

APPENDIX 'A'

GEOTECHNICAL REPORT

APPENDIX 'A' - GEOTECHNICAL REPORT

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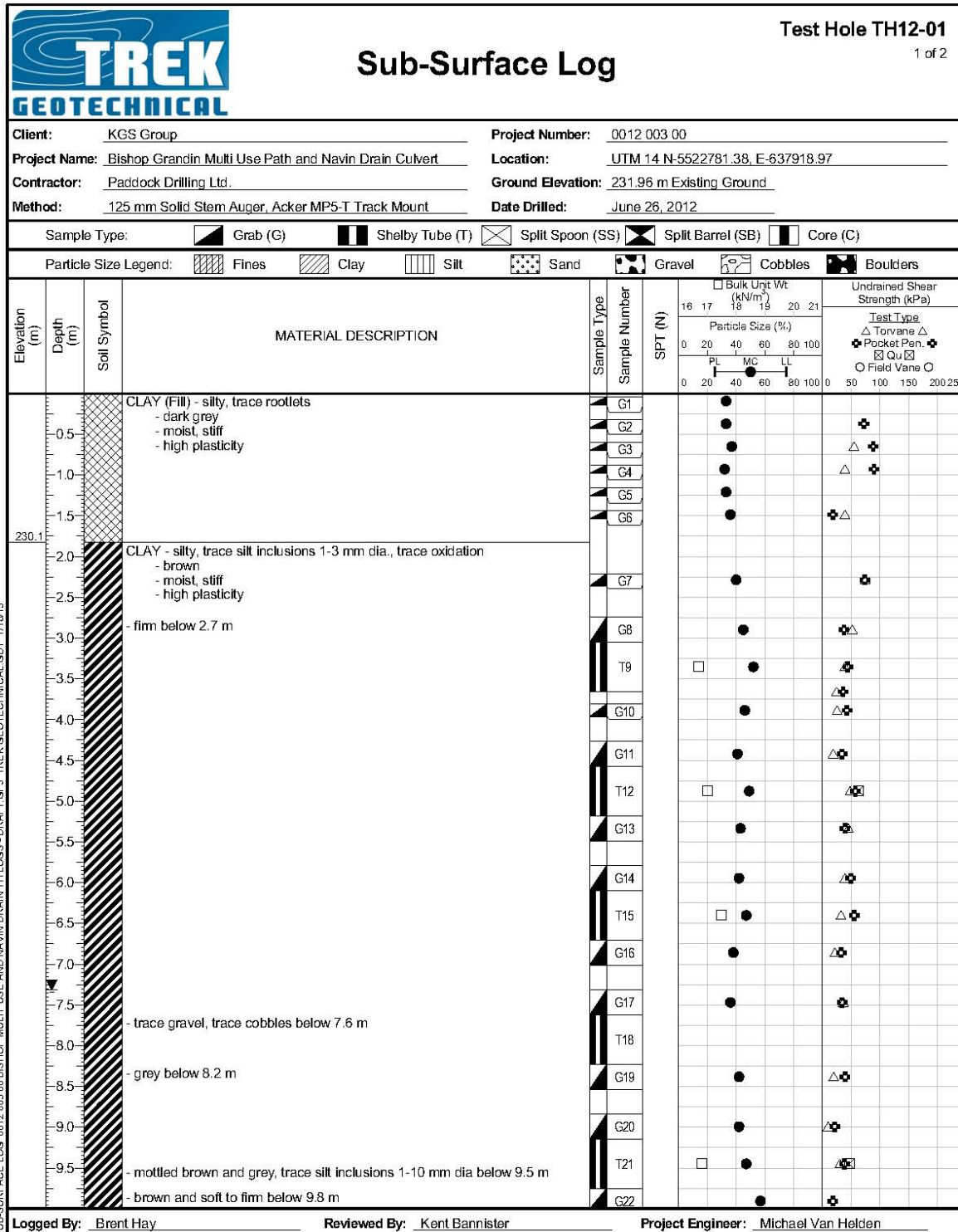
The geotechnical report is provided to aid in the Contractor's evaluation of the existing pavement soil conditions. The information presented is considered accurate at the locations shown on the Drawings and at the time of drilling. However, variations in pavement soil conditions may exist between test holes and fluctuations in groundwater levels can be expected seasonally and may occur as a result of construction activities. The nature and extent of variations may not become evident until construction commences.

