APÊNDICES

APÊNDICE-A

Photograph Report

Appendix-A: Photograph Report

Period: 5/14/2007～5/19/2007

Setting out of the Building：Indoor Market Shed

Delivered Concrete Block materials

Foundation Work：Indoor Market Shed excavation

Delivered Cement materials

Foundation Work：Indoor Market Shed laid rubbles

General view（5/19）

Period: 5/21/2007～5/26/2007

Foundation work： Indoor Market Shed view

Foundation work： Indoor Market Shed corner stone

Survey by District Office for registry of land (5/23)

Foundation work： Public Toilet Shed excavation

Foundation work： Public Toilet Shed completed

General View（5/26）

Period: 5/28/2007～6/2/2007

Floor concrete：Indoor Market Shed rubbles preparation

Sewage piping: Public Toilet Shed

Site inspection by JICA and Japan embassy (5/30)

Septic Tank: excavation

Floor concrete：Indoor Market Shed casting

General View（6/1）

Period: 6/4/2007～6/9/2007

General view1（6/4）: from terrace side

General view 2（6/4）: public toilet side

Construction registered plate

Septic Tank: excavation

Septic Tank: wall masonry

General View (6/9)

Period: 6/11/2007～6/15/2007

Parking Area： preparation borrow material for grading

Septic Tank: side wall completed

Masonry wall: Indoor Market Shed from patio side

Masonry wall: Public Toilet from patio side

General View 1（6/14）

General View 2（6/14）

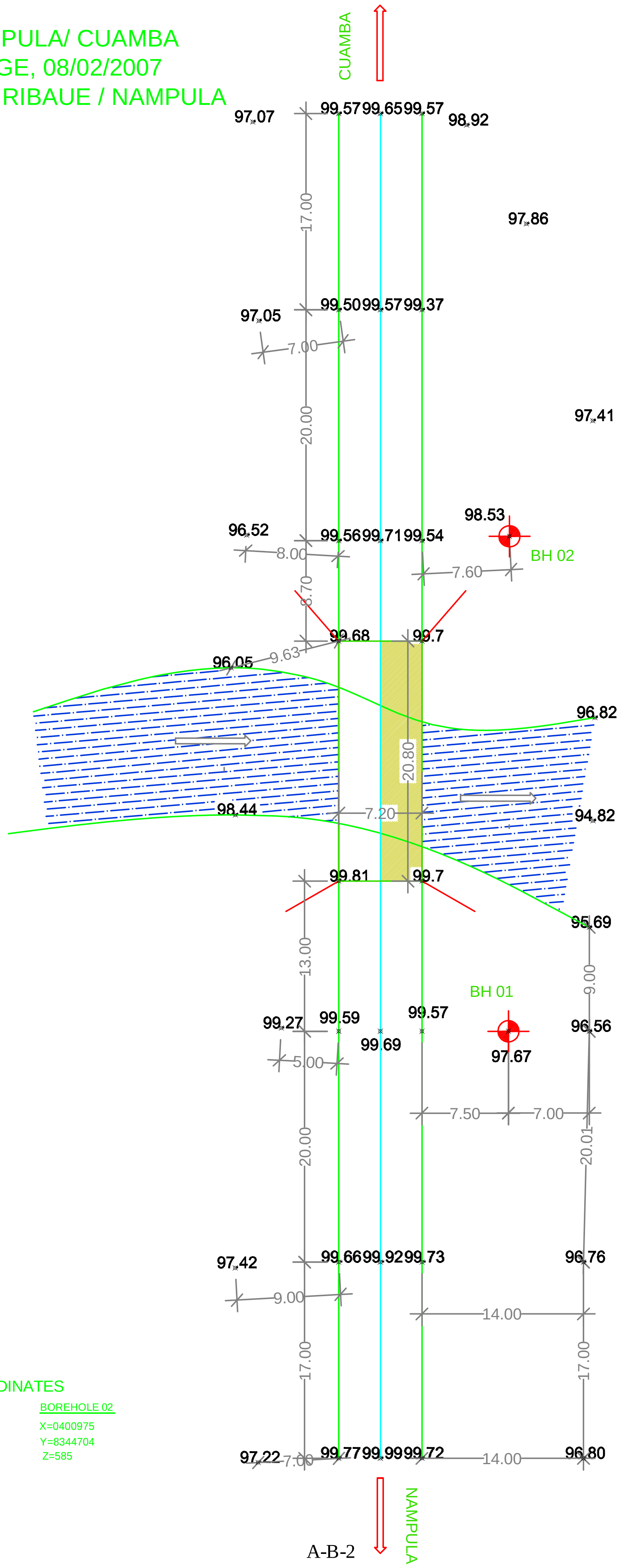
APÊNDICE-B

Geotechnical Survey Result

Appendix B-1

BOREHOLE LOGS AND LOCATION MAP

ROAD N13 - NAMPULA/ CUAMBA
MONAPO BRIDGE, 08/02/2007
BOREHOLE 01 & 02 - RIBAUE / NAMPULA



COORDINATES

BOREHOLE 01	BOREHOLE 02
X=0401025	X=0400975
Y=8344703	Y=8344704
Z=582	Z=585

TÉCNICA - ENGENHEIROS CONSULTORES, LDA

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DRILLING RECORD

BORING NO: BH 01

DRILLING METHOD	% CORE RECOVERY	SAMPLING	TESTING	FRACTURE SPACING	FRACTURE ANGLE (DEG) 15 30 45 60	DEPTH (Meters)	PROFILE (Meters)	MATERIAL DESCRIPTION: Hardness/ Dimension	MATERIAL DESCRIPTION: Color	MATERIAL DESCRIPTION: Soil/Rock Quality
			SPT N=4			1		Medium grained	Brown	Sand
			SPT N=5			2		Medium and fine grained	Brown and white	Sand
			SPT N=3			3				
			SPT N=1			4				
	100		SPT N=4			5		Stiff (low moisture content)	Grey	Clay with some fine white sand
			SPT N=20			6				
			SPT N=33/15			7				
			SPT N>50			8				
			SPT N>50			9				
	78		SPT N>50			10		Very weak	Grey	Weathered granite rock
			SPT N>50			11				
	100		SPT N>50			12		Weak	Grey	Slightly weathered granite rock
			SPT N>50			13				
			SPT N>50			14				
						15				

DRILLING RIG	D900 ATLAS COPCO	DATE STARTED	2007-02-06	DATE COMP.	2007-02-08
CONTRACTOR		LOGGED BY	S . Taula	DATE	2007-02-12
LOCATION	Monapa River, Iapala	DEPTH W/TABLE		AFTER	
PROJECT	N 13 - Nampula , Cuamba	ELEVATION	97.67	JOB NO	P 318
CLIENT	JICA / ANE	ORIENTATION	VERTICAL	SHEET NO	1 OF 2

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DRILLING RECORD | BORING NO: BH 01

DRILLING METHOD	% CORE RECOVERY	SAMPLING	TESTING	FRACTURE SPACING	FRACTURE ANGLE (DEG) 15 30 45 60	DEPTH (Meters)	PROFILE (Meters)	MATERIAL DESCRIPTION Hardness/ Dimension	Color	Soil/Rock Quality
	100		SPT N>50 SPT N>50 SPT N>50 SPT N>50 SPT N>50 SPT N>50 SPT N>50 SPT N>50 SPT N>50 SPT N>50			16 17 18 19 20 21 22 23 24	▩	Weak	Grey	Slightly weathered granite rock
						25 26 27 28 29 30		End of borehole at 72.87		

DRILLING RIG	D900 ATLAS COPCO	DATE STARTED	2007-02-06	DATE COMP.	2007-02-08
CONTRACTOR		LOGGED BY	S . Taula	DATE	2007-02-12
LOCATION	Monapa River, Iapala	DEPTH W/TABLE		AFTER	
PROJECT	N 13 - Nampula , Cuamba	ELEVATION	98.39	JOB NO	P 318
CLIENT	JICA / ANE	ORIENTATION	VERTICAL	SHEET NO	2 OF 2

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DRILLING RECORD

BORING NO: BH 02

DRILLING METHOD	% CORE RECOVERY	SAMPLING	TESTING	FRACTURE SPACING	FRACTURE ANGLE (DEG) 15 30 45 60	DEPTH (Meters)	PROFILE (Meters)	MATERIAL DESCRIPTION Hardness/ Dimension	Color	Soil/Rock Quality
			SPT N=5 SPT N=7			1 2	▨	Medium grained	Brown	Sand
			SPT N=13 SPT N=9			3 4	▨	Fine Grained sand	Brown	Clayey
			SPT N>50 SPT N>50 SPT N>50			5 6 7	▨	Coarse grained	Brown	Sand mixed with hight Clayey
	100		SPT N>50 SPT N>50 SPT N>50 SPT N>50 SPT N>50 SPT N>50 SPT N>50			8 9 10 11 12 13 14 15	▨	Very weak	Grey	Severily weathered granite Rock

DRILLING RIG	D900 ATLAS COPCO	DATE STARTED	2007-01-31	DATE COMP.	2007-01-31
CONTRACTOR		LOGGED BY	S. Taula	DATE	2007-02-04
LOCATION	MONAPO RIVER	DEPTH W/TABLE		AFTER	
PROJECT	N 13 - Nampula , Cuamba	ELEVATION	98.53	JOB NO	P 318
CLIENT	JICA / ANE	ORIENTATION	Vertical	SHEET NO	1 OF 2

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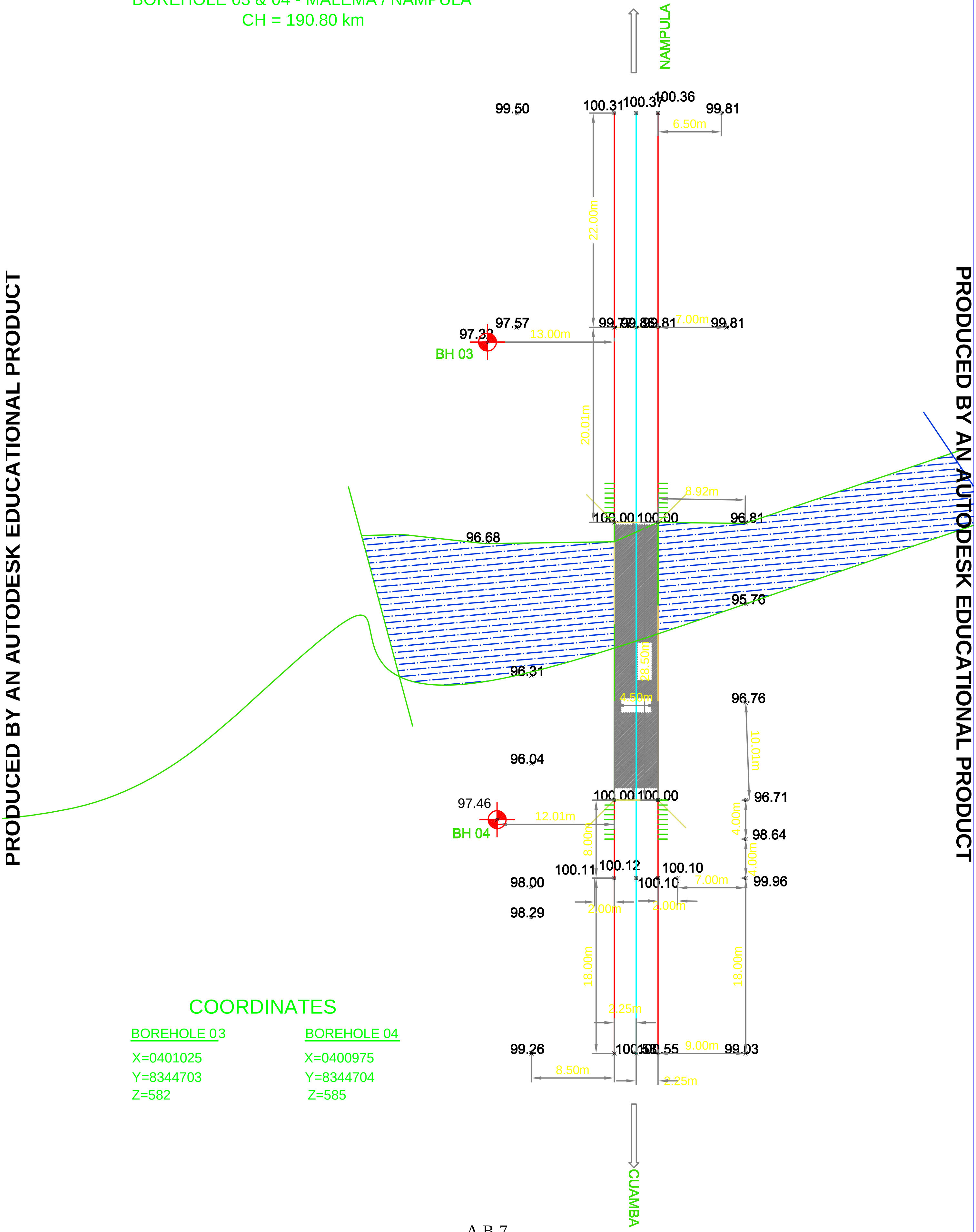
DRILLING RECORD	BORING NO: BH 02

DRILLING METHOD	**% CORE RECOVERY**	**SAMPLING**	**TESTING**	**FRACTURE SPACING**	**FRACTURE ANGLE (DEG)** 15 30 45 60	**DEPTH** (Meters)	**PROFILE** (Meters)	**MATERIAL DESCRIPTION** Hardness/ Dimension	Color	Soil/Rock Quality
	100		SPT N>50 SPT N>50 SPT N>50 SPT N>50 SPT N>50 SPT N>50 SPT N>50 SPT N>50 SPT N>50			16 17 18 19 20 21 22 23 24 25 26	▨	Very weak	Grey	Severily weathered granite Rock
	100					27	■	Weak	Grey	Slightly weathered granite Rock
	100					28 29	▥	Hard	Grey	Unweathered granite rock
						30		End of borehole at 68.99m		

DRILLING RIG	D900 ATLAS COPCO	DATE STARTED	2007-01-31	DATE COMP.	2007-01-31
CONTRACTOR		LOGGED BY	S. Taula	DATE	2007-02-04
LOCATION	MONAPO RIVER	DEPTH W/TABLE		AFTER	
PROJECT	N 13 - Nampula , Cuamba	ELEVATION	98.53	JOB NO	P 318
CLIENT	JICA / ANE	ORIENTATION	Vertical	SHEET NO	2 OF 2

ROAD N13 - NAMPULA/ CUAMBA
LALAUA BRIDGE, 27/01/2007
BOREHOLE 03 & 04 - MALEMA / NAMPULA
CH = 190.80 km



COORDINATES

BOREHOLE 03	BOREHOLE 04
X=0401025	X=0400975
Y=8344703	Y=8344704
Z=582	Z=585

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DRILLING RECORD BORING NO: BH 03

DRILLING METHOD	% CORE RECOVERY	SAMPLING	TESTING	FRACTURE SPACING	FRACTURE ANGLE (DEG) 15 30 45 60	DEPTH (Meters)	PROFILE (Meters)	Hardness/ Dimension	Color	Soil/Rock Quality
	100		SPT N=7			1 2		Fine grained	Brown	Sand
	100		SPT N=6/12					Coarse grained	Brown	Sand mixed with some rock material
	100					3 4 5 6 7		Hard	Grey	Unweathered granite rock
						8 9 10 11 12 13 14 15		End of borehole at 89.56m		

DRILLING RIG	D900 ATLAS COPCO	DATE STARTED	2006-12-28	DATE COMP.	2006-01-29
CONTRACTOR		LOGGED BY	S . Taula	DATE	2007-01-30
LOCATION	Lalava River	DEPTH W/TABLE		AFTER	
PROJECT	N 13 - Nampula Cuamba	ELEVATION	97.32	JOB NO	P 318
CLIENT	JICA / ANE	ORIENTATION	VERTICAL	SHEET NO	1 OF 1

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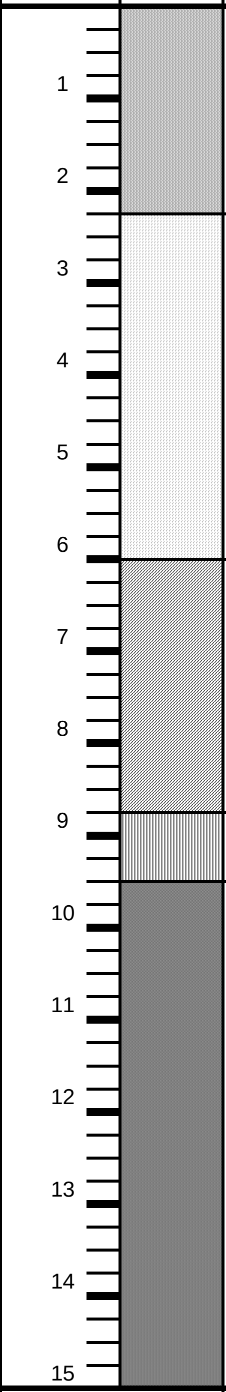
DRILLING RECORD

BORING NO: BH 04

DRILLING METHOD	% CORE RECOVERY	SAMPLING	TESTING	FRACTURE SPACING	FRACTURE ANGLE (DEG) 15 30 45 60	DEPTH (Meters)	PROFILE (Meters)	MATERIAL DESCRIPTION: Hardness/ Dimension	Color	Soil/Rock Quality
	100		SPT N=1/37 SPT N=2 SPT N=5 SPT N=12/15 SPT N=4/3 SPT N>50			1 2	▒	Medium grained coarse grained	Brown	Sand
						3 4 5 6	░	Coarse Grained	Brown	Sand with some clay content
	100					7 8	▨	Very weak to weak	Brown	Weathered granite rock
	100					9	▥	Hard	Grey	Unweathered granite rock
	100					10 11 12 13 14 15	▓	Weak	Grey	Weathered granite rock



DRILLING RIG	D900 ATLAS COPCO	DATE STARTED	2006-12-28	DATE COMP.	
CONTRACTOR		LOGGED BY	S. Taula	DATE	2007-01-25
LOCATION	Lalava River	DEPTH W/TABLE		AFTER	2007-01-28
PROJECT	N 13 - Nampula Cuamba	ELEVATION	97.46	JOB NO	P 318
CLIENT	JICA / ANE	ORIENTATION	Vertical	SHEET NO	1 OF 2

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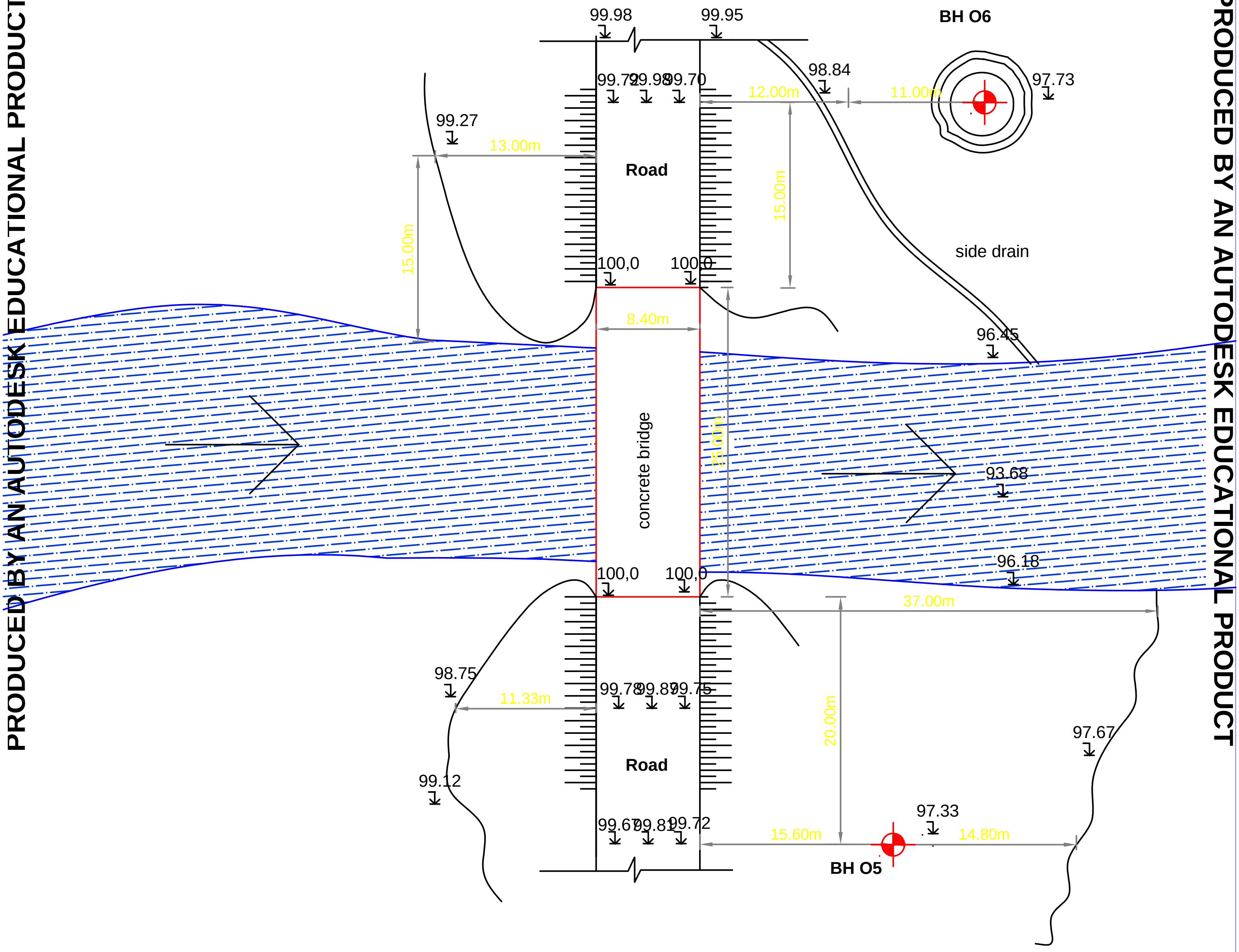
DRILLING RECORD

BORING NO: BH 04

DRILLING METHOD	% CORE RECOVERY	SAMPLING	TESTING	FRACTURE SPACING	FRACTURE ANGLE (DEG)	DEPTH (Meters)	PROFILE (Meters)	MATERIAL DESCRIPTION		
					15 30 45 60			Hardness/ Dimension	Color	Soil/Rock Quality
	100					16	▨	Weak	Grey	Weathered granite rock
						17		End of borehole at 81.39m		
						18				
						19				
						20				
						21				
						22				
						23				
						24				
						25				
						26				
						27				
						28				
						29				
						30				

DRILLING RIG	D900 ATLAS COPCO	DATE STARTED	2006-12-28	DATE COMP.	
CONTRACTOR		LOGGED BY	S. Taula	DATE	2007-01-25
LOCATION	Lalava River	DEPTH W/TABLE		AFTER	2007-01-28
PROJECT	N 13 - Nampula Cuamba	ELEVATION	97.46 m	JOB NO	P 318
CLIENT	JICA / ANE	ORIENTATION	Vertical	SHEET NO	2 OF 2

ROAD N13 - NAMPULA/ CUAMBA
NATALEIA BRIDGE, 09/01/2007
BOREHOLE 05 & 06 - MALEMA / NAMPULA
CH = 230 km



COORDINATES

BOREHOLE 05	BOREHOLE 06
X=0338602	X=0338799
Y=8347016	Y=8347018
Z=599	Z=612

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DRILLING RECORD	BORING NO: BH 05

DRILLING METHOD	**% CORE RECOVERY**	**SAMPLING**	**TESTING**	**FRACTURE SPACING**	**FRACTURE ANGLE (DEG)**	**DEPTH** (Meters)	**PROFILE** (Meters)	**MATERIAL DESCRIPTION**		
					15 30 45 60			Hardness/ Dimension	Color	Soil/Rock Quality
	100					1		Medium grained	Dark brown	Sand
	100		SPT N=20 SPT N>50 SPT N>50			2 3		Stiff silty clay	Brown	Weathered fracture granite rock
	100	UCS S1V1 UCS S2V1				4 5 6 7 8		Hard	Grey	Unweathered granite
						9 10 11 12 13 14 15		End of borehole at 88.83 m		

DRILLING RIG	D900 ATLAS COPCO	DATE STARTED	2007-01-09	DATE COMP.	2006-09-01
CONTRACTOR		LOGGED BY	S.TAULA	DATE	2007-01-30
LOCATION	NATALEIA RIVER, MALEMA	DEPTH W/TABLE		AFTER	
PROJECT	N13 - NAMPULA CUAMBA	ELEVATION	97.33 m	JOB NO	P318
CLIENT	JICA / ANE	ORIENTATION	VERTICAL	SHEET NO	1 OF 1

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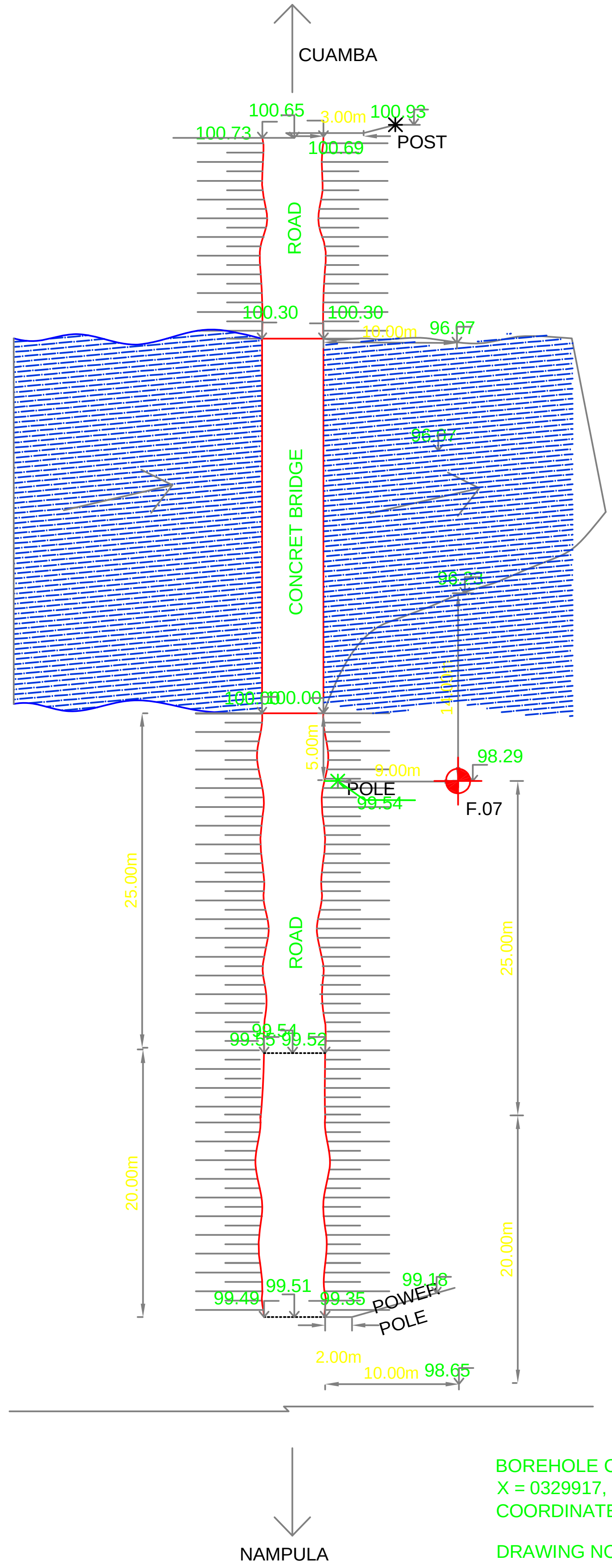
DRILLING RECORD

BORING NO: BH 06

DRILLING METHOD	% CORE RECOVERY	SAMPLING	TESTING	FRACTURE SPACING	FRACTURE ANGLE (DEG) 15 30 45 60	DEPTH (Meters)	PROFILE (Meters)	MATERIAL DESCRIPTION Hardness/ Dimension	Color	Soil/Rock Quality
	100							Medium grained	Brown	Sand
	100	UCS S1V1 UCS S2V1				1 2 3 4 5		Hard	Grey	Sound granite
						6 7 8 9 10 11 12 13 14 15		End of borehole a 92.18 m		

DRILLING RIG	D900 ATLAS COPCO	DATE STARTED	2006-12-28	DATE COMP.	2006-12-28
CONTRACTOR		LOGGED BY	S. Taula	DATE	2007-01-30
LOCATION	Nataleia River ,Malema	DEPTH W/TABLE		AFTER	
PROJECT	N 13 - Nampula Cuamba	ELEVATION	97.93 m	JOB NO	P 318
CLIENT	JICA / ANE	ORIENTATION	Vertical	SHEET NO	1 OF 1

ROAD N13 - NAMPULA/ CUAMBA
MUTIVASSE BRIDGE, 27/12/2006
BOREHOLE 07 - MALEMA / NAMPULA
CH = 239.80 Km



BOREHOLE COORDINATES:
X = 0329917, Y = 8346484, Z=608
COORDINATE SYSTEM: UTM

DRAWING NOT TO BE SCALED

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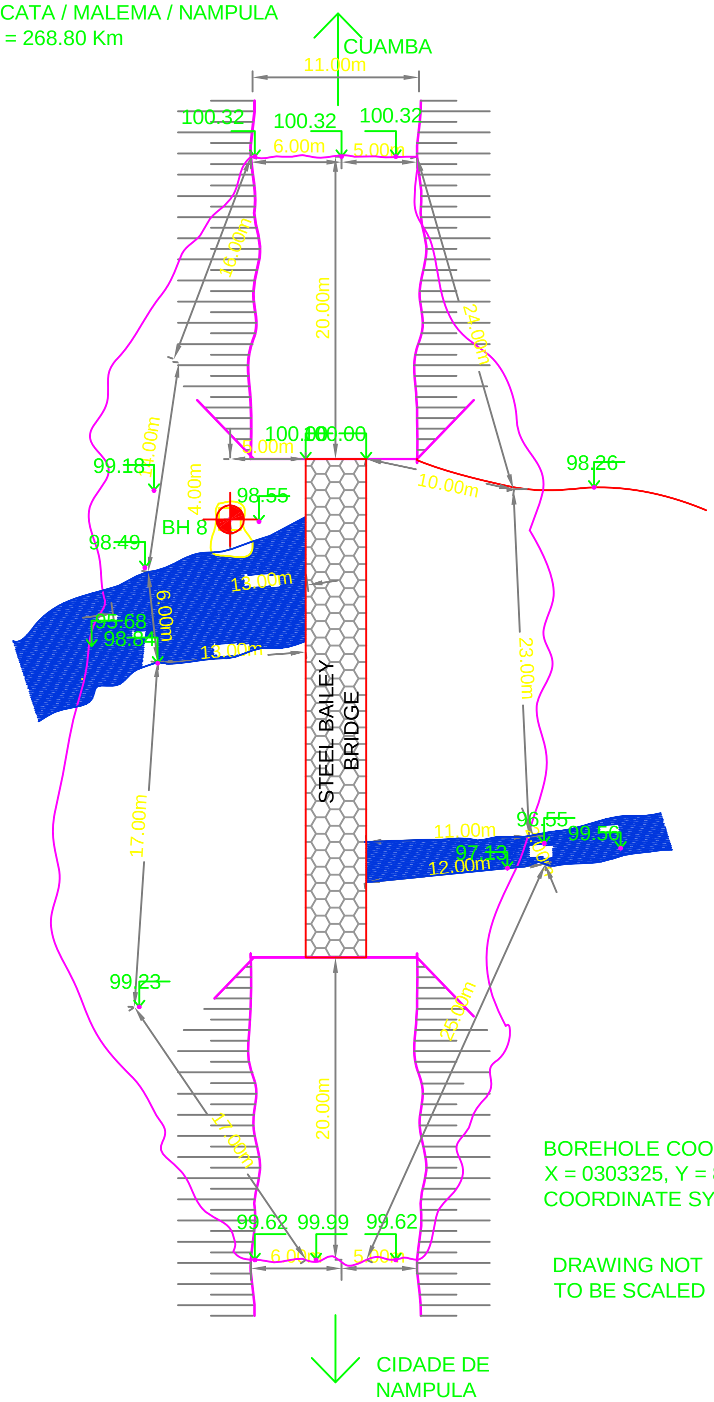
DRILLING RECORD

BORING NO: BH 07

DRILLING METHOD	% CORE RECOVERY	SAMPLING	TESTING	FRACTURE SPACING	FRACTURE ANGLE (DEG)	DEPTH (Meters)	PROFILE (Meters)	MATERIAL DESCRIPTION		
					15 30 45 60			Hardness/ Dimension	Color	Soil/Rock Quality
			SPT N=1 SPT N=2 SPT N=8 SPT N=5			1 2 3 4 5	▒	Medium grained	White to dark brown	Sand
	100		SPT N>50 SPT N>50			6	▨	Weak	Grey	Slightly weathered granite rock
	100	UCS S1V1 UCS S2V1 S2V2 S2V3 UCS S3V1				7 8 9 10 11	▥	Hard to very hard	Grey	sound granite
						12 13 14 15		End of borehole at 86.79 m		

DRILLING RIG	D900 ATLAS COPCO	DATE STARTED	2006-12-27	DATE COMP.	2006-12-27
CONTRACTOR		LOGGED BY	S.TAULA	DATE	2007-01-30
LOCATION	MUTIVASSE RIVER	DEPTH W/TABLE		AFTER	
PROJECT	N13 - NAMPULA CUAMBA	ELEVATION	98.29 m	JOB NO	P318
CLIENT	JICA / ANE	ORIENTATION	VERTICAL	SHEET NO	1 OF1

ROAD N13 - NAMPULA/ CUAMBA
NOMOLA BRIDGE, 23/12/2006
BOREHOLE 08 - NACATA / MALEMA / NAMPULA
CH = 268.80 Km



BOREHOLE COORDINATES:
X = 0303325, Y = 834789, Z=644
COORDINATE SYSTEM: UTM

DRAWING NOT
TO BE SCALED

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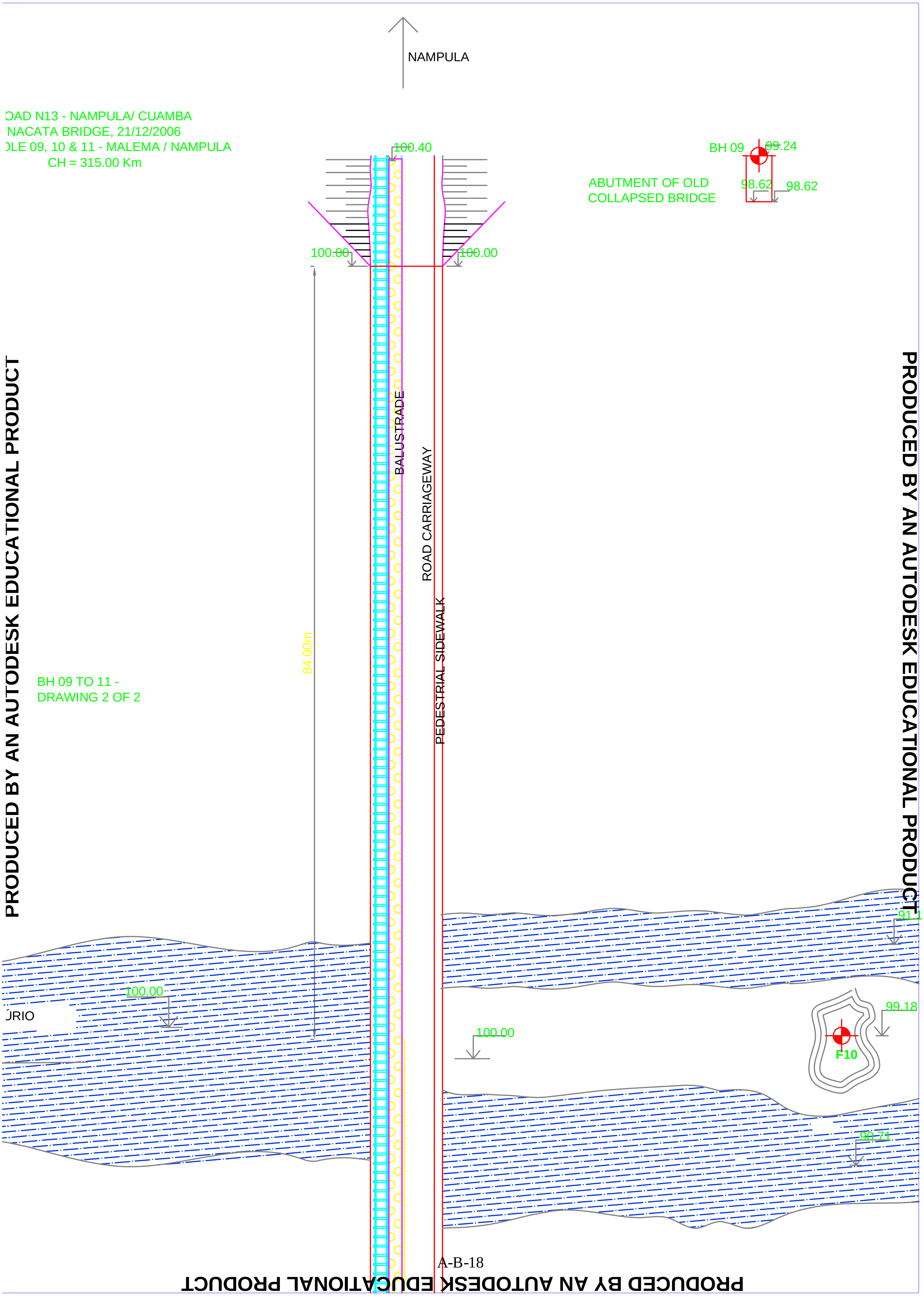
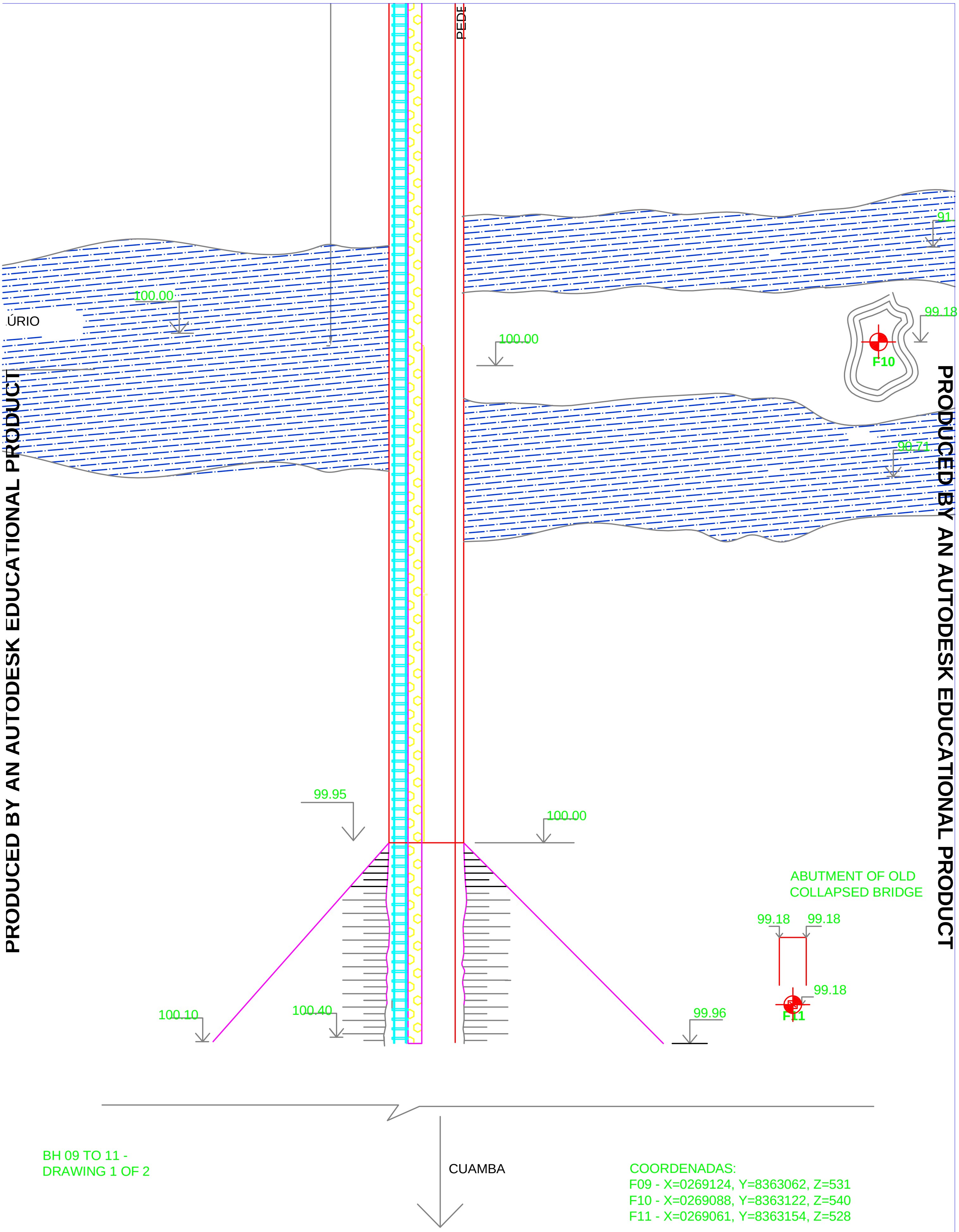
DRILLING RECORD

BORING NO: BH 08

DRILLING METHOD	% CORE RECOVERY	SAMPLING	TESTING	FRACTURE SPACING	FRACTURE ANGLE (DEG) 15 30 45 60	DEPTH (Meters)	PROFILE (Meters)	MATERIAL DESCRIPTION Hardness/ Dimension	Color	Soil/Rock Quality
						1	▒	Fine grained	Dark brown	Clayey Sand
			SPT N=22 SPT N=3 SPT N=2 SPT N=4 SPT N=10			2 3 4 5 6	░	Medium to coarse grained	Grey to brown	Sand
	100		SPT N>50 SPT N>50 SPT N>50 SPT N>50 SPT N>50			7 8 9 10 11	▨	Very weak to weak	Grey	Weathered granite rock
	100	UCS S1V1				12 13 14	▥	Hard to very hard	Grey	Sound granite rock
						15	▥	End of borehole at 83.30 m		

DRILLING RIG	D900 ATLAS COPCO	DATE STARTED	2006-12-23	DATE COMP.	2006-12-24
CONTRACTOR		LOGGED BY	S.TAULA	DATE	2007-01-30
LOCATION	N0NOLA RIVER, NACATA	DEPTH W/TABLE		AFTER	
PROJECT	N13 - NAMPULA CUAMBA	ELEVATION	98.55 m	JOB NO	P318
CLIENT	JICA / ANE	ORIENTATION	VERTICAL	SHEET NO	1 OF 1


NAMPULA
OAD N13 - NAMPULA/ CUAMBA
NACATA BRIDGE, 21/12/2006
OLE 09, 10 & 11 - MALEMA / NAMPULA
CH = 315.00 Km
100.40
BH 09
99.24
ABUTMENT OF OLD
COLLAPSED BRIDGE
98.62
98.62
100.00
100.00
BALUSTRADE
ROAD CARRIAGEWAY
PEDESTRIAL SIDEWALK
84.00m
BH 09 TO 11 -
DRAWING 2 OF 2
91.1
100.00
ÚRIO
99.18
100.00
F10
90.71



BH 09 TO 11 -
DRAWING 1 OF 2

COORDENADAS:
F09 - X=0269124, Y=8363062, Z=531
F10 - X=0269088, Y=8363122, Z=540
F11 - X=0269061, Y=8363154, Z=528

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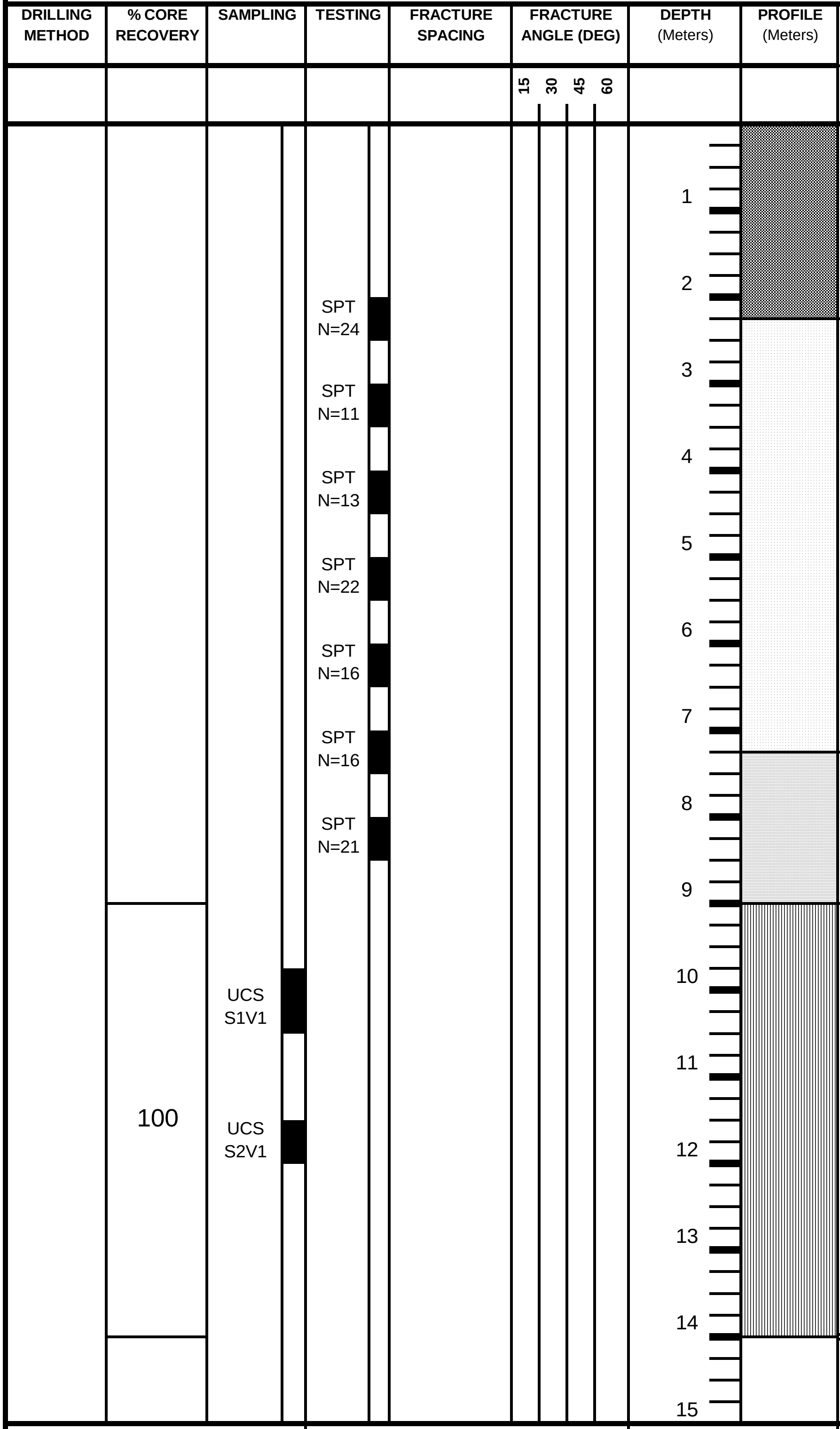
DRILLING RECORD

BORING NO: BH 09



MATERIAL DESCRIPTION		
Hardness/ Dimension	Color	Soil/Rock Quality
Fine grained	Dark brown	Silty clay
Fine to medium grained	Grey to dark brown	Sand
Coarse grained	Brown	Sand
Hard	Grey	Sound granite rock

End of borehole at 84.29 m

DRILLING RIG	D900 ATLAS COPCO	DATE STARTED	2006-12-28	DATE COMP.	2006-12-28
CONTRACTOR		LOGGED BY	S. Taula	DATE	2007-01-30
LOCATION	Lurio River, Malema	DEPTH W/TABLE		AFTER	
PROJECT	N 13 - Nampula , Cuamba	ELEVATION	98.29	JOB NO	P 318
CLIENT	JICA / ANE	ORIENTATION	Vertical	SHEET NO	1 OF 1

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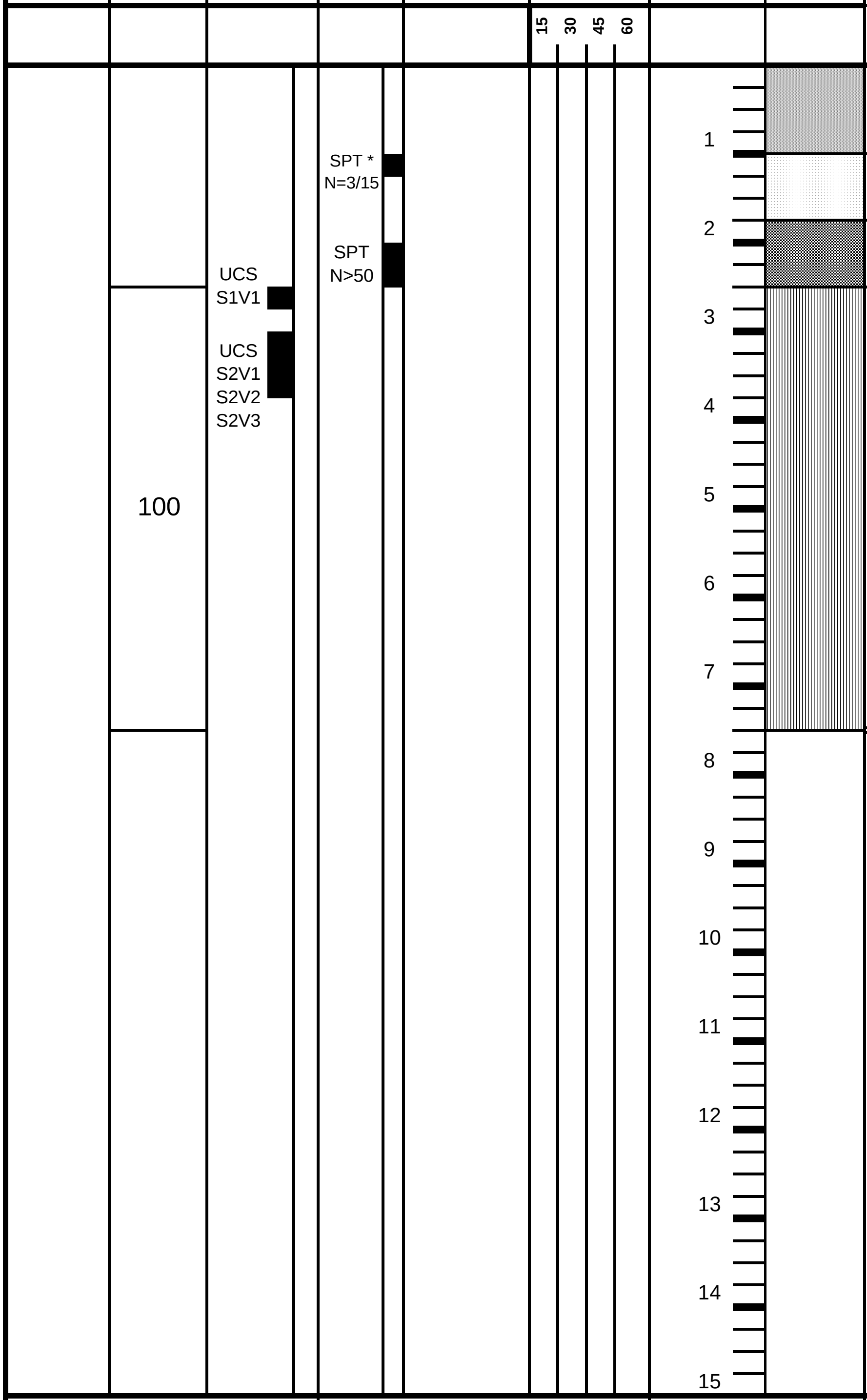
DRILLING RECORD

BORING NO: BH 10

DRILLING METHOD	% CORE RECOVERY	SAMPLING	TESTING	FRACTURE SPACING	FRACTURE ANGLE (DEG)	DEPTH (Meters)	PROFILE (Meters)	MATERIAL DESCRIPTION



Hardness/ Dimension	Color	Soil/Rock Quality
Fine to medium grained	Brown	Clayey sand
Coarse grained		Sand mixed with gravel and boulders
Concrete from the foundation of an old bridge		
Hard	Grey	Sound granite rock

End of borehole at 84.99 m
NOTE: * SPT refusal when concrete was hit.

DRILLING RIG	D900 ATLAS COPCO	DATE STARTED	2006-12-28	DATE COMP.	2006-12-28
CONTRACTOR		LOGGED BY	S . Taula	DATE	2007-01-30
LOCATION	Lurio river , Malema	DEPTH W/TABLE		AFTER	
PROJECT	N 13 - Nampula Cuamba	ELEVATION	92.49	JOB NO	P 318
CLIENT	JICA / ANE	ORIENTATION	VERTICAL	SHEET NO	1 OF 1

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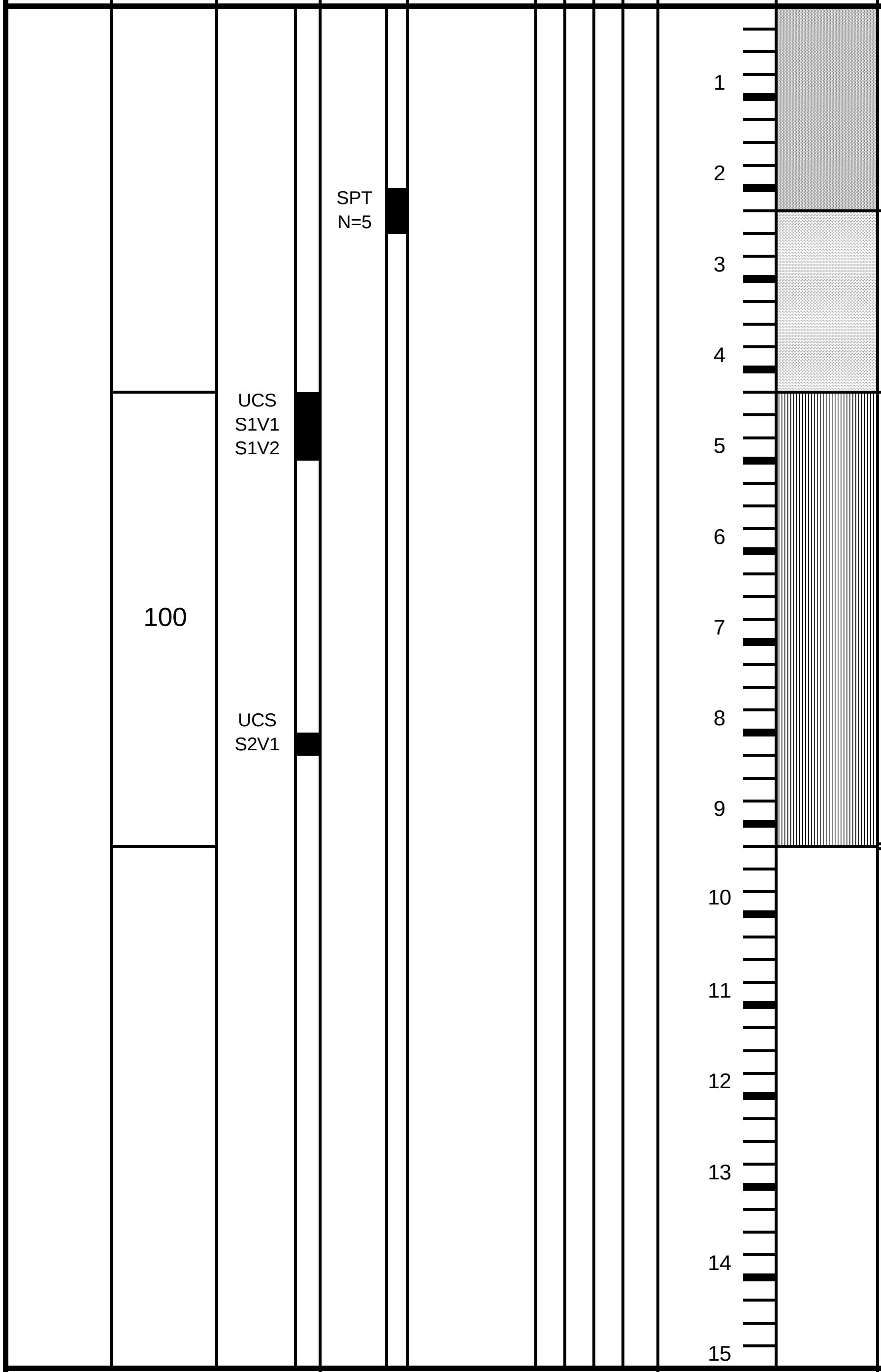
DRILLING RECORD

BORING NO: BH 11

DRILLING METHOD	% CORE RECOVERY	SAMPLING	TESTING	FRACTURE SPACING	FRACTURE ANGLE (DEG)	DEPTH (Meters)	PROFILE (Meters)	MATERIAL DESCRIPTION		
					15 30 45 60			Hardness/ Dimension	Color	Soil/Rock Quality



Hardness/ Dimension	Color	Soil/Rock Quality
Fine grained	Dark brown	Clayey sand
Medium grained	Brown	Sand
Hard	Grey	Sound granite rock

End of borehole at 89.14 m

DRILLING RIG	D900 ATLAS COPCO	DATE STARTED	2006-12-28	DATE COMP.	2006-12-28
CONTRACTOR		LOGGED BY	S . Taula	DATE	2007-01-30
LOCATION	Lurio River	DEPTH W/TABLE		AFTER	
PROJECT	N 13 - Nampula , Cuamba	ELEVATION	98.39	JOB NO	P 318
CLIENT	JICA / ANE	ORIENTATION	VERTICAL	SHEET NO	1 OF 1

Appendix B-2

UCS TEST RESULTS ROCK CORES

TÉCNICA - ENGENHEIROS CONSULTORES, LDA

AV. 25 DE SETEMBRO, NR. 2526, 1ST FLOOR
MAPUTO-MOCAMBIQUE

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BOREHOLE NO 05
SITE: NATALEMA RIVER - MALEMA / NAMPULA
UNCONFINED COMPRESSIVE STRENGTH (UCS)

DRY SAMPLE

Sample	Depth (m)	Weight (kg)	Height (mm)	Diameter (mm)	Area (mm²)	Total Failure Load (N)	Failure Strength (Mpa)	Average Failure Strength (Mpa)
S1V1	3.75	1.300	87.5	87.5	5765.4	446875	77.5	**77.5**

SATURATED SAMPLE

Sample	Depth (m)	Weight (kg)	Height (mm)	Diameter (mm)	Area (mm²)	Total Failure Load (N)	Failure Strength (Mpa)	Average Failure Strength (Mpa)
S1V1	3.75	1.250	85.7	85.7	5765.4	340000	59.0	**58.6**
S1V1	3.75	1.350	85.7	85.7	5765.4	340000	58.3	
S2V1	5.00	0.640	66.3	66.3	3450.6	300000	86.9	**86.9**

TÉCNICA - ENGENHEIROS CONSULTORES, LDA

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BOREHOLE NO 06
SITE: NATALEMA RIVER - MALEMA / NAMPULA
UNCONFINED COMPRESSIVE STRENGTH (UCS)

DRY SAMPLE

Sample	Depth (m)	Weight (kg)	Height (mm)	Diameter (mm)	Area (mm²)	Total Failure Load (N)	Failure Strength (Mpa)	Average Failure Strength (Mpa)
S1V1	2.00	0.640	66.3	66.3	3450.6	337500	97.8	**98.7**
S1V1	2.00	0.620	66.3	66.3	3450.6	343750	99.6	
S2V1	3.75	0.630	66.3	66.3	3450.6	322500	108.3	**108.3**

SATURATED SAMPLE

Sample	Depth (m)	Weight (kg)	Height (mm)	Diameter (mm)	Area (mm²)	Total Failure Load (N)	Failure Strength (Mpa)	Average Failure Strength (Mpa)
S1V1	2.00	0.630	66.3	66.3	3450.6	375000	108.7	**108.7**
S1V1	2.00	0.620	66.3	66.3	3450.6	375000	108.7	
S2V1	3.75	0.620	66.3	66.3	3450.6	368750	106.9	**107.8**
S2V1	3.75	0.620	66.3	66.3	3450.6	365000	108.7	

TÉCNICA - ENGENHEIROS CONSULTORES, LDA

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BOREHOLE NO 07
SITE: NATALEMA RIVER - MALEMA / NAMPULA
UNCONFINED COMPRESSIVE STRENGTH (UCS)

DRY SAMPLE

Sample	**Depth (m)**	**Weight (kg)**	**Height (mm)**	**Diameter (mm)**	**Area (mm²)**	**Total Failure Load (N)**	**Failure Strength (Mpa)**	**Average Failure Strength (Mpa)**
S2V1	8.00	0.620	66.3	66.3	3450.6	336300	97.5	**97.2**
S2V1	8.00	0.600	66.3	66.3	3450.6	334500	96.9	
S2V1	8.00	0.610	66.3	66.3	3450.6	334600	97.0	**97.1**
S2V1	8.00	0.620	66.3	66.3	3450.6	335600	97.3	
S3V1	10.00	0.600	66.3	66.3	3450.6	261250	75.7	**75.7**
S3V1	10.00	0.610	66.3	66.3	3450.6	331250	96.0	**94.1**
S3V1	10.00	0.600	66.3	66.3	3450.6	331150	96.0	
S3V1	10.00	0.620	66.3	66.3	3450.6	336400	97.5	
S3V1	10.00	0.620	66.3	66.3	3450.6	300000	86.9	

SATURATED SAMPLE

Sample	**Depth (m)**	**Weight (kg)**	**Height (mm)**	**Diameter (mm)**	**Area (mm²)**	**Total Failure Load (N)**	**Failure Strength (Mpa)**	**Average Failure Strength (Mpa)**
S1V1	6.50	1.300	85.7	85.7	57.65.4	237500	41.20	**41.2**
S1V1	6.50	1.300	85.7	85.7	5765.4	237500	41.20	
S2V1	8.00	0.640	66.3	66.3	3450.6	231250	67.00	**67**
S2V2	8.00	0.600	66.3	66.3	3450.6	187500	54.30	**57.9**
S2V2	8.00	0.63	66.3	66.3	3450.6	200000	58.00	
S2V2	8.00	0.6	66.3	66.3	3450.6	181250	52.50	
S2V3	8.00	0.61	66.3	66.3	3450.6	212500	61.60	**61.3**
S2V3	8.00	0.6	66.3	66.3	3450.6	250625	61.00	
S3V1	10.00	0.62	66.3	66.3	3450.6	177500	51.40	**54.9**
S3V1	10.00	0.61	66.3	66.3	3450.6	201250	58.30	
S3V1	10.00	0.63	66.3	66.3	3450.6	200000	58.00	**57.4**
S3V1	10.00	0.62	66.3	66.3	3450.6	181250	52.50	
S3V1	10.00	0.62	66.3	66.3	3450.6	212500	61.60	

TÉCNICA - ENGENHEIROS CONSULTORES, LDA

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BOREHOLE NO 08
SITE: NATALEMA RIVER - MALEMA / NAMPULA
UNCONFINED COMPRESSIVE STRENGTH (UCS)

