



LEGEND:

No bedrock detected within 5.0m of ground surface - Low probability of bedrock within 5m of ground surface

Intermittent bedrock detected within 5.0m of ground surface - Moderate probability of bedrock within 5m of ground surface

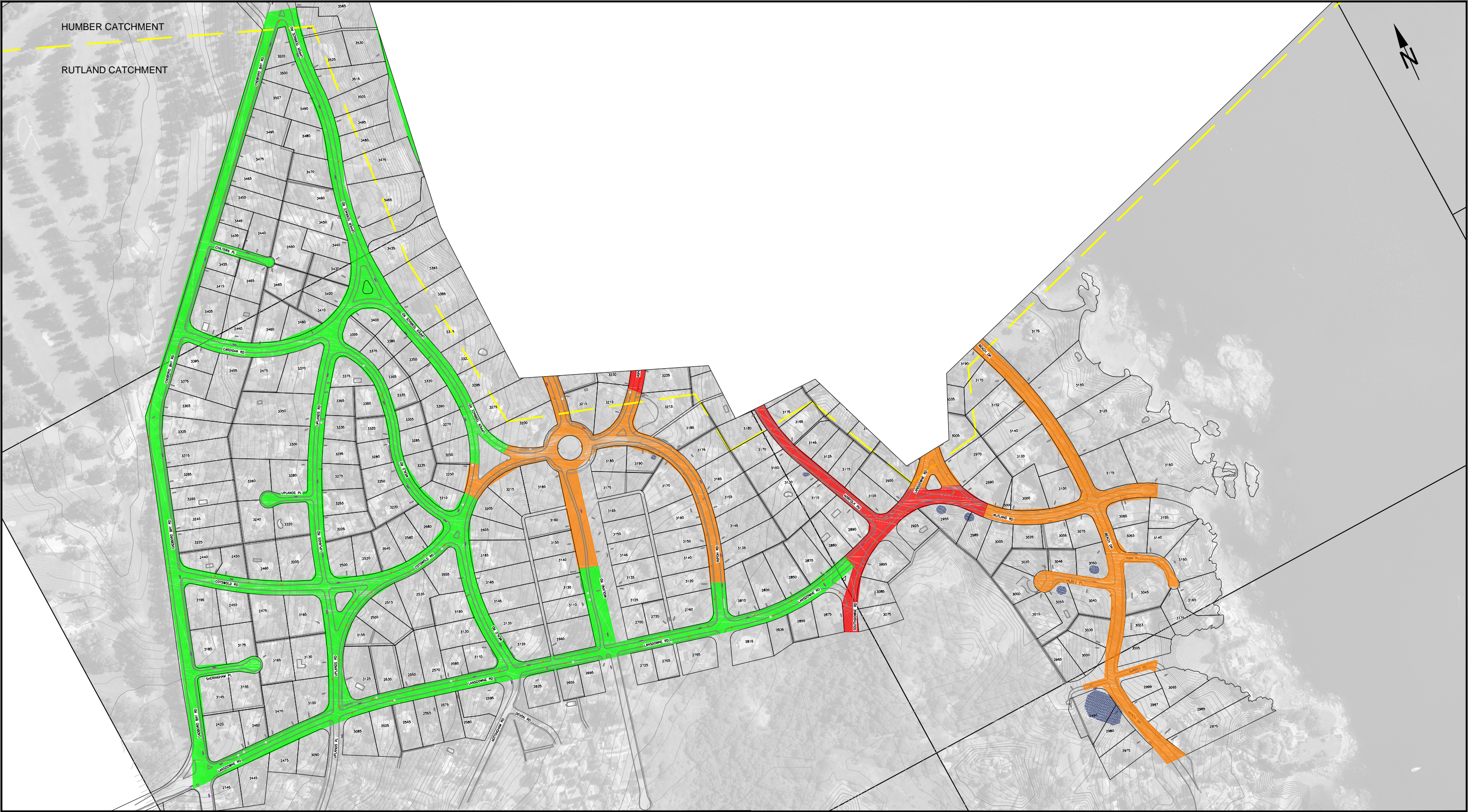
Frequent bedrock detected within 5.0m of ground surface - High probability of bedrock within 5m of ground surface






Bedrock Observed at surface

See section 5.2 for more detailed description of bedrock colour zones

| | | | | | |
|--------|-----------------------------|--------------------|---|-------------------|--|
| | | | PROJECT: Uplands Combined Sewer Separation Project | DATE: AUG 2016 | WSP Canada Inc. Victoria, BC V8Z 6R4 T: 250.475.1000 F: 250.475.2211 E: victoria@levelton.com www.wspgroup.com |
| | | | | DESIGN BY: PS | |
| | | | | DRAWN BY: DP | |
| | | | | CHECKED BY: CM | |
| 1 | FINAL | AUG/15/2016 | CLIENT: The District of Oak Bay | SCALE: 1:5000 | PROJECT No.: 161-08447-00 |
| 0 | ISSUED FOR CLIENT REVIEW | JUL/22/2016 | TITLE: Ground Penetrating Radar Survey Results - Humber Catchment | FIGURE NO.: 2A | |
| REV. : | DESCRIPTION: | DATE : (M/D/YR) | THIS DRAWING IS THE SOLE PROPERTY OF WSP CANADA INC. AND CANNOT BE USED OR DUPLICATED IN ANY WAY WITHOUT THE EXPRESSED WRITTEN CONSENT OF WSP. THE GENERAL CONTRACTOR SHALL VERIFY ALL DIMENSIONS AND REPORT ANY DISCREPANCIES OR OMISSIONS TO WSP. | | |

Base Plan: McElhanney Consulting Services Ltd. - Uplands Combined Sewer Separation Option 2, Project Number 15-326, Dated: October 2015



| | | | | | | | | | | | | | | | | | | | | |
|--|--|--|--------------|--|--|--------------------------|--|--|---|--|--|---|--|--|---|--|--|-------------------|--|--|
| LEGEND: | | | | | | | | | PROJECT: Uplands Combined Sewer Separation Project | | | DATE: AUG 2016 | | |  WSP Canada Inc. Victoria, BC V8Z 6R4 T: 250.475.1000 F: 250.475.2211 E: victoria@levelton.com www.wspgroup.com | | | | | |
|  No bedrock detected within 5.0m of ground surface - Low probability of bedrock within 5m of ground surface | | | | | | | | | CLIENT: The District of Oak Bay | | | DESIGN BY: PS | | | | | | | | |
|  Intermittent bedrock detected within 5.0m of ground surface - Moderate probability of bedrock within 5m of ground surface | | | | | | | | | TITLE: Ground Penetrating Radar Survey Results - Rutland Catchment | | | DRAWN BY: DP | | | | | | | | |
|  Frequent bedrock detected within 5.0m of ground surface - High probability of bedrock within 5m of ground surface | | | | | | | | | | | | CHECKED BY: CM | | | | | | | | |
|  Bedrock Observed at surface | | | | | | | | | | | | SCALE: 1:5000 | | | | | | | | |
| See section 5.2 for more detailed description of bedrock colour zones | | | | | | | | | | | | | | | | | | | | |
| | | | 1 | | | FINAL | | | AUG/15/2016 | | | | | | | | | | | |
| | | | 0 | | | ISSUED FOR CLIENT REVIEW | | | JUL/22/2016 | | | | | | | | | | | |
| REV. : | | | DESCRIPTION: | | | DATE : | | | (M/D/YR) | | | THIS DRAWING IS THE SOLE PROPERTY OF WSP CANADA INC. AND CANNOT BE USED OR DUPLICATED IN ANY WAY WITHOUT THE EXPRESSED WRITTEN CONSENT OF WSP. THE GENERAL CONTRACTOR SHALL VERIFY ALL DIMENSIONS AND REPORT ANY DISCREPANCIES OR OMISSIONS TO WSP. | | | PROJECT No.: 161-08447-00 | | | FIGURE NO.: 2B | | |
| Base Plan: McElhanney Consulting Services Ltd. - Uplands Combined Sewer Separation Option 2, Project Number 15-326, Dated: October 2015 | | | | | | | | | | | | | | | | | | | | |

Appendix B

INVESTIGATION PHOTOGRAPHS



Ground Penetrating Radar Survey along Exeter Road.



Exposed bedrock outcrop adjacent Exeter Road.



Exposed bedrock outcrop adjacent Exeter Road.





Exposed bedrock adjacent Norfolk Road.



Drillwell completing BH16-02 along Cadboro Bay Road.



Segment of auger with sand during BH16-02.



| | | | | |
|---|--------------------|---------------------------|---------------|-----------------|
| PROJECT: Uplands Combined Sewer Separation Project: Phase 1 Geotechnical Investigation | | | | |
| TITLE: Investigation Photographs | | | | |
| CLIENT: District of Oak Bay | | | | |
| PAGE No.: 2 | DATE: June 2016 | FILE NO.: 161-08447-00 | SCALE: NTS | DRAWN BY: PS |
| | | | REV NO.: | |



Segment of auger with sand during BH16-01.



Installation of standpipe in BH16-04.



Western Grater rock probing along Norfolk Road.





Western Grader rock probing along Midland Road.



Completed asphalt borehole patch at BH16-07.



Reading groundwater level in BH16-01.



| | | | | |
|---|---------------------------|---------------|-----------------|----------|
| PROJECT: Uplands Combined Sewer Separation Project: Phase 1 Geotechnical Investigation | | | | |
| TITLE: Investigation Photographs | | | | |
| CLIENT: District of Oak Bay | | | | |
| DATE: June 2016 | FILE NO.: 161-08447-00 | SCALE: NTS | DRAWN BY: PS | REV NO.: |

Appendix C

BOREHOLE LOGS



WSP Canada Inc.
760 Enterprise Crescent
Victoria, B.C. V8Z 6R4
Tel: +1 250-475-1000
Fax: +1 250-475-2211
www.wspgroup.com

Uplands Combined Sewer Separation Project
The District of Oak Bay

TH16-1

Pg 1 of 1

Project No: 161-08447-00

| Depth (m) (ft) | Description | C | N | Type/ Sample # | Water Level | 10 | 20 | 30 | 40 | 50 | 60 | 70 | 80 | 90 |
|-------------------|--|---|---|-------------------|----------------|----|----|----|----|----|----|----|------------|----|
| 0 | TOPSOIL | | | | | | | | | | | | | |
| 2 | SAND Brown, fine to medium grained, some silt, dry | | | G | | ● | | | | | | | | |
| 4 | | | | | | | | | | | | | | |
| 6 | CLAY Hard, brown/grey, silty, some sand and trace gravel, moist, interpreted to be glacial till | | | G | | | | | | | | | | |
| 8 | | | | | | | | | | | | | X = 225kPa | |
| 10 | | | | | | | | | | | | | | |
| 12 | SAND Grey, medium grained, trace silt, dry to moist | | | G | | ● | | | | | | | | |
| 14 | | | | | | | | | | | | | | |
| 16 | End of hole at 4.6m | | | | | | | | | | | | | |
| 18 | | | | | | | | | | | | | | |
| 20 | | | | | | | | | | | | | | |
| 22 | | | | | | | | | | | | | | |
| 24 | | | | | | | | | | | | | | |
| 26 | | | | | | | | | | | | | | |
| 28 | | | | | | | | | | | | | | |
| 30 | | | | | | | | | | | | | | |
| 32 | | | | | | | | | | | | | | |

C: Condition of Sample

Good

Disturbed

No Recovery

Type: Type of Sampler

SPT : 2 in. standard

ST : Shelby

G : Grab

CORE

N: Number of Blows

WH : Weight of Hammer

WR : Weight of Rod

Standard Penetration Test : ASTM D1586

Hammer Type:

Plastic Limit (%) Liquid Limit (%)

Moisture Content (%)

Ground Water Level

Shear strength in kPa (Torvane)

Pocket Penetrometer

(compressive strength in kPa)

Shear strength in kPa

(Unconfined)

Shear strength in kPa (Field vane)

Remolded strength in kPa

Percent Passing # 200 sieve

Drill Method:

Solid Stem Auger

Date Drilled: 20/06/2016

Logged by: PS

Checked by: TAM

SOIL CLASSIFICATION IN ACCORDANCE WITH THE CANADIAN
FOUNDATION ENGINEERING MANUAL 4TH EDITION 2006.

THIS LOG IS FOR GEOTECHNICAL PURPOSES ONLY
THIS LOG IS THE SOLE PROPERTY OF WSP CANADA INC.
AND CANNOT BE USED OR DUPLICATED IN
ANY WAY WITHOUT EXPRESS WRITTEN PERMISSION.



WSP Canada Inc.
760 Enterprise Crescent
Victoria, B.C. V8Z 6R4
Tel: +1 250-475-1000
Fax: +1 250-475-2211
www.wspgroup.com

Uplands Combined Sewer Separation Project
The District of Oak Bay

TH16-10

Pg 1 of 1

Project No: 161-08447-00

| Depth (m) (ft) | Description | Piezo 1 | C | N | Type/ Sample # | Water Level | 10 | 20 | 30 | 40 | 50 | 60 | 70 | 80 | 90 |
|-------------------|---|---------|---|---|-------------------|----------------|----|----|----|----|----|----|----|----|----|
| 2 | SAND Brown, medium to coarse grained, some gravel, dry to moist | | | | | | | | | | | | | | |
| 4 | | | | | | | | | | | | | | | |
| 6 | | | | | | | | | | | | | | | |
| 8 | CLAY Hard, brown, sandy, trace gravel, moist. Interpreted to be glacial till | | | | G | | | | | | | | | | |
| 10 | | | | | | | | | | | | | | | |
| 12 | SAND Brown, medium grained, moist | | | | | | | | | | | | | | |
| 14 | | | | | | | | | | | | | | | |
| 16 | | | | | | | | | | | | | | | |
| 18 | | | | | | | | | | | | | | | |
| 20 | | | | | G | | | | | | | | | | |
| 22 | | | | | | | | | | | | | | | |
| 24 | | | | | | | | | | | | | | | |
| 26 | | | | | | | | | | | | | | | |
| 28 | | | | | | | | | | | | | | | |
| 30 | | | | | | | | | | | | | | | |
| 32 | | | | | | | | | | | | | | | |

| | | | | |
|--|---|--|---|--|
| C: Condition of Sample Good <input type="checkbox"/> Disturbed <input type="checkbox"/> No Recovery <input type="checkbox"/> | Type: Type of Sampler SPT : 2 in. standard ST : Shelby G : Grab CORE | N: Number of Blows WH : Weight of Hammer WR : Weight of Rod Standard Penetration Test : ASTM D1586 Hammer Type: | Plastic Limit (%) Liquid Limit (%) Moisture Content (%) ▼ Ground Water Level (X) Shear strength in kPa (Torvane) PP Pocket Penetrometer (compressive strength in kPa) X Shear strength in kPa (Unconfined) ⊗ Shear strength in kPa (Field vane) ⊠ Remolded strength in kPa ■ Percent Passing # 200 sieve | Bentonite/Grout Plug <input type="checkbox"/> Solid Pipe <input type="checkbox"/> Cuttings <input type="checkbox"/> Slotted Pipe <input type="checkbox"/> Sand/Pea-Gravel <input type="checkbox"/> |
| SOIL CLASSIFICATION IN ACCORDANCE WITH THE CANADIAN FOUNDATION ENGINEERING MANUAL 4TH EDITION 2006. | | | DYNAMIC CONE PENETRATION TEST | |
| THIS LOG IS FOR GEOTECHNICAL PURPOSES ONLY THIS LOG IS THE SOLE PROPERTY OF WSP CANADA INC. AND CANNOT BE USED OR DUPLICATED IN ANY WAY WITHOUT EXPRESS WRITTEN PERMISSION. | | | Drill Method: Solid Stem Auger Date Drilled: 20/06/2016 Logged by: PS Checked by: TAM | |



WSP Canada Inc.
760 Enterprise Crescent
Victoria, B.C. V8Z 6R4
Tel: +1 250-475-1000
Fax: +1 250-475-2211
www.wspgroup.com

