



420 Turenne Street Winnipeg, Manitoba R2J 3W8
Phone: (204) 233-1694 Fax: (204) 235-1579
E-mail: engtech@mymts.net
www.eng-tech.ca

November 14, 2022

Project No. 22-142-02

Miller Environmental Corporation
P.O. Box 279
St. Jean Baptiste
MB R0G 2B0

ATTENTION: Chris Bell

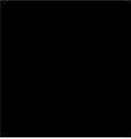
RE: Hydraulic Conductivity Test Results, Cell #5, Miller Environmental, South of St. Jean Baptiste, Manitoba

ENG-TECH Consulting Limited (ENG-TECH) collected a total of five (5) Shelby tube samples from the above project on October 17, 2022. The Shelby tube samples (identified as ST1 to ST5) were extracted on October 26, 2022 at the ENG-TECH laboratory. The soil samples were prepared for testing in accordance with ASTM D5084-16a, *Standard Test Method for Measurement of Hydraulic Conductivity of Saturated Porous Materials using a Flexible Wall Permeameter*.

Four (4) hydraulic conductivity tests were performed on samples ST1, ST3, ST4, and ST5, which were selected by Manitoba Environment. The final hydraulic conductivity values (k_{20}) of these samples ranged from 1.6×10^{-8} to 9.7×10^{-8} cm/sec. The hydraulic conductivity test data is summarized in Table 1, while the graphical representations of the hydraulic conductivity versus elapsed time are shown in Charts 1 to 4. Photographs of the sampling and samples are attached.

ENG-TECH trusts this is all the information you require. If you have any questions or require additional information, please contact the undersigned.

Sincerely,
ENG-TECH Consulting Limited


Walter Holowka, C.E.T., N.C.S.O.
Senior Geoenvironmental Technologist


Clark Hryhoruk, M.Sc., P.Eng.
President

CDH/wgh

Attachments

Table 1 – Hydraulic Conductivity Test Data Miller Environmental – Cell #5
Chart 1 – Hydraulic Conductivity Versus Elapsed Time Miller Environmental Cell #5: Sample ST1
Chart 2 – Hydraulic Conductivity Versus Elapsed Time Miller Environmental Cell #5: Sample ST3
Chart 3 – Hydraulic Conductivity Versus Elapsed Time Miller Environmental Cell #5: Sample ST4
Chart 4 – Hydraulic Conductivity Versus Elapsed Time Miller Environmental Cell #5: Sample ST5
Photographs (1 to 4)

**TABLE 1
HYDRAULIC CONDUCTIVITY TEST DATA
MILLER ENVIRONMENTAL – CELL #5**

SAMPLE ID	ST1	ST3	ST4	ST5
INITIAL VALUES				
ENG-TECH Reference No.	22-142-2-1	22-142-2-2	22-142-2-3	22-142-2-4
Length of Sample in Tube (cm)	~60	~40	~50	~40
Length (cm)	6.08	5.89	5.72	5.85
Diameter (cm)	7.19	7.15	7.16	7.01
Area (cm ²)	40.6	40.1	40.2	38.6
Volume (cm ³)	246.7	236.4	230.2	225.7
Water Content (%)	26.9	25.5	17.3	28.8
Bulk Dry Density (kg/m ³)	1,498	1,594	1,875	1,542
Specific Gravity (G _s) (assumed)	2.70	2.70	2.70	2.70
Void Ratio	0.803	0.694	0.440	0.751
Degree of Saturation (%)	~100	~100	~100	~100
FINAL VALUES				
Length (cm)	6.10	5.90	5.69	5.87
Diameter (cm)	7.24	7.23	7.18	7.05
Area (cm ²)	41.1	41.0	40.5	39.0
Volume (cm ³)	251.0	242.1	230.3	229.0
Water Content (%)	34.0	27.4	16.6	27.8
Bulk Dry Density (kg/m ³)	1,424	1,563	1,891	1,546
Specific Gravity (G _s) (assumed)	2.70	2.70	2.70	2.70
Void Ratio	0.896	0.728	0.428	0.747
Degree of Saturation (%)	~100	~100	~100	~100
CONSOLIDATION PHASE				
Confining Pressure (kPa)	103.4	103.4	103.4	103.4
Pore Water Pressure (kPa)	82.7	82.7	82.7	82.7
Effective Stress (kPa)	20.7	20.7	20.7	20.7
PERMEATION PHASE				
Confining Pressure (kPa)	103.4	103.4	103.4	103.4
Pore Water Pressure (kPa)	82.7	82.7	82.7	82.7
Effective Stress (kPa)	20.7	20.7	20.7	20.7
Hydraulic Gradient	15.4	15.4	15.4	15.4
Permeant Fluid	Potable Tap Water			
HYDRAULIC CONDUCTIVITY AT TEST TEMPERATURE: 21°C (cm/sec)	1.6 x 10 ⁻⁸	6.7 x 10 ⁻⁸	7.0 x 10 ⁻⁸	9.9 x 10 ⁻⁸
HYDRAULIC CONDUCTIVITY TEMPERATURE CORRECTED TO 20°C (K₂₀) (cm/sec)	1.6 x 10 ⁻⁸	6.5 x 10 ⁻⁸	6.8 x 10 ⁻⁸	9.7 x 10 ⁻⁸