DRY SAMPLE

Sample	Depth (m)	Weight (kg)	Height (mm)	Diameter (mm)	Area (mm²)	Total Failure Load (N)	Failure Strength (Mpa)	Average Failure Strength (Mpa)
S1V1	11.25	0.680	66.3	66.3	368750.0	337500	106.9	**103.5**
S1V1	11.25	0.650	66.3	66.3	367850.0	343750	106.9	
S1V1	11.25	0.610	66.3	66.3	335000.0	322500	97.1	

SATURATED SAMPLE

Sample	Depth (m)	Weight (kg)	Height (mm)	Diameter (mm)	Area (mm²)	Total Failure Load (N)	Failure Strength (Mpa)	Average Failure Strength (Mpa)
S1V1	11.25	0.640	66.3	66.3	3450.6	375000	108.7	**108.7**
S1V1	11.25	0.620	66.3	66.3	3450.6	375000	108.7	

TÉCNICA - ENGENHEIROS CONSULTORES, LDA

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BOREHOLE NO 09
SITE: NATALEMA RIVER - MALEMA / NAMPULA
UNCONFINED COMPRESSIVE STRENGTH (UCS)

DRY SAMPLE

Sample	Depth (m)	Weight (kg)	Height (mm)	Diameter (mm)	Area (mm²)	Total Failure Load (N)	Failure Strength (Mpa)	Average Failure Strength (Mpa)
S1V1	9.75	1.240	85.7	85.7	5765.4	496875	86.2	**86.2**
S1V2	9.75	1.200	85.7	85.7	5765.4	750000	130.1	**130.1**
S1V2	9.75	1.210	85.7	85.7	5765.4	750000	130.1	
S2V1	11.50	1.260	85.7	85.7	5765.4	668125	115.9	**118.1**
S2V1	11.50	1.270	85.7	85.7	5765.4	693125	120.2	

SATURATED SAMPLE

Sample	Depth (m)	Weight (kg)	Height (mm)	Diameter (mm)	Area (mm²)	Total Failure Load (N)	Failure Strength (Mpa)	Average Failure Strength (Mpa)
S1V1	9.75	1.220	85.7	85.7	5765.4	756000	130.10	**130.1**
S1V1	9.75	1.210	85.7	85.7	5765.4	750000	130.10	
S1V2	9.75	1.230	85.7	85.7	5765.4	750000	130.10	**130.1**
S1V2	9.75	1.220	85.7	85.7	5765.4	750000	130.10	
S2V1	11.50	0.63	66.3	85.7	5765.4	593750	103.00	**101.9**
S2V1	11.50	0.6	66.3	85.7	5765.4	581250	100.80	

TÉCNICA - ENGENHEIROS CONSULTORES, LDA

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BOREHOLE NO 10
SITE: NATALEMA RIVER - MALEMA / NAMPULA
UNCONFINED COMPRESSIVE STRENGTH (UCS)

DRY SAMPLE

Sample	Depth (m)	Weight (kg)	Height (mm)	Diameter (mm)	Area (mm²)	Total Failure Load (N)	Failure Strength (Mpa)	Average Failure Strength (Mpa)
S1V1	2.50	1.330	85.7	85.7	5765.4	276875	48.0	**48.0**
S2V1	3.00	1.240	85.7	85.7	5765.4	284375	49.3	**49.3**
S2V2	3.00	1.360	85.7	85.7	5765.4	450000	78.1	**78.1**
S2V3	3.00	1.240	85.7	85.7	5765.4	493125	75.5	**75.5**

SATURATED SAMPLE

Sample	Depth (m)	Weight (kg)	Height (mm)	Diameter (mm)	Area (mm²)	Total Failure Load (N)	Failure Strength (Mpa)	Average Failure Strength (Mpa)
S1V1	2.50	1.300	85.7	85.7	5765.4	212500	36.90	**36.9**
S2V1	3.00	1.250	85.7	85.7	5765.4	718750	124.70	**124.7**
S2V2	3.00	1.400	85.7	85.7	5765.4	337500	58.50	**59.1**
S2V2	3.00	1.400	85.7	85.7	5765.4	343750	59.60	
S2V3	3.00	1.3	85.7	85.7	5765.4	493750	85.60	**84.6**
S2V3	3.00	1.3	85.7	85.7	5765.4	481250	83.50	

TÉCNICA - ENGENHEIROS CONSULTORES, LDA

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BOREHOLE NO 11
SITE: NATALEMA RIVER - MALEMA / NAMPULA
UNCONFINED COMPRESSIVE STRENGTH (UCS)

DRY SAMPLE

Sample	Depth (m)	Weight (kg)	Height (mm)	Diameter (mm)	Area (mm²)	Total Failure Load (N)	Failure Strength (Mpa)	Average Failure Strength (Mpa)
S1V1	4.25	1.140	85.7	85.7	5765.4	287500	49.9	**52.0**
S1V1	4.25	1.140	85.7	85.7	5765.4	312500	54.2	
S1V2	4.25	1.140	85.7	85.7	5765.4	385000	66.8	**66.8**
S2V1	8.00	1.140	85.7	85.7	5765.4	371875	64.5	**64.5**

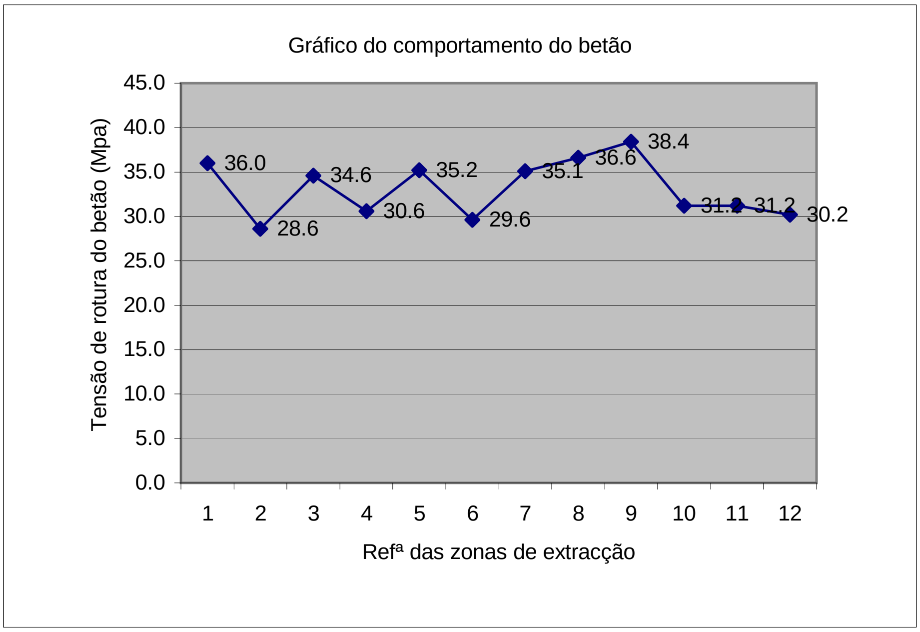
SATURATED SAMPLE

Sample	Depth (m)	Weight (kg)	Height (mm)	Diameter (mm)	Area (mm²)	Total Failure Load (N)	Failure Strength (Mpa)	Average Failure Strength (Mpa)
S1V1	4.25	1.170	85.7	85.7	5765.4	296875	51.50	**55.8**
S1V1	4.25	1.160	85.7	85.7	5765.4	346875	60.20	
S1V2	4.25	1.150	85.7	85.7	5765.4	353125	61.20	**61.20**
S2V1	8.00	1.140	85.7	85.7	5765.4	343125	59.50	**59.50**

Laboratório de Engenharia de Moçambique
Departamento de Materiais de Construção e Estruturas
Tratamento Estatístco dos resultados

Registo nº.24.026

Nº de Ordem	Refª. dos Pilares	Tensão média Individual (Mpa)
1	PED-1	36.0
2	PLEFX-1	28.6
3	PPDN-1	34.6
4	PLEINT-1	30.6
5	PPEINT-1	35.2
6	PPDNEXT-1	29.6
7	PAE-1	35.1
8	PG-1	36.6
9	PES-1	38.4
10	PPN-1	31.2
11	PCE-2	31.2
12	PAE-2	30.2
Média		33.1
Desvio Padrão		3.2

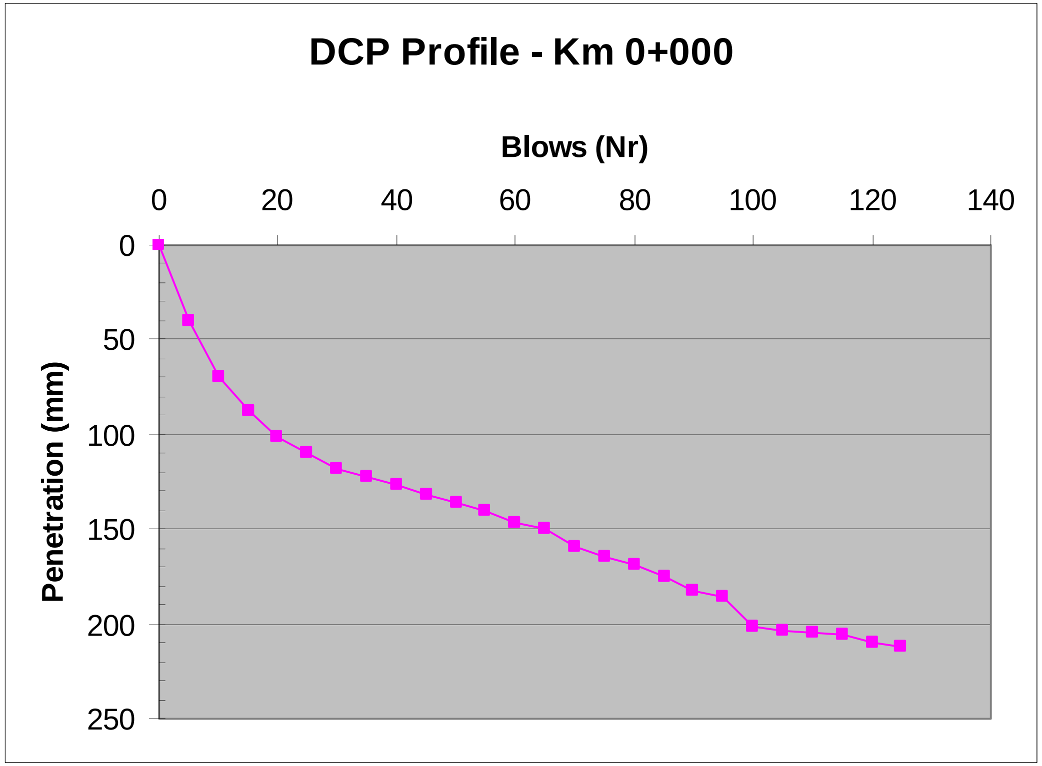


Appendix B-3

DCP TEST RESULTS

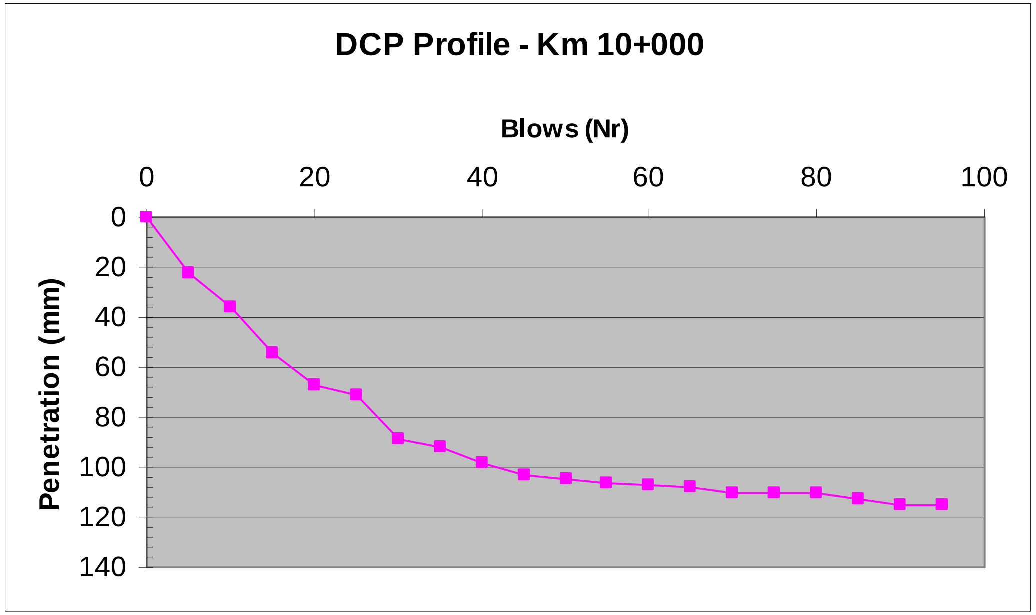
DCP Tests
Section 0+000
UTM Coordinates: X=0524455, Y=8329373

Blows (Nr)	Readings (mm)	Penetration (mm)	DN (mm/blow)	CBR in-situ (%)
0	1000.1	0		
5	960	40.1	8.02	29.1
10	930	70.1	6	42.1
15	913	87.1	3.4	86.7
20	899	101.1	2.8	110.9
25	890	110.1	1.8	185.3
30	882	118.1	1.6	206.0
35	878	122.1	0.8	>210
40	873	127.1	1	>210
45	868	132.1	1	>210
50	864	136.1	0.8	>210
55	860	140.1	0.8	>210
60	853	147.1	1.4	>210
65	850	150.1	0.6	>210
70	841	159.1	1.8	185.3
75	836	164.1	1	>210
80	831	169.1	1	>210
85	825	175.1	1.2	>210
90	818	182.1	1.4	>210
95	814	186.1	0.8	>210
100	799	201.1	3	101.6
105	797	203.1	0.4	>210
110	795	205.1	0.4	>210
115	794	206.1	0.2	>210
120	790	210.1	0.8	>210
125	788	212.1	0.4	>210



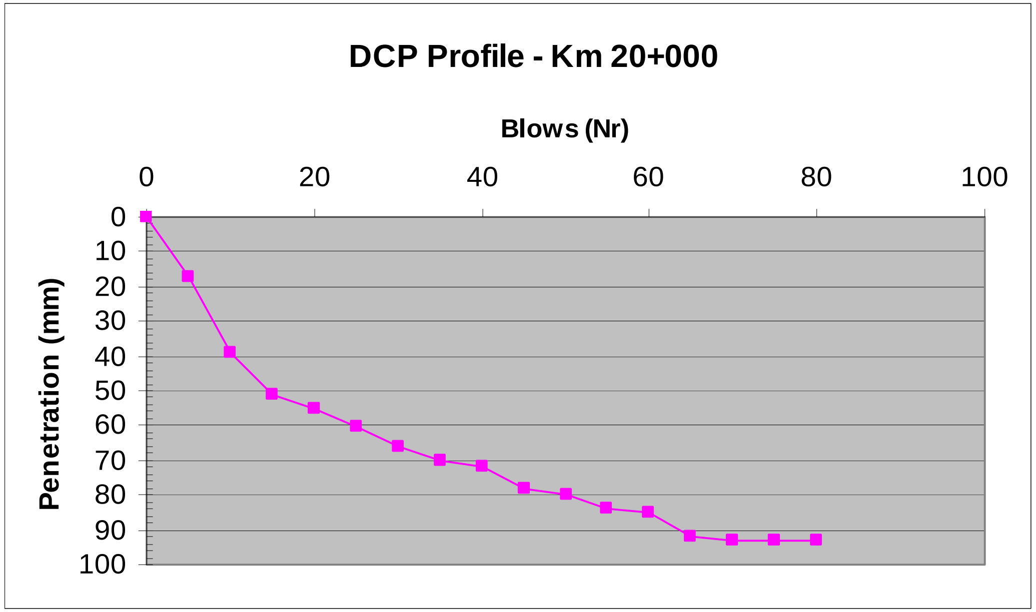
DCP Tests
Section 10+000
UTM Coordinates: X=0521848, Y=8332402

Blows	Readings	Penetration	DN (mm/blow)	CBR in-situ (%)
0	1000.1	0		
5	978	22.1	4.42	62.1
10	964	36.1	2.8	110.9
15	946	54.1	3.6	80.6
20	933	67.1	2.6	121.8
25	929	71.1	0.8	>210
30	911	89.1	3.6	80.6
35	908	92.1	0.6	>210
40	902	98.1	1.2	>210
45	897	103.1	1	>210
50	895	105.1	0.4	>210
55	894	106.1	0.2	>210
60	893	107.1	0.2	>210
65	892	108.1	0.2	>210
70	890	110.1	0.4	>210
75	890	110.1	0	>210
80	890	110.1	0	>210
85	887	113.1	0.6	>210
90	885	115.1	0.4	>210
95	885	115.1	0	>210



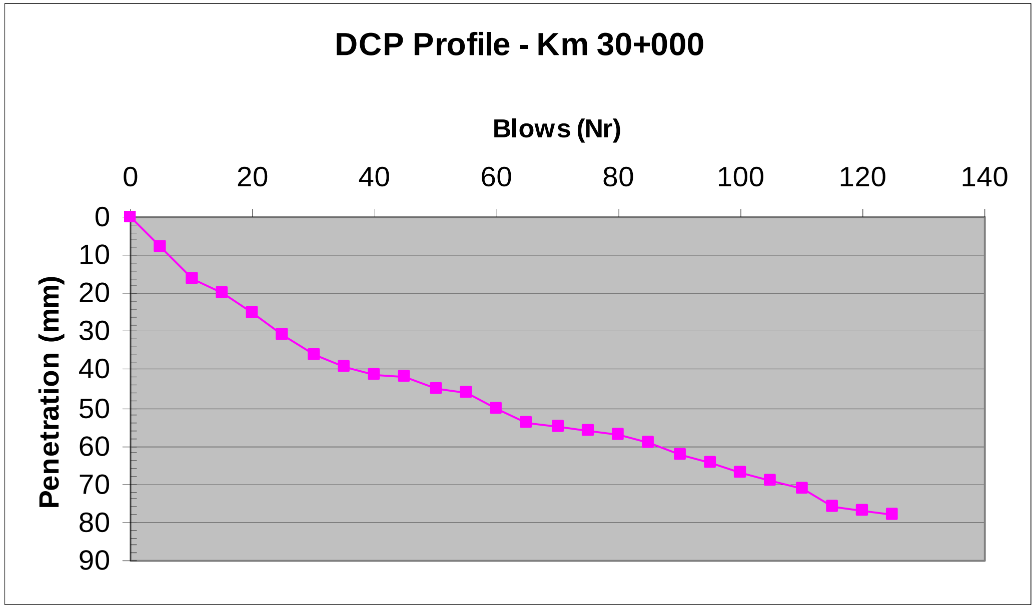
DCP Tests
Section 20+000
UTM Coordinates: X=0515002, Y=8336253

Blows (Nr)	Readings (mm)	Penetration (mm)	DN (mm/blow)	CBR in-situ (%)
0	1000.12	0		
5	983	17.12	3.424	85.9
10	961	39.12	4.4	62.5
15	949	51.12	2.4	134.9
20	945	55.12	0.8	>210
25	940	60.12	1	>210
30	934	66.12	1.2	>210
35	930	70.12	0.8	>210
40	928	72.12	0.4	>210
45	922	78.12	1.2	>210
50	920	80.12	0.4	>210
55	916	84.12	0.8	>210
60	915	85.12	0.2	>210
65	908	92.12	1.4	>210
70	907	93.12	0.2	>210
75	907	93.12	0	>210
80	907	93.12	0	>210



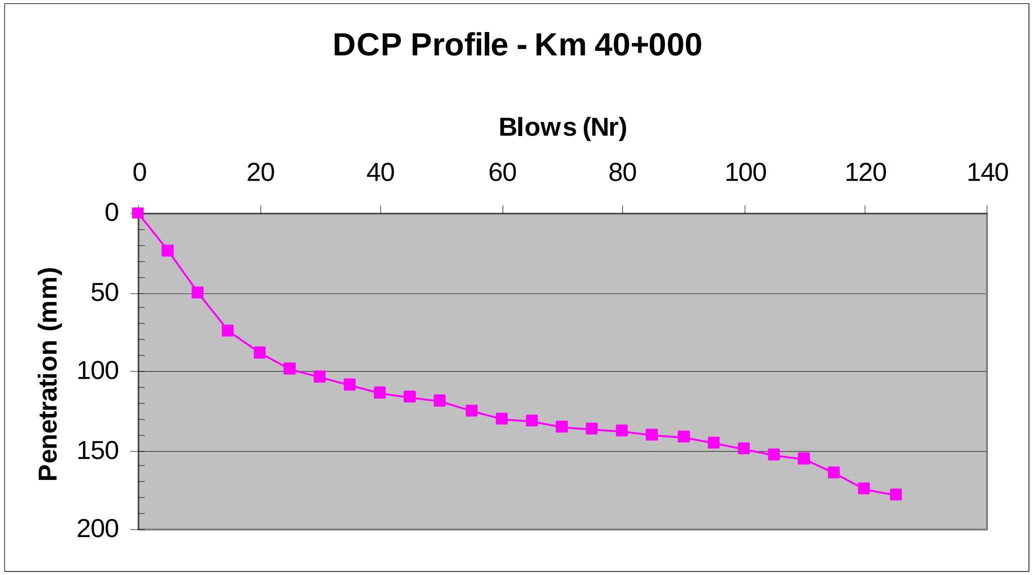
DCP Tests
Section 30+000
UTM Coordinates: X=0508883, Y=8340263

Blows (Nr)	Readings (mm)	Penetration (mm)	DN (mm/blow)	CBR in-situ (%)
0	1000.1	0		
5	992	8.1	1.62	203.7
10	984	16.1	1.6	206.0
15	980	20.1	0.8	>210
20	975	25.1	1	>210
25	969	31.1	1.2	>210
30	964	36.1	1	>210
35	961	39.1	0.6	>210
40	959	41.1	0.4	>210
45	958	42.1	0.2	>210
50	955	45.1	0.6	>210
55	954	46.1	0.2	>210
60	950	50.1	0.8	>210
65	946	54.1	0.8	>210
70	945	55.1	0.2	>210
75	944	56.1	0.2	>210
80	943	57.1	0.2	>210
85	941	59.1	0.4	>210
90	938	62.1	0.6	>210
95	936	64.1	0.4	>210
100	933	67.1	0.6	>210
105	931	69.1	0.4	>210
110	929	71.1	0.4	>210
115	924	76.1	1	>210
120	923	77.1	0.2	>210
125	922	78.1	0.2	>210



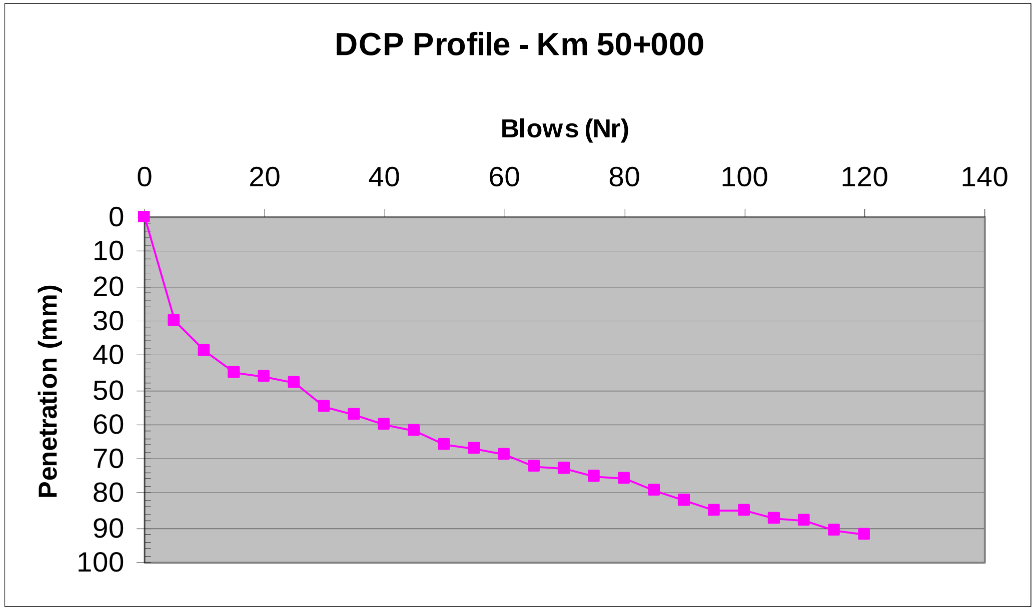
DCP Tests
Section 40+000
UTM Coordinates: X=0499651, Y=8341554

Blows (Nr)	Readings (mm)	Penetration (mm)	DN (mm/blow)	CBR in-situ (%)
0	1000	0		
5	976	24	4.8	56
10	950	50	5.2	51
15	926	74	4.8	56
20	911	89	3.0	102
25	901	99	2.0	170
30	896	104	1.0	>210
35	891	109	1.0	>210
40	886	114	1.0	>210
45	884	116	0.4	>210
50	881	119	0.6	>210
55	875	125	1.2	>210
60	870	130	1.0	>210
65	868	132	0.4	>210
70	865	135	0.6	>210
75	864	136	0.2	>210
80	862	138	0.4	>210
85	860	140	0.4	>210
90	858	142	0.4	>210
95	854	146	0.8	>210
100	851	149	0.6	>210
105	847	153	0.8	>210
110	845	155	0.4	>210
115	835	165	2.0	170
120	825	175	2.0	170
125	821	179	0.8	>210



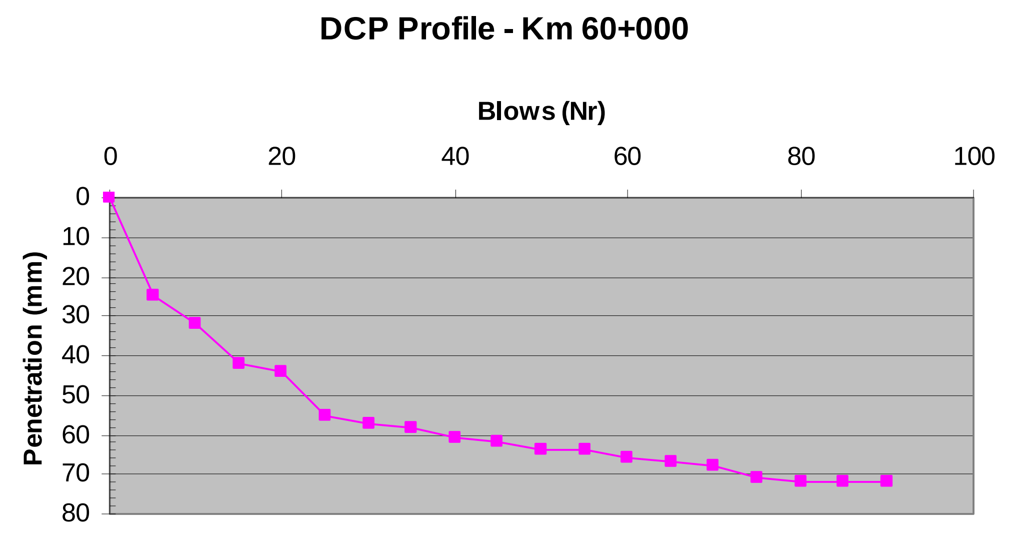
DCP Tests
Section 50+000
UTM Coordinates: X=0490613, Y=8343436

Blows (Nr)	Readings (mm)	Penetration (mm)	DN (mm/blow)	CBR in-situ (%)
0	1000	0		
5	970	30	6.0	42
10	961	39	1.8	185
15	955	45	1.2	>210
20	954	46	0.2	>210
25	952	48	0.4	>210
30	945	55	1.4	>210
35	943	57	0.4	>210
40	940	60	0.6	>210
45	938	62	0.4	>210
50	934	66	0.8	>210
55	933	67	0.2	>210
60	931	69	0.4	>210
65	928	72	0.6	>210
70	927	73	0.2	>210
75	925	75	0.4	>210
80	924	76	0.2	>210
85	921	79	0.6	>210
90	918	82	0.6	>210
95	915	85	0.6	>210
100	915	85	0.0	>210
105	913	87	0.4	>210
110	912	88	0.2	>210
115	909	91	0.6	>210
120	908	92	0.2	>210



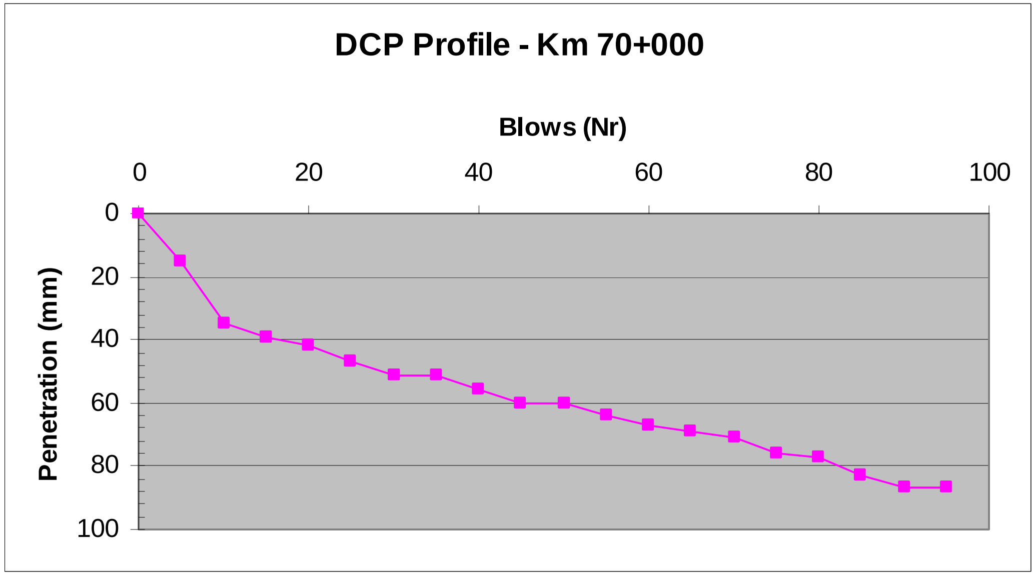
DCP Tests
Section 60+000
UTM Coordinates: X=0481425, Y=8344113

Blows (Nr)	Readings (mm)	Penetration (mm)	DN (mm/blow)	CBR in-situ (%)
0	1000	0		
5	975	25	5.0	53
10	968	32	1.4	>210
15	958	42	2.0	170
20	956	44	0.4	>210
25	945	55	2.2	151
30	943	57	0.4	>210
35	942	58	0.2	>210
40	939	61	0.6	>210
45	938	62	0.2	>210
50	936	64	0.4	>210
55	936	64	0.0	>210
60	934	66	0.4	>210
65	933	67	0.2	>210
70	932	68	0.2	>210
75	929	71	0.6	>210
80	928	72	0.2	>210
85	928	72	0.0	>210
90	928	72	0.0	>210



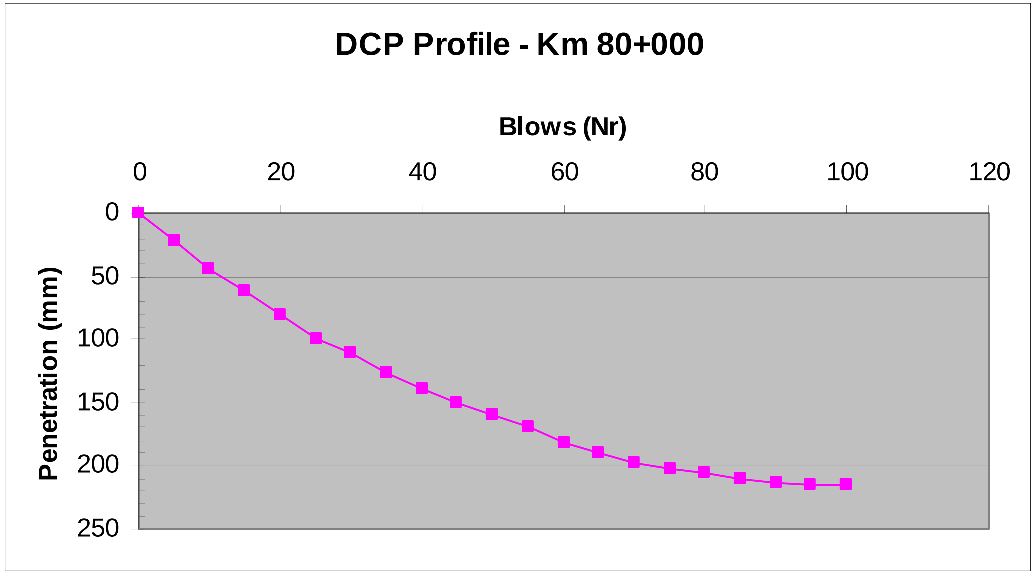
DCP Tests
Section 70+000
UTM Coordinates: X=0476022, Y=8350925

Blows (Nr)	Readings (mm)	Penetration (mm)	DN (mm/blow)	CBR in-situ (%)
0	1000	0		
5	985	15	3.0	102
10	965	35	4.0	70
15	961	39	0.8	>210
20	958	42	0.6	>210
25	953	47	1.0	>210
30	949	51	0.8	>210
35	949	51	0.0	>210
40	944	56	1.0	>210
45	940	60	0.8	>210
50	940	60	0.0	>210
55	936	64	0.8	>210
60	933	67	0.6	>210
65	931	69	0.4	>210
70	929	71	0.4	>210
75	924	76	1.0	>210
80	923	77	0.2	>210
85	917	83	1.2	>210
90	913	87	0.8	>210
95	913	87	0.0	>210



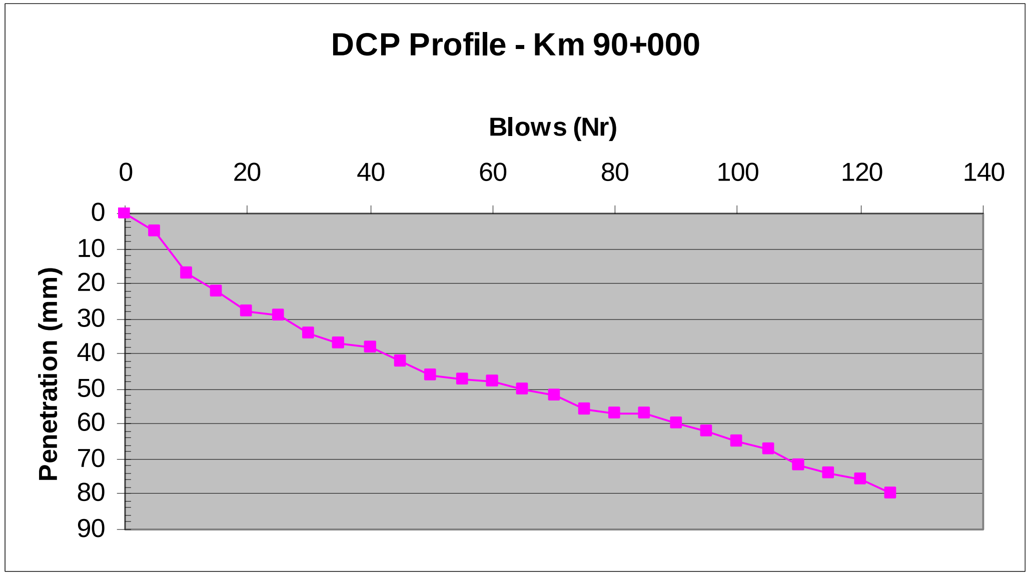
DCP Tests
Section 80+000
UTM Coordinates: X=0467130, Y=8348134

Blows (Nr)	Readings (mm)	Penetration (mm)	DN (mm/blow)	CBR in-situ (%)
0	1000	0		
5	978	22	4.4	62
10	956	44	4.4	62
15	939	61	3.4	87
20	919	81	4.0	70
25	900	100	3.8	75
30	889	111	2.2	151
35	874	126	3.0	102
40	861	139	2.6	122
45	849	151	2.4	135
50	840	160	1.8	185
55	830	170	2.0	170
60	818	182	2.4	135
65	810	190	1.6	206
70	802	198	1.6	206
75	798	202	0.8	>210
80	794	206	0.8	>210
85	790	210	0.8	>210
90	786	214	0.8	>210
95	785	215	0.2	>210
100	785	215	0.0	>210



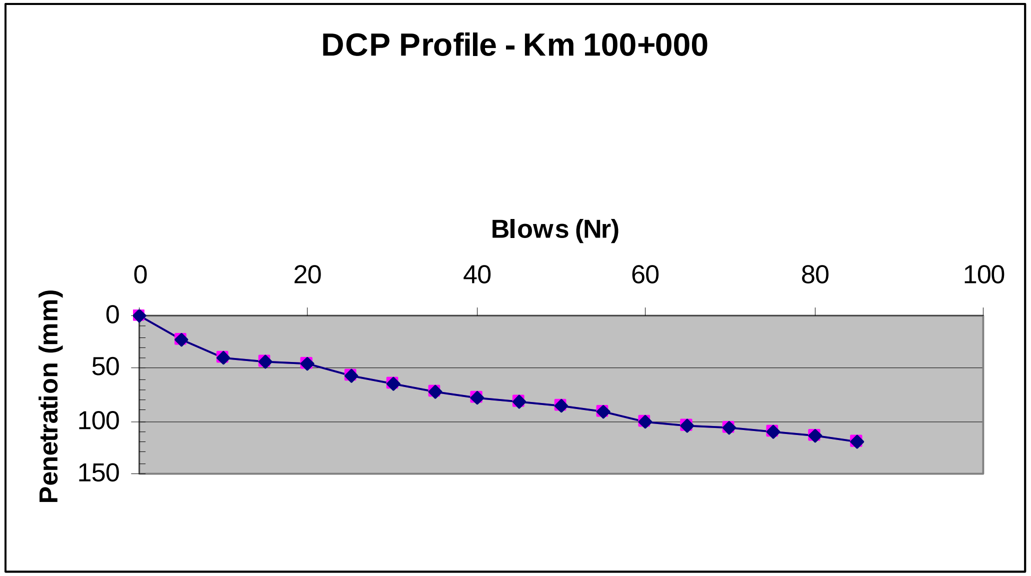
DCP Tests
Section 90+000
UTM Coordinates: X=0459081, Y=8346001

Blows (Nr)	Readings (mm)	Penetration (mm)	DN (mm/blow)	CBR in-situ (%)
0	1000	0		
5	995	5	1.0	>210
10	983	17	2.4	135
15	978	22	1.0	>210
20	972	28	1.2	>210
25	971	29	0.2	>210
30	966	34	1.0	>210
35	963	37	0.6	>210
40	962	38	0.2	>210
45	958	42	0.8	>210
50	954	46	0.8	>210
55	953	47	0.2	>210
60	952	48	0.2	>210
65	950	50	0.4	>210
70	948	52	0.4	>210
75	944	56	0.8	>210
80	943	57	0.2	>210
85	943	57	0.0	>210
90	940	60	0.6	>210
95	938	62	0.4	>210
100	935	65	0.6	>210
105	933	67	0.4	>210
110	928	72	1.0	>210
115	926	74	0.4	>210
120	924	76	0.4	>210
125	920	80	0.8	>210



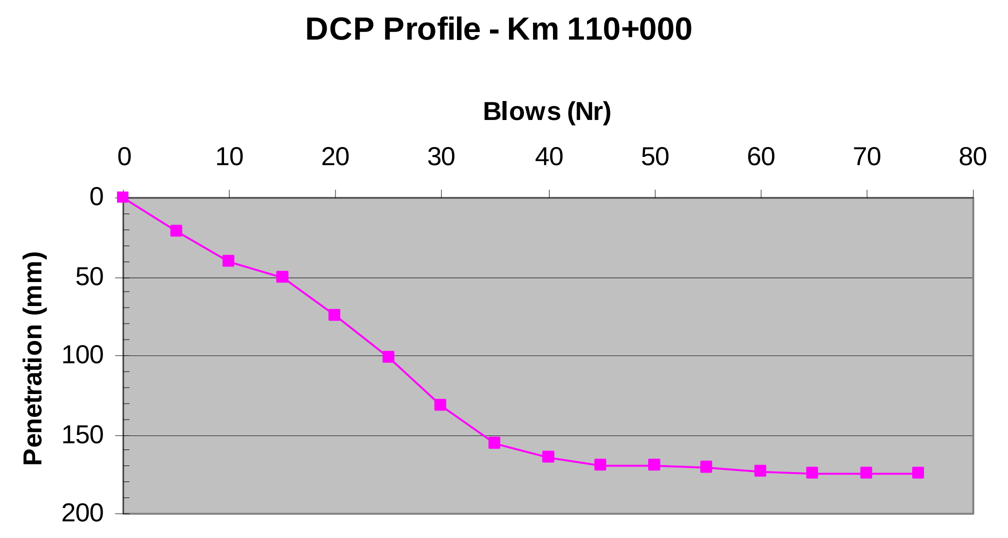
DCP Tests
Section 100+000
UTM Coordinates: X=0450644, Y=8344466

Blows (Nr)	Readings (mm)	Penetration (mm)	DN (mm/blow)	CBR in-situ (%)
0	1000	0		
5	978	22	4.4	62
10	960	40	3.6	81
15	956	44	0.8	>210
20	954	46	0.4	>210
25	944	56	2.0	170
30	936	64	1.6	206
35	928	72	1.6	206
40	923	77	1.0	>210
45	918	82	1.0	>210
50	914	86	0.8	>210
55	909	91	1.0	>210
60	899	101	2.0	170
65	895	105	0.8	>210
70	893	107	0.4	>210
75	890	110	0.6	>210
80	886	114	0.8	>210
85	880	120	1.2	>210



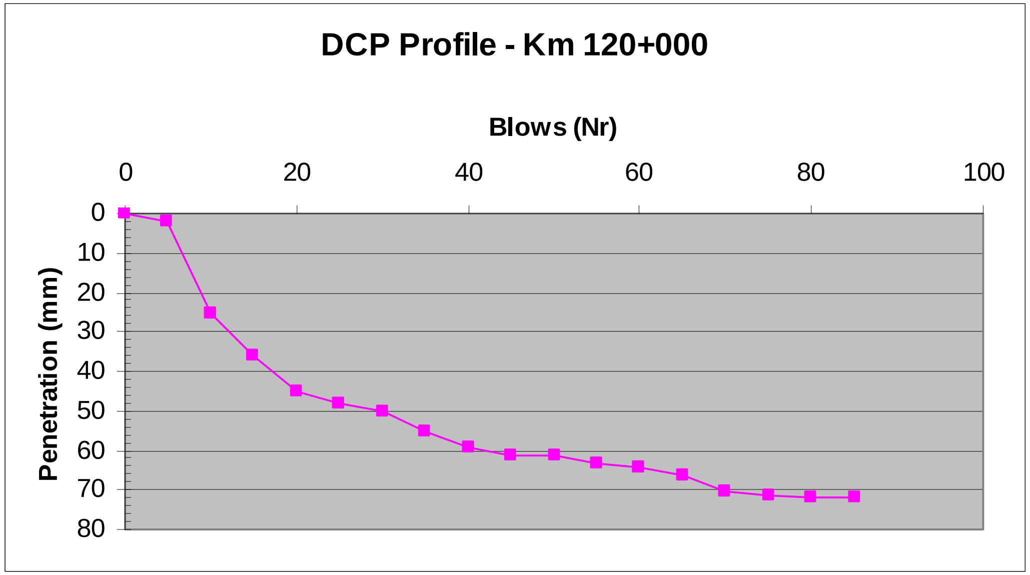
DCP Tests
Section 110+000
UTM Coordinates: X=0443329, Y=8338901

Blows (Nr)	Readings (mm)	Penetration (mm)	DN (mm/blow)	CBR in-situ (%)
0	1000	0		
5	979	21	4.2	66
10	960	40	3.8	75
15	950	50	2.0	170
20	925	75	5.0	53
25	899	101	5.2	51
30	869	131	6.0	42
35	845	155	4.8	56
40	835	165	2.0	170
45	831	169	0.8	>210
50	830	170	0.2	>210
55	829	171	0.2	>210
60	827	173	0.4	>210
65	826	174	0.2	>210
70	825	175	0.2	>210
75	825	175	0.0	>210



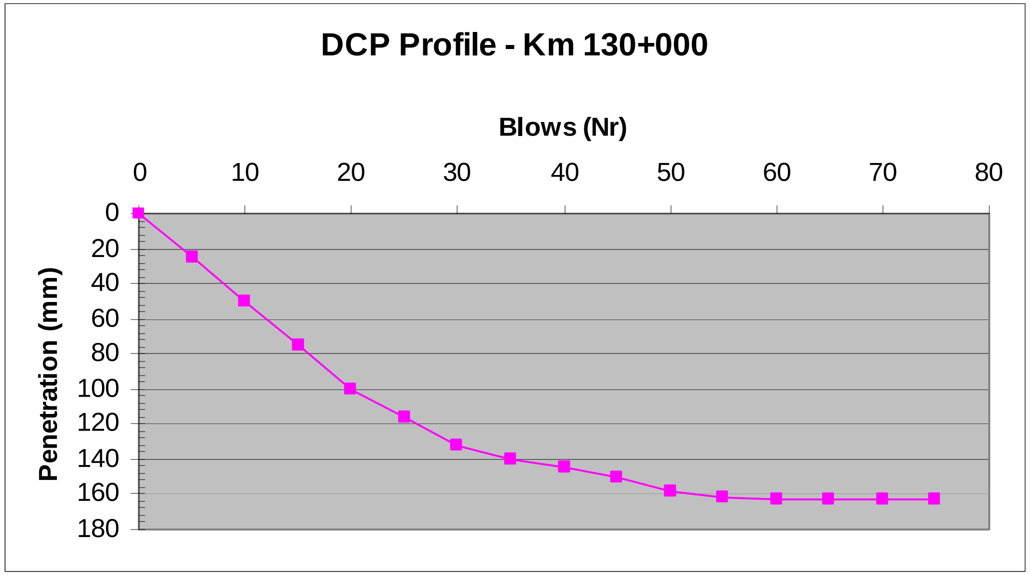
DCP Tests
Section 120+000
UTM Coordinates: X=0435161, Y=8335396

Blows (Nr)	Readings (mm)	Penetration (mm)	DN (mm/blow)	CBR in-situ (%)
0	1000	0		
5	998	2	0.4	>210
10	975	25	4.6	59
15	964	36	2.2	151
20	955	45	1.8	185
25	952	48	0.6	>210
30	950	50	0.4	>210
35	945	55	1.0	>210
40	941	59	0.8	>210
45	939	61	0.4	>210
50	939	61	0.0	>210
55	937	63	0.4	>210
60	936	64	0.2	>210
65	934	66	0.4	>210
70	930	70	0.8	>210
75	929	71	0.2	>210
80	928	72	0.2	>210
85	928	72	0.0	>210



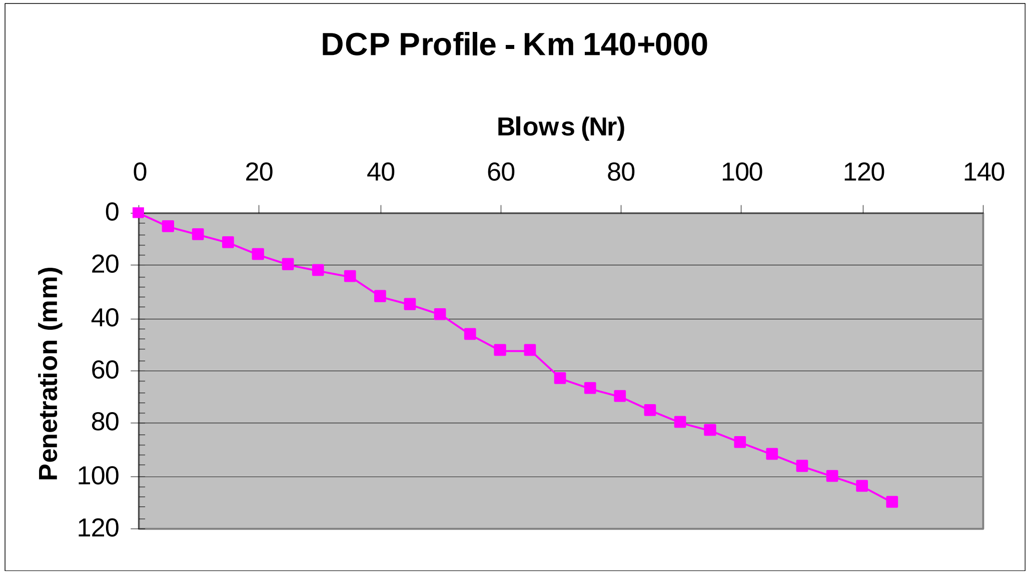
DCP Tests
Section 130+000
UTM Coordinates: X=0420136, Y=8338660

Blows (Nr)	Readings (mm)	Penetration (mm)	DN (mm/blow)	CBR in-situ (%)
0	1000	0		
5	975	25	5.0	53
10	950	50	5.0	53
15	925	75	5.0	53
20	900	100	5.0	53
25	884	116	3.2	94
30	868	132	3.2	94
35	860	140	1.6	206
40	855	145	1.0	>210
45	850	150	1.0	>210
50	842	158	1.6	206
55	838	162	0.8	>210
60	837	163	0.2	>210
65	837	163	0.0	>210
70	837	163	0.0	>210
75	837	163	0.0	>210



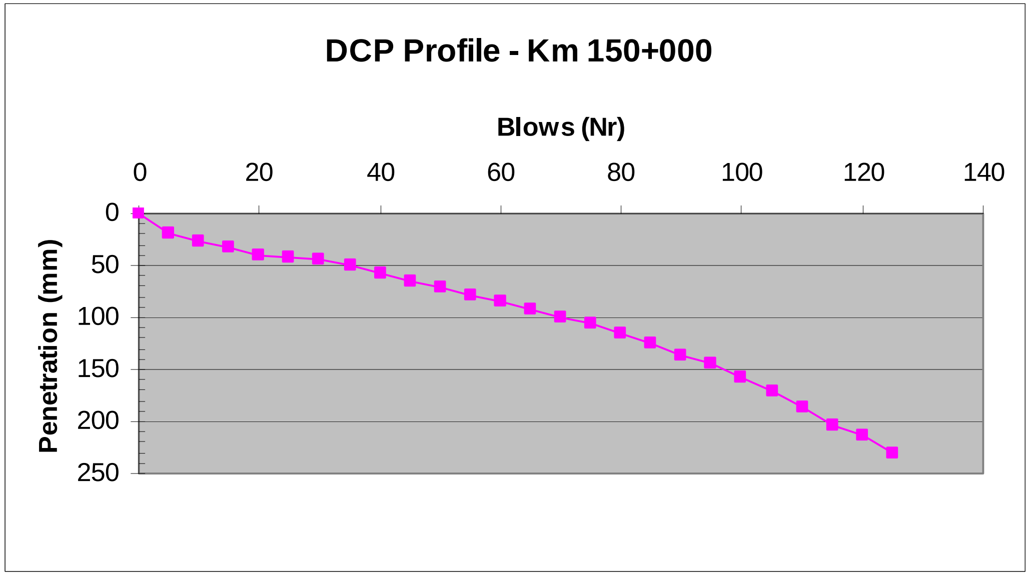
DCP Tests
Section 140+000
UTM Coordinates: X=0426920, Y=8348122

Blows (Nr)	Readings (mm)	Penetration (mm)	DN (mm/blow)	CBR in-situ (%)
0	0	1000		
5.09	5	995	1.0	>210
8.09	10	992	0.6	>210
11.09	15	989	0.6	>210
16.09	20	984	1.0	>210
20.09	25	980	0.8	>210
22.09	30	978	0.4	>210
24.09	35	976	0.4	>210
32.09	40	968	1.6	206
35.09	45	965	0.6	>210
39.09	50	961	0.8	>210
46.09	55	954	1.4	>210
52.09	60	948	1.2	>210
52.09	65	948	0.0	>210
63.09	70	937	2.2	151
67.09	75	933	0.8	>210
70.09	80	930	0.6	>210
75.09	85	925	1.0	>210
80.09	90	920	1.0	>210
83.09	95	917	0.6	>210
87.09	100	913	0.8	>210
92.09	105	908	1.0	>210
96.09	110	904	0.8	>210
100.09	115	900	0.8	>210
104.09	120	896	0.8	>210
110.09	125	890	1.2	>210



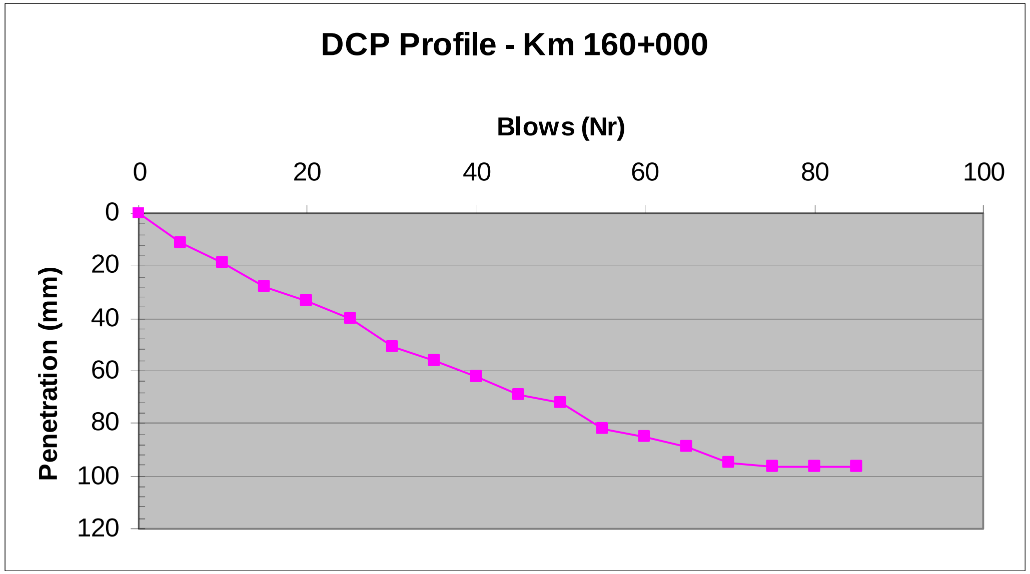
DCP Tests
Section 150+000
UTM Coordinates: X=0417824, Y=8344814

Blows (Nr)	Readings (mm)	Penetration (mm)	DN (mm/blow)	CBR in-situ (%)
0	1000	0		
5	981	19	3.8	75
10	973	27	1.6	206
15	967	33	1.2	>210
20	959	41	1.6	206
25	958	42	0.2	>210
30	955	45	0.6	>210
35	950	50	1.0	>210
40	942	58	1.6	206
45	934	66	1.6	206
50	929	71	1.0	>210
55	922	78	1.4	>210
60	916	84	1.2	>210
65	908	92	1.6	206
70	901	99	1.4	>210
75	895	105	1.2	>210
80	885	115	2.0	170
85	876	124	1.8	185
90	864	136	2.4	135
95	856	144	1.6	206
100	843	157	2.6	122
105	829	171	2.8	111
110	814	186	3.0	102
115	797	203	3.4	87
120	787	213	2.1	160
125	770	230	3.4	87



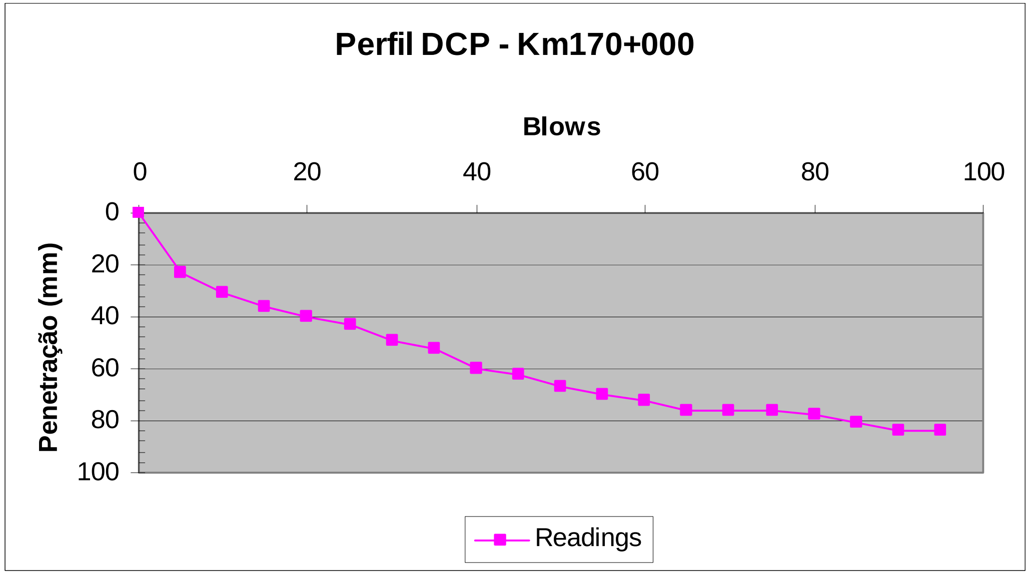
DCP Tests
Section 160+000
UTM Coordinates: X=0404318, Y=8344552

Blows (Nr)	Readings (mm)	Penetration (mm)	DN (mm/blow)	CBR in-situ (%)
0	1000	0		
5	989	11	2.2	148
10	981	19	1.6	206
15	972	28	1.8	185
20	967	33	1.0	>210
25	960	40	1.4	>210
30	949	51	2.2	151
35	944	56	1.0	>210
40	938	62	1.2	>210
45	931	69	1.4	>210
50	928	72	0.6	>210
55	918	82	2.0	170
60	915	85	0.6	>210
65	911	89	0.8	>210
70	905	95	1.2	>210
75	904	96	0.2	>210
80	904	96	0.0	>210
85	904	96	0.0	>210



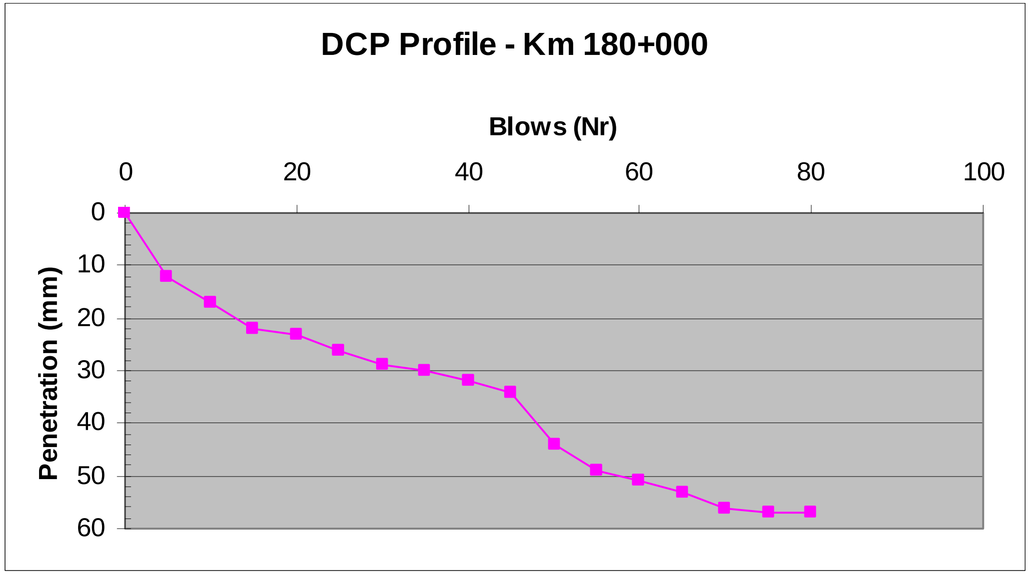
DCP Tests
Section 170+000
UTM Coordinates: X=0394637, Y=8344865

Blows (Nr)	Readings (mm)	Penetration (mm)	DN (mm/blow)	CBR in-situ (%)
0	1000	0		
5	977	23	4.6	59
10	969	31	1.6	206
15	964	36	1.0	>210
20	960	40	0.8	>210
25	957	43	0.6	>210
30	951	49	1.2	>210
35	948	52	0.6	>210
40	940	60	1.6	206
45	938	62	0.4	>210
50	933	67	1.0	>210
55	930	70	0.6	>210
60	928	72	0.4	>210
65	924	76	0.8	>210
70	924	76	0.0	>210
75	924	76	0.0	>210
80	922	78	0.4	>210
85	919	81	0.6	>210
90	916	84	0.6	>210
95	916	84	0.0	>210



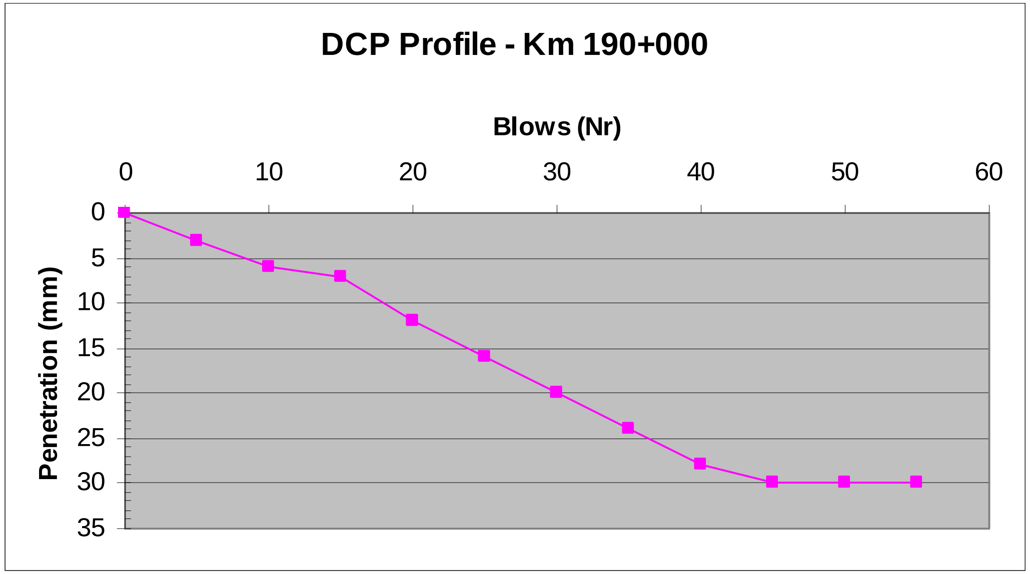
DCP Tests
Section 180+000
UTM Coordinates: X=0385281, Y=8346554

Blows (Nr)	Readings (mm)	Penetration (mm)	DN (mm/blow)	CBR in-situ (%)
0	1000	0		
5	988	12	2.4	134
10	983	17	1.0	>210
15	978	22	1.0	>210
20	977	23	0.2	>210
25	974	26	0.6	>210
30	971	29	0.6	>210
35	970	30	0.2	>210
40	968	32	0.4	>210
45	966	34	0.4	>210
50	956	44	2.0	170
55	951	49	1.0	>210
60	949	51	0.4	>210
65	947	53	0.4	>210
70	944	56	0.6	>210
75	943	57	0.2	>210
80	943	57	0.0	>210



