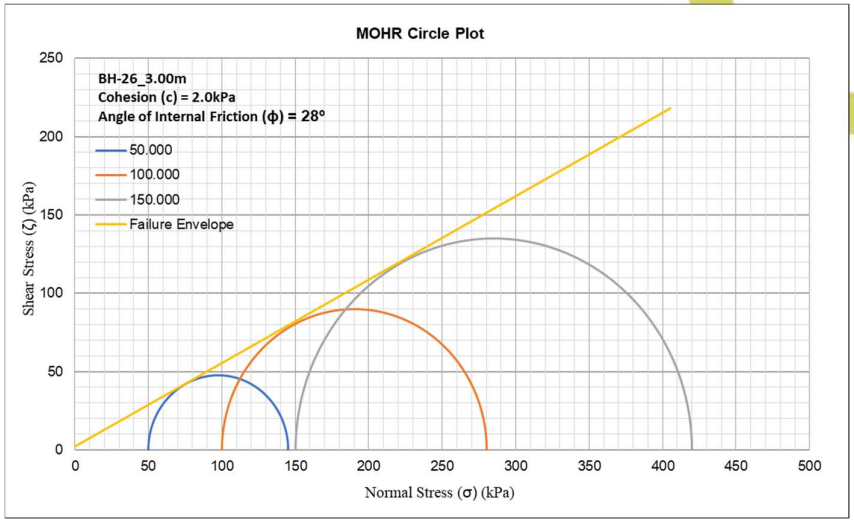
Depth [m]	Sample Type	Descriptions	SPT Test Results					Soil Particles				Atterberg Limits			Physical Characteristics				Direct Shear Test			Triaxial Comp Test			Consolidation Test				
			N1 (Seating Drive)	N2 (First Drive)	N3 (Second Drive)	Observed SPT	N (Correct N)	Gravel [%]	Sand [%]	Silt [%]	Clay [%]	Liquid Limit [%]	Plastic Limit [%]	Plasticity Index [%]	Moisture Content [%]	Bulk Density [gm/cm^3]	Dry Density [gm/cm^3]	Specific Gravity	Type	Cohesion [kg/cm^2]	Angle of Friction [°]	Type	Cohesion [kPa]	Angle of Friction [°]	Compression Index (Cc)	Coefficient of Volume Compressibility (Mv) [cm^2/kg]	Coefficient of Consolidation (Cv) [cm^2/sec]	Over Consolidation Ratio (OCR)	Preconsolidation Pressure [kg/cm^2]
0.00	DS	Top Soil	-	-	-	-	-	0.0	11.3	28.7	60.0	38	20	18	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1.50	SPT/DS	Stiff, yellowish, fine grained Inorganic Clay of Intermediate plasticity with Silt (CI)	3	5	7	12	17	1.7	6.2	30.2	61.9	39	19	20	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
3.00	UDS							5.5	8.4	31.7	54.4	30	17	13	21.12	1.75	1.45	2.60	F	0.09	24	UU	2	28	0.100	-	0.0011	0.733	1.12
3.50	SPT/DS		3	6	9	15	16	-																					
4.50	SPT/DS		4	5	8	13	13	3.2	7.5	27.4	61.9	36	18	18	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
6.00	UDS							3.5	14.2	23.4	59.0	26	NP	NP	23.59	1.92	1.55	2.70	F	0.07	26	UU	4	27	-	-	-	-	-
6.50	SPT/DS		3	8	12	20	19	3.5	14.2	82.4		-																	
7.50	SPT/DS		5	10	14	24	22	1.2	36.3	41.8	20.7	28	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
9.00	DS							0.1	28.0	43.1	28.8	27	NP	NP	24.53	-	-	2.51	F	0.03	28	-	-	-	-	-	-	-	-	-
9.50	SPT/DS		4	12	16	28	24	-																					
10.50	SPT/DS		6	10	14	24	20	0.0	32.4	55.6	12.1	27	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
12.00	UDS							0.0	38.1	42.2	19.8	29	NP	NP	28.34	1.78	1.39	2.60	F	0.00	32	-	-	-	-	-	-	-	-	-
12.50	SPT/DS		4	9	11	20	15	-																					
13.50	SPT/DS	Very stiff, yellow to Brownish, finegrained inorganic silt of low compressibility with sand (ML)	5	8	10	18	13	0.0	44.3	37.5	18.2	24	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
15.00	DS							0.7	39.8	40.3	19.2	25	NP	NP	23.24	-	-	2.61	F	0.13	28	-	-	-	-	-	-	-	-	-
15.50	SPT/DS		6	11	16	27	17	-																					
16.50	SPT/DS		5	8	11	19	13	15.5	10.8	51.3	22.5	26	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
18.00	UDS							0.3	7.5	64.9	27.3	28	NP	NP	22.14	1.85	1.52	2.61	F	0.00	30	-	-	-	-	-	-	-	-	-
18.50	SPT/DS		5	9	12	21	14	-																					
19.50	SPT/DS		6	12	13	25	16	10.6	11.0	49.7	28.7	27	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
21.00	DS							1.0	44.7	40.5	13.7	27	NP	NP	25.60	-	-	2.67	F	0.00	35	-	-	-	-	-	-	-	-	-
21.50	SPT/DS		4	8	10	18	11	-																					
22.50	SPT/DS		12	16	17	33	18	0.0	43.3	37.2	19.4	28	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
24.00	DS	Dense, greyed to brownish, fine-grained silty sand with gravels (SM)						0.7	54.2	31.7	13.3	25	NP	NP	18.23	-	-	2.65	F	0.07	29	-	-	-	-	-	-	-	-	-
24.50	SPT/DS		8	16	18	34	18	-																					
25.50	SPT/DS		9	21	24	45	21	5.8	12.5	53.7	28.0	27	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
27.00	DS							0.5	43.2	38.1	18.2	24	NP	NP	20.32	-	-	2.61	F	0.09	30	-	-	-	-	-	-	-	-	-
27.50	SPT/DS		14	24	31	55	23	-																					
28.50	SPT/DS	Very dense, greyed, fine-grained silty sand (SM)	16	30	42	72	28	0.0	65.3	23.3	11.4	26	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
30.00	DS							0.0	51.3	33.6	15.2	27	NP	NP	19.49	-	-	2.67	-	-	-	-	-	-	-	-	-	-	-	-
30.50	SPT/DS		21	33	45	78	29	-																					

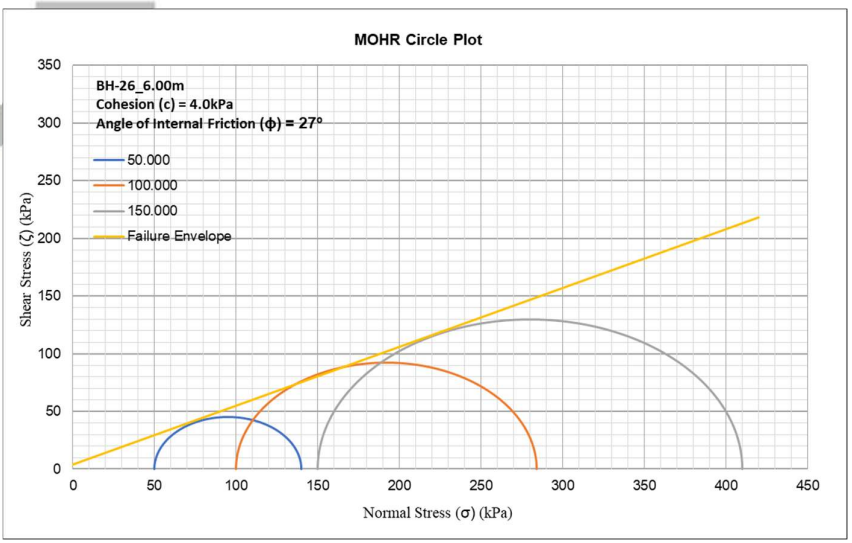
Notations: UDS = Undisturbed Sample, DS = Disturbed Sample, RC = Rock Core, F = Fast, NP = Non-Plastic, S = Slow, UU = Unconsolidated Undrained Tri-axial compression Test.

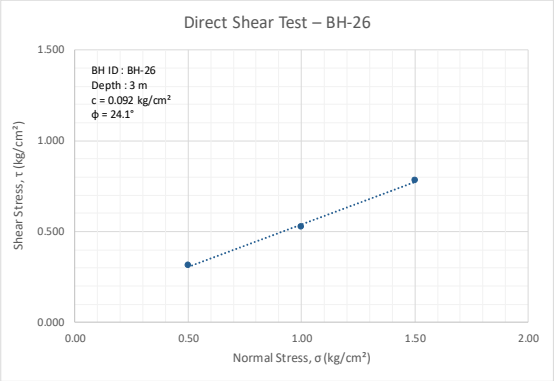

Grain Size Distribution Curve
BH-26_0m
BH-26_1.5m
BH-26_3m
BH-26_4.5m
BH-26_6m
BH-26_7.5m
BH-26_9m
Percent Finer (%)
Particle Size (mm)

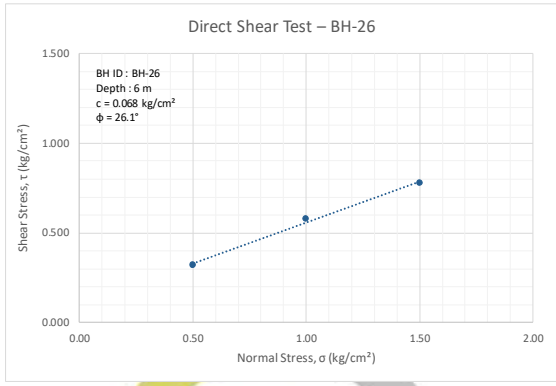

Grain Size Distribution Curve
BH-26_10.5m
BH-26_12m
BH-26_13.5m
BH-26_15m
BH-26_16.5m
BH-26_18m
BH-26_19.5m
Percent Finer (%)
Particle Size (mm)

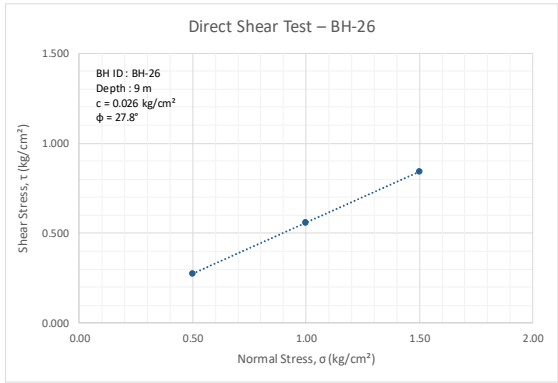

Grain Size Distribution Curve
BH-26_21m
BH-26_22.5m
BH-26_24m
BH-26_25.5m
BH-26_27m
BH-26_28.5m
BH-26_30m
Percent Finer (%)
Particle Size (mm)

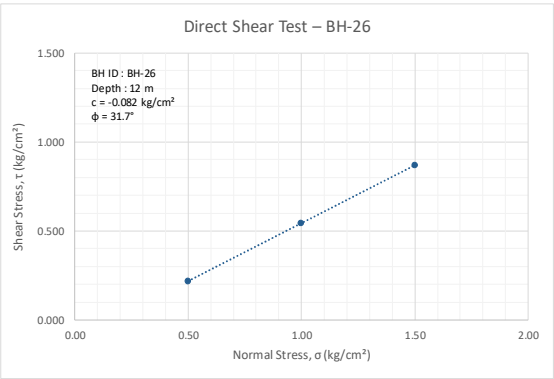

MOHR Circle Plot
BH-26_3.00m
Cohesion (c) = 2.0kPa
Angle of Internal Friction (ϕ) = 28°
50.000
100.000
150.000
Failure Envelope
Shear Stress (ζ) (kPa)
Normal Stress (σ) (kPa)

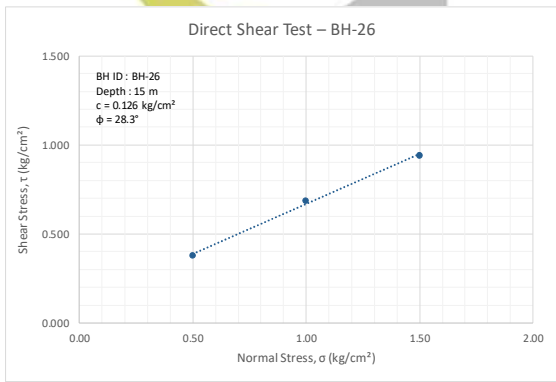

MOHR Circle Plot
BH-26_6.00m
Cohesion (c) = 4.0kPa
Angle of Internal Friction (ϕ) = 27°
50.000
100.000
150.000
Failure Envelope
Shear Stress (ζ) (kPa)
Normal Stress (σ) (kPa)

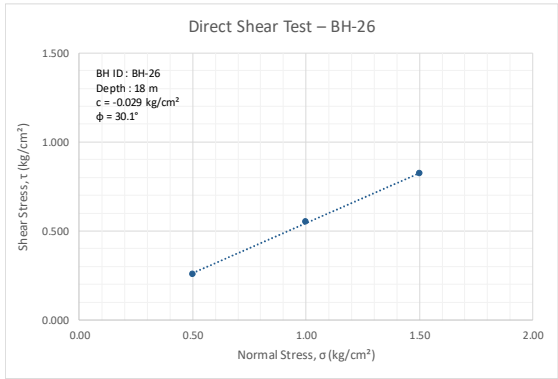

Direct Shear Test – BH-26
BH ID : BH-26
Depth : 3 m
c = 0.092 kg/cm²
ϕ = 24.1°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)

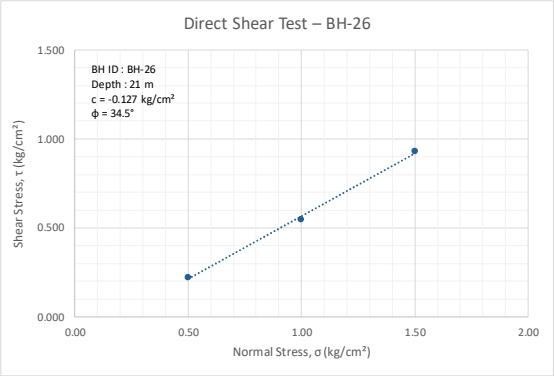

Direct Shear Test – BH-26
BH ID : BH-26
Depth : 6 m
c = 0.068 kg/cm²
ϕ = 26.1°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)

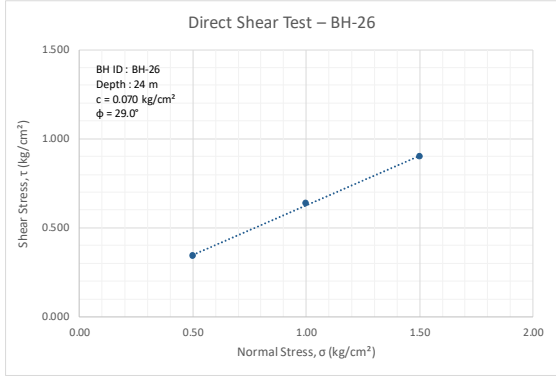

Direct Shear Test – BH-26
BH ID : BH-26
Depth : 9 m
c = 0.026 kg/cm²
ϕ = 27.8°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)

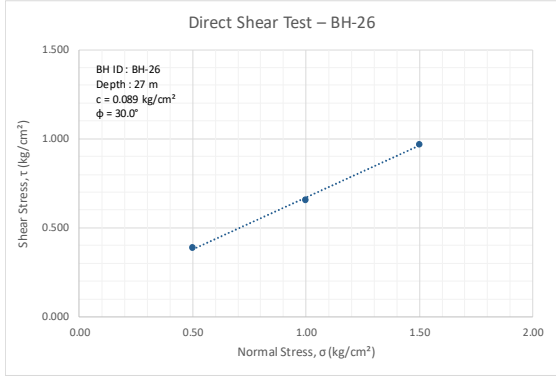

Direct Shear Test – BH-26
BH ID : BH-26
Depth : 12 m
c = -0.082 kg/cm²
ϕ = 31.7°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)


Direct Shear Test – BH-26
BH ID : BH-26
Depth : 15 m
c = 0.126 kg/cm²
ϕ = 28.3°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)


Direct Shear Test – BH-26
BH ID : BH-26
Depth : 18 m
c = -0.029 kg/cm²
ϕ = 30.1°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)


Direct Shear Test – BH-26
BH ID : BH-26
Depth : 21 m
c = -0.127 kg/cm²
ϕ = 34.5°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
1.500
1.000
0.500
0.000
0.00
0.50
1.00
1.50
2.00

