

TEST REPORT



Serial number: LT1050

Date of issue: 14/03/2008

Page 1 of 7

1265

Issued by

Norwest Holst Limited - Soil Engineering Division,

Authorised signatory

8

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M. J. Baldwin

(Technical Manager)

R. J. Rogers

(Principal Engineer)

S. Kirk

(Laboratory Manager)

S. K. Sharda

(Assistant Laboratory Manager)

Customer name

Address

SRK Consulting

Albion Spring 183 Main Road Rombebosch Cape Town 7700

South Africa

Contract name

Koeberg - 385908 - 42C

Your reference

K5888

Dates of receipt of samples

28/02/2008

Dates of testing

04/03/2008

o 14/03/2008

Testing was performed to the standard named on individual test results.

Sampling was not performed by the Laboratory of Norwest Holst Soil Engineering.

Testing was performed on 4 number of samples received in good condition.

Opinions and interpretations expressed herein are outside the scope of our UKAS accreditation.

Results reported relate only to the samples tested.

Tests marked 'Not UKAS' in this report are not included in the UKAS accreditation schedule for our laboratory. These results will appear in italics on any summary of tests.

Samples will be retained for 28 days from date of issue of this report and then be disposed of, unless we receive written instruction to the contrary

Quality Control Check performed by



K. A. Walker (Laboratory Quality Manager)

This test report shall not be reproduced except in full without the written permission of Norwest Holst Soil Engineering.

Key to Laboratory Summary Sheets Common to all summaries Sample Type Undisturbed sample U Small disturbed sample Piston sample Bulk disturbed sample TW Thin walled sample BLK Block sample Liner sample Rock core AMAL Amalgamated sample Any result in italics indicates a test that is not within the scope of the UKAS accreditation for this laboratory. Test status Summary of Laboratory Soil Tests: Index / Classification Tests Particle density Small pyknometer method Gas jar method Plastic index N/P Non plastic, although liquid limit will have been determined if requested Particle size (PSD) Following value in silt column denotes combined clay and silt fraction Following value in clay column denotes sedimentation by pipette, else sedimentation is by hydrometer. Summary of Laboratory Soil Tests: Strength and Permeability Tests Triaxial Single stage unconsolidated quick undrained Ш UUM Multi stage unconsolidated quick undrained UU3 Set of 3 unconsolidated quick undrained CU Single stage consolidated undrained CUM Multi stage consolidated undrained CU3 Set of 3 consolidated undrained CD Single stage consolidated drained CDM Multi stage consolidated drained Set of 3 consolidated drained CD3 Note that single stage tests are reported assuming $\phi = 0$ for total stress and c' = 0 for effective stress Consol One-dimensional oedometer Oed Hyd Hydraulic cell consolidation m_v coefficient of compressibility quoted for p0 to p0 + 100kPa, where determined Permeability Constant head permeability C Triaxial permeability Shearbox SSB Small shear box LSB Large shear box Peak value Residual value Ring shear RS Summary of Laboratory Soil Re-Use Test MCV Intercept of calibration line in MCV calibration * MCV value at natural or specified moisture int content Summary of Laboratory Rock Strength Tests Point Load Diametral Type Axial Α (Combination of) Irregular lump Block Test performed parallel to planes of weakness L Test performed perpendicular to planes of weakness Invalid failure of point load (not broken between points of load application) Summary of Laboratory Rock Materials Tests Ten% fines Soaked test Dry test Point Load Index Result Point Load D Diametral Type Α Axial (Combination of) Ī Irregular lump В Block Parallel to planes of weakness L Perpendicular to planes of weakness Χ Invalid failure of point load (not broken between points of load application) Diameter of core or average smallest width perpendicular to axis of loading in a block or irregular lump **Dimensions** W D Distance between platens when just in contact with specimen יח Distance between platens at point of failure De Equivalent core diameter ls P/De² Is(50) F x Is $(De/50)^{0.45}$ Is(50) point load strength index corrected for a diametral test of core diameter 50mm For Axial/Lump tests $De^2 = (4/Pi) \times (W \times D')$ For Diametral tests $De^2 = D \times D'$ Important note: summary sheets are provided for convenience and in no way replace individual test result sheets which shall, without exception, be regarded as the definitive result. Report number LT1050 Page 2 of 7

Issue Date 24/01/2006

SOIL ENGINEERING

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Form No.

LABO01

Revision No.

2.01

Project Name	Koeberg -	38590	08 - 42	2C					f Lal					*			
Project No.	LT1050					F	Rock	Stre	ngth	Tes	ts						
Engineer	Ben Engel	sman															
Client	SRK Consu	lting					_										
	_			٤		‡‡			ity	F	Point lo	ad				Sn	.0.
Hole ID	Sample depth m	Sample no.	Sample type	Specimen depth m	Specimen no.	* Water Content	Bulk Density	Dry Density	Particle density	Туре	l _s	I₅50	SON	Brazil	Porosity	Elastic Modulus	Posissons Ratio
KB1	18.670	001	C	18.670	01	4.7		2350	Mg/m³	Ĕ	MIN/III	IWIN/m*	24.8	MN/m²	%	GPa 11.5	0.13
KB12	33.000	002	С	33.000	01	0.9		2750					34.6			58	0.1.
KB27	22.180	003	Č	22.180	01	4.5		2260									
KB36	26.280												21.5			9.87 101.	0.15
KB30	20.200	004	С	26.280	01	0.4	2700	2690 End					123			5	0.31
A.E.																	
Approved by: Kevin Walker			Leeds	Laboratory		3 of 7						N		МЕ			
		Revisio	ı No.	2.01	i uye .		e Date	Р	rint date 18/08/		03/2008			L ENGI			

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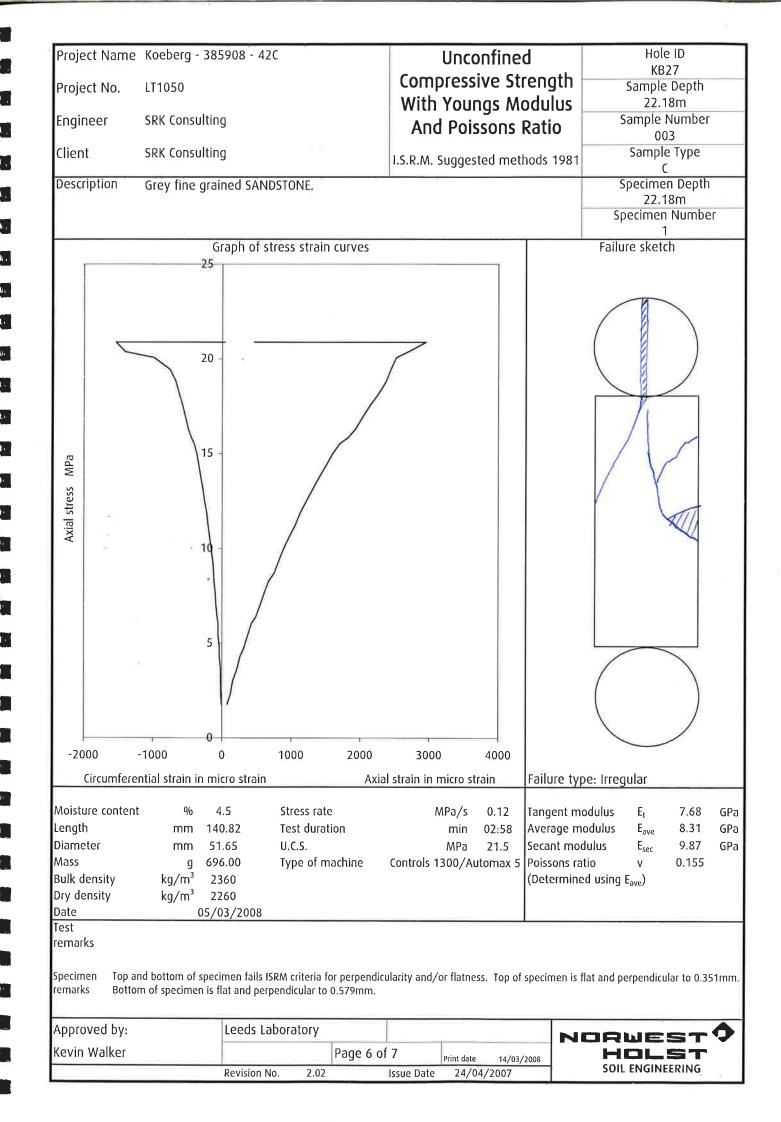
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Hole ID Unconfined Project Name Koeberg - 385908 - 42C KB₁ Compressive Strength Sample Depth Project No. LT1050 With Youngs Modulus 18.67m Sample Number Ben Engelsman Engineer **And Poissons Ratio** 001 Sample Type Client SRK Consulting I.S.R.M. Suggested methods 1981 Specimen Depth Description Grey metamorphic SHALE. 18.67m Specimen Number Failure sketch Graph of stress strain curves 20 Axial stress MPa 10 5 -1500 -1000 -500 500 1000 1500 2000 2500 3000 3500 Failure type: Axial Axial strain in micro strain Circumferential strain in micro strain Moisture content Stress rate MPa/s 0.10 Tangent modulus 9.36 GPa % 4.7 GPa Average modulus 9.86 Length mm 139.97 Test duration min 04:11 Secant modulus 11.5 GPa Diameter U.C.S. MPa 24.8 50.44 mm 0.132 Poissons ratio Controls 1300/Automax 5 Mass 689.00 Type of machine (Determined using Eave) **Bulk density** 2460 kg/m³ Dry density kg/m³ 2350 04/03/2008 Date Test remarks Top and bottom of specimen fails ISRM criteria for perpendicularity and/or flatness. Top of specimen is flat and perpendicular to 0.441mm. Specimen Bottom of specimen is flat and perpendicular to 0.317mm. remarks Approved by: Leeds Laboratory Kevin Walker Page 4 of 7 14/03/2008 Print date SOIL ENGINEERING 24/04/2007 Revision No. 2.02 Issue Date

Unconfined Hole ID Project Name Koeberg - 385908 - 42C **KB12** Compressive Strength Sample Depth Project No. LT1050 With Youngs Modulus 33.00m Sample Number Engineer SRK Consulting And Poissons Ratio 002 Sample Type Client SRK Consulting I.S.R.M. Suggested methods 1981 Description Specimen Depth Grey metamorphic SHALE. 33.00m Specimen Number Failure sketch Graph of stress strain curves 35 30 25 Axial stress 20 15 10 5 -2500 -2000 -1500 -1000 -500 0 500 1000 Circumferential strain in micro strain Axial strain in micro strain Failure type: Axial Moisture content % Stress rate 0.9 MPa/s 0.09 Tangent modulus 53.7 GPa Length Test duration Average modulus GPa mm 139.19 06:08 51.5 min Diameter 51.59 U.C.S. MPa 34.6 Secant modulus 58.0 GPa Mass Type of machine Controls 1300/Automax 5 Poissons ratio 0.170 806.44 (Determined using Eave) Bulk density kg/m^3 2770 Dry density kg/m³ 2750 Date 03/03/2008 Test remarks Top and bottom of specimen fails ISRM criteria for perpendicularity and/or flatness. Top of specimen is flat and perpendicular to 0.298mm. Specimen Bottom of specimen is flat and perpendicular to 0.319mm. remarks Approved by: Leeds Laboratory Kevin Walker Page 5 of 7 Print date 14/03/2008 SOIL ENGINEERING 24/04/2007 Revision No. 2.02 Issue Date



Project Name Koeberg - 385908 - 420 Hole ID Unconfined **KB36 Compressive Strength** Project No. Sample Depth LT1050 With Youngs Modulus 26.28m Engineer SRK Consulting Sample Number And Poissons Ratio 004 Client SRK Consulting Sample Type I.S.R.M. Suggested methods 1981 C Description Grey metamorphic SANDSTONE. Specimen Depth 26.28m Specimen Number Graph of stress strain curves Failure sketch T20 100 80 Axial stress 60 20 -1000 -500 500 1000 1500 2000 Circumferential strain in micro strain Axial strain in micro strain Failure type: Axial Moisture content 0.4 Stress rate MPa/s 0.54 Tangent modulus GPa 66.4 Length Test duration mm 133.86 min 03:49 Average modulus 117 GPa Diameter 51.47 U.C.S. Secant modulus mm 102 GPa MPa 123 Mass 751.73 Type of machine Controls 1300/Automax 5 Poissons ratio 0.313 Bulk density 2700 (Determined using Eave) kg/m³ Dry density kg/m³ 2690 Date 04/03/2008 Test remarks Specimen Top and bottom of specimen fails ISRM criteria for perpendicularity and/or flatness. Top of specimen is flat and perpendicular to 0.074mm. remarks Bottom of specimen is flat and perpendicular to 0.718mm. Approved by: Leeds Laboratory Kevin Walker Page 7 of 7 Print date 14/03/2008 **SOIL ENGINEERING** Revision No. 2.02 24/04/2007 Issue Date



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SUPPORTING FACTUAL DATA SECTION E Photographs

SOIL SAMPLE / ROCK CORE / CONCRETE CORE PHOTOGRAPHS





Project Nam	e Koeberg - 385908 - 42C	Photographic Record	Hole ID
Project No.	LT1050		KB1
Engineer	SRK Consulting		Fig no.
Client	SRK Consulting		01

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18.67-18.86m Before Test



Photographed by		Date photographed	Filename 1 P3040020.JPG
P. Ashworth		04/03/2008	Filename 2 P3040021.JPG
Form No.	SI PMPA4	Revision No. 2.02	Issue Date 26/02/2007



Project Nam	e Koeberg - 385908 - 42C	Photographic Record	Hole ID
Project No.	LT1050		KB12
Engineer	SRK Consulting		Fig no.
Client	SRK Consulting		02

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33.00-33.30m Before Test



Photographed by	Date photographed	Filename 1 P3040001.JPG
P. Ashworth	03/03/2008	Filename 2 P3040005.JPG
Form No. SI PMPA4	Revision No. 2.02	Issue Date 26/02/2007

