

**GEOTECHNICAL REPORT TO
ROYAL HASKONINGDHV
BASED ON THE RESULTS
OF THE LOGGING OF BOREHOLES,
MBOZA PEDESTRIAN BRIDGE
NO. 3513, PONGOLA RIVER**

Reference
N7786

Prepared By
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Date
July 2013



CONSULTING ENGINEERS &
ENGINEERING GEOLOGISTS

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APPENDIX 1

BOREHOLE PROFILES : *BH1 THROUGH BH5*

DRAWING

N7786/01 : *SITE PLAN*

GEOTECHNICAL REPORT TO ROYAL HASKONINGDHV BASED ON THE RESULTS OF THE LOGGING OF BOREHOLES, MBOZA PEDESTRIAN BRIDGE NO. 3513, PONGOLA RIVER

1. TERMS OF REFERENCE

Davies Lynn & Partners (Pty) Ltd (DLP) were appointed by Royal HaskoningDHV (RHDHV) to log four (4No.) boreholes set out by RHDHV and drilled by Earthtech c.c., also appointed by RHDHV, at the proposed Mboza Pedestrian Bridge No. 3513 across the Pongola River. The quotation submitted by DLP included for a Site visit and logging of the core initially on Site and then at RHDHV premises in Pietermaritzburg.

2. INFORMATION SUPPLIED

- 2.1 RHDHV Drawing No. 3513/01 provided a Site Plan which shows the proposed positions of the four (4No.) boreholes relative to the Pongola River, spot elevations and contours as well as a Section/Elevation across the River providing elevations of approach fills, deck elevations and anticipated piling depths.
- 2.2 A Locality Plan, Typical Deck Section and Hydraulic and Hydrological Data were also shown on RHDHV Drawing No. 3513/01.
- 2.3 Verbal communication with Stephen Jaya (RHDHV) that pile design loads should be 1200kN.

3. FIELD INVESTIGATION

The field investigation comprised the drilling of five (5No.) boreholes (rather than the envisaged 4No.) by Earthtech c.c. to depths indicated by RHDHV at locations which were surveyed and levelled. The SPT samples and core samples were logged and borehole profiles prepared that appear in Appendix 1.

4. INFERRED GEOLOGY

The borehole material symbols have been plotted onto the "Bridge Elevation" section on the Site Plan appearing in DLP Drawing No. N7786/01, together with the SPT 'Nf' values. The latter are the field values which have not been corrected for overburden pressure nor normalized.

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The boreholes indicate that alluvial materials underlie the Site for the entire depth of the boreholes, which largely have been terminated in subrounded to rounded pebbles and cobbles at depths ranging between 21.4m and 22.51m below EGL. It is inferred that the latter form a basal horizon that overlies the bedrock.

The alluvial sediments comprise predominantly CLAYS, SILTY CLAYS, fine grained sandy SILTS and SILTY SANDS, which are interlayered and laterally discontinuous. The SPT 'Nf' values indicate that the clays are predominantly firm to stiff (Nf <15) to between 7m and 11m depth below EGL on the western abutment (Mboza Clinic) and to between 11m and 14m below EGL on the eastern abutment (Munyu Primary School). Thereafter, the clays become stiff to very stiff and interlayered sands medium dense down to the basal "boulder" layer at depths greater than 21m below EGL.

5. **FOUNDATIONS**

5.1 **Shallow Foundations**

The firm to stiff near surface conditions as well as the potential scour during flooding events result in the shallow foundation option being considered unsuitable to support the anticipated loads.

5.2 **Piled Foundations**

It is probable that the Continuous Flight Auger (CFA) pile will be the most economical and suitable pile type on this Site for the installation of 1200kN capacity piles, although the Driven Cast in Place (DCIP) pile or "Franki" type pile may also prove competitive. The high end-bearing stresses exerted by the DCIP piles may, however, result in some degree of longterm consolidation of the stiff clays where these occur.

5.2.1 **CFA Pile**

On the basis of our interpretation of the results of the borehole SPT 'N' values, the anticipated founding depths for both a 500mm Ø and a 500mm Ø CFA pile supporting a load of 1200kN with a factor of safety of 2.5 are given below.

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TABLE 1

ANTICIPATED FOUNDING DEPTHS OF BOTH 500MM Ø AND 600MM Ø CFA PILES BELOW EXISTING GROUND LEVEL

Borehole No.	Depth to End of Borehole	CFA Pile Founding Depth in metres below Existing Ground Level	
		500mm Ø 1200kN load	600mm Ø 1200kN load
BH1	22.45	20.5	19.0
BH2	22.51	21.0	19.25
BH3	21.65	21.75 *	20.0
BH4	21.39	22.5 *	21.25
BH5	21.75	21.0	19.75

* last SPT Nf value has been extrapolated downwards to achieve the founding depth indicated.

5.2.2 DCIP Pile

On the basis of an interpretation of the borehole SPT Nf values, the anticipated founding depths for DCIP piles should generally be as indicated in Table 2 below for a 520mm Ø DCIP pile supporting a load of 1200kN.

TABLE 2

ANTICIPATED FOUNDING DEPTHS OF A 520MM Ø DCIP PILE BELOW EXISTING GROUND LEVEL

Borehole No.	Depth of End of Borehole	DCIP Pile Founding Depth in metres below Existing Ground Level
		520mm Ø 1200kN load
BH1	22.45	13.0
BH2	22.51	15.25
BH3	21.65	12.75
BH4	21.39	18.0
BH5	21.75	15.75

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The depth of 18m at BH4 location is likely to be in excess of the conventional DCIP driven tube length, while the depths of 15.25m and 15.75m at BH2 and BH5 (western abutment) respectively, are marginally within the conventional DCIP piling depth, but without a significant degree of flexibility should an acceptable set not be achieved at these depths. While an extension to the conventional DCIP tube length can be arranged, the additional expense for the small size of the project may not be warranted.

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APPENDIX 1

BOREHOLE PROFILES:

BH1 THROUGH BH5

BOREHOLE PROFILE

BOREHOLE NO.
BH 1

CONTRACT NO.	N7786	LOGGED BY	A. ZWIERS	SHEET	1 of 3
CONTRACTOR	EARTHTECH	DRILLING STARTED	06/2013	X CO-ORDINATE	3 008 703.413
DRILLER	W. PRINSLOO	DRILLING COMPLETED	06/2013	Y CO-ORDINATE	75 319.330
MACHINE	XX	ORIENTATION	VERTICAL	ELEVATION	39.149 m M.S.L.

Drilling Method and Size	Core Recovery %	R.Q.D. %	Fracture Frequency	Test	Test Result	Depth m	Symbolic Log	Description	
N X C C O R E B A R R E L				↓	5.7.4. N=11	1,0	[Diagonal Hatching]	2.00	Dry to slightly moist with depth, dark brown mottled medium orange brown, stiff, SILTY CLAY.
				↓	5.6.5. N=11	2,0	[Circular Pattern]	3.00	Moist, medium orange brown speckled medium orange, medium dense, very slightly clayey fine to coarse grained SAND with subrounded to rounded pebbles (up to 15mm).
				↓	6.7.7. N=14	3,0	[Diagonal Hatching]	4.00	Slightly moist, dark brown speckled medium orange, medium dense, moderately clayey to very slightly clayey with depth, fine to medium grained SANDY SILT.
				↓	6.9.6. N=15	4,0	[Diagonal Hatching]	5.00	Slightly moist, dark grey to brown, stiff, micro shattered, silty CLAY.
				↓	7.7.7. N=14	5,0	[Diagonal Hatching]	6.00	Slightly moist, dark grey to dark brown, stiff, micro shattered, silty CLAY.
				↓	5.6.8. N=14	6,0	[Diagonal Hatching]		
				↓	6.8.7. N=15	7,0	[Diagonal Hatching]		
				↓	6.8.8. N=16	8,0	[Diagonal Hatching]		
				↓	5.8.11. N=19	9,0	[Diagonal Hatching]		
						10,0	[Diagonal Hatching]		

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FIG. NO.

REV.

<ul style="list-style-type: none"> [B] Bulk Sample — Drilling Progress/Shift === Casing Depth ▼ Standing Water Level S Strength Test C Consolidation Test 	<ul style="list-style-type: none"> ⊗ In situ Density Test ▼ Standard Penetration Test ○ Disturbed Sample V Insitu Shear Vane Test □ Piston Sample ■ U4 Tube Sample
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BOREHOLE PROFILE

BOREHOLE NO.
BH 1

CONTRACT NO.	N7786	LOGGED BY	A. ZWIERS	SHEET	2 of 3
CONTRACTOR	EARTHTECH	DRILLING STARTED	06/2013	X CO-ORDINATE	3 008 703.413
DRILLER	W. PRINSLOO	DRILLING COMPLETED	06/2013	Y CO-ORDINATE	75 319.330
MACHINE	XX	ORIENTATION	VERTICAL	ELEVATION	39.149 m M.S.L.

