APPENDIX A - TEST HOLE LOGS

TEST HOLE LOCATION FOR FERRY ROAD
CSR WORKS CONTRACT 5E-2

Complex World
Clear Solutions

DYREGROV ROBINSON INC.
CONSULTING GEOTECHNICAL ENGINEERS

AUTHORIZED BY:
AUTHORIZED
DATE:

CLIENT
CLIENT DRAWING NO.

DRAWING DESCRIPTION

TETRA TECH

TEST HOLE LOGS

CONTRACT
5E-2
## EXPLANATION OF TERMS & SYMBOLS

<table>
<thead>
<tr>
<th>Description</th>
<th>TH Log Symbols</th>
<th>USCS Classification</th>
<th>Laboratory Classification Criteria</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>COARSE GRAINED SOILS</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>GRAVELS</strong> (More than 50% of coarse fraction of gravel size)</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
| CLEAN GRAVELS (Little or no fines) | Well graded gravels, sandy gravels, with little or no fines | GW | 0-5 | C_U > 4 \(1 < C_C < 3\)  
Dual symbols if 5-12% fines. Dual symbols if above "A" line and \(4 < W_P < 7\) |
| DIRTY GRAVELS (With some fines)  | Poorly graded gravels, sandy gravels, with little or no fines | GP | 0-5 | Not satisfying GW requirements |
| **SANDS** (More than 50% of coarse fraction of sand size) |                |                     |                                    |
| CLEAN SANDS (Little or no fines) | Well graded sands, gravelly sands, with little or no fines | SW | 0-5 | C_U > 6 \(1 < C_C < 3\)  
Dual symbols if above "A" line and \(W_P < 4\) |
| DIRTY SANDS (With some fines)    | Poorly graded sands, gravelly sands, with little or no fines | SP | 0-5 | Not satisfying SW requirements |
| **FINE GRAINED SOILS**           |                |                     |                                    |
| SILTS (Below 'A' line negligible organic content) | W_L<50 | Inorganic silts, silty or clayey fine sands, with slight plasticity | ML | Classification based upon Plasticity Chart |
|                                   | W_L>50 | Inorganic silts of high plasticity | MH |                                    |
| CLAYS (Above 'A' line negligible organic content) | W_L<30 | Inorganic clays, silty clays, sandy clays of low plasticity, lean clays | CL |                                    |
|                                   | 30<W_L<50 | Inorganic clays and silty clays of medium plasticity | CI |                                    |
|                                   | W_L>50 | Inorganic clays of high plasticity, fat clays | CH |                                    |
| ORGANIC SILTS & CLAYS (Below 'A' line) | W_L<50 | Organic silts and organic silty clays of low plasticity | OL |                                    |
|                                   | W_L>50 | Organic clays of high plasticity | OH |                                    |
| **HIGHLY ORGANIC SOILS**         | Peat and other highly organic soils | Pt | Von Post Classification Limit | Strong colour or odour, and often fibrous texture |

### Symbols:
- Asphalt
- Glacial Till
- Bedrock (Igneous)
- Concrete
- Clay Shale
- Bedrock (Limestone)
- Fill
- Bedrock (Undifferentiated)

DYREGROV ROBINSON INC.
CONSULTING GEOTECHNICAL ENGINEERS
**TERMS and SYMBOLS**

Laboratory and field tests are identified as follows:

**Unconfined Comp.**.: undrained shear strength (kPa or psf) derived from unconfined compression testing.

**Torvane**: undrained shear strength (kPa or psf) measured using a Torvane

**Pocket Pen.**: undrained shear strength (kPa or psf) measured using a pocket penetrometer.

**Unit Weight**   bulk unit weight of soil or rock (kN/m³ or pcf).

**SPT – N** Standard Penetration Test: The number of blows (N) required to drive a 51 mm O.D. split barrel sampler 300 mm into the soil using a 63.5 kg hammer with a free fall drop height of 760 mm.