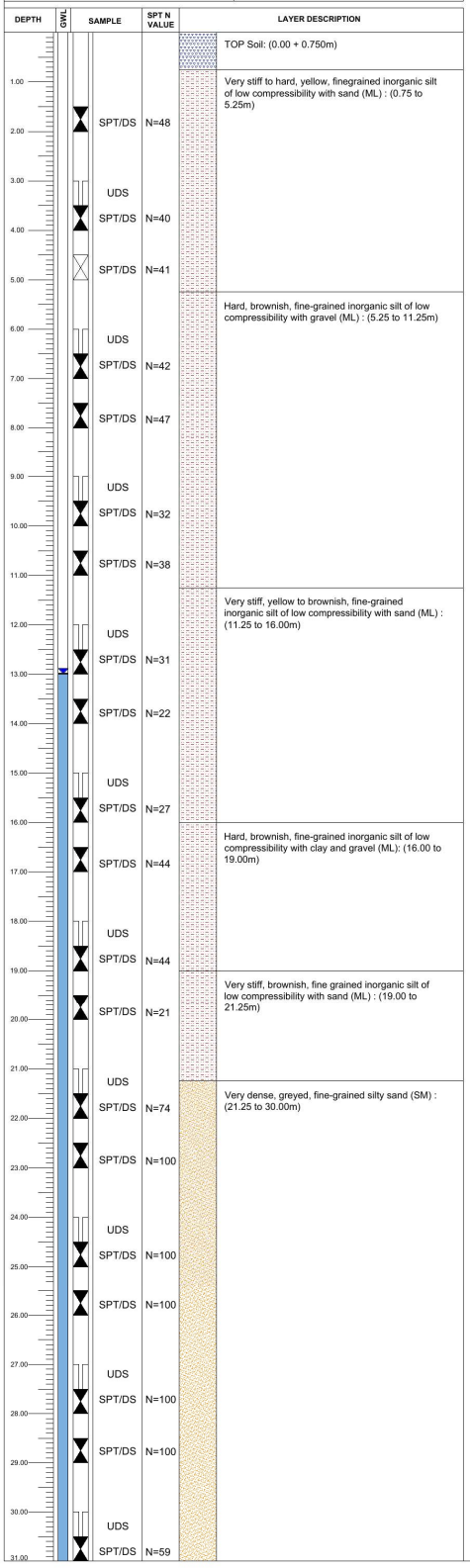

Direct Shear Test – BH-26
BH ID : BH-26
Depth : 24 m
c = 0.070 kg/cm²
ϕ = 29.0°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
1.500
1.000
0.500
0.000
0.00
0.50
1.00
1.50
2.00


Direct Shear Test – BH-26
BH ID : BH-26
Depth : 27 m
c = 0.089 kg/cm²
ϕ = 30.0°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
1.500
1.000
0.500
0.000
0.00
0.50
1.00
1.50
2.00

NAME OF WORK: GEOTECHNICAL INVESTIGATION WORK FOR PROPOSED EXTENSION METRO CORRIDORS OF AQUA LINE FROM NOIDA SECTOR-142 TO BOTANICAL GARDEN AND DEPOT STATION TO BORAKI MMTH (14.16 KM)

Stretch: Depot Station to Boraki MMTH (CH 0+000 km to 2+600 km)

BH ID : BH-27	**Chainage** : 2+586 KM
Groundwater Level : 13.00 M	**Location** : Lat. 28.5086540 Long. 77.5583970



LEGENDS

Sample Type

- Split Spoon Sampler
- Shelby Tube (UDS)

General

- Groundwater Level

Soil

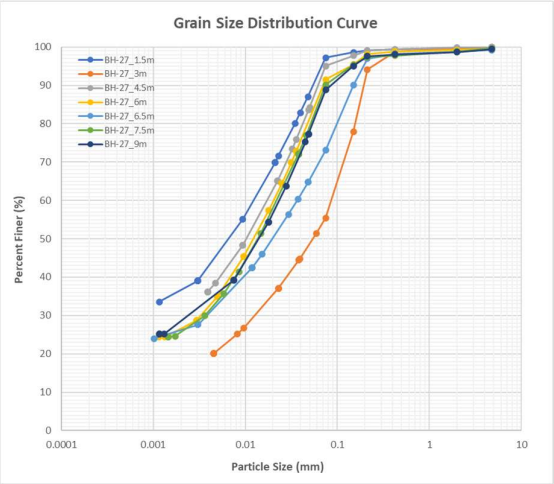
- Well Graded Gravel (GW)
- Poorly Graded Gravel (GP)
- Silty Gravel (GM)
- Clayey Gravel (GC)
- Well Graded Sand (SW)
- Poorly Graded Sand (SP)
- Silty Sand (SM)
- Clayey Sand (SC)
- Inorganic Silt of Low Compressibility (ML)
- Inorganic Silt of Intermediate Compressibility (MI)
- Inorganic Silt of High Compressibility (MH)
- Inorganic Clay of Low Compressibility (CL)
- Inorganic Clay of Intermediate Compressibility (CI)
- Inorganic Clay of High Compressibility (CH)
- Organic Soil of Low Compressibility (OL)
- Organic Soil of Intermediate Compressibility OI)
- Organic Soil of High Compressibility (OH)
- Peat (Pt)
- Top Soil (TS)

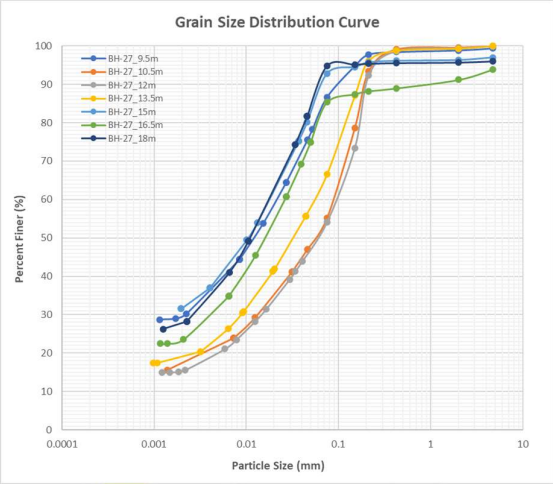
GOMA ENGINEERING AND CONSULTANCY
Quality we put forward

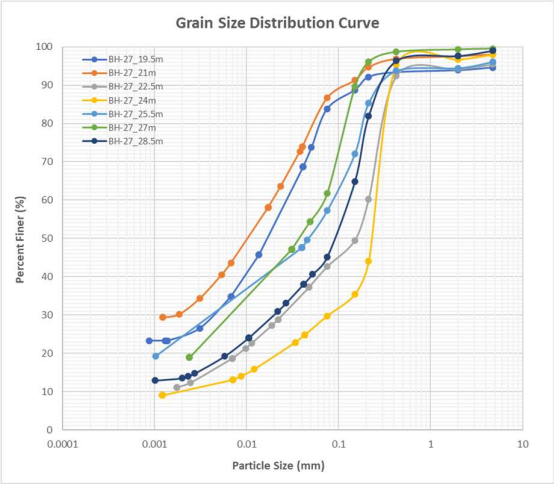
Project		Borehole Details		Drilling Details	
Name of Work:	Geotechnical Investigation work for Proposed Extension Metro Corridors of Aqua Line from Noida Sector-142 to Botanical Garden and Depot Station to Boraki MMTH (14.16 km).	**BH ID:**	BH-27	**Contractor:**	Goma Engineering & Consultancy
		Chainage [km]:	2+586	**Method of Drilling:**	Rotary Drilling
Client:	Noida Metro Rail Corporation (NMRC) Limited	**Depth [m]:**	30.00	**Start Date:**	27-11-2025
Stretch:	Depot Station to Boraki MMTH	**Elevation [m]:**	205.97	**End Date:**	29-11-2025
Project Code:	158_R3_DEST TO BOMM_2+000 km TO 2+600 km	**Water table Level [m]:**	13.00	**Location:**	**Lat:** 28.5086540 **Long:** 77.5583970

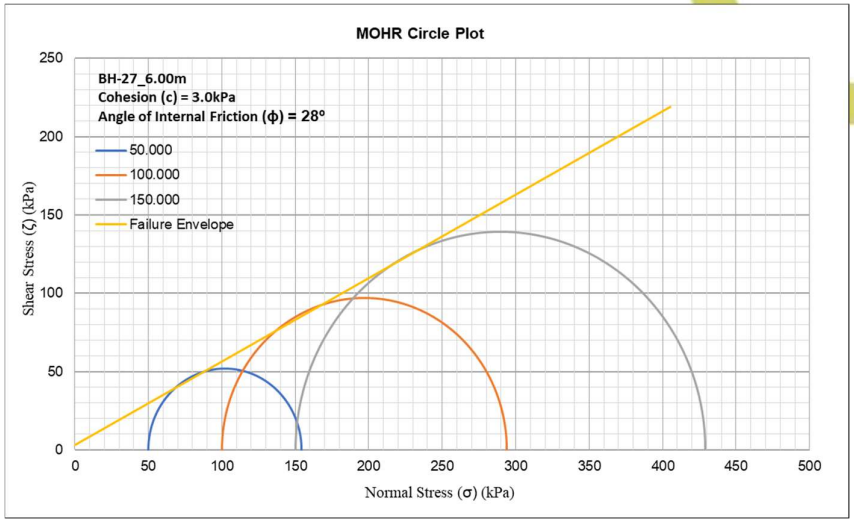
Depth [m]	Sample Type	Descriptions	SPT Test Results					Soil Particles				Atterberg Limits			Physical Characteristics				Direct Shear Test			Triaxial Comp Test			Consolidation Test				
			N1 (Seating Drive)	N2 (First Drive)	N3 (Second Drive)	Observed SPT	N (Correct N)	Gravel [%]	Sand [%]	Silt [%]	Clay [%]	Liquid Limit [%]	Plastic Limit [%]	Plasticity Index [%]	Moisture Content [%]	Bulk Density [gm/cm^3]	Dry Density [gm/cm^3]	Specific Gravity	Type	Cohesion [kg/cm^2]	Angle of Friction [°]	Type	Cohesion [kPa]	Angle of Friction [°]	Compression Index (Cc)	Coefficient of Volume Compressibility (Mv) [cm^2/kg]	Coefficient of Consolidation (Cv) [cm^2/sec]	Over Consolidation Ratio (OCR)	Preconsolidation Pressure [kg/cm^2]
0.00	DS	Top Soil	-	-	-	-	-	2.4	18.6	79.0		30	17	13	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1.50	SPT/DS	Very stiff to hard, yellow, finegrained inorganic silt of low compressibility with sand (ML)	16	22	26	48	67	0.1	2.7	60.6	36.6	26	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
3.00	UDS							0.1	44.4	43.8	11.7	27	NP	NP	11.47	1.59	1.42	2.62	F	0.04	27	-	-	-	-	-	-	-	-
3.50	SPT/DS		15	19	21	40	44	-																					
4.50	SPT/DS		7	8	13	21	21	0.0	4.9	66.3	28.8	24	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
6.00	UDS	Hard, brownish, fine-grained inorganic silt of low compressibility with gravel (ML)						0.5	8.0	64.9	26.6	25	NP	NP	19.6	1.93	1.61	2.63	F	0.05	29	UU	3	27	-	-	-	-	-
6.50	SPT/DS		16	20	22	42	39	0.8	26.1	46.9	26.2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
7.50	SPT/DS		18	22	25	47	43	0.3	9.5	64.5	25.7	25	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
9.00	UDS							0.6	10.6	60.2	28.6	26	NP	NP	22.80	2.05	1.67	2.63	F	0.08	28	UU	6	26	0.071	-	0.0011	0.667	1.02
9.50	SPT/DS		13	15	17	32	27	0.6	12.7	57.0	29.7	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
10.50	SPT/DS		15	18	20	38	31	0.0	44.8	37.7	17.5	27	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
12.00	UDS	Very stiff, yellow to brownish, fine-grained inorganic silt of low compressibility with sand (ML)						0.0	45.8	38.8	15.3	28	NP	NP	23.68	1.86	1.51	2.60	F	0.03	29	-	-	-	-	-	-	-	-
12.50	SPT/DS		10	13	18	31	23	-																					
13.50	SPT/DS		9	10	12	22	15	0.0	33.4	47.4	19.2	24	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
15.00	UDS							3.0	4.2	61.1	31.7	26	NP	NP	18.03	1.84	1.56	2.64	F	0.00	34	-	-	-	-	-	-	-	-
15.50	SPT/DS		10	12	15	27	17	-																					
16.50	SPT/DS	Hard, brownish, fine-grained inorganic silt of low compressibility with clay and gravel (ML)	10	17	27	44	23	6.1	8.5	61.9	23.4	26	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
18.00	UDS							4.0	1.2	67.0	27.8	27	NP	NP	31.05	1.84	1.40	2.69	F	0.00	32	-	-	-	-	-	-	-	-
18.50	SPT/DS		10	17	27	44	22	-																					
19.50	SPT/DS	Very stiff, brownish, fine grained inorganic silt of low compressibility with sand (ML)	8	9	12	21	14	5.4	10.7	59.1	24.7	28	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
21.00	DS							2.0	11.3	55.9	30.8	29	NP	NP	20.15	-	-	2.65	F	0.00	30	-	-	-	-	-	-	-	-
21.50	SPT/DS	Very dense, greyed, fine-grained silty sand (SM)	30	34	40	74	31	-																					
22.50	SPT/DS		23	48	50/04cm	100	38	4.6	52.8	31.0	11.6	29	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
24.00	DS							2.0	68.2	19.6	10.1	27	NP	NP	17.91	-	-	2.60	F	0.00	35	-	-	-	-	-	-	-	-
24.50	SPT/DS		45	50/12cm	-	100	38	-																					
25.50	SPT/DS		45	50/10cm	-	100	37	3.9	38.9	32.8	24.4	27	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
27.00	DS							0.5	37.8	46.2	15.5	26	NP	NP	32.50	-	-	2.62	F	0.03	30	-	-	-	-	-	-	-	-
27.50	SPT/DS		50/10cm	-	-	100	36	-																					
28.50	SPT/DS		50/13cm	-	-	100	36	1.0	53.9	31.6	13.5	26	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
30.00	DS							1.2	46.1	39.5	13.2	25	NP	NP	17.58	-	-	2.67	-	-	-	-	-	-	-	-	-	-	-
30.50	SPT/DS		21	33	45	78	29	-																					

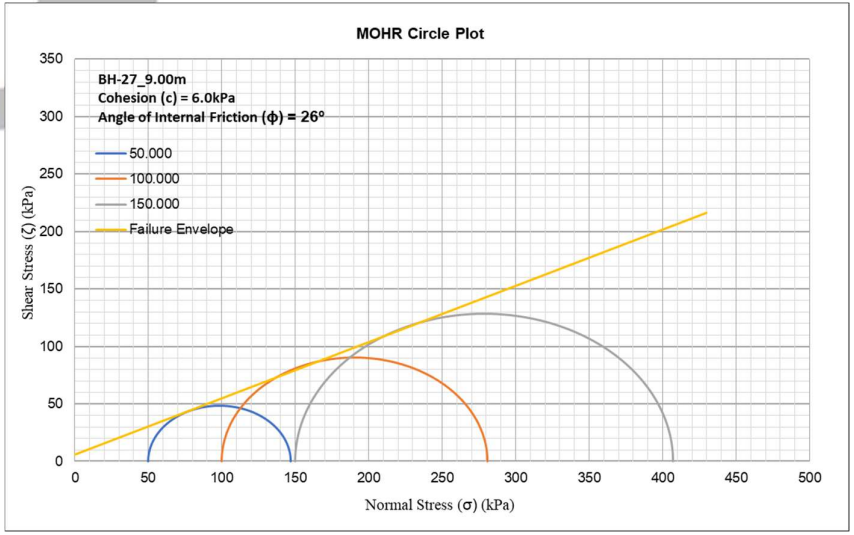
Notations: UDS = Undisturbed Sample, DS = Disturbed Sample, RC = Rock Core, F = Fast, NP = Non-Plastic, S = Slow, UU = Unconsolidated Undrained Tri-axial compression Test.