Geotechnical Report for Bishop Grandin Blvd/Shorehill Dr to Beaverhill Blvd: Multi-Use Path and Navin Drain Cast-In-Place Culvert

Test Hole Locations













Test Hole Log for TH12-01







SUB-SURFACE LOG 0012 003 00 BISHOP MULT USE AND NAVIN DRAIN TH LOGS - DR4FT.GPJ - TREK GEOTECHNICAL.GDT 11/8/13

Test Hole Log for TH12-02

|  | | <h2 style="margin: 0;">Sub-Surface Log</h2> | | Test Hole TH12-02 <small>1 of 1</small> | | | | | | |
|---|-------------|---|---|---|---------------|---|---|--|---|--|
| Client: <u>KGS Group</u> | | Project Number: <u>0012 003 00</u> | | | | | | | | |
| Project Name: <u>Bishop Grandin Multi Use Path and Navin Drain Culvert</u> | | Location: <u>UTM 14 N-5522890.383, E-637921.946</u> | | | | | | | | |
| Contractor: <u>Paddock Drilling Ltd.</u> | | Ground Elevation: <u>231.65 m Existing Ground</u> | | | | | | | | |
| Method: <u>125 mm Solid Stem Auger, Acker MP5-T Track Mount</u> | | Date Drilled: <u>June 26, 2012</u> | | | | | | | | |
| Sample Type: <input checked="" type="checkbox"/> Grab (G) <input type="checkbox"/> Shelby Tube (T) <input type="checkbox"/> Split Spoon (SS) <input type="checkbox"/> Split Barrel (SB) <input type="checkbox"/> Core (C) | | | | | | | | | | |
| Particle Size Legend: <input checked="" type="checkbox"/> Fines <input type="checkbox"/> Clay <input type="checkbox"/> Silt <input type="checkbox"/> Sand <input type="checkbox"/> Gravel <input type="checkbox"/> Cobbles <input type="checkbox"/> Boulders | | | | | | | | | | |
| Elevation (m) | Depth (m) | Soil Symbol | MATERIAL DESCRIPTION | Sample Type | Sample Number | SPT (N) | <input type="checkbox"/> Bulk Unit Wt (kN/m ³) 16 17 18 19 20 21 | | Undrained Shear Strength (kPa) Test Type Δ Torvane Δ ♦ Pocket Pen. ♦ ⊠ Qu ⊠ ○ Field Vane ○ | |
| | | | | | | | Particle Size (%) 0 20 40 60 80 100 PL MC LL | | 0 50 100 150 200 250 | |
| | |  | CLAY - silty - dark grey - moist, stiff to very stiff - high plasticity |  | G37 | ● | | | | |
| | 0.5 | | |  | G38 | ● | | | ♦ | |
| | | | |  | G39 | ● | | | ♦ | |
| | 1.0 | | - trace silt inclusions 1-3 mm in diameter below 1.0 m |  | G40 | ● | | | ♦ | |
| | | | |  | G41 | ● | | | ♦ | |
| | 1.5 | | |  | G42 | ● | | | ♦ | |
| | | | - brown below 2.1 m | | | | | | | |
| | 2.5 | | - firm to stiff below 2.4 m |  | G43 | ● | | | ♦ | |
| | | | |  | G44 | ● | | | ♦ | |
| | 228.6 - 3.0 | | END OF TEST HOLE AT 3.1 m IN CLAY Notes: 1) No sloughing or seepage observed. 2) Test hole backfilled with auger cuttings upon completion. | | | | | | | |
| Logged By: <u>Brent Hay</u> | | | | | | Reviewed By: <u>Kent Bannister</u> | | Project Engineer: <u>Michael Van Helden</u> | | |


