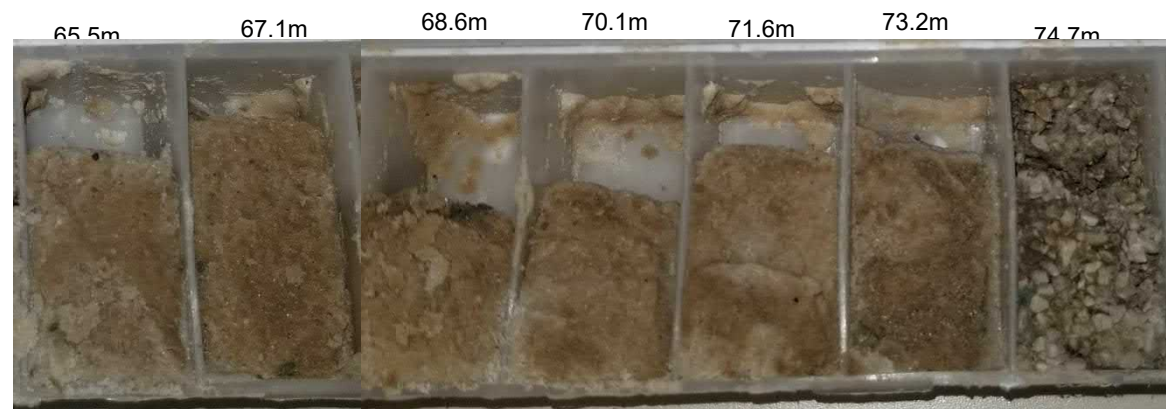
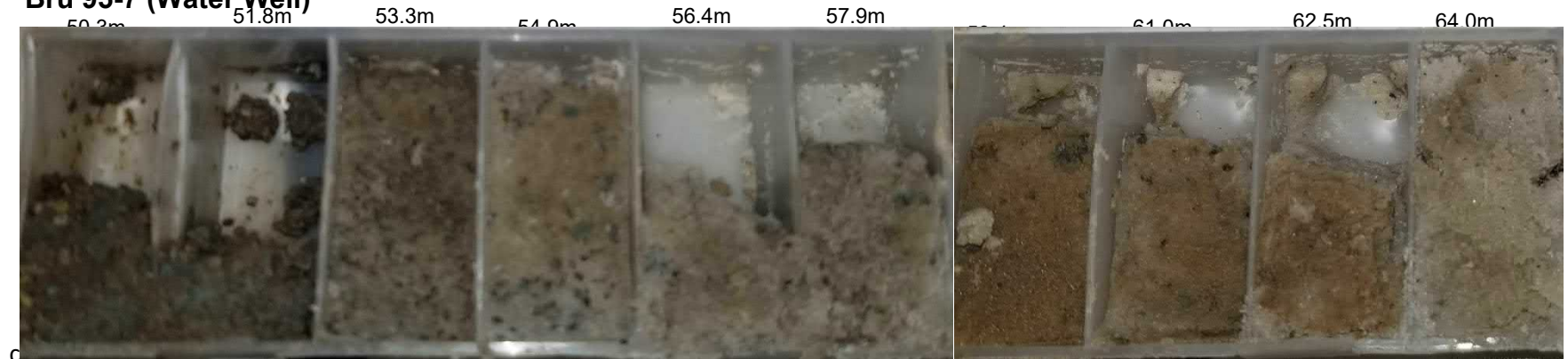


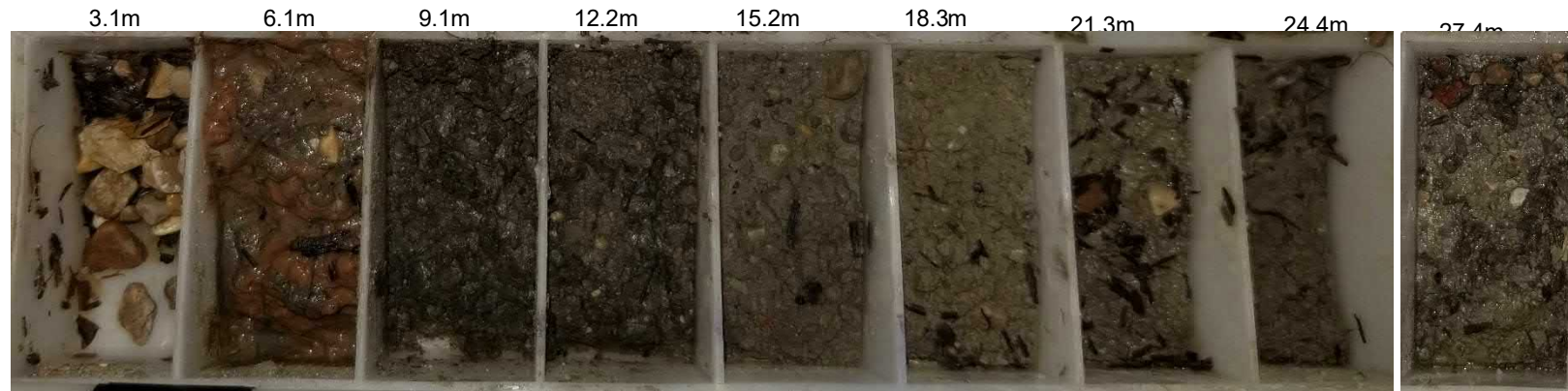
Chip Tray Photo Log

Bru 95-7 (Water Well)



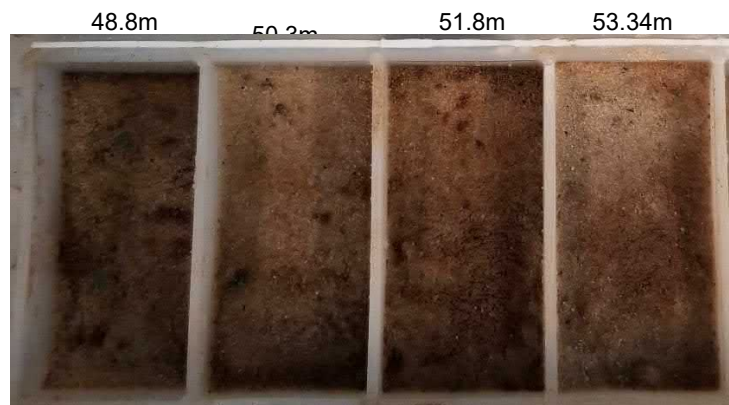
Chip Tray Photo Log

Bru 95-9 (adjacent to Bru 95-5 and Bru 95-6)



Chip Tray Photo Log

Bru 96-1 (adjacent to Bru 96-2)



Appendix C.3. Geochemistry Sample Photos

GEOCHEMISTRY SAMPLE PHOTOGRAPHIC LOG

Photo No. 1

Description:

Sample ID: Bru 121-1
Depth: 24.38 – 24.83m
Lithology: Carbonate

Core Sample

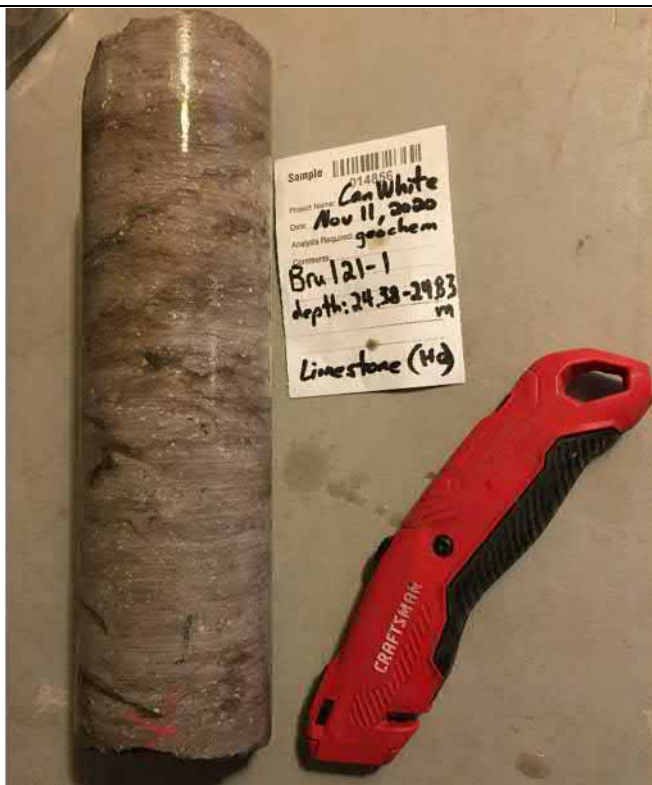
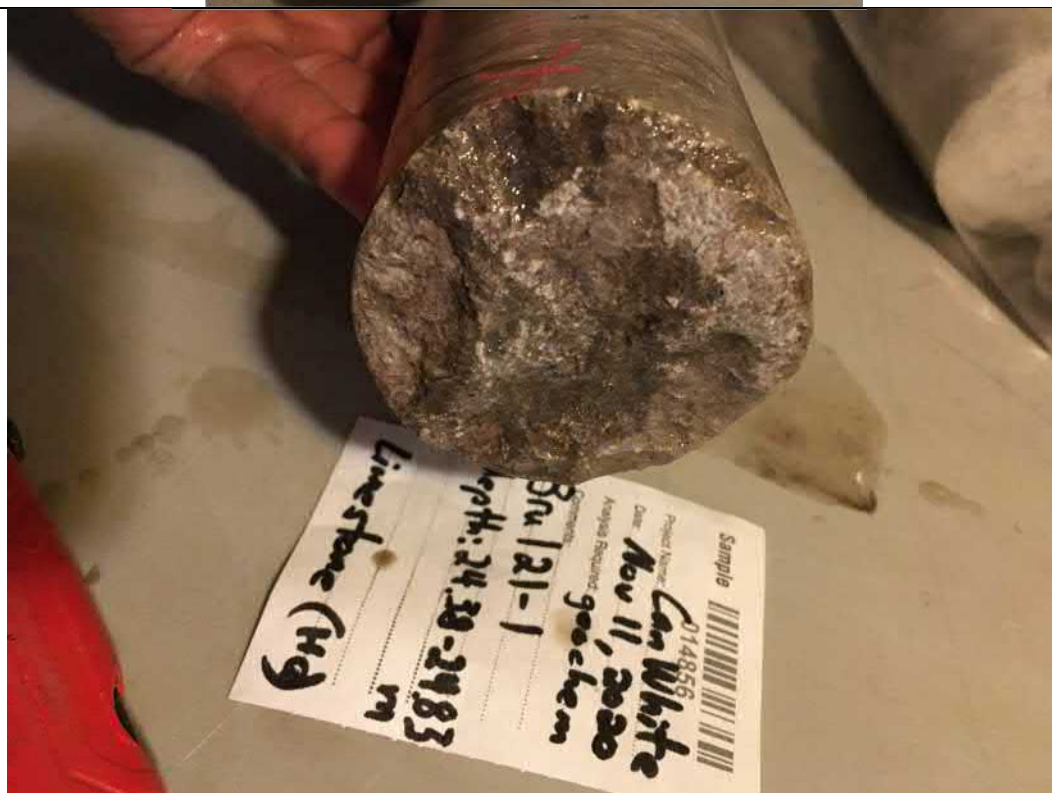


Photo No. 2

Description:

Sample ID: Bru 121-1
Depth: 24.38 – 24.83m
Lithology: Carbonate

Core Sample



GEOCHEMISTRY SAMPLE PHOTOGRAPHIC LOG

Photo No. 3

Description:

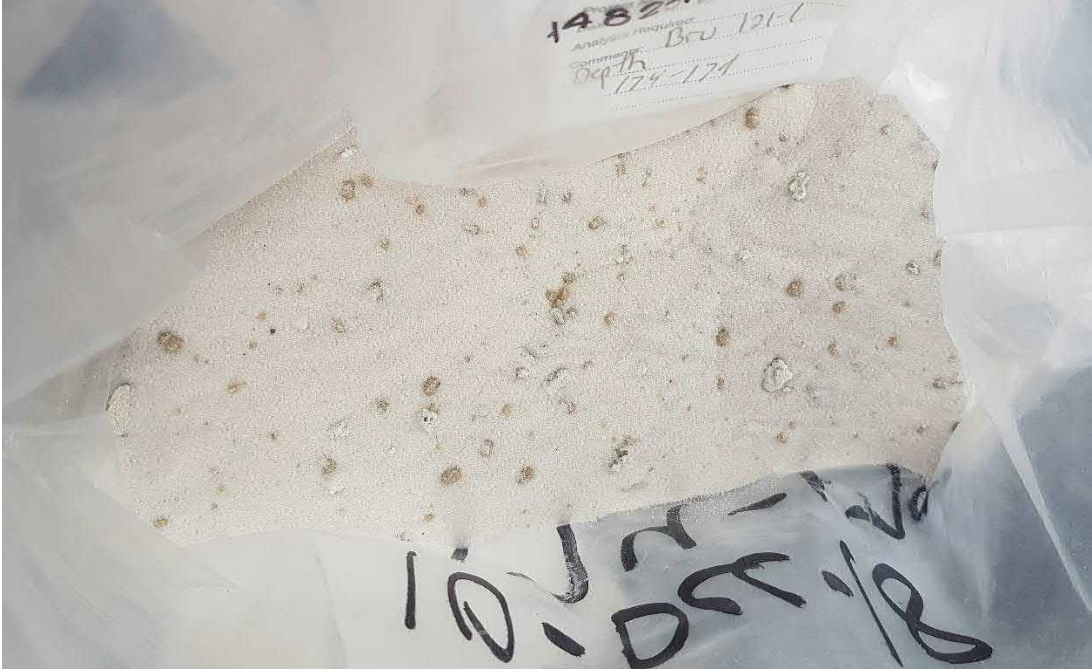
Sample ID: Bru 121-1
Depth: 36.57 – 37.00m
Lithology: Shale