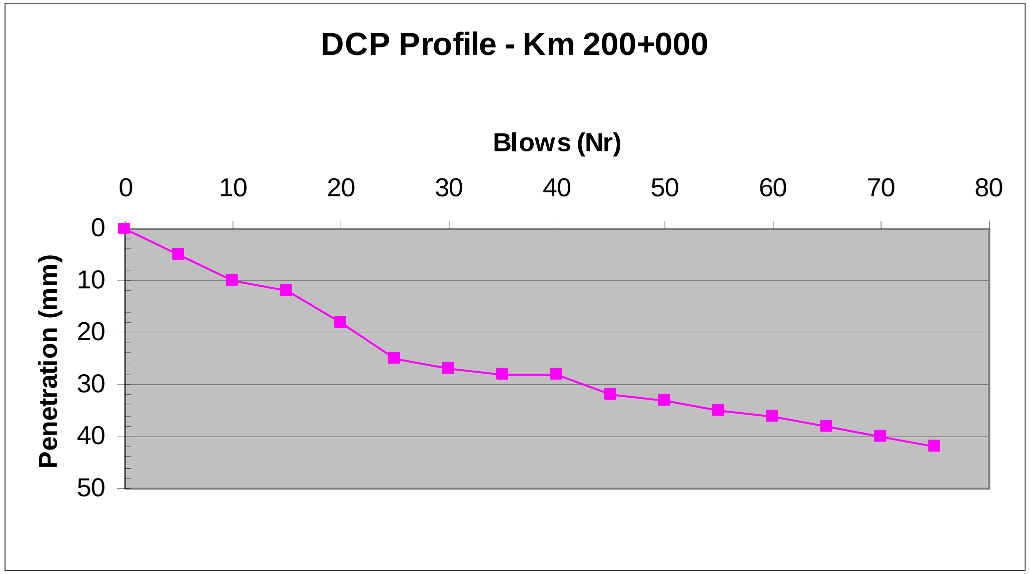
DCP Tests
Section 0+000
UTM Coordinates: X=0386238, Y=8349544

Blows (Nr)	Readings (mm)	Penetration (mm)	DN (mm/blow)	CBR in-situ (%)
0	1000	0		
5	997	3	0.6	>210
10	994	6	0.6	>210
15	993	7	0.2	>210
20	988	12	1.0	>210
25	984	16	0.8	>210
30	980	20	0.8	>210
35	976	24	0.8	>210
40	972	28	0.8	>210
45	970	30	0.4	>210
50	970	30	0.0	>210
55	970	30	0.0	>210



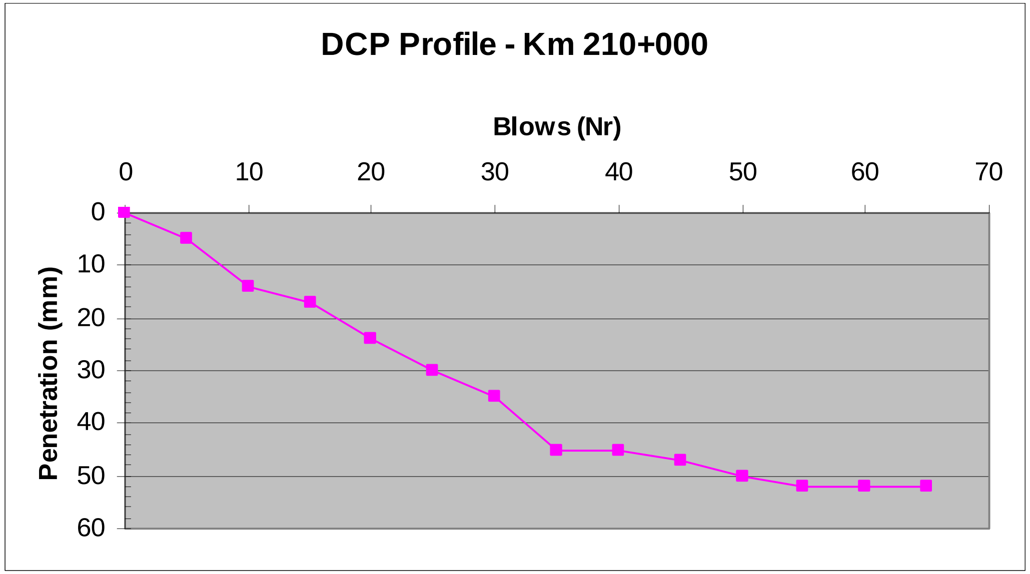
DCP Tests
Section 200+000
UTM Coordinates: X=0367550, Y=8353065

Blows (Nr)	Readings (mm)	Penetration (mm)	DN (mm/blow)	CBR in-situ (%)
0	1000	0		
5	995	5	1.0	>210
10	990	10	1.0	>210
15	988	12	0.4	>210
20	982	18	1.2	>210
25	975	25	1.4	>210
30	973	27	0.4	>210
35	972	28	0.2	>210
40	972	28	0.0	>210
45	968	32	0.8	>210
50	967	33	0.2	>210
55	965	35	0.4	>210
60	964	36	0.2	>210
65	962	38	0.4	>210
70	960	40	0.4	>210
75	958	42	0.4	>210



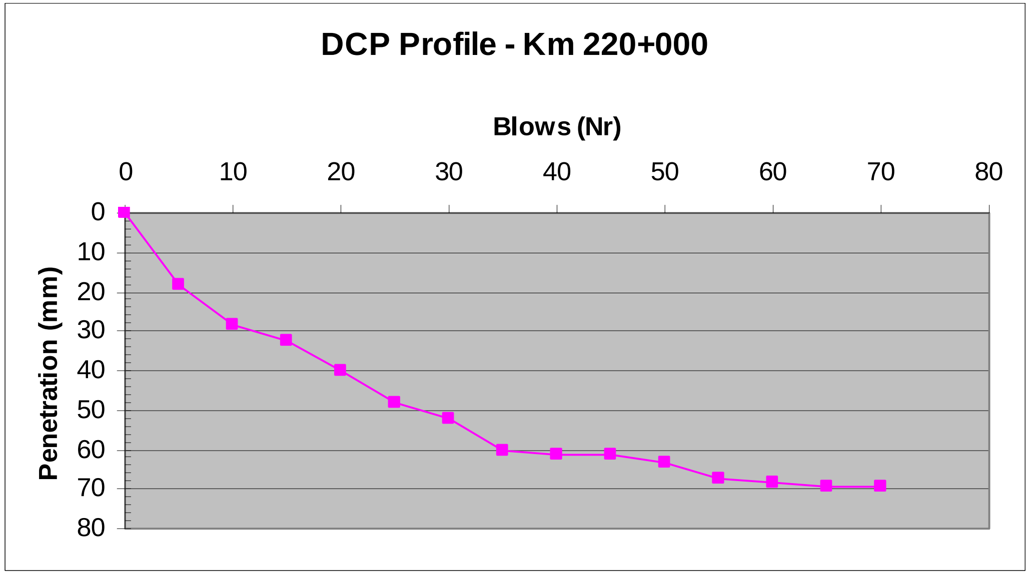
DCP Tests
Section 210+000
UTM Coordinates: X=0358171, Y=8350912

Blows (Nr)	Readings (mm)	Penetration (mm)	DN (mm/blow)	CBR in-situ (%)
0	1000	0		
5	995	5	1.0	>210
10	986	14	1.8	185
15	983	17	0.6	>210
20	976	24	1.4	>210
25	970	30	1.2	>210
30	965	35	1.0	>210
35	955	45	2.0	170
40	955	45	0.0	>210
45	953	47	0.4	>210
50	950	50	0.6	>210
55	948	52	0.4	>210
60	948	52	0.0	>210
65	948	52	0.0	>210



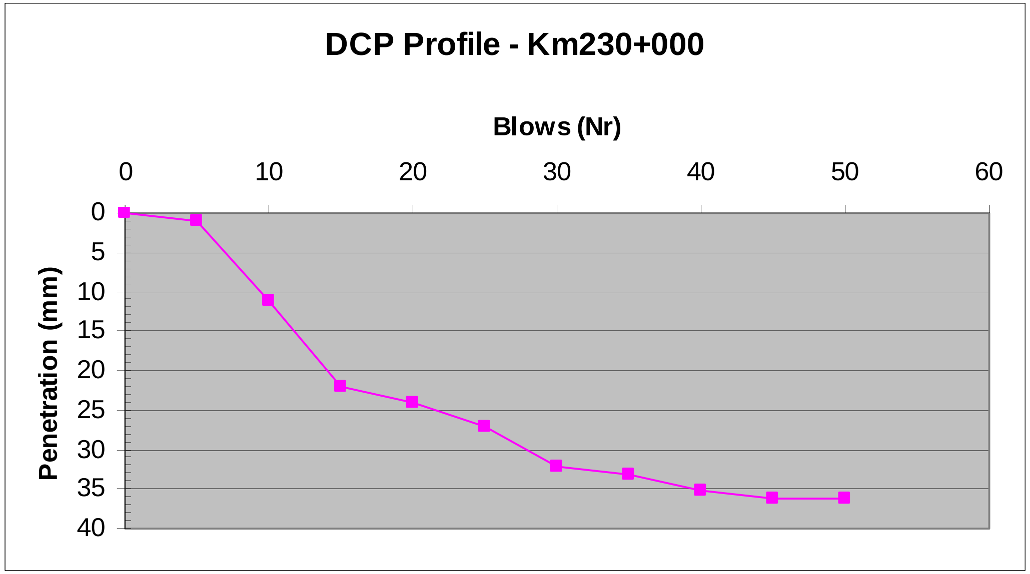
DCP Tests
Section 220+000
UTM Coordinates: X=0348702, Y=8349522

Blows (Nr)	Readings (mm)	Penetration (mm)	DN (mm/blow)	CBR in-situ (%)
0	1000	0		
5	982	18	3.6	79
10	972	28	2.0	170
15	968	32	0.8	>210
20	960	40	1.6	206
25	952	48	1.6	206
30	948	52	0.8	>210
35	940	60	1.6	206
40	939	61	0.2	>210
45	939	61	0.0	>210
50	937	63	0.4	>210
55	933	67	0.8	>210
60	932	68	0.2	>210
65	931	69	0.2	>210
70	931	69	0.0	>210



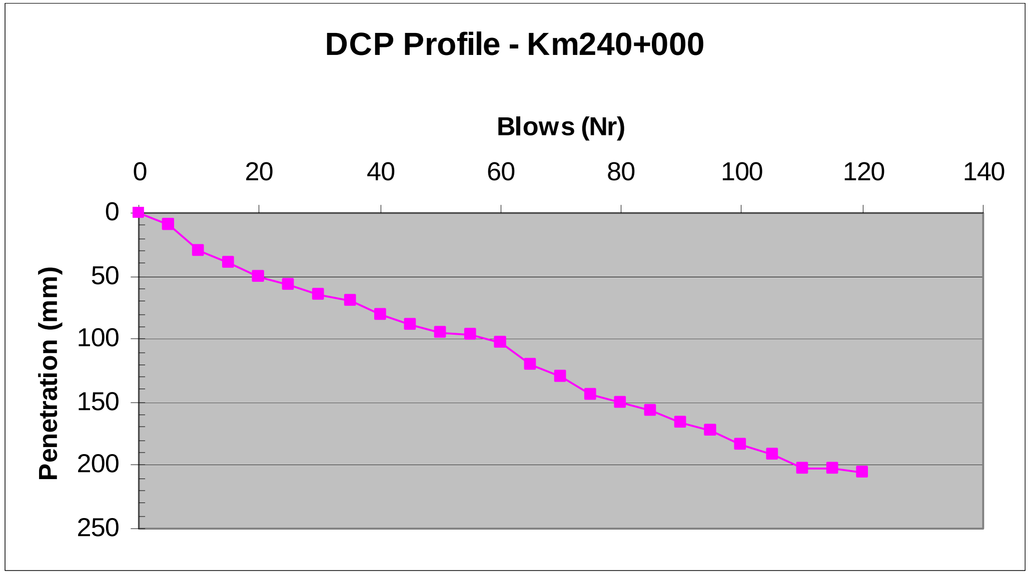
DCP Tests
Section 230+000
UTM Coordinates: X=0339463, Y=8347047

Blows (Nr)	Readings (mm)	Penetration (mm)	DN (mm/blow)	CBR in-situ (%)
0	1000	0		
5	999	1	0.2	>210
10	989	11	2.0	170
15	978	22	2.2	151
20	976	24	0.4	>210
25	973	27	0.6	>210
30	968	32	1.0	>210
35	967	33	0.2	>210
40	965	35	0.4	>210
45	964	36	0.2	>210
50	964	36	0.0	>210



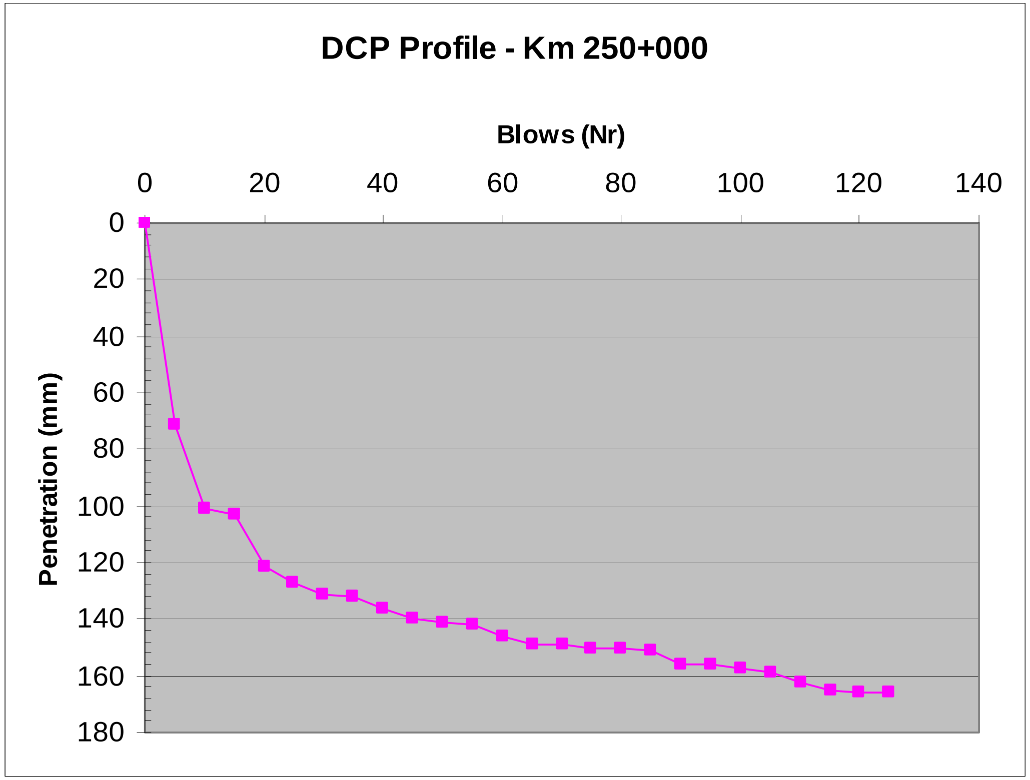
DCP Tests
Section 240+000
UTM Coordinates: X=0829914, Y=8346467

Blows (Nr)	Readings (mm)	Penetration (mm)	DN (mm/blow)	CBR in-situ (%)
0	1000	0		
5	990	10	2.0	168
10	970	30	4.0	70
15	960	40	2.0	170
20	950	50	2.0	170
25	943	57	1.4	>210
30	935	65	1.6	206
35	930	70	1.0	>210
40	920	80	2.0	170
45	911	89	1.8	185
50	905	95	1.2	>210
55	903	97	0.4	>210
60	897	103	1.2	>210
65	880	120	3.4	87
70	870	130	2.0	170
75	856	144	2.8	111
80	850	150	1.2	>210
85	843	157	1.4	>210
90	834	166	1.8	185
95	828	172	1.2	>210
100	816	184	2.4	135
105	809	191	1.4	>210
110	798	202	2.2	151
115	798	202	0.0	>210
120	795	205	0.6	>210



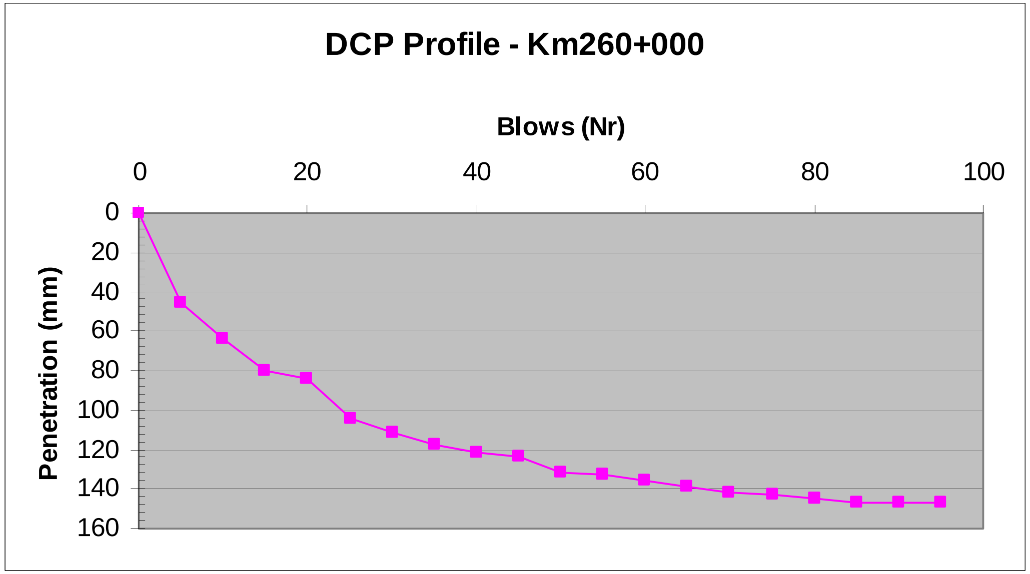
DCP Tests
Section 250+000
UTM Coordinates: X=0321870, Y=8344650

Blows (Nr)	Readings (mm)	Penetration (mm)	DN (mm/blow)	CBR in-situ (%)
0	1000	0		
5	929	71	14.2	14
10	899	101	6.0	42
15	897	103	0.4	>210
20	879	121	3.6	81
25	873	127	1.2	>210
30	869	131	0.8	>210
35	868	132	0.2	>210
40	864	136	0.8	>210
45	860	140	0.8	>210
50	859	141	0.2	>210
55	858	142	0.2	>210
60	854	146	0.8	>210
65	851	149	0.6	>210
70	851	149	0.0	>210
75	850	150	0.2	>210
80	850	150	0.0	>210
85	849	151	0.2	>210
90	844	156	1.0	>210
95	844	156	0.0	>210
100	843	157	0.2	>210
105	841	159	0.4	>210
110	838	162	0.6	>210
115	835	165	0.6	>210
120	834	166	0.2	>210
125	834	166	0.0	>210



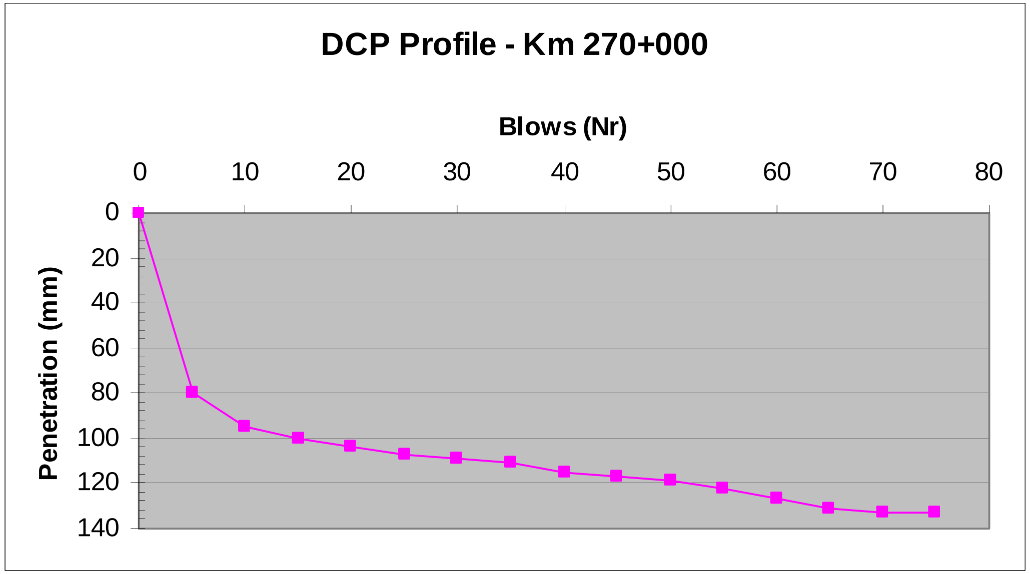
DCP Tests
Section 260+000
UTM Coordinates: X=0312017, Y=8345586

Blows (Nr)	Readings (mm)	Penetration (mm)	DN (mm/blow)	CBR in-situ (%)
0	1000	0		
5	954	46	9.2	24
10	936	64	3.6	81
15	920	80	3.2	94
20	916	84	0.8	>210
25	896	104	4.0	70
30	889	111	1.4	>210
35	883	117	1.2	>210
40	878	122	1.0	>210
45	876	124	0.4	>210
50	868	132	1.6	206
55	867	133	0.2	>210
60	864	136	0.6	>210
65	861	139	0.6	>210
70	858	142	0.6	>210
75	857	143	0.2	>210
80	855	145	0.4	>210
85	853	147	0.4	>210
90	853	147	0.0	>210
95	853	147	0.0	>210



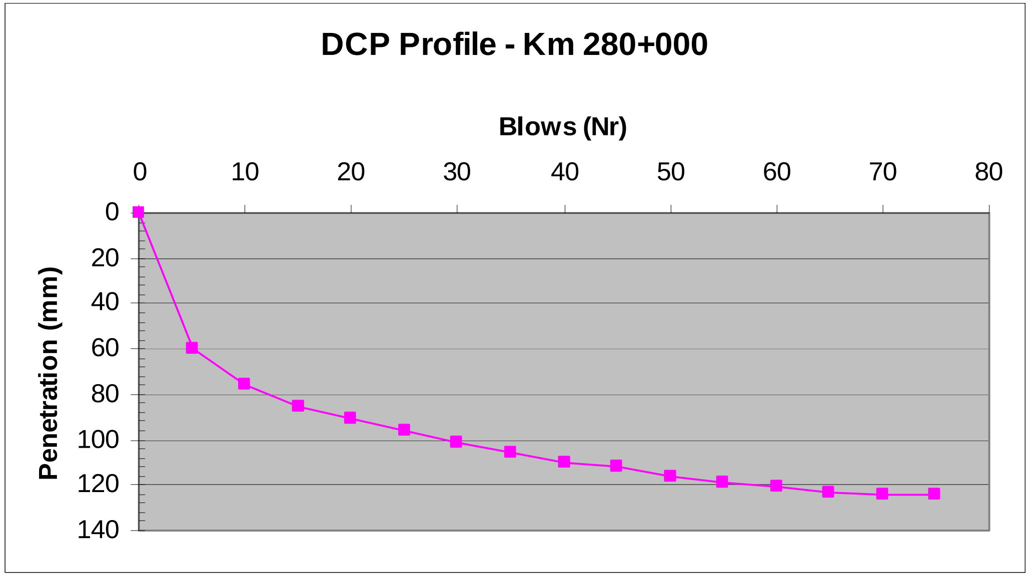
DCP Tests
Section 270+000
UTM Coordinates: X=0302519, Y=8348168

Blows (Nr)	Readings (mm)	Penetration (mm)	DN (mm/blow)	CBR in-situ (%)
0	1000	0		
5	920	80	16.0	12
10	905	95	3.0	102
15	900	100	1.0	>210
20	896	104	0.8	>210
25	893	107	0.6	>210
30	891	109	0.4	>210
35	889	111	0.4	>210
40	885	115	0.8	>210
45	883	117	0.4	>210
50	881	119	0.4	>210
55	878	122	0.6	>210
60	873	127	1.0	>210
65	869	131	0.8	>210
70	867	133	0.4	>210
75	867	133	0.0	>210



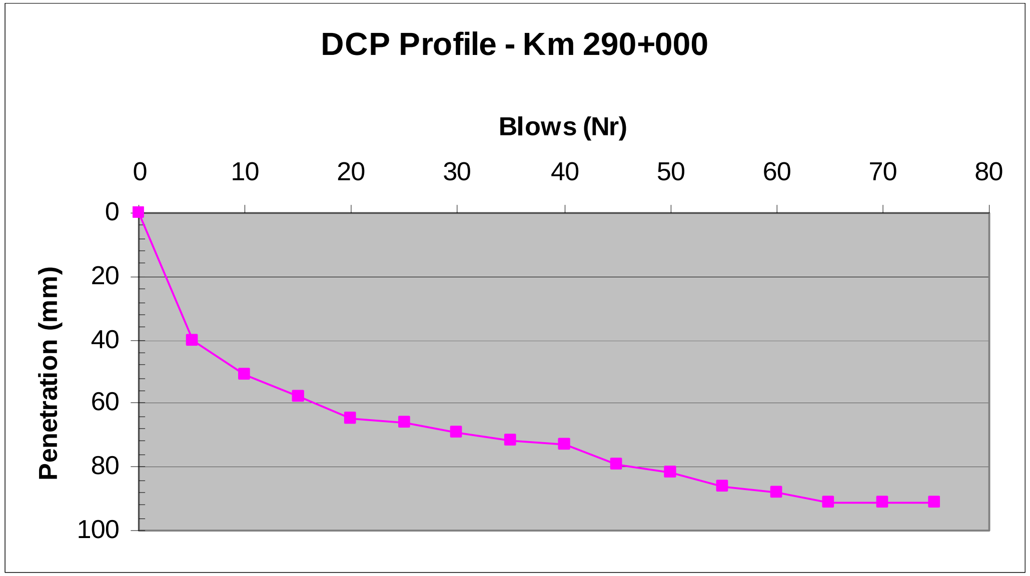
DCP Tests
Section 280+000
UTM Coordinates: X=0293234, Y=8351497

Blows (Nr)	Readings (mm)	Penetration (mm)	DN (mm/blow)	CBR in-situ (%)
0	1000	0		
5	940	60	12.0	17
10	924	76	3.2	94
15	915	85	1.8	185
20	909	91	1.2	>210
25	904	96	1.0	>210
30	899	101	1.0	>210
35	894	106	1.0	>210
40	890	110	0.8	>210
45	888	112	0.4	>210
50	884	116	0.8	>210
55	881	119	0.6	>210
60	879	121	0.4	>210
65	877	123	0.4	>210
70	876	124	0.2	>210
75	876	124	0.0	>210



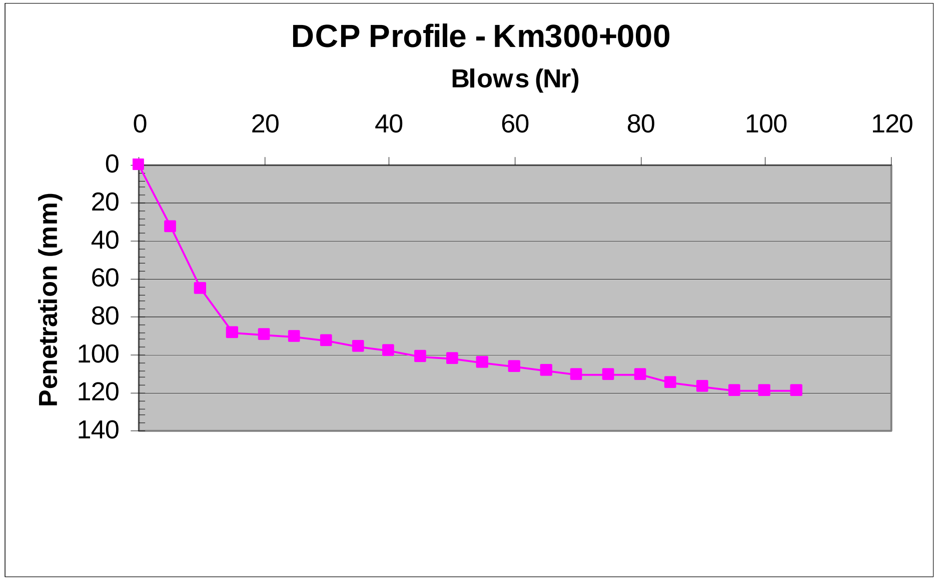
DCP Tests
Section 290+000
UTM Coordinates: X=0286219, Y=8355627

Blows (Nr)	Readings (mm)	Penetration (mm)	DN (mm/blow)	CBR in-situ (%)
0	1000	0		
5	960	40	8.0	29
10	949	51	2.2	151
15	942	58	1.4	>210
20	935	65	1.4	>210
25	934	66	0.2	>210
30	931	69	0.6	>210
35	928	72	0.6	>210
40	927	73	0.2	>210
45	921	79	1.2	>210
50	918	82	0.6	>210
55	914	86	0.8	>210
60	912	88	0.4	>210
65	909	91	0.6	>210
70	909	91	0.0	>210
75	909	91	0.0	>210



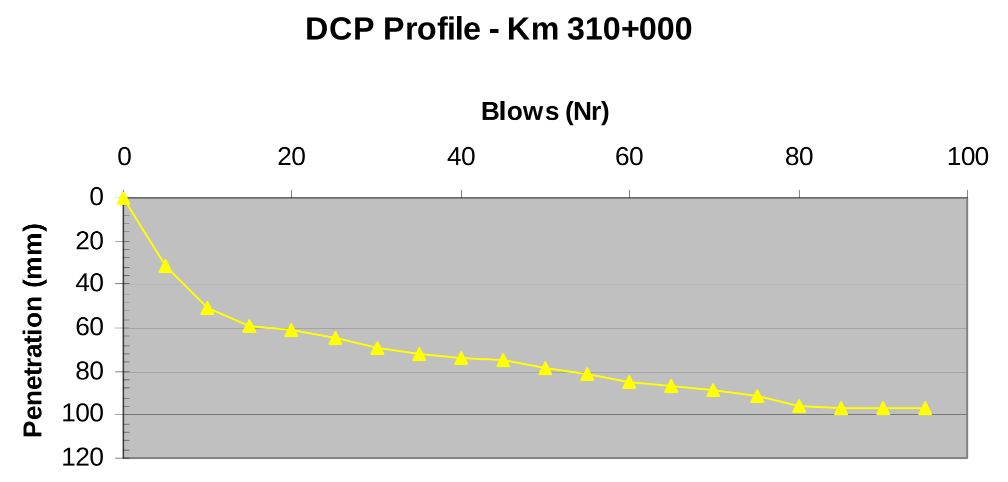
DCP Tests
Section 300+000
UTM Coordinates: X=0280865, Y=8363820

Blows (Nr)	Readings (mm)	Penetration (mm)	DN (mm/blow)	CBR in-situ (%)
0	1000	0		
5	967	33	6.6	37
10	935	65	6.4	39
15	912	88	4.6	59
20	911	89	0.2	>210
25	909	91	0.4	>210
30	907	93	0.4	>210
35	904	96	0.6	>210
40	902	98	0.4	>210
45	899	101	0.6	>210
50	898	102	0.2	>210
55	896	104	0.4	>210
60	894	106	0.4	>210
65	892	108	0.4	>210
70	890	110	0.4	>210
75	889	111	0.2	>210
80	889	111	0.0	>210
85	885	115	0.8	>210
90	883	117	0.4	>210
95	881	119	0.4	>210
100	881	119	0.0	>210
105	881	119	0.0	>210



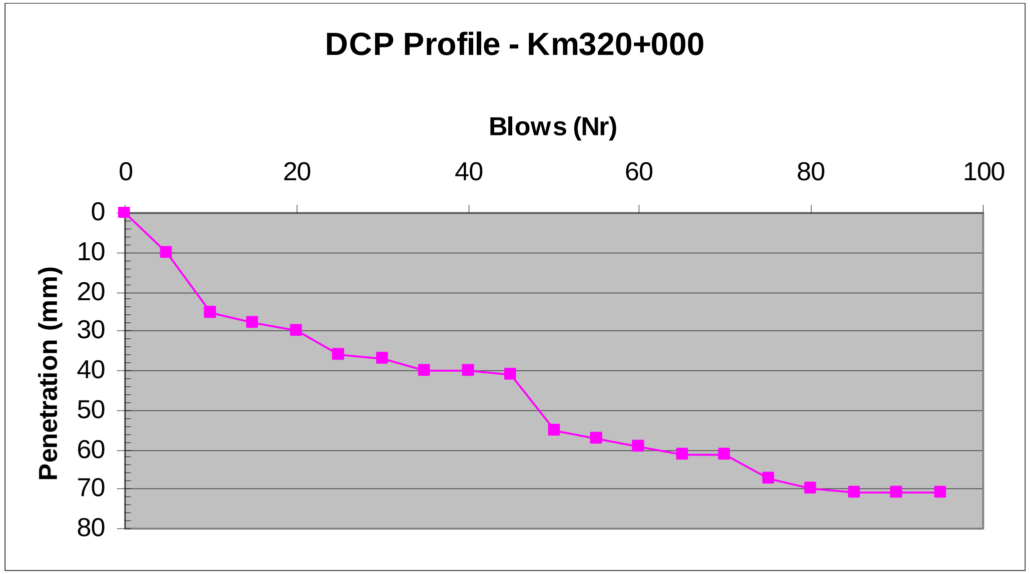
DCP Tests
Section 310+000
UTM Coordinates: X=0274432, Y=8364716

Blows (Nr)	Readings (mm)	Penetration (mm)	DN (mm/blow)	CBR in-situ (%)
0	1000	0		
5	969	31	6.2	40
10	949	51	4.0	70
15	941	59	1.6	206
20	939	61	0.4	>210
25	935	65	0.8	>210
30	931	69	0.8	>210
35	928	72	0.6	>210
40	926	74	0.4	>210
45	925	75	0.2	>210
50	922	78	0.6	>210
55	919	81	0.6	>210
60	915	85	0.8	>210
65	913	87	0.4	>210
70	911	89	0.4	>210
75	909	91	0.4	>210
80	904	96	1.0	>210
85	903	97	0.2	>210
90	903	97	0.0	>210
95	903	97	0.0	>210



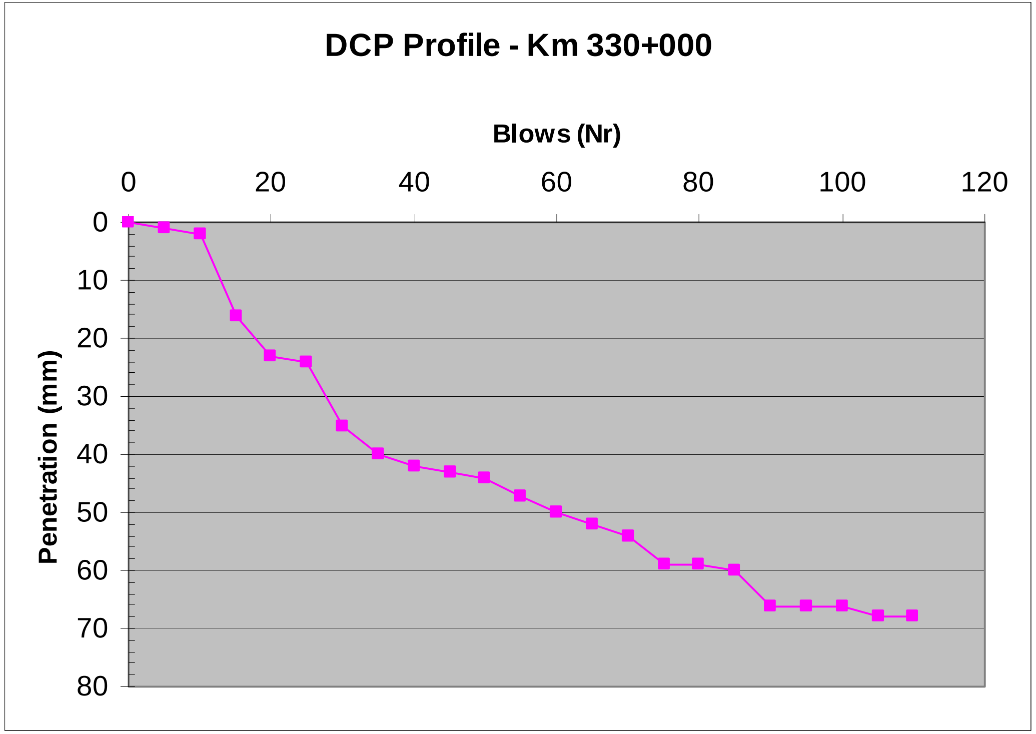
DCP Tests
Section 320+000
UTM Coordinates: X=0265986, Y=8364961

Blows (Nr)	Readings (mm)	Penetration (mm)	DN (mm/blow)	CBR in-situ (%)
0	1000	0		
5	990	10	2.0	168
10	975	25	3.0	102
15	972	28	0.6	>210
20	970	30	0.4	>210
25	964	36	1.2	>210
30	963	37	0.2	>210
35	960	40	0.6	>210
40	960	40	0.0	>210
45	959	41	0.2	>210
50	945	55	2.8	111
55	943	57	0.4	>210
60	941	59	0.4	>210
65	939	61	0.4	>210
70	939	61	0.0	>210
75	933	67	1.2	>210
80	930	70	0.6	>210
85	929	71	0.2	>210
90	929	71	0.0	>210
95	929	71	0.0	>210



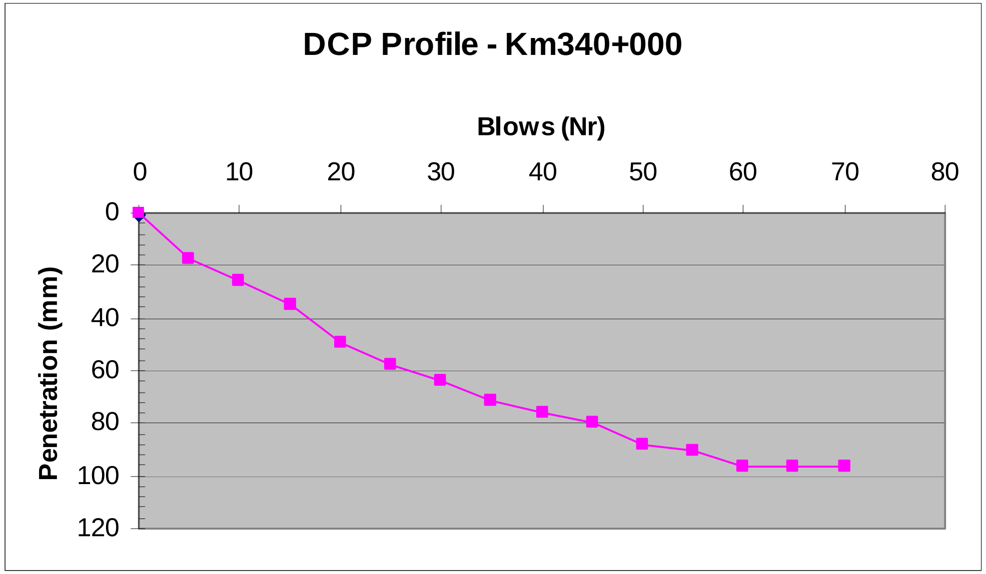
DCP Tests
Section 330+000
UTM Coordinates: X=0257183, Y=8364470

Blows (Nr)	Readings (mm)	Penetration (mm)	DN (mm/blow)	CBR in-situ (%)
0	1000	0		
5	999	1	0.2	>210
10	998	2	0.2	>210
15	984	16	2.8	111
20	977	23	1.4	>210
25	976	24	0.2	>210
30	965	35	2.2	151
35	960	40	1.0	>210
40	958	42	0.4	>210
45	957	43	0.2	>210
50	956	44	0.2	>210
55	953	47	0.6	>210
60	950	50	0.6	>210
65	948	52	0.4	>210
70	946	54	0.4	>210
75	941	59	1.0	>210
80	941	59	0.0	>210
85	940	60	0.2	>210
90	934	66	1.2	>210
95	934	66	0.0	>210
100	934	66	0.0	>210
105	932	68	0.4	>210
110	932	68	0.0	>210



DCP Tests
Section 340+000
UTM Coordinates: X=0247584, Y=8363368

Blows (Nr)	Readings (mm)	Penetration (mm)	DN (mm/blow)	CBR in-situ (%)
0	1000	0		
5	983	17	3.4	86
10	974	26	1.8	185
15	965	35	1.8	185
20	951	49	2.8	111
25	942	58	1.8	185
30	936	64	1.2	>210
35	929	71	1.4	>210
40	924	76	1.0	>210
45	920	80	0.8	>210
50	912	88	1.6	206
55	910	90	0.4	>210
60	904	96	1.2	>210
65	904	96	0.0	>210
70	904	96	0.0	>210



Appendix B-4

CBR TEST FOR SUBGRADE

CONSULTOR / EMPREITEIRO : TÉC. ENGS. CONSULTORES DATA: 13-11-06
PROJECTO : N13 NAMPULA/CUAMBA
CAMADA ENSAIADA : BASE - NATURAL Km: 15+00 L/E VERIF. POR:
AMOSTRA Nº : NAM/0027/06 EFECT. POR : RAFAEL
DESCRIÇÃO DO SOLO : AREIA ARGILOSA (SAIBRO)

ENSAIO DE COMPACTAÇÃO

Barid. Seca Máx. 2.086 gr/cm3
Teor Ópt. Água 9.8 %

DETERMINAÇÃO DO TEOR DE HUMIDADE

			Hygroscópico		Depois da Mistura		
Nº da Cápsula/Molde		Nº			6	7	8
Peso do Solo Húmido + Cápsula	(P0)	gr			303.60	299.80	294.1
Peso do Solo Seco + Cápsula	(P1)	gr			283.40	279.10	274.8
Peso da Cápsula	(P2)	gr			84.00	84.60	85
Peso da Água	(P3)= (P0)-(P1)	gr			20.20	20.70	19.30
Peso do Solo Seco	(P4)=(P1)-(P2)	gr			199.40	194.50	189.80
Teor de Húmidade	W=(P3)/(P4)x100	%		1.7	10.1	10.6	10.2

Água a Adicionar

Óptimo % (a) 9.8
Hygroscópico % (b) 1.7
Volume de Água = 8.1

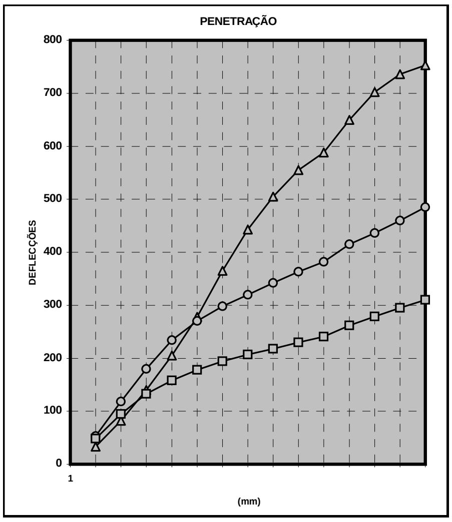
$$\frac{\text{Solo seco x}(100+a)}{100} - \text{Solo seco} = 1434$$

Moldagem

Compactação			55x10x5	25x10x5	55x5,5x3
Nº do Molde	Nº	Nº	4	5	6
Peso do Molde + Solo Húmido	(M0)	gr	11052	10825	10534
Peso do Molde	(M1)	gr	6221	6243	6181
Peso do Solo Húmido	(M2)=(M0)-(M1)	gr	4831	4582	4353
Volume do Molde	V	cc	2104	7104	2104
Baridade Húmida do Solo	Dh=(M2)/V	gr/cc	2.296	7.178	2.069
Teor Húmidade da Moldagem	W	%	10.3	10.3	11.3
Baridade Seca do Solo	Ds=Dhx100/100+W	gr/cc	2.082	1.971	1.876
% de Compactação	Ds/Ds Máx.x100	%	99.8	94.7	89.9
Peso Molde+Solo Após Embebição	(M3)	gr	11088	10901	10665
Peso Solo Húmid. Final	(M4)=(M3)-(M1)	gr	4867	4658	4484
Teor Húmidade Final	Wf=[M4-(DsxV)]/(DsxV)	%	11.1	12.1	13.6

Expansão

Nº do Molde	1	2	3
Leitura Inicial			
Leitura Final			
% Expanção			



Nº Molde	4 △		5 ○		6 □	
% Mod AASHTO	100.0		95.0		90	
Penetração	Leitura	Corrig.	Leitura	Corrig.	Leitura	Corrig.
0.0						
0.5	33		53		48	
1.0	82		118		95	
1.5	140		180		133	
2.0	205		234		158	
2.5*	278	278	270	270	178	178
3.0	365		298		194	
3.5	443		320		207	
4.0	505		342		218	
4.5	555		363		230	
5.0*	588	588	382	382	241	241
6.0	650		415		262	
7.0	702		436		279	
8.0	736		460		295	
9.0	753		485		310	
Factor do Anel			0.012 KN			
CBR	2.5mm=13.344KN		5.0mm=20.016KN		7.5mm=25.354KN	
2,5mm *	25.0		24.3		16.0	
5,0mm **	35.3		22.9		14.4	
% Compactação						
CBR 2,5mm						
CBR 5,0mm						

CONSULTOR / EMPREITEIRO : TÉC. ENGS. CONSULTORES DATA: 24-11-06
PROJECTO : N13 NAMPULA/CUAMBA
CAMADA ENSAIADA : BASE - NATURAL Km: 35+00 L/E VERIF. POR:
AMOSTRA Nº : NAM/00 /06 EFECT. POR : RAFAEL
DESCRIÇÃO DO SOLO : AREIA ARGILOSA CASTANHO CLARO

ENSAIO DE COMPACTAÇÃO

Barid. Seca Máx. 1.852 gr/cm3
Teor Ópt. Água 15.5 %

DETERMINAÇÃO DO TEOR DE HUMIDADE

			Hygroscópico		Depois da Mistura	
Nº da Cápsula/Molde		Nº			15	16	17
Peso do Solo Húmido + Cápsula	(P0)	gr			289.90	316.10	319.5
Peso do Solo Seco + Cápsula	(P1)	gr			262.60	286.00	288
Peso da Cápsula	(P2)	gr			84.40	84.50	84.3
Peso da Água	(P3)= (P0)-(P1)	gr			27.30	30.10	31.50
Peso do Solo Seco	(P4)=(P1)-(P2)	gr			178.20	201.50	208.70
Teor de Húmidade	W=(P3)/(P4)x100	%		1.6	15.3	14.9	15.5

Água a Adicionar

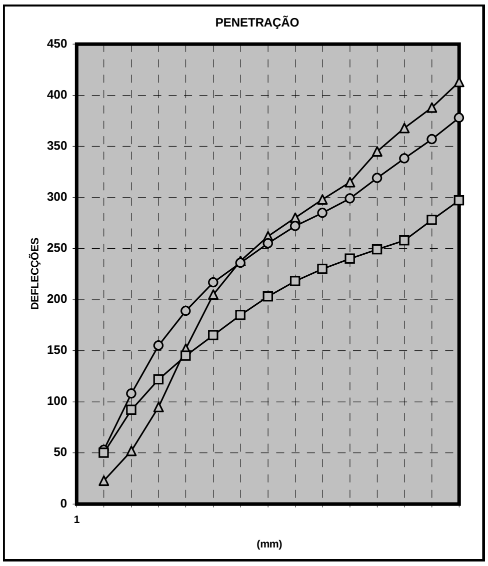
Óptimo % (a) 15.5
Hygroscópico % (b) 1.6
Volume de Água = 13.9
Solo seco x(100+a) - Solo seco =
100
= 2463

Moldagem

Compactação			55x10x5	25x10x5	55x5,5x3
Nº do Molde	Nº	Nº	1	2	3
Peso do Molde + Solo Húmido	(M0)	gr	10702	10481	10259
Peso do Molde	(M1)	gr	6201	6200	6196
Peso do Solo Húmido	(M2)=(M0)-(M1)	gr	4501	4276	4063
Volume do Molde	V	cc		2104	
Baridade Húmida do Solo	Dh=(M2)/V	gr/cc	2.139	2.032	1.931
Teor Húmidade da Moldagem	W	%	15.2	15.2	15.2
Baridade Seca do Solo	Ds=Dhx100/100+W	gr/cc	1.857	1.764	1.676
% de Compactação	Ds/Ds Máx.x100	%	100.3	95.2	90.5
Peso Molde+Solo Após Embebição	(M3)	gr	10733	10550	10340
Peso Solo Húmid. Final	(M4)=(M3)-(M1)	gr	4532	4345	4144
Teor Húmidade Final	Wf=[M4-(DsxV)]/(DsxV)	%	16.0	17.1	17.5

Expansão

Nº do Molde	1	2	3
Leitura Inicial			
Leitura Final			
% Expanção			



Nº Molde	1 △		2 ○		3 □	
% Mod AASHTO	100.0		95.0		90	
Penetração	Leitura	Corrig.	Leitura	Corrig.	Leitura	Corrig.
0.0						
0.5	23		53		50	
1.0	52		108		92	
1.5	95		155		122	
2.0	152		189		145	
2.5*	205	205	217	217	165	165
3.0	238		236		185	
3.5	262		255		203	
4.0	280		272		218	
4.5	298		285		230	
5.0*	315	315	299	299	240	240
6.0	345		319		249	
7.0	368		338		258	
8.0	388		357		278	
9.0	413		378		297	
Factor do Anel			0.012 KN			
CBR	2.5mm=13.344KN		5.0mm=20.016KN		7.5mm=25.354KN	
2,5mm *	18.4		19.5		14.8	
5,0mm **	18.9		17.9		14.4	
% Compactação						
CBR 2,5mm						
CBR 5,0mm						

CONSULTOR / EMPREITEIRO : **TÉC. ENGS. CONSULTORES** DATA: 24-11-06
PROJECTO : **N13 NAMPULA/CUAMBA**
CAMADA ENSAIADA : **BASE - NATURAL Km: 148+10 L/E** VERIF. POR:
AMOSTRA Nº : NAM/00 /06 EFECT. POR : RAFAEL
DESCRIÇÃO DO SOLO : AREIA ARGILOSA CASTANHO CLARO COM CASCALHO

ENSAIO DE COMPACTAÇÃO

Barid. Seca Máx. 1.958 gr/cm3
Teor Ópt. Água 12.9 %

DETERMINAÇÃO DO TEOR DE HUMIDADE

		Hygroscópico		Depois da Mistura		
Nº da Cápsula/Molde	Nº			18	19	20
Peso do Solo Húmido + Cápsula (P0)	gr			328.40	271.90	279.84
Peso do Solo Seco + Cápsula (P1)	gr			300.60	250.10	217.1
Peso da Cápsula (P2)	gr			84.20	84.30	84.8
Peso da Água (P3)= (P0)-(P1)	gr			27.80	21.80	22.74
Peso do Solo Seco (P4)=(P1)-(P2)	gr			216.40	165.80	172.30
Teor de Húmidade W=(P3)/(P4)x100	%		2.7	12.8	13.1	13.2

Água a Adicionar

Óptimo	% (a)	12.9
Hygroscópico	% (b)	2.7
Volume de Água =		10.2

$\frac{\text{Solo seco x(100+a)}}{100}$ - Solo seco =

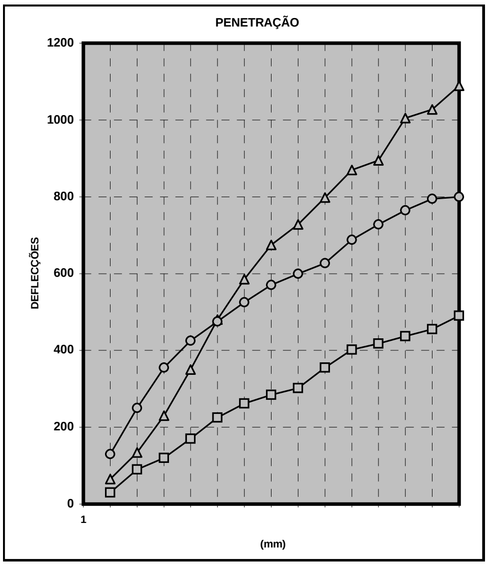
= 1787

Moldagem

Compactação		55x10x5	25x10x5	55x5,5x3
Nº do Molde Nº	Nº	4	5	6
Peso do Molde + Solo Húmido (M0)	gr	10872	10665	10367
Peso do Molde (M1)	gr	6221	6243	6181
Peso do Solo Húmido (M2)=(M0)-(M1)	gr	4651	4422	4186
Volume do Molde V	cc		2104	
Baridade Húmida do Solo Dh=(M2)/V	gr/cc	2.211	2.102	1.990
Teor Húmidade da Moldagem W	%	13.0	13.0	13.0
Baridade Seca do Solo Ds=Dhx100/100+W	gr/cc	1.957	1.860	1.761
% de Compactação Ds/Ds Máx.x100	%	99.9	95.0	90.0
Peso Molde+Solo Após Embebição (M3)	gr	10936	10788	10544
Peso Solo Húmid. Final (M4)=(M3)-(M1)	gr	4715	454.5	4363
Teor Húmidade Final Wf=[M4-(DsxV)]/(DsxV)	%	14.5	16.2	17.8

Expansão

Nº do Molde	1	2	3
Leitura Inicial			
Leitura Final			
% Expanção			



Nº Molde	4 △		5 ○		6 □	
% Mod AASHTO	100.0		95.0		90	
Penetração	Leitura	Corrig.	Leitura	Corrig.	Leitura	Corrig.
0.0						
0.5	65		130		30	
1.0	134		250		90	
1.5	230		355		120	
2.0	350		425		170	
2.5*	480	480	475	475	225	215
3.0	585		525		262	
3.5	675		570		284	
4.0	728		600		302	
4.5	798		627		355	
5.0*	870	870	688	688	402	402
6.0	895		728		418	
7.0	1005		765		437	
8.0	1027		795		455	
9.0	1089		800		490	
Factor do Anel			0.012 KN			
CBR	2.5mm=13.344KN		5.0mm=20.016KN		7.5mm=25.354KN	
2,5mm *	43.2		42.7		19.3	
5,0mm **	52.2		41.2		24.1	
% Compactação						
CBR 2,5mm						
CBR 5,0mm						

CONSULTOR / EMPREITEIRO : TÉC. ENGS. CONSULTORES **DATA:** 25-11-06
PROJECTO : N13 NAMPULA/CUAMBA
CAMADA ENSAIADA : BASE - NATURAL Km: 199+30 L/E **VERIF. POR:**
AMOSTRA Nº : NAM/00 /06 **EFECT. POR :** RAFAEL
DESCRIÇÃO DO SOLO : AREIA ARGILOSA CASTANHO ESCURO COM CASCALHO

ENSAIO DE COMPACTAÇÃO

Barid. Seca Máx. 2.160 gr/cm3
Teor Ópt. Água 7.9 %

DETERMINAÇÃO DO TEOR DE HUMIDADE

			Hygroscópico		Depois da Mistura		
Nº da Cápsula/Molde		Nº			1	2	3
Peso do Solo Húmido + Cápsula	(P0)	gr			287.10	299.10	180.6
Peso do Solo Seco + Cápsula	(P1)	gr			273.10	283.30	266.1
Peso da Cápsula	(P2)	gr			84.30	84.10	84.5
Peso da Água	(P3)= (P0)-(P1)	gr			14.00	15.80	14.50
Peso do Solo Seco	(P4)=(P1)-(P2)	gr			188.80	199.20	181.60
Teor de Húmidade	W=(P3)/(P4)x100	%		2	7.4	7.9	8.0

Água a Adicionar

Óptimo % (a) 7.9
Hygroscópico % (b) 2.0
Volume de Água = 5.9

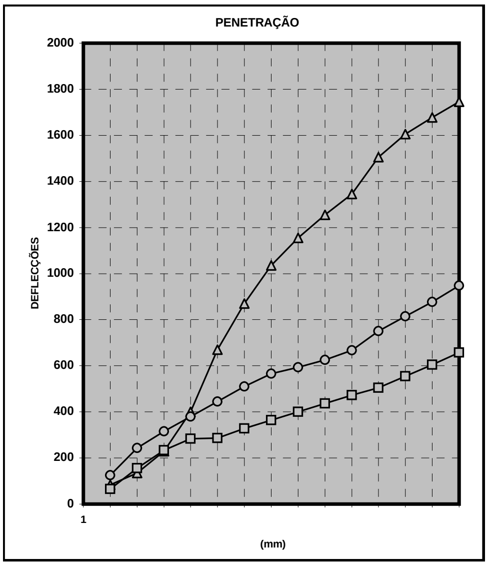
$$\frac{\text{Solo seco x}(100+a)}{100} - \text{Solo seco} = 1041$$

Moldagem

Compactação			55x10x5	25x10x5	55x5,5x3
Nº do Molde	Nº	Nº	18	20	24
Peso do Molde + Solo Húmido	(M0)	gr	12151	11662	11705
Peso do Molde	(M1)	gr	7158	6908	7193
Peso do Solo Húmido	(M2)=(M0)-(M1)	gr	4993	4754	4512
Volume do Molde	V	cc		2151	
Baridade Húmida do Solo	Dh=(M2)/V	gr/cc	2.321	2.210	2.098
Teor Húmidade da Moldagem	W	%	7.8	7.8	7.8
Baridade Seca do Solo	Ds=Dhx100/100+W	gr/cc	2.153	2.050	1.946
% de Compactação	Ds/Ds Máx.x100	%	99.7	94.9	90.1
Peso Molde+Solo Após Embebição	(M3)	gr	12228	11836	11915
Peso Solo Húmid. Final	(M4)=(M3)-(M1)	gr	5070	4928	4722
Teor Húmidade Final	Wf=[M4-(DsxV)]/(DsxV)	%	9.5	11.7	12.8

Expansão

Nº do Molde	1	2	3
Leitura Inicial			
Leitura Final			
% Expanção			



Nº Molde	18 △		20 ○		24 □	
% Mod AASHTO	100.0		95.0		90	
Penetração	Leitura	Corrig.	Leitura	Corrig.	Leitura	Corrig.
0.0						
0.5	83		125		65	
1.0	135		243		155	
1.5	230		315		233	
2.0	400		380		283	
2.5*	670	825	445	445	287	287
3.0	870		510		328	
3.5	1035		565		364	
4.0	1155		593		400	
4.5	1255		625		437	
5.0*	1345	1400	667	667	472	472
6.0	1505		750		504	
7.0	1605		815		555	
8.0	1678		877		604	
9.0	1745		948		658	
Factor do Anel			0.012 KN			
CBR	2.5mm=13.344KN		5.0mm=20.016KN		7.5mm=25.354KN	
2,5mm *	74.2		40.0		25.8	
5,0mm **	83.9		40.0		28.3	
% Compactação						
CBR 2,5mm						
CBR 5,0mm						

CONSULTOR / EMPREITEIRO : TÉC. ENGS. CONSULTORES **DATA:** 25-11-06
PROJECTO : N13 NAMPULA/CUAMBA
CAMADA ENSAIADA : BASE - NATURAL Km: 351+00 L/E **VERIF. POR:**
AMOSTRA Nº : NAM/00 /06 **EFECT. POR :** RAFAEL
DESCRIÇÃO DO SOLO : AREIA ARGILOSA CIZENTA COM CASCALHO

ENSAIO DE COMPACTAÇÃO
Barid. Seca Máx. 2.080 gr/cm3
Teor Ópt. Água 9.6 %

DETERMINAÇÃO DO TEOR DE HUMIDADE

			Hygroscópico		Depois da Mistura		
Nº da Cápsula/Molde		Nº			23	14	11
Peso do Solo Húmido + Cápsula	(P0)	gr			285.50	283.87	251.2
Peso do Solo Seco + Cápsula	(P1)	gr			268.60	266.10	236.6
Peso da Cápsula	(P2)	gr			83.80	84.80	84.5
Peso da Água	(P3)= (P0)-(P1)	gr			16.90	17.77	14.60
Peso do Solo Seco	(P4)=(P1)-(P2)	gr			184.80	181.30	152.10
Teor de Húmidade	W=(P3)/(P4)x100	%		2.6	9.1	9.8	9.6

Água a Adicionar

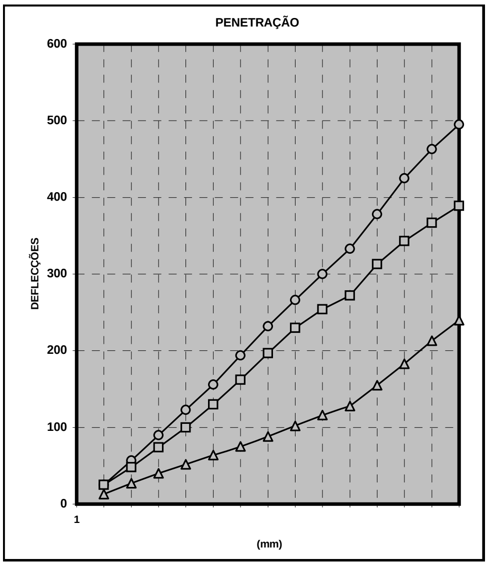
Óptimo	% (a)	9.6
Hygroscópico	% (b)	2.6
Volume de Água =		7.0
Solo seco x(100+a) - Solo seco = 100		
	=	1228

Moldagem

Compactação			55x10x5	25x10x5	55x5,5x3
Nº do Molde	Nº	Nº	X-10	X-11	11
Peso do Molde + Solo Húmido	(M0)	gr	11594	11368	12074
Peso do Molde	(M1)	gr	6267	6295	7661
Peso do Solo Húmido	(M2)=(M0)-(M1)	gr	5327	5073	4413
Volume do Molde	V	cc	2340	2240	2115
Baridade Húmida do Solo	Dh=(M2)/V	gr/cc	2.276	2.168	2.052
Teor Húmidade da Moldagem	W	%	9.5	9.5	9.5
Baridade Seca do Solo	Ds=Dhx100/100+W	gr/cc	2.079	1.980	1.874
% de Compactação	Ds/Ds Máx.x100	%	100.0	95.2	90.1
Peso Molde+Solo Após Embebição	(M3)	gr	11650	11420	12126
Peso Solo Húmid. Final	(M4)=(M3)-(M1)	gr	5383	5125	4465
Teor Húmidade Final	Wf=[M4-(DsxV)]/(DsxV)	%	10.6	10.6	10.8

Expansão

Nº do Molde	1	2	3
Leitura Inicial			
Leitura Final			
% Expanção			



Nº Molde	X-10 △		X-11 ○		11 □	
% Mod AASHTO	100.0		95.0		90	
Penetração	Leitura	Corrig.	Leitura	Corrig.	Leitura	Corrig.
0.0						
0.5	13		25		25	
1.0	27		57		48	
1.5	40		90		74	
2.0	52		123		100	
2.5*	64	64	156	156	130	180
3.0	75		194		162	
3.5	88		232		197	
4.0	102		266		230	
4.5	116		300		254	
5.0*	128	128	333	333	272	272
6.0	155		378		313	
7.0	183		425		343	
8.0	213		463		367	
9.0	240		495		389	
Factor do Anel			0.012 KN			
CBR	2.5mm=13.344KN		5.0mm=20.016KN		7.5mm=25.354KN	
2,5mm *	5.8		14.0		11.7	
5,0mm **	7.7		20.0		16.3	
% Compactação						
CBR 2,5mm						
CBR 5,0mm						