**DCPT** Dynamic Cone Penetration Test. The number of blows (N) required to drive a 50 mm diameter cone 300 mm into the soil using a 63.5 kg hammer with a free fall drop height of 760 mm.

**M/C** insitu soil moisture content in percent

**PL** Plastic limit, moisture content in percent

**LL** Liquid limit, moisture content in percent

The undrained shear strength (Su) of cohesive soil is related to its consistency as follows:

<table>
<thead>
<tr>
<th>Su (kPa)</th>
<th>Su (psf)</th>
<th>CONSISTENCY</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;12</td>
<td>250</td>
<td>very soft</td>
</tr>
<tr>
<td>12 – 25</td>
<td>250 – 525</td>
<td>soft</td>
</tr>
<tr>
<td>25 – 50</td>
<td>525 – 1050</td>
<td>firm</td>
</tr>
<tr>
<td>50 – 100</td>
<td>1050 – 2100</td>
<td>stiff</td>
</tr>
<tr>
<td>100 – 200</td>
<td>2100 – 4200</td>
<td>very stiff</td>
</tr>
<tr>
<td>200</td>
<td>4200</td>
<td>hard</td>
</tr>
</tbody>
</table>

The SPT - N of non-cohesive soil is related to compactness condition as follows:

<table>
<thead>
<tr>
<th>N – Blows / 300 mm</th>
<th>COMPACTNESS</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 - 4</td>
<td>very loose</td>
</tr>
<tr>
<td>4 - 10</td>
<td>loose</td>
</tr>
<tr>
<td>10 - 30</td>
<td>compact</td>
</tr>
<tr>
<td>30 - 50</td>
<td>dense</td>
</tr>
<tr>
<td>50 +</td>
<td>very dense</td>
</tr>
</tbody>
</table>

**References:**

ASTM D2487 – Classification of Soils For Engineering Purposes (Unified Soil Classification System)

<table>
<thead>
<tr>
<th>DEPTH (m)</th>
<th>ELEVATION (m)</th>
<th>SOIL SYMBOL</th>
<th>SOIL DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.00</td>
<td>235.50</td>
<td></td>
<td></td>
</tr>
<tr>
<td>0.50</td>
<td>233.00</td>
<td>GG</td>
<td>SAND AND GRAVEL (FR)</td>
</tr>
<tr>
<td>0.50</td>
<td>233.00</td>
<td>GG</td>
<td>- brown, moist, fine to coarse graded, well graded</td>
</tr>
<tr>
<td>0.50</td>
<td>233.00</td>
<td>GG</td>
<td>- clay, silty</td>
</tr>
<tr>
<td>1.00</td>
<td>232.50</td>
<td>GG</td>
<td>- mottled brown and grey</td>
</tr>
<tr>
<td>1.00</td>
<td>232.50</td>
<td>GG</td>
<td>- stiff, moist, high plasticity</td>
</tr>
<tr>
<td>1.00</td>
<td>232.50</td>
<td>GG</td>
<td>- trace silt inclusions</td>
</tr>
<tr>
<td>1.50</td>
<td>232.00</td>
<td>GG</td>
<td>- firm below 2.0 m</td>
</tr>
<tr>
<td>2.00</td>
<td>231.50</td>
<td>GG</td>
<td></td>
</tr>
<tr>
<td>2.50</td>
<td>231.00</td>
<td>GG</td>
<td></td>
</tr>
<tr>
<td>3.00</td>
<td>230.50</td>
<td>GG</td>
<td></td>
</tr>
<tr>
<td>3.50</td>
<td>230.00</td>
<td>GG</td>
<td></td>
</tr>
<tr>
<td>4.00</td>
<td>229.50</td>
<td>GG</td>
<td></td>
</tr>
<tr>
<td>4.50</td>
<td>229.00</td>
<td>GG</td>
<td></td>
</tr>
<tr>
<td>5.00</td>
<td>228.50</td>
<td>GG</td>
<td></td>
</tr>
<tr>
<td>5.50</td>
<td>228.00</td>
<td>GG</td>
<td></td>
</tr>
<tr>
<td>6.00</td>
<td>227.50</td>
<td>GG</td>
<td></td>
</tr>
<tr>
<td>6.50</td>
<td>227.00</td>
<td>GG</td>
<td></td>
</tr>
<tr>
<td>7.00</td>
<td>226.50</td>
<td>GG</td>
<td></td>
</tr>
<tr>
<td>7.50</td>
<td>226.00</td>
<td>GG</td>
<td></td>
</tr>
<tr>
<td>8.00</td>
<td>225.50</td>
<td>GG</td>
<td></td>
</tr>
</tbody>
</table>