Chart 1: Hydraulic Conductivity Versus Elapsed Time
Miller Environmental Cell #5: Sample ST1

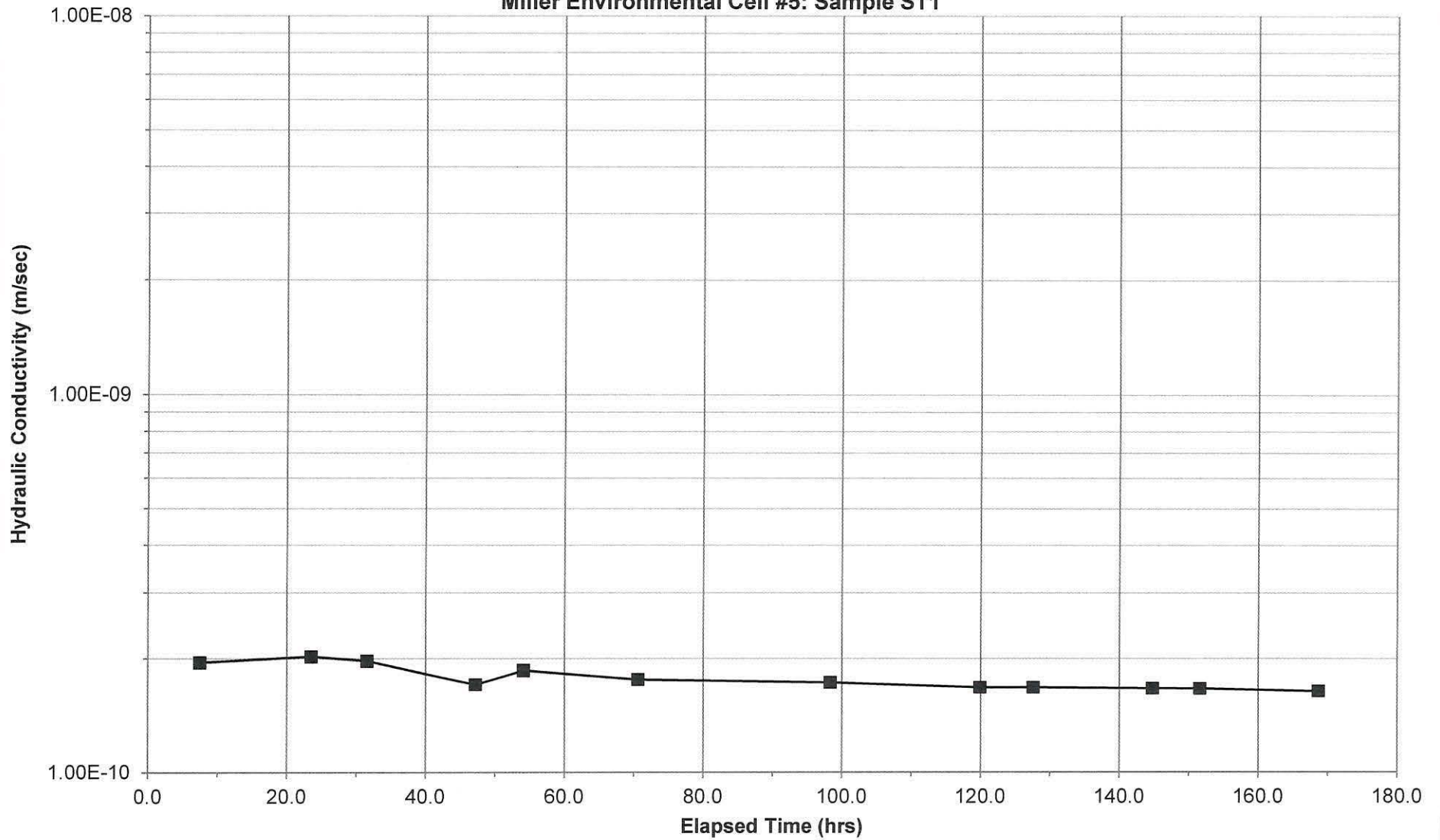


Chart 2: Hydraulic Conductivity Versus Elapsed Time
Miller Environmental Cell: Sample ST3