SUB-SURFACE LOG 0012 003 00 BISHOP MULT USE AND NAVIN DRAIN TH LOGS - DR4FT.GPJ TREK GEOTECHNICAL.GDT 11:18:13

Test Hole Log for TH12-03

|  | | <h2 style="margin: 0;">Sub-Surface Log</h2> | | Test Hole TH12-03 <small>1 of 1</small> | | | | | |
|---|-----------|--|--|---|--|--|--|---|--|
| Client: <u>KGS Group</u> | | Project Number: <u>0012 003 00</u> | | | | | | | |
| Project Name: <u>Bishop Grandin Multi Use Path and Navin Drain Culvert</u> | | Location: <u>UTM 14 N-5522967.179, E-637918.972</u> | | | | | | | |
| Contractor: <u>Paddock Drilling Ltd.</u> | | Ground Elevation: <u>231.71 m Existing Ground</u> | | | | | | | |
| Method: <u>125 mm Solid Stem Auger, Acker MP5-T Track Mount</u> | | Date Drilled: <u>June 26, 2012</u> | | | | | | | |
| Sample Type: <input checked="" type="checkbox"/> Grab (G) <input type="checkbox"/> Shelby Tube (T) <input type="checkbox"/> Split Spoon (SS) <input type="checkbox"/> Split Barrel (SB) <input type="checkbox"/> Core (C) | | | | | | | | | |
| Particle Size Legend: <input checked="" type="checkbox"/> Fines <input type="checkbox"/> Clay <input type="checkbox"/> Silt <input type="checkbox"/> Sand <input type="checkbox"/> Gravel <input type="checkbox"/> Cobbles <input type="checkbox"/> Boulders | | | | | | | | | |
| Elevation (m) | Depth (m) | Soil Symbol | MATERIAL DESCRIPTION | Sample Type | Sample Number | Bulk Unit Wt (kN/m ³) 16 17 18 19 20 21 | | Undrained Shear Strength (kPa) | |
| | | | | | | Particle Size (%) 0 20 40 60 80 100 PL MC LL | | Test Type Δ Torvane Δ ♦ Pocket Pen. ♦ □ Qu □ ○ Field Vane ○ | |
| 228.7 | 3.0 |  | CLAY - silty - dark grey - moist, stiff to very stiff - high plasticity - brown below 1.0 m - trace silt inclusions 1-3 mm in diameter below 1.2 m - firm to stiff below 2.1 m | <input checked="" type="checkbox"/> G | G45 G46 G47 G48 G49 G50 G51 G52 |  |  | | |
| END OF TEST HOLE AT 3.1 m IN CLAY Notes: 1) No sloughing or seepage observed. 2) Test hole backfilled with auger cuttings upon completion. | | | | | | | | | |
| Logged By: <u>Brent Hay</u> Reviewed By: <u>Kent Bannister</u> Project Engineer: <u>Michael Van Helden</u> | | | | | | | | | |

SUB-SURFACE LOG 0012 003 00 BISHOP MULT USE AND NAVIN DRAIN TH LOGS - DR4FT.GPJ_TREK\GEOTECHNICAL.GDT_111813

Test Hole Log for TH12-04

| | | | | | | |
|--|--|--|------------------------------|--|---|--------------------------------|
|  | | <h1>Sub-Surface Log</h1> | | Test Hole TH12-04 1 of 1 | | |
| Client: KGS Group | | Project Number: 0012 003 00 | | | | |
| Project Name: Bishop Grandin Multi Use Path and Navin Drain Culvert | | Location: See Test Hole Location Plan | | | | |
| Contractor: Paddock Drilling Ltd. | | Ground Elevation: Not Surveyed | | | | |
| Method: 125mm Solid Stem Auger RM30 | | Date Drilled: December 17, 2013 | | | | |
| Sample Type: <input type="checkbox"/> Grab (G) <input checked="" type="checkbox"/> Shelby Tube (T) <input type="checkbox"/> Split Spoon (SS) <input type="checkbox"/> Split Barrel (SB) <input type="checkbox"/> Core (C) | | | | | | |
| Particle Size Legend: <input type="checkbox"/> Fines <input type="checkbox"/> Clay <input type="checkbox"/> Silt <input type="checkbox"/> Sand <input type="checkbox"/> Gravel <input type="checkbox"/> Cobbles <input type="checkbox"/> Boulders | | | | | | |
| Depth (m) | Soil Symbol | MATERIAL DESCRIPTION | Sample Type Sample Number | <input type="checkbox"/> Bulk Unit Wt (kN/m ³) 16 17 18 19 20 21 | | Undrained Shear Strength (kPa) |
| | | | | Particle Size (%) 0 20 40 60 80 100 PL MC LL 0 20 40 60 80 100 0 50 100 150 200 250 | | |
| 0.0 | CLAY - silty, trace sand, trace organics - dark grey - moist, soft to firm - intermediate plasticity -no organics below 0.3 m | G11 | ● | ● | ● | ● |
| 0.5 | -trace clay and dry below 0.5 m | G12 | ● | ● | ● | ● |
| 1.0 | SILT - clayey, trace sand, trace oxidation - light brown - moist, firm to stiff - low plasticity | G13 | ● | ● | ● | ● |
| 1.5 | CLAY - silty, trace silt inclusions (<2 mm diam.), trace silt laminations (<2 mm diam.) - dark grey - moist, stiff to very stiff - high plasticity | G14 | ● | ● | ● | ● |
| 2.0 | -occasional dropstone (<20 mm diam.) below 1.4 m | G15 | ● | ● | ● | ● |
| 2.5 | -mottled grey and brown below 1.7 m | G16 | ● | ● | ● | ● |
| 3.0 | -firm to stiff below 2.6 m | G17 | ● | ● | ● | ● |
| 3.1 | END OF HOLE AT 3.1 m IN CLAY | G18 | ● | ● | ● | ● |
| 3.2 | Notes: 1) No seepage or sloughing observed. 2) Test hole was dry upon completion. 3) Test hole squeezed in to 1.5 m below ground surface upon completion. 3) Test hole backfilled with auger cuttings upon completion. | G19 | ● | ● | ● | ● |
| 3.3 | Notes: 1) No seepage or sloughing observed. 2) Test hole was dry upon completion. 3) Test hole squeezed in to 1.5 m below ground surface upon completion. 3) Test hole backfilled with auger cuttings upon completion. | G20 | ● | ● | ● | ● |
| Logged By: Tom Hildahl Reviewed By: Kent Bannister Project Engineer: Michael Van Helden | | | | | | |

