

## **Report LT-3**

### **Static Load Testing at Highway 400-89**

**Highway 400-89 Interchange Reconstruction  
Site 30-256  
MTO 2018-2024**

Prepared for

**Fermar Paving Limited  
1921 Albion Road  
Etobicoke, ON M9W 5S8**

Our File No. 1905CS1373

November 15, 2019

Prepared by:


**Shawn Ferguson, P.Eng.**

Distribution: 1 electronic copy to Fermar Paving Limited  
1 electronic copy to Urkkada

## Report LT-3

### Static Load Testing at Highway 400-89

#### Highway 400-89 Interchange Reconstruction

##### Site 30-256

##### MTO 2018-2024

#### 1. Terms of Reference

Urkada has been retained by Fermar Paving Inc. (Fermar) to observe and document the static load tests performed at the Highway 400-89 Interchange. Mr. Charles Ezomo, Fermar, was the contact person and coordinated the activities during the load test.

The purpose of the static load testing was to investigate the axial resistances of a driven steel 310 x 110 H-pile. This report presents the results of the static load test performed from November 12 – 13<sup>th</sup>, 2019. The static load test was performed in general conformance with the contract documents and ASTM D1143, and as amended on-site by Golder Associates (Golder) acting as the Foundation Engineering Specialist for the owner.

#### 2. Test Pile

One 310x110 H-pile with a cross sectional area of 141.0 cm<sup>2</sup> was subjected to static load testing. Per Item 103, vibrating wire piezometers were installed around the test pile location.

The test pile was an existing pile, which was previously installed for Load Test #1 and #2. Please refer to our “*Report LT-1, Static Load Testing at Highway 400-89*” for details on the location, installation, and test results.

### 3. Pile Installation and Static Load Test Set-up

The existing test pile was unchanged from Load Test No. 3. Please refer to our *“Report LT-1, Static Load Testing at Highway 400-89”* for the driving notes for the installation to 36.3 m, the PDA testing results, and the piling subcontractor’s submittal. Please refer to our *“Report LT-2, Static Load Testing at Highway 400-89”* for the driving notes for the installation to 50.8 m and PDA testing results.

The reaction system remained unchanged from Load Test #1, 2 and 3, as described in our *“Report LT-1, Static Load Testing at Highway 400-89”*. The reaction piles consisted of steel 310 x 110 H-piles, three driven to a tip depth of 36.0 m and the fourth to a tip depth of 43.3 m below grade.

The measurement system was the same as used during Load Test #1, 2, and 3, as described in *“Report LT-1, Static Load Testing at Highway 400-89”*. Two linear displacement dial gauges for vertical movement and two linear displacement dial gauges for lateral movement were used the primary instruments used to measure pile movements. A test pile wireline was also installed to provide backup measurements for the vertical movement. A sketch showing the location and numbering of the monitoring points and reaction piles is provided in Appendix 1.

### 4. Soils Information

Based on the boring logs provided in the contract documents, the soil profile at the test location is as follows:

1. Elev. 227.4 m to 226.7 m: Fill
2. Elev. 226.7 m to 209.6 m: Silty – Sandy Silt
3. Elev. 209.6 m to 208.9 m: Silty Clay
4. Elev. 208.9 m to 206.5 m: Silt and Sand
5. Elev. 206.5 m to 195.5 m: Clayey Silt – Silty Clay
6. Elev. 195.5 m to 189.0 m: Silt and Sandy Silt
7. Elev. 189.0 m to 182.9 m: Clayey Silt
8. Elev. 182.9 m: Clayey Silt Till

Copies of the logs from the two closest borings, 89UP-03 and 89UP-05, as taken from *“Foundation Investigation Report, Hill Embankment, Highway 400-89 Interchange Reconstruction, Town of Innisfil, Simcoe County”* prepared by Golder dated September 2018, are included in Appendix 2.

### 5. Calibration Records

The load cell used during the static loading test was calibrated on August 12, 2019 by RocTest. A copy of the calibration record is included in Appendix 3.

Powell's test pile submission package contained a calibration record for the hydraulic jack / digital pressure gauge performed by Canadian BBR Inc. dated August 28, 2019. A copy of this calibration record is included in Appendix 3.

During the test, the load cell was the primary instrument used to determine the load applied to the pile.

## 6. Static Load Test Results

The complete field readings for the static load tests are provided in Appendix 4. The enclosed tables provide the following information:

- ☐ Date and time of each reading
- ☐ Load cell reading
- ☐ Pressure gauge reading
- ☐ Readings from two vertical dial gauges mounted to the test pile
- ☐ Average vertical movement of the pile head based on the two dial gauges
- ☐ Readings from two lateral dial gauges mounted to the test pile
- ☐ Test pile wire line reading
- ☐ Test pile movement based on wire line
- ☐ Survey readings from the four reaction piles

The Load Test #4 procedure was provided by Golder staff on-site during the test, and was amended continually during testing, per their instructions. A summary of Golder's procedure and amendments are detailed below.

- 09:00 Nov. 12, Load at time of instruction: 0 kN - The procedure was to increase loads in 300 kN intervals to a maximum of 2,400 kN following ASTM D1143 Procedure B, with a maximum movement limit of 10% + 40 mm (71 mm)
- 13:55 Nov. 12, Load at time of instruction: 1,200 kN - The procedure was amended at the 1 hr reading interval to maintain 1,200 kN until instructed otherwise, and perform readings at 30 minute intervals
- 15:04 Nov. 12, Load at time of instruction: 1,200 kN – The procedure was amended at the 2 hr reading interval to increase the load to 1,500 kN and return to ASTM D1143 Procedure B as detailed at 09:00 Nov. 12
- 18:30 Nov. 12, Load at time of instruction: 1,800 kN – The procedure was amended at the 2 hr reading interval to increase the load to 1,900 kN and take a 0 minute and 5 minute reading only
- 18:45 Nov. 12, Load at time of instruction: 1,900 kN – The procedure was amended after the 5 minute reading interval to increase the load to 2,000 kN and take a 0 minute and 5 minute reading only
- 18:57 Nov. 12, Load at time of instruction: 2,000 kN – The procedure was amended after the 5 minute reading interval to increase the load to 2,100 kN and take a 0 minute and 5 minute reading only

- 19:10 Nov. 12, Load at time of instruction: 2,100 kN – The procedure was amended after the 5 minute reading interval to continue readings at 10 and 20 minutes, then every 20 minutes until 2 hrs. If the load on the pile dropped below 2,000 kN, the load was to be increased back to 2,100 kN
- 21:02 Nov. 12, Load at time of instruction: 2,100 kN – The procedure was amended after the 2 hr reading interval to increase the load to 2,200 kN. If the load on the pile dropped below 2,150 kN, the load was to be increased back to 2,200 kN. Readings were to be performed only when increasing the load back to 2,200 kN. The allowable movement limit was increased to a maximum  $10\% + 47 \text{ mm}$  (78 mm)
- 21:35 Nov. 12, Load at time of instruction: 2,200 kN – The procedure was amended after three readings where the pile load was increased back to 2,200 kN. The amended procedure was in to increase the load to 2,300 kN and maintain the same procedure as provided at 21:02
- 22:00 Nov. 12, Load at time of instruction: 2,300 kN – The procedure was amended after three readings where the pile load was increased back to 2,300 kN. The amended procedure was in to increase the load to 2,400 kN and maintain the same procedure as provided at 21:02
- 23:02 Nov 12, Load at time of instruction: 2,400 kN – The procedure was amended to perform readings at 20 minute intervals
- 00:02 Nov 13, Load at time of instruction: 2,400 kN – The procedure was amended to begin unloading the pile following ASTM D1143 Procedure B

The load movement data for Test #4 is presented in Figure 1 placed in Appendix 5. The results are plotted as the applied load based on the load cell and the vertical movements based on the displacement dial gauges. The Davisson Offset based on the as-built pile dimensions (310x110 H-pile) are also plotted on Figure 1. A summary of Load – Movement data used to produce Figure 1 is provided in Table 1, also placed in Appendix 5.

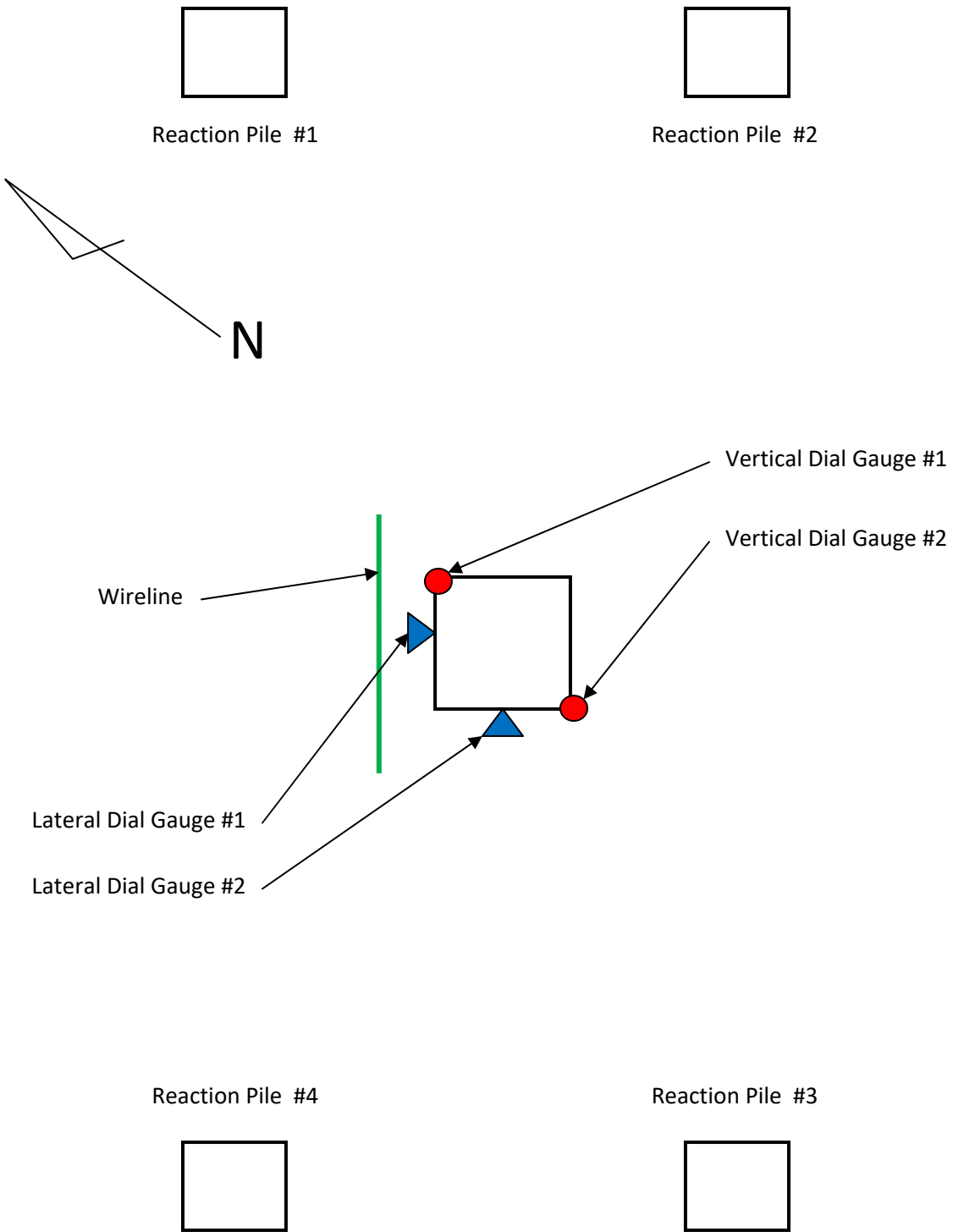
## 8. Conclusion

Based on the results of the static load test, the following comments can be made:

1. Using the Davisson Offset Load Limit criterion, the ultimate capacity of the pile is typically defined as the point where the load-movement curve crosses the Offset Load Limit Line (unless a specific movement criterion is specified, which has not been provided for this project). Based on the load-movement curves provided in Appendix 5, the ultimate capacity of the test pile using the Davisson Offset Load Limit Method was found to be 1,815 kN during Load Test #4.
2. A plunging failure was observed during Load Test #4. The pile was not capable of maintaining the 2,100 kN loading.