Uplands Combined Sewer Separation Project The District of Oak Bay

TH16-11

Pg 1 of 1
Project No: 161-08447-00

| Depth (m) (ft) | Description | Well 1 | C | N | Type/ Sample # | Water Level | 10 | 20 | 30 | 40 | 50 | 60 | 70 | 80 | 90 |
|-------------------|--|--------|---|---|-------------------|----------------|----|----|----|----|----|----|----|----|----|
| 2 | SAND Brown, fine grained, some silt, trace gravel, dry | | | | G | | | | | | | | | | |
| 4 | | | | | | | | | | | | | | | |
| 6 | | | | | | | | | | | | | | | |
| 8 | SAND Grey/brown, medium grained, trace gravel, moist | | | | G | | | | | | | | | | |
| 10 | Turning to wet, coarse sand at 3.0m | | | | | | | | | | | | | | |
| 12 | | | | | | | | | | | | | | | |
| 14 | Turning to brown, medium to coarse grained wet sand at 3.9m | | | | | | | | | | | | | | |
| 16 | | | | | | | | | | | | | | | |
| 18 | | | | | G | | | | | | | | | | |
| 20 | End of hole at 6.1m | | | | | | | | | | | | | | |
| 22 | | | | | | | | | | | | | | | |
| 24 | | | | | | | | | | | | | | | |
| 26 | | | | | | | | | | | | | | | |
| 28 | | | | | | | | | | | | | | | |
| 30 | | | | | | | | | | | | | | | |
| 32 | | | | | | | | | | | | | | | |

C: Condition of Sample

Good

Disturbed

No Recovery

Type: Type of Sampler

SPT : 2 in. standard

ST : Shelby

G : Grab

CORE

N: Number of Blows

WH : Weight of Hammer

WR : Weight of Rod

Standard Penetration Test : ASTM D1586

Hammer Type:

DYNAMIC CONE PENETRATION TEST

Plastic Limit (%) Liquid Limit (%)

Moisture Content (%)

Ground Water Level

Shear strength in kPa (Torvane)

Pocket Penetrometer

(compressive strength in kPa)

Shear strength in kPa

(Unconfined)

Shear strength in kPa (Field vane)

Remolded strength in kPa

Percent Passing # 200 sieve

Bentonite/Grout Plug

Solid Pipe

Cuttings

Slotted Pipe

Sand/Pea-Gravel

Drill Method:

Solid Stem Auger

Date Drilled: 20/06/2016

Logged by: PS

Checked by: TAM

SOIL CLASSIFICATION IN ACCORDANCE WITH THE CANADIAN
FOUNDATION ENGINEERING MANUAL 4TH EDITION 2006.

THIS LOG IS FOR GEOTECHNICAL PURPOSES ONLY
THIS LOG IS THE SOLE PROPERTY OF WSP CANADA INC.
AND CANNOT BE USED OR DUPLICATED IN
ANY WAY WITHOUT EXPRESS WRITTEN PERMISSION.



WSP Canada Inc.
760 Enterprise Crescent
Victoria, B.C. V8Z 6R4
Tel: +1 250-475-1000
Fax: +1 250-475-2211
www.wspgroup.com

Uplands Combined Sewer Separation Project
The District of Oak Bay

TH16-2

Pg 1 of 1

Project No: 161-08447-00

| Depth (m) (ft) | Description | C | N | Type/ Sample # | Water Level | 10 | 20 | 30 | 40 | 50 | 60 | 70 | 80 | 90 |
|-------------------|---|---|---|-------------------|----------------|----|----|----|----|----|----|----|----|----|
| 2 | ASPHALT SAND Grey/brown, fine to medium grained, silty, trace gravel, dry | | | G | | | | | | | | | | |
| 4 | | | | | | | | | | | | | | |
| 6 | | | | | | | | | | | | | | |
| 8 | SAND Grey, medium grained, trace silt, dry to moist | | | | | | | | | | | | | |
| 10 | | | | | | | | | | | | | | |
| 12 | | | | | | | | | | | | | | |
| 14 | | | | G | | | | | | | | | | |
| 16 | | | | | | | | | | | | | | |
| 18 | | | | | | | | | | | | | | |
| 20 | | | | | | | | | | | | | | |
| 22 | End of hole at 6.1m | | | | | | | | | | | | | |
| 24 | | | | | | | | | | | | | | |
| 26 | | | | | | | | | | | | | | |
| 28 | | | | | | | | | | | | | | |
| 30 | | | | | | | | | | | | | | |
| 32 | | | | | | | | | | | | | | |

C: Condition of Sample

Good ☒

Disturbed ☐

No Recovery ☐

Type: Type of Sampler

SPT : 2 in. standard

ST : Shelby

G : Grab

CORE

N: Number of Blows

WH : Weight of Hammer

WR : Weight of Rod

Standard Penetration Test : ASTM D1586

Hammer Type:

SOIL CLASSIFICATION IN ACCORDANCE WITH THE CANADIAN
FOUNDATION ENGINEERING MANUAL 4TH EDITION 2006.

DYNAMIC CONE PENETRATION TEST

THIS LOG IS FOR GEOTECHNICAL PURPOSES ONLY
THIS LOG IS THE SOLE PROPERTY OF WSP CANADA INC.
AND CANNOT BE USED OR DUPLICATED IN
ANY WAY WITHOUT EXPRESS WRITTEN PERMISSION.

Plastic Limit (%) Liquid Limit (%)

Moisture Content (%)

Ground Water Level

Shear strength in kPa (Torvane)

Pocket Penetrometer

(compressive strength in kPa)

Shear strength in kPa

(Unconfined)

Shear strength in kPa (Field vane)

Remolded strength in kPa

Percent Passing # 200 sieve

Drill Method:

Solid Stem Auger

Date Drilled: 20/06/2016

Logged by: PS

Checked by: TAM



WSP Canada Inc.
760 Enterprise Crescent
Victoria, B.C. V8Z 6R4
Tel: +1 250-475-1000
Fax: +1 250-475-2211
www.wspgroup.com

Uplands Combined Sewer Separation Project
The District of Oak Bay

TH16-3

Pg 1 of 1

Project No: 161-08447-00

| Depth (m) (ft) | Description | C | N | Type/ Sample # | Water Level | 10 | 20 | 30 | 40 | 50 | 60 | 70 | 80 | 90 |
|-------------------|---|---|---|-------------------|----------------|----|----|----|----|----|----|----|----|----|
| | ASPHALT | | | | | | | | | | | | | |
| | Borehole terminated on concrete surface | | | | | | | | | | | | | |
| 2 | | | | | | | | | | | | | | |
| 4 | | | | | | | | | | | | | | |
| 6 | | | | | | | | | | | | | | |
| 8 | | | | | | | | | | | | | | |
| 10 | | | | | | | | | | | | | | |
| 12 | | | | | | | | | | | | | | |
| 14 | | | | | | | | | | | | | | |
| 16 | | | | | | | | | | | | | | |
| 18 | | | | | | | | | | | | | | |
| 20 | | | | | | | | | | | | | | |
| 22 | | | | | | | | | | | | | | |
| 24 | | | | | | | | | | | | | | |
| 26 | | | | | | | | | | | | | | |
| 28 | | | | | | | | | | | | | | |
| 30 | | | | | | | | | | | | | | |
| 32 | | | | | | | | | | | | | | |

C: Condition of Sample

Good ☒
Disturbed ☐
No Recovery ☐

Type: Type of Sampler

SPT : 2 in. standard
ST : Shelby
G : Grab
CORE

N: Number of Blows

WH : Weight of Hammer
WR : Weight of Rod
Standard Penetration Test : ASTM D1586
Hammer Type:

DYNAMIC CONE PENETRATION TEST

Plastic Limit (%) Liquid Limit (%)

Moisture Content (%)
Ground Water Level
Shear strength in kPa (Torvane)
Pocket Penetrometer
(compressive strength in kPa)
Shear strength in kPa
(Unconfined)
Shear strength in kPa (Field vane)
Remolded strength in kPa
Percent Passing # 200 sieve

Drill Method:

Solid Stem Auger

Date Drilled: 20/06/2016

Logged by: PS

Checked by: TAM

SOIL CLASSIFICATION IN ACCORDANCE WITH THE CANADIAN
FOUNDATION ENGINEERING MANUAL 4TH EDITION 2006.

THIS LOG IS FOR GEOTECHNICAL PURPOSES ONLY
THIS LOG IS THE SOLE PROPERTY OF WSP CANADA INC.
AND CANNOT BE USED OR DUPLICATED IN
ANY WAY WITHOUT EXPRESS WRITTEN PERMISSION.



WSP Canada Inc.
760 Enterprise Crescent
Victoria, B.C. V8Z 6R4
Tel: +1 250-475-1000
Fax: +1 250-475-2211
www.wspgroup.com

Uplands Combined Sewer Separation Project
The District of Oak Bay

TH16-4

Pg 1 of 1

Project No: 161-08447-00

| Depth (m) (ft) | Description | Piezo 1 | C | N | Type/ Sample # | Water Level | 10 | 20 | 30 | 40 | 50 | 60 | 70 | 80 | 90 |
|-------------------|--|---------|---|---|-------------------|----------------|----|----|----|----|----|----|----|----|----|
| 2 | TOPSOIL | | | | | | | | | | | | | | |
| 2 | SAND Brown/grey, medium grained, trace silt, moist | | | | | | | | | | | | | | |
| 4 | | | | | | | | | | | | | | | |
| 6 | | | | | | | | | | | | | | | |
| 8 | | | | | G | ● | | | | | | | | | |
| 10 | | | | | | | | | | | | | | | |
| 12 | | | | | | | | | | | | | | | |
| 14 | | | | | | | | | | | | | | | |
| 16 | Sand turning coarse from 4.8m to 6.1m | | | | | | | | | | | | | | |
| 18 | | | | | | | | | | | | | | | |
| 20 | | | | | | | | | | | | | | | |
| 22 | End of hole at 6.7m | | | | | | | | | | | | | | |
| 24 | | | | | | | | | | | | | | | |
| 26 | | | | | | | | | | | | | | | |
| 28 | | | | | | | | | | | | | | | |
| 30 | | | | | | | | | | | | | | | |
| 32 | | | | | | | | | | | | | | | |

C: Condition of Sample

Good
Disturbed
No Recovery

Type: Type of Sampler

SPT : 2 in. standard
ST : Shelby
G : Grab
CORE

N: Number of Blows

WH : Weight of Hammer
WR : Weight of Rod
Standard Penetration Test : ASTM D1586
Hammer Type:

Plastic Limit (%) Liquid Limit (%)

Moisture Content (%)

Ground Water Level
Shear strength in kPa (Torvane)

Pocket Penetrometer
(compressive strength in kPa)

Shear strength in kPa

(Unconfined)

Shear strength in kPa (Field vane)

Remolded strength in kPa

Percent Passing # 200 sieve

Bentonite/Grout Plug
Solid Pipe
Cuttings
Slotted Pipe
Sand/Pea-Gravel

Drill Method:

Solid Stem Auger

Date Drilled: 20/06/2016

Logged by: PS

Checked by: TAM

SOIL CLASSIFICATION IN ACCORDANCE WITH THE CANADIAN
FOUNDATION ENGINEERING MANUAL 4TH EDITION 2006.

THIS LOG IS FOR GEOTECHNICAL PURPOSES ONLY
THIS LOG IS THE SOLE PROPERTY OF WSP CANADA INC.
AND CANNOT BE USED OR DUPLICATED IN
ANY WAY WITHOUT EXPRESS WRITTEN PERMISSION.



WSP Canada Inc.
760 Enterprise Crescent
Victoria, B.C. V8Z 6R4
Tel: +1 250-475-1000
Fax: +1 250-475-2211
www.wspgroup.com

Uplands Combined Sewer Separation Project
The District of Oak Bay

TH16-5

Pg 1 of 1

Project No: 161-08447-00

| Depth (m) (ft) | Description | C | N | Type/ Sample # | Water Level | 10 | 20 | 30 | 40 | 50 | 60 | 70 | 80 | 90 |
|-------------------|--|---|---|-------------------|----------------|----|----|----|----|----|----|----|----|----|
| 2 | TOPSOIL | | | | | | | | | | | | | |
| | SAND & GRAVEL Brown, silty, dry | | | | | | | | | | | | | |
| 4 | CLAY Very hard, brown/grey, silty, moist. Transition to very stiff at base. Sandy wet clay at very bottom of hole | | | | | | | | | | | | | |
| 6 | | | | | | | | | | | | | | |
| 8 | | | | G | | | | ● | | | | | | |
| 10 | | | | | | | | | | | | | | |
| 12 | | | | | | | | | | | | | | |
| 14 | BEDROCK Inferred bedrock | | | | | | | | | | | | | |
| 16 | End of hole at 4.3m | | | | | | | | | | | | | |
| 18 | | | | | | | | | | | | | | |
| 20 | | | | | | | | | | | | | | |
| 22 | | | | | | | | | | | | | | |
| 24 | | | | | | | | | | | | | | |
| 26 | | | | | | | | | | | | | | |
| 28 | | | | | | | | | | | | | | |
| 30 | | | | | | | | | | | | | | |
| 32 | | | | | | | | | | | | | | |

C: Condition of Sample

Good ☒
Disturbed ☐
No Recovery ☐

Type: Type of Sampler

SPT : 2 in. standard
ST : Shelby
G : Grab
CORE

N: Number of Blows

WH : Weight of Hammer
WR : Weight of Rod
Standard Penetration Test : ASTM D1586
Hammer Type:

DYNAMIC CONE PENETRATION TEST

Plastic Limit (%) Liquid Limit (%)

Moisture Content (%)

▼ Ground Water Level
⊗ Shear strength in kPa (Torvane)
PP Pocket Penetrometer
(compressive strength in kPa)
X Shear strength in kPa
(Unconfined)
⊗ Shear strength in kPa (Field vane)
⊗ Remolded strength in kPa
■ Percent Passing # 200 sieve

Drill Method:

Solid Stem Auger

Date Drilled: 20/06/2016

Logged by: PS

Checked by: TAM

SOIL CLASSIFICATION IN ACCORDANCE WITH THE CANADIAN
FOUNDATION ENGINEERING MANUAL 4TH EDITION 2006.

THIS LOG IS FOR GEOTECHNICAL PURPOSES ONLY
THIS LOG IS THE SOLE PROPERTY OF WSP CANADA INC.
AND CANNOT BE USED OR DUPLICATED IN
ANY WAY WITHOUT EXPRESS WRITTEN PERMISSION.



WSP Canada Inc.
760 Enterprise Crescent
Victoria, B.C. V8Z 6R4
Tel: +1 250-475-1000
Fax: +1 250-475-2211
www.wspgroup.com

Uplands Combined Sewer Separation Project
The District of Oak Bay

TH16-6

Pg 1 of 1

Project No: 161-08447-00

| Depth (m) (ft) | Description | C | N | Type/ Sample # | Water Level | 10 | 20 | 30 | 40 | 50 | 60 | 70 | 80 | 90 |
|-------------------|--|---|---|-------------------|----------------|----|----|----|----|----|----|----|----|----|
| 0 | ASPHALT | | | | | | | | | | | | | |
| 2 | ORGANIC SOIL Black, silty, moist | | | | | | | | | | | | | |
| | SILT Stiff, green/blue, moist | | | | | | | | | | | | | |
| 4 | CLAY Very stiff, brown, silty, moist | | | | | | | | | | | | | |
| 6 | | | | | | | | | | | | | | |
| 8 | | | | | | | | | | | | | | |
| 10 | | | | | | | | | | | | | | |
| 12 | SAND Fine grained, clayey, wet | | | | | | | | | | | | | |
| 14 | BEDROCK Inferred bedrock | | | | | | | | | | | | | |
| 16 | | | | | | | | | | | | | | |
| 18 | | | | | | | | | | | | | | |
| 20 | | | | | | | | | | | | | | |
| 22 | | | | | | | | | | | | | | |
| 24 | | | | | | | | | | | | | | |
| 26 | | | | | | | | | | | | | | |
| 28 | | | | | | | | | | | | | | |
| 30 | | | | | | | | | | | | | | |
| 32 | | | | | | | | | | | | | | |

C: Condition of Sample

Good

Disturbed

No Recovery

Type: Type of Sampler

SPT : 2 in. standard

ST : Shelby

G : Grab

CORE

N: Number of Blows

WH : Weight of Hammer

WR : Weight of Rod

Standard Penetration Test : ASTM D1586

Hammer Type:

Plastic Limit (%) Liquid Limit (%)

Moisture Content (%)

Ground Water Level

Shear strength in kPa (Torvane)

Pocket Penetrometer

(compressive strength in kPa)

Shear strength in kPa

(Unconfined)

Shear strength in kPa (Field vane)

Remolded strength in kPa

Percent Passing # 200 sieve

Drill Method:

Solid Stem Auger

Date Drilled: 20/06/2016

Logged by: PS

Checked by: TAM

SOIL CLASSIFICATION IN ACCORDANCE WITH THE CANADIAN
FOUNDATION ENGINEERING MANUAL 4TH EDITION 2006.