CONSULTOR/EMPREITEIRO : **TÉC. ENGS. CONSULTORES**

PROJECTO : **N13 NAMPULA/CUAMBA**

CAMADA ENSAIADA : **BASE - NATURAL Km: 15+00 L/E**

AMOSTRA Nº : **NAM/0022/06** EFECTUADO POR : **RAFAEL** VERIFICADO POR: RAFAEL DATA : #

BARIDADE SECA MÁX. 2.086 gr/cm3

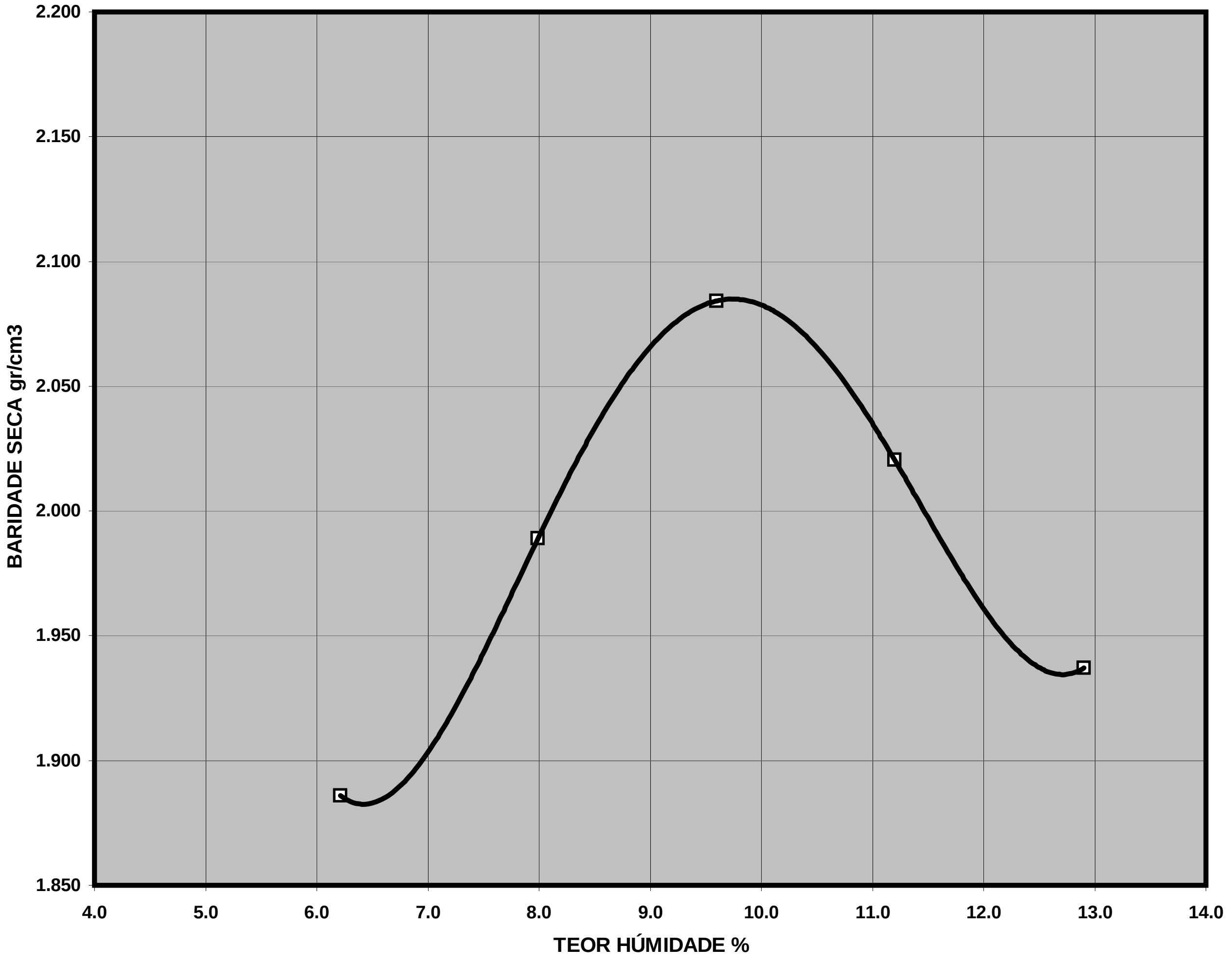
TEOR HUMIDADE ÓPTIMO 9.8 %

1. DETERMINAÇÃO DA BARIDADE HÚMIDA

NÙMERO DO MOLDE	Nº			1			
% DE ÁGUA ADICIONADA + (7.0% B.E.)	%	4	6	8	10	12	
QUANTIDADE DE ÁGUA ADICIONADA	cc	240	360	480	600	720	
PESO DO MOLDE + SOLO HÙMIDO (P1)	gr	9547	9852	10139	10066	9934	
PESO DO MOLDE (P2)	gr			5330			
PESO DO SOLO HÙMIDO (Ph)= (P1) - (P2)	gr	4217	4522	4809	4730	4604	
VOLUME DO MOLDE (V)	cm^3	0.000475	0.000475	0.000475	0.000475	0.000475	
BARIDADE HÙMIDA DO SOLO (Dh) = (Ph)/V	gr/cm^3	2.003	2.148	2.284	2.247	2.187	

2. DETERMINAÇÃO DO TEOR DE HÙMIDADE

NÚMERO DA CÁPSULA	Nº	1	2	3	4	5	
PESO DA CÁPSULA + SOLO HÙMIDO (M1)	gr	354.20	315.20	292.19	324.00	313.00	
PESO DA CÀPSULA + SOLO SECO (M2)	gr	338.50	298.10	274.00	300.50	286.80	
PESO DA CÁPSULA (M3)	gr	84.30	84.10	84.50	84.40	83.70	
PESO DA ÁGUA (Ma) = (M1) - (M2)	gr	15.80	17.10	18.19	24.20	26.20	
PESO DO SOLO SECO (Ms) = (M2) - (M3)	gr	254.20	214.00	189.50	216.10	203.10	
TEOR DE HÚMIDADE W = (Ma)/(Ms) x 100	%	6.2	8.0	9.6	11.2	12.9	
BARIDADE SECA SOLO (Ds) = (Dh)x100/100+W	gr/cm3	1.886	1.989	2.084	2.020	1.937	



CONSULTOR/EMPREITEIRO : **TÉC. ENGS. CONSULTORES**
PROJECTO : **N13 NAMPULA/CUAMBA**
CAMADA ENSAIADA : **BASE - NATURAL Km: 35+10 L/E**
AMOSTRA Nº : **NAM/0022/06** EFECTUADO POR : **RAFAEL**

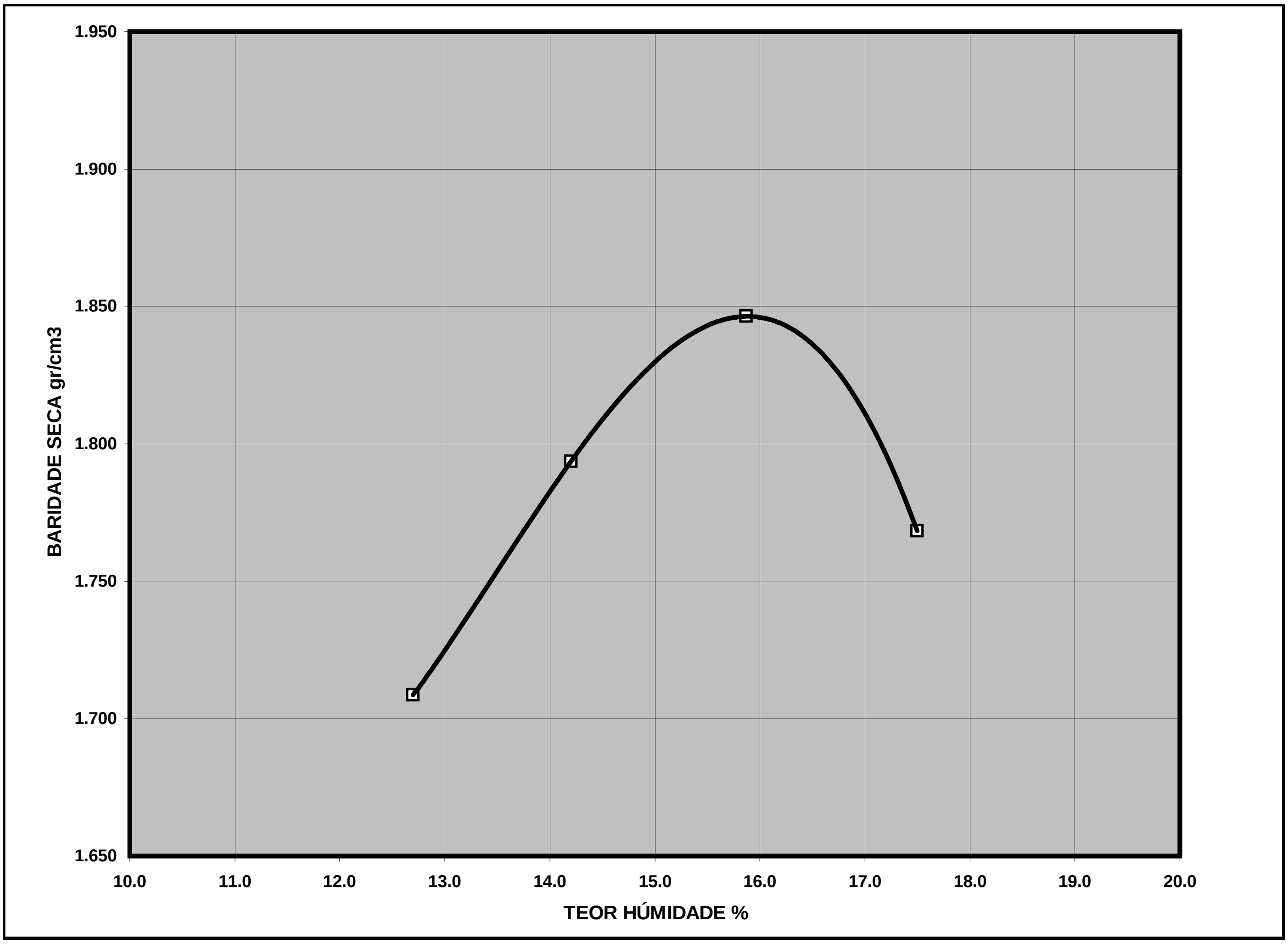
BARIDADE SECA MÁX. **1.851** gr/cm3
TEOR HUMIDADE ÓPTIMO **15.5** %
VERIFICADO POR: RAFAEL DATA : #

1. DETERMINAÇÃO DA BARIDADE HÚMIDA

NÙMERO DO MOLDE	Nº			1			
% DE ÁGUA ADICIONADA + (7.0% B.E.)	%	6	8	10	12		
QUANTIDADE DE ÁGUA ADICIONADA	cc	360	480	600	720		
PESO DO MOLDE + SOLO HÙMIDO (P1)	gr	9384	9642	9834	9704		
PESO DO MOLDE (P2)	gr	5330	5330	5330	5330		
PESO DO SOLO HÙMIDO (Ph)= (P1) - (P2)	gr	4054	4312	4504	4374		
VOLUME DO MOLDE (V)	cm^3	0.000475	0.000475	0.000475	0.000475		
BARIDADE HÙMIDA DO SOLO (Dh) = (Ph)/V	gr/cm^3	1.926	2.048	2.139	2.078		

2. DETERMINAÇÃO DO TEOR DE HÙMIDADE

NÚMERO DA CÁPSULA	Nº	7	8	10	11		
PESO DA CÁPSULA + SOLO HÙMIDO (M1)	gr	369.05	348.80	366.30	379.54		
PESO DA CÀPSULA + SOLO SECO (M2)	gr	337.00	316.00	327.70	335.60		
PESO DA CÁPSULA (M3)	gr	84.60	85.00	84.50	84.50		
PESO DA ÁGUA (Ma) = (M1) - (M2)	gr	32.05	32.80	38.60	43.94		
PESO DO SOLO SECO (Ms) = (M2) - (M3)	gr	252.40	231.00	243.20	251.10		
TEOR DE HÚMIDADE W = (Ma)/(Ms) x 100	%	12.7	14.2	15.9	17.5		
BARIDADE SECA SOLO (Ds) = (Dh)x100/100+W	gr/cm3	1.709	1.794	1.846	1.768		



CONSULTOR/EMPREITEIRO : **TÉC. ENGS. CONSULTORES**
PROJECTO : **N13 NAMPULA/CUAMBA**
CAMADA ENSAIADA : **BASE - NATURAL Km: 148+00 L/E**
AMOSTRA Nº : **NAM/0024/06** EFECTUADO POR : **RAFAEL** VERIFICADO POR: **RAFAEL** DATA : **29-04-99**

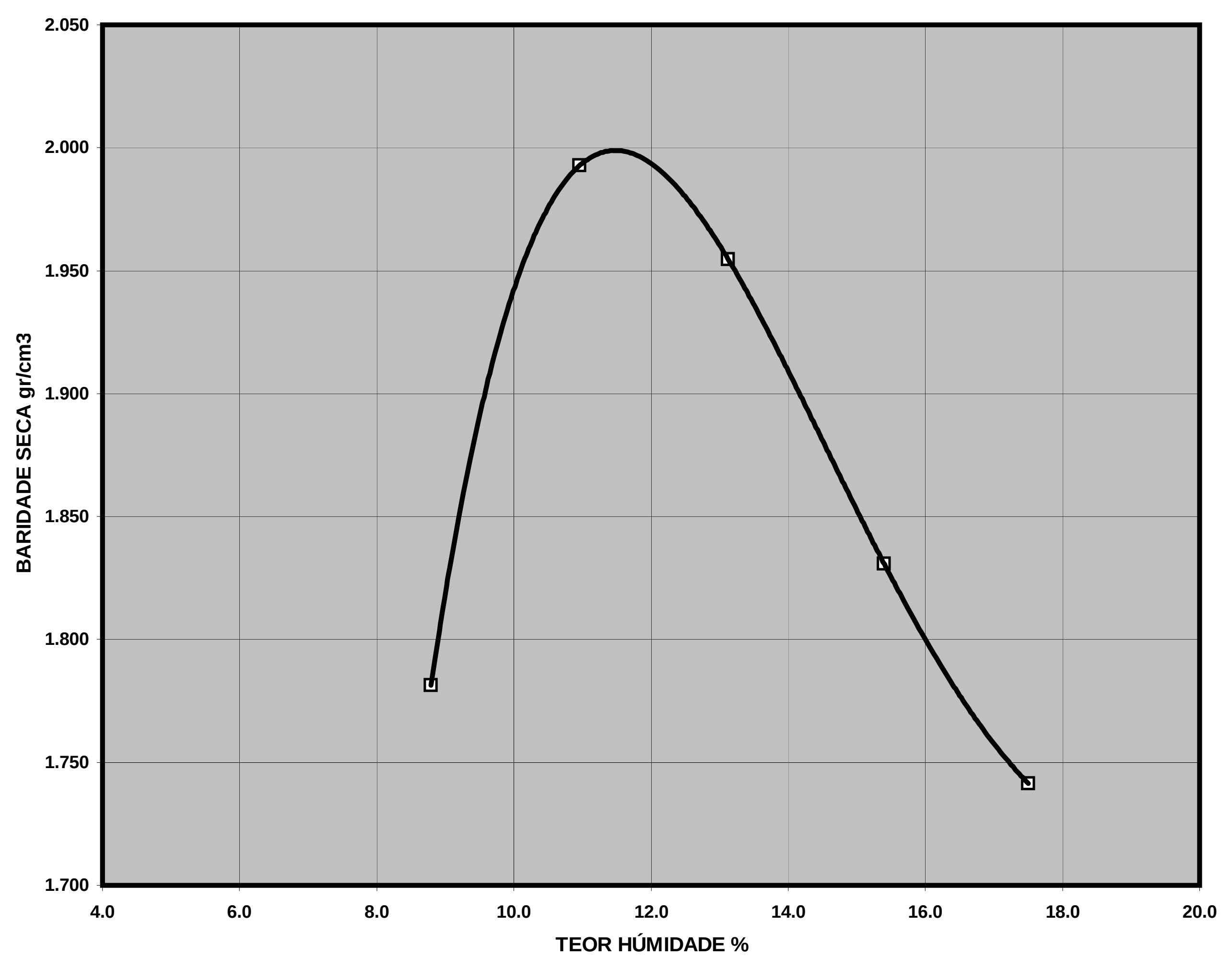
BARIDADE SECA MÁX. **1.958** gr/cm3
TEOR HUMIDADE ÓPTIMO **12.9** %

1. DETERMINAÇÃO DA BARIDADE HÚMIDA

NÙMERO DO MOLDE	Nº			1			
% DE ÁGUA ADICIONADA + (7.0% B.E.)	%	5	7	9	11	13	
QUANTIDADE DE ÁGUA ADICIONADA	cc	300	420	540	660	780	
PESO DO MOLDE + SOLO HÙMIDO (P1)	gr	9410	9728	9985	9778	9638	
PESO DO MOLDE (P2)	gr	5330	5330	5330	5330	5330	
PESO DO SOLO HÙMIDO (Ph)= (P1) - (P2)	gr	4080	4655	4655	4448	4308	
VOLUME DO MOLDE (V)	cm^3	0.000475	0.000475	0.000475	0.000475	0.000475	
BARIDADE HÙMIDA DO SOLO (Dh) = (Ph)/V	gr/cm^3	1.938	2.211	2.211	2.113	2.046	

2. DETERMINAÇÃO DO TEOR DE HÙMIDADE

NÚMERO DA CÁPSULA	Nº	12	13	14	15	16	
PESO DA CÁPSULA + SOLO HÙMIDO (M1)	gr	329.40	373.70	336.10	326.62	334.89	
PESO DA CÀPSULA + SOLO SECO (M2)	gr	309.60	345.10	306.80	294.30	297.60	
PESO DA CÁPSULA (M3)	gr	84.40	84.10	84.80	84.40	84.50	
PESO DA ÁGUA (Ma) = (M1) - (M2)	gr	19.80	28.60	29.80	32.32	37.29	
PESO DO SOLO SECO (Ms) = (M2) - (M3)	gr	225.20	261.00	227.00	209.90	213.10	
TEOR DE HÚMIDADE W = (Ma)/(Ms) x 100	%	8.8	11.0	13.1	15.4	17.5	
BARIDADE SECA SOLO (Ds) = (Dh)x100/100+W	gr/cm3	1.781	1.993	1.955	1.831	1.742	



CONSULTOR/EMPREITEIRO : **TÉC. ENGS. CONSULTORES**

PROJECTO : **N13 NAMPULA/CUAMBA**

CAMADA ENSAIADA : **BASE - NATURAL Km: 199+30 L/E**

AMOSTRA Nº : **NAM/00 /06** EFECTUADO POR : **RAFAEL** VERIFICADO POR: **RAFAEL** DATA : **29-04-99**

BARIDADE SECA MÁX. **2160.000** gr/cm3

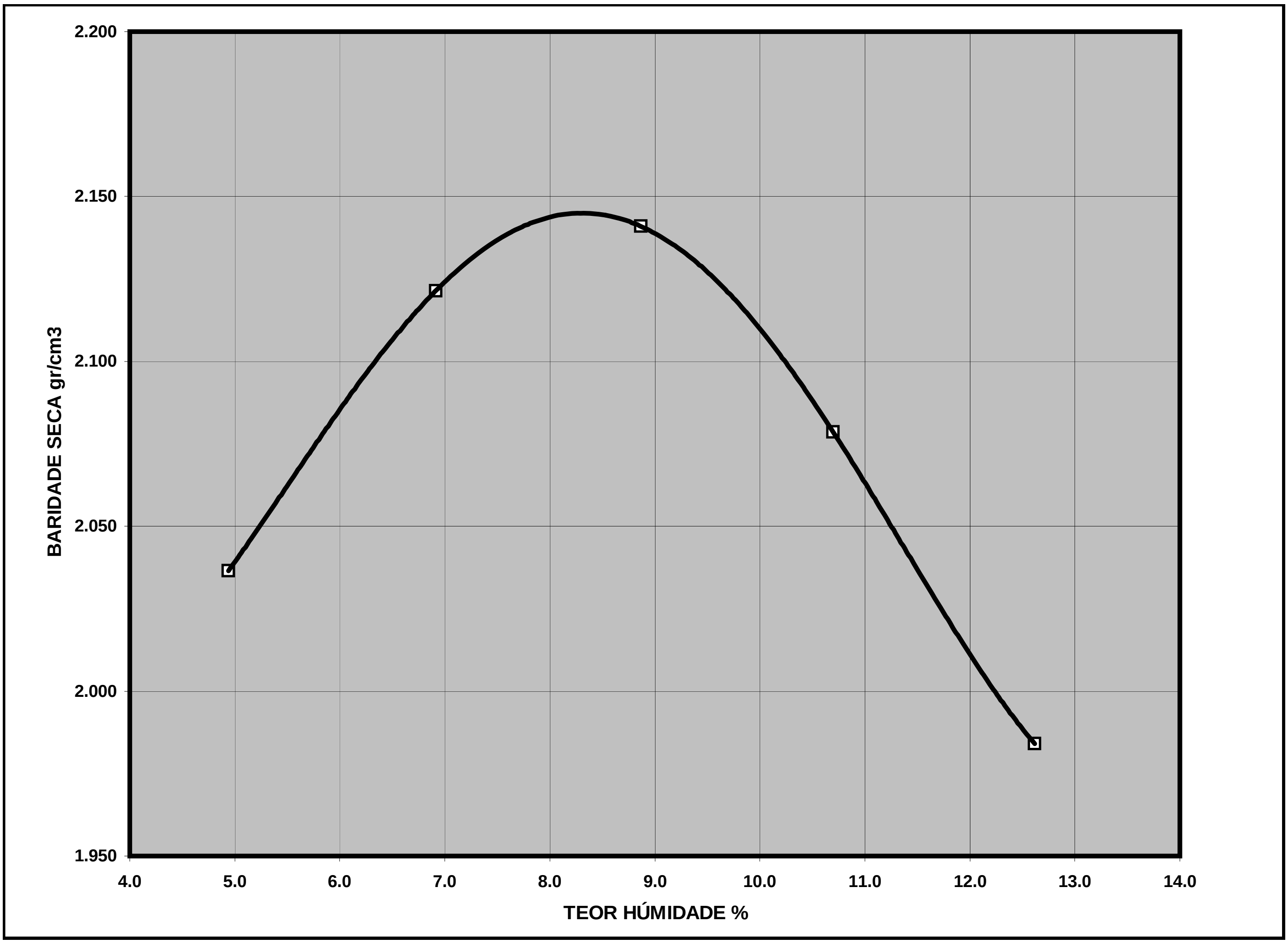
TEOR HUMIDADE ÓPTIMO **7.9** %

1. DETERMINAÇÃO DA BARIDADE HÚMIDA

NÙMERO DO MOLDE	Nº			1			
% DE ÁGUA ADICIONADA + (7.0% B.E.)	%	3	5	7	9	11	
QUANTIDADE DE ÁGUA ADICIONADA	cc	180	300	40	540	660	
PESO DO MOLDE + SOLO HÙMIDO (P1)	gr	9829	10105	10237	10174	10034	
PESO DO MOLDE (P2)	gr	5330	5330	5330	5330	5330	
PESO DO SOLO HÙMIDO (Ph)= (P1) - (P2)	gr	4499	4775	4907	4844	4704	
VOLUME DO MOLDE (V)	cm^3	0.000475	0.000475	0.000475	0.000475	0.000475	
BARIDADE HÙMIDA DO SOLO (Dh) = (Ph)/V	gr/cm^3	2.137	2.268	2.331	2.301	2.234	

2. DETERMINAÇÃO DO TEOR DE HÙMIDADE

NÚMERO DA CÁPSULA	Nº	6	7	8	10	11	
PESO DA CÁPSULA + SOLO HÙMIDO (M1)	gr	358.10	403.10	312.10	380.40	416.50	
PESO DA CÀPSULA + SOLO SECO (M2)	gr	345.20	382.50	293.60	352.80	379.30	
PESO DA CÁPSULA (M3)	gr	84.00	84.60	850.00	84.50	84.50	
PESO DA ÁGUA (Ma) = (M1) - (M2)	gr	12.90	20.60	18.50	28.60	37.20	
PESO DO SOLO SECO (Ms) = (M2) - (M3)	gr	261.20	297.90	208.60	267.30	294.80	
TEOR DE HÚMIDADE W = (Ma)/(Ms) x 100	%	4.9	6.9	8.9	10.7	12.6	
BARIDADE SECA SOLO (Ds) = (Dh)x100/100+W	gr/cm3	2.036	2.121	2.141	2.079	1.984	



CONSULTOR/EMPREITEIRO : TÉC. ENGS. CONSULTORES

PROJECTO : N13 NAMPULA/CUAMBA

CAMADA ENSAIADA : BASE - NATURAL Km: 351+00 L/E

AMOSTRA Nº : NAM/0026/06 EFECTUADO POR : RAFAEL

VERIFICADO POR: RAFAEL DATA : 29-04-99

BARIDADE SECA MÁX. 2.080 gr/cm3

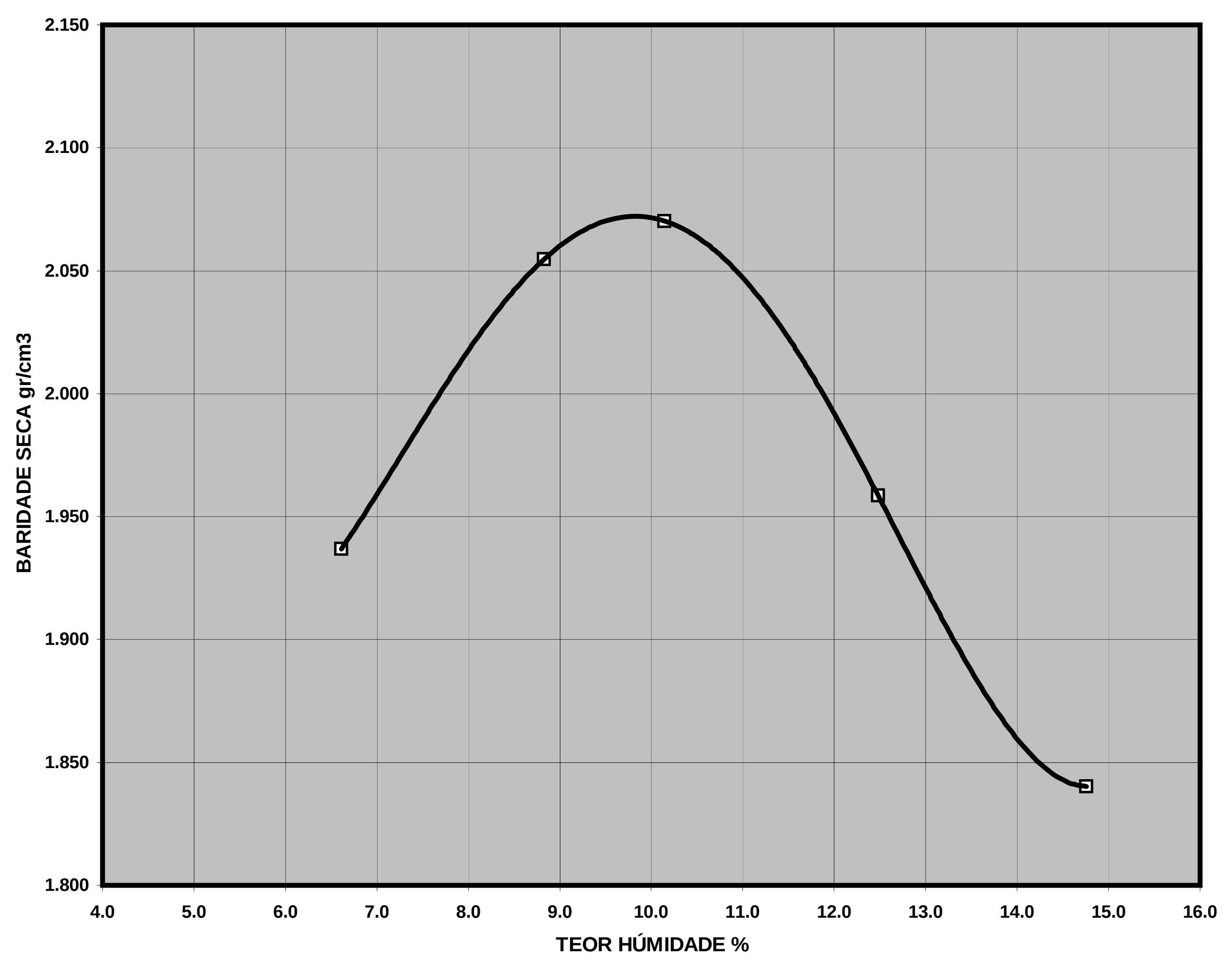
TEOR HUMIDADE ÓPTIMO 9.6 %

1. DETERMINAÇÃO DA BARIDADE HÚMIDA

NÙMERO DO MOLDE	Nº			1			
% DE ÁGUA ADICIONADA + (7.0% B.E.)	%	4	6	8	10	12	
QUANTIDADE DE ÁGUA ADICIONADA	cc	240	360	480	600	720	
PESO DO MOLDE + SOLO HÙMIDO (P1)	gr	10218	10612	10714	10536	10326	
PESO DO MOLDE (P2)	gr	5460	5460	5460	5460	5460	
PESO DO SOLO HÙMIDO (Ph)= (P1) - (P2)	gr	4758	5152	5254	5076	4866	
VOLUME DO MOLDE (V)	cm^3	0.000434	0.000434	0.000434	0.000434	0.000434	
BARIDADE HÙMIDA DO SOLO (Dh) = (Ph)/V	gr/cm^3	2.065	2.236	2.280	2.203	2.112	

2. DETERMINAÇÃO DO TEOR DE HÙMIDADE

NÚMERO DA CÁPSULA	Nº	1	2	3	7	8	
PESO DA CÁPSULA + SOLO HÙMIDO (M1)	gr	366.50	319.60	341.80	363.10	347.10	
PESO DA CÀPSULA + SOLO SECO (M2)	gr	349.00	300.50	318.10	332.20	313.40	
PESO DA CÁPSULA (M3)	gr	84.30	84.10	84.50	84.60	85.00	
PESO DA ÁGUA (Ma) = (M1) - (M2)	gr	17.50	19.10	23.70	30.90	33.70	
PESO DO SOLO SECO (Ms) = (M2) - (M3)	gr	264.70	216.40	233.60	247.60	228.40	
TEOR DE HÚMIDADE W = (Ma)/(Ms) x 100	%	6.6	8.8	10.1	12.5	14.8	
BARIDADE SECA SOLO (Ds) = (Dh)x100/100+W	gr/cm3	1.937	2.055	2.070	1.959	1.840	



Appendix B-5

LATERITE TEST

LABORATÓRIO DE ENGENHARIA DE MOÇAMBIQUE

DEPARTAMENTO DE VIAS DE COMUNICAÇÃO

Solos

ANÁLISE GRANULOMÉTRICA POR PENEIRAÇÃO HÚMIDA

PENEIROS		P. RETIDO (g)	% RETIDA	% TOTAL QUE PASSA
ASTM	(mm)			
3"	75.000			
2" 1/2	63.000			
2"	50.790			
1"1/2	37.500			
1"	25.000			
3/4"	19.000			100
1/2"	13.200	11.2	0.6	99.4
3/8"	9.500	13.00	0.7	98.7
1/4"	6.700	47.50	2.4	96.3
3/16"	4.750	58.80	2.9	93.4
14	2.000	218.20	10.9	82.5
18	1.180	115.00	5.8	76.7
36	0.600	190.04	9.5	67.2
40	0.425	150.02	7.5	59.7
52	0.300	108.00	5.4	54.3
100	0.150	134.50	6.7	47.6
200	0.075	39.40	2.0	45.6

Amostra

REFª DO LEM: - NAM/0017/06
REFª DO REQUISITANTE: KM: 79+00 L/D
O REQUISITANTE: TÉC. ENG. CONSULTORES
PROVENIÊNCIA: NAMPULA
OBRA/DESTINO: N13 NPL/CUAMBA
DATA DO ENSAIO: 10/11/2006
PROFUNDIDADE: ---

Análise granulométrica da fracção grossa

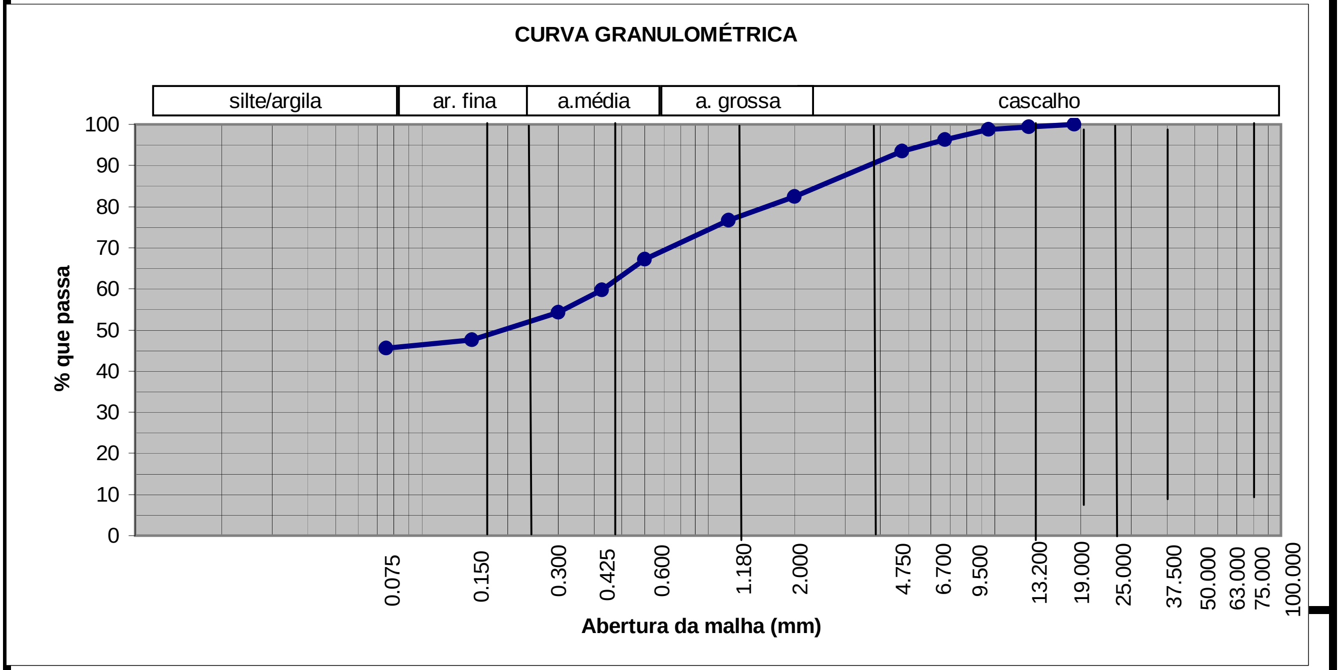
Peso total da amostra (g)	*2000*
Peso da fracção grossa (g)	
Peso da fracção fina (g)	
Peso da fracção grossa seca (g)	
Percentagem total da fracção fina	

Análise granulométrica da fracção fina

Peso total da amostra (g)	2000.00
Peso do material lavado seco (g)	1089.00
Peso do material fino lavado (g)	911.00

LIMITES	LL (%)	LP (%)	IP (%)
	47.8	**27.6**	**20.02**

Análise Granulométrica por peneiração húmida LNEC E195/E239



Albino Caetano

LABORATÓRIO DE ENGENHARIA DE MOÇAMBIQUE

DEPARTAMENTO DE VIAS DE COMUNICAÇÃO

Solos

ANÁLISE GRANULOMÉTRICA POR PENEIRAÇÃO HÚMIDA

PENEIROS		P. RETIDO (g)	% RETIDA	% TOTAL QUE PASSA
ASTM	(mm)			
3"	75.000			
2" 1/2	63.000			
2"	50.790			
1"1/2	37.500			
1"	25.000			100
3/4"	19.000	56.5	2.8	97.2
1/2"	13.200	42.4	2.1	95.1
3/8"	9.500	20.04	1.0	94.1
1/4"	6.700	68.50	3.4	90.7
3/16"	4.750	140.05	7.0	83.7
14	2.000	405.60	20.3	63.4
18	1.180	199.40	10.0	53.4
36	0.600	246.00	12.3	41.1
40	0.425	148.40	7.4	33.7
52	0.300	122.70	6.1	27.6
100	0.150	166.20	8.3	19.3
200	0.075	57.00	2.9	16.4

Amostra

REFª DO LEM: - NAM/0018/06
REFª DO REQUISITANTE: KM:124+00 L/D
O REQUISITANTE: TÉC. ENG. CONSULTORES
PROVENIÊNCIA: NAMPULA
OBRA/DESTINO: N13 NPL/CUAMBA
DATA DO ENSAIO: 10/11/2006
PROFUNDIDADE: ---

Análise granulométrica da fracção grossa

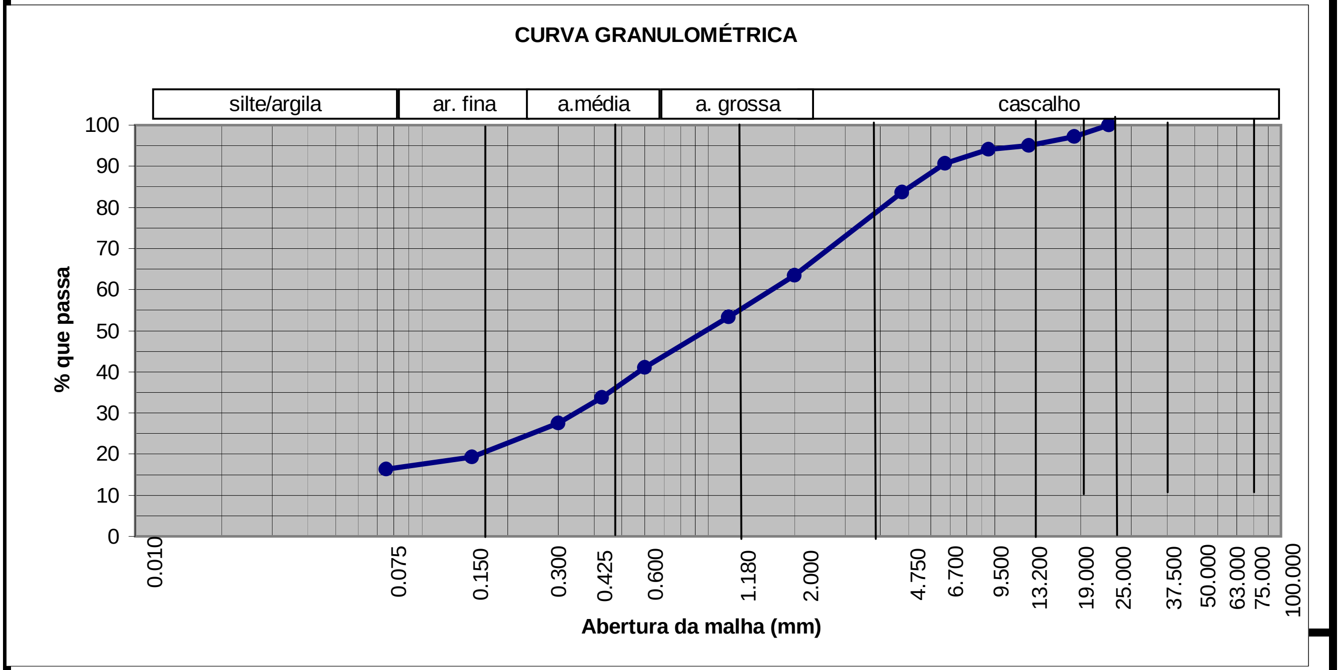
Peso total da amostra (g)	*2000*
Peso da fracção grossa (g)	
Peso da fracção fina (g)	
Peso da fracção grossa seca (g)	
Percentagem total da fracção fina	

Análise granulométrica da fracção fina

Peso total da amostra (g)	2000.00
Peso do material lavado seco (g)	1683.00
Peso do material fino lavado (g)	317.00

LIMITES	LL (%)	LP (%)	IP (%)
	26.7	**15.1**	**11.6**

Análise Granulométrica por peneiração húmida LNEC E195/E239



Albino Caetano

LABORATÓRIO DE ENGENHARIA DE MOÇAMBIQUE

DEPARTAMENTO DE VIAS DE COMUNICAÇÃO

Solos
ANÁLISE GRANULOMÉTRICA POR PENEIRAÇÃO HÚMIDA

PENEIROS		P. RETIDO (g)	% RETIDA	% TOTAL QUE PASSA
ASTM	(mm)			
3"	75.000			
2" 1/2	63.000			
2"	50.790			
1"1/2	37.500			
1"	25.000			100
3/4"	19.000			100
1/2"	13.200	33.5	1.7	98.3
3/8"	9.500	58.60	2.9	95.4
1/4"	6.700	122.90	6.1	89.3
3/16"	4.750	68.30	3.4	85.9
14	2.000	172.90	8.6	77.3
18	1.180	133.20	6.7	70.6
36	0.600	218.80	10.9	59.7
40	0.425	153.90	7.7	52.0
52	0.300	115.60	5.8	46.2
100	0.150	170.08	8.5	37.7
200	0.075	52.80	2.6	35.1

Amostra

REFª DO LEM: -
REFª DO REQUISITANTE: KM:204+00 L/E
O REQUISITANTE: TÉC. ENG. CONSULTORES
PROVENIÊNCIA: NAMPULA
OBRA/DESTINO: N13 NPL/CUAMBA
DATA DO ENSAIO: 10/11/2006
PROFUNDIDADE: ---

Análise granulométrica da fracção grossa

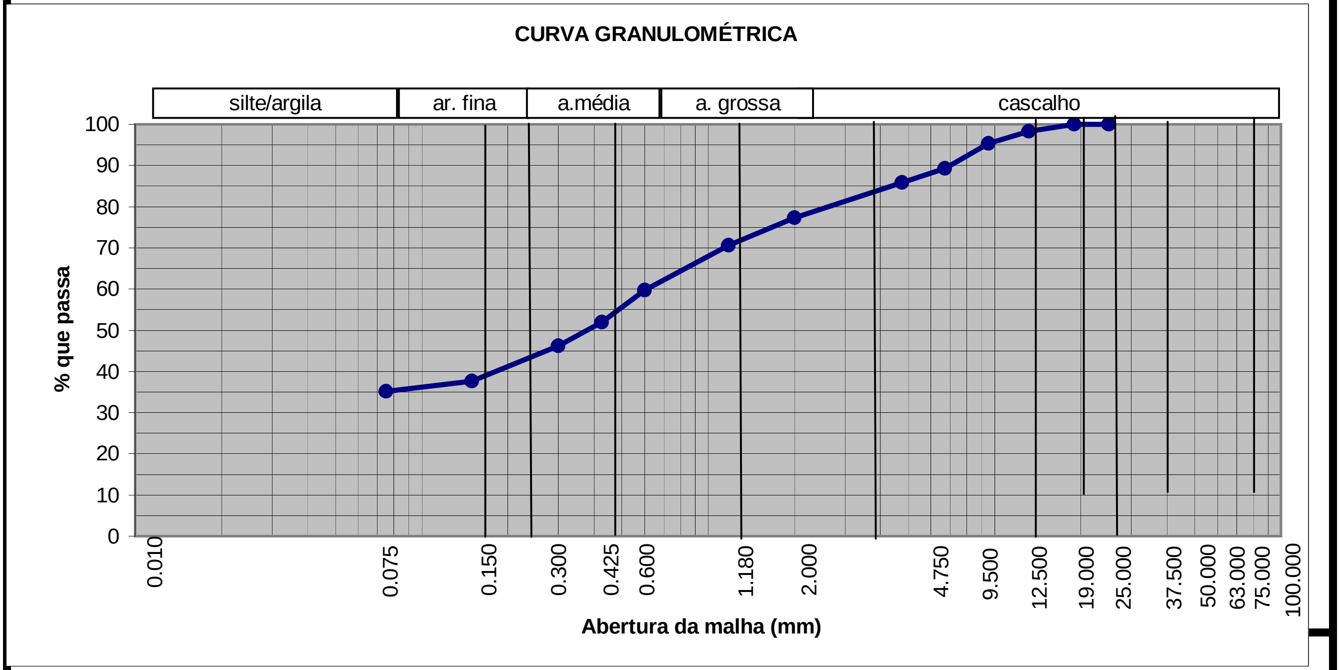
Peso total da amostra (g)	*2000*
Peso da fracção grossa (g)	
Peso da fracção fina (g)	
Peso da fracção grossa seca (g)	
Percentagem total da fracção fina	

Análise granulométrica da fracção fina

Peso total da amostra (g)	2000.00
Peso do material lavado seco (g)	1308.00
Peso do material fino lavado (g)	692.00

LIMITES	LL (%)	LP (%)	IP (%)
	39.1	**20.7**	**18.4**

Análise Granulométrica por peneiração húmida LNEC E195/E239



Albino Caetano

LABORATÓRIO DE ENGENHARIA DE MOÇAMBIQUE

DEPARTAMENTO DE VIAS DE COMUNICAÇÃO

Solos

ANÁLISE GRANULOMÉTRICA POR PENEIRAÇÃO HÚMIDA

PENEIROS		P. RETIDO (g)	% RETIDA	% TOTAL QUE PASSA
ASTM	(mm)			
3"	75.000			
2" 1/2	63.000			
2"	50.790			
1"1/2	37.500			
1"	25.000			
3/4"	19.000			100
1/2"	13.200	8.3	0.4	99.6
3/8"	9.500	41.00	2.1	97.5
1/4"	6.700	277.70	13.9	83.6
3/16"	4.750	334.00	16.7	66.9
14	2.000	260.00	13.0	53.9
18	1.180	316.20	15.8	38.1
36	0.600	72.00	3.6	34.5
40	0.425	164.20	8.2	26.3
52	0.300	57.00	2.9	23.4
100	0.150	76.10	3.8	19.6
200	0.075	44.00	2.2	17.4

Amostra

REFª DO LEM:
REFª DO REQUISITANTE: KM:256+50 L/D
O REQUISITANTE: TÉC. ENG. CONSULTORE
PROVENIÊNCIA: NAMPULA
OBRA/DESTINO: N13 NPL/CUAMBA
DATA DO ENSAIO: 16/11/2006
PROFUNDIDADE: ---

Análise granulométrica da fracção grossa

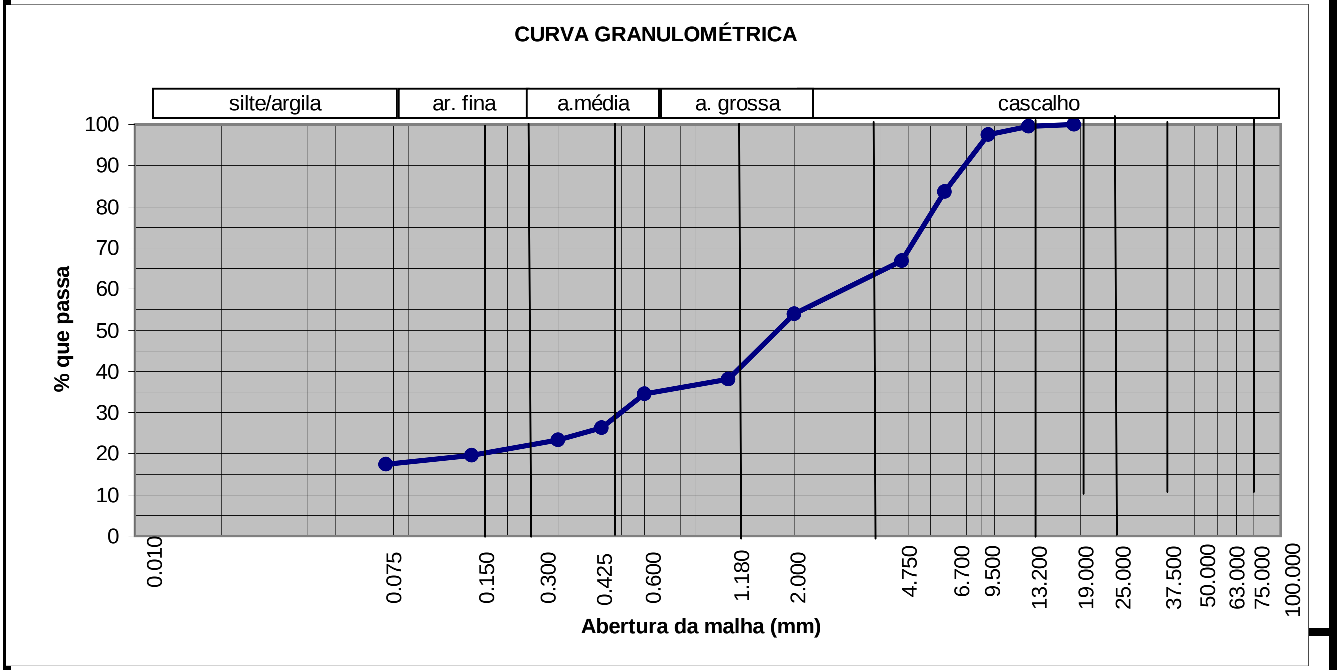
Peso total da amostra (g)	*2000*
Peso da fracção grossa (g)	
Peso da fracção fina (g)	
Peso da fracção grossa seca (g)	
Percentagem total da fracção fina	

Análise granulométrica da fracção fina

Peso total da amostra (g)	2000.00
Peso do material lavado seco (g)	1661.00
Peso do material fino lavado (g)	339.00

LIMITES	LL (%)	LP (%)	IP (%)
	30.6	**15.2**	**15.4**

Análise Granulométrica por peneiração húmida LNEC E195/E239



Albino Caetano

LABORATÓRIO DE ENGENHARIA DE MOÇAMBIQUE

DEPARTAMENTO DE VIAS DE COMUNICAÇÃO

Solos

ANÁLISE GRANULOMÉTRICA POR PENEIRAÇÃO HÚMIDA

PENEIROS		P. RETIDO (g)	% RETIDA	% TOTAL QUE PASSA
ASTM	(mm)			
3"	75.000			
2" 1/2	63.000			
2"	50.790			
1"1/2	37.500			
1"	25.000			
3/4"	19.000			100
1/2"	13.200	92	4.6	95.4
3/8"	9.500	197.70	9.9	85.5
1/4"	6.700	335.40	16.8	68.7
3/16"	4.750	207.00	10.4	58.3
14	2.000	480.00	24.0	34.3
18	1.180	108.60	5.4	28.9
36	0.600	112.20	5.6	23.3
40	0.425	35.70	2.8	20.5
52	0.300	32.50	1.6	18.9
100	0.150	20.02	1.0	17.9
200	0.075	4.50	0.2	17.7

Amostra

REFª DO LEM:

REFª DO REQUISITANTE: KM:332+10 L/D

O REQUISITANTE: TÉC. ENG. CONSULTORE

PROVENIÊNCIA: NAMPULA

OBRA/DESTINO: N13 NPL/CUAMBA

DATA DO ENSAIO: 13/11/2006

PROFUNDIDADE: ---

Análise granulométrica da fracção grossa

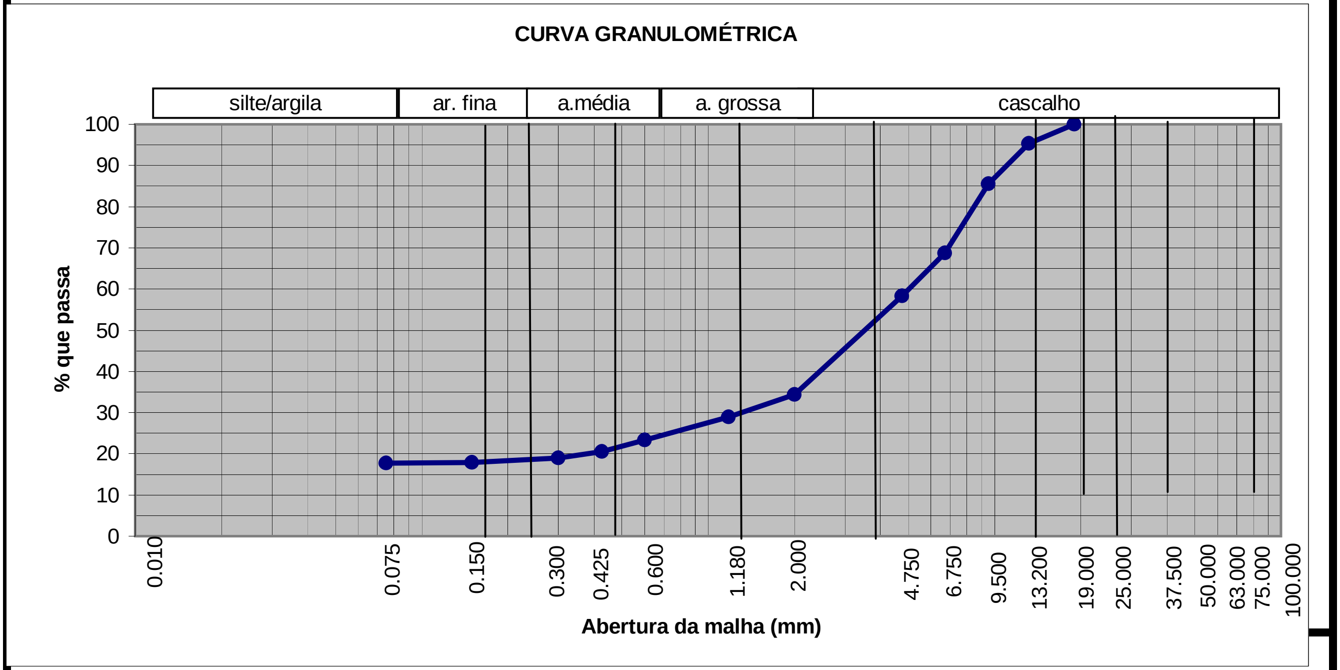
Peso total da amostra (g)	*2000*
Peso da fracção grossa (g)	
Peso da fracção fina (g)	
Peso da fracção grossa seca (g)	
Percentagem total da fracção fina	

Análise granulométrica da fracção fina

Peso total da amostra (g)	2000.00
Peso do material lavado seco (g)	1646.00
Peso do material fino lavado (g)	354.00

LIMITES	LL (%)	LP (%)	IP (%)
	41.5	**22.2**	**19.3**

Análise Granulométrica por peneiração húmida LNEC E195/E239


CURVA GRANULOMÉTRICA

Albino Caetano

DEPARTAMENTO DE ESTRADAS E PONTES

LIMITES ATTEBERG

LABORATÒRIO PROVINCIAL **MAPUTO**

CONSULTOR / EMPREITEIRO : D.N.E.P.

PROJECTO : Téc. Engs. Consultores

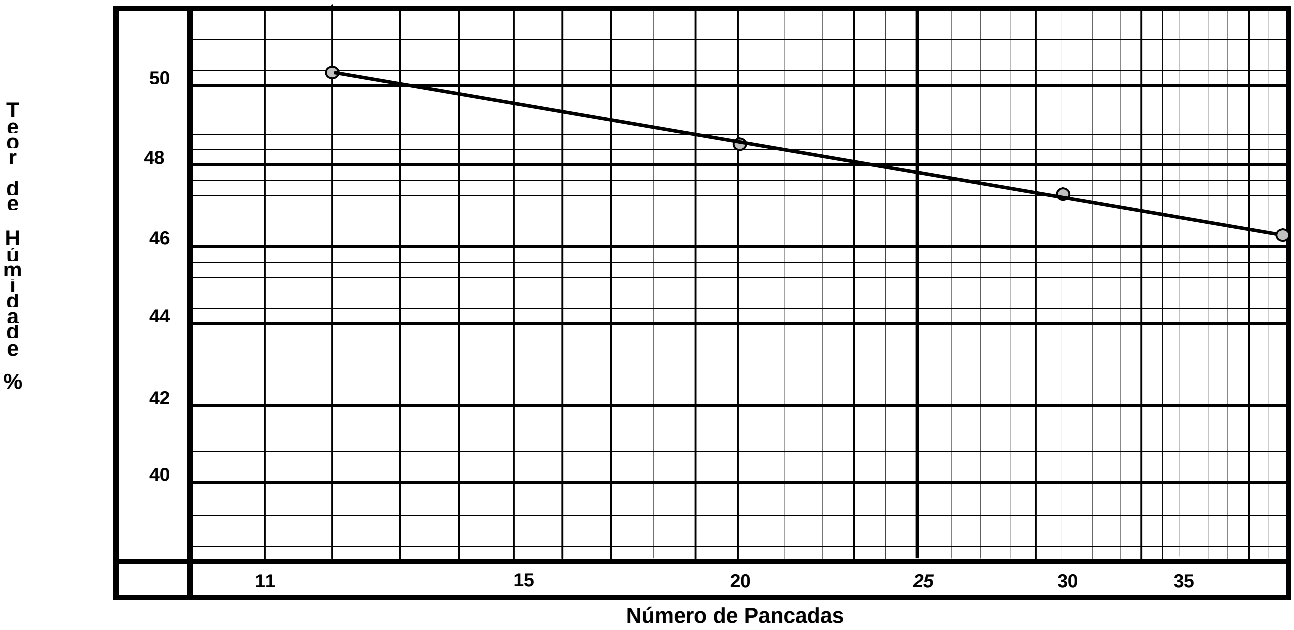
CAMADA ENSAIADA : C.E do km: 79+00 L/E

AMOSTRA Nº : NAM/0017/06 **EFECTUADO POR :** Rafael **VERIFICADO POR:** Rafael **DATA:** 2006/6/11

DESCRIÇÃO DO SOLO : Areia argilosa Castanho Claro com Cascalho, "Laterite"

1. DETERMINAÇÃO DO LIMITE DE LIQUIDEZ

Nº da Cápsula		Nº	12	13	14	15			
Peso Solo Húmido + Cápsula	(P0)	gr	24.40	25.30	23.00	24.14			
Peso Solo Seco + Cápsula	(P1)	gr	21.60	22.30	20.80	21.5			
Peso da Cápsula	(P2)	gr	16.04	16.13	16.14	15.8			
Peso da Água	P3 = (P0) - (P1)	gr	2.80	3.00	2.20	2.64			
Peso do Solo Seco	P4 = (P1) - (P2)	gr	5.56	6.17	4.66	5.7			
Teor de Húmidade	W = P3 / P4 x 100	gr	50.4	48.6	47.2	46.3			
Nº de Pancadas		Nº	12	20	30	40			



2. DETERMINAÇÃO DO LIMITE DE PLASTICIDADE

Nº da Cápsula		Nº	18	19	20				
Peso do Solo Húmido + Cápsula	(P0)	gr	24.90	24.70	25.6				
Peso Solo Seco + Cápsula	(P1)	gr	23.00	22.80	23.5				
Peso da Cápsula	(P2)	gr	16.03	16.00	15.9				
Peso da Água	P3 = (P0) - (P1)	gr	1.90	1.90	2.1				
Peso do Solo Seco	P4 = (P1) - (P2)	gr	6.97	6.80	7.6				
Teor de Húmidade	W = P3 / P4 x 100	gr	27.3	27.9	27.6				

3. DETERMINAÇÃO DO LIMITE DE RETRAÇÃO

Nº do Moulde		Nº	1			
Comprimento do Moulde	(L1)	mm	15.20			
Distância Retraída	(L2)	mm	1.50			
Retração Linear	L.S. = (L2) / (L1) x 100	%	9.9			

4. RESUMO RESULTADOS

Limite de Liquidez	48	%
Limite Plasticidade	28	%
Indice Plasticidade	20	%
Limite Retração	9.9	%

TA to Deps
J.V. RI/LBII
Moçambique

October, 1994

FORM T2

DEPARTAMENTO DE ESTRADAS E PONTES

LIMITES ATTEBERG

LABORATÒRIO PROVINCIAL **MAPUTO**

CONSULTOR / EMPREITEIRO : Téc. Engs. Consultores

PROJECTO : N13 Nampula/Cuamba

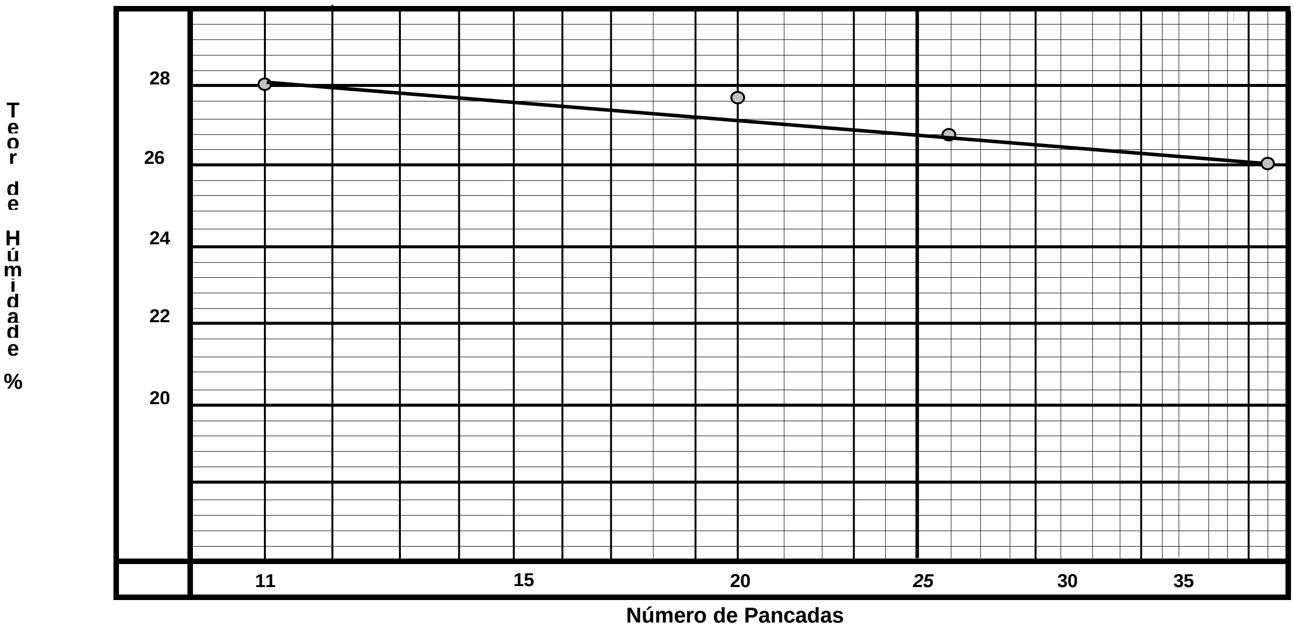
CAMADA ENSAIADA : C.E do km: 124+00 L/D "Namiganha"

AMOSTRA Nº : NAM/0018/06 **EFECTUADO POR :** Rafael **VERIFICADO POR:** Rafael **DATA:** 2006/7/11

DESCRIÇÃO DO SOLO : Areia argilosa Castanho Claro com Cascalho, "Laterite"

1. DETERMINAÇÃO DO LIMITE DE LIQUIDEZ

Nº da Cápsula		Nº	1	2	3	4				
Peso Solo Húmido + Cápsula	(P0)	gr	26.30	27.70	26.80	24.11				
Peso Solo Seco + Cápsula	(P1)	gr	24.00	25.10	24.50	22.4				
Peso da Cápsula	(P2)	gr	15.80	15.74	15.84	15.81				
Peso da Água	P3 = (P0) - (P1)	gr	2.30	2.60	2.30	1.71				
Peso do Solo Seco	P4 = (P1) - (P2)	gr	8.10	9.36	8.66	6.59				
Teor de Húmidade	W = P3 / P4 x 100	gr	28.0	27.8	26.6	25.9				
Nº de Pancadas		Nº	11	20	26	39				



2. DETERMINAÇÃO DO LIMITE DE PLASTICIDADE

Nº da Cápsula		Nº	5	624.71	7					
Peso do Solo Húmido + Cápsula	(P0)	gr	25.60	24.71	24.44					
Peso Solo Seco + Cápsula	(P1)	gr	24.30	23.60	23.3					
Peso da Cápsula	(P2)	gr	15.93	15.95	15.81					
Peso da Água	P3 = (P0) - (P1)	gr	1.30	1.11	1.14					
Peso do Solo Seco	P4 = (P1) - (P2)	gr	8.37	7.65	7.49					
Teor de Húmidade	W = P3 / P4 x 100	gr	15.5	14.5	15.2					

3. DETERMINAÇÃO DO LIMITE DE RETRAÇÃO

Nº do Moulde		Nº	2			
Comprimento do Moulde	(L1)	mm	15.20			
Distância Retraída	(L2)	mm	0.50			
Retração Linear	L.S. = (L2) / (L1) x 100	%	5.3			

