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** B.C. Lynn

**Date** July 2013



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# TABLE OF CONTENTS

1.	TER	MS OF REFERENCE	1
2.	INFO	DRMATION SUPPLIED	1
3.	FIEL	D INVESTIGATION	1
4.	INFE	ERRED GEOLOGY	1
5.	FOU	NDATIONS	2
	5.1	Shallow Foundations	2

# APPENDIX 1

BOREHOLE PROFILES : BH1 THROUGH BH5

# **DRAWING**

N7786/01 : SITE PLAN

#### 1. <u>TERMS OF REFERENCE</u>

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. <u>FIELD INVESTIGATION</u>

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. <u>INFERRED GEOLOGY</u>

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.

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

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. <u>FOUNDATIONS</u>

#### 5.1 <u>Shallow Foundations</u>

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 <u>Piled Foundations</u>

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  $\emptyset$  and a 500mm  $\emptyset$  CFA pile supporting a load of 1200kN with a factor of safety of 2.5 are given below.

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

# TABLE 1

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

	Depth to End of	CFA Pile Founding Depth in metres belo Existing Ground Level						
Borehole No.	Borehole	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  $\emptyset$  DCIP pile supporting a load of 1200kN.

#### TABLE 2

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

	Depth of End of	DCIP Pile Founding Depth in metres below Existing Ground Level
Borehole No.	Borehole	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

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

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

			B	OR	EH	OL	EPF	ROF	FILE		BOREHOL	ENO. BH 1		
CONTE	ACT NC	).	N7786	<u> </u>	LOG	GED B	 /	T	A. ZWIERS	SHEET		1 of 3		
CONTE	ACTOR		EART	- HTECH			TARTED	<b>-</b>  ····	06/2013		3 008	3 703.413		
DRILLE	:R			RINSLOC			OMPLETE	<b></b>	06/2013	Y CO-ORDINATE	75 3	19.330		
масни	NE		XX		ORII	ENTATIO	ON	4	VERTICAL	ELEVATION	39.14	19 m M.S.L.		
Drilling Method and Size	Core Recovery %	R.Q.D. %	Fracture Frequency	Test	Test Result	Depth m	Symbolic Log	•		Description				
	5.7.4. N=11 N=11 S.6.5. N=11 S.6.5. N=11 S.6.7. N=14 S.6.7. N=14								Dry to slight medium ora Moist, mediu orange, medicoarse grain pebbles (up	ly moist with dept nge brown, stiff, S um orange brown dium dense, very s ned SAND with su to 15mm).	h, dark brow SILTY CLAY. speckled me slightly claye ibrounded to	n mottled edium ey fine to rounded		
N X C	N X C C C C C C C C C C C C C C C C C C								Slightly moist, dark brown speckled medium orang- medium dense, moderately clayey to very slightly clayey with depth, fine to medium grained SANDY 30 SILT. Slightly moist, dark grey to brown, stiff, micro					
O R E B A R R		Y						5.00 6.00	Slightly mois shattered, si	st, dark grey to da ilty CLAY.	rk brown, sti	ff, micro		
E					5.6.8. N=14 6.8.7. N=15 6.8.8. N=16 5.8.11. N=19	7,0 8,0 9,0			Slightly mois brown, stiff t	st, dark brown mo to very stiff, SILTY	ottled mediun ′ CLAY.	n orange		
	ROYAL HASKONING DHV MBOZA PEDESTRIAN BRIDGE GEOTECHNICAL INVESTIGATION									DAVIES _YNN & PARTNÉI	RS	REF. NO. N7786		
B       Bulk Sample       ∑       Insitu Density Test         →       Drilling Progress/Shift       ★       Standard Penetration Test         →       Casing Depth       ○       Disturbed Sample         ▼       Standing Water Level       ∨       Insitu Shear Vane Test         S       Strength Test       □       Piston Sample         C       Consolidation Test       □       U4 Tube Sample									(( C E P 1 K P E E	PROPRIETARY) LIN CONSULTING ENGINEERS NGINEERING GEOLOGIS 0.0.Box 586, Kloof, 3640, S 0.VIIIage Road, Cnr VIIIage Goof, 3610, South Africa HONE : + 27 31 7647335 AX : + 27 31 7647385 -Mail : dlpdbn@dlp.co.z	AITED S & TS South Africa //Belluve Roads) S a	FIG. NO. REV.		

