Miller Environmental Corporation
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Committed to Leadership in Our Industry

November 16, 2020

Manitoba Conservation and Climate
Environmental Compliance and Enforcement
1007 Century Street
Winnipeg, MB R3H 0W4

Attn: Edward Yazon – Environmental Engineer

Dear Mr. Yazon:

RE: Repository 2 SW Corner Hydraulic Conductivity Results - License DGHTA No. 58 HW S2 RRRR

Please accept this as Miller Environmental Corporation's (Miller) hydraulic conductivity results for the samples taken on October 6, 2020 in repository 2 (RC2) SW corner as regulated under the issued Dangerous Goods Handling & Transportation Act License No. 58 HW S2 RRRR.

For result details, please refer to Appendix A – Repository Cell 2 SW Corner Hydraulic Conductivity Results.

If you have any questions, please feel free to contact me at 204-925-9604 or by email at daveh@millerenvironmental.mb.ca

Sincerely yours,
Miller Environmental Corporation

Dave Howes
Director of Regulatory Affairs

CC: Paul Bauer – Vice President & General Manager, Miller Environmental Corporation
Yolo Ortiz – Operations Manager, Miller Environmental Corporation

Appendix A

Repository Cell 2 SW Corner Hydraulic Conductivity Results

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 13, 2020

Project No. 20-142-01

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

ATTENTION: Chris Bell

RE: Hydraulic Conductivity Test Results, RC2 SW Repository Cell
NE-02-03-1E, South of St. Jean Baptiste, Manitoba

ENG-TECH Consulting Limited (ENG-TECH) collected a total of four (4) Shelby tube samples from the above project on October 6, 2020. The Shelby tube samples (identified as S7 to S10) were extracted on October 7, 2020 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*.

Two (2) hydraulic conductivity tests were performed on samples S7 and S9, which were selected by Manitoba Conservation and Climate. At the start of the permeation phase for sample S9, a preferential flow developed and the test was ended shortly after (therefore no hydraulic conductivity value was calculated). It is unknown why the sample developed a preferential flow. The sample was visually classified as a medium to highly plastic clay and capable of obtaining a hydraulic conductivity of less than $1x10^{-7}$ cm/sec. Another test sample was prepared from the same Shelby tube (S9) adjacent the previous sample. There were no visual concerns with the new sample.

The final hydraulic conductivity values (k_{20}) for samples S7 and S9 were 9.2×10^{-9} and 8.6×10^{-9} cm/sec, respectively. 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 and 2. Photographs of the sampling and samples are attached. Shelby tube sample locations are presented on Figure 1.

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 RC2 Repository Cell
Chart 1 – Hydraulic Conductivity Versus Elapsed Time Miller Environmental RC2 Repository Construction: Sample S7
Chart 2 – Hydraulic Conductivity Versus Elapsed Time Miller Environmental RC2 Repository Construction: Sample S9
Photographs (1 & 2)
Figure 1 – Shelby Tube Sample Locations (S7-S10)

TABLE 1 HYDRAULIC CONDUCTIVITY TEST DATA MILLER ENVIRONMENTAL RC2 SW REPOSITORY CELL		
SAMPLE ID	**S7**	**S9**
INITIAL VALUES		
ENG-TECH Reference No.	20-142-1-6	20-142-1-8
Length of Sample in Tube (cm)	~60	~60
Length (cm)	6.06	7.01
Diameter (cm)	7.14	7.15
Area (cm^2)	40.0	40.1
Volume (cm^3)	242.5	281.3
Water Content (%)	35.3	23.3
Bulk Dry Density (kg/m^3)	1,364	1,646
Specific Gravity (G_s) (assumed)	2.70	2.70
Void Ratio	0.980	0.640
Degree of Saturation (%)	97.2	98.2
FINAL VALUES		
Length (cm)	6.09	7.11
Diameter (cm)	7.20	7.21
Area (cm^2)	40.7	40.8
Volume (cm^3)	247.8	291.0
Water Content (%)	37.2	25.3
Bulk Dry Density (kg/m^3)	1,347	1,604
Specific Gravity (G_s) (assumed)	2.70	2.70
Void Ratio	1,004	0.683
Degree of Saturation (%)	~100	~100
CONSOLIDATION PHASE		
Confining Pressure (kPa)	103.4	103.4
Pore Water Pressure (kPa)	82.7	82.7
Effective Stress (kPa)	20.7	20.7
PERMEATION PHASE		
Confining Pressure (kPa)	103.4	103.4
Pore Water Pressure (kPa)	82.7	82.7
Effective Stress (kPa)	20.7	20.7
Hydraulic Gradient	15.4	15.4
Permeant Fluid	Potable Tap Water	
HYDRAULIC CONDUCTIVITY AT TEST TEMPERATURE: 21°C (cm/sec)	9.4×10^{-9}	8.9×10^{-9}
HYDRAULIC CONDUCTIVITY TEMPERATURE CORRECTED TO 20°C (K_{20}) (cm/sec)	9.2×10^{-9}	8.6×10^{-9}

