APPENDIX F
CALIBRATION CERTIFICATES

Style: APPENDIX E File: P:\GINTW\PROJECTS\26491.GPJ Printed: 20/11/2023 10:46:01 Raeburn Drilling and Geotechnical, Whistleberry Rd, Hamilton ML3 0HP Tel: 01698-711177 E-mail: enquiries@raeburndrilling.com

RAEBURN DRILLING & GEOTECHNICAL LTD

SPT Hammer Energy Test Report

in accordance with BSEN ISO 22476-3:2005

Raeburn Drilling & Geotechnical
Whistleberry road
Hamilton
ML3 0HP

SPT Hammer Ref:	RD48 2023
Test Date:	31/03/2023
Report Date:	31/03/2023
File Name:	RD48 2023.spt
Test Operator:	KS

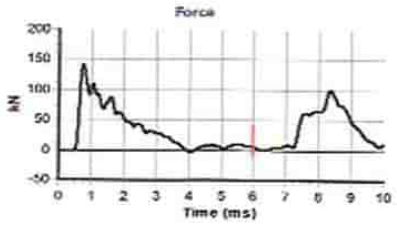
Instrumented Rod Data

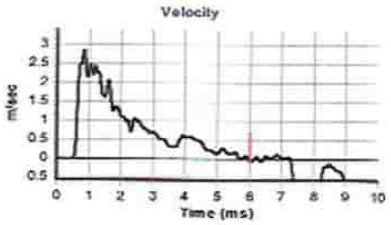
Diameter d_r (mm):	54
Wall Thickness t_r (mm):	6.9
Assumed Modulus E_a (GPa):	208
Accelerometer No.1:	69559
Accelerometer No.2:	69560

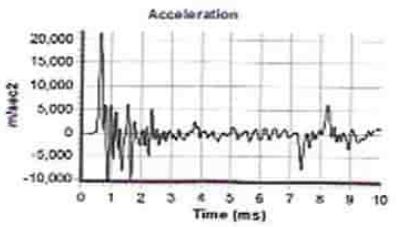
SPT Hammer Information

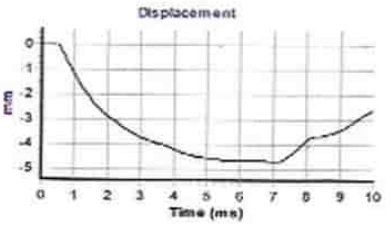
Hammer Mass m (kg):	63.5
Falling Height h (mm):	760
SPT String Length L (m):	14.0

Comments / Location









Calculations

Area of Rod A (mm2):	1021
Theoretical Energy E_{theor} (J):	473
Measured Energy E_{meas} (J):	308

Energy Ratio E_r (%): **65**

Signed: Kevin Steele

Title: Head Storeman

The recommended calibration interval is 12 months

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Style: A4 NAMEBOX File: P:\GINTW\PROJECTS\26491.GPJ Printed: 19/11/2023 17:16:04 Raeburn Drilling and Geotechnical, Whistleberry Rd, Hamilton ML3 0HP Tel: 01698-711177 E-mail: enquiries@raeburndrilling.com

RAEBURN DRILLING & GEOTECHNICAL LTD

SPT Hammer Energy Test Report

in accordance with BSEN ISO 22476-3:2005

Raeburn Drilling & Geotechnical
Whistleberry road
Hamilton
ML3 0HP

SPT Hammer Ref: RD140 23
Test Date: 25/04/2023
Report Date: 25/04/2023
File Name: RD140 23.spt
Test Operator: K STEELE

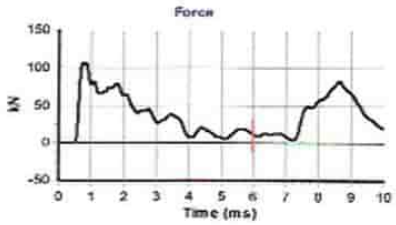
Instrumented Rod Data

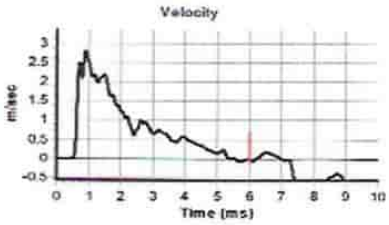
Diameter d_r (mm):	54
Wall Thickness t_r (mm):	6.9
Assumed Modulus E_a (GPa):	208
Accelerometer No.1:	69559
Accelerometer No.2:	69560

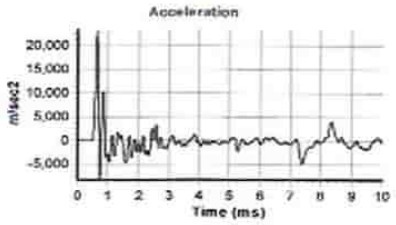
SPT Hammer Information

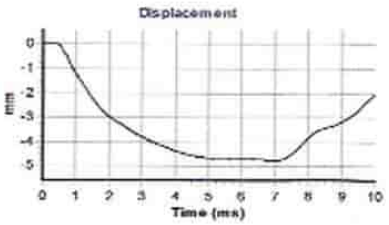
Hammer Mass m (kg):	63.5
Falling Height h (mm):	760
SPT String Length L (m):	14.5

Comments / Location









Calculations

Area of Rod A (mm2):	1021
Theoretical Energy E_{theor} (J):	473
Measured Energy E_{meas} (J):	293

Energy Ratio E_r (%): 62

The recommended calibration interval is 12 months

Signed: Kevin Steele
Title: Head Storeman

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Certificate of calibration

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Certificate number CRU02-0120-20220906

