

**From:** [Bunn, Jason](#)  
**To:** [Dey, Asit \(SD\)](#)  
**Cc:** [cameron@hbni.net](mailto:cameron@hbni.net); [Chris Maendel \(chrispm2@gmail.com\)](mailto:Chris.Maendel@gmail.com); [Mitchell Loewen](#)  
**Subject:** Hydraulic Conductivity Results - Fairholme Colony Lagoon [WSP# 131-13812-00]  
**Date:** January 16, 2020 8:25:39 AM  
**Attachments:** [image001.png](#)  
[Hydraulic Conductivity x ST2 PB.PDF](#)  
[Hydraulic Conductivity x ST4 PB.PDF](#)

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Good morning Asit,

RE: Environment Act Licence No. 3101 – Clause 18&19; Client File No. 5661.00

I hope your year has gotten off to a good start!

As required by Clause 19 of the EAL, attached are the hydraulic conductivity testing reports for Shelby Tube samples ST2 & ST4 (that were obtained from the Fairholme Colony lagoon liner on November 12, 2019) for your review and final approval.

Kind regards,

**Jason Bunn, P.Eng.**  
Engineer, Wastewater Infrastructure



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## HYDRAULIC CONDUCTIVITY TEST REPORT

|                           |                      |
|---------------------------|----------------------|
| CLIENT: WSP Canada Inc.   | PROJECT NO. 103-1825 |
| 1600 Buffalo Place        | TEST NO.: 1          |
| Winnipeg, MB R3T 6B8      | LAB NO.: HM 553      |
| ATTENTION: Jason Bunn     |                      |
| PROJECT: Fairholme Colony |                      |

|                         |                          |                    |
|-------------------------|--------------------------|--------------------|
| Date Sampled: 12-Nov-19 | Date Received: 14-Nov-19 | Sampled By: Client |
| Test Started: 26-Nov-19 | Test Ended: 18-Dec-19    | Sample ID: ST2     |

**Test Result**

**Corrected Saturated Hydraulic Conductivity, Ks (cm/sec)  $1.63 \times 10^{-8}$**

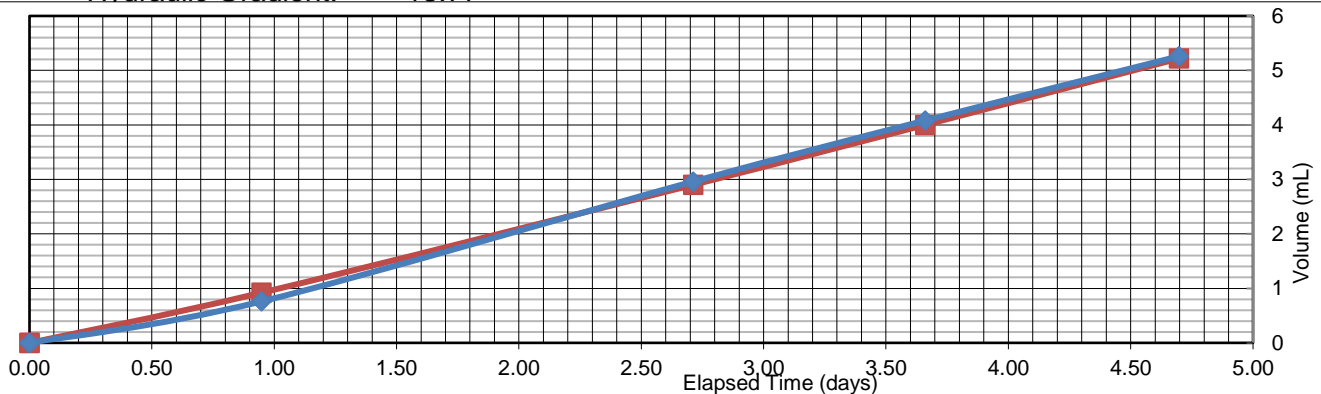
**Consolidation Data**

|         | Avg. Height (m) | Avg. Diameter (m) | Moisture Content % | Degree of Saturation % | Cell Pressure kPa | Back Pressure kPa |
|---------|-----------------|-------------------|--------------------|------------------------|-------------------|-------------------|
| Initial | 0.088           | 0.071             | 26.8               | 99.0                   | 120.0             | 89.9              |
| Final   | 0.087           | 0.072             | 27.8               | 101.0                  | 120.0             | 89.9              |

**Permeation Data**

| Time Increment (Days) | Elapsed Time (Days) | Q (ml) |      | In/Out Ratio | Average Flow (ml) | Temperature Correction | Corrected Conductivity, Ks (m/s) |
|-----------------------|---------------------|--------|------|--------------|-------------------|------------------------|----------------------------------|
|                       |                     | In     | Out  |              |                   |                        |                                  |
| 0.95                  | 0.95                | 0.76   | 0.92 | 0.826        | 0.84              | 0.95                   | 1.32E-10                         |
| 1.76                  | 2.71                | 2.20   | 1.98 | 1.111        | 2.09              | 0.95                   | 1.76E-10                         |
| 0.95                  | 3.66                | 1.12   | 1.10 | 1.018        | 1.11              | 0.95                   | 1.74E-10                         |
| 1.04                  | 4.70                | 1.18   | 1.22 | 0.967        | 1.20              | 0.95                   | 1.72E-10                         |