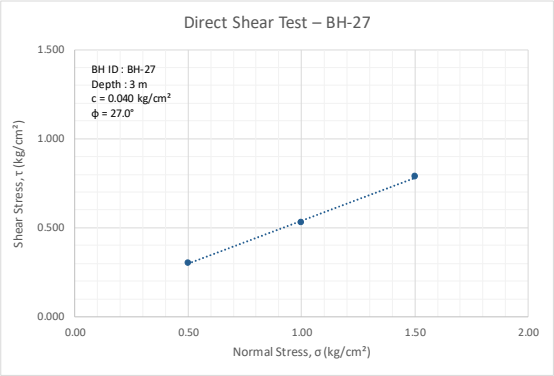

Grain Size Distribution Curve
BH-27_1.5m
BH-27_3m
BH-27_4.5m
BH-27_6m
BH-27_6.5m
BH-27_7.5m
BH-27_9m
Percent Finer (%)
Particle Size (mm)

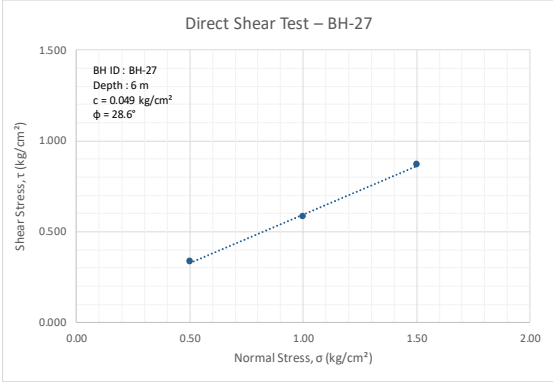

Grain Size Distribution Curve
BH-27_9.5m
BH-27_10.5m
BH-27_12m
BH-27_13.5m
BH-27_15m
BH-27_16.5m
BH-27_18m
Percent Finer (%)
Particle Size (mm)

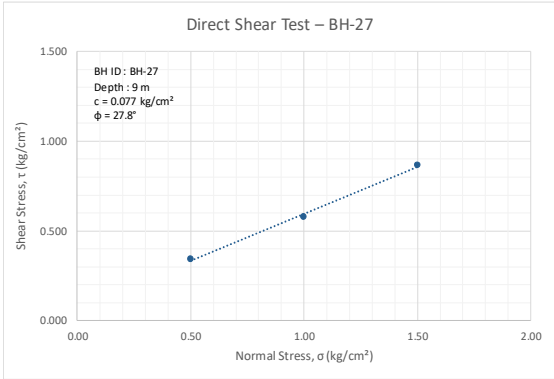

Grain Size Distribution Curve
BH-27_19.5m
BH-27_21m
BH-27_22.5m
BH-27_24m
BH-27_25.5m
BH-27_27m
BH-27_28.5m
Percent Finer (%)
Particle Size (mm)

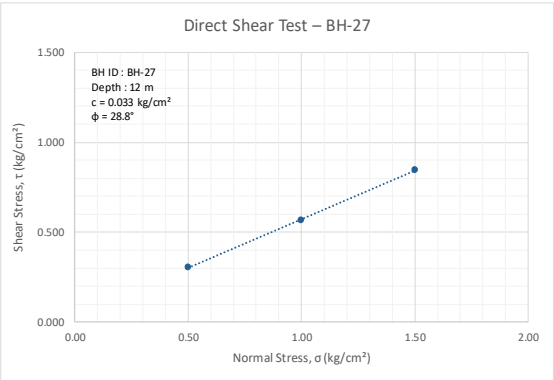

MOHR Circle Plot
BH-27_6.00m
Cohesion (c) = 3.0kPa
Angle of Internal Friction (ϕ) = 28°
50.000
100.000
150.000
Failure Envelope
Shear Stress (Ƶ) (kPa)
Normal Stress (σ) (kPa)

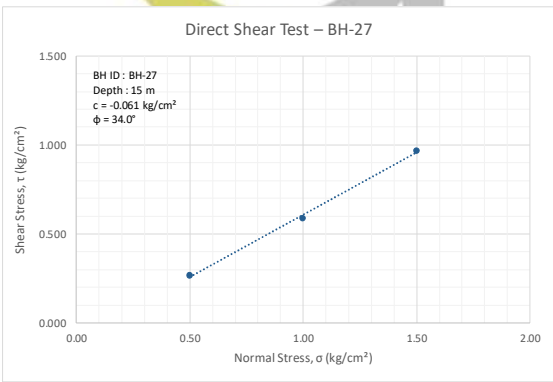

MOHR Circle Plot
BH-27_9.00m
Cohesion (c) = 6.0kPa
Angle of Internal Friction (ϕ) = 26°
50.000
100.000
150.000
Failure Envelope
Shear Stress (Ƶ) (kPa)
Normal Stress (σ) (kPa)

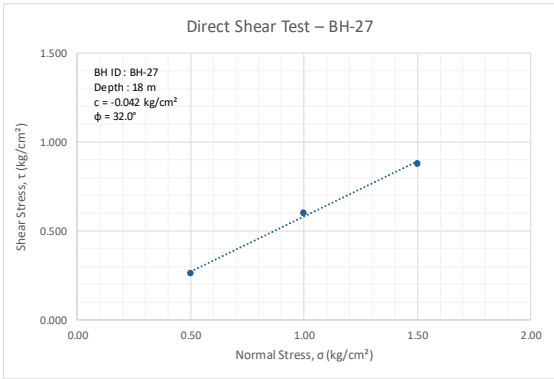

Direct Shear Test – BH-27
BH ID : BH-27
Depth : 3 m
c = 0.040 kg/cm²
ϕ = 27.0°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
1.500
1.000
0.500
0.000
0.00
0.50
1.00
1.50
2.00

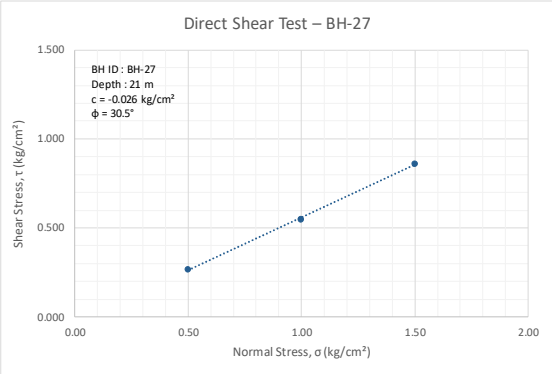

Direct Shear Test – BH-27
BH ID : BH-27
Depth : 6 m
c = 0.049 kg/cm²
ϕ = 28.6°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
1.500
1.000
0.500
0.000
0.00
0.50
1.00
1.50
2.00

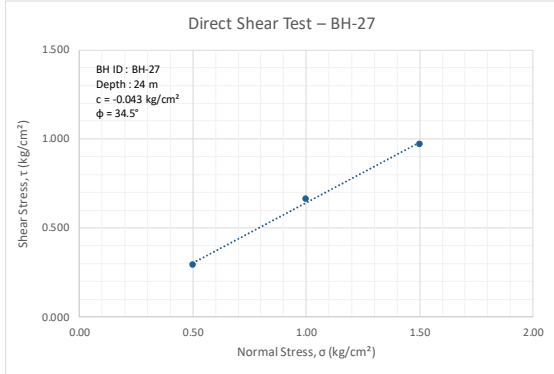

Direct Shear Test – BH-27
BH ID : BH-27
Depth : 9 m
c = 0.077 kg/cm²
ϕ = 27.8°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
1.500
1.000
0.500
0.000
0.00
0.50
1.00
1.50
2.00

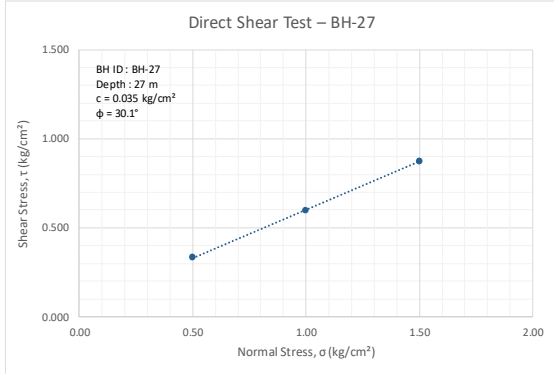

Direct Shear Test – BH-27
BH ID : BH-27
Depth : 12 m
c = 0.033 kg/cm²
ϕ = 28.8°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
1.500
1.000
0.500
0.000
0.00
0.50
1.00
1.50
2.00


Direct Shear Test – BH-27
BH ID : BH-27
Depth : 15 m
c = -0.061 kg/cm²
ϕ = 34.0°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
1.500
1.000
0.500
0.000
0.00
0.50
1.00
1.50
2.00


Direct Shear Test – BH-27
BH ID : BH-27
Depth : 18 m
c = -0.042 kg/cm²
ϕ = 32.0°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
1.500
1.000
0.500
0.000
0.00
0.50
1.00
1.50
2.00


Direct Shear Test – BH-27
BH ID : BH-27
Depth : 21 m
c = -0.026 kg/cm²
ϕ = 30.5°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
1.500
1.000
0.500
0.000
0.00
0.50
1.00
1.50
2.00


Direct Shear Test – BH-27
BH ID : BH-27
Depth : 24 m
c = -0.043 kg/cm²
ϕ = 34.5°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
1.500
1.000
0.500
0.000
0.00
0.50
1.00
1.50
2.00


Direct Shear Test – BH-27
BH ID : BH-27
Depth : 27 m
c = 0.035 kg/cm²
ϕ = 30.1°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
1.500
1.000
0.500
0.000
0.00
0.50
1.00
1.50
2.00

Appendix C1: Chemical Test Results (Soil & Groundwater)

CHEMICAL TEST RESULTS (SOIL)

Test Parameter		pH	Sulphate (%)	Chloride (%)
Test Reference		IS:2720(Part 26) R.A 2021	BS 1377 (Part-3) 1990	IS:2720(Part 27) R.A 2020
BH ID	Chainage (km)	-	-	-
BH-01	0+031	8.05	0.018	0.028
BH-02	0+124	8.14	0.021	0.032
BH-03	0+202	8.23	0.029	0.034
BH-04	0+291	8.05	0.024	0.031
BH-05	0+410	8.20	0.028	0.029
BH-06	0+501	8.26	0.018	0.033
BH-07	0+622	8.07	0.042	0.038
BH-08	0+701	8.28	0.013	0.022
BH-09	0+802	8.23	0.035	0.027
BH-10	0+907	8.20	0.016	0.039
BH-11	1+004	8.25	0.028	0.041
BH-12	1+092	8.20	0.031	0.017
BH-13	1+214	8.04	0.046	0.014
BH-14	1+293	8.06	0.027	0.018
BH-15	1+392	7.91	0.027	0.011
BH-16	1+487	7.78	0.044	0.011
BH-17	1+587	7.03	0.022	0.013
BH-20	1+869	8.29	0.036	0.012
BH-21	1+925	8.15	0.023	0.015
BH-22	2+036	8.66	0.042	0.011
BH-23(A)	2+116	-	-	-
BH-23(B)	2+190	-	-	-
BH-23	2+157	-	-	-
BH-24	2+338	8.17	0.017	0.01
BH-25	2+404	8.12	0.026	0.013
BH-26	2+532	8.09	0.027	0.013
BH-27	2+586	7.91	0.016	0.014

CHEMICAL TEST RESULTS (GROUNDWATER)

Test Parameter		pH	Sulphate (mg/l)	Chloride (mg/l)
Test Reference		IS 3025:PART 11 RY 2022	IS 3025:PART 32 RY 2019	IS 3025:PART 24 RY 2022
BH ID	Chainage (km)	-	-	-
BH-01	0+031	6.77	922	9608
BH-02	0+124	6.89	908	9362
BH-03	0+202	6.83	853	9263
BH-04	0+291	6.95	946	9017
BH-05	0+410	7.16	860	8869
BH-06	0+501	6.75	970	9066
BH-07	0+622	6.91	974	8771
BH-08	0+701	7.21	964	9460
BH-09	0+802	7.15	798	9559
BH-10	0+907	6.75	877	9313
BH-11	1+004	6.68	902	9510
BH-12	1+092	7.17	310	249
BH-13	1+214	-	-	-
BH-14	1+293	7.04	309	239
BH-15	1+392	7.23	336	409
BH-16	1+487	7.01	378	354
BH-17	1+587	7.28	384	349
BH-20	1+869	7.23	319	334
BH-21	1+925	7.14	298	354
BH-22	2+036	7.24	307	349
BH-23(A)	2+116	7.2	399	329
BH-23(B)	2+190	7.28	403	409
BH-23(C)	2+157	7.43	381	314
BH-24	2+338	7.03	393	329
BH-25	2+404	7.04	373	264
BH-26	2+532	7.09	410	284
BH-27	2+586	7.06	392	239

IS 456: 2000 Permissible Limit

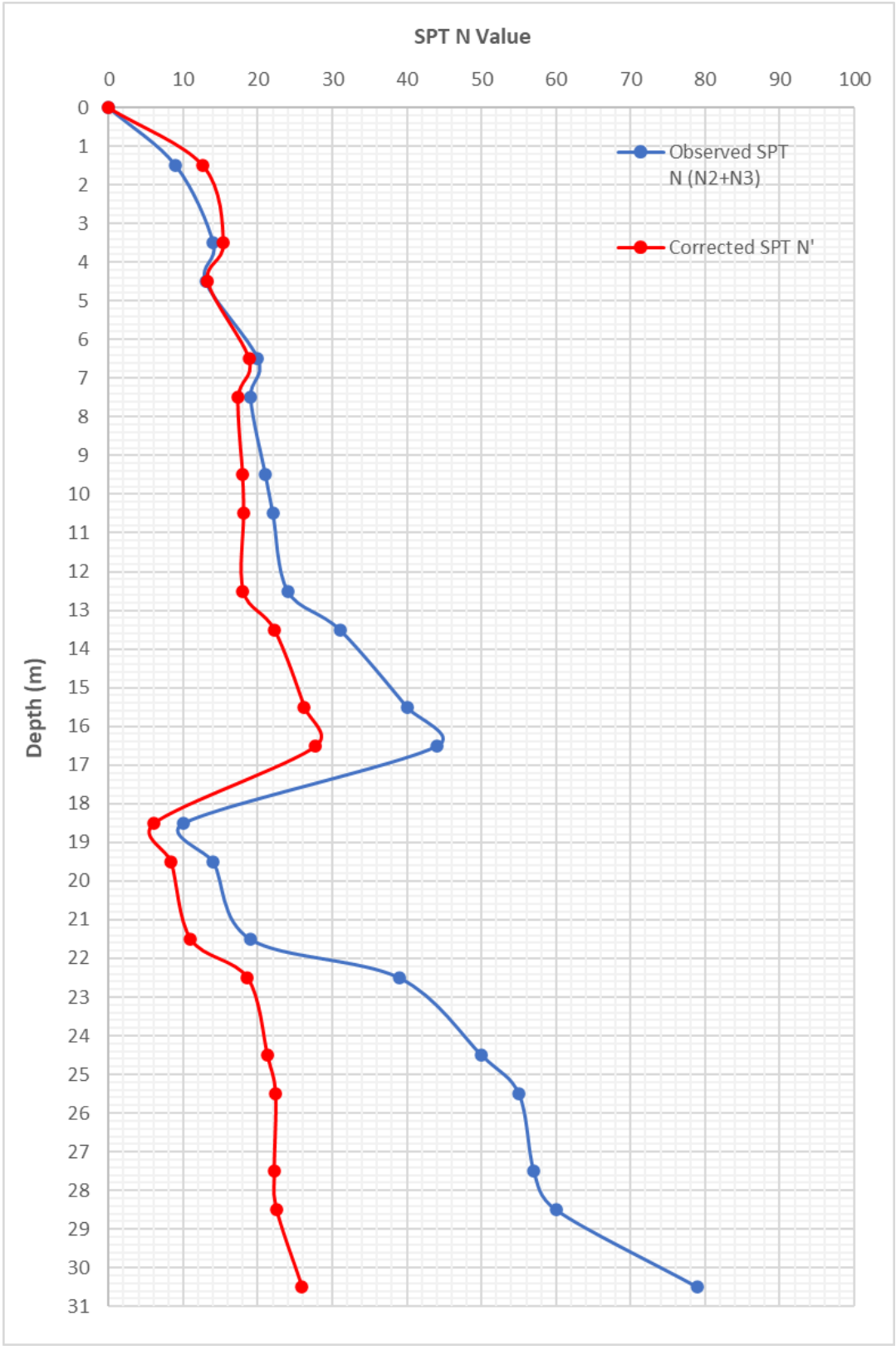
SR No.	Parameter	Permissible Limit	Unit
1	pH	not less than 6	-
2	Sulphate	2000 & 500*	(mg/l)
3	Chloride	400	(mg/l)

Note :*Sulphate Content limit of 2000 mg/l for plain concrete and 500 mg/l for reinforced concrete work.

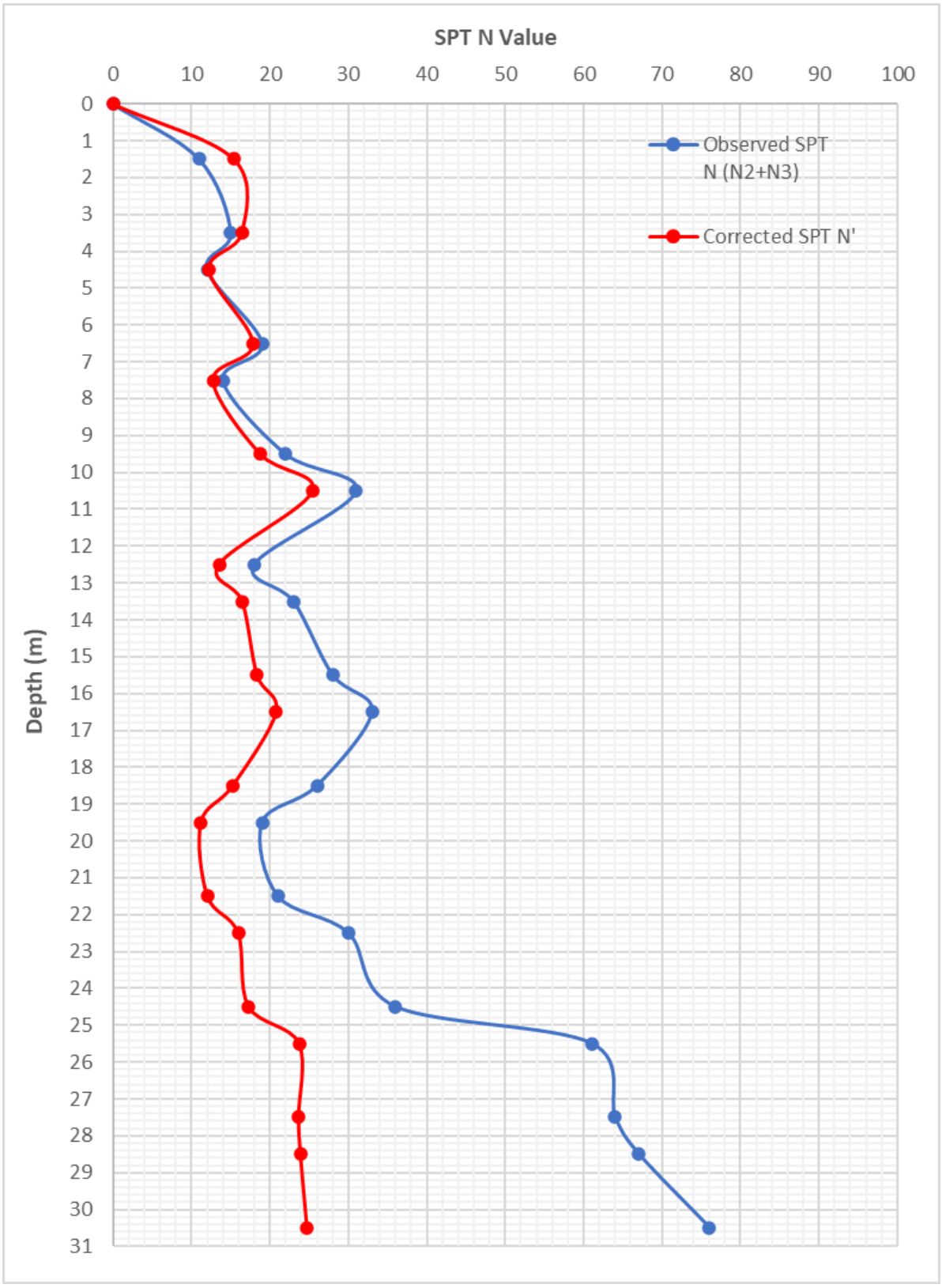
Appendix D SPT Results

D.1 Zone 1: CH: 0+000 km to 1+004 km (BH-01 to BH-11)