SUB-SURFACE LOG 0012 003 00 BISHOP MULT USE AND NAVIN DRAIN TH LOGS - DR4FT.GPJ, TREK GEOTECHNICAL.GDT, 11/18/13

Test Hole Log for TH12-06

| | | <h2 style="margin: 0;">Sub-Surface Log</h2> | | Test Hole TH12-06 1 of 1 | | |
|--|---|--|-------------|--|--------------------------------|---|
| Client: <u>KGS Group</u> | | Project Number: <u>0012 003 00</u> | | | | |
| Project Name: <u>Bishop Grandin Multi Use Path and Navin Drain Culvert</u> | | Location: <u>See Test Hole Location Plan</u> | | | | |
| Contractor: <u>Paddock Drilling Ltd.</u> | | Ground Elevation: <u>Not Surveyed</u> | | | | |
| Method: <u>125mm Solid Stem Auger RM30</u> | | Date Drilled: <u>December 17, 2013</u> | | | | |
| Sample Type: <input type="checkbox"/> Grab (G) <input checked="" type="checkbox"/> Shelby Tube (T) <input type="checkbox"/> Split Spoon (SS) <input type="checkbox"/> Split Barrel (SB) <input type="checkbox"/> Core (C) | | | | | | |
| Particle Size Legend: <input checked="" type="checkbox"/> Fines <input checked="" type="checkbox"/> Clay <input type="checkbox"/> Silt <input type="checkbox"/> Sand <input type="checkbox"/> Gravel <input type="checkbox"/> Cobbles <input type="checkbox"/> Boulders | | | | | | |
| Depth (m) | Soil Symbol | MATERIAL DESCRIPTION | Sample Type | Sample Number | SPT (N) | |
| | | | | | Undrained Shear Strength (kPa) | |
| Bulk Unit Wt (kN/m ³): 16 17 18 19 20 21 Particle Size (%): 0 20 40 60 80 100 PL MC LL 0 20 40 60 80 100 0 50 100 150 200 250 | | | | | | |
| 1.1813 | SUB-SURFACE LOG 0012 003 00 BISHOP MULTI USE AND NAVIN DRAIN TH LOGS - DRAFT GRJ - TREK GEOTECHNICAL.GDT 11/18/13 | CLAY (Fill) - silty, trace sand, trace gravel, trace organics, trace rootlets (<1 mm diam.) - grey - moist, firm - high plasticity | ▲ | G01 | ● | |
| -0.5 | | SILT (Fill) - some clay, some sand, trace gravel - light grey, dry, soft to firm, intermediate plasticity | ▲ | G02 | ● | ▨ |
| -1.0 | | CLAY (Fill) - silty, trace sand, trace gravel, trace silt inclusions (<5 mm diam.), trace oxidation - grey - moist, stiff to very stiff - high plasticity | ▲ | G03 | ● | |
| -1.5 | | CLAY (Fill) - silty, trace sand, trace gravel, trace silt inclusions (<5 mm diam.), trace oxidation - grey - moist, stiff to very stiff - high plasticity | ▲ | G04 | ● | △ |
| -2.0 | | CLAY (Fill) - silty, trace sand, trace gravel, trace silt inclusions (<5 mm diam.), trace oxidation - grey - moist, stiff to very stiff - high plasticity | ▲ | G05 | ● | △ |
| -2.5 | | SAND (Fill) - trace silt, trace clay, trace gravel - brown - wet, compact - poorly graded, coarse grained | ▲ | G06 | ● | ◆ |
| -3.0 | | CLAY - silty - mottled brown and grey - moist, firm to stiff, high plasticity | ▲ | G07 | ● | ◆ |
| | | CLAY - silty - mottled brown and grey - moist, firm to stiff, high plasticity | ▲ | G08 | ● | ◆ |
| | | SAND (Fill) - trace silt, trace clay, trace gravel - brown - wet, compact - poorly graded, coarse grained | ▲ | G09 | ● | ◆ |
| | | CLAY - silty - mottled brown and grey - moist, firm to stiff, high plasticity | ▲ | G10 | ● | ◆ |
| END OF HOLE AT 3.1 m IN CLAY Notes: 1) Test hole was dry upon completion. 2) Sloughing observed at 2.4 m in sand fill. 3) Test hole backfilled with auger cuttings upon completion. | | | | | | |
| Logged By: <u>Tom Hildahl</u> | | Reviewed By: <u>Kent Bannister</u> | | Project Engineer: <u>Michael Van Helden</u> | | |

