L.S. SIMS & ASSOCIATES
Environmental Consulting

January 6, 2015

Mr. Joe Haberfeld, P.G.
Florida Department of Environmental Protection
Mail Station 3530
2600 Blair Stone Road
Twin Towers Office Bldg.
Tallahassee, FL. 32399

RE: **Class I, Injection Well System**
Medley Landfill, Medley, Florida
Permit No. 56401-021-UC

Dear Mr. Haberfeld:

The following information is provided with our request for Operational Testing Approval for the referenced injection well facility. Pursuant to requirements of Chapter 62-528, FAC and the construction and testing permit No. 56401-021-UC, the following information is provided to support the request for operational testing approval. The requirements for operational testing approval as listed in the construction and testing permit are shown below in italics. The discussion following each italicized permit condition (4.a - 4.m) satisfies that requirement.

4. Prior to operational testing approval, the following items must be submitted (with the request for operational testing approval) for Department review and approval:

a. Lithologic and geophysical logs with interpretations.

Lithologic and geophysical logs have been submitted during the construction process within weekly reports and were provided with interpretation within the Intermediate Casing Report, Nov. 2013, Final Casing Report Dec. 2013, Monitor Well Casing Report April 2014, and Mechanical Integrity Test (MIT) Report and Injection Test Request, June 2014.

b. A copy of the borehole television survey(s) or borehole televiewer log(s) of the injection well with interpretation.

Copies of the Video Surveys are provided as **Attachment A.** Video survey logs have previously been provided in the Final Casing Report, Dec. 2013, Monitor Well Casing Report April 2014, MIT Report and Injection Test Request, June 2014. No videos were submitted prior due to limited quantities of the original videos. The videos attached include the following:

1.) IW FRP Tubing inspection 0-710 and 710-1892
2.) IW 16" Final Casing Inspection 0-782' and 782'-2787'
3.) IW reamed hole inspection 2450'-3507'
4.) IW Pilot Hole 1995'-3515', 2865'-2447' and 1086'-1986'
5.) DZMW FRP Tubing inspection
6.) DZMW 16" Casing Inspection 0-472' and 472'-1864'
7.) DZMW pilot hole 1841'-1959'

c. Certification of mechanical integrity and interpreted test data.

The engineer's certification and drilling contractor's certifications are included as **Attachment B**. Descriptions of the MIT and Interpretation of the test data were included in the MIT Report and Injection Test Request, June 2014.

d. Results of the short-term injection test with interpretation of the data.

A summary of the injection test data was submitted with Weekly Report 45 in August, 2014 and in the daily log during the test. The full data set is provided in digital format as an Excel file which is located on the attached compact disc (CD) containing the electronic version of this submittal. In addition, the injection test data is displayed in graphical form as **Attachment C**. The injection test included 24 hours of background monitoring 18 hours of active injection, and 25 hours of recovery data collection. Pressures were monitored in the injection well, the injection well annulus, both the upper and lower zones in the Deep Monitoring Well and barometric pressure was recorded.

The injection portion of the test was conducted at a rate of 2,100 gallons per minute (gpm) for a period of 18 hours. The injection portion of the test was terminated after 18 hours because the water supply (storm-water retention pond) could not keep up with the injection pumping rate. The potentiometric surface of the two monitoring zones remained stable through the transitions from background, to pumping, to recovery. Barometric pressure remained stable throughout the entire test.

The comparatively high temperature of the water being injected caused an increase in the pressure in the annular space during the pumping portion of the test. The temperature differential was about 30° F. During the 18 hour pumping portion of the test, pressure was bled off from the annulus several times. After the pumping portion of the test, the temperature differential reduced as temperatures inside the casing reached equilibrium with formation temperatures; pressure in the annular space dropped considerably during the recovery portion of the test. We know the pressure changes in the annulus were due to temperature because the pressure was higher in the annulus than in the injection tubing at all times.

e. A description of the actual injection procedure including the anticipated maximum pressure and flow rate at which the well will be operated under normal and emergency conditions.

A description of the actual injection procedure is included in the Operation & Maintenance (O&M) Manual (**Attached**). The anticipated maximum injection pressure is expected to be approximately 65 psi at 2,100 GPM. Normal operation of the well will be at a much lower injection rate; typical injection rate during operational testing is expected to be up to 800 GPM with a well-head pressure of about 30 psi.

f. Information concerning the compatibility of the injected waste with fluids in the injection zone and minerals in both the injection zone and the confining zone.

The sequence of rocks in the injection zone and confining zone is made up of limestone and dolomite. Nothing in the planned injectate is incompatible with the minerals that make up limestone and dolomite. The injectate is also compatible with the native formation water which resembles sea water.

Table F Injection Zone and Effluent Water Quality Comparison

Analyte	Units	MLF Injection Zone 12/14/13	Medley LF Leachate
pH	mg/L	6.67	7.9
Sodium	mg/L	11,200	1,040
Aluminum	mg/L	< 0.0520	0.726
Arsenic	mg/L	< 0.0068	0.152
Barium	mg/L	0.0274	0.396
Chromium	mg/L	0.0027	0.202
Copper	mg/L	0.0035	0.0059
Manganese	mg/L	< 0.0125	0.132
Nickel	mg/L	0.0027	0.0798
Selenium	mg/L	< 0.0050	0.0027
Antimony	mg/L	< 0.0025	0.0118
Lead	mg/L	< 0.0050	0.004
Ammonia	mg/L	0.021	778
Chloride	mg/L	19,900	1,400
TDS	mg/L	41,000	6,520
Sulfate	mg/L	2,540	< 50
Fluoride	mg/L	1.3	1.9
Iron	mg/L	0.170	5.880
TKN	mg/L	1.7	862
Zinc	mg/L	< 0.010	0.0673
Total Phosphorous	mg/L	< 0.050	3.4
COD	mg/L	1,050	4,000
BOD	mg/L	18.9	310
Gross Alpha	pCi/L	15.2 ± 3.67	71 ± 44
Acetone	mg/L	< 0.0025	1.310
Cyanide	mg/L	< 0.005	0.014
Alkalinity	mg/L	71.4	NM
Potassium	mg/L	423	NM
Nitrate	mg/L	< 0.86	< 0.50

The pH of the fluids is similar (within 1.12 standard pH unit). Ammonia is higher than the native injection zone water as expected. The nitrate levels in the leachate may be higher than in the injection zone formation water but the concentration was below the detection limit for the test method and should not result in operational problems. The concentration of a few metals (Aluminum, Arsenic, Barium, Chromium, Manganese, Nickel and Iron) are higher than the injection zone fluids but these concentrations are still lower than the drinking water standards. The remaining principal constituents in the leachate are generally less than the levels in the injection zone formation water

g. Certification of completion of well construction from water well contractor and certification by the Engineer of Record that permit conditions are met.

Original signed and sealed copies of the engineer's certification are attached along with an Owner's certification (**Attachment B**). The Well Drilling Contractor's certification is also attached. There is no form for construction completion of a Class I injection well in Section 62-528.900, FAC.

h. Surface equipment (including piping, pressure gauges and flow meters, and all appurtenances) completion certified by the Engineer of Record.

A signed and sealed certification from the engineer of record is provided in **Attachment B**.

i. A survey indicating the exact location in metes and bounds of all wells authorized by this permit shall be provided prior to issuance of an operating permit. Draft operation and maintenance manual, including a description of surge and water hammer control and emergency discharge management plan procedures. The emergency discharge system must be fully constructed and operational (ready to operate) prior to approval of operational testing.

A signed and sealed survey drawing of the site is provided as **Attachment D**. The Operation & Maintenance Manual is also included as a separate attachment to this submittal.

j. Calibration certificates for pressure gauges and flow meters.

A copy of each calibration certificate that matches a gauge or instrument in the as-built drawings is provided in **Attachment E**. Calibration certificates for pressure gauges and flow meters used in construction and testing of the injection well were provided in the MIT Report and Injection Test Request June 2014. The calibration certificate for the flow meter used in the injection test is the only exception and that certificate is included with the attached.

k. Signed and sealed record "as-built" engineering drawings of the injection well system including all well construction, subsurface and surface piping and equipment, and appurtenances.

Signed and sealed copies of the "as-built" drawings are included in the O&M Manual but is being shipped under separate cover due to size.

l. Demonstration of confinement and definition of the injection and confining sequences shall utilize data collected during the drilling, logging and testing of the injection monitoring wells. This submittal shall be prepared, signed, and sealed by a Florida Registered Professional Geologist or appropriately qualified Professional Engineer.

The data used to demonstrate confinement came from the following tests/sources including the following: drilled sample cuttings, conventional core testing, geophysical logs, packer tests, and the injection test. Discussions regarding confinement for the injection zone regarding drilled sample cuttings, conventional cores, packer tests and geophysical logs were presented in the Final Casing Report, Dec. 2013 and the Monitor Well Casing Report, April 2014. The injection test data confirmed the suitability of the confining sequence when no significant changes in either the upper monitoring zone or lower monitoring zone were observed before during or after the pumping portion of the injection test. The potentiometric surface in the upper and lower monitoring zones remained generally stable throughout the injection test.

The MLF IW-1 testing program has identified a sequence of rocks between 1,962 and 2,728 in the Avon Park Formation and between 2,728 and 2800 feet in the upper Oldsmar Formation that serve as the Primary Confining Unit separating the injection zone from the overlying underground source of drinking water (USDW). Using water quality data collected during the packer tests and TDS derived from the geophysical logs, the base of the USDW was identified at approximately 1,841 feet bls. The basic geologic and hydrogeologic units are shown in the tables below.

Table L-1 Geologic Units Identified Using Site Logs

Depth (bls*)	Geologic Units
0 to 230	Miami, Ft. Thompson, Key Largo, Tamiami Formations/Limestones
230 to 1080	Hawthorn Group
1080 to 1120	Suwannee Limestone
1120 to 2,728	Avon Park Formation
2,728 to 3,515	Oldsmar Formation

Table L-2 Hydrogeologic Units Identified Using Site Logs

Depth (bls*)	Hydrogeologic Units
0 to 230	Surficial Aquifer System
230 to 1080	Confining Unit
1080 to 1962	Upper Floridan Aquifer System
1962 to 2800	Primary Confining Unit
2800 to 3515	Lower Floridan Aquifer System

* bls -Feet Below Land Surface

The testing program collected data to support this in a variety of ways. The tests to verify confinement included physical examination of the drilled sample cuttings and cores, packer pumping tests evaluation, core analysis, geophysical log interpretation, video survey analysis, RTS analysis and the injection test analysis.

L.1 Drilled Sample Cuttings

Samples of the cuttings were collected during the construction of IW-1 and MW-1 at 10-foot intervals. The sample cuttings were examined using a binocular microscope and described in detail to establish the nature of the formation being drilled. Based on the microscopic examination by the site geologists, drilled sample cuttings collected while drilling the sections of borehole from 1,962 to 2,728 in the Avon Park Formation and between 2,728 and 2800 feet in the upper Oldsmar Formation generally exhibited relatively low visible porosity. In addition, the rocks were identified as dense micritic limestones, dolomitic limestones, dolostones and dolomites typical of deposits with low hydraulic conductivity.

L.2 Packer Tests

The construction and testing program for the MLF injection well system included the performance of 13 packer tests. The details of these tests have been provided in previous correspondence and reports (Final Casing Report Dec. 2013, Monitor Well Casing Report April 2014).

The packer test results were utilized to determine the hydraulic characteristics of the Primary Confining Unit and to evaluate potential monitoring zones. The table below summarizes the depth and interval of single packer and straddle packer tests completed in the injection well pilot-hole. Horizontal hydraulic conductivity (K) and transmissivity (T) estimates are also included in the table.

Table L-2.1 Summary of Packer Tests

Medley IW-1 and DMW Packer Test Program							
Packer Test No.	Date	Depth Interval Tested	Q gpm	Recovery K		Recovery T	
				(cm/sec)	(ft/day)	(cm^2/sec)	(ft^2/day)
1	10/24/13	1614-1643	82	$5.4x10^{-4}$	1.5	0.48	44
2	10/27/13	1839-1858	27	$1.3x10^{-4}$	0.36	0.073	6.8
3	11/01/13	1796-1824	24	$8.4x10^{-5}$	0.24	0.071	6.6
4	11/02/13	1818-1846	18	$5.8x10^{-5}$	0.17	0.05	4.6
5	11/24/13	2699-2713	58	$6.4x10^{-4}$	1.8	0.27	26
6	11/26/13	2762-2776	80	$1.4x10^{-3}$	3.9	0.58	54
7	11/30/13	2803-2816	82	$2.2x10^{-3}$	6.1	0.86	80
8	12/13/13	2803-2820	82	$2.2x10^{-3}$	6.3	1.2	110
9	12/14/13	2720-2737	1.5	$2.4x10^{-5}$	0.068	0.012	1.2
10	12/15/13	2651-2668	30	$2.3x10^{-4}$	0.65	0.12	11
11	12/15/13	2610-2627	5.8	$5.6x10^{-5}$	0.16	0.029	2.7
12	12/16/13	2225-2239	14	$9.6x10^{-5}$	0.27	0.05	4.6
1 MW	3/16/14	1845-1862	9	$5.6x10^{-6}$	0.016	0.029	2.7
2 MW	3/17/14	1906-1923	51	$5.2x10^{-4}$	1.5	0.27	25
3 MW	3/18/14	1985-2002	13	$8.9x10^{-5}$	0.25	0.046	4.3

Each of the packer tests isolated a 17 or 18-foot long vertical section of the pilot-hole. The hydraulic conductivity and transmissivity estimates by L.S. Sims & Associates for the tests are also included on Table L-2.1. Details of the packer test procedures, analyses and results are presented in the reports noted above (Final Casing Report Dec. 2013, Monitor Well Casing Report April 2014).

The packer testing program showed most of the tested intervals within the Avon Park and upper Oldsmar Formations should be suitable for confinement of the injection zone.

L.3 Video Survey

The TV survey also confirms the lithology present in the well. A large diameter section of borehole indicative of less indurated limestone was present from 2,820 feet to 3,040 feet BPL. Dolomite and chert beds were present from 2,028 feet to 2,280 feet BPL. Highly fractured sections are clearly visible below 2,850 feet to the deepest significant cavernous zones at 3312 feet. The video generally becomes cloudy below 3350 and too cloudy to view any details below 3,400 feet unless using the camera's side-view capability. Visibility problems during the video were due to the inability to induce sufficient flows to clear water with the higher suspended solids below the most permeable sections of the borehole. The video survey verified the presence of injection zones from 2,850 to 3,515 feet BPL.

L.4 Core Collection and Analysis

Core samples were used to obtain undisturbed (compared to drilled sample cuttings) samples of the formation. Core samples were also sent to a laboratory where hydraulic conductivity (K) values were measured. The details of the core collection procedures have been provided in previous correspondence and reports (L.S. Sims & Associates, Final Casing Report Dec. 2013, Monitor Well Casing Report April 2014).The table below summarizes the depth and interval of the cores collected from IW-1 and the Deep Monitoring Well. Selected samples from several cores were taken from the interval between 1,628 feet and 2,905 feet bls for laboratory analysis. The core lab report is summarized in the table.

Table L-4.1 Summary of Core Data

Core #	Depth Interval		Recovery in Feet	Lab Sample	Hydraulic Conductivity (K)	
	From	To			Vertical	Horizontal
1	1623	1643	17	1628	8.0×10^{-04}	2.9×10^{-03}
2	1847	1858	11			
3	1892	1912	12			
4	1950	1962	12	1955	6.1×10^{-06}	1.3^{-05}
5	2613	2624	2.5	2614	NM	1.9×10^{-05}
6	2703	2713	2	2703	6.2×10^{-06}	5.0×10^{-06}
7	2764	2776	8	2765	9.3×10^{-04}	1.2×10^{-03}
8	2793	2797	0			
9	2805	2816	8	2810	7.9×10^{-04}	8.2×10^{-04}
10	2850	2860	5	2857	3.0×10^{-04}	3.7×10^{-04}
11	2900	2915	6	2905	1.5×10^{-03}	9.7×10^{-04}
12	2930	2950	4			
13	2950	2960	0			
Dual Zone Deep Monitor Well						
1	1866	1878	12			
2	1937	1948	11	1943	1.7×10^{-03}	2.2×10^{-03}
3	2027	2041	7	2041	4.2×10^{-05}	6.7×10^{-05}

The core results show comparatively low vertical K values for sections of the formation comprising the Primary Confining Unit. A copy of the core lab report is attached.

L.5 Geophysical Logs

The geophysical logs conducted on the pilot-hole include; natural gamma ray, caliper, fluid conductivity, temperature (static and ΔT), flowmeter (dynamic and static), dual induction, and sonic. The logs were correlated with the lithologic data derived from the cutting and core samples. Log interpretations have been provided in the Intermediate Casing Report, Nov. 2013, Final Casing Report Dec. 2013, Monitor Well Casing Report April 2014, and Mechanical Integrity Test (MIT) Report and Injection Test Request, June 2014

In general, each geophysical log by itself is not definitive, but when looked at collectively, the geophysical logs confirm the presence of a thick confining sequence in the Avon Park Formation and upper Oldsmar Formation.

L.6 Radioactive Tracer Survey

The details of the RTS have been provided in previous correspondence and reports (L.S. Sims & Associates, Mechanical Integrity Test (MIT) Report and Injection Test Request, June 2014). While the RTS is designed primarily to provide evidence of mechanical integrity, it also demonstrates the presence of confinement or absence of fluid movement behind the borehole wall or through the formation. The RTS did not detect the vertical migration of any fluids and demonstrated that the confining sequence of rocks effectively prevents vertical migration of fluids past the depth of the casing shoe at 2,778 bls.

L.7 Injection Test

As described in Section 3 of this report, no indication of a change in pressure was observed in the either the upper or lower monitor zone before, during or after active injection of fluids during the injection test. The absence of a response to injection in either of the two monitoring zones demonstrates that the sequence of rocks between 1,962 and 2,778 provide effective confinement.

A thorough review of available data from all of the tests described in this section confirms the presence and effectiveness of a thick confining sequence of rocks between 1,962 and 2778' bls. The confining sequence of rocks collectively possesses sufficient thickness and areal extent, and appropriate lithologic and hydrologic characteristics to prevent the upward migration of injected fluids from the injection zone resulting in impacts to the USDW.

m. Background water quality data from the monitoring and injection zones, analyzed for primary and secondary drinking water standards (62-550, F.A.C.) and minimum criteria parameters (62-520, F.A.C.) as attached. (The results submitted as part of the Facility's request for Department authorization to conduct injection testing may be referenced.)

The background water quality data for the injection zone and both monitoring zones was provided in the Injection Test Request, June 2014

n. Other data obtained during well construction needed by the Department to evaluate whether the well will operate in compliance with Department Rules.

There is no "other data" requested at this time. In the event FDEP requests additional information prior to authorizing operational testing approval, we will respond to that request as soon as possible.

If you have any comments or questions or require additional information please contact me at (321) 504-4046.

Sincerely,
L.S. Sims & Associates, Inc.

James E. McGrath, P.G.

Attachment A

Video Survey Logs

Attachment B
Engineer's Certification and Drilling Contractor's Certifications

WASTE MANAGEMENT

OPERATIONAL TESTING REQUEST
MEDLEY LANDFILL
CLASS I INJECTION WELL SYSTEM
MEDLEY, FLORIDA
FDEP PERMIT NO. 563401-021-UC UC

"I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, this information submitted is to the best of my knowledge and belief, true accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations."