Drilling Method and Size	Core Recovery %	R.Q.D. %	Fracture Frequency	Test	Test Result	Depth m	Symbolic Log	Description	
N X C C O R E B A R R E L				↓	4.6.4. N=10	10.20	10.20		
				↓	7.9.11. N=20	11.0	11.33	Wet, dark brown mottled medium orange brown, stiff, SILTY CLAY.	
				↓	8.12.10. N=22	12.0		Wet, dark orange brown, medium dense, moderately clayey, fine sandy SILT.	
				↓	10.12.8. N=20	14.0	14.80	14.90	Wet, dark grey, very stiff, SILTY CLAY.
				↓	11.13.12 N=25	15.0	16.30	16.30	Wet, dark orange brown, medium dense, moderately clayey fine SANDY SILT with intercalated slightly clayey, fine to medium grained silty SAND lenses.
				↓	4.8.12. N=20	16.0	17.30	17.30	Wet, dark brown to dark orange brown speckled pale grey (minor), medium dense, slightly to moderately clayey SILT, fine to coarse grained SAND.
				↓	10.14.12 N=26	17.0	18.05	18.05	Wet, dark brown to dark orange brown, medium dense, fine grained SANDY SILT.
				↓		18.0		19.0	Wet, dark brown speckled medium orange and pale grey (minor), medium dense, slightly clayey, fine to coarse grained SAND.
				↓		19.0		20.0	

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REF. NO.

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FIG. NO.

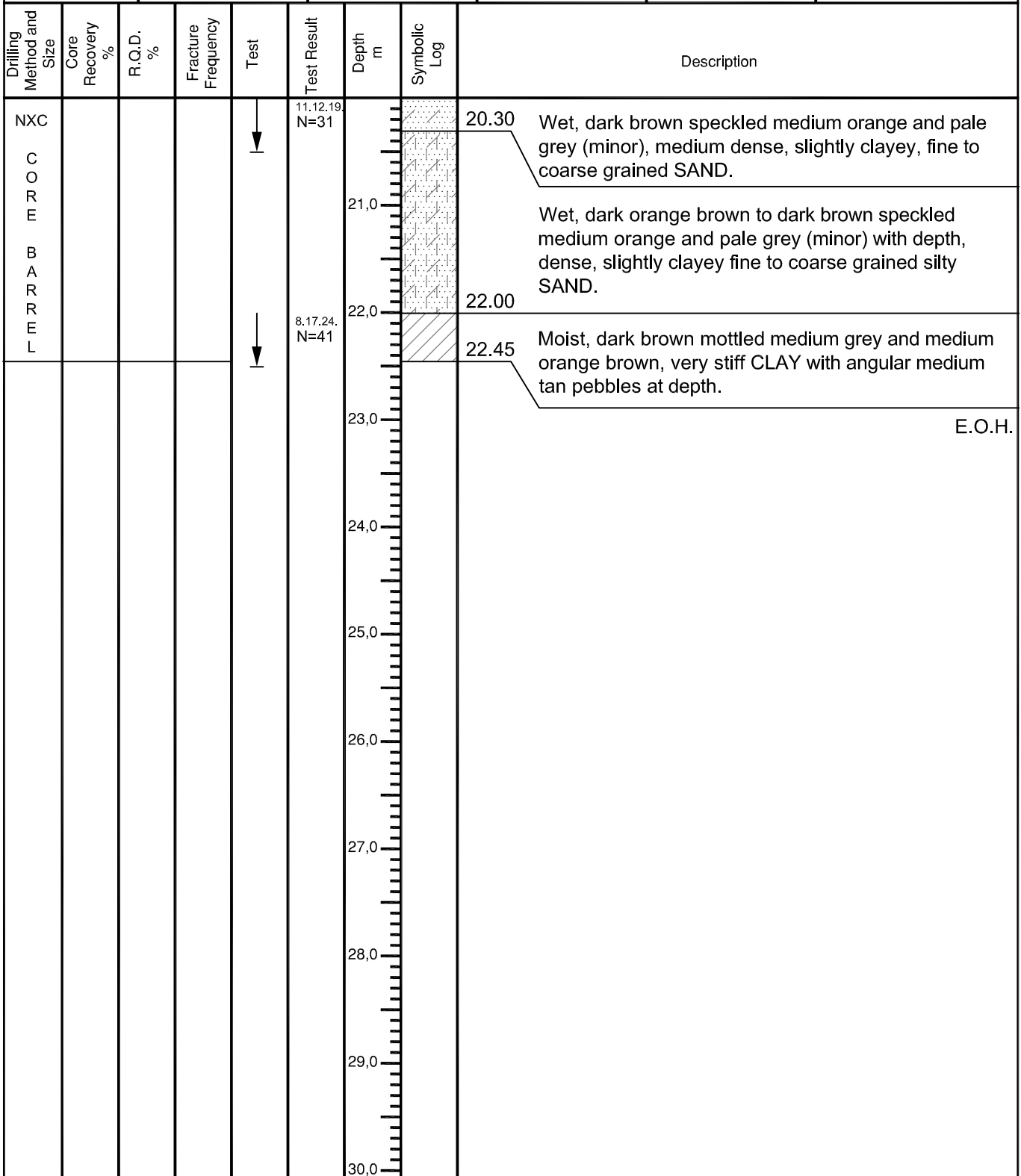
REV.

<p>[B] Bulk Sample</p> <p>— Drilling Progress/Shift</p> <p>== Casing Depth</p> <p>▼ Standing Water Level</p> <p>S Strength Test</p> <p>C Consolidation Test</p>	<p>⊗ Insitu Density Test</p> <p>▼ Standard Penetration Test</p> <p>○ Disturbed Sample</p> <p>V Insitu Shear Vane Test</p> <p>□ Piston Sample</p> <p>■ U4 Tube Sample</p>
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BOREHOLE PROFILE

BOREHOLE NO.
BH 1

CONTRACT NO.	N7786	LOGGED BY	A. ZWIERS	SHEET	3 of 3
CONTRACTOR	EARTHTECH	DRILLING STARTED	06/2013	X CO-ORDINATE	3 008 703.413
DRILLER	W. PRINSLOO	DRILLING COMPLETED	06/2013	Y CO-ORDINATE	75 319.330
MACHINE	XX	ORIENTATION	VERTICAL	ELEVATION	39.149 m M.S.L.



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REF. NO.

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FIG. NO.

REV.

<ul style="list-style-type: none"> [B] Bulk Sample — Drilling Progress/Shift — Casing Depth ▼ Standing Water Level S Strength Test C Consolidation Test 	<ul style="list-style-type: none"> ⊗ Insitu Density Test ▼ Standard Penetration Test ○ Disturbed Sample V Insitu Shear Vane Test □ Piston Sample ■ U4 Tube Sample
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BOREHOLE PROFILE

BOREHOLE NO.
BH 2

CONTRACT NO.	N7786	LOGGED BY	A. ZWIERS	SHEET	1 of 3
CONTRACTOR	EARTHTECH	DRILLING STARTED	06/2013	X CO-ORDINATE	3 008 690.397
DRILLER	W. PRINSLOO	DRILLING COMPLETED	06/2013	Y CO-ORDINATE	75 326.786
MACHINE	XX	ORIENTATION	VERTICAL	ELEVATION	39.206 m M.S.L.

Drilling Method and Size	Core Recovery %	R.Q.D. %	Fracture Frequency	Test	Test Result	Depth m	Symbolic Log	Description
N X C C O R E B A R R E L				↓	3.6.6. N=12	1,0	1.00	Dry to slightly moist, dark brown, firm to stiff, shattered to intact with depth, SILTY CLAY.
				↓	2.5.4. N=9	2,0		Slightly moist to moist with depth, dark brown to dark orange brown, medium dense to loose with depth, slightly to moderately clayey SANDY SILT.
				↓	3.4.5. N=9	3,0	3.50	
				↓	2.3.5. N=8	4,0	4.00	Moist to wet, dark brown, firm to stiff, SILTY CLAY.
				↓	3.5.6. N=11	5,0	5.00	Wet, dark brown to dark orange brown, loose, moderately clayey, fine grained, sandy SILT.
				↓	2.4.3. N=7	6,0	5.45	Moist, dark grey, stiff SILTY CLAY.
				↓		6,0	6.25 6.45	Wet, dark grey, firm to stiff, SILTY CLAY.
				↓		6,0	6.25 6.45	Wet, dark brown grey, loose, moderately clayey fine to medium grained SANDY SILT.
				↓	4.8.10. N=18	7,0	7.00 7.20 7.45	Wet, dark brown speckled medium orange and pale grey, loose to medium dense, fine to coarse grained SAND.
				↓	4.9.13. N=22	8,0	8.00	Wet, dark brown grey, medium dense, slightly clayey fine sandy SILT.
				↓	5.8.9. N=17	9,0		Wet, dark grey mottled medium orange brown, medium dense, fine to medium grained silty SAND.
				↓		9,0		Wet, dark brown mottled dark orange brown, medium dense, moderately clayey, fine to medium grained silty SAND.
					10,0		Wet, dark grey mottled medium brown speckled medium orange and pale grey, medium dense, very slightly clayey, fine to medium grained SAND.	