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Chart 1: Hydraulic Conductivity Versus Elapsed Time
Miller Environmental RC2 SW Repository Cell: Sample S7

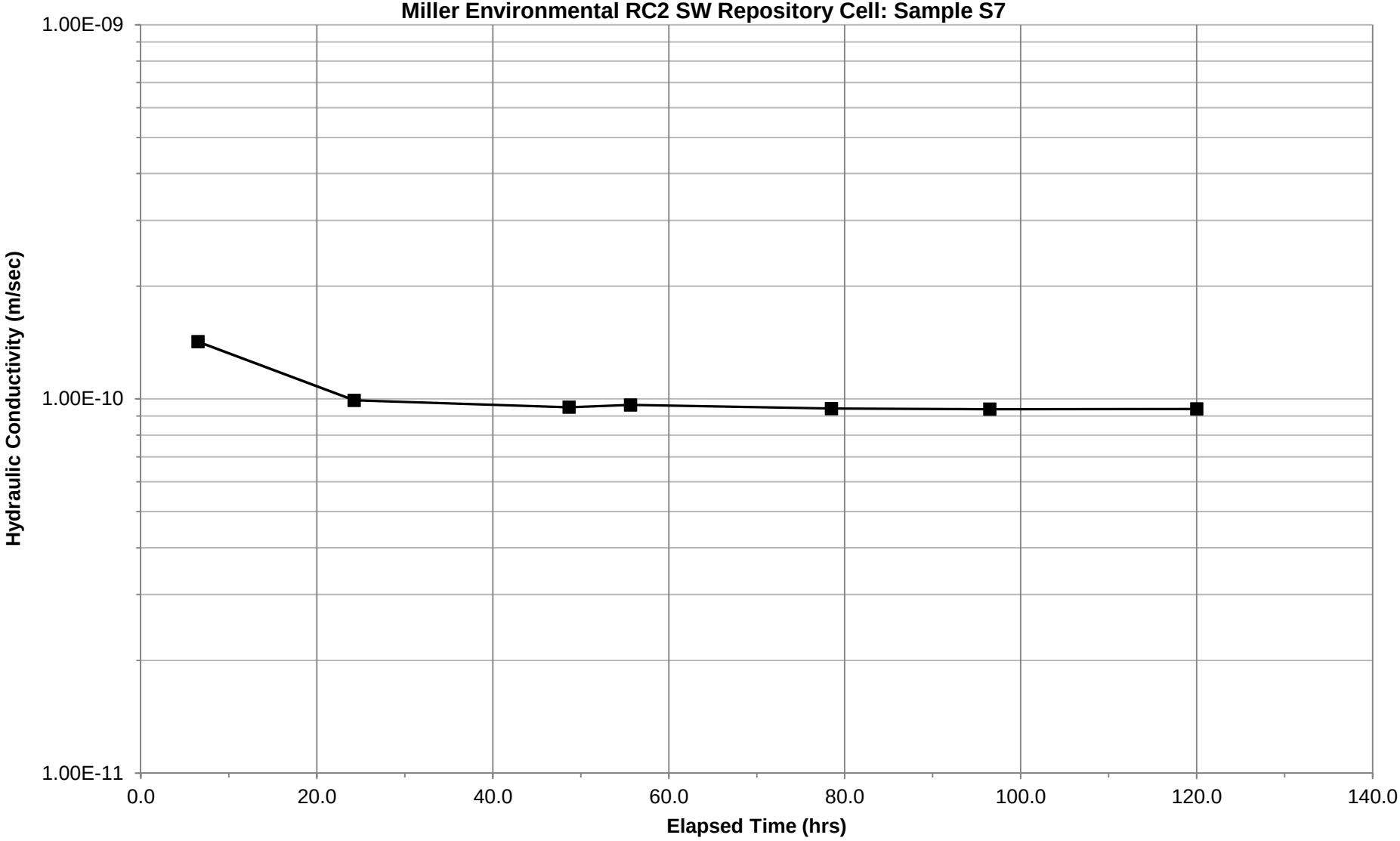