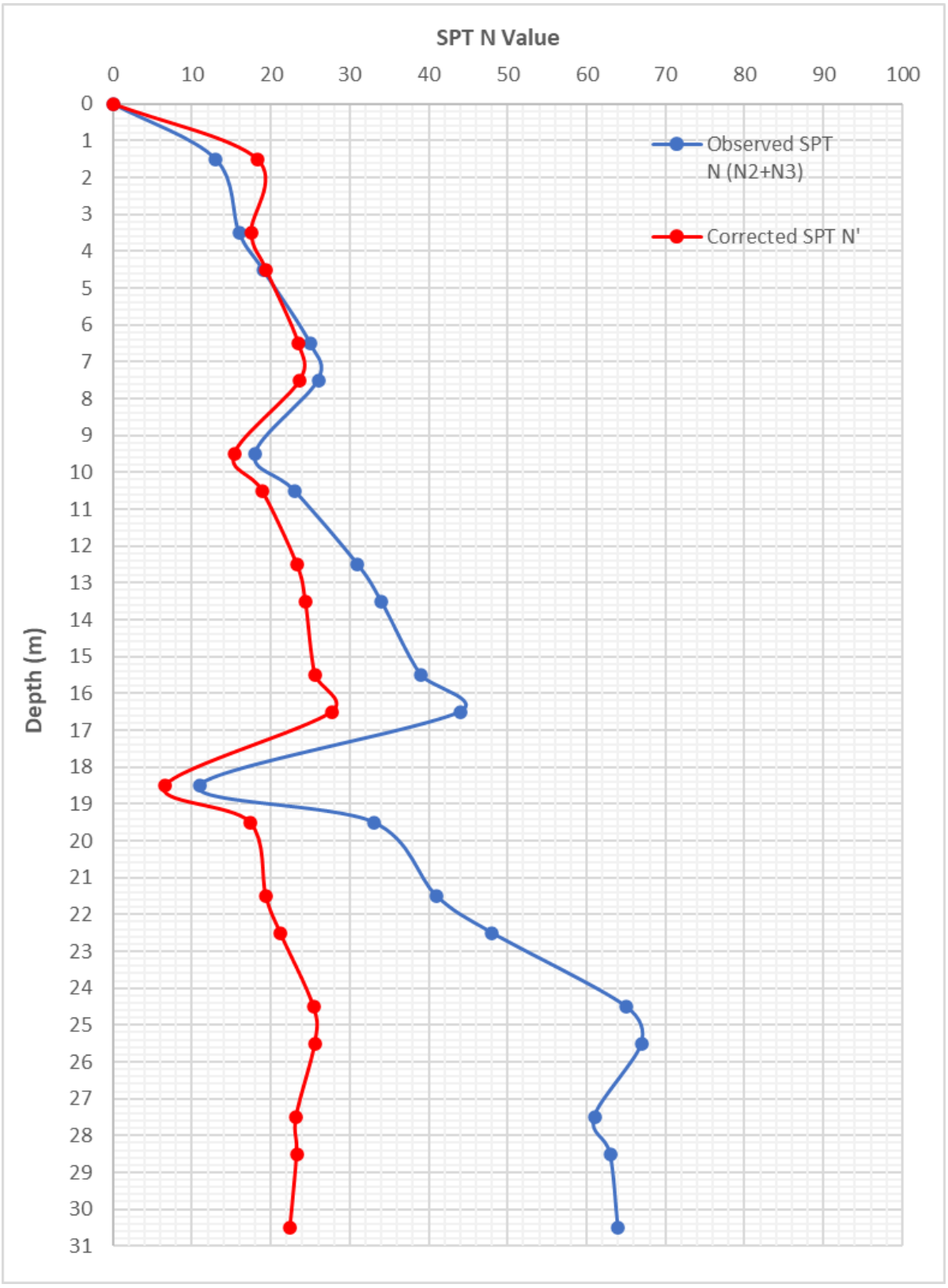
BH-01



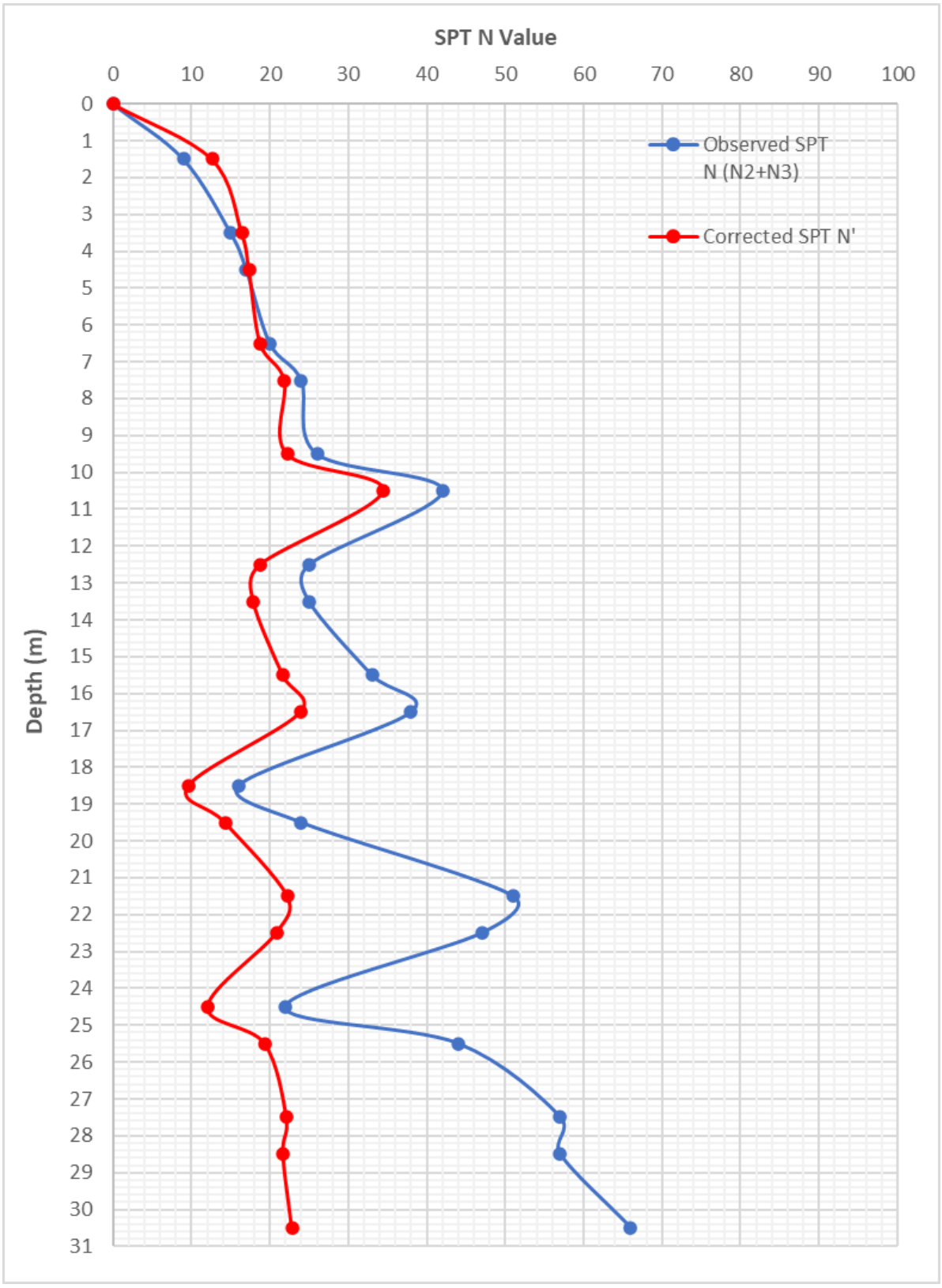
BH-02


SPT N Value
0
10
20
30
40
50
60
70
80
90
100
Depth (m)
0
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
Observed SPT N (N2+N3)
Corrected SPT N'

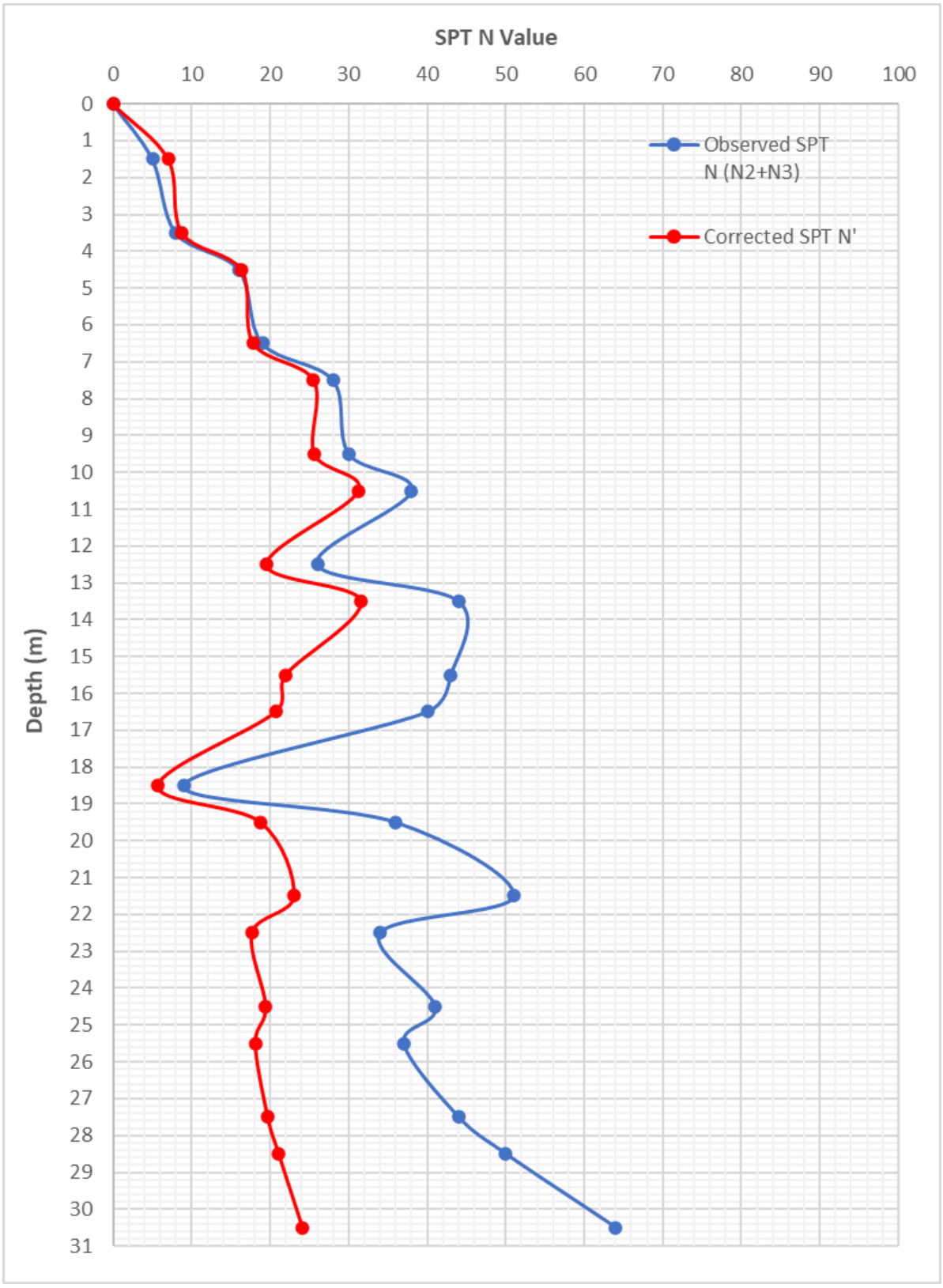
BH-03


SPT N Value
0
10
20
30
40
50
60
70
80
90
100
Depth (m)
0
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
Observed SPT N (N2+N3)
Corrected SPT N'

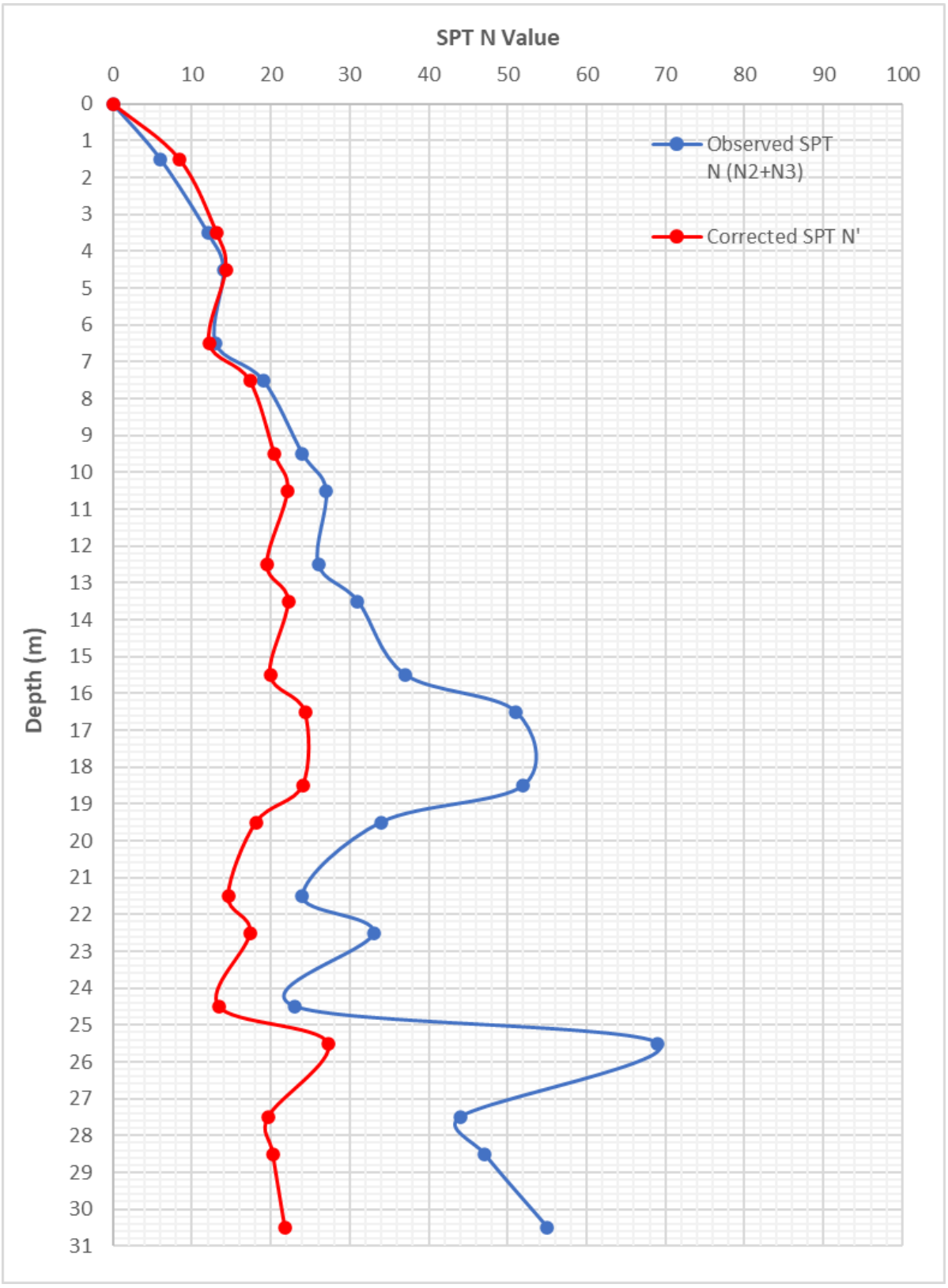
BH-04


SPT N Value
0
10
20
30
40
50
60
70
80
90
100
Depth (m)
0
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
Observed SPT N (N2+N3)
Corrected SPT N'