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FIG. NO.

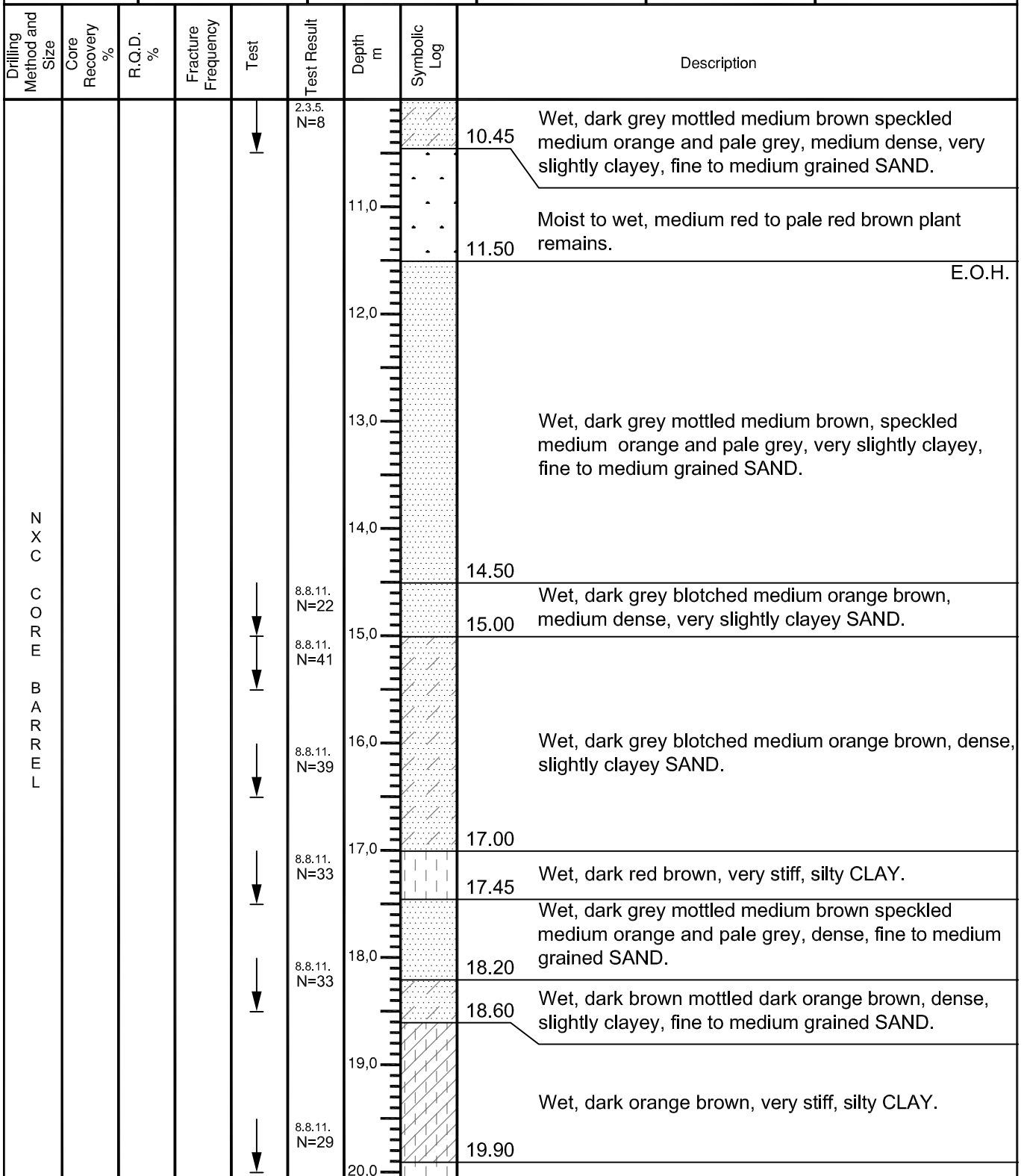
REV.

<ul style="list-style-type: none"> Bulk Sample Drilling Progress/Shift Casing Depth Standing Water Level S Strength Test C Consolidation Test 	<ul style="list-style-type: none"> In situ Density Test Standard Penetration Test Disturbed Sample V In situ Shear Vane Test Piston Sample U4 Tube Sample
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BOREHOLE PROFILE

BOREHOLE NO.
BH 2

CONTRACT NO.	N7786	LOGGED BY	A. ZWIERS	SHEET	2 of 3
CONTRACTOR	EARTHTECH	DRILLING STARTED	06/2013	X CO-ORDINATE	3 008 690.397
DRILLER	W. PRINSLOO	DRILLING COMPLETED	06/2013	Y CO-ORDINATE	75 326.786
MACHINE	XX	ORIENTATION	VERTICAL	ELEVATION	39.206 m M.S.L.



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REF. NO.

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FIG. NO.

REV.

<p>B Bulk Sample</p> <p>— Drilling Progress/Shift</p> <p>— Casing Depth</p> <p>▼ Standing Water Level</p> <p>S Strength Test</p> <p>C Consolidation Test</p>	<p>⊗ Insitu Density Test</p> <p>▼ Standard Penetration Test</p> <p>○ Disturbed Sample</p> <p>V Insitu Shear Vane Test</p> <p>□ Piston Sample</p> <p>■ U4 Tube Sample</p>
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BOREHOLE PROFILE

BOREHOLE NO.
BH 2

CONTRACT NO.	N7786	LOGGED BY	A. ZWIERS	SHEET	3 of 3
CONTRACTOR	EARTHTECH	DRILLING STARTED	06/2013	X CO-ORDINATE	3 008 690.397
DRILLER	W. PRINSLOO	DRILLING COMPLETED	06/2013	Y CO-ORDINATE	75 326.786
MACHINE	XX	ORIENTATION	VERTICAL	ELEVATION	39.206 m M.S.L.

Drilling Method and Size	Core Recovery %	R.Q.D. %	Fracture Frequency	Test	Test Result	Depth m	Symbolic Log	Description	
NXC C O R E B A R R E L						21,0	▨	21.17	Wet, dark orange brown, mottled dark grey and medium orange, very stiff SILTY CLAY.
						22,0	○	22.51	Pale grey, medium red and medium brown, subrounded to rounded pebbles and cobbles.
						23,0			E.O.H.
						24,0			
						25,0			
						26,0			
						27,0			
						28,0			
						29,0			
						30,0			

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<ul style="list-style-type: none"> ▢ Bulk Sample — Drilling Progress/Shift === Casing Depth ▼ Standing Water Level S Strength Test C Consolidation Test 	<ul style="list-style-type: none"> ⊗ Insitu Density Test ▼ Standard Penetration Test ○ Disturbed Sample V Insitu Shear Vane Test □ Piston Sample ■ U4 Tube Sample



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REF. NO.	N7786
FIG. NO.	
REV.	

BOREHOLE PROFILE

BOREHOLE NO.
BH 3

CONTRACT NO.	N7786	LOGGED BY	A. ZWIERS	SHEET	1 of 3
CONTRACTOR	EARTHTECH	DRILLING STARTED	06/2013	X CO-ORDINATE	3 008 627.921
DRILLER	W. PRINSLOO	DRILLING COMPLETED	06/2013	Y CO-ORDINATE	75 362.574
MACHINE	XX	ORIENTATION	VERTICAL	ELEVATION	39.312 m M.S.L.