THIS LOG IS FOR GEOTECHNICAL PURPOSES ONLY
THIS LOG IS THE SOLE PROPERTY OF WSP CANADA INC.
AND CANNOT BE USED OR DUPLICATED IN
ANY WAY WITHOUT EXPRESS WRITTEN PERMISSION.



WSP Canada Inc.
760 Enterprise Crescent
Victoria, B.C. V8Z 6R4
Tel: +1 250-475-1000
Fax: +1 250-475-2211
www.wspgroup.com

Uplands Combined Sewer Separation Project
The District of Oak Bay

TH16-7

Pg 1 of 1

Project No: 161-08447-00

| Depth (m) (ft) | Description | C | N | Type/ Sample # | Water Level | 10 | 20 | 30 | 40 | 50 | 60 | 70 | 80 | 90 |
|-------------------|--|---|---|-------------------|------------------------|----|----|----|----|----|----|----|----|----|
| 2 | ASPHALT FILL Sandy gravel, dry | | | | | | | | | | | | | |
| 4 | ORGANIC SOIL Soft/loose, dark brown, silty, sandy, dry to moist | | | | | | | | | | | | | |
| 6 | SAND Brown/grey, medium grained, trace silt, dry | | | G | | | | | | | | | | |
| 8 | Becoming suddenly saturated | | | | | | | | | | | | | |
| 10 | SAND Brown/grey, medium to coarse grained, some gravel, saturated. Hole sloughing from 2.7m onwards | | | | ▼ P1 Jun 20 2016 | | | | | | | | | |
| 12 | | | | G | | | | | | | | | | |
| 14 | | | | | | | | | | | | | | |
| 16 | End of hole at 4.9m | | | | | | | | | | | | | |
| 18 | | | | | | | | | | | | | | |
| 20 | | | | | | | | | | | | | | |
| 22 | | | | | | | | | | | | | | |
| 24 | | | | | | | | | | | | | | |
| 26 | | | | | | | | | | | | | | |
| 28 | | | | | | | | | | | | | | |
| 30 | | | | | | | | | | | | | | |
| 32 | | | | | | | | | | | | | | |

C: Condition of Sample

Good ☒
Disturbed ☐
No Recovery ☐

Type: Type of Sampler

SPT : 2 in. standard
ST : Shelby
G : Grab
CORE

N: Number of Blows

WH : Weight of Hammer
WR : Weight of Rod
Standard Penetration Test : ASTM D1586
Hammer Type:

DYNAMIC CONE PENETRATION TEST

Plastic Limit (%) Liquid Limit (%)

Moisture Content (%)
▼ Ground Water Level
(X) Shear strength in kPa (Torvane)
PP Pocket Penetrometer
(compressive strength in kPa)
X Shear strength in kPa
(Unconfined)
⊗ Shear strength in kPa (Field vane)
⊗ Remolded strength in kPa
■ Percent Passing # 200 sieve

Bentonite/Grout Plug
Solid Pipe
Cuttings
Slotted Pipe
Sand/Pea-Gravel

Drill Method:
Solid Stem Auger
Date Drilled: 20/06/2016
Logged by: PS
Checked by: TAM

SOIL CLASSIFICATION IN ACCORDANCE WITH THE CANADIAN
FOUNDATION ENGINEERING MANUAL 4TH EDITION 2006.

THIS LOG IS FOR GEOTECHNICAL PURPOSES ONLY
THIS LOG IS THE SOLE PROPERTY OF WSP CANADA INC.
AND CANNOT BE USED OR DUPLICATED IN
ANY WAY WITHOUT EXPRESS WRITTEN PERMISSION.



WSP Canada Inc.
760 Enterprise Crescent
Victoria, B.C. V8Z 6R4
Tel: +1 250-475-1000
Fax: +1 250-475-2211
www.wspgroup.com

Uplands Combined Sewer Separation Project
The District of Oak Bay

TH16-8

Pg 1 of 1

Project No: 161-08447-00

| Depth (m) (ft) | Description | C | N | Type/ Sample # | Water Level | 10 | 20 | 30 | 40 | 50 | 60 | 70 | 80 | 90 |
|-------------------|---|---|---|-------------------|----------------|----|----|----|----|----|----|----|----|----|
| | ASPHALT | | | | | | | | | | | | | |
| | CONCRETE | | | | | | | | | | | | | |
| | Borehole terminated on concrete surface | | | | | | | | | | | | | |
| 2 | | | | | | | | | | | | | | |
| 4 | | | | | | | | | | | | | | |
| 6 | | | | | | | | | | | | | | |
| 8 | | | | | | | | | | | | | | |
| 10 | | | | | | | | | | | | | | |
| 12 | | | | | | | | | | | | | | |
| 14 | | | | | | | | | | | | | | |
| 16 | | | | | | | | | | | | | | |
| 18 | | | | | | | | | | | | | | |
| 20 | | | | | | | | | | | | | | |
| 22 | | | | | | | | | | | | | | |
| 24 | | | | | | | | | | | | | | |
| 26 | | | | | | | | | | | | | | |
| 28 | | | | | | | | | | | | | | |
| 30 | | | | | | | | | | | | | | |
| 32 | | | | | | | | | | | | | | |

C: Condition of Sample

Good ☒
Disturbed ☐
No Recovery ☐

Type: Type of Sampler

SPT : 2 in. standard
ST : Shelby
G : Grab
CORE

N: Number of Blows

WH : Weight of Hammer
WR : Weight of Rod
Standard Penetration Test : ASTM D1586
Hammer Type:

SOIL CLASSIFICATION IN ACCORDANCE WITH THE CANADIAN
FOUNDATION ENGINEERING MANUAL 4TH EDITION 2006.

DYNAMIC CONE PENETRATION TEST

THIS LOG IS FOR GEOTECHNICAL PURPOSES ONLY
THIS LOG IS THE SOLE PROPERTY OF WSP CANADA INC.
AND CANNOT BE USED OR DUPLICATED IN
ANY WAY WITHOUT EXPRESS WRITTEN PERMISSION.

Plastic Limit (%) Liquid Limit (%)

Moisture Content (%)
Ground Water Level
Shear strength in kPa (Torvane)
Pocket Penetrometer
(compressive strength in kPa)
Shear strength in kPa
(Unconfined)
Shear strength in kPa (Field vane)
Remolded strength in kPa
Percent Passing # 200 sieve

Drill Method: Solid Stem Auger
Date Drilled: 20/06/2016
Logged by: PS
Checked by: TAM



WSP Canada Inc.
760 Enterprise Crescent
Victoria, B.C. V8Z 6R4
Tel: +1 250-475-1000
Fax: +1 250-475-2211
www.wspgroup.com

Uplands Combined Sewer Separation Project
The District of Oak Bay

TH16-9

Pg 1 of 1

Project No: 161-08447-00

| Depth (m) (ft) | Description | C | N | Type/ Sample # | Water Level | 10 | 20 | 30 | 40 | 50 | 60 | 70 | 80 | 90 |
|-------------------|--|---|---|-------------------|----------------|----|----|----|----|----|----|----|----|----|
| 2 | ASPHALT FILL Sand and gravel (pit run), dry | | | | | | | | | | | | | |
| 4 | ORGANIC SOIL Dark brown, silty, sandy with roots | | | | | | | | | | | | | |
| 6 | SAND Brown, fine to coarse grained, trace silt and gravel, dry | | | | | | | | | | | | | |
| 8 | SAND Brown, fine to coarse grained, trace silt, moist | | | G | | | | | | | | | | |
| 10 | | | | | | | | | | | | | | |
| 12 | | | | | | | | | | | | | | |
| 14 | | | | G | | | | | | | | | | |
| 16 | | | | | | | | | | | | | | |
| 18 | | | | | | | | | | | | | | |
| 20 | End of hole at 5.5m | | | | | | | | | | | | | |
| 22 | | | | | | | | | | | | | | |
| 24 | | | | | | | | | | | | | | |
| 26 | | | | | | | | | | | | | | |
| 28 | | | | | | | | | | | | | | |
| 30 | | | | | | | | | | | | | | |
| 32 | | | | | | | | | | | | | | |

C: Condition of Sample

Good

Disturbed

No Recovery

Type: Type of Sampler

SPT : 2 in. standard

ST : Shelby

G : Grab

CORE

N: Number of Blows

WH : Weight of Hammer

WR : Weight of Rod

Standard Penetration Test : ASTM D1586

Hammer Type:

Plastic Limit (%) Liquid Limit (%)

Moisture Content (%)

Ground Water Level

Shear strength in kPa (Torvane)

Pocket Penetrometer

(compressive strength in kPa)

Shear strength in kPa

(Unconfined)

Shear strength in kPa (Field vane)

Remolded strength in kPa

Percent Passing # 200 sieve

Drill Method:

Solid Stem Auger

Date Drilled: 20/06/2016

Logged by: PS

Checked by: TAM

SOIL CLASSIFICATION IN ACCORDANCE WITH THE CANADIAN
FOUNDATION ENGINEERING MANUAL 4TH EDITION 2006.

THIS LOG IS FOR GEOTECHNICAL PURPOSES ONLY
THIS LOG IS THE SOLE PROPERTY OF WSP CANADA INC.
AND CANNOT BE USED OR DUPLICATED IN
ANY WAY WITHOUT EXPRESS WRITTEN PERMISSION.

Appendix D

ROCK PROBE RESULTS TABLE

Rock Probe Results Table

| Rock Probe # | Depth to Bedrock (m) | Comments |
|--------------|----------------------|--|
| RP16-1 | 3.1 | |
| RP16-2 | 4.2 | |
| RP16-3 | 0.9 | |
| RP16-4 | 1.2 | |
| RP16-5 | 3.6 | |
| RP16-6 | 2.7 | |
| RP16-7 | No bedrock at 2.7 | sand sidewalls collapsing on drill bit |
| RP16-8 | 3.0 | |
| RP16-9 | No bedrock at 4.8 | |
| RP16-10 | 0.9 | |
| RP16-11 | 0.6 | |
| RP16-12 | 1.5 | |
| RP16-13 | 1.2 | |
| RP16-14 | 3.0 | |
| RP16-15 | 1.2 | |
| RP16-16 | No bedrock at 4.0 | Wet conditions at 3 m |
| RP16-17 | No bedrock at 5.1 | |
| RP16-18 | 0.9 | |
| RP16-19 | 3.0 | |
| RP16-20 | 3.3 | |
| RP16-21 | No bedrock at 4.0 | Wet conditions at 1.8 m |
| RP16-22 | 1.8 | |
| RP16-23 | 1.5 | |
| RP16-24 | 0.9 | |
| RP16-25 | 1.2 | |
| RP16-26 | No bedrock at 4.8 | Wet conditions at 3.6 m |
| RP16-27 | No bedrock at 5.1 | Moist medium brown sand cuttings |
| RP16-28 | No bedrock at 5.4 | Moist medium brown sand cuttings |
| RP16-29 | No bedrock at 5.1 | Moist medium brown sand cuttings, *see notes |
| RP16-30 | 1.8 | Moist medium brown sand cuttings |
| RP16-31 | 1.5 | Moist medium brown sand cuttings |
| RP16-32 | 4.8 | Moist medium brown sand cuttings |
| RP16-33 | 4.4 | Moist medium brown sand cuttings |
| RP16-34 | No bedrock at 6.0 | Moist medium brown sand cuttings |
| RP16-35 | 0.9 | |
| RP16-36 | 4.8 | |
| RP16-37 | 3.6 | |
| RP16-38 | No bedrock at 4.8 | |
| RP16-39 | No bedrock at 5.1 | |
| RP16-40 | No bedrock at 5.4 | Moist medium brown sand cuttings |
| RP16-41 | No bedrock at 5.4 | Moist medium brown sand cuttings |

Notes:

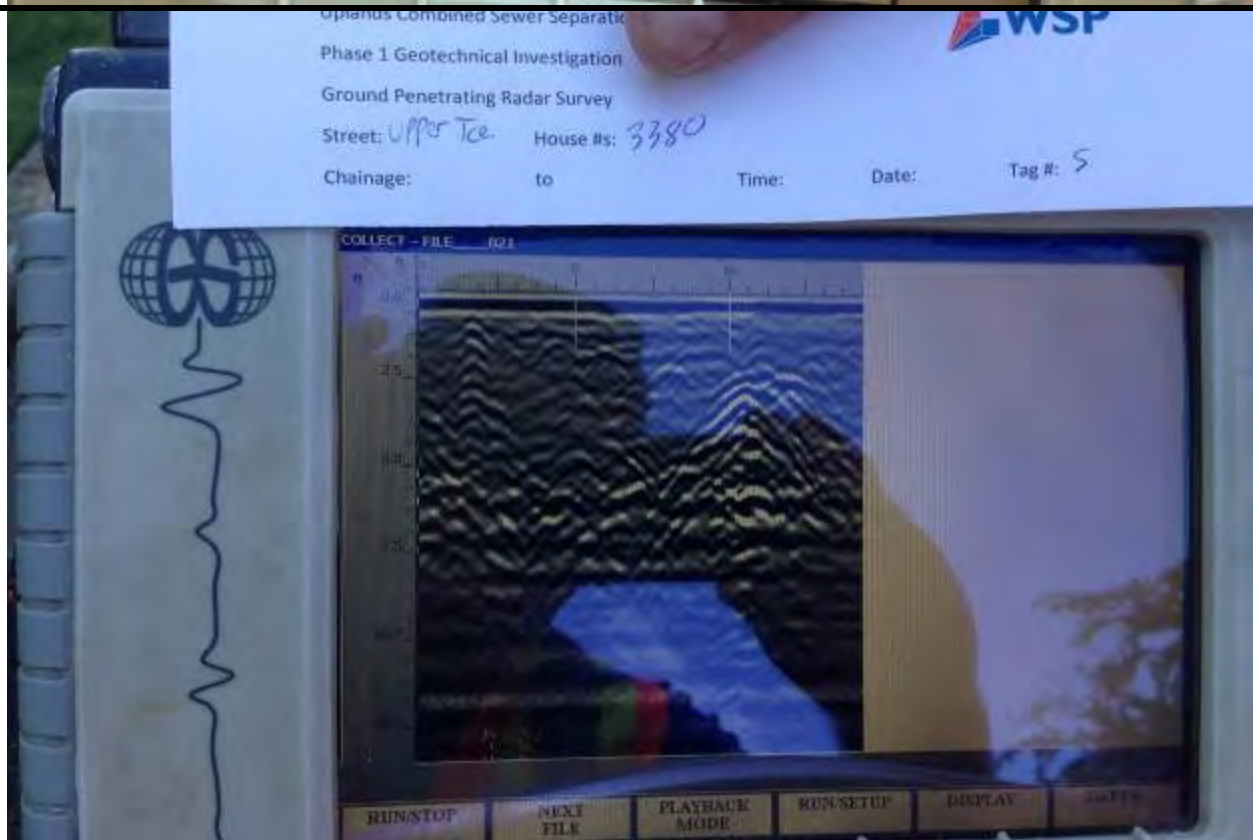
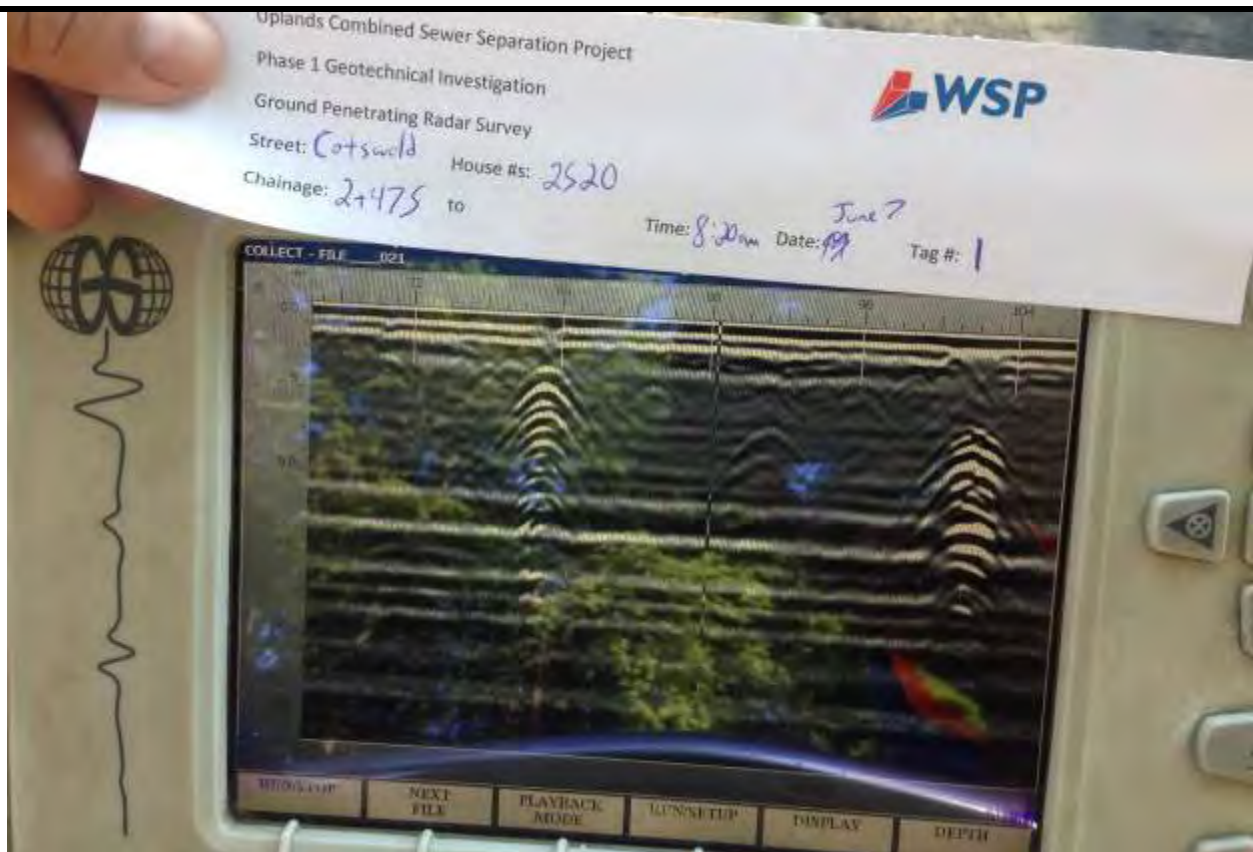
Rock probing completed on June 22nd and 30th, 2016, using a Flexiroc Top-drive hydraulic drill operated by Western Grater Contracting.

Probe was advanced minimum of 0.6 m into bedrock where encountered.

* Due to broken hydraulic hose and collapsed hole, 3.75 m long steel drill rod abandoned in probe hole.

Appendix E

GROUND PENETRATING RADAR PHOTOGRAPHS



PROJECT:
 Uplands Combined Sewer Separation Project: Phase 1 Geotechnical Investigation

TITLE:
 Ground Penetrating Radar Photographs

CLIENT:
 District of Oak Bay

DRAWING NO.:
 1

DATE:
 June 2016

FILE NO.:
 161-08447-00

SCALE:
 NTS

DRAWN BY:
 BV

REV NO.:



PROJECT:
 Uplands Combined Sewer Separation Project: Phase 1 Geotechnical Investigation

TITLE:
 Ground Penetrating Radar Photographs

CLIENT:
 District of Oak Bay

DRAWING NO.:
 2

DATE:
 June 2016

FILE NO.:
 161-08447-00

SCALE:
 NTS

DRAWN BY:
 BV

REV NO.:



PROJECT:
Uplands Combined Sewer Separation Project: Phase 1 Geotechnical Investigation

TITLE:
Ground Penetrating Radar Photographs

CLIENT:
District of Oak Bay

DRAWING NO.:
3

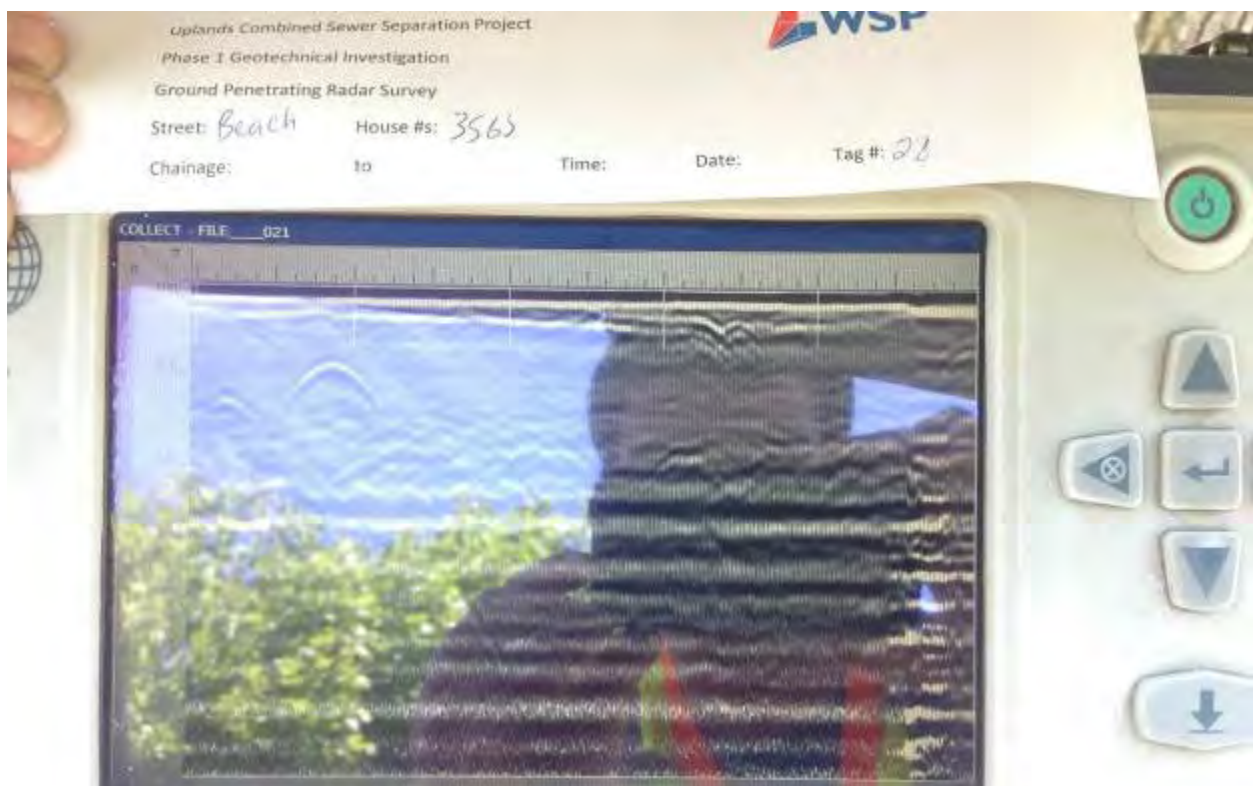
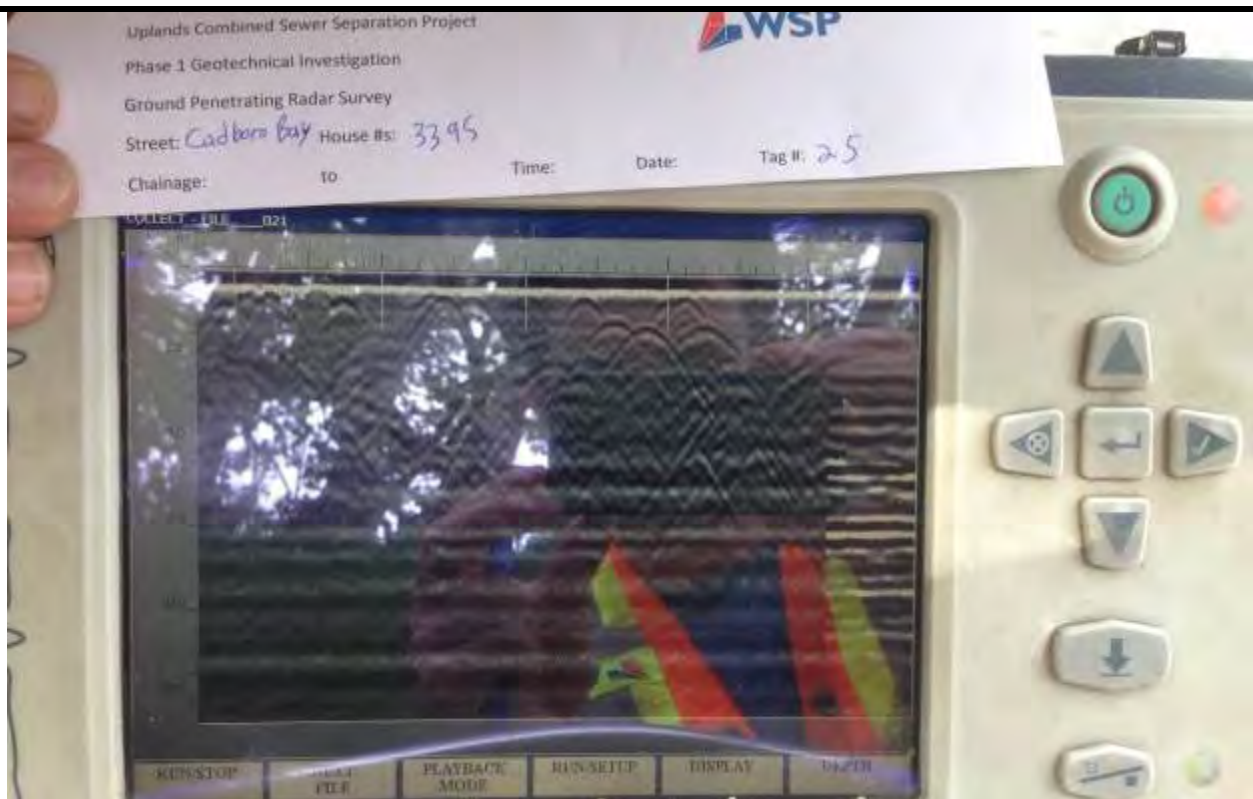
DATE:
June 2016

FILE NO.:
161-08447-00

SCALE:
NTS

DRAWN BY:
BV

REV NO.:



PROJECT:
Uplands Combined Sewer Separation Project: Phase 1 Geotechnical Investigation

TITLE:
Ground Penetrating Radar Photographs

CLIENT:
District of Oak Bay

DRAWING NO.:
4

DATE:
June 2016

FILE NO.:
161-08447-00

SCALE:
NTS

DRAWN BY:
BV

REV NO.:



PROJECT:
 Uplands Combined Sewer Separation Project: Phase 1 Geotechnical Investigation

TITLE:
 Ground Penetrating Radar Photographs

CLIENT:
 District of Oak Bay

DRAWING NO.:
 5

DATE:
 June 2016

FILE NO.:
 161-08447-00

SCALE:
 NTS

DRAWN BY:
 BV

REV NO.:



PROJECT:
Uplands Combined Sewer Separation Project: Phase 1 Geotechnical Investigation

TITLE:
Ground Penetrating Radar Photographs

CLIENT:
District of Oak Bay

DRAWING NO.:
6

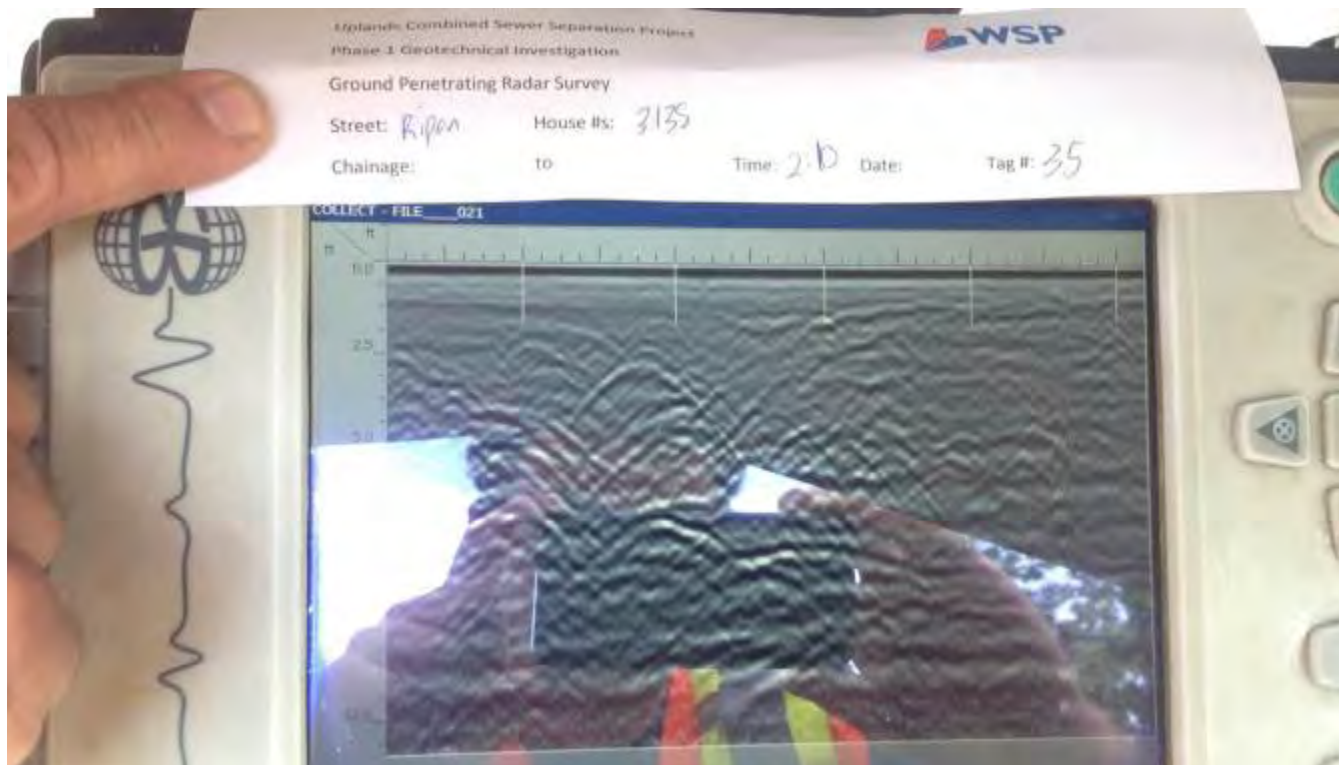
DATE:
June 2016

FILE NO.:
161-08447-00

SCALE:
NTS

DRAWN BY:
BV

REV NO.:



PROJECT:
Uplands Combined Sewer Separation Project: Phase 1 Geotechnical Investigation