4. RESUMO RESULTADOS

Limite de Liquidez	27	%
Limite Plasticidade	15	%
Indice Plasticidade	12	%
Limite Retração	5.3	%

TA to Deps
J.V. RI/LBII
Moçambique

DEPARTAMENTO DE ESTRADAS E PONTES

October, 1994

LIMITES ATTEBERG

FORM T2

LABORATÒRIO PROVINCIAL **MAPUTO**

CONSULTOR / EMPREITEIRO : Téc. Engs. Consultores

PROJECTO : N13 Nampula/Cuamba

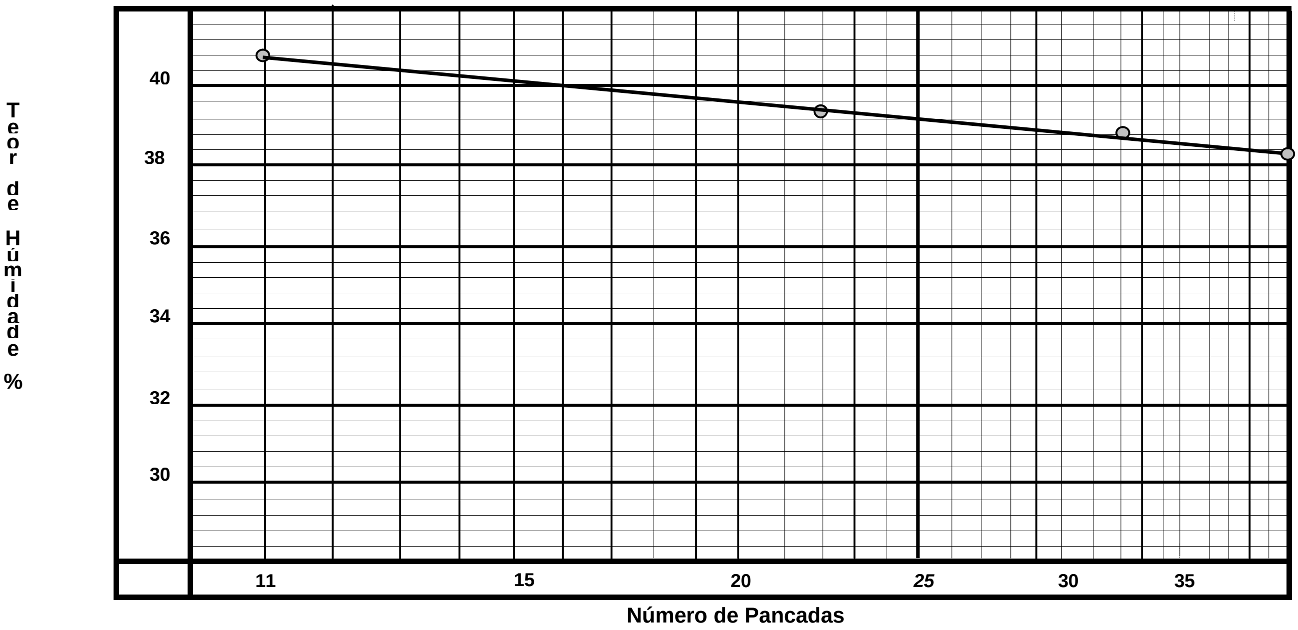
CAMADA ENSAIADA : C.E do km: 204+00 L/E "Cache"

AMOSTRA Nº : NAM/0019/06 **EFECTUADO POR :** Rafael **VERIFICADO POR:** Rafael **DATA:** 2006/6/11

DESCRIÇÃO DO SOLO : Areia argilosa Castanho Escuro com Cascalho, "Laterite"

1. DETERMINAÇÃO DO LIMITE DE LIQUIDEZ

Nº da Cápsula		**Nº**	8	9	10	11				
Peso Solo Húmido + Cápsula	**(P0)**	**gr**	24.70	23.09	25.60	23.7				
Peso Solo Seco + Cápsula	**(P1)**	**gr**	22.20	21.10	22.90	21.5				
Peso da Cápsula	**(P2)**	**gr**	16.04	16.03	15.96	15.74				
Peso da Água	**P3 = (P0) - (P1)**	**gr**	2.50	1.99	2.70	2.2				
Peso do Solo Seco	**P4 = (P1) - (P2)**	**gr**	6.16	5.07	6.94	5.7				
Teor de Húmidade	**W = P3 / P4 x 100**	**gr**	40.6	39.3	38.9	38.2				
Nº de Pancadas		**Nº**	11	22	32	40				



2. DETERMINAÇÃO DO LIMITE DE PLASTICIDADE

Nº da Cápsula		**Nº**	12	13	14					
Peso do Solo Húmido + Cápsula	**(P0)**	**gr**	25.42	25.50	26.7					
Peso Solo Seco + Cápsula	**(P1)**	**gr**	23.80	23.90	24.9					
Peso da Cápsula	**(P2)**	**gr**	16.04	16.13	16.14					
Peso da Água	**P3 = (P0) - (P1)**	**gr**	1.62	1.60	1.8					
Peso do Solo Seco	**P4 = (P1) - (P2)**	**gr**	7.76	7.77	8.76					
Teor de Húmidade	**W = P3 / P4 x 100**	**gr**	20.9	20.6	20.5					

3. DETERMINAÇÃO DO LIMITE DE RETRAÇÃO

Nº do Moulde		**Nº**	1			
Comprimento do Moulde	**(L1)**	**mm**	15.20			
Distância Retraída	**(L2)**	**mm**	1.30			
Retração Linear	**L.S. = (L2) / (L1) x 100**	**%**	8.6			

4. RESUMO RESULTADOS

Limite de Liquidez	39	%
Limite Plasticidade	21	%
Indice Plasticidade	18	%
Limite Retração	8.6	%

TA to Deps
J.V. RI/LBII
Moçambique

October, 1994

FORM T2

DEPARTAMENTO DE ESTRADAS E PONTES

LIMITES ATTEBERG

LABORATÒRIO PROVINCIAL **MAPUTO**

CONSULTOR / EMPREITEIRO : Téc. Engs. Consultores

PROJECTO : N13 Nampula/Cuamba

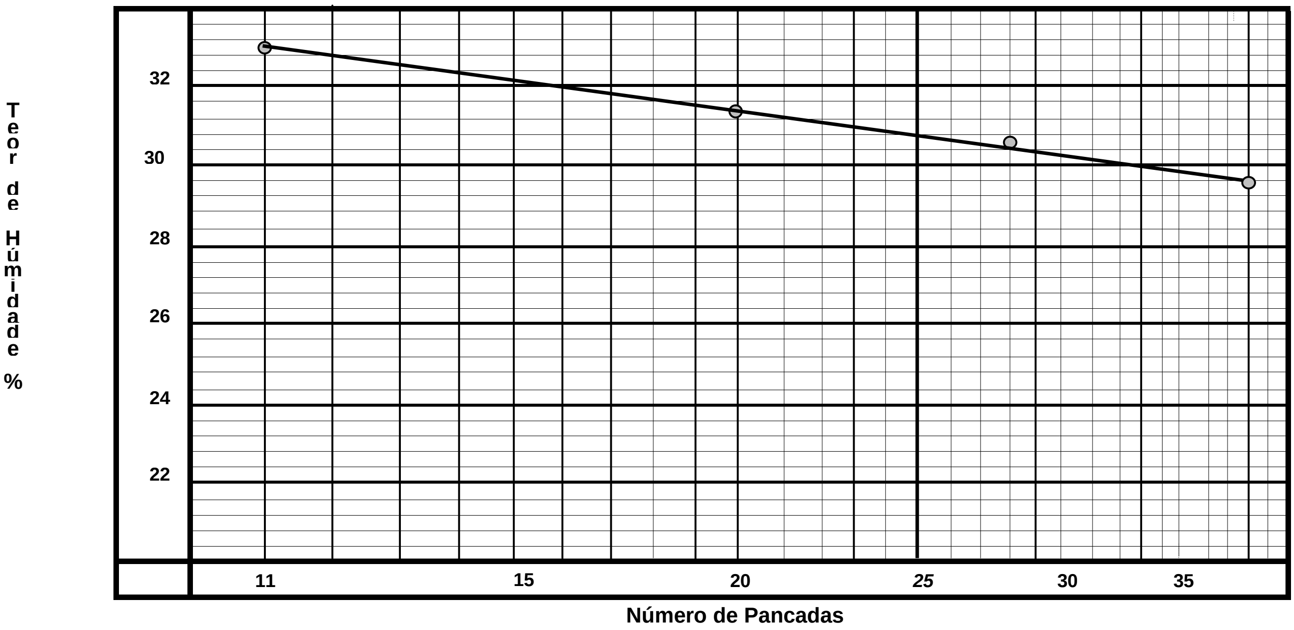
CAMADA ENSAIADA : C.E do km: 256+50 L/D

AMOSTRA Nº : NAM/0020/06 **EFECTUADO POR :** Rafael **VERIFICADO POR:** Rafael **DATA:** 22/11/2006

DESCRIÇÃO DO SOLO : Areia argilosa Castanho Escuro com Laterite

1. DETERMINAÇÃO DO LIMITE DE LIQUIDEZ

Nº da Cápsula		**Nº**	1	2	3	4				
Peso Solo Húmido + Cápsula	**(P0)**	**gr**	25.10	25.67	24.80	24.6				
Peso Solo Seco + Cápsula	**(P1)**	**gr**	22.80	23.30	22.70	22.6				
Peso da Cápsula	**(P2)**	**gr**	15.80	15.74	15.84	15.81				
Peso da Água	**P3 = (P0) - (P1)**	**gr**	2.30	2.37	2.10	2				
Peso do Solo Seco	**P4 = (P1) - (P2)**	**gr**	7.00	7.56	6.86	6.79				
Teor de Húmidade	**W = P3 / P4 x 100**	**gr**	32.9	31.3	30.6	29.5				
Nº de Pancadas		**Nº**	11	20	28	38				



2. DETERMINAÇÃO DO LIMITE DE PLASTICIDADE

Nº da Cápsula		**Nº**	5	6	7					
Peso do Solo Húmido + Cápsula	**(P0)**	**gr**	26.50	25.20	24.9					
Peso Solo Seco + Cápsula	**(P1)**	**gr**	25.10	24.00	23.7					
Peso da Cápsula	**(P2)**	**gr**	15.93	15.95	15.91					
Peso da Água	**P3 = (P0) - (P1)**	**gr**	1.40	1.20	1.2					
Peso do Solo Seco	**P4 = (P1) - (P2)**	**gr**	9.17	8.05	7.79					
Teor de Húmidade	**W = P3 / P4 x 100**	**gr**	15.3	14.9	15.4					

3. DETERMINAÇÃO DO LIMITE DE RETRAÇÃO

Nº do Moulde		**Nº**	2			
Comprimento do Moulde	**(L1)**	**mm**	15.20			
Distância Retraída	**(L2)**	**mm**	1.10			
Retração Linear	**L.S. = (L2) / (L1) x 100**	**%**	7.2			

4. RESUMO RESULTADOS

Limite de Liquidez	31	**%**
Limite Plasticidade	15	**%**
Indice Plasticidade	15	**%**
Limite Retração	7.2	**%**

DEPARTAMENTO DE ESTRADAS E PONTES

LIMITES ATTEBERG

LABORATÒRIO PROVINCIAL **MAPUTO**

CONSULTOR / EMPREITEIRO : Téc. Engs. Consultores

PROJECTO : N13 Nampula/Cuamba

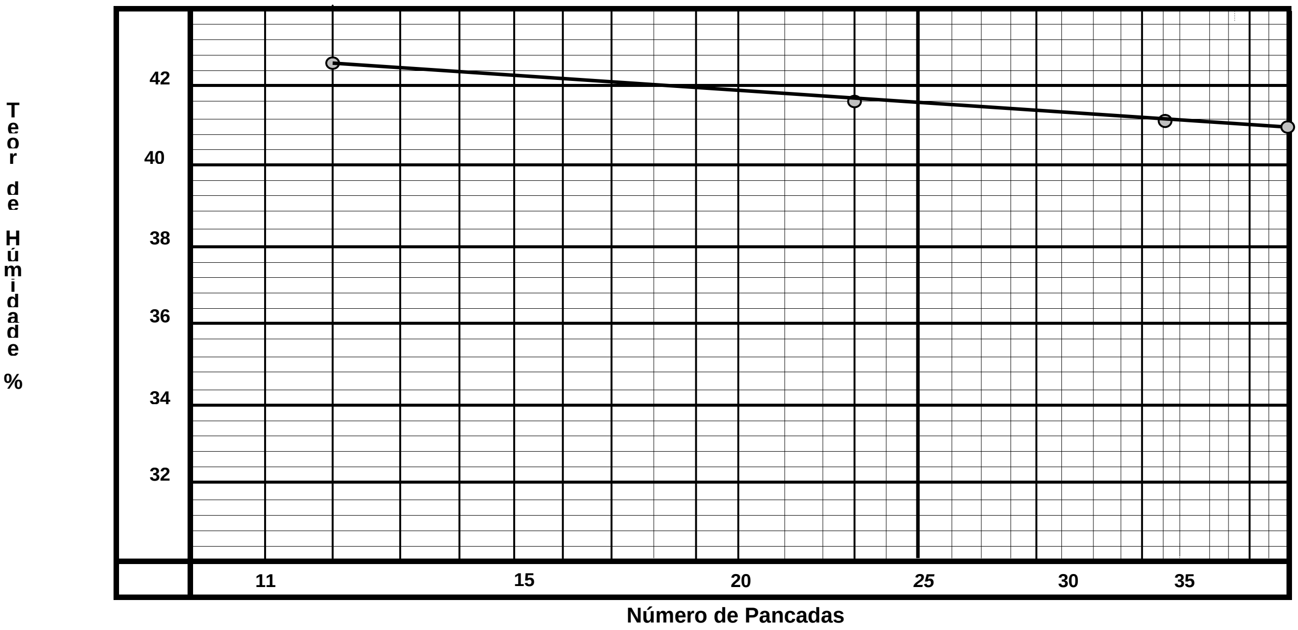
CAMADA ENSAIADA : C.E do km: 332+10 L/D

AMOSTRA Nº : NAM/0021/06 **EFECTUADO POR :** Rafael **VERIFICADO POR:** Rafael **DATA:** 22/11/2006

DESCRIÇÃO DO SOLO : Areia argilosa Castanho Claro com Laterite

1. DETERMINAÇÃO DO LIMITE DE LIQUIDEZ

Nº da Cápsula		**Nº**	8	9	10	11				
Peso Solo Húmido + Cápsula	**(P0)**	**gr**	26.10	23.50	24.06	24				
Peso Solo Seco + Cápsula	**(P1)**	**gr**	23.10	21.30	21.70	21.6				
Peso da Cápsula	**(P2)**	**gr**	16.04	16.03	15.96	15.74				
Peso da Água	**P3 = (P0) - (P1)**	**gr**	3.00	2.20	2.36	2.4				
Peso do Solo Seco	**P4 = (P1) - (P2)**	**gr**	4.06	8.27	5.74	5.86				
Teor de Húmidade	**W = P3 / P4 x 100**	**gr**	42.5	41.7	41.1	41.0				
Nº de Pancadas		**Nº**	12	23	34	40				



2. DETERMINAÇÃO DO LIMITE DE PLASTICIDADE

Nº da Cápsula		**Nº**	12	13	14					
Peso do Solo Húmido + Cápsula	**(P0)**	**gr**	26.30	28.40	27.7					
Peso Solo Seco + Cápsula	**(P1)**	**gr**	24.40	26.20	25.6					
Peso da Cápsula	**(P2)**	**gr**	16.04	16.13	16.14					
Peso da Água	**P3 = (P0) - (P1)**	**gr**	1.90	2.20	2.1					
Peso do Solo Seco	**P4 = (P1) - (P2)**	**gr**	8.36	10.07	9.46					
Teor de Húmidade	**W = P3 / P4 x 100**	**gr**	22.7	21.8	22.2					

3. DETERMINAÇÃO DO LIMITE DE RETRAÇÃO

Nº do Moulde		**Nº**	1			
Comprimento do Moulde	**(L1)**	**mm**	15.20			
Distância Retraída	**(L2)**	**mm**	1.40			
Retração Linear	**L.S. = (L2) / (L1) x 100**	**%**	9.2			

4. RESUMO RESULTADOS

Limite de Liquidez	42	**%**
Limite Plasticidade	22	**%**
Indice Plasticidade	19	**%**
Limite Retração	9.2	**%**

CONSULTOR / EMPREITEIRO : TÉC. ENGS. CONSULTORES DATA: 2006/6/11
PROJECTO : N13 NAMPULA/CUAMBA
CAMADA ENSAIADA : C.E Km: 79+00 L/E VERIF. POR:
AMOSTRA Nº : NAM/0017/06 EFECT. POR : RAFAEL
DESCRIÇÃO DO SOLO : AREIA ARGILOSA CASTANHA CLARA COM LATERITE

DETERMINAÇÃO DO PESO ESPECIFÍCO

Nº do Picnómetro	Nº					
Peso da Brita + Picnómetro (P1)	gr					
Peso da Brita + Água + Picnómetro (P2)	gr					
Peso do Picnómetro + Água (P3)	gr					
Peso da Picnómetro (P4)	gr					
Peso da Brita Ps= (P1)-(P4)	gr					
Peso da Água - Volume da Brita P6= (P2)-(P1)	gr					
Peso da Água P7= (P3)-(P4)	gr					
Volume da Brita Vs=P7-P6	cc					
Peso Específico SG=Ps/Vs	_					

DETERMINAÇÃO DA ABSORÇÃO DE ÁGUA

Nº Da Cápsula	Nº					
Peso da Cápsula + Brita Seca (P1)	gr					
Peso da Cápsula + Brita Molhada * (P2)	gr					
Peso da Cápsula (P3)	gr					
Peso da Água P4=(P2)-(P1)	gr					
Peso da Brita Seca P5= (P1)-(P3)	gr					
Absorção de Água W=P4/P5x100	%					

DETERMINAÇÃO DA BARIDADE APARENTE

Nº Da Molde	Nº					
Peso da Brita + Molde (P1)	gr					
Peso do Molde (P2)	gr					
Peso da Brita (P3)=(P1)-(P2)	gr					
Volume do Molde V	cc					
Baridade da Brita Bs=P3/V	gr/cc					

DETERMINAÇÃO DO TEOR DE HUMIDADE

Nº Da Cápsula	Nº	1	2	3		
Peso Do Solo Húmido + Cápsula (P1)	gr	326.1	315.2	293		
Peso Do Solo Seco + Cápsula (P2)	gr	311.1	301.4	284.9		
Peso da Cápsula (P3)	gr	84.3	84.5	84.5		
Peso da Água P4=(P1)-(P2)	gr	15	13.8	8.1		
Peso do Solo Seco P5= (P2)-(P3)	gr	226.8	216.9	200.4		
Teor de Húmidade W=P4/P5x100	%	6.6	6.4	4.0		

MÉDIA = 5.7 %

CONSULTOR / EMPREITEIRO : TÉC. ENGS. CONSULTORES DATA: 2006/6/11
PROJECTO : N13 NAMPULA/CUAMBA
CAMADA ENSAIADA : C.E Km: 124+00 L/D "NAMIGONHA" VERIF. POR:
AMOSTRA Nº : NAM/0018/06 EFECT. POR : RAFAEL
DESCRIÇÃO DO SOLO AREIA ARGILOSA CASTANHA CLARA COM CASCALHO "LATERITE"

DETERMINAÇÃO DO PESO ESPECIFÍCO

Nº do Picnómetro		Nº					
Peso da Brita + Picnómetro	(P1)	gr					
Peso da Brita + Água + Picnómetro	(P2)	gr					
Peso do Picnómetro + Água	(P3)	gr					
Peso da Picnómetro	(P4)	gr					
Peso da Brita	Ps= (P1)-(P4)	gr					
Peso da Água - Volume da Brita	P6= (P2)-(P1)	gr					
Peso da Água	P7= (P3)-(P4)	gr					
Volume da Brita	Vs=P7-P6	cc					
Peso Específico	SG=Ps/Vs	_					

DETERMINAÇÃO DA ABSORÇÃO DE ÁGUA

Nº Da Cápsula		Nº					
Peso da Cápsula + Brita Seca	(P1)	gr					
Peso da Cápsula + Brita Molhada *	(P2)	gr					
Peso da Cápsula	(P3)	gr					
Peso da Água	P4=(P2)-(P1)	gr					
Peso da Brita Seca	P5= (P1)-(P3)	gr					
Absorção de Água	W=P4/P5x100	%					

DETERMINAÇÃO DA BARIDADE APARENTE

Nº Da Molde		Nº					
Peso da Brita + Molde	(P1)	gr					
Peso do Molde	(P2)	gr					
Peso da Brita	(P3)=(P1)-(P2)	gr					
Volume do Molde	V	cc					
Baridade da Brita	Bs=P3/V	gr/cc					

DETERMINAÇÃO DO TEOR DE HUMIDADE

Nº Da Cápsula		Nº	4	5	6		
Peso Do Solo Húmido + Cápsula	(P1)	gr	389.4	394.8	351.2		
Peso Do Solo Seco + Cápsula	(P2)	gr	384.3	389.2	347		
Peso da Cápsula	(P3)	gr	84.4	83.7	84		
Peso da Água	P4=(P1)-(P2)	gr	5.1	5.6	4.2		
Peso do Solo Seco	P5= (P2)-(P3)	gr	299.9	305.5	263		
Teor de Húmidade	W=P4/P5x100	%	1.7	1.8	1.6		

MÉDIA = 1.7 %

CONSULTOR / EMPREITEIRO : TÉC. ENGS. CONSULTORES DATA: 2006/6/11
PROJECTO:13 NAMPULA/CUAMBA " MALEMA"
CAMADA ENSAIADA : C.E Km: 204+00 L/E "CACHE" VERIF. POR:
AMOSTRA Nº : NAM/0019/06 EFECT. POR : RAFAEL
DESCRIÇÃO DO SOLO : AREIA ARGILOSA CASTANHA ESCURA COM CASCALHO "LATERITE"

DETERMINAÇÃO DO PESO ESPECIFÍCO

Nº do Picnómetro		Nº					
Peso da Brita + Picnómetro	(P1)	gr					
Peso da Brita + Água + Picnómetro	(P2)	gr					
Peso do Picnómetro + Água	(P3)	gr					
Peso da Picnómetro	(P4)	gr					
Peso da Brita	Ps= (P1)-(P4)	gr					
Peso da Água - Volume da Brita	P6= (P2)-(P1)	gr					
Peso da Água	P7= (P3)-(P4)	gr					
Volume da Brita	Vs=P7-P6	cc					
Peso Específico	SG=Ps/Vs	_					

DETERMINAÇÃO DA ABSORÇÃO DE ÁGUA

Nº Da Cápsula		Nº					
Peso da Cápsula + Brita Seca	(P1)	gr					
Peso da Cápsula + Brita Molhada *	(P2)	gr					
Peso da Cápsula	(P3)	gr					
Peso da Água	P4=(P2)-(P1)	gr					
Peso da Brita Seca	P5= (P1)-(P3)	gr					
Absorção de Água	W=P4/P5x100	%					

DETERMINAÇÃO DA BARIDADE APARENTE

Nº Da Molde		Nº					
Peso da Brita + Molde	(P1)	gr					
Peso do Molde	(P2)	gr					
Peso da Brita	(P3)=(P1)-(P2)	gr					
Volume do Molde	V	cc					
Baridade da Brita	Bs=P3/V	gr/cc					

DETERMINAÇÃO DO TEOR DE HUMIDADE

Nº Da Cápsula		Nº	7	8	9		
Peso Do Solo Húmido + Cápsula	(P1)	gr	382.3	401	362		
Peso Do Solo Seco + Cápsula	(P2)	gr	376.9	394.8	356.1		
Peso da Cápsula	(P3)	gr	84.6	85	84.5		
Peso da Água	P4=(P1)-(P2)	gr	5.4	6.2	5.9		
Peso do Solo Seco	P5= (P2)-(P3)	gr	292.3	309.8	271.6		
Teor de Húmidade	W=P4/P5x100	%	1.8	2.0	2.2		

MÉDIA = 2.0 %

CONSULTOR / EMPREITEIRO : TÉC. ENGS. CONSULTORES
DATA: 2006/6/11
PROJECTO:13 NAMPULA/CUAMBA "MALEMA"
CAMADA ENSAIADA : C.E Km: 256+50 L/D 100m DO EIXO
VERIF. POR:
AMOSTRA Nº : NAM/0020/06
EFECT. POR : RAFAEL
DESCRIÇÃO DO SOLO : AREIA ARGILOSA CASTANHA ESCURA COM CASCALHO "LATERITE"

DETERMINAÇÃO DO PESO ESPECIFÍCO

Nº do Picnómetro	Nº					
Peso da Brita + Picnómetro (P1)	gr					
Peso da Brita + Água + Picnómetro (P2)	gr					
Peso do Picnómetro + Água (P3)	gr					
Peso da Picnómetro (P4)	gr					
Peso da Brita Ps= (P1)-(P4)	gr					
Peso da Água - Volume da Brita P6= (P2)-(P1)	gr					
Peso da Água P7= (P3)-(P4)	gr					
Volume da Brita Vs=P7-P6	cc					
Peso Específico SG=Ps/Vs	_					

DETERMINAÇÃO DA ABSORÇÃO DE ÁGUA

Nº Da Cápsula	Nº					
Peso da Cápsula + Brita Seca (P1)	gr					
Peso da Cápsula + Brita Molhada * (P2)	gr					
Peso da Cápsula (P3)	gr					
Peso da Água P4=(P2)-(P1)	gr					
Peso da Brita Seca P5= (P1)-(P3)	gr					
Absorção de Água W=P4/P5x100	%					

DETERMINAÇÃO DA BARIDADE APARENTE

Nº Da Molde	Nº					
Peso da Brita + Molde (P1)	gr					
Peso do Molde (P2)	gr					
Peso da Brita (P3)=(P1)-(P2)	gr					
Volume do Molde V	cc					
Baridade da Brita Bs=P3/V	gr/cc					

DETERMINAÇÃO DO TEOR DE HUMIDADE

Nº Da Cápsula	Nº	10	11	12		
Peso Do Solo Húmido + Cápsula (P1)	gr	484.5	545.3	446.3		
Peso Do Solo Seco + Cápsula (P2)	gr	475.9	537	438.7		
Peso da Cápsula (P3)	gr	84.5	84.5	84.4		
Peso da Água P4=(P1)-(P2)	gr	8.6	8.3	7.6		
Peso do Solo Seco P5= (P2)-(P3)	gr	391.4	452.5	354.3		
Teor de Húmidade W=P4/P5x100	%	2.2	1.8	2.1		

MÉDIA = 2.1 %

CONSULTOR / EMPREITEIRO : TÉC. ENGS. CONSULTORES DATA: 2006/6/11

PROJECTO: 13 NAMPULA/CUAMBA "CUAMBA"

CAMADA ENSAIADA : C.E Km: 332+10 L/D VERIF. POR:

AMOSTRA Nº : NAM/0021/06 EFECT. POR : RAFAEL

DESCRIÇÃO DO SOLO : AREIA ARGILOSA CASTANHA ESCURA COM CASCALHO "LATERITE"

DETERMINAÇÃO DO PESO ESPECIFÍCO

Nº do Picnómetro		Nº					
Peso da Brita + Picnómetro	(P1)	gr					
Peso da Brita + Água + Picnómetro	(P2)	gr					
Peso do Picnómetro + Água	(P3)	gr					
Peso da Picnómetro	(P4)	gr					
Peso da Brita	Ps= (P1)-(P4)	gr					
Peso da Água - Volume da Brita	P6= (P2)-(P1)	gr					
Peso da Água	P7= (P3)-(P4)	gr					
Volume da Brita	Vs=P7-P6	cc					
Peso Específico	SG=Ps/Vs	_					

DETERMINAÇÃO DA ABSORÇÃO DE ÁGUA

Nº Da Cápsula		Nº					
Peso da Cápsula + Brita Seca	(P1)	gr					
Peso da Cápsula + Brita Molhada *	(P2)	gr					
Peso da Cápsula	(P3)	gr					
Peso da Água	P4=(P2)-(P1)	gr					
Peso da Brita Seca	P5= (P1)-(P3)	gr					
Absorção de Água	W=P4/P5x100	%					

DETERMINAÇÃO DA BARIDADE APARENTE

Nº Da Molde		Nº					
Peso da Brita + Molde	(P1)	gr					
Peso do Molde	(P2)	gr					
Peso da Brita	(P3)=(P1)-(P2)	gr					
Volume do Molde	V	cc					
Baridade da Brita	Bs=P3/V	gr/cc					

DETERMINAÇÃO DO TEOR DE HUMIDADE

Nº Da Cápsula		Nº	13	14	15		
Peso Do Solo Húmido + Cápsula	(P1)	gr	427	406.2	342.8		
Peso Do Solo Seco + Cápsula	(P2)	gr	418.5	396.9	335.1		
Peso da Cápsula	(P3)	gr	84.1	84.8	84.4		
Peso da Água	P4=(P1)-(P2)	gr	8.5	9.3	7.7		
Peso do Solo Seco	P5= (P2)-(P3)	gr	334.4	312.1	250.7		
Teor de Húmidade	W=P4/P5x100	%	2.5	3.0	3.1		

MÉDIA = 2.9 %

Moçambique

FORM T6

DEPARTAMENTO DE ESTRADAS E PONTES

LABORATÓRIO PROVINCIAL Nampula

(✓)

CONSULTOR / EMPREITEIRO : Téc. eng. Consultores DATA : 06/11/06
PROJECTO : A13 Nampula / Cuamba 1' Cuamba
CAMADA ENSAIADA C.E. do Km: 322+10 LD
AMOSTRA Nº : Nam/00021/06 ENSAIO EFECTUADO POR : Rafael
DESCRIÇÃO DO SOLO : Areia argilosa castanha clara c/ cascalho "laterite"

DETERMINAÇÃO DO PESO ESPECIFÍCO

Nº do Picnómetro		Nº						
Peso da Brita + Picnómetro	(P1)	gr						
Peso da Brita + Água + Picnómetro	(P2)	gr						
Peso Picnómetro + Água	(P3)	gr						
Peso do Picnómetro	(P4)	gr						
Peso da Brita	Ps=(P1)-(P4)	gr						
Peso Água - Volume da Brita	P6=(P2)-(P1)	gr						
Peso da Água	P7=(P3)-(P4)	gr						
Volume da Brita	Vs=P7-P6	cc						
Peso Específico	SG=Ps/Vs	-						

DETERMINAÇÃO DA ABSORÇÃO DE ÁGUA

Nº da Cápsula		Nº						
Peso da Cápsula + Brita Seca	(P1)	gr						
Peso da Cápsula + Brita Molhada *	(P2)	gr						
Peso da Cápsula	(P3)	gr						
Peso da Água	P4=(P2)-(P1)	gr						
Peso da Brita Seca	P5=(P1)-(P3)	gr						
Absorção de Água	W=P4/P5x100	%						

DETERMINAÇÃO DA BARIDADE APARENTE

Nº do Molde		Nº						
Peso da Brita+ Molde	(P1)	gr						
Peso do Molde	(P2)	gr						
Peso da Brita	P3=(P1)-(P2)	gr						
Volume do Molde	V	cc						
Baridade da Brita	Bs=P3/V	gr/cc						

DETERMINAÇÃO DO TEOR DE HÚMIDADE

Nº da Cápsula		Nº	13	14	15			
Peso do Solo Húmido + Cápsula	(P1)	gr	427.00	406.20	342.80			
Peso do Solo Seco + Cápsula	(P2)	gr	418.50	396.90	335.10			
Peso da Cápsula	(P3)	gr	84.10	84.80	84.40			
Peso da Água	P4=(P1)-(P2)	gr	8.50	9.30	7.70			
Peso do Solo Seco	P5=(P2)-(P3)	gr	334.40	312.10	250.70	média – 2.9%		
Teor de Húmidade	W=P4/P5x100	%	2.5	3.0	3.1			

Appendix B-6

QUARRY TEST

CONSULTOR / EMPREITEIRO : **TÉC. ENGS. CONSULTORES** DATA: 29/11/2006
PROJECTO : N13 NAMPULA/CUAMBA-NAMIALO
CAMADA ENSAIADA : PEDREIRA DE NAMIALO Km: 92+00 L/E ; 0.5 mm VERIF. POR:
AMOSTRA Nº : NAM/Q/01 EFECT. POR : RAFAEL
DESCRIÇÃO DO SOLO :

DETERMINAÇÃO DO ACV

Nº da Amostras	Nº	1			
Peso Total da Amostra Seca Após o Ensaio (P1)	gr	2039.7	2670.6		
Peso da Fracção Passada no Peneiro 2.36 (P2)	gr	562.0	761.7		
ACV da Amostra Seca ACV=(P2)/(P1)*100	%	27.6	28.5		
ACV Médio	%	28.0			

DETERMINAÇÃO DO 10% FACT

Nº da Amostras	Nº				
Força Aplicada em KN _______	KN				
Peso Total da Amostra Seca Após o Ensaio (P1)	gr				
Peso da Fracção Passada no Peneiro 2.36 (P2)	gr				
% FACT da Amostra Seca 10%FACT=(P2)/(P1)x100	KN				
% FACT Seco Médio	KN				
Peso Total Da Amostra Seca Após o Ensaio Satur. W=P4/P5x100	gr				
Peso da Fracção Passada no Peneiro _______ (P2)	gr				
10% FACT da Amostra Saturada 10% FACT=(P2)/(P1)*100	KN				
10% FACT da Amostra Média	KN				
% Perda de Resistência Média 10% FACT/10% FACTx100	%				

DETERMINAÇÃO DO INDICE DE LAMELAÇÃO

Amostra Nº	Nº				
Peso Total da Amostra - 26.6mm+19.0mm (P1)	gr				
Peso da Amostra Passada - 25.5mm+19.0mm (P2)	gr				
Indice Lamentação - 25.5mm+19.0mm IL=(P2)/(P1)x100	%				
Indice Lamentação Médio - 25.5mm+19.0mm	%				
Peso Total da Amostra - 19.0mm + 13.2mm	gr				
Peso Da Amostra Passada - 19.0mm + 13.2mm	gr				
Indice de Lamelação - 19.0mm + 13.2mm	%				
Indice de Lamelação Médio - 19.0mm + 13.2mm					
Peso Total da Amostra - 13.2mm + 9.5mm	gr				
Peso da Amostra Passada - 13.2mm + 9.5mm	gr				
Indice de Lamelação - 13.2mm + 9.5mm	%				
Indice de Lamelação Médio - 13.2mm + 9.5mm	%				
Peso Total da Amostra - 9.5mm + 6.7mm	gr				
Peso da Amostra Passada - 9.5mm + 6.7mm	gr				
Indice de Lamelação - 9.5mm + 6.7mm	%				
Indice de Lamelação Médio - 9.5mm + 6.7mm					

CONSULTOR / EMPREITEIRO : TÉC. ENGS. CONSULTORES DATA: 29/11/2006
PROJECTO 13 NAMPULA/CUAMBA - CARAMACHA-2
CAMADA ENSAIADA : PEDREIRA DO Km: 60+30 L/D VERIF. POR:
AMOSTRA Nº : NAM/Q/02 EFECT. POR : RAFAEL
DESCRIÇÃO DO SOLO :

DETERMINAÇÃO DO ACV

Nº da Amostras	Nº	2			
Peso Total da Amostra Seca Após o Ensaio (P1)	gr	3055.6	1711.9		
Peso da Fracção Passada no Peneiro 2.36 (P2)	gr	118.3	672.5		
ACV da Amostra Seca ACV=(P2)/(P1)*100	%	3.9	39.3		
ACV Médio	%	21.6			

DETERMINAÇÃO DO 10% FACT

Nº da Amostras	Nº				
Força Aplicada em KN _______	KN				
Peso Total da Amostra Seca Após o Ensaio (P1)	gr				
Peso da Fracção Passada no Peneiro 2.36 (P2)	gr				
% FACT da Amostra Seca 10%FACT=(P2)/(P1)x100	KN				
% FACT Seco Médio	KN				
Peso Total Da Amostra Seca Após o Ensaio Satur. W=P4/P5x100	gr				
Peso da Fracção Passada no Peneiro _______ (P2)	gr				
10% FACT da Amostra Saturada 10% FACT=(P2)/(P1)*100	KN				
10% FACT da Amostra Média	KN				
% Perda de Resistência Média 10% FACT/10% FACTx100	%				

DETERMINAÇÃO DO INDICE DE LAMELAÇÃO

Amostra Nº	Nº				
Peso Total da Amostra - 26.6mm+19.0mm (P1)	gr				
Peso da Amostra Passada - 25.5mm+19.0mm (P2)	gr				
Indice Lamentação - 25.5mm+19.0mm IL=(P2)/(P1)x100	%				
Indice Lamentação Médio - 25.5mm+19.0mm	%				
Peso Total da Amostra - 19.0mm + 13.2mm	gr				
Peso Da Amostra Passada - 19.0mm + 13.2mm	gr				
Indice de Lamelação - 19.0mm + 13.2mm	%				
Indice de Lamelação Médio - 19.0mm + 13.2mm					
Peso Total da Amostra - 13.2mm + 9.5mm	gr				
Peso da Amostra Passada - 13.2mm + 9.5mm	gr				
Indice de Lamelação - 13.2mm + 9.5mm	%				
Indice de Lamelação Médio - 13.2mm + 9.5mm	%				
Peso Total da Amostra - 9.5mm + 6.7mm	gr				
Peso da Amostra Passada - 9.5mm + 6.7mm	gr				
Indice de Lamelação - 9.5mm + 6.7mm	%				
Indice de Lamelação Médio - 9.5mm + 6.7mm					

CONSULTOR / EMPREITEIRO : TÉC. ENGS. CONSULTORES DATA: 29/11/2006
PROJECTO : N13 NAMPULA/CUAMBA-RIBANÉ
CAMADA ENSAIADA : PEDREIRA RIBANÉ-CUAMBA Km: 10+00 L/E VERIF. POR:
AMOSTRA Nº : NAM/Q/03 EFECT. POR : RAFAEL
DESCRIÇÃO DO SOLO :

DETERMINAÇÃO DO ACV

Nº da Amostras		Nº	3			
Peso Total da Amostra Seca Após o Ensaio	(P1)	gr	3123.5	2896.3		
Peso da Fracção Passada no Peneiro 2.36	(P2)	gr	1241.3	1047.3		
ACV da Amostra Seca	ACV=(P2)/(P1)*100	%	39.7	36.2		
ACV Médio		%	38.0			

DETERMINAÇÃO DO 10% FACT

Nº da Amostras		Nº				
Força Aplicada em KN _______		KN				
Peso Total da Amostra Seca Após o Ensaio	(P1)	gr				
Peso da Fracção Passada no Peneiro 2.36	(P2)	gr				
% FACT da Amostra Seca	10%FACT=(P2)/(P1)x100	KN				
% FACT Seco Médio		KN				
Peso Total Da Amostra Seca Após o Ensaio Satur. W=P4/P5x100		gr				
Peso da Fracção Passada no Peneiro _______	(P2)	gr				
10% FACT da Amostra Saturada	10% FACT=(P2)/(P1)*100	KN				
10% FACT da Amostra Média		KN				
% Perda de Resistência Média	10% FACT/10% FACTx100	%				

DETERMINAÇÃO DO INDICE DE LAMELAÇÃO

Amostra Nº		Nº				
Peso Total da Amostra - 26.6mm+19.0mm	(P1)	gr				
Peso da Amostra Passada - 25.5mm+19.0mm	(P2)	gr				
Indice Lamentação - 25.5mm+19.0mm	IL=(P2)/(P1)x100	%				
Indice Lamentação Médio - 25.5mm+19.0mm		%				
Peso Total da Amostra - 19.0mm + 13.2mm		gr				
Peso Da Amostra Passada - 19.0mm + 13.2mm		gr				
Indice de Lamelação - 19.0mm + 13.2mm		%				
Indice de Lamelação Médio - 19.0mm + 13.2mm						
Peso Total da Amostra - 13.2mm + 9.5mm		gr				
Peso da Amostra Passada - 13.2mm + 9.5mm		gr				
Indice de Lamelação - 13.2mm + 9.5mm		%				
Indice de Lamelação Médio - 13.2mm + 9.5mm		%				
Peso Total da Amostra - 9.5mm + 6.7mm		gr				
Peso da Amostra Passada - 9.5mm + 6.7mm		gr				
Indice de Lamelação - 9.5mm + 6.7mm		%				
Indice de Lamelação Médio - 9.5mm + 6.7mm						

CONSULTOR / EMPREITEIRO : TÉC. ENGS. CONSULTORES DATA: 29/11/2006
PROJECTO : N13 NAMPULA/CUAMBA-MALEMA/NPL
CAMADA ENSAIADA : PEDREIRA DE MALEMA Km: 11+50 L/E VERIF. POR:
AMOSTRA Nº : NAM/Q/04 EFECT. POR : RAFAEL
DESCRIÇÃO DO SOLO :

DETERMINAÇÃO DO ACV

Nº da Amostras	Nº	4			
Peso Total da Amostra Seca Após o Ensaio (P1)	gr	3037.9	3046		
Peso da Fracção Passada no Peneiro 2.36 (P2)	gr	848.0	864.9		
ACV da Amostra Seca ACV=(P2)/(P1)*100	%	27.9	28.4		
ACV Médio	%	28.2			

DETERMINAÇÃO DO 10% FACT

Nº da Amostras	Nº				
Força Aplicada em KN _______	KN				
Peso Total da Amostra Seca Após o Ensaio (P1)	gr				
Peso da Fracção Passada no Peneiro 2.36 (P2)	gr				
% FACT da Amostra Seca 10%FACT=(P2)/(P1)x100	KN				
% FACT Seco Médio	KN				
Peso Total Da Amostra Seca Após o Ensaio Satur. W=P4/P5x100	gr				
Peso da Fracção Passada no Peneiro _______ (P2)	gr				
10% FACT da Amostra Saturada 10% FACT=(P2)/(P1)*100	KN				
10% FACT da Amostra Média	KN				
% Perda de Resistência Média 10% FACT/10% FACTx100	%				

DETERMINAÇÃO DO INDICE DE LAMELAÇÃO

Amostra Nº	Nº				
Peso Total da Amostra - 26.6mm+19.0mm (P1)	gr				
Peso da Amostra Passada - 25.5mm+19.0mm (P2)	gr				
Indice Lamentação - 25.5mm+19.0mm IL=(P2)/(P1)x100	%				
Indice Lamentação Médio - 25.5mm+19.0mm	%				
Peso Total da Amostra - 19.0mm + 13.2mm	gr				
Peso Da Amostra Passada - 19.0mm + 13.2mm	gr				
Indice de Lamelação - 19.0mm + 13.2mm	%				
Indice de Lamelação Médio - 19.0mm + 13.2mm					
Peso Total da Amostra - 13.2mm + 9.5mm	gr				
Peso da Amostra Passada - 13.2mm + 9.5mm	gr				
Indice de Lamelação - 13.2mm + 9.5mm	%				
Indice de Lamelação Médio - 13.2mm + 9.5mm	%				
Peso Total da Amostra - 9.5mm + 6.7mm	gr				
Peso da Amostra Passada - 9.5mm + 6.7mm	gr				
Indice de Lamelação - 9.5mm + 6.7mm	%				
Indice de Lamelação Médio - 9.5mm + 6.7mm					

CONSULTOR / EMPREITEIRO : TÉC. ENGS. CONSULTORES **DATA:** 2006/1/12
PROJECTO : N13 NAMPULA/CUAMBA
CAMADA ENSAIADA : PEDREIRA: CUAMBA/LICHINGA Km: 36+00 L/D **VERIF. POR:**
AMOSTRA Nº : NAM/Q/05 **EFECT. POR :** RAFAEL
DESCRIÇÃO DO SOLO :

DETERMINAÇÃO DO ACV

Nº da Amostras	Nº	5			
Peso Total da Amostra Seca Após o Ensaio (P1)	gr	3470.5	2168		
Peso da Fracção Passada no Peneiro 2.36 (P2)	gr	741.7	520.8		
ACV da Amostra Seca ACV=(P2)/(P1)*100	%	21.4	24.0		
ACV Médio	%	22.7			

DETERMINAÇÃO DO 10% FACT

Nº da Amostras	Nº				
Força Aplicada em KN _______	KN				
Peso Total da Amostra Seca Após o Ensaio (P1)	gr				
Peso da Fracção Passada no Peneiro 2.36 (P2)	gr				
% FACT da Amostra Seca 10%FACT=(P2)/(P1)x100	KN				
% FACT Seco Médio	KN				
Peso Total Da Amostra Seca Após o Ensaio Satur. W=P4/P5x100	gr				
Peso da Fracção Passada no Peneiro _______ (P2)	gr				
10% FACT da Amostra Saturada 10% FACT=(P2)/(P1)*100	KN				
10% FACT da Amostra Média	KN				
% Perda de Resistência Média 10% FACT/10% FACTx100	%				

DETERMINAÇÃO DO INDICE DE LAMELAÇÃO

Amostra Nº	Nº				
Peso Total da Amostra - 26.6mm+19.0mm (P1)	gr				
Peso da Amostra Passada - 25.5mm+19.0mm (P2)	gr				
Indice Lamentação - 25.5mm+19.0mm IL=(P2)/(P1)x100	%				
Indice Lamentação Médio - 25.5mm+19.0mm	%				
Peso Total da Amostra - 19.0mm + 13.2mm	gr				
Peso Da Amostra Passada - 19.0mm + 13.2mm	gr				
Indice de Lamelação - 19.0mm + 13.2mm	%				
Indice de Lamelação Médio - 19.0mm + 13.2mm					
Peso Total da Amostra - 13.2mm + 9.5mm	gr				
Peso da Amostra Passada - 13.2mm + 9.5mm	gr				
Indice de Lamelação - 13.2mm + 9.5mm	%				
Indice de Lamelação Médio - 13.2mm + 9.5mm	%				
Peso Total da Amostra - 9.5mm + 6.7mm	gr				
Peso da Amostra Passada - 9.5mm + 6.7mm	gr				
Indice de Lamelação - 9.5mm + 6.7mm	%				
Indice de Lamelação Médio - 9.5mm + 6.7mm					

Appendix B-7

UCS TEST RESULTS SOIL – CEMENT MIXTURES

TÉCNICA - ENGENHEIROS CONSULTORES, LDA

AV. 25 DE SETEMBRO, NR. 2526, 1ST FLOOR
MAPUTO-MOCAMBIQUE

TELEPHONE: 21322185
FAX: 21322186
E-MAIL: tec@tec.co.mz

UCS SOILCEMENT

ORDEM	km	Nº	PROVETE	COMPOSIÇÃO (%)	ENERGIA	DATA /HORA DA MOLDAGEM	CARGA (kN	RESISTÊNCIA (kPa)*
1	204.30	03	1º provete	95late. + 5cimento	5x25	17,01,07 - 23,01,07/10:00	15.4	1923
2	204.30	03	2º provete	95late. + 5cimento	5x25	17,01,07 - 23,01,07/10:15	15.1	1885
3	204.30	03	3º provete	95late. + 5cimento	5x25	17,01,07 - 23,01,07/11:16	15.7	1960
4	204.30	03	1º provete	96late. + 4cimento	5x25	17,01,07 - 23,01,07/11:15	10.5	1211
5	204.30	03	2º provete	96late. + 4cimento	5x25	17,01,07 - 23,01,07/11:16	13.1	1635
6	204.30	03	3º provete	96late. + 4cimento	5x25	17,01,07 - 23,01,07/10:15		
7	204.30	03	1º provete	97late. + 3cimento	5x25	17,01,07 - 23,01,07/08;00	8.6	1074
8	204.30	03	2º provete	97late. + 3cimento	5x25	17,01,07 - 23,01,07/08:15	6.8	849
9	256.50	03	3º provete	97late. + 3cimento	5x25	17,01,07 - 23,01,07/08:30	8.5	1061
10	256.50	04	1º provete	95late. + 5cimento	3x25	17,01,07 - 23,01,07/13:30	19.5	2434
11	256.50	04	2º provete	95late. + 5cimento	5x25	17,01,07 - 23,01,07/12:30	20.5	2559
12	256.50	04	3º provete	96late. + 4cimento	5x25	17,01,07 - 23,01,07/12:15	18.9	2360
13	256.50	04	1º provete	96late. + 4cimento	5x25	17,01,07 - 23,01,07/11:30	11.0	1373
14	256.50	04	2º provete	96late. + 4cimento	5x25	17,01,07 - 23,01,07/sem hora	19.3	2409
15	256.50	04	3º provete	97late. + 3cimento	5x25	17,01,07 - 23,01,07/10:00	17.2	2147
16	256.50	04	1º provete	97late. + 3cimento	5x25	17,01,07 - 23,01,07/09:30	20.2	2522
17	256.50	04	2º provete	97late. + 3cimento	5x25	17,01,07 - 23,01,07/09:15	19.3	2409
18	256.50	04	3º provete	96late. + 4cimento	5x25	17,01,07 - 23,01,07/09:00	9.5	1186
19	332.10	05	1º provete	95late. + 5cimento	5x25	18,01,07/11:10	18.4	2297
20	332.10	05	2º provete	95late. + 5cimento	5x25	18,01,07/11:55	15.3	1910
21	332.10	05	3º provete	95late. + 5cimento	5x25	sem data/11:40	13.1	1635
22	332.10	05	1º provete	96late. + 4cimento	5x25	sem data/10:31	6.0	749
23	332.10	05	2º provete	96late. + 4cimento	5x25	18,01,07/10:35	6.8	849
24	332.10	05	3º provete	97late. + 3cimento	5x25	sem data/09:45		
25	332.10	05	1º provete	97late. + 3cimento	5x25	18,01,07/09:40	10.8	1348
26	332.10	05	2º provete	97late. + 3cimento	5x25	18,01,07/09:25	9.6	1199
27	332.10	05	3º provete	96late. + 4cimento	5x25	18,01,07/10:55	8.7	1086.1

Appendix B-8

CBR TEST RESULTS MATERIAL MIXTURES

CONSULTOR / EMPREITEIRO : TÉC. ENGS. CONSULTORES DATA: 16-01-06
PROJECTO : N13 NAMPULA/CUAMBA
CAMADA ENSAIADA : C.E DO Km: 79+00 L/E NAMIALO VERIF. POR:
AMOSTRA Nº : NAM/0016/07 EFECT. POR : RAFAEL
DESCRIÇÃO DO SOLO : AREIA ARGILOSA CASTANHO CLARO COM CASCALHO

ENSAIO DE COMPACTAÇÃO
Barid. Seca Máx. 2.152 gr/cm3
Teor Ópt. Água 16.6 %

DETERMINAÇÃO DO TEOR DE HUMIDADE

			Hygroscópico		Depois da Mistura		
Nº da Cápsula/Molde		Nº			15	16	17
Peso do Solo Húmido + Cápsula	(P0)	gr			301.31	325.11	340.57
Peso do Solo Seco + Cápsula	(P1)	gr			272.20	289.80	303.90
Peso da Cápsula	(P2)	gr			84.40	84.50	84.30
Peso da Água	(P3)= (P0)-(P1)	gr			29.11	35.31	36.67
Peso do Solo Seco	(P4)=(P1)-(P2)	gr			187.80	205.30	219.60
Teor de Húmidade	W=(P3)/(P4)x100	%		5.5	15.5	17.2	16.7

Água a Adicionar

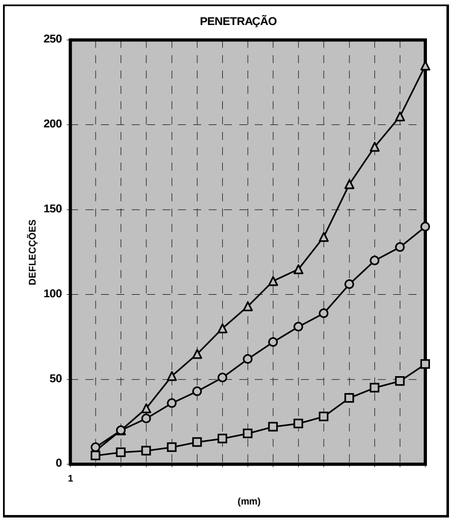
Óptimo % (a) 16.6
Hygroscópico % (b) 5.5
Volume de Água =
Solo seco x(100+a) - Solo seco =
100
= 1894

Moldagem

Compactação			55x10x5	25x10x5	55x5,5x3
Nº do Molde	Nº	Nº	4	5	6
Peso do Molde + Solo Húmido	(M0)	gr	11490	11250	10937
Peso do Molde	(M1)	gr	6218	6239	6175
Peso do Solo Húmido	(M2)=(M0)-(M1)	gr	5272	5011	4762
Volume do Molde	V	cc	2104	2104	2104
Baridade Húmida do Solo	Dh=(M2)/V	gr/cc	2.506	2.382	2.263
Teor Húmidade da Moldagem	W	%	16.5	16.5	16.5
Baridade Seca do Solo	Ds=Dhx100/100+W	gr/cc	2.151	2.044	1.943
% de Compactação	Ds/Ds Máx.x100	%	99.0	95.0	90.2
Peso Molde+Solo Após Embebição	(M3)	gr			
Peso Solo Húmid. Final	(M4)=(M3)-(M1)	gr			
Teor Húmidade Final	Wf=[M4-(DsxV)]/(DsxV)	%			

Expansão

Nº do Molde	1	2	3
Leitura Inicial			
Leitura Final			
% Expanção			



Nº Molde	4 △		5 ○		6 □	
% Mod AASHTO	100.0		95.0		90	
Penetração	Leitura	Corrig.	Leitura	Corrig.	Leitura	Corrig.
0.0						
0.5	8		10		5	
1.0	20		20		7	
1.5	33		27		8	
2.0	52		36		10	
2.5*	65	65	43	43	13	13
3.0	80		51		15	
3.5	93		62		18	
4.0	108		72		22	
4.5	115		81		24	
5.0*	134	134	89	89	28	28
6.0	165		106		39	
7.0	187		120		45	
8.0	205		128		49	
9.0	235		140		59	
Factor do Anel			0.012 KN			
CBR	2.5mm=13.344KN		5.0mm=20.016KN		7.5mm=25.354KN	
2,5mm *	5.8		3.9		1.2	
5,0mm **	8.0		5.3		1.7	
% Compactação						
CBR 2,5mm						
CBR 5,0mm						

CONSULTOR / EMPREITEIRO : TÉC. ENGS. CONSULTORES DATA: 15-01-06
PROJECTO : N13 NAMPULA/CUAMBA
CAMADA ENSAIADA : C.E DO Km: 124+20 L/D LAT.02 VERIF. POR:
AMOSTRA Nº : NAM/0017/07 EFECT. POR : RAFAEL
DESCRIÇÃO DO SOLO : AREIA ARGILOSA CASTANHO CLARA COM CASCALHO

ENSAIO DE COMPACTAÇÃO

Barid. Seca Máx. 2.287 gr/cm3
Teor Ópt. Água 7.6 %

DETERMINAÇÃO DO TEOR DE HUMIDADE

		Hygroscópico		Depois da Mistura		
Nº da Cápsula/Molde	Nº			10	11	12
Peso do Solo Húmido + Cápsula (P0)	gr			467.10	395.60	396.57
Peso do Solo Seco + Cápsula (P1)	gr			440.50	373.20	375.60
Peso da Cápsula (P2)	gr			84.50	84.50	84.40
Peso da Água (P3)= (P0)-(P1)	gr			26.60	22.40	20.97
Peso do Solo Seco (P4)=(P1)-(P2)	gr			356.00	288.70	291.20
Teor de Húmidade W=(P3)/(P4)x100	%		0.7	7.5	7.8	7.2

Água a Adicionar

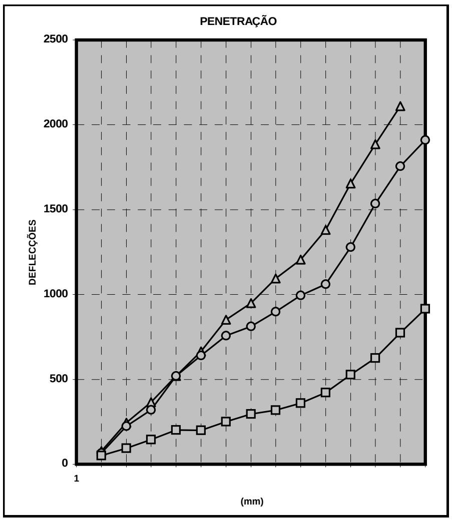
Óptimo % (a) 7.6
Hygroscópico % (b) 0.7
Volume de Água =
Solo seco x(100+a) - Solo seco =
100
= 1233

Moldagem

Compactação		55x10x5	25x10x5	55x5,5x3
Nº do Molde Nº	Nº	4	5	6
Peso do Molde + Solo Húmido (M0)	gr	11376	11148	10830
Peso do Molde (M1)	gr	6218	6239	6175
Peso do Solo Húmido (M2)=(M0)-(M1)	gr	5158	4909	4655
Volume do Molde V	cc	2104	2104	2104
Baridade Húmida do Solo Dh=(M2)/V	gr/cc	2.452	2.333	2.212
Teor Húmidade da Moldagem W	%	7.5	7.5	7.5
Baridade Seca do Solo Ds=Dhx100/100+W	gr/cc	2.280	2.170	2.058
% de Compactação Ds/Ds Máx.x100	%	99.7	94.9	90.0
Peso Molde+Solo Após Embebição (M3)	gr			
Peso Solo Húmid. Final (M4)=(M3)-(M1)	gr			
Teor Húmidade Final Wf=[M4-(DsxV)]/(DsxV)	%			

Expansão

Nº do Molde	1	2	3
Leitura Inicial			
Leitura Final			
% Expanção			



Nº Molde	4 △		5 ○		6 □	
% Mod AASHTO	100.0		95.0		90	
Penetração	Leitura	Corrig.	Leitura	Corrig.	Leitura	Corrig.
0.0						
0.5	78		65		50	
1.0	245		225		95	
1.5	365		320		146	
2.0	520		520		202	
2.5*	665	665	640	640	200	200
3.0	852		758		250	
3.5	950		812		295	
4.0	1095		898		318	
4.5	1205		995		360	
5.0*	1380	1380	1060	1060	422	422
6.0	1655		1280		528	
7.0	1885		1535		625	
8.0	2110		1755		775	
9.0			1910		915	
Factor do Anel			0.012 KN			
CBR	2.5mm=13.344KN		5.0mm=20.016KN		7.5mm=25.354KN	
2,5mm *	59.8		57.6		18.0	
5,0mm **	82.7		53.0		25.3	
% Compactação						
CBR 2,5mm						
CBR 5,0mm						

CONSULTOR / EMPREITEIRO : **TÉC. ENGS. CONSULTORES** DATA: 16-01-07
PROJECTO : **N13 NAMPULA/CUAMBA**
CAMADA ENSAIADA : **C.E DO Km: 79+00 L/E NAMIALO** VERIF. POR:
AMOSTRA Nº : **NAM/0016/07** EFECT. POR : **RAFAEL**
DESCRIÇÃO DO SOLO : AREIA ARGILOSA CASTANHO CLARO COM CASCALHO

ENSAIO DE COMPACTAÇÃO

Barid. Seca Máx. 2.152 gr/cm3
Teor Ópt. Água 16.6 %

DETERMINAÇÃO DO TEOR DE HUMIDADE

		Hygroscópico		Depois da Mistura		
Nº da Cápsula/Molde	Nº			1	2	3
Peso do Solo Húmido + Cápsula (P0)	gr			297.96	332.26	238.43
Peso do Solo Seco + Cápsula (P1)	gr			267.70	296.20	217.20
Peso da Cápsula (P2)	gr			84.30	84.10	84.50
Peso da Água (P3)= (P0)-(P1)	gr			30.26	36.06	21.23
Peso do Solo Seco (P4)=(P1)-(P2)	gr			183.40	212.10	132.70
Teor de Húmidade W=(P3)/(P4)x100	%		5.5	16.5	17.0	16.0

Água a Adicionar

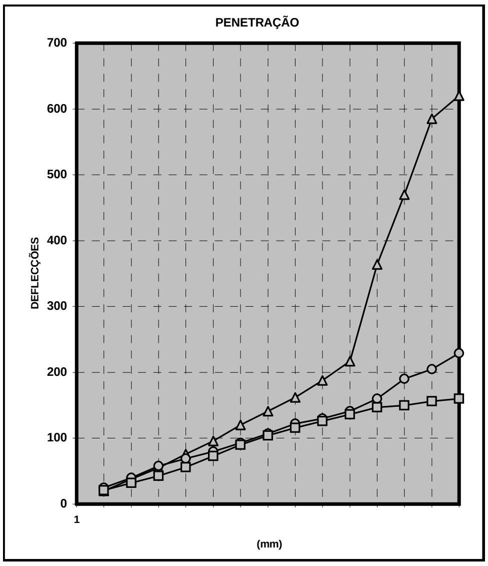
Óptimo % (a) 16.6
Hygroscópico % (b) 5.5
Volume de Água =
Solo seco x(100+a) - Solo seco =
100
= 1894

Moldagem

Compactação		55x10x5	25x10x5	55x5,5x3
Nº do Molde Nº	Nº	4	5	6
Peso do Molde + Solo Húmido (M0)	gr	11490	11250	10937
Peso do Molde (M1)	gr	6218	6239	6175
Peso do Solo Húmido (M2)=(M0)-(M1)	gr	5272	5011	4762
Volume do Molde V	cc	2104	2104	2104
Baridade Húmida do Solo Dh=(M2)/V	gr/cc	2.506	2.382	2.263
Teor Húmidade da Moldagem W	%	16.5	16.5	16.5
Baridade Seca do Solo Ds=Dhx100/100+W	gr/cc	2.154	2.044	1.943
% de Compactação Ds/Ds Máx.x100	%	100.0	95.0	90.2
Peso Molde+Solo Após Embebição (M3)	gr	11492	11258	10960
Peso Solo Húmid. Final (M4)=(M3)-(M1)	gr	5274	5019	4785
Teor Húmidade Final Wf=[M4-(DsxV)]/(DsxV)	%	16.4	16.6	17.3

Expansão

Nº do Molde	1	2	3
Leitura Inicial			
Leitura Final			
% Expanção			



Nº Molde	4 △		5 ○		6 □	
% Mod AASHTO	100.0		95.0		90	
Penetração	Leitura	Corrig.	Leitura	Corrig.	Leitura	Corrig.
0.0						
0.5	20		25		21	
1.0	38		40		32	
1.5	55		58		43	
2.0	76		69		56	
2.5*	96	96	80	80	73	73
3.0	120		93		90	
3.5	141		107		104	
4.0	162		122		116	
4.5	188		130		126	
5.0*	217	217	141	141	136	136
6.0	364		160		147	
7.0	470		190		150	
8.0	585		205		156	
9.0	620		229		160	
Factor do Anel			0.012 KN			
CBR	2.5mm=13.344KN		5.0mm=20.016KN		7.5mm=25.354KN	
2,5mm *	8.6		7.2		6.6	
5,0mm **	13.0		8.5		8.2	
% Compactação						
CBR 2,5mm						
CBR 5,0mm						

CONSULTOR / EMPREITEIRO : **TÉC. ENGS. CONSULTORES** DATA: 15-01-07
PROJECTO : N13 NAMPULA/CUAMBA
CAMADA ENSAIADA : C.E DO Km: 124+20 L/D VERIF. POR:
AMOSTRA Nº : NAM/0017/07 EFECT. POR : RAFAEL
DESCRIÇÃO DO SOLO : AREIA ARGILOSA CASTANHO CLARA COM CASCALHO