## **Appendix 1**

### **Monitoring Point Layout Sketch**



**General Test Pile Layout**  
Not to Scale

## **Appendix 2**

### **Borehole Logs**


|                                    |  |   |  |                          |  |               |  |
|------------------------------------|--|---|--|--------------------------|--|---------------|--|
| PROJECT <u>1668512</u>             |  | <b>RECORD OF BOREHOLE No 89UP-03</b>  |  | SHEET 1 OF 4             |  | <b>METRIC</b> |  |
| G.W.P. <u>2438-13-00</u>           |  | LOCATION <u>N 4895628.3; E 292375.2 MTM NAD 83 ZONE 10 (LAT. 44.200549; LONG. -79.655451)</u> |  | ORIGINATED BY <u>DF</u>  |  |               |  |
| DIST <u>Central</u> HWY <u>400</u> |  | BOREHOLE TYPE <u>D50 Track Mount, NW Casing and Wash Boring with Drilling Mud</u>             |  | COMPILED BY <u>DH</u>    |  |               |  |
| DATUM <u>Geodetic</u>              |  | DATE <u>July 17 to 21, 2017</u>   |  | CHECKED BY <u>SMM/TZ</u> |  |               |  |

| SOIL PROFILE  |   |            | SAMPLES |      |            | GROUND WATER<br>CONDITIONS | ELEVATION SCALE | DYNAMIC CONE PENETRATION<br>RESISTANCE PLOT |    | PLASTIC LIMIT   NATURAL MOISTURE CONTENT   LIQUID LIMIT |    |     | UNIT<br>WEIGHT<br><br>γ<br><br>kN/m³ | REMARKS<br>&<br>GRAIN SIZE<br>DISTRIBUTION<br>(%) |   |                |    |    |    |    |
|---------------|---|------------|---------|------|------------|----------------------------|-----------------|---|----|---|----|-----|--------------------------------------|---|---|----------------|----|----|----|----|
| ELEV<br>DEPTH | DESCRIPTION   | STRAT PLOT | NUMBER  | TYPE | "N" VALUES |                            |                 | SHEAR STRENGTH kPa                          |    |   |    |     |                                      | WATER CONTENT (%)                                 |   |                | GR | SA | SI | CL |
|               |   |            |         |      |            |                            |                 | 20  | 40 | 60  | 80 | 100 |                                      | W <sub>p</sub>                                    | W | W <sub>L</sub> |    |    |    |    |
| 227.4         | GROUND SURFACE  |            |         |      |            |                            |                 |   |    |   |    |     |                                      |   |   |                |    |    |    |    |
| 0.0           | TOPSOIL   |            |         |      |            |                            |                 |   |    |   |    |     |                                      |   |   |                |    |    |    |    |
| 0.2           | Gravelly sand, some silt (FILL)   |            | 1       | SS   | 6          |                            |                 |   |    |   |    |     |                                      |   |   |                |    |    |    |    |
| 226.7         | Loose<br>Brown  |            |         |      |            |                            |                 |   |    |   |    |     |                                      |   |   |                |    |    |    |    |
| 0.7           | Moist   |            |         |      |            |                            |                 |   |    |   |    |     |                                      |   |   |                |    |    |    |    |
|               | SILT, trace to some sand to SILT<br>and SAND, trace to some clay<br>Loose to very dense |            | 2       | SS   | 6          |                            |                 |   |    |   |    |     |                                      |   |   |                |    |    |    |    |
|               | Grey  |            | 3       | SS   | 16         |                            |                 |   |    |   |    |     |                                      |   |   |                |    |    |    |    |
|               | Wet   |            | 4       | SS   | 22         |                            |                 |   |    |   |    |     |                                      |   |   |                |    |    |    |    |
|               |   |            |         |      |            |                            |                 |   |    |   |    |     |                                      |   |   |                |    |    |    |    |
|               |   |            | 5       | SS   | 17         |                            |                 |   |    |   |    |     |                                      |   |   |                |    |    |    |    |
|               |   |            | 6       | SS   | 22         |                            |                 |   |    |   |    |     |                                      |   |   |                |    |    |    |    |
|               |   |            |         |      |            |                            |                 |   |    |   |    |     |                                      |   |   |                |    |    |    |    |
|               |   |            | 7       | SS   | 13         |                            |                 |   |    |   |    |     |                                      |   |   |                |    |    |    |    |
|               |   |            |         |      |            |                            |                 |   |    |   |    |     |                                      |   |   |                |    |    |    |    |
|               |   |            | 8A      |      |            |                            |                 |   |    |   |    |     |                                      |   |   |                |    |    |    |    |
|               |   |            | 8B      | SS   | 23         |                            |                 |   |    |   |    |     |                                      |   |   |                |    |    |    |    |
|               |   |            |         |      |            |                            |                 |   |    |   |    |     |                                      |   |   |                |    |    |    |    |
|               |   |            | 9       | SS   | 17         |                            |                 |   |    |   |    |     |                                      |   |   |                |    |    |    |    |
|               |   |            |         |      |            |                            |                 |   |    |   |    |     |                                      |   |   |                |    |    |    |    |
|               |   |            | 10      | SS   | 10         |                            |                 |   |    |   |    |     |                                      |   |   |                |    |    |    |    |
|               |   |            |         |      |            |                            |                 |   |    |   |    |     |                                      |   |   |                |    |    |    |    |
|               |   |            | 11A     |      |            |                            |                 |   |    |   |    |     |                                      |   |   |                |    |    |    |    |
|               |   |            | 11B     | SS   | 33         |                            |                 |   |    |   |    |     |                                      |   |   |                |    |    |    |    |
|               |   |            |         |      |            |                            |                 |   |    |   |    |     |                                      |   |   |                |    |    |    |    |
|               |   |            | 12      | SS   | 16         |                            |                 |   |    |   |    |     |                                      |   |   |                |    |    |    |    |
|               |   |            |         |      |            |                            |                 |   |    |   |    |     |                                      |   |   |                |    |    |    |    |
|               |   |            | 13      | SS   | 17         |                            |                 |   |    |   |    |     |                                      |   |   |                |    |    |    |    |
|               |   |            |         |      |            |                            |                 |   |    |   |    |     |                                      |   |   |                |    |    |    |    |
|               |   |            |         |      |            |                            |                 |   |    |   |    |     |                                      |   |   |                |    |    |    |    |

Continued Next Page

+<sup>3</sup>, ×<sup>3</sup>: Numbers refer to Sensitivity      ○ 3% STRAIN AT FAILURE





GTA-MTO 001 S:\CLIENTS\TOHWY\_400\_AND\_HWY\_89\_INTERCHANGE\02\_DATA\GINT\HWY\_400\_AND\_HWY\_89\_INTERCHANGE.GPJ GAL-GTA.GDT 09/12/18

| PROJECT 1668512                      |  | RECORD OF BOREHOLE No 89UP-03  |         |      |            | SHEET 2 OF 4            |                 | METRIC                                   |  |                                 |                               |                                |                                       |                                       |
|--------------------------------------|--|--|---------|------|------------|-------------------------|-----------------|--|--|---------------------------------|-------------------------------|--------------------------------|---------------------------------------|---------------------------------------|
| G.W.P. 2438-13-00                    |  | LOCATION N 4895628.3; E 292375.2 MTM NAD 83 ZONE 10 (LAT. 44.200549; LONG. -79.655451) |         |      |            | ORIGINATED BY DF        |                 |  |  |                                 |                               |                                |                                       |                                       |
| DIST Central HWY 400                 |  | BOREHOLE TYPE D50 Track Mount, NW Casing and Wash Boring with Drilling Mud             |         |      |            | COMPILED BY DH          |                 |  |  |                                 |                               |                                |                                       |                                       |
| DATUM Geodetic                       |  | DATE July 17 to 21, 2017   |         |      |            | CHECKED BY SMM/TZ       |                 |  |  |                                 |                               |                                |                                       |                                       |
| SOIL PROFILE                         |  |  | SAMPLES |      |            | GROUND WATER CONDITIONS | ELEVATION SCALE | DYNAMIC CONE PENETRATION RESISTANCE PLOT |  | PLASTIC LIMIT<br>W <sub>p</sub> | NATURAL MOISTURE CONTENT<br>W | LIQUID LIMIT<br>W <sub>L</sub> | UNIT WEIGHT<br>γ<br>kN/m <sup>3</sup> | REMARKS & GRAIN SIZE DISTRIBUTION (%) |
| ELEV<br>DEPTH                        | DESCRIPTION  | STRAT PLOT   | NUMBER  | TYPE | "N" VALUES |                         |                 | SHEAR STRENGTH kPa                       |  |                                 |                               |                                |                                       |                                       |
| --- CONTINUED FROM PREVIOUS PAGE --- |  |  |         |      |            |                         |                 |  |  |                                 |                               |                                |                                       |                                       |
| 209.6                                | SILT, trace to some sand to SILT and SAND, trace to some clay<br>Loose to very dense<br>Grey<br>Wet  |      | 14      | SS   | 37         |                         | 212             |  |  |                                 |                               |                                |                                       |                                       |
|                                      |  |  |         |      |            |                         | 211             |  |  |                                 |                               |                                |                                       |                                       |
|                                      |  |  |         |      |            |                         | 210             |  |  |                                 |                               |                                |                                       |                                       |
| 17.8                                 | SILTY CLAY, trace sand<br>Grey<br>Moist  |  | 15      | SS   | 80         |                         |                 |  |  |                                 |                               |                                |                                       |                                       |
| 208.9                                |  |  | 16A     |      |            |                         | 209             |  |  |                                 |                               |                                |                                       |                                       |
| 18.5                                 | SILT and SAND<br>Dense to very dense<br>Grey<br>Wet  |  | 16B     | SS   | 44         |                         |                 |  |  |                                 |                               |                                |                                       |                                       |
|                                      |  |  |         |      |            |                         | 208             |  |  |                                 |                               |                                |                                       |                                       |
|                                      |  |  |         |      |            |                         | 207             |  |  |                                 |                               |                                |                                       |                                       |
| 206.5                                |  |  | 17      | SS   | 59         |                         |                 |  |  |                                 |                               |                                |                                       |                                       |
| 20.9                                 | Varved CLAYEY SILT to SILTY CLAY with silt and clay laminae<br>Stiff to very stiff<br>Grey<br>Moist<br>- Sand inclusions from 20.9 m to 22.4 m |  | 18      | SS   | 11         |                         | 206             |  |  |                                 |                               |                                |                                       |                                       |
|                                      |  |  |         |      |            |                         | 205             |  |  |                                 |                               |                                |                                       |                                       |
|                                      |  |  | 19      | SS   | 8          |                         | 204             |  |  |                                 |                               |                                |                                       |                                       |
|                                      |  |  |         |      |            | 203                     |                 |  |  |                                 |                               |                                |                                       |                                       |
|                                      |  | 20   | TO      | PH   |            |                         |                 |  |  |                                 |                               |                                |                                       |                                       |
|                                      |  |  |         |      |            | 202                     |                 |  |  |                                 |                               |                                |                                       |                                       |
|                                      |  | 21   | SS      | 3    |            | 201                     |                 |  |  |                                 |                               |                                |                                       |                                       |
|                                      |  |  |         |      |            | 200                     |                 |  |  |                                 |                               |                                |                                       |                                       |
|                                      |  | 22   | TO      | PH   |            | 199                     |                 |  |  |                                 |                               |                                |                                       |                                       |
|                                      |  |  |         |      |            | 198                     |                 |  |  |                                 |                               |                                |                                       |                                       |
|                                      |  | 23   | SS      | 4    |            |                         |                 |  |  |                                 |                               |                                |                                       |                                       |

Continued Next Page

+<sup>3</sup>, ×<sup>3</sup>: Numbers refer to Sensitivity      ○ 3% STRAIN AT FAILURE