_____ Date: 12-18-14

Mr. Tim Hawkins
President
Waste Management Inc. of Florida

PROFESSIONAL GEOLOGIST'S CERTIFICATION

for

MEDLEY LANDFILL CLASS I INJECTION WELL SYSTEM
PERMIT No. 563401-021-UC

OPERATIONAL TESTING REQUEST
CERTIFIED DOCUMENTS

MEDLEY LANDFILL, INC.
MEDLEY, FLORIDA

December 2014

"This submittal has been prepared under the responsible charge of the undersigned and the geology contained herein has been found to conform to commonly accepted procedures consistent with applicable standards of practice pursuant to Chapter 492 of the Florida Statutes. Moreover, I certify that **L.S. Sims & Associates, Inc.** holds an active State of Florida certificate of authorization No. GB298 to provide these geological services."

L.S. Sims & Associates, Inc.
1530 US Highway 1
Rockledge, Florida 32955

James E. McGrath, P.G.
State of Florida P.G. No.: PG961

12/30/14
Date

L.S. SIMS
& ASSOCIATES
Environmental Consulting

December 29, 2014

Mr. Joe Haberfeld, P.G.
Florida Department of Environmental Protection
Mail Station 3530
2600 Blairstone Road
Twin Towers Office Bldg.
Tallahassee, FL. 32399

RE: **Class I, Injection Well System**
Medley Landfill, Medley, Florida
Permit No. 563401-021-UC

Dear Mr..Haberfeld:

This is to certify that the construction of the injection well IW-1, deep monitor well DMW-1 and surface equipment, at the referenced facility have been completed in accordance with the plans and specifications submitted and approved by the Florida Department of Protection and in accordance with Chapter 62-528 of the FAC.

If you should have any questions or wish to discuss this further, please call.

Sincerely,

12/29/14

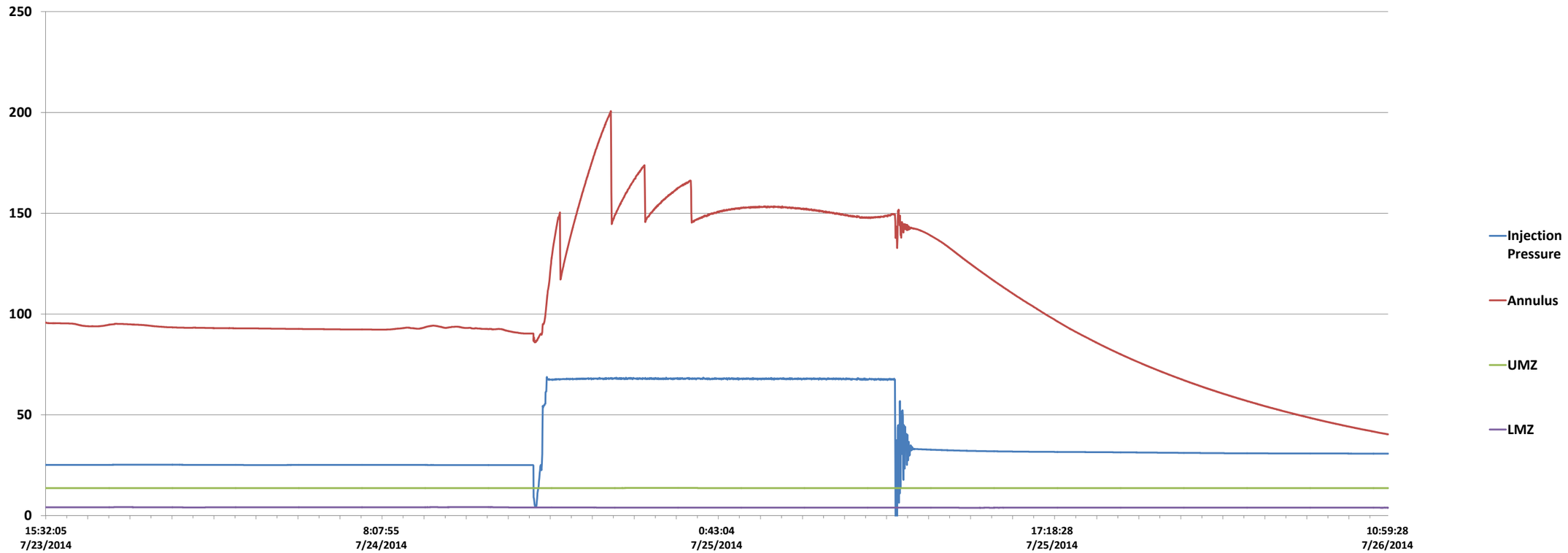
Roger E. Mayfield, P.E.
Registration No. 0046092

1530 U.S. Highway 1 Rockledge, Florida 32955 Phone (321) 504-4046 Fax (321) 504-4035

Attachment C

Injection Test Graph

MEDLEY LANDFILL NJECTION TEST SUMMARY - PERMIT NO. 56401-0210-UC



Attachment D

Operation & Maintenance Manual

Attachment E

Calibration Certificates

WATER SPECIALTIES
PROPELLER METER

CERTIFIED TEST REPORT

CUSTOMER: YOUNGQUIST BROTHERS
MODEL NO: ML-03
METER SERIAL NO: 963052-12

CONFIGURATION

METER INSIDE DIAMETER: 11.25
DIAL: GAL X 1000 5000 GPM
GEARS: 37T / 22S
TOTALIZER GEARS: 256 / 1
ACTUAL METER INDEX: 1.3177
TEST DATE: 05/07/2014
TEST FACILITY: Volumetric

CALIBRATION DATA

	FLOW RATE GPM	% ACCURACY
1	4908.50	101.35
2	3029.00	101.16
3	1221.60	100.29

CERTIFED BY: **PAUL HOBBS** DATE: 05/07/2014

This calibration was performed on a primary or secondary test facility, traceable to the National Institute of Standards and Technology, USA. The estimated flow measurement uncertainty of the calibration facilities are:

Primary +/- 0.15% Secondary +/- 0.5%

McCROMETER
3255 WEST STETSON AVENUE
HEMET, CA 92545 USA
PHONE (951) 652-6811 / FAX (951) 652-3078
WEB SITE: http://www.mccrometer.com E-MAIL: info@mccrometer.com

Revere Control Systems
2240 Rocky Ridge Road Birmingham, AL 35216
(205) 824-0004 Fax (205) 824-0408

Instrument Calibration Sheet

Project Name: Medley Landfill
Project Number: R0550

Loop Name: Injection Well pH Meter
Tag Number: AE - 200
Manufacturer: Rosemount
Model Number: 396P-01-10-55
Serial Number: I14-7054970-002
Service: pH measurement
Calibrated Range: 0-14
Output Function: [x] Linear [ ] Square Root

Analog Elements chanel 1

Percentage	Input (PV)	Expected Indication	Actual Indication	Expected Output	Actual Output	
0				4.0 mA	4.0 mA	
25				8.0 mA	8.0 mA	
50		7	7	12.0 mA	12.0 mA	
75				16.0 mA	16.0 mA	
100				20.0 mA	20.0 mA	

Discrete Elements

Switch Setting	Contact Action	Increasing (Actual)	Decreasing (Actual)	Reset		
N/A						

Comments:

new instrument, pH element, shop calibrated with 4,7 and 10 pH buffer solution

Instrument Ready for Service: [x]

Customer Representative: _____ Date: _____

RCS Representative: *Mark Collier* Date: 12/18/2014

Revere Control Systems
2240 Rocky Ridge Road Birmingham, AL 35216
(205) 824-0004 Fax (205) 824-0408

Instrument Calibration Sheet

Project Name: Medley Landfill
Project Number: R0550

Loop Name: Injection Well pH Meter
Tag Number: AiT - 200
Manufacturer: Rosemount
Model Number: 56
Serial Number: I14-7115746-001
Service: pH measurement
Calibrated Range: 0-14
Output Function: [x] Linear [ ] Square Root

Analog Elements chanel 1

Percentage	Input (PV)	Expected Indication	Actual Indication	Expected Output	Actual Output	
0				4.0 mA	4.0 mA	
25				8.0 mA	8.0 mA	
50		7	7	12.0 mA	12.0 mA	
75				16.0 mA	16.0 mA	
100				20.0 mA	20.0 mA	

Discrete Elements

Switch Setting	Contact Action	Increasing (Actual)	Decreasing (Actual)	Reset		
N/A						

Comments:

new instrument, pH transmitter, shop calibrated with 4,7 and 10 pH buffer solution

Instrument Ready for Service: [x]

Customer Representative: _____ Date: _____

RCS Representative: *Mark Collier* Date: 12/18/2014

Revere Control Systems
2240 Rocky Ridge Road Birmingham, AL 35216
(205) 824-0004 Fax (205) 824-0408

Instrument Calibration Sheet

Project Name: Medley Landfill
Project Number: R0550

Loop Name: Injection Well Flow Meter
Tag Number: FE - 200
Manufacturer: ABB Watermaster
Model Number: FEW325200A1S4A1B1A1A3G3B3A13G3B3A1M5V3CWY
Serial Number: 3K620000166179
Service: Flow
Calibrated Range: 0-4750 GPM
Output Function: [x] Linear [ ] Square Root

Analog Elements chanel 1

Percentage	Input (PV)	Expected Indication	Actual Indication	Expected Output	Actual Output	
0				4.0 mA	4.0 mA	
25				8.0 mA	8.0 mA	
50				12.0 mA	12.0 mA	
75				16.0 mA	16.0 mA	
100				20.0 mA	20.0 mA	

Discrete Elements

Switch Setting	Contact Action	Increasing (Actual)	Decreasing (Actual)	Reset		
N/A						

Comments:

new instrument , shop calibrated , Flow Element for Mag Meter

Q3 = 4403gpm , Q2/Q1 = 1.6 , Q3/Q1 = 314

Instrument Ready for Service: [x]

Customer Representative: _____ Date: _____

RCS Representative: *Mark Collier* Date: 12/18/2014

Revere Control Systems
2240 Rocky Ridge Road Birmingham, AL 35216
(205) 824-0004 Fax (205) 824-0408

Instrument Calibration Sheet

Project Name: Medley Landfill
Project Number: R0550

Loop Name: Injection Well Flow Meter
Tag Number: FT - 200
Manufacturer: ABB Watermaster
Model Number: FEW325200A1S4A1B1A1A3G3B3A1
Serial Number: 3K620000166180
Service: Flow
Calibrated Range: 0-4750 GPM
Output Function: [x] Linear [ ] Square Root

Analog Elements chanel 1

Percentage	Input (PV)	Expected Indication	Actual Indication	Expected Output	Actual Output	
0				4.0 mA	4.0 mA	
25				8.0 mA	8.0 mA	
50				12.0 mA	12.0 mA	
75				16.0 mA	16.0 mA	
100				20.0 mA	20.0 mA	

Discrete Elements

Switch Setting	Contact Action	Increasing (Actual)	Decreasing (Actual)	Reset		
N/A						

Comments:

new instrument, shop calibrated

Mag Meter Transmitter

Q MAX 4750GPM, Pulse width .30ms , pulses/unit 30.0 , damping 3.0 sec

Instrument Ready for Service: [x]

Customer Representative: _____ Date: _____

RCS Representative: *Mark Collier* Date: 12/18/2014

Revere Control Systems
2240 Rocky Ridge Road Birmingham, AL 35216
(205) 824-0004 Fax (205) 824-0408

Instrument Calibration Sheet

Project Name: Medley Landfill
Project Number: R0550

Loop Name: Leachate Transfer Station Discharge Pressure Guage
Tag Number: PI/PE - 100
Manufacturer: Ashcroft
Model Number: Duraguage
Serial Number: n/a
Service: Pressure
Calibrated Range: 0 - 100 psi
Output Function: [x] Linear [ ] Square Root

Analog Elements chanel 1

Percentage	Input (PV)	Expected Indication	Actual Indication	Expected Output	Actual Output	
0	0.0 psi	0 psi	0 psi			
25	25.0 psi	25 psi	25 psi			
50	50.0 psi	50 psi	50 psi			
75	75.0 psi	75 psi	75 psi			
100	100.0 psi	100 psi	100 psi			

Discrete Elements

Switch Setting	Contact Action	Increasing (Actual)	Decreasing (Actual)	Reset		
N/A						

Comments:

new instrument, field verified, Glycerin filled, AISI 316 tube, AISI socket, welded, 8400, Oct 2014, 2804

Instrument Ready for Service: [x]

Customer Representative: _____ Date: _____

RCS Representative: *Mark Collier* Date: 12/18/2014

Revere Control Systems
2240 Rocky Ridge Road Birmingham, AL 35216
(205) 824-0004 Fax (205) 824-0408

Instrument Calibration Sheet

Project Name: Medley Landfill
Project Number: R0550

Loop Name: Injection Well Pressure Guage
Tag Number: PI/PE - 200
Manufacturer: Ashcroft
Model Number: Duraguage
Serial Number: n/a
Service: Pressure
Calibrated Range: 0 - 100 psi
Output Function: [x] Linear [ ] Square Root

Analog Elements chanel 1

Percentage	Input (PV)	Expected Indication	Actual Indication	Expected Output	Actual Output	
0	0.0 psi	0 psi	0 psi			
25	25.0 psi	25 psi	25 psi			
50	50.0 psi	50 psi	50 psi			
75	75.0 psi	75 psi	75 psi			
100	100.0 psi	100 psi	100 psi			

Discrete Elements

Switch Setting	Contact Action	Increasing (Actual)	Decreasing (Actual)	Reset		
N/A						

Comments:

new instrument, field verified, Glycerin filled, AISI 316 tube, AISI socket, welded, 8400, Oct 2014, 2804

Instrument Ready for Service: [x]

Customer Representative: _____ Date: _____

RCS Representative: *Mark Collier* Date: 12/18/2014

Revere Control Systems
2240 Rocky Ridge Road Birmingham, AL 35216
(205) 824-0004 Fax (205) 824-0408

Instrument Calibration Sheet

Project Name: Medley Landfill
Project Number: R0550

Loop Name: Annulus Tank Pressure Guage
Tag Number: PI/PE - 210
Manufacturer: Ashcroft
Model Number: Duraguage
Serial Number: n/a
Service: Pressure
Calibrated Range: 0 - 160 psi
Output Function: [x] Linear [ ] Square Root

Analog Elements chanel 1

Percentage	Input (PV)	Expected Indication	Actual Indication	Expected Output	Actual Output	
0	0.0 psi	0 psi	0 psi			
25	40.0 psi	40 psi	40 psi			
50	80.0 psi	80 psi	80 psi			
75	120.0 psi	120 psi	120 psi			
100	160.0 psi	160 psi	160 psi			

Discrete Elements

Switch Setting	Contact Action	Increasing (Actual)	Decreasing (Actual)	Reset		
N/A						

Comments:

new instrument, field verified, Glycerin filled, AISI 316 tube, AISI socket, welded, 8400, Oct 2014, 2804

Instrument Ready for Service: [x]

Customer Representative: _____ Date: _____

RCS Representative: *Mark Collier* Date: 12/18/2014

Revere Control Systems
2240 Rocky Ridge Road Birmingham, AL 35216
(205) 824-0004 Fax (205) 824-0408

Instrument Calibration Sheet

Project Name: Medley Landfill
Project Number: R0550

Loop Name: Filter System Influent Pressure Guage
Tag Number: PI/PE - 310
Manufacturer: Ashcroft
Model Number: Duraguage
Serial Number: n/a
Service: Pressure
Calibrated Range: 0 - 100 psi
Output Function: [x] Linear [ ] Square Root

Analog Elements chanel 1

Percentage	Input (PV)	Expected Indication	Actual Indication	Expected Output	Actual Output	
0	0.0 psi	0 psi	0 psi			
25	25.0 psi	25 psi	25 psi			
50	50.0 psi	50 psi	50 psi			
75	75.0 psi	75 psi	75 psi			
100	100.0 psi	100 psi	100 psi			

Discrete Elements

Switch Setting	Contact Action	Increasing (Actual)	Decreasing (Actual)	Reset		
N/A						

Comments:

new instrument, field verified, Glycerin filled, AISI 316 tube, AISI socket, welded, 8400, Oct 2014, 2804

Instrument Ready for Service: [x]

Customer Representative: _____ Date: _____

RCS Representative: *Mark Collier* Date: 12/18/2014

Revere Control Systems
2240 Rocky Ridge Road Birmingham, AL 35216
(205) 824-0004 Fax (205) 824-0408

Instrument Calibration Sheet

Project Name: Medley Landfill
Project Number: R0550

Loop Name: Filter System Strainer Effluent Pressure Guage
Tag Number: PI/PE - 311
Manufacturer: Ashcroft
Model Number: Duraguage
Serial Number: n/a
Service: Pressure
Calibrated Range: 0 - 100 psi
Output Function: [x] Linear [ ] Square Root

Analog Elements chanel 1

Percentage	Input (PV)	Expected Indication	Actual Indication	Expected Output	Actual Output	
0	0.0 psi	0 psi	0 psi			
25	25.0 psi	25 psi	25 psi			
50	50.0 psi	50 psi	50 psi			
75	75.0 psi	75 psi	75 psi			
100	100.0 psi	100 psi	100 psi			

Discrete Elements

Switch Setting	Contact Action	Increasing (Actual)	Decreasing (Actual)	Reset		
N/A						

Comments:

new instrument, field verified, Glycerin filled, AISI 316 tube, AISI socket, welded, 8400, Oct 2014, 2804

Instrument Ready for Service: [x]

Customer Representative: _____ Date: _____

RCS Representative: *Mark Collier* Date: 12/18/2014

Revere Control Systems
2240 Rocky Ridge Road Birmingham, AL 35216
(205) 824-0004 Fax (205) 824-0408

Instrument Calibration Sheet

Project Name: Medley Landfill
Project Number: R0550

Loop Name: Filter System Discharge Pressure Guage
Tag Number: PI/PE - 312
Manufacturer: Ashcroft
Model Number: Duraguage
Serial Number: n/a
Service: Pressure
Calibrated Range: 0 - 100 psi
Output Function: [x] Linear [ ] Square Root

Analog Elements chanel 1

Percentage	Input (PV)	Expected Indication	Actual Indication	Expected Output	Actual Output	
0	0.0 psi	0 psi	0 psi			
25	25.0 psi	25 psi	25 psi			
50	50.0 psi	50 psi	50 psi			
75	75.0 psi	75 psi	75 psi			
100	100.0 psi	100 psi	100 psi			

Discrete Elements

Switch Setting	Contact Action	Increasing (Actual)	Decreasing (Actual)	Reset		
N/A						

Comments:

new instrument, field verified, Glycerin filled, AISI 316 tube, AISI socket, welded, 8400, Oct 2014, 2804

Instrument Ready for Service: [x]

Customer Representative: _____ Date: _____

RCS Representative: *Mark Collier* Date: 12/18/2014

Revere Control Systems
2240 Rocky Ridge Road Birmingham, AL 35216
(205) 824-0004 Fax (205) 824-0408

Instrument Calibration Sheet

Project Name: Medley Landfill
Project Number: R0550

Loop Name: Injection Well Annulus Tank Low Level Switch
Tag Number: LS - 210
Manufacturer: Rosemount
Model Number: 2120D26T1E5YH0000
Serial Number: 1072055
Service: Low Level Alarm
Calibrated Range: fixed
Output Function: [x] Linear [ ] Square Root

Analog Elements chanel 1

Percentage	Input (PV)	Expected Indication	Actual Indication	Expected Output	Actual Output	
0						
25						
50		7	7			
75						
100						

Discrete Elements

Switch Setting	Contact Action	Increasing (Actual)	Decreasing (Actual)	Reset		
fixed mount	NC					