Particle Size Analysis for TH12-04

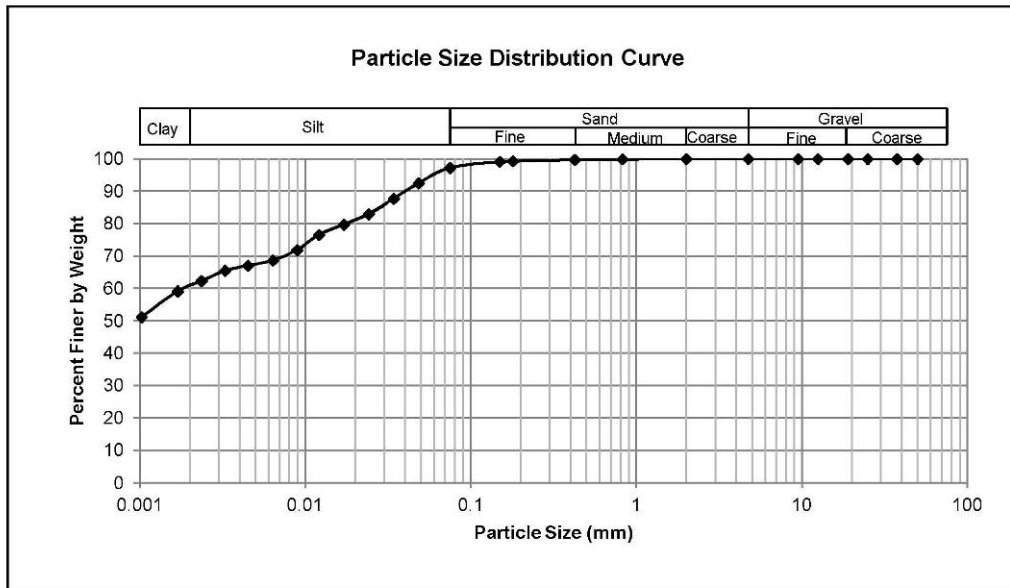


Grain Size Analysis (Hydrometer Method) ASTM D422

Project No. 0012 003 00
Client KGS Group
Project Bishop Grandin Multi-Use Path and Navin Drain Culvert