TITLE:
Ground Penetrating Radar Photographs

CLIENT:
District of Oak Bay

DRAWING NO.:
7

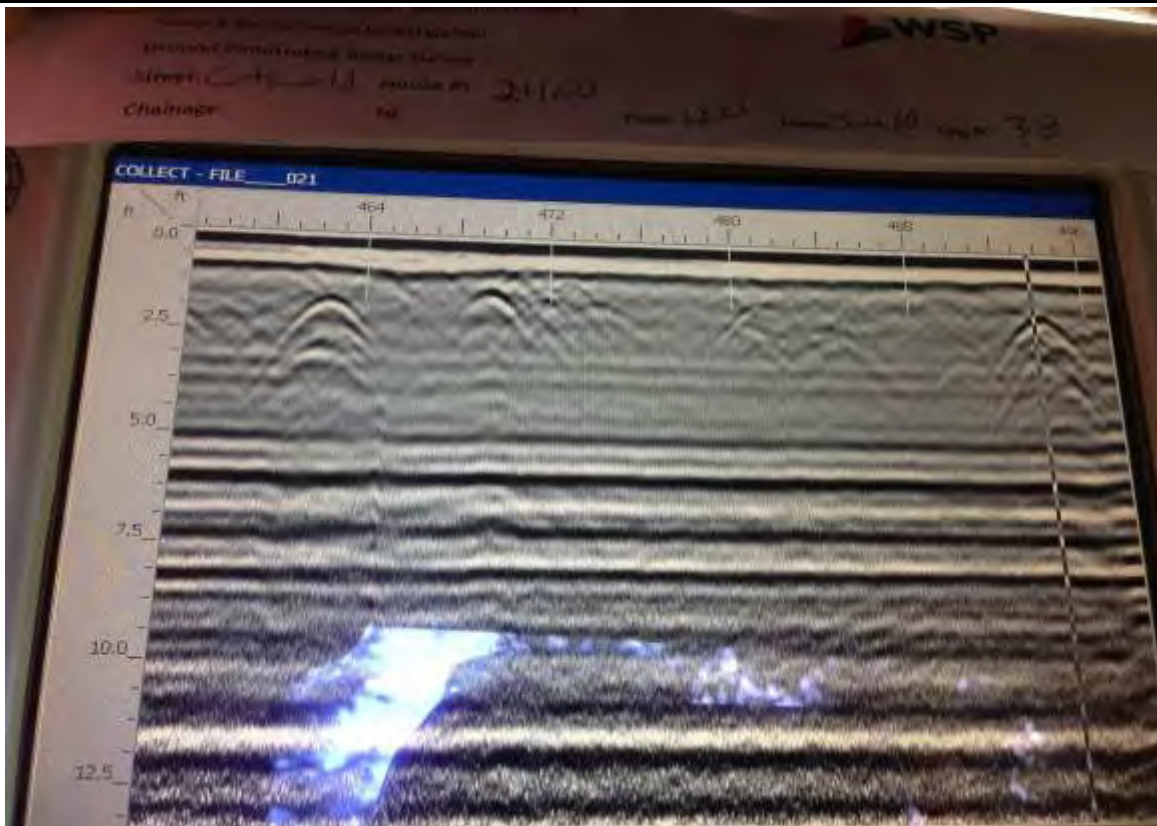
DATE:
June 2016

FILE NO.:
161-08447-00

SCALE:
NTS

DRAWN BY:
BV

REV NO.:



PROJECT:
Uplands Combined Sewer Separation Project: Phase 1 Geotechnical Investigation

TITLE:
Ground Penetrating Radar Photographs

CLIENT:
District of Oak Bay

DRAWING NO.:
8

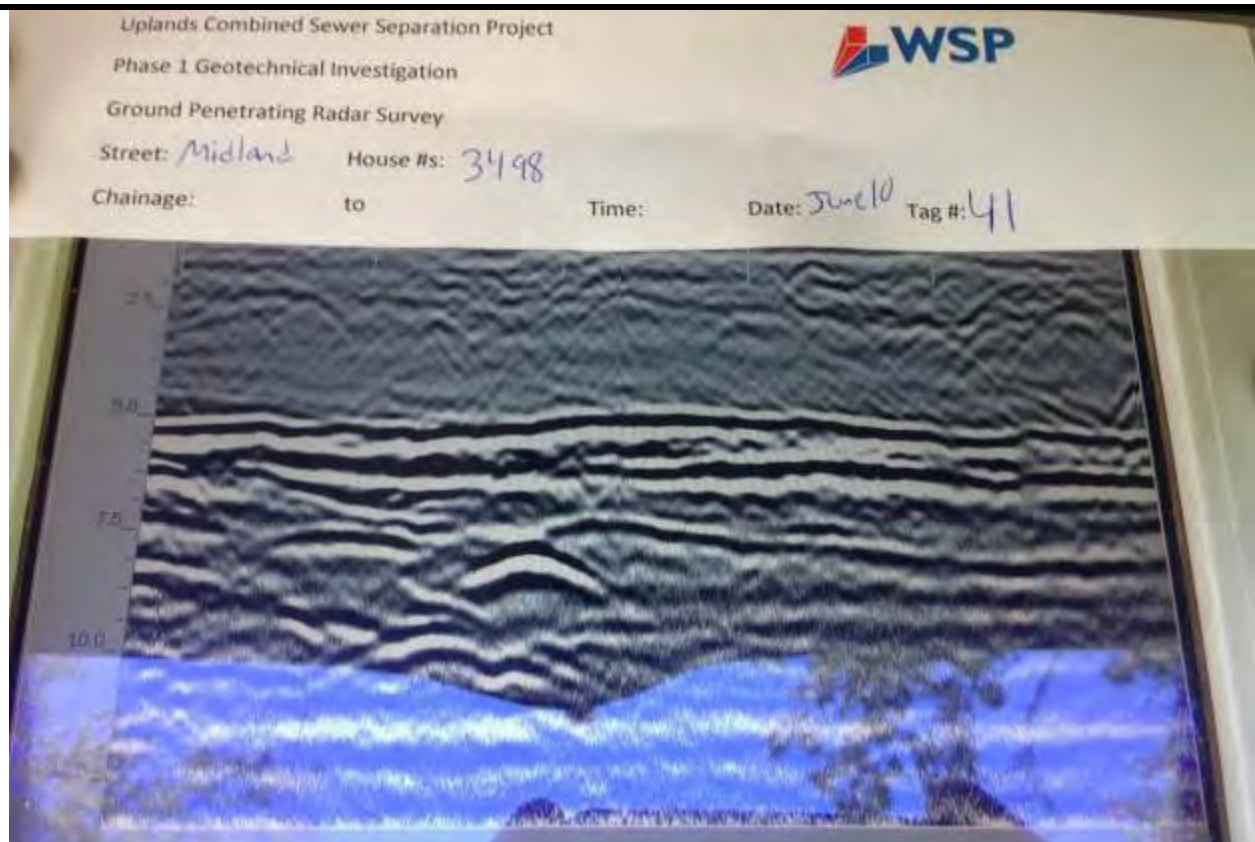
DATE:
June 2016

FILE NO.:
161-08447-00

SCALE:
NTS

DRAWN BY:
BV

REV NO.:



PROJECT:
Uplands Combined Sewer Separation Project: Phase 1 Geotechnical Investigation

TITLE:
Ground Penetrating Radar Photographs

CLIENT:
District of Oak Bay

DRAWING NO.:
9

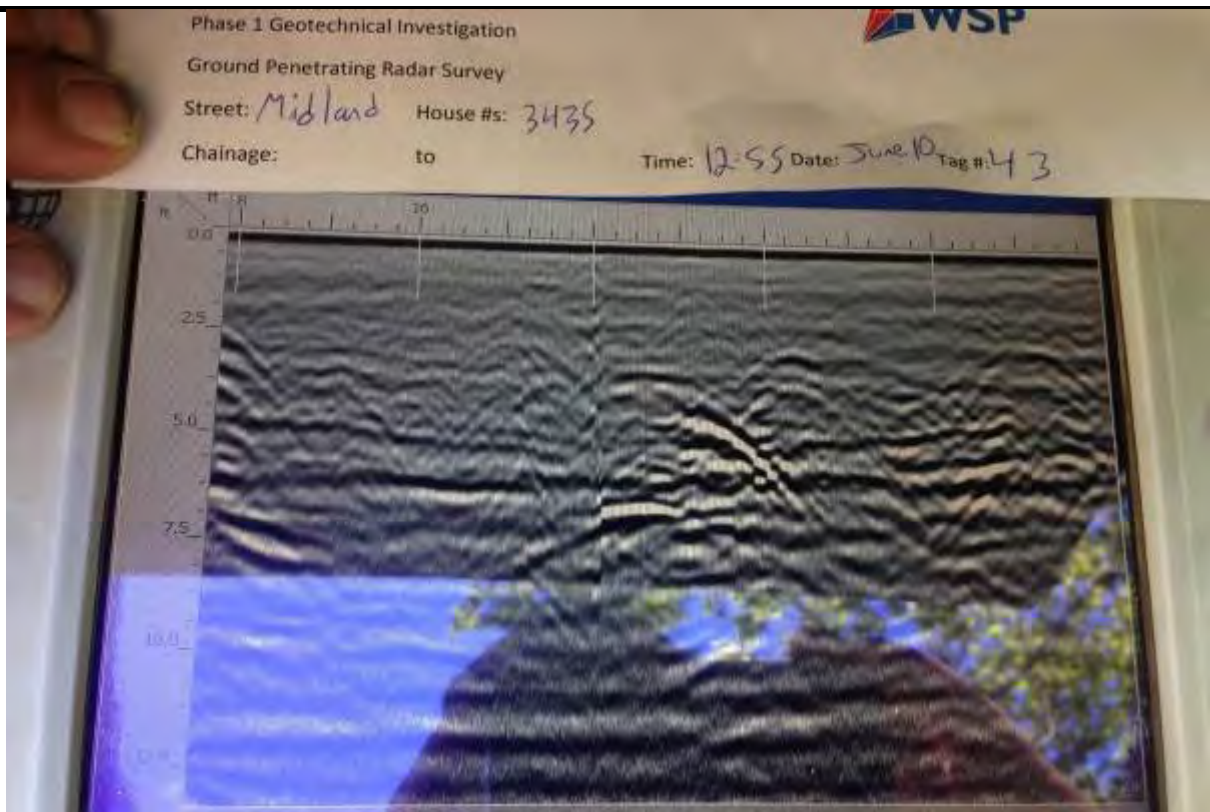
DATE:
June 2016

FILE NO.:
161-08447-00

SCALE:
NTS

DRAWN BY:
BV

REV NO.:



PROJECT:
Uplands Combined Sewer Separation Project: Phase 1 Geotechnical Investigation

TITLE:
Ground Penetrating Radar Photographs

CLIENT:
District of Oak Bay

DRAWING NO.:
10

DATE:
June 2016

FILE NO.:
161-08447-00

SCALE:
NTS

DRAWN BY:
BV

REV NO.:

Appendix F

GEOTECHNICAL LABORATORY TESTING

**WSP Canada Inc.**

760 Enterprise Crescent
Victoria, BC
Canada V8Z 6R4
Tel.: 250-475-1000
Fax.: 250-475-2211

AGGREGATE GRADATION CHART**IDENTIFICATION:**

Client District of Oak Bay
Project Uplands Combined Sewer Separation Project
Sample Location TH16-2 2'-5'

File No.: 161-08447-00
Report No.: 1

Date: _____

SAMPLING INFORMATION:

Material: Silty sand with trace gravel
Specification: n/a

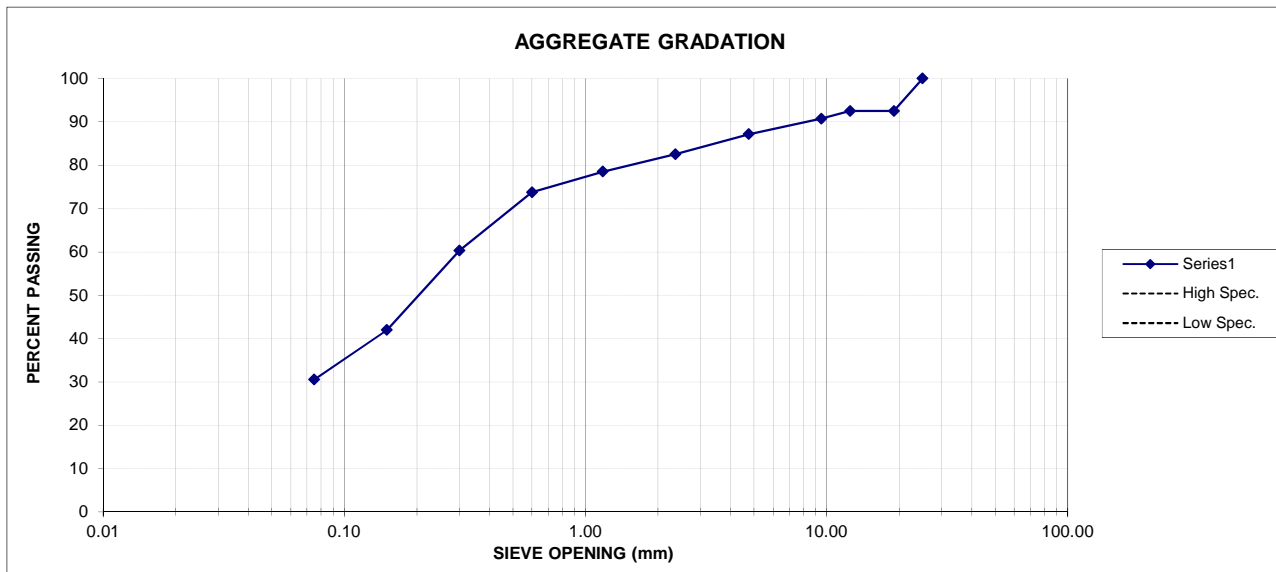
Material Specification

Sieve High Spec. Low Spec.

Sieve Analysis

| Sieve | % Passing |
|-------|-----------|
| 75.0 | |
| 63.0 | |
| 50.0 | |
| 37.5 | |
| 25.0 | 100.0 |
| 19.0 | 92.5 |
| 12.5 | 92.5 |
| 9.5 | 90.7 |
| 4.75 | 87.2 |
| 2.36 | 82.6 |
| 1.18 | 78.5 |
| 0.600 | 73.8 |
| 0.300 | 60.3 |
| 0.150 | 42.0 |
| 0.075 | 30.5 |

Date Sampled 20-Jun-16
Date Tested 04-Jul-16
Sample No: 1
Fracture by mass 0.0%
Supplier: Native
Sampled by: PS
Tested by: GG
Moisture (%): 5.8

AGGREGATE GRADATION:

REMARKS: Tested according to ASTM C- 136 and C-117

REPORTS TO: _____

WSP CANADA INC.

per: _____

**WSP Canada Inc.**

760 Enterprise Crescent
Victoria, BC
Canada V8Z 6R4
Tel.: 250-475-1000
Fax.: 250-475-2211

AGGREGATE GRADATION CHART**IDENTIFICATION:**

Client District of Oak Bay
Project Uplands Combined Sewer Separation Project
Sample Location TH16-2 12'-15'

File No.: 161-08447-00
Report No.: 2

Date: _____

SAMPLING INFORMATION:

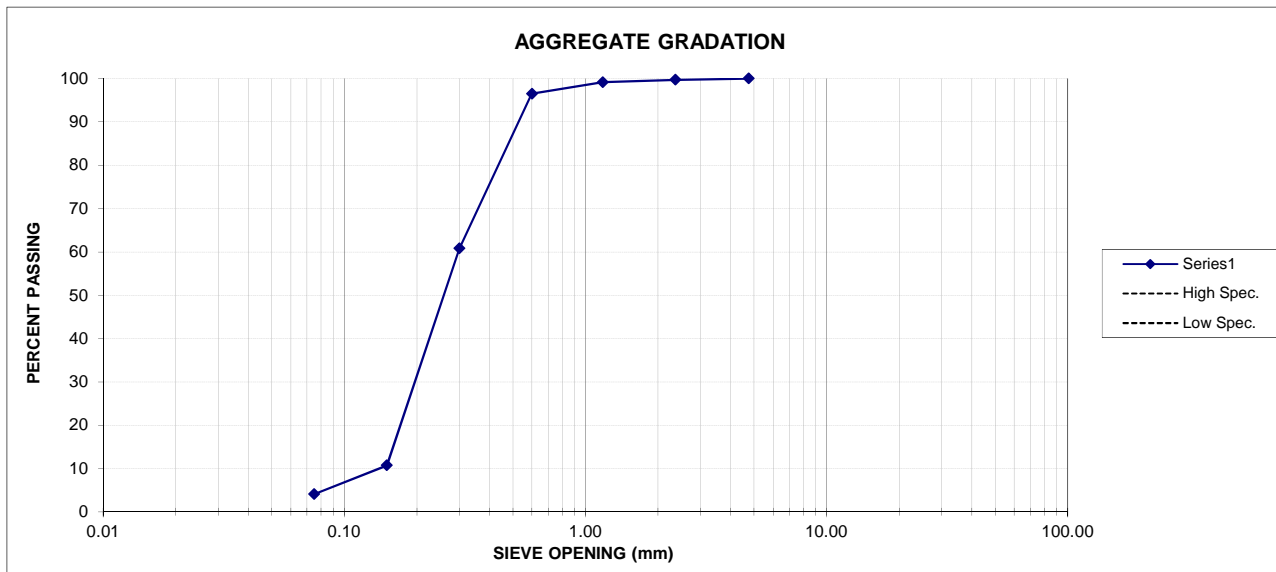
Material: Sand with trace silt
Specification: n/a

Material Specification
Sieve High Spec. Low Spec.