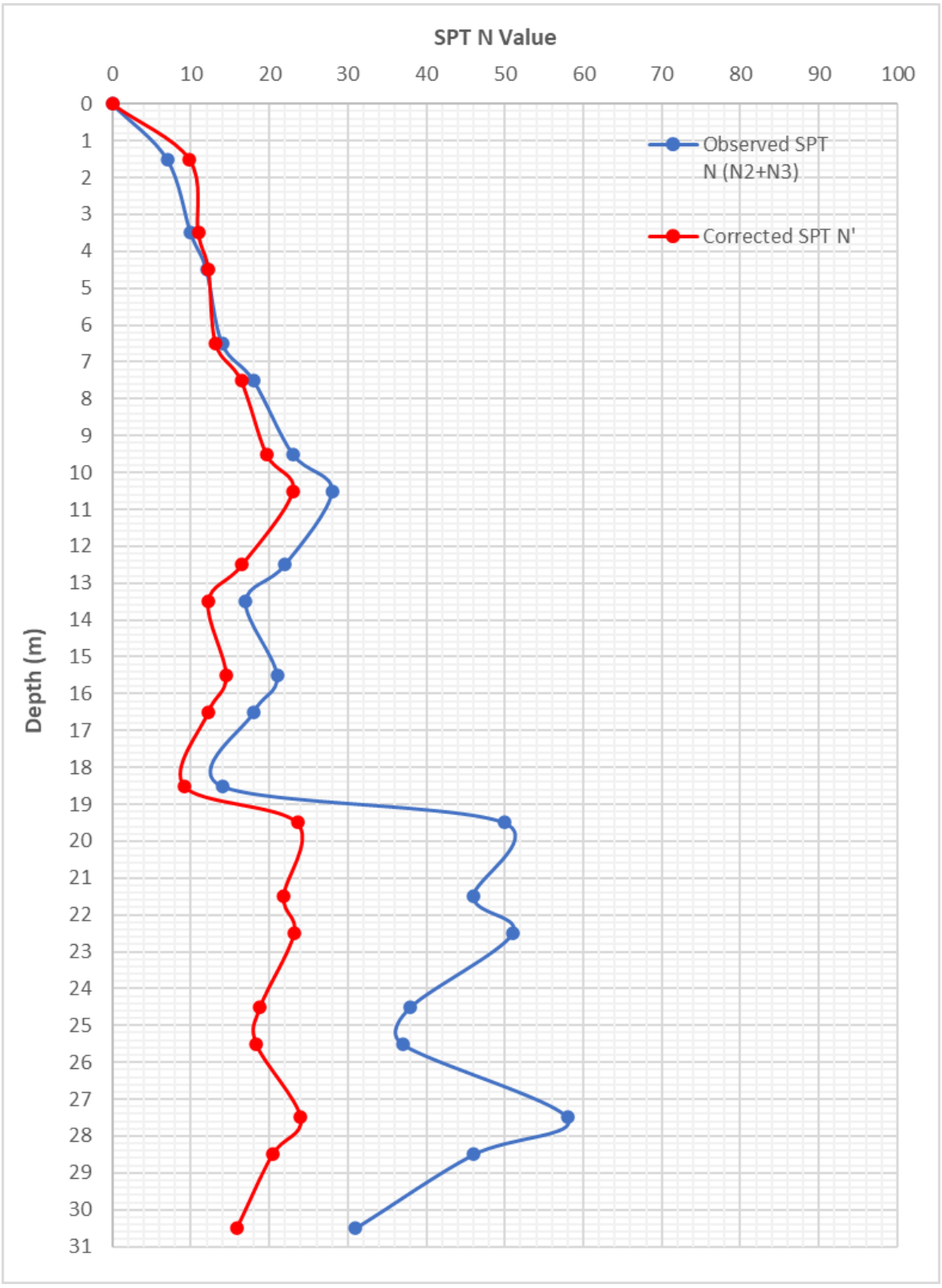
BH-05


SPT N Value
0
10
20
30
40
50
60
70
80
90
100
Depth (m)
0
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
Observed SPT N (N2+N3)
Corrected SPT N'

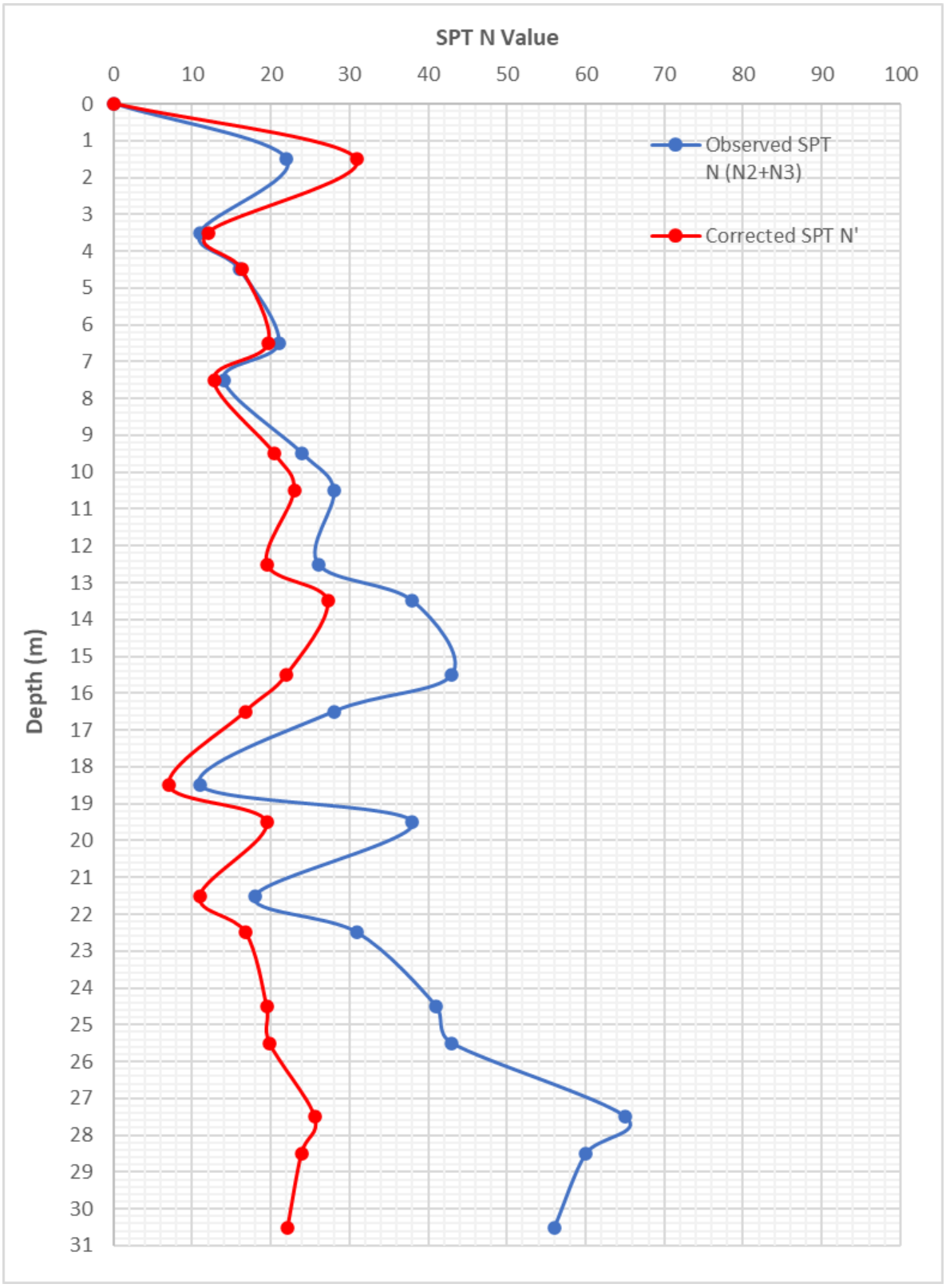
BH-06


SPT N Value
0
10
20
30
40
50
60
70
80
90
100
Depth (m)
0
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
Observed SPT N (N2+N3)
Corrected SPT N'

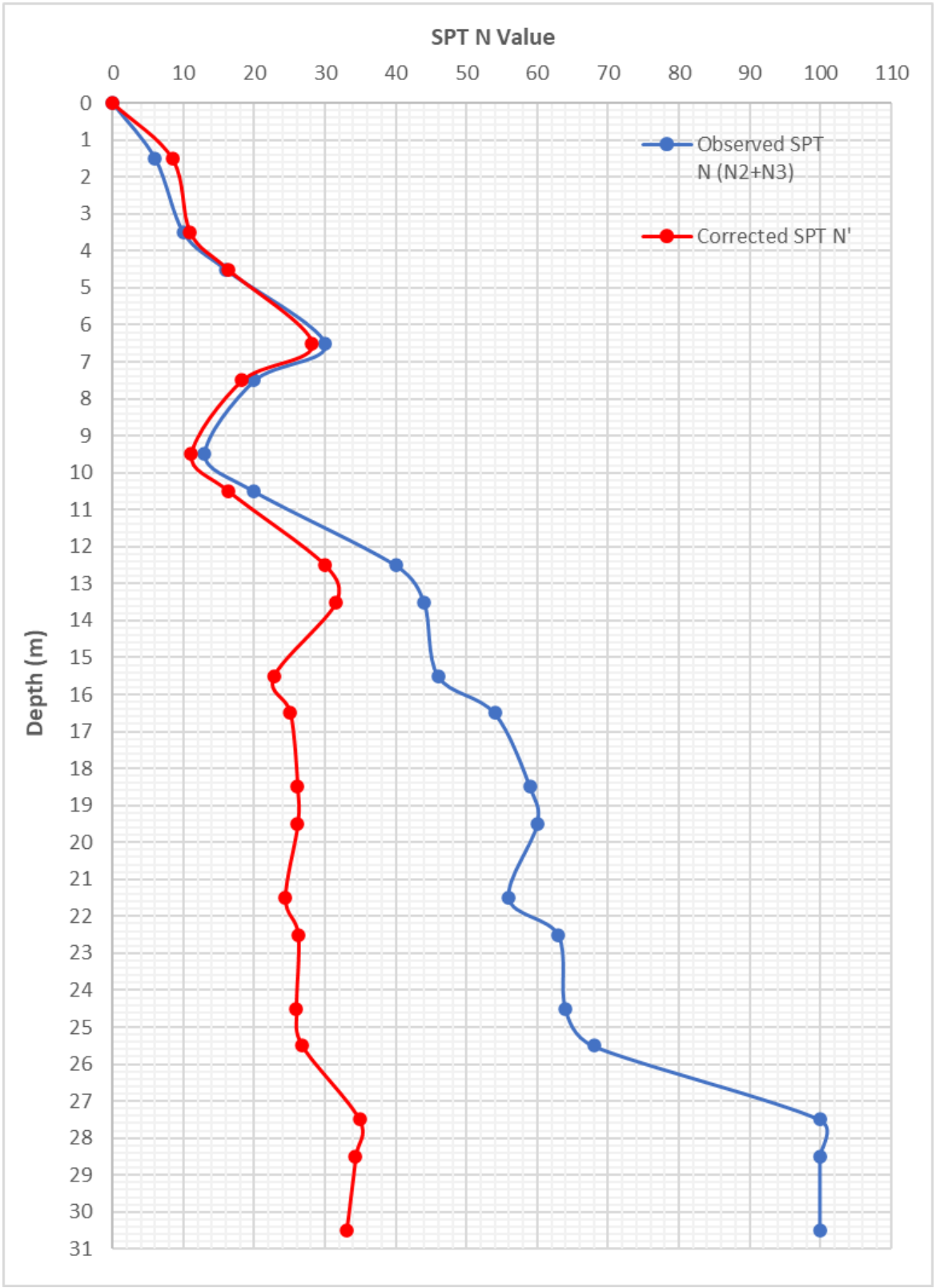
BH-07


SPT N Value
0
10
20
30
40
50
60
70
80
90
100
Depth (m)
0
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
Observed SPT N (N2+N3)
Corrected SPT N'

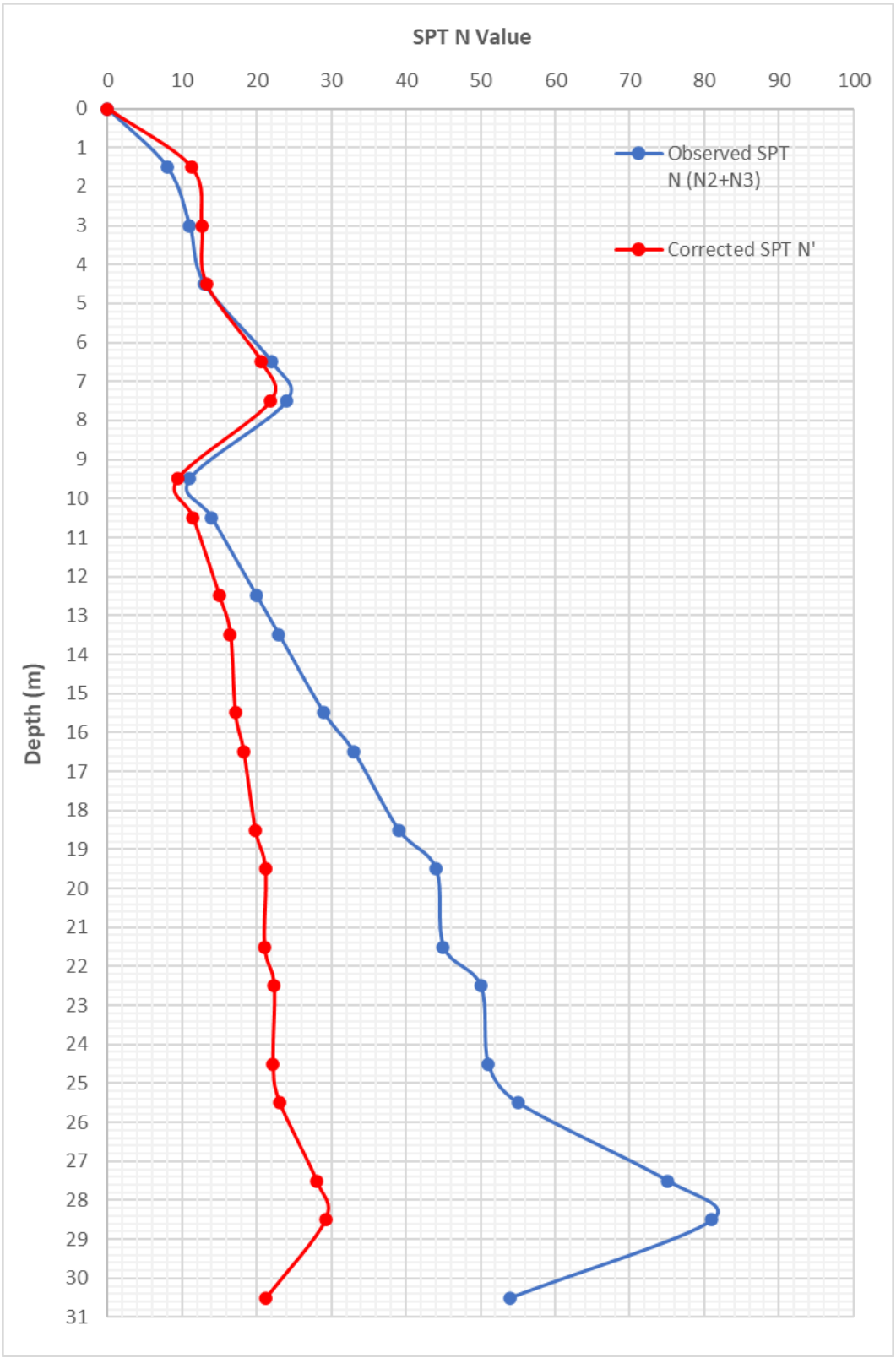
BH-08


SPT N Value
0
10
20
30
40
50
60
70
80
90
100
Depth (m)
0
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
Observed SPT N (N2+N3)
Corrected SPT N'

BH-08A


SPT N Value
0
10
20
30
40
50
60
70
80
90
100
110
Depth (m)
0
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
Observed SPT N (N2+N3)
Corrected SPT N'

BH-08B


SPT N Value
0
10
20
30
40
50
60
70
80
90
100
Depth (m)
0
1
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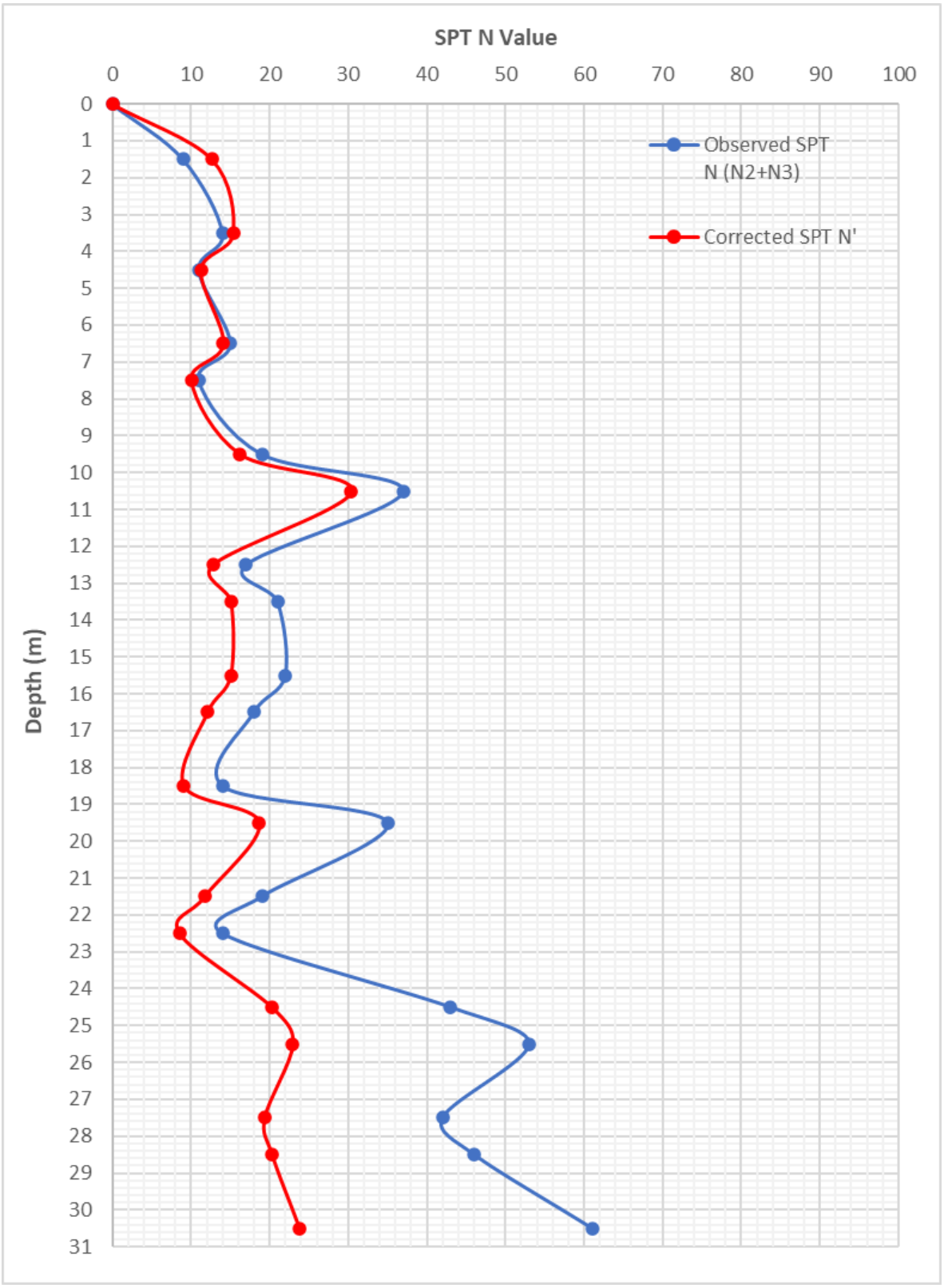
31
Observed SPT N (N2+N3)
Corrected SPT N'