Drilling Method and Size	Core Recovery %	R.Q.D. %	Fracture Frequency	Test	Test Result	Depth m	Symbolic Log	Description
N X C C O R E B A R R E L						0.90	[Symbolic Log Pattern]	Moist, dark brown, soft, SILTY CLAY.
				↓	2.5.5. N=10	1.95	[Symbolic Log Pattern]	Slightly moist, dark orange brown, stiff, SILTY CLAY.
						3.00	[Symbolic Log Pattern]	Slightly moist, dark brown mottled dark orange brown, stiff, SILTY CLAY.
				↓	2.4.6. N=10	3.45	[Symbolic Log Pattern]	Moist, dark orange brown, loose, slightly to moderately clayey fine SANDY SILT.
						4.95	[Symbolic Log Pattern]	Wet, dark brown mottled dark orange brown and dark grey, firm SILTY CLAY.
				↓	2.4.3. N=7	6.00	[Symbolic Log Pattern]	Wet, dark brown mottled dark orange brown, medium dense, moderately clayey, silty, fine to medium grained SAND.
						7.95	[Symbolic Log Pattern]	Wet, dark brown mottled dark orange brown and dark grey, stiff to very stiff, SILTY CLAY.
				↓	4.7.6. N=13	8.52	[Symbolic Log Pattern]	Wet, dark brown mottled dark orange brown and dark grey, very stiff, SILTY CLAY to silty CLAY.
						8.97	[Symbolic Log Pattern]	Wet, dark brown mottled dark orange brown and dark grey, stiff, SILTY CLAY.
				↓	5.9.6. N=15	9.83	[Symbolic Log Pattern]	Wet, dark grey mottled dark brown, medium dense, moderately clayey, silty, fine to medium grained SAND.
					10.0	[Symbolic Log Pattern]		
				↓	3.7.7. N=14		[Symbolic Log Pattern]	
					3.6.7. N=13		[Symbolic Log Pattern]	

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FIG. NO.

REV.

<ul style="list-style-type: none"> [B] Bulk Sample — Drilling Progress/Shift ==== Casing Depth ▼ Standing Water Level S Strength Test C Consolidation Test 	<ul style="list-style-type: none"> ⊗ In situ Density Test ▼ Standard Penetration Test ○ Disturbed Sample V Insitu Shear Vane Test □ Piston Sample ■ U4 Tube Sample
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BOREHOLE PROFILE

BOREHOLE NO.
BH 3

CONTRACT NO.	N7786	LOGGED BY	A. ZWIERS	SHEET	2 of 3
CONTRACTOR	EARTHTECH	DRILLING STARTED	06/2013	X CO-ORDINATE	3 008 627.921
DRILLER	W. PRINSLOO	DRILLING COMPLETED	06/2013	Y CO-ORDINATE	75 362.574
MACHINE	XX	ORIENTATION	VERTICAL	ELEVATION	39.312 m M.S.L.

Drilling Method and Size	Core Recovery %	R.Q.D. %	Fracture Frequency	Test	Test Result	Depth m	Symbolic Log	Description
N X C C O R E B A R R E L				↓		11,0	11.32	Wet, dark orange brown to dark grey, medium dense, silty, fine grained SAND interbedded stiff SILTY CLAY.
				↓	6.10.13. N=23	12,0		
				↓	4.10.11. N=21	13,0		
				↓	7.10.10. N=20	14,0		
				↓	5.7.11. N=18	15,0		Wet, dark orange brown to dark grey, medium dense, silty, fine to medium grained SAND interbedded very stiff SILTY CLAY.
				↓	6.12.15. N=27	16,0		
			↓	5.9.13. N=22	17,0	18.83		Wet, dark grey mottled medium brown, speckled pale grey and medium orange, medium dense, very slightly clayey, fine to coarse grained SAND.
				↓		18,0		
				↓		19,0		
				↓		20,0		

ROYAL HASKONING DHV

MBOZA PEDESTRIAN BRIDGE
GEOTECHNICAL INVESTIGATION



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E-Mail : dlpdbn@dlp.co.za

REF. NO.

N7786

FIG. NO.

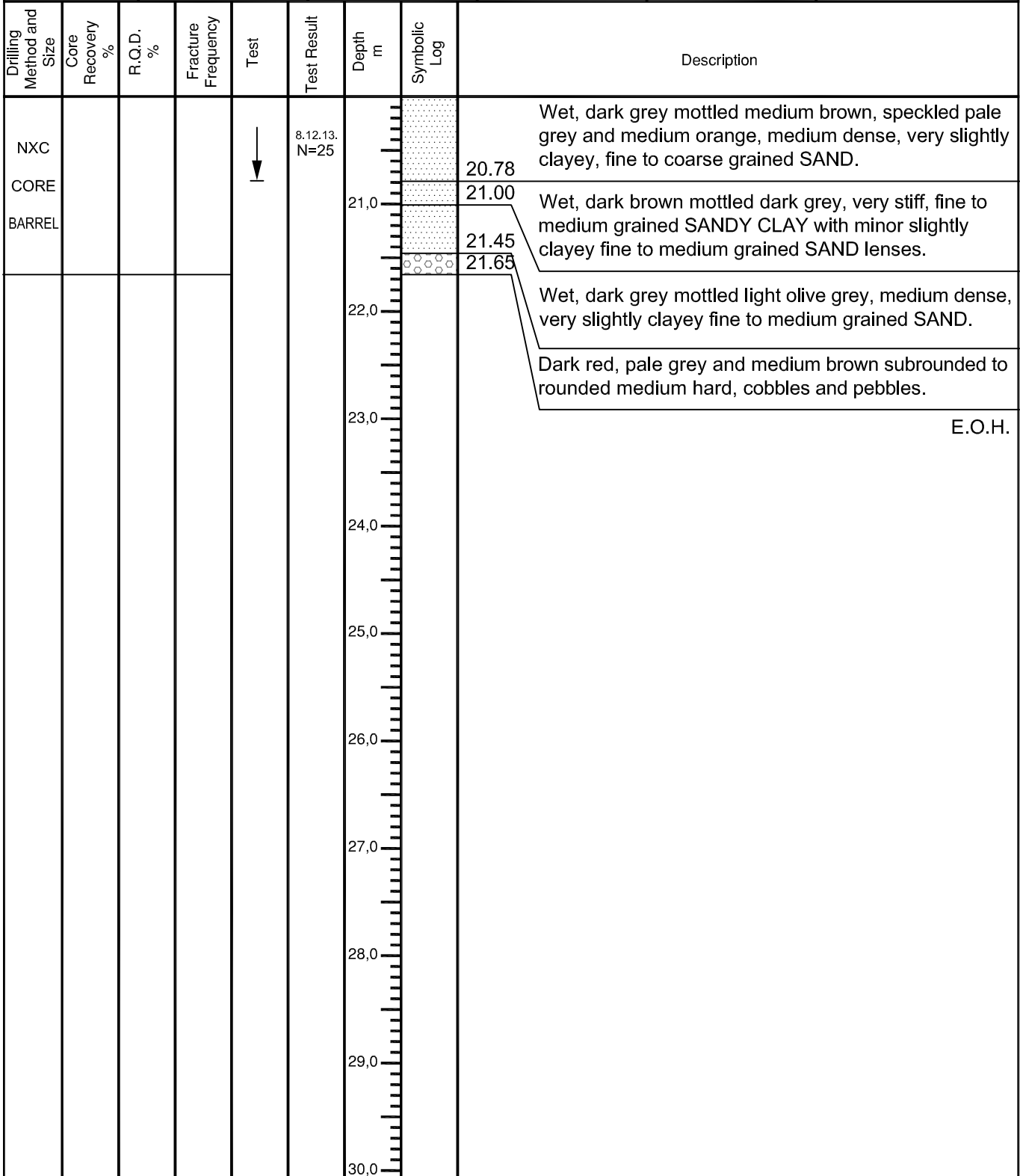
REV.

<p>B Bulk Sample</p> <p>— Drilling Progress/Shift</p> <p>— Casing Depth</p> <p>▼ Standing Water Level</p> <p>S Strength Test</p> <p>C Consolidation Test</p>	<p>⊗ Insitu Density Test</p> <p>▼ Standard Penetration Test</p> <p>○ Disturbed Sample</p> <p>V Insitu Shear Vane Test</p> <p>□ Piston Sample</p> <p>■ U4 Tube Sample</p>
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BOREHOLE PROFILE

BOREHOLE NO.
BH 3

CONTRACT NO.	N7786	LOGGED BY	A. ZWIERS	SHEET	3 of 3
CONTRACTOR	EARTHTECH	DRILLING STARTED	06/2013	X CO-ORDINATE	3 008 627.921
DRILLER	W. PRINSLOO	DRILLING COMPLETED	06/2013	Y CO-ORDINATE	75 362.574
MACHINE	XX	ORIENTATION	VERTICAL	ELEVATION	39.312 m M.S.L.



E.O.H.