			B	OR	EH	OLI	ΕP	RO	FILE		BOREHOLE	ENO. BH 1
CONTE	ACT NC	,	N7786	<u> </u>		GED BY			A. ZWIERS	SHEFT		2 of 3
CONTE	ACTOR		EART	HTECH			TARTER	, · · · · ·	06/2013		3 008	3 703.413
DRILLE	R		W. PF	RINSLOC	DRIL	LING CO	OMPLET	ED	06/2013	Y CO-ORDINATE	75 31	9.330
MACHI	ΝE		XX		ORI	ΕΝΤΑΤΙΟ	ON		VERTICAL	ELEVATION	39.14	<sup>19</sup> 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					н. 4.6.4. N=10 7.9.11. N=20 8.12.10. N=22	11,0 12,0 13,0 14,0		10.20 11.33 14.80	Wet, dark b SILTY CLA Wet, dark o clayey, fine	prown mottled med Y. prange brown, med sandy SILT.	dium orange l	brown, stiff,
E B A R E L					10.12.8. N=20 11.13.12 N=25 4.8.12. N=20 10.14.12 N=26	16,0 17,0 18,0		16.30 17.30 18.05	Wet, dark o clayey fine s clayey, fine Wet, dark b grey (minor clayey SILT Wet, dark b fine grained Wet, dark b grey (minor coarse grain	prange brown, med SANDY SILT with to medium graine prown to dark oran ), medium dense, 7, fine to coarse gr prown to dark oran d SANDY SILT.	dium dense, r intercalated d silty SAND ge brown spe slightly to mo ained SAND. ge brown, mo edium orange slightly claye	moderately slightly lenses. eckled pale oderately edium dense, e and pale ey, fine to
	<u> </u>					20,0 —	//,		<u> </u>			
Bulk Sample       Insitu Density Test         Drilling Progress/Shift       Standard Penetration Test         Casing Depth       O Disturbed Sample         Standing Water Level       V         Strength Test       Piston Sample         Generalization Test       Piston Sample									Ð	LAVIES LYNNS PARTING (PROPRIETARY) LIN CONSULTING ENGINEERI P.O.BOX 586, KIOOF, 3640, S 10 VIIIage Road, Crr VIIIag (Koof, 3610, South Africa PHONE : + 27 31 7647335 FAX : + 27 31 7647335 FAX : + 27 31 7647335	RS AITED 5 & 5 TS South Africa e/Belluve Roads) 5 5 5	REF. NO. N7786 FIG. NO.

			B	OR	EH	OL	ΕP	ROF	ILE		BOREHOL	e no. BH 1
CONTF	ACT NC	) <u> </u>	N7786	3	LOG	GED B	(		A. ZWIERS	SHEET		3 of 3
CONTF	ACTOR	-	EART	HTECH	DRI	LING S	TARTED	,	06/2013	X CO-ORDINATE	3 008	8 703.413
DRILLE	R		W. PF	RINSLOC	) DRIL	LING C	OMPLET	ED	06/2013	Y CO-ORDINATE	75 3 <sup>.</sup>	19.330
MACHI	NE		XX		ORI	INTATIO	N		VERTICAL	ELEVATION	39.14	49 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				Ţ	11.12.19 N=31			20.30	Wet, dark b grey (minor) \coarse grair	rown speckled me ), medium dense, s ned SAND.	dium orange slightly claye	e and pale ey, fine to
R E B A R R						21,0		22.00	Wet, dark or medium ora dense, sligh SAND.	range brown to da nge and pale grey tly clayey fine to c	rk brown sp ⁄ (minor) witl oarse graine	eckled h depth, ed silty
EL				<u>▼</u>	8.17.24. N=41			22.45	Moist, dark orange brov tan pebbles	brown mottled me vn, very stiff CLAY at depth.	dium grey a ´with angula	nd medium ar medium
						23,0 —						E.O.H.
						24,0 25,0 26,0 27,0 28,0 29,0 30,0						
	R	OYAL	. HAS	KONI	NG D	HV				DAVIES		REF. NO.
MBOZA PEDESTRIAN BRIDGE GEOTECHNICAL INVESTIGATION									YNN & Partnei	RS	N7786	
Bulk Sample       △ Insitu Density Test         → Drilling Progress/Shift       ✓ Standard Penetration Test						t tion Test		( C E	PROPRIE LARY) LIM CONSULTING ENGINEERS ENGINEERING GEOLOGIS	пе <b>D</b> & гs	FIG. NO.	
Casing Depth     Casing Water Lovel     Standing Water Lovel     Vinetal Standing Water Lovel							Teet		F 1 ×	O.Box 586, Kloof, 3640, S 0 VIIIage Road, Cnr VIIIage (loof, 3610, South Africa	outh Africa /Belluve Roads)	
SS	Strength	Test			iston Sa	mple	1001		F	PHONE + 27 31 7647335 AX + 27 31 7647385		
<u> </u>	vonsolida	ation Les	5l	🗖 U	4 IUDe	Sample			E	-waii aipapn@dip.co.za	а	KEV.