Sieve Analysis
Sieve % Passing

Date Sampled 20-Jun-16
Date Tested 04-Jul-16
Sample No: 2
Fracture by mass 0.0%
Supplier: Native
Sampled by: PS
Tested by: GG
Moisture (%): 5.6

| | |
|-------|-------|
| 75.0 | |
| 63.0 | |
| 50.0 | |
| 37.5 | |
| 25.0 | |
| 19.0 | |
| 12.5 | |
| 9.5 | |
| 4.75 | 100.0 |
| 2.36 | 99.7 |
| 1.18 | 99.2 |
| 0.600 | 96.5 |
| 0.300 | 60.8 |
| 0.150 | 10.7 |
| 0.075 | 4.1 |

AGGREGATE GRADATION:

REMARKS: Tested according to ASTM C- 136 and C-117

REPORTS TO: _____

WSP CANADA INC.

per: _____

**WSP Canada Inc.**

760 Enterprise Crescent
Victoria, BC
Canada V8Z 6R4
Tel.: 250-475-1000
Fax.: 250-475-2211

AGGREGATE GRADATION CHART**IDENTIFICATION:**

Client District of Oak Bay
Project Uplands Combined Sewer Separation Project
Sample Location TH16-1 2'-5'

File No.: 161-08447-00
Report No.: 3

Date: _____

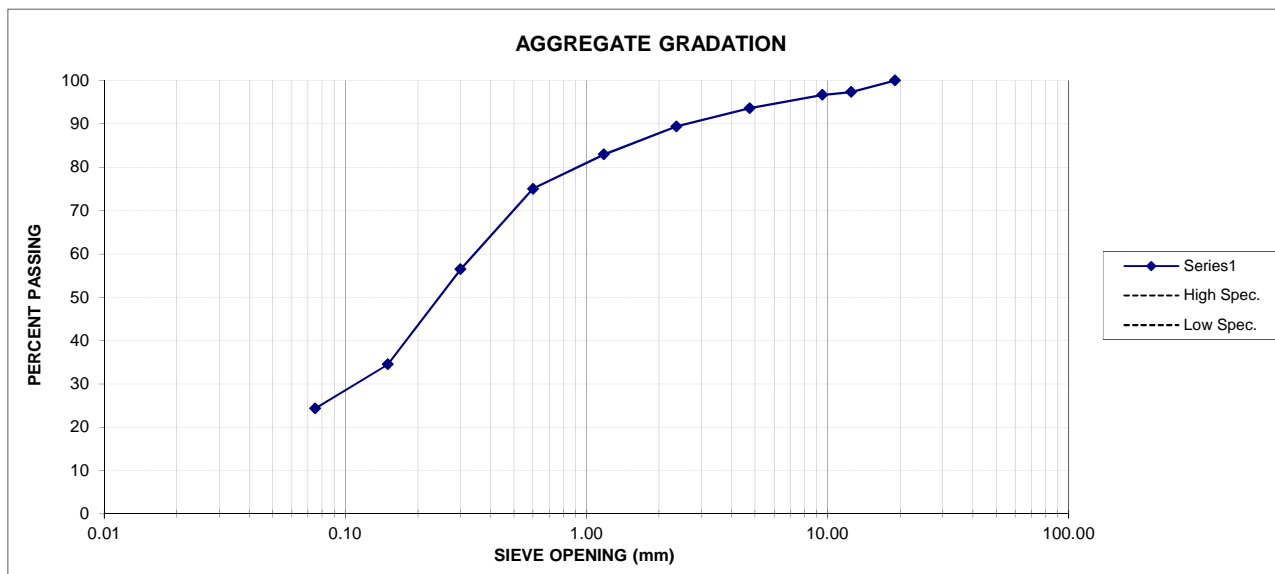
SAMPLING INFORMATION:

Material: Silty sand
Specification: n/a

Material Specification
Sieve High Spec. Low Spec.

Sieve Analysis
Sieve % Passing
75.0
63.0
50.0
37.5
25.0
19.0 100.0
12.5 97.3
9.5 96.7
4.75 93.6
2.36 89.4
1.18 82.9
0.600 75.0
0.300 56.4
0.150 34.5
0.075 24.3

Date Sampled 20-Jun-16
Date Tested 04-Jul-16
Sample No: 3
Fracture by mass 0.0%
Supplier: Native
Sampled by: PS
Tested by: GG
Moisture (%): 8.1

AGGREGATE GRADATION:

REMARKS: Tested according to ASTM C- 136 and C-117

REPORTS TO: _____

WSP CANADA INC.

per: _____

**WSP Canada Inc.**

760 Enterprise Crescent
Victoria, BC
Canada V8Z 6R4
Tel.: 250-475-1000
Fax.: 250-475-2211

AGGREGATE GRADATION CHART**IDENTIFICATION:**

Client District of Oak Bay
Project Uplands Combined Sewer Separation Project
Sample Location TH16-1 12'-15'

File No.: 161-08447-00
Report No.: 4

Date: _____

SAMPLING INFORMATION:

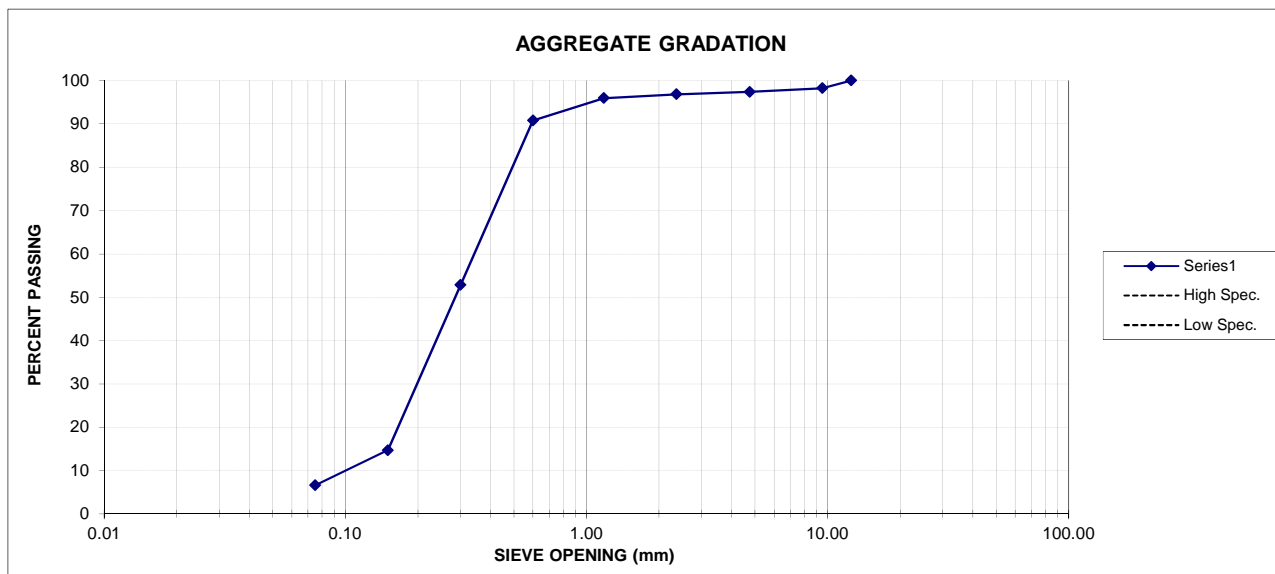
Material: Sand with trace silt
Specification: n/a

Material Specification
Sieve High Spec. Low Spec.

Sieve Analysis
Sieve % Passing

Date Sampled 20-Jun-16
Date Tested 04-Jul-16
Sample No: 4
Fracture by mass 0.0%
Supplier: Native
Sampled by: PS
Tested by: GG
Moisture (%): 4.2

| | |
|-------|-------|
| 75.0 | |
| 63.0 | |
| 50.0 | |
| 37.5 | |
| 25.0 | |
| 19.0 | |
| 12.5 | 100.0 |
| 9.5 | 98.2 |
| 4.75 | 97.4 |
| 2.36 | 96.8 |
| 1.18 | 95.9 |
| 0.600 | 90.8 |
| 0.300 | 52.8 |
| 0.150 | 14.7 |
| 0.075 | 6.6 |

AGGREGATE GRADATION:

REMARKS: Tested according to ASTM C- 136 and C-117

REPORTS TO: _____

WSP CANADA INC.

per: _____

**WSP Canada Inc.**

760 Enterprise Crescent
Victoria, BC
Canada V8Z 6R4
Tel.: 250-475-1000
Fax.: 250-475-2211

AGGREGATE GRADATION CHART**IDENTIFICATION:**

Client District of Oak Bay
Project Uplands Combined Sewer Separation Project
Sample Location TH16-4 6'-9'

File No.: 161-08447-00
Report No.: 5

Date: _____

SAMPLING INFORMATION:

Material: Sand with trace silt
Specification: n/a

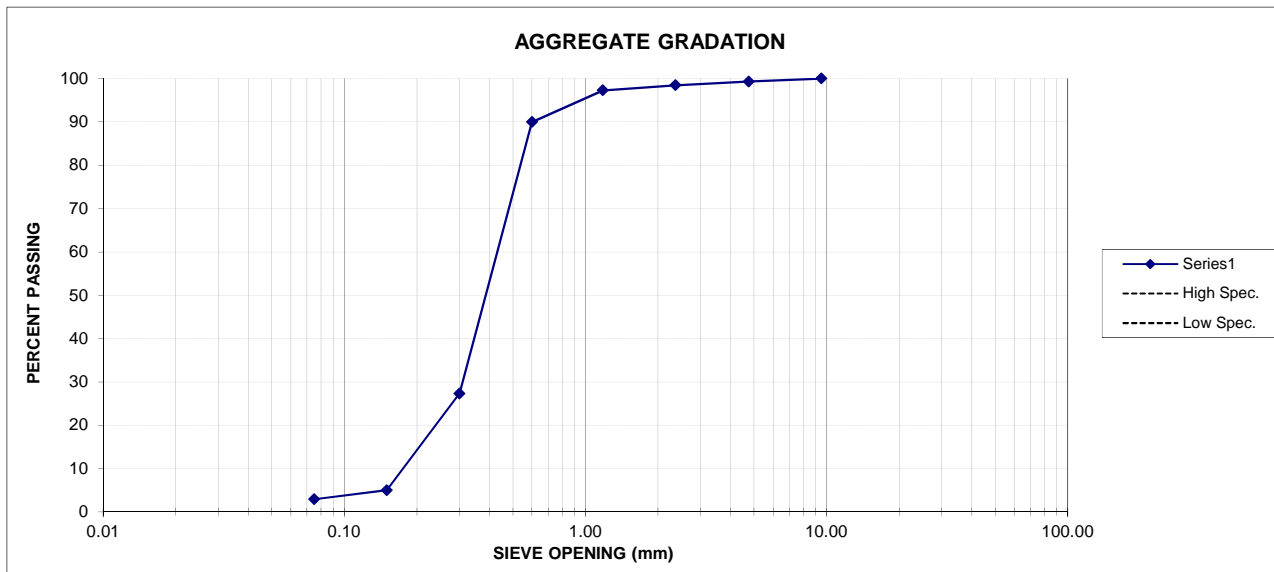
Material Specification

Sieve High Spec. Low Spec.

Sieve Analysis

| Sieve | % Passing |
|-------|-----------|
| 75.0 | |
| 63.0 | |
| 50.0 | |
| 37.5 | |
| 25.0 | |
| 19.0 | |
| 12.5 | |
| 9.5 | 100.0 |
| 4.75 | 99.3 |
| 2.36 | 98.5 |
| 1.18 | 97.3 |
| 0.600 | 90.0 |
| 0.300 | 27.3 |
| 0.150 | 5.0 |
| 0.075 | 2.9 |

Date Sampled 20-Jun-16
Date Tested 04-Jul-16
Sample No: 5
Fracture by mass 0.0%
Supplier: Native
Sampled by: PS
Tested by: GG
Moisture (%): 4.0

AGGREGATE GRADATION:

REMARKS: Tested according to ASTM C- 136 and C-117

REPORTS TO: _____

WSP CANADA INC.

per: _____



WSP Canada Inc.
760 Enterprise Crescent
Victoria, BC
Canada V8Z 6R4
Tel.: 250-475-1000
Fax.: 250-475-2211

AGGREGATE GRADATION CHART

IDENTIFICATION:

Client District of Oak Bay
Project Uplands Combined Sewer Separation Project
Sample Location TH16-7 3'-5'

File No.: 161-08447-00
Report No.: 6

Date: _____

SAMPLING INFORMATION:

Material: Sand with trace silt
Specification: n/a

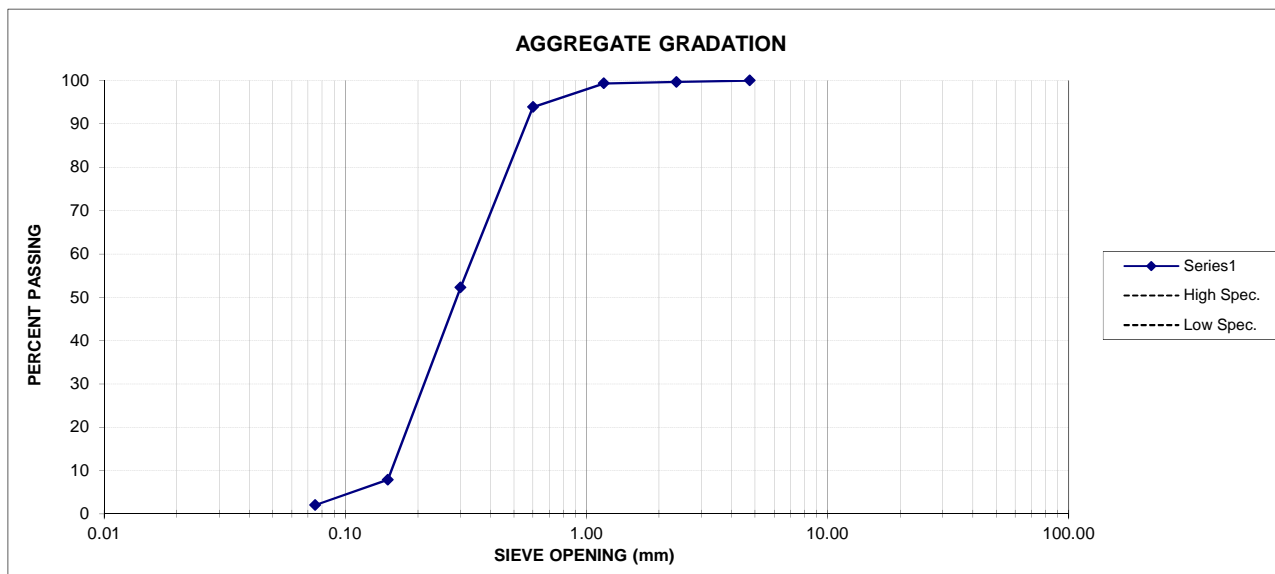
Material Specification
Sieve High Spec. Low Spec.