GTA-MTO 001 S:\CLIENTS\TOHWY\_400\_AND\_HWY\_89\_INTERCHANGE\02\_DATA\GINT\HWY\_400\_AND\_HWY\_89\_INTERCHANGE.GPJ GAL-GTA.GDT 09/12/18

| PROJECT                              |   | 1668512   |         | <b>RECORD OF BOREHOLE No 89UP-03</b> |            |   |                 | SHEET 3 OF 4                             |                 | <b>METRIC</b>                                       |          |  |                                       |
|--------------------------------------|---|---|---------|--------------------------------------|------------|---|-----------------|--|-----------------|---|----------|--|---------------------------------------|
| G.W.P.                               |   | 2438-13-00  |         | LOCATION                             |            | N 4895628.3; E 292375.2 MTM NAD 83 ZONE 10 (LAT. 44.200549; LONG. -79.655451) |                 |  |                 | ORIGINATED BY DF                                    |          |  |                                       |
| DIST                                 |   | Central HWY 400   |         | BOREHOLE TYPE                        |            | D50 Track Mount, NW Casing and Wash Boring with Drilling Mud                  |                 |  |                 | COMPILED BY DH                                      |          |  |                                       |
| DATUM                                |   | Geodetic  |         | DATE                                 |            | July 17 to 21, 2017   |                 |  |                 | CHECKED BY SMM/TZ                                   |          |  |                                       |
| SOIL PROFILE                         |   |   | SAMPLES |                                      |            | GROUND WATER CONDITIONS   | ELEVATION SCALE | DYNAMIC CONE PENETRATION RESISTANCE PLOT |                 | PLASTIC LIMIT NATURAL MOISTURE CONTENT LIQUID LIMIT |          | UNIT WEIGHT $\gamma$ kN/m <sup>3</sup> | REMARKS & GRAIN SIZE DISTRIBUTION (%) |
| ELEV DEPTH                           | DESCRIPTION   | STRAT PLOT  | NUMBER  | TYPE                                 | "N" VALUES |   |                 | 20 40 60 80 100                          | 20 40 60 80 100 | W <sub>p</sub> W W <sub>L</sub>                     | 10 20 30 |  |                                       |
| --- CONTINUED FROM PREVIOUS PAGE --- |   |   |         |                                      |            |   |                 |  |                 |   |          |  |                                       |
| 195.5<br>31.9                        | Varved CLAYEY SILT to SILTY CLAY with silt and clay laminae<br>Stiff to very stiff<br>Grey<br>Moist   |    | 24      | SS                                   | 9          |   | 197             |  |                 |   |          |  |                                       |
|                                      |   |   |         |                                      |            |   |                 |  |                 |   |          |  |                                       |
|                                      |   |   |         |                                      |            |   |                 |  |                 |   |          |  |                                       |
|                                      |   |   |         |                                      |            |   |                 |  |                 |   |          |  |                                       |
| 192.0<br>35.4                        | SILT, some sand, trace clay<br>Compact to very dense<br>Grey<br>Wet<br>- Clayey silt inclusions encountered between depths of about 32.0 m and 32.6 m |    | 25      | SS                                   | 27         |   | 196             |  |                 |   |          |  |                                       |
|                                      |   |   |         |                                      |            |   |                 |  |                 |   |          |  |                                       |
|                                      |   |   |         |                                      |            |   |                 |  |                 |   |          |  |                                       |
|                                      |   |   |         |                                      |            |   |                 |  |                 |   |          |  |                                       |
| 189.0<br>38.4                        | Sandy SILT, trace clay<br>Very dense<br>Grey<br>Wet   |   | 26      | SS                                   | 86         |   | 195             |  |                 |   |          |  | 0 15 84 1                             |
|                                      |   |   |         |                                      |            |   |                 |  |                 |   |          |  |                                       |
|                                      |   |   |         |                                      |            |   |                 |  |                 |   |          |  |                                       |
|                                      |   |   |         |                                      |            |   |                 |  |                 |   |          |  |                                       |
| 182.9<br>44.5                        | CLAYEY SILT, some sand<br>Very stiff<br>Grey<br>Moist   |  | 27A     | SS                                   | 100        |   | 194             |  |                 |   |          |  |                                       |
|                                      |   |   | 27B     |                                      |            |   |                 |  |                 |   |          |  |                                       |
|                                      |   |   |         |                                      |            |   |                 |  |                 |   |          |  |                                       |
|                                      |   |   |         |                                      |            |   |                 |  |                 |   |          |  |                                       |
|                                      |   |   |         |                                      |            |   | 193             |  |                 |   |          |  |                                       |
|                                      |   |   |         |                                      |            |   |                 |  |                 |   |          |  |                                       |
|                                      |   |   |         |                                      |            |   |                 |  |                 |   |          |  |                                       |
|                                      |   |   |         |                                      |            |   |                 |  |                 |   |          |  |                                       |
|                                      |   |   |         |                                      |            |   | 192             |  |                 |   |          |  |                                       |
|                                      |   |   |         |                                      |            |   |                 |  |                 |   |          |  |                                       |
|                                      |   |   |         |                                      |            |   |                 |  |                 |   |          |  |                                       |
|                                      |   |   |         |                                      |            |   |                 |  |                 |   |          |  |                                       |
|                                      |   |   |         |                                      |            |   | 191             |  |                 |   |          |  |                                       |
|                                      |   |   |         |                                      |            |   |                 |  |                 |   |          |  |                                       |
|                                      |   |   |         |                                      |            |   |                 |  |                 |   |          |  |                                       |
|                                      |   |   |         |                                      |            |   |                 |  |                 |   |          |  |                                       |
|                                      |   |   |         |                                      |            |   | 190             |  |                 |   |          |  |                                       |
|                                      |   |   |         |                                      |            |   |                 |  |                 |   |          |  |                                       |
|                                      |   |   |         |                                      |            |   |                 |  |                 |   |          |  |                                       |
|                                      |   |   |         |                                      |            |   |                 |  |                 |   |          |  |                                       |
|                                      |   |   |         |                                      |            |   | 189             |  |                 |   |          |  |                                       |
|                                      |   |   |         |                                      |            |   |                 |  |                 |   |          |  |                                       |
|                                      |   |   |         |                                      |            |   |                 |  |                 |   |          |  |                                       |
|                                      |   |   |         |                                      |            |   |                 |  |                 |   |          |  |                                       |
|                                      |   |   |         |                                      |            |   | 188             |  |                 |   |          |  |                                       |
|                                      |   |   |         |                                      |            |   |                 |  |                 |   |          |  |                                       |
|                                      |   |   |         |                                      |            |   |                 |  |                 |   |          |  |                                       |
|                                      |   |   |         |                                      |            |   |                 |  |                 |   |          |  |                                       |
|                                      |   |   |         |                                      |            |   | 187             |  |                 |   |          |  |                                       |
|                                      |   |   |         |                                      |            |   |                 |  |                 |   |          |  |                                       |
|                                      |   |   |         |                                      |            |   |                 |  |                 |   |          |  |                                       |
|                                      |   |   |         |                                      |            |   |                 |  |                 |   |          |  |                                       |
|                                      |   |   |         |                                      |            |   | 186             |  |                 |   |          |  |                                       |
|                                      |   |   |         |                                      |            |   |                 |  |                 |   |          |  |                                       |
|                                      |   |   |         |                                      |            |   |                 |  |                 |   |          |  |                                       |
|                                      |   |   |         |                                      |            |   |                 |  |                 |   |          |  |                                       |
|                                      |   |   |         |                                      |            |   | 185             |  |                 |   |          |  |                                       |
|                                      |   |   |         |                                      |            |   |                 |  |                 |   |          |  |                                       |
|                                      |   |   |         |                                      |            |   |                 |  |                 |   |          |  |                                       |
|                                      |   |   |         |                                      |            |   |                 |  |                 |   |          |  |                                       |
|                                      |   |   |         |                                      |            |   | 184             |  |                 |   |          |  |                                       |
|                                      |   |   |         |                                      |            |   |                 |  |                 |   |          |  |                                       |
|                                      |   |   |         |                                      |            |   |                 |  |                 |   |          |  |                                       |
|                                      |   |   |         |                                      |            |   |                 |  |                 |   |          |  |                                       |
|                                      |   |   |         |                                      |            |   | 183             |  |                 |   |          |  |                                       |
|                                      |   |   |         |                                      |            |   |                 |  |                 |   |          |  |                                       |
|                                      |   |   |         |                                      |            |   |                 |  |                 |   |          |  |                                       |
|                                      |   |   |         |                                      |            |   |                 |  |                 |   |          |  |                                       |

Continued Next Page

+<sup>3</sup>, ×<sup>3</sup>: Numbers refer to Sensitivity      ○ 3% STRAIN AT FAILURE

GTA-MTO 001 S:\CLIENTS\TOHWY\_400\_AND\_HWY\_89\_INTERCHANGE\02\_DATA\GINT\HWY\_400\_AND\_HWY\_89\_INTERCHANGE.GPJ GAL-GTA.GDT 09/12/18

| PROJECT   |  | 1668512   |         | <b>RECORD OF BOREHOLE No 89UP-03</b> |            |   |                 | SHEET 4 OF 4                             |  | <b>METRIC</b>     |  |  |                                 |                               |                                |                                       |  |
|---|--|---|---------|--------------------------------------|------------|---|-----------------|--|--|-------------------|--|--|---------------------------------|-------------------------------|--------------------------------|---------------------------------------|--|
| G.W.P.  |  | 2438-13-00  |         | LOCATION                             |            | N 4895628.3; E 292375.2 MTM NAD 83 ZONE 10 (LAT. 44.200549; LONG. -79.655451) |                 |  |  | ORIGINATED BY DF  |  |  |                                 |                               |                                |                                       |  |
| DIST  |  | Central HWY 400   |         | BOREHOLE TYPE                        |            | D50 Track Mount, NW Casing and Wash Boring with Drilling Mud                  |                 |  |  | COMPILED BY DH    |  |  |                                 |                               |                                |                                       |  |
| DATUM   |  | Geodetic  |         | DATE                                 |            | July 17 to 21, 2017   |                 |  |  | CHECKED BY SMM/TZ |  |  |                                 |                               |                                |                                       |  |
| SOIL PROFILE  |  |   | SAMPLES |                                      |            | GROUND WATER CONDITIONS   | ELEVATION SCALE | DYNAMIC CONE PENETRATION RESISTANCE PLOT |  |                   |  |  | PLASTIC LIMIT<br>W <sub>p</sub> | NATURAL MOISTURE CONTENT<br>W | LIQUID LIMIT<br>W <sub>L</sub> | UNIT WEIGHT<br>γ<br>kN/m <sup>3</sup> | REMARKS & GRAIN SIZE DISTRIBUTION (%)<br>GR SA SI CL |
| ELEV<br>DEPTH   | DESCRIPTION  | STRAT PLOT  | NUMBER  | TYPE                                 | "N" VALUES |   |                 | SHEAR STRENGTH kPa                       |  |                   |  |  |                                 |                               |                                |                                       |  |
|   | --- CONTINUED FROM PREVIOUS PAGE ---   |   |         |                                      |            |   |                 |  |  |                   |  |  |                                 |                               |                                |                                       |  |
| 181.4   | CLAYEY SILT (TILL)<br>Grey<br>Moist  |  | 30A     | SS                                   | 101        |   |                 |  |  |                   |  |  |                                 |                               |                                |                                       |  |
| 46.0  | SILT and SAND, trace gravel,<br>trace clay (TILL)<br>Very dense<br>Grey<br>Wet |   | 30B     |                                      |            |   |                 |  |  |                   |  |  |                                 |                               |                                |                                       |  |
|   |  |   |         |                                      |            |   |                 |  |  |                   |  |  |                                 |                               |                                |                                       |  |
|   |  |   |         |                                      |            |   |                 |  |  |                   |  |  |                                 |                               |                                |                                       |  |
| 178.2   |  |   | 31      | SS                                   | 100/0.10   |   |                 |  |  |                   |  |  |                                 |                               |                                |                                       |  |
| 49.2  | END OF BOREHOLE  |   |         |                                      |            |   |                 |  |  |                   |  |  |                                 |                               |                                |                                       |  |
| NOTES:<br><br>1. Water level measurements in the casing at the beginning of each work shift:<br><br>Date    Depth (m)    Elev. (m)<br>18/07/17    0.7    226.7<br>19/07/17    1.6    225.8<br>20/07/17    0.0    227.4<br>21/07/17    3.3    224.1<br><br>2. A borehole was advanced to a depth of about 4.0 m immediately next to borehole 89UP-03 in order to install a standpipe piezometer.<br><br>3. Water level measurements in standpipe piezometer:<br><br>Date    Depth (m)    Elev. (m)<br>03/08/17    1.0    226.4<br>10/08/17    1.0    226.4<br>15/08/17    1.2    226.2<br>19/09/17    1.3    226.1<br>05/03/18    0.7    226.7<br>16/05/18    0.5    226.9 |  |   |         |                                      |            |   |                 |  |  |                   |  |  |                                 |                               |                                |                                       |  |