Test Hole TH12-04
Sample # G12
Depth (m) 4.6 - 5.0
Sample Date 17-Dec-12
Test Date 8-Jan-13
Technician Beta Taryana

| | |
|---------------|-------|
| Gravel | 0.0% |
| Sand | 2.8% |
| Silt | 36.2% |
| Clay | 61.0% |



| Gravel | | Sand | | Silt and Clay | |
|--------------------|-----------------|--------------------|-----------------|--------------------|-----------------|
| Particle Size (mm) | Percent Passing | Particle Size (mm) | Percent Passing | Particle Size (mm) | Percent Passing |
| 50.0 | 100.00 | 4.75 | 100.00 | 0.0750 | 97.22 |
| 37.5 | 100.00 | 2.00 | 100.00 | 0.0484 | 92.45 |
| 25.0 | 100.00 | 0.825 | 99.90 | 0.0343 | 87.69 |
| 19.0 | 100.00 | 0.425 | 99.73 | 0.0242 | 82.92 |
| 12.5 | 100.00 | 0.180 | 99.28 | 0.0171 | 79.75 |
| 9.50 | 100.00 | 0.150 | 99.14 | 0.0121 | 76.57 |
| 4.75 | 100.00 | 0.075 | 97.22 | 0.0089 | 71.81 |
| | | | | 0.0064 | 68.63 |
| | | | | 0.0045 | 67.04 |
| | | | | 0.0033 | 65.46 |
| | | | | 0.0024 | 62.28 |
| | | | | 0.0017 | 59.10 |
| | | | | 0.0010 | 51.16 |

Particle Size Analysis for TH12-05

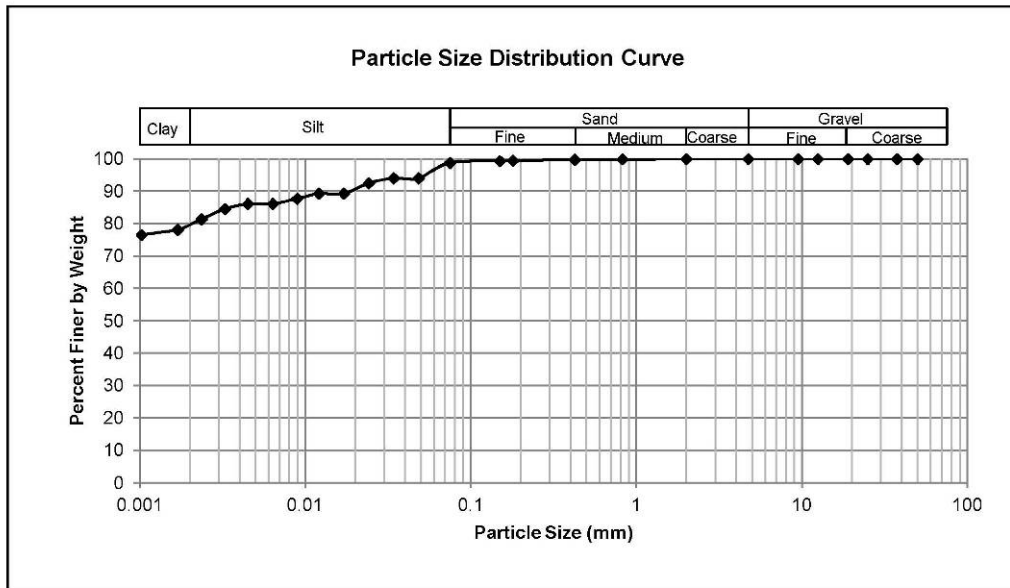


Grain Size Analysis (Hydrometer Method) ASTM D422

Project No. 0012 003 00
Client KGS Group
Project Bishop Grandin Multi-Use Path and Navin Drain Culvert

Test Hole TH12-05
Sample # G22
Depth (m) 4.6 - 5.0
Sample Date 17-Dec-12
Test Date 8-Jan-13
Technician Beta Taryana

| | |
|---------------|-------|
| Gravel | 0.0% |
| Sand | 1.2% |
| Silt | 18.7% |
| Clay | 80.1% |



| Gravel | | Sand | | Silt and Clay | |
|--------------------|-----------------|--------------------|-----------------|--------------------|-----------------|
| Particle Size (mm) | Percent Passing | Particle Size (mm) | Percent Passing | Particle Size (mm) | Percent Passing |
| 50.0 | 100.00 | 4.75 | 100.00 | 0.0750 | 98.78 |
| 37.5 | 100.00 | 2.00 | 100.00 | 0.0484 | 94.04 |
| 25.0 | 100.00 | 0.825 | 99.87 | 0.0343 | 94.04 |
| 19.0 | 100.00 | 0.425 | 99.78 | 0.0242 | 92.45 |
| 12.5 | 100.00 | 0.180 | 99.46 | 0.0171 | 89.28 |
| 9.50 | 100.00 | 0.150 | 99.38 | 0.0121 | 89.28 |
| 4.75 | 100.00 | 0.075 | 98.78 | 0.0089 | 87.69 |
| | | | | 0.0064 | 86.10 |
| | | | | 0.0045 | 86.10 |
| | | | | 0.0033 | 84.51 |
| | | | | 0.0024 | 81.34 |
| | | | | 0.0017 | 78.16 |
| | | | | 0.0010 | 76.57 |