			B	OR	EH	OLI	E PF	ROI	FILE		BOREHOLE	E NO. BH 2		
CONTR	ACT NC	).	N7786	3	LOG	GED BY	(		A. ZWIERS	SHEET		1 of 3		
CONTR	ACTOR		EART	HTECH	DRI	LING S	TARTED	••••	06/2013	X CO-ORDINATE	3 008	690.397		
DRILLE	R		W. PF	RINSLOC	DRIL	LING CO	OMPLETED		06/2013	Y CO-ORDINATE	75 32	 6.786		
MACHI	NE		XX		ORI	ΕΝΤΑΤΙΟ	ON		VERTICAL	ELEVATION	39.20	6 m M.S.L.		
Drilling Method and Size	Core Recovery %	R.Q.D. %	Fracture Frequency	Test	Test Result	Depth m	Symbolic Log			Description	·			
				_	366	1,0		.00	Dry to slightl to intact with	ly moist, dark bro n depth, SILTY CL	wn, firm to st AY.	iff, shattered		
				▶ ▶ ₩	N=12 2.5.4. N=9 3.4.5.	2,0			Slightly mois orange brow slightly to mo	st to moist with de /n, medium dense oderately clayey S	pth, dark bro to loose wit SANDY SILT	own to dark h depth,		
N				¥	N=9			.50	0 Moist to wet, dark brown, firm to stiff, SILTY CLAY					
C C C C				⊥ ⊻	2.3.5. N=8			i.00	Wet, dark br moderately o	own to dark orang clayey, fine graine	ge brown, loo ed, sandy SIL	ose, .T.		
E					3.5.6. N=11	5,0 —			Moist dark d	arev stiff SILTY C				
B A R B				<u>▼</u>		6.0		.45	Wet, dark gr	rey, firm to stiff, Sl	LTY CLAY.			
E				<b>⊻</b>	2.4.3. N=7		6	5.25 5.45	Wet, dark br medium grai	own grey, loose, ined SANDY SILT	moderately o	clayey fine to		
				↓ ¥	4.8.10. N=18	7,0	7 	<u>.00</u> .20 .45	Wet, dark br grey, loose t SAND.	own speckled me	edium orange	e and pale se grained		
					4.9.13. N=22	8,0	к	5.00 \ \	fine sandy S Wet, dark gr	File and the second sec	m orange br	own, medium		
				⊻ ↓	<sup>5.8.9.</sup> N=17	9,0			Wet, dark br dense, mode SAND.	o medium grained own mottled dark erately clayey, find	orange brov to medium	vn, medium grained silty		
				<u>•</u>		10,0			Wet, dark gr medium orai slightly claye	ey mottled mediu nge and pale grey ey, fine to medium	m brown spe /, medium de i grained SA	eckled ense, very ND.		
	R	OYAL	. HAS	KONI	NG D	HV				)AVIES		REF. NO.		
	( Bulk Sam		ZA PED CHNIC	ESTRIA AL INV	AN BRI ESTIG		+			YNN & PARTNEI		N7786		
→ Drilling Progress/Shift       ✓ Standard Penetration Test         → Casing Depth       ○ Disturbed Sample         ▼ Standing Water Level       ∨ Insitu Shear Vane Test									(r C E P 1( K	ONSULTING ENGINEERS NGINEERING GEOLOGIS .O.Box 586, Kloof, 3640, S 0 Village Road, Cnr Village loof, 3610, South Africa	/Belluve Roads)	FIG. NO.		
S S C O	Strength Consolida	Test ation Tes	st	□ P ■ U	iston Sa 4 Tube	mple Sample			How maye         Road, Gut Mildge/Delitive Roads)           Kloof, 3610, South Africa           PHONE           PHONE           + 27 31 7647335           FAX           + 27 31 7647355           E-Mail           : dlpdbn@dlp.co.za					