GTA-MTO 001 S:\CLIENTS\TOHWY\_400\_AND\_HWY\_89\_INTERCHANGE\02\_DATA\GINT\HWY\_400\_AND\_HWY\_89\_INTERCHANGE.GPJ GAL-GTA.GDT 09/12/18

| PROJECT 1668512      |   | RECORD OF BOREHOLE No 89UP-05  |         | SHEET 1 OF 4      |            | METRIC                                   |                 |                 |                                     |                   |   |                             |
|----------------------|---|--|---------|-------------------|------------|--|-----------------|-----------------|-------------------------------------|-------------------|---|-----------------------------|
| G.W.P. 2438-13-00    |   | LOCATION N 4895649.6; E 292418.6 MTM NAD 83 ZONE 10 (LAT. 44.200750; LONG. -79.654912) |         | ORIGINATED BY DF  |            |  |                 |                 |                                     |                   |   |                             |
| DIST Central HWY 400 |   | BOREHOLE TYPE D50 Track Mount, NW Casing and Wash Boring with Drilling Mud             |         | COMPILED BY DM    |            |  |                 |                 |                                     |                   |   |                             |
| DATUM Geodetic       |   | DATE June 26 to 29 and July 3, 2017  |         | CHECKED BY SMM/TZ |            |  |                 |                 |                                     |                   |   |                             |
| SOIL PROFILE         |   |  | SAMPLES |                   |            | DYNAMIC CONE PENETRATION RESISTANCE PLOT |                 |                 | PLASTIC NATURAL LIQUID UNIT REMARKS |                   |   |                             |
| ELEV<br>DEPTH        | DESCRIPTION   | STRAT PLOT   | NUMBER  | TYPE              | "N" VALUES | GROUND WATER CONDITIONS                  | ELEVATION SCALE | 20 40 60 80 100 | W <sub>p</sub> W W <sub>L</sub>     | WATER CONTENT (%) | γ | GRAIN SIZE DISTRIBUTION (%) |
| 229.2                | GROUND SURFACE  |  |         |                   |            |  |                 |                 |                                     |                   |   |                             |
| 0.0                  | ASPHALT (250 mm)  |  |         |                   |            |  | 229             |                 |                                     |                   |   |                             |
|                      | Sand and gravel (FILL) (250 mm)   |  |         |                   |            |  | 228             |                 |                                     |                   |   |                             |
| 0.5                  | Silt and sand, trace to some clay with organic odour (FILL)<br>Very loose to loose<br>Brown mottled with grey<br>Moist to wet |  | 1       | SS                | 6          |  | 227             |                 |                                     |                   |   |                             |
|                      |   |  | 2       | SS                | 3          |  | 226             |                 |                                     | ○                 |   | 0 45 46 9                   |
| 226.2                | Silty SAND<br>Compact<br>Grey<br>Wet  |  | 3       | SS                | 17         |  | 225             |                 |                                     | ○                 |   |                             |
| 3.0                  |   |  | 4       | SS                | 20         |  | 224             |                 |                                     |                   |   |                             |
|                      |   |  | 5       | SS                | 26         |  | 223             |                 |                                     |                   |   |                             |
| 223.6                | SILT to Sandy SILT, trace clay with clayey silt pockets<br>Compact to very dense<br>Grey<br>Wet                               |  | 6       | SS                | 14         |  | 222             |                 |                                     |                   |   |                             |
| 5.6                  |   |  | 7       | SS                | 16         |  | 221             |                 |                                     |                   |   |                             |
|                      |   |  | 8       | SS                | 20         |  | 220             |                 |                                     | ○                 |   | 0 26 73 1                   |
|                      |   |  | 9       | SS                | 25         |  | 219             |                 |                                     |                   |   |                             |
|                      |   |  | 10      | SS                | 15         |  | 218             |                 |                                     | ○                 |   |                             |
|                      |   |  | 11      | SS                | 20         |  | 217             |                 |                                     |                   |   |                             |
|                      |   |  |         |                   |            |  | 216             |                 |                                     |                   |   |                             |
|                      |   |  |         |                   |            |  | 215             |                 |                                     | H ○               |   | 0 11 77 12                  |

Continued Next Page

+<sup>3</sup>, ×<sup>3</sup>: Numbers refer to Sensitivity ○ 3% STRAIN AT FAILURE

GTA-MTO 001 S:\CLIENTS\TOHWY\_400\_AND\_HWY\_89\_INTERCHANGE02\_DATA\GINT\HWY\_400\_AND\_HWY\_89\_INTERCHANGE.GPJ GAL-GTA.GDT 09/12/18

|                                    |  |   |  |                          |  |               |  |
|------------------------------------|--|---|--|--------------------------|--|---------------|--|
| PROJECT <u>1668512</u>             |  | <b>RECORD OF BOREHOLE No 89UP-05</b>  |  | SHEET 2 OF 4             |  | <b>METRIC</b> |  |
| G.W.P. <u>2438-13-00</u>           |  | LOCATION <u>N 4895649.6; E 292418.6 MTM NAD 83 ZONE 10 (LAT. 44.200750; LONG. -79.654912)</u> |  | ORIGINATED BY <u>DF</u>  |  |               |  |
| DIST <u>Central</u> HWY <u>400</u> |  | BOREHOLE TYPE <u>D50 Track Mount, NW Casing and Wash Boring with Drilling Mud</u>             |  | COMPILED BY <u>DM</u>    |  |               |  |
| DATUM <u>Geodetic</u>              |  | DATE <u>June 26 to 29 and July 3, 2017</u>  |  | CHECKED BY <u>SMM/TZ</u> |  |               |  |

| SOIL PROFILE                         |  |            | SAMPLES |      |            | GROUND WATER<br>CONDITIONS | ELEVATION<br>SCALE | DYNAMIC CONE PENETRATION<br>RESISTANCE PLOT |    |    |    |     | PLASTIC LIMIT NATURAL<br>MOISTURE CONTENT LIQUID LIMIT |   |                | UNIT<br>WEIGHT<br><br>γ<br><br>kN/m³ | REMARKS<br>&<br>GRAIN SIZE<br>DISTRIBUTION<br>(%) |    |    |    |  |
|--------------------------------------|--|------------|---------|------|------------|----------------------------|--------------------|---|----|----|----|-----|--|---|----------------|--------------------------------------|---|----|----|----|--|
| ELEV<br>DEPTH                        | DESCRIPTION  | STRAT PLOT | NUMBER  | TYPE | "N" VALUES |                            |                    | SHEAR STRENGTH kPa                          |    |    |    |     | WATER CONTENT (%)                                      |   |                |                                      | GR  | SA | SI | CL |  |
|                                      |  |            |         |      |            |                            |                    | 20  | 40 | 60 | 80 | 100 | W <sub>p</sub>   | W | W <sub>L</sub> |                                      |   |    |    |    |  |
| --- CONTINUED FROM PREVIOUS PAGE --- |  |            |         |      |            |                            |                    |   |    |    |    |     |  |   |                |                                      |   |    |    |    |  |
|                                      | SILT to Sandy SILT, trace clay<br>with clayey silt pockets<br>Compact to very dense<br>Grey<br>Wet |            | 12      | SS   | 27         |                            | 214                |   |    |    |    |     |  |   |                | 0                                    | 10  | 87 | 3  |    |  |
|                                      |  |            |         |      |            |                            | 213                |   |    |    |    |     |  |   |                |                                      |   |    |    |    |  |
|                                      |  |            | 13      | SS   | 30         |                            | 212                |   |    |    |    |     |  |   |                |                                      |   |    |    |    |  |
|                                      |  |            |         |      |            |                            | 211                |   |    |    |    |     |  |   |                |                                      |   |    |    |    |  |
|                                      |  |            | 14      | SS   | 44         |                            | 210                |   |    |    |    |     |  |   |                |                                      |   |    |    |    |  |
|                                      |  |            |         |      |            |                            | 209                |   |    |    |    |     |  |   |                |                                      |   |    |    |    |  |
|                                      |  |            | 15      | SS   | 39         |                            | 208                |   |    |    |    |     |  |   |                |                                      |   |    |    |    |  |
|                                      |  |            |         |      |            |                            | 207                |   |    |    |    |     |  |   |                |                                      |   |    |    |    |  |
| 206.8                                |  |            | 16      | SS   | 55         |                            | 206                |   |    |    |    |     |  |   |                |                                      |   |    |    |    |  |
| 22.4                                 | Varved CLAYEY SILT, with silt<br>and clay laminae<br>Stiff to very stiff<br>Grey<br>Wet            |            | 17      | SS   | 10         |                            | 205                |   |    |    |    |     |  |   |                |                                      |   |    |    |    |  |
|                                      |  |            |         |      |            |                            | 204                |   |    |    |    |     |  |   |                |                                      |   |    |    |    |  |
| 204.1                                |  |            |         |      |            |                            | 203                |   |    |    |    |     |  |   |                |                                      |   |    |    |    |  |
| 25.1                                 | Varved SILTY CLAY, with silt and<br>clay laminae<br>Stiff to very stiff<br>Grey<br>Wet             |            | 18      | SS   | 5          |                            | 202                |   |    |    |    |     |  |   |                |                                      |   |    |    |    |  |
|                                      |  |            |         |      |            |                            | 201                |   |    |    |    |     |  |   |                |                                      |   |    |    |    |  |
|                                      |  |            | 19      | SS   | 1          |                            | 200                |   |    |    |    |     |  |   |                |                                      |   |    |    |    |  |

Continued Next Page

+<sup>3</sup>, ×<sup>3</sup>: Numbers refer to Sensitivity      ○ 3% STRAIN AT FAILURE

GTA-MTO 001 S:\CLIENTS\TOHWY\_400\_AND\_HWY\_89\_INTERCHANGE\02\_DATA\GINT\HWY\_400\_AND\_HWY\_89\_INTERCHANGE.GPJ GAL-GTA.GDT 09/12/18

|                                    |  |   |  |                          |  |               |  |
|------------------------------------|--|---|--|--------------------------|--|---------------|--|
| PROJECT <u>1668512</u>             |  | <b>RECORD OF BOREHOLE No 89UP-05</b>  |  | SHEET 3 OF 4             |  | <b>METRIC</b> |  |
| G.W.P. <u>2438-13-00</u>           |  | LOCATION <u>N 4895649.6; E 292418.6 MTM NAD 83 ZONE 10 (LAT. 44.200750; LONG. -79.654912)</u> |  | ORIGINATED BY <u>DF</u>  |  |               |  |
| DIST <u>Central</u> HWY <u>400</u> |  | BOREHOLE TYPE <u>D50 Track Mount, NW Casing and Wash Boring with Drilling Mud</u>             |  | COMPILED BY <u>DM</u>    |  |               |  |
| DATUM <u>Geodetic</u>              |  | DATE <u>June 26 to 29 and July 3, 2017</u>  |  | CHECKED BY <u>SMM/TZ</u> |  |               |  |

| SOIL PROFILE  |   |            | SAMPLES |      |            | GROUND WATER<br>CONDITIONS | ELEVATION SCALE | DYNAMIC CONE PENETRATION<br>RESISTANCE PLOT               |    |    |    |     | PLASTIC LIMIT NATURAL MOISTURE CONTENT LIQUID LIMIT |   |                | UNIT<br>WEIGHT<br>$\gamma$<br>kN/m <sup>3</sup> | REMARKS<br>&<br>GRAIN SIZE<br>DISTRIBUTION<br>(%)<br>GR SA SI CL |
|---------------|---|------------|---------|------|------------|----------------------------|-----------------|---|----|----|----|-----|---|---|----------------|---|--|
| ELEV<br>DEPTH | DESCRIPTION   | STRAT PLOT | NUMBER  | TYPE | "N" VALUES |                            |                 | SHEAR STRENGTH kPa  |    |    |    |     | W <sub>p</sub>                                      | W | W <sub>L</sub> |   |  |
|               |   |            |         |      |            |                            |                 | ○ UNCONFINED + FIELD VANE<br>● QUICK TRIAXIAL × REMOULDED |    |    |    |     |   |   |                |   |  |
|               | --- CONTINUED FROM PREVIOUS PAGE ---  |            |         |      |            |                            |                 | 20  | 40 | 60 | 80 | 100 |   |   |                |   |  |
| 195.0         | Varved SILTY CLAY, with silt and clay laminae<br>Stiff to very stiff<br>Grey<br>Wet |            |         |      |            |                            | 199             |   |    |    |    |     |   |   |                |   |  |
|               |   |            |         |      |            |                            | 198             |   |    |    |    |     |   |   |                |   |  |
|               |   |            | 20      | SS   | 5          |                            | 197             |   |    |    |    |     |   |   |                |   |  |
|               |   |            |         |      |            |                            | 196             |   |    |    |    |     |   |   |                |   |  |
| 34.2          | SILT, trace to some sand, trace clay<br>Very dense<br>Grey<br>Wet                   |            |         |      |            |                            | 195             |   |    |    |    |     |   |   |                |   |  |
|               |   |            | 21      | SS   | 54         |                            | 194             |   |    |    |    |     |   |   |                |   | 0 9 89 2   |
|               |   |            |         |      |            |                            | 193             |   |    |    |    |     |   |   |                |   |  |
|               |   |            |         |      |            |                            | 192             |   |    |    |    |     |   |   |                |   |  |
|               |   |            | 22      | SS   | 71         |                            | 191             |   |    |    |    |     |   |   |                |   |  |
|               |   |            |         |      |            |                            | 190             |   |    |    |    |     |   |   |                |   |  |
| 189.3         | CLAYEY SILT, trace to some sand<br>Very stiff<br>Grey<br>Wet                        |            |         |      |            |                            | 189             |   |    |    |    |     |   |   |                |   |  |
|               |   |            | 23      | SS   | 15         |                            | 188             |   |    |    |    |     |   |   |                |   |  |
|               |   |            |         |      |            |                            | 187             |   |    |    |    |     |   |   |                |   |  |
| 186.2         | Sandy CLAYEY SILT, some gravel (TILL)<br>Hard<br>Grey<br>Wet                        |            |         |      |            |                            | 186             |   |    |    |    |     |   |   |                |   |  |
| 43.0          |   |            | 24      | SS   | 35         |                            | 185             |   |    |    |    |     |   |   |                |   | 14 24 48 14  |