Particle Size Analysis for TH12-06

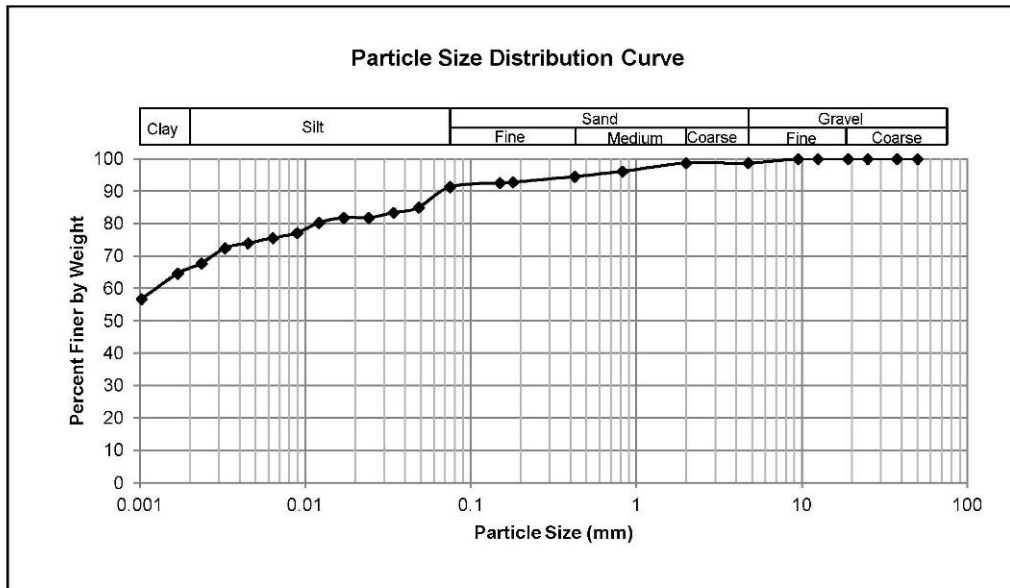


Grain Size Analysis (Hydrometer Method) ASTM D422

Project No. 0012 003 00
Client KGS Group
Project Bishop Grandin Multi-Use Path and Navin Drain Culvert

Test Hole TH12-06
Sample # G2
Depth (m) 4.6 - 5.0
Sample Date 17-Dec-12
Test Date 8-Jan-13
Technician Beta Taryana

| | |
|---------------|-------|
| Gravel | 1.3% |
| Sand | 7.4% |
| Silt | 25.5% |
| Clay | 65.9% |



| Gravel | | Sand | | Silt and Clay | |
|--------------------|-----------------|--------------------|-----------------|--------------------|-----------------|
| Particle Size (mm) | Percent Passing | Particle Size (mm) | Percent Passing | Particle Size (mm) | Percent Passing |
| 50.0 | 100.00 | 4.75 | 98.71 | 0.0750 | 91.31 |
| 37.5 | 100.00 | 2.00 | 98.65 | 0.0484 | 84.94 |
| 25.0 | 100.00 | 0.825 | 96.13 | 0.0343 | 83.37 |
| 19.0 | 100.00 | 0.425 | 94.51 | 0.0242 | 81.81 |
| 12.5 | 100.00 | 0.180 | 92.79 | 0.0171 | 81.81 |
| 9.50 | 100.00 | 0.150 | 92.56 | 0.0121 | 80.24 |
| 4.75 | 98.71 | 0.075 | 91.31 | 0.0089 | 77.11 |
| | | | | 0.0064 | 75.54 |
| | | | | 0.0045 | 73.97 |
| | | | | 0.0033 | 72.41 |
| | | | | 0.0024 | 67.71 |
| | | | | 0.0017 | 64.57 |
| | | | | 0.0010 | 56.74 |