Comments:

new instrument, shop calibrated, SWITH OPENS WHEN SUBMERGED IN WATER

CAN BE TESTED WITH A MAGNET, BY PLACING AT TEST POINT ON SIDE OF TRANSMITTER

Instrument Ready for Service: [x]

Customer Representative: _____ Date: _____

RCS Representative: *Mark Collier* Date: 12/18/2014

Revere Control Systems
2240 Rocky Ridge Road Birmingham, AL 35216
(205) 824-0004 Fax (205) 824-0408

Instrument Calibration Sheet

Project Name: Medley Landfill
Project Number: R0550

Loop Name: Lower Monitoring Zone
Tag Number: LT-401
Manufacturer: Rosemount
Model Number: 3051CG4A02A1AM5S5
Serial Number: 2643082
Service: Level
Calibrated Range: 0-60 ft H2O (26.0 psi)
Output Function: [x] Linear [ ] Square Root

Analog Elements chanel 1

Percentage	Input (PV)	Expected Indication	Actual Indication	Expected Output	Actual Output	
0	0 psi	0.0 ft	0.0 ft	4.0 mA	4.0 mA	
25	6.5 psi	15.0 ft	15 ft	8.0 mA	8.0 mA	
50	13.0 psi	30.0 ft	30.0 ft	12.0 mA	12.0 mA	
75	19.5 psi	45.0 ft	45.0 ft	16.0 mA	16.0 mA	
100	26.0 psi	60.0 ft	60.0 ft	20.0 mA	20.0 mA	

Discrete Elements

Switch Setting	Contact Action	Increasing (Actual)	Decreasing (Actual)	Reset		
N/A						

Comments:

NEW INSTRUMENT, SHOP CALIBRATED

Instrument Ready for Service: [x]

Customer Representative: _____ Date: _____

RCS Representative: *Mark Collier* Date: 12/18/2014

Revere Control Systems
2240 Rocky Ridge Road Birmingham, AL 35216
(205) 824-0004 Fax (205) 824-0408

Instrument Calibration Sheet

Project Name: Medley Landfill
Project Number: R0550

Loop Name: Upper Monitoring Zone
Tag Number: LT-402
Manufacturer: Rosemount
Model Number: 3051CG4A02A1AM5S5
Serial Number: 2643083
Service: Level
Calibrated Range: 0-60 ft H2O (26.0 psi)
Output Function: [x] Linear [ ] Square Root

Analog Elements chanel 1

Percentage	Input (PV)	Expected Indication	Actual Indication	Expected Output	Actual Output	
0	0 psi	0.0 ft	0.0 ft	4.0 mA	4.0 mA	
25	6.5 psi	15.0 ft	15 ft	8.0 mA	8.0 mA	
50	13.0 psi	30.0 ft	30.0 ft	12.0 mA	12.0 mA	
75	19.5 psi	45.0 ft	45.0 ft	16.0 mA	16.0 mA	
100	26.0 psi	60.0 ft	60.0 ft	20.0 mA	20.0 mA	

Discrete Elements

Switch Setting	Contact Action	Increasing (Actual)	Decreasing (Actual)	Reset		
N/A						

Comments:

new instrument, shop calibrated

Instrument Ready for Service: [x]

Customer Representative: _____ Date: _____

RCS Representative: *Mark Collier* Date: 12/18/2014

Revere Control Systems
2240 Rocky Ridge Road Birmingham, AL 35216
(205) 824-0004 Fax (205) 824-0408

Instrument Calibration Sheet

Project Name: Medley Landfill
Project Number: R0550

Loop Name: 3rd Party Waste Pressure
Tag Number: PIT - 311
Manufacturer: Rosemount
Model Number: 3051CG4A02A1AM5S5
Serial Number: 2631268
Service: Pressure
Calibrated Range: 0 - 100 psi
Output Function: [x] Linear [ ] Square Root

Analog Elements chanel 1

Percentage	Input (PV)	Expected Indication	Actual Indication	Expected Output	Actual Output	
0	0.0 psi	0.0 psi	0.0 psi	4.0 mA	4.0 mA	
25	25.0 psi	25.0 psi	25.0 psi	8.0 mA	8.0 mA	
50	50.0 psi	50.0 psi	50.0 psi	12.0 mA	12.0 mA	
75	75.0 psi	75.0 psi	75.0 psi	16.0 mA	16.0 mA	
100	100.0 psi	100.0 psi	100.0 psi	20.0 mA	20.0 mA	

Discrete Elements

Switch Setting	Contact Action	Increasing (Actual)	Decreasing (Actual)	Reset		
N/A						

Comments:

new instrument, shop calibrated

Instrument Ready for Service: [x]

Customer Representative: _____ Date: _____

RCS Representative: *Mark Collier* Date: 12/18/2014

Revere Control Systems
2240 Rocky Ridge Road Birmingham, AL 35216
(205) 824-0004 Fax (205) 824-0408

Instrument Calibration Sheet

Project Name: Medley Landfill
Project Number: R0550

Loop Name: Injection Well Annulus Pressure
Tag Number: PIT - 210
Manufacturer: Rosemount
Model Number: 3051CG4A02A1AM5S5
Serial Number: 2631267
Service: Pressure
Calibrated Range: 0 - 150 psi
Output Function: [x] Linear [ ] Square Root

Analog Elements chanel 1

Percentage	Input (PV)	Expected Indication	Actual Indication	Expected Output	Actual Output	
0	0.0 psi	0.0 psi	0.0 psi	4.0 mA	4.0 mA	
25	37.5 psi	37.5 psi	37.5 psi	8.0 mA	8.0 mA	
50	75.0 psi	75.0 psi	75.0 psi	12.0 mA	12.0 mA	
75	112.5 psi	112.5 psi	112.5 psi	16.0 mA	16.0 mA	
100	150.0 psi	150.0 psi	150.0 psi	20.0 mA	20.0 mA	

Discrete Elements

Switch Setting	Contact Action	Increasing (Actual)	Decreasing (Actual)	Reset		
N/A						

Comments:

new instrument, shop calibrated

Instrument Ready for Service: [x]

Customer Representative: _____ Date: _____

RCS Representative: *Mark Collier* Date: 12/18/2014

Revere Control Systems
2240 Rocky Ridge Road Birmingham, AL 35216
(205) 824-0004 Fax (205) 824-0408

Instrument Calibration Sheet

Project Name: Medley Landfill
Project Number: R0550

Loop Name: Injection Well Pressure
Tag Number: PIT - 200
Manufacturer: Rosemount
Model Number: 3051CG4A02A1AM5S5
Serial Number: 2631266
Service: Pressure
Calibrated Range: 0 - 100 psi
Output Function: [x] Linear [ ] Square Root

Analog Elements chanel 1

Percentage	Input (PV)	Expected Indication	Actual Indication	Expected Output	Actual Output	
0	0.0 psi	0.0 psi	0.0 psi	4.0 mA	4.0 mA	
25	25.0 psi	25.0 psi	25.0 psi	8.0 mA	8.0 mA	
50	50.0 psi	50.0 psi	50.0 psi	12.0 mA	12.0 mA	
75	75.0 psi	75.0 psi	75.0 psi	16.0 mA	16.0 mA	
100	100.0 psi	100.0 psi	100.0 psi	20.0 mA	20.0 mA	

Discrete Elements

Switch Setting	Contact Action	Increasing (Actual)	Decreasing (Actual)	Reset		
N/A						

Comments:

new instrument, shop calibrated

Instrument Ready for Service: [x]

Customer Representative: _____ Date: _____

RCS Representative: *Mark Collier* Date: 12/18/2014

Attachment F

Core Labs Test Report

Ardaman & Associates, Inc.

Geotechnical, Environmental and
Materials Consultants

August 18, 2014
File Number 14-13-0056

Youngquist Brothers, Inc.
15465 Pine Ridge Road
Fort Myers, FL 33908

Attention: Harvey Youngquist

Subject: Rock Core Testing, Medley Landfill

Gentlemen:

As requested, vertical and horizontal permeability, unconfined compression and specific gravity tests have been completed on ten rock cores provided for testing by your firm. Multiple cores were provided from three of the depth intervals (i.e., 2703'; 2765'; and 2028'). The cores were received on May 1, 2014 and designated as follows:

Core	Depth (feet)
IW-1	1628
IW-1	1955
IW-1	2614
IW-1	2703, 2708, 2712
IW-1	2765, 2776
IW-1	2810
IW-1	2857
IW-1	2905
DMW-1	1943
DMW-1	2028, 2041

Photographs of the permeability and unconfined compression test specimens after cutting and/or coring to size are attached.

Permeability Tests

Permeability tests were performed in general accordance with ASTM Standard D5084 "Measurement of Hydraulic Conductivity of Saturated Porous Materials Using a Flexible Wall Permeameter" using either the constant head (Method A) or the falling head - rising tailwater (Method C) test method. The permeability test results are presented on the attached hydraulic conductivity test reports. A total of 19 permeability tests were performed.

Unconfined Compression Tests

Unconfined compression tests were performed in general accordance with ASTM Standard D7012 "Compressive Strength and Elastic Moduli of Intact Rock Core Specimens under Varying States of Stress and Temperatures" using the unconfined test method (Method C). The unconfined compression test results are presented on the attached test reports. Unconfined compression tests were performed on five samples.

Specific Gravity Tests

The measured mineral specific gravities are presented on the attached test reports. The specific gravity tests were performed in general accordance with ASTM Standard D854 "Specific Gravity of Soil Solids by Water Pycnometer" using approximately 80 gram specimens ground to pass the U.S. Standard No. 40 sieve. A total of eleven specific gravity tests were performed.

The test samples were reported to be from the client-specified designations herein. The test results are indicative of only the specimens that were actually tested. The test results presented are based upon accepted industry practice as well as test method(s) listed. Ardaman & Associates, Inc. neither accepts responsibility for, nor makes claims to the final use and purpose of the test results.

Please contact us if you have any questions about the test results or require additional information.

Very truly yours,
ARDAMAN & ASSOCIATES, INC.

Thomas S. Ingra, P.E.
Laboratory Director
Florida License No. 31987

C:\Users\Jan.Wildman\Documents\Projects\11\11-13-0179 Youngquist\report01.docx

ARDAMAN & ASSOCIATES, INC. GEOTECHNICAL TESTING LABORATORY
ROCK CORE HYDRAULIC CONDUCTIVITY TEST REPORT

CLIENT: Youngquist Brothers, Inc.

PROJECT: Medley Landfill

FILE NO.: 14-13-0056

DATE SAMPLE RECEIVED: 05/01/14 SET UP: 06/30/14

DATE REPORTED: 08/18/14

INCOMING SAMPLE NO.: **IW-1, 1628'**

LABORATORY IDENTIFICATION NO.: 140056/IW1628KV

SAMPLE DESCRIPTION: Light brown limestone

ASTM D5084 TEST METHOD:

- ☐ A - Constant Head
- ☐ B - Falling Head; Constant Tailwater
- ☒ C - Falling Head; Rising Tailwater
- ☐ F - Constant Volume; Falling Head - Rising Tailwater

B-FACTOR: 80 %

- ☐ Beginning of Test;
- ☒ End of Test

$\Delta\sigma_c$ (psi): 11, 17, 23

SPECIMEN DATA:

As-Received Diameter (inch): 4 Diameter Trimmed: ☐ Yes ☒ No

As-Received Length (inch): 11.0/8.5* Length Trimmed: ☒ Yes ☐ No

TEST SPECIMEN ORIENTATION: ☒ **Vertical** ☐ Horizontal

SPECIFIC GRAVITY, G_s: 2.69

- ☐ Assumed
- ☒ Measured (ASTM D854)

PERMEANT: ☒ Deaired Tap Water ☐ Other _____

Initial Conditions							Test Conditions					Final Conditions			Hydraulic Conductivity
H (cm)	D (cm)	V (cm^3)	w_c (%)	γ_d (lb/ft^3)	n	S (%)	$\bar{\sigma}_c$ (psi)	u_b (psi)	i_{avg}	Q (cm^3)	t (days)	WDS (g)	w_c (%)	S (%)	k_{20} (cm/sec)
7.46	9.93	577.57	24.0	99.4	0.403	94	30	70	2.6	23.7	2	920.34	24.6	96	**8.0E-04**

COMMENTS: (1) Core sample was cut to length, air-dried, deaired under vacuum for a minimum of 24 hours, and then saturated with deaired tap water from the bottom up while maintaining the vacuum. (2) Final w_c from horizontal permeability test specimen. WDS calculated from measured wet mass and final w_c.
*First length is total sample length. Second length is useable length at full core diameter.

The test data and all associated project information presented hereon shall be held in confidence and disclosed to other parties only with the authorization of the Client. Physical and electronic records of each project are kept for a minimum of 7 years. Test samples are kept in storage for at least 10 working days after mailing of the test report, prior to being discarded, unless a longer storage period is requested in writing and accepted by Ardaman & Associates, Inc.

Where: H = Specimen height; D = Specimen diameter; V = Volume; WDS = Dry mass; w_c = Water content (ASTM D2216); γ_d = Dry density; S = Saturation; $\bar{\sigma}_c$ = Isotropic effective confining stress; u_b = Back-pressure; i_{avg} = Average hydraulic gradient; Q = Flow volume; t = Test duration; k_{20} = Saturated hydraulic conductivity at 20°C; n = Total porosity; and G_s = Specific gravity.

Checked By: TM Date: 08/18/14

Form SR-2B: Rev. 0

ARDAMAN & ASSOCIATES, INC. GEOTECHNICAL TESTING LABORATORY
ROCK CORE HYDRAULIC CONDUCTIVITY TEST REPORT

CLIENT: Youngquist Brothers, Inc.

PROJECT: Medley Landfill

FILE NO.: 14-13-0056

DATE SAMPLE RECEIVED: 05/01/14 SET UP: 07/24/14

DATE REPORTED: 08/18/14

INCOMING SAMPLE NO.: **IW-1, 1628'**

LABORATORY IDENTIFICATION NO.: 140056/IW1628KH

SAMPLE DESCRIPTION: Light brown limestone

ASTM D5084 TEST METHOD:

- ☐ A - Constant Head
- ☐ B - Falling Head; Constant Tailwater
- ☒ C - Falling Head; Rising Tailwater
- ☐ F - Constant Volume; Falling Head - Rising Tailwater

B-FACTOR: 83 %

- ☐ Beginning of Test;
- ☒ End of Test

$\Delta\sigma_c$ (psi): 12

SPECIMEN DATA:

As-Received Diameter (inch): 4 Diameter Trimmed: ☒ Yes ☐ No

As-Received Length (inch): 11.0/8.5* Length Trimmed: ☒ Yes ☐ No

TEST SPECIMEN ORIENTATION: ☐ Vertical ☒ **Horizontal**

SPECIFIC GRAVITY, G_s: 2.69 ☐ Assumed ☒ Measured (ASTM D854)

PERMEANT: ☒ Deaired Tap Water ☐ Other

Initial Conditions							Test Conditions					Final Conditions			Hydraulic Conductivity
H (cm)	D (cm)	V (cm^3)	w_c (%)	γ_d (lb/ft^3)	n	S (%)	$\bar{\sigma}_c$ (psi)	u_b (psi)	i_{avg}	Q (cm^3)	t (days)	WDS (g)	w_c (%)	S (%)	k_{20} (cm/sec)
6.93	5.04	138.28	24.6	97.2	0.421	91	30	70	2.5	7.1	1	215.39	24.6	91	**2.9E-03**

COMMENTS: (1) Horizontal permeability test specimen was cross-cored from the corresponding vertical test specimen.
*First length is total sample length. Second length is useable length at full core diameter.

The test data and all associated project information presented hereon shall be held in confidence and disclosed to other parties only with the authorization of the Client. Physical and electronic records of each project are kept for a minimum of 7 years. Test samples are kept in storage for at least 10 working days after mailing of the test report, prior to being discarded, unless a longer storage period is requested in writing and accepted by Ardaman & Associates, Inc.

Where: H = Specimen height; D = Specimen diameter; V = Volume; WDS = Dry mass; w_c = Water content (ASTM D2216); γ_d = Dry density; S = Saturation; $\bar{\sigma}_c$ = Isotropic effective confining stress; u_b = Back-pressure; i_{avg} = Average hydraulic gradient; Q = Flow volume; t = Test duration; k_{20} = Saturated hydraulic conductivity at 20°C; n = Total porosity; and G_s = Specific gravity.

Checked By: TM Date: 08/18/14

Form SR-2B: Rev. 0

ARDAMAN & ASSOCIATES, INC. GEOTECHNICAL TESTING LABORATORY
ROCK CORE HYDRAULIC CONDUCTIVITY TEST REPORT

CLIENT: Youngquist Brothers, Inc.

PROJECT: Medley Landfill

FILE NO.: 14-13-0056

DATE SAMPLE RECEIVED: 05/01/14 SET UP: 07/02/14

DATE REPORTED: 08/18/14

INCOMING SAMPLE NO.: **IW-1, 1955'**

LABORATORY IDENTIFICATION NO.: 140056/IW1955KV

SAMPLE DESCRIPTION: Light brown limestone

ASTM D5084 TEST METHOD:

- ☒ A - Constant Head
- ☐ B - Falling Head; Constant Tailwater
- ☐ C - Falling Head; Rising Tailwater
- ☐ F - Constant Volume; Falling Head - Rising Tailwater

B-FACTOR: 88 %

- ☐ Beginning of Test;
- ☒ End of Test

$\Delta\sigma_c$ (psi): 16

SPECIMEN DATA:

As-Received Diameter (inch): 4 Diameter Trimmed: ☐ Yes ☒ No

As-Received Length (inch): 19.5/18.0* Length Trimmed: ☒ Yes ☐ No

TEST SPECIMEN ORIENTATION: ☒ **Vertical** ☐ Horizontal

SPECIFIC GRAVITY, G_s: 2.71

- ☐ Assumed
- ☒ Measured (ASTM D854)

PERMEANT: ☒ Deaired Tap Water ☐ Other

Initial Conditions							Test Conditions					Final Conditions			Hydraulic Conductivity
H (cm)	D (cm)	V (cm^3)	w_c (%)	γ_d (lb/ft^3)	n	S (%)	$\bar{\sigma}_c$ (psi)	u_b (psi)	i_{avg}	Q (cm^3)	t (days)	WDS (g)	w_c (%)	S (%)	k_{20} (cm/sec)
11.51	9.86	877.92	21.2	107.4	0.365	100	30	160	19	1.3	1	1510.99	21.2	100	**6.1E-06**

COMMENTS: (1) Core sample was cut to length, air-dried, deaired under vacuum for a minimum of 24 hours, and then saturated with deaired tap water from the bottom up while maintaining the vacuum. (2) Final w_c from horizontal permeability test specimen. WDS calculated from measured wet mass and final w_c.
*First length is total sample length. Second length is useable length at full core diameter.

Where: H = Specimen height; D = Specimen diameter; V = Volume; WDS = Dry mass; w_c = Water content (ASTM D2216); γ_d = Dry density; S = Saturation; $\bar{\sigma}_c$ = Isotropic effective confining stress; u_b = Back-pressure; i_{avg} = Average hydraulic gradient; Q = Flow volume; t = Test duration; k_{20} = Saturated hydraulic conductivity at 20°C; n = Total porosity; and G_s = Specific gravity.

Checked By: JM Date: 08/18/14

Form SR-2B: Rev. 0

ARDAMAN & ASSOCIATES, INC. GEOTECHNICAL TESTING LABORATORY
ROCK CORE HYDRAULIC CONDUCTIVITY TEST REPORT

CLIENT: Youngquist Brothers, Inc.