Continued Next Page

+<sup>3</sup>, ×<sup>3</sup>: Numbers refer to Sensitivity      ○ 3% STRAIN AT FAILURE

GTA-MTO 001 S:\CLIENTS\MTOWHY\_400\_AND\_HWY\_89\_INTERCHANGE\02\_DATA\GINT\HWY\_400\_AND\_HWY\_89\_INTERCHANGE.GPJ GAL-GTA.GDT 09/12/18

|                                    |  |   |  |                          |  |               |  |
|------------------------------------|--|---|--|--------------------------|--|---------------|--|
| PROJECT <u>1668512</u>             |  | <b>RECORD OF BOREHOLE No 89UP-05</b>  |  | SHEET 4 OF 4             |  | <b>METRIC</b> |  |
| G.W.P. <u>2438-13-00</u>           |  | LOCATION <u>N 4895649.6; E 292418.6 MTM NAD 83 ZONE 10 (LAT. 44.200750; LONG. -79.654912)</u> |  | ORIGINATED BY <u>DF</u>  |  |               |  |
| DIST <u>Central</u> HWY <u>400</u> |  | BOREHOLE TYPE <u>D50 Track Mount, NW Casing and Wash Boring with Drilling Mud</u>             |  | COMPILED BY <u>DM</u>    |  |               |  |
| DATUM <u>Geodetic</u>              |  | DATE <u>June 26 to 29 and July 3, 2017</u>  |  | CHECKED BY <u>SMM/TZ</u> |  |               |  |

| SOIL PROFILE  |   |            | SAMPLES |      |            | GROUND WATER<br>CONDITIONS | ELEVATION SCALE | DYNAMIC CONE PENETRATION<br>RESISTANCE PLOT |    |    |    |     | PLASTIC LIMIT   NATURAL MOISTURE CONTENT   LIQUID LIMIT |   |                | UNIT<br>WEIGHT<br><br>γ<br><br>kN/m³ | REMARKS<br>&<br>GRAIN SIZE<br>DISTRIBUTION<br>(%) |    |    |    |
|---------------|---|------------|---------|------|------------|----------------------------|-----------------|---|----|----|----|-----|---|---|----------------|--------------------------------------|---|----|----|----|
| ELEV<br>DEPTH | DESCRIPTION   | STRAT PLOT | NUMBER  | TYPE | "N" VALUES |                            |                 | SHEAR STRENGTH kPa                          |    |    |    |     | WATER CONTENT (%)                                       |   |                |                                      | GR  | SA | SI | CL |
|               |   |            |         |      |            |                            |                 | 20  | 40 | 60 | 80 | 100 | W <sub>p</sub>  | W | W <sub>L</sub> |                                      |   |    |    |    |
|               | --- CONTINUED FROM PREVIOUS PAGE ---  |            |         |      |            |                            |                 |   |    |    |    |     |   |   |                |                                      |   |    |    |    |
|               | Sandy CLAYEY SILT, some gravel (TILL)<br>Hard<br>Grey<br>Wet  |            |         |      |            |                            |                 |   |    |    |    |     |   |   |                |                                      |   |    |    |    |
|               | - Inferred cobbles/boulders encountered between depths of about 46.3 m and 46.9 m   |            |         |      |            |                            |                 |   |    |    |    |     |   |   |                |                                      |   |    |    |    |
|               |   |            | 25      | SS   | 43         |                            |                 |   |    |    |    |     |   |   |                |                                      |   |    |    |    |
|               |   |            |         |      |            |                            |                 |   |    |    |    |     |   |   |                |                                      |   |    |    |    |
|               |   |            |         |      |            |                            |                 |   |    |    |    |     |   |   |                |                                      |   |    |    |    |
|               |   |            |         |      |            |                            |                 |   |    |    |    |     |   |   |                |                                      |   |    |    |    |
|               |   |            |         |      |            |                            |                 |   |    |    |    |     |   |   |                |                                      |   |    |    |    |
|               |   |            |         |      |            |                            |                 |   |    |    |    |     |   |   |                |                                      |   |    |    |    |
| 178.8<br>50.4 | END OF BOREHOLE   |            | 26      | SS   | 100/70 10  |                            |                 |   |    |    |    |     |   |   |                |                                      |   |    |    |    |
|               | NOTE:<br><br>1. Water level measurements in the casing at the beginning of each work shift:<br><br>Date    Depth (m)    Elev. (m)<br>27/06/17    1.1    228.1<br>28/06/17    4.3    224.9<br>29/06/17    1.1    228.1<br>03/07/17    9.0    220.2<br><br>The water level measurements are not considered to be representative of the groundwater level due to introduction of water/drilling mud during wash boring operations. |            |         |      |            |                            |                 |   |    |    |    |     |   |   |                |                                      |   |    |    |    |

## **Appendix 3**

### **Calibration Records**



48 Spencer St. Lebanon, NH 03766 USA

## Load Cell Calibration Report

Model Number: 3000-1000-6Calibration Date: November 14, 2017Serial Number: 1700884

This calibration has been verified/validated as of 01/25/2018

Max. Range (lbs): 1000000Calibration Instruction: CI-3000

### Initial Cycling Data

Cable Length: 40 feet

|             |      |      |         |      |
|-------------|------|------|---------|------|
| Load (lbs): | 0    | 0    | 1500000 | 0    |
| Reading:    | -322 | -324 | 7309    | -327 |

Technician: 

### Calibration

| Applied Load in lbs | Readings from GK-501 or GK-502 readout box |         |         |        | Linearity % Max Load | Polynomial Error (%FS) |
|---------------------|--|---------|---------|--------|----------------------|------------------------|
|                     | Cycle 1                                    | Cycle 2 | Average | Change |                      |                        |
| 0                   | -327                                       | -327    | -327    |        | 0.51                 | 0.48                   |
| 100000              | 165  | 162     | 164     | 491    | 0.12                 | 0.10                   |
| 200000              | 664  | 664     | 664     | 500    | -0.07                | -0.08                  |
| 300000              | 1175                                       | 1172    | 1174    | 510    | -0.09                | -0.09                  |
| 400000              | 1695                                       | 1687    | 1691    | 517    | 0.05                 | 0.05                   |
| 500000              | 2197                                       | 2197    | 2197    | 506    | -0.04                | -0.03                  |
| 600000              | 2708                                       | 2710    | 2709    | 512    | -0.01                | 0.00                   |
| 700000              | 3228                                       | 3220    | 3224    | 515    | 0.09                 | 0.09                   |
| 800000              | 3728                                       | 3733    | 3731    | 507    | 0.01                 | 0.01                   |
| 900000              | 4238                                       | 4241    | 4240    | 509    | -0.02                | -0.03                  |
| 1000000             | 4751                                       | 4751    | 4751    | 511    | 0.00                 | -0.02                  |
| 0                   | -319                                       | -324    | -322    |        |                      |                        |

### GK-501 or GK-502 Readout

Linear Gage Factor (G): 195.9 lbs/digitRegression Zero ( $R_0$ ):\* -353Polynomial Gage Factors: A: -0.00005872 B: 196.2 C: 68890

$$\text{Polynomial, } L = AR_1^2 + BR_1 + C$$

Full Scale mV/ V: 1.270 mV/ VCalculate C by setting  $L=0$  and  $R_1$  = initial field zero reading in the polynomial equation

\* Note: The above calibration uses a linear regression method. The Regression Zero Reading shown is ideal for straight line computation and does not usually agree with the actual no-load reading.

The above named instrument has been calibrated by comparison with standards traceable to the NIST, in compliance with ANSI Z540-1.

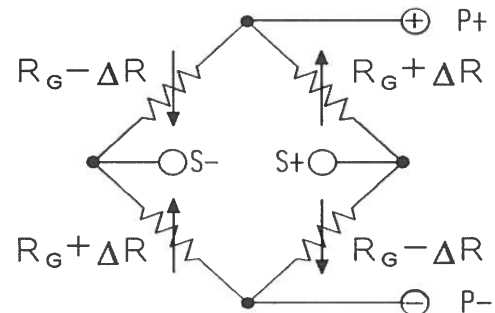
This report shall not be reproduced except in full without written permission of Geokon Inc.



## CALIBRATION DATA SHEET

### LOAD CELL

**Model:** ANCLO-4500  
**Serial number:** 1700884  
**Capacity:** 4500 kN  
**Max. excitation:** 10.00 VDC  
**Temperature:** 21 °C  
**Cable model:** Three twisted pair (six conductor)  
**Cable length:** 11 m



**Color code:**  
 Red ( B ): Power P +  
 Black ( C ): Power P -  
 Green ( D ): Signal S +  
 White ( A ): Signal S -

#### Calibration data:

| First pass |                | Second pass |                | Average reading |                | Linear regression |                   |
|------------|----------------|-------------|----------------|-----------------|----------------|-------------------|-------------------|
| Load<br>kN | Output<br>mV/V | Load<br>kN  | Output<br>mV/V | Load<br>kN      | Output<br>mV/V | Load<br>kN        | Error<br>(% F.S.) |
| 0.0        | -0.079         | 0.0         | -0.079         | 0.0             | -0.079         | ---               | ---               |
| 450.0      | 0.065          | 452.0       | 0.061          | 451.0           | 0.063          | 444.6             | -0.14             |
| 900.0      | 0.213          | 901.0       | 0.207          | 900.5           | 0.210          | 902.2             | 0.04              |
| 1353.0     | 0.361          | 1352.0      | 0.350          | 1352.5          | 0.356          | 1355.1            | 0.06              |
| 1802.0     | 0.508          | 1799.0      | 0.491          | 1800.5          | 0.500          | 1803.4            | 0.06              |
| 2250.0     | 0.652          | 2252.0      | 0.635          | 2251.0          | 0.644          | 2251.7            | 0.01              |
| 2700.0     | 0.797          | 2706.0      | 0.779          | 2703.0          | 0.788          | 2701.5            | -0.03             |
| 3156.0     | 0.944          | 3166.0      | 0.925          | 3161.0          | 0.935          | 3157.5            | -0.08             |
| 3605.0     | 1.088          | 3604.0      | 1.066          | 3604.5          | 1.077          | 3601.1            | -0.07             |
| 4049.0     | 1.229          | 4053.0      | 1.216          | 4051.0          | 1.223          | 4054.1            | 0.07              |
| 4495.0     | 1.372          | 4504.0      | 1.360          | 4499.5          | 1.366          | 4500.8            | 0.03              |

**Load cell sensitivity:** 1.4456 mV/V at full scale  
**Regression zero ( $L_0$ ):** -0.0798 mV/V

**Traceability no:** TR-12-07  
**Certificate no:** 1700884.xlsx

**Calibrated by:** Stéphane Fortin *SF*

**Date:** 2019-08-12



Canadian BBR Inc.  
3450 Midland Avenue  
Agincourt Ontario

Calibration of Hydraulic Components

28-Aug-19

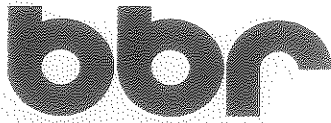
RJ 1000-18-5306

Ram Area (sq. in.) 243.7  
Friction Calibration 1.017

Calibrated with Digital pressure gauge  
Enerpac Model DGB / 10000 psi  
Load cell BBR no.2



| Gauge<br>psi | Voltage<br>run 1 | Voltage<br>run 2 | Voltage<br>run 3 | Voltage<br>(avg) | Load<br>kips |
|--------------|------------------|------------------|------------------|------------------|--------------|
| 1000         | 1.691            | 1.703            | 1.711            | 1.702            | 238.23       |
| 2000         | 3.409            | 3.423            | 3.422            | 3.418            | 478.52       |
| 3000         | 5.136            | 5.14             | 5.146            | 5.141            | 719.69       |
| 4000         | 6.834            | 6.855            | 6.855            | 6.848            | 958.72       |
| 5000         | 8.55             | 8.567            | 8.566            | 8.561            | 1198.54      |
| 5800         | 9.9              | 9.918            | 9.91             | 9.909            | 1387.31      |