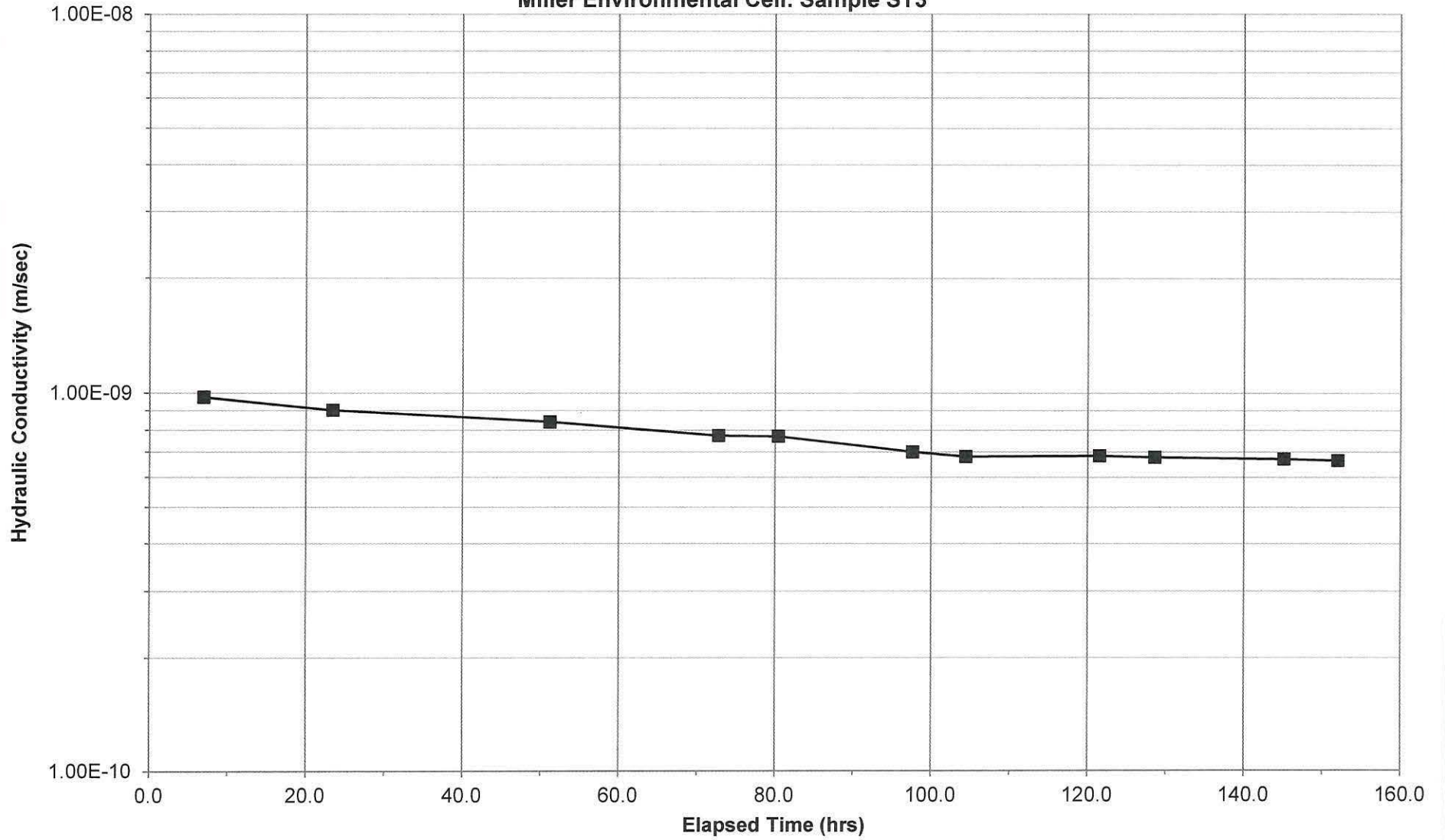


Chart 3: Hydraulic Conductivity Versus Elapsed Time
Miller Environmental Cell #5: Sample ST4