			B	OR	EH	OLI	ΕP	RO	FILE		BOREHOLE	NO. BH 2		
CONTE			N7786	<u> </u>			/		A ZWIERS	SHEET		2 of 3		
CONTR		<u> </u>	FART	' HTECH					06/2013		3.008	690 397		
	R							 -D	06/2013		75.32	6 786		
MACHI	NF		XX		OBI			<u> </u>	VERTICAL		39.20	6 m M S I		
p			~		<u>+</u>							in wiole.		
Drilling Method ar Size	Core Recovery %	R.Q.D. %	Fracture Frequenc	Test	Test Resu	Depth m	Symbolic Log		Description					
NXC CORE BARREL					2.3.5 N=8 8.8.11. N=22 8.8.11. N=33 8.8.11. N=33 8.8.11. N=33 8.8.11. N=33 8.8.11. N=29	11,0 12,0 13,0 14,0 15,0 16,0 17,0 18,0 19,0		10.45 11.50 11.50 14.50 15.00 17.45 18.20 18.60	Wet, dark gr medium ora slightly claye Moist to wet remains. Wet, dark gr medium ora fine to mediu Wet, dark gr medium den Wet, dark gr slightly claye Wet, dark pr medium ora grained SAN Wet, dark br slightly claye	rey mottled mediu nge and pale gre ey, fine to medium , medium red to p rey mottled mediu ange and pale gre um grained SANE rey blotched med ise, very slightly of rey blotched med ex SAND.	im brown spe y, medium de n grained SAN pale red brown pale red brown brown, spe y, very slight D. ium orange brown ium orange brown ff, silty CLAY. im brown spe y, dense, fine c orange brown n grained SAN	ckled nse, very ND. n plant E.O.H. eckled y clayey, rown, rown, dense, ckled to medium ckled to medium (n, dense, ND.		
									<u>г</u>			REE NO		
MBOZA PEDESTRIAN BRIDGE GEOTECHNICAL INVESTIGATION										JAVIES YNN & PARTNE	RS	N7786		
凹 E	ouk Sam Drilling Pi	ipie ′ogress/	Shift	⊥ Ir L S	isitu Der tandard	Penetra	ι tion Test		(I C E	CONSULTING ENGINEERS	S & STS	FIG. NO.		
= c	Casing Depth O Disturbed Sample								P 1	0.Box 586, Kloof, 3640, 5 0 VIIIage Road, Cnr VIIIage	South Africa e/Belluve Roads)			
<b>▼</b> 5	Standing	Water L	evel	V Ir	isitu She	ear Vane	Test		к Р	loof, 3610, South Africa HONE : + 27 31 7647335	5			
	Consolida	tion Tes	st		4 Tube	Sample			E	AX + 27 31 7647385 -Mail dlpdbn@dlp.co.z	za	REV.		