P.O. Box 37, Agincourt, ON M1S 3B4  
3450 Midland Ave., Scarborough, ON M1V 4V4

Tel: (416) 291-1618  
Fax: (416) 291-9960

## CERTIFIED TEST REPORTS

Reference No. : **256** Date : **09-Aug-19**

Gauge Type : **WIKA 0 - 10,000 PSI**

Machine : **Deadweight Tester Mansfield & Green**


Traceability To : **National Bureau Standards**

### Dead Weight Pressure

1000 psi  
2000 psi  
3000 psi  
4000 psi  
5000 psi  
6000 psi  
7000 psi  
8000 psi  
9000 psi

### Gauge Indicated Pressure

1025 psi  
2025 psi  
3025 psi  
4000 psi  
5000 psi  
6000 psi  
7000 psi  
8000 psi  
9000 psi

Signature : 



P.O. Box 37, Agincourt, ON M1S 3B4  
3450 Midland Ave., Scarborough, ON M1V 4V4

Tel: (416) 291-1618  
Fax: (416) 291-9960

## CERTIFIED TEST REPORTS

Reference No. : 257

Date : 28-Aug-19

Gauge Type : WIKA 0 - 10,000 PSI

Machine : Deadweight Tester Mansfield & Green


Traceability To : National Bureau Standards

### Dead Weight Pressure

|      |     |
|------|-----|
| 1000 | psi |
| 2000 | psi |
| 3000 | psi |
| 4000 | psi |
| 5000 | psi |
| 6000 | psi |
| 7000 | psi |
| 8000 | psi |
| 9000 | psi |

### Gauge Indicated Pressure

|      |     |
|------|-----|
| 975  | psi |
| 2000 | psi |
| 3000 | psi |
| 4000 | psi |
| 5000 | psi |
| 5975 | psi |
| 6975 | psi |
| 7950 | psi |
| 8950 | psi |

Signature : 

## **Appendix 4**

### **Load Test Records**



**Load Increment 300 kN**

PILE NO: Test Pile

**Urkkada Job No.** 1905CS1373

The hydraulic pump did not have a pressure dial on the jack side of the lock off. Pressure readings were of the pump and not reflective of the jack.

Project: MTO 2018-2024

**Date:** November 12, 2019

Location: HWY 400 & 89

**Start Time:** 09:46

Owner: MTO

**Pile Size:** 310x110

**Contractor:** Fermar Paving Limited

**Pile Type:** H-Pile

Inspector: S. Ferguson

Embedment (m): 50.80

[illegible]



**Load Increment 600 kN**

PILE NO: Test Pile

**Urkkada Job No.** 1905CS1373

See sheet 300 kN for comments on Gauge Pressure

**Project:** MTO 2018-2024

**Date:** November 12, 2019

Location: HWY 400 & 89

**Start Time:** 10:49

Owner: MTO

**Pile Size:** 310x110

**Contractor:** Fermar Paving Limited

**Pile Type:** H-Pile

Inspector: S. Ferguson/ M. Ferguson

Embedment (m): 50.80

[illegible]



**Load Increment 900 kN**

PILE NO: Test Pile

**Urkkada Job No.** 1905CS1373

See sheet 300 kN for comments on Gauge Pressure

Project: MTO 2018-2024

**Date:** November 12, 2019

**Location:** HWY 400 & 89

**Start Time:** 11:52

Owner: MTO

**Pile Size:** 310x110

**Contractor:** Fermar Paving Limited

**Pile Type:** H-Pile

Inspector: M. Ferguson

Embedment (m): 50.80

[illegible]



Load Increment 1200 kN

PILE NO: \_\_\_\_\_ Test Pile \_\_\_\_\_

Urkkada Job No. 1905CS1373

See sheet 300 kN for comments on Gauge Pressure

Project: MTO 2018-2024

Date: November 12, 2019

Location: HWY 400 &amp; 89

Start Time: 12:55

Owner: MTO

Pile Size: 310x110

Contractor: Fermar Paving Limited

Pile Type: H-Pile

Inspector: M. Ferguson

Embedment (m): 50.80

| Date       | Time    |       | Applied Load<br>(kN) | Gauge Reading<br>(psi) | Test Pile                 |                           |                    |                    |                         |                    |                    |                           |                                 |                         |                         |                         |                         |
|------------|---------|-------|----------------------|------------------------|---------------------------|---------------------------|--------------------|--------------------|-------------------------|--------------------|--------------------|---------------------------|---------------------------------|-------------------------|-------------------------|-------------------------|-------------------------|
|            |         |       |                      |                        | Vertical Gauge #1<br>(in) | Vertical Gauge #2<br>(in) | Gauge #1 Δ<br>(mm) | Gauge #2 Δ<br>(mm) | Average Δ Gauge<br>(mm) | Lateral #1<br>(in) | Lateral #2<br>(in) | Wire Line Reading<br>(cm) | Movement from Wire Line<br>(cm) | Reaction Pile 1<br>(cm) | Reaction Pile 2<br>(cm) | Reaction Pile 3<br>(cm) | Reaction Pile 4<br>(cm) |
|            | ZERO    |       | 0                    | 0                      | 2.957                     | 3.626                     | -                  | -                  | -                       | 0.533              | 0.391              | 83.90                     | -                               |                         |                         |                         |                         |
| 2019-11-12 | 0 min   | 12:55 | 1203                 | 1200                   | 2.199                     | 2.803                     | 19.25              | 20.90              | 20.08                   | 0.429              | 0.444              | 85.50                     | -1.60                           |                         |                         |                         |                         |
|            | 2 min   | 12:57 | 1193                 | 1200                   | 2.198                     | 2.803                     | 19.28              | 20.90              | 20.09                   | 0.425              | 0.444              | 85.50                     | -1.60                           |                         |                         |                         |                         |
|            | 5 min   | 13:00 | 1183                 | 1200                   | 2.198                     | 2.803                     | 19.28              | 20.90              | 20.09                   | 0.425              | 0.442              | 85.50                     | -1.60                           |                         |                         |                         |                         |
|            | 10 min  | 13:05 | 1178                 | 1200                   | 2.198                     | 2.802                     | 19.28              | 20.93              | 20.10                   | 0.421              | 0.440              | 85.50                     | -1.60                           |                         |                         |                         |                         |
|            | 20 min  | 13:15 | 1174                 | 1150                   | 2.198                     | 2.801                     | 19.28              | 20.96              | 20.12                   | 0.417              | 0.437              | 85.50                     | -1.60                           |                         |                         |                         |                         |
|            | 40 min  | 13:35 | 1167                 | 1150                   | 2.198                     | 2.801                     | 19.28              | 20.96              | 20.12                   | 0.411              | 0.435              | 85.50                     | -1.60                           |                         |                         |                         |                         |
|            | 60 min  | 13:55 | 1160                 | 1100                   | 2.200                     | 2.802                     | 19.23              | 20.93              | 20.08                   | 0.410              | 0.432              | 85.50                     | -1.60                           |                         |                         |                         |                         |
|            | 90 min  | 14:25 | 1159                 | 1100                   | 2.201                     | 2.803                     | 19.20              | 20.90              | 20.05                   | 0.408              | 0.431              | 85.50                     | -1.60                           |                         |                         |                         |                         |
|            | 120 min | 14:55 | 1154                 | 1100                   | 2.202                     | 2.803                     | 19.18              | 20.90              | 20.04                   | 0.407              | 0.431              | 85.50                     | -1.60                           |                         |                         |                         |                         |



**Load Increment 1500 kN**

PILE NO: Test Pile

Urkkada Job No. 1905CS1373

See sheet 300 kN for comments on Gauge Pressure

Project: MTO 2018-2024

**Date:** November 12, 2019

Location: HWY 400 & 89

**Start Time:** 15:10

Owner: MTO

**Pile Size:** 310x110

**Contractor:** Fermar Paving Limited

**Pile Type:** H-Pile

Inspector: M. Ferguson

Embedment (m): 50.80

[illegible]



Load Increment 1800 kN

PILE NO: \_\_\_\_\_ Test Pile \_\_\_\_\_

Urkkada Job No. 1905CS1373

See sheet 300 kN for comments on Gauge Pressure

Project: MTO 2018-2024

Date: November 12, 2019

Location: HWY 400 &amp; 89

Start Time: 16:14

Owner: MTO

Pile Size: 310x110

Contractor: Fermar Paving Limited

Pile Type: H-Pile

Inspector: M. Ferguson

Embedment (m): 50.80

| Date       | Time    |       | Applied Load<br>(kN) | Gauge Reading<br>(psi) | Test Pile                 |                           |                    |                    |                         |                    |                    |                           |                                 |                         |                         |                         |                         |
|------------|---------|-------|----------------------|------------------------|---------------------------|---------------------------|--------------------|--------------------|-------------------------|--------------------|--------------------|---------------------------|---------------------------------|-------------------------|-------------------------|-------------------------|-------------------------|
|            |         |       |                      |                        | Vertical Gauge #1<br>(in) | Vertical Gauge #2<br>(in) | Gauge #1 Δ<br>(mm) | Gauge #2 Δ<br>(mm) | Average Δ Gauge<br>(mm) | Lateral #1<br>(in) | Lateral #2<br>(in) | Wire Line Reading<br>(cm) | Movement from Wire Line<br>(cm) | Reaction Pile 1<br>(cm) | Reaction Pile 2<br>(cm) | Reaction Pile 3<br>(cm) | Reaction Pile 4<br>(cm) |
|            | ZERO    |       | 0                    | 0                      | 2.957                     | 3.626                     | -                  | -                  | -                       | 0.533              | 0.391              | 83.90                     | -                               | 56.0                    | 56.1                    | 63.5                    | 64.1                    |
| 2019-11-12 | 0 min   | 16:14 | 1791                 | 1900                   | 1.611                     | 2.205                     | 34.19              | 36.09              | 35.14                   | 0.381              | 0.470              | 87.00                     | -3.10                           |                         |                         |                         |                         |
|            | 2 min   | 16:16 | 1765                 | 1900                   | 1.608                     | 2.202                     | 34.26              | 36.17              | 35.22                   | 0.381              | 0.469              | 87.00                     | -3.10                           |                         |                         |                         |                         |
|            | 5 min   | 16:19 | 1749                 | 1850                   | 1.605                     | 2.200                     | 34.34              | 36.22              | 35.28                   | 0.381              | 0.469              | 87.00                     | -3.10                           |                         |                         |                         |                         |
|            | 10 min  | 16:24 | 1734                 | 1850                   | 1.603                     | 2.197                     | 34.39              | 36.30              | 35.34                   | 0.380              | 0.469              | 87.00                     | -3.10                           |                         |                         |                         |                         |
|            | 20 min  | 16:34 | 1719                 | 1800                   | 1.601                     | 2.194                     | 34.44              | 36.37              | 35.41                   | 0.379              | 0.469              | 87.10                     | -3.20                           |                         |                         |                         |                         |
|            | 40 min  | 16:54 | 1707                 | 1800                   | 1.598                     | 2.190                     | 34.52              | 36.47              | 35.50                   | 0.378              | 0.470              | 87.20                     | -3.30                           |                         |                         |                         |                         |
|            | 60 min  | 17:14 | 1700                 | 1800                   | 1.597                     | 2.189                     | 34.54              | 36.50              | 35.52                   | 0.377              | 0.470              | 87.20                     | -3.30                           |                         |                         |                         |                         |
|            | 80 min  | 17:34 | 1697                 | 1800                   | 1.596                     | 2.188                     | 34.57              | 36.53              | 35.55                   | 0.376              | 0.470              | 87.20                     | -3.30                           | 55.8                    | 55.9                    | 63.3                    | 63.9                    |
|            | 100 min | 17:54 | 1692                 | 1750                   | 1.597                     | 2.188                     | 34.54              | 36.53              | 35.53                   | 0.375              | 0.470              | 87.20                     | -3.30                           |                         |                         |                         |                         |
|            | 120 min | 18:14 | 1688                 | 1750                   | 1.597                     | 2.186                     | 34.54              | 36.58              | 35.56                   | 0.375              | 0.470              | 87.20                     | -3.30                           |                         |                         |                         |                         |



### Load Increments 1900 and 2000 kN

PILE NO: Test Pile

Urkkada Job No. 1905CS1373

See sheet 300 kN for comments on Gauge Pressure

Project: MTO 2018-2024

**Date:** November 12, 2019

**Location:** HWY 400 & 89

**Start Time:** 18:37

Owner: MTO

**Pile Size:** 310x110

**Contractor:** Fermar Paving Limited

**Pile Type:** H-Pile

Inspector: M. Ferguson

Embedment (m): 50.80

[illegible]