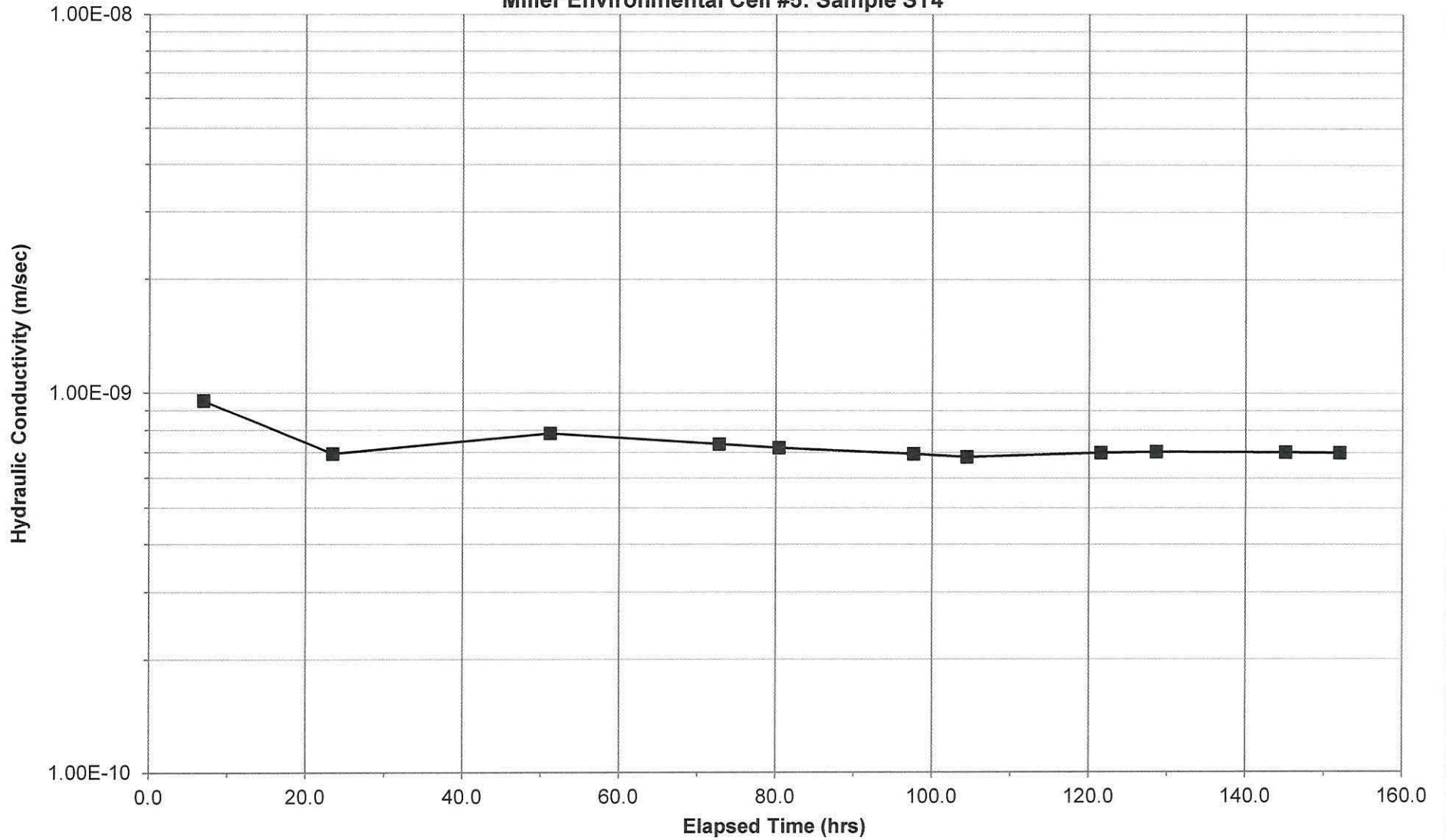