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<ul style="list-style-type: none"> [B] Bulk Sample — Drilling Progress/Shift === Casing Depth ▼ Standing Water Level S Strength Test C Consolidation Test 	<ul style="list-style-type: none"> ⊗ Insitu Density Test ▼ Standard Penetration Test ○ Disturbed Sample V Insitu Shear Vane Test □ Piston Sample ■ U4 Tube Sample



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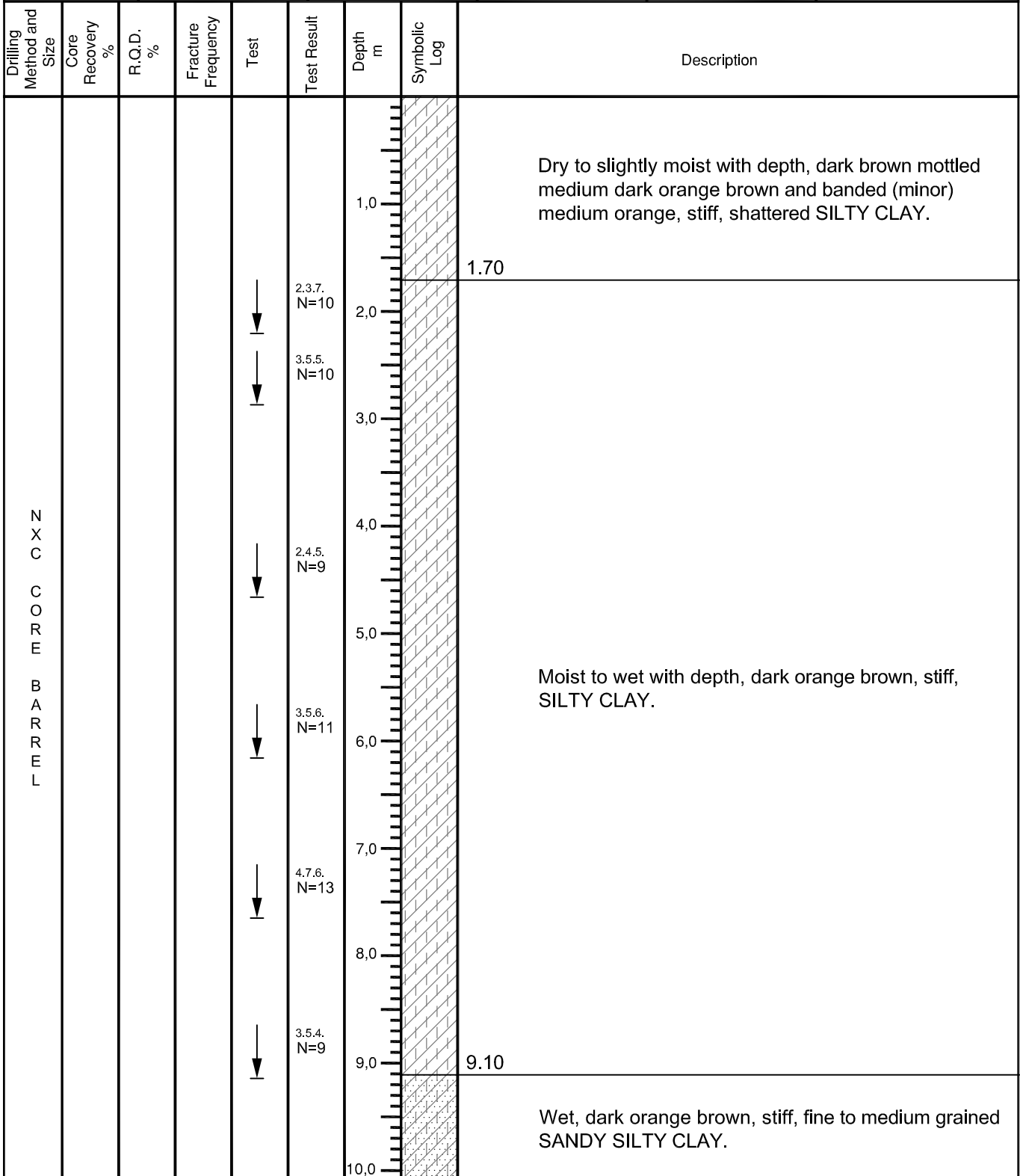
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REF. NO.	N7786
FIG. NO.	
REV.	

BOREHOLE PROFILE

BOREHOLE NO.
BH 4

CONTRACT NO.	N7786	LOGGED BY	A. ZWIERS	SHEET	1 of 3
CONTRACTOR	EARTHTECH	DRILLING STARTED	06/2013	X CO-ORDINATE	3 008 614.905
DRILLER	W. PRINSLOO	DRILLING COMPLETED	06/2013	Y CO-ORDINATE	75 370.030
MACHINE	XX	ORIENTATION	VERTICAL	ELEVATION	39.069 m M.S.L.



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REF. NO.

N7786

FIG. NO.

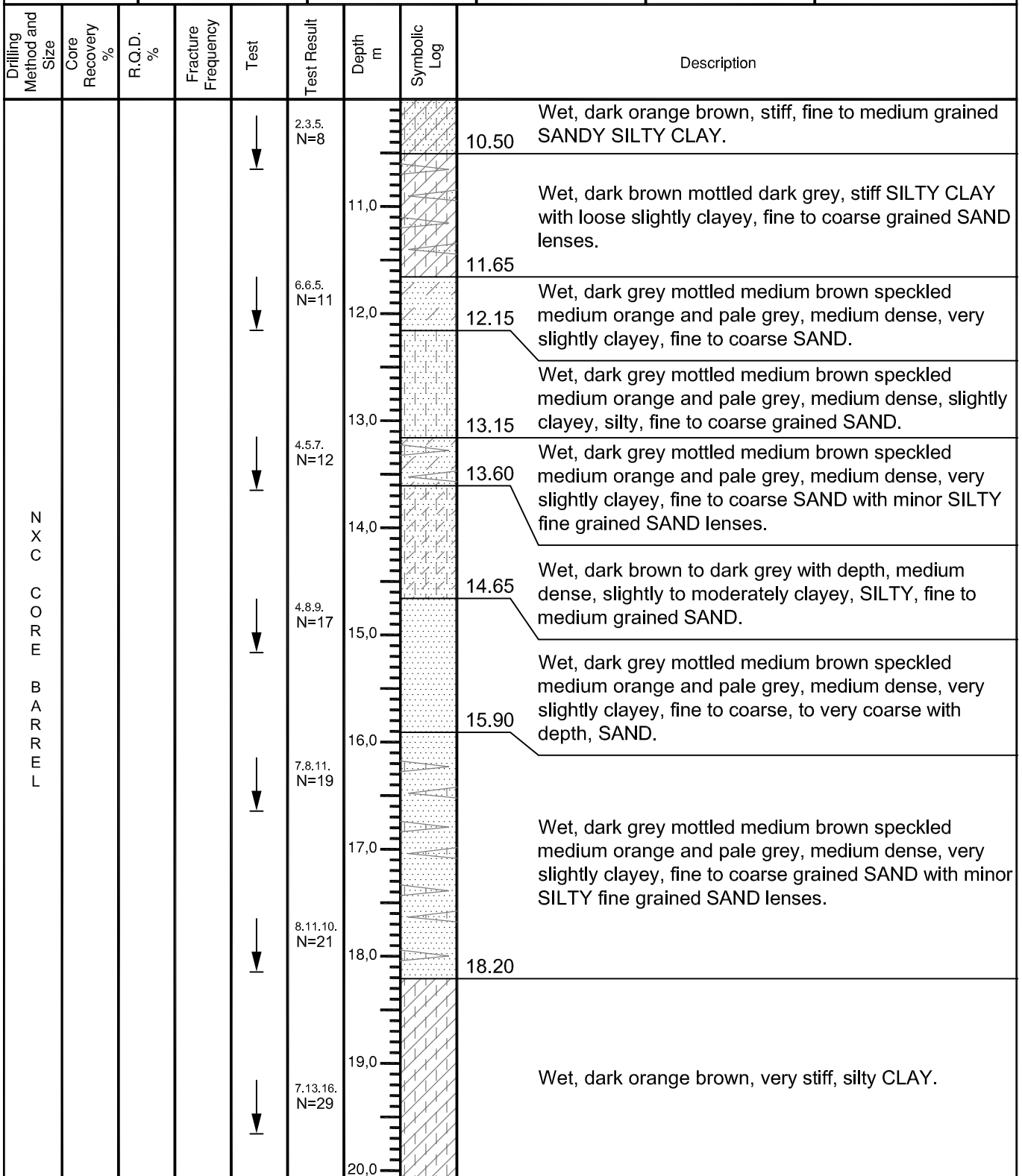
REV.