PROJECT: Medley Landfill

FILE NO.: 14-13-0056

DATE SAMPLE RECEIVED: 05/01/14 SET UP: 07/24/14

DATE REPORTED: 08/18/14

INCOMING SAMPLE NO.: **IW-1, 1955'**

LABORATORY IDENTIFICATION NO.: 140056/IW1955KH

SAMPLE DESCRIPTION: Light brown limestone

ASTM D5084 TEST METHOD:

- ☒ A - Constant Head
- ☐ B - Falling Head; Constant Tailwater
- ☐ C - Falling Head; Rising Tailwater
- ☐ F - Constant Volume; Falling Head - Rising Tailwater

B-FACTOR: ---- %

- ☐ Beginning of Test;
- ☒ End of Test

$\Delta\sigma_c$ (psi): ----

SPECIMEN DATA:

As-Received Diameter (inch): 4 Diameter Trimmed: ☒ Yes ☐ No

As-Received Length (inch): 19.5/18.0* Length Trimmed: ☒ Yes ☐ No

TEST SPECIMEN ORIENTATION: ☐ Vertical ☒ **Horizontal**

SPECIFIC GRAVITY, G_s: 2.71 ☐ Assumed ☒ Measured (ASTM D854)

PERMEANT: ☒ Deaired Tap Water ☐ Other _____

Initial Conditions							Test Conditions					Final Conditions			Hydraulic Conductivity
H (cm)	D (cm)	V (cm^3)	w_c (%)	γ_d (lb/ft^3)	n	S (%)	$\bar{\sigma}_c$ (psi)	u_b (psi)	i_{avg}	Q (cm^3)	t (days)	WDS (g)	w_c (%)	S (%)	k_{20} (cm/sec)
7.77	5.06	155.95	21.2	106.3	0.372	97	30	160	28	1.5	1	265.56	21.2	97	**1.3E-05**

COMMENTS: (1) Horizontal permeability test specimen was cross-cored from the corresponding vertical test specimen.
*First length is total sample length. Second length is useable length at full core diameter.

The test data and all associated project information presented hereon shall be held in confidence and disclosed to other parties only with the authorization of the Client. Physical and electronic records of each project are kept for a minimum of 7 years. Test samples are kept in storage for at least 10 working days after mailing of the test report, prior to being discarded, unless a longer storage period is requested in writing and accepted by Ardaman & Associates, Inc.

Where: H = Specimen height; D = Specimen diameter; V = Volume; WDS = Dry mass; w_c = Water content (ASTM D2216); γ_d = Dry density; S = Saturation; $\bar{\sigma}_c$ = Isotropic effective confining stress; u_b = Back-pressure; i_{avg} = Average hydraulic gradient; Q = Flow volume; t = Test duration; k_{20} = Saturated hydraulic conductivity at 20°C; n = Total porosity; and G_s = Specific gravity.

Checked By: TM Date: 08/10/14

Form SR-2B: Rev. 0

ARDAMAN & ASSOCIATES, INC. GEOTECHNICAL TESTING LABORATORY
ROCK CORE HYDRAULIC CONDUCTIVITY TEST REPORT

CLIENT: Youngquist Brothers, Inc.

PROJECT: Medley Landfill

FILE NO.: 14-13-0056

DATE SAMPLE RECEIVED: 05/01/14 SET UP: 07/24/14

DATE REPORTED: 08/18/14

INCOMING SAMPLE NO.: **IW-1, 2614'**

LABORATORY IDENTIFICATION NO.: 140056/IW2614

SAMPLE DESCRIPTION: Light brown limestone

ASTM D5084 TEST METHOD:

- ☒ A - Constant Head
- ☐ B - Falling Head; Constant Tailwater
- ☐ C - Falling Head; Rising Tailwater
- ☐ F - Constant Volume; Falling Head - Rising Tailwater

B-FACTOR: 79 %

- ☐ Beginning of Test;
- ☒ End of Test

$\Delta\sigma_c$ (psi): 9

SPECIMEN DATA:

As-Received Diameter (inch): 4 Diameter Trimmed: ☒ Yes ☐ No

As-Received Length (inch): 7.0/0.0* Length Trimmed: ☒ Yes ☐ No

TEST SPECIMEN ORIENTATION: ☐ Vertical ☒ **Horizontal**

SPECIFIC GRAVITY, G_s: 2.73 ☐ Assumed ☒ Measured (ASTM D854)

PERMEANT: ☒ Deaired Tap Water ☐ Other

Initial Conditions							Test Conditions					Final Conditions			Hydraulic Conductivity
H (cm)	D (cm)	V (cm^3)	w_c (%)	γ_d (lb/ft^3)	n	S (%)	$\bar{\sigma}_c$ (psi)	u_b (psi)	i_{avg}	Q (cm^3)	t (days)	WDS (g)	w_c (%)	S (%)	k_{20} (cm/sec)
7.03	5.05	141.06	9.7	130.0	0.237	86	30	160	32	1.2	1	293.88	10.6	93	**1.9E-05**

COMMENTS: (1) Insufficient core sample for a vertical permeability test.
*First length is total sample length. Second length is useable length at full core diameter.

The test data and all associated project information presented hereon shall be held in confidence and disclosed to other parties only with the authorization of the Client. Physical and electronic records of each project are kept for a minimum of 7 years. Test samples are kept in storage for at least 10 working days after mailing of the test report, prior to being discarded, unless a longer storage period is requested in writing and accepted by Ardaman & Associates, Inc.

Where: H = Specimen height; D = Specimen diameter; V = Volume; WDS = Dry mass; w_c = Water content (ASTM D2216); γ_d = Dry density; S = Saturation; $\bar{\sigma}_c$ = Isotropic effective confining stress; u_b = Back-pressure; i_{avg} = Average hydraulic gradient; Q = Flow volume; t = Test duration; k_{20} = Saturated hydraulic conductivity at 20°C; n = Total porosity; and G_s = Specific gravity.

Checked By: TM Date: 08/18/14

Form SR-2B: Rev. 0

ARDAMAN & ASSOCIATES, INC. GEOTECHNICAL TESTING LABORATORY
ROCK CORE HYDRAULIC CONDUCTIVITY TEST REPORT

CLIENT: Youngquist Brothers, Inc.

PROJECT: Medley Landfill

FILE NO.: 14-13-0056

DATE SAMPLE RECEIVED: 05/01/14 SET UP: 07/09/14

DATE REPORTED: 08/18/14

INCOMING SAMPLE NO.: **IW-1, 2703'**

LABORATORY IDENTIFICATION NO.: 140056/IW2703KV

SAMPLE DESCRIPTION: Light brown limestone

ASTM D5084 TEST METHOD:

- ☒ A - Constant Head
- ☐ B - Falling Head; Constant Tailwater
- ☐ C - Falling Head; Rising Tailwater
- ☐ F - Constant Volume; Falling Head - Rising Tailwater

B-FACTOR: 90 %

- ☐ Beginning of Test;
- ☒ End of Test

$\Delta\sigma_c$ (psi): 15

SPECIMEN DATA:

As-Received Diameter (inch): 4 Diameter Trimmed: ☐ Yes ☒ No

As-Received Length (inch): 5.3/3.1* Length Trimmed: ☒ Yes ☐ No

TEST SPECIMEN ORIENTATION: ☒ **Vertical** ☐ Horizontal

SPECIFIC GRAVITY, G_s: 2.72

- ☐ Assumed
- ☒ Measured (ASTM D854)

PERMEANT: ☒ Deaired Tap Water ☐ Other

Initial Conditions							Test Conditions					Final Conditions			Hydraulic Conductivity
H (cm)	D (cm)	V (cm^3)	w_c (%)	γ_d (lb/ft^3)	n	S (%)	$\bar{\sigma}_c$ (psi)	u_b (psi)	i_{avg}	Q (cm^3)	t (days)	WDS (g)	w_c (%)	S (%)	k_{20} (cm/sec)
7.79	9.78	585.08	9.7	133.1	0.216	96	30	160	40	1.3	2	1247.97	9.7	96	**6.2E-06**

COMMENTS: (1) Core sample was cut to length, air-dried, deaired under vacuum for a minimum of 24 hours, and then saturated with deaired tap water from the bottom up while maintaining the vacuum. (2) Final w_c from horizontal permeability test specimen. WDS calculated from measured wet mass and final w_c.
*First length is total sample length. Second length is useable length at full core diameter.

The test data and all associated project information presented hereon shall be held in confidence and disclosed to other parties only with the authorization of the Client. Physical and electronic records of each project are kept for a minimum of 7 years. Test samples are kept in storage for at least 10 working days after mailing of the test report, prior to being discarded, unless a longer storage period is requested in writing and accepted by Ardaman & Associates, Inc.

Where: H = Specimen height; D = Specimen diameter; V = Volume; WDS = Dry mass; w_c = Water content (ASTM D2216); γ_d = Dry density; S = Saturation; $\bar{\sigma}_c$ = Isotropic effective confining stress; u_b = Back-pressure; i_{avg} = Average hydraulic gradient; Q = Flow volume; t = Test duration; k_{20} = Saturated hydraulic conductivity at 20°C; n = Total porosity; and G_s = Specific gravity.

Checked By: DM Date: 08/18/14

Form SR-2B: Rev. 0

ARDAMAN & ASSOCIATES, INC. GEOTECHNICAL TESTING LABORATORY
ROCK CORE HYDRAULIC CONDUCTIVITY TEST REPORT

CLIENT: Youngquist Brothers, Inc.

PROJECT: Medley Landfill

FILE NO.: 14-13-0056

DATE SAMPLE RECEIVED: 05/01/14 SET UP: 07/24/14

DATE REPORTED: 08/18/14

INCOMING SAMPLE NO.: **IW-1, 2703'**

LABORATORY IDENTIFICATION NO.: 140056/IW2703KH

SAMPLE DESCRIPTION: Light brown limestone

ASTM D5084 TEST METHOD:

- ☒ A - Constant Head
- ☐ B - Falling Head; Constant Tailwater
- ☐ C - Falling Head; Rising Tailwater
- ☐ F - Constant Volume; Falling Head - Rising Tailwater

B-FACTOR: 79 %

- ☐ Beginning of Test;
- ☒ End of Test

$\Delta\sigma_c$ (psi): 10

SPECIMEN DATA:

As-Received Diameter (inch): 4 Diameter Trimmed: ☒ Yes ☐ No

As-Received Length (inch): 5.3/3.1* Length Trimmed: ☒ Yes ☐ No

TEST SPECIMEN ORIENTATION: ☐ Vertical ☒ **Horizontal**

SPECIFIC GRAVITY, G_s: 2.72 ☐ Assumed ☒Measured (ASTM D854)

PERMEANT: ☒ Deaired Tap Water ☐ Other _____

Initial Conditions							Test Conditions					Final Conditions			Hydraulic Conductivity
H (cm)	D (cm)	V (cm^3)	w_c (%)	γ_d (lb/ft^3)	n	S (%)	$\bar{\sigma}_c$ (psi)	u_b (psi)	i_{avg}	Q (cm^3)	t (days)	WDS (g)	w_c (%)	S (%)	k_{20} (cm/sec)
7.32	5.06	146.92	9.7	132.7	0.215	95	30	160	37	1.2	1	312.51	9.7	95	**5.0E-06**

COMMENTS: (1) Horizontal permeability test specimen was cross-cored from the corresponding vertical test specimen.
*First length is total sample length. Second length is useable length at full core diameter.

Where: H = Specimen height; D = Specimen diameter; V = Volume; WDS = Dry mass; w_c = Water content (ASTM D2216); γ_d = Dry density; S = Saturation; $\bar{\sigma}_c$ = Isotropic effective confining stress; u_b = Back-pressure; i_{avg} = Average hydraulic gradient; Q = Flow volume; t = Test duration; k_{20} = Saturated hydraulic conductivity at 20°C; n = Total porosity; and G_s = Specific gravity.

Checked By: TM Date: 08/18/14

Form SR-2B: Rev. 0

ARDAMAN & ASSOCIATES, INC. GEOTECHNICAL TESTING LABORATORY
ROCK CORE HYDRAULIC CONDUCTIVITY TEST REPORT

CLIENT: Youngquist Brothers, Inc.

PROJECT: Medley Landfill

FILE NO.: 14-13-0056

DATE SAMPLE RECEIVED: 05/01/14 SET UP: 07/10/14

DATE REPORTED: 08/18/14

INCOMING SAMPLE NO.: **IW-1, 2765'**

LABORATORY IDENTIFICATION NO.: 140056/IW2765KV

SAMPLE DESCRIPTION: Light brown limestone

ASTM D5084 TEST METHOD:

- ☐ A - Constant Head
- ☐ B - Falling Head; Constant Tailwater
- ☒ C - Falling Head; Rising Tailwater
- ☐ F - Constant Volume; Falling Head - Rising Tailwater

B-FACTOR: 96 %

- ☐ Beginning of Test;
- ☒ End of Test

$\Delta\sigma_c$ (psi): 4

SPECIMEN DATA:

As-Received Diameter (inch): 4 Diameter Trimmed: ☐ Yes ☒ No

As-Received Length (inch): 7.5/6.0* Length Trimmed: ☒ Yes ☐ No

TEST SPECIMEN ORIENTATION: ☒ **Vertical** ☐ Horizontal

SPECIFIC GRAVITY, G_s: 2.72

- ☐ Assumed
- ☒ Measured (ASTM D854)

PERMEANT: ☒ Deaired Tap Water ☐ Other

Initial Conditions							Test Conditions					Final Conditions			Hydraulic Conductivity
H (cm)	D (cm)	V (cm^3)	w_c (%)	γ_d (lb/ft^3)	n	S (%)	$\bar{\sigma}_c$ (psi)	u_b (psi)	i_{avg}	Q (cm^3)	t (days)	WDS (g)	w_c (%)	S (%)	k_{20} (cm/sec)
11.71	9.84	890.74	27.2	95.6	0.437	96	30	160	7.0	10.6	1	1364.44	27.3	96	**9.3E-04**

COMMENTS: (1) Core sample was cut to length, air-dried, deaired under vacuum for a minimum of 24 hours, and then saturated with deaired tap water from the bottom up while maintaining the vacuum. (2) Final w_c from horizontal permeability test specimen. WDS calculated from measured wet mass and final w_c.
*First length is total sample length. Second length is useable length at full core diameter.

The test data and all associated project information presented hereon shall be held in confidence and disclosed to other parties only with the authorization of the Client. Physical and electronic records of each project are kept for a minimum of 7 years. Test samples are kept in storage for at least 10 working days after mailing of the test report, prior to being discarded, unless a longer storage period is requested in writing and accepted by Ardaman & Associates, Inc.

Where: H = Specimen height; D = Specimen diameter; V = Volume; WDS = Dry mass; w_c = Water content (ASTM D2216); γ_d = Dry density; S = Saturation; $\bar{\sigma}_c$ = Isotropic effective confining stress; u_b = Back-pressure; i_{avg} = Average hydraulic gradient; Q = Flow volume; t = Test duration; k_{20} = Saturated hydraulic conductivity at 20°C; n = Total porosity; and G_s = Specific gravity.

Checked By: M Date: 08/18/14

Form SR-2B: Rev. 0

ARDAMAN & ASSOCIATES, INC. GEOTECHNICAL TESTING LABORATORY
ROCK CORE HYDRAULIC CONDUCTIVITY TEST REPORT

CLIENT: Youngquist Brothers, Inc.

PROJECT: Medley Landfill

FILE NO.: 14-13-0056

DATE SAMPLE RECEIVED: 05/01/14 SET UP: 07/24/14

DATE REPORTED: 08/18/14

INCOMING SAMPLE NO.: **IW-1, 2765'**

LABORATORY IDENTIFICATION NO.: 140056/IW2765KH

SAMPLE DESCRIPTION: Light brown limestone

ASTM D5084 TEST METHOD:

- ☐ A - Constant Head
- ☐ B - Falling Head; Constant Tailwater
- ☒ C - Falling Head; Rising Tailwater
- ☐ F - Constant Volume; Falling Head - Rising Tailwater

B-FACTOR: 88 %

- ☐ Beginning of Test;
- ☒ End of Test

$\Delta\sigma_c$ (psi): 6

SPECIMEN DATA:

As-Received Diameter (inch): 4 Diameter Trimmed: ☒ Yes ☐ No

As-Received Length (inch): 7.5/6.0* Length Trimmed: ☒ Yes ☐ No

TEST SPECIMEN ORIENTATION: ☐ Vertical ☒ **Horizontal**

SPECIFIC GRAVITY, G_s: 2.72 ☐ Assumed ☒Measured (ASTM D854)

PERMEANT: ☒ Deaired Tap Water ☐ Other

Initial Conditions							Test Conditions					Final Conditions			Hydraulic Conductivity
H (cm)	D (cm)	V (cm^3)	w_c (%)	γ_d (lb/ft^3)	n	S (%)	$\bar{\sigma}_c$ (psi)	u_b (psi)	i_{avg}	Q (cm^3)	t (days)	WDS (g)	w_c (%)	S (%)	k_{20} (cm/sec)
7.37	5.05	147.63	27.3	95.2	0.439	95	30	70	2.2	6.1	1	225.19	27.3	95	**1.2E-03**

COMMENTS: (1) Horizontal permeability test specimen was cross-cored from the corresponding vertical test specimen.
*First length is total sample length. Second length is useable length at full core diameter.

Where: H = Specimen height; D = Specimen diameter; V = Volume; WDS = Dry mass; w_c = Water content (ASTM D2216); γ_d = Dry density; S = Saturation; $\bar{\sigma}_c$ = Isotropic effective confining stress; u_b = Back-pressure; i_{avg} = Average hydraulic gradient; Q = Flow volume; t = Test duration; k_{20} = Saturated hydraulic conductivity at 20°C; n = Total porosity; and G_s = Specific gravity.

Checked By: PM Date: 08/18/14

Form SR-2B: Rev. 0

ARDAMAN & ASSOCIATES, INC. GEOTECHNICAL TESTING LABORATORY
ROCK CORE HYDRAULIC CONDUCTIVITY TEST REPORT

CLIENT: Youngquist Brothers, Inc.

PROJECT: Medley Landfill

FILE NO.: 14-13-0056

DATE SAMPLE RECEIVED: 05/01/14 SET UP: 07/07/14

DATE REPORTED: 08/18/14

INCOMING SAMPLE NO.: **IW-1, 2810'**

LABORATORY IDENTIFICATION NO.: 140056/IW2810KV

SAMPLE DESCRIPTION: Light brown limestone

ASTM D5084 TEST METHOD:

- ☐ A - Constant Head
- ☐ B - Falling Head; Constant Tailwater
- ☒ C - Falling Head; Rising Tailwater
- ☐ F - Constant Volume; Falling Head - Rising Tailwater

B-FACTOR: 97 % ☐ Beginning of Test; ☒ End of Test

$\Delta\sigma_c$ (psi): 11

SPECIMEN DATA:

As-Received Diameter (inch): 4 Diameter Trimmed: ☐ Yes ☒ No

As-Received Length (inch): 5.0/3.75* Length Trimmed: ☒ Yes ☐ No

TEST SPECIMEN ORIENTATION: ☒ **Vertical** ☐ Horizontal

SPECIFIC GRAVITY, G_s: 2.71 ☐ Assumed ☒ Measured (ASTM D854)

PERMEANT: ☒ Deaired Tap Water ☐ Other

Initial Conditions							Test Conditions					Final Conditions			Hydraulic Conductivity
H (cm)	D (cm)	V (cm^3)	w_c (%)	γ_d (lb/ft^3)	n	S (%)	$\bar{\sigma}_c$ (psi)	u_b (psi)	i_{avg}	Q (cm^3)	t (days)	WDS (g)	w_c (%)	S (%)	k_{20} (cm/sec)
9.13	9.52	649.96	22.9	103.6	0.388	98	30	70	1.8	23.1	1	1078.54	22.9	98	**7.9E-04**

COMMENTS: (1) Core sample was cut to length, air-dried, deaired under vacuum for a minimum of 24 hours, and then saturated with deaired tap water from the bottom up while maintaining the vacuum. (2) Final w_c from horizontal permeability test specimen. WDS calculated from measured wet mass and final w_c.
*First length is total sample length. Second length is useable length at full core diameter.