AFTER ADJUSTMENT						
Calibration results zero-scale measurement						
Reference zero scale value	Measured zero scale value	Uncertainty of calibration	Allowed minimum	Allowed maximum	Range	PASS (P) FAIL (F)
909.1	909.1	0.2	908.7	909.5	R (Ohm)	P
96.59	96.57	0.00015	96.09	97.09	I (mA)	P
1.00	1.00	7µV	0.99	1.01	U (V)	P

AFTER ADJUSTMENT						
Calibration results full-scale measurement						
Reference full scale value	Measured full scale value	Uncertainty of calibration	Allowed minimum	Allowed maximum	Range	PASS (P) FAIL (F)
1299.8	1299.8	0.46	1298.8	1300.8	R (Ohm)	P
386.12	386.08	1	385.12	387.12	I (mA)	P
4.00	4.00	0.34mV	3.96	4.04	U (V)	P
1.0000	1.0000	0.00014	0.9994	1.0006	I (Hz)	P

Serial number	0120
Date of calibration	06/09/2022

Certificate of calibration

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Certificate number CRU02-0120-20220906

Manufacturer Location of calibration	Leiderdorp Instruments Achthovenerweg 19 2351AX Leiderdorp The Netherlands
Model	CRU02
Serial number	0120
Date of calibration	06/09/2022
Temperature (°C)	23+/-5°C
Humidity (% RH)	60+/-30%
Performed by (calibration technician)	Peter Chung
Signature	

Style: A4 NAMEBOX File: P:\GINTW\PROJECTS\26491.GPJ Printed: 19/11/2023 14:12:40 Raeburn Drilling and Geotechnical, Whistleberry Rd, Hamilton ML3 0HP Tel: 01698-711177 E-mail: enquiries@raeburndrilling.com

Certificate of calibration

Certificate number CRU02-0120-20220906

Calibration procedure

The environmental conditions of all equipment including the device are stable for at least 4 hours before use. Laboratory calibration process is based on direct measurement of output voltage, output current, and timebase signal of the device, using a reference instrument. The Pt-1000 input is calibrated by connecting fixed resistors to the device, which are measured immediately before use, using a reference instrument. Voltage, current and resistance are measured at two points, one at the low end of the range and one at the high end of the range. The timebase is measured at the nominal value. If the output of the device, plus the uncertainty in the reference instrument, is within the specified uncertainty of the device, the result is Pass, otherwise the result is Fail.

Traceability

The reference instrument is traceable to SI units and is calibrated every year by Keysight Technologies, Germany. Supporting documentation relative to traceability is available for review by appointment.

Calibration uncertainty

Reported expanded uncertainty of measurement is stated as the combined standard uncertainty of measurement multiplied by the coverage factor of 2, which for a normal distribution corresponds to a coverage probability of approximately 95%. Where applicable the standard uncertainty of measurement has been determined in accordance with Publication EA-4/02. The combined uncertainty of the result of calibration is the positive root sum square of uncertainty of calibration of the reference instrument, uncertainty of long time stability of the reference instrument, and uncertainty of the reference instrument.

Certificate of calibration

Certificate number CRU02-0120-20220906

Calibration equipment used

Model	*Serial nr.*	*Calibration certificate*
34410A	MY47000125	1-15566595057-1

Style: A4 NAMEBOX File: P:\GINTW\PROJECTS\26491.GPJ Printed: 19/11/2023 14:13:17 Raeburn Drilling and Geotechnical, Whistleberry Rd, Hamilton ML3 0HP Tel: 01698-711177 E-mail: enquiries@raeburndrilling.com

Form : CAL59

Equipment No:	DCP 001	Certificate No:	27/01/23
		Date of Calibration:	21/03/2023
		Ambient Temperature:	19.7 °C

Reference Equipment No.	Certificate No.	Uncertainty of Measurement		
REF 025	DML-0922-010	±	16.10	µm
REF 005A+005B	02645	±	0.13	°C
BAL 003	62614022040707	±	2.5	g

The above equipment was checked in accrodance with CS229 cl. 6 of the DMRB
The reference equipment used is traceable to National Standards and as a general rule shall have an accuracy 10 times that of the device being calibrated.

EQUIPMENT TYPE	DESCRIPTION	REQUIRED MEASUREMENT	ACTUAL MEASUREMENT	IN/OUT OF CALIBRATION
Hammer	Mass	8 ± 0.2kg	8.01kg	In
Height of Fall	Length	575 ± 10mm	577mm	In
Hammer	Diameter	> Than Anvil	100.18	In
Anvil	Diameter	>50mm and <Hammer Diameter	59.86	In
Anvil	Mass (including Guide Rod)	6kg (Maximum)	3.1kg	In
Drive Rod	Mass	3kg (Maximum)	1.4kg	In
Drive Rod	Diameter	20mm (Maximum)	16mm	In
Extension Rods	Diameter	20mm (Maximum)	16mm	In
Cone	Diameter	20mm (Maximum)	16mm	In
Cone	Angle	60°		

Comments: **Tolerances given are Manufacturers Tolerances in accordance with CS229 cl.6 in the DMRB**

Type: Verification

Originator	SG	**CALIBRATION REPORT** in accordance with Internal Calibration Procedures	TERRA TEK Site Investigation & Laboratory Services
Checked & Approved	CL	DCP EQUIPMENT	Fig 1

Terra Tek Ltd, 62 Rochsolloch Road, Airdrie, ML6 9BG.