<p>[B] Bulk Sample</p> <p>— Drilling Progress/Shift</p> <p>==== Casing Depth</p> <p>▼ Standing Water Level</p> <p>S Strength Test</p> <p>C Consolidation Test</p>	<p>⊗ Insitu Density Test</p> <p>▼ Standard Penetration Test</p> <p>○ Disturbed Sample</p> <p>V Insitu Shear Vane Test</p> <p>□ Piston Sample</p> <p>■ U4 Tube Sample</p>
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BOREHOLE PROFILE

BOREHOLE NO.
BH 4

CONTRACT NO.	N7786	LOGGED BY	A. ZWIERS	SHEET	2 of 3
CONTRACTOR	EARTHTECH	DRILLING STARTED	06/2013	X CO-ORDINATE	3 008 614.905
DRILLER	W. PRINSLOO	DRILLING COMPLETED	06/2013	Y CO-ORDINATE	75 370.030
MACHINE	XX	ORIENTATION	VERTICAL	ELEVATION	39.069 m M.S.L.



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REF. NO.

N7786

FIG. NO.

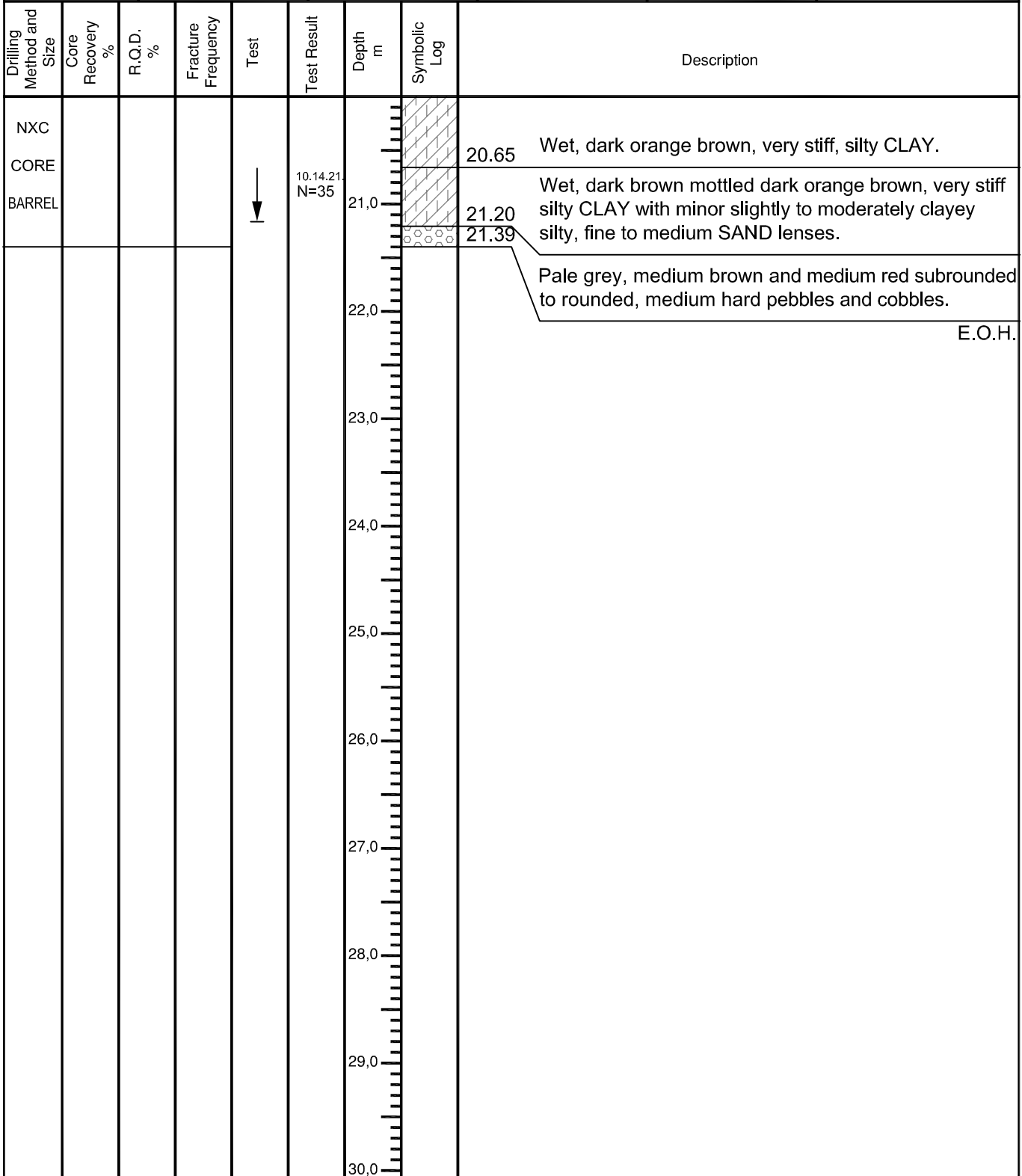
REV.

<ul style="list-style-type: none"> B Bulk Sample — Drilling Progress/Shift — Casing Depth ▼ Standing Water Level S Strength Test C Consolidation Test 	<ul style="list-style-type: none"> Insitu Density Test ▼ Standard Penetration Test ○ Disturbed Sample ∇ Insitu Shear Vane Test □ Piston Sample ■ U4 Tube Sample
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BOREHOLE PROFILE

BOREHOLE NO.
BH 4

CONTRACT NO.	N7786	LOGGED BY	A. ZWIERS	SHEET	3 of 3
CONTRACTOR	EARTHTECH	DRILLING STARTED	06/2013	X CO-ORDINATE	3 008 614.905
DRILLER	W. PRINSLOO	DRILLING COMPLETED	06/2013	Y CO-ORDINATE	75 370.030
MACHINE	XX	ORIENTATION	VERTICAL	ELEVATION	39.069 m M.S.L.