ENSAIO DE COMPACTAÇÃO

Barid. Seca Máx. 2.287 gr/cm3
Teor Ópt. Água 7.6 %

DETERMINAÇÃO DO TEOR DE HUMIDADE

			Hygroscópico		Depois da Mistura		
Nº da Cápsula/Molde		Nº			14	18	12
Peso do Solo Húmido + Cápsula	(P0)	gr			392.10	377.90	412.12
Peso do Solo Seco + Cápsula	(P1)	gr			372.60	357.20	388.40
Peso da Cápsula	(P2)	gr			84.80	84.20	84.40
Peso da Água	(P3)= (P0)-(P1)	gr			19.50	20.70	23.72
Peso do Solo Seco	(P4)=(P1)-(P2)	gr			287.80	273.00	304.00
Teor de Húmidade	W=(P3)/(P4)x100	%		0.7	6.8	7.6	7.8

Água a Adicionar

Óptimo	% (a)	7.6
Hygroscópico	% (b)	0.7

Volume de Água =

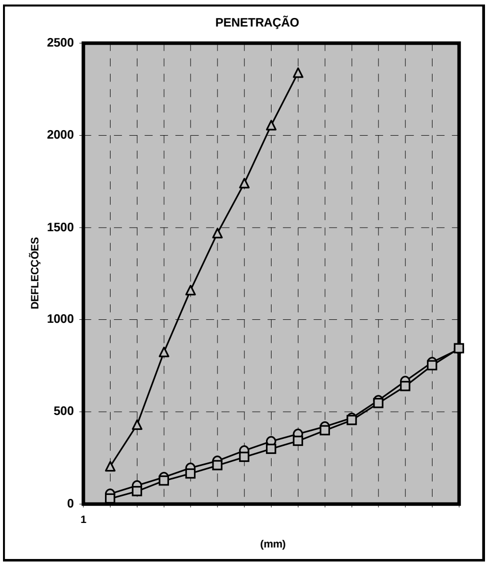
$$\frac{\text{Solo seco x}(100+a)}{100} - \text{Solo seco} = 1233$$

Moldagem

Compactação			55x10x5	25x10x5	55x5,5x3
Nº do Molde	Nº	Nº	1	2	3
Peso do Molde + Solo Húmido	(M0)	gr	11374	11108	10856
Peso do Molde	(M1)	gr	6196	6189	6196
Peso do Solo Húmido	(M2)=(M0)-(M1)	gr	5178	4919	4660
Volume do Molde	V	cc	2104	2104	2104
Baridade Húmida do Solo	Dh=(M2)/V	gr/cc	2.461	2.338	2.215
Teor Húmidade da Moldagem	W	%	7.4	7.4	7.4
Baridade Seca do Solo	Ds=Dhx100/100+W	gr/cc	2.291	2.177	2.062
% de Compactação	Ds/Ds Máx.x100	%	100.2	95.2	90.2
Peso Molde+Solo Após Embebição	(M3)	gr	11418	11208	10985
Peso Solo Húmid. Final	(M4)=(M3)-(M1)	gr	5222	5015	4789
Teor Húmidade Final	Wf=[M4-(DsxV)]/(DsxV)	%	8.3	9.5	10.4

Expansão

Nº do Molde	1	2	3
Leitura Inicial			
Leitura Final			
% Expanção			



Nº Molde	1 △		2 ○		3 □	
% Mod AASHTO	100.0		95.0		90	
Penetração	Leitura	Corrig.	Leitura	Corrig.	Leitura	Corrig.
0.0						
0.5	205		55		30	
1.0	430		100		70	
1.5	825		146		127	
2.0	1160		196		165	
2.5*	1470	1470	235	235	210	210
3.0	1740		291		255	
3.5	2055		341		298	
4.0	2340		380		343	
4.5			420		400	
5.0*		1380	468	468	455	455
6.0			563		548	
7.0			667		639	
8.0			769		753	
9.0			840		845	
Factor do Anel			0.012 KN			
CBR	2.5mm=13.344KN		5.0mm=20.016KN		7.5mm=25.354KN	
2,5mm *	132.2		21.1		18.9	
5,0mm **	11.0		28.1		27.3	
% Compactação						
CBR 2,5mm						
CBR 5,0mm						

APÊNDICE-C

Breakdown of the Project Cost by Pavement Type

Summary of the Project Cost

ALT1-1 Design speed = 80kph (Currency: USD)

No.	Description		Section 1 Nampula - Ribaue	Section 2 Ribaue - Malema	Section 3 Malema - Cuamba	Total	% of
			131.85 km	102.87 km	112.91 km	347.63 km	(1-10)
0	Compensation		443,675	346,158	379,942	1,169,775	
1	Preliminary & general		18,992,194	16,918,330	20,497,596	56,408,120	28.7%
2	Earthworks		5,742,767	4,589,201	3,032,348	13,364,316	6.8%
3	Pavement		33,541,268	26,941,386	33,951,207	94,433,862	48.0%
4	Drainage		4,571,881	5,557,400	6,949,201	17,078,482	8.7%
5	Road furniture		175,198	176,688	292,253	644,139	0.3%
6	Miscellaneous		12,000	22,450	113,962	148,412	0.1%
7	Bridge		0	2,043,004	3,498,934	5,541,938	2.8%
8	Temporary construction road		1,262,692	1,028,483	1,059,032	3,350,207	1.7%
9	Dayworks		1,114,523	992,822	1,202,865	3,310,209	1.7%
10	Social issues		810,974	722,419	875,255	2,408,648	1.2%
	Total (1-10)		66,223,498	58,992,183	71,472,652	196,688,334	100.0%
11	Contingency	10%	6,622,350	5,899,218	7,147,265	19,668,833	
	Total construction cost (1-11)		72,845,848	64,891,402	78,619,917	216,357,167	
12	Engineering cost	8%	5,827,668	5,191,312	6,289,593	17,308,573	
	Total project cost (1-12)		78,673,516	70,082,714	84,909,510	233,665,740	
13	VAT	17%	13,374,498	11,914,061	14,434,617	39,723,176	
	Total project cost with VAT		92,048,014	81,996,775	99,344,127	273,388,916	
14	Total (13) + (0) Compensation		92,491,689	82,342,933	99,724,069	274,558,691	

	Section 1	Section 2	Section 3	Total		
Unit construction cost (1-11)	$552,490 /km	$630,810 /km	$696,306 /km	$622,378 /km	SC:	A100 => =>
Unit project cost (1-12)	$596,690 /km	$681,275 /km	$752,011 /km	$672,168 /km	BC:	G200 G150 =>
Unit project cost with VAT	$698,127 /km	$797,091 /km	$879,852 /km	$786,436 /km	SBC:	G175 G150 =>
Unit project cost +VAT + Compen.	$701,492 /km	$800,456 /km	$883,217 /km	$789,801 /km		
Unit construction cost (0-10)	$505,629 /km	$576,828 /km	$636,371 /km	$569,163 /km		

ALT1-2 Design speed = 80kph (Currency: USD)

No.	Description		Section 1 Nampula - Ribaue	Section 2 Ribaue - Malema	Section 3 Malema - Cuamba	Total	% of
			131.85 km	102.87 km	112.91 km	347.63 km	(1-10)
0	Compensation		443,675	346,158	379,942	1,169,775	
1	Preliminary & general		17,774,842	13,211,335	15,710,452	46,696,629	28.7%
2	Earthworks		5,044,228	4,423,641	2,876,294	12,344,162	7.6%
3	Pavement		31,335,818	18,263,922	22,687,549	72,287,289	44.4%
4	Drainage		4,571,881	5,557,400	6,949,201	17,078,482	10.5%
5	Road furniture		175,198	176,688	292,253	644,139	0.4%
6	Miscellaneous		12,000	22,450	113,962	148,412	0.1%
7	Bridge		0	2,043,004	3,498,934	5,541,938	3.4%
8	Temporary construction road		1,262,692	1,028,483	1,059,032	3,350,207	2.1%
9	Dayworks		1,043,085	775,283	921,940	2,740,308	1.7%
10	Social issues		758,993	564,129	670,842	1,993,964	1.2%
	Total (1-10)		61,978,736	46,066,335	54,780,459	162,825,531	100.0%
11	Contingency	10%	6,197,874	4,606,634	5,478,046	16,282,553	
	Total construction cost (1-11)		68,176,610	50,672,969	60,258,505	179,108,084	
12	Engineering cost	8%	5,454,129	4,053,838	4,820,680	14,328,647	
	Total project cost (1-12)		73,630,739	54,726,806	65,079,185	193,436,730	
13	VAT	17%	12,517,226	9,303,557	11,063,461	32,884,244	
	Total project cost with VAT		86,147,964	64,030,364	76,142,647	226,320,974	
14	Total (13) + (0) Compensation		86,591,639	64,376,521	76,522,589	227,490,749	

	Section 1	Section 2	Section 3	Total		
Unit construction cost (1-11)	$517,077 /km	$492,592 /km	$533,686 /km	$515,226 /km	SC:	A50 => =>
Unit project cost (1-12)	$558,443 /km	$532,000 /km	$576,381 /km	$556,444 /km	BC:	C150 => =>
Unit project cost with VAT	$653,379 /km	$622,440 /km	$674,366 /km	$651,040 /km	SBC:	C200 => =>
Unit project cost +VAT + Compen.	$656,744 /km	$625,805 /km	$677,731 /km	$654,405 /km		
Unit construction cost (0-10)	$473,435 /km	$451,176 /km	$488,534 /km	$471,752 /km		

Summary of the Project Cost

ALT1-3 Design speed = 80kph (Currency: USD)

No.	Description		Section 1 Nampula - Ribaue 131.85 km	Section 2 Ribaue - Malema 102.87 km	Section 3 Malema - Cuamba 112.91 km	Total 347.63 km	% of (1-10)
0	Compensation		443,675	346,158	379,942	1,169,775	
1	Preliminary & general		12,059,163	10,274,299	12,482,967	34,816,429	28.7%
2	Earthworks		5,263,486	4,406,071	3,445,411	13,114,968	10.8%
3	Pavement		17,481,829	11,275,205	14,419,277	43,176,311	35.6%
4	Drainage		4,571,881	5,557,400	6,949,201	17,078,482	14.1%
5	Road furniture		175,198	176,688	292,253	644,139	0.5%
6	Miscellaneous		12,000	22,450	113,962	148,412	0.1%
7	Bridge		0	2,043,004	3,498,934	5,541,938	4.6%
8	Temporary construction road		1,262,692	1,028,483	1,059,032	3,350,207	2.8%
9	Dayworks		707,670	602,929	732,541	2,043,140	1.7%
10	Social issues		514,931	438,716	533,027	1,486,675	1.2%
	Total (1-10)		42,048,851	35,825,246	43,526,604	121,400,701	100.0%
11	Contingency	10%	4,204,885	3,582,525	4,352,660	12,140,070	
	Total construction cost (1-11)		46,253,736	39,407,770	47,879,265	133,540,771	
12	Engineering cost	8%	3,700,299	3,152,622	3,830,341	10,683,262	
	Total project cost (1-12)		49,954,035	42,560,392	51,709,606	144,224,032	
13	VAT	17%	8,492,186	7,235,267	8,790,633	24,518,085	
	Total project cost with VAT		58,446,220	49,795,659	60,500,239	168,742,118	
14	Total (13) + (0) Compensation		58,889,896	50,141,816	60,880,181	169,911,893	

	Section 1	Section 2	Section 3	Total
Unit construction cost (1-11)	$350,806 /km	$383,083 /km	$424,048 /km	$384,146 /km
Unit project cost (1-12)	$378,870 /km	$413,730 /km	$457,972 /km	$414,878 /km
Unit project cost with VAT	$443,278 /km	$484,064 /km	$535,827 /km	$485,407 /km
Unit project cost +VAT + Compen.	$446,643 /km	$487,429 /km	$539,192 /km	$488,772 /km
Unit construction cost (0-10)	$322,279 /km	$351,622 /km	$388,863 /km	$352,589 /km

SC: DS => =>
BC: G250 G200 =>
SBC: G400 G375 =>

ALT1-4 Design speed = 80kph (Currency: USD)

No.	Description		Section 1 Nampula - Ribaue 131.85 km	Section 2 Ribaue - Malema 102.87 km	Section 3 Malema - Cuamba 112.91 km	Total 347.63 km	% of (1-10)
0	Compensation		443,675	346,158	379,942	1,169,775	
1	Preliminary & general		16,868,459	11,636,635	13,926,648	42,431,742	28.7%
2	Earthworks		5,263,486	4,128,457	2,782,879	12,174,823	8.2%
3	Pavement		28,954,386	14,802,667	18,525,704	62,282,757	42.1%
4	Drainage		4,571,881	5,557,400	6,949,201	17,078,482	11.5%
5	Road furniture		175,198	176,688	292,253	644,139	0.4%
6	Miscellaneous		12,000	22,450	113,962	148,412	0.1%
7	Bridge		0	2,043,004	3,498,934	5,541,938	3.7%
8	Temporary construction road		1,262,692	1,028,483	1,059,032	3,350,207	2.3%
9	Dayworks		989,895	682,875	817,260	2,490,031	1.7%
10	Social issues		720,290	496,889	594,673	1,811,852	1.2%
	Total (1-10)		58,818,287	40,575,549	48,560,546	147,954,382	100.0%
11	Contingency	10%	5,881,829	4,057,555	4,856,055	14,795,438	
	Total construction cost (1-11)		64,700,116	44,633,104	53,416,600	162,749,820	
12	Engineering cost	8%	5,176,009	3,570,648	4,273,328	13,019,986	
	Total project cost (1-12)		69,876,125	48,203,752	57,689,928	175,769,806	
13	VAT	17%	11,878,941	8,194,638	9,807,288	29,880,867	
	Total project cost with VAT		81,755,067	56,398,390	67,497,216	205,650,673	
14	Total (13) + (0) Compensation		82,198,742	56,744,547	67,877,158	206,820,448	

	Section 1	Section 2	Section 3	Total
Unit construction cost (1-11)	$490,710 /km	$433,879 /km	$473,090 /km	$468,170 /km
Unit project cost (1-12)	$529,967 /km	$468,589 /km	$510,937 /km	$505,623 /km
Unit project cost with VAT	$620,061 /km	$548,249 /km	$597,797 /km	$591,579 /km
Unit project cost +VAT + Compen.	$623,426 /km	$551,614 /km	$601,162 /km	$594,944 /km
Unit construction cost (0-10)	$449,465 /km	$397,800 /km	$433,447 /km	$428,974 /km

SC: DS => =>
BC: C150 => =>
SBC: C300 => =>

Summary of the Project Cost

ALT1-5 Design speed = 80kph (Currency: USD)

No.	Description		Section 1	Section 2	Section 3	Total	% of
			Nampula - Ribaue	Ribaue - Malema	Malema - Cuamba		
			131.85 km	102.87 km	112.91 km	347.63 km	(1-10)
0	Compensation		443,675	346,158	379,942	1,169,775	
1	Preliminary & general		20,433,391	17,530,159	21,204,095	59,167,645	28.7%
2	Earthworks		5,993,063	4,589,201	3,018,632	13,600,896	6.6%
3	Pavement		36,728,942	28,400,902	35,650,275	100,780,118	48.8%
4	Drainage		4,571,881	5,557,400	6,949,201	17,078,482	8.3%
5	Road furniture		175,198	176,688	292,253	644,139	0.3%
6	Miscellaneous		12,000	22,450	113,962	148,412	0.1%
7	Bridge		0	2,043,004	3,498,934	5,541,938	2.7%
8	Temporary construction road		1,262,692	1,028,483	1,059,032	3,350,207	1.6%
9	Dayworks		1,199,097	1,028,726	1,244,324	3,472,147	1.7%
10	Social issues		872,514	748,544	905,423	2,526,481	1.2%
	Total (1-10)		71,248,778	61,125,558	73,936,130	206,310,465	100.0%
11	Contingency	10%	7,124,878	6,112,556	7,393,613	20,631,047	
	Total construction cost (1-11)		78,373,656	67,238,113	81,329,743	226,941,512	
12	Engineering cost	8%	6,269,892	5,379,049	6,506,379	18,155,321	
	Total project cost (1-12)		84,643,548	72,617,162	87,836,122	245,096,833	
13	VAT	17%	14,389,403	12,344,918	14,932,141	41,666,462	
	Total project cost with VAT		99,032,951	84,962,080	102,768,263	286,763,294	
14	Total (13) + (0) Compensation		99,476,626	85,308,238	103,148,205	287,933,069	

	Section 1	Section 2	Section 3	Total		
Unit construction cost (1-11)	$594,415 /km	$653,622 /km	$720,306 /km	$652,825 /km	SC:	A100 => =>
Unit project cost (1-12)	$641,969 /km	$705,912 /km	$777,930 /km	$705,051 /km	BC:	G150 => =>
Unit project cost with VAT	$751,103 /km	$825,917 /km	$910,179 /km	$824,910 /km	SBC:	C175 C150 =>
Unit project cost +VAT + Compen.	$754,468 /km	$829,282 /km	$913,544 /km	$828,275 /km		
Unit construction cost (0-10)	$543,743 /km	$597,567 /km	$658,189 /km	$596,842 /km		

ALT1-6 Design speed = 80kph (Currency: USD)

No.	Description		Section 1	Section 2	Section 3	Total	% of
			Nampula - Ribaue	Ribaue - Malema	Malema - Cuamba		
			131.85 km	102.87 km	112.91 km	347.63 km	(1-10)
0	Compensation		443,675	346,158	379,942	1,169,775	
1	Preliminary & general		15,060,428	11,578,742	14,002,471	40,641,641	28.7%
2	Earthworks		4,957,126	4,285,016	3,306,783	12,548,925	8.9%
3	Pavement		24,947,695	14,508,004	18,182,678	57,638,377	40.7%
4	Drainage		4,571,881	5,557,400	6,949,201	17,078,482	12.1%
5	Road furniture		175,198	176,688	292,253	644,139	0.5%
6	Miscellaneous		12,000	22,450	113,962	148,412	0.1%
7	Bridge		0	2,043,004	3,498,934	5,541,938	3.9%
8	Temporary construction road		1,262,692	1,028,483	1,059,032	3,350,207	2.4%
9	Dayworks		883,794	679,478	821,710	2,384,982	1.7%
10	Social issues		643,086	494,417	597,911	1,735,414	1.2%
	Total (1-10)		52,513,900	40,373,682	48,824,934	141,712,517	100.0%
11	Contingency	10%	5,251,390	4,037,368	4,882,493	14,171,252	
	Total construction cost (1-11)		57,765,290	44,411,050	53,707,428	155,883,768	
12	Engineering cost	8%	4,621,223	3,552,884	4,296,594	12,470,701	
	Total project cost (1-12)		62,386,514	47,963,934	58,004,022	168,354,470	
13	VAT	17%	10,605,707	8,153,869	9,860,684	28,620,260	
	Total project cost with VAT		72,992,221	56,117,803	67,864,706	196,974,729	
14	Total (13) + (0) Compensation		73,435,896	56,463,960	68,244,648	198,144,504	

	Section 1	Section 2	Section 3	Total		
Unit construction cost (1-11)	$438,114 /km	$431,720 /km	$475,666 /km	$448,419 /km	SC:	DS => =>
Unit project cost (1-12)	$473,163 /km	$466,258 /km	$513,719 /km	$484,292 /km	BC:	G250 G225 =>
Unit project cost with VAT	$553,600 /km	$545,522 /km	$601,051 /km	$566,622 /km	SBC:	C325 => =>
Unit project cost +VAT + Compen.	$556,965 /km	$548,887 /km	$604,416 /km	$569,987 /km		
Unit construction cost (0-10)	$401,650 /km	$395,838 /km	$435,788 /km	$411,018 /km		

Summary of the Project Cost

ALT2-1 Design speed = 100kph (Currency: USD)

No.	Description		Section 1	Section 2	Section 3	Total	% of (1-10)
			Nampula - Ribaue	Ribaue - Malema	Malema - Cuamba		
			132.03 km	102.82 km	112.66 km	347.51 km	
0	Compensation		444,281	345,989	379,101	1,169,371	
1	Preliminary & general		19,757,362	18,038,731	20,920,764	58,716,857	28.7%
2	Earthworks		6,312,582	7,126,371	4,213,892	17,652,846	8.6%
3	Pavement		34,748,616	26,923,115	33,877,656	95,549,387	46.7%
4	Drainage		4,618,866	5,711,323	6,848,555	17,178,744	8.4%
5	Road furniture		176,356	176,578	294,372	647,305	0.3%
6	Miscellaneous		12,000	22,450	113,962	148,412	0.1%
7	Bridge		0	2,043,004	3,498,934	5,541,938	2.7%
8	Temporary construction road		1,262,692	1,028,483	1,059,032	3,350,207	1.6%
9	Dayworks		1,159,425	1,058,571	1,227,697	3,445,693	1.7%
10	Social issues		843,647	770,261	893,325	2,507,232	1.2%
	Total (1-10)		68,891,546	62,898,888	72,948,187	204,738,621	100.0%
11	Contingency	10%	6,889,155	6,289,889	7,294,819	20,473,862	
	Total construction cost (1-11)		75,780,701	69,188,776	80,243,006	225,212,483	
12	Engineering cost	8%	6,062,456	5,535,102	6,419,440	18,016,999	
	Total project cost (1-12)		81,843,157	74,723,878	86,662,447	243,229,482	
13	VAT	17%	13,913,337	12,703,059	14,732,616	41,349,012	
	Total project cost with VAT		95,756,494	87,426,938	101,395,062	284,578,494	
14	Total (13) + (0) Compensation		96,200,775	87,772,927	101,774,163	285,747,865	

	Section 1	Section 2	Section 3	Total
Unit construction cost (1-11)	$573,966 /km	$672,912 /km	$712,258 /km	$648,075 /km
Unit project cost (1-12)	$619,883 /km	$726,745 /km	$769,239 /km	$699,921 /km
Unit project cost with VAT	$725,263 /km	$850,291 /km	$900,009 /km	$818,907 /km
Unit project cost +VAT + Compen.	$728,628 /km	$853,656 /km	$903,374 /km	$822,272 /km
Unit construction cost (0-10)	$525,152 /km	$615,103 /km	$650,872 /km	$592,524 /km

SC:	A100 => =>
BC:	G250 G150 =>
SBC:	G175 G150 =>

Breakdown of the Project Cost (BQ_ALT1-1_80kph)

Item	Description		Unit	Section 1 (Nampula - Ribaue)			131.85	(km)	Section 2 (Ribaue - Malema)			102.87	(km)	Section 3 (Malema - Cuamba)			112.91	(km)	Total (Section1-3) 347.63 (km)
				Q'ty	Material coefficient	Transport coefficient	Unit Price 1	Amount 1	Q'ty	Material coefficient	Transport coefficient	Unit Price 2	Amount 2	Q'ty	Material coefficient	Transport coefficient	Unit Price 3	Amount 3	
0	Compensation	COI + Construction Rd. + Diversion	km	131.85			3,365.00	443,675.25	102.87			3,365.00	346,157.55	112.91			3,365.00	379,942.15	1,169,774.95
1	Preliminary & general works	41.92% of Total (2 -7)	L.S.	1			18,992,194.41	18,992,194.41	1			16,918,330.22	16,918,330.22	1			20,497,595.68	20,497,595.68	56,408,120.31
2	Earthworks																		
	2.1	Excavation	cu.m	619,354			3.12	1,934,242.54	523,493			3.12	1,634,868.64	338,605			3.12	1,057,463.42	4,626,574.60
	2.2	Fill (use excavated soil)	cu.m	619,354			3.16	1,954,190.28	523,493			3.16	1,651,728.95	338,605			3.16	1,068,368.98	4,674,288.21
	2.3	Fill (borrow material)	cu.m	380,845			4.87	1,854,334.31	267,530			4.87	1,302,603.57	186,181			4.87	906,515.29	4,063,453.16
	2.4	Disposal of surplus soil	cu.m				3.50	0.00				3.50	0.00				3.50	0.00	0.00
							Total S1-2	**5,742,767.13**				**Total S2-2**	**4,589,201.16**				**Total S3-2**	**3,032,347.68**	**13,364,315.97**
3	Pavement																		
	3.1.1	Replacement of subgrade (t = 150mm)	sq.m				2.47	0.00				2.47	0.00				2.47	0.00	0.00
	3.1.2	Replacement of subgrade (t = 200mm)	sq.m				2.87	0.00				2.87	0.00				2.87	0.00	0.00
	3.2	Granular sub base course (t = 150mm) (Soaked CBR > 30%)	sq.m		80.9%	69.7%	0.89	0.00	1,031,870	80.9%	23.7%	0.45	466,808.09	1,145,540	80.9%	26.0%	0.47	543,425.71	1,010,233.80
	3.3	Granular sub base course (t = 175mm) (Soaked CBR > 30%)	sq.m	1,333,600	80.9%	69.7%	1.04	1,388,237.41		80.9%	23.7%	0.53	0.00		80.9%	26.0%	0.55	0.00	1,388,237.41
	3.4	Granular sub base course (t = 225mm) (Soaked CBR > 30%)	sq.m		80.9%	69.7%	1.34	0.00		80.9%	23.7%	0.68	0.00		80.9%	26.0%	0.71	0.00	0.00
	3.5.1	Granular sub base course (t = 325mm) (Soaked CBR > 30%)	sq.m		80.9%	69.7%	1.93	0.00		80.9%	23.7%	0.98	0.00		80.9%	26.0%	1.03	0.00	0.00
	3.5.2	Granular sub base course (t = 375mm) (Soaked CBR > 30%)	sq.m		80.9%	69.7%	2.23	0.00		80.9%	23.7%	1.13	0.00		80.9%	26.0%	1.19	0.00	0.00
	3.5.3	Granular sub base course (t = 400mm) (Soaked CBR > 30%)	sq.m		80.9%	69.7%	2.38	0.00		80.9%	23.7%	1.21	0.00		80.9%	26.0%	1.27	0.00	0.00
	3.6	Cemented sub base course (t = 150mm) (7day UCS 0.75 - 1.5MPa)	sq.m		80.9%	69.7%	3.68	0.00		80.9%	23.7%	1.87	0.00		80.9%	26.0%	1.96	0.00	0.00
	3.7	Cemented sub base course (t = 175mm) (7day UCS 0.75 - 1.5MPa)	sq.m		80.9%	69.7%	4.30	0.00		80.9%	23.7%	2.18	0.00		80.9%	26.0%	2.28	0.00	0.00
	3.8	Cemented sub base course (t = 200mm) (7day UCS 0.75 - 1.5MPa)	sq.m		80.9%	69.7%	4.91	0.00		80.9%	23.7%	2.49	0.00		80.9%	26.0%	2.61	0.00	0.00
	3.9.1	Cemented sub base course (t = 225mm) (7day UCS 0.75 - 1.5MPa)	sq.m		80.9%	69.7%	5.52	0.00		80.9%	23.7%	2.80	0.00		80.9%	26.0%	2.94	0.00	0.00
	3.9.2	Cemented sub base course (t = 250mm) (7day UCS 0.75 - 1.5MPa)	sq.m		80.9%	69.7%	6.14	0.00		80.9%	23.7%	3.11	0.00		80.9%	26.0%	3.26	0.00	0.00
	3.9.3	Cemented sub base course (t = 300mm) (7day UCS 0.75 - 1.5MPa)	sq.m		80.9%	69.7%	7.36	0.00		80.9%	23.7%	3.73	0.00		80.9%	26.0%	3.92	0.00	0.00
	3.9.4	Cemented sub base course (t = 325mm) (7day UCS 0.75 - 1.5MPa)	sq.m		80.9%	69.7%	7.98	0.00		80.9%	23.7%	4.04	0.00		80.9%	26.0%	4.24	0.00	0.00
	3.10	Granular base course (t = 150mm) (Soaked CBR > 80%)	sq.m		80.9%	69.7%	2.59	0.00	1,031,870	80.9%	23.7%	1.31	1,356,705.44	1,145,540	80.9%	26.0%	1.38	1,579,382.69	2,936,088.13
	3.11.1	Granular base course (t = 200mm) (Soaked CBR > 80%)	sq.m	1,333,600	80.9%	69.7%	3.46	4,611,082.42		80.9%	23.7%	1.75	0.00		80.9%	26.0%	1.84	0.00	4,611,082.42
	3.11.2	Granular base course (t = 225mm) (Soaked CBR > 80%)	sq.m		80.9%	69.7%	3.89	0.00		80.9%	23.7%	1.97	0.00		80.9%	26.0%	2.07	0.00	0.00
	3.11.3	Granular base course (t = 250mm) (Soaked CBR > 80%)	sq.m		80.9%	69.7%	4.32	0.00		80.9%	23.7%	2.19	0.00		80.9%	26.0%	2.30	0.00	0.00
	3.12	Cemented base course (t = 150mm) (7day UCS 1.5 - 3.0MPa)	sq.m		80.9%	69.7%	5.07	0.00		80.9%	23.7%	2.57	0.00		80.9%	26.0%	2.69	0.00	0.00
	3.13	Cemented base course (t = 180mm) (7day UCS 1.5 - 3.0MPa)	sq.m		80.9%	69.7%	6.08	0.00		80.9%	23.7%	3.08	0.00		80.9%	26.0%	3.23	0.00	0.00
	3.14	Cemented base course (t = 200mm) (7day UCS 1.5 - 3.0MPa)	sq.m		80.9%	69.7%	6.76	0.00		80.9%	23.7%	3.43	0.00		80.9%	26.0%	3.59	0.00	0.00
	3.15	Prime coat	sq.m	1,201,770		79.3%	1.59	1,912,678.25	929,010		116.2%	2.33	2,166,575.81	1,032,660		150.1%	3.01	3,110,895.48	7,190,149.53
	3.16	Tack coat	sq.m	1,201,770		79.3%	0.88	1,054,975.00	929,010		116.2%	1.29	1,195,017.15	1,032,660		150.1%	1.66	1,715,875.08	3,965,867.23
	3.17.1	Asphalt concrete (t = 50mm)	sq.m		36.4%	79.3%	10.22	0.00		36.4%	116.2%	11.71	0.00		36.4%	150.1%	13.07	0.00	0.00
	3.17.2	Asphalt concrete (t = 100mm)	sq.m	1,201,770	36.4%	79.3%	20.45	24,574,295.35	929,010	36.4%	116.2%	23.42	21,756,279.39	1,032,660	36.4%	150.1%	26.15	27,001,628.32	73,332,203.07
	3.18	Double bituminous surface treatment (DBST)	sq.m		36.4%	79.3%	4.64	0.00		36.4%	116.2%	5.31	0.00		36.4%	150.1%	5.93	0.00	0.00
	3.19	Otta seal for sidewalk	sq.m		36.4%	79.3%	2.78	0.00		36.4%	116.2%	3.19	0.00		36.4%	150.1%	3.56	0.00	0.00
	3.20	Granular sub base course for sidewalk (t = 100mm; Soaked CBR > 30%)	sq.m		80.9%	69.7%	0.59	0.00		80.9%	23.7%	0.30	0.00		80.9%	26.0%	0.32	0.00	0.00
							Total S1-3	**33,541,268.43**				**Total S2-3**	**26,941,385.88**				**Total S3-3**	**33,951,207.29**	**94,433,861.59**

Breakdown of the Project Cost (BQ_ALT1-1_80kph)

Item	Description		Unit	Section 1 (Nampula - Ribaue)			131.85	(km)	Section 2 (Ribaue - Malema)			102.87	(km)	Section 3 (Malema - Cuamba)			112.91	(km)	Total (Section1-3)
				Q'ty	Material coefficient	Transport coefficient	Unit Price 1	Amount 1	Q'ty	Material coefficient	Transport coefficient	Unit Price 2	Amount 2	Q'ty	Material coefficient	Transport coefficient	Unit Price 3	Amount 3	347.63 (km)
4	Drainage																		
	4.1	Unlined side ditch	m				3.35	0.00				3.35	0.00				3.35	0.00	0.00
	4.2	Concrete lined side ditch	m	98,800	49.0%	79.3%	21.36	2,110,027.74	97,400	49.0%	116.2%	25.65	2,498,691.44	91,000	49.0%	150.1%	29.60	2,693,772.67	7,302,491.85
	4.3	U-shaped side ditch (open)	m	1,170	49.0%	79.3%	38.43	44,958.42	240	49.0%	116.2%	46.16	11,077.94	1,260	49.0%	150.1%	53.26	67,109.50	123,145.86
	4.4	U-shaped side ditch (covered)	m	16,240	49.0%	79.3%	47.79	776,124.13	3,010	49.0%	116.2%	57.41	172,796.17	15,686	49.0%	150.1%	66.24	1,039,072.14	1,987,992.44
	4.5	Cross culvert	m	252	49.0%	79.3%	292.41	73,687.76	72	49.0%	116.2%	351.25	25,290.05	384	49.0%	150.1%	405.31	155,637.55	254,615.36
	4.6	Box culvert (1.0*1.0)	No	179	49.0%	79.3%	7,226.46	1,293,537.03	139	49.0%	116.2%	8,680.57	1,206,599.35	179	49.0%	150.1%	10,016.46	1,792,945.94	4,293,082.32
	4.7	Box culvert (2.0*2.0)	No	12	49.0%	79.3%	22,795.51	273,546.12	60	49.0%	116.2%	27,382.42	1,642,944.94	38	49.0%	150.1%	31,596.40	1,200,663.30	3,117,154.35
							Total S1-4	**4,571,881.20**				**Total S2-4**	**5,557,399.89**				**Total S3-4**	**6,949,201.11**	**17,078,482.20**
5	Road furniture																		
	5.1	Road sign (Warning) A=0.62m2/no	m2	54		79.3%	232.05	12,530.65	16		116.2%	340.03	5,440.42	64		150.1%	439.23	28,110.41	46,081.48
	5.2	Road sign (Regulatory) A=1.13m3/no	m2	54		79.3%	232.05	12,530.65	14		116.2%	340.03	4,760.37	44		150.1%	439.23	19,325.91	36,616.92
	5.3	Road marking (continuous) W=100mm	m	283,242		79.3%	0.52	147,164.99	217,356		116.2%	0.76	165,482.25	244,095		150.1%	0.98	240,056.37	552,703.62
	5.4	Road marking (continuous) W=400m	m	1,430		79.3%	2.08	2,971.96	330		116.2%	3.05	1,004.97	1,210		150.1%	3.93	4,759.92	8,736.85
							Total S1-5	**175,198.24**				**Total S2-5**	**176,688.02**				**Total S3-5**	**292,252.61**	**644,138.87**
6	Miscellaneous work																		
	6.1	Concrete kerb	m	0	49.0%	79.3%	16.21	0.00	0	49.0%	116.2%	19.48	0.00	4,260	49.0%	150.1%	22.47	95,742.93	95,742.93
	6.2	Demolishing existing concrete (plain)	m3	754			12.49	9,413.99	826			12.49	10,312.94	1,183			12.49	14,770.22	34,497.15
	6.3	Demolishing existing concrete (reinforced)	m3	114			22.69	2,586.29	535			22.69	12,137.41	28			22.69	635.23	15,358.93
	6.4	Removal of bailey bridge (W=4m)	m				90.75	0.00				90.75	0.00	31			90.75	2,813.16	2,813.16
							Total S1-6	**12,000.28**				**Total S2-6**	**22,450.35**				**Total S3-6**	**113,961.54**	**148,412.17**
7	Bridge																		
	No. 12 Monapo bridge	L = 25m	No									445,448.07	0.00						0.00
	No. 19 Lalaua bridge	L = 30m	No									515,746.94	0.00						0.00
	No. 24 Nataleia bridge	L = 48m	No									704,005.02	0.00						0.00
	No. 27 Mutivasse bridge	L = 30m	No									645,390.18	0.00						0.00
	No. 30 Namuela bridge	L = 30m	No														594,300.46	0.00	0.00
	No. 34 Lurio bridge	L = 94m	No														1,444,775.81	0.00	0.00
							Total S1-7	**0.00**				**Total S2-7**	**2,043,003.87**				**Total S3-7**	**3,498,934.03**	**5,541,937.90**
8	Temporary construction road		km	124.00			10,183.00	1,262,692.00	101.00			10,183.00	1,028,483.00	104.00			10,183.00	1,059,032.00	3,350,207.00
	Total (2 - 8)						**Total S1 (2-8)**	**45,305,807.27**				**Total S2 (2-8)**	**40,358,612.17**				**Total S3 (2-8)**	**48,896,936.26**	**134,561,355.70**
9	Dayworks	2.46% of Total (2 - 8)	L.S.	1			1,114,522.86	1,114,522.86	1			992,821.86	992,821.86	1			1,202,864.63	1,202,864.63	3,310,209.35
10	Social issues	1.79% of Total (2 - 8)	L.S.	1			810,973.95	810,973.95	1			722,419.16	722,419.16	1			875,255.16	875,255.16	2,408,648.27
	Total (1 - 10)						**Total S1 (1-10)**	**66,223,498.49**				**Total S2 (1-10)**	**58,992,183.40**				**Total S3 (1-10)**	**71,472,651.74**	**196,688,333.63**
11	Contingency cost	10% of Total (1 - 10)	L.S.	1			6,622,349.85	6,622,349.85	1			5,899,218.34	5,899,218.34	1			7,147,265.17	7,147,265.17	19,668,833.36
	Total construction cost (1 - 11)			1			72,845,848.34	72,845,848.34	1			64,891,401.74	64,891,401.74	1			78,619,916.91	78,619,916.91	216,357,166.99
	VAT (17%) of total construction cost (1 - 11)			1			12,383,794.22	12,383,794.22	1			11,031,538.30	11,031,538.30	1			13,365,385.87	13,365,385.87	36,780,718.39
	Total construction cost (1 - 11) inclu. VAT						**Total Construction S1 (1-11)**	**85,229,642.56**				**Total Construction S2 (1-11)**	**75,922,940.04**				**Total Construction S3 (1-11)**	**91,985,302.78**	**253,137,885.38**
12	Engineering cost	8% of total construction cost (1-11)	L.S.	1			5,827,667.87	5,827,667.87	1			5,191,312.14	5,191,312.14	1			6,289,593.35	6,289,593.35	17,308,573.36
	VAT (17%) of engineering cost			1			990,703.54	990,703.54	1			882,523.06	882,523.06	1			1,069,230.87	1,069,230.87	2,942,457.47
	Total engineering cost inclu. VAT						**Total engineering S1**	**6,818,371.40**				**Total engineering S2**	**6,073,835.20**				**Total engineering S3**	**7,358,824.22**	**20,251,030.83**
	Total project cost (1 - 12)			1			78,673,516.21	78,673,516.21	1			70,082,713.88	70,082,713.88	1			84,909,510.26	84,909,510.26	233,665,740.35
	VAT (17%) of total project cost (1 - 12)			1			13,374,497.76	13,374,497.76	1			11,914,061.36	11,914,061.36	1			14,434,616.74	14,434,616.74	39,723,175.86
	Total project cost (1 - 12) inclu. VAT						**Total project S1 (1-12)**	**92,048,013.96**				**Total project S2 (1-12)**	**81,996,775.24**				**Total project S3 (1-12)**	**99,344,127.01**	**273,388,916.21**

Breakdown of the Project Cost (BQ_ALT1-2_80kph)

Item	Description		Unit	Section 1 (Nampula - Ribaue)			131.85	(km)	Section 2 (Ribaue - Malema)			102.87	(km)	Section 3 (Malema - Cuamba)			112.91	(km)	Total (Section1-3) 347.63 (km)
				Q'ty	Material coefficient	Transport coefficient	Unit Price 1	Amount 1	Q'ty	Material coefficient	Transport coefficient	Unit Price 2	Amount 2	Q'ty	Material coefficient	Transport coefficient	Unit Price 3	Amount 3	
0	Compensation	COI + Construction Rd. + Diversion	km	131.85			3,365.00	443,675.25	102.87			3,365.00	346,157.55	112.91			3,365.00	379,942.15	1,169,774.95
1	Preliminary & general works	41.92% of Total (2 -7)	L.S.	1			17,774,841.78	17,774,841.78	1			13,211,334.61	13,211,334.61	1			15,710,452.47	15,710,452.47	46,696,628.86
2	Earthworks																		
	2.1	Excavation	cu.m	748,107			3.12	2,336,338.16	551,124			3.12	1,721,160.25	371,624			3.12	1,160,581.75	5,218,080.17
	2.2	Fill (use excavated soil)	cu.m	748,107			3.16	2,360,432.69	551,124			3.16	1,738,910.49	371,624			3.16	1,172,550.77	5,271,893.95
	2.3	Fill (borrow material)	cu.m	71,361			4.87	347,456.71	197,899			4.87	963,570.23	111,555			4.87	543,161.30	1,854,188.24
	2.4	Disposal of surplus soil	cu.m				3.50	0.00				3.50	0.00				3.50	0.00	0.00
							Total S1-2	**5,044,227.56**				**Total S2-2**	**4,423,640.97**				**Total S3-2**	**2,876,293.82**	**12,344,162.35**
3	Pavement																		
	3.1.1	Replacement of subgrade (t = 150mm)	sq.m				2.47	0.00				2.47	0.00				2.47	0.00	0.00
	3.1.2	Replacement of subgrade (t = 200mm)	sq.m	1,333,600			2.87	3,831,966.24				2.87	0.00				2.87	0.00	3,831,966.24
	3.2	Granular sub base course (t = 150mm) (Soaked CBR > 30%)	sq.m		80.9%	69.7%	0.89	0.00		80.9%	23.7%	0.45	0.00		80.9%	26.0%	0.47	0.00	0.00
	3.3	Granular sub base course (t = 175mm) (Soaked CBR > 30%)	sq.m		80.9%	69.7%	1.04	0.00		80.9%	23.7%	0.53	0.00		80.9%	26.0%	0.55	0.00	0.00
	3.4	Granular sub base course (t = 225mm) (Soaked CBR > 30%)	sq.m		80.9%	69.7%	1.34	0.00		80.9%	23.7%	0.68	0.00		80.9%	26.0%	0.71	0.00	0.00
	3.5.1	Granular sub base course (t = 325mm) (Soaked CBR > 30%)	sq.m		80.9%	69.7%	1.93	0.00		80.9%	23.7%	0.98	0.00		80.9%	26.0%	1.03	0.00	0.00
	3.5.2	Granular sub base course (t = 375mm) (Soaked CBR > 30%)	sq.m		80.9%	69.7%	2.23	0.00		80.9%	23.7%	1.13	0.00		80.9%	26.0%	1.19	0.00	0.00
	3.5.3	Granular sub base course (t = 400mm) (Soaked CBR > 30%)	sq.m		80.9%	69.7%	2.38	0.00		80.9%	23.7%	1.21	0.00		80.9%	26.0%	1.27	0.00	0.00
	3.6	Cemented sub base course (t = 150mm) (7day UCS 0.75 - 1.5MPa)	sq.m		80.9%	69.7%	3.68	0.00		80.9%	23.7%	1.87	0.00		80.9%	26.0%	1.96	0.00	0.00
	3.7	Cemented sub base course (t = 175mm) (7day UCS 0.75 - 1.5MPa)	sq.m		80.9%	69.7%	4.30	0.00		80.9%	23.7%	2.18	0.00		80.9%	26.0%	2.28	0.00	0.00
	3.8	Cemented sub base course (t = 200mm) (7day UCS 0.75 - 1.5MPa)	sq.m	1,333,600	80.9%	69.7%	4.91	6,547,064.56	1,031,870	80.9%	23.7%	2.49	2,568,431.81	1,145,540	80.9%	26.0%	2.61	2,989,990.78	12,105,487.15
	3.9.1	Cemented sub base course (t = 225mm) (7day UCS 0.75 - 1.5MPa)	sq.m		80.9%	69.7%	5.52	0.00		80.9%	23.7%	2.80	0.00		80.9%	26.0%	2.94	0.00	0.00
	3.9.2	Cemented sub base course (t = 250mm) (7day UCS 0.75 - 1.5MPa)	sq.m		80.9%	69.7%	6.14	0.00		80.9%	23.7%	3.11	0.00		80.9%	26.0%	3.26	0.00	0.00
	3.9.3	Cemented sub base course (t = 300mm) (7day UCS 0.75 - 1.5MPa)	sq.m		80.9%	69.7%	7.36	0.00		80.9%	23.7%	3.73	0.00		80.9%	26.0%	3.92	0.00	0.00
	3.9.4	Cemented sub base course (t = 325mm) (7day UCS 0.75 - 1.5MPa)	sq.m		80.9%	69.7%	7.98	0.00		80.9%	23.7%	4.04	0.00		80.9%	26.0%	4.24	0.00	0.00
	3.10	Granular base course (t = 150mm) (Soaked CBR > 80%)	sq.m		80.9%	69.7%	2.59	0.00		80.9%	23.7%	1.31	0.00		80.9%	26.0%	1.38	0.00	0.00
	3.11.1	Granular base course (t = 200mm) (Soaked CBR > 80%)	sq.m		80.9%	69.7%	3.46	0.00		80.9%	23.7%	1.75	0.00		80.9%	26.0%	1.84	0.00	0.00
	3.11.2	Granular base course (t = 225mm) (Soaked CBR > 80%)	sq.m		80.9%	69.7%	3.89	0.00		80.9%	23.7%	1.97	0.00		80.9%	26.0%	2.07	0.00	0.00
	3.11.3	Granular base course (t = 250mm) (Soaked CBR > 80%)	sq.m		80.9%	69.7%	4.32	0.00		80.9%	23.7%	2.19	0.00		80.9%	26.0%	2.30	0.00	0.00
	3.12	Cemented base course (t = 150mm) (7day UCS 1.5 - 3.0MPa)	sq.m	1,333,600	80.9%	69.7%	5.07	6,756,961.22	1,031,870	80.9%	23.7%	2.57	2,650,774.86	1,145,540	80.9%	26.0%	2.69	3,085,848.87	12,493,584.96
	3.13	Cemented base course (t = 180mm) (7day UCS 1.5 - 3.0MPa)	sq.m		80.9%	69.7%	6.08	0.00		80.9%	23.7%	3.08	0.00		80.9%	26.0%	3.23	0.00	0.00
	3.14	Cemented base course (t = 200mm) (7day UCS 1.5 - 3.0MPa)	sq.m		80.9%	69.7%	6.76	0.00		80.9%	23.7%	3.43	0.00		80.9%	26.0%	3.59	0.00	0.00
	3.15	Prime coat	sq.m	1,201,770		79.3%	1.59	1,912,678.25	929,010		116.2%	2.33	2,166,575.81	1,032,660		150.1%	3.01	3,110,895.48	7,190,149.53
	3.16	Tack coat	sq.m			79.3%	0.88	0.00			116.2%	1.29	0.00			150.1%	1.66	0.00	0.00
	3.17.1	Asphalt concrete (t = 50mm)	sq.m	1,201,770	36.4%	79.3%	10.22	12,287,147.68	929,010	36.4%	116.2%	11.71	10,878,139.70	1,032,660	36.4%	150.1%	13.07	13,500,814.16	36,666,101.53
	3.17.2	Asphalt concrete (t = 100mm)	sq.m		36.4%	79.3%	20.45	0.00		36.4%	116.2%	23.42	0.00		36.4%	150.1%	26.15	0.00	0.00
	3.18	Double bituminous surface treatment (DBST)	sq.m		36.4%	79.3%	4.64	0.00		36.4%	116.2%	5.31	0.00		36.4%	150.1%	5.93	0.00	0.00
	3.19	Otta seal for sidewalk	sq.m		36.4%	79.3%	2.78	0.00		36.4%	116.2%	3.19	0.00		36.4%	150.1%	3.56	0.00	0.00
	3.20	Granular sub base course for sidewalk (t = 100mm; Soaked CBR > 30%)	sq.m		80.9%	69.7%	0.59	0.00		80.9%	23.7%	0.30	0.00		80.9%	26.0%	0.32	0.00	0.00
							Total S1-3	**31,335,817.94**				**Total S2-3**	**18,263,922.18**				**Total S3-3**	**22,687,549.29**	**72,287,289.41**

Breakdown of the Project Cost (BQ_ALT1-2_80kph)

Item	Description		Unit	Section 1 (Nampula - Ribaue)			131.85	(km)	Section 2 (Ribaue - Malema)			102.87	(km)	Section 3 (Malema - Cuamba)			112.91	(km)	Total (Section1-3) 347.63 (km)
				Q'ty	Material coefficient	Transport coefficient	Unit Price 1	Amount 1	Q'ty	Material coefficient	Transport coefficient	Unit Price 2	Amount 2	Q'ty	Material coefficient	Transport coefficient	Unit Price 3	Amount 3	
4	Drainage																		
	4.1	Unlined side ditch	m				3.35	0.00				3.35	0.00				3.35	0.00	0.00
	4.2	Concrete lined side ditch	m	98,800	49.0%	79.3%	21.36	2,110,027.74	97,400	49.0%	116.2%	25.65	2,498,691.44	91,000	49.0%	150.1%	29.60	2,693,772.67	7,302,491.85
	4.3	U-shaped side ditch (open)	m	1,170	49.0%	79.3%	38.43	44,958.42	240	49.0%	116.2%	46.16	11,077.94	1,260	49.0%	150.1%	53.26	67,109.50	123,145.86
	4.4	U-shaped side ditch (covered)	m	16,240	49.0%	79.3%	47.79	776,124.13	3,010	49.0%	116.2%	57.41	172,796.17	15,686	49.0%	150.1%	66.24	1,039,072.14	1,987,992.44
	4.5	Cross culvert	m	252	49.0%	79.3%	292.41	73,687.76	72	49.0%	116.2%	351.25	25,290.05	384	49.0%	150.1%	405.31	155,637.55	254,615.36
	4.6	Box culvert (1.0*1.0)	No	179	49.0%	79.3%	7,226.46	1,293,537.03	139	49.0%	116.2%	8,680.57	1,206,599.35	179	49.0%	150.1%	10,016.46	1,792,945.94	4,293,082.32
	4.7	Box culvert (2.0*2.0)	No	12	49.0%	79.3%	22,795.51	273,546.12	60	49.0%	116.2%	27,382.42	1,642,944.94	38	49.0%	150.1%	31,596.40	1,200,663.30	3,117,154.35
							Total S1-4	**4,571,881.20**				**Total S2-4**	**5,557,399.89**				**Total S3-4**	**6,949,201.11**	**17,078,482.20**
5	Road furniture																		
	5.1	Road sign (Warning) A=0.62m2/no	m2	54		79.3%	232.05	12,530.65	16		116.2%	340.03	5,440.42	64		150.1%	439.23	28,110.41	46,081.48
	5.2	Road sign (Regulatory) A=1.13m3/no	m2	54		79.3%	232.05	12,530.65	14		116.2%	340.03	4,760.37	44		150.1%	439.23	19,325.91	36,616.92
	5.3	Road marking (continuous) W=100mm	m	283,242		79.3%	0.52	147,164.99	217,356		116.2%	0.76	165,482.25	244,095		150.1%	0.98	240,056.37	552,703.62
	5.4	Road marking (continuous) W=400m	m	1,430		79.3%	2.08	2,971.96	330		116.2%	3.05	1,004.97	1,210		150.1%	3.93	4,759.92	8,736.85
							Total S1-5	**175,198.24**				**Total S2-5**	**176,688.02**				**Total S3-5**	**292,252.61**	**644,138.87**
6	Miscellaneous work																		
	6.1	Concrete kerb	m	0	49.0%	79.3%	16.21	0.00	0	49.0%	116.2%	19.48	0.00	4,260	49.0%	150.1%	22.47	95,742.93	95,742.93
	6.2	Demolishing existing concrete (plain)	m3	754			12.49	9,413.99	826			12.49	10,312.94	1,183			12.49	14,770.22	34,497.15
	6.3	Demolishing existing concrete (reinforced)	m3	114			22.69	2,586.29	535			22.69	12,137.41	28			22.69	635.23	15,358.93
	6.4	Removal of bailey bridge (W=4m)	m				90.75	0.00				90.75	0.00	31			90.75	2,813.16	2,813.16
							Total S1-6	**12,000.28**				**Total S2-6**	**22,450.35**				**Total S3-6**	**113,961.54**	**148,412.17**
7	Bridge																		
	No. 12 Monapo bridge	L = 25m	No									445,448.07	0.00						0.00
	No. 19 Lalaua bridge	L = 30m	No									515,746.94	0.00						0.00
	No. 24 Nataleia bridge	L = 48m	No									704,005.02	0.00						0.00
	No. 27 Mutivasse bridge	L = 30m	No									645,390.18	0.00						0.00
	No. 30 Namuela bridge	L = 30m	No														594,300.46	0.00	0.00
	No. 34 Lurio bridge	L = 94m	No														1,444,775.81	0.00	0.00
							Total S1-7	**0.00**				**Total S2-7**	**2,043,003.87**				**Total S3-7**	**3,498,934.03**	**5,541,937.90**
8	Temporary construction road		km	124.00			10,183.00	1,262,692.00	101.00			10,183.00	1,028,483.00	104.00			10,183.00	1,059,032.00	3,350,207.00
	Total (2 - 8)						**Total S1 (2-8)**	**42,401,817.22**				**Total S2 (2-8)**	**31,515,588.28**				**Total S3 (2-8)**	**37,477,224.40**	**111,394,629.90**
9	Dayworks	2.46% of Total (2 - 8)	L.S.	1			1,043,084.70	1,043,084.70	1			775,283.47	775,283.47	1			921,939.72	921,939.72	2,740,307.90
10	Social issues	1.79% of Total (2 - 8)	L.S.	1			758,992.53	758,992.53	1			564,129.03	564,129.03	1			670,842.32	670,842.32	1,993,963.88
	Total (1 - 10)						**Total S1 (1-10)**	**61,978,736.24**				**Total S2 (1-10)**	**46,066,335.39**				**Total S3 (1-10)**	**54,780,458.91**	**162,825,530.53**
11	Contingency cost	10% of Total (1 - 10)	L.S.	1			6,197,873.62	6,197,873.62	1			4,606,633.54	4,606,633.54	1			5,478,045.89	5,478,045.89	16,282,553.05
	Total construction cost (1 - 11)			1			68,176,609.86	68,176,609.86	1			50,672,968.92	50,672,968.92	1			60,258,504.80	60,258,504.80	179,108,083.59
	VAT (17%) of total construction cost (1 - 11)			1			11,590,023.68	11,590,023.68	1			8,614,404.72	8,614,404.72	1			10,243,945.82	10,243,945.82	30,448,374.21
	Total construction cost (1 - 11) inclu. VAT						**Total Construction S1 (1-11)**	**79,766,633.54**				**Total Construction S2 (1-11)**	**59,287,373.64**				**Total Construction S3 (1-11)**	**70,502,450.62**	**209,556,457.79**
12	Engineering cost	8% of total construction cost (1-11)	L.S.	1			5,454,128.79	5,454,128.79	1			4,053,837.51	4,053,837.51	1			4,820,680.38	4,820,680.38	14,328,646.69
	VAT (17%) of engineering cost			1			927,201.89	927,201.89	1			689,152.38	689,152.38	1			819,515.67	819,515.67	2,435,869.94
	Total engineering cost inclu. VAT						**Total engineering S1**	**6,381,330.68**				**Total engineering S2**	**4,742,989.89**				**Total engineering S3**	**5,640,196.05**	**16,764,516.62**
	Total project cost (1 - 12)			1			73,630,738.65	73,630,738.65	1			54,726,806.44	54,726,806.44	1			65,079,185.18	65,079,185.18	193,436,730.27
	VAT (17%) of total project cost (1 - 12)			1			12,517,225.57	12,517,225.57	1			9,303,557.09	9,303,557.09	1			11,063,461.48	11,063,461.48	32,884,244.15
	Total project cost (1 - 12) inclu. VAT						**Total project S1 (1-12)**	**86,147,964.22**				**Total project S2 (1-12)**	**64,030,363.53**				**Total project S3 (1-12)**	**76,142,646.67**	**226,320,974.42**

Breakdown of the Project Cost (BQ_ALT1-3_80kph)

Appendix-C

Item	Description		Unit	Section 1 (Nampula - Ribaue)			131.85	(km)	Section 2 (Ribaue - Malema)			102.87	(km)	Section 3 (Malema - Cuamba)			112.91	(km)	Total (Section1-3) 347.63 (km)
				Q'ty	Material coefficient	Transport coefficient	Unit Price 1	Amount 1	Q'ty	Material coefficient	Transport coefficient	Unit Price 2	Amount 2	Q'ty	Material coefficient	Transport coefficient	Unit Price 3	Amount 3	
0	Compensation	COI + Construction Rd. + Diversion	km	131.85			3,365.00	443,675.25	102.87			3,365.00	346,157.55	112.91			3,365.00	379,942.15	1,169,774.95
1	Preliminary & general works	41.92% of Total (2 -7)	L.S.	1			12,059,162.74	12,059,162.74	1			10,274,299.13	10,274,299.13	1			12,482,966.72	12,482,966.72	34,816,428.58
2	Earthworks																		
	2.1	Excavation	cu.m	832,667			3.12	2,600,419.04	695,594			3.12	2,172,340.06	536,731			3.12	1,676,210.91	6,448,970.02
	2.2	Fill (use excavated soil)	cu.m	728,531			3.16	2,298,666.35	582,281			3.16	1,837,217.28	316,711			3.16	999,288.87	5,135,172.50
	2.3	Fill (borrow material)	cu.m				4.87	0.00				4.87	0.00				4.87	0.00	0.00
	2.4	Disposal of surplus soil	cu.m	104,136			3.50	364,400.88	113,313			3.50	396,513.76	220,020			3.50	769,911.29	1,530,825.94
							Total S1-2	**5,263,486.28**				**Total S2-2**	**4,406,071.11**				**Total S3-2**	**3,445,411.07**	**13,114,968.46**
3	Pavement																		
	3.1.1	Replacement of subgrade (t = 150mm)	sq.m				2.47	0.00				2.47	0.00				2.47	0.00	0.00
	3.1.2	Replacement of subgrade (t = 200mm)	sq.m				2.87	0.00				2.87	0.00				2.87	0.00	0.00
	3.2	Granular sub base course (t = 150mm) (Soaked CBR > 30%)	sq.m		80.9%	69.7%	0.89	0.00		80.9%	23.7%	0.45	0.00		80.9%	26.0%	0.47	0.00	0.00
	3.3	Granular sub base course (t = 175mm) (Soaked CBR > 30%)	sq.m		80.9%	69.7%	1.04	0.00		80.9%	23.7%	0.53	0.00		80.9%	26.0%	0.55	0.00	0.00
	3.4	Granular sub base course (t = 225mm) (Soaked CBR > 30%)	sq.m		80.9%	69.7%	1.34	0.00		80.9%	23.7%	0.68	0.00		80.9%	26.0%	0.71	0.00	0.00
	3.5.1	Granular sub base course (t = 325mm) (Soaked CBR > 30%)	sq.m		80.9%	69.7%	1.93	0.00		80.9%	23.7%	0.98	0.00		80.9%	26.0%	1.03	0.00	0.00
	3.5.2	Granular sub base course (t = 375mm) (Soaked CBR > 30%)	sq.m		80.9%	69.7%	2.23	0.00	1,031,870	80.9%	23.7%	1.13	1,167,020.22	1,145,540	80.9%	26.0%	1.19	1,358,564.27	2,525,584.50
	3.5.3	Granular sub base course (t = 400mm) (Soaked CBR > 30%)	sq.m	1,333,600	80.9%	69.7%	2.38	3,173,114.09		80.9%	23.7%	1.21	0.00		80.9%	26.0%	1.27	0.00	3,173,114.09
	3.6	Cemented sub base course (t = 150mm) (7day UCS 0.75 - 1.5MPa)	sq.m		80.9%	69.7%	3.68	0.00		80.9%	23.7%	1.87	0.00		80.9%	26.0%	1.96	0.00	0.00
	3.7	Cemented sub base course (t = 175mm) (7day UCS 0.75 - 1.5MPa)	sq.m		80.9%	69.7%	4.30	0.00		80.9%	23.7%	2.18	0.00		80.9%	26.0%	2.28	0.00	0.00
	3.8	Cemented sub base course (t = 200mm) (7day UCS 0.75 - 1.5MPa)	sq.m		80.9%	69.7%	4.91	0.00		80.9%	23.7%	2.49	0.00		80.9%	26.0%	2.61	0.00	0.00
	3.9.1	Cemented sub base course (t = 225mm) (7day UCS 0.75 - 1.5MPa)	sq.m		80.9%	69.7%	5.52	0.00		80.9%	23.7%	2.80	0.00		80.9%	26.0%	2.94	0.00	0.00
	3.9.2	Cemented sub base course (t = 250mm) (7day UCS 0.75 - 1.5MPa)	sq.m		80.9%	69.7%	6.14	0.00		80.9%	23.7%	3.11	0.00		80.9%	26.0%	3.26	0.00	0.00
	3.9.3	Cemented sub base course (t = 300mm) (7day UCS 0.75 - 1.5MPa)	sq.m		80.9%	69.7%	7.36	0.00		80.9%	23.7%	3.73	0.00		80.9%	26.0%	3.92	0.00	0.00
	3.9.4	Cemented sub base course (t = 325mm) (7day UCS 0.75 - 1.5MPa)	sq.m		80.9%	69.7%	7.98	0.00		80.9%	23.7%	4.04	0.00		80.9%	26.0%	4.24	0.00	0.00
	3.10	Granular base course (t = 150mm) (Soaked CBR > 80%)	sq.m		80.9%	69.7%	2.59	0.00		80.9%	23.7%	1.31	0.00		80.9%	26.0%	1.38	0.00	0.00
	3.11.1	Granular base course (t = 200mm) (Soaked CBR > 80%)	sq.m		80.9%	69.7%	3.46	0.00	1,031,870	80.9%	23.7%	1.75	1,808,940.58	1,145,540	80.9%	26.0%	1.84	2,105,843.59	3,914,784.17
	3.11.2	Granular base course (t = 225mm) (Soaked CBR > 80%)	sq.m		80.9%	69.7%	3.89	0.00		80.9%	23.7%	1.97	0.00		80.9%	26.0%	2.07	0.00	0.00
	3.11.3	Granular base course (t = 250mm) (Soaked CBR > 80%)	sq.m	1,333,600	80.9%	69.7%	4.32	5,763,853.02		80.9%	23.7%	2.19	0.00		80.9%	26.0%	2.30	0.00	5,763,853.02
	3.12	Cemented base course (t = 150mm) (7day UCS 1.5 - 3.0MPa)	sq.m		80.9%	69.7%	5.07	0.00		80.9%	23.7%	2.57	0.00		80.9%	26.0%	2.69	0.00	0.00
	3.13	Cemented base course (t = 180mm) (7day UCS 1.5 - 3.0MPa)	sq.m		80.9%	69.7%	6.08	0.00		80.9%	23.7%	3.08	0.00		80.9%	26.0%	3.23	0.00	0.00
	3.14	Cemented base course (t = 200mm) (7day UCS 1.5 - 3.0MPa)	sq.m		80.9%	69.7%	6.76	0.00		80.9%	23.7%	3.43	0.00		80.9%	26.0%	3.59	0.00	0.00
	3.15	Prime coat	sq.m	1,201,770		79.3%	1.59	1,912,678.25	929,010		116.2%	2.33	2,166,575.81	1,032,660		150.1%	3.01	3,110,895.48	7,190,149.53
	3.16	Tack coat	sq.m	1,201,770		79.3%	0.88	1,054,975.00	929,010		116.2%	1.29	1,195,017.15	1,032,660		150.1%	1.66	1,715,875.08	3,965,867.23
	3.17.1	Asphalt concrete (t = 50mm)	sq.m		36.4%	79.3%	10.22	0.00		36.4%	116.2%	11.71	0.00		36.4%	150.1%	13.07	0.00	0.00
	3.17.2	Asphalt concrete (t = 100mm)	sq.m		36.4%	79.3%	20.45	0.00		36.4%	116.2%	23.42	0.00		36.4%	150.1%	26.15	0.00	0.00
	3.18	Double bituminous surface treatment (DBST)	sq.m	1,201,770	36.4%	79.3%	4.64	5,577,208.33	929,010	36.4%	116.2%	5.31	4,937,651.35	1,032,660	36.4%	150.1%	5.93	6,128,098.66	16,642,958.35
	3.19	Otta seal for sidewalk	sq.m		36.4%	79.3%	2.78	0.00		36.4%	116.2%	3.19	0.00	0	36.4%	150.1%	3.56	0.00	0.00
	3.20	Granular sub base course for sidewalk (t = 100mm; Soaked CBR > 30%)	sq.m		80.9%	69.7%	0.59	0.00		80.9%	23.7%	0.30	0.00	0	80.9%	26.0%	0.32	0.00	0.00
							Total S1-3	**17,481,828.69**				**Total S2-3**	**11,275,205.11**				**Total S3-3**	**14,419,277.09**	**43,176,310.89**