			В	OR	EH	OLI	E P	RO	FILE			BOREHOL	E NO. BH 2	
CONTE	ACT NC	).	N778	<u> </u>		GED BY	/	T	A. ZWI	ERS	SHEET		3 of 3	
CONTE	ACTOR	<u>-</u>	EART	HTECH	. DBI		TARTED		06/201	3		3 008	3 690.397	
DRILLE	R			RINSLOC	DRI	LING CO	OMPLETE	 D		 3	Y CO-ORDINATE	75 32	26.786	
MACHI	١E		XX		ORI	ENTATIO	DN	<b>-</b>  ···	VERT	CAL	ELEVATION	39.20	 06 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					·	21,0		21.17	Wet, c mediu 7	lark oi m ora	range brown, m nge, very stiff S	ottled dark gre ILTY CLAY.	y and	
B A R E L						22,0		22.5 <sup>-</sup>	Pale grey, medium red and medium brown, subrounded to rounded pebbles and cobbles. 51					
						23,0 24,0 25,0 26,0 27,0 28,0 29,0							E.O.H.	
BE	C Bulk Sam	MBOZ GEOTE			N BRI ESTIG		t				JAVIES JANN & PARTNE PROPRIETARY) L		N7786	
B       Bulk Sample       X       Insitu Density Test         —       Drilling Progress/Shift       ✓       Standard Penetration Test         —       Casing Depth       ○       Disturbed Sample         ✓       Standing Water Level       V       Insitu Shear Vane Test         S       Strength Test       □       Piston Sample         C       Consolidation Test       ■       U/4 Tube Scample										E P 1 K F E	NGINEERING GEOLOC P.O.Box 586, Kloof, 3640 0 VIIIage Road, Cnr VIIIa loof, 3610, South Africa PHONE : + 27 31 76473 -X : + 27 31 76473 -Mail : dlpdbn@dlp.c	GISTS O, South Africa age/Belluve Roads) 335 385 o.za	FIG. NO.	

			B	OR	EH	OL	ΕP	RO	FILE		BOREHOLE	ENO. BH 3	
CONTE	ACT NC	,	N7786	<u> </u>		GED BY	·		A. ZWIERS	SHEFT		1 of 3	
CONTE	ACTOR		EART	HTECH			TARTED	-	06/2013		3 008	627.921	
DRILLE	RILLER W. PRINSLOO DRILLING STATED								06/2013	Y CO-ORDINATE	75 36	2.574	
MACHI	NE		XX		ORII	ENTATIO	NC		VERTICAL	ELEVATION	39.31	2 m M.S.L.	
Drilling Method and Size	Core Recovery %	R.Q.D. %	Fracture Frequency	Test	Test Result	Depth m	Symbolic Log	•		Description			
								0.90	Moist, dark	brown, soft, SILT`	Y CLAY.		
	2.5.5. N=10								Slightly moist, dark orange brown, stiff, SILTY CLAY				
								3.00	Slightly moist, dark brown mottled dark orange brown stiff, SILTY CLAY.				
	2.4.6. N=10 3,0							3.45	Moist, dark clayey fine s	orange brown, loc SANDY SILT.	ose, slightly to	o moderately	
N X C C O B				Ť	2.4.3. N=7	4,0		4.95	Wet, dark b grey, firm S	rown mottled dark ILTY CLAY.	corange brov	vn and dark	
E B A R R				Ť	4.7.6. N=13	6,0		6.00	Wet, dark b dense, mod SAND.	rown mottled dark erately clayey, silt	c orange brov ty, fine to me	vn, medium dium grained	
L				Ť	<sup>5.9.6.</sup> N=15	7,0 —			Wet, dark b grey, stiff to	rown mottled darł very stiff, SILTY (	k orange brov CLAY.	vn and dark	
				↓ ▼	<sup>3.7.7.</sup> N=14	8,0		7.95 8.52	Wet, dark b grey, very s	rown mottled darł tiff, SILTY CLAY t	orange brov o silty CLAY.	vn and dark	
						9,0 —		8.97	Wet, dark b grey, stiff, S	rown mottled dark SILTY CLAY.	c orange brov	vn and dark	
					3.6.7. N=13	10.0		9.83	Wet, dark g moderately	rey mottled dark k clayey, silty, fine t	orown, mediu o medium gr	m dense, ained SAND.	
	R		HAS	KONI	NG F	)HV	V V 'A '/					REF. NO.	
B	( Bulk Sarr		ZA PED	ESTRIA AL INV	AN BRI ESTIG	IDGE ATION	st			PARTNE PARTNE		N7786	
□       Drilling Progress/Shift       ▲       Institu Density Test         □       Drilling Progress/Shift       ★       Standard Penetration Test         □       Casing Depth       ○       Disturbed Sample         ▼       Standing Water Level       ∨       Insitu Shear Vane Test         S       Strength Test       □       Piston Sample         C       Consolidation Test       ■       I/4 Tube Sample									C E T T F F F F F	CONSULTING ENGINEER: ENGINEERING GEOLOGIS 2.0.Box 586, Kloof, 3640, 5 10 Village Road, Cnr Village (doof, 3610, South Africa 9HONE : + 27 31 7647385 FAX : + 27 31 7647385 FAX : + 27 31 7647385	S & STS South Africa a/Belluve Roads) S S Sa	FIG. NO.	