Where: H = Specimen height; D = Specimen diameter; V = Volume; WDS = Dry mass; w_c = Water content (ASTM D2216); γ_d = Dry density; S = Saturation; $\bar{\sigma}_c$ = Isotropic effective confining stress; u_b = Back-pressure; i_{avg} = Average hydraulic gradient; Q = Flow volume; t = Test duration; k_{20} = Saturated hydraulic conductivity at 20°C; n = Total porosity; and G_s = Specific gravity.

Checked By: TM Date: 08/18/14

Form SR-2B: Rev. 0

ARDAMAN & ASSOCIATES, INC. GEOTECHNICAL TESTING LABORATORY
ROCK CORE HYDRAULIC CONDUCTIVITY TEST REPORT

CLIENT: Youngquist Brothers, Inc.

PROJECT: Medley Landfill

FILE NO.: 14-13-0056

DATE SAMPLE RECEIVED: 05/01/14 SET UP: 07/25/14

DATE REPORTED: 08/18/14

INCOMING SAMPLE NO.: **IW-1, 2810'**

LABORATORY IDENTIFICATION NO.: 140056/IW2810KH

SAMPLE DESCRIPTION: Light brown limestone

ASTM D5084 TEST METHOD:

- ☐ A - Constant Head
- ☐ B - Falling Head; Constant Tailwater
- ☒ C - Falling Head; Rising Tailwater
- ☐ F - Constant Volume; Falling Head - Rising Tailwater

B-FACTOR: 88 %

- ☐ Beginning of Test;
- ☒ End of Test

$\Delta\sigma_c$ (psi): 6

SPECIMEN DATA:

As-Received Diameter (inch): 4 Diameter Trimmed: ☒ Yes ☐ No

As-Received Length (inch): 5.0/3.75* Length Trimmed: ☒ Yes ☐ No

TEST SPECIMEN ORIENTATION: ☐ Vertical ☒ **Horizontal**

SPECIFIC GRAVITY, G_s: 2.71 ☐ Assumed ☒Measured (ASTM D854)

PERMEANT: ☒ Deaired Tap Water ☐ Other _____

Initial Conditions							Test Conditions					Final Conditions			Hydraulic Conductivity
H (cm)	D (cm)	V (cm^3)	w_c (%)	γ_d (lb/ft^3)	n	S (%)	$\bar{\sigma}_c$ (psi)	u_b (psi)	i_{avg}	Q (cm^3)	t (days)	WDS (g)	w_c (%)	S (%)	k_{20} (cm/sec)
2.08	5.04	41.61	22.6	100.0	0.409	89	30	70	7.8	8.1	1	66.68	22.9	90	**8.2E-04**

COMMENTS: (1) Horizontal permeability test specimen was cross-cored from the corresponding vertical test specimen.
*First length is total sample length. Second length is useable length at full core diameter.

The test data and all associated project information presented hereon shall be held in confidence and disclosed to other parties only with the authorization of the Client. Physical and electronic records of each project are kept for a minimum of 7 years. Test samples are kept in storage for at least 10 working days after mailing of the test report, prior to being discarded, unless a longer storage period is requested in writing and accepted by Ardaman & Associates, Inc.

Where: H = Specimen height; D = Specimen diameter; V = Volume; WDS = Dry mass; w_c = Water content (ASTM D2216); γ_d = Dry density; S = Saturation; $\bar{\sigma}_c$ = Isotropic effective confining stress; u_b = Back-pressure; i_{avg} = Average hydraulic gradient; Q = Flow volume; t = Test duration; k_{20} = Saturated hydraulic conductivity at 20°C; n = Total porosity; and G_s = Specific gravity.

Checked By: TM Date: 08/18/14

Form SR-2B: Rev. 0

ARDAMAN & ASSOCIATES, INC. GEOTECHNICAL TESTING LABORATORY
ROCK CORE HYDRAULIC CONDUCTIVITY TEST REPORT

CLIENT: Youngquist Brothers, Inc.

PROJECT: Medley Landfill

FILE NO.: 14-13-0056

DATE SAMPLE RECEIVED: 05/01/14 SET UP: 07/01/14

DATE REPORTED: 08/18/14

INCOMING SAMPLE NO.: **IW-1, 2857'**

LABORATORY IDENTIFICATION NO.: 140056/IW2857KV

SAMPLE DESCRIPTION: Light brown limestone

ASTM D5084 TEST METHOD:

- ☐ A - Constant Head
- ☐ B - Falling Head; Constant Tailwater
- ☒ C - Falling Head; Rising Tailwater
- ☐ F - Constant Volume; Falling Head - Rising Tailwater

B-FACTOR: 89 (stable) % ☐ Beginning of Test; ☒ End of Test

$\Delta\sigma_c$ (psi): 17, 23

SPECIMEN DATA:

As-Received Diameter (inch): 4 Diameter Trimmed: ☐ Yes ☒ No

As-Received Length (inch): 6.0/4.5* Length Trimmed: ☒ Yes ☐ No

TEST SPECIMEN ORIENTATION: ☒ **Vertical** ☐ Horizontal

SPECIFIC GRAVITY, G_s: 2.72 ☐ Assumed ☒ Measured (ASTM D854)

PERMEANT: ☒ Deaired Tap Water ☐ Other

Initial Conditions							Test Conditions					Final Conditions			Hydraulic Conductivity
H (cm)	D (cm)	V (cm^3)	w_c (%)	γ_d (lb/ft^3)	n	S (%)	$\bar{\sigma}_c$ (psi)	u_b (psi)	i_{avg}	Q (cm^3)	t (days)	WDS (g)	w_c (%)	S (%)	k_{20} (cm/sec)
10.95	9.54	783.33	24.8	101.3	0.403	100	30	70	1.7	43.1	1	1272.13	24.9	100	**3.0E-04**

COMMENTS: (1) Core sample was cut to length, air-dried, deaired under vacuum for a minimum of 24 hours, and then saturated with deaired tap water from the bottom up while maintaining the vacuum. (2) Final w_c from horizontal permeability test specimen. WDS calculated from measured wet mass and final w_c.
*First length is total sample length. Second length is useable length at full core diameter.

The test data and all associated project information presented hereon shall be held in confidence and disclosed to other parties only with the authorization of the Client. Physical and electronic records of each project are kept for a minimum of 7 years. Test samples are kept in storage for at least 10 working days after mailing of the test report, prior to being discarded, unless a longer storage period is requested in writing and accepted by Ardaman & Associates, Inc.

Where: H = Specimen height; D = Specimen diameter; V = Volume; WDS = Dry mass; w_c = Water content (ASTM D2216); γ_d = Dry density; S = Saturation; $\bar{\sigma}_c$ = Isotropic effective confining stress; u_b = Back-pressure; i_{avg} = Average hydraulic gradient; Q = Flow volume; t = Test duration; k_{20} = Saturated hydraulic conductivity at 20°C; n = Total porosity; and G_s = Specific gravity.

Checked By: JM Date: 08/18/14

Form SR-2B: Rev. 0

ARDAMAN & ASSOCIATES, INC. GEOTECHNICAL TESTING LABORATORY
ROCK CORE HYDRAULIC CONDUCTIVITY TEST REPORT

CLIENT: Youngquist Brothers, Inc.

PROJECT: Medley Landfill

FILE NO.: 14-13-0056

DATE SAMPLE RECEIVED: 05/01/14 SET UP: 07/25/14

DATE REPORTED: 08/18/14

INCOMING SAMPLE NO.: **IW-1, 2857'**

LABORATORY IDENTIFICATION NO.: 140056/IW2857KH

SAMPLE DESCRIPTION: Light brown limestone

ASTM D5084 TEST METHOD:

- ☐ A - Constant Head
- ☐ B - Falling Head; Constant Tailwater
- ☒ C - Falling Head; Rising Tailwater
- ☐ F - Constant Volume; Falling Head - Rising Tailwater

B-FACTOR: 80 %

- ☐ Beginning of Test;
- ☒ End of Test

$\Delta\sigma_c$ (psi): 12

SPECIMEN DATA:

As-Received Diameter (inch): 4 Diameter Trimmed: ☒ Yes ☐ No

As-Received Length (inch): 6.0/4.5* Length Trimmed: ☒ Yes ☐ No

TEST SPECIMEN ORIENTATION: ☐ Vertical ☒ **Horizontal**

SPECIFIC GRAVITY, G_s: 2.72

- ☐ Assumed
- ☒ Measured (ASTM D854)

PERMEANT: ☒ Deaired Tap Water ☐ Other

Initial Conditions							Test Conditions					Final Conditions			Hydraulic Conductivity
H (cm)	D (cm)	V (cm^3)	w_c (%)	γ_d (lb/ft^3)	n	S (%)	$\bar{\sigma}_c$ (psi)	u_b (psi)	i_{avg}	Q (cm^3)	t (days)	WDS (g)	w_c (%)	S (%)	k_{20} (cm/sec)
7.05	5.05	141.14	24.9	99.7	0.413	96	30	70	2.4	7.6	1	225.47	24.9	96	**3.7E-04**

COMMENTS: (1) Horizontal permeability test specimen was cross-cored from the corresponding vertical test specimen.
*First length is total sample length. Second length is useable length at full core diameter.

Where: H = Specimen height; D = Specimen diameter; V = Volume; WDS = Dry mass; w_c = Water content (ASTM D2216); γ_d = Dry density; S = Saturation; $\bar{\sigma}_c$ = Isotropic effective confining stress; u_b = Back-pressure; i_{avg} = Average hydraulic gradient; Q = Flow volume; t = Test duration; k_{20} = Saturated hydraulic conductivity at 20°C; n = Total porosity; and G_s = Specific gravity.

Checked By: MM Date: 08/18/14

Form SR-2B: Rev. 0

ARDAMAN & ASSOCIATES, INC. GEOTECHNICAL TESTING LABORATORY
ROCK CORE HYDRAULIC CONDUCTIVITY TEST REPORT

CLIENT: Youngquist Brothers, Inc.

PROJECT: Medley Landfill

FILE NO.: 14-13-0056

DATE SAMPLE RECEIVED: 05/01/14 SET UP: 06/26/14

DATE REPORTED: 08/18/14

INCOMING SAMPLE NO.: **IW-1, 2905'**

LABORATORY IDENTIFICATION NO.: 140056/IW2905KV

SAMPLE DESCRIPTION: Light brown limestone

ASTM D5084 TEST METHOD:

- ☐ A - Constant Head
- ☐ B - Falling Head; Constant Tailwater
- ☒ C - Falling Head; Rising Tailwater
- ☐ F - Constant Volume; Falling Head - Rising Tailwater

B-FACTOR: 87 %

- ☐ Beginning of Test;
- ☒ End of Test

$\Delta\sigma_c$ (psi): 7

SPECIMEN DATA:

As-Received Diameter (inch): 4 Diameter Trimmed: ☐ Yes ☒ No

As-Received Length (inch): 8.0/5.0* Length Trimmed: ☒ Yes ☐ No

TEST SPECIMEN ORIENTATION: ☒ **Vertical** ☐ Horizontal

SPECIFIC GRAVITY, G_s: 2.71

- ☐ Assumed
- ☒ Measured (ASTM D854)

PERMEANT: ☒ Deaired Tap Water ☐ Other

Initial Conditions							Test Conditions					Final Conditions			Hydraulic Conductivity
H (cm)	D (cm)	V (cm^3)	w_c (%)	γ_d (lb/ft^3)	n	S (%)	$\bar{\sigma}_c$ (psi)	u_b (psi)	i_{avg}	Q (cm^3)	t (days)	WDS (g)	w_c (%)	S (%)	k_{20} (cm/sec)
10.83	9.97	845.69	25.3	98.4	0.418	95	30	70	1.6	82.7	2	1333.01	25.3	95	**1.5E-03**

COMMENTS: (1) Core sample was cut to length, air-dried, deaired under vacuum for a minimum of 24 hours, and then saturated with deaired tap water from the bottom up while maintaining the vacuum. (2) Final w_c from horizontal permeability test specimen. WDS calculated from measured wet mass and final w_c.
*First length is total sample length. Second length is useable length at full core diameter.

The test data and all associated project information presented hereon shall be held in confidence and disclosed to other parties only with the authorization of the Client. Physical and electronic records of each project are kept for a minimum of 7 years. Test samples are kept in storage for at least 10 working days after mailing of the test report, prior to being discarded, unless a longer storage period is requested in writing and accepted by Ardaman & Associates, Inc.

Where: H = Specimen height; D = Specimen diameter; V = Volume; WDS = Dry mass; w_c = Water content (ASTM D2216); γ_d = Dry density; S = Saturation; $\bar{\sigma}_c$ = Isotropic effective confining stress; u_b = Back-pressure; i_{avg} = Average hydraulic gradient; Q = Flow volume; t = Test duration; k_{20} = Saturated hydraulic conductivity at 20°C; n = Total porosity; and G_s = Specific gravity.

Checked By: TW Date: 08/18/14

Form SR-2B: Rev. 0

ARDAMAN & ASSOCIATES, INC. GEOTECHNICAL TESTING LABORATORY
ROCK CORE HYDRAULIC CONDUCTIVITY TEST REPORT

CLIENT: Youngquist Brothers, Inc.

PROJECT: Medley Landfill

FILE NO.: 14-13-0056

DATE SAMPLE RECEIVED: 05/01/14 SET UP: 07/25/14

DATE REPORTED: 08/18/14

INCOMING SAMPLE NO.: **IW-1, 2905'**

LABORATORY IDENTIFICATION NO.: 140056/IW2905KH

SAMPLE DESCRIPTION: Light brown limestone

ASTM D5084 TEST METHOD:

- ☐ A - Constant Head
- ☐ B - Falling Head; Constant Tailwater
- ☒ C - Falling Head; Rising Tailwater
- ☐ F - Constant Volume; Falling Head - Rising Tailwater

B-FACTOR: 81 %

- ☐ Beginning of Test;
- ☒ End of Test

$\Delta\sigma_c$ (psi): 12

SPECIMEN DATA:

As-Received Diameter (inch): 4 Diameter Trimmed: ☒ Yes ☐ No

As-Received Length (inch): 8.0/5.0* Length Trimmed: ☒ Yes ☐ No

TEST SPECIMEN ORIENTATION: ☐ Vertical ☒ **Horizontal**

SPECIFIC GRAVITY, G_s: 2.71 ☐ Assumed ☒Measured (ASTM D854)

PERMEANT: ☒ Deaired Tap Water ☐ Other _____

Initial Conditions							Test Conditions					Final Conditions			Hydraulic Conductivity
H (cm)	D (cm)	V (cm^3)	w_c (%)	γ_d (lb/ft3)	n	S (%)	$\bar{\sigma}_c$ (psi)	u_b (psi)	i_{avg}	Q (cm^3)	t (days)	WDS (g)	w_c (%)	S (%)	k_{20} (cm/sec)
7.39	5.05	147.99	25.3	98.9	0.415	97	30	70	2.4	6.9	1	234.66	25.3	97	**9.7E-04**

COMMENTS: (1) Horizontal permeability test specimen was cross-cored from the corresponding vertical test specimen.
*First length is total sample length. Second length is useable length at full core diameter.

The test data and all associated project information presented hereon shall be held in confidence and disclosed to other parties only with the authorization of the Client. Physical and electronic records of each project are kept for a minimum of 7 years. Test samples are kept in storage for at least 10 working days after mailing of the test report, prior to being discarded, unless a longer storage period is requested in writing and accepted by Ardaman & Associates, Inc.

Where: H = Specimen height; D = Specimen diameter; V = Volume; WDS = Dry mass; w_c = Water content (ASTM D2216); γ_d = Dry density; S = Saturation; $\bar{\sigma}_c$ = Isotropic effective confining stress; u_b = Back-pressure; i_{avg} = Average hydraulic gradient; Q = Flow volume; t = Test duration; k_{20} = Saturated hydraulic conductivity at 20°C; n = Total porosity; and G_s = Specific gravity.

Checked By: TM Date: 08/18/14

Form SR-2B: Rev. 0

ARDAMAN & ASSOCIATES, INC. GEOTECHNICAL TESTING LABORATORY
ROCK CORE HYDRAULIC CONDUCTIVITY TEST REPORT

CLIENT: Youngquist Brothers, Inc.

PROJECT: Medley Landfill

FILE NO.: 14-13-0056

DATE SAMPLE RECEIVED: 05/01/14 SET UP: 07/09/14

DATE REPORTED: 08/18/14

INCOMING SAMPLE NO.: **DMW-1, 1943'**

LABORATORY IDENTIFICATION NO.: 140056/DMW1943KV

SAMPLE DESCRIPTION: Light brown limestone

ASTM D5084 TEST METHOD:

- ☐ A - Constant Head
- ☐ B - Falling Head; Constant Tailwater
- ☒ C - Falling Head; Rising Tailwater
- ☐ F - Constant Volume; Falling Head - Rising Tailwater

B-FACTOR: 91 %

- ☐ Beginning of Test;
- ☒ End of Test

$\Delta\sigma_c$ (psi): 16

SPECIMEN DATA:

As-Received Diameter (inch): 4 Diameter Trimmed: ☐ Yes ☒ No

As-Received Length (inch): 6.25/4.25* Length Trimmed: ☒ Yes ☐ No

TEST SPECIMEN ORIENTATION: ☒ **Vertical** ☐ Horizontal

SPECIFIC GRAVITY, G_s: 2.72

- ☐ Assumed
- ☒ Measured (ASTM D854)

PERMEANT: ☒ Deaired Tap Water ☐ Other

Initial Conditions							Test Conditions					Final Conditions			Hydraulic Conductivity
H (cm)	D (cm)	V (cm^3)	w_c (%)	γ_d (lb/ft^3)	n	S (%)	$\bar{\sigma}_c$ (psi)	u_b (psi)	i_{avg}	Q (cm^3)	t (days)	WDS (g)	w_c (%)	S (%)	k_{20} (cm/sec)
10.55	9.74	785.81	26.0	99.3	0.415	100	30	70	1.6	7.1	1	1250.11	26.0	100	**1.7E-03**

COMMENTS: (1) Core sample was cut to length, air-dried, deaired under vacuum for a minimum of 24 hours, and then saturated with deaired tap water from the bottom up while maintaining the vacuum. (2) Final w_c from horizontal permeability test specimen. WDS calculated from measured wet mass and final w_c.
*First length is total sample length. Second length is useable length at full core diameter.

Where: H = Specimen height; D = Specimen diameter; V = Volume; WDS = Dry mass; w_c = Water content (ASTM D2216); γ_d = Dry density; S = Saturation; $\bar{\sigma}_c$ = Isotropic effective confining stress; u_b = Back-pressure; i_{avg} = Average hydraulic gradient; Q = Flow volume; t = Test duration; k_{20} = Saturated hydraulic conductivity at 20°C; n = Total porosity; and G_s = Specific gravity.