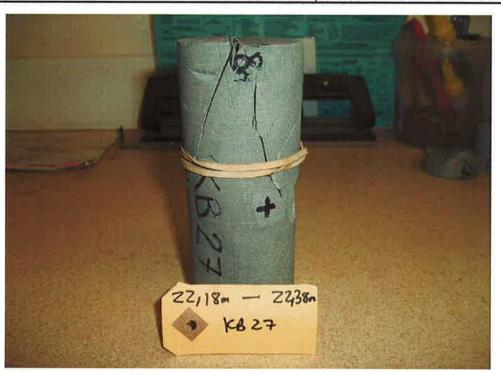


Project Nam	e Koeberg - 385908 - 42C	Photographic Record	Hole ID
Project No.	LT1050		KB27
Engineer	SRK Consulting		Fig no.
Client	SRK Consulting		03

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22.18-22.38m Before Test



			22.18-22.38m After Test
Photographed by	Date photographed	Filename 1 P3040032	NORWEST
P. Ashworth	05/03/2008	Filename 2 P3040034	JPG HOLST
Form No. SI PMPA4	Revision No. 2.02	Issue Date 26/02/2007	SOIL ENGINEERING



Project Nam	e Koeberg - 385908 - 42C	Photographic Record	Hole ID
Project No.	LT1050		KB36
Engineer	SRK Consulting		Fig no.
Client	SRK Consulting		04

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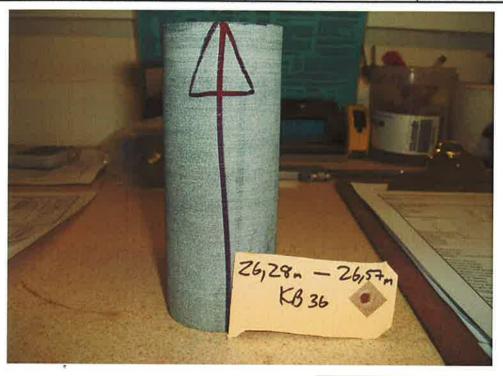
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26.28-26.57m Before Test



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P. Ashwo	orth	04/03/2008	Filename 2 P3040011.JPG
Form No.	SI PMPA4	Revision No. 2.02	Issue Date 26/02/2007





TEST REPORT



Serial number: LT1064

Date of issue: 18/07/2008

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1265

Issued by

Norwest Holst Limited - Soil Engineering Division,

Authorised signatory



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(Technical Manager) (Principal Engineer)

(Laboratory Manager)

(Assistant Laboratory Manager)

Customer name

Address

SRK Consulting

Postnet Suite #206 Private Bag X18 Rondebosch 7701 South Africa

Contract name

#2 Duynefontein

Your reference

385908 - 42C

Dates of receipt of samples

10/06/2008

Dates of testing

21/06/2008

0 18/07/2008

Testing was performed to the standard named on individual test results.

Sampling was not performed by the Laboratory of Norwest Holst Soil Engineering.

Testing was performed on 18 number of samples received in good condition.

Opinions and interpretations expressed herein are outside the scope of our UKAS accreditation.

Results reported relate only to the samples tested.

Tests marked 'Not UKAS' in this report are not included in the UKAS accreditation schedule for our laboratory. These results will appear in italics on any summary of tests.

Samples will be retained for 28 days from date of issue of this report and then be disposed of, unless we receive written instruction to the contrary

Quality Control Check performed by

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K. A. Walker (Laboratory Quality Manager)

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Key to Laboratory Summary Sheets Common to all summaries Sample Type U Undisturbed sample n Small disturbed sample Ρ Piston sample В Bulk disturbed sample Thin walled sample TW BLK Block sample Liner sample Rock core 1 C AMAL Amalgamated sample Test status Any result in italics indicates a test that is not within the scope of the UKAS accreditation for this laboratory. Summary of Laboratory Soil Tests: Index / Classification Tests Particle density Small pyknometer method Gas jar method Plastic index N/P Non plastic, although liquid limit will have been determined if requested Particle size (PSD) Following value in silt column denotes combined clay and silt fraction Following value in clay column denotes sedimentation by pipette, else sedimentation is by hydrometer. Summary of Laboratory Soil Tests: Strength and Permeability Tests Triaxial UU Single stage unconsolidated quick undrained UUM Multi stage unconsolidated quick undrained UU3 Set of 3 unconsolidated quick undrained CU Single stage consolidated undrained CUM Multi stage consolidated undrained CU3 Set of 3 consolidated undrained Single stage consolidated drained CD CDM Multi stage consolidated drained CD3 Set of 3 consolidated drained Note that single stage tests are reported assuming $\phi = 0$ for total stress and c' = 0 for effective stress Consol One-dimensional oedometer 0ed Hydraulic cell consolidation Hyd m_{v} coefficient of compressibility quoted for p0 to p0 + 100kPa, where determined Permeability C Constant head permeability Triaxial permeability Т Shearbox SSB Small shear box LSB Large shear box Peak value Residual value р RS Ring shear Summary of Laboratory Soil Re-Use Test MCV Intercept of calibration line in MCV calibration int MCV value at natural or specified moisture content Summary of Laboratory Rock Strength Tests Point Load Type Diametral Axial Α (Combination of) Irregular lump Block Test performed parallel to planes of weakness Test performed perpendicular to planes of weakness Χ Invalid failure of point load (not broken between points of load application) Summary of Laboratory Rock Materials Tests Ten% fines Soaked test Dry test Point Load Index Result Point Load Type Diametral Axial Α (Combination of) Irregular lump В Block Parallel to planes of weakness Perpendicular to planes of weakness Invalid failure of point load (not broken between points of load application) Χ Dimensions Diameter of core or average smallest width perpendicular to axis of loading in a block or irregular lump Distance between platens when just in contact with specimen ים Distance between platens at point of failure De Equivalent core diameter $(De/50)^{0.45}$ Is(50) F x Is Is(50) point load strength index corrected for a diametral test of core diameter 50mm For Axial/Lump tests $De^2 = (4/Pi) \times (W \times D')$ For Diametral tests $De^2 = D \times D'$ Important note: summary sheets are provided for convenience and in no way replace individual test result sheets which shall, without exception, be regarded as the definitive result. Report number LT1064 Page 2 of 21

Form No.

LAB001

Revision No.

2.01

Issue Date 24/01/2006

Project Name	e #2 Duynef	onteir	1					_	f Lat		-						
Project No.	LT1064						₹ock	Stre	ngth	Tes	ts						
Engineer	BM Engels	man															
Client	SRK Consu	lting															
				E					<u> </u>	P	oint lo	ad				Si	
Hole ID	Sample depth m	Sample no.	Sample type	Specimen depth m	Specimen no.	Water Content	Bulk Density	Dry Density	Particle density	Туре	l _s	I₅50	UCS	Brazil	Porosity	Elastic Modulus	
		1				%	kg/m³	kg/m³	Mg/m³	Ţ.	MN/m ²	MN/m²		MN/m²	%	GPa	
KB05	25.460	001	С	25.460	01	1.0		2270					13.1			0.24	
KB08	37.820	001	С	37.820	01	0.5	2480	2470					39.4			14.5	
KB09	28.610	001	С	28.610	01	8.2	2230	2060					3.11			0.74 8	
KB11	28.990	001	С	28.990	01	1.6	2470	2430					10.7			22.5	,
KB18	23.630	001	С	23.630	01	0.7	2580	2570					10.7			54.4	1
KB19	24.480	001	С	24.480	01	2.4	2500	2440					10.6			24.9	,
KB25	19.130	001	С	19.130	01	3.1	1900	1840					2.81			5.34	1
KB26	28.940	001	С	28.940	01	2.0	2400	2350					15.1			9.55	,
KB30	19.700	001	С	19.700	01	2.9	2480	2410					29.6			27.3	3
KB31	29.540	001	С	29.540	01	0.4	2520	2510					31.7			22.3	3
KB33	14.740	001	С	14.740	01	0.2	2600	2590					95.4			39	
KB33	25.910	002	С	25.910	01	0.4	2590	2580					6.23			203. 9	
KB40	27.210	001	С	27.210	01	4.9	2450	2340					20.8			8.82	,
KB41	19.900	001	С	19.900	01	1.2	2480	2450					53.1			24.3	,
KB41	22.790	002	С	22.790	01	0.6	2620	2610					28.0			59.7	
KB42	29.680	001	С	29.680	01	0.6	2490	2480					10.7			42.4	
KB43	30.710	001	С	30.710	01	3.9	2340	2250					11.2			2.94	
KB45	28.730	001	С	28.730	01	0.8	2620	2600					53.1			85.5	
				_				End									
Approved by:			Leeds	Laboratory	/									ME			
Kevin Walker		Revisio		2.01	Page	3 of 2	1 ie Date	Р	rint date		07/2008		H	L ENGI	-5	T	

Project Name #2 Duynefontein Unconfined Hole ID KB05 **Compressive Strength** Project No. LT1064 Sample Depth With Youngs Modulus 25.46m Engineer SRK Consulting Sample Number **And Poissons Ratio** 001 Client SRK Consulting Sample Type I.S.R.M. Suggested methods 1981 Description Grey SANDSTONE. Specimen Depth 25.46m Specimen Number Graph of stress strain curves Failure sketch 12 10 Axial stress MPa 8 -4000 -2000 4000 0 2000 6000 8000 Circumferential strain in micro strain Axial strain in micro strain Failure type: Shear Moisture content 0/0 1.0 Stress rate MPa/s 0.11 Tangent modulus 2.95 GPa Length Average modulus 2.95 138.29 Test duration min 02:00 GPa mm Eave Diameter Secant modulus mm 50.25 U.C.S. MPa 13.1 E_{sec} 0.240 GPa Mass Type of machine Controls 1300/Automax 5 Poissons ratio 0.229 629.01 g Bulk density (Determined using Eave) kg/m³ 2290 Dry density kg/m³ 2270 Date 20/06/2008 Test remarks Top and bottom of specimen fails ISRM criteria for perpendicularity and/or flatness. Top of specimen is flat and perpendicular to 0.250mm. Specimen remarks Bottom of specimen is flat and perpendicular to 0.112mm. Approved by: Leeds Laboratory

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Issue Date

2.03

Revision No.

Print date

24/04/2007

17/07/2008

Kevin Walker

NORWES

Project Name #2 Duynefontein **Unconfined** Hole ID KB08 **Compressive Strength** Project No. LT1064 Sample Depth With Youngs Modulus 37.82m Engineer SRK Consulting Sample Number **And Poissons Ratio** 001 Client SRK Consulting Sample Type I.S.R.M. Suggested methods 1981 Description Grey SANDSTONE. Specimen Depth 37.82m Specimen Number Graph of stress strain curves Failure sketch 40 35 30 Axial stress MPa 25 20 -500 -1000 0 500 1500 2000 1000 2500 3000 Circumferential strain in micro strain Axial strain in micro strain Failure type: Axial Moisture content % 0.5 Stress rate MPa/s 0.05 Tangent modulus E, 11.6 GPa Length 137.75 Test duration min 13:23 Average modulus 13.1 GPa mm Eave Diameter E_{sec} mm 50.16 U.C.S. MPa 39.4 Secant modulus 14.5 GPa Mass Type of machine Controls 1300/Automax 5 0.212 676.11 Poissons ratio g Bulk density (Determined using Eave) kg/m³ 2480 Dry density 2470 kg/m³ Date 23/06/2008 Test remarks Specimen Top and bottom of specimen fails ISRM criteria for perpendicularity and/or flatness. Top of specimen is flat and perpendicular to 0.469mm. remarks Bottom of specimen is flat and perpendicular to 0.351mm. Approved by: Leeds Laboratory

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Issue Date

2.03

Revision No.

17/07/2008

SOIL ENGINEERING

Print date

24/04/2007

Kevin Walker

Project Name #2 Duynefontein **Unconfined** Hole ID **KB09 Compressive Strength** Project No. LT1064 Sample Depth With Youngs Modulus 28.61m Engineer SRK Consulting Sample Number **And Poissons Ratio** 001 Client SRK Consulting Sample Type I.S.R.M. Suggested methods 1981 Description Grey SANDSTONE. Specimen Depth 28.61m Specimen Number Graph of stress strain curves Failure sketch 2.5 2 Axial stress 1.5 1 0. -3000 -2000 -1000 0 1000 2000 3000 4000 5000 Circumferential strain in micro strain Axial strain in micro strain Failure type: Shear Moisture content % 8.2 Stress rate MPa/s 0.03 Tangent modulus 1.07 GPa Length mm 138.87 Test duration min 01:36 Average modulus \boldsymbol{E}_{ave} 0.923 GPa Diameter Secant modulus U.C.S. 0.748 GPa mm51.15 MPa 3.11 E_{sec} Mass 636.05 Type of machine Controls 1300/Automax 5 Poissons ratio 0.746 **Bulk density** kg/m³ (Determined using Eave) 2230 Dry density kg/m³ 2060 Date 20/06/2008 Test remarks Specimen Top and bottom of specimen fails ISRM criteria for perpendicularity and/or flatness. Top of specimen is flat and perpendicular to 0.322mm. remarks Bottom of specimen is flat and perpendicular to 0.326mm. Approved by: Leeds Laboratory Kevin Walker Page 6 of 21 Print date 17/07/2008

2.03

Issue Date

24/04/2007

Revision No.