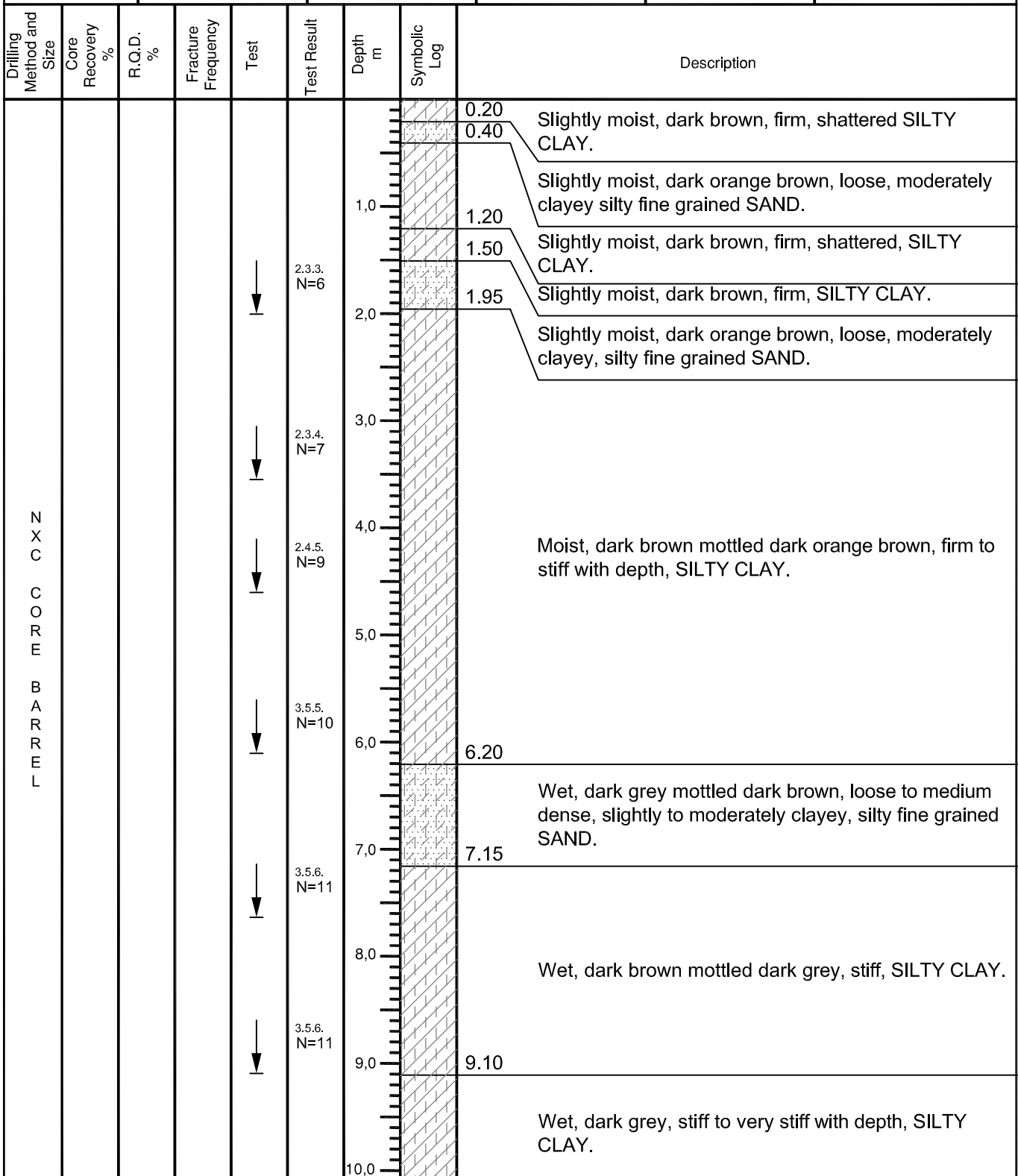


<p>ROYAL HASKONING DHV</p> <p>MBOZA PEDESTRIAN BRIDGE GEOTECHNICAL INVESTIGATION</p>	<p>DAVIES LYNN & PARTNERS</p> <p>(PROPRIETARY) LIMITED CONSULTING ENGINEERS & ENGINEERING GEOLOGISTS P.O.Box 586, Kloof, 3640, South Africa 10 Village Road, Cnr Village/Belluve Roads) Kloof, 3610, South Africa PHONE : + 27 31 7647335 FAX : + 27 31 7647385 E-Mail : dlpdbn@dlp.co.za</p>	<p>REF. NO.</p> <p style="font-size: 1.2em;">N7786</p> <p>FIG. NO.</p> <p>REV.</p>		
<table style="width: 100%; border: none;"> <tr> <td style="width: 50%; border: none;"> <ul style="list-style-type: none"> Bulk Sample Drilling Progress/Shift Casing Depth Standing Water Level S Strength Test C Consolidation Test </td> <td style="width: 50%; border: none;"> <ul style="list-style-type: none"> Insitu Density Test Standard Penetration Test ○ Disturbed Sample ∇ Insitu Shear Vane Test □ Piston Sample ■ U4 Tube Sample </td> </tr> </table>	<ul style="list-style-type: none"> Bulk Sample Drilling Progress/Shift Casing Depth Standing Water Level S Strength Test C Consolidation Test 	<ul style="list-style-type: none"> Insitu Density Test Standard Penetration Test ○ Disturbed Sample ∇ Insitu Shear Vane Test □ Piston Sample ■ U4 Tube Sample 		
<ul style="list-style-type: none"> Bulk Sample Drilling Progress/Shift Casing Depth Standing Water Level S Strength Test C Consolidation Test 	<ul style="list-style-type: none"> Insitu Density Test Standard Penetration Test ○ Disturbed Sample ∇ Insitu Shear Vane Test □ Piston Sample ■ U4 Tube Sample 			

BOREHOLE PROFILE

BOREHOLE NO.
BH 5

CONTRACT NO.	N7786	LOGGED BY	A. ZWIERS	SHEET	1 of 3
CONTRACTOR	EARTHTECH	DRILLING STARTED	06/2013	X CO-ORDINATE	3 008 681.720
DRILLER	W. PRINSLOO	DRILLING COMPLETED	06/2013	Y CO-ORDINATE	75 331.756
MACHINE	XX	ORIENTATION	VERTICAL	ELEVATION	38.900 m M.S.L.



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REF. NO.

N7786

FIG. NO.

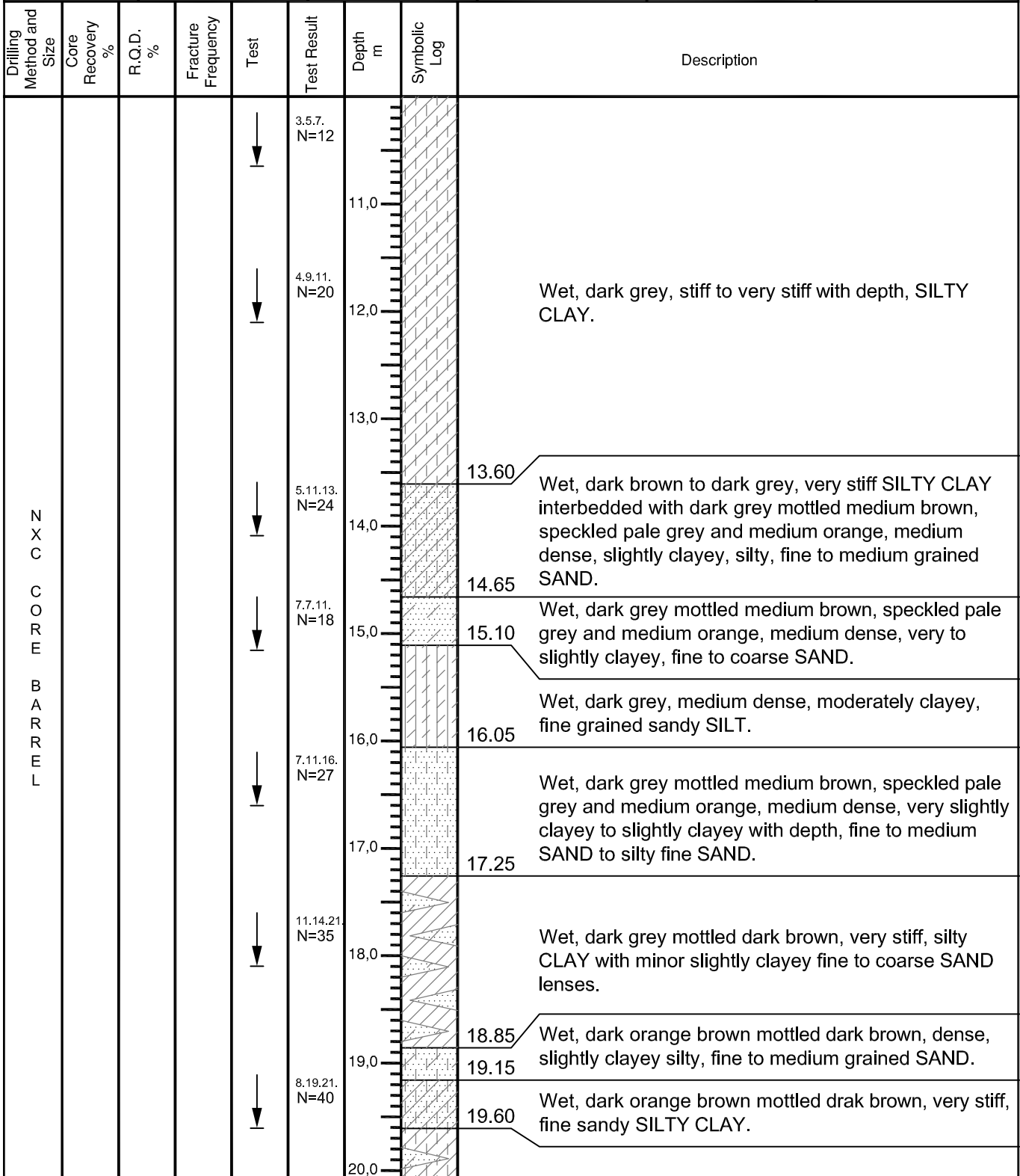
REV.

<p>[B] Bulk Sample</p> <p>— Drilling Progress/Shift</p> <p>==== Casing Depth</p> <p>▼ Standing Water Level</p> <p>S Strength Test</p> <p>C Consolidation Test</p>	<p>⊗ Insitu Density Test</p> <p>▼ Standard Penetration Test</p> <p>○ Disturbed Sample</p> <p>V Insitu Shear Vane Test</p> <p>□ Piston Sample</p> <p>■ U4 Tube Sample</p>
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BOREHOLE PROFILE

BOREHOLE NO.
BH 5

CONTRACT NO.	N7786	LOGGED BY	A. ZWIERS	SHEET	2 of 3
CONTRACTOR	EARTHTECH	DRILLING STARTED	06/2013	X CO-ORDINATE	3 008 681.720
DRILLER	W. PRINSLOO	DRILLING COMPLETED	06/2013	Y CO-ORDINATE	75 331.756
MACHINE	XX	ORIENTATION	VERTICAL	ELEVATION	38.900 m M.S.L.



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REF. NO.

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FIG. NO.

REV.