Load Increment 2100 kN

PILE NO: \_\_\_\_\_ Test Pile \_\_\_\_\_  
 Project: \_\_\_\_\_ MTO 2018-2024 \_\_\_\_\_  
 Location: \_\_\_\_\_ HWY 400 & 89 \_\_\_\_\_  
 Owner: \_\_\_\_\_ MTO \_\_\_\_\_  
 Contractor: \_\_\_\_\_ Fermar Paving Limited \_\_\_\_\_  
 Inspector: \_\_\_\_\_ M. Ferguson \_\_\_\_\_

Urkkada Job No. 1905CS1373  
 Date: November 12, 2019  
 Start Time: 19:02  
 Pile Size: 310x110  
 Pile Type: H-Pile  
 Embedment (m): 50.80

See sheet 300 kN for comments on Gauge Pressure

| Date | Time    |       | Applied Load<br>(kN) | Gauge Reading<br>(psi) | Test Pile                 |                           |                    |                    |                         |                    |                    |                           |                                 |                         |                         |                         |                         |
|------|---------|-------|----------------------|------------------------|---------------------------|---------------------------|--------------------|--------------------|-------------------------|--------------------|--------------------|---------------------------|---------------------------------|-------------------------|-------------------------|-------------------------|-------------------------|
|      |         |       |                      |                        | Vertical Gauge #1<br>(in) | Vertical Gauge #2<br>(in) | Gauge #1 Δ<br>(mm) | Gauge #2 Δ<br>(mm) | Average Δ Gauge<br>(mm) | Lateral #1<br>(in) | Lateral #2<br>(in) | Wire Line Reading<br>(cm) | Movement from Wire Line<br>(cm) | Reaction Pile 1<br>(cm) | Reaction Pile 2<br>(cm) | Reaction Pile 3<br>(cm) | Reaction Pile 4<br>(cm) |
|      | ZERO    |       | 0                    | 0                      | 2.957                     | 3.626                     | -                  | -                  | -                       | 0.533              | 0.391              | 83.90                     | -                               | 56.0                    | 56.1                    | 63.5                    | 64.1                    |
|      | 0 min   | 19:02 | 2100                 | 2225                   | 1.125                     | 1.719                     | 46.53              | 48.44              | 47.49                   | 0.357              | 0.470              | 88.10                     | -4.20                           |                         |                         |                         |                         |
|      | 5 min   | 19:07 | 2009                 | 2200                   | 1.109                     | 1.700                     | 46.94              | 48.92              | 47.93                   | 0.356              | 0.473              | 88.10                     | -4.20                           |                         |                         |                         |                         |
|      | 10 min  | 19:12 | 1992                 | 2150                   | 1.106                     | 1.697                     | 47.02              | 49.00              | 48.01                   | 0.356              | 0.474              | 88.20                     | -4.30                           |                         |                         |                         |                         |
|      | 11 min  | 19:13 | 2060                 | 2150                   | 1.055                     | 1.645                     | 48.31              | 50.32              | 49.31                   | 0.355              | 0.470              | 88.30                     | -4.40                           |                         |                         |                         |                         |
|      | 16 min  | 19:18 | 2102                 | 2200                   | 1.012                     | 1.607                     | 49.40              | 51.28              | 50.34                   | 0.355              | 0.462              | 88.40                     | -4.50                           |                         |                         |                         |                         |
|      | 20 min  | 19:22 | 2045                 | 2150                   | 1.005                     | 1.594                     | 49.58              | 51.61              | 50.60                   | 0.355              | 0.466              | 88.50                     | -4.60                           |                         |                         |                         |                         |
|      | 40 min  | 19:42 | 2005                 | 2100                   | 0.997                     | 1.589                     | 49.78              | 51.74              | 50.76                   | 0.352              | 0.468              | 88.50                     | -4.60                           | 55.7                    | 55.8                    | 63.2                    | 63.8                    |
|      | 60 min  | 20:02 | 1988                 | 2100                   | 0.995                     | 1.584                     | 49.83              | 51.87              | 50.85                   | 0.351              | 0.470              | 88.50                     | -4.60                           |                         |                         |                         |                         |
|      | 61min   | 20:04 | 2102                 | 2250                   | 0.925                     | 1.516                     | 51.61              | 53.59              | 52.60                   | 0.347              | 0.460              | 88.50                     | -4.60                           | 55.7                    | 55.8                    | 63.2                    | 63.8                    |
|      | 80 min  | 20:22 | 2037                 | 2200                   | 0.911                     | 1.504                     | 51.97              | 53.90              | 52.93                   | 0.346              | 0.467              | 88.60                     | -4.70                           |                         |                         |                         |                         |
|      | 93 min  | 20:35 | 2104                 | 2250                   | 0.880                     | 1.468                     | 52.76              | 54.81              | 53.78                   | 0.346              | 0.463              | 88.80                     | -4.90                           | 55.7                    | 55.8                    | 63.2                    | 63.8                    |
|      | 100 min | 20:42 | 2062                 | 2200                   | 0.875                     | 1.462                     | 52.88              | 54.97              | 53.92                   | 0.346              | 0.466              | 88.80                     | -4.90                           |                         |                         |                         |                         |
|      | 120 min | 21:02 | 2042                 | 2200                   | 0.873                     | 1.460                     | 52.93              | 55.02              | 53.98                   | 0.346              | 0.468              | 88.80                     | -4.90                           |                         |                         |                         |                         |



# Load Increments 2200 and 2300 kN

Maximum vertical movement limit increased by Golder to 78 mm, required

\*Vertical Gauge #1 to be adjusted to allow for increased movement

See sheet 300 kN for comments on Gauge Pressure

PILE NO: \_\_\_\_\_ Test Pile \_\_\_\_\_  
 Project: \_\_\_\_\_ MTO 2018-2024 \_\_\_\_\_  
 Location: \_\_\_\_\_ HWY 400 & 89 \_\_\_\_\_  
 Owner: \_\_\_\_\_ MTO \_\_\_\_\_  
 Contractor: \_\_\_\_\_ Fermar Paving Limited \_\_\_\_\_  
 Inspector: \_\_\_\_\_ M. Ferguson / S. Ferguson \_\_\_\_\_

Urkkada Job No. \_\_\_\_\_ 1905CS1373 \_\_\_\_\_  
 Date: \_\_\_\_\_ November 12, 2019 \_\_\_\_\_  
 Start Time: \_\_\_\_\_ 21:11 \_\_\_\_\_  
 Pile Size: \_\_\_\_\_ 310x110 \_\_\_\_\_  
 Pile Type: \_\_\_\_\_ H-Pile \_\_\_\_\_  
 Embedment (m): \_\_\_\_\_ 50.80 \_\_\_\_\_

| Date       | Time   |         | Applied Load<br>(kN) | Gauge Reading<br>(psi) | Test Pile                 |                           |                    |                    |                         |                    |                    |                           |                                 |                         |                         |                         |                         |
|------------|--------|---------|----------------------|------------------------|---------------------------|---------------------------|--------------------|--------------------|-------------------------|--------------------|--------------------|---------------------------|---------------------------------|-------------------------|-------------------------|-------------------------|-------------------------|
|            |        |         |                      |                        | Vertical Gauge #1<br>(in) | Vertical Gauge #2<br>(in) | Gauge #1 Δ<br>(mm) | Gauge #2 Δ<br>(mm) | Average Δ Gauge<br>(mm) | Lateral #1<br>(in) | Lateral #2<br>(in) | Wire Line Reading<br>(cm) | Movement from Wire Line<br>(cm) | Reaction Pile 1<br>(cm) | Reaction Pile 2<br>(cm) | Reaction Pile 3<br>(cm) | Reaction Pile 4<br>(cm) |
|            | ZERO   |         | 0                    | 0                      | 2.957                     | 3.626                     | -                  | -                  | -                       | 0.533              | 0.391              | 83.90                     | -                               | 56.0                    | 56.1                    | 63.5                    | 64.1                    |
| 2019-11-12 |        | 2200 kN |                      |                        | *1.386 = 52.93 mm travel  |                           |                    |                    |                         |                    |                    |                           |                                 |                         |                         |                         |                         |
|            | 0 min  | 21:11   | 2207                 | 2250                   | 1.359                     | 1.331                     | 53.62              | 58.29              | 55.95                   | 0.342              | 0.461              | 89.30                     | -5.40                           | 55.7                    | 55.8                    | 63.2                    | 63.8                    |
|            | 5 min  | 21:16   | 2203                 | 2250                   | 1.328                     | 1.300                     | 54.40              | 59.08              | 56.74                   | 0.342              | 0.461              | 89.30                     | -5.40                           | 55.7                    | 55.8                    | 63.2                    | 63.8                    |
|            | 11 min | 21:22   | 2207                 | 2250                   | 1.190                     | 1.260                     | 57.91              | 60.10              | 59.00                   | 0.340              | 0.460              | 89.60                     | -5.70                           | 55.7                    | 55.8                    | 63.2                    | 63.8                    |
|            | 20 min | 21:31   | 2207                 | 2250                   | 1.162                     | 1.232                     | 58.62              | 60.81              | 59.71                   | 0.340              | 0.460              | 89.70                     | -5.80                           |                         |                         |                         |                         |
|            |        | 2300 kN |                      |                        |                           |                           |                    |                    |                         |                    |                    |                           |                                 |                         |                         |                         |                         |
|            | 0 min  | 21:43   | 2304                 | 2400                   | 1.035                     | 1.105                     | 61.85              | 64.03              | 62.94                   | 0.340              | 0.454              | 89.90                     | -6.00                           | 55.6                    | 55.7                    | 63.2                    | 63.8                    |
|            | 3 min  | 21:46   | 2306                 | 2400                   | 0.986                     | 1.055                     | 63.09              | 65.30              | 64.20                   | 0.335              | 0.455              | 90.10                     | -6.20                           |                         |                         |                         |                         |
|            | 7 min  | 21:50   | 2305                 | 2400                   | 0.955                     | 1.024                     | 63.88              | 66.09              | 64.98                   | 0.336              | 0.456              | 90.10                     | -6.20                           | 55.6                    | 55.7                    | 63.2                    | 63.7                    |
|            | 13 min | 21:56   | 2305                 | 2400                   | 0.926                     | 0.995                     | 64.61              | 66.83              | 65.72                   | 0.335              | 0.459              | 90.20                     | -6.30                           |                         |                         |                         |                         |



**Load Increment 2400 kN**

\*1 - Movement exceed reading area of Lateral #2. Reset at 16 min.

\*2 - Movement exceeded reading area of wireline

See sheet 300 kN for comments on Gauge Pressure

PILE NO: \_\_\_\_\_ Test Pile \_\_\_\_\_

Urkkada Job No. 1905CS1373

Project: MTO 2018-2024

Date: Nov. 12-13, 2019

Location: HWY 400 & 89

Start Time: 22:02

Owner: MTO

Pile Size: 310x110

Contractor: Fermar Paving Limited

Pile Type: H-Pile

Inspector: S. Ferguson

Embedment (m): 50.80

| Date       | Time    |       | Applied Load<br>(kN) | Gauge Reading<br>(psi) | Test Pile                 |                           |                    |                    |                         |                    |                    |                           |                                 | Reaction                |                         |                         |                         |
|------------|---------|-------|----------------------|------------------------|---------------------------|---------------------------|--------------------|--------------------|-------------------------|--------------------|--------------------|---------------------------|---------------------------------|-------------------------|-------------------------|-------------------------|-------------------------|
|            |         |       |                      |                        | Vertical Gauge #1<br>(in) | Vertical Gauge #2<br>(in) | Gauge #1 Δ<br>(mm) | Gauge #2 Δ<br>(mm) | Average Δ Gauge<br>(mm) | Lateral #1<br>(in) | Lateral #2<br>(in) | Wire Line Reading<br>(cm) | Movement from Wire Line<br>(cm) | Reaction Pile 1<br>(cm) | Reaction Pile 2<br>(cm) | Reaction Pile 3<br>(cm) | Reaction Pile 4<br>(cm) |
|            | ZERO    |       | 0                    | 0                      | 2.957                     | 3.626                     | -                  | -                  | -                       | 0.533              | 0.391              | 83.90                     | -                               | 56.0                    | 56.1                    | 63.5                    | 64.1                    |
| 2019-11-12 | 0 min   | 22:02 | 2406                 | 2500                   | 0.760                     | 0.831                     | 68.83              | 70.99              | 69.91                   | 0.336              | 0.452              | 90.70                     | -6.80                           |                         |                         |                         |                         |
|            | 16 min  | 22:18 | 2410                 | 2500                   | 0.623                     | 0.689                     | 72.31              | 74.60              | 73.46                   | 0.337              | *10.422            | *2                        |                                 |                         |                         |                         |                         |
|            | 21 min  | 22:23 | 2406                 | 2500                   | 0.583                     | 0.648                     | 73.33              | 75.64              | 74.48                   | 0.330              | 0.424              |                           |                                 |                         |                         |                         |                         |
|            | 32 min  | 22:34 | 2405                 | 2500                   | 0.545                     | 0.607                     | 74.29              | 76.68              | 75.49                   | 0.340              | 0.430              |                           |                                 | 55.5                    | 55.6                    | 63.1                    | 63.5                    |
|            | 43 min  | 22:45 | 2400                 | 2500                   | 0.509                     | 0.577                     | 75.21              | 77.44              | 76.33                   | 0.339              | 0.431              |                           |                                 |                         |                         |                         |                         |
|            | 60 min  | 23:02 | 2350                 | 2450                   | 0.504                     | 0.566                     | 75.33              | 77.72              | 76.53                   | 0.338              | 0.434              |                           |                                 |                         |                         |                         |                         |
|            | 80 min  | 23:22 | 2358                 | 2450                   | 0.459                     | 0.521                     | 76.48              | 78.87              | 77.67                   | 0.337              | 0.435              |                           |                                 |                         |                         |                         |                         |
|            | 100 min | 23:42 | 2367                 | 2450                   | 0.429                     | 0.490                     | 77.24              | 79.65              | 78.45                   | 0.333              | 0.436              |                           |                                 |                         |                         |                         |                         |
| Nov-13     | 120 min | 00:02 | 2352                 | 2450                   | 0.427                     | 0.486                     | 77.29              | 79.76              | 78.52                   | 0.326              | 0.437              |                           |                                 |                         |                         |                         |                         |