Sieve Analysis
Sieve % Passing

Date Sampled 20-Jun-16
Date Tested 04-Jul-16
Sample No: 6
Fracture by mass 0.0%
Supplier: Native
Sampled by: PS
Tested by: GG
Moisture (%): 3.3

| | |
|-------|-------|
| 75.0 | |
| 63.0 | |
| 50.0 | |
| 37.5 | |
| 25.0 | |
| 19.0 | |
| 12.5 | |
| 9.5 | |
| 4.75 | 100.0 |
| 2.36 | 99.7 |
| 1.18 | 99.4 |
| 0.600 | 93.9 |
| 0.300 | 52.2 |
| 0.150 | 7.9 |
| 0.075 | 2.0 |

AGGREGATE GRADATION:



REMARKS: Tested according to ASTM C- 136 and C-117

REPORTS TO: _____

WSP CANADA INC.

per: _____

**WSP Canada Inc.**

760 Enterprise Crescent
Victoria, BC
Canada V8Z 6R4
Tel.: 250-475-1000
Fax.: 250-475-2211

AGGREGATE GRADATION CHART**IDENTIFICATION:**

Client District of Oak Bay
Project Uplands Combined Sewer Separation Project
Sample Location TH16-7 12'

File No.: 161-08447-00
Report No.: 7

Date: _____

SAMPLING INFORMATION:

Material: Sand with some gravel
Specification: n/a

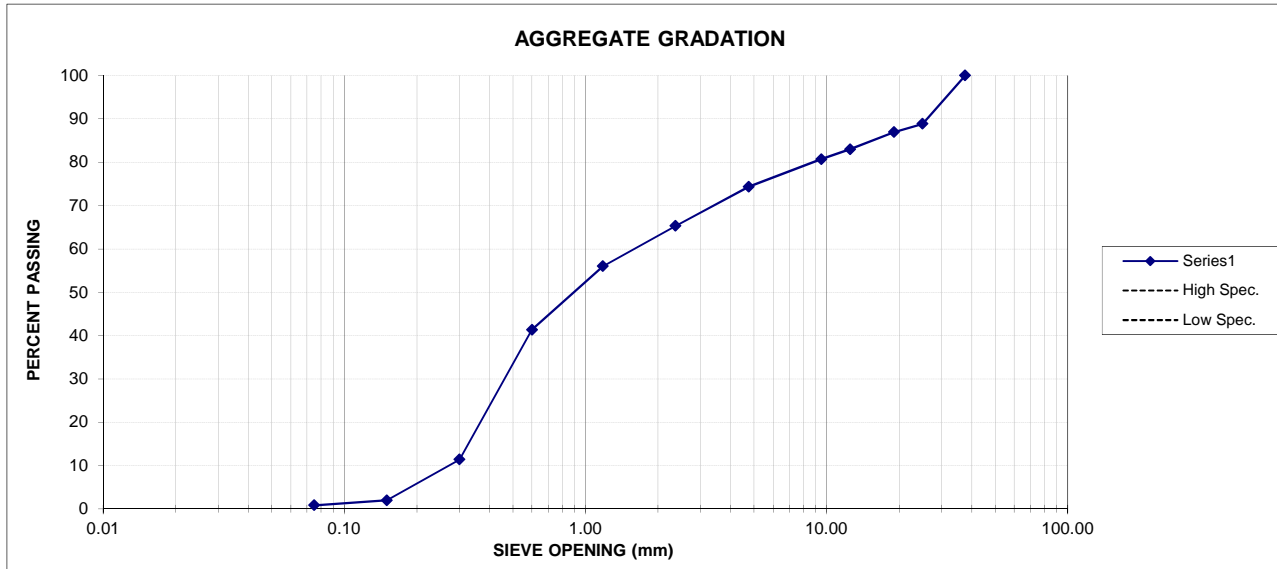
Material Specification

Sieve High Spec. Low Spec.

Sieve Analysis

| Sieve | % Passing |
|-------|-----------|
| 75.0 | |
| 63.0 | |
| 50.0 | |
| 37.5 | 100.0 |
| 25.0 | 88.9 |
| 19.0 | 86.9 |
| 12.5 | 83.0 |
| 9.5 | 80.7 |
| 4.75 | 74.3 |
| 2.36 | 65.3 |
| 1.18 | 56.0 |
| 0.600 | 41.3 |
| 0.300 | 11.4 |
| 0.150 | 2.0 |
| 0.075 | 0.8 |

Date Sampled 20-Jun-16
Date Tested 04-Jul-16
Sample No: 7
Fracture by mass 0.0%
Supplier: Native
Sampled by: PS
Tested by: GG
Moisture (%): 12.7

AGGREGATE GRADATION:

REMARKS: Tested according to ASTM C- 136 and C-117

REPORTS TO: _____

WSP CANADA INC.

per: _____

**WSP Canada Inc.**

760 Enterprise Crescent
Victoria, BC
Canada V8Z 6R4
Tel.: 250-475-1000
Fax.: 250-475-2211

AGGREGATE GRADATION CHART**IDENTIFICATION:**

Client District of Oak Bay
Project Uplands Combined Sewer Separation Project
Sample Location TH16-9 12'-16'

File No.: 161-08447-00
Report No.: 8

Date: _____

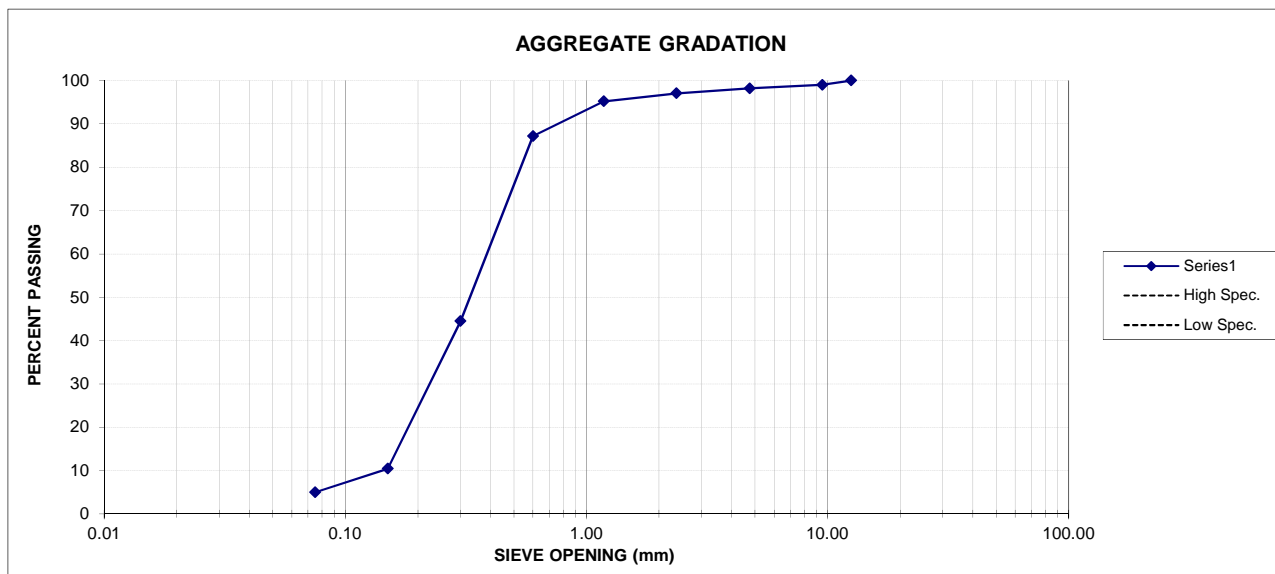
SAMPLING INFORMATION:

Material: Sand with trace silt
Specification: n/a

Material Specification
Sieve High Spec. Low Spec.

Sieve Analysis
Sieve % Passing
75.0
63.0
50.0
37.5
25.0
19.0
12.5 100.0
9.5 99.0
4.75 98.2
2.36 97.0
1.18 95.2
0.600 87.2
0.300 44.5
0.150 10.4
0.075 5.0

Date Sampled 20-Jun-16
Date Tested 04-Jul-16
Sample No: 8
Fracture by mass 0.0%
Supplier: Native
Sampled by: PS
Tested by: GG/AM
Moisture (%): 7.6

AGGREGATE GRADATION:

REMARKS: Tested according to ASTM C- 136 and C-117

REPORTS TO: _____

WSP CANADA INC.

per: _____

**WSP Canada Inc.**

760 Enterprise Crescent
Victoria, BC
Canada V8Z 6R4
Tel.: 250-475-1000
Fax.: 250-475-2211

AGGREGATE GRADATION CHART**IDENTIFICATION:**

Client District of Oak Bay
Project Uplands Combined Sewer Separation Project
Sample Location TH16-10 18'-20'

File No.: 161-08447-00
Report No.: 9

Date: _____

SAMPLING INFORMATION:

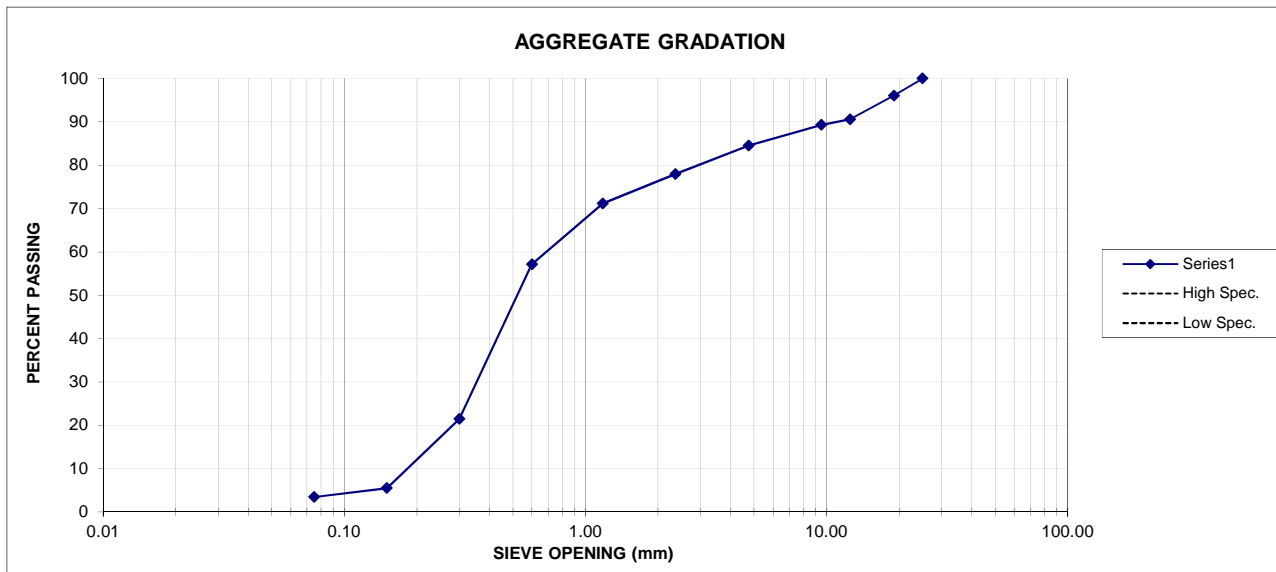
Material: Sand with trace gravel and silt
Specification: n/a

Material Specification
Sieve High Spec. Low Spec.

Sieve Analysis
Sieve % Passing

Date Sampled 20-Jun-16
Date Tested 04-Jul-16
Sample No: 9
Fracture by mass 0.0%
Supplier: Native
Sampled by: PS
Tested by: GG/AM
Moisture (%): 4.0

| | |
|-------|-------|
| 75.0 | |
| 63.0 | |
| 50.0 | |
| 37.5 | |
| 25.0 | 100.0 |
| 19.0 | 96.1 |
| 12.5 | 90.6 |
| 9.5 | 89.3 |
| 4.75 | 84.5 |
| 2.36 | 78.0 |
| 1.18 | 71.2 |
| 0.600 | 57.1 |
| 0.300 | 21.5 |
| 0.150 | 5.5 |
| 0.075 | 3.4 |

AGGREGATE GRADATION:

REMARKS: Tested according to ASTM C- 136 and C-117

REPORTS TO: _____

WSP CANADA INC.

per: _____

**WSP Canada Inc.**

760 Enterprise Crescent
Victoria, BC
Canada V8Z 6R4
Tel.: 250-475-1000
Fax.: 250-475-2211

AGGREGATE GRADATION CHART**IDENTIFICATION:**

Client District of Oak Bay
Project Upland Sewer Rehabilitation
Sample Location TH16-11 7'-9'

File No.: 161-08447-00
Report No.: 10

Date: _____

SAMPLING INFORMATION:

Material: Sand with trace silt
Specification: n/a

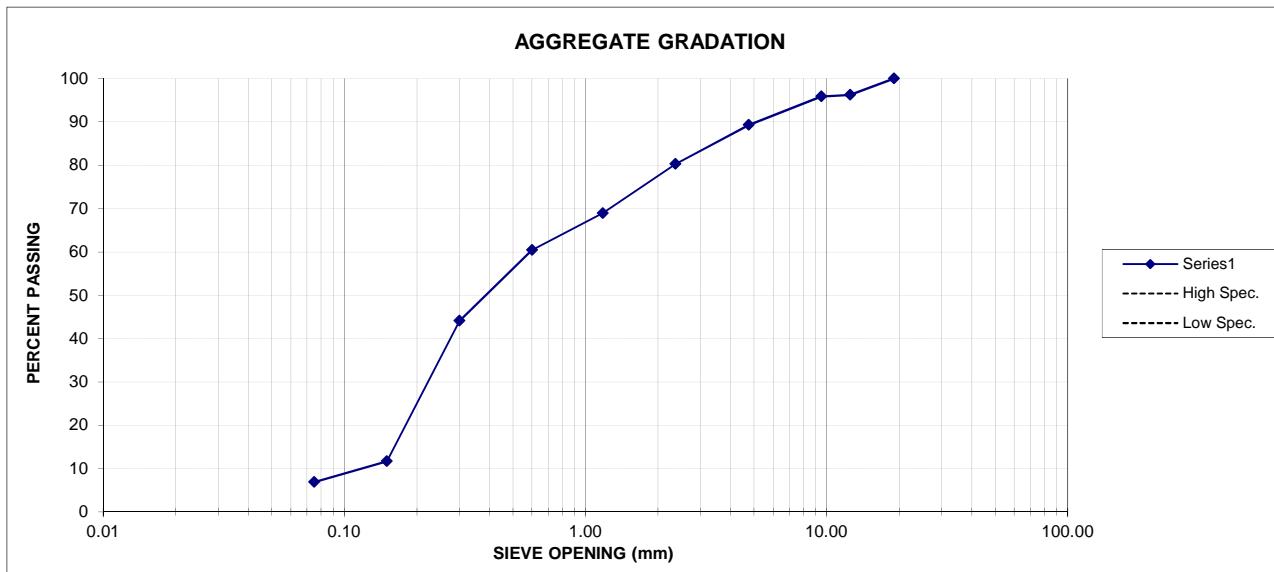
Material Specification

Sieve High Spec. Low Spec.