Project Name #2 Duynefontein **Unconfined** Hole ID **KB18 Compressive Strength** Project No. LT1064 Sample Depth With Youngs Modulus 23.63m Engineer SRK Consulting Sample Number **And Poissons Ratio** 001 Client SRK Consulting Sample Type I.S.R.M. Suggested methods 1981 Description Grey MICRODIORITE with crystalline veins. Specimen Depth 23.63m Specimen Number Graph of stress strain curves Failure sketch Axial stress MPa 2 -800 -600 -400 -200 0 200 400 600 800 Circumferential strain in micro strain Axial strain in micro strain Failure type: Axial Moisture content 0.7 Stress rate MPa/s 0.05 Tangent modulus Eŧ 34.6 GPa Length Average modulus 136.12 Test duration 03:52 31.2 GPa mm min Eave Diameter mm U.C.S. 10.7 Secant modulus 54.4 GPa 51.84 MPa Mass Controls 1300/Automax 5 0.163 742.01 Type of machine Poissons ratio g (Determined using Eave) **Bulk density** kg/m³ 2580 Dry density kg/m³ 2570 Date 23/06/2008 Test remarks Specimen Top and bottom of specimen fails ISRM criteria for perpendicularity and/or flatness. Top of specimen is flat and perpendicular to 0.425mm. remarks Bottom of specimen is flat and perpendicular to 0.327mm. Approved by: Leeds Laboratory Kevin Walker Page 8 of 21 Print date 17/07/2008 **SOIL ENGINEERING** Revision No. 2.03 Issue Date 24/04/2007

Project Name #2 Duynefontein Unconfined Hole ID **KB11 Compressive Strength** Project No. LT1064 Sample Depth With Youngs Modulus 28.99m Engineer SRK Consulting Sample Number **And Poissons Ratio** 001 Client **SRK Consulting** Sample Type I.S.R.M. Suggested methods 1981 Description Specimen Depth Grey veined metamorphosed SANDSTONE. 28.99m Specimen Number Graph of stress strain curves Failure sketch 10 8 Axial stress MPa 2 -1000 -800 -600 -400 -200 0 200 400 600 Circumferential strain in micro strain Axial strain in micro strain Failure type: Irregular Moisture content 0/0 Stress rate MPa/s 0.07 Tangent modulus 1.6 23.2 GPa Length mm 133.51 Test duration min 02:26 Average modulus Eave 20.4 GPa Diameter U.C.S. Secant modulus 22.5 49.12 MPa 10.7 E_{sec} GPa mm Mass 624.10 Type of machine Controls 1300/Automax 5 Poissons ratio 0.218 g **Bulk density** (Determined using Eave) kg/m³ 2470 Dry density kg/m³ 2430 Date 21/06/2008 Test remarks Specimen Top and bottom of specimen fails ISRM criteria for perpendicularity and/or flatness. Top of specimen is flat and perpendicular to 0.474mm. remarks Bottom of specimen is flat and perpendicular to 0.269mm. Sides of specimen are not smooth and straight to within ISRM tolerance, the largest irregularity measured as 0.50mm. Approved by: Leeds Laboratory Kevin Walker Page 7 of 21 HOL Print date 17/07/2008

Revision No.

2.03

Issue Date

24/04/2007

Unconfined Project Name #2 Duynefontein Hole ID KB19 **Compressive Strength** Project No. LT1064 Sample Depth With Youngs Modulus 24.48m Engineer SRK Consulting Sample Number **And Poissons Ratio** 001 Client SRK Consulting Sample Type I.S.R.M. Suggested methods 1981 Description Grey fractured metamorphosed SANDSTONE. Specimen Depth 24.48m Specimen Number Graph of stress strain curves Failure sketch 10 Axial stress MPa -100 100 200 300 400 500 Circumferential strain in micro strain Failure type: Shear Axial strain in micro strain Moisture content % 2.4 Stress rate MPa/s 0.06 Tangent modulus 29.1 GPa Length Test duration Average modulus 139.85 03:07 22.6 GPa mm min Eave Diameter mm 51.51 U.C.S. 10.6 Secant modulus 24.9 GPa MPa Mass 728.03 Type of machine Controls 1300/Automax 5 g Poissons ratio 0.0217 kg/m³ (Determined using Eave) Bulk density 2500 Dry density kg/m³ 2440 Date 21/06/2008 Test remarks Specimen Top and bottom of specimen fails ISRM criteria for perpendicularity and/or flatness. Top of specimen is flat and perpendicular to 0.344mm. remarks Bottom of specimen is flat and perpendicular to 0.165mm. Approved by: Leeds Laboratory Kevin Walker Page 9 of 21 17/07/2008 Print date SOIL ENGINEERING

Revision No.

2.03

Issue Date

24/04/2007

Unconfined Project Name #2 Duynefontein Hole ID KB25 **Compressive Strength** Project No. LT1064 Sample Depth With Youngs Modulus 19.13m Engineer **SRK Consulting** Sample Number **And Poissons Ratio** 001 Client SRK Consulting Sample Type I.S.R.M. Suggested methods 1981 C Description Specimen Depth Light orangish grey SILTSTONE. 19.13m Specimen Number Graph of stress strain curves Failure sketch 2.5 2 1.5 Axial stress MPa 1 -200 -100 0 100 200 300 400 500 Circumferential strain in micro strain Axial strain in micro strain Failure type: Shear Moisture content % 3.1 Stress rate MPa/s 0.05 Tangent modulus 5.01 GPa Length 138.53 $\mathsf{E}_{\mathsf{ave}}$ 4.93 Test duration 00:59 Average modulus GPa mm min Diameter mm 51.68 U.C.S. MPa 2.81 Secant modulus E_{sec} 5.34 GPa Mass Type of machine Controls 1300/Automax 5 Poissons ratio 0.144 552.14 g kg/m³ Bulk density 1900 (Determined using Eave) Dry density kg/m³ 1840 Date 23/06/2008 Test remarks Specimen Top and bottom of specimen fails ISRM criteria for perpendicularity and/or flatness. Top of specimen is flat and perpendicular to 0.250mm. Bottom of specimen is flat and perpendicular to 0.463mm. remarks Approved by: Leeds Laboratory NORWES Kevin Walker Page 10 of 21 17/07/2008

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Issue Date

2.03

Revision No.

Project Name #2 Duynefontein Unconfined Hole ID **KB26 Compressive Strength** Project No. LT1064 Sample Depth With Youngs Modulus 28.94m Engineer SRK Consulting Sample Number **And Poissons Ratio** 001 Client SRK Consulting Sample Type I.S.R.M. Suggested methods 1981 Specimen Depth Description Grey veined SCHIST. 28.94m Specimen Number Graph of stress strain curves Failure sketch 16 14 12 10 Axial stress MPa 8 6 -400 -200 200 400 600 800 1000 1200 1400 Failure type: Axial Circumferential strain in micro strain Axial strain in micro strain Moisture content 2.0 Stress rate MPa/s 0.11 Tangent modulus E۲ 9.29 GPa Average modulus 6.91 GPa Length 139.28 Test duration 02:22 Eave mm min Diameter U.C.S. MPa 15.1 Secant modulus E_{sec} 9.55 GPa 51.86 mm Mass Controls 1300/Automax 5 Poissons ratio 0.146 704.67 Type of machine g (Determined using Eave) Bulk density kg/m^3 2400 Dry density kg/m^3 2350 Date 26/06/2008 Test remarks Specimen Top and bottom of specimen fails ISRM criteria for perpendicularity and/or flatness. Top of specimen is flat and perpendicular to 0.513mm. remarks Bottom of specimen is flat and perpendicular to 0.488mm. Sides of specimen are not smooth and straight to within ISRM tolerance, the largest irregularity measured as 0.50mm.

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Kevin Walker

Leeds Laboratory

2.03

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Unconfined Hole ID Project Name #2 Duynefontein **KB30 Compressive Strength** Sample Depth Project No. LT1064 With Youngs Modulus 19.70m Engineer **SRK Consulting** Sample Number **And Poissons Ratio** 001 Client Sample Type SRK Consulting I.S.R.M. Suggested methods 1981 Description Specimen Depth Light grey MUDSTONE. 19.70m Specimen Number Graph of stress strain curves Failure sketch 30 25 Axial stress MPa 20 -1500 -1000 -500 500 1000 1500 2000 Axial strain in micro strain Circumferential strain in micro strain Failure type: Axial Moisture content % 2.9 Stress rate MPa/s 0.05 Tangent modulus E_{t} 22.7 GPa Length Average modulus 19.2 GPa 138.72 Test duration min 10:18 Eave mm Diameter Secant modulus 27.3 GPa mm 50.82 U.C.S. MPa 29.6 Esec Mass Type of machine Controls 1300/Automax 5 Poissons ratio 0.297 698.88 kg/m³ (Determined using Eave) **Bulk density** 2480 Dry density kg/m³ 2410 Date 11/07/2008 Test remarks Specimen Top and bottom of specimen fails ISRM criteria for perpendicularity and/or flatness. Top of specimen is flat and perpendicular to 0.328mm. Bottom of specimen is flat and perpendicular to 0.217mm. remarks

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Unconfined Project Name #2 Duynefontein Hole ID **KB31 Compressive Strength** Project No. LT1064 Sample Depth With Youngs Modulus 29.54m Engineer SRK Consulting Sample Number **And Poissons Ratio** 001 Client SRK Consulting Sample Type I.S.R.M. Suggested methods 1981 Specimen Depth Description Grey fractured metamorphosed SANDSTONE. 29.54m Specimen Number Failure sketch Graph of stress strain curves 30 Axial stress MPa 15 10 5 1000 -4000 -3000 -2000 -1000 0 2000 3000 Circumferential strain in micro strain Failure type: Cleavage Axial strain in micro strain Moisture content 0.4 Stress rate MPa/s 80.0 Tangent modulus E, 16.4 GPa Average modulus 16.3 GPa Length Test duration min 06:22 Eave mm 139.01 Diameter U.C.S. MPa 31.7 Secant modulus E_{sec} 22.3 GPa 51.65 mm 0.334 Mass Type of machine Controls 1300/Automax 5 Poissons ratio 734.82 g (Determined using Eave) **Bulk density** kg/m³ 2520 Dry density kg/m³ 2510 Date 26/06/2008 Test remarks Specimen Top and bottom of specimen fails ISRM criteria for perpendicularity and/or flatness. Top of specimen is flat and perpendicular to 0.097mm. remarks Bottom of specimen is flat and perpendicular to 0.352mm. Approved by: Leeds Laboratory

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Project Name #2 Duynefontein Unconfined Hole ID **KB33 Compressive Strength** Project No. LT1064 Sample Depth With Youngs Modulus 14.74m Engineer **SRK Consulting** Sample Number **And Poissons Ratio** 001 Client SRK Consulting Sample Type I.S.R.M. Suggested methods 1981 Description Specimen Depth Grey metamorphosed LIMESTONE. 14.74m Specimen Number Graph of stress strain curves Failure sketch 120 100 80 Axial stress MPa 60 -1500 -1000 2500 -500 0 500 1000 1500 2000 3000 Circumferential strain in micro strain Failure type: Axial Axial strain in micro strain Moisture content 0.2 Stress rate Tangent modulus % MPa/s 0.11 36.0 GPa Length 140.09 Test duration min 14:31 Average modulus Eave 36.6 GPa mm GPa Diameter 39.0 Secant modulus mm 51.66 U.C.S. MPa 95.4 E_{sec} Mass 762.63 Type of machine Controls 1300/Automax 5 Poissons ratio 0.336 g Bulk density (Determined using Eave) kg/m³ 2600 kg/m^3 Dry density 2590 Date 26/06/2008 Test remarks Specimen Top and bottom of specimen fails ISRM criteria for perpendicularity and/or flatness. Top of specimen is flat and perpendicular to 0.823mm. Bottom of specimen is flat and perpendicular to 0.622mm. Sides of specimen are not smooth and straight to within ISRM tolerance, the remarks largest irregularity measured as 0.60mm. Approved by: Leeds Laboratory Kevin Walker Page 14 of 21 Print date 17/07/2008

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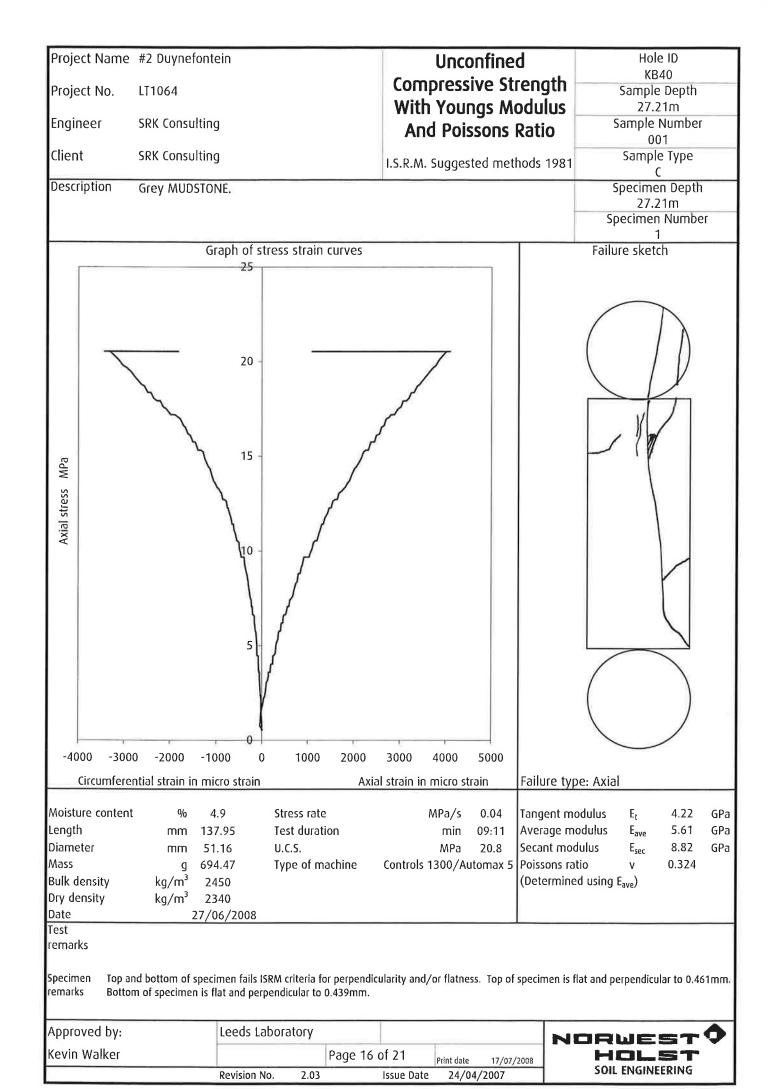
Project Name #2 Duynefontein **Unconfined** Hole ID **KB33 Compressive Strength** Project No. LT1064 Sample Depth With Youngs Modulus 25.91m Engineer SRK Consulting Sample Number **And Poissons Ratio** 002 Client SRK Consulting Sample Type I.S.R.M. Suggested methods 1981 Description Grey fractured metamorphosed SANDSTONE. Specimen Depth 25.91m Specimen Number Graph of stress strain curves Failure sketch 5 4 Axial stress MPa 3 2 -60 -40 -20 40 0 20 60 80 100 Circumferential strain in micro strain Axial strain in micro strain Failure type: Shear Moisture content % 0.4 Stress rate MPa/s 0.09 Tangent modulus 54.0 GPa Length 140.40 Test duration 01:10 Average modulus 51.7 GPa min mm Diameter mm 51.57 U.C.S. MPa 6.23 Secant modulus E_{sec} 204 GPa Mass 760.06 Type of machine Controls 1300/Automax 5 Poissons ratio 0.184 g kg/m³ (Determined using Eave) Bulk density 2590 Dry density kg/m^3 2580 Date 26/06/2008 Test remarks Specimen . Top and bottom of specimen fails ISRM criteria for perpendicularity and/or flatness. Top of specimen is flat and perpendicular to 0.707mm. Bottom of specimen is flat and perpendicular to 0.667mm. remarks Approved by: Leeds Laboratory NORWEST Kevin Walker Page 15 of 21 17/07/2008 Print date