B Bulk Sample — Drilling Progress/Shift — Casing Depth ▼ Standing Water Level S Strength Test C Consolidation Test	⊗ Insitu Density Test ▼ Standard Penetration Test ○ Disturbed Sample V Insitu Shear Vane Test □ Piston Sample ■ U4 Tube Sample
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BOREHOLE PROFILE

BOREHOLE NO.
BH 5

CONTRACT NO.	N7786	LOGGED BY	A. ZWIERS	SHEET	3 of 3
CONTRACTOR	EARTHTECH	DRILLING STARTED	06/2013	X CO-ORDINATE	3 008 681.720
DRILLER	W. PRINSLOO	DRILLING COMPLETED	06/2013	Y CO-ORDINATE	75 331.756
MACHINE	XX	ORIENTATION	VERTICAL	ELEVATION	38.900 m M.S.L.

Drilling Method and Size	Core Recovery %	R.Q.D. %	Fracture Frequency	Test	Test Result	Depth m	Symbolic Log	Description
NXC CORE BARREL						20.65		Wet, dark brown mottled dark grey, very stiff, SILTY CLAY with slightly clayey silty, fine to medium grained SAND lenses.
						21.75		Pale grey, medium red and medium brown, subrounded to rounded pebbles and cobbles.
						22.0		E.O.H.
						23.0		
						24.0		
						25.0		
						26.0		
						27.0		
						28.0		
						29.0		
						30.0		

ROYAL HASKONING DHV	
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<ul style="list-style-type: none"> B Bulk Sample — Drilling Progress/Shift === Casing Depth ▼ Standing Water Level S Strength Test C Consolidation Test 	<ul style="list-style-type: none"> ⊗ Insitu Density Test ▼ Standard Penetration Test ○ Disturbed Sample V Insitu Shear Vane Test □ Piston Sample ■ U4 Tube Sample



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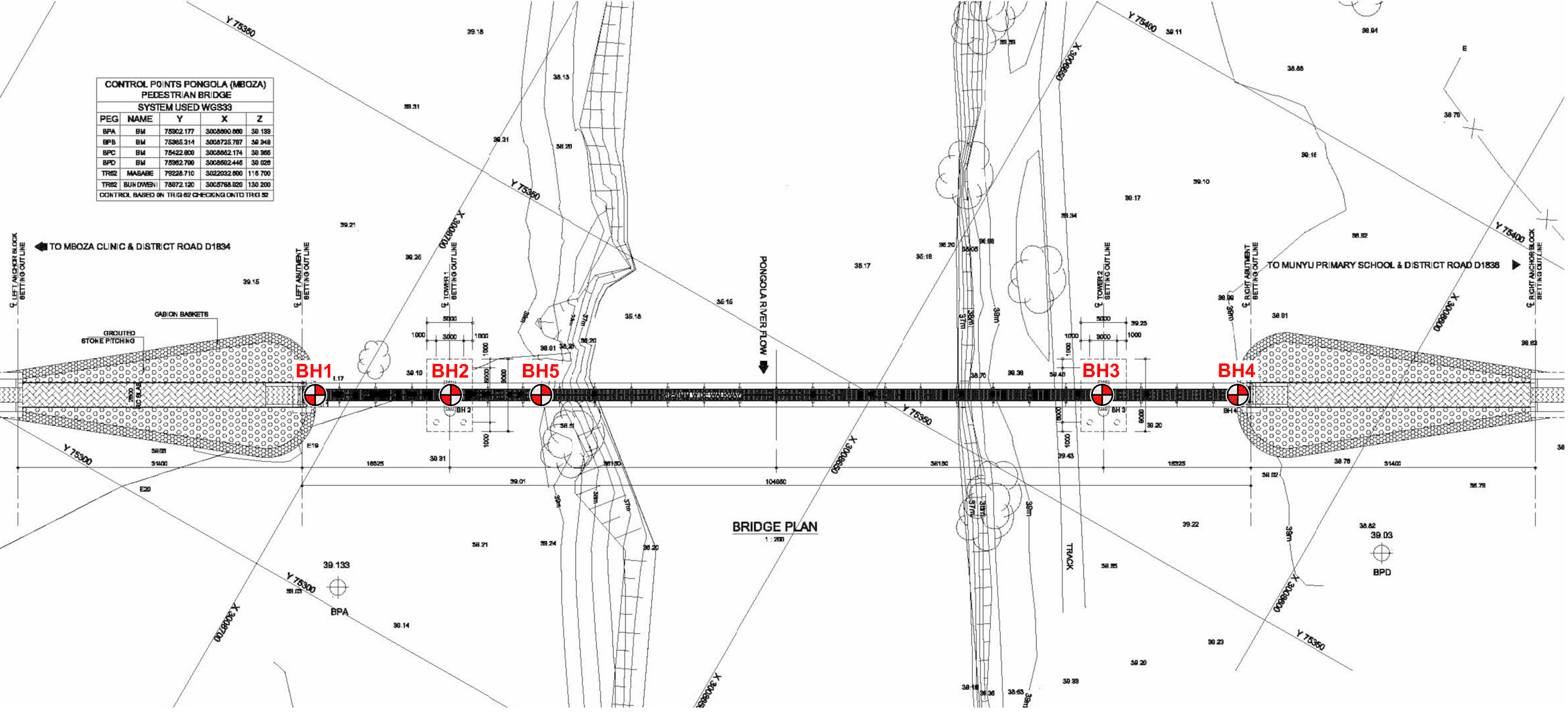
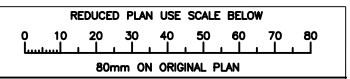
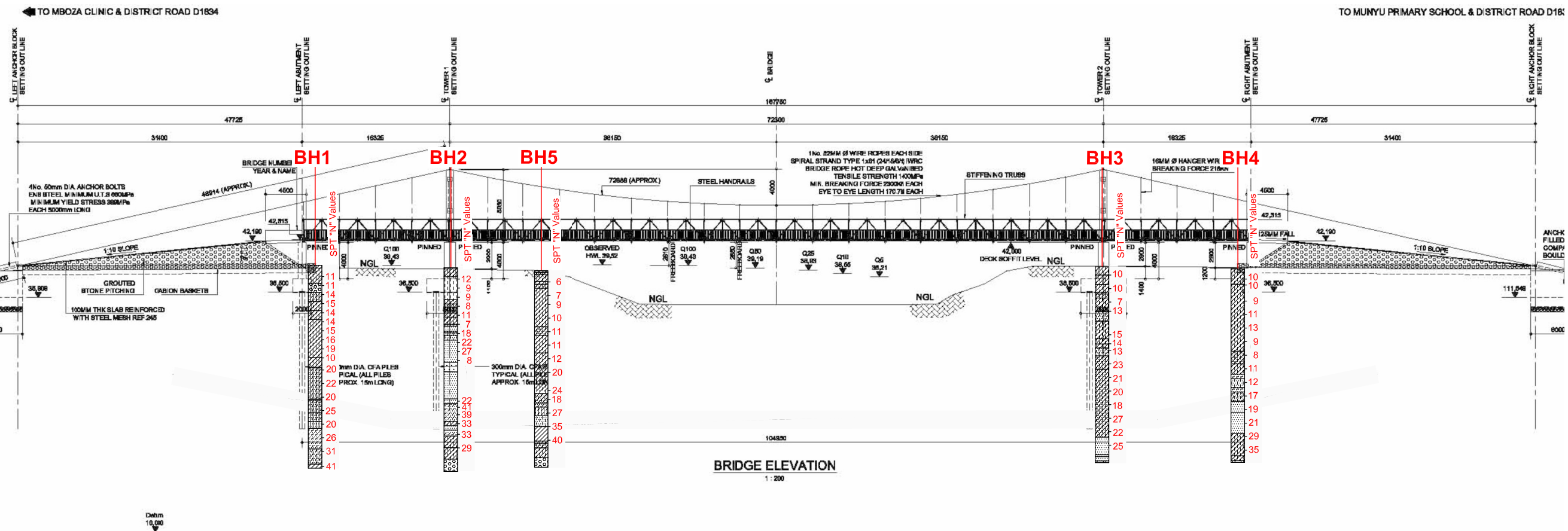
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REF. NO.	N7786
FIG. NO.	
REV.	

DRAWING

DWG. NO. N7786/01

SITE PLAN



CAD DRAWING FILE No.: N6851Fg2-option3e-FEB-SHDWG

MARK	DATE	DESCRIPTION	BY

DESIGNED	DRAWN	CHECKED

TRACED	DATE	APPROVED

DAVIES LYNN & PARTNERS
(PROPRIETARY) LIMITED
CONSULTING ENGINEERS & ENGINEERING GEOLOGISTS

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E-MAIL: dlp@dlp.co.za

CLIENT
ROYAL HASKONING DHV

TITLE
**MBOZA PEDESTRIAN BRIDGE
GEOTECHNICAL INVESTIGATION**

SCALE	DRG No.	REV
1:5000	N7786/01	

A3.