			В	OR	EH	OLI	ΕΡ	ROF	FILE		BOREHOLE	BH 3
CONTRACT NO. N7786 LOGGED BY									A ZWIERS	SHEET		3 of 3
CONTE	CONTRACT NO. N7786 LOGGED BY CONTRACTOR EARTHTECH DRILLING START								06/2013		3 008	627.921
	B								06/2013		75.36	2 574
								<u> </u>	VERTICAL		39 31	2.014 
									VERTICAL	ELEVATION	33.31	2 III WI.S.L.
Drilling Method an Size	Core Recovery %	R.Q.D. %	Fracture Frequency	Test	Test Result	Depth m	Symbolic Log			Description		
NXC CORE				⊥ ⊻	8.12.13. N=25	21.0		20.78 21.00	Wet, dark gr grey and me clayey, fine Wet, dark br	rey mottled mediur edium orange, med to coarse grained s rown mottled dark	n brown, spo lium dense, SAND. arev. verv s	eckled pale very slightly tiff. fine to
BARREL							00000	21.45 21.65	medium grai	ined SANDY CLAY o medium grained	/ with minor SAND lense	slightly es.
						22,0			Wet, dark gi very slightly	rey mottled light oli clayey fine to med	ive grey, me lium grained	dium dense, SAND.
									Dark red, pa	le grey and mediu dium hard, cobble	im brown su s and pebble	brounded to es.
						23,0			L			E.O.H.
						24,0						
						25,0						
						26,0						
						27,0						
						200						
						28,0						
						29,0						
			<u> </u>			30,0 —			<u> </u>			
	R		A PED	KON ESTRI	NG E	DGE				JAVIES _YNN &		N7786
GEOTECHNICAL INVESTIGATION         B       Bulk Sample         X       Insitu Density Test         Drilling Program       Ctuate of Density Test							t 			PARTNER PROPRIETARY) LIMI		
	Drilling Pr Dasing Dr	ogress/: epth	SUIT	I I I I I I I I I I I I I I I I I I I	iandard	renetra Sample	uon rest		E	NGINEERING GEOLOGIST O.Box 586, Kloof, 3640, Sc	S outh Africa	FIG. NU.
▼ 5	Standing	Water L	evel	V Ir	nsitu She	ear Vane	Test		1 K -	u village Road, Cnr Village/l loof, 3610, South Africa	вешиve Roads)	
	Strength Consolida	Test ation Tes	st	⊡ P ■ U	iston Sa 4 Tube	mple Sample			P F E	AX + 27 31 7647335 AX + 27 31 7647385 -Mail dipdbn@dip.co.za		REV.