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Unconfined Project Name #2 Duynefontein Hole ID KB41 **Compressive Strength** Project No. LT1064 Sample Depth With Youngs Modulus 19.90m Engineer SRK Consulting Sample Number **And Poissons Ratio** 001 Client SRK Consulting Sample Type I.S.R.M. Suggested methods 1981 Description Specimen Depth Grey SANDSTONE. 19.90m Specimen Number Graph of stress strain curves Failure sketch 50 40 Axial stress MPa 30 -1500 -1000 2500 -500 0 500 1000 1500 2000 3000 Failure type: Shear Circumferential strain in micro strain Axial strain in micro strain Moisture content % 1.2 Stress rate MPa/s 0.05 Tangent modulus 19.4 GPa Length mm 138.42 Test duration min 18:02 Average modulus Eave 19.5 GPa Diameter Secant modulus 24.3 GPa mm 51.20 U.C.S. MPa 53.1 Mass 705.70 Type of machine Controls 1300/Automax 5 Poissons ratio 0.202 g Bulk density kg/m³ (Determined using Eave) 2480 Dry density kg/m³ 2450 Date 20/06/2008 Test remarks Specimen Top and bottom of specimen fails ISRM criteria for perpendicularity and/or flatness. Top of specimen is flat and perpendicular to 0.134mm. remarks Bottom of specimen is flat and perpendicular to 0.303mm. Approved by: Leeds Laboratory

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Kevin Walker

Unconfined Project Name #2 Duynefontein Hole ID **KB41 Compressive Strength** Project No. LT1064 Sample Depth With Youngs Modulus 22.79m Sample Number Engineer SRK Consulting And Poissons Ratio 002 Client SRK Consulting Sample Type I.S.R.M. Suggested methods 1981 Description Grey metamorphosed SANDSTONE. Specimen Depth 22.79m Specimen Number Failure sketch Graph of stress strain curves 30 25 20 Axial stress 15 -200 -100 300 400 500 0 100 200 600 Circumferential strain in micro strain Failure type: Shear Axial strain in micro strain Moisture content Tangent modulus 0.6 Stress rate MPa/s 0.10 56.8 GPa Average modulus Length mm 135.88 Test duration min 04:34 53.0 GPa Diameter Secant modulus 59.7 GPa 51.25 U.C.S. 28.0 mm MPa Mass 0.176 735.83 Type of machine Controls 1300/Automax 5 Poissons ratio Bulk density kg/m³ (Determined using Eave) 2620 Dry density kg/m³ 2610 Date 26/06/2008 Test remarks Specimen Top and bottom of specimen fails ISRM criteria for perpendicularity and/or flatness. Top of specimen is flat and perpendicular to 0.300mm. remarks Bottom of specimen is flat and perpendicular to 0.571mm. Sides of specimen are not smooth and straight to within ISRM tolerance, the largest irregularity measured as 0.40mm. Approved by: Leeds Laboratory Kevin Walker Page 18 of 21

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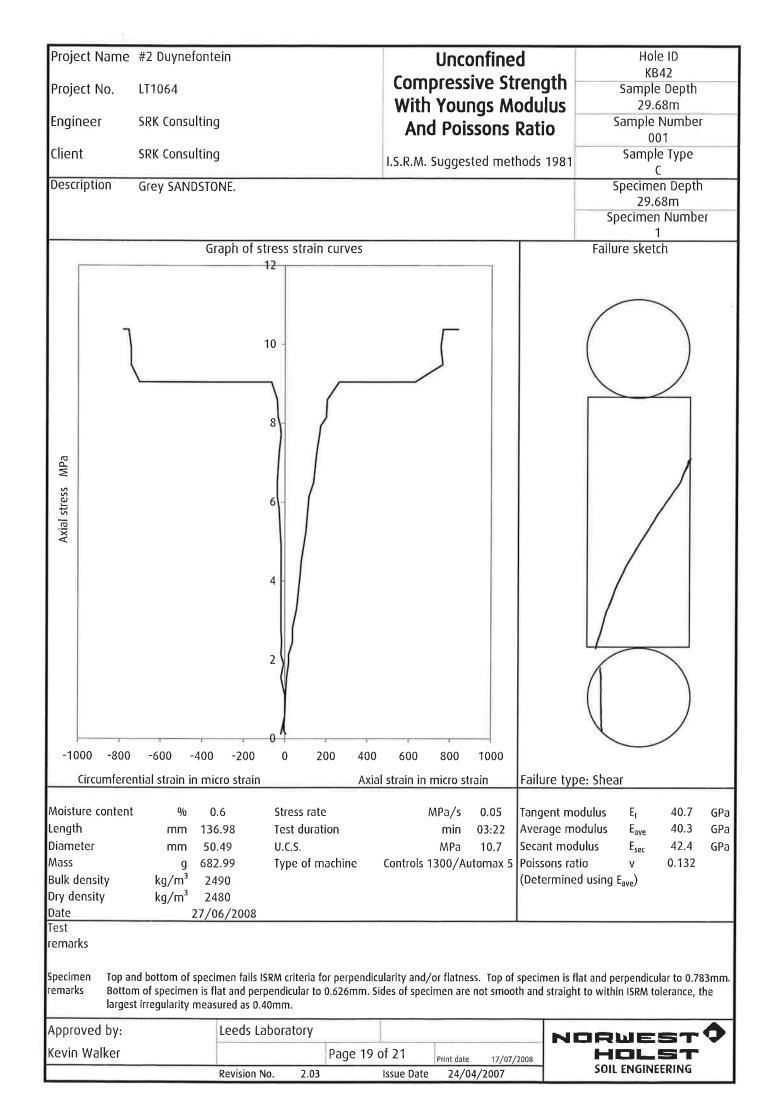
24/04/2007

Issue Date

Revision No.

2.03

17/07/2008



Project Name #2 Duynefontein **Unconfined** Hole ID **KB43 Compressive Strength** Project No. LT1064 Sample Depth With Youngs Modulus 30.71m Engineer SRK Consulting Sample Number **And Poissons Ratio** 001 Client SRK Consulting Sample Type I.S.R.M. Suggested methods 1981 Description Specimen Depth Light grey SANDSTONE. 30.71m Specimen Number Graph of stress strain curves Failure sketch 10 8 Axial stress MPa -6000 -4000 -2000 0 2000 4000 6000 8000 Circumferential strain in micro strain Failure type: Axial Axial strain in micro strain Moisture content % 3.9 Stress rate MPa/s 0.07 Tangent modulus 2.07 E, **GPa** Length 138,48 Test duration 02:52 Average modulus 1.68 GPa mm min Eave Diameter Secant modulus 2.94 U.C.S. GPa mm 51.20 MPa 11.2 E_{sec} Controls 1300/Automax 5 Mass 667.83 Type of machine Poissons ratio 0.661 **Bulk density** kg/m^3 (Determined using E_{ave}) 2340 Dry density kg/m³ 2250 Date 11/07/2008 Test remarks Specimen Top and bottom of specimen fails ISRM criteria for perpendicularity and/or flatness. Top of specimen is flat and perpendicular to 0.652mm. remarks Bottom of specimen is flat and perpendicular to 0.334mm. Approved by:

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Project Name #2 Duynefontein Unconfined Hole ID **KB45 Compressive Strength** Project No. LT1064 Sample Depth With Youngs Modulus 28.73m Engineer **SRK Consulting** Sample Number **And Poissons Ratio** 001 Client SRK Consulting Sample Type I.S.R.M. Suggested methods 1981 C Description Specimen Depth Grey SANDSTONE with infilled fractures. 28.73m Specimen Number Graph of stress strain curves Failure sketch 50 40 Axial stress MPa 30 20 -400 -200 200 400 600 800 Circumferential strain in micro strain Failure type: Axial Axial strain in micro strain Moisture content 8.0 Stress rate MPa/s 0.08 Tangent modulus E, 64.5 GPa Length Average modulus 67.7 GPa 138.68 Test duration min 11:04 mm Diameter 51.28 U.C.S. MPa 53.1 Secant modulus E_{sec} 85.5 GPa mm Mass 0.250 Type of machine Controls 1300/Automax 5 Poissons ratio 750.69 g (Determined using Eave) **Bulk density** kg/m³ 2620 Dry density kg/m³ 2600 Date 20/06/2008 Test remarks Specimen Top and bottom of specimen fails ISRM criteria for perpendicularity and/or flatness. Top of specimen is flat and perpendicular to 0.559mm. remarks Bottom of specimen is flat and perpendicular to 0.259mm. Sides of specimen are not smooth and straight to within ISRM tolerance, the largest irregularity measured as 0.40mm. Approved by: Leeds Laboratory

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Kevin Walker

Project Name #2 Duynefontein

Photographic Record

Froject No. LT 1064

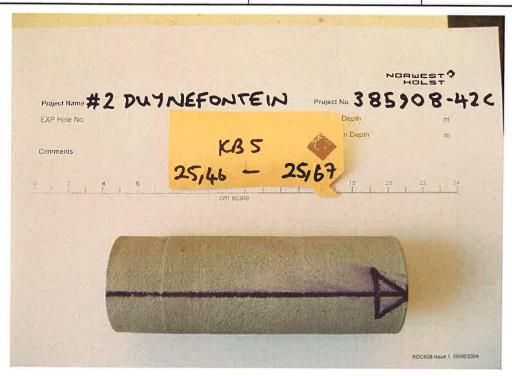
Engineer SRK Consulting

Client SRK Consulting

Hole ID

KB5

Fig no.



Before test



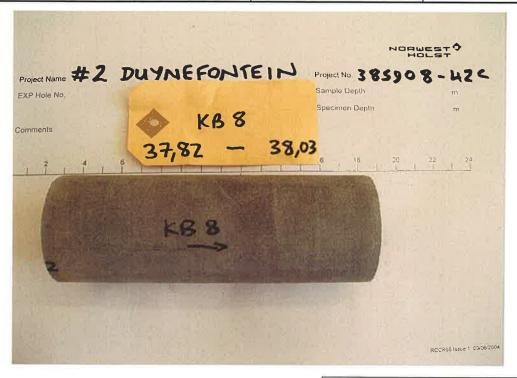
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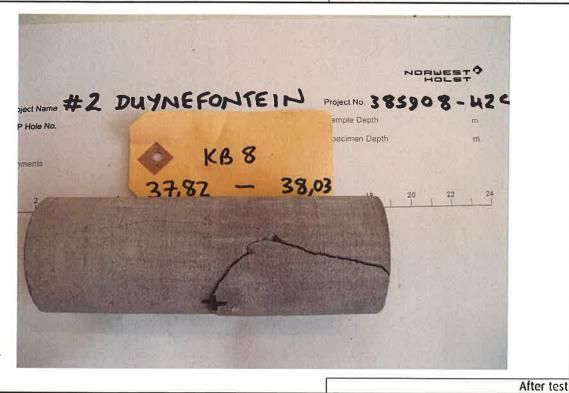
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Form No. SI PMPA4 Revision No. 2.02 Issue Date 26/02/2007 SOIL ENGINEERING

Project Name #2 Duynefontein		Photographic Record	Hole ID
Project No.	LT 1064		KB8
Engineer	SRK Consulting		Fig no.
Client	SRK Consulting		



Before test



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Form No.	SI PMPA4	Revision No.	2.02	Issue Date	26/02/2007	\neg



Project Name #2 Duynefontein

Photographic Record

Hole ID

KB9

Engineer SRK Consulting

Client SRK Consulting



Before test



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Date photographed

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KW

20/06/2008

Filename 2

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Revision No. 2.02

Issue Date 26/02/2007

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Project Name #2 Duynefontein

Photographic Record

Froject No. LT 1064

Engineer SRK Consulting

Client SRK Consulting

Hole ID

KB11

Fig no.





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KW	20/06/2008	Filename 2	HOLST
Form No. SI PMPA4	Revision No. 2.02	Issue Date 26/02/2007	SOIL ENGINEERING

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Project No.	LT 1064		KB18
Engineer	SRK Consulting		Fig no.
Client	SRK Consulting		





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Revision No. 2.02

Issue Date 26/02/2007

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Project Name #2 Duynefontein

Photographic Record

Froject No. LT 1064

Engineer SRK Consulting

Client SRK Consulting

Hole ID

KB19

Fig no.



Before test



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21/06/2008

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Revision No. 2.02

Issue Date 26/02/2007

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SOIL ENGINEERING

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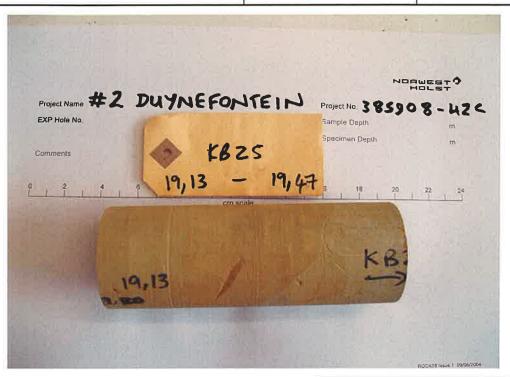
Engineer SRK Consulting

Client SRK Consulting

Hole ID

KB25

Fig no.