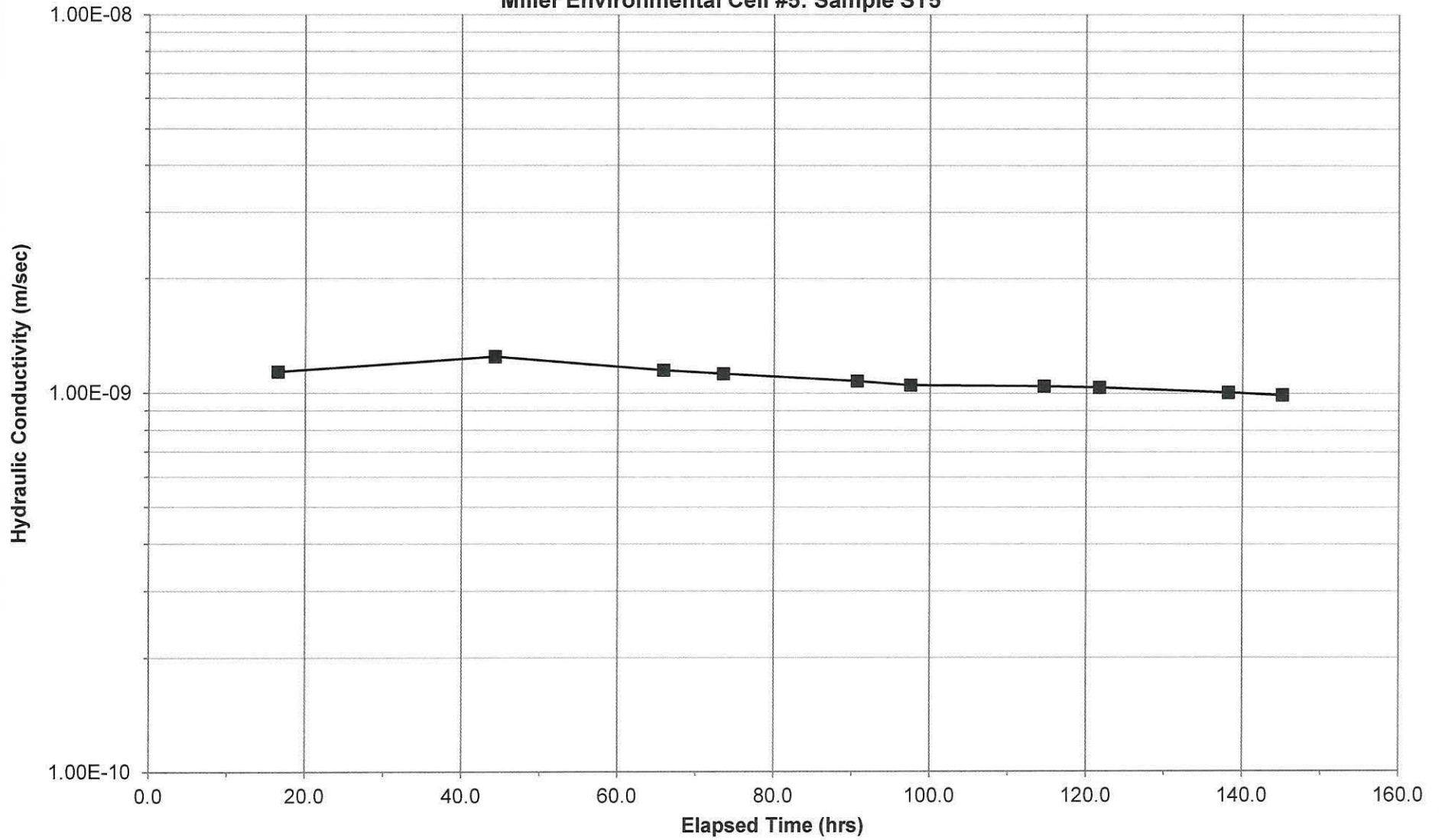