Sieve Analysis

| Sieve | % Passing |
|-------|-----------|
| 75.0 | |
| 63.0 | |
| 50.0 | |
| 37.5 | |
| 25.0 | |
| 19.0 | 100.0 |
| 12.5 | 96.3 |
| 9.5 | 95.9 |
| 4.75 | 89.3 |
| 2.36 | 80.3 |
| 1.18 | 69.0 |
| 0.600 | 60.4 |
| 0.300 | 44.1 |
| 0.150 | 11.7 |
| 0.075 | 6.9 |

Date Sampled 20-Jun-16
Date Tested 04-Jul-16
Sample No: 10
Fracture by mass 0.0%
Supplier: Native
Sampled by: PS
Tested by: GG/AM
Moisture (%): 5.5

AGGREGATE GRADATION:

REMARKS: Tested according to ASTM C- 136 and C-117

REPORTS TO: _____

WSP CANADA INC.

per: _____

**WSP Canada Inc.**

760 Enterprise Crescent
Victoria, BC
Canada V8Z 6R4
Tel.: 250-475-1000
Fax.: 250-475-2211

AGGREGATE GRADATION CHART**IDENTIFICATION:**

Client District of Oak Bay
Project Uplands Combined Sewer Separation Project
Sample Location TH16-11 17'-20'

File No.: 161-08447-00
Report No.: 11

Date: _____

SAMPLING INFORMATION:

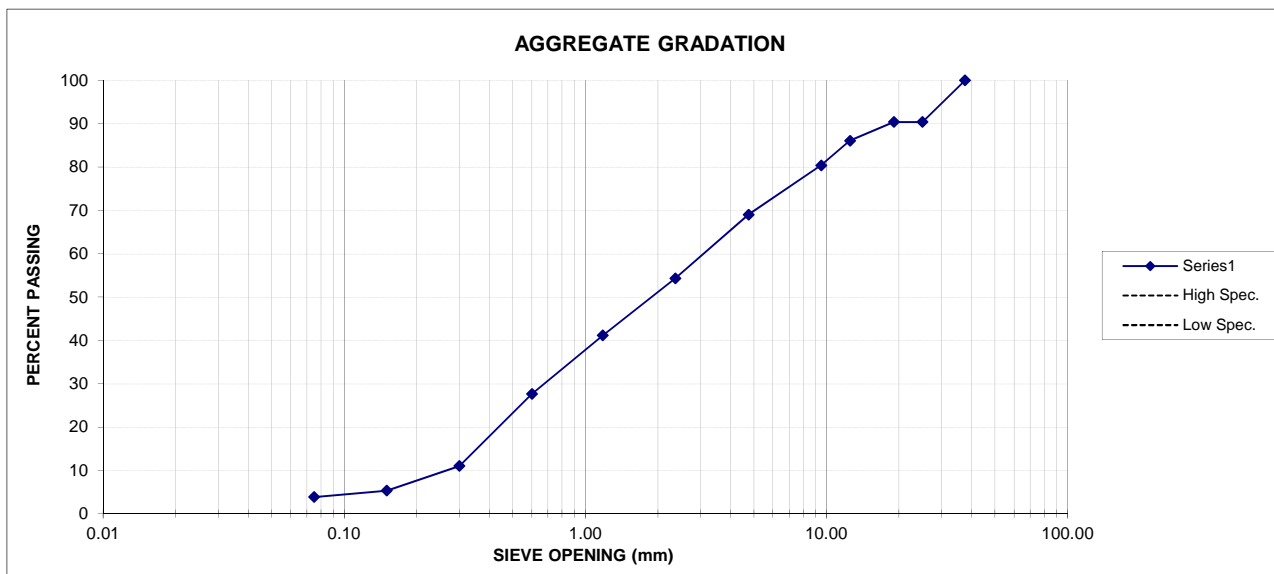
Material: Sand with some gravel, trace silt
Specification: n/a

Material Specification
Sieve High Spec. Low Spec.

Sieve Analysis
Sieve % Passing

Date Sampled 20-Jun-16
Date Tested 04-Jul-16
Sample No: 11
Fracture by mass 0.0%
Supplier: Native
Sampled by: PS
Tested by: GG
Moisture (%): 3.5

| | |
|-------|-------|
| 75.0 | |
| 63.0 | |
| 50.0 | |
| 37.5 | 100.0 |
| 25.0 | 90.4 |
| 19.0 | 90.4 |
| 12.5 | 86.1 |
| 9.5 | 80.4 |
| 4.75 | 69.1 |
| 2.36 | 54.4 |
| 1.18 | 41.2 |
| 0.600 | 27.7 |
| 0.300 | 11.0 |
| 0.150 | 5.3 |
| 0.075 | 3.9 |

AGGREGATE GRADATION:

REMARKS: Tested according to ASTM C- 136 and C-117

REPORTS TO: _____

WSP CANADA INC.

per: _____



WSP CANADA INC.
 760 Enterprise Crescent
 Victoria, BC
 Canada V8Z 6R4
 Tel.: 250-475-1000
 Fax.: 250-475-2211

Atterberg Limits

CLIENT: District of Oak Bay

FILE: 161-08447-00

PROJECT: Uplands Combined Sewer Separation Project

DATE: July 7, 2016

REPORT NO.: 1

SAMPLE #: 1

Plasticity Index 36.31

TP/BH: BH16-5

Liquidity Index 0.10

Grab Number:

Sample Depth: 8'

Class: Fat Clay

Natural MC: 27.8

| Plastic Limit | | | | Liquid Limit | | | | |
|--------------------------------|--------|--------|--------|------------------|-------|-------|-------|-------|
| Trial | 1 | 2 | 3 | Trial | 1 | 2 | 3 | 4 |
| Wt of Wet + T | 138.04 | 137.4 | 105.47 | Number of Blows | 29 | 25 | 21 | 15 |
| Wt of Dry + T | 136.37 | 135.82 | 103.61 | Wt of Wet + T | 29.91 | 24.67 | 25.24 | 25.23 |
| Wt of Tare | 129.42 | 129.27 | 96.06 | Wt of Dry + T | 20.14 | 16.85 | 17.07 | 17 |
| Mass of Water | 1.67 | 1.58 | 1.86 | Wt of Tare | 3.91 | 3.98 | 3.88 | 4.03 |
| Mass of Dry Soil | 6.95 | 6.55 | 7.55 | Mass of Water | 9.77 | 7.82 | 8.17 | 8.23 |
| Moisture Content | 24.03 | 24.12 | 24.64 | Mass of Dry Soil | 16.23 | 12.87 | 13.19 | 12.97 |
| Average | 24.26 | | | Moisture Content | 60.20 | 60.76 | 61.94 | 63.45 |
| Material Passing 425µm: _____ | | | | Corrected Limit | 61.41 | 60.78 | 60.59 | 59.52 |
| Material Retained 425µm: _____ | | | | Average | 60.57 | | | |

Sample

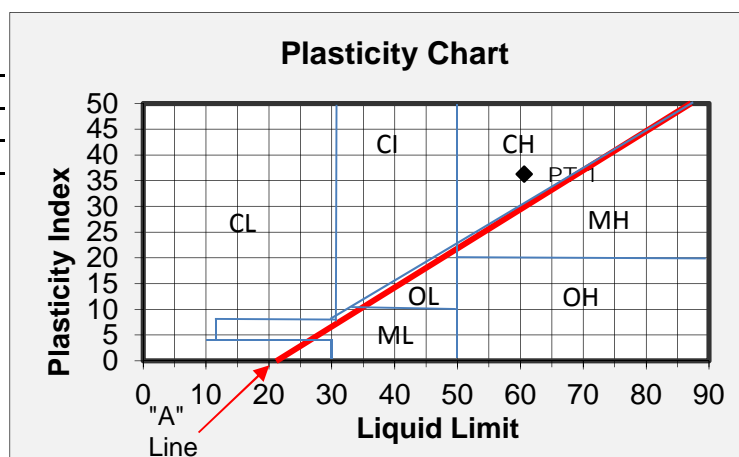
Fat Clay

Description:

Comments:

Legend

ML = Silt
 CL = Lean Clay
 OL = Organic Clay
 CI = CL or OL
 CH = Fat Clay
 MH = Elastic Silt
 OH = Organic Clay



This report represents a testing service only. No engineering interpretation opinion is expressed or implied. Engineering review and interpretation can be provided on written request.

Appendix G

TERMS OF REFERENCE FOR GEOTECHNICAL REPORTS

TERMS OF REFERENCE FOR GEOTECHNICAL REPORTS ISSUED BY WSP CANADA INC.

1. STANDARD OF CARE

WSP Canada Inc. ("WSP") prepared and issued this geotechnical report (the "Report") for its client (the "Client") in accordance with generally-accepted engineering consulting practices for the geotechnical discipline. No other warranty, expressed or implied, is made. Unless specifically stated in the Report, the Report does not address environmental issues.

The terms of reference for geotechnical reports issued by WSP (the "Terms of Reference") contained in the present document provide additional information and caution related to standard of care and the use of the Report. The Client should read and familiarize itself with these Terms of Reference.

2. COMPLETENESS OF THE REPORT

All documents, records, drawings, correspondence, data, files and deliverables, whether hard copy, electronic or otherwise, generated as part of the services for the Client are inherent components of the Report and, collectively, form the instruments of professional services (the "Instruments of Professional Services"). The Report is of a summary nature and is not intended to stand alone without reference to the instructions given to WSP by the Client, the communications between WSP and the Client, and to any other reports, writings, proposals or documents prepared by WSP for the Client relative to the specific site described in the Report, all of which constitute the Report.

TO PROPERLY UNDERSTAND THE INFORMATION, OBSERVATIONS, FINDINGS, SUGGESTIONS, RECOMMENDATIONS AND OPINIONS CONTAINED IN THE REPORT, REFERENCE MUST BE MADE TO THE WHOLE OF THE REPORT. WSP CANNOT BE RESPONSIBLE FOR USE BY ANY PARTY OF PORTIONS OF THE REPORT WITHOUT REFERENCE TO THE WHOLE REPORT AND ITS VARIOUS COMPONENTS.

3. BASIS OF THE REPORT

WSP prepared the Report for the Client for the specific site, development, building, design or building assessment objectives and purpose that the Client described to WSP. The applicability and reliability of any of the information, observations, findings, suggestions, recommendations and opinions contained in the Report are only valid to the extent that there was no material alteration to or variation from any of the said descriptions provided by the Client to WSP unless the Client specifically requested WSP to review and revise the Report in light of such alteration or variation.

4. USE OF THE REPORT

The information, observations, findings, suggestions, recommendations and opinions contained in the Report, or any component forming the Report, are for the sole use and benefit of the Client and the team of consultants selected by the Client for the specific project that the Report was provided. NO OTHER PARTY MAY USE OR RELY UPON THE REPORT OR ANY PORTION OR COMPONENT WITHOUT THE WRITTEN CONSENT OF WSP. WSP will consent to any reasonable request by the Client to approve the use of this Report by other parties designated by the Client as the "Approved Users". As a condition for the consent of WSP to approve the use of the Report by an Approved User, the Client must provide a copy of these Terms of Reference to that Approved User and the Client must obtain written confirmation from that Approved User that the Approved User will comply with these Terms of Reference, such written confirmation to be provided separately by each Approved User prior to beginning use of the Report. The Client will provide WSP with a copy of the written confirmation from an Approved User when it becomes available to the Client, and in any case, within two weeks of the Client receiving such written confirmation.

The Report and all its components remain the copyright property of WSP and WSP authorises only the Client and the Approved Users to make copies of the Report, but only in such quantities as are reasonably necessary for the use of the Report by the Client and the Approved Users. The Client and the Approved Users may not give, lend, sell or otherwise disseminate or make the Report, or any portion thereof, available to any party without the written permission of WSP. Any use which a third party makes of the Report, or any portion of the Report, is the sole responsibility of such third parties. WSP accepts no responsibility for damages suffered by any third party resulting from the use of the Report. The Client and the Approved Users acknowledge and agree to indemnify and hold harmless WSP, its officers, directors, employees, agents, representatives or sub-consultants, or any or all of them, against any claim of any nature whatsoever brought against WSP by any third parties, whether in contract or in tort, arising or related to the use of contents of the Report.

TERMS OF REFERENCE FOR GEOTECHNICAL REPORTS ISSUED BY WSP CANADA INC. (continued)

5. INTERPRETATION OF THE REPORT

- a. **Nature and Exactness of Descriptions:** The classification and identification of soils, rocks and geological units, as well as engineering assessments and estimates have been based on investigations performed in accordance with the standards set out in Paragraph 1 above. The classification and identification of these items are judgmental in nature and even comprehensive sampling and testing programs, implemented with the appropriate equipment by experienced personnel, may fail to locate some conditions. All investigations or assessments utilizing the standards of Paragraph 1 involve an inherent risk that some conditions will not be detected and all documents or records summarizing such investigations will be based on assumptions of what exists between the actual points sampled. Actual conditions may vary significantly between the points investigated and all persons making use of such documents or records should be aware of, and accept, this risk. Some conditions are subject to changes over time and the parties making use of the Report should be aware of this possibility and understand that the Report only presents the conditions at the sampled points at the time of sampling. Where special concerns exist, or when the Client has special considerations or requirements, the Client must disclose them to WSP so that additional or special investigations may be undertaken, which would not otherwise be within the scope of investigations made by WSP or the purposes of the Report.
- b. **Reliance on information:** The evaluation and conclusions contained in the Report have been prepared on the basis of conditions in evidence at the time of site investigation and field review and on the basis of information provided to WSP. WSP has relied in good faith upon representations, information and instructions provided by the Client and others concerning the site. Accordingly, WSP cannot accept responsibility for any deficiency, misstatement or inaccuracy contained in the report as a result of misstatements, omissions, misrepresentations or fraudulent acts of persons providing information.
- c. **Additional Involvement by WSP:** To avoid misunderstandings, WSP should be retained to assist other professionals to explain relevant engineering findings and to review the geotechnical aspects of the plans, drawings and specifications of other professionals relative to the engineering issues pertaining to the geotechnical consulting services provided by WSP. To ensure compliance and consistency with the applicable building codes, legislation, regulations, guidelines and generally-accepted practices, WSP should also be retained to provide field review services during the performance of any related work. Where applicable, it is understood that such field review services must meet or exceed the minimum necessary requirements to ascertain that the work being carried out is in general conformity with the recommendations made by WSP. Any reduction from the level of services recommended by WSP will result in WSP providing qualified opinions regarding adequacy of the work.

6. ALTERNATE REPORT FORMAT

When WSP submits both electronic and hard copy versions of the Instruments of Professional Services, the Client agrees that only the signed and sealed hard copy versions shall be considered final and legally binding upon WSP. The hard copy versions submitted by WSP shall be the original documents for record and working purposes, and, in the event of a dispute or discrepancy, the hard copy versions shall govern over the electronic versions; furthermore, the Client agrees and waives all future right of dispute that the original hard copy signed and sealed versions of the Instruments of Professional Services maintained or retained, or both, by WSP shall be deemed to be the overall originals for the Project.

The Client agrees that the electronic file and hard copy versions of Instruments of Professional Services shall not, under any circumstances, no matter who owns or uses them, be altered by any party except WSP. The Client warrants that the Instruments of Professional Services will be used only and exactly as submitted by WSP.

The Client recognizes and agrees that WSP prepared and submitted electronic files using specific software or hardware systems, or both. WSP makes no representation about the compatibility of these files with the current or future software and hardware systems of the Client, the Approved Users or any other party. The Client further agrees that WSP is under no obligation, unless otherwise expressly specified, to provide the Client, the Approved Users and any other party, or any or all of them, with specific software and hardware systems that are compatible with any electronic submitted by WSP. The Client further agrees that should the Client, an Approved User or a third party require WSP to provide specific software or hardware systems, or both, compatible with the electronic files prepared and submitted by WSP, for any reason whatsoever included but not restricted to an order from a court, then the Client will pay WSP for all reasonable costs related to the provision of the specific software or hardware systems, or both. The Client further agrees to indemnify and hold harmless WSP, its officers, directors, employees, agents, representative or sub-consultant, or any or all of them, against any claim or any nature whatsoever brought against WSP, whether in contract or in tort, arising or related to the provision or use of any specific software or hardware provided by WSP.