			B	OR	EH	OL	ΕP	RO	FILE		BOREHOLE	ENO. BH 4		
CONTE	RACT NC	).	N7786	<u> </u>	LOG	GED B	 (	<u> </u>	A. ZWIERS	SHEET		2 of 3		
CONTE	RACTOR	<u> </u>	EART	HTECH	DRII	LLING S	TARTED	, <b>,</b> , , , , , , , , , , , , , , , , ,	06/2013	X CO-ORDINATE	3 008	614.905		
DRILLE	DNTRACTOR         EARTHTECH         DRILLING STARTED           RILLER         W. PRINSLOO         DRILLING COMPLET								06/2013	Y CO-ORDINATE	75 37	0.030		
MACHI	NE		XX		ORI	ΕΝΤΑΤΙΟ	NC	<b>-</b>  ···	VERTICAL	ELEVATION	39.06	<sup>9</sup> m M.S.L.		
Drilling Method and Size	Core Recovery %	R.Q.D. %	Fracture Frequency	Test	Test Result	Depth m	Symbolic Log			Description				
					2.3.5. N=8			10.50	Wet, dark or SANDY SIL <sup>-</sup>	ange brown, stiff, TY CLAY.	, fine to medi	um grained		
								11.65	Wet, dark br with loose sl lenses.	own mottled dark ightly clayey, fine	grey, stiff S to coarse gr	LTY CLAY ained SAND		
								12.15	Wet, dark grey mottled medium brown speckled 5 medium orange and pale grey, medium dense, very slightly clayey, fine to coarse SAND.					
	13,0								Wet, dark gr medium orai clayey, silty,	Wet, dark grey mottled medium brown speckled medium orange and pale grey, medium dense, sligh clayey, silty, fine to coarse grained SAND.				
N X				<u>↓</u>	4.5.7. N=12	14,0		13.60	Wet, dark gr medium orai slightly claye fine grained	ey mottled mediu nge and pale grey ey, fine to coarse SAND lenses.	m brown spe /, medium de SAND with n	eckled ense, very ninor SILTY		
C C O R				↓	<sup>4.8.9.</sup> N=17	15,0	/	14.65	Wet, dark br dense, sligh medium grai	own to dark grey tly to moderately ined SAND.	with depth, r clayey, SILT	nedium Y, fine to		
B A R R						16,0		15.90	Wet, dark gr medium orai slightly claye depth, SANE	ey mottled mediu nge and pale grey ey, fine to coarse, D.	m brown spe /, medium de to very coar	eckled ense, very se with		
				<u> </u>	7.8.11. N=19	17,0			Wet, dark gr medium orai slightly claye SII TX fine o	ey mottled mediu nge and pale grey ey, fine to coarse g trained SAND leng	m brown spe /, medium de grained SAN	eckled ense, very D with minor		
				Ť	8.11.10. N=21	18,0		18.20	)					
				<b>⊢</b>	7.13.16. N=29	19,0			Wet, dark or	ange brown, very	<sup>v</sup> stiff, silty CL	AY.		
	R	OYAL	. HAS	KON	NG D	ЭНV				DAVIES		REF. NO.		
	(	MBOZ GEOTE	A PED CHNIC	ESTRI AL INV	AN BRI ESTIG	DGE ATION				ÝNN & PARTNEI	RS	N7786		
B       Bulk Sample       X       Insitu Density Test         →       Drilling Progress/Shift       ★       Standard Penetration Test         →       Casing Depth       ○       Disturbed Sample         ▼       Standing Water Level       V       Insitu Shear Vane Test         S       Strength Test       □       Piston Sample									(F C E 1( K P	-ROPRIE LARY) LIN ONSULTING ENGINEERS NGINEERING GEOLOGIS .0. Box 586, Kloof, 3640, S 0 Village Road, Cnr Village Road, Cnr Village Road, Cnr Village Ioof, 3610, South Africa HONE : + 27 31 7647335	ii i ED 5 & TS south Africa //Belluve Roads)	FIG. NO.		
	Consolida	ation Tes	st		4 Tube	Sample			E-	AX : + 27 31 7647385 -Mail : dlpdbn@dlp.co.z	а	REV.		