Permeant: De-aired tap water  
Hydraulic Gradient: 18.77



**Comments**

Specific gravity of soil was assumed to be 2.75

Remarks: Test Method: ASTM D5084 (Constant Head)  
Technician: NS

*P. Bevel*  
Reviewed by: Paul Bevel

## HYDRAULIC CONDUCTIVITY TEST REPORT

|            |   |              |          |
|------------|---|--------------|----------|
| CLIENT:    | WSP Canada Inc.<br>1600 Buffalo Place<br>Winnipeg, MB R3T 6B8 | PROJECT NO.: | 103-1825 |
| ATTENTION: | Jason Bunn  | TEST NO.:    | 2        |
| PROJECT:   | Fairholme Colony  | LAB NO.:     | HM 553   |

|               |           |                |           |             |        |
|---------------|-----------|----------------|-----------|-------------|--------|
| Date Sampled: | 12-Nov-19 | Date Received: | 14-Nov-19 | Sampled By: | Client |
| Test Started: | 12-Dec-19 | Test Ended:    | 06-Jan-20 | Sample ID:  | ST4    |

### Test Result

**Corrected Saturated Hydraulic Conductivity,  $K_s$  (cm/sec)  $1.09 \times 10^{-8}$**

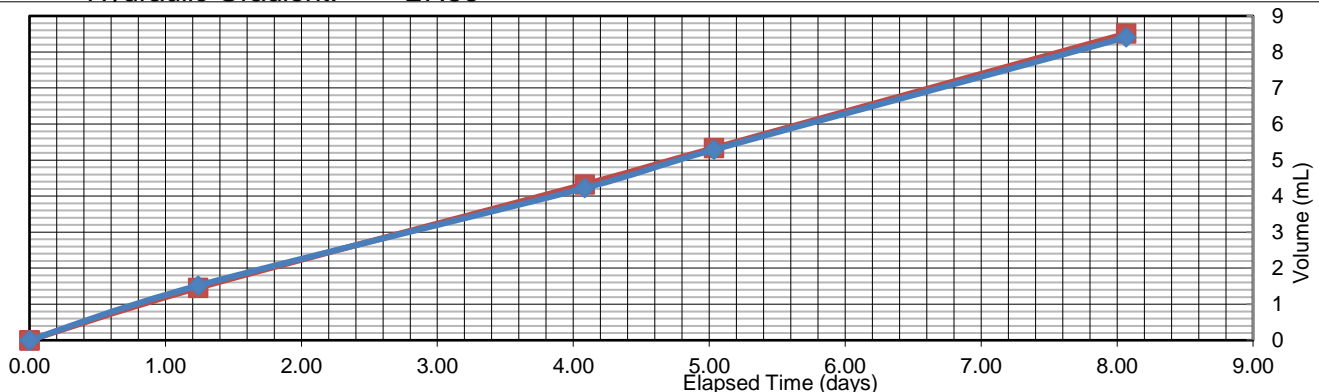
### Consolidation Data

|         | Avg. Height (m) | Avg. Diameter (m) | Moisture Content % | Degree of Saturation % | Cell Pressure kPa | Back Pressure kPa |
|---------|-----------------|-------------------|--------------------|------------------------|-------------------|-------------------|
| Initial | 0.073           | 0.072             | 35.5               | 95.1                   | 120.0             | 84.0              |
| Final   | 0.074           | 0.072             | 41.1               | 100.2                  | 120.0             | 84.0              |

### Permeation Data

| Time Increment (Days) | Elapsed Time (Days) | Q (ml) |      | In/Out Ratio | Average Flow (ml) | Temperature Correction | Corrected Conductivity, $K_s$ (m/s) |
|-----------------------|---------------------|--------|------|--------------|-------------------|------------------------|-------------------------------------|
|                       |                     | In     | Out  |              |                   |                        |                                     |
| 1.24                  | 1.24                | 1.52   | 1.45 | 1.044        | 1.49              | 0.95                   | 1.21E-10                            |
| 2.84                  | 4.08                | 2.71   | 2.87 | 0.942        | 2.79              | 0.95                   | 9.93E-11                            |
| 0.95                  | 5.03                | 1.07   | 1.01 | 1.058        | 1.04              | 0.95                   | 1.10E-10                            |
| 3.03                  | 8.07                | 3.12   | 3.18 | 0.981        | 3.15              | 0.95                   | 1.05E-10                            |

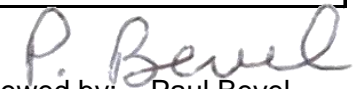
Permeant: De-aired tap water  
 Hydraulic Gradient: 27.56



### Comments

Specific gravity of soil was assumed to be 2.75

Remarks: Test Method: ASTM D5084 (Constant Head)  
 Technician: NPB

  
 Reviewed by: Paul Bevel