BH-09


SPT N Value
0
10
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60
70
80
90
100
Depth (m)
0
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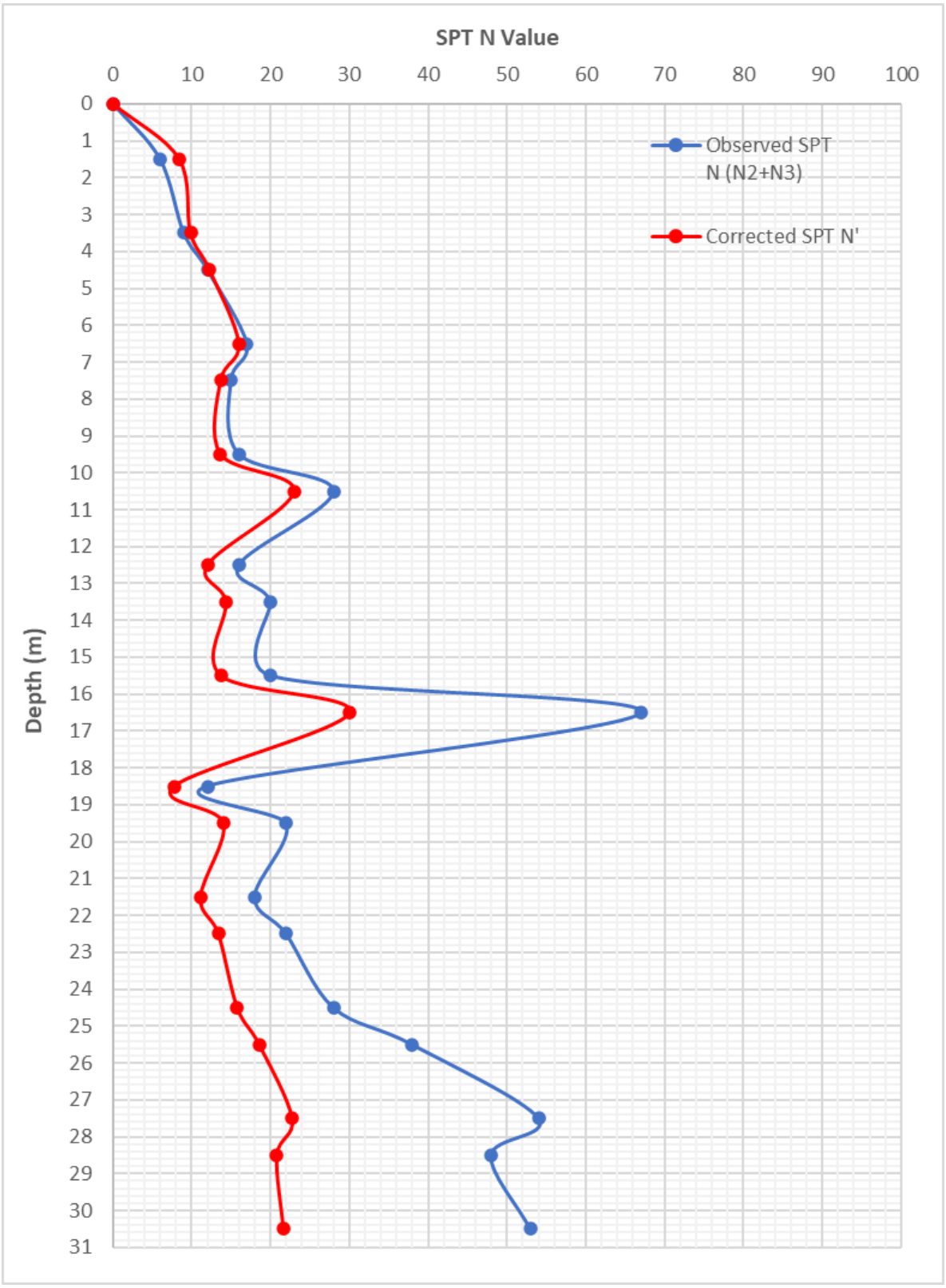
Observed SPT N (N2+N3)
Corrected SPT N'

BH-10


SPT N Value
0
10
20
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40
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60
70
80
90
100
Depth (m)
0
1
2
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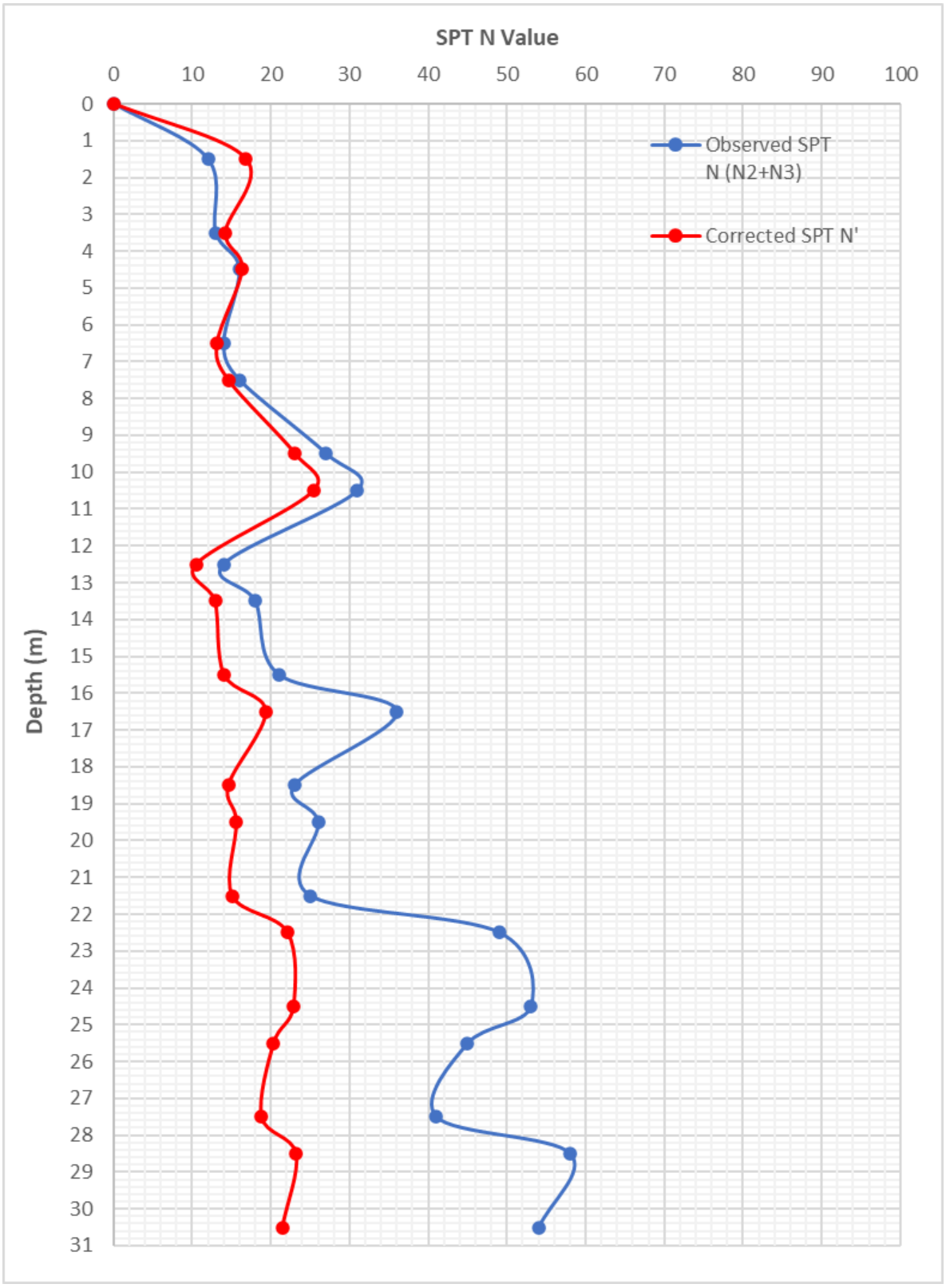
Observed SPT N (N2+N3)
Corrected SPT N'

BH-11


SPT N Value
0
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90
100
Depth (m)
0
1
2
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4
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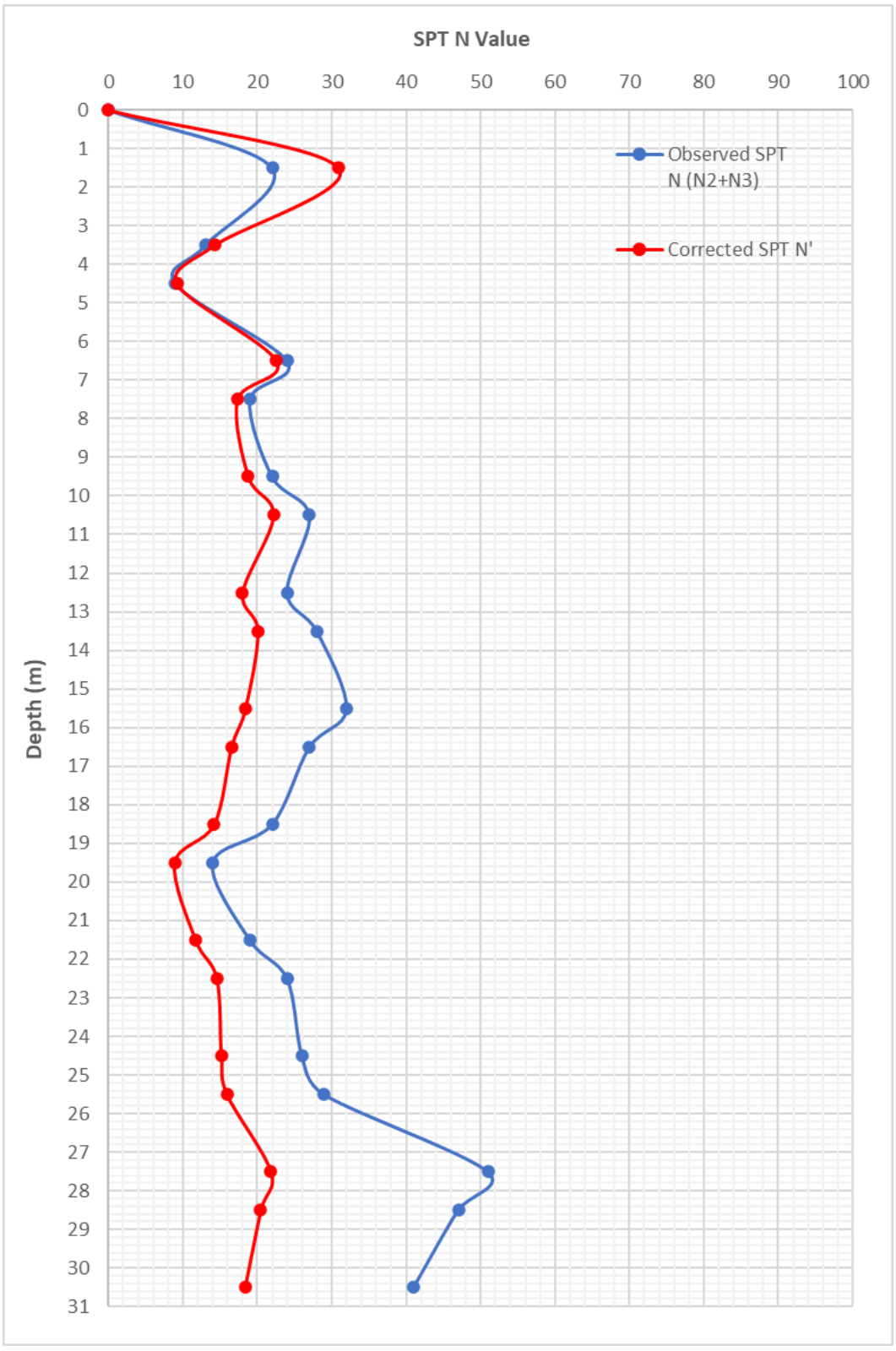
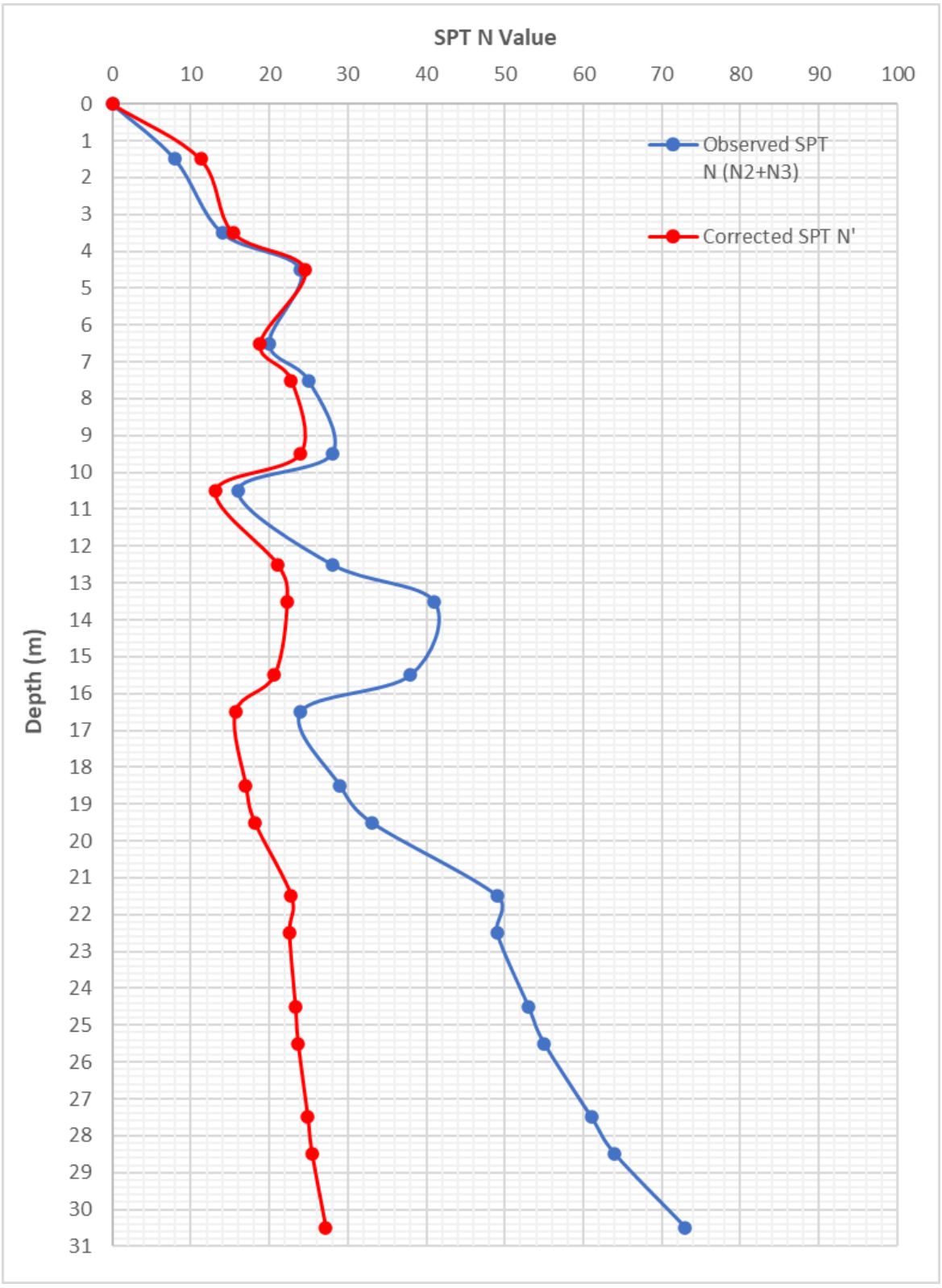
Observed SPT N (N2+N3)
Corrected SPT N'

D.2 Zone 2: CH: 1+004 km to 1+925 km (BH-12 to BH-21)