Core Sample



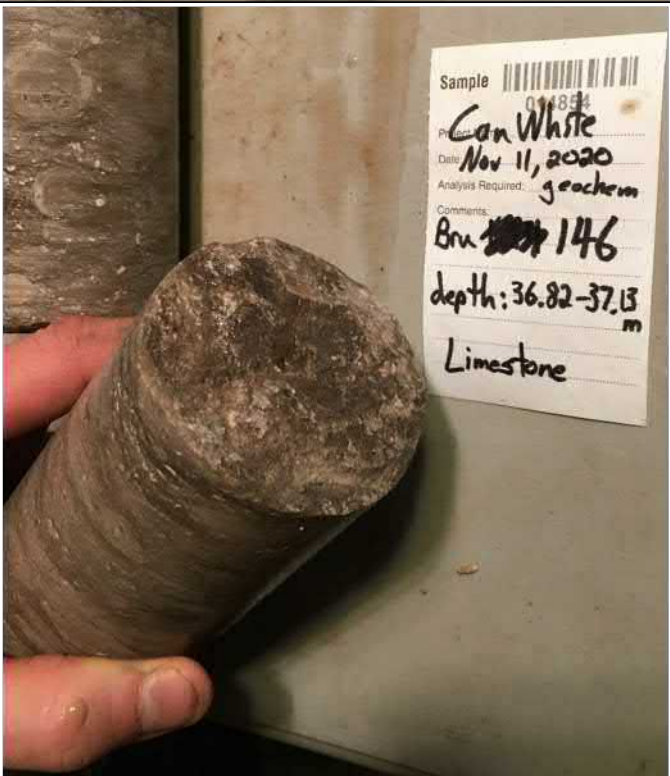
GEOCHEMISTRY SAMPLE PHOTOGRAPHIC LOG

Photo No. 5

Description: Sample ID: Bru 121-1 Depth: 174 – 179m Lithology: Sandstone Grab Sample	
Photo No. 6	
Description: Sample ID: Bru 121-1 Depth: 174 – 179m Lithology: Sandstone Grab Sample	

GEOCHEMISTRY SAMPLE PHOTOGRAPHIC LOG

Photo No. 7	
---------------------------	--

Description: Sample ID: Bru 146 Depth: 36.82 – 37.13m Lithology: Carbonate Core Sample	
Photo No. 8	

GEOCHEMISTRY SAMPLE PHOTOGRAPHIC LOG	
Photo No. 9	

Description: Sample ID: Bru 146 Depth: 49.86 – 50.29m Lithology: Shale Core Sample	
Photo No. 10 Description: Sample ID: Bru 146 Depth: 49.86 – 50.29m Lithology: Shale Core Sample	

GEOCHEMISTRY SAMPLE PHOTOGRAPHIC LOG

Photo No. 11	
----------------------------	--

Description: Sample ID: Bru 146 Depth: 189 – 194m Lithology: Sandstone Grab Sample	
Photo No. 12	
Description: Sample ID: Bru 146 Depth: 189 – 194m Lithology: Sandstone Grab Sample	

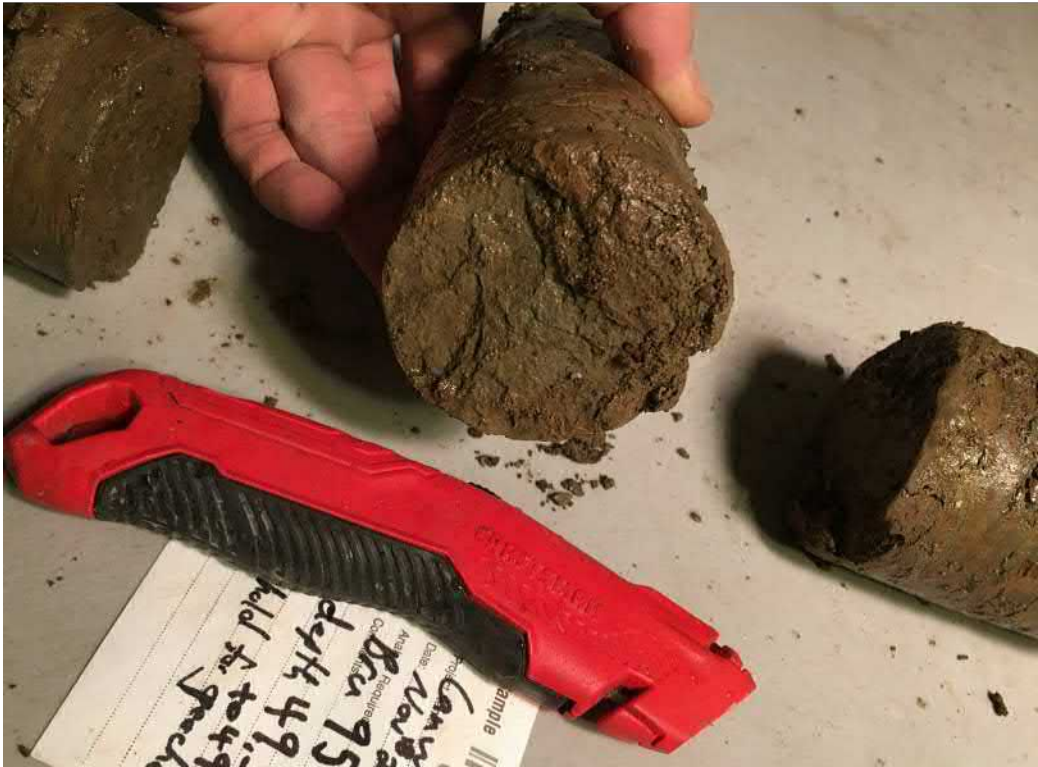
GEOCHEMISTRY SAMPLE PHOTOGRAPHIC LOG

Photo No. 13	
----------------------------	--

Description: Sample ID: Bru 95-8 Depth: 40.16 – 40.65m Lithology: Carbonate Core Sample	
Photo No. 14 Description: Sample ID: Bru 95-8 Depth: 40.16 – 40.65m Lithology: Carbonate Core Sample	

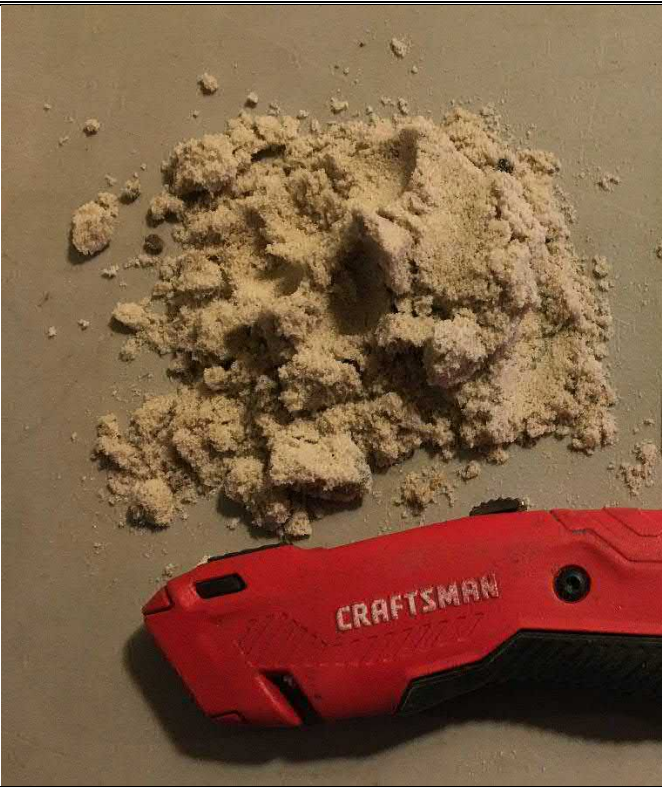
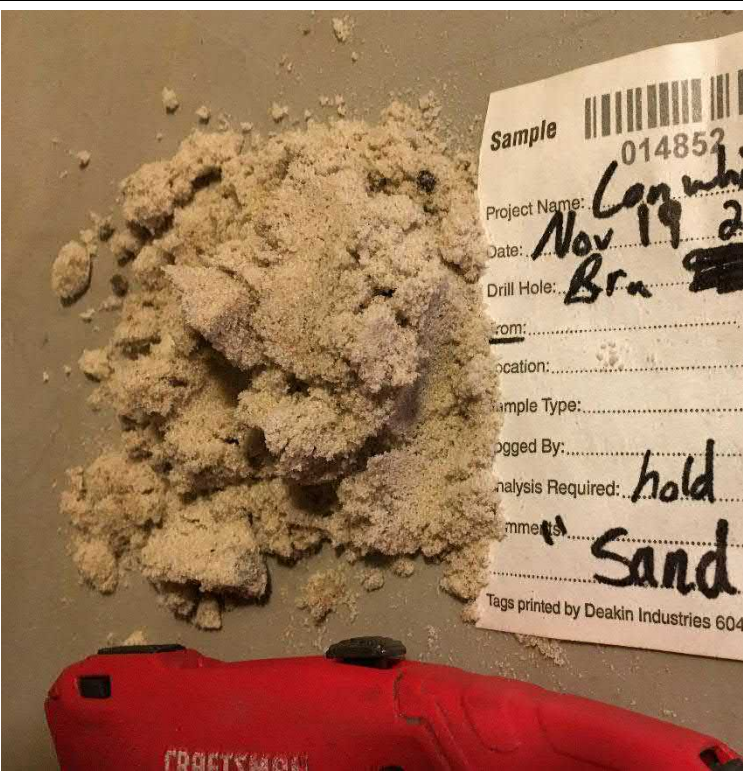
GEOCHEMISTRY SAMPLE PHOTOGRAPHIC LOG

Photo No. 15	
----------------------------	--

Description: Sample ID: Bru 95-8 Depth: 49.39 – 49.79m Lithology: Shale Core Sample	 A photograph showing two cylindrical shale core samples and a red core catcher tool. A handwritten label is placed next to the tool, reading: "Sample Bru 95-8 depth 49.39m to 49.79m held for geochem".
Photo No. 16	 A photograph showing a hand holding a large, irregular shale core sample. A red core catcher tool and a handwritten label are visible in the foreground. The label reads: "Sample Bru 95-8 depth 49.39m to 49.79m held for geochem".

GEOCHEMISTRY SAMPLE PHOTOGRAPHIC LOG

Photo No. 17	
----------------------------	--

Description: Sample ID: Bru 95-3 Depth: Unknown Lithology: Sandstone Grab Sample From Test Extraction Pile	
Photo No. 18	 Sample 014852 Project Name: Con wh Date: Nov 19 2 Drill Hole: Bru Location: Sample Type: Logged By: Analysis Required: hold Comments: Sand Tags printed by Deakin Industries 604

Appendix D. Vibrating Wire Piezometer Instrumentation Records



Vibrating Wire Piezometer Instrumentation Record

Project Number: 60640258
Project Name: Canadian White Sands
Client: CanWhite

AECOM Staff: Steve Dickin / Reuben Dandurand
Date of install: Nov 19 2020
Drill Company: Paddock Drilling Ltd.
Lead Driller: Gord

Borehole Details

ID: Bru 95-8
UTM: E: 681953
UTM: N: 5527630
Drilling Method: Rotary
Drill Rig: Acker MP8
Completion Date: Nov 19 2020

Total Hole Length: 55.09 m
Inclination (from vertical): -90
Azimuth: N/A
Elevation: 277.271 m AS(ground) / top of pipe / top of casing
Casing Stick up: 1.116 m AGS Casing Diameter: HW
Hole Diameter: HQ
Mechanical Hole Plug (Y/N): N if yes, Depth btoc: N/A

True Vertical Depth = $\sin(\text{inclination}) \times \text{Total Hole Length}$
True BH TOE Vertical Depth = 55.09 m
True Plug Vertical Depth = N/A
True Casing Toe Vertical Depth = N/A

Data Logger Details

Type (e.g. Therm, VW)	Name	Model No.	Serial No	Logging frequency	Start date dd/mm/yy	Start time 24hr time	Comment
1 VW	Bru 95-8	DT2055B	11732	30 sec	21/11/20	12:36:00 pm	5 Channel
2							
3							
4							

Vibrating Wire Piezometers Details

Type (e.g. RST)	Name	Model No.	Serial No	Installed Depth (m below ground)
1 RST	Bru 95-8D	VW2100-2.0	VW71104	54.689 m BGS
2 RST	Bru 95-8I	VW2100-2.0	VW71102	50.832 m BGS
3 RST	Bru 95-8S bottom	VW2100-2.0	VW71101	43.759 m BGS
4 RST	Bru 95-8S top	VW2100-2.0	VW71103	40.762 m BGS

Completion Details and Materials Used

1 inch, 2.975 m long PVC Tremie Pipe (19 pieces in total)
Bentonite-Cement grout mixture (1:1 ratio)
Protective Casing: RST 8inch protective box welded to the top of the HW casing at surface.

VIBRATING WIRE INSTRUMENT INSTALLATION - PHOTOGRAPHIC LOG

Client Name: Canadian White Sands		Site Location: Vivian Sand Facility Project	Project Number: 60640258
Photo No. 1	Date: Nov 2020		
Direction Photo Taken: N/A			
Description: Vibrating wire piezometer completion.			
Photo No. 2	Date: Nov 2020		
Direction Photo Taken: N/A			
Description: Vibrating wire piezometer completion.			