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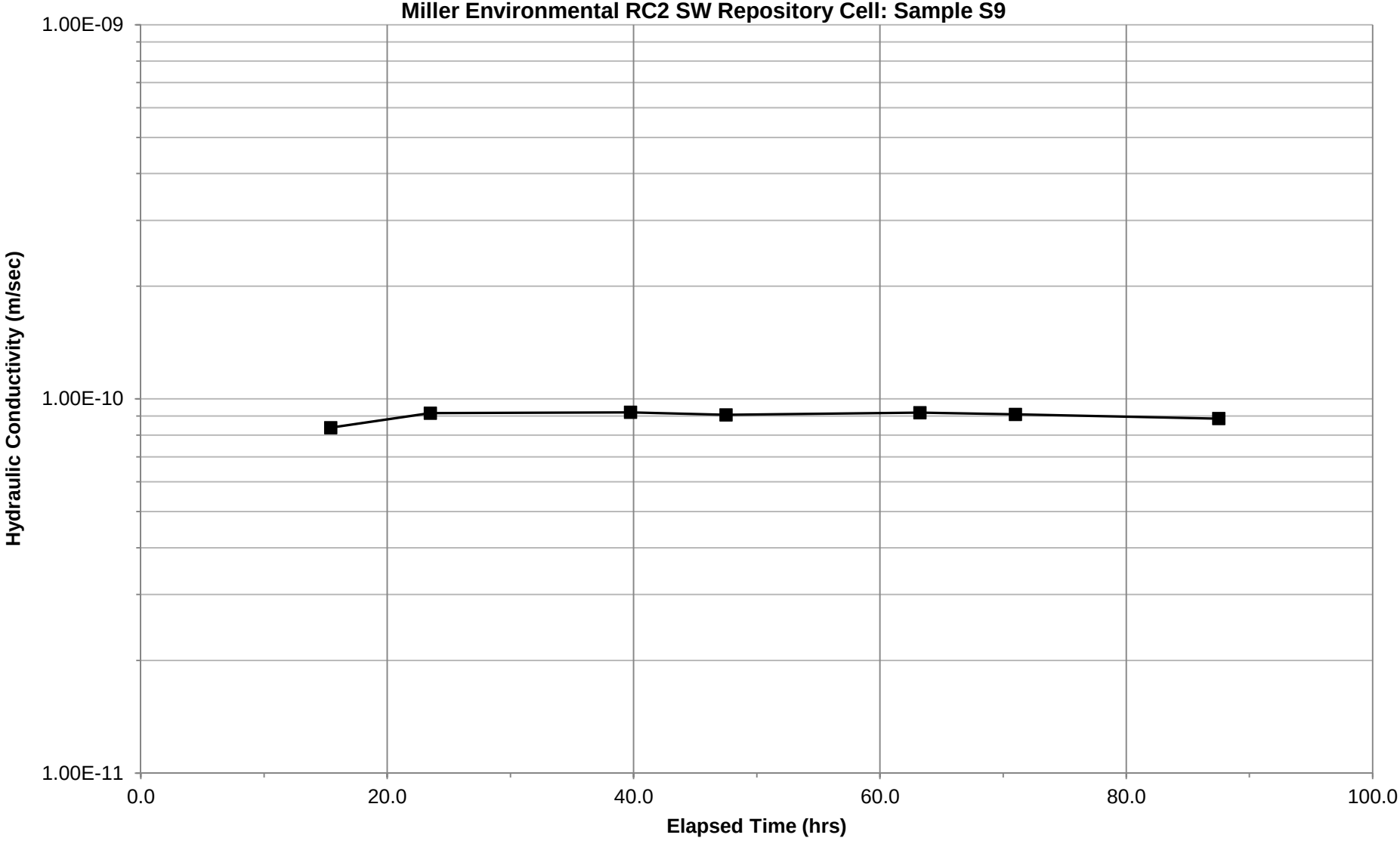
Chart 2: Hydraulic Conductivity Versus Elapsed Time
Miller Environmental RC2 SW Repository Cell: Sample S9