BH-12



BH-13


SPT N Value
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100
Depth (m)
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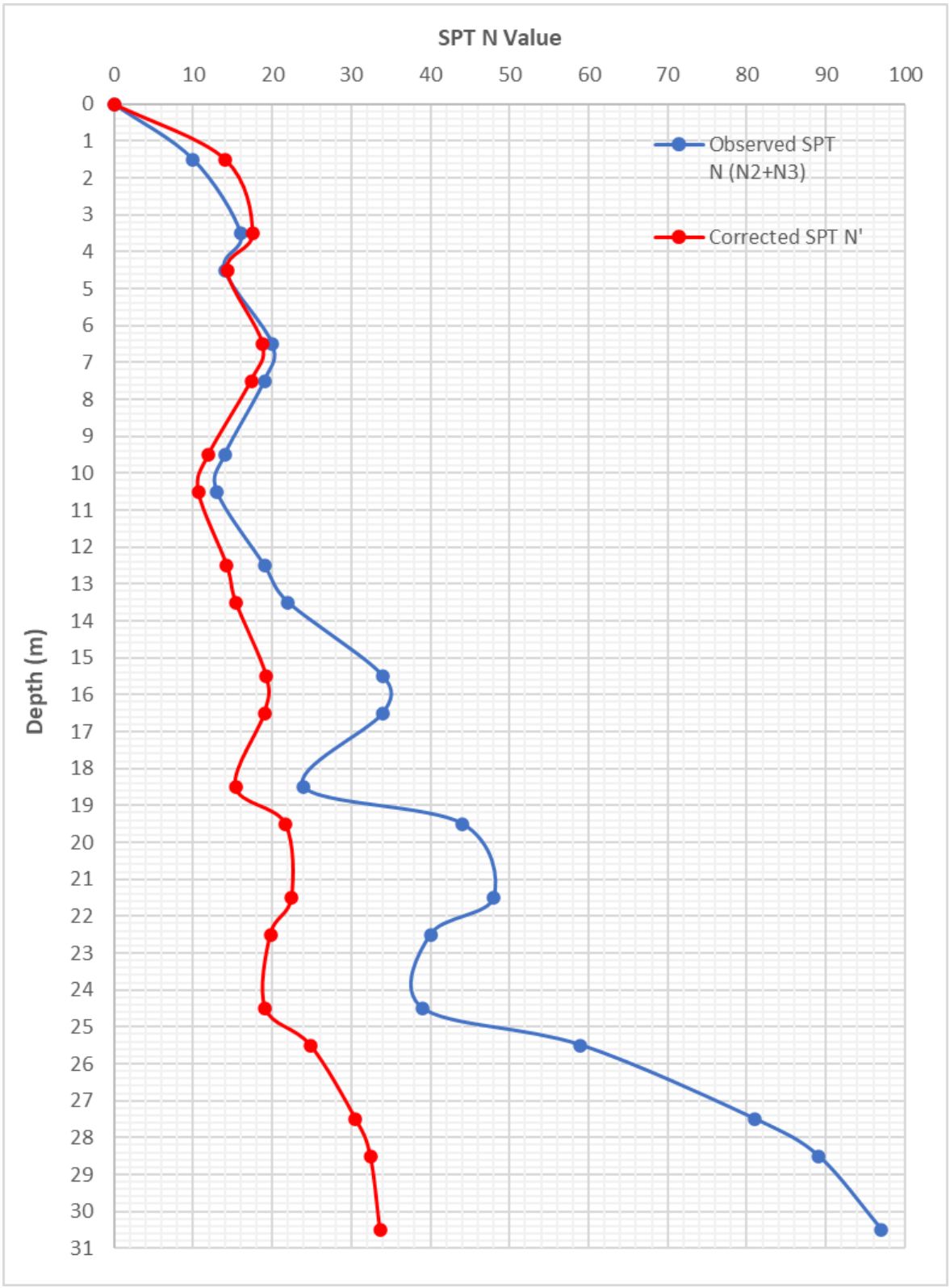
Observed SPT N (N2+N3)
Corrected SPT N'

BH-14


SPT N Value
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100
Depth (m)
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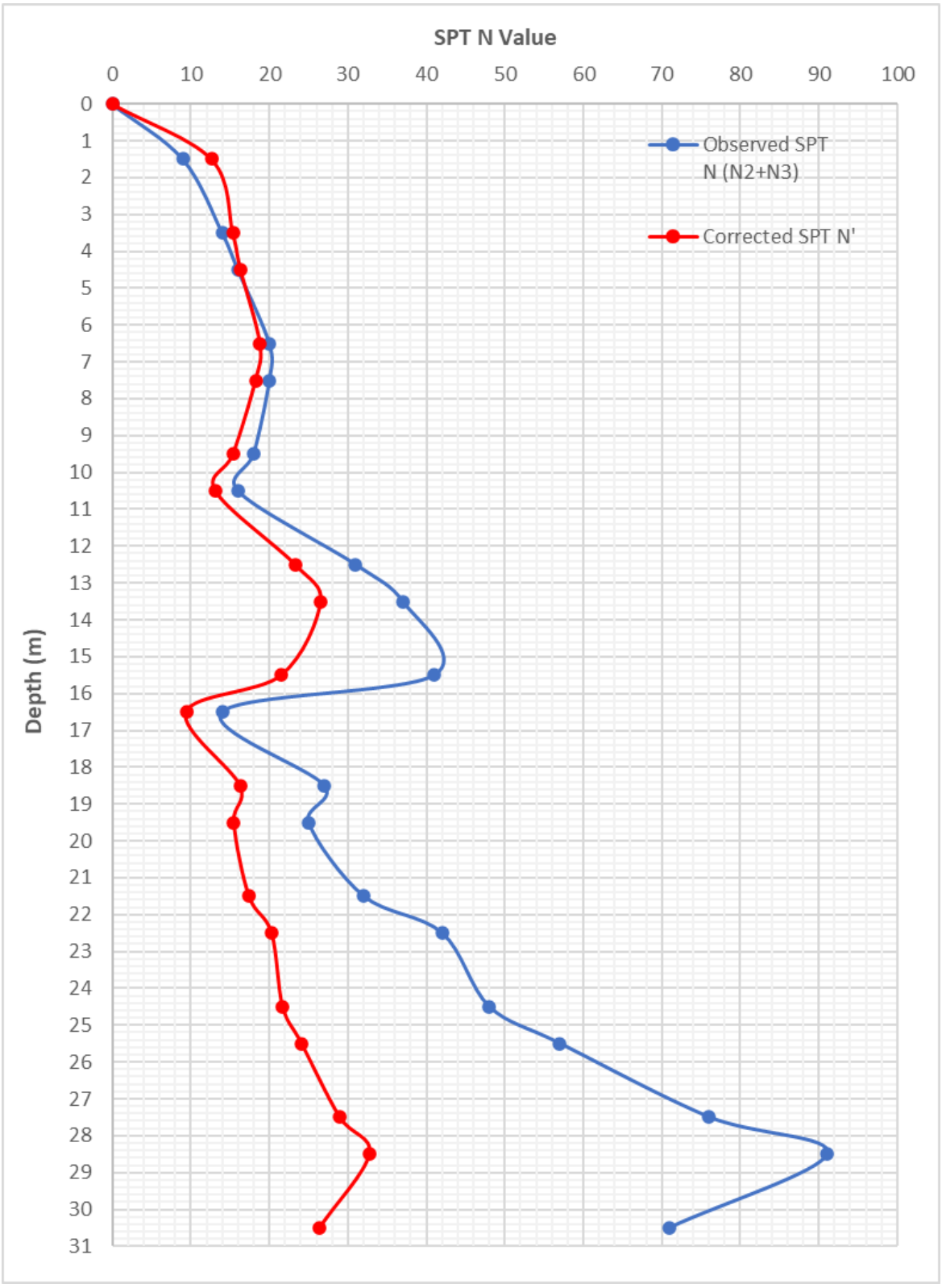
Observed SPT N (N2+N3)
Corrected SPT N'

BH-15


SPT N Value
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Depth (m)
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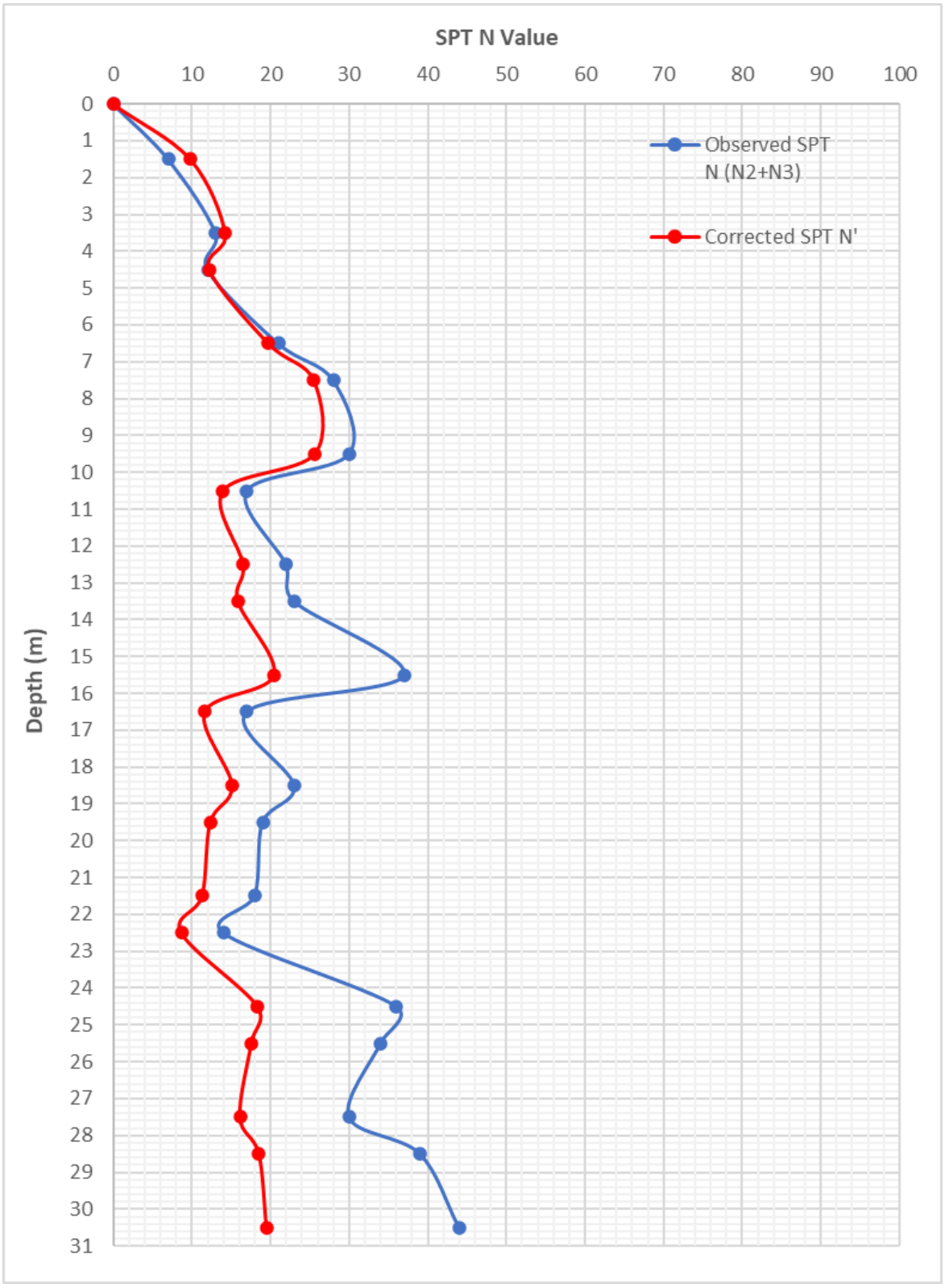
Observed SPT N (N2+N3)
Corrected SPT N'

BH-16


SPT N Value
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100
Depth (m)
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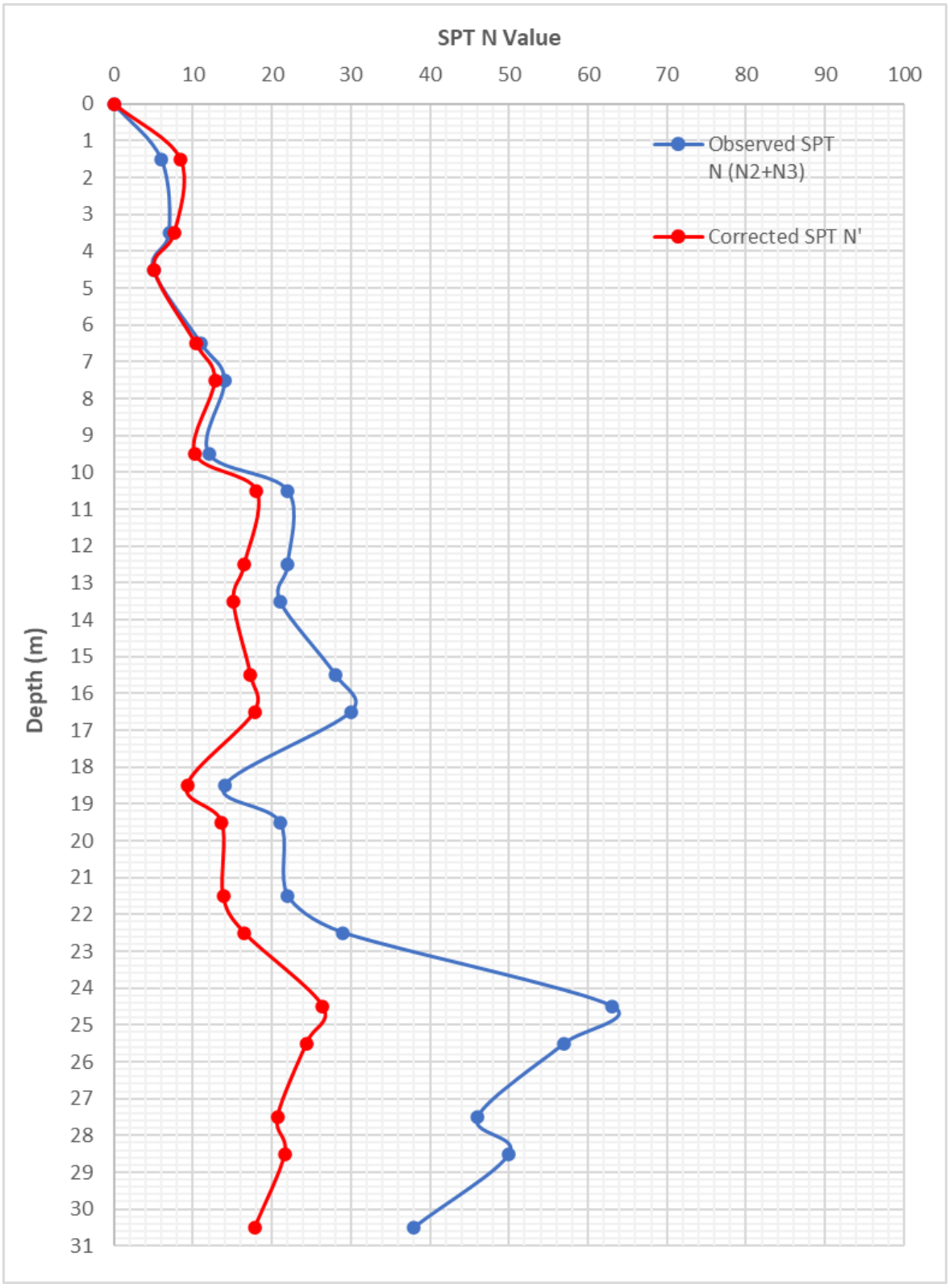
Observed SPT N (N2+N3)
Corrected SPT N'

BH-17


SPT N Value
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Depth (m)
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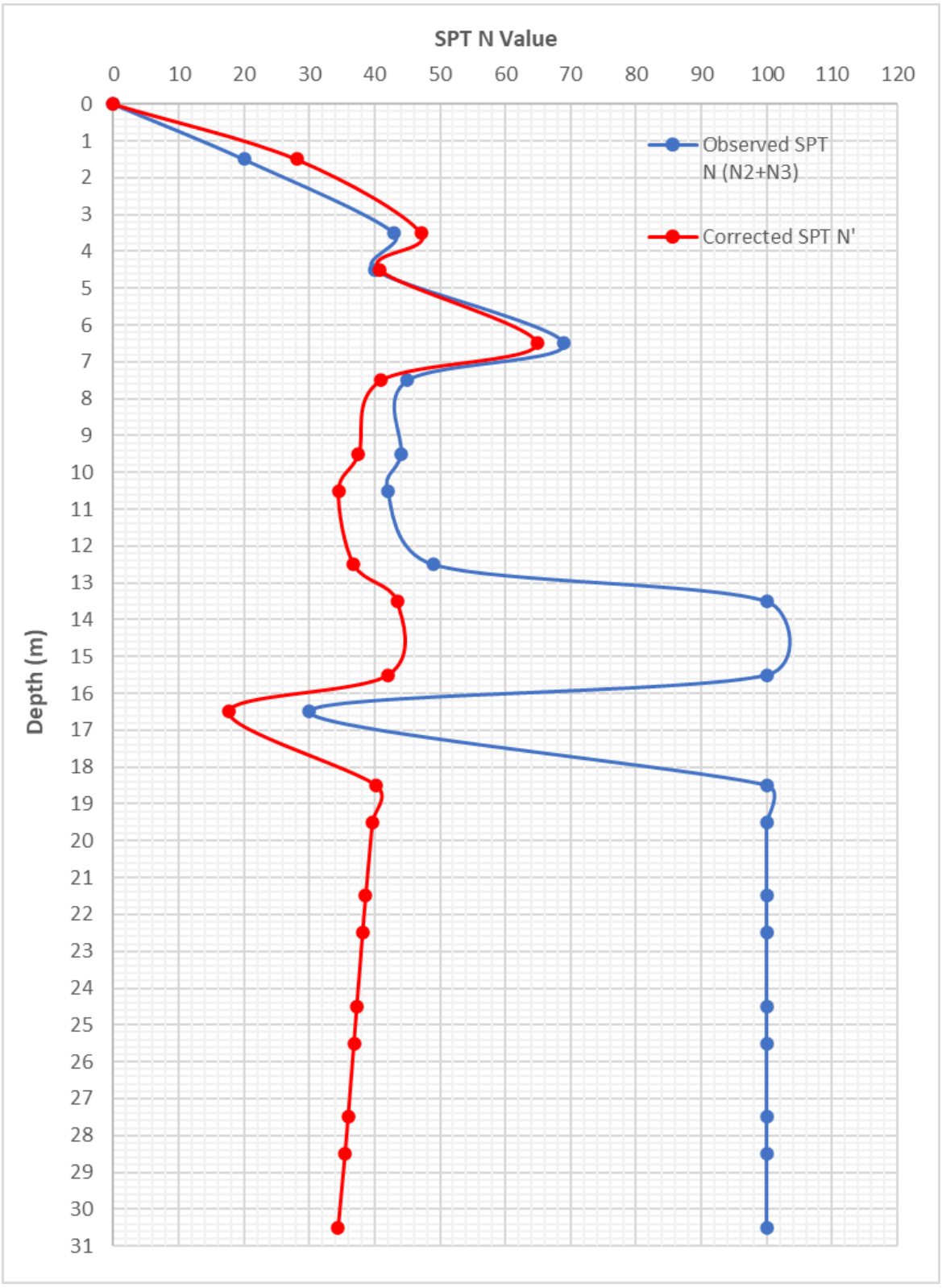
Observed SPT N (N2+N3)
Corrected SPT N'