Monitor
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Calibration Record

RST Instruments Ltd., 11545 Kingston St., Maple Ridge, British Columbia, Canada V2X 0Z5
Tel: 604 540 1100 • Fax: 604 540 1005 • Toll Free: 1 800 665 5599 (North America only)
e-mail: info@rstinstruments.com • Website: www.rstinstruments.com

Vibrating Wire Piezometer

Customer: AECOM CANADA LTD
Sales Order: 226278
Customer ID:
Model: VW2100-2.0
Serial Number: VW71103
Mfg Number: P124601
Range: 2.0 MPa
Cable Length: 55 meters
Cable Marking: 644347 m to 644401 m
Cable Type: EL380004
Cable Colour Code: Red/Black (Coil) Green/White (Thermistor)
Thermistor Type: 3K

Bru 95-8

Shallow Top

VW1
(Sensor 1)

Therm
(Sensor 2)

Applied Pressure (MPa)	First Reading (B units)	Second Reading (B units)	Average Reading (B units)	Calculated Linear (MPa)	Linearity Error (%FS)	Calculated Polynomial (MPa)	Polynomial Error (%FS)
0.000	8937	8943	8940	0.002	0.08	-0.000	-0.01
0.400	8276	8277	8276	0.400	0.00	0.400	0.02
0.800	7613	7613	7613	0.798	-0.08	0.800	-0.00
1.200	6947	6947	6947	1.198	-0.08	1.200	-0.01
1.600	6278	6279	6279	1.600	-0.02	1.600	-0.00
2.000	5609	5609	5609	2.002	0.09	2.000	0.00
Max Error (%)					0.09		0.02

Linear Calibration Factor: CF = $6.0051e-04$ MPa/B unit
Temperature Correction Factor: Tk = $-3.7832e-04$ MPa/°C rise

Polynomial Gauge Factor:

A = $-1.2183e-09$ MPa/(B unit)² B = $-5.8278e-04$ MPa/B unit C = calculate (see below) MPa

Users must establish site zero readings for calculation purposes

Polynomial C = $-[A(L_0^2) + B(L_0)]$

Pressure is calculated with the following equations:

Linear: $P = CF(L_0 - L) - Tk(T_0 - T) + (S_0 - S)$

Polynomial: $P = A(L^2) + B(L) + C - Tk(T_0 - T) + (S_0 - S)$

L_0 , L = initial (installation) and current readings, in B units

T_0 , T = initial (installation) and current temperature, in °C

S_0 , S = initial (installation) and current barometric pressure readings, in MPa

B units = Hz²/1000 ie: 1700 Hz = 2890 B units

Shipped Zero Readings:	Date	VW Reading (B Units)	Temperature (°C)	Baro (mbar)
	13 Nov 2020	8944	21.1	985.9

This instrument has been calibrated using standards traceable to the NIST in compliance with ANSI Z540-1

Technician: Kailah Toews Date: 13/11/2020

Approved: Ora Nygren Date: 13/11/2020



Monitor
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Calibration Record

RST Instruments Ltd., 11545 Kingston St., Maple Ridge, British Columbia, Canada V2X 0Z5
Tel: 604 540 1100 • Fax: 604 540 1005 • Toll Free: 1 800 665 5599 (North America only)
e-mail: info@rstinstruments.com • Website: www.rstinstruments.com

Vibrating Wire Piezometer

Customer: AECOM CANADA LTD
Sales Order: 226278
Customer ID:
Model: VW2100-2.0
Serial Number: VW71101
Mfg Number: P117704
Range: 2.0 MPa
Cable Length: 50 meters
Cable Marking: 644241 m to 644290 m
Cable Type: EL380004
Cable Colour Code: Red/Black (Coil) Green/White (Thermistor)
Thermistor Type: 3K

Bra 95-8 Shallow (Limestone)

bottom

VW 2 (sensor 3)

Therm 2 (sensor 4)

Applied Pressure (MPa)	First Reading (B units)	Second Reading (B units)	Average Reading (B units)	Calculated Linear (MPa)	Linearity Error (%FS)	Calculated Polynomial (MPa)	Polynomial Error (%FS)
0.000	8627	8630	8628	0.002	0.10	0.000	0.02
0.400	7846	7847	7847	0.399	-0.04	0.400	-0.02
0.800	7061	7062	7061	0.798	-0.09	0.799	-0.03
1.200	6272	6273	6273	1.199	-0.06	1.200	0.01
1.600	5482	5482	5482	1.601	0.03	1.601	0.05
2.000	4693	4694	4694	2.001	0.05	1.999	-0.03
Max Error (%)					0.10		0.05

Linear Calibration Factor: CF = 5.0801×10^{-4} MPa/B unit
Temperature Correction Factor: Tk = 4.6991×10^{-5} MPa/°C rise

Polynomial Gauge Factor:

A = -8.0347×10^{-10} MPa/(B unit)² B = -4.9730×10^{-4} MPa/B unit C = calculate (see below) MPa

Users must establish site zero readings for calculation purposes

Polynomial C = $-[A(L_0^2) + B(L_0)]$

Pressure is calculated with the following equations:

Linear: $P = CF(L_0 - L) - Tk(T_0 - T) + (S_0 - S)$

Polynomial: $P = A(L^2) + B(L) + C - Tk(T_0 - T) + (S_0 - S)$

L_0 L = initial (installation) and current readings, in B units

T_0 T = initial (installation) and current temperature, in °C

S_0 S = initial (installation) and current barometric pressure readings, in MPa

B units = Hz²/1000 ie: 1700 Hz = 2890 B units

Shipped Zero Readings:	Date	VW Reading (B Units)	Temperature (°C)	Baro (mbar)
	13 Nov 2020	8626	20.9	985.9

This instrument has been calibrated using standards traceable to the NIST in compliance with ANSI Z540-1

Technician: Kallah Toews

Date: 13/11/2020

Approved: Ora Nygren

Date: 13/11/2020



Monitor
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Calibration Record

RST Instruments Ltd., 11545 Kingston St., Maple Ridge, British Columbia, Canada V2X 0Z5
Tel: 604 540 1100 • Fax: 604 540 1005 • Toll Free: 1 800 665 5599 (North America only)
e-mail: info@rstinstruments.com • Website: www.rstinstruments.com

Vibrating Wire Piezometer

Customer: AECOM CANADA LTD
Sales Order: 226278
Customer ID:
Model: VW2100-2.0
Serial Number: VW71102
Mfg Number: P117735
Range: 2.0 MPa
Cable Length: 55 meters
Cable Marking: 644291 m to 644345 m
Cable Type: EL380004
Cable Colour Code: Red/Black (Coil) Green/White (Thermistor)
Thermistor Type: 3K

Bru 95-8 Intermediate (shale)
VW 3 (sensor 5) Therm 3 (Sensor 6)

Applied Pressure (MPa)	First Reading (B units)	Second Reading (B units)	Average Reading (B units)	Calculated Linear (MPa)	Linearity Error (%FS)	Calculated Polynomial (MPa)	Polynomial Error (%FS)
0.000	8608	8610	8609	0.003	0.14	0.000	0.02
0.400	7835	7836	7835	0.399	-0.04	0.400	-0.02
0.800	7057	7057	7057	0.798	-0.120	0.800	-0.02
1.200	6275	6275	6275	1.198	-0.09	1.200	0.01
1.600	5490	5490	5490	1.600	0.01	1.601	0.04
2.000	4706	4707	4706	2.002	0.10	2.000	-0.02
Max Error (%)					0.14		0.04

Linear Calibration Factor: CF = $5.1224e-04$ MPa/B unit
Temperature Correction Factor: Tk = $-1.2806e-04$ MPa/°C rise

Polynomial Gauge Factor:

A = $-1.1911e-09$ MPa/(B unit)² B = $-4.9638e-04$ MPa/B unit C = calculate (see below) MPa

Users must establish site zero readings for calculation purposes

Polynomial C = $-[A(L_0^2) + B(L_0)]$

Pressure is calculated with the following equations:

Linear: $P = CF(L_0 - L) - Tk(T_0 - T) + (S_0 - S)$

Polynomial: $P = A(L^2) + B(L) + C - Tk(T_0 - T) + (S_0 - S)$

L_0 , L = initial (installation) and current readings, in B units

T_0 , T = initial (installation) and current temperature, in °C

S_0 , S = initial (installation) and current barometric pressure readings, in MPa

B units = Hz²/1000 ie: 1700 Hz = 2890 B units

Shipped Zero Readings:	Date	VW Reading (B Units)	Temperature (°C)	Baro (mbar)
	13 Nov 2020	8611	21.0	985.9

This instrument has been calibrated using standards traceable to the NIST in compliance with ANSI Z540-1

Technician: Kailah Toews Date: 13/11/2020

Approved: Ora Nygren Date: 13/11/2020



Monitor
with
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Calibration Record

RST Instruments Ltd., 11545 Kingston St., Maple Ridge, British Columbia, Canada V2X 0Z5
Tel: 604 540 1100 • Fax: 604 540 1005 • Toll Free: 1 800 665 5599 (North America only)
e-mail: info@rstinstruments.com • Website: www.rstinstruments.com

Vibrating Wire Piezometer

Customer: AECOM CANADA LTD
Sales Order: 226278
Customer ID:
Model: VW2100-2.0
Serial Number: VW71104
Mfg Number: P124605
Range: 2.0 MPa
Cable Length: 75 meters
Cable Marking: 644402 m to 644476 m
Cable Type: EL380004
Cable Colour Code: Red/Black (Coil) Green/White (Thermistor)
Thermistor Type: 3K

Bru 95-8 Deep (sandstone)
VW 4 (sensor 7)
Therm 4 (sensor 8)

Applied Pressure (MPa)	First Reading (B units)	Second Reading (B units)	Average Reading (B units)	Calculated Linear (MPa)	Linearity Error (%FS)	Calculated Polynomial (MPa)	Polynomial Error (%FS)
0.000	9041	9045	9043	0.002	0.12	0.000	0.01
0.400	8333	8334	8333	0.399	-0.03	0.400	-0.00
0.800	7620	7621	7621	0.798	-0.10	0.800	-0.01
1.200	6905	6906	6905	1.198	-0.09	1.200	-0.00
1.600	6187	6188	6187	1.600	-0.01	1.600	0.02
2.000	5468	5468	5468	2.002	0.11	2.000	-0.01
Max Error (%)					0.12		0.02

Linear Calibration Factor: CF = $5.5938e-04$ MPa/B unit
Temperature Correction Factor: Tk = $3.6360e-05$ MPa/°C rise

Polynomial Gauge Factor:

A = $-1.3405e-09$ MPa/(B unit)² B = $-5.3993e-04$ MPa/B unit C = calculate (see below) MPa

Users must establish site zero readings for calculation purposes

Polynomial C = $-[A(L_0^2) + B(L_0)]$

Pressure is calculated with the following equations:

Linear: $P = CF(L_0 - L) - Tk(T_0 - T) + (S_0 - S)$

Polynomial: $P = A(L^2) + B(L) + C - Tk(T_0 - T) + (S_0 - S)$

L_0 , L = initial (installation) and current readings, in B units

T_0 , T = initial (installation) and current temperature, in °C

S_0 , S = initial (installation) and current barometric pressure readings, in MPa

B units = Hz²/1000 ie: 1700 Hz = 2890 B units

Shipped Zero Readings:	Date	VW Reading (B Units)	Temperature (°C)	Baro (mbar)
	13 Nov 2020	9047	21.1	985.9

This instrument has been calibrated using standards traceable to the NIST in compliance with ANSI Z540-1

Technician: Kailah Toews

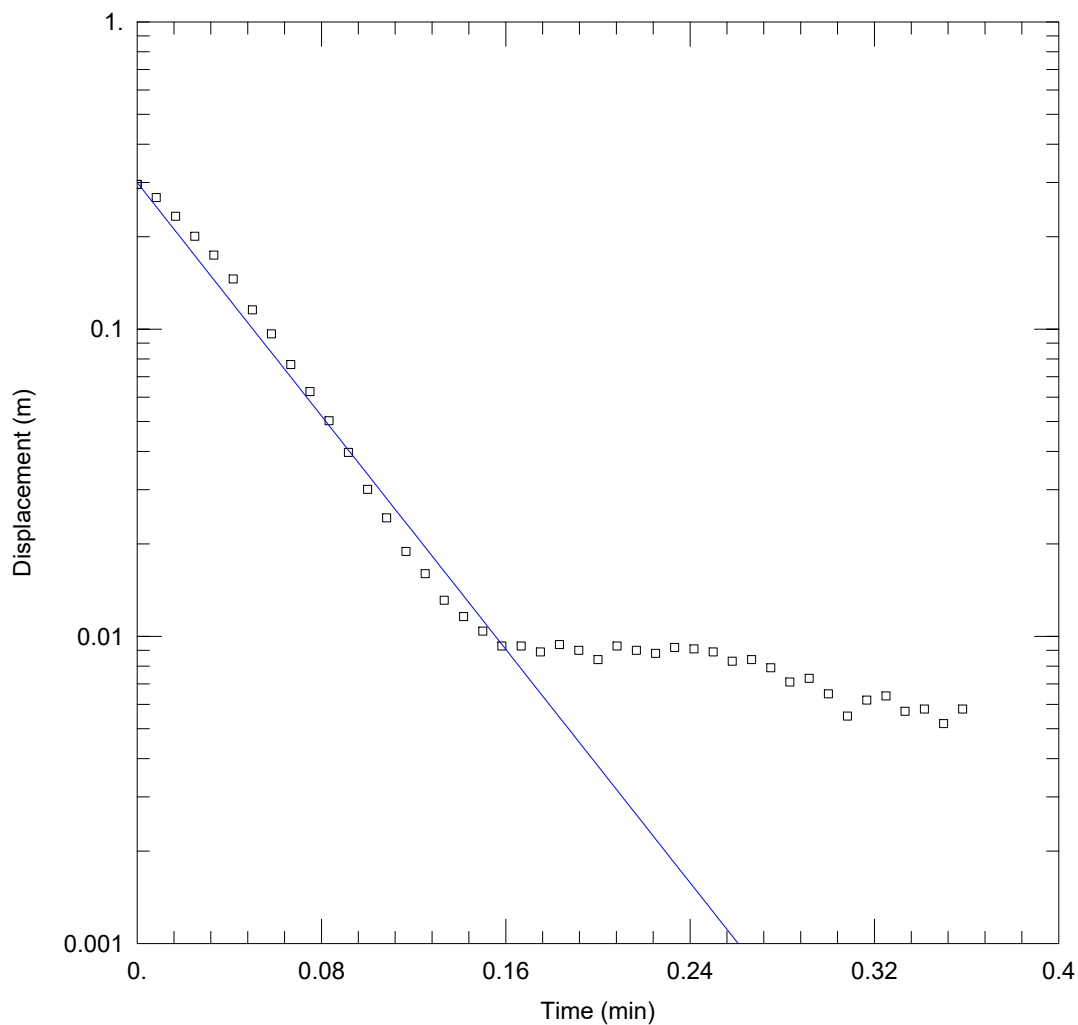
Date: 13/11/2020

Approved: Ora Nygren

Date: 13/11/2020

Appendix E. Aquifer Testing Results

Appendix E.1. Slug Test Analyses



WELL TEST ANALYSIS

Data Set: C:\Users\dickins\Desktop\CanWhite Slug Testing\Bru 95-5.aqt
 Date: 01/25/21 Time: 15:57:43