**UNDRAINED SHEAR STRENGTH**

<table>
<thead>
<tr>
<th>QU</th>
<th>UNCONFINED COMPRESSION</th>
</tr>
</thead>
<tbody>
<tr>
<td>TV</td>
<td>TORVANE</td>
</tr>
<tr>
<td>PP</td>
<td>POCKET PEN</td>
</tr>
<tr>
<td>Y</td>
<td>UNIT WEIGHT</td>
</tr>
</tbody>
</table>

**Test Results**

- TV = 88 kPa
- PP = 98 kPa
- TV = 86 kPa
- PP = 71 kPa
- TV = 35 kPa

**Notes:**
1. Squeezing below 6.1 m in clay layer.
2. Test hole backfilled with auger cuttings, capped with concrete core and cold patch.
<table>
<thead>
<tr>
<th>DEPTH (m)</th>
<th>ELEVATION (m)</th>
<th>SOIL SYMBOL</th>
<th>SOIL DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.00</td>
<td>231.85</td>
<td></td>
<td>ASPHALT</td>
</tr>
<tr>
<td>0.50</td>
<td>231.35</td>
<td>0.051 - 0.23 m</td>
<td>CONCRETE</td>
</tr>
<tr>
<td>1.00</td>
<td>230.85</td>
<td>0.23 - 1.5 m</td>
<td>CLAY (Fill) - silty, trace sand, trace gravel</td>
</tr>
<tr>
<td>1.50</td>
<td>230.35</td>
<td>1.5 - 4.6 m</td>
<td>CLAY (Alluvial) - stratified with silt and sand</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>- black</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>- stiff, moist, high plasticity</td>
</tr>
<tr>
<td>2.00</td>
<td>229.85</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2.50</td>
<td>229.35</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3.00</td>
<td>228.85</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3.50</td>
<td>228.35</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4.00</td>
<td>227.85</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4.50</td>
<td>227.35</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5.00</td>
<td>226.85</td>
<td>4.6 - 7.6 m</td>
<td>SILT (Till) - some sand, trace gravel</td>
</tr>
<tr>
<td>5.50</td>
<td>226.35</td>
<td></td>
<td>- tan</td>
</tr>
<tr>
<td>6.00</td>
<td>225.85</td>
<td></td>
<td>- dense below 6.0 m</td>
</tr>
<tr>
<td>6.50</td>
<td>225.35</td>
<td></td>
<td>- light grey below 6.7 m</td>
</tr>
<tr>
<td>7.00</td>
<td>224.85</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7.50</td>
<td>224.35</td>
<td></td>
<td></td>
</tr>
<tr>
<td>8.00</td>
<td>223.85</td>
<td>7.6 m</td>
<td>END OF TEST HOLE AT 7.6 m IN SILT TILL</td>
</tr>
</tbody>
</table>

Notes:
1. Test hole backfilled with auger cuttings, capped with concrete core and cold patch.