BH-20


SPT N Value
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120
Depth (m)
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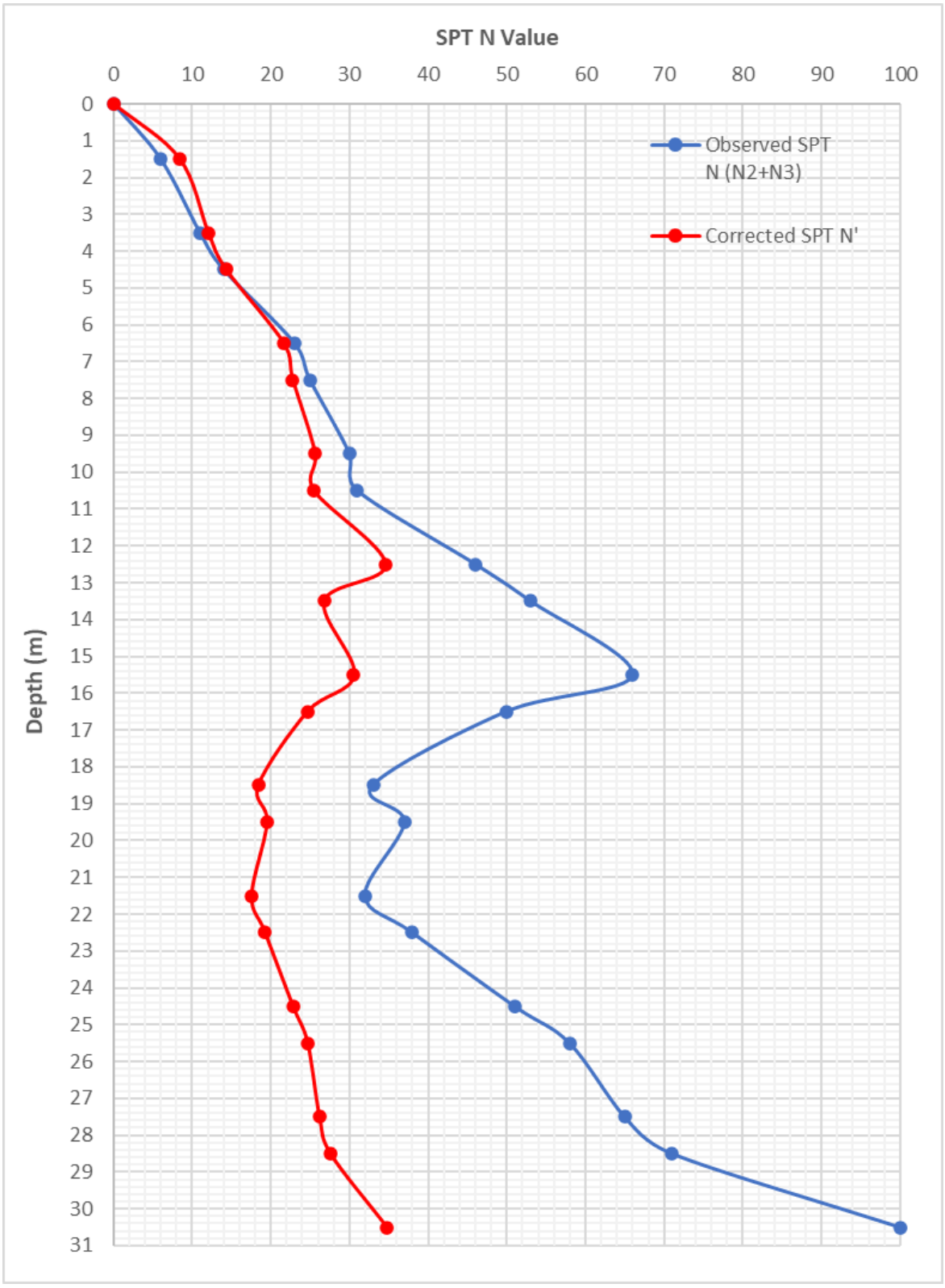
Observed SPT N (N2+N3)
Corrected SPT N'

BH-21


SPT N Value
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Depth (m)
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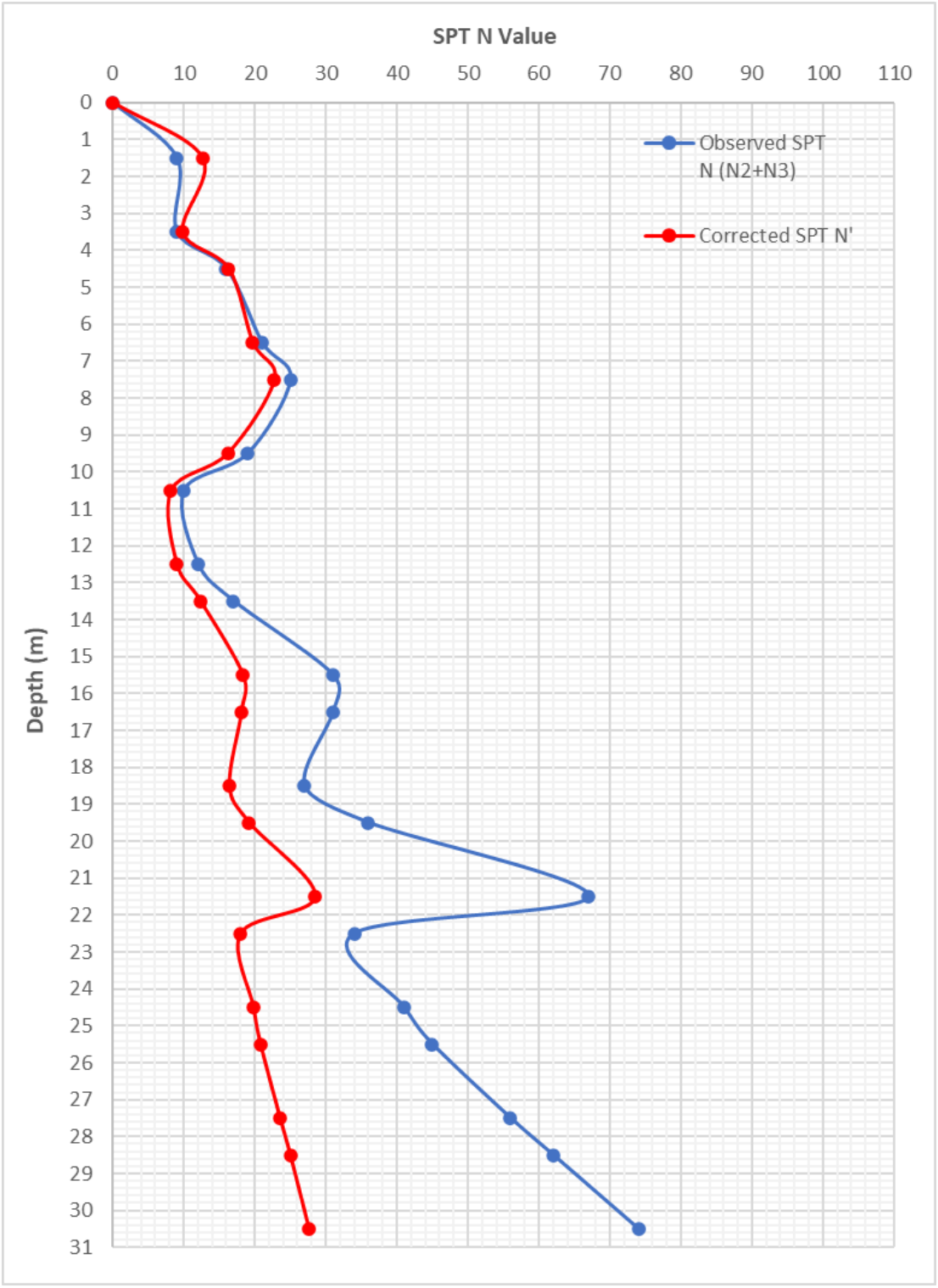
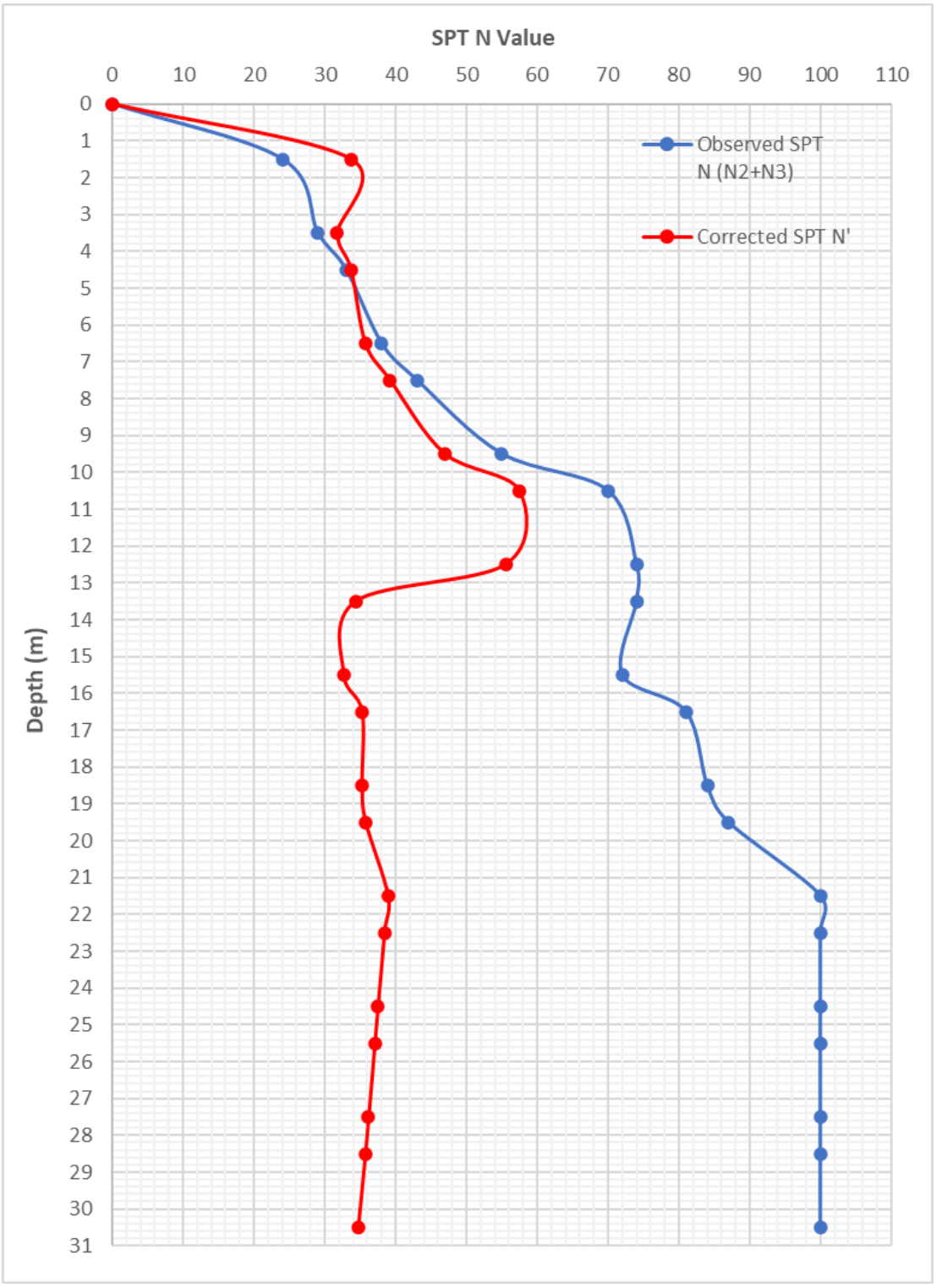
Observed SPT N (N2+N3)
Corrected SPT N'

D.3 Zone 3: CH: 1+925 km to 2+586 km (BH-22 to BH-27)

BH-22



BH-23


SPT N Value
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Depth (m)
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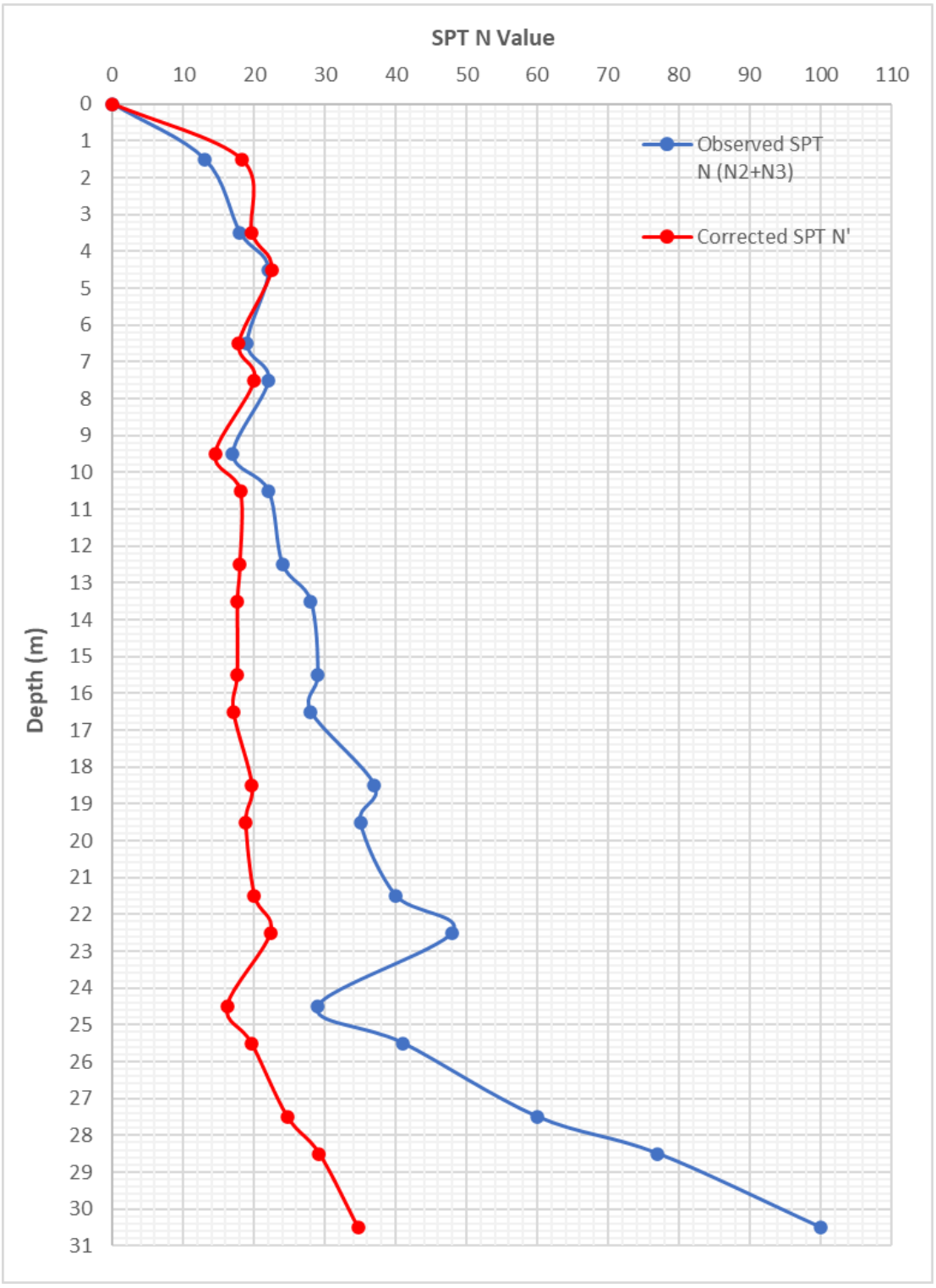
Observed SPT N (N2+N3)
Corrected SPT N'

BH-23A


SPT N Value
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Depth (m)
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31
Observed SPT N (N2+N3)
Corrected SPT N'