PROJECT INFORMATION

Company: AECOM
 Client: CanWhite Sands
 Project: 60640258
 Location: Vivian MB
 Test Well: Bru 95-5
 Test Date: 2020-11-17

AQUIFER DATA

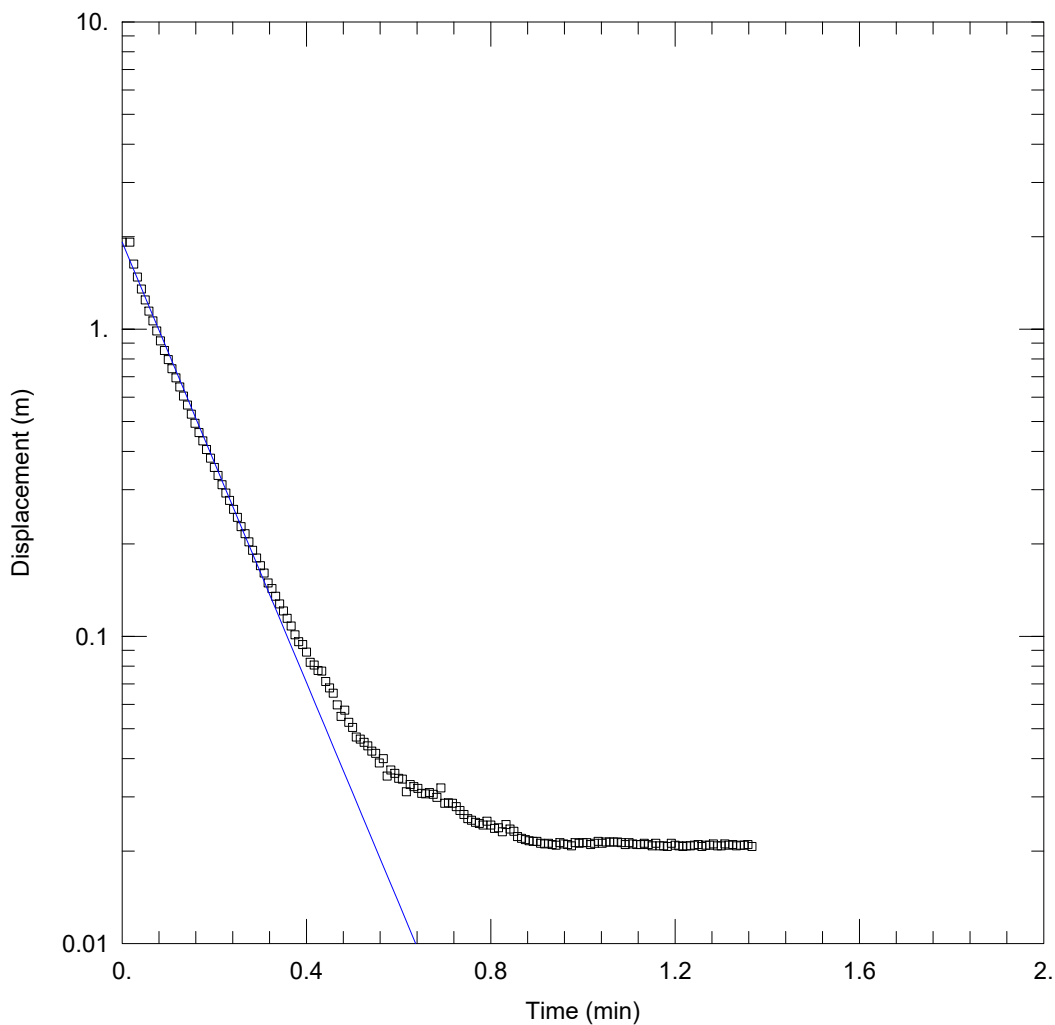
Saturated Thickness: 9.7 m Anisotropy Ratio (K_z/K_r): 1.

WELL DATA (Bru 95-5)

Initial Displacement: 0.2958 m Static Water Column Height: 36.85 m
 Total Well Penetration Depth: 7.35 m Screen Length: 6.44 m
 Casing Radius: 0.064 m Well Radius: 0.06 m

SOLUTION

Aquifer Model: Confined Solution Method: Bouwer-Rice
 $K = 0.00039$ m/sec $y_0 = 0.3$ m



WELL TEST ANALYSIS

Data Set: C:\Users\dickins\Desktop\CanWhite Slug Testing\Bru 95-6.aqt
 Date: 01/25/21 Time: 15:39:02

PROJECT INFORMATION

Company: AECOM
 Client: CanWhite Sands
 Project: 60640258
 Location: Vivian MB
 Test Well: Bru 95-6
 Test Date: 2020-11-16

AQUIFER DATA

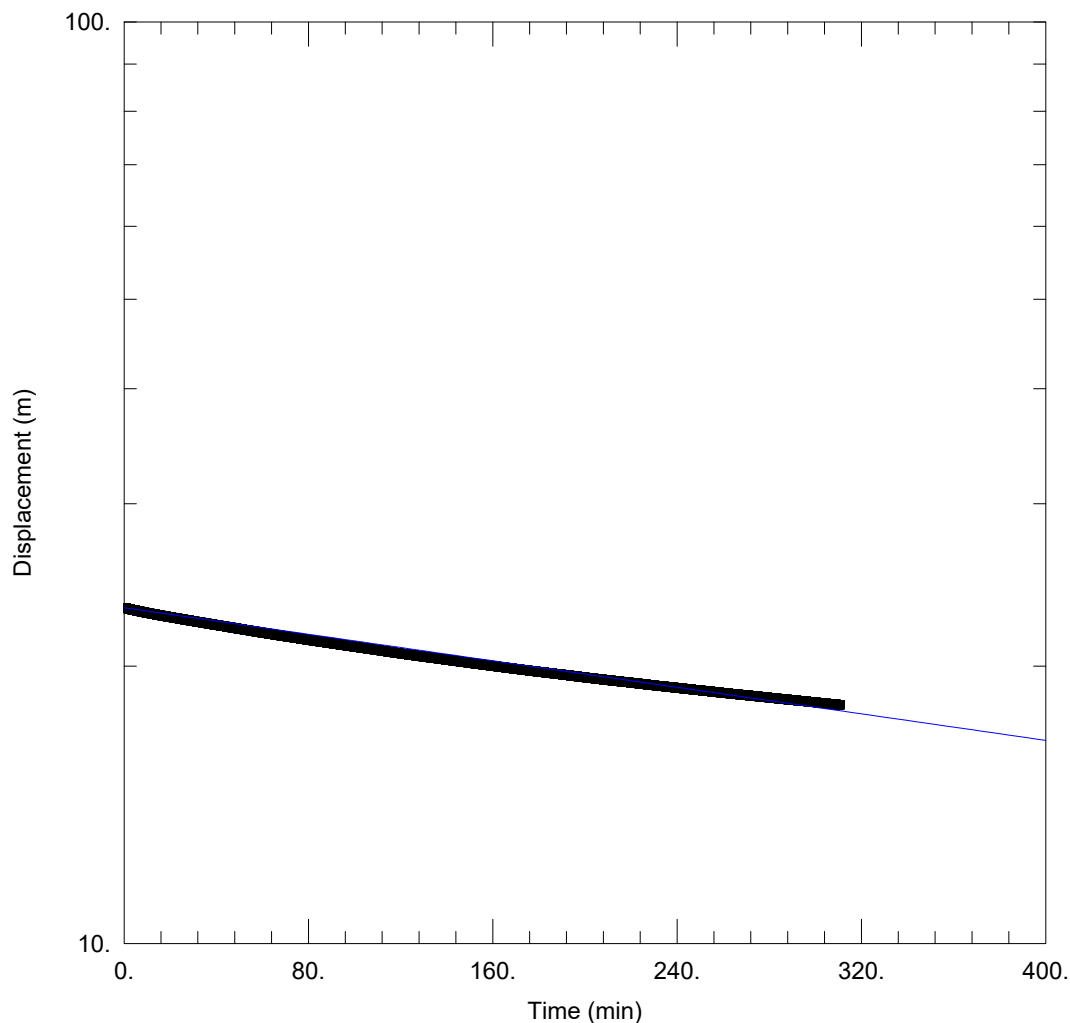
Saturated Thickness: 22.9 m Anisotropy Ratio (K_z/K_r): 1.

WELL DATA (Bru 95-6)

Initial Displacement: 1.918 m Static Water Column Height: 47.08 m
 Total Well Penetration Depth: 6.4 m Screen Length: 3.05 m
 Casing Radius: 0.0254 m Well Radius: 0.0254 m

SOLUTION

Aquifer Model: Confined Solution Method: Bouwer-Rice
 $K = 5.2E-5$ m/sec $y_0 = 1.92$ m



WELL TEST ANALYSIS

Data Set: C:\Users\dickins\Desktop\CanWhite Slug Testing\Bru 95-9.aqt
 Date: 01/25/21 Time: 15:04:10

PROJECT INFORMATION

Company: AECOM
 Client: CanWhite Sands
 Project: 60640258
 Location: Vivian MB
 Test Well: Bru 95-9
 Test Date: 2020-11-23

AQUIFER DATA

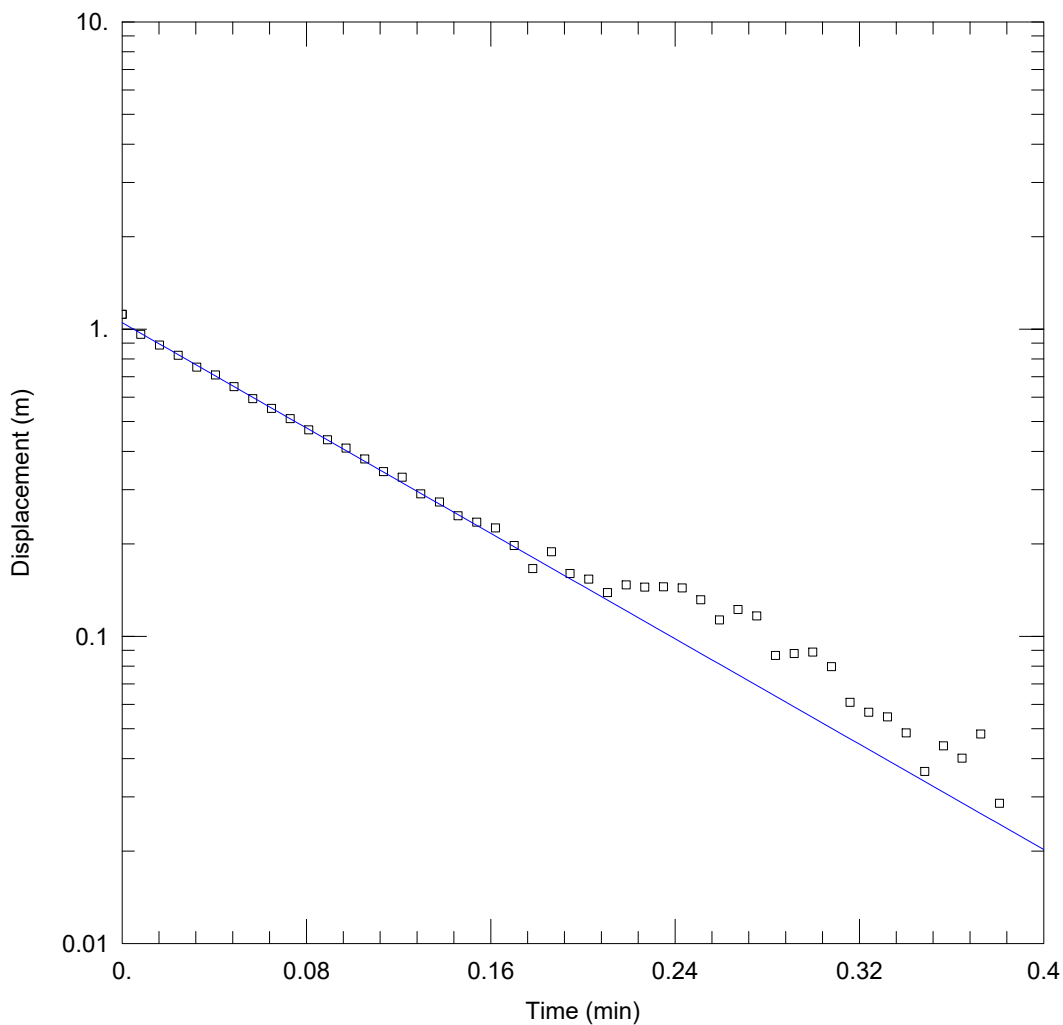
Saturated Thickness: 2.5 m Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (Bru 95-9)

Initial Displacement: 23.14 m Static Water Column Height: 40.92 m
 Total Well Penetration Depth: 1.51 m Screen Length: 0.31 m
 Casing Radius: 0.0254 m Well Radius: 0.0254 m

SOLUTION

Aquifer Model: Confined Solution Method: Bouwer-Rice
 $K = 2.8E-8$ m/sec $y_0 = 23.14$ m



WELL TEST ANALYSIS

Data Set: C:\Users\dickins\Desktop\CanWhite Slug Testing\Bru 96-1.aqt
 Date: 01/25/21 Time: 14:52:40

PROJECT INFORMATION

Company: AECOM
 Client: CanWhite Sands
 Project: 60640258
 Location: Vivian MB
 Test Well: Bru 96-1
 Test Date: 2020-11-20