Test Results

- Moisture Content (%)

Graph showing test results with PP values 61 kPa at 0.00, 37 kPa at 5.00.
<table>
<thead>
<tr>
<th>DEPTH (m)</th>
<th>ELEVATION (m)</th>
<th>SOIL SYMBOL</th>
<th>SOIL DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.00</td>
<td>234.84</td>
<td>0 - 0.15 m</td>
<td>CONCRETE</td>
</tr>
<tr>
<td>0.50</td>
<td>234.34</td>
<td>0.15 - 0.36 m</td>
<td>SAND AND GRAVEL (Fill)</td>
</tr>
<tr>
<td>1.00</td>
<td>233.84</td>
<td>0.36 - 0.9 m</td>
<td>CLAY (Fill) - silty, trace sand, trace gravel</td>
</tr>
<tr>
<td>0.9 - 5.0 m</td>
<td></td>
<td></td>
<td>- grey, stiff, moist, high plasticity</td>
</tr>
<tr>
<td>1.50</td>
<td>233.34</td>
<td>0.9 - 5.0 m</td>
<td>CLAY - silty</td>
</tr>
<tr>
<td>2.00</td>
<td>232.84</td>
<td></td>
<td>- mottled brown and grey</td>
</tr>
<tr>
<td>2.50</td>
<td>232.34</td>
<td></td>
<td>- stiff, moist, high plasticity</td>
</tr>
<tr>
<td>3.00</td>
<td>231.84</td>
<td></td>
<td>- trace silt inclusions</td>
</tr>
<tr>
<td>3.50</td>
<td>231.34</td>
<td></td>
<td>- firm below 3.7 m</td>
</tr>
<tr>
<td>4.00</td>
<td>230.84</td>
<td></td>
<td>- trace till inclusions, trace sand, trace gravel</td>
</tr>
<tr>
<td>4.50</td>
<td>230.34</td>
<td></td>
<td>below 4.0 m</td>
</tr>
<tr>
<td>5.00</td>
<td>229.84</td>
<td></td>
<td>TV = 26 kPa</td>
</tr>
<tr>
<td>5.50</td>
<td>229.34</td>
<td>5.0 m</td>
<td>END OF TEST HOLE AT 5.0 m IN CLAY</td>
</tr>
</tbody>
</table>

Notes:
1. Test hole backfilled with auger cuttings, capped with concrete core and cold patch.
PROJECT: Ferry Road & Riverbend CSR Works  
CLIENT: Tetra Tech WEI

LOCATION: Bourkevale Drive - UTM 5526577 N, 628391 E  
CONTRACTOR: Paddock Drilling Ltd.

ELEVATION (m): 234.602

TESTHOLE NO: 15-109
PROJECT NO: 143691

SAND and GRAVEL (Base)
- black
- stiff, moist
- high plasticity, trace silt inclusions
- mottled brown and grey below 2.1 m

CLAY - silty, trace organics
- grey and wet below 6.4 m

SILT (Till) - trace sand, trace gravel
- grey, compact, moist

END OF TEST HOLE AT 7.6 m IN SILT (TILL)
Notes:
1. Frost to 1.5 m.
2. No sloughing or seepage observed.
3. Test hole backfilled with auger cuttings and bentonite chips.
4. Cold patch placed over core.

CONTACT:  
Dyregrov Robinson Inc.
Consulting Geotechnical Engineers

LOGGED BY: CR  
REVIEWED BY: GR
COMPLETION DEPTH: 7.62 m
COMPLETION DATE: 17/2/15
PROJECT ENGINEER: Gil Robinson
CONCRETE - 150 mm thick

CLAY - silty, trace organics
- black
- stiff, moist
- high plasticity, trace silt inclusions
- mottled brown and grey below 1.5 m

- trace till inclusions below 6.7 m

END OF TEST HOLE AT 7.6 m IN CLAY

Notes:
1. Frost to 1.5 m.
2. No sloughing or seepage observed.
3. Test hole backfilled with auger cuttings and bentonite chips.
4. Cold patch placed over core.
CONCRETE - 150 mm thick

SAND (BASE)

CLAY - silty, trace organics
- black
- stiff, moist
- high plasticity, trace silt inclusions
- mottled brown and grey below 0.6 m

SILT (Till) - trace sand, trace gravel, grey, dry, compact

END OF TEST HOLE AT 7.6 m IN SILT (TILL)