Before test



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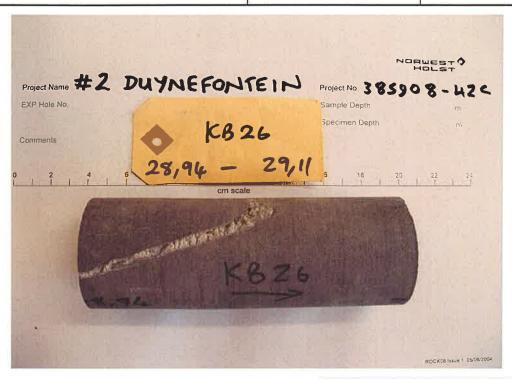
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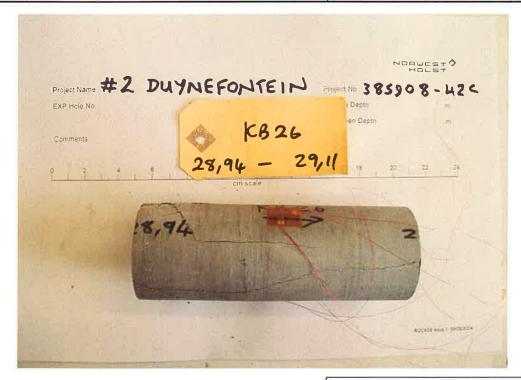
KB26

Engineer SRK Consulting

Client SRK Consulting



Before test



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26/06/2008

Filename 2

Form No. SI PMPA4

Revision No. 2.02

Issue Date 26/02/2007

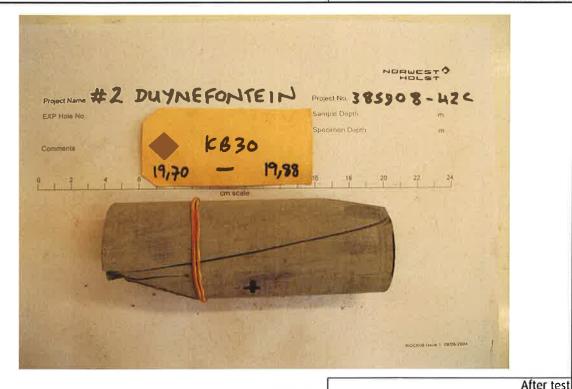
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SOIL ENGINEERING

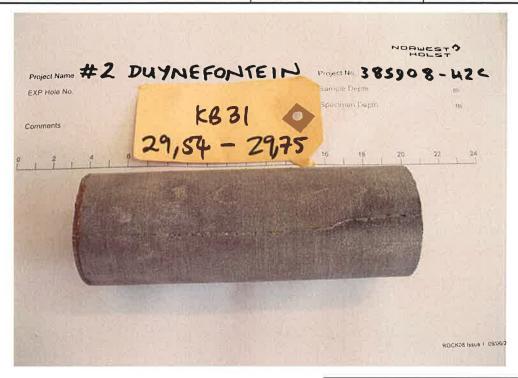
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Project No.	LT 1064		KB30
Engineer	SRK Consulting		Fig no.
Client	SRK Consulting		





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Form No.	SI PMPA4	Revision No. 2.02	Issue Date 26/02/2007	SOIL ENGINEERING

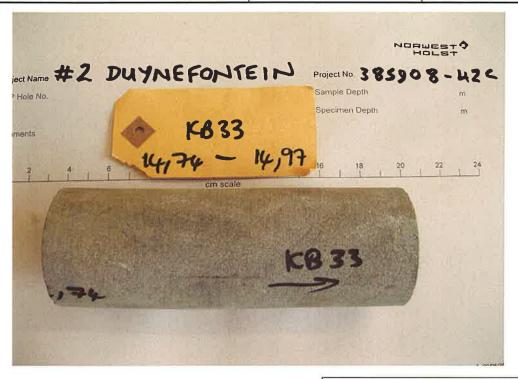
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Project No.	LT1064		KB31
Engineer	SRK Consulting		Fig no.
Client	SRK Consulting		





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Form No. SI PMPA4	Revision No. 2.02	Issue Date 26/02/2007	SOIL ENGINEERING

Project Name #2 Duynefontein		Photographic Record	Hole ID
Project No.	LT1064		KB33
Engineer	SRK Consulting		Fig no.
Client	SRK Consulting		





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Form No. SI PMPA4	Revision No. 2.02	Issue Date 26/02/2007	SOIL ENGINEERING

Project Name #2 Duynefontein		Photographic Record	Hole ID
Project No.	LT1064		KB33
Engineer	SRK Consulting		Fig no.
Client	SRK Consulting		





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Project Name #2 Duynefontein

Photographic Record

Froject No. LT1064

Engineer SRK Consulting

Client SRK Consulting

Hole ID

KB40

Fig no.





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PA	26/06/2008	Filename 2	HOLST
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Project Name #2 Duynefontein

Project No. LT1064

Engineer SRK Consulting

Client SRK Consulting

Hole ID

KB41

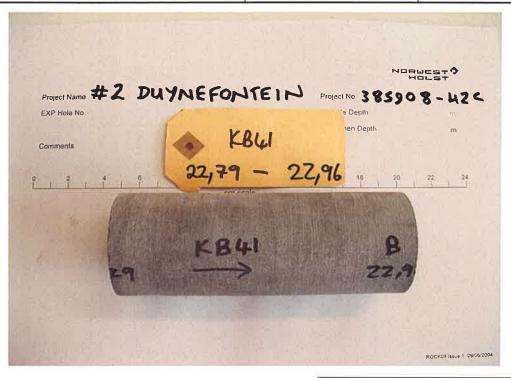
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Form No. SI PMPA4	Revision No. 2.02	Issue Date 26/02/2007	SOIL ENGINEERING

Project Name#2 Duynefontein		Photographic Record	Hole ID
Project No.	LT1064		KB41
Engineer	SRK Consulting		Fig no.
Client	SRK Consulting		





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26/06/2008

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Revision No. 2.02

Issue Date 26/02/2007

After test

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Revision No. 2.02

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Project Name #2 Duynefontein

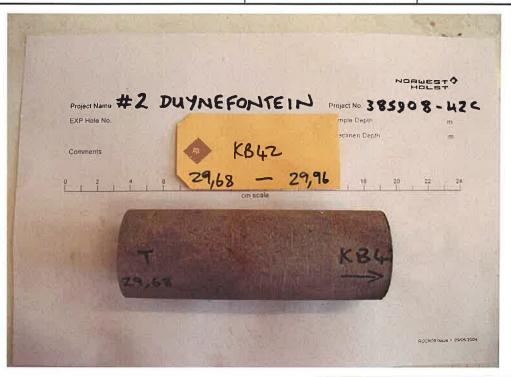
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Hole ID

KB42

Engineer SRK Consulting

Client SRK Consulting





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PA	27/06/2008	Filename 2	HOLST
Form No. SI PMPA4	Revision No. 2.02	Issue Date 26/02/2007	SOIL ENGINEERING

Project Name #2 Duynefontein

Photographic Record

Froject No. LT1064

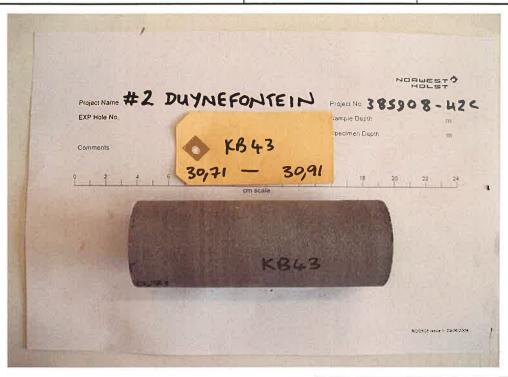
Engineer SRK Consulting

Client SRK Consulting

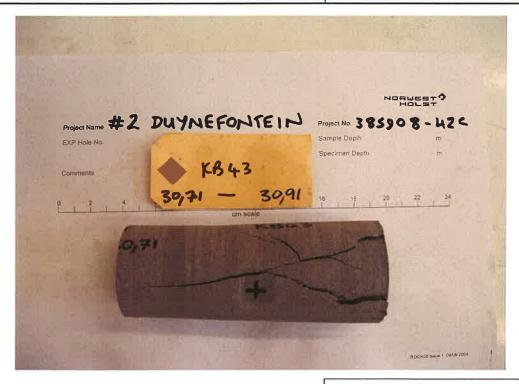
Hole ID

KB43

Fig no.



Before test



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Date photographed

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PA

02/08/2008

Filename 2

Form No. SI PMPA4

Revision No. 2.02

Issue Date 26/02/2007

After test

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Project Name #2 Duynefontein

Photographic Record

Froject No. LT1064

Engineer SRK Consulting

Client SRK Consulting

Hole ID

KB45

Fig no.





			After test	
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KW	20/06/2008	Filename 2	HOLST	
Form No. SI PMPA4	Revision No. 2.02	Issue Date 26/02/2007	SOIL ENGINEERING	



TEST REPORT



Serial number: LT1067

Parkside Lane,

Date of issue: 12/09/2008

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Issued by

Norwest Holst Limited - Soil Engineering Division,

Authorised signatory

2

Dewsbury Road, Leeds

LS11 55X.

Tel: 0113 2711111 Fax: 0113 2760472

Email: soils@norwest.co.uk

M. J. Baldwin

(Technical Manager)

R. J. Rogers

(Principal Engineer)

S. Kirk

(Laboratory Manager)

S. K. Sharda

(Assistant Laboratory Manager)

Customer name

SRK Consulting Ltd

Address

Postnet Suite #206 Private Bag X18 Rondebosch 7701 South Africa

Contract name

#3 Duynefontein

Your reference

385908 - 42C

Dates of receipt of samples

13/06/2008

Dates of testing

01/09/2008

12/09/2008

Testing was performed to the standard named on individual test results.

Sampling was not performed by the Laboratory of Norwest Holst Soil Engineering.

Testing was performed on 12 number of samples received in good condition.

Opinions and interpretations expressed herein are outside the scope of our UKAS accreditation.

Results reported relate only to the samples tested.

Tests marked 'Not UKAS' in this report are not included in the UKAS accreditation schedule for our laboratory. These results will appear in italics on any summary of tests.

Samples will be retained for 28 days from date of issue of this report and then be disposed of, unless we receive written instruction to the contrary

Quality Control Check performed by

Challer

K. A. Walker (Laboratory Quality Manager)

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		Key to Laboratory Summ	ary Sh	neets	
Common to all summarie	25				
Sample Type	U	Undisturbed sample	D	Small distu	rbed sample
	Ρ	Piston sample	В	Bulk distur	bed sample
	TW	Thin walled sample	BLK	Block samp	ole
	L	Liner sample	С	Rock core	
	AMA	Amalgamated sample			
est status	Any r	esult in italics indicates a test that is not within the	ne scope	of the UKAS	accreditation for this laboratory.
Summary of Laboratory S	oil Test	s: Index / Classification Tests			
Particle density	р	Small pyknometer method	g	Gas jar met	thod
Plastic index	N/P	Non plastic, although liquid limit will have been	determi	ned if request	ted
Particle size (PSD)	1	Following value in silt column denotes combined	d clay an	d silt fraction	
	Р	Following value in clay column denotes sedimer	itation by	y pipette, else	e sedimentation is by hydrometer.
Summary of Laboratory S	ioil Test	s: Strength and Permeability Tests			
riaxial	UU	Single stage unconsolidated quick undrained	UUM	Multi stage	unconsolidated quick undrained
	UU3	Set of 3 unconsolidated quick undrained	CU	Single stage	e consolidated undrained
	CUM	Multi stage consolidated undrained	CU3	Set of 3 cor	nsolidated undrained
	CD	Single stage consolidated drained	CDM	Multi stage	consolidated drained
	CD3	Set of 3 consolidated drained			
	Note	that single stage tests are reported assuming ϕ =	0 for tota	al stress and o	c' = 0 for effective stress
onsol	0ed	One-dimensional oedometer	Hyd	Hydraulic ce	ell consolidation
	m_{ν}	coefficient of compressibility quoted for p0 to p0	+ 100kP	a, where det	ermined
ermeability	C	Constant head permeability	Ī	Triaxial perr	meability
hearbox	SSB	Small shear box	LSB	Large shear	box
	р	Peak value	Г	Residual va	lue
	RS	Ring shear			
ummary of Laboratory S	oil Re-U	se Test			
ACV	S	MCV value at natural or specified moisture content	int	Intercept of	calibration line in MCV calibration
ummary of Laboratory R	ock Stre	ength Tests			
oint Load Type	D	Diametral	Α	Axial	
(Combination of)	1	Irregular lump	В	Block	
	L	Test performed parallel to planes of weakness			
	P	Test performed perpendicular to planes of weak	iess		
	Х	Invalid failure of point load (not broken between	points o	of load applica	ition)
ummary of Laboratory R	ock Mat	erials Tests			
en% fines	w	Soaked test	d	Dry test	
oint Load Index Result					
oint Load Type	D	Diametral	Α	Axial	
(Combination of)	1	Irregular lump	В	Block	
	L	Parallel to planes of weakness	Р	Perpendicula	ar to planes of weakness
	X	Invalid failure of point load (not broken between	points o	of load applica	tion)
Dimensions	W	Diameter of core or average smallest width perp			-
	D	Distance between platens when just in contact w			
	D'	Distance between platens at point of failure	·		
	De	Equivalent core diameter	ls	P/De ²	
	Is(50)	•	F	(De/50) ^{0.45}	
		point load strength index corrected for a diametra	al test of	, , ,	er 50mm
		ial/Lump tests De ² = (4/Pi) x (W x D')		metral tests D	
nportant note: summary xception, be regarded as	sheets	are provided for convenience and in no way repla			
		Page 2 of 15	ort num	iber LT1067	NORWEST