AQUIFER DATA

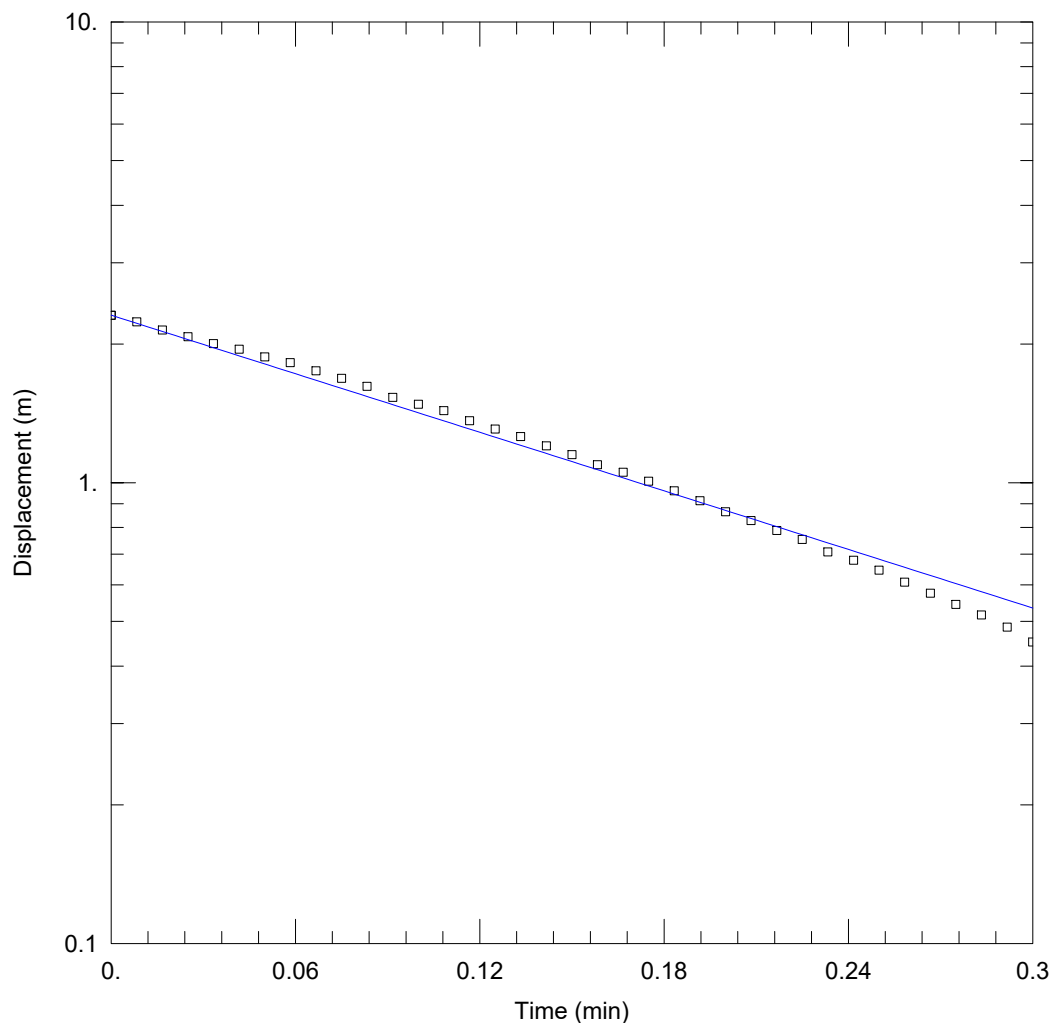
Saturated Thickness: 19.85 m Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (Bru 96-1)

Initial Displacement: 1.117 m Static Water Column Height: 45.61 m
 Total Well Penetration Depth: 6.23 m Screen Length: 3.05 m
 Casing Radius: 0.0254 m Well Radius: 0.0254 m

SOLUTION

Aquifer Model: Confined Solution Method: Bouwer-Rice
 $K = 6.2E-5$ m/sec $y_0 = 1.05$ m



WELL TEST ANALYSIS

Data Set: C:\Users\dickins\Desktop\CanWhite Slug Testing\Bru 96-2.aqt
 Date: 01/25/21 Time: 14:40:56

PROJECT INFORMATION

Company: AECOM
 Client: CanWhite Sands
 Project: 60640258
 Location: Vivian MB
 Test Well: Bru 96-2
 Test Date: 2020-11-20

AQUIFER DATA

Saturated Thickness: 8.25 m Anisotropy Ratio (Kz/Kr): 1.

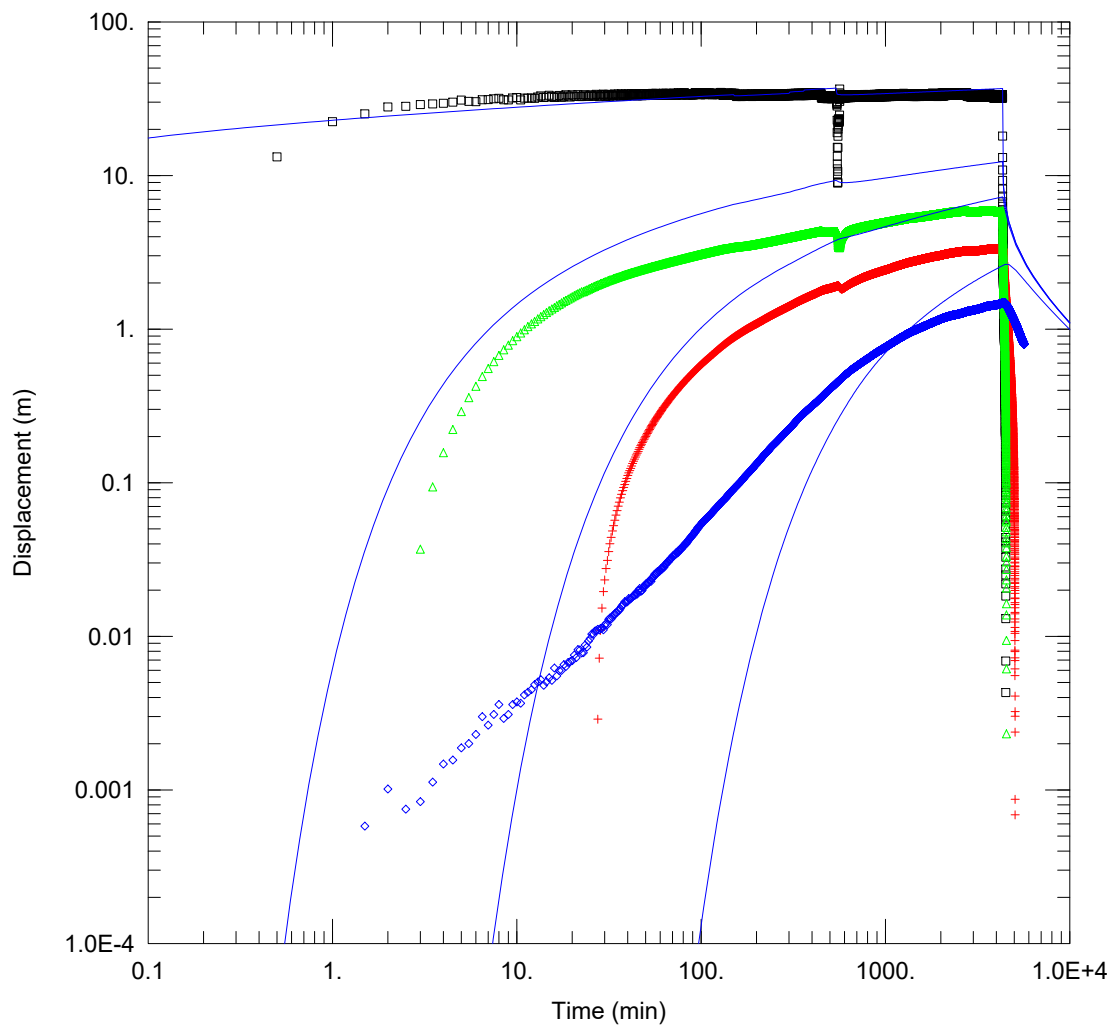
WELL DATA (Bru 96-2)

Initial Displacement: 2.309 m Static Water Column Height: 35.11 m
 Total Well Penetration Depth: 6.7 m Screen Length: 5.79 m
 Casing Radius: 0.0254 m Well Radius: 0.06 m

SOLUTION

Aquifer Model: Confined Solution Method: Bouwer-Rice
 $K = 1.5E-5$ m/sec $y_0 = 2.31$ m

Appendix E.2. Pumping Test Analyses



WELL TEST ANALYSIS

Data Set: C:\Users\dickins\Desktop\Pumping Test\Theis - Pumping Well Fit.aqt
 Date: 02/06/21 Time: 20:25:06

PROJECT INFORMATION

Company: AECOM
 Client: CanWhite Sands
 Project: 60640258
 Location: Vivian MB
 Test Well: Bru 95-7
 Test Date: Nov 28 2020 - Dec 1 2020

WELL DATA

Pumping Wells

Well Name	X (m)	Y (m)
Bru 95-7	681865.27	5527611.99

Observation Wells

Well Name	X (m)	Y (m)
□ Bru 95-7	681865.27	5527611.99
+ Bru 95-6	682199.25	5527624.2
△ Bru 95-8	681953	5527630
◇ Bru 96-1	683064	5527787

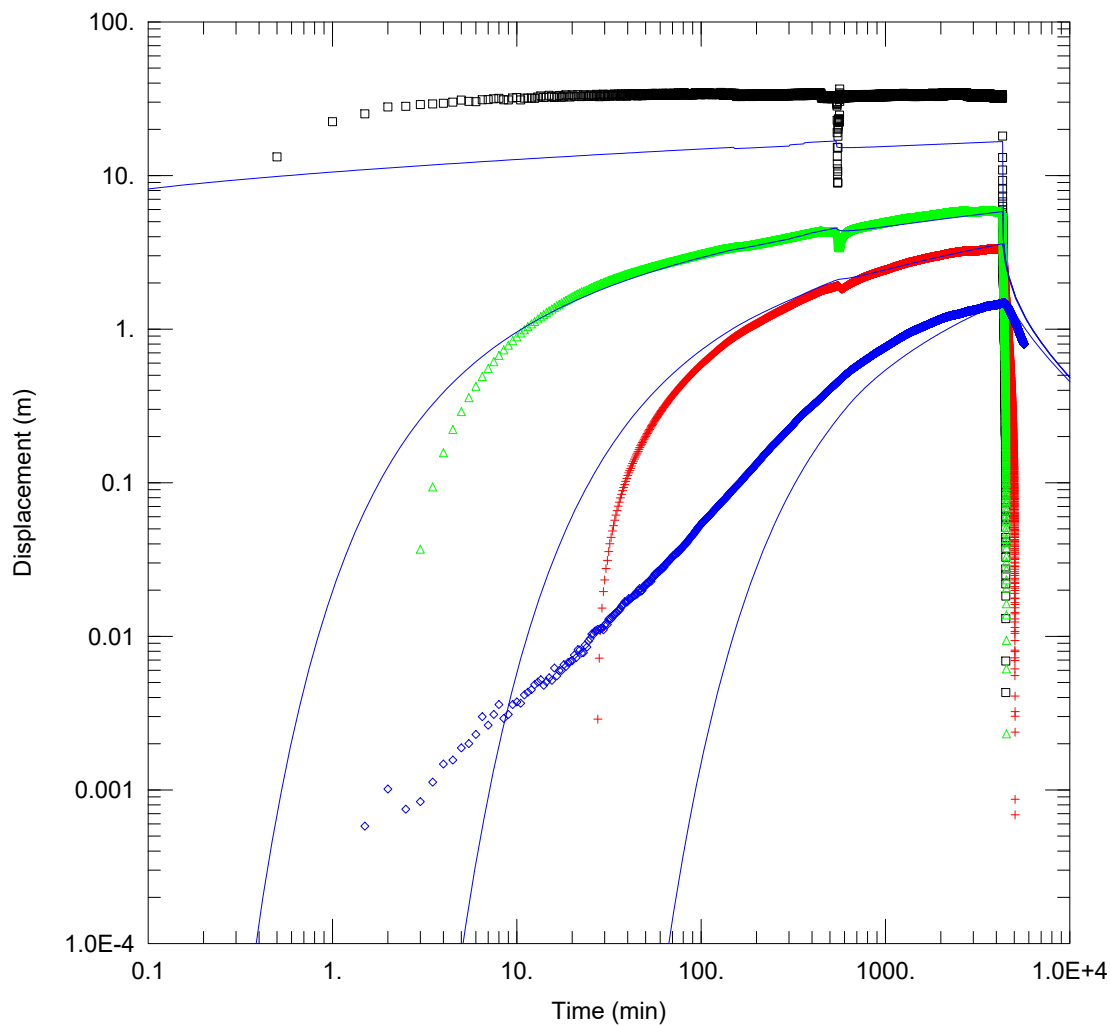
SOLUTION

Aquifer Model: Confined

Solution Method: Theis

T = 0.00097 m²/sec
 Kz/Kr = 1.