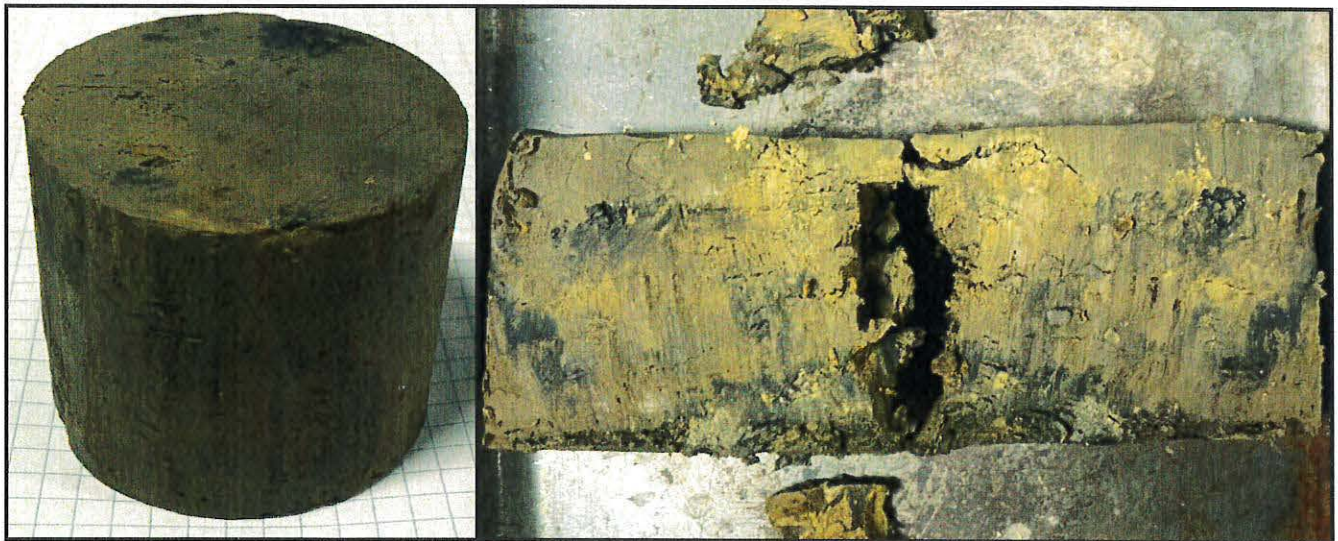