Project Name Project No.	#3 Duynef LT1067	onteir	1			4.1		_	f Lat		_						
		14: 1							5								
Engineer	SRK Consu																
Client	SRK Consu	lting L	td ——														
Hole ID	Sample depth m	Sample no.	Sample type	Specimen depth m	Specimen no.	* Water Content	Bulk Density	Dry Density	Particle density	Туре	l _s	I _s 50	SON (BA	Brazil	& Porosity	음 Elastic Modulus	Posissons Ratio
KB06	21.290	001	C	21.290	01	0.1		2640		-	MINTIN	IVIIV/ III	180	WIN/ III:	70	93.4	0.44
KB06	39.270	002	С	39.270	01	0.2		2690					195			Ave 68.6	0.26
KB10	24.760	001	С	24.760	01	0.5		2540					25.3			Ave 28.4	0.23
KB14	20.240	001	С	20.240	01	0.2		2610					63.4			Ave 55	0.25
KB17	17.030	001	C	17.030	01	0.7		2460					14.8			Ave 21	0.17
KB21	24.730	001	С	24.730	01	0.7		2540					50.9			Ave 29.4	0.55
KB21	42.250	002	С	42.250	01	0.5		2650					69.5			<i>Ave</i> 37.9	0.25
KB21	51.900	003	C	51.900	01	0.1		2710					87.2			83.7	0.23
KB29	29.770	001	С	29.770	01	1.1	2320	2300					16.9			Ave 11 Ave	0.37.
KB30	24.930	001	С	24.930	01	2.9	2370	2300					8.22			35 Ave	0.29
KB34	21.570	001	С	21.570	01	9.8	2120	1930					1.21			6.1	0.57
KB37	27.880	001	С	27.880	01	0.4	2620	2610					67.8			56.8 Ave	0.23
								End									
Approved by:			Leeds	Laboratory								7			 :s		>
Kevin Walker		Revisio	ın No.	2.01	Page	3 of 1	5 Je Date	F	rint date		09/2008			IL ENGI	_5	T	

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Hole ID Project Name #3 Duynefontein Unconfined KB06 **Compressive Strength** Sample Depth Project No. LT1067 With Youngs Modulus 21.29m Sample Number Engineer SRK Consulting Ltd **And Poissons Ratio** 001 Sample Type Client SRK Consulting Ltd I.S.R.M. Suggested methods 1981 Specimen Depth Description Grey metamorphic SANDSTONE. 21.29m Specimen Number Failure sketch Graph of stress strain curves 200 160 140 120 Axial stress MPa 100 Unable to sketch 80 60 10 -1000 -500 500 1000 1500 2000 Failure type: Explosive Circumferential strain in micro strain Axial strain in micro strain Moisture content MPa/s Tangent modulus E_{t} 96.7 GPa 0/0 0.1 Stress rate 0.36 93.4 GPa Average modulus Length 08:24 Eave mm 139.85 Test duration min $\mathsf{E}_{\mathsf{sec}}$ Diameter 180 Secant modulus 91.2 GPa U.C.S. MPa 51.58 mm Mass Poissons ratio 0.447 772.49 Type of machine Controls 1300/Automax 5 (Determined using Eave) Bulk density kg/m³ 2640 Dry density kg/m^3 2640 Date 01/09/2008 Test remarks Top and bottom of specimen fails ISRM criteria for perpendicularity and/or flatness. Top of specimen is flat and perpendicular to 0.237mm. 5pecimen remarks Bottom of specimen is flat and perpendicular to 0.124mm. Approved by: Leeds Laboratory NORWE HOLST Stuart Kirk Page 4 of 15 12/09/2008 Print date SOIL ENGINEERING 24/04/2007 Issue Date Revision No. 2.03

Project Name #3 Duynefontein Unconfined Hole ID **KB06 Compressive Strength** Project No. LT1067 Sample Depth With Youngs Modulus 39.27m Sample Number Engineer SRK Consulting Ltd **And Poissons Ratio** 002 Client SRK Consulting Ltd Sample Type I.S.R.M. Suggested methods 1981 Description Grey metamorphic SANDSTONE. Specimen Depth 39.27m Specimen Number Graph of stress strain curves Failure sketch 250 200 150 Axial stress MPa 100 -1000 -500 500 1000 1500 2000 2500 3000 Circumferential strain in micro strain Axial strain in micro strain Failure type: Axial Moisture content 0/0 0.2 Stress rate MPa/s 0.41 Tangent modulus 67.8 E_t GPa Average modulus Length mm 140.94 Test duration 08:00 68.6 GPa min Eave Diameter Secant modulus E_{sec} 75.6 mm 51.61 U.C.S. MPa 195 GPa Mass Type of machine 795.65 Controls 1300/Automax 5 Poissons ratio 0.263 **Bulk density** kg/m³ 2700 (Determined using Eave) Dry density kg/m^3 2690 Date 02/09/2008 Test remarks Specimen Top and bottom of specimen fails ISRM criteria for perpendicularity and/or flatness. Top of specimen is flat and perpendicular to 0.406mm. remarks Bottom of specimen is flat and perpendicular to 0.322mm. Sides of specimen are not smooth and straight to within ISRM tolerance, the largest irregularity measured as 0.60mm. Approved by: Leeds Laboratory Stuart Kirk Page 5 of 15 HOLST 12/09/2008 Print date SOIL ENGINEERING

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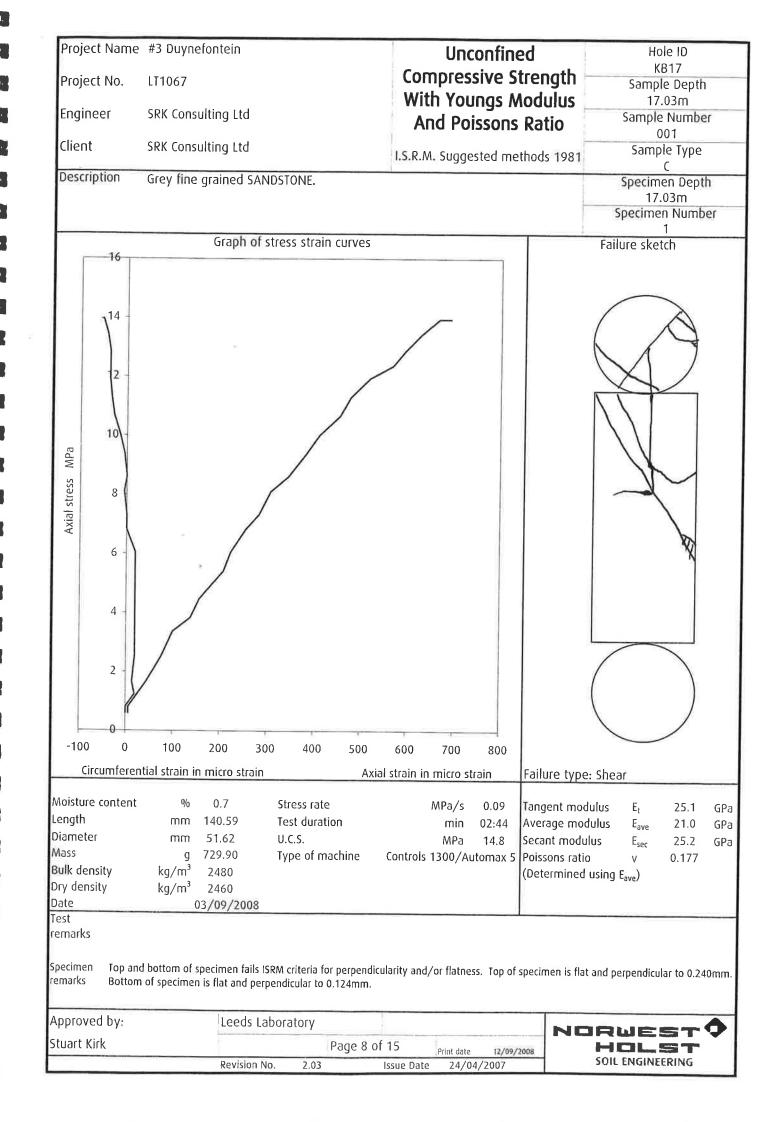
Revision No.

Issue Date

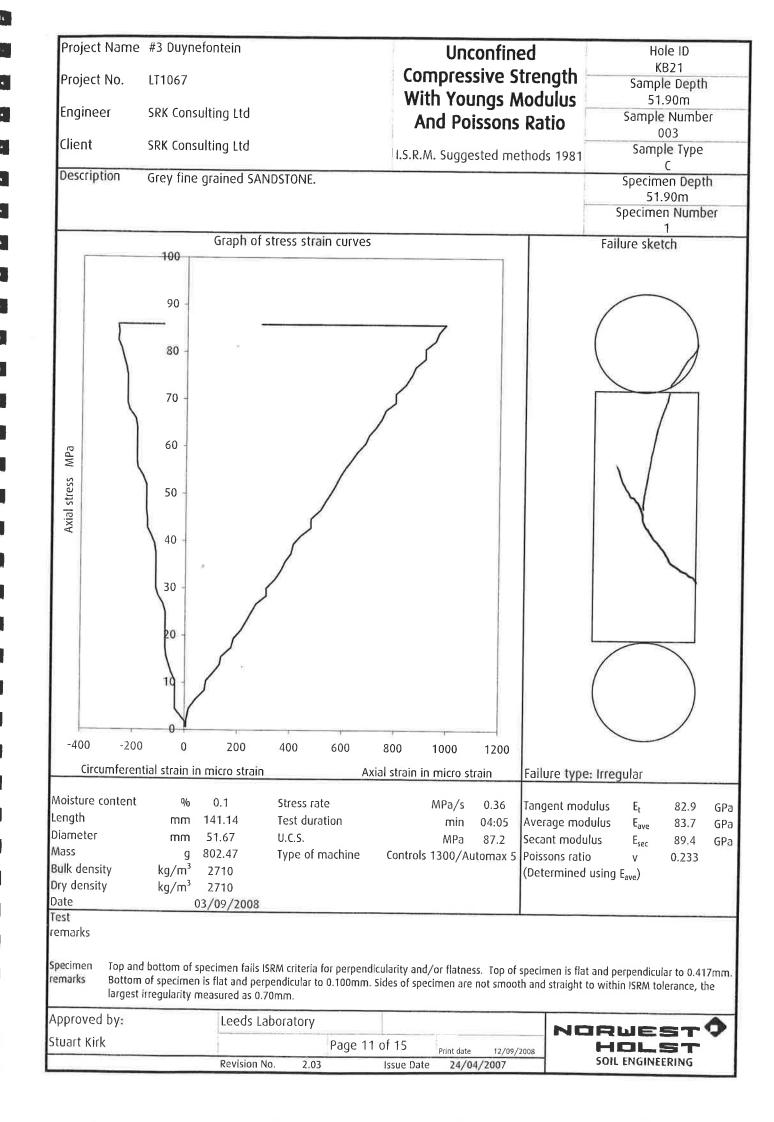
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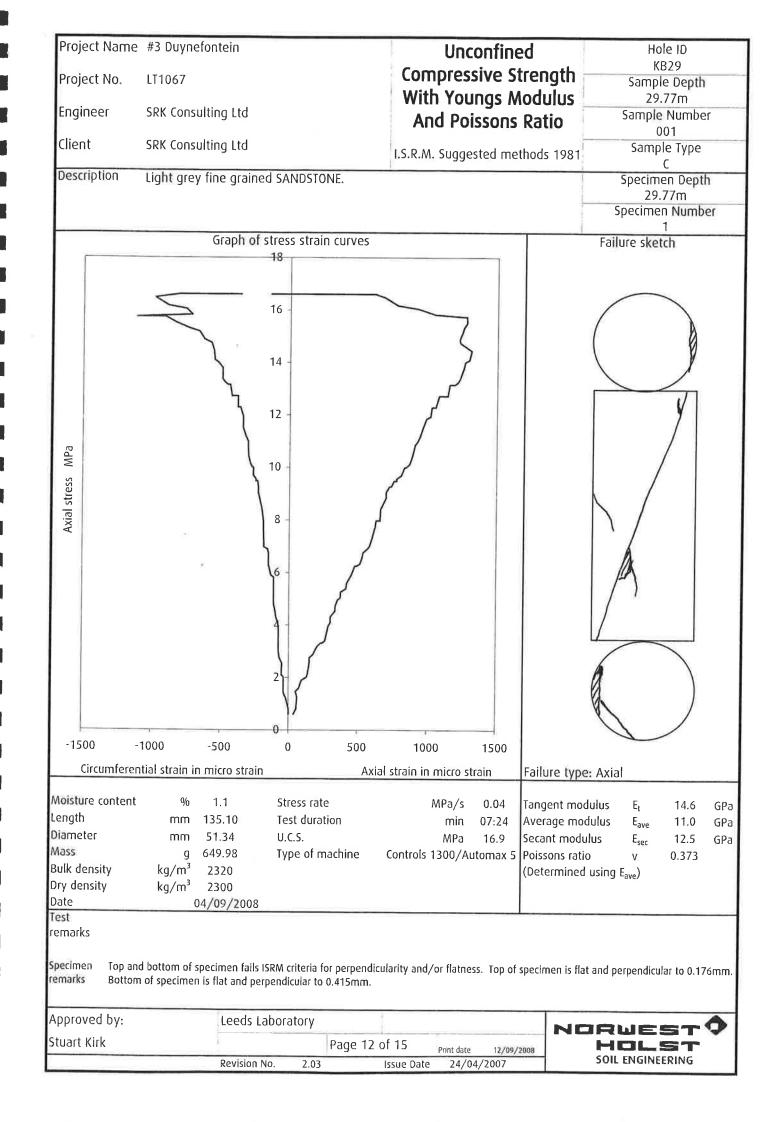
Project Name #3 Duynefontein Unconfined Hole ID KB10 **Compressive Strength** Project No. LT1067 Sample Depth With Youngs Modulus 24.76m Engineer SRK Consulting Ltd Sample Number And Poissons Ratio 001 Client SRK Consulting Ltd Sample Type I.S.R.M. Suggested methods 1981 Description Grey SANDSTONE. Specimen Depth 24.76m Specimen Number Graph of stress strain curves Failure sketch 30 25 20 Axial stress MPa 15 0 -400 -200 200 400 600 800 1000 1200 Circumferential strain in micro strain Failure type: Axial Axial strain in micro strain Moisture content % 0.5 Stress rate MPa/s 0.24 Tangent modulus 27.7 GPa Length $\mathsf{E}_{\mathsf{ave}}$ 135.09 Test duration 01:46 Average modulus 28.4 GPa mm min Diameter 51.51 U.C.S. MPa Secant modulus 33.4 mm 25.3 E_{sec} GPa Mass 717.54 Type of machine Controls 1300/Automax 5 Poissons ratio 0.235 Bulk density kg/m³ 2550 (Determined using Eave) Dry density kg/m³ 2540 Date 04/09/2008 Test remarks Specimen Top and bottom of specimen fails ISRM criteria for perpendicularity and/or flatness. Top of specimen is flat and perpendicular to 0.154mm. remarks Bottom of specimen is flat and perpendicular to 0.204mm. Approved by: Leeds Laboratory Stuart Kirk Page 6 of 15 12/09/2008 Print date **SOIL ENGINEERING** 24/04/2007 Revision No. 2.03 Issue Date