S = 0.00012
 b = 20.14 m



WELL TEST ANALYSIS

Data Set: C:\Users\dickins\Desktop\Pumping Test\Theis - Observation Well Fit.aqt
 Date: 02/06/21 Time: 20:14:44

PROJECT INFORMATION

Company: AECOM
 Client: CanWhite Sands
 Project: 60640258
 Location: Vivian MB
 Test Well: Bru 95-7
 Test Date: Nov 28 2020 - Dec 1 2020

WELL DATA

Pumping Wells

Well Name	X (m)	Y (m)
Bru 95-7	681865.27	5527611.99

Observation Wells

Well Name	X (m)	Y (m)
□ Bru 95-7	681865.27	5527611.99
+ Bru 95-6	682199.25	5527624.2
△ Bru 95-8	681953	5527630
◇ Bru 96-1	683064	5527787

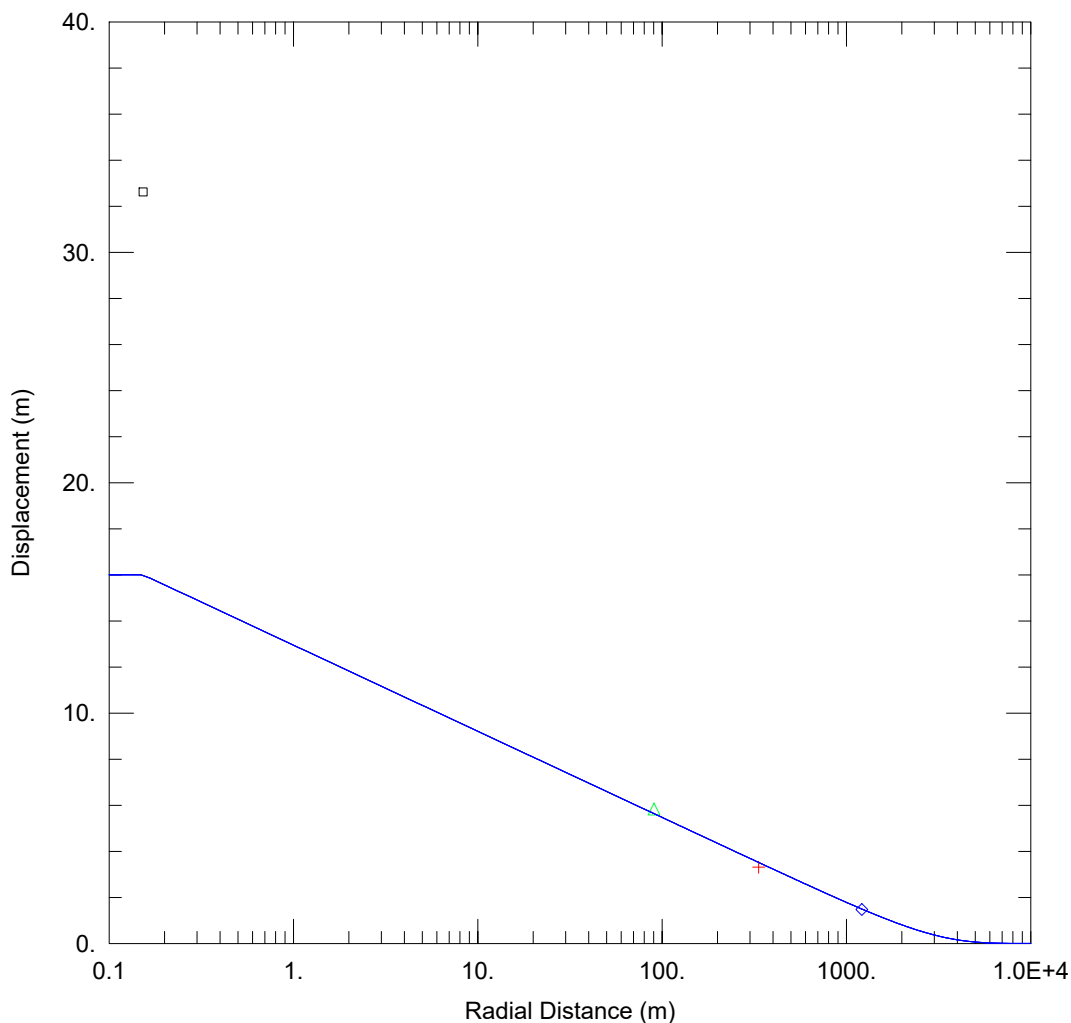
SOLUTION

Aquifer Model: Confined

Solution Method: Theis

T = 0.0022 m²/sec
 Kz/Kr = 1.

S = 0.00017
 b = 20.14 m



WELL TEST ANALYSIS

Data Set: C:\Users\dickins\Desktop\Pumping Test\Theis - Distance Drawdown.aqt
 Date: 02/07/21 Time: 11:01:16

PROJECT INFORMATION

Company: AECOM
 Client: CanWhite Sands
 Project: 60640258
 Location: Vivian MB
 Test Well: Bru 95-7
 Test Date: Nov 28 2020 - Dec 1 2020

WELL DATA

Pumping Wells

Well Name	X (m)	Y (m)
Bru 95-7	681865.27	5527611.99

Observation Wells

Well Name	X (m)	Y (m)
□ Bru 95-7	681865.27	5527611.99
+ Bru 95-6	682199.25	5527624.2
△ Bru 95-8	681953.74	5527630.417
◇ Bru 96-1	683064.23	5527787.13

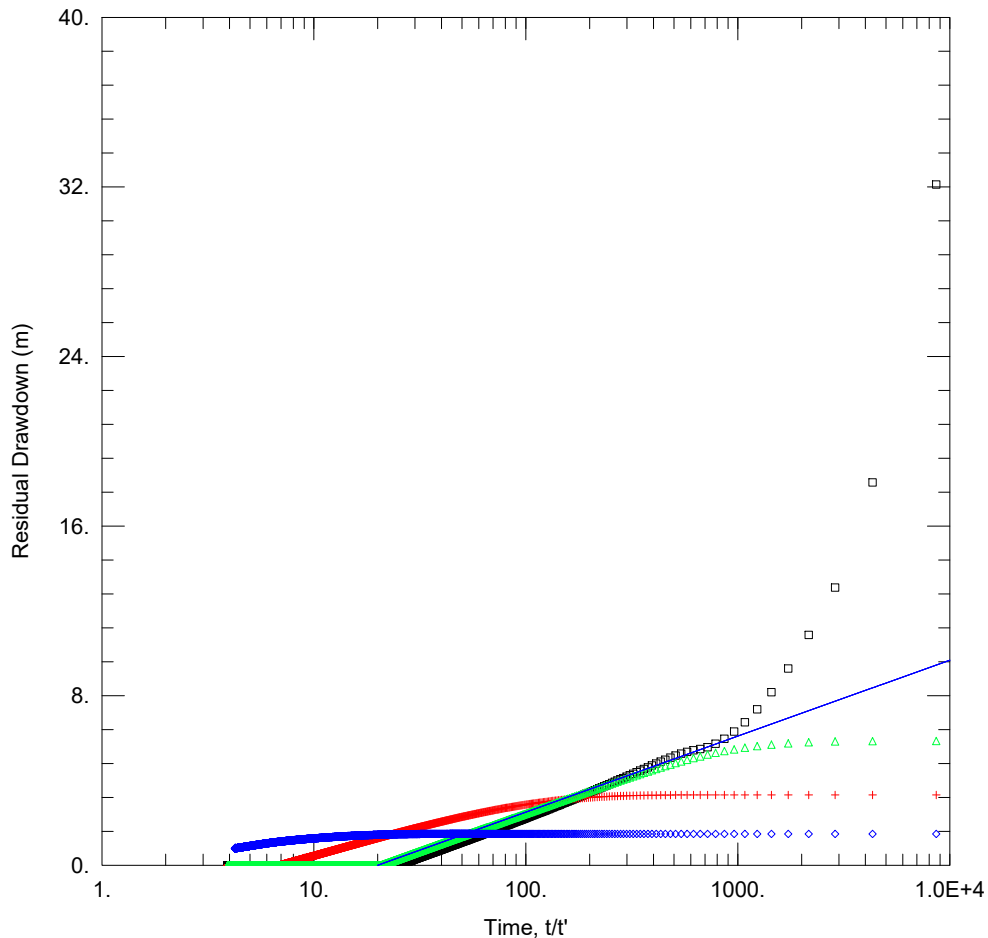
SOLUTION

Aquifer Model: Confined

Solution Method: Theis

T = 0.0023 m²/sec
 Kz/Kr = 1.

S = 0.00016
 b = 20.14 m



WELL TEST ANALYSIS

Data Set: C:\Users\dickins\Desktop\Pumping Test\Theis Recovery - Observation Well Fit.aqt
 Date: 02/07/21 Time: 11:44:14

PROJECT INFORMATION

Company: AECOM
 Client: CanWhite Sands
 Project: 60640258
 Location: Vivian MB
 Test Well: Bru 95-7
 Test Date: Nov 28 2020 - Dec 1 2020

AQUIFER DATA

Saturated Thickness: 20.14 m Anisotropy Ratio (Kz/Kr): 1.

WELL DATA

Pumping Wells

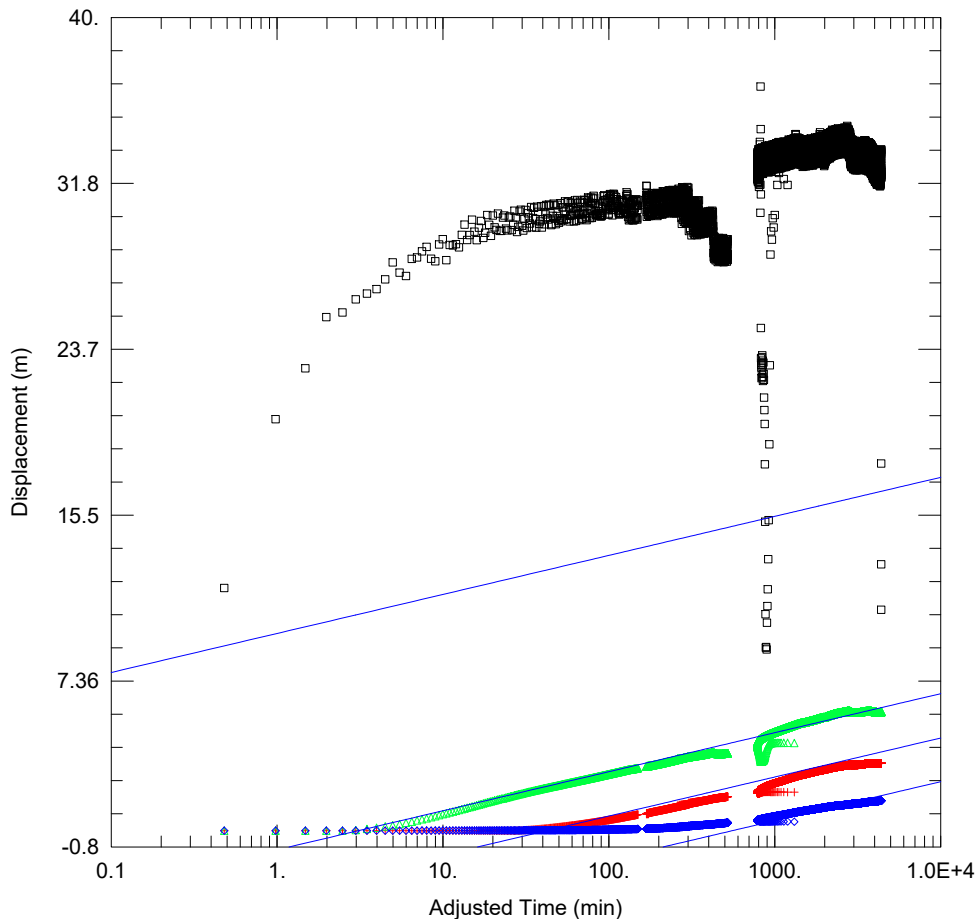
Well Name	X (m)	Y (m)
Bru 95-7	681865.27	5527611.99

Observation Wells

Well Name	X (m)	Y (m)
□ <u>Bru 95-7</u>	681865.27	5527611.99
+ <u>Bru 95-6</u>	682199.25	5527624.2
△ <u>Bru 95-8</u>	681953.742	5527630.417
◇ <u>Bru 96-1</u>	683064.234	5527787.13

SOLUTION

Aquifer Model: Confined Solution Method: Theis (Recovery)
 $T = 0.0012 \text{ m}^2/\text{sec}$ $S/S' = 20.$



WELL TEST ANALYSIS

Data Set: C:\Users\dickins\Desktop\Pumping Test\Cooper Jacob - Observation Well Fit.aqt
 Date: 02/07/21 Time: 11:11:43

PROJECT INFORMATION

Company: AECOM
 Client: CanWhite Sands
 Project: 60640258
 Location: Vivian MB
 Test Well: Bru 95-7
 Test Date: Nov 28 2020 - Dec 1 2020

AQUIFER DATA

Saturated Thickness: 20.14 m Anisotropy Ratio (Kz/Kr): 1.

WELL DATA

Pumping Wells			Observation Wells		
Well Name	X (m)	Y (m)	Well Name	X (m)	Y (m)
Bru 95-7	681865.27	5527611.99	□ Bru 95-7	681865.27	5527611.99
			+ Bru 95-6	682199.25	5527624.2
			△ Bru 95-8	681953.74	5527630.417
			◇ Bru 96-1	683064.23	5527787.13

SOLUTION

Aquifer Model: Confined Solution Method: Cooper-Jacob
 $T = 0.00224 \text{ m}^2/\text{sec}$ $S = 0.000114$

Appendix F. Laboratory Analytical Reports

Appendix F.1. Solid Phase Geochemistry Reports

QUANTITATIVE PHASE ANALYSIS OF TWO POWDER SAMPLES USING THE RIETVELD METHOD AND X-RAY POWDER DIFFRACTION DATA.

WO#: VA20C2173

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February 11, 2021

EXPERIMENTAL METHOD

The two samples of **WO# VA20C2173** were reduced to the optimum grain-size range for quantitative X-ray analysis ($<10\ \mu\text{m}$) by grinding under ethanol in a vibratory McCrone XRD Mill (Retsch GmbH, Germany) for 10 minutes. Continuous-scan X-ray powder-diffraction data were collected over a range $3\text{--}80^\circ 2\theta$ with $\text{CoK}\alpha$ radiation on a Bruker D8 Focus Bragg-Brentano diffractometer equipped with an Fe filter foil, $0.6\ \text{mm}$ (0.3°) divergence slit, incident- and diffracted-beam Soller slits and a LynxEye-XE detector. The long fine-focus Co X-ray tube was operated at 35 kV and 40 mA, using a take-off angle of 6° .

RESULTS

The X-ray diffractograms were analyzed using the International Centre for Diffraction Database PDF-4 using Search-Match software by Bruker. X-ray powder-diffraction data of the samples were refined with Rietveld program Topas 4.2 (Bruker AXS). The results of quantitative phase analysis by Rietveld refinements are given in Table 1. These amounts represent the relative amounts of crystalline phases normalized to 100%. The Rietveld refinement plots are shown in Figures 1 and 2.