Breakdown of the Project Cost (BQ_ALT1-3_80kph)

Item	Description		Unit	Section 1 (Nampula - Ribaue)			131.85	(km)	Section 2 (Ribaue - Malema)			102.87	(km)	Section 3 (Malema - Cuamba)			112.91	(km)	Total (Section1-3) 347.63 (km)
				Q'ty	Material coefficient	Transport coefficient	Unit Price 1	Amount 1	Q'ty	Material coefficient	Transport coefficient	Unit Price 2	Amount 2	Q'ty	Material coefficient	Transport coefficient	Unit Price 3	Amount 3	
4	Drainage																		
	4.1	Unlined side ditch	m				3.35	0.00				3.35	0.00				3.35	0.00	0.00
	4.2	Concrete lined side ditch	m	98,800	49.0%	79.3%	21.36	2,110,027.74	97,400	49.0%	116.2%	25.65	2,498,691.44	91,000	49.0%	150.1%	29.60	2,693,772.67	7,302,491.85
	4.3	U-shaped side ditch (open)	m	1,170	49.0%	79.3%	38.43	44,958.42	240	49.0%	116.2%	46.16	11,077.94	1,260	49.0%	150.1%	53.26	67,109.50	123,145.86
	4.4	U-shaped side ditch (covered)	m	16,240	49.0%	79.3%	47.79	776,124.13	3,010	49.0%	116.2%	57.41	172,796.17	15,686	49.0%	150.1%	66.24	1,039,072.14	1,987,992.44
	4.5	Cross culvert	m	252	49.0%	79.3%	292.41	73,687.76	72	49.0%	116.2%	351.25	25,290.05	384	49.0%	150.1%	405.31	155,637.55	254,615.36
	4.6	Box culvert (1.0*1.0)	No	179	49.0%	79.3%	7,226.46	1,293,537.03	139	49.0%	116.2%	8,680.57	1,206,599.35	179	49.0%	150.1%	10,016.46	1,792,945.94	4,293,082.32
	4.7	Box culvert (2.0*2.0)	No	12	49.0%	79.3%	22,795.51	273,546.12	60	49.0%	116.2%	27,382.42	1,642,944.94	38	49.0%	150.1%	31,596.40	1,200,663.30	3,117,154.35
							Total S1-4	4,571,881.20				Total S2-4	5,557,399.89				Total S3-4	6,949,201.11	17,078,482.20
5	Road furniture																		
	5.1	Road sign (Warning) A=0.62m2/no	m2	54		79.3%	232.05	12,530.65	16		116.2%	340.03	5,440.42	64		150.1%	439.23	28,110.41	46,081.48
	5.2	Road sign (Regulatory) A=1.13m3/no	m2	54		79.3%	232.05	12,530.65	14		116.2%	340.03	4,760.37	44		150.1%	439.23	19,325.91	36,616.92
	5.3	Road marking (continuous) W=100mm	m	283,242		79.3%	0.52	147,164.99	217,356		116.2%	0.76	165,482.25	244,095		150.1%	0.98	240,056.37	552,703.62
	5.4	Road marking (continuous) W=400m	m	1,430		79.3%	2.08	2,971.96	330		116.2%	3.05	1,004.97	1,210		150.1%	3.93	4,759.92	8,736.85
							Total S1-5	175,198.24				Total S2-5	176,688.02				Total S3-5	292,252.61	644,138.87
6	Miscellaneous work																		
	6.1	Concrete kerb	m	0	49.0%	79.3%	16.21	0.00	0	49.0%	116.2%	19.48	0.00	4,260	49.0%	150.1%	22.47	95,742.93	95,742.93
	6.2	Demolishing existing concrete (plain)	m3	754			12.49	9,413.99	826			12.49	10,312.94	1,183			12.49	14,770.22	34,497.15
	6.3	Demolishing existing concrete (reinforced)	m3	114			22.69	2,586.29	535			22.69	12,137.41	28			22.69	635.23	15,358.93
	6.4	Removal of bailey bridge (W=4m)	m				90.75	0.00				90.75	0.00	31			90.75	2,813.16	2,813.16
							Total S1-6	12,000.28				Total S2-6	22,450.35				Total S3-6	113,961.54	148,412.17
7	Bridge																		
	No. 12 Monapo bridge	L = 25m	No									445,448.07	0.00						0.00
	No. 19 Lalaua bridge	L = 30m	No									515,746.94	0.00						0.00
	No. 24 Nataleia bridge	L = 48m	No									704,005.02	0.00						0.00
	No. 27 Mutivasse bridge	L = 30m	No									645,390.18	0.00						0.00
	No. 30 Namuela bridge	L = 30m	No														594,300.46	0.00	0.00
	No. 34 Lurio bridge	L = 94m	No														1,444,775.81	0.00	0.00
							Total S1-7	0.00				Total S2-7	2,043,003.87				Total S3-7	3,498,934.03	5,541,937.90
8	Temporary construction road		km	124.00			10,183.00	1,262,692.00	101.00			10,183.00	1,028,483.00	104.00			10,183.00	1,059,032.00	3,350,207.00
	Total (2 - 8)						**Total S1 (2-8)**	**28,767,086.68**				**Total S2 (2-8)**	**24,509,301.35**				**Total S3 (2-8)**	**29,778,069.46**	**83,054,457.49**
9	Dayworks	2.46% of Total (2 - 8)	L.S.	1			707,670.33	707,670.33	1			602,928.81	602,928.81	1			732,540.51	732,540.51	2,043,139.65
10	Social issues	1.79% of Total (2 - 8)	L.S.	1			514,930.85	514,930.85	1			438,716.49	438,716.49	1			533,027.44	533,027.44	1,486,674.79
	Total (1 - 10)						**Total S1 (1-10)**	**42,048,850.60**				**Total S2 (1-10)**	**35,825,245.78**				**Total S3 (1-10)**	**43,526,604.12**	**121,400,700.51**
11	Contingency cost	10% of Total (1 - 10)	L.S.	1			4,204,885.06	4,204,885.06	1			3,582,524.58	3,582,524.58	1			4,352,660.41	4,352,660.41	12,140,070.05
	Total construction cost (1 - 11)			1			46,253,735.66	46,253,735.66	1			39,407,770.36	39,407,770.36	1			47,879,264.54	47,879,264.54	133,540,770.56
	VAT (17%) of total construction cost (1 - 11)			1			7,863,135.06	7,863,135.06	1			6,699,320.96	6,699,320.96	1			8,139,474.97	8,139,474.97	22,701,931.00
	Total construction cost (1 - 11) inclu. VAT						**Total Construction S1 (1-11)**	**54,116,870.73**				**Total Construction S2 (1-11)**	**46,107,091.32**				**Total Construction S3 (1-11)**	**56,018,739.51**	**156,242,701.56**
12	Engineering cost	8% of total construction cost (1-11)	L.S.	1			3,700,298.85	3,700,298.85	1			3,152,621.63	3,152,621.63	1			3,830,341.16	3,830,341.16	10,683,261.64
	VAT (17%) of engineering cost			1			629,050.81	629,050.81	1			535,945.68	535,945.68	1			651,158.00	651,158.00	1,816,154.48
	Total engineering cost inclu. VAT						**Total engineering S1**	**4,329,349.66**				**Total engineering S2**	**3,688,567.31**				**Total engineering S3**	**4,481,499.16**	**12,499,416.12**
	Total project cost (1 - 12)			1			49,954,034.52	49,954,034.52	1			42,560,391.99	42,560,391.99	1			51,709,605.70	51,709,605.70	144,224,032.21
	VAT (17%) of total project cost (1 - 12)			1			8,492,185.87	8,492,185.87	1			7,235,266.64	7,235,266.64	1			8,790,632.97	8,790,632.97	24,518,085.47
	Total project cost (1 - 12) inclu. VAT						**Total project S1 (1-12)**	**58,446,220.39**				**Total project S2 (1-12)**	**49,795,658.63**				**Total project S3 (1-12)**	**60,500,238.67**	**168,742,117.68**

Breakdown of the Project Cost (BQ_ALT1-4_80kph)

Item	Description		Unit	Section 1 (Nampula - Ribaue)			131.85	(km)	Section 2 (Ribaue - Malema)			102.87	(km)	Section 3 (Malema - Cuamba)			112.91	(km)	Total (Section1-3) 347.63 (km)
				Q'ty	Material coefficient	Transport coefficient	Unit Price 1	Amount 1	Q'ty	Material coefficient	Transport coefficient	Unit Price 2	Amount 2	Q'ty	Material coefficient	Transport coefficient	Unit Price 3	Amount 3	
0	Compensation	COI + Construction Rd. + Diversion	km	131.85			3,365.00	443,675.25	102.87			3,365.00	346,157.55	112.91			3,365.00	379,942.15	1,169,774.95
1	Preliminary & general works	41.92% of Total (2 -7)	L.S.	1			16,868,458.71	16,868,458.71	1			11,636,635.48	11,636,635.48	1			13,926,647.54	13,926,647.54	42,431,741.73
2	Earthworks																		
	2.1	Excavation	cu.m	832,667			3.12	2,600,419.04	611,827			3.12	1,910,735.72	441,260			3.12	1,378,054.98	5,889,209.74
	2.2	Fill (use excavated soil)	cu.m	728,531			3.16	2,298,666.35	611,827			3.16	1,930,441.04	404,764			3.16	1,277,114.34	5,506,221.73
	2.3	Fill (borrow material)	cu.m				4.87	0.00	59,002			4.87	287,280.74				4.87	0.00	287,280.74
	2.4	Disposal of surplus soil	cu.m	104,136			3.50	364,400.88				3.50	0.00	36,496			3.50	127,709.67	492,110.56
							Total S1-2	**5,263,486.28**				**Total S2-2**	**4,128,457.50**				**Total S3-2**	**2,782,879.00**	**12,174,822.77**
3	Pavement																		
	3.1.1	Replacement of subgrade (t = 150mm)	sq.m				2.47	0.00				2.47	0.00				2.47	0.00	0.00
	3.1.2	Replacement of subgrade (t = 200mm)	sq.m	1,333,600			2.87	3,831,966.24				2.87	0.00				2.87	0.00	3,831,966.24
	3.2	Granular sub base course (t = 150mm) (Soaked CBR > 30%)	sq.m		80.9%	69.7%	0.89	0.00		80.9%	23.7%	0.45	0.00		80.9%	26.0%	0.47	0.00	0.00
	3.3	Granular sub base course (t = 175mm) (Soaked CBR > 30%)	sq.m		80.9%	69.7%	1.04	0.00		80.9%	23.7%	0.53	0.00		80.9%	26.0%	0.55	0.00	0.00
	3.4	Granular sub base course (t = 225mm) (Soaked CBR > 30%)	sq.m		80.9%	69.7%	1.34	0.00		80.9%	23.7%	0.68	0.00		80.9%	26.0%	0.71	0.00	0.00
	3.5.1	Granular sub base course (t = 325mm) (Soaked CBR > 30%)	sq.m		80.9%	69.7%	1.93	0.00		80.9%	23.7%	0.98	0.00		80.9%	26.0%	1.03	0.00	0.00
	3.5.2	Granular sub base course (t = 375mm) (Soaked CBR > 30%)	sq.m		80.9%	69.7%	2.23	0.00		80.9%	23.7%	1.13	0.00		80.9%	26.0%	1.19	0.00	0.00
	3.5.3	Granular sub base course (t = 400mm) (Soaked CBR > 30%)	sq.m		80.9%	69.7%	2.38	0.00		80.9%	23.7%	1.21	0.00		80.9%	26.0%	1.27	0.00	0.00
	3.6	Cemented sub base course (t = 150mm) (7day UCS 0.75 - 1.5MPa)	sq.m		80.9%	69.7%	3.68	0.00		80.9%	23.7%	1.87	0.00		80.9%	26.0%	1.96	0.00	0.00
	3.7	Cemented sub base course (t = 175mm) (7day UCS 0.75 - 1.5MPa)	sq.m		80.9%	69.7%	4.30	0.00		80.9%	23.7%	2.18	0.00		80.9%	26.0%	2.28	0.00	0.00
	3.8	Cemented sub base course (t = 200mm) (7day UCS 0.75 - 1.5MPa)	sq.m		80.9%	69.7%	4.91	0.00		80.9%	23.7%	2.49	0.00		80.9%	26.0%	2.61	0.00	0.00
	3.9.1	Cemented sub base course (t = 225mm) (7day UCS 0.75 - 1.5MPa)	sq.m		80.9%	69.7%	5.52	0.00		80.9%	23.7%	2.80	0.00		80.9%	26.0%	2.94	0.00	0.00
	3.9.2	Cemented sub base course (t = 250mm) (7day UCS 0.75 - 1.5MPa)	sq.m		80.9%	69.7%	6.14	0.00		80.9%	23.7%	3.11	0.00		80.9%	26.0%	3.26	0.00	0.00
	3.9.3	Cemented sub base course (t = 300mm) (7day UCS 0.75 - 1.5MPa)	sq.m	1,333,600	80.9%	69.7%	7.36	9,820,596.84	1,031,870	80.9%	23.7%	3.73	3,852,647.72	1,145,540	80.9%	26.0%	3.92	4,484,986.17	18,158,230.73
	3.9.4	Cemented sub base course (t = 325mm) (7day UCS 0.75 - 1.5MPa)	sq.m		80.9%	69.7%	7.98	0.00		80.9%	23.7%	4.04	0.00		80.9%	26.0%	4.24	0.00	0.00
	3.10	Granular base course (t = 150mm) (Soaked CBR > 80%)	sq.m		80.9%	69.7%	2.59	0.00		80.9%	23.7%	1.31	0.00		80.9%	26.0%	1.38	0.00	0.00
	3.11.1	Granular base course (t = 200mm) (Soaked CBR > 80%)	sq.m		80.9%	69.7%	3.46	0.00		80.9%	23.7%	1.75	0.00		80.9%	26.0%	1.84	0.00	0.00
	3.11.2	Granular base course (t = 225mm) (Soaked CBR > 80%)	sq.m		80.9%	69.7%	3.89	0.00		80.9%	23.7%	1.97	0.00		80.9%	26.0%	2.07	0.00	0.00
	3.11.3	Granular base course (t = 250mm) (Soaked CBR > 80%)	sq.m		80.9%	69.7%	4.32	0.00		80.9%	23.7%	2.19	0.00		80.9%	26.0%	2.30	0.00	0.00
	3.12	Cemented base course (t = 150mm) (7day UCS 1.5 - 3.0MPa)	sq.m	1,333,600	80.9%	69.7%	5.07	6,756,961.22	1,031,870	80.9%	23.7%	2.57	2,650,774.86	1,145,540	80.9%	26.0%	2.69	3,085,848.87	12,493,584.96
	3.13	Cemented base course (t = 180mm) (7day UCS 1.5 - 3.0MPa)	sq.m		80.9%	69.7%	6.08	0.00		80.9%	23.7%	3.08	0.00		80.9%	26.0%	3.23	0.00	0.00
	3.14	Cemented base course (t = 200mm) (7day UCS 1.5 - 3.0MPa)	sq.m		80.9%	69.7%	6.76	0.00		80.9%	23.7%	3.43	0.00		80.9%	26.0%	3.59	0.00	0.00
	3.15	Prime coat	sq.m	1,201,770		79.3%	1.59	1,912,678.25	929,010		116.2%	2.33	2,166,575.81	1,032,660		150.1%	3.01	3,110,895.48	7,190,149.53
	3.16	Tack coat	sq.m	1,201,770		79.3%	0.88	1,054,975.00	929,010		116.2%	1.29	1,195,017.15	1,032,660		150.1%	1.66	1,715,875.08	3,965,867.23
	3.17.1	Asphalt concrete (t = 50mm)	sq.m		36.4%	79.3%	10.22	0.00		36.4%	116.2%	11.71	0.00		36.4%	150.1%	13.07	0.00	0.00
	3.17.2	Asphalt concrete (t = 100mm)	sq.m		36.4%	79.3%	20.45	0.00		36.4%	116.2%	23.42	0.00		36.4%	150.1%	26.15	0.00	0.00
	3.18	Double bituminous surface treatment (DBST)	sq.m	1,201,770	36.4%	79.3%	4.64	5,577,208.33	929,010	36.4%	116.2%	5.31	4,937,651.35	1,032,660	36.4%	150.1%	5.93	6,128,098.66	16,642,958.35
	3.19	Otta seal for sidewalk	sq.m		36.4%	79.3%	2.78	0.00		36.4%	116.2%	3.19	0.00		36.4%	150.1%	3.56	0.00	0.00
	3.20	Granular sub base course for sidewalk (t = 100mm; Soaked CBR > 30%)	sq.m		80.9%	69.7%	0.59	0.00		80.9%	23.7%	0.30	0.00		80.9%	26.0%	0.32	0.00	0.00
							Total S1-3	**28,954,385.87**				**Total S2-3**	**14,802,666.89**				**Total S3-3**	**18,525,704.27**	**62,282,757.03**

Breakdown of the Project Cost (BQ_ALT1-4_80kph)

Item	Description		Unit	Section 1 (Nampula - Ribaue)			131.85	(km)	Section 2 (Ribaue - Malema)			102.87	(km)	Section 3 (Malema - Cuamba)			112.91	(km)	
				Q'ty	Material coefficient	Transport coefficient	Unit Price 1	Amount 1	Q'ty	Material coefficient	Transport coefficient	Unit Price 2	Amount 2	Q'ty	Material coefficient	Transport coefficient	Unit Price 3	Amount 3	Total (Section1-3) 347.63 (km)
4	Drainage																		
	4.1	Unlined side ditch	m				3.35	0.00				3.35	0.00				3.35	0.00	0.00
	4.2	Concrete lined side ditch	m	98,800	49.0%	79.3%	21.36	2,110,027.74	97,400	49.0%	116.2%	25.65	2,498,691.44	91,000	49.0%	150.1%	29.60	2,693,772.67	7,302,491.85
	4.3	U-shaped side ditch (open)	m	1,170	49.0%	79.3%	38.43	44,958.42	240	49.0%	116.2%	46.16	11,077.94	1,260	49.0%	150.1%	53.26	67,109.50	123,145.86
	4.4	U-shaped side ditch (covered)	m	16,240	49.0%	79.3%	47.79	776,124.13	3,010	49.0%	116.2%	57.41	172,796.17	15,686	49.0%	150.1%	66.24	1,039,072.14	1,987,992.44
	4.5	Cross culvert	m	252	49.0%	79.3%	292.41	73,687.76	72	49.0%	116.2%	351.25	25,290.05	384	49.0%	150.1%	405.31	155,637.55	254,615.36
	4.6	Box culvert (1.0*1.0)	No	179	49.0%	79.3%	7,226.46	1,293,537.03	139	49.0%	116.2%	8,680.57	1,206,599.35	179	49.0%	150.1%	10,016.46	1,792,945.94	4,293,082.32
	4.7	Box culvert (2.0*2.0)	No	12	49.0%	79.3%	22,795.51	273,546.12	60	49.0%	116.2%	27,382.42	1,642,944.94	38	49.0%	150.1%	31,596.40	1,200,663.30	3,117,154.35
							Total S1-4	**4,571,881.20**				**Total S2-4**	**5,557,399.89**				**Total S3-4**	**6,949,201.11**	**17,078,482.20**
5	Road furniture																		
	5.1	Road sign (Warning) A=0.62m2/no	m2	54		79.3%	232.05	12,530.65	16		116.2%	340.03	5,440.42	64		150.1%	439.23	28,110.41	46,081.48
	5.2	Road sign (Regulatory) A=1.13m3/no	m2	54		79.3%	232.05	12,530.65	14		116.2%	340.03	4,760.37	44		150.1%	439.23	19,325.91	36,616.92
	5.3	Road marking (continuous) W=100mm	m	283,242		79.3%	0.52	147,164.99	217,356		116.2%	0.76	165,482.25	244,095		150.1%	0.98	240,056.37	552,703.62
	5.4	Road marking (continuous) W=400m	m	1,430		79.3%	2.08	2,971.96	330		116.2%	3.05	1,004.97	1,210		150.1%	3.93	4,759.92	8,736.85
							Total S1-5	**175,198.24**				**Total S2-5**	**176,688.02**				**Total S3-5**	**292,252.61**	**644,138.87**
6	Miscellaneous work																		
	6.1	Concrete kerb	m	0	49.0%	79.3%	16.21	0.00	0	49.0%	116.2%	19.48	0.00	4,260	49.0%	150.1%	22.47	95,742.93	95,742.93
	6.2	Demolishing existing concrete (plain)	m3	754			12.49	9,413.99	826			12.49	10,312.94	1,183			12.49	14,770.22	34,497.15
	6.3	Demolishing existing concrete (reinforced)	m3	114			22.69	2,586.29	535			22.69	12,137.41	28			22.69	635.23	15,358.93
	6.4	Removal of bailey bridge (W=4m)	m				90.75	0.00				90.75	0.00	31			90.75	2,813.16	2,813.16
							Total S1-6	**12,000.28**				**Total S2-6**	**22,450.35**				**Total S3-6**	**113,961.54**	**148,412.17**
7	Bridge																		
	No. 12 Monapo bridge	L = 25m	No									445,448.07	0.00						0.00
	No. 19 Lalaua bridge	L = 30m	No									515,746.94	0.00						0.00
	No. 24 Nataleia bridge	L = 48m	No									704,005.02	0.00						0.00
	No. 27 Mutivasse bridge	L = 30m	No									645,390.18	0.00						0.00
	No. 30 Namuela bridge	L = 30m	No														594,300.46	0.00	0.00
	No. 34 Lurio bridge	L = 94m	No														1,444,775.81	0.00	0.00
							Total S1-7	**0.00**				**Total S2-7**	**2,043,003.87**				**Total S3-7**	**3,498,934.03**	**5,541,937.90**
8	Temporary construction road		km	124.00			10,183.00	1,262,692.00	101.00			10,183.00	1,028,483.00	104.00			10,183.00	1,059,032.00	3,350,207.00
	Total (2 - 8)						**Total S1 (2-8)**	**40,239,643.87**				**Total S2 (2-8)**	**27,759,149.52**				**Total S3 (2-8)**	**33,221,964.56**	**101,220,757.94**
9	Dayworks	2.46% of Total (2 - 8)	L.S.	1			989,895.24	989,895.24	1			682,875.08	682,875.08	1			817,260.33	817,260.33	2,490,030.65
10	Social issues	1.79% of Total (2 - 8)	L.S.	1			720,289.63	720,289.63	1			496,888.78	496,888.78	1			594,673.17	594,673.17	1,811,851.57
	Total (1 - 10)						**Total S1 (1-10)**	**58,818,287.45**				**Total S2 (1-10)**	**40,575,548.85**				**Total S3 (1-10)**	**48,560,545.59**	**147,954,381.89**
11	Contingency cost	10% of Total (1 - 10)	L.S.	1			5,881,828.74	5,881,828.74	1			4,057,554.88	4,057,554.88	1			4,856,054.56	4,856,054.56	14,795,438.19
	Total construction cost (1 - 11)			1			64,700,116.19	64,700,116.19	1			44,633,103.73	44,633,103.73	1			53,416,600.15	53,416,600.15	162,749,820.08
	VAT (17%) of total construction cost (1 - 11)			1			10,999,019.75	10,999,019.75	1			7,587,627.63	7,587,627.63	1			9,080,822.03	9,080,822.03	27,667,469.41
	Total construction cost (1 - 11) inclu. VAT						**Total Construction S1 (1-11)**	**75,699,135.94**				**Total Construction S2 (1-11)**	**52,220,731.37**				**Total Construction S3 (1-11)**	**62,497,422.18**	**190,417,289.49**
12	Engineering cost	8% of total construction cost (1-11)	L.S.	1			5,176,009.30	5,176,009.30	1			3,570,648.30	3,570,648.30	1			4,273,328.01	4,273,328.01	13,019,985.61
	VAT (17%) of engineering cost			1			879,921.58	879,921.58	1			607,010.21	607,010.21	1			726,465.76	726,465.76	2,213,397.55
	Total engineering cost inclu. VAT						**Total engineering S1**	**6,055,930.88**				**Total engineering S2**	**4,177,658.51**				**Total engineering S3**	**4,999,793.77**	**15,233,383.16**
	Total project cost (1 - 12)			1			69,876,125.49	69,876,125.49	1			48,203,752.03	48,203,752.03	1			57,689,928.16	57,689,928.16	175,769,805.68
	VAT (17%) of total project cost (1 - 12)			1			11,878,941.33	11,878,941.33	1			8,194,637.85	8,194,637.85	1			9,807,287.79	9,807,287.79	29,880,866.97
	Total project cost (1 - 12) inclu. VAT						**Total project S1 (1-12)**	**81,755,066.82**				**Total project S2 (1-12)**	**56,398,389.88**				**Total project S3 (1-12)**	**67,497,215.95**	**205,650,672.65**

Breakdown of the Project Cost (BQ_ALT1-5_80kph)

Item	Description		Unit	Section 1 (Nampula - Ribaue)			131.85	(km)	Section 2 (Ribaue - Malema)			102.87	(km)	Section 3 (Malema - Cuamba)			112.91	(km)	Total (Section1-3) 347.63 (km)
				Q'ty	Material coefficient	Transport coefficient	Unit Price 1	Amount 1	Q'ty	Material coefficient	Transport coefficient	Unit Price 2	Amount 2	Q'ty	Material coefficient	Transport coefficient	Unit Price 3	Amount 3	
0	Compensation	COI + Construction Rd. + Diversion	km	131.85			3,365.00	443,675.25	102.87			3,365.00	346,157.55	112.91			3,365.00	379,942.15	1,169,774.95
1	Preliminary & general works	41.92% of Total (2 -7)	L.S.	1			20,433,391.01	20,433,391.01	1			17,530,159.23	17,530,159.23	1			21,204,094.99	21,204,094.99	59,167,645.23
2	Earthworks																		
	2.1	Excavation	cu.m	591,229			3.12	1,846,408.17	523,493			3.12	1,634,868.64	338,605			3.12	1,057,463.42	4,538,740.22
	2.2	Fill (use excavated soil)	cu.m	591,229			3.16	1,865,450.08	523,493			3.16	1,651,728.95	338,605			3.16	1,068,368.98	4,585,548.01
	2.3	Fill (borrow material)	cu.m	468,516			4.87	2,281,204.40	267,530			4.87	1,302,603.57	183,364			4.87	892,799.32	4,476,607.29
	2.4	Disposal of surplus soil	cu.m				3.50	0.00				3.50	0.00				3.50	0.00	0.00
							Total S1-2	**5,993,062.65**				**Total S2-2**	**4,589,201.16**				**Total S3-2**	**3,018,631.71**	**13,600,895.52**
3	Pavement																		
	3.1.1	Replacement of subgrade (t = 150mm)	sq.m				2.47	0.00				2.47	0.00				2.47	0.00	0.00
	3.1.2	Replacement of subgrade (t = 200mm)	sq.m				2.87	0.00				2.87	0.00				2.87	0.00	0.00
	3.2	Granular sub base course (t = 150mm) (Soaked CBR > 30%)	sq.m		80.9%	69.7%	0.89	0.00		80.9%	23.7%	0.45	0.00		80.9%	26.0%	0.47	0.00	0.00
	3.3	Granular sub base course (t = 175mm) (Soaked CBR > 30%)	sq.m		80.9%	69.7%	1.04	0.00		80.9%	23.7%	0.53	0.00		80.9%	26.0%	0.55	0.00	0.00
	3.4	Granular sub base course (t = 225mm) (Soaked CBR > 30%)	sq.m		80.9%	69.7%	1.34	0.00		80.9%	23.7%	0.68	0.00		80.9%	26.0%	0.71	0.00	0.00
	3.5.1	Granular sub base course (t = 325mm) (Soaked CBR > 30%)	sq.m		80.9%	69.7%	1.93	0.00		80.9%	23.7%	0.98	0.00		80.9%	26.0%	1.03	0.00	0.00
	3.5.2	Granular sub base course (t = 375mm) (Soaked CBR > 30%)	sq.m		80.9%	69.7%	2.23	0.00		80.9%	23.7%	1.13	0.00		80.9%	26.0%	1.19	0.00	0.00
	3.5.3	Granular sub base course (t = 400mm) (Soaked CBR > 30%)	sq.m		80.9%	69.7%	2.38	0.00		80.9%	23.7%	1.21	0.00		80.9%	26.0%	1.27	0.00	0.00
	3.6	Cemented sub base course (t = 150mm) (7day UCS 0.75 - 1.5MPa)	sq.m		80.9%	69.7%	3.68	0.00	1,031,870	80.9%	23.7%	1.87	1,926,323.86	1,145,540	80.9%	26.0%	1.96	2,242,493.09	4,168,816.95
	3.7	Cemented sub base course (t = 175mm) (7day UCS 0.75 - 1.5MPa)	sq.m	1,333,600	80.9%	69.7%	4.30	5,728,681.49		80.9%	23.7%	2.18	0.00		80.9%	26.0%	2.28	0.00	5,728,681.49
	3.8	Cemented sub base course (t = 200mm) (7day UCS 0.75 - 1.5MPa)	sq.m		80.9%	69.7%	4.91	0.00		80.9%	23.7%	2.49	0.00		80.9%	26.0%	2.61	0.00	0.00
	3.9.1	Cemented sub base course (t = 225mm) (7day UCS 0.75 - 1.5MPa)	sq.m		80.9%	69.7%	5.52	0.00		80.9%	23.7%	2.80	0.00		80.9%	26.0%	2.94	0.00	0.00
	3.9.2	Cemented sub base course (t = 250mm) (7day UCS 0.75 - 1.5MPa)	sq.m		80.9%	69.7%	6.14	0.00		80.9%	23.7%	3.11	0.00		80.9%	26.0%	3.26	0.00	0.00
	3.9.3	Cemented sub base course (t = 300mm) (7day UCS 0.75 - 1.5MPa)	sq.m		80.9%	69.7%	7.36	0.00		80.9%	23.7%	3.73	0.00		80.9%	26.0%	3.92	0.00	0.00
	3.9.4	Cemented sub base course (t = 325mm) (7day UCS 0.75 - 1.5MPa)	sq.m		80.9%	69.7%	7.98	0.00		80.9%	23.7%	4.04	0.00		80.9%	26.0%	4.24	0.00	0.00
	3.10	Granular base course (t = 150mm) (Soaked CBR > 80%)	sq.m	1,333,600	80.9%	69.7%	2.59	3,458,311.81	1,031,870	80.9%	23.7%	1.31	1,356,705.44	1,145,540	80.9%	26.0%	1.38	1,579,382.69	6,394,399.94
	3.11.1	Granular base course (t = 200mm) (Soaked CBR > 80%)	sq.m		80.9%	69.7%	3.46	0.00		80.9%	23.7%	1.75	0.00		80.9%	26.0%	1.84	0.00	0.00
	3.11.2	Granular base course (t = 225mm) (Soaked CBR > 80%)	sq.m		80.9%	69.7%	3.89	0.00		80.9%	23.7%	1.97	0.00		80.9%	26.0%	2.07	0.00	0.00
	3.11.3	Granular base course (t = 250mm) (Soaked CBR > 80%)	sq.m		80.9%	69.7%	4.32	0.00		80.9%	23.7%	2.19	0.00		80.9%	26.0%	2.30	0.00	0.00
	3.12	Cemented base course (t = 150mm) (7day UCS 1.5 - 3.0MPa)	sq.m		80.9%	69.7%	5.07	0.00		80.9%	23.7%	2.57	0.00		80.9%	26.0%	2.69	0.00	0.00
	3.13	Cemented base course (t = 180mm) (7day UCS 1.5 - 3.0MPa)	sq.m		80.9%	69.7%	6.08	0.00		80.9%	23.7%	3.08	0.00		80.9%	26.0%	3.23	0.00	0.00
	3.14	Cemented base course (t = 200mm) (7day UCS 1.5 - 3.0MPa)	sq.m		80.9%	69.7%	6.76	0.00		80.9%	23.7%	3.43	0.00		80.9%	26.0%	3.59	0.00	0.00
	3.15	Prime coat	sq.m	1,201,770		79.3%	1.59	1,912,678.25	929,010		116.2%	2.33	2,166,575.81	1,032,660		150.1%	3.01	3,110,895.48	7,190,149.53
	3.16	Tack coat	sq.m	1,201,770		79.3%	0.88	1,054,975.00	929,010		116.2%	1.29	1,195,017.15	1,032,660		150.1%	1.66	1,715,875.08	3,965,867.23
	3.17.1	Asphalt concrete (t = 50mm)	sq.m		36.4%	79.3%	10.22	0.00		36.4%	116.2%	11.71	0.00		36.4%	150.1%	13.07	0.00	0.00
	3.17.2	Asphalt concrete (t = 100mm)	sq.m	1,201,770	36.4%	79.3%	20.45	24,574,295.35	929,010	36.4%	116.2%	23.42	21,756,279.39	1,032,660	36.4%	150.1%	26.15	27,001,628.32	73,332,203.07
	3.18	Double bituminous surface treatment (DBST)	sq.m		36.4%	79.3%	4.64	0.00		36.4%	116.2%	5.31	0.00		36.4%	150.1%	5.93	0.00	0.00
	3.19	Otta seal for sidewalk	sq.m		36.4%	79.3%	2.78	0.00		36.4%	116.2%	3.19	0.00		36.4%	150.1%	3.56	0.00	0.00
	3.20	Granular sub base course for sidewalk (t = 100mm; Soaked CBR > 30%)	sq.m		80.9%	69.7%	0.59	0.00		80.9%	23.7%	0.30	0.00		80.9%	26.0%	0.32	0.00	0.00
							Total S1-3	**36,728,941.90**				**Total S2-3**	**28,400,901.65**				**Total S3-3**	**35,650,274.66**	**100,780,118.20**

Breakdown of the Project Cost (BQ_ALT1-5_80kph)

Item	Description		Unit	Section 1 (Nampula - Ribaue)			131.85	(km)	Section 2 (Ribaue - Malema)			102.87	(km)	Section 3 (Malema - Cuamba)			112.91	(km)	Total (Section1-3) 347.63 (km)
				Q'ty	Material coefficient	Transport coefficient	Unit Price 1	Amount 1	Q'ty	Material coefficient	Transport coefficient	Unit Price 2	Amount 2	Q'ty	Material coefficient	Transport coefficient	Unit Price 3	Amount 3	
4	Drainage																		
	4.1	Unlined side ditch	m				3.35	0.00				3.35	0.00				3.35	0.00	0.00
	4.2	Concrete lined side ditch	m	98,800	49.0%	79.3%	21.36	2,110,027.74	97,400	49.0%	116.2%	25.65	2,498,691.44	91,000	49.0%	150.1%	29.60	2,693,772.67	7,302,491.85
	4.3	U-shaped side ditch (open)	m	1,170	49.0%	79.3%	38.43	44,958.42	240	49.0%	116.2%	46.16	11,077.94	1,260	49.0%	150.1%	53.26	67,109.50	123,145.86
	4.4	U-shaped side ditch (covered)	m	16,240	49.0%	79.3%	47.79	776,124.13	3,010	49.0%	116.2%	57.41	172,796.17	15,686	49.0%	150.1%	66.24	1,039,072.14	1,987,992.44
	4.5	Cross culvert	m	252	49.0%	79.3%	292.41	73,687.76	72	49.0%	116.2%	351.25	25,290.05	384	49.0%	150.1%	405.31	155,637.55	254,615.36
	4.6	Box culvert (1.0*1.0)	No	179	49.0%	79.3%	7,226.46	1,293,537.03	139	49.0%	116.2%	8,680.57	1,206,599.35	179	49.0%	150.1%	10,016.46	1,792,945.94	4,293,082.32
	4.7	Box culvert (2.0*2.0)	No	12	49.0%	79.3%	22,795.51	273,546.12	60	49.0%	116.2%	27,382.42	1,642,944.94	38	49.0%	150.1%	31,596.40	1,200,663.30	3,117,154.35
							Total S1-4	**4,571,881.20**				**Total S2-4**	**5,557,399.89**				**Total S3-4**	**6,949,201.11**	**17,078,482.20**
5	Road furniture																		
	5.1	Road sign (Warning) A=0.62m2/no	m2	54		79.3%	232.05	12,530.65	16		116.2%	340.03	5,440.42	64		150.1%	439.23	28,110.41	46,081.48
	5.2	Road sign (Regulatory) A=1.13m3/no	m2	54		79.3%	232.05	12,530.65	14		116.2%	340.03	4,760.37	44		150.1%	439.23	19,325.91	36,616.92
	5.3	Road marking (continuous) W=100mm	m	283,242		79.3%	0.52	147,164.99	217,356		116.2%	0.76	165,482.25	244,095		150.1%	0.98	240,056.37	552,703.62
	5.4	Road marking (continuous) W=400m	m	1,430		79.3%	2.08	2,971.96	330		116.2%	3.05	1,004.97	1,210		150.1%	3.93	4,759.92	8,736.85
							Total S1-5	**175,198.24**				**Total S2-5**	**176,688.02**				**Total S3-5**	**292,252.61**	**644,138.87**
6	Miscellaneous work																		
	6.1	Concrete kerb	m	0	49.0%	79.3%	16.21	0.00	0	49.0%	116.2%	19.48	0.00	4,260	49.0%	150.1%	22.47	95,742.93	95,742.93
	6.2	Demolishing existing concrete (plain)	m3	754			12.49	9,413.99	826			12.49	10,312.94	1,183			12.49	14,770.22	34,497.15
	6.3	Demolishing existing concrete (reinforced)	m3	114			22.69	2,586.29	535			22.69	12,137.41	28			22.69	635.23	15,358.93
	6.4	Removal of bailey bridge (W=4m)	m				90.75	0.00				90.75	0.00	31			90.75	2,813.16	2,813.16
							Total S1-6	**12,000.28**				**Total S2-6**	**22,450.35**				**Total S3-6**	**113,961.54**	**148,412.17**
7	Bridge																		
	No. 12 Monapo bridge	L = 25m	No									445,448.07	0.00						0.00
	No. 19 Lalaua bridge	L = 30m	No									515,746.94	0.00						0.00
	No. 24 Nataleia bridge	L = 48m	No									704,005.02	0.00						0.00
	No. 27 Mutivasse bridge	L = 30m	No									645,390.18	0.00						0.00
	No. 30 Namuela bridge	L = 30m	No														594,300.46	0.00	0.00
	No. 34 Lurio bridge	L = 94m	No														1,444,775.81	0.00	0.00
							Total S1-7	**0.00**				**Total S2-7**	**2,043,003.87**				**Total S3-7**	**3,498,934.03**	**5,541,937.90**
8	Temporary construction road		km	124.00			10,183.00	1,262,692.00	101.00			10,183.00	1,028,483.00	104.00			10,183.00	1,059,032.00	3,350,207.00
	Total (2 - 8)						**Total S1 (2-8)**	**48,743,776.26**				**Total S2 (2-8)**	**41,818,127.94**				**Total S3 (2-8)**	**50,582,287.67**	**141,144,191.87**
9	Dayworks	2.46% of Total (2 - 8)	L.S.	1			1,199,096.90	1,199,096.90	1			1,028,725.95	1,028,725.95	1			1,244,324.28	1,244,324.28	3,472,147.12
10	Social issues	1.79% of Total (2 - 8)	L.S.	1			872,513.60	872,513.60	1			748,544.49	748,544.49	1			905,422.95	905,422.95	2,526,481.03
	Total (1 - 10)						**Total S1 (1-10)**	**71,248,777.76**				**Total S2 (1-10)**	**61,125,557.61**				**Total S3 (1-10)**	**73,936,129.88**	**206,310,465.25**
11	Contingency cost	10% of Total (1 - 10)	L.S.	1			7,124,877.78	7,124,877.78	1			6,112,555.76	6,112,555.76	1			7,393,612.99	7,393,612.99	20,631,046.52
	Total construction cost (1 - 11)			1			78,373,655.54	78,373,655.54	1			67,238,113.37	67,238,113.37	1			81,329,742.87	81,329,742.87	226,941,511.77
	VAT (17%) of total construction cost (1 - 11)			1			13,323,521.44	13,323,521.44	1			11,430,479.27	11,430,479.27	1			13,826,056.29	13,826,056.29	38,580,057.00
	Total construction cost (1 - 11) inclu. VAT						**Total Construction S1 (1-11)**	**91,697,176.98**				**Total Construction S2 (1-11)**	**78,668,592.64**				**Total Construction S3 (1-11)**	**95,155,799.16**	**265,521,568.78**
12	Engineering cost	8% of total construction cost (1-11)	L.S.	1			6,269,892.44	6,269,892.44	1			5,379,049.07	5,379,049.07	1			6,506,379.43	6,506,379.43	18,155,320.94
	VAT (17%) of engineering cost			1			1,065,881.72	1,065,881.72	1			914,438.34	914,438.34	1			1,106,084.50	1,106,084.50	3,086,404.56
	Total engineering cost inclu. VAT						**Total engineering S1**	**7,335,774.16**				**Total engineering S2**	**6,293,487.41**				**Total engineering S3**	**7,612,463.93**	**21,241,725.50**
	Total project cost (1 - 12)			1			84,643,547.98	84,643,547.98	1			72,617,162.44	72,617,162.44	1			87,836,122.30	87,836,122.30	245,096,832.72
	VAT (17%) of total project cost (1 - 12)			1			14,389,403.16	14,389,403.16	1			12,344,917.61	12,344,917.61	1			14,932,140.79	14,932,140.79	41,666,461.56
	Total project cost (1 - 12) inclu. VAT						**Total project S1 (1-12)**	**99,032,951.14**				**Total project S2 (1-12)**	**84,962,080.05**				**Total project S3 (1-12)**	**102,768,263.09**	**286,763,294.28**

Breakdown of the Project Cost (BQ_ALT1-6_80kph)

Item	Description		Unit	Section 1 (Nampula - Ribaue)			131.85	(km)	Section 2 (Ribaue - Malema)			102.87	(km)	Section 3 (Malema - Cuamba)			112.91	(km)	Total (Section1-3) 347.63 (km)
				Q'ty	Material coefficient	Transport coefficient	Unit Price 1	Amount 1	Q'ty	Material coefficient	Transport coefficient	Unit Price 2	Amount 2	Q'ty	Material coefficient	Transport coefficient	Unit Price 3	Amount 3	
0	Compensation	COI + Construction Rd. + Diversion	km	131.85			3,365.00	443,675.25	102.87			3,365.00	346,157.55	112.91			3,365.00	379,942.15	1,169,774.95
1	Preliminary & general works	41.92% of Total (2 -7)	L.S.	1			15,060,427.59	15,060,427.59	1			11,578,742.15	11,578,742.15	1			14,002,471.45	14,002,471.45	40,641,641.19
2	Earthworks																		
	2.1	Excavation	cu.m	768,261			3.12	2,399,279.10	678,194			3.12	2,117,999.86	516,659			3.12	1,613,526.06	6,130,805.02
	2.2	Fill (use excavated soil)	cu.m	768,261			3.16	2,424,022.74	599,218			3.16	1,890,657.03	333,295			3.16	1,051,614.83	5,366,294.60
	2.3	Fill (borrow material)	cu.m	27,485			4.87	133,824.47				4.87	0.00				4.87	0.00	133,824.47
	2.4	Disposal of surplus soil	cu.m				3.50	0.00	78,976			3.50	276,359.03	183,364			3.50	641,641.73	918,000.77
							Total S1-2	**4,957,126.31**				**Total S2-2**	**4,285,015.92**				**Total S3-2**	**3,306,782.62**	**12,548,924.85**
3	Pavement																		
	3.1.1	Replacement of subgrade (t = 150mm)	sq.m				2.47	0.00				2.47	0.00				2.47	0.00	0.00
	3.1.2	Replacement of subgrade (t = 200mm)	sq.m				2.87	0.00				2.87	0.00				2.87	0.00	0.00
	3.2	Granular sub base course (t = 150mm) (Soaked CBR > 30%)	sq.m		80.9%	69.7%	0.89	0.00		80.9%	23.7%	0.45	0.00		80.9%	26.0%	0.47	0.00	0.00
	3.3	Granular sub base course (t = 175mm) (Soaked CBR > 30%)	sq.m		80.9%	69.7%	1.04	0.00		80.9%	23.7%	0.53	0.00		80.9%	26.0%	0.55	0.00	0.00
	3.4	Granular sub base course (t = 225mm) (Soaked CBR > 30%)	sq.m		80.9%	69.7%	1.34	0.00		80.9%	23.7%	0.68	0.00		80.9%	26.0%	0.71	0.00	0.00
	3.5.1	Granular sub base course (t = 325mm) (Soaked CBR > 30%)	sq.m		80.9%	69.7%	1.93	0.00		80.9%	23.7%	0.98	0.00		80.9%	26.0%	1.03	0.00	0.00
	3.5.2	Granular sub base course (t = 375mm) (Soaked CBR > 30%)	sq.m		80.9%	69.7%	2.23	0.00		80.9%	23.7%	1.13	0.00		80.9%	26.0%	1.19	0.00	0.00
	3.5.3	Granular sub base course (t = 400mm) (Soaked CBR > 30%)	sq.m		80.9%	69.7%	2.38	0.00		80.9%	23.7%	1.21	0.00		80.9%	26.0%	1.27	0.00	0.00
	3.6	Cemented sub base course (t = 150mm) (7day UCS 0.75 - 1.5MPa)	sq.m		80.9%	69.7%	3.68	0.00		80.9%	23.7%	1.87	0.00		80.9%	26.0%	1.96	0.00	0.00
	3.7	Cemented sub base course (t = 175mm) (7day UCS 0.75 - 1.5MPa)	sq.m		80.9%	69.7%	4.30	0.00		80.9%	23.7%	2.18	0.00		80.9%	26.0%	2.28	0.00	0.00
	3.8	Cemented sub base course (t = 200mm) (7day UCS 0.75 - 1.5MPa)	sq.m		80.9%	69.7%	4.91	0.00		80.9%	23.7%	2.49	0.00		80.9%	26.0%	2.61	0.00	0.00
	3.9.1	Cemented sub base course (t = 225mm) (7day UCS 0.75 - 1.5MPa)	sq.m		80.9%	69.7%	5.52	0.00		80.9%	23.7%	2.80	0.00		80.9%	26.0%	2.94	0.00	0.00
	3.9.2	Cemented sub base course (t = 250mm) (7day UCS 0.75 - 1.5MPa)	sq.m		80.9%	69.7%	6.14	0.00		80.9%	23.7%	3.11	0.00		80.9%	26.0%	3.26	0.00	0.00
	3.9.3	Cemented sub base course (t = 300mm) (7day UCS 0.75 - 1.5MPa)	sq.m		80.9%	69.7%	7.36	0.00		80.9%	23.7%	3.73	0.00		80.9%	26.0%	3.92	0.00	0.00
	3.9.4	Cemented sub base course (t = 325mm) (7day UCS 0.75 - 1.5MPa)	sq.m	1,333,600	80.9%	69.7%	7.98	10,638,979.91	1,031,870	80.9%	23.7%	4.04	4,173,701.69	1,145,540	80.9%	26.0%	4.24	4,858,735.02	19,671,416.62
	3.10	Granular base course (t = 150mm) (Soaked CBR > 80%)	sq.m		80.9%	69.7%	2.59	0.00		80.9%	23.7%	1.31	0.00		80.9%	26.0%	1.38	0.00	0.00
	3.11.1	Granular base course (t = 200mm) (Soaked CBR > 80%)	sq.m		80.9%	69.7%	3.46	0.00		80.9%	23.7%	1.75	0.00		80.9%	26.0%	1.84	0.00	0.00
	3.11.2	Granular base course (t = 225mm) (Soaked CBR > 80%)	sq.m		80.9%	69.7%	3.89	0.00	1,031,870	80.9%	23.7%	1.97	2,035,058.15	1,145,540	80.9%	26.0%	2.07	2,369,074.04	4,404,132.19
	3.11.3	Granular base course (t = 250mm) (Soaked CBR > 80%)	sq.m	1,333,600	80.9%	69.7%	4.32	5,763,853.02		80.9%	23.7%	2.19	0.00		80.9%	26.0%	2.30	0.00	5,763,853.02
	3.12	Cemented base course (t = 150mm) (7day UCS 1.5 - 3.0MPa)	sq.m		80.9%	69.7%	5.07	0.00		80.9%	23.7%	2.57	0.00		80.9%	26.0%	2.69	0.00	0.00
	3.13	Cemented base course (t = 180mm) (7day UCS 1.5 - 3.0MPa)	sq.m		80.9%	69.7%	6.08	0.00		80.9%	23.7%	3.08	0.00		80.9%	26.0%	3.23	0.00	0.00
	3.14	Cemented base course (t = 200mm) (7day UCS 1.5 - 3.0MPa)	sq.m		80.9%	69.7%	6.76	0.00		80.9%	23.7%	3.43	0.00		80.9%	26.0%	3.59	0.00	0.00
	3.15	Prime coat	sq.m	1,201,770		79.3%	1.59	1,912,678.25	929,010		116.2%	2.33	2,166,575.81	1,032,660		150.1%	3.01	3,110,895.48	7,190,149.53
	3.16	Tack coat	sq.m	1,201,770		79.3%	0.88	1,054,975.00	929,010		116.2%	1.29	1,195,017.15	1,032,660		150.1%	1.66	1,715,875.08	3,965,867.23
	3.17.1	Asphalt concrete (t = 50mm)	sq.m		36.4%	79.3%	10.22	0.00		36.4%	116.2%	11.71	0.00		36.4%	150.1%	13.07	0.00	0.00
	3.17.2	Asphalt concrete (t = 100mm)	sq.m		36.4%	79.3%	20.45	0.00		36.4%	116.2%	23.42	0.00		36.4%	150.1%	26.15	0.00	0.00
	3.18	Double bituminous surface treatment (DBST)	sq.m	1,201,770	36.4%	79.3%	4.64	5,577,208.33	929,010	36.4%	116.2%	5.31	4,937,651.35	1,032,660	36.4%	150.1%	5.93	6,128,098.66	16,642,958.35
	3.19	Otta seal for sidewalk	sq.m		36.4%	79.3%	2.78	0.00		36.4%	116.2%	3.19	0.00		36.4%	150.1%	3.56	0.00	0.00
	3.20	Granular sub base course for sidewalk (t = 100mm; Soaked CBR > 30%)	sq.m		80.9%	69.7%	0.59	0.00		80.9%	23.7%	0.30	0.00		80.9%	26.0%	0.32	0.00	0.00
							Total S1-3	**24,947,694.50**				**Total S2-3**	**14,508,004.16**				**Total S3-3**	**18,182,678.28**	**57,638,376.94**

Breakdown of the Project Cost (BQ_ALT1-6_80kph)

Item	Description		Unit	Section 1 (Nampula - Ribaue)			131.85	(km)	Section 2 (Ribaue - Malema)			102.87	(km)	Section 3 (Malema - Cuamba)			112.91	(km)	Total (Section1-3) 347.63 (km)
				Q'ty	Material coefficient	Transport coefficient	Unit Price 1	Amount 1	Q'ty	Material coefficient	Transport coefficient	Unit Price 2	Amount 2	Q'ty	Material coefficient	Transport coefficient	Unit Price 3	Amount 3	
4	Drainage																		
	4.1	Unlined side ditch	m				3.35	0.00				3.35	0.00				3.35	0.00	0.00
	4.2	Concrete lined side ditch	m	98,800	49.0%	79.3%	21.36	2,110,027.74	97,400	49.0%	116.2%	25.65	2,498,691.44	91,000	49.0%	150.1%	29.60	2,693,772.67	7,302,491.85
	4.3	U-shaped side ditch (open)	m	1,170	49.0%	79.3%	38.43	44,958.42	240	49.0%	116.2%	46.16	11,077.94	1,260	49.0%	150.1%	53.26	67,109.50	123,145.86
	4.4	U-shaped side ditch (covered)	m	16,240	49.0%	79.3%	47.79	776,124.13	3,010	49.0%	116.2%	57.41	172,796.17	15,686	49.0%	150.1%	66.24	1,039,072.14	1,987,992.44
	4.5	Cross culvert	m	252	49.0%	79.3%	292.41	73,687.76	72	49.0%	116.2%	351.25	25,290.05	384	49.0%	150.1%	405.31	155,637.55	254,615.36
	4.6	Box culvert (1.0*1.0)	No	179	49.0%	79.3%	7,226.46	1,293,537.03	139	49.0%	116.2%	8,680.57	1,206,599.35	179	49.0%	150.1%	10,016.46	1,792,945.94	4,293,082.32
	4.7	Box culvert (2.0*2.0)	No	12	49.0%	79.3%	22,795.51	273,546.12	60	49.0%	116.2%	27,382.42	1,642,944.94	38	49.0%	150.1%	31,596.40	1,200,663.30	3,117,154.35
							Total S1-4	**4,571,881.20**				**Total S2-4**	**5,557,399.89**				**Total S3-4**	**6,949,201.11**	**17,078,482.20**
5	Road furniture																		
	5.1	Road sign (Warning) A=0.62m2/no	m2	54		79.3%	232.05	12,530.65	16		116.2%	340.03	5,440.42	64		150.1%	439.23	28,110.41	46,081.48
	5.2	Road sign (Regulatory) A=1.13m3/no	m2	54		79.3%	232.05	12,530.65	14		116.2%	340.03	4,760.37	44		150.1%	439.23	19,325.91	36,616.92
	5.3	Road marking (continuous) W=100mm	m	283,242		79.3%	0.52	147,164.99	217,356		116.2%	0.76	165,482.25	244,095		150.1%	0.98	240,056.37	552,703.62
	5.4	Road marking (continuous) W=400m	m	1,430		79.3%	2.08	2,971.96	330		116.2%	3.05	1,004.97	1,210		150.1%	3.93	4,759.92	8,736.85
							Total S1-5	**175,198.24**				**Total S2-5**	**176,688.02**				**Total S3-5**	**292,252.61**	**644,138.87**
6	Miscellaneous work																		
	6.1	Concrete kerb	m	0	49.0%	79.3%	16.21	0.00	0	49.0%	116.2%	19.48	0.00	4,260	49.0%	150.1%	22.47	95,742.93	95,742.93
	6.2	Demolishing existing concrete (plain)	m3	754			12.49	9,413.99	826			12.49	10,312.94	1,183			12.49	14,770.22	34,497.15
	6.3	Demolishing existing concrete (reinforced)	m3	114			22.69	2,586.29	535			22.69	12,137.41	28			22.69	635.23	15,358.93
	6.4	Removal of bailey bridge (W=4m)	m				90.75	0.00				90.75	0.00	31			90.75	2,813.16	2,813.16
							Total S1-6	**12,000.28**				**Total S2-6**	**22,450.35**				**Total S3-6**	**113,961.54**	**148,412.17**
7	Bridge																		
	No. 12 Monapo bridge	L = 25m	No									445,448.07	0.00						0.00
	No. 19 Lalaua bridge	L = 30m	No									515,746.94	0.00						0.00
	No. 24 Nataleia bridge	L = 48m	No									704,005.02	0.00						0.00
	No. 27 Mutivasse bridge	L = 30m	No									645,390.18	0.00						0.00
	No. 30 Namuela bridge	L = 30m	No														594,300.46	0.00	0.00
	No. 34 Lurio bridge	L = 94m	No														1,444,775.81	0.00	0.00
							Total S1-7	**0.00**				**Total S2-7**	**2,043,003.87**				**Total S3-7**	**3,498,934.03**	**5,541,937.90**
8	Temporary construction road		km	124.00			10,183.00	1,262,692.00	101.00			10,183.00	1,028,483.00	104.00			10,183.00	1,059,032.00	3,350,207.00
	Total (2 - 8)						**Total S1 (2-8)**	**35,926,592.53**				**Total S2 (2-8)**	**27,621,045.21**				**Total S3 (2-8)**	**33,402,842.19**	**96,950,479.94**
9	Dayworks	2.46% of Total (2 - 8)	L.S.	1			883,794.18	883,794.18	1			679,477.71	679,477.71	1			821,709.92	821,709.92	2,384,981.81
10	Social issues	1.79% of Total (2 - 8)	L.S.	1			643,086.01	643,086.01	1			494,416.71	494,416.71	1			597,910.88	597,910.88	1,735,413.59
	Total (1 - 10)						**Total S1 (1-10)**	**52,513,900.30**				**Total S2 (1-10)**	**40,373,681.78**				**Total S3 (1-10)**	**48,824,934.44**	**141,712,516.52**
11	Contingency cost	10% of Total (1 - 10)	L.S.	1			5,251,390.03	5,251,390.03	1			4,037,368.18	4,037,368.18	1			4,882,493.44	4,882,493.44	14,171,251.65
	Total construction cost (1 - 11)			1			57,765,290.33	57,765,290.33	1			44,411,049.96	44,411,049.96	1			53,707,427.88	53,707,427.88	155,883,768.17
	VAT (17%) of total construction cost (1 - 11)			1			9,820,099.36	9,820,099.36	1			7,549,878.49	7,549,878.49	1			9,130,262.74	9,130,262.74	26,500,240.59
	Total construction cost (1 - 11) inclu. VAT						**Total Construction S1 (1-11)**	**67,585,389.69**				**Total Construction S2 (1-11)**	**51,960,928.46**				**Total Construction S3 (1-11)**	**62,837,690.62**	**182,384,008.76**
12	Engineering cost	8% of total construction cost (1-11)	L.S.	1			4,621,223.23	4,621,223.23	1			3,552,884.00	3,552,884.00	1			4,296,594.23	4,296,594.23	12,470,701.45
	VAT (17%) of engineering cost			1			785,607.95	785,607.95	1			603,990.28	603,990.28	1			730,421.02	730,421.02	2,120,019.25
	Total engineering cost inclu. VAT						**Total engineering S1**	**5,406,831.18**				**Total engineering S2**	**4,156,874.28**				**Total engineering S3**	**5,027,015.25**	**14,590,720.70**
	Total project cost (1 - 12)			1			62,386,513.56	62,386,513.56	1			47,963,933.96	47,963,933.96	1			58,004,022.11	58,004,022.11	168,354,469.63
	VAT (17%) of total project cost (1 - 12)			1			10,605,707.31	10,605,707.31	1			8,153,868.77	8,153,868.77	1			9,860,683.76	9,860,683.76	28,620,259.84
	Total project cost (1 - 12) inclu. VAT						**Total project S1 (1-12)**	**72,992,220.86**				**Total project S2 (1-12)**	**56,117,802.73**				**Total project S3 (1-12)**	**67,864,705.87**	**196,974,729.46**

Breakdown of the Project Cost (BQ_ALT2-1_100kph)