Notes:
1. Frost to 1.5 m.
2. No sloughing or seepage observed.
3. Test hole backfilled with auger cuttings and bentonite chips.
4. Cold patch placed over core.
CONCRETE - 150 mm thick
SAND and GRAVEL (BASE)
CLAY - silty, trace organics
- black
- stiff, moist
- high plasticity, trace silt inclusions
- mottled brown and grey below 1.5 m

- grey and wet below 4.5 m
- trace sand, trace gravel

END OF TEST HOLE AT 7.6 m IN CLAY

Notes:
1. Frost to 1.5 m.
2. No sloughing or seepage observed.
3. Test hole backfilled with auger cuttings and bentonite chips.
4. Cold patch placed over core.
CONCRETE - 150 mm thick
SAND and GRAVEL (BASE)
CLAY - silty, trace organics
- black
- stiff, moist
- high plasticity, trace silt inclusions
- mottled brown and grey below 3 m
- trace till inclusions below 7.3 m

END OF TEST HOLE AT 7.6 m IN CLAY
Notes:
1. Frost to 1.5 m.
2. No sloughing or seepage observed.
3. Test hole backfilled with auger cuttings and bentonite chips.
4. Cold patch placed over core.
CONCRETE - 150 mm

CLAY - silty, trace organics
- black
- stiff, moist
- high plasticity, trace silt inclusions

- mottled brown and grey below 3 m

END OF TEST HOLE AT 6.1 m IN CLAY

Notes:
1. Frost to 1.5 m.
2. No sloughing or seepage observed.
3. Test hole backfilled with auger cuttings and bentonite chips.
4. Cold patch placed over core.
CONCRETE - 150 mm thick

CLAY - silty, trace organics
- black
- stiff, moist
- high plasticity, trace silt inclusions

- mottled brown and grey below 1.5 m

- trace till inclusions below 7.3 m

END OF TEST HOLE AT 7.6 m IN CLAY

Notes:
1. Frost to 1.5 m.
2. No sloughing or seepage observed.
3. Test hole backfilled with auger cuttings and bentonite chips.
4. Cold patch placed over core.
CLAY - silty, trace organics - black - stiff, moist - high plasticity, trace silt inclusions - mottled brown and grey below 1.1 m

SILT (Till) - trace clay, trace sand, trace gravel - brown - loose, moist - grey and moist to wet below 5.8 m

END OF TEST HOLE AT 7.6 m IN SILT (TILL)

Notes:
1. No sloughing or seepage observed.
2. Test hole backfilled with auger cuttings and bentonite chips.
SOIL DESCRIPTION

- CONCRETE - 175 mm thick
- CLAY - silty, trace organics
  - black
  - stiff, moist
  - high plasticity, trace silt inclusions
  - mottled brown and grey below 1.5 m
- trace till inclusions below 6.1 m
- SILT (Till) - trace sand, trace gravel
  - grey
  - loose, wet

END OF TEST HOLE AT 7.6 m IN SILT (TILL)

Notes:
1. Frost to 1.5 m.
2. No sloughing or seepage observed.
3. Test hole backfilled with auger cuttings and bentonite chips.
4. Cold patch placed over core.
**PROJECT:** Ferry Road & Riverbend CSR Works  
**CLIENT:** Tetra Tech WEI  
**LOCATION:** Cavell Drive - UTM 5526404 N, 628471 E  
**CONTRACTOR:** Paddock Drilling Ltd.  
**METHOD:** BRAT 22R - 125 mm SSA diameter auger  
**ELEVATION (m):** 234.399  
**TESTHOLE NO:** 15-118  
**PROJECT NO:** 143691

**SOIL DESCRIPTION**

- **CONCRETE - 150 mm thick**
  - CLAY - silty, trace organics
    - black
    - stiff, moist
    - high plasticity, trace silt inclusions
  - mottled brown and grey below 1.5 m

- **SILT (Till) - trace sand, trace gravel**
  - grey
  - compact, moist

**END OF TEST HOLE AT 7.6 m IN SILT (TILL)**

Notes:
1. Frost to 1.5 m.
2. No sloughing or seepage observed.
3. Test hole backfilled with auger cuttings and bentonite chips.
4. Cold patch placed over core.