Table 1. Results of quantitative phase analysis (wt.%)

Mineral	Ideal Formula	#1 VA20C2173-001 (Bru 121-1_174 to 179)	#2 VA20C2173-002 (Bru 146_189 to 194)
Calcite	CaCO_3		0.2
Iron	$\alpha\text{-Fe}$	0.1	0.1
Kaolinite	$\text{Al}_2\text{Si}_2\text{O}_5(\text{OH})_4$	0.8	0.2
Plagioclase	$\text{NaAlSi}_3\text{O}_8 - \text{CaAl}_2\text{Si}_2\text{O}_8$	0.9	0.7
Quartz	SiO_2	97.3	98.7
Siderite	$\text{Fe}^{2+}\text{CO}_3$	0.9	0.1
Total		100.0	100.0

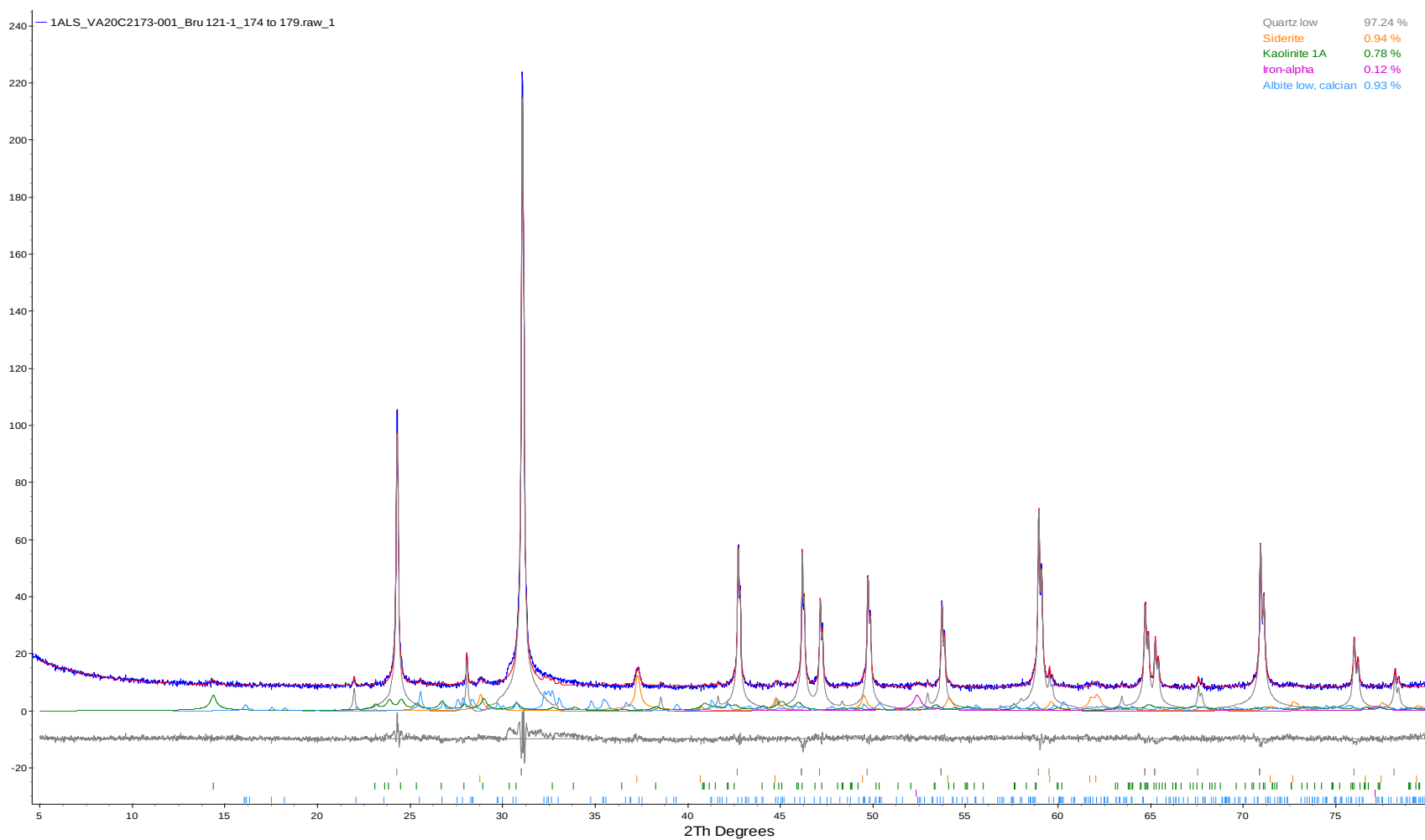


Figure 1. Rietveld refinement plot of sample **ALS Environmental #1: VA20C2173-001 (Bru 121-1_174 to 179)** (blue line - observed intensity at each step; red line - calculated pattern; solid grey line below - difference between observed and calculated intensities; vertical bars - positions of all Bragg reflections; vertical blue line - position of peak phase). Coloured lines are individual diffraction patterns of all phases.

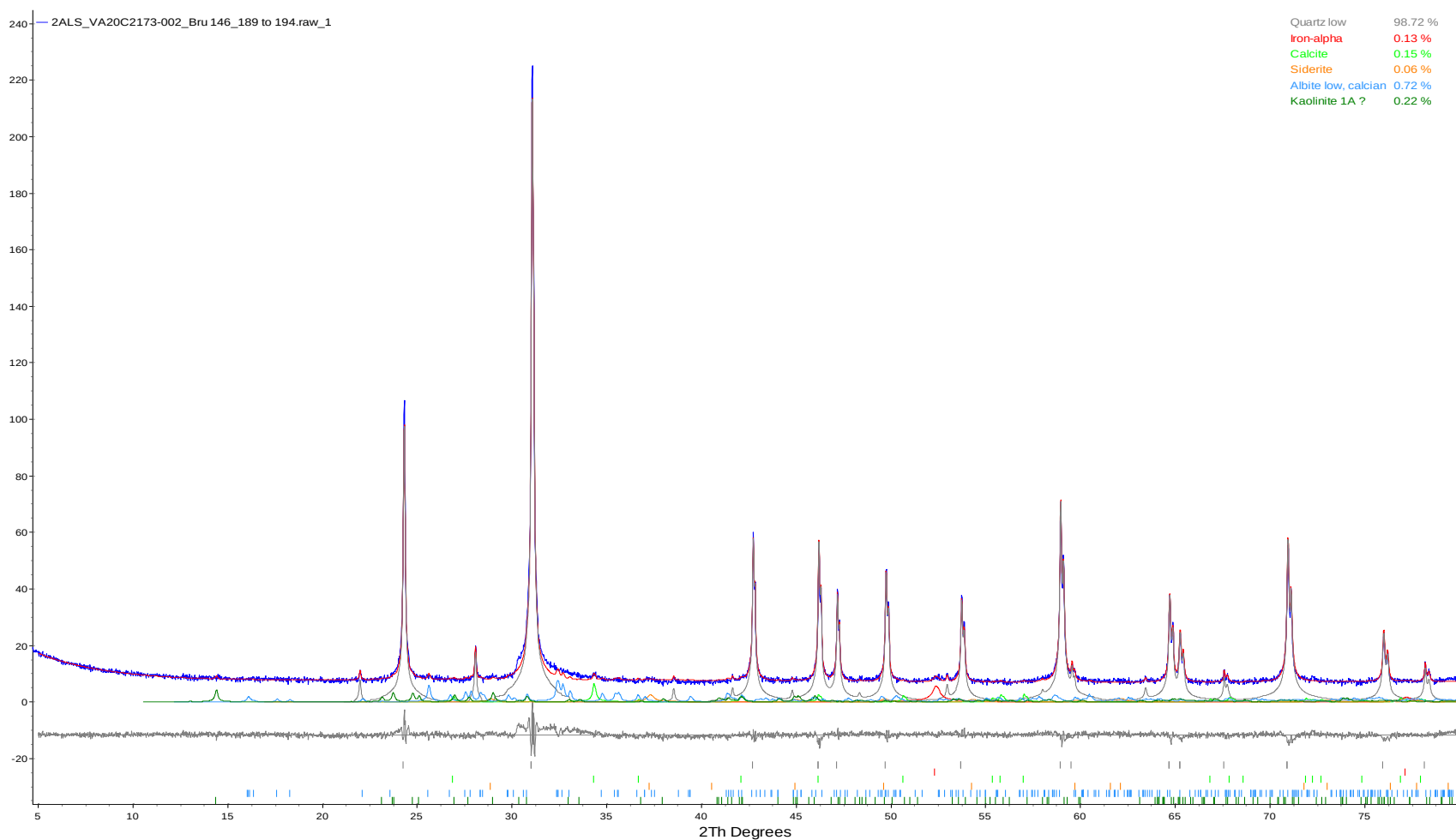


Figure 2. Rietveld refinement plot of sample **ALS Environmental #2: VA20C2173-002 (Bru 146_189 to 194)** (blue line - observed intensity at each step; red line - calculated pattern; solid grey line below - difference between observed and calculated intensities; vertical bars - positions of all Bragg reflections; vertical blue line - position of peak phase). Coloured lines are individual diffraction patterns of all phases.

QUANTITATIVE PHASE ANALYSIS OF SEVEN POWDER SAMPLES USING THE RIETVELD METHOD AND X-RAY POWDER DIFFRACTION DATA.

WO#: VA20C2029

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**Dept. of Earth, Ocean & Atmospheric Sciences
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January 20, 2021

EXPERIMENTAL METHOD

The seven samples of **WO# VA20C2029** were reduced to the optimum grain-size range for quantitative X-ray analysis ($<10\ \mu\text{m}$) by grinding under ethanol in a vibratory McCrone XRD Mill (Retsch GmbH, Germany) for 10 minutes. Continuous-scan X-ray powder-diffraction data were collected over a range $3\text{--}80^\circ 2\theta$ with $\text{CoK}\alpha$ radiation on a Bruker D8 Focus Bragg-Brentano diffractometer equipped with an Fe filter foil, $0.6\ \text{mm}$ (0.3°) divergence slit, incident- and diffracted-beam Soller slits and a LynxEye-XE detector. The long fine-focus Co X-ray tube was operated at 35 kV and 40 mA, using a take-off angle of 6° .

RESULTS

The X-ray diffractograms were analyzed using the International Centre for Diffraction Database PDF-4 and Search-Match software by Bruker. X-ray powder-diffraction data of the samples were refined with Rietveld program Topas 4.2 (Bruker AXS). The results of quantitative phase analysis by Rietveld refinements are given in Table 1 (separate file, *ALS Environmental (Bby) Results Jan 20 2021 – WO# VA20C2029 – 7 samples.xlsx*). These amounts represent the relative amounts of crystalline phases normalized to 100%. The Rietveld refinement plots are shown in Figures 1 – 7. Ideal formulae for the minerals present are given in Table 2.

The X-ray pattern of sample #1, Figure #1, shows the presence of some amorphous/nanoscale material that was accounted for by fitting the pattern with a broad calculated peak at about $30.7^\circ 2\theta$ (vertical line).

The X-ray patterns of samples #3, #5 and #7 show the presence of some unknown clay minerals, likely interstratified illite-smectite which could not be analyzed (see humps at around $10^\circ 2\theta$ fitted with calculated peaks) as well as some amorphous/nanoscale material that was accounted for by fitting the pattern with broad calculated peaks (see vertical lines in Figures).

Therefore, the results should be considered approximate.

Table 2.

Mineral	Ideal Formula
Anatase	TiO_2
Ankerite-Dolomite	$\text{Ca}(\text{Fe}^{2+}, \text{Mg}, \text{Mn})(\text{CO}_3)_2 - \text{CaMg}(\text{CO}_3)_2$
Calcite	CaCO_3
Clinocllore	$(\text{Mg}, \text{Fe}^{2+})_5\text{Al}(\text{Si}_3\text{Al})\text{O}_{10}(\text{OH})_8$
Goethite	$\alpha\text{-Fe}^{3+}\text{O}(\text{OH})$
Gypsum	$\text{CaSO}_4 \cdot 2\text{H}_2\text{O}$
Hematite	$\alpha\text{-Fe}_2\text{O}_3$
Illite-Muscovite 2M	$\text{K}_{0.65}\text{Al}_{2.0}\text{Al}_{0.65}\text{Si}_{3.35}\text{O}_{10}(\text{OH})_2 - \text{KAl}_2\text{AlSi}_3\text{O}_{10}(\text{OH})_2$
Kaolinite	$\text{Al}_2\text{Si}_2\text{O}_5(\text{OH})_4$
K-feldspar (orthoclase)	KAlSi_3O_8
Plagioclase (albite, calc.)	$\text{NaAlSi}_3\text{O}_8 - \text{CaAl}_2\text{Si}_2\text{O}_8$
Pyrite	FeS_2
Quartz	SiO_2
Rutile ?	TiO_2
Siderite	FeCO_3

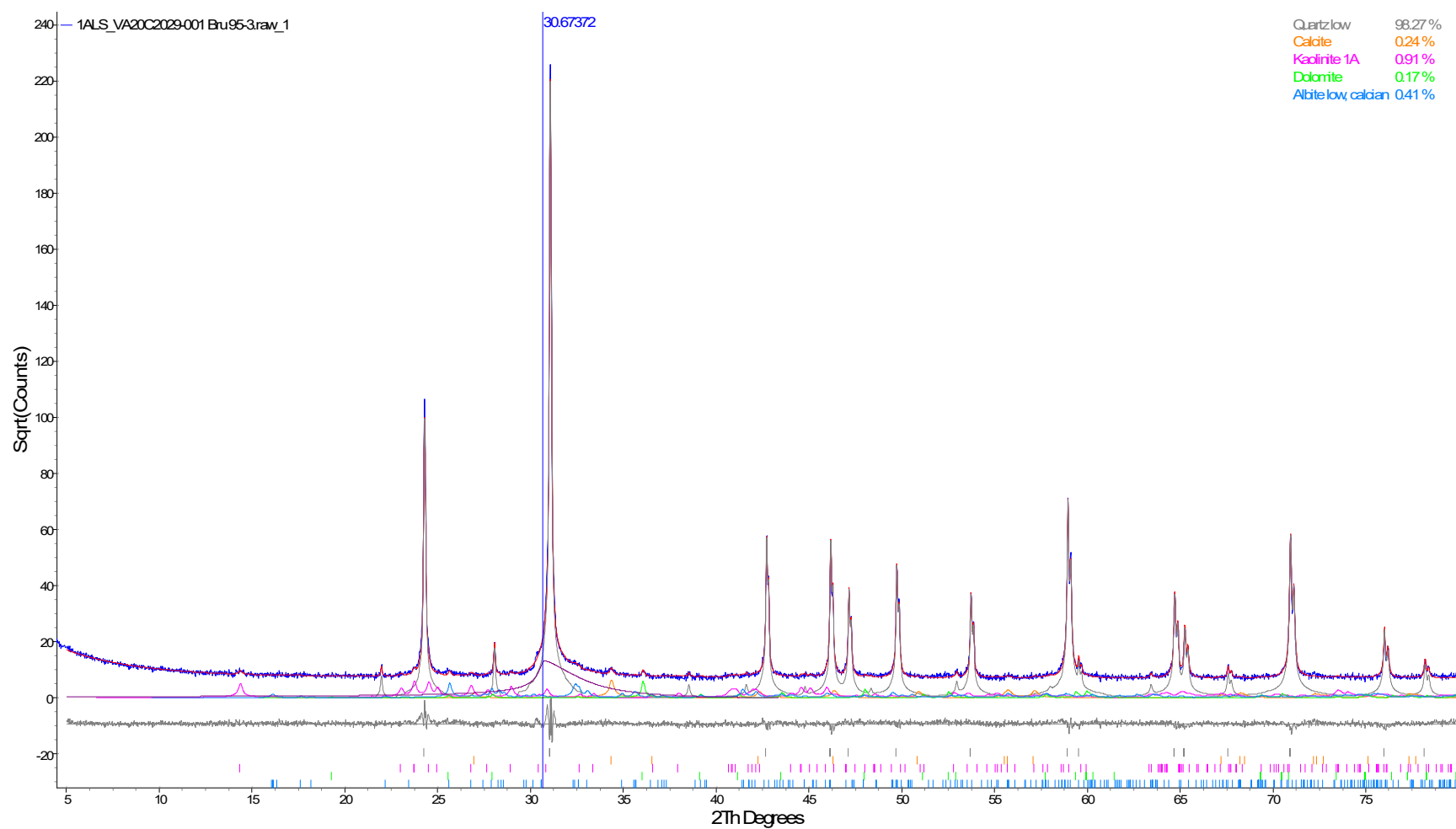


Figure 1. Rietveld refinement plot of sample **ALS Geochemistry #1: VA20C2029-001 Bru 95-3** (blue line - observed intensity at each step; red line - calculated pattern; solid grey line below - difference between observed and calculated intensities; vertical bars - positions of all Bragg reflections; vertical blue line - position of peak phase). Coloured lines are individual diffraction patterns of all phases.