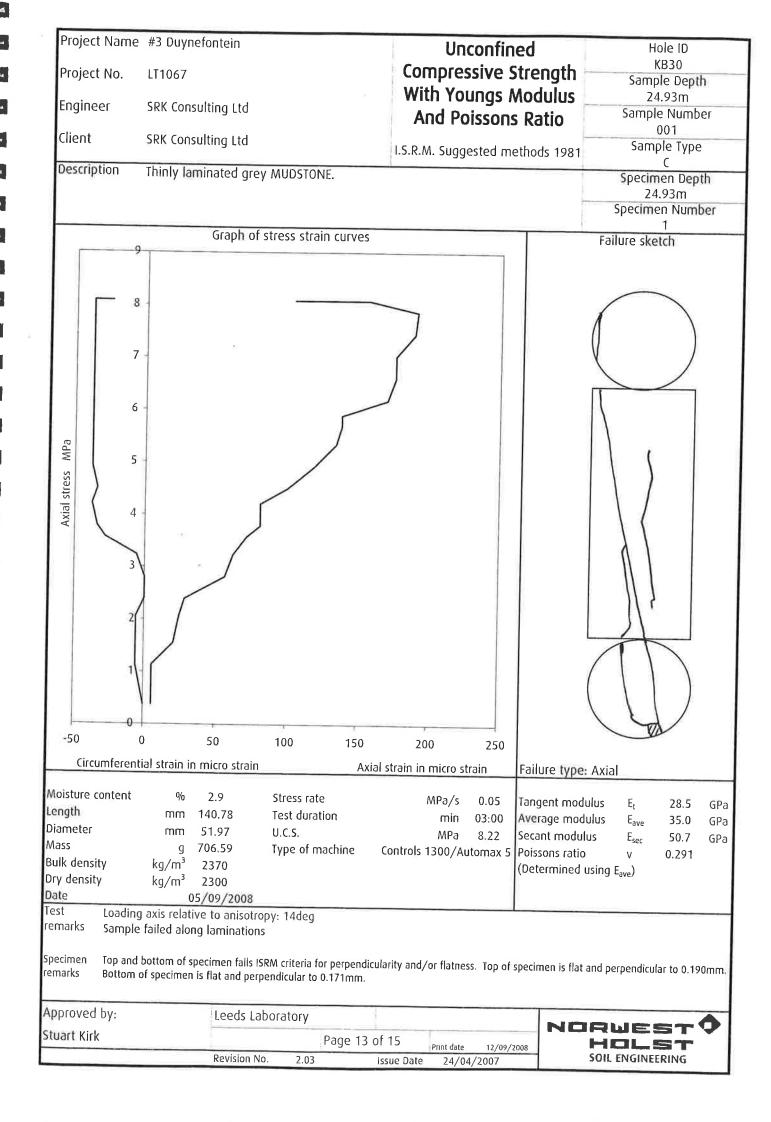
Unconfined Project Name #3 Duynefontein Hole ID **KB14 Compressive Strength** Sample Depth Project No. LT1067 With Youngs Modulus 20.24m Sample Number Engineer SRK Consulting Ltd **And Poissons Ratio** 001 Client SRK Consulting Ltd Sample Type I.S.R.M. Suggested methods 1981 Description Grey metamorphic SANDSTONE. Specimen Depth 20,24m Specimen Number Graph of stress strain curves Failure sketch 60 50 MPa 40 Axial stress 30 -600 -400 -200 200 400 600 800 1000 1200 Circumferential strain in micro strain Failure type: Axial Axial strain in micro strain Moisture content 0.2 Stress rate MPa/s 0.27 Tangent modulus E_{t} 61.2 GPa Length Average modulus 55.0 Test duration GPa 114.86 03:58 mm min Diameter Secant modulus 60.6 GPa mm 52.00 U.C.S. MPa 63.4 Esec Mass 638.31 Type of machine Controls 1300/Automax 5 Poissons ratio 0.252 g (Determined using Eave) Bulk density kg/m³ 2620 Dry density kg/m³ 2610 Date 04/09/2008 Test remarks Tested on specimen with length to diameter ratio outside 2.5-3.0 recommendation. Specimen Top and bottom of specimen fails ISRM criteria for perpendicularity and/or flatness. Top of specimen is flat and perpendicular to 0.459mm. remarks Bottom of specimen is flat and perpendicular to 0.247mm. Approved by: Leeds Laboratory Stuart Kirk HOL _57 Page 7 of 15 12/09/2008 Print date **SOIL ENGINEERING** Issue Date 24/04/2007 Revision No. 2.03

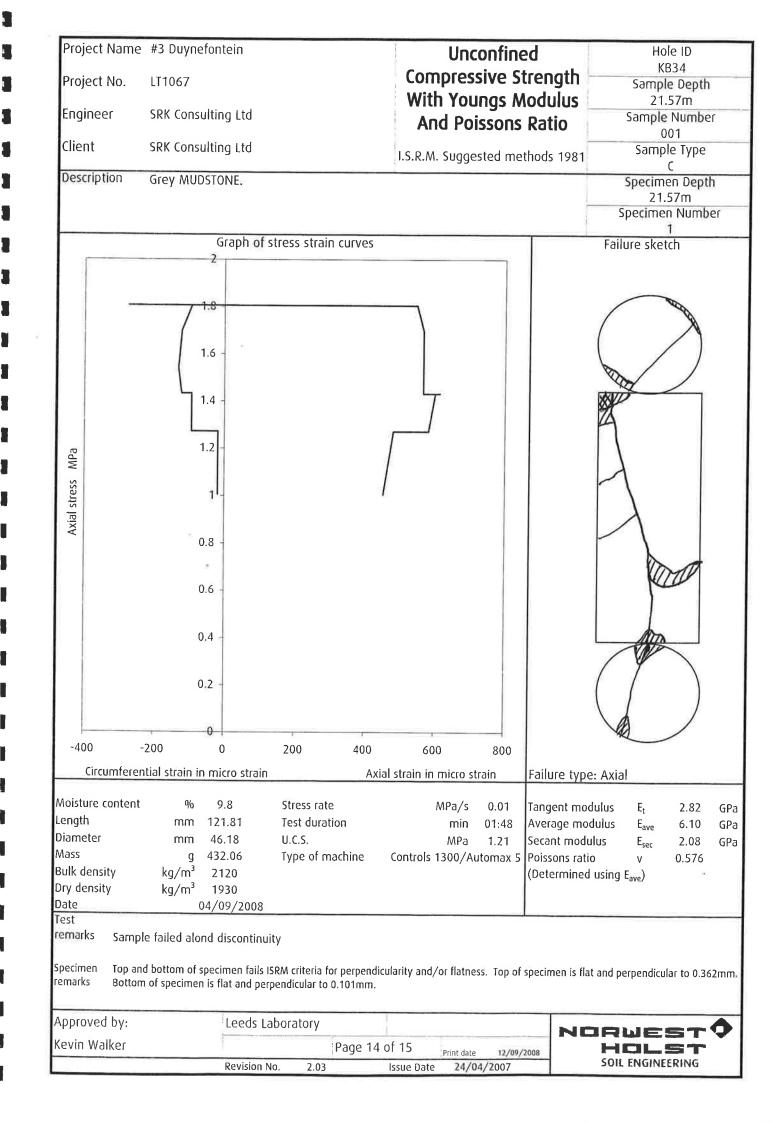


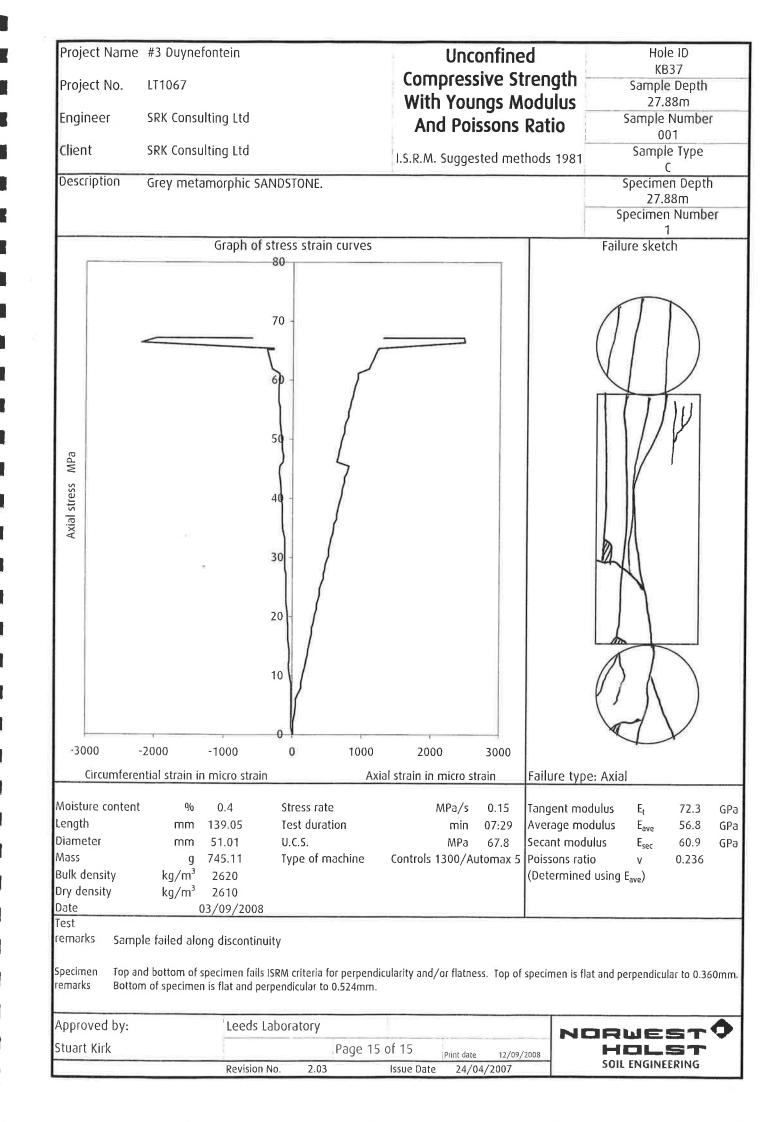
Project Name #3 Duynefontein Hole ID Unconfined **KB21 Compressive Strength** Project No. Sample Depth LT1067 With Youngs Modulus 24.73m Sample Number Engineer SRK Consulting Ltd **And Poissons Ratio** 001 Client SRK Consulting Ltd Sample Type I.S.R.M. Suggested methods 1981 C Description Specimen Depth Grey metamorphic SANDSTONE. 24.73m Specimen Number Failure sketch Graph of stress strain curves 50 40 Axial stress 30 20 10 -1000 -500 500 1000 1500 2000 2500 Circumferential strain in micro strain Axial strain in micro strain Failure type: Axial Moisture content 0.7 Stress rate MPa/s 0.19 Tangent modulus E_{t} 33.3 GPa Length Average modulus 29.4 Test duration 04:33 GPa 141.87 min Eave mm $\mathsf{E}_{\mathsf{sec}}$ Diameter MPa 50.9 Secant modulus 32.4 GPa mm 52.10 U.C.S. Mass 774.59 Type of machine Controls 1300/Automax 5 Poissons ratio 0.553 kg/m³ (Determined using Eave) Bulk density 2560 Dry density kg/m^3 2540 Date 02/09/2008 Test remarks Sample failed along discontinuity Specimen Top and bottom of specimen fails ISRM criteria for perpendicularity and/or flatness. Top of specimen is flat and perpendicular to 0.323mm. remarks Bottom of specimen is flat and perpendicular to 0.188mm. Approved by: Leeds Laboratory Stuart Kirk Page 9 of 15 101 12/09/2008 Print date SOIL ENGINEERING 2.03 Issue Date 24/04/2007 Revision No.











Project Name #3 Duynefontein

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Client SRK Consulting

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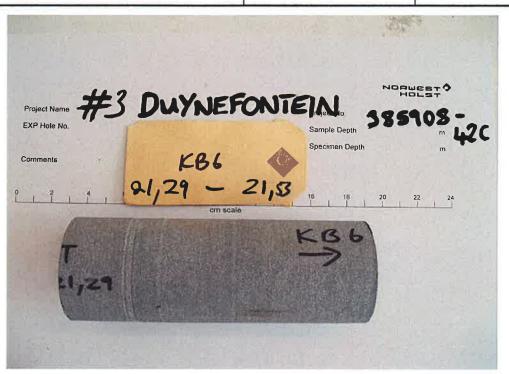
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Project Name #3 Duynefontein

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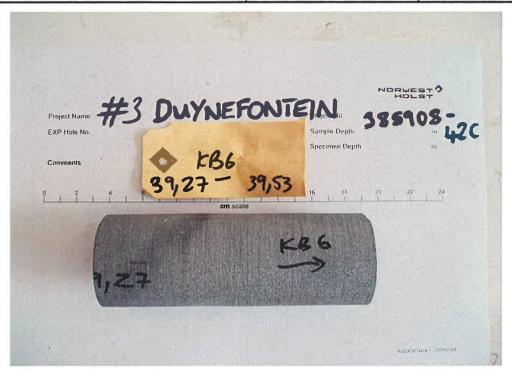
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Project No. LT1067
Engineer SRK Consulting
Client SRK Consulting
Hole ID
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Project Name #3 Duynefontein

Photographic Record

Hole ID

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Engineer SRK Consulting

Client SRK Consulting

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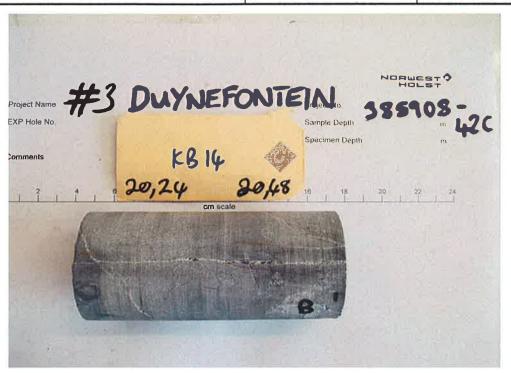
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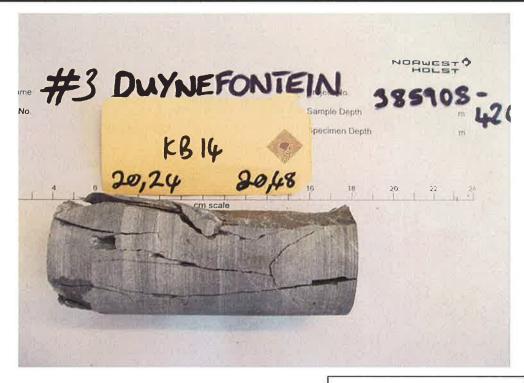
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Project Name #3 Duynefontein