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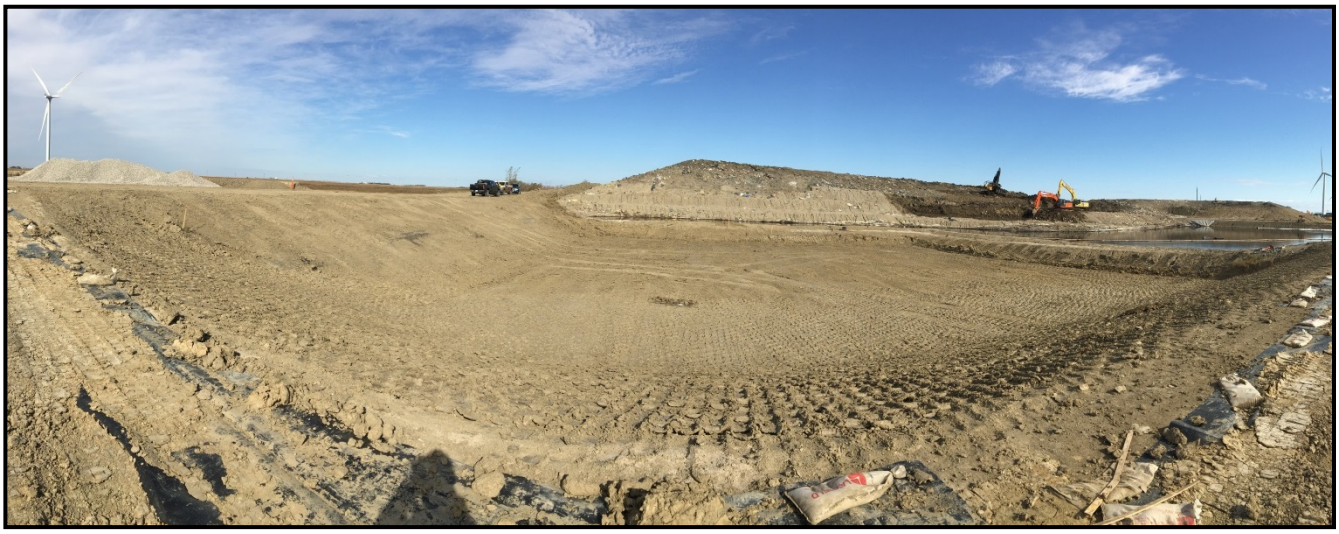
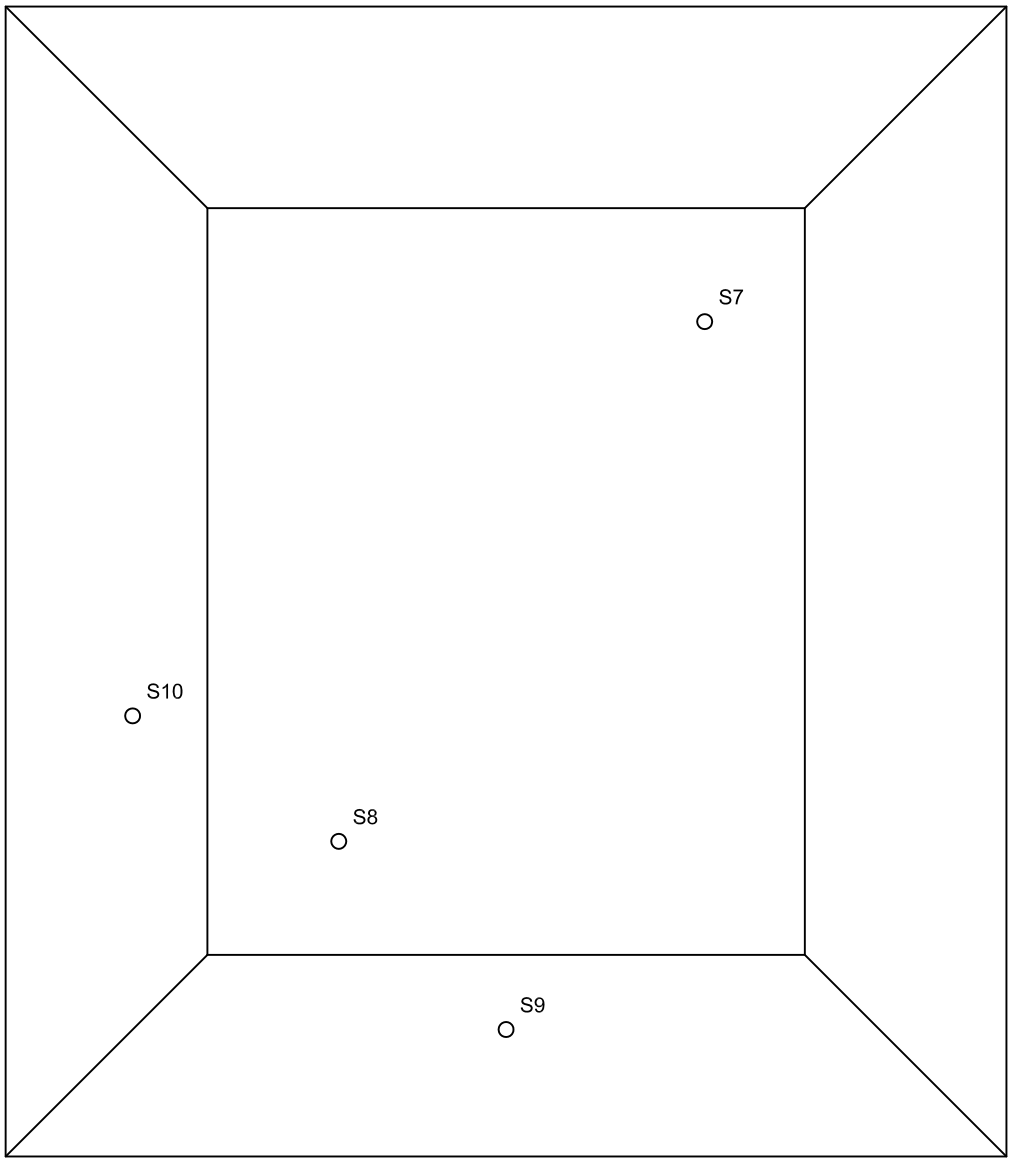
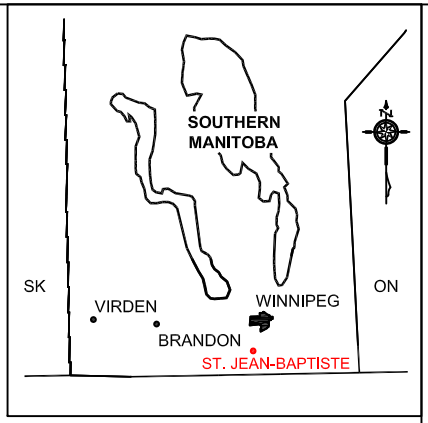


PHOTOGRAPH #1: View of the cell as seen facing north from the south berm.

PHOTOGRAPH #2: Sample S7 after completion of hydraulic conductivity testing.





LEGEND

S7 SHELBY TUBE SAMPLE LOCATION

NO.	DATE	ISSUE / REVISION
0	NOV 2020	REPORT

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ENG. STAMP:

ENGINEERS GEOSCIENTISTS MANITOBA
Certificate of Authorization
ENG-TECH Consulting Limited
No.2475

CLIENT:
MILLER ENVIRONMENTAL CORPORATION

PROJECT:
RC2 SW REPOSITORY CELL
HYDRAULIC CONDUCTIVITY
ST. JEAN BAPTISTE, MANITOBA

DWG DESCRIPTION:
SHELBY TUBE SAMPLE LOCATIONS (S7-S10)

SCALE:
1:500

DRAWN BY:	DATE:
WGH	NOVEMBER 2020

FILE No.:	CLIENT DWG/FIG. No.:
20-142-01	

ENG-TECH DWG/FIG. No.:	NO.:
1	0

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