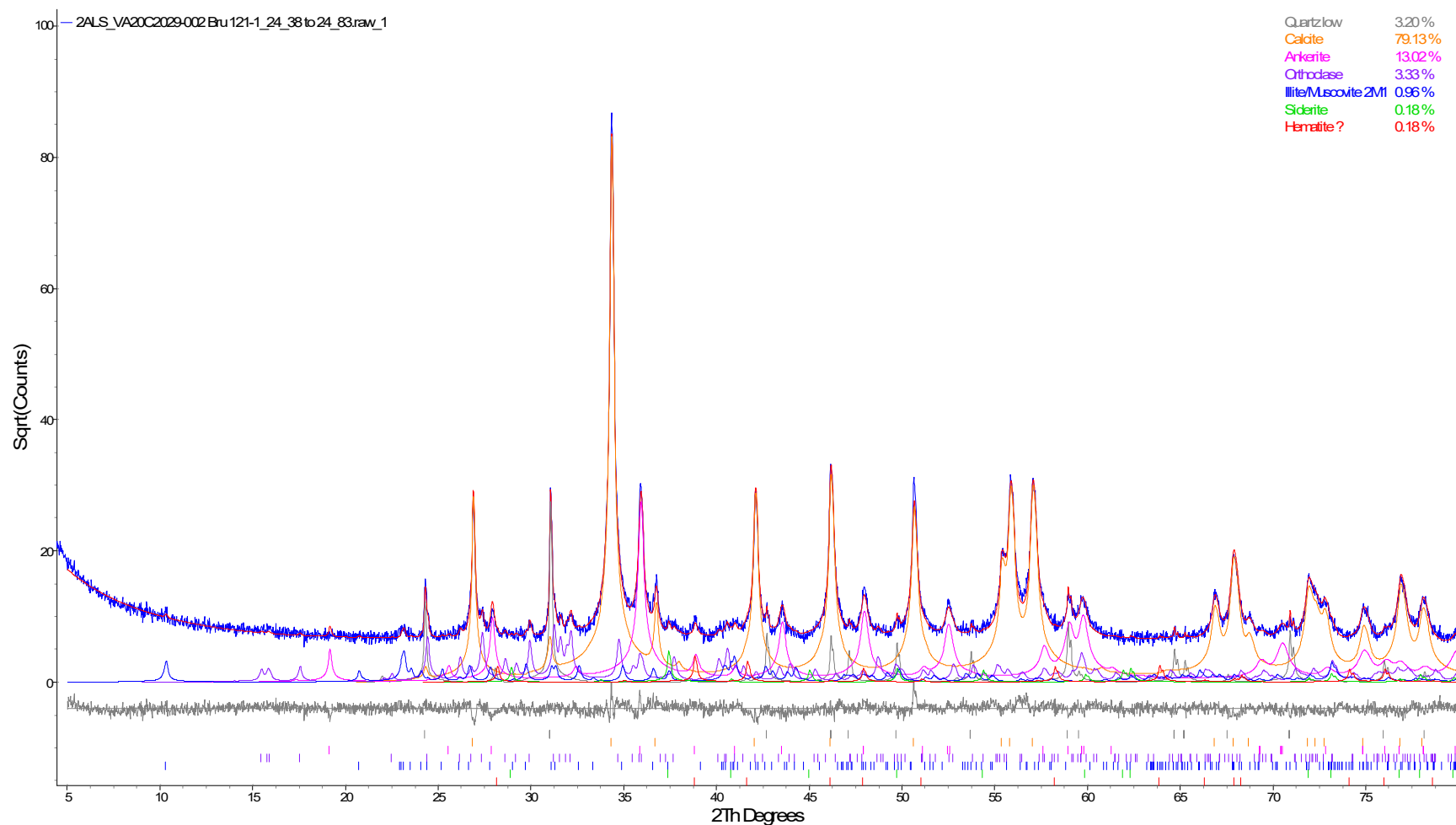


Figure 2. Rietveld refinement plot of sample **ALS Geochemistry #2: VA20C2029-002 Bru 121-1_24.38 to 24.83** (blue line - observed intensity at each step; red line - calculated pattern; solid grey line below - difference between observed and calculated intensities; vertical bars - positions of all Bragg reflections; vertical blue line - position of peak phase). Coloured lines are individual diffraction patterns of all phases.

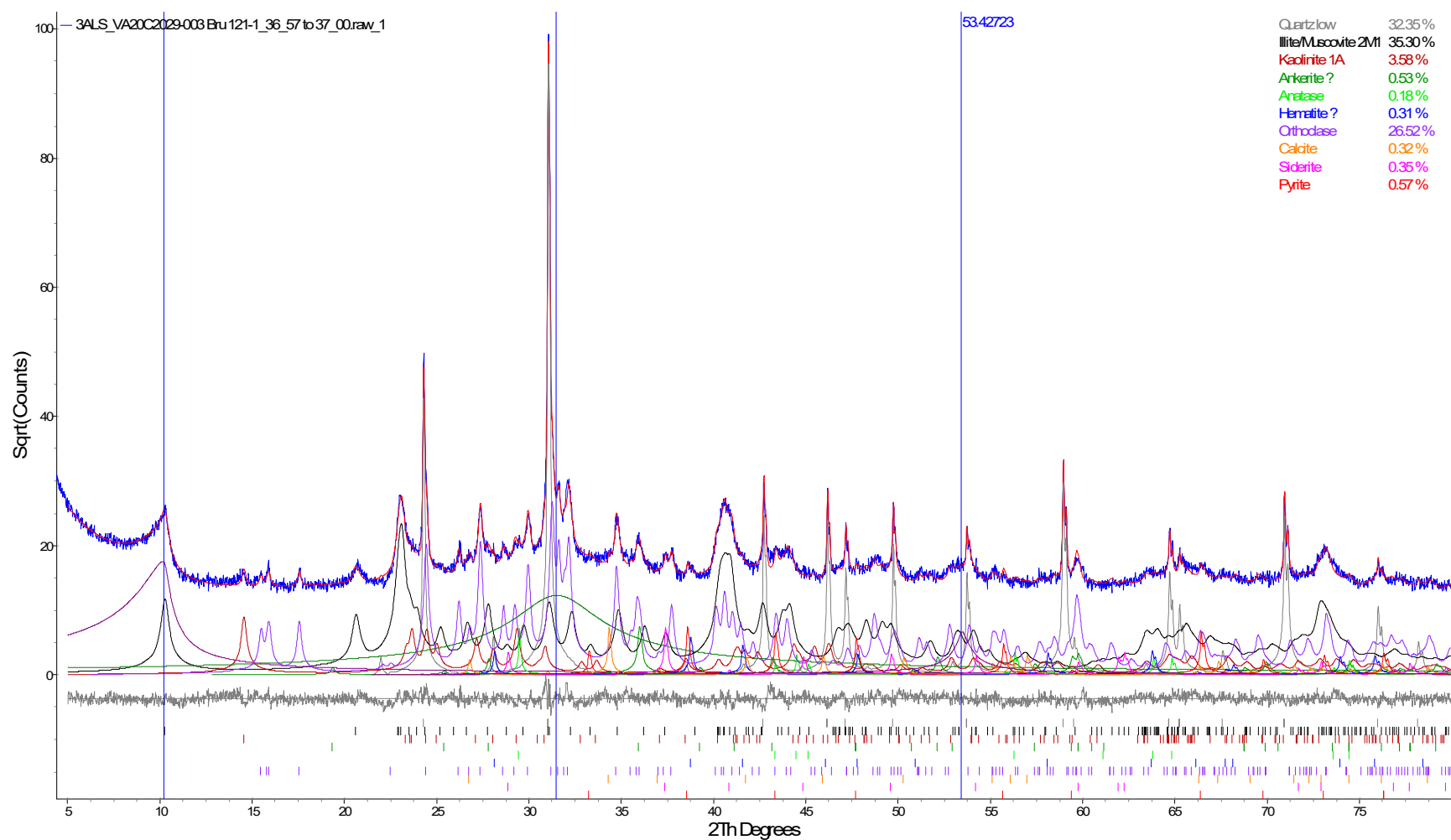


Figure 3. Rietveld refinement plot of sample **ALS Geochemistry #3: VA20C2029-003 Bru 121-1_36.57 to 37.00** (blue line - observed intensity at each step; red line - calculated pattern; solid grey line below - difference between observed and calculated intensities; vertical bars - positions of all Bragg reflections; vertical blue line - position of peak phase). Coloured lines are individual diffraction patterns of all phases.

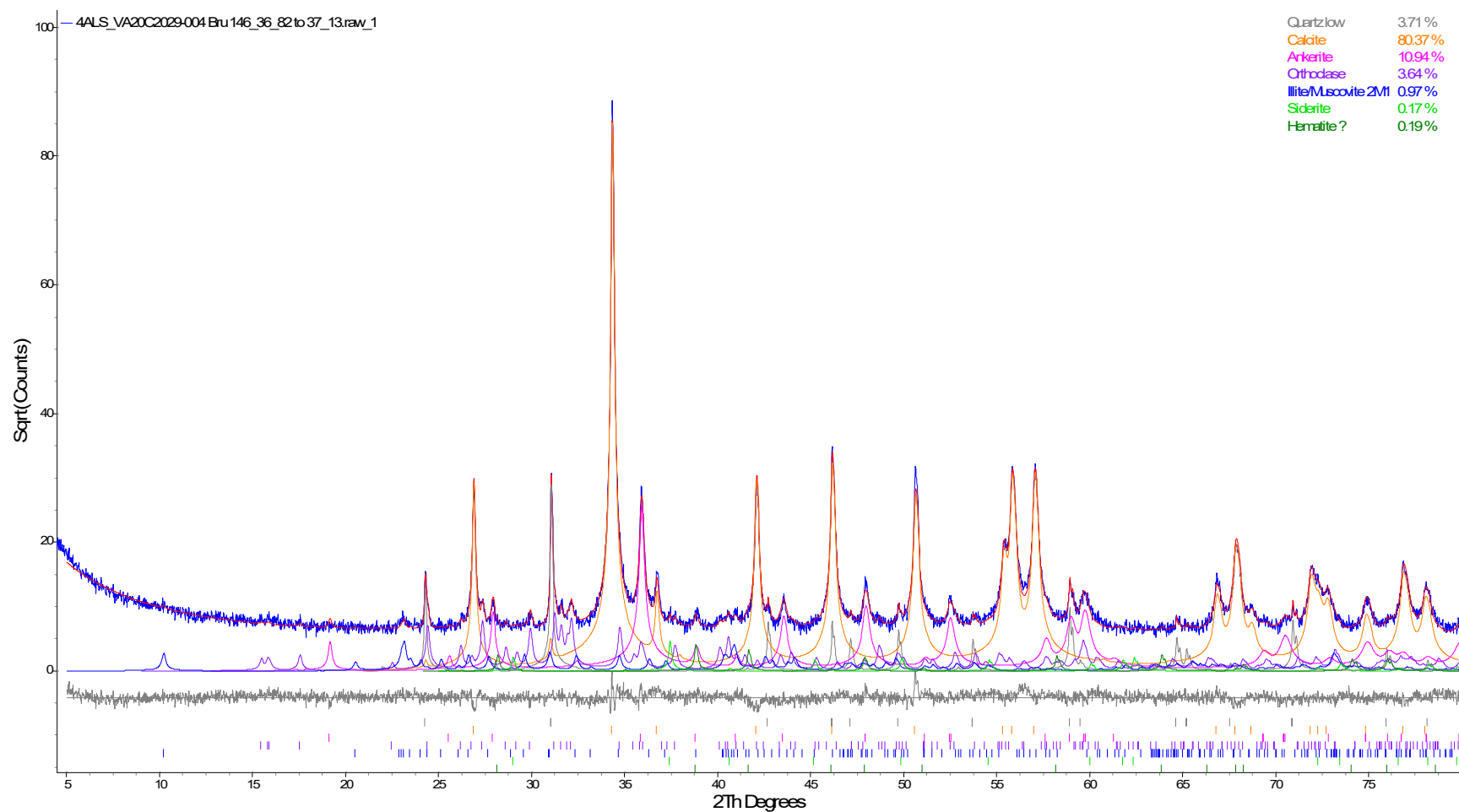


Figure 4. Rietveld refinement plot of sample **ALS Geochemistry #4: VA20C2029-004 Bru 146_36.82 to 37.13** (blue line - observed intensity at each step; red line - calculated pattern; solid grey line below - difference between observed and calculated intensities; vertical bars - positions of all Bragg reflections; vertical blue line - position of peak phase). Coloured lines are individual diffraction patterns of all phases.