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Engineer SRK Consulting

Client SRK Consulting



Before test



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Project Name #3 Duynefontein

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Hole ID

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Engineer SRK Consulting

Client SRK Consulting





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Project Name #3 Duynefontein
Project No. LT1067
Engineer SRK Consulting
Client SRK Consulting
Hole ID
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Project Name #3 Duynefontein

Photographic Record

Project No. LT1067

Engineer SRK Consulting

Client SRK Consulting

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Project Name #3 Duynefontein

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Project No. LT1067

Engineer SRK Consulting

Client SRK Consulting

Hole ID

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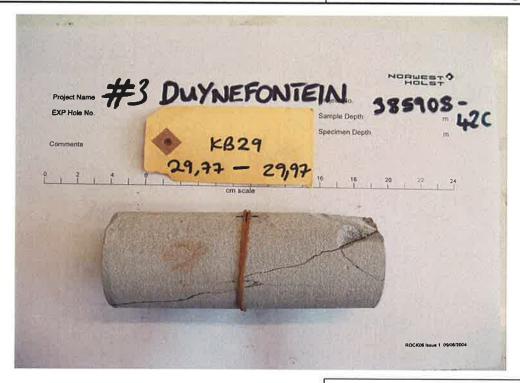
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Project Nam	e#3 Duynefontein	Photographic Record	Hole ID
Project No.	LT1067		KB30
Engineer	SRK Consulting		Fig no.
Client	SRK Consulting		



Before test



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Project No.	LT1067		KB34
Engineer	SRK Consulting	,	Fig no.
Client	SRK Consulting		

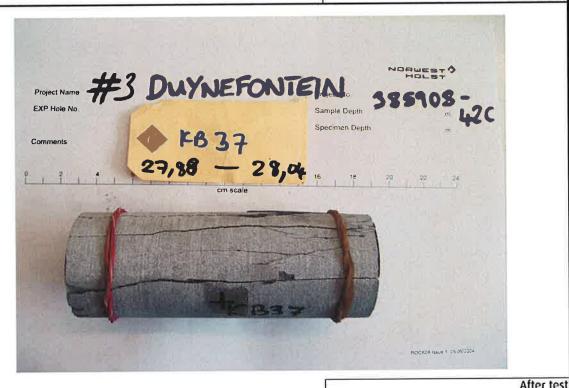




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Project No.	LT1067		KB37
Engineer	SRK Consulting		Fig no.
Client	SRK Consulting		





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Revision No. 2.02	Issue Date 26/02/2007	SOIL ENGINEERING
	03/09/2008	03/09/2008 Filename 2



TEST REPORT



Serial number: LT1072

Date of issue: 22/09/2008

Page 1 of 5

Issued by

Norwest Holst Limited - Soil Engineering Division,

Parkside Lane, Dewsbury Road,

Leeds

LS11 55X.

Tel: 0113 2711111 Fax: 0113 2760472

Email: soils@norwest.co.uk

Authorised signatory



M. J. Baldwin

R. J. Rogers

S. Kirk

S. K. Sharda

(Technical Manager)

(Principal Engineer) (Laboratory Manager)

(Assistant Laboratory Manager)

Customer name

Address

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1

SRK Consulting Postnet Suite #206

Private Bag X18 Rondebosch 7701 South Africa

Contract name

#7 Duynefontein

Your reference

385908 - 420

Dates of receipt of samples

11/08/2008

Dates of testing

18/09/2008 to

22/09/2008

Testing was performed to the standard named on individual test results.

Sampling was not performed by the Laboratory of Norwest Holst Soil Engineering.

Testing was performed on 2 number of samples received in good condition.

Opinions and interpretations expressed herein are outside the scope of our UKAS accreditation.

Results reported relate only to the samples tested.

Tests marked 'Not UKAS' in this report are not included in the UKAS accreditation schedule for our laboratory. These results will appear in italics on any summary of tests.

Samples will be retained for 28 days from date of issue of this report and then be disposed of, unless we receive written instruction to the contrary

Quality Control Check performed by



K. A. Walker (Laboratory Quality Manager)

This test report shall not be reproduced except in full without the written permission of Norwest Holst Soil Engineering.

		Key to Laboratory Summ	31,7 31	
Common to all summarie	25			
Sample Type	U	Undisturbed sample	D	Small disturbed sample
	Р	Piston sample	В	Bulk disturbed sample
	TW	Thin walled sample	BLK	Block sample
	L	Liner sample	c	Rock core
	AMA	L Amalgamated sample		
Test status		result in <i>italics</i> indicates a test that is not within t	he scope	of the UKAS accreditation for this laboratory.
Summary of Laboratory S		s: Index / Classification Tests		
Particle density	р	Small pyknometer method	g	Gas jar method
Plastic index	N/P	Non plastic, although liquid limit will have been	determi	ned if requested
Particle size (PSD)	1	Following value in silt column denotes combine	d clay an	d silt fraction
	Р	Following value in clay column denotes sedime	ntation b	y pipette, else sedimentation is by hydrometer.
Summary of Laboratory S	oil Test	s: Strength and Permeability Tests		
riaxial	UU	Single stage unconsolidated quick undrained	UUM	Multi stage unconsolidated quick undrained
	UU3	Set of 3 unconsolidated quick undrained	CU	Single stage consolidated undrained
	CUM		CU3	Set of 3 consolidated undrained
	CD	Single stage consolidated drained	CDM	Multi stage consolidated drained
	CD3	Set of 3 consolidated drained		.
	Note	that single stage tests are reported assuming ϕ =	O for tota	al stress and c' = 0 for effective stress
Consol	0ed	One-dimensional oedometer	Hyd	Hydraulic cell consolidation
	m _v	coefficient of compressibility quoted for p0 to p		
Permeability	C	Constant head permeability	T	Triaxial permeability
Shearbox	SSB	Small shear box	LSB	Large shear box
nedi box	P	Peak value	ſ	Residual value
	RS	Ring shear	'	Residual Value
Summary of Laboratory S				
MCV	s	MCV value at natural or specified moisture content	int	Intercept of calibration line in MCV calibration
Summary of Laboratory R	ock Stre	ength Tests		
Point Load Type	D	Diametral	Α	Axial
(Combination of)	Ī	trregular lump	В	Block
	L	Test performed parallel to planes of weakness		
	Р	Test performed perpendicular to planes of weak	ness	
	X	Invalid failure of point load (not broken betwee		of load application)
Summary of Laboratory R			F-S-W-S-S-	and approximation of the second of the secon
en% fines	w	Soaked test	d	Dry test
Point Load Index Result				
Point Load Type	D	Diametral	Α	Axial
(Combination of)	ī	Irregular lump	В	Block
, ,	Ĺ	Parallel to planes of weakness	Р	Perpendicular to planes of weakness
	X	Invalid failure of point load (not broken between	n points o	
Dimensions	w	Diameter of core or average smallest width per		
	D	Distance between platens when just in contact v		
	D'	Distance between platens at point of failure	vitii spec	inch
	De		le.	n /n-²
		Equivalent core diameter) F x Is	ls F	P/De ²
				(De/50) ^{0.45}
		point load strength index corrected for a diametr		
		xial/Lump tests $De^2 = (4/Pi) \times (W \times D')$		metral tests De ² = D x D'
mportant note: summary exception, be regarded a		are provided for convenience and in no way replefinitive result.	ace indiv	idual test result sheets which shall, without
		Page 2 of 5	ort nun	nber LT1072
		rage 2 or 3		NORWEST

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Form No.

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Revision No.

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Issue Date 24/01/2006

Project Name	#7 Duynef	onteir	1			Sur	mma	ırv 0	f Lal	ога	torv						
Project No.	LT1072						≀ock										
Engineer	SRK Consu	lting													_		
Client	SRK Consu	lting 		a 14													
Hole ID	Sample depth m	Sample no.	Sample type	Specimen depth m	Specimen no.	% Water Content	Bulk Density	علا Dry Density	Particle density	90	l _s	I _s 50	SDU ZE	w√w√g Brazil	& Porosity	ම Elastic Modulus	Posissons Ratio
KB07	47.030	001	С	47.030	01	0.3	1	2670			,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,	14.4711	51.6	1	70	80.3 Ave	0.32
KB07	52.280	002	С	52.280	01	0.3	2690	2680					50.8			94.1	0.28
								End								Ave	_
Approved by:	L		Leeds	Laboratory								Z	QF	5ME		T (>
Kevin Walker		Revisio	on No.	2.01	Page	3 of 5	je Date		Print date 18/08		/09/2008			IL ENG	_ =	T	

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Project Name #7 Duynefontein Hole ID Unconfined **KB07 Compressive Strength** Sample Depth Project No. LT1072 With Youngs Modulus 47.03m Sample Number Engineer SRK Consulting **And Poissons Ratio** 001 Client SRK Consulting Sample Type I.S.R.M. Suggested methods 1981 Description Specimen Depth Grey metamorphic SANDSTONE. 47.03m Specimen Number Failure sketch Graph of stress strain curves 50 40 Axial stress 30 20 -300 -200 -100 100 200 300 400 500 600 700 Circumferential strain in micro strain Failure type: Axial Axial strain in micro strain Moisture content 0.3 Stress rate MPa/s 0.14 Tangent modulus E_t 96.7 GPa Length 142.59 Test duration min 06:05 Average modulus 80.3 GPa mm Diameter Secant modulus 94.8 GPa mm 52.47 U.C.S. MPa 51.6 E_{sec} Mass Poissons ratio 0.321 826.33 Type of machine Controls 1300/Automax 5 Bulk density (Determined using Eave) kg/m³ 2680 2670 Dry density kg/m³ Date 18/09/2008 Test remarks Top and bottom of specimen fails ISRM criteria for perpendicularity and/or flatness. Top of specimen is flat and perpendicular to 0.474mm. Specimen remarks Bottom of specimen is flat and perpendicular to 0.116mm. Leeds Laboratory Approved by: Report No.: LT1072

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Issue Date

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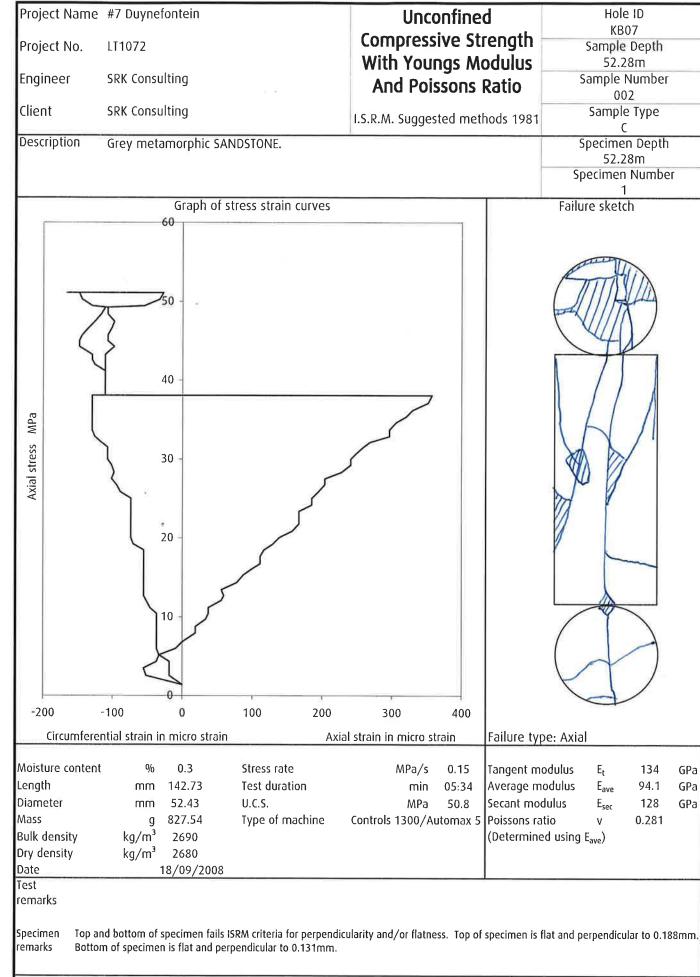
Revision No.

22/09/2008

24/04/2007

SOIL ENGINEERING

Kevin Walker



Approved by:

Kevin Walker

Leeds Laboratory

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Revision No.

Page 5 of 5

Issue Date

NORWEST OF HOLST SOIL ENGINEERING

Report No.: LT1072

24/04/2007

Print date

22/09/2008

Project Name #7 Duynefontein

Photographic Record

Hole ID

KB7

Engineer SRK Consulting

Client SRK Consulting





Photogra	phed by	Date photog	raphed	Filename	1	NO		
PA		18/09/2008	9/2008 Filename 2		Filename 2			
Form No.	SI PMPA4	Revision No.	2.02	Issue Date	26/02/2007	- 9		



Project Name #7 Duynefontein

Photographic Record

Project No. LT1072

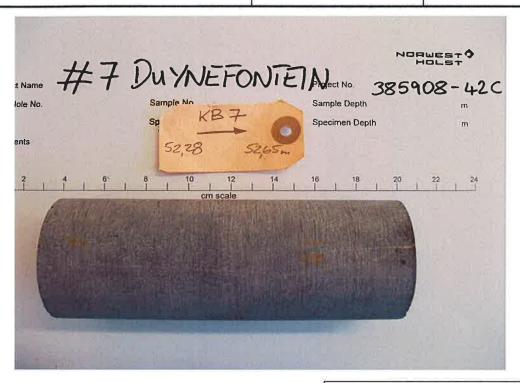
Engineer SRK Consulting

Client SRK Consulting

Hole ID

KB7

Fig no.



Before test



Photographed by Date photographed Filename 1

PA 18/09/2008 Filename 2

Form No. SI PMPA4 Revision No. 2.02 Issue Date 26/02/2007

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