Checked By: TM Date: 08/18/14

Form SR-2B: Rev. 0

ARDAMAN & ASSOCIATES, INC. GEOTECHNICAL TESTING LABORATORY
ROCK CORE HYDRAULIC CONDUCTIVITY TEST REPORT

CLIENT: Youngquist Brothers, Inc.

PROJECT: Medley Landfill

FILE NO.: 14-13-0056

DATE SAMPLE RECEIVED: 05/01/14 SET UP: 07/25/14

DATE REPORTED: 08/18/14

INCOMING SAMPLE NO.: **DMW-1, 1943'**

LABORATORY IDENTIFICATION NO.: 140056/DMW1943KH

SAMPLE DESCRIPTION: Light brown limestone

ASTM D5084 TEST METHOD:

- ☐ A - Constant Head
- ☐ B - Falling Head; Constant Tailwater
- ☒ C - Falling Head; Rising Tailwater
- ☐ F - Constant Volume; Falling Head - Rising Tailwater

B-FACTOR: 93 %

- ☐ Beginning of Test;
- ☒ End of Test

$\Delta\sigma_c$ (psi): 12

SPECIMEN DATA:

As-Received Diameter (inch): 4 Diameter Trimmed: ☒ Yes ☐ No

As-Received Length (inch): 6.25/4.25* Length Trimmed: ☒ Yes ☐ No

TEST SPECIMEN ORIENTATION: ☐ Vertical ☒ **Horizontal**

SPECIFIC GRAVITY, G_s: 2.72 ☐ Assumed ☒Measured (ASTM D854)

PERMEANT: ☒ Deaired Tap Water ☐ Other _____

Initial Conditions							Test Conditions					Final Conditions			Hydraulic Conductivity
H (cm)	D (cm)	V (cm^3)	w_c (%)	γ_d (lb/ft^3)	n	S (%)	$\bar{\sigma}_c$ (psi)	u_b (psi)	i_{avg}	Q (cm^3)	t (days)	WDS (g)	w_c (%)	S (%)	k_{20} (cm/sec)
7.11	5.05	142.37	25.8	95.5	0.438	90	30	70	2.4	7.5	1	217.87	26.0	91	**2.2E-03**

COMMENTS: (1) Horizontal permeability test specimen was cross-cored from the corresponding vertical test specimen.
*First length is total sample length. Second length is useable length at full core diameter.

Where: H = Specimen height; D = Specimen diameter; V = Volume; WDS = Dry mass; w_c = Water content (ASTM D2216); γ_d = Dry density; S = Saturation; $\bar{\sigma}_c$ = Isotropic effective confining stress; u_b = Back-pressure; i_{avg} = Average hydraulic gradient; Q = Flow volume; t = Test duration; k_{20} = Saturated hydraulic conductivity at 20°C; n = Total porosity; and G_s = Specific gravity.

Checked By: TM Date: 08/18/14

Form SR-2B: Rev. 0

ARDAMAN & ASSOCIATES, INC. GEOTECHNICAL TESTING LABORATORY
ROCK CORE HYDRAULIC CONDUCTIVITY TEST REPORT

CLIENT: Youngquist Brothers, Inc.

PROJECT: Medley Landfill

FILE NO.: 14-13-0056

DATE SAMPLE RECEIVED: 05/01/14 SET UP: 07/09/14

DATE REPORTED: 08/18/14

INCOMING SAMPLE NO.: **DMW-1, 2041'**

LABORATORY IDENTIFICATION NO.: 140056/DMW2041KV

SAMPLE DESCRIPTION: Light brown limestone

ASTM D5084 TEST METHOD:

- ☒ A - Constant Head
- ☐ B - Falling Head; Constant Tailwater
- ☐ C - Falling Head; Rising Tailwater
- ☐ F - Constant Volume; Falling Head - Rising Tailwater

B-FACTOR: 91 (stable) % ☐ Beginning of Test; ☒ End of Test

$\Delta\sigma_c$ (psi): 17, 22

SPECIMEN DATA:

As-Received Diameter (inch): 4 Diameter Trimmed: ☐ Yes ☒ No

As-Received Length (inch): 8.5/6.5* Length Trimmed: ☒ Yes ☐ No

TEST SPECIMEN ORIENTATION: ☒ **Vertical** ☐ Horizontal

SPECIFIC GRAVITY, G_s: 2.71 ☐ Assumed ☒ Measured (ASTM D854)

PERMEANT: ☒ Deaired Tap Water ☐ Other _____

Initial Conditions							Test Conditions					Final Conditions			Hydraulic Conductivity
H (cm)	D (cm)	V (cm^3)	w_c (%)	γ_d (lb/ft^3)	n	S (%)	$\bar{\sigma}_c$ (psi)	u_b (psi)	i_{avg}	Q (cm^3)	t (days)	WDS (g)	w_c (%)	S (%)	k_{20} (cm/sec)
11.12	9.94	861.96	21.3	105.5	0.376	96	30	160	34	3.8	1	1457.13	21.3	96	**4.2E-05**

COMMENTS: (1) Core sample was cut to length, air-dried, deaired under vacuum for a minimum of 24 hours, and then saturated with deaired tap water from the bottom up while maintaining the vacuum. (2) Final w_c from horizontal permeability test specimen. WDS calculated from measured wet mass and final w_c.
*First length is total sample length. Second length is useable length at full core diameter.

The test data and all associated project information presented hereon shall be held in confidence and disclosed to other parties only with the authorization of the Client. Physical and electronic records of each project are kept for a minimum of 7 years. Test samples are kept in storage for at least 10 working days after mailing of the test report, prior to being discarded, unless a longer storage period is requested in writing and accepted by Ardaman & Associates, Inc.

Where: H = Specimen height; D = Specimen diameter; V = Volume; WDS = Dry mass; w_c = Water content (ASTM D2216); γ_d = Dry density; S = Saturation; $\bar{\sigma}_c$ = Isotropic effective confining stress; u_b = Back-pressure; i_{avg} = Average hydraulic gradient; Q = Flow volume; t = Test duration; k_{20} = Saturated hydraulic conductivity at 20°C; n = Total porosity; and G_s = Specific gravity.

Checked By: TM Date: 08/18/14

Form SR-2B: Rev. 0

ARDAMAN & ASSOCIATES, INC. GEOTECHNICAL TESTING LABORATORY
ROCK CORE HYDRAULIC CONDUCTIVITY TEST REPORT

CLIENT: Youngquist Brothers, Inc.

PROJECT: Medley Landfill

FILE NO.: 14-13-0056

DATE SAMPLE RECEIVED: 05/01/14 SET UP: 07/25/14

DATE REPORTED: 08/18/14

INCOMING SAMPLE NO.: **DMW-1, 2041'**

LABORATORY IDENTIFICATION NO.: 140056/DMW2041

SAMPLE DESCRIPTION: Light brown limestone

ASTM D5084 TEST METHOD:

- ☒ A - Constant Head
- ☐ B - Falling Head; Constant Tailwater
- ☐ C - Falling Head; Rising Tailwater
- ☐ F - Constant Volume; Falling Head - Rising Tailwater

B-FACTOR: 70 %

- ☐ Beginning of Test;
- ☒ End of Test

$\Delta\sigma_c$ (psi): 9

SPECIMEN DATA:

As-Received Diameter (inch): 4 Diameter Trimmed: ☒ Yes ☐ No

As-Received Length (inch): 8.5/6.5* Length Trimmed: ☒ Yes ☐ No

TEST SPECIMEN ORIENTATION: ☐ Vertical ☒ **Horizontal**

SPECIFIC GRAVITY, G_s: 2.71 ☐ Assumed ☒Measured (ASTM D854)

PERMEANT: ☒ Deaired Tap Water ☐ Other _____

Initial Conditions							Test Conditions					Final Conditions			Hydraulic Conductivity
H (cm)	D (cm)	V (cm^3)	w_c (%)	γ_d (lb/ft^3)	n	S (%)	$\bar{\sigma}_c$ (psi)	u_b (psi)	i_{avg}	Q (cm^3)	t (days)	WDS (g)	w_c (%)	S (%)	k_{20} (cm/sec)
7.42	5.06	148.89	21.3	105.4	0.377	96	30	160	26	2.4	1	251.57	21.3	96	**6.7E-05**

COMMENTS: (1) Horizontal permeability test specimen was cross-cored from the corresponding vertical test specimen.
*First length is total sample length. Second length is useable length at full core diameter.

The test data and all associated project information presented hereon shall be held in confidence and disclosed to other parties only with the authorization of the Client. Physical and electronic records of each project are kept for a minimum of 7 years. Test samples are kept in storage for at least 10 working days after mailing of the test report, prior to being discarded, unless a longer storage period is requested in writing and accepted by Ardaman & Associates, Inc.

Where: H = Specimen height; D = Specimen diameter; V = Volume; WDS = Dry mass; w_c = Water content (ASTM D2216); γ_d = Dry density; S = Saturation; $\bar{\sigma}_c$ = Isotropic effective confining stress; u_b = Back-pressure; i_{avg} = Average hydraulic gradient; Q = Flow volume; t = Test duration; k_{20} = Saturated hydraulic conductivity at 20°C; n = Total porosity; and G_s = Specific gravity.

Checked By: RM Date: 08/18/14

Form SR-2B: Rev. 0

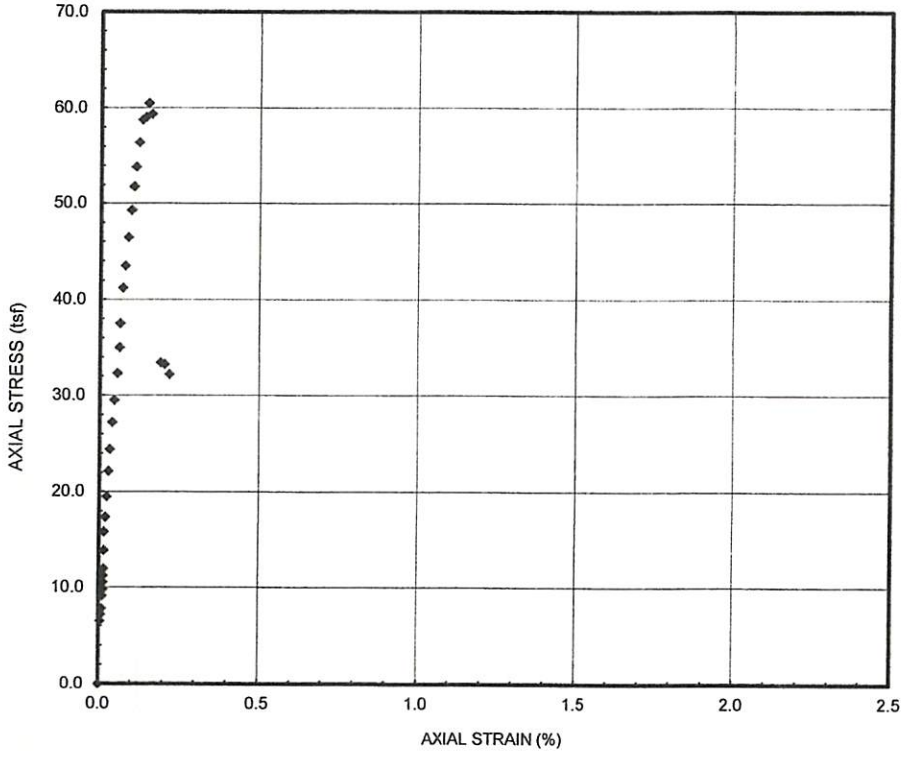
ARDAMAN & ASSOCIATES, INC. GEOTECHNICAL TESTING LABORATORY
INTACT ROCK CORE UNCONFINED COMPRESSION TEST REPORT

CLIENT: Youngquist Brothers, Inc.
PROJECT: Medley Landfill
FILE NO.: 14-13-0056

DATE SAMPLE RECEIVED: 05/01/14
DATE TEST SET-UP: 07/25/14
DATE REPORTED: 08/18/15

INCOMING SAMPLE NO.: **IW-1, 1628'**
BORING: ----- SAMPLE: ------
DEPTH: 1628 ☒ ft; ☐ m
LABORATORY IDENTIFICATION NO.: 140056/FB/1628'
SAMPLE DESCRIPTION: Light brown limestone

Specimen Dimensions			Initial Conditions			Rate of Loading		Time to Failure (minutes)	Unconfined Compressive Strength, σ_a(ult) (lb/in^2)	Young's Modulus, E at 50% σ_a(ult) (lb/in^2)
H (cm)	D (cm)	H/D	w_c (%)	γ_d (lb/ft^3)	S (%)	ε (cm/minute)	$\dot{\varepsilon}$ (%/minute)			
11.16	5.04	2.2	13.7	102.2	57	0.009	0.08	1.4	**840**	**$6.5x10^5$**



TEST PROCEDURES

ASTM Standard D 7012
[Method A]

Air Temperature (°C): 20.8

Capping Material: ☐ None ☒ Lab-Stone ☐ Sulfur

[E_{50}/σ_a(ult))]: 770
Comments:

SPECIMEN PREPARATION

Original Core Diameter (inch): 4

Specimen Sub-Cored for Testing: ☒Yes ☐ No

G_s: 2.69 ☐ Assumed ☒ Measured

FAILURE SKETCH

Where: H = Specimen height; D = Specimen diameter; w_c = Water content (ASTM D 2216); γ_d = Dry density; S = Saturation; $\dot{\varepsilon}$ = Vertical displacement rate; and G_s = Specific gravity.

Checked By: TM Date: 08/10/14

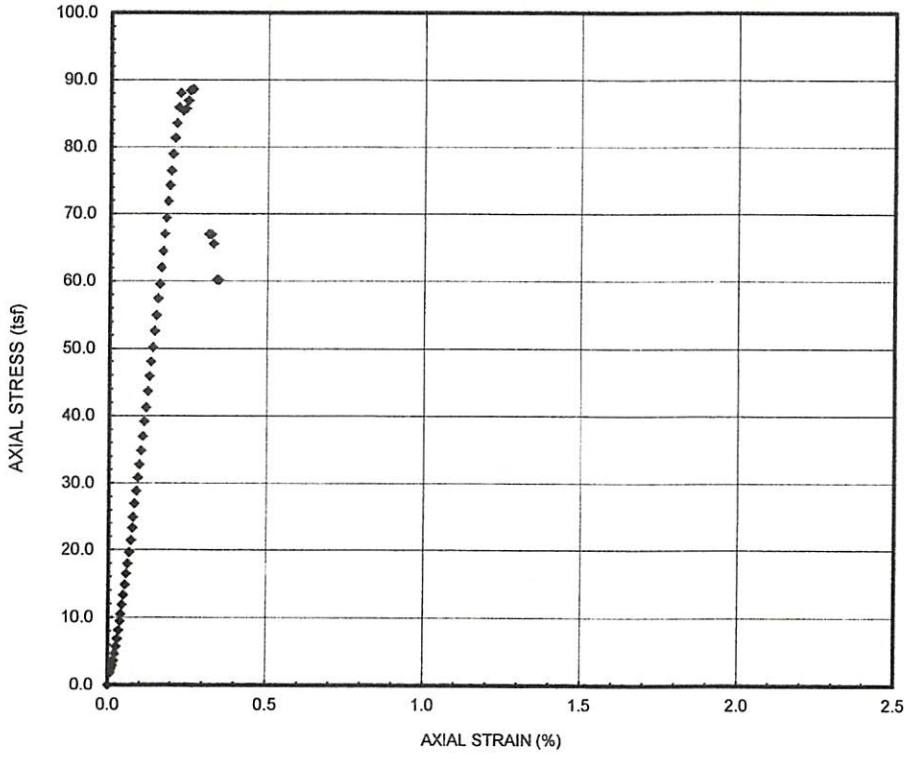
ARDAMAN & ASSOCIATES, INC. GEOTECHNICAL TESTING LABORATORY
INTACT ROCK CORE UNCONFINED COMPRESSION TEST REPORT

CLIENT: Youngquist Brothers, Inc.
PROJECT: Medley Landfill
FILE NO.: 14-13-0056

DATE SAMPLE RECEIVED: 05/01/14
DATE TEST SET-UP: 07/25/14
DATE REPORTED: 08/18/15

INCOMING SAMPLE NO.: **IW-1, 1955'**
BORING: ----- SAMPLE: -----
DEPTH: 1955 ☒ ft; ☐ m
LABORATORY IDENTIFICATION NO.: 140056/Core/1955'
SAMPLE DESCRIPTION: Light brown limestone

Specimen Dimensions			Initial Conditions			Rate of Loading		Time to Failure (minutes)	Unconfined Compressive Strength, σ_a(ult) (lb/in^2)	Young's Modulus, E at 50% σ_a(ult) (lb/in^2)
H (cm)	D (cm)	H/D	w_c (%)	γ_d (lb/ft^3)	S (%)	ε (cm/minute)	$\dot{\varepsilon}$ (%/minute)			
21.96	9.98	2.2	3.1	105.8	14	0.02	0.10	2.4	**1,220**	**6.2x10^5**



TEST PROCEDURES

ASTM Standard D 7012
[Method A]

Air Temperature (°C): 20.8

Capping Material: ☐ None ☒ Lab-Stone ☐ Sulfur

[E_{50}/σ_a(ult))]: 510

Comments:

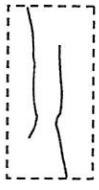
SPECIMEN PREPARATION

Original Core Diameter (inch): 4

Specimen Sub-Cored for Testing: ☒Yes ☐ No

G_s: 2.71 ☐ Assumed ☒ Measured

FAILURE SKETCH



The test data and all associated project information presented hereon shall be held in confidence and disclosed to other parties only with the authorization of the Client. Physical and electronic records of each project are kept for a minimum of 7 years. Test samples are kept in storage for at least 10 working days after mailing of the test report, prior to being discarded, unless a longer storage period is requested in writing and accepted by Ardaman & Associates, Inc.

Where: H = Specimen height; D = Specimen diameter; w_c = Water content (ASTM D 2216); γ_d = Dry density; S = Saturation; $\dot{\varepsilon}$ = Vertical displacement rate; and G_s = Specific gravity.