# Unloading Cycle - 25% Decrements

PILE NO: \_\_\_\_\_ Test Pile \_\_\_\_\_

Project: \_\_\_\_\_ MTO 2018-2024 \_\_\_\_\_

Location: \_\_\_\_\_ HWY 400&89 \_\_\_\_\_

Owner: \_\_\_\_\_ MTO \_\_\_\_\_

Contractor: \_\_\_\_\_ Fermar Paving Limited \_\_\_\_\_

Inspector: \_\_\_\_\_ S. Ferguson \_\_\_\_\_

Urkkada Job No. \_\_\_\_\_ 1905CS1373 \_\_\_\_\_

Date: \_\_\_\_\_ November 13, 2019 \_\_\_\_\_

Start Time: \_\_\_\_\_ 00:08 \_\_\_\_\_

Pile Size: \_\_\_\_\_ 310x110 \_\_\_\_\_

Pile Type: \_\_\_\_\_ H-Pile \_\_\_\_\_

Embedment (m): \_\_\_\_\_ 50.80 \_\_\_\_\_

\*1 - Pump was not used for unloading, pressure remained at 2450 in pump

| Date       | Time   |         | Applied Load<br><br>(kN) | Gauge Reading<br><br>(psi) | Test Pile                 |                           |                    |                    |                         |                    |                    |                           |                                 |                         |                         |                         |                         |  |
|------------|--------|---------|--------------------------|----------------------------|---------------------------|---------------------------|--------------------|--------------------|-------------------------|--------------------|--------------------|---------------------------|---------------------------------|-------------------------|-------------------------|-------------------------|-------------------------|--|
|            |        |         |                          |                            | Vertical Gauge #1<br>(in) | Vertical Gauge #2<br>(in) | Gauge #1 Δ<br>(mm) | Gauge #2 Δ<br>(mm) | Average Δ Gauge<br>(mm) | Lateral #1<br>(in) | Lateral #2<br>(in) | Wire Line Reading<br>(cm) | Movement from Wire Line<br>(cm) | Reaction Pile 1<br>(cm) | Reaction Pile 2<br>(cm) | Reaction Pile 3<br>(cm) | Reaction Pile 4<br>(cm) |  |
|            | ZERO   |         | 0                        | 0                          | 2.957                     | 3.626                     | -                  | -                  | -                       | 0.533              | 0.391              | 83.90                     | -                               | 56.0                    | 56.1                    | 63.5                    | 64.1                    |  |
| 2019-11-13 |        | 1800 kN |                          |                            |                           |                           |                    |                    |                         |                    |                    |                           |                                 |                         |                         |                         |                         |  |
|            | 0 min  | 00:08   | 1742                     | *1                         | 0.742                     | 0.802                     | 69.29              | 71.73              | 70.51                   | 0.323              | 0.441              |                           |                                 |                         |                         |                         |                         |  |
|            | 20 min | 00:28   | 1754                     |                            | 0.746                     | 0.802                     | 69.19              | 71.73              | 70.46                   | 0.322              | 0.444              |                           |                                 |                         |                         |                         |                         |  |
|            | 40 min | 00:48   | 1754                     |                            | 0.746                     | 0.802                     | 69.19              | 71.73              | 70.46                   | 0.321              | 0.443              |                           |                                 |                         |                         |                         |                         |  |
|            | 60 min | 01:08   | 1754                     |                            | 0.746                     | 0.802                     | 69.19              | 71.73              | 70.46                   | 0.321              | 0.444              |                           |                                 |                         |                         |                         |                         |  |
|            |        | 1200 kN |                          |                            |                           |                           |                    |                    |                         |                    |                    |                           |                                 |                         |                         |                         |                         |  |
|            | 0 min  | 01:14   | 1208                     |                            | 1.192                     | 1.254                     | 57.86              | 60.25              | 59.05                   | 0.319              | 0.413              | 89.40                     | -5.50                           | 55.8                    | 55.9                    | 63.2                    | 63.7                    |  |
|            | 20 min | 01:34   | 1223                     |                            | 1.194                     | 1.255                     | 57.81              | 60.22              | 59.02                   | 0.319              | 0.413              | 89.40                     | -5.50                           |                         |                         |                         |                         |  |
|            | 40 min | 01:54   | 1228                     |                            | 1.195                     | 1.255                     | 57.78              | 60.22              | 59.00                   | 0.318              | 0.414              | 89.40                     | -5.50                           |                         |                         |                         |                         |  |
|            | 60 min | 02:14   | 1228                     |                            | 1.195                     | 1.257                     | 57.78              | 60.17              | 58.98                   | 0.318              | 0.414              | 89.40                     | -5.50                           |                         |                         |                         |                         |  |

**Unloading Cycle - 25% Decrements**

PILE NO: \_\_\_\_\_ Test Pile \_\_\_\_\_

Urkkada Job No. 1905CS1373

\*1 - Pump was not used for unloading, pressure remained at 2450 in pump

Project: MTO 2018-2024

Date: November 13, 2019

Location: HWY 400&amp;89

Start Time: 00:08

Owner: MTO

Pile Size: 310x110

Contractor: Fermar Paving Limited

Pile Type: H-Pile

Inspector: S. Ferguson

Embedment (m): 50.80

|            |        |               |     |  |       |       |       |       |       |       |       |       |       |      |      |      |      |
|------------|--------|---------------|-----|--|-------|-------|-------|-------|-------|-------|-------|-------|-------|------|------|------|------|
| 2019-11-13 |        | <b>600 kN</b> |     |  |       |       |       |       |       |       |       |       |       |      |      |      |      |
|            | 0 min  | 02:24         | 606 |  | 1.675 | 1.748 | 45.59 | 47.70 | 46.65 | 0.331 | 0.380 | 88.20 | -4.30 |      |      |      |      |
|            | 20 min | 02:44         | 630 |  | 1.678 | 1.752 | 45.51 | 47.60 | 46.56 | 0.331 | 0.377 | 88.20 | -4.30 |      |      |      |      |
|            | 40 min | 03:04         | 635 |  | 1.678 | 1.752 | 45.51 | 47.60 | 46.56 | 0.331 | 0.376 | 88.20 | -4.30 |      |      |      |      |
|            | 60 min | 03:24         | 635 |  | 1.679 | 1.753 | 45.49 | 47.57 | 46.53 | 0.331 | 0.375 | 88.20 | -4.30 |      |      |      |      |
|            |        | <b>0 kN</b>   |     |  |       |       |       |       |       |       |       |       |       |      |      |      |      |
|            | 0 min  | 03:30         | 2   |  | 2.117 | 2.250 | 34.36 | 34.95 | 34.66 | 0.505 | 0.362 | 87.10 | -3.20 | 56.0 | 56.1 | 63.5 | 63.9 |
|            | 12 hr  | 15:30         | 26  |  | 2.134 | 2.274 | 33.93 | 34.34 | 34.14 | 0.510 | 0.353 | 87.10 | -3.20 | 56.0 | 56.1 | 63.5 | 64.0 |

## **Appendix 5**

### **Load Movement Curves**

Figure 1: Load Movement Curve for from Static Load Test #4

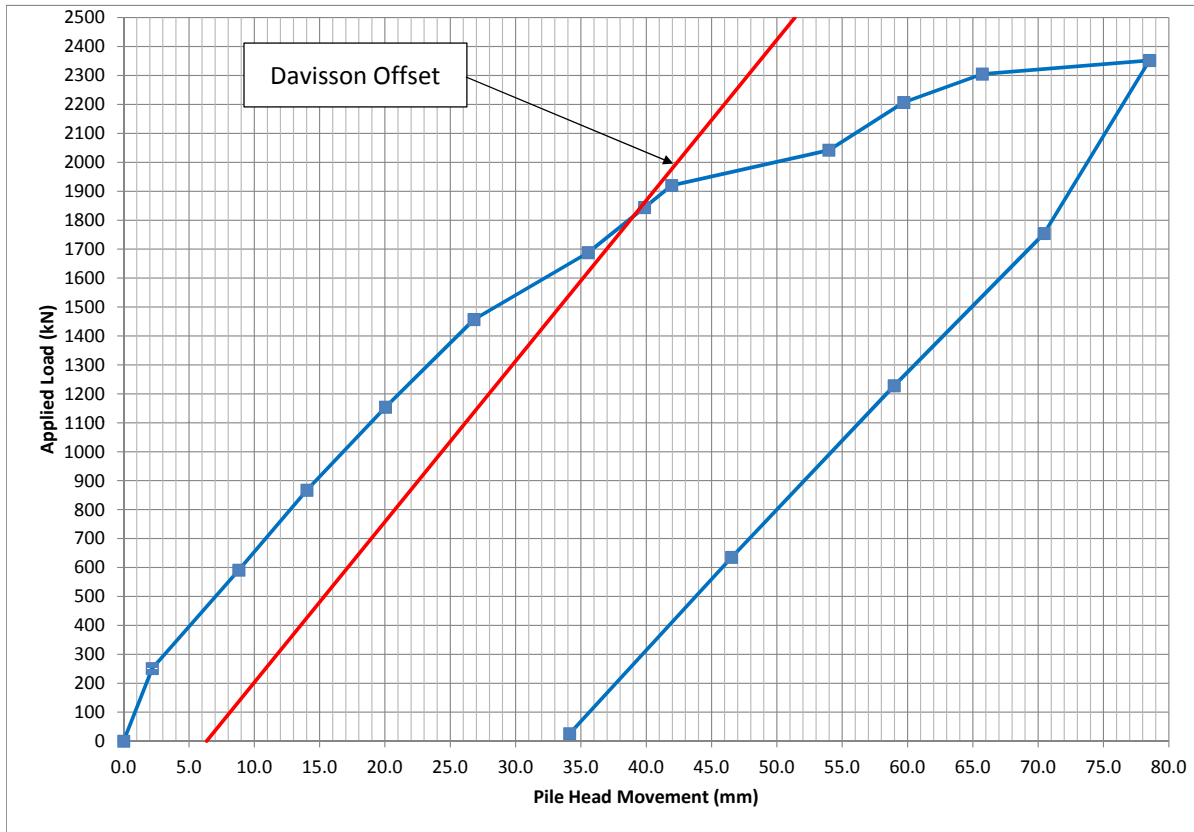


Table 1: Load Movement Summary

| Load (kN) | Movement (mm) |
|-----------|---------------|
| 0         | 0.0           |
| 251       | 2.2           |
| 591       | 8.8           |
| 867       | 14.0          |
| 1154      | 20.0          |
| 1457      | 26.8          |
| 1688      | 35.6          |
| 1844      | 39.9          |
| 1920      | 41.9          |
| 2042      | 54.0          |
| 2207      | 59.7          |
| 2305      | 65.7          |
| 2352      | 78.5          |
| 1754      | 70.5          |
| 1228      | 59.0          |
| 635       | 46.5          |
| 26        | 34.1          |