Chart 4: Hydraulic Conductivity Versus Elapsed Time
Miller Environmental Cell #5: Sample ST5

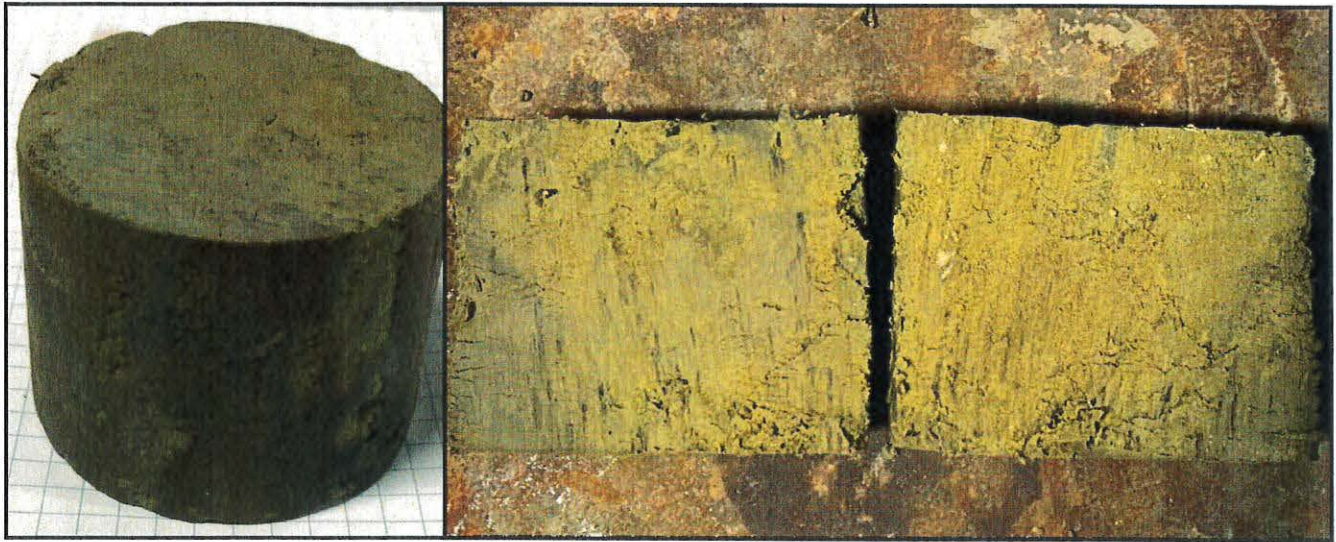




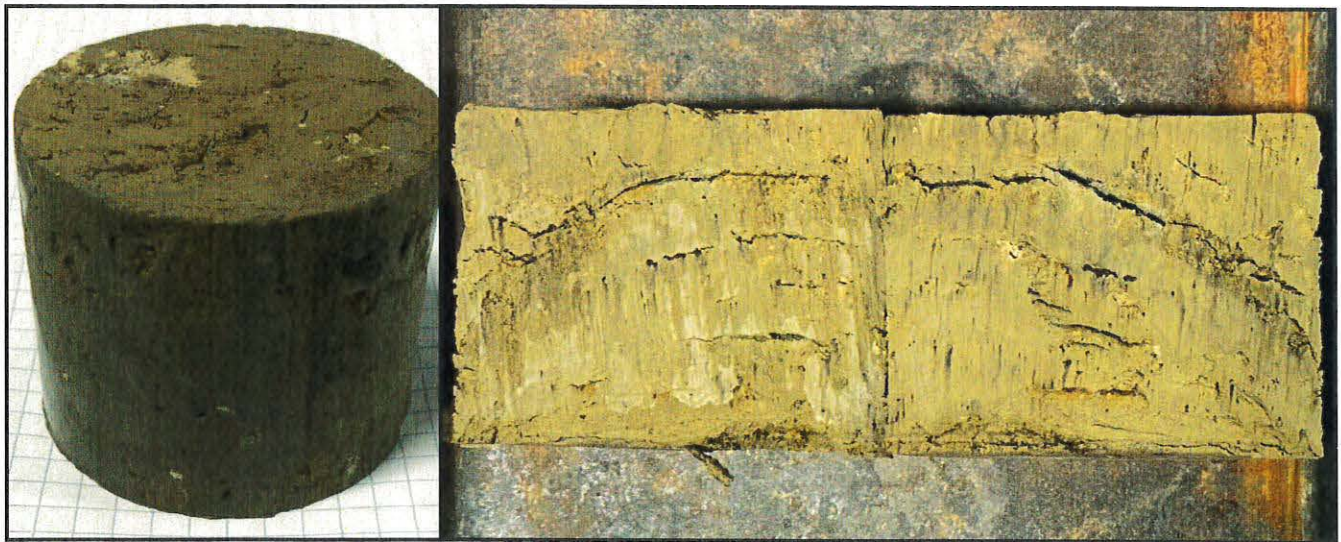
PHOTOGRAPH #1: Sample ST1 after hydraulic conductivity testing.



PHOTOGRAPH #2: Sample ST3 after hydraulic conductivity testing.



PHOTOGRAPH #3: Sample ST4 after hydraulic conductivity testing.



PHOTOGRAPH #4: Sample ST5 after hydraulic conductivity testing.