BOREHOLE PROFIL F											BOREHOL	ENO. BH 1		
CONTE		)	N7786	<u> </u>					A. ZWIERS SHE			-		3 of 3
			EART	HTECH	DBI				06	6/2013	· x co-c	BDINATE	3 00	8 614.905
DRILLE	R			RINSLOC	D DRII	DRILLING COMPLETED				;/2013	Y CO-C	RDINATE	75 3	70.030
MACHII	NE		XX		ORI	ΕΝΤΑΤΙΟ	ON		VE	ERTICAL	ELEVA	TION	39.0	69 m M.S.L.
Drilling Method and Size	Core Recovery %	R.Q.D. %	Fracture Frequency	Test	Test Result	Depth m	Symbolic Log				De	scription		
NXC CORE BARREL					L 10.14.21 N=35	21,0 22,0 23,0 24,0 25,0 26,0 27,0 28,0		20.65	5 We 0 silt Pa to	et, dark k et, dark k ty CLAY ty, fine to le grey, rounded	orange k brown m with mir o medium medium I, medium	prown, ver nottled dar nor slightly n SAND le n brown ar m hard pe	ry stiff, silty C rk orange bro v to moderate enses. nd medium re bbles and co	LAY. wn, very stiff ly clayey d subrounded bbles. E.O.H.
						30,0								
	R	OYAL	HAS	KON	NG E	ЭНV					DA	/IES		REF. NO.
B	MBOZA PEDESTRIAN BRIDGE GEOTECHNICAL INVESTIGATION										LYN PAF (propr	IN & RTNE		N7786
Drilling Progress/Shift     Casing Depth     Standard Penetration Test     O Disturbed Sample     V Insitu Shear Vane Test     Strength Test     District Sample											CONSULTI ENGINEER P.O. Box 58 10 VIIIage F Kloof, 3610 PHONE	NG ENGINEER RING GEOLOGI 36, Kloof, 3640, Road, Cnr VIIIag 1, South Africa + 27 31 764733	RS & ISTS South Africa ge/Belluve Roads) 35	FIG. NO.
S Strength Test D Piston Sample C Consolidation Test D U4 Tube Sample											FAX -	+ 27 31 764738 dlpdbn@dlp.co.	s5 .za	REV





BOREHOLE PROFILE											BOREHOL	ENO. BH 5	
							/			<u> </u>	QUEET		3 of 3
			FART	 НТЕСН					06/2013				3 681 720
									06/2013	• • • •		75.33	31 756
									VERTICA			38.90	0 m M S I
p p					+				VEININ	-		00.00	, 111 Wi.O.∟.
Drilling Method ar Size	Core Recovery %	R.Q.D. %	Fracture Frequency	Test	Test Resul	Depth m	Symbolic Log				Description		
NXC								20.65	Wet, dar CLAY wi SAND le	k br th sl nse:	own mottled darł lightly clayey silty s.	< grey, very s /, fine to med	tiff, SILTY lium grained
CORE													
BARREL	BARREL					21,0			Pale gre	y, m	edium red and m	nedium browr	٦,
								21.75	subround	ded	to rounded pebb	les and cobb	les.
						22,0	-0-0-						E.O.H.
						=							
						23,0							
						=							
						24,0							
						_							
						25,0							
						26,0							
						27.0							
						27,0							
						28.0							
						29,0							
						-							
						30,0							
	R	OYAL	. HAS	KONI	NG E	HV					DAVIES		REF. NO.
MBOZA PEDESTRIAN BRIDGE GEOTECHNICAL INVESTIGATION									Ų	) L F	YNN & PARTNE	RS	N7786
Bulk Sample       △       Insitu Density Test         →       Drilling Progress/Shift       ★       Standard Penetration Test										(F Ci	PROPRIETARY) LIN ONSULTING ENGINEERS NGINEERING GEOLOGIS	AITED S & STS	FIG. NO.
□ Casing Depth       ○ Disturbed Sample         ▼ Standing Water Level       ∨ Insitu Shear Vane Test										Р. 10 КІ	.O.Box 586, Kloof, 3640, 5 ) VIIIage Road, Cnr VIIIage loof, 3610, South Africa	south Africa e/Belluve Roads)	
S Strength Test  C Consolidation Test										PI F#	HONE : + 27 31 7647335 AX : + 27 31 7647385 Mail : dlodbn@dlp.co.z	5 5 28	

# DRAWING

DWG. NO. N7786/01

SITE PLAN