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Consulting Geotechnical Engineers
CONCRETE (165 mm thick)
- brown, moist

CLAY - silty, trace organics
- black
- stiff, moist
- high plasticity, trace silt inclusions
- mottled brown and grey below 0.9 m

- soft below 4.9 m
- grey and wet below 5.2 m

END OF TEST HOLE AT 6.1 m IN CLAY
Notes:
1. No seepage or sloughing observed.
2. Test hole backfilled with auger cuttings and bentonite chips.
CONCRETE - 150 mm thick

SAND and GRAVEL (Base)

CLAY - silty
- mottled brown and grey
- stiff, moist
- high plasticity, trace silt inclusions

SILT (Till) - trace sand, trace gravel
- grey
- loose, moist to wet

END OF TEST HOLE AT 7.6 m IN SILT (TILL)

Notes:
1. Frost to 1.5 m.
2. No sloughing or seepage observed.
3. Test hole backfilled with auger cuttings and bentonite chips.
4. Cold patch placed over core.
CONCRETE - 175 mm thick

CLAY - silty, trace organics
- black
- stiff, moist
- high plasticity, trace silt inclusions
- mottled brown and grey below 1 m

- trace till inclusions below 5.4 m

SILT (Till) - trace sand, trace gravel
- grey
- compact, dry to moist

END OF TEST HOLE AT 7.6 m IN SILT (TILL)

Notes:
1. Frost to 1.5 m.
2. No sloughing or seepage observed.
3. Test hole backfilled with auger cuttings and bentonite chips.
4. Cold patch placed over core.
**SOIL DESCRIPTION**

- **CONCRETE** - 175 mm thick
- **CLAY** - silty, trace organics
  - black
  - stiff, moist
  - high plasticity, trace silt inclusions
  - mottled brown and grey below 1.2 m
- **SILT (Till)** - trace sand, trace gravel
  - grey
  - loose, moist to wet

**END OF TEST HOLE AT 7.6 m IN SILT (TILL)**

Notes:
1. Frost to 1.5 m.
2. No sloughing or seepage observed.
3. Test hole backfilled with auger cuttings and bentonite chips.
4. Cold patch placed over core.
SOIL DESCRIPTION

CONCRETE - 150 mm thick
CRUSHED LIMESTONE (20 mm)
CLAY - silty, trace organics
- black
- stiff, moist
- high plasticity, trace silt inclusions
- mottled brown and grey below 1.5 m

SILT (Till) - trace sand, trace gravel
- grey
- loose, wet
- compact and moist below 6.7 m

END OF TEST HOLE AT 7.6 m IN SILT (TILL)

Notes:
1. Frost to 1.5 m.
2. No sloughing or seepage observed.
3. Test hole backfilled with auger cuttings and bentonite chips.
4. Cold patch placed over core.
CONCRETE - 175 mm thick
GRAVEL (BASE)

CLAY - silty, trace organics
- black
- stiff, moist
- high plasticity, trace silt inclusions
- mottled brown and grey below 1.5 m

SILT (Till) - trace sand, trace gravel
- grey
- compact, moist

END OF TEST HOLE AT 7.6 m IN SILT (TILL)

Notes:
1. Frost to 1.5 m.
2. No sloughing or seepage observed.
3. Test hole backfilled with auger cuttings and bentonite chips.
4. Cold patch placed over core.
CONCRETE - 175 mm thick
GRAVEL (BASE)
CLAY - silty, trace organics
- black
- stiff, moist
- high plasticity, trace silt inclusions

- trace sand, trace gravel below 3 m

SILT (Till) - trace sand, trace gravel
- grey
- compact, moist

END OF TEST HOLE AT 7.6 m IN SILT (TILL)
Notes:
1. Frost to 1.5 m.
2. No sloughing or seepage observed.
3. Test hole backfilled with auger cuttings and bentonite chips.
4. Cold patch placed over core.