Appendix-C

Item	Description		Unit	Section 1 (Nampula - Ribaue)			132.03	(km)	Section 2 (Ribaue - Malema)			102.82	(km)	Section 3 (Malema - Cuamba)			112.66	(km)	Total (Section1-3) 347.51 (km)
				Q'ty	Material coefficient	Transport coefficient	Unit Price 1	Amount 1	Q'ty	Material coefficient	Transport coefficient	Unit Price 2	Amount 2	Q'ty	Material coefficient	Transport coefficient	Unit Price 3	Amount 3	
0	Compensation	COI + Construction Rd. + Diversion	km	132.03			3,365.00	444,280.95	102.82			3,365.00	345,989.30	112.66			3,365.00	379,100.90	1,169,371.15
1	Preliminary & general works	41.92% of Total (2 -7)	L.S.	1			19,757,362.10	19,757,362.10	1			18,038,731.37	18,038,731.37	1			20,920,763.58	20,920,763.58	58,716,857.05
2	Earthworks																		
	2.1	Excavation	cu.m	744,593			3.12	2,325,363.94	925,306			3.12	2,889,730.64	331,134			3.12	1,034,131.48	6,249,226.06
	2.2	Fill (use excavated soil)	cu.m	744,593			3.16	2,349,345.29	925,306			3.16	2,919,532.28	331,134			3.16	1,044,796.43	6,313,674.00
	2.3	Fill (borrow material)	cu.m	336,388			4.87	1,637,873.17	270,509			4.87	1,317,108.32	438,481			4.87	2,134,963.99	5,089,945.48
	2.4	Disposal of surplus soil	cu.m				3.50	0.00				3.50	0.00				3.50	0.00	0.00
							Total S1-2	**6,312,582.40**				**Total S2-2**	**7,126,371.24**				**Total S3-2**	**4,213,891.90**	**17,652,845.54**
3	Pavement																		
	3.1.1	Replacement of subgrade (t = 150mm)	sq.m				2.47	0.00				2.47	0.00				2.47	0.00	0.00
	3.1.2	Replacement of subgrade (t = 200mm)	sq.m				2.87	0.00				2.87	0.00				2.87	0.00	0.00
	3.2	Granular sub base course (t = 150mm) (Soaked CBR > 30%)	sq.m		80.9%	69.7%	0.89	0.00	1,031,170	80.9%	23.7%	0.45	466,491.41	1,143,056	80.9%	26.0%	0.47	542,247.34	1,008,738.76
	3.3	Granular sub base course (t = 175mm) (Soaked CBR > 30%)	sq.m	1,335,700	80.9%	69.7%	1.04	1,390,423.45		80.9%	23.7%	0.53	0.00		80.9%	26.0%	0.55	0.00	1,390,423.45
	3.4	Granular sub base course (t = 225mm) (Soaked CBR > 30%)	sq.m		80.9%	69.7%	1.34	0.00		80.9%	23.7%	0.68	0.00		80.9%	26.0%	0.71	0.00	0.00
	3.5.1	Granular sub base course (t = 325mm) (Soaked CBR > 30%)	sq.m		80.9%	69.7%	1.93	0.00		80.9%	23.7%	0.98	0.00		80.9%	26.0%	1.03	0.00	0.00
	3.5.2	Granular sub base course (t = 375mm) (Soaked CBR > 30%)	sq.m		80.9%	69.7%	2.23	0.00		80.9%	23.7%	1.13	0.00		80.9%	26.0%	1.19	0.00	0.00
	3.5.3	Granular sub base course (t = 400mm) (Soaked CBR > 30%)	sq.m		80.9%	69.7%	2.38	0.00		80.9%	23.7%	1.21	0.00		80.9%	26.0%	1.27	0.00	0.00
	3.6	Cemented sub base course (t = 150mm) (7day UCS 0.75 - 1.5MPa)	sq.m		80.9%	69.7%	3.68	0.00		80.9%	23.7%	1.87	0.00		80.9%	26.0%	1.96	0.00	0.00
	3.7	Cemented sub base course (t = 175mm) (7day UCS 0.75 - 1.5MPa)	sq.m		80.9%	69.7%	4.30	0.00		80.9%	23.7%	2.18	0.00		80.9%	26.0%	2.28	0.00	0.00
	3.8	Cemented sub base course (t = 200mm) (7day UCS 0.75 - 1.5MPa)	sq.m		80.9%	69.7%	4.91	0.00		80.9%	23.7%	2.49	0.00		80.9%	26.0%	2.61	0.00	0.00
	3.9.1	Cemented sub base course (t = 225mm) (7day UCS 0.75 - 1.5MPa)	sq.m		80.9%	69.7%	5.52	0.00		80.9%	23.7%	2.80	0.00		80.9%	26.0%	2.94	0.00	0.00
	3.9.2	Cemented sub base course (t = 250mm) (7day UCS 0.75 - 1.5MPa)	sq.m		80.9%	69.7%	6.14	0.00		80.9%	23.7%	3.11	0.00		80.9%	26.0%	3.26	0.00	0.00
	3.9.3	Cemented sub base course (t = 300mm) (7day UCS 0.75 - 1.5MPa)	sq.m		80.9%	69.7%	7.36	0.00		80.9%	23.7%	3.73	0.00		80.9%	26.0%	3.92	0.00	0.00
	3.9.4	Cemented sub base course (t = 325mm) (7day UCS 0.75 - 1.5MPa)	sq.m		80.9%	69.7%	7.98	0.00		80.9%	23.7%	4.04	0.00		80.9%	26.0%	4.24	0.00	0.00
	3.10	Granular base course (t = 150mm) (Soaked CBR > 80%)	sq.m		80.9%	69.7%	2.59	0.00	1,031,170	80.9%	23.7%	1.31	1,355,785.07	1,143,056	80.9%	26.0%	1.38	1,575,957.94	2,931,743.02
	3.11.1	Granular base course (t = 200mm) (Soaked CBR > 80%)	sq.m		80.9%	69.7%	3.46	0.00		80.9%	23.7%	1.75	0.00		80.9%	26.0%	1.84	0.00	0.00
	3.11.2	Granular base course (t = 225mm) (Soaked CBR > 80%)	sq.m		80.9%	69.7%	3.89	0.00		80.9%	23.7%	1.97	0.00		80.9%	26.0%	2.07	0.00	0.00
	3.11.3	Granular base course (t = 250mm) (Soaked CBR > 80%)	sq.m	1,335,700	80.9%	69.7%	4.32	5,772,929.28		80.9%	23.7%	2.19	0.00		80.9%	26.0%	2.30	0.00	5,772,929.28
	3.12	Cemented base course (t = 150mm) (7day UCS 1.5 - 3.0MPa)	sq.m		80.9%	69.7%	5.07	0.00		80.9%	23.7%	2.57	0.00		80.9%	26.0%	2.69	0.00	0.00
	3.13	Cemented base course (t = 180mm) (7day UCS 1.5 - 3.0MPa)	sq.m		80.9%	69.7%	6.08	0.00		80.9%	23.7%	3.08	0.00		80.9%	26.0%	3.23	0.00	0.00
	3.14	Cemented base course (t = 200mm) (7day UCS 1.5 - 3.0MPa)	sq.m		80.9%	69.7%	6.76	0.00		80.9%	23.7%	3.43	0.00		80.9%	26.0%	3.59	0.00	0.00
	3.15	Prime coat	sq.m	1,203,660		79.3%	1.59	1,915,686.28	928,380		116.2%	2.33	2,165,106.56	1,030,423		150.1%	3.01	3,104,156.50	7,184,949.34
	3.16	Tack coat	sq.m	1,203,660		79.3%	0.88	1,056,634.13	928,380		116.2%	1.29	1,194,206.76	1,030,423		150.1%	1.66	1,712,158.07	3,962,998.96
	3.17.1	Asphalt concrete (t = 50mm)	sq.m		36.4%	79.3%	10.22	0.00		36.4%	116.2%	11.71	0.00		36.4%	150.1%	13.07	0.00	0.00
	3.17.2	Asphalt concrete (t = 100mm)	sq.m	1,203,660	36.4%	79.3%	20.45	24,612,942.86	928,380	36.4%	116.2%	23.42	21,741,525.56	1,030,423	36.4%	150.1%	26.15	26,943,136.04	73,297,604.46
	3.18	Double bituminous surface treatment (DBST)	sq.m		36.4%	79.3%	4.64	0.00		36.4%	116.2%	5.31	0.00		36.4%	150.1%	5.93	0.00	0.00
	3.19	Otta seal for sidewalk	sq.m		36.4%	79.3%	2.78	0.00		36.4%	116.2%	3.19	0.00		36.4%	150.1%	3.56	0.00	0.00
	3.20	Granular sub base course for sidewalk (t = 100mm; Soaked CBR > 30%)	sq.m		80.9%	69.7%	0.59	0.00		80.9%	23.7%	0.30	0.00		80.9%	26.0%	0.32	0.00	0.00
							Total S1-3	**34,748,616.00**				**Total S2-3**	**26,923,115.38**				**Total S3-3**	**33,877,655.89**	**95,549,387.27**

Breakdown of the Project Cost (BQ_ALT2-1_100kph)

Item	Description		Unit	Section 1 (Nampula - Ribaue)			132.03	(km)	Section 2 (Ribaue - Malema)			102.82	(km)	Section 3 (Malema - Cuamba)			112.66	(km)	Total (Section1-3) 347.51 (km)
				Q'ty	Material coefficient	Transport coefficient	Unit Price 1	Amount 1	Q'ty	Material coefficient	Transport coefficient	Unit Price 2	Amount 2	Q'ty	Material coefficient	Transport coefficient	Unit Price 3	Amount 3	
4	Drainage																		
	4.1	Unlined side ditch	m				3.35	0.00				3.35	0.00				3.35	0.00	0.00
	4.2	Concrete lined side ditch	m	101,000	49.0%	79.3%	21.36	2,157,012.16	103,400	49.0%	116.2%	25.65	2,652,614.94	87,600	49.0%	150.1%	29.60	2,593,126.22	7,402,753.32
	4.3	U-shaped side ditch (open)	m	1,170	49.0%	79.3%	38.43	44,958.42	240	49.0%	116.2%	46.16	11,077.94	1,260	49.0%	150.1%	53.26	67,109.50	123,145.86
	4.4	U-shaped side ditch (covered)	m	16,240	49.0%	79.3%	47.79	776,124.13	3,010	49.0%	116.2%	57.41	172,796.17	15,686	49.0%	150.1%	66.24	1,039,072.14	1,987,992.44
	4.5	Cross culvert	m	252	49.0%	79.3%	292.41	73,687.76	72	49.0%	116.2%	351.25	25,290.05	384	49.0%	150.1%	405.31	155,637.55	254,615.36
	4.6	Box culvert (1.0*1.0)	No	179	49.0%	79.3%	7,226.46	1,293,537.03	139	49.0%	116.2%	8,680.57	1,206,599.35	179	49.0%	150.1%	10,016.46	1,792,945.94	4,293,082.32
	4.7	Box culvert (2.0*2.0)	No	12	49.0%	79.3%	22,795.51	273,546.12	60	49.0%	116.2%	27,382.42	1,642,944.94	38	49.0%	150.1%	31,596.40	1,200,663.30	3,117,154.35
							Total S1-4	**4,618,865.62**				**Total S2-4**	**5,711,323.39**				**Total S3-4**	**6,848,554.65**	**17,178,743.67**
5	Road furniture																		
	5.1	Road sign (Warning) A=0.62m2/no	m2	58		79.3%	232.05	13,458.84	16		116.2%	340.03	5,440.42	70		150.1%	439.23	30,745.76	49,645.03
	5.2	Road sign (Regulatory) A=1.13m3/no	m2	54		79.3%	232.05	12,530.65	14		116.2%	340.03	4,760.37	44		150.1%	439.23	19,325.91	36,616.92
	5.3	Road marking (continuous) W=100mm	m	283,683		79.3%	0.52	147,394.12	217,211		116.2%	0.76	165,371.86	243,570		150.1%	0.98	239,540.06	552,306.04
	5.4	Road marking (continuous) W=400m	m	1,430		79.3%	2.08	2,971.96	330		116.2%	3.05	1,004.97	1,210		150.1%	3.93	4,759.92	8,736.85
							Total S1-5	**176,355.57**				**Total S2-5**	**176,577.62**				**Total S3-5**	**294,371.65**	**647,304.84**
6	Miscellaneous work																		
	6.1	Concrete kerb	m	0	49.0%	79.3%	16.21	0.00	0	49.0%	116.2%	19.48	0.00	4,260	49.0%	150.1%	22.47	95,742.93	95,742.93
	6.2	Demolishing existing concrete (plain)	m3	754			12.49	9,413.99	826			12.49	10,312.94	1,183			12.49	14,770.22	34,497.15
	6.3	Demolishing existing concrete (reinforced)	m3	114			22.69	2,586.29	535			22.69	12,137.41	28			22.69	635.23	15,358.93
	6.4	Removal of bailey bridge (W=4m)	m				90.75	0.00				90.75	0.00	31			90.75	2,813.16	2,813.16
							Total S1-6	**12,000.28**				**Total S2-6**	**22,450.35**				**Total S3-6**	**113,961.54**	**148,412.17**
7	Bridge																		
	No. 12 Monapo bridge	L = 25m	No									445,448.07	0.00						0.00
	No. 19 Lalaua bridge	L = 30m	No									515,746.94	0.00						0.00
	No. 24 Nataleia bridge	L = 48m	No									704,005.02	0.00						0.00
	No. 27 Mutivasse bridge	L = 30m	No									645,390.18	0.00						0.00
	No. 30 Namuela bridge	L = 30m	No														594,300.46	0.00	0.00
	No. 34 Lurio bridge	L = 94m	No														1,444,775.81	0.00	0.00
							Total S1-7	**0.00**				**Total S2-7**	**2,043,003.87**				**Total S3-7**	**3,498,934.03**	**5,541,937.90**
8	Temporary construction road		km	124.00			10,183.00	1,262,692.00	101.00			10,183.00	1,028,483.00	104.00			10,183.00	1,059,032.00	3,350,207.00
	Total (2 - 8)						**Total S1 (2-8)**	**47,131,111.87**				**Total S2 (2-8)**	**43,031,324.84**				**Total S3 (2-8)**	**49,906,401.67**	**140,068,838.38**
9	Dayworks	2.46% of Total (2 - 8)	L.S.	1			1,159,425.35	1,159,425.35	1			1,058,570.59	1,058,570.59	1			1,227,697.48	1,227,697.48	3,445,693.42
10	Social issues	1.79% of Total (2 - 8)	L.S.	1			843,646.90	843,646.90	1			770,260.71	770,260.71	1			893,324.59	893,324.59	2,507,232.21
	Total (1 - 10)						**Total S1 (1-10)**	**68,891,546.23**				**Total S2 (1-10)**	**62,898,887.52**				**Total S3 (1-10)**	**72,948,187.32**	**204,738,621.07**
11	Contingency cost	10% of Total (1 - 10)	L.S.	1			6,889,154.62	6,889,154.62	1			6,289,888.75	6,289,888.75	1			7,294,818.73	7,294,818.73	20,473,862.11
	Total construction cost (1 - 11)			1			75,780,700.85	75,780,700.85	1			69,188,776.28	69,188,776.28	1			80,243,006.05	80,243,006.05	225,212,483.17
	VAT (17%) of total construction cost (1 - 11)			1			12,882,719.14	12,882,719.14	1			11,762,091.97	11,762,091.97	1			13,641,311.03	13,641,311.03	38,286,122.14
	Total construction cost (1 - 11) inclu. VAT						**Total Construction S1 (1-11)**	**88,663,419.99**				**Total Construction S2 (1-11)**	**80,950,868.24**				**Total Construction S3 (1-11)**	**93,884,317.07**	**263,498,605.31**
12	Engineering cost	8% of total construction cost (1-11)	L.S.	1			6,062,456.07	6,062,456.07	1			5,535,102.10	5,535,102.10	1			6,419,440.48	6,419,440.48	18,016,998.65
	VAT (17%) of engineering cost			1			1,030,617.53	1,030,617.53	1			940,967.36	940,967.36	1			1,091,304.88	1,091,304.88	3,062,889.77
	Total engineering cost inclu. VAT						**Total engineering S1**	**7,093,073.60**				**Total engineering S2**	**6,476,069.46**				**Total engineering S3**	**7,510,745.37**	**21,079,888.42**
	Total project cost (1 - 12)			1			81,843,156.92	81,843,156.92	1			74,723,878.38	74,723,878.38	1			86,662,446.53	86,662,446.53	243,229,481.83
	VAT (17%) of total project cost (1 - 12)			1			13,913,336.68	13,913,336.68	1			12,703,059.32	12,703,059.32	1			14,732,615.91	14,732,615.91	41,349,011.91
	Total project cost (1 - 12) inclu. VAT						**Total project S1 (1-12)**	**95,756,493.59**				**Total project S2 (1-12)**	**87,426,937.70**				**Total project S3 (1-12)**	**101,395,062.44**	**284,578,493.74**

APÊNDICE-D

Short Report for the First Stakeholder Meetings

16th November, 2006

Short Report for the Fist Stakeholder Meetings along the Road from Nampula-Cuamba

ANE UASMA/JICA Study Team

I. Objectives of the meetings

Holding public consultation is prescribed in the Mozambique's EIA law and procedures, and also in JICA's environmental and social consideration guidelines. Hence ANE in cooperation with JICA Study Team held the first meetings in relevant districts and municipality along the N-13 road.

II. Outline of Stakeholder Meeting

1. Schedule

Conducted meetings are as follows.

Most of attendances are village leaders and personnel's in district office.

Table 1 Schedule of Stakeholder Meetings

Date	Time	Venue	Attendance/Num.		Contact/Key Person
6th Nov. (Mon)	0930-1130	District meeting hall Rapale, Nampula District	Nampula	40	Secretary of district governor Ms. Flora MEQUE Cell: 82-3800980
			Mecuburi		District governor Mr. Manuel Joao GABRIEL Cell: no service area Post Administrator for Namina Mr. Johane CASTRO (Namina) Cell: no service area
7th Nov. (Tue)	0900-1100	Ines Complex (Private) Ribaue, Ribaue District	Ribaue	47	Secretary of district governor Mr. Armand MAILANHIHA Cell: 82-3858194
8th Nov. (Wed)	0900-1100	Maleya Complex Malema, Malema District	Malema	44	District governor Mr. Cristene Joquim Consula Cell: 82-2571784 Secretary of district governor Mr. Jaime Braz SAIDE Cell: 82-587594
	1400-1600	District meeting hall Cuamba, Cuamba Districit	Cuamba	34	Secretary of district governor Mr. Angelo SABITE Cell: 82-7082940
16th Nov. (Thu)	0930-1130	Nampula Municipality	Nampula Municipality	37	
			Total	202	

Attendance from ANE, JICA Study Team and other organizations

Date	Venue	Attendance of Organizer
6th Nov. (Mon)	District meeting hall Rapale, Nampula District	ANE Nampula ; Mr. Nyaca (Master of Ceremony), Mr. Gabriel UASMA: Ms. Deolinda Nunes, Ms. Angelina Balate JICA: Mr. Hironori KUROKI, Mr. Manabu SHIMIZU Ministry of Public Works and Housing in Nampura Privince Mr. Antonio Alberto Mahave (Director)
7th Nov. (Tue)	Ines Complex (Private) Ribaue, Ribaue District	ANE Nampula ; Mr. Gabriel (Master of Ceremony) UASMA: Ms. Deolinda Nunes, Ms. Angelina Balate JICA: Mr. Hironori KUROKI
8th Nov. (Wed)	Maleya Complex	ANE Nampula ; Mr. Gabriel (Master of Ceremony)

Date	Venue	Attendance of Organizer
	Malema, Malema District	UASMA: Ms. Deolinda Nunes, Ms. Angelina Balate JICA: Mr. Hironori KUROKI
	District meeting hall Cuamba, Cuamba Districit	ANE Niassa (Master of Ceremony) UASMA: Ms. Deolinda Nunes, Ms. Angelina Balate JICA: Mr. Hironori KUROKI
16th Nov. (Thu)	Nampula Municipality	ANE Nampula ; Mr. Nyaca (Master of Ceremony) UASMA: Ms. Deolinda Nunes, Ms. Angelina Balate JICA: Mr. Hironori KUROKI

2. Agenda and Presentation

ANE in cooperation with JICA Study Team carried out presentation in English, Portuguese and local language Makua through translator.

Table 2 Agenda and Presentation

Agenda	Person in charge	Details of Presentation
1. Opening the ceremony	- District governor / Representative of district - ANE, UASMA, JICA Study Team	
2. Explanation of Project Outline	ANE or JICA Study Team	ANE and JICA explained we are in feasibility study, not construction stage strongly
3. Predicted Negative and Positive Impact, Collection information	ANE or JICA Study Team	- Positive/Negative impact - What is EIA? - Scopes for EIA in this time
4. Discussion	All participants	- Collection of natural and social information - Collection present problems for using the road - Opinion about improvement of the road
5. Closing the ceremony	-MC (Mr. Notece: Makuwa speaker is required) - ANE (UASMA/JICA Study Team) - District governor	Explanation of next schedule

3. Major Opinion and Interests from Participants

Q-1:From when is this road construction start?

A-1: Feasibility study will complete in September 2007. And Mozambique government will contact with donors for borrowing finances of construction road. Thus these steps are required for construction of the road.

Q-2: When can residents know information and new alignment regarding resettlement?

A-2: ANE in cooperation with JICA Study Team will be able to show you rough alignment in the next stakeholder meeting in April to June 2007.

Q-3: Can affected residents by construction of the road receive compensation?

A-3: Mozambique government will compensate any structures, crops, agricultural field and tress based on the land law and relevant guidelines. With regard to compensation, Ministry of public works & housing will evaluate structures, and Ministry of agriculture will do about farming land and crops.

Q-4: How many maters of the road width?

A-4: ANE is planning classification of the road. ANE can inform you road structure and rough alignments in the next meeting.

Opinions from Participants

Op.-1 There is dangerous points on existing road such as crossing points with railway in carve.

Information from participants

Info.-1 : 5 elephants were confirmed 40km from Nampula in January 2006.

Info-2 : Some grave yard are located along the road (near Lulio River, Lalawa, Mutuali in Malema)

Info-3 : Some preying trees are located along the road (none at least/ Ribaue, Nampula Municipality)

Conclusion

All participants agreed with road improvement project by applause. (Nampula, Ribaue, Malema and Cuamba)

III Pictures

In Nampula District
Date: 6th Nov. 2006
Time: 0930-1130
Participants: 40
Venue: Rapale

In Ribaue District
Date: 7th Nov. 2006
Time: 0900-1100
Participants: 47
Venue: Ribaue

In Malema District
Date: 8th Nov. 2006
Time: 0900-1100
Participants: 44
Venue: Malema Meleya Comlex

In Cuamba District
Date: 8th Nov. 2006
Time: 1400-1600
Participants: 34
Venue: Cuamba

In Namupa Municipality
Date: 16th Nov. 2006
Time: 0940-1140
Participants: 37
Venue: Nampula Municipality hall

NAMPULA/CUAMBA ROAD STAKE HOLDERS MEETINGS

Meeting Record, prepared by ANE-UASMA
(These meetings have been held in Nampula, Ribaue, Malema, Cuamba district and Nampula Municipality. Makuwa local language was used in all meetings.)

NAMPULA-MECUBURI DISTRICTS (6TH November, 2006)

ANE provincial delegate has opened a meeting, explaining to all the participants the objectives of the meeting.
He has also explained about the on going feasibility study in that section of road.

Major Participants;

After this presentation, he gave time for each participant to present him selves and among them, there were:

- Provincial Director from Public works and Housings Traditional Leaders;
- Chefes de Posto;
- Secretários de Bairros ;
- Agriculture authorities representatives;
- Education representatives.

After all presentations, the Provincial Director from Public works, as the Government representative has appreciated the initiative and has also appreciated the presence of all participants in the meeting. He has said the rehabilitation of this section of road will facilitate the circulation of people and goods from the Districts of Rapale and Namina to Nampula.

The Director has explained to the participants that the study will be helpful on knowing the problems that may occur during the construction period, and this is the reason why this meeting is taking place, to involve all the communities, and to have the contributions of all the stakeholders.

He also mentioned that the presence of all stakeholders is of high importance because the meeting is also about social aspects regarded to the project and the collaboration of all stakeholders in giving the relevant information will lead to good results of the study.

The Presentation of the study

After the intervention of the Public works Director, the speech was given to the study team to proceed with the presentation of the study.
The presentation was made in English, with translation to Portuguese and to Makuwa, the local language.
The Concerns of the participants was as follows:

1. What will happen to people who are going to loose their properties.
2. All the people with ‘’machambas’’ in the road reserve zone should be informed to abandon the area before the harvest period;

3. What is the extension of the roads reserve zone that people should avoid to occupy;
4. The new road will be paved?
5. The new alignment of the road will also pass through the railway like the present one?

After the intervention of the participants, the provincial director has stressed once again the importance of giving the relevant information like sacred trees, cultural heritage, graveyards, animal passing zones (elephants, lions, etc)

The participants were asked to spread the information for all the communities about the project and about the discussions on the meeting. They were also asked to be aware of the new constructions after the project has started.

One of the participants has mentioned one case of elephants coming from Gilé to Mecuburi, but it happened just once.

RIBAUE DISTRICT (7th November, 2006)

Major Participants:
Local leaders;
Suburb leaders;
Religious Leaders;

In this district the participants were also concerned about the people who may be displaced when the project starts and they have requested that people should be advised before the construction.

The Ribaue Administrative Post head said that it would be better to increase the width of the road, and he also sown his concern about the bad conditions of the road (‘’the road has too many potholes, we are asking to the project to consider the possibility of closing this potholes).

He has also called attention to the existing improved houses built with bricks and cement that has to be taken in consideration before resettlement of people living in those houses.

QUESTIONS TO BE TAKEN IN CONSIDERATION

About the places with cultural heritage, the leader of Mathai (one of the community leader) said: There is a problem with a strange wind close to one mountain.

The Suburb leader of Napasso said: ‘’Last year there was a lion that used to be next to the road in October. Every year we see lions passing through, in October.

MALEMA DISTRICT (8th November, 2006)

Major Participants:
Judicial court of Malema ;
Administrative Post Head;
Local Leader;
Agriculture Director;
Traders;
Teachers;

Mozambican Women Organization Representative

QUESTIONS

- When does the construction will start?

QUESTIONS TO BE CONSIDERED

There is a graveyard in Lalaua/Mutuali;
In the curve to Lúrio River, there is also a graveyard;
In the Chigulo zone, there are elephants;
In Malema, there are too many people next to the road;
In Mutuáli, there is a school and houses close to the road.

CUAMBA DISTRICT (8th November, 2008)

Participants: see attendance list with signature

Questions arose

1. Cabo António: We are pleased with this initiative and we promise that we will give you all the relevant information;
2. Agostinho, Adjunto do Cabo de Ncuapa: We are very happy and we promise to cooperate with the team;
3. Rafael- Cabo Chovela (In the border between Nampula and Niassa province) said: I am very happy with the project and I promise that I will take the message to my community;
4. Baptista Xavier- Lurio Administrative Post: Does the project affected people will be compensated?
5. There are too many graveyards along the road, what will be done regarding to this?

6. When the projects starts, it will be important to revise all the existing box culverts because many of them were doesn't respect the required standard;
7. Municipality: WE will collaborate with the team and ANE in the project implementation period
8. MICOA: From Lurio to Cuamba, there is no elephants;
9. From Cuamba to Ncuapa there are people making bricks, the team has to take this in consideration.

NAMPULA MUNICIPARITY (16th November, 2006)

Major Participants;

- Commission agent ANE – Nampula,
- Coordinating of the ANE,
- Heads of the administrative ranks;
- Councilmen;
- Leader communitarian

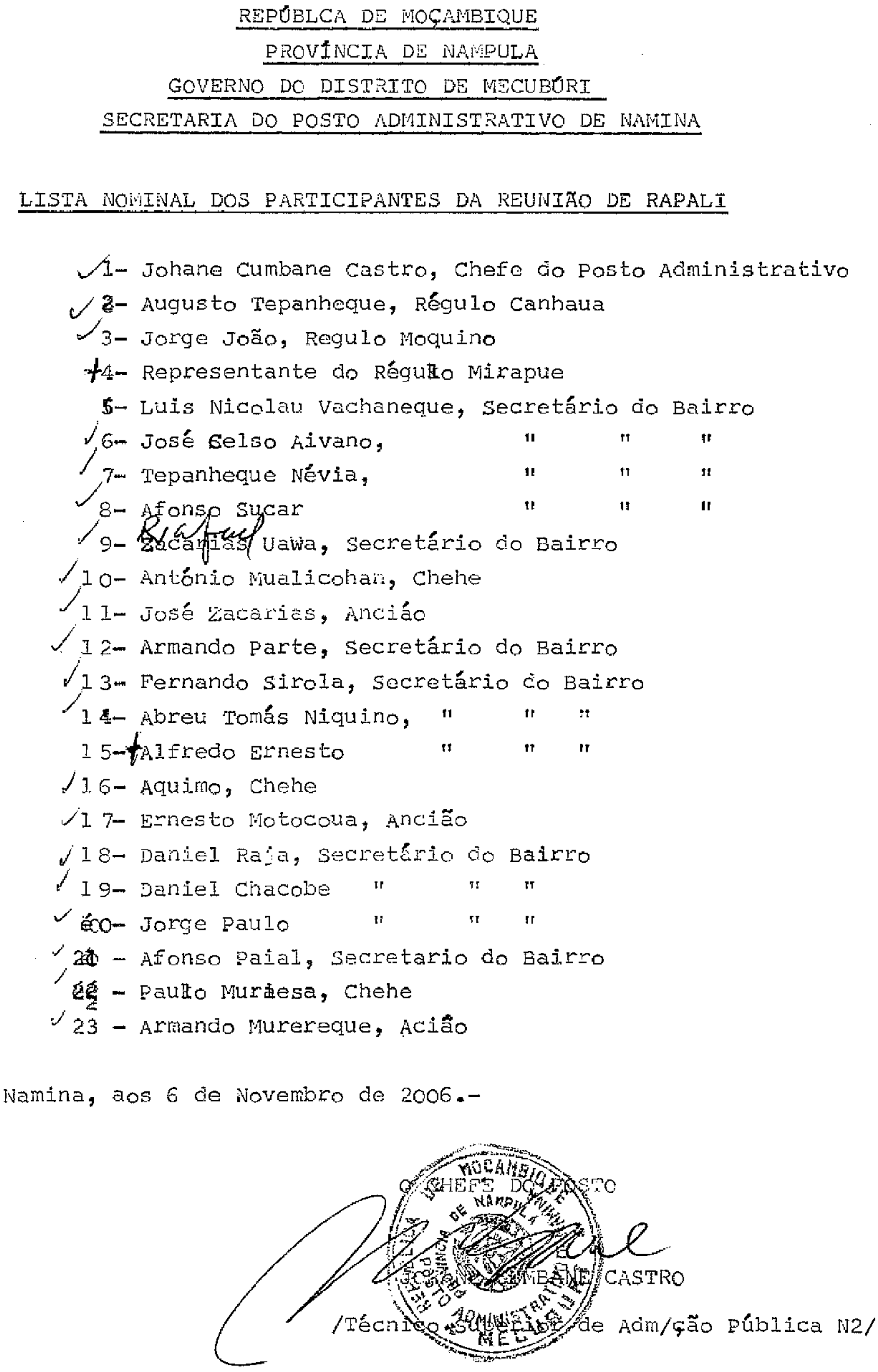
- Secretaries of the Quarters;
- Representative of the Municipal Chairman of the board;
- Consultants of JICA
- Technician and Engineers of the ANE;
- Community in general

QUESTIONS

-What one will become with the cultural heritage along the roads the sanctuaries, monuments?
- I think that number of accident will be increase due to speeding
- Some structures are located along the road now. Which is a main organization which has responsibility for compensation and relocation?
- Some graveyards and sanctuaries are located along the road. Such relocation of facilities and places are too difficult. Do you have some alternatives for it?

Answers clarified for the ANE:
- It is predicted that number of accident will be reduce due to improvement of dangerous points such as narrow road and shape corners. Main reason for accidents is speeding without respect traffic regulations.
- The compensations should be done by the Government. Concrete alignments with options will be reported in the next meeting.

Final aspects of the meeting:
It is not possible that it has one project of this dimension without that has impacts it is noticed along the roads, that people they construct houses for authorization of the state or for ignorance they are used to advantage of these lands for construct, for this reason exist must themselves be made a minute study to give to who of opportunist right indemnification, and it that when discovers that one exists project they do not make - to transfer for the owners of the houses.
As communities the long one of the way must be given chance in the participation of the construction of the road, this is part of the politics of development of the proper community, and, so thus the construction will give to greater value.
The population in the rainy weather must itself be prevented to make compensations to prevent the movement at this time.
To prevent constructions of tents, houses, crops to the long one of the not authorized roads and, for the culture zones they must be informed anticipated harvesting its products.



REPÚBLCA DE MOÇAMBIQUE
PROVÍNCIA DE NAMPULA
GOVERNO DO DISTRITO DE MECUBÚRI
SECRETARIA DO POSTO ADMINISTRATIVO DE NAMINA

LISTA NOMINAL DOS PARTICIPANTES DA REUNIÃO DE RAPALI

✓1- Johane Cumbane Castro, Chefe do Posto Administrativo
✓2- Augusto Tepanheque, Régulo Canhaua
✓3- Jorge João, Regulo Moquino
4- Representante do Régulo Mirapue
5- Luis Nicolau Vachaneque, Secretário do Bairro
✓6- José Celso Aivano, " " "
✓7- Tepanheque Névia, " " "
✓8- Afonso Sucar " " "
✓9- ~~Zacarias~~ Rafael Uawa, Secretário do Bairro
✓10- António Mualicohan, Chehe
✓11- José Zacarias, Anciáo
✓12- Armando Parte, Secretário do Bairro
✓13- Fernando Sirola, Secretário do Bairro
✓14- Abreu Tomás Niquino, " " "
15- Alfredo Ernesto " " "
✓16- Aquimo, Chehe
✓17- Ernesto Motocoua, Ancião
✓18- Daniel Raja, Secretário do Bairro
✓19- Daniel Chacobe " " "
✓20- Jorge Paulo " " "
✓21 - Afonso Paial, Secretario do Bairro
✓22 - Paulo Muraesa, Chehe
✓23 - Armando Murereque, Acião

Namina, aos 6 de Novembro de 2006.-

O CHEFE DO POSTO

JOHANE CUMBANE CASTRO
/Técnico Superior de Adm/ção Pública N2/

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Nampula-Cuamba Road Feasibility Study - Stakeholder Meeting -

Venue Nampula District / RAPALE

Date 6 th Nov. 2006

List of Attendance Nome Posição Contacto

No	NAME	POSITION	CONTACT NUMBER (CELL)
1	Luis Ernesto	Régulo - Anchilo -	
2	Eduardo Juvaldo	Cabo de Nuezia Anchilo	
3	Amade Carrosua	Lider Comunitário	
4	Ernesto Matias	Lider Comunitário	
5	Santos Napuecha	Lider Comunitária	
6	Trasicio Mutamuro	Cabo	
7	Lucas Manuel	Lider Comunitário	
8	Manuel Lialey	Lider de Muassi	
9	Marcelino Joing	Lider - Mutivaze	
10	Mariane da Silva	Lider - Namaita	
11	Viegas Rufia	Cabo	Muito nalama
12	Alfredo C. Machaúce	Chefe da Equipa Técnica	826737660
13	Bartolomeu J. Yecatesaute	Tecnico OPH no Distrito	82581 3134
14	Matiane H. de Chorane	Tecnico OPH-Distrito	
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Nampula-Cuamba Road Feasibility Study - Stakeholder Meeting -

Venue RAPALE

Date 6 th Nov. 2006

List of Attendance Nome Posição Contacto

No	NAME	POSITION	CONTACT NUMBER (CELL)
1	Adriano R. Mutiua	Chefe de Posto	Rapale Sede
2	Latifo V. Salimo	Chefe do Posto	826471720
3	Johanelo Castro	Chefe do Posto Adm	Namina/Sede
4	Paulo Mucanilae	Chefe	Namina
5	José Celso Aivamo	Secretario do Bairro	Namina
6	Antonio Mua	Vientane Chefe	Namina
7	Augusto Tepenlequ	Régulo	Namina
8	Daniel Jacobo	Secretário - Bairro	Namina
9	Armando Porto	Secretário - Bairro	Namina
10	Tepenlequ Nevia	Secretário - Bairro	Namina
11	João Albisto António	Chefe	Namina
12	Afonso Lucas	Secretário - Bairro	Namina
13	Afonso Paial	Secretario do Bairro	Namina
14	Jorge Jacob	Secretario B	Namina
15	[illegible]	Secretário Bairro	Namina
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Nampula-Cuamba Road Feasibility Study - Stakeholder Meeting -

Venue RAPALE

Date 6th Nov. 2006

List of Attendance Nome Posição Contacto

No	NAME	POSITION	CONTACT NUMBER (CELL)
1	Armando E. Dimande	Chefe do Posto	82-4014349
2	Dauda Musso	Chefe do Posto	829197030
3	Jose Zacarias	Pastor	Namina
4	Jorge João	Regulo Namina	
5	Abreu Tomas Niquino	Secretario do Bairro	Namina
6	Fernando Sirola	Secretario do Bairro	Namina .
7	Ernesto Matroua	Conselheiro do Boregia	Namina
8	Daniel	Racha	Namina
9	Armando Auraregue	Animador	Namina
10	Rafael Uaio	Secretario do Bairro	Naminoro
11	António Malua	Dir. do Prov OPAHN	828047020
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Nampula-Cuamba Road Feasibility Study - Stakeholder Meeting -

Venue RIBAUE

Date 7th Nov. 2006

List of Attendance

No	NAME	POSITION	ASSINATURA ~~Sign~~ ~~AW~~ ~~CONTACT NUMBER (CELL)~~
1	Ernesto Manuel	cabo de Terra	
2	Celgiuio Pedufria	cabo de terra	Celgiuio
3	Manuel INBera	cabo de Terra	Manuel
4	Alberto Bareia	cabo de Terra	Alberto
5	Gabriel Catolina	Secretário	Gabriel
6	Eduardo Compe	Secretario	Eduardo
7	Jorge Wassura	Chefe de povoação	
8	Manuel Ernesto	Delegado de Neca	
9	JOAQUIM Colete	Adjundo do	Secretario
10	Bernardo C. Amuado	C/Localidade Namig.	
11	Manuel Mianelequi	C/Localid. Mathora	
12	Manuel C. Nãmo	C/Loc. Namig	
13	GUILHERMINA PEDRO	CHEFE DO POSTO IAPALA	
14	Francisco dos Santos	Secretário de	Quithele
15	Alberto Vachequi	2º Secretário	Quithele
16	Mario Vatipere	chefe	Quithele
17	Rafael Lanchequa	Cabo de terra	Varancha
18	Alberto Rocheru	Secretario	Molifiha "B"
19	Carlito Assome	Selula	Moheliate "A"
20	António P. Joaquim	Selula	Murrapania "A"
21	Rafael Ohele	Secretário de bairro	B. NOVO
22	Constantino Colete	Secretário	Junta

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Nampula-Cuamba Road Feasibility Study - Stakeholder Meeting -

Venue ~~RAPALE~~ RIBAVE

Date 7th Nov- 2006

List of Attendance Nome Posição Assinatura

No	NAME	POSITION	CONTACT NUMBER (CELL)
1	Alto João [illegible]	Lider	Nouicouba
2	Jacinto Pascal	Regulo Tarrua	Retace
3	Gonçalves Francisco	Litre de	Mathatya
4	Pedro Gasolina	Lidre Comunita	Merrenta
5	Chave Jamal	Lidro Comunitário	Nake
6	Joaquim S. Simone	Secretário de Muatala	Muatala
7	Mário Lafissone	1º Secretário	Mathacya
8	Bernardo Chave	Secretário de Sauasaua	Saua-Saua
9	Rodrigues Francisco	Cabo de terra Sauasaua	Saua-Saua
10	Samuel António	Chefe de Povoação	Napasso
11	JOSÉ Alberto	Secretario de Napasso	Napasso
12	Ernesto Mussaruire	secretário [illegible]	Namicomba
13	Rastolo Salimado	cabo de Terra	Molipilho
14	João Manuel	Secretário	Nachilapa
15	Feleciano Petro	secretário Reigou	Namicomba
16	Agostinho Viagem	Secretário Bairro	Harroeauce
17	Emiliano Albino	Secretário	MOLIPIHA
18	Júlio Gustavo	Secretário	Nachuho
19	Celestino Paulo	Asunto Social	Nachilapa
20	Daniel Ernesto	Chefe da Povoação	Nachilapa

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Nampula-Cuamba Road Feasibility Study - Stakeholder Meeting -

Venue Ribaue

Date 7th Nov. 2006

List of Attendance Nome Posição Assinatura

No	NAME	POSITION	CONTACT NUMBER (CELL)
1	Mário João	Secretário	Napasso
2	Mário Afonso	camponês	Cuetele
3	Armando Munilhiha	Chefe Gabinete	Gabinete Administrador
4	CAMILO DE SOUSA JR	DIR. DIST. PLAN. E INFRAS	826693450.
5	José Nahiala Massé	Secretário de Namurapué	
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Nampula-Cuamba Road Feasibility Study - Stakeholder Meeting -

Venue MALEMA

Date 8th NOV. 2006

List of Attendance Nome Posição ~~Contacto~~ assinatura

No	NAME	POSITION	CONTACT NUMBER (CELL)
1	[illegible] Macuela	Juiz Presidente TJD	Tribunal-Malema
2	Armindo Francisco	Supervisor TDM-Malema	829232260
3	Maria Teresa Neves	Directora EPC [illegible]	
4	Domélia Frederico	Chefe de Posto Medico	82 7632650
5	Luís Alimissaia	membro do Partido	Frelimo
6	Fonito Alufai	comerciante	
7	António Vahiqua	Regulo - Aivava	
8	André Pirijuipa	comerciante	
9	LUIS ABEL MOFATE		comerciante
10	David Liana		Cafunes
11	Armando Almeida	chefe da localidade	Muosse
12	[illegible] Viriano	[illegible]	
13	Luís Mário Ipo		
14	Augusto Namuera	Assuntos sociais	União control
15	Maurolio	Bartolomeu Suaiy	luis Caula
16	António Sobão		
17	Estefânia Juriasse		
18	Jaime	Atanácio	NC Codiguali
19	Luís	MANUEL	camponeas NATALEIA
20	Celilia Norma Faria	membro do Partido	Frelimo

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Nampula-Cuamba Road Feasibility Study - Stakeholder Meeting -

Venue MALEMA

Date 8th Nov. 2006

List of Attendance Nome Posicaõ ~~Contacto~~ Assinatura

No	NAME	POSITION	CONTACT NUMBER (CELL)
1	António Serafim Ricote	Administração	
2	NUBSA PIACHIDO	TECNICO	820125820
3	Luciano Cassalupa		
4	Aissa Malla		
5	Bernardino Lapequeue	D.D.Agricultura Malema	824201331
6	Mutuáli Gaiasse Alcorolalar		
7	Hinacio Hamumawa Hunana		
8	AGOSTINHO ARNALDO NAMECUNA		
9	Nhauaser Dezanove Hilassan		
10	DANIEL NAPUANHA	COMERCIANTE	823845830
11	Manuel António Metacure		
12	Jaime Brito Saide	Sec. Permanente	825875394
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Nampula-Cuamba Road Feasibility Study - Stakeholder Meeting -

Venue MaLEMA

Date 8th Nov. 2006

List of Attendance Nome Posição ~~Contacto~~ Assinatura

No	NAME	POSITION	CONTACT NUMBER (CELL)
1	FERNANDO SARANGE	CONSERVADOR	826439580
2	FONSECA B- SATACA	COMERCIANTE	825906276
3	Eusébio Francisco [illegible]	Pastor da Imumo	829088980
4	Abdul Alfredo	Comerciante	
5	Gonçalves Leite	comerciante	
6	[illegible]	[illegible]	Camponeso
7	Xavier Podreero	Carpinteiro	Milar
8	cristina matus	Secretária FNAM.	
9	Angelina	Manuel Muc	opa
10	Nammosa	Lemos Secre	tária de mulheres
11	Júlio Albino	Chefe da localidade	de [illegible]
12	Manuel Namme	coco Regulo	Namuecua
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Nampula-Cuamba Road Feasibility Study - Stakeholder Meeting -

Venue CUAMBA

Date 8th NOV. 2006

List of Attendance Nome Posição Assinatura

No	NAME	POSITION	CONTACT ~~NUMBER (CELL)~~
1	Francisco A. Simbine	coordenador	823269620
2	Adelino Chuau	chefe Pononque	Administração
3	Baptista Xavier	chefe Cuinhuma	administração
4	Henriques Rofinde	chefe Mucoma	administração
5	Fabião José	chefe Macaué	Administração
6	Rafael Jeuisa	Cabo Chedda	Administração
7	Alberto Ussecuane	Regedor Mecenca	825272255
8	Batine Bacuccio	Cabo	Mecenca
9	Agostinho Assibo	Adjuncto Batone	Mecenca
10	Macega	Chefe	Mecurresso
11	Uniare	Chefe	Nanigonha
12	Arsénio Saraite	SPD	827082949
13	Jaime Lamique	Director Distrital M-A Social	825964894
14	João Mutepia	P/ Director dist. Agricult.	Cuamba
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Nampula-Cuamba Road Feasibility Study - Stakeholder Meeting -

Venue CUAMBA

Date 8th Nov. 2006

List of Attendance Nome Posição Assinatura

No	NAME	~~POSITION~~	~~CONTACT NUMBER (CELL)~~
1	EUSÉBIO SAISSE	CHEFE do Posto Lúri	
2	MARIAMA JUISSA	RAINHA	MARIAMA JU
3	Maurício Fabião Quilua	Estatística	
4	Alberto Ernesto	C/E.M ME	
5	Estevão Jonas Hastala	Técnico do R.N.C.	
6	ALEXANDRE P. JOSÉ	MEIO AMBIENTE	
7	Valentim B. Issp	DDIC - Cba	
8	Maurício Paulo	DDOPH Cuamba	
9	Dinis António Tefa	DDAP e CBA.	
10	Jelimo Lualei	Comando P.R.M	
11	Maurício Tila	Escola	
12	Teresa Jorge Vintero	D.D.A. Aud. Contabil.	
13	ARLINDO C. MACHAR	D. AREA FISCAL	
14	Francelino Queralves	DDSC	
15	Pôncio Cavete	Presid. Assembleia Mun.	
16	Maria da Graça A.	D.D. Juventude e D-	
17	Dinis Vigo	[illegible]	
18	Zacarias Filipe	AAEC	
19	Mário de A.F. Lázaro	Vereador CMCC	
20	Stiven Tlapira	Repórter	

Nampula-Cuamba Road Feasibility Study - Stakeholder Meeting -

Venue Nampula Municiparity

Date 16th November 2006

List of Attendance Posisão ASSiNATURA

No	NAME	POSITION	~~CONTACT NUMBER (CELL~~)
1	Atumane Vitor	Chefe da J. S. Liber Central	876837300
2	João Malicana	secretário do Bairro	Muhala 829501020
3	Manuel Hagagião	Secretário do bairro	Murrapaniua
4	António A. Rafy	Representante chefe	Namicopo
5	António Wagera	Representante do chefe do	Posto de Muhala 825401258
6	Rafael Cie António	Chefe do Posto Natikiri	Natikiri 825278374
7	[illegible] A. Sater Jamú	chefe do Posto Central	827434010
8	[illegible] A. [illegible]	[illegible]	82 8837070
9	Gustiona J. Santos	Chefe do Posto Muatala	824374500
10	Fernando Mucaquiua	Secret.º subst. B/Namicopo	825279321
11	Francisco Coquel	Lider Natikiri	826451470
12	José A. C. Vahute	Vereador	82 6015360
13	Tomas Narom	–	825806129
14	Carolina E. Rafael	Vereadora	825281182
15	Juma Juaussete	Vereador	823834750
16	Bazílio Fil. [illegible]	"	826685530
17	Fatima Estevão	Vereadora	827170730
18			
19			
20			

Nampula-Cuamba Road Feasibility Study - Stakeholder Meeting -

Venue Nampula Municiparity

Date 16/11/2006

List of Attendance Posição Assinatura

No	NAME	POSITION	~~CONTACT NUMBER (CELL)~~
1	[illegible]	Chefe D. Bairro	
2	Maria Luísa Bile	" " Limoeiros	Luísa Bile
3	Madalena Sirola	" " 25 de Setembro	
4	[illegible]	" " Liberdade	
5	Clara Iris	Estudante . UCM	Clara José
6	CUSTODIO VOABIL	ASSESSOR TÉCNICO DPCAA –	
7	Francisco Mucucusa	Secretário-bairro Liberdade	
8	Maurício Pacati	– " DO B. Militar	Maurício Pacati
9	Manuel Bastigo Mapuanhe	C/ Direcção Social B. Militar	Mapuanhe
10	CALADO LOPES LAVIEQUE	SECRETÁRIO DO B. 1º DE MAIO	Calado Lopes Lavieque
11	Ernesto J. Namaialo	Secretário do B. Napipine	Ernesto J. Namaialo
12	Maria A. Boço	Chefe do 1º Presidente	
13	Rafael N. Tarcísio	Vereador I.A.T	
14	José Sabonete	Secretário DO BAIRRO Muhalala	
15	Zeferino M. [illegible]	D. S. Adm Muatala	
16	Alexandre R. [illegible]	Delegado	
17	Agostinho V. [illegible]	Coordenador – ANE	
18	Angelina Balate	Contraparte ANE	Balate
19	António Molaica	[illegible]	
20	Deolinda Nunes	Coordenadora – ANE	Nunes

EIA FOR THE REHABILITATION OF NAMPULA – CUAMBA ROAD (N13), IN NAMPULA AND NIASSA PROVINCES

Public Meeting - Nampula

Note

This meeting has been attended by local consultant the CONSULTEC which contracted with ANE regarding EIA activities. This meeting is the second stakeholder meeting in this JICA's feasibility study, and at the same time, prescribed preliminary public consultation based on the Mozambican EIA law.

Venue: NAMPULA – Municipal Council

Date: 20th August, 2007

Time: 08.30 h – 11:00 h

PARTICIPANTS:

PROPONENT: Bento Mualoja (Director of Public Works), Alexandre Nhaca (ANE Delegate), Angelina Balate (UASMA)

NAMPULA MUNICIPALITY: José Valente
*CONSULTANTS***:** Madalena Dray, Vera Ribeiro

JICA: Hironori Kuroki

FACILITATOR: Madalena Dray

PARTICIPANTS: As per attached list.

WELCOMING

The Director of Public Works in Nampula welcomed the participants and gave a brief presentation about the purpose of the meeting and solicited the participation of all.

PRESENTATION CONSULTEC (Madalena Dray)

- Objectives of the meeting,
- Meeting's agenda
- Project definition
- Environmental Impact Assessment Process & Public Participation Process
- Project Description
- Project's Timeframe
- Project's alternatives
- Project details
- Construction phase
- Post-construction phase
- Description of the area's environment: Physical, Biological and Socio-economic environment
- Main potential impacts during construction phase & post-construction phase
- Interested & affected parties
- Objectives of the meeting

After the presentation, the facilitator opened the meeting for comments and/or questions:

Questions / suggestions	Made by
1. This project seems to have taken into consideration few alternatives. The question about road safety, especially within towns, should be taken into consideration, since the project did not include an alternative to bypass main towns. 2. In the past, we have experienced many contractors who promise employment opportunities to local people, and then fail to pay them. The signing of contracts with local workforce should be implemented and enforced.	Augusto Ferro – Nampula District Administrator
3. Local committees shall be established, both by contractors and local	Madalena Dray -

communities, to ensure that contracts are signed and followed.	Consultec
4. The rehabilitation of this road will bring about not only an increase in traffic, but also crime rates are likely to increase. The Ministry of Interior should therefore be involved in the process. 5. Programmes should be developed during pre-construction phase and post-construction phase in order to educate communities on possible impacts such as cultural clashes with workers, increase in HIV/AIDS, road safety and security in general, links to markets, etc. 6. Communities should also be warned early on that they shall not build any more infrastructures or establish machambas (agricultural plots) along the road. 7. What can be done in order for local communities to respect the 30m of ROW required along roads? This is a very important issue, as the speed limit will substantially increase with the road's rehabilitation, and hence the risk of accidents. 8. In terms of resettlement, an information dissemination programme should be developed early on in the project, especially with possibly affected families, and this programme should be carried out in an integrated manner, together with the social services and other relevant institutions.	António Murserene - Executive Director OLIPA
9. First contacts with District Directorates have already been done, and later on there will be some work towards identifying and demarcating suitable areas for the establishment of markets and fares, as well as parking spots. We are only doing a preliminary study, but will later identify all possibly affected houses, machambas and other infrastructure. The executive project will be ready in 2008, and only then will we be able to identify the exact number of infrastructures that will be affected. We are now working with an aerial photograph of the area, which shall be distributed amongst district administrations and local leaders, in order to avoid the construction of more houses or the establishment of machambas along the road's ROW between now and when the project starts. This aerial photograph will also be used when working with the owners of possibly affected houses and agricultural plots.	Madalena Dray - Consultec
10. It is necessary to ensure the management of funds, as many projects in	Arnaldo Chalala -

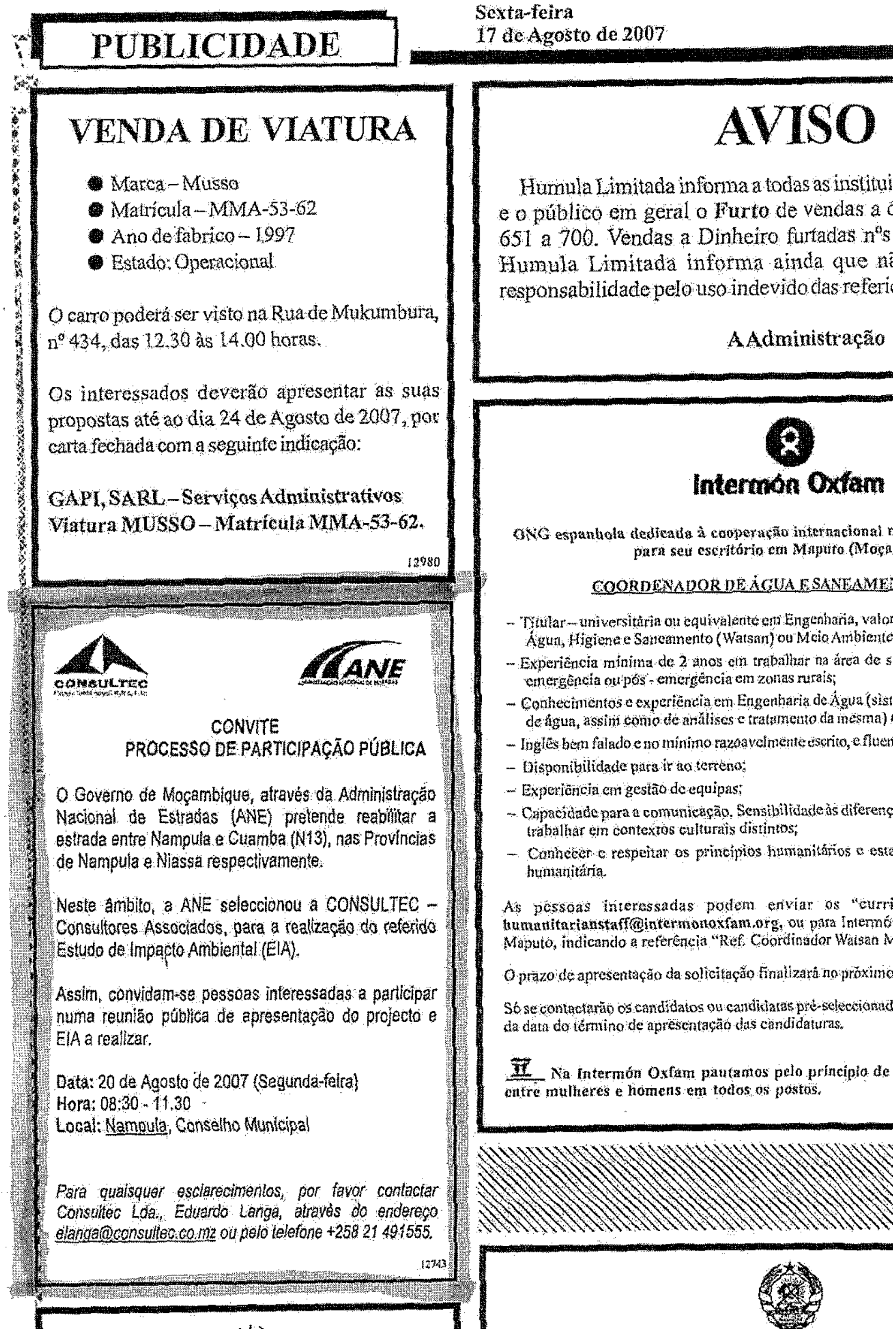
this country are not followed due to the mismanagement of funds and lack of transparency. 11. Due to the risk of increase in HIV/AIDS, I would suggest that a hospital unit be built on the camp site. 12. In relation to noise and dust, will there be any mechanism to ensure that the generated dust will not negatively impact on people health as dust can generate several diseases as tuberculosis? 13. There is usually agglomeration of people and markets around camping sites, and this should be controlled by introducing some form of policing.	Renamo Party
14. There are many dust controlling measures which are used both internationally and nationally such as water aspersion, especially during the dry season. For piles of sand, the measure taken includes planting grass to avoid dust emissions.	Madalena Dray -Consultec
15. There should be a strong coordination between the different municipal councils and districts for the resettlement process. Construction is due to start in 2009, so 2008 will be a preparatory year. 16. There are lots of machambas and infrastructures within the 30m ROW, which is dangerous in terms of road safety. There is a need for us, government, to work towards the implementation of the law. 17. In terms of sacred places, the administrators and municipal councils shall identify these areas, by working with local communities. 18. Whenever possible, the road crossing main towns should be avoided. One of the reasons behind it being general disrespect for speed limits and hence increased accident rates.	Alexandre Nhaca – ANE delegate
19. The fact that the road will cross towns is a main worry, as this will not only be a national road but in fact a national corridor, where vehicle traffic will substantially increase to approximately 936 vehicles/day by 2026. The road will be the main route used for the export of agricultural products. Today, even with the small maintenance works carried out on the road, traffic is already high, and speeds are often above 100km/hr. Therefore, I believe that Alternative B should be implemented in town sections, and Alternative A should be left to areas outside major towns.	Provincial Director of Public Works - Nampula

20. Communities must be educated on road safety. There is an area just outside Malema which has a propensity for accidents. There are lots of domestic animals such as chickens, pigs and goats crossing the road. This situation should be carefully analysed and the Ministry of Interior should be involved in the process.	
22. ANE already has a programme of work for HIV/AIDS. This entails contracting local institutions which are already working on HIV/AIDS at the local level, so that they develop a programme with those communities that live within the road's area of influence.	Angelina Balate ANE - UASMA
23. I would like to know exactly when the road starts and when it ends. 24. The question of clearance width, as in Natiquir Locality even the Administrative post is within 5 metres from the road.	Camponês – Chief of Natiquir Administrative Post
25. Its important that each administrative post and municipal council have information regarding where the project starts and where it ends, as well as the project's timeframe and planned activities (at least information regarding the section of the road which falls within each administrative post/municipality). 26. Once people find out about compensations, they might start building or cultivating along the road in order to receive some form of compensation. It is therefore important to identify each infrastructure and machambas along the road as soon as possible. 27. Proper signalling will be needed, especially on those deviations which are usually areas where accident rates are high. 28. Would like to ask contractors to contract local labour whenever possible. 29. Roads should be built for the future, and not only for a period of 3 or 4 years.	José Valente - Municipal Council Nampula
30. The N13 starts at the crossing between National Road 1 towards Cuamba. 31. We need much more than 12 meters width clearence in urban areas for many reasons, one of them is that the number of vehicles is increasing, and this always happens faster in urban areas.	Alexandre Nhaca – ANE delegate

32. The Alternative A route would cause many inconveniences to Malema town. For example, the road ends exactly where the District Administration office is located. There will be no road safety, and therefore I agree that the project should consider another alternative for those areas inside towns.	Tadeu Mariano - Director of Economic Activities, Malema District Administration
33. I am worried about the rights of those farmers who will loose their agricultural plots, as well as food security. The farmers and their families will loose cultivated areas; therefore dissemination of information regarding the project should start immediately if not Today. I would like to ask the relevant people to come up with adequate methodologies to inform local families about the project.	Calisto Ribeiro - ORAM
34. ANE and JICA already have stipulated resettlement guidelines. These guidelines entail a survey of the houses, agricultural plots and other infrastructure located along the road, which will be done as soon as the executive project is complete, in 2008. A survey of all affected families will be followed, as well as a survey of all the crops and fruit trees. The latter will be then analysed according to the provincial compensation table, which stipulates prices for different crops and fruit trees. There will be a team working together affected families, and later on a Resettlement Action Plan will be implemented. It is however important to start as early as possible the process of information dissemination, so as to avoid further construction of houses or agricultural plots along the road. This process will be roughly detailed during 2008.	Madalena Dray - Consultec
35. It seems the study is based on two main alternatives, A and B, without any other proposed alternative. Both these alternatives seem to be very focused on the costs rather than on the benefits. Most of the roads in Mozambique were designed during the colonial period, and therefore served the interests of the then District Administrators, which included, amongst other things, information regarding visitors, proximity to the military school, etc. Today we live in a completely different context, and it is important to re-think the design of our roads. The rehabilitation of the road will bring	António Murserene - Executive Director OLIPA

about an increase in traffic, hence we should include the possibility of avoiding towns.	
36 Would like to know if anybody has information regarding the existence of mines in the areas along the road	Hironori Kuroki – JICA
37. Where does the road start and end? 38. Wouldn't it be better if we could use the road that goes through Rua Chave? If the road started in Rua Chave (5000 Road) instead, we could have two roads coming into Nampula town, therefore improving the traffic conditions.	Arnaldo Chalala - Renamo Party
38. If traffic congestion is bad in Trabalho Avenue, then the idea of using 5000 Road is a good one. However, this project has been designed a long time ago, and it has to start in FAINA. The Municipal council should look into possible alternatives, if they think this is necessary. We can then make a proposal, but I don not think it is a possible alternative. This is a national road, which is part of the Nacala Corridor, and the main worry now is to find a road design that may improve traffic in towns, but this alternative is not included. Perhaps with more discussions and suggestions, we could come up with another feasible alternative.	Alexandre Nhaca – ANE delegate

Once all comments were made, the facilitator ended the meeting.



PUBLICIDADE

Sexta-feira
17 de Agosto de 2007

VENDA DE VIATURA

- Marca – Musso
- Matrícula – MMA-53-62
- Ano de fabrico – 1997
- Estado: Operacional

O carro poderá ser visto na Rua de Mukumbura, nº 434, das 12.30 às 14.00 horas.

Os interessados deverão apresentar as suas propostas até ao dia 24 de Agosto de 2007, por carta fechada com a seguinte indicação:

GAPI, SARL – Serviços Administrativos
Viatura MUSSO – Matrícula MMA-53-62.

12980

CONSULTEC

ANE

CONVITE
PROCESSO DE PARTICIPAÇÃO PÚBLICA

O Governo de Moçambique, através da Administração Nacional de Estradas (ANE) pretende reabilitar a estrada entre Nampula e Cuamba (N13), nas Províncias de Nampula e Niassa respectivamente.

Neste âmbito, a ANE seleccionou a CONSULTEC – Consultores Associados, para a realização do referido Estudo de Impacto Ambiental (EIA).

Assim, convidam-se pessoas interessadas a participar numa reunião pública de apresentação do projecto e EIA a realizar.

Data: 20 de Agosto de 2007 (Segunda-feira)
Hora: 08:30 - 11.30
Local: Nampula, Conselho Municipal

Para quaisquer esclarecimentos, por favor contactar Consultec Lda., Eduardo Langa, através do endereço elanga@consultec.co.mz ou pelo telefone +258 21 491555.

12743

AVISO

Humula Limitada informa a todas as institui
e o público em geral o **Furto** de vendas a
651 a 700. Vendas a Dinheiro furtadas nºs
Humula Limitada informa ainda que n
responsabilidade pelo uso indevido das refer

A Administração

Intermón Oxfam

ONG espanhola dedicada à cooperação internacional
para seu escritório em Maputo (Moça

COORDENADOR DE ÁGUA E SANEAME

- Titular – universitária ou equivalente em Engenharia, valo
  Água, Higiene e Saneamento (Watsan) ou Meio Ambiente
- Experiência mínima de 2 anos em trabalhar na área de s
  emergência ou pós - emergência em zonas rurais;
- Conhecimentos e experiência em Engenharia de Água (sis
  de água, assim como de análises e tratamento da mesma)
- Inglês bem falado e no mínimo razoavelmente escrito, e fluen
- Disponibilidade para ir ao terreno;
- Experiência em gestão de equipas;
- Capacidade para a comunicação. Sensibilidade às diferenç
  trabalhar em contextos culturais distintos;
- Conhecer e respeitar os princípios humanitários e est
  humanitária.

As pessoas interessadas podem enviar os "curri
humanitarianstaff@intermonoxfam.org, ou para Intermó
Maputo, indicando a referência "Ref. Coordinador Watsan

O prazo de apresentação da solicitação finalizará no próxim

Só se contactarão os candidatos ou candidatas pré-seleccionad
da data do término de apresentação das candidaturas.

Na Intermón Oxfam pautamos pelo princípio de
entre mulheres e homens em todos os postos.

Announcement for the Public Consultation on the Newspaper (17th August 2007)

Estudo de Impacto Ambiental (EIA) da estrada Nampula-Cuamba

Reunião Pública - Nampula

Nome	Instituição	Telefone/ Cel.	Fax.	E-mail
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Boaventura Manuel	DDCAA - NPL	825280842	26216478	—
David José	Ad/tivo Ribaue	84 4557700	26 21 82 0006	—
Atanásio Chigoma	CMN - DCU	84 4075160		
Momade Sedik	CMCN	820719040		
Rogério V. [illegible]	Wan-Phil fax	26217315	26218868	–
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Guilherme [illegible]	CMCN	843989177	—	—
Arnaldo F. Chelaue	Renamo	820580480	—	—
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Estudo de Impacto Ambiental (EIA) da estrada Nampula-Cuamba

Reunião Pública - Nampula

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Armindo Gabriel Antur	ANE-Nampula	826440740		
Ghulamo Ismail	D.P.Ind. e C.	824549730	217990	-
Manuel Magalhães	[illegible]	—	—	—
Fernando Salgado	[illegible]	827161727	—	V
Elísio [illegible]	DA.D.P.C.T.	824012422	—	—
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Stalwart Silvino Kazangi	Chefe do Posto Natikiri	826997150		
Zubayda Salimuato	chefe de Serviço	826410500		
TOMÁS A. ROSÁRIO	DPOPH - NPL	842271760		
Júlio Paulino	[illegible]	827428762	26216868	julio_paulino@yahoo.com.br
Flávia Gabriela Vaile	DPTurismo	824557860	26212421	gabriela_vaile@yahoo.com.br
Carlos Coelho	VISÃO MUNDIAL	826702850	26035192	carlos_coelho@wvi.org

Data: 20/08/2004

Estudo de Impacto Ambiental (EIA) da estrada Nampula-Cuamba

Reunião Pública - Nampula

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