Checked By: RM Date: 08/18/14

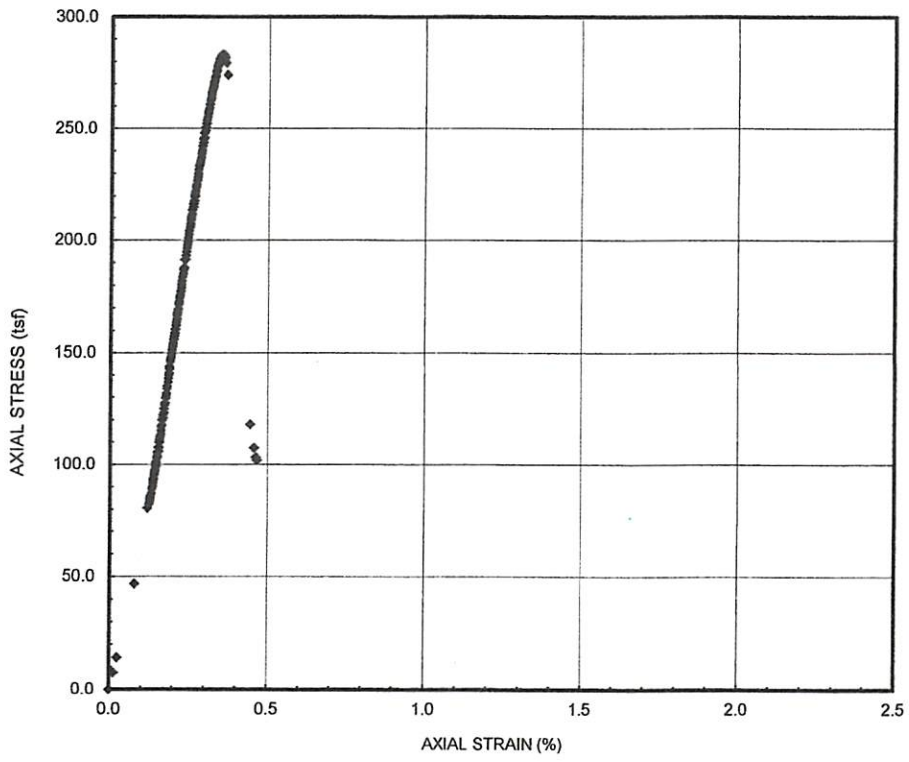
ARDAMAN & ASSOCIATES, INC. GEOTECHNICAL TESTING LABORATORY
INTACT ROCK CORE UNCONFINED COMPRESSION TEST REPORT

CLIENT: Youngquist Brothers, Inc.
PROJECT: Medley Landfill
FILE NO.: 14-13-0056

DATE SAMPLE RECEIVED: 05/01/14
DATE TEST SET-UP: 07/28/14
DATE REPORTED: 08/18/15

INCOMING SAMPLE NO.: **IW-1, 2712'**
BORING: ----- SAMPLE: -----
DEPTH: 2712 ☒ ft; ☐ m
LABORATORY IDENTIFICATION NO.: 140056/IWA/2712'
SAMPLE DESCRIPTION: Light brown limestone

Specimen Dimensions			Initial Conditions			Rate of Loading		Time to Failure (minutes)	Unconfined Compressive Strength, σ_a(ult) (lb/in^2)	Young's Modulus, E at 50% σ_a(ult) (lb/in^2)
H (cm)	D (cm)	H/D	w_c (%)	γ_d (lb/ft^3)	S (%)	ε (cm/minute)	$\dot{\varepsilon}$ (%/minute)			
9.64	5.05	1.9	5.0	138.9	60	0.003	0.029	7.5	**3,930**	**1.4x10^6**



TEST PROCEDURES

ASTM Standard D 7012
[Method A]

Air Temperature (°C): 20.5

Capping Material: ☐ None ☒ Lab-Stone ☐ Sulfur

[E_{50}/σ_a(ult))]: 360
Comments:

SPECIMEN PREPARATION

Original Core Diameter (inch): 4

Specimen Sub-Cored for Testing: ☒Yes ☐ No

G_s: 2.73 ☐ Assumed ☒ Measured

FAILURE SKETCH

The test data and all associated project information presented hereon shall be held in confidence and disclosed to other parties only with the authorization of the Client. Physical and electronic records of each project are kept for a minimum of 7 years. Test samples are kept in storage for at least 10 working days after mailing of the test report, prior to being discarded, unless a longer storage period is requested in writing and accepted by Ardaman & Associates, Inc.

Where: H = Specimen height; D = Specimen diameter; w_c = Water content (ASTM D 2216); γ_d = Dry density; S = Saturation; $\dot{\varepsilon}$ = Vertical displacement rate; and G_s = Specific gravity.

Checked By: PM Date: 08/18/14

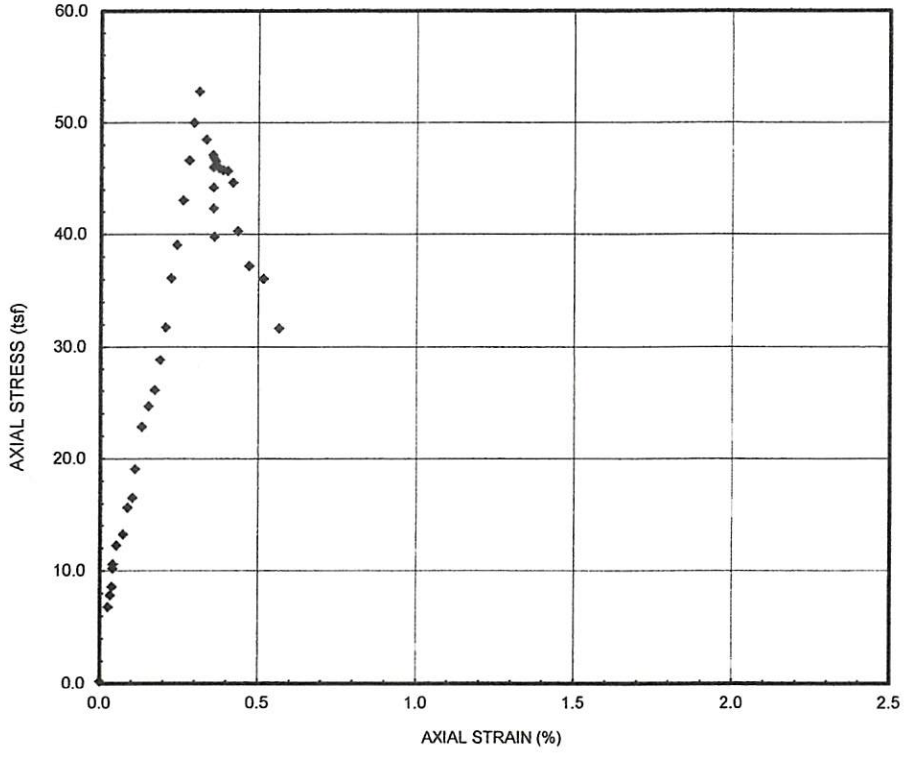
ARDAMAN & ASSOCIATES, INC. GEOTECHNICAL TESTING LABORATORY
INTACT ROCK CORE UNCONFINED COMPRESSION TEST REPORT

CLIENT: Youngquist Brothers, Inc.
PROJECT: Medley Landfill
FILE NO.: 14-13-0056

DATE SAMPLE RECEIVED: 05/01/14
DATE TEST SET-UP: 07/24/14
DATE REPORTED: 08/18/15

INCOMING SAMPLE NO.: **IW-1, 2776'**
BORING: ----- SAMPLE: -----
DEPTH: 2776 ☒ ft; ☐ m
LABORATORY IDENTIFICATION NO.: 140056/IWB/2776'
SAMPLE DESCRIPTION: Light brown limestone

Specimen Dimensions			Initial Conditions			Rate of Loading		Time to Failure (minutes)	Unconfined Compressive Strength, σ_a(ult) (lb/in^2)	Young's Modulus, E at 50% σ_a(ult) (lb/in^2)
H (cm)	D (cm)	H/D	w_c (%)	γ_d (lb/ft^3)	S (%)	ε (cm/minute)	$\dot{\varepsilon}$ (%/minute)			
11.31	5.05	2.2	9.4	114.2	52	0.034	0.30	1.0	**733**	**$2.0x10^5$**



TEST PROCEDURES

ASTM Standard D 7012
[Method A]

Air Temperature (°C): 20.8

Capping Material: ☐ None ☒ Lab-Stone ☐ Sulfur

[E_{50}/σ_a(ult))]: 270
Comments:

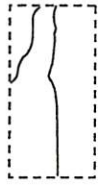
SPECIMEN PREPARATION

Original Core Diameter (inch): 4

Specimen Sub-Cored for Testing: ☒Yes ☐ No

G_s: 2.72 ☐ Assumed ☒ Measured

FAILURE SKETCH



Where: H = Specimen height; D = Specimen diameter; w_c = Water content (ASTM D 2216); γ_d = Dry density; S = Saturation; $\dot{\varepsilon}$ = Vertical displacement rate; and G_s = Specific gravity.

Checked By: TM Date: 08/10/14

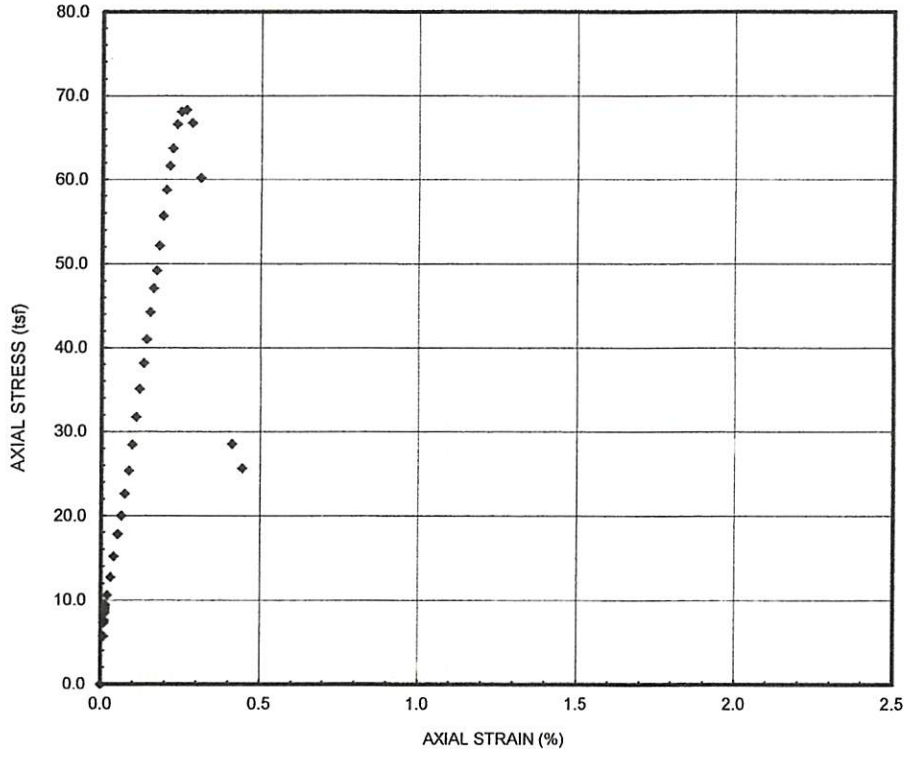
ARDAMAN & ASSOCIATES, INC. GEOTECHNICAL TESTING LABORATORY
INTACT ROCK CORE UNCONFINED COMPRESSION TEST REPORT

CLIENT: Youngquist Brothers, Inc.
PROJECT: Medley Landfill
FILE NO.: 14-13-0056

DATE SAMPLE RECEIVED: 05/01/14
DATE TEST SET-UP: 07/28/14
DATE REPORTED: 08/18/15

INCOMING SAMPLE NO.: **DMW-1, 2028'**
BORING: ----- SAMPLE: -----
DEPTH: 2028 ☒ ft; ☐ m
LABORATORY IDENTIFICATION NO.: 140056/DMWC/2028'
SAMPLE DESCRIPTION: Light brown limestone

Specimen Dimensions			Initial Conditions			Rate of Loading		Time to Failure (minutes)	Unconfined Compressive Strength, σ_a(ult) (lb/in^2)	Young's Modulus, E at 50% σ_a(ult) (lb/in^2)
H (cm)	D (cm)	H/D	w_c (%)	γ_d (lb/ft^3)	S (%)	ε (cm/minute)	$\dot{\varepsilon}$ (%/minute)			
9.40	5.05	1.9	16.4	99.9	64	0.021	0.22	1.5	**949**	**4.0x10^5**



TEST PROCEDURES

ASTM Standard D 7012
[Method A]

Air Temperature (°C): 20.5

Capping Material: ☐ None ☒ Lab-Stone ☐ Sulfur

[E_{50}/σ_a(ult))]: 420

Comments:

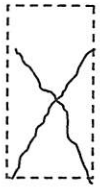
SPECIMEN PREPARATION

Original Core Diameter (inch): 4

Specimen Sub-Cored for Testing: ☒Yes ☐ No

G_s: 2.71 ☐ Assumed ☒ Measured

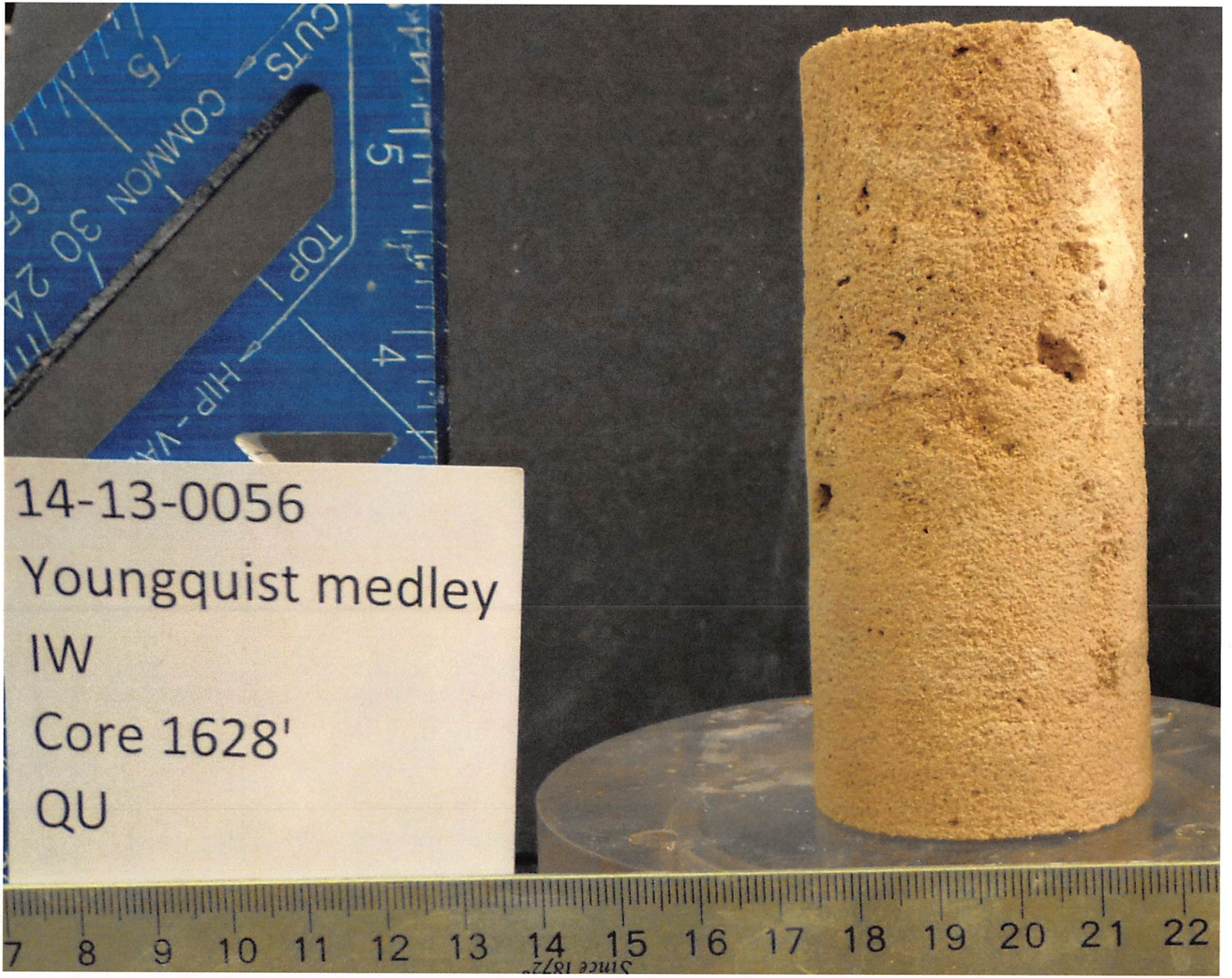
FAILURE SKETCH



The test data and all associated project information presented hereon shall be held in confidence and disclosed to other parties only with the authorization of the Client. Physical and electronic records of each project are kept for a minimum of 7 years. Test samples are kept in storage for at least 10 working days after mailing of the test report, prior to being discarded, unless a longer storage period is requested in writing and accepted by Ardaman & Associates, Inc.

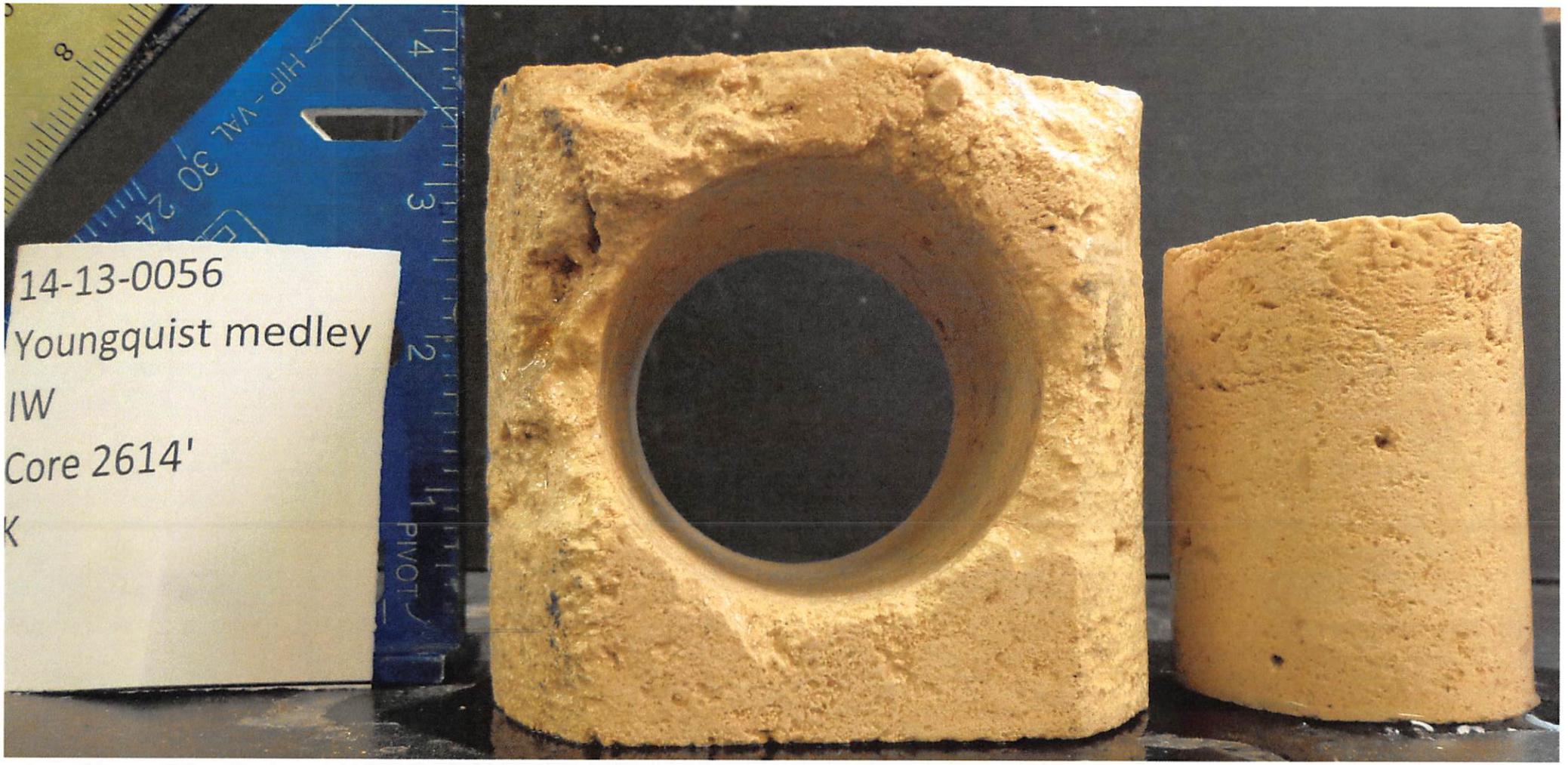
Where: H = Specimen height; D = Specimen diameter; w_c = Water content (ASTM D 2216); γ_d = Dry density; S = Saturation; $\dot{\varepsilon}$ = Vertical displacement rate; and G_s = Specific gravity.

Checked By: TM Date: 08/18/14


14-13-0056
Youngquist medley
IW
Core 1628'
QU
7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22


14-13-0056
Youngquist medley
IW
Core 1628'
K


14-13-0056
Youngquist medley
Core 1955'
K

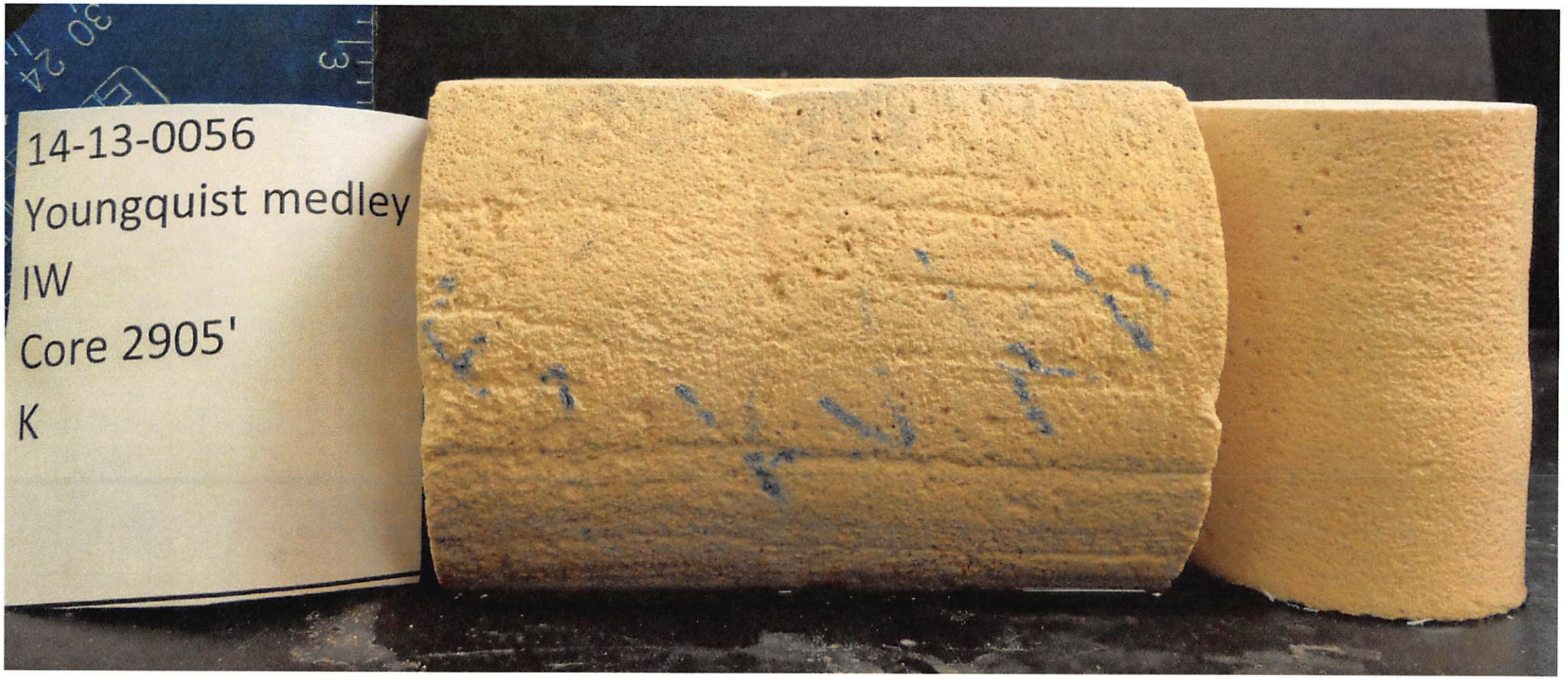

14-13-0056
Youngquist medley
IW
Core 2614'
K

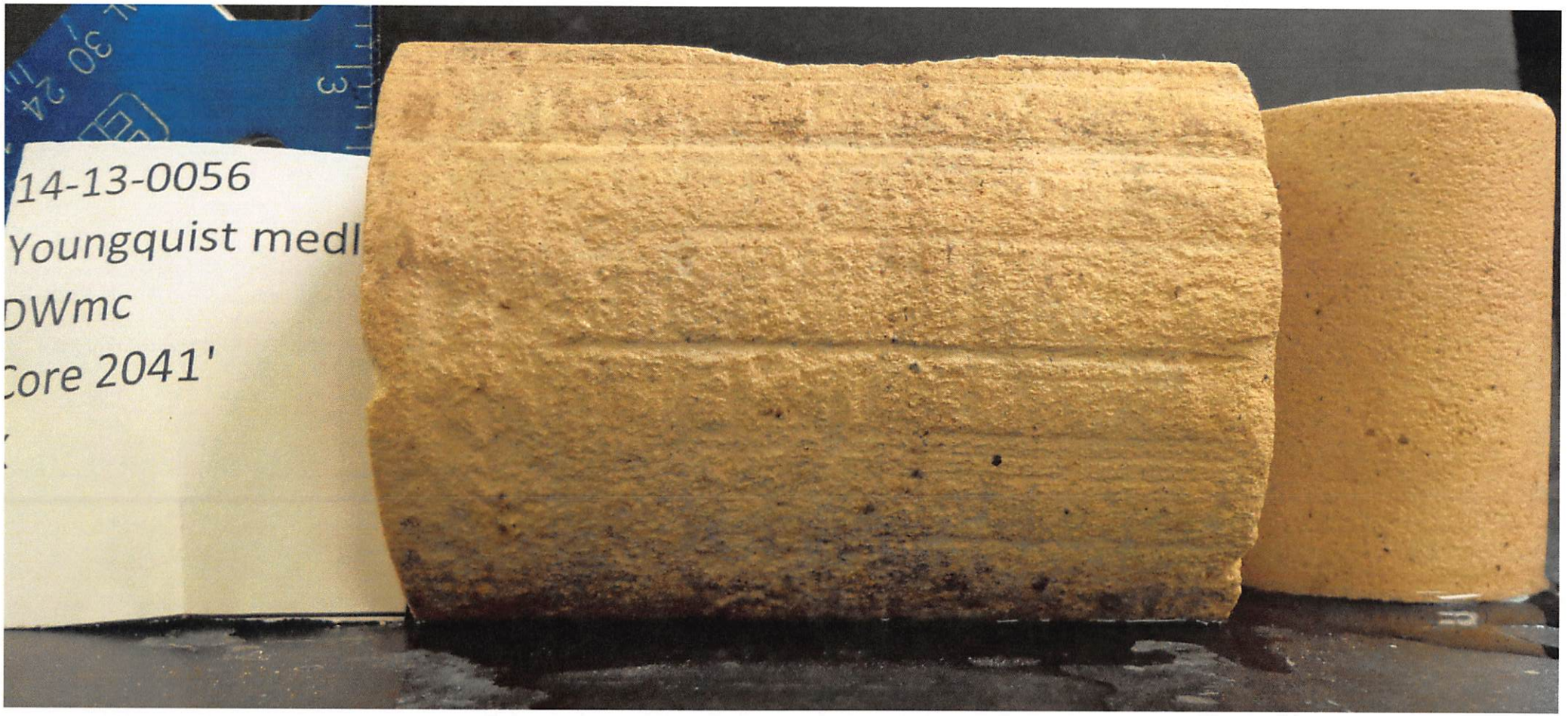

14-13-0056
Youngquist medley
IWA
Core 2703'
K

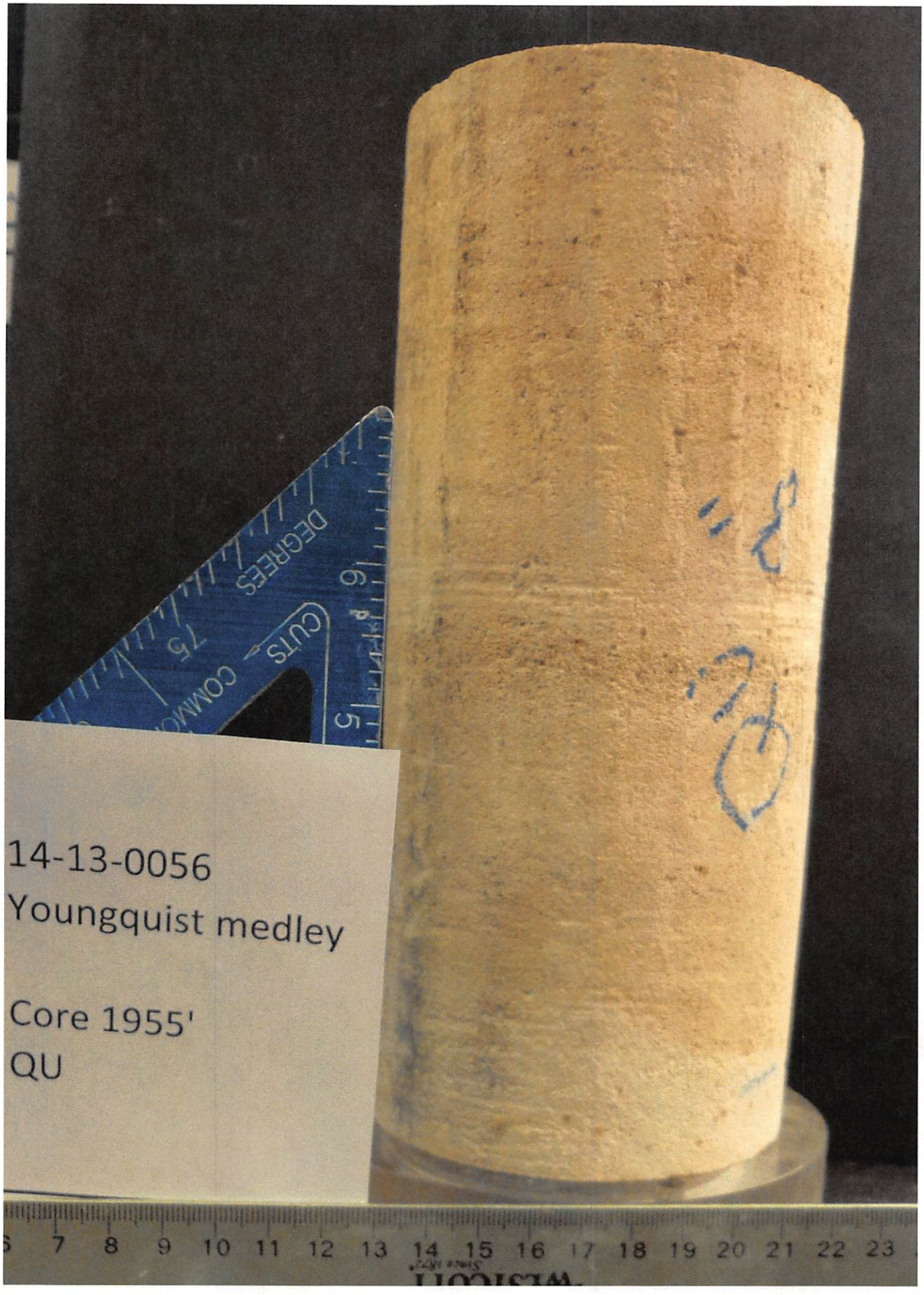

14-13-0056
Youngquist medley
IWB
Core 2765'
K

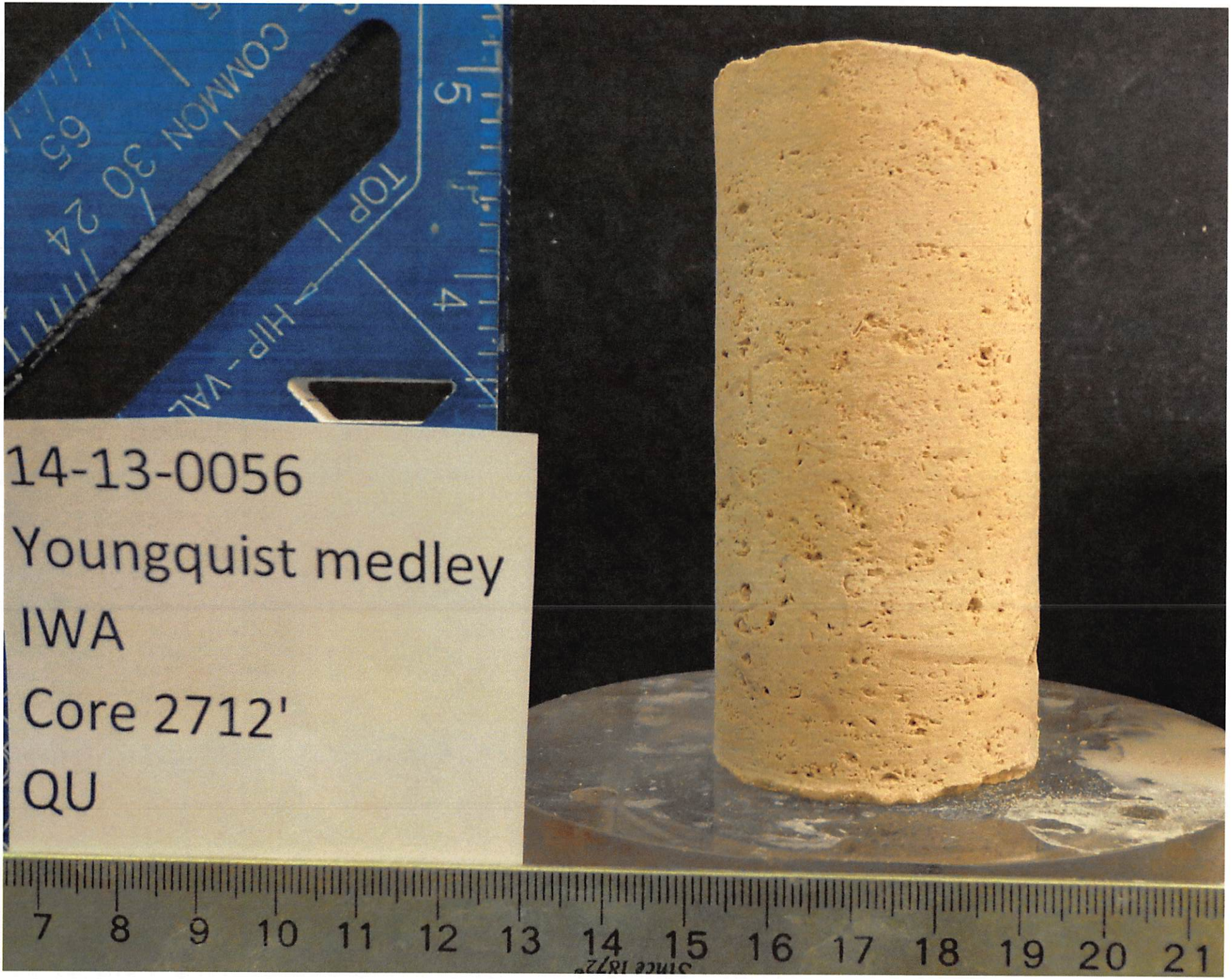

Youngquist medley
IW
Core 2810'
K


14-13-0056
Youngquist medley
IW
Core 2857'
K

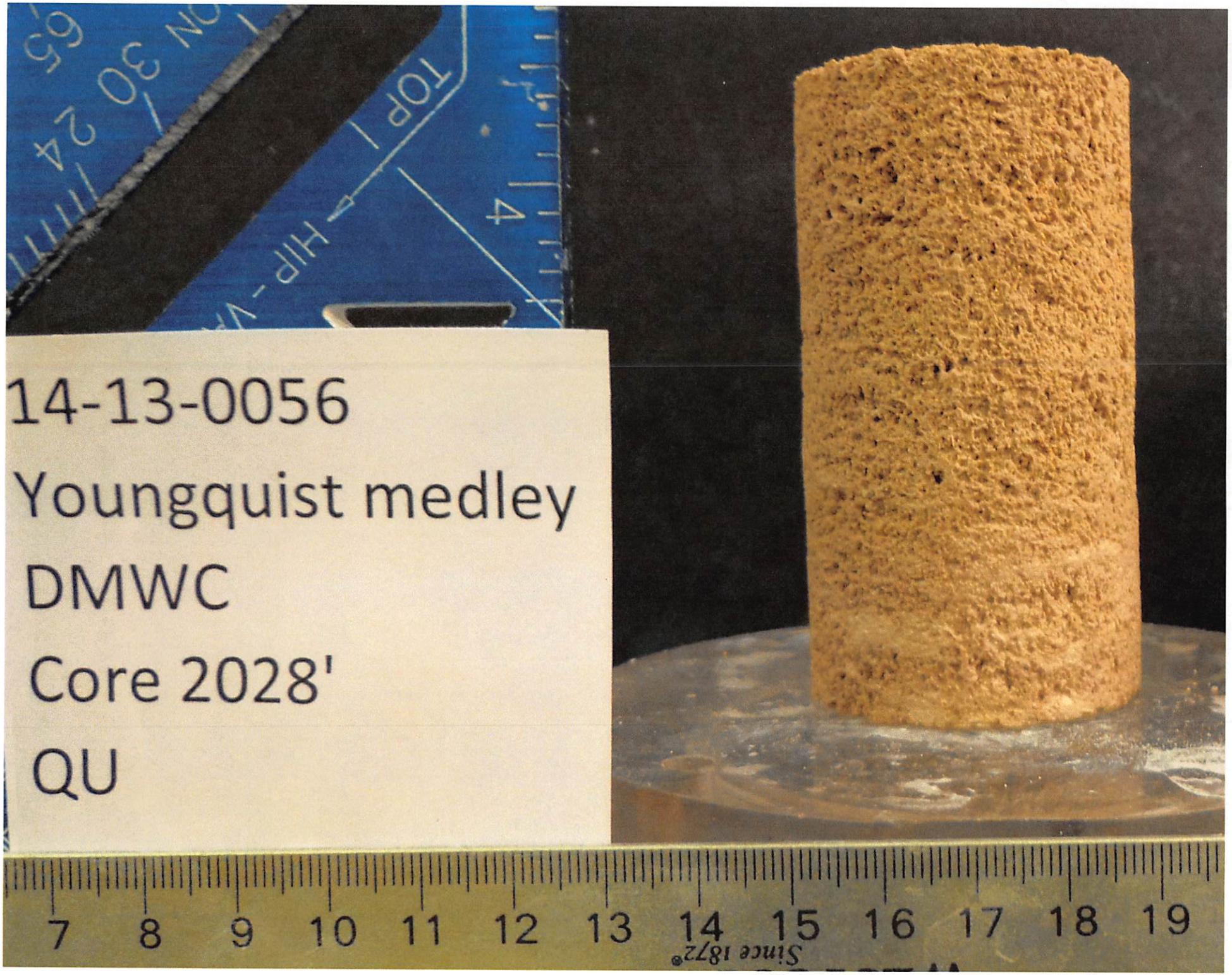

14-13-0056
Youngquist medley
IW
Core 2905'
K


14-13-0056
Youngquist medl
DWmc
Core 2041'


14-13-0056
Youngquist medley
Core 1955'
QU


14-13-0056
Youngquist medley
IWA
Core 2712'
QU


14-13-0056
Youngquist medley
IWB
Core 2776'
QU


14-13-0056
Youngquist medley
DMWC
Core 2028'
QU
7 8 9 10 11 12 13 14 15 16 17 18 19
Since 1872