



**Submitted To AECOM Canada Ltd.
189 Wyld Street Suite 103, North Bay, Ontario P1B 1Z2
On Behalf of the Ontario Ministry of Transportation**

**Highway 11 Rehabilitation
Proposed Grade Raise
Station 18+700 to 19+700 - Twp. of Gladman
GWP 712-92-00**

**Highway 11
From 19 km South of Highway 64, Northerly 28.8 km**

FINAL FOUNDATION INVESTIGATION REPORT

Date: December 5, 2013
Ref. N°: 12/09/12193

Geocres No. 31L-174

LVM | MERLEX

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Proposed Grade Raise
Stations 18+700 to 19+700 - Twp. of Gladman
GWP 712-92-00**

Final Foundation Investigation Report

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Client:

AECOM Canada Ltd.

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Attention: **Mr. Al Rose**

| REVISION AND PUBLICATION REGISTER | | |
|-----------------------------------|------------|---|
| Revision N° | Date | Modification And/Or Publication Details |
| 00 | 2013-06-19 | DRAFT Report Issued |
| 01 | 2013-12-05 | Final FIR Issued |

| REPORT DISTRIBUTION | |
|----------------------------------|---|
| 3 hard copies, 1 electronic copy | MTO Project Manager |
| 1 hard copy, 1 electronic copy | MTO Pavement and Foundations Section – Foundation Group |
| 1 hard copy | File |
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1 INTRODUCTION

LVM | MERLEX has been retained by AECOM Canada Ltd., on behalf of the Ministry of Transportation of Ontario (MTO), to carry out a foundation investigation for a proposed grade raise under GWP 712-92-00. The grade raise is located on Highway 11 between Stations 18+700 and 19+700 in the Township of Gladman.

The foundation investigation location was specified by the MTO in the RFP/TPM documentation Agreement No. 5011-E-0020. The terms of reference for the scope of work are outlined in LVM | MERLEX's Proposal P-12-075, dated May 2012. The purpose of this investigation was to determine the subsurface conditions in the area of the proposed grade raise in order to provide design and construction recommendations. LVM | MERLEX investigated the foundation area by the drilling of boreholes, carrying out in-situ tests, and performing laboratory testing on select samples.

It is understood that the MTO HST exemption request for the proposed grade raise has been declined and as such, this grade raise is not to be constructed at this time. Foundation design and construction recommendations have been developed for future use.

2 SITE DESCRIPTION

The terrain in the vicinity of this section of highway generally comprises a low wetland area with organic deposits. Bedrock outcrops were also observed along this section of the highway. The existing highway is constructed on a fill embankment currently supporting two lanes of undivided highway running in an approximately north-south direction. The embankment is generally constructed of granular (sand and gravel) fill with a section of rock fill.

Infrastructure along this section of highway consists of overhead wires on the west (left) side of the highway.

2.1 SITE PHYSIOGRAPHY AND SURFICIAL GEOLOGY

This project is located in the Geomorphic Sub-province known as the Eastern Sandy Uplands. The topography on this section of Highway 11 is generally slightly rolling and there are exposed bedrock ridges. At many locations, significant layers of earth overburden overlay the bedrock. Thick deposits of organic material were also observed. Within the project area, the overburden consists primarily of sands with varying amounts of silt and gravel.

3 INVESTIGATION PROCEDURES

The field work for this investigation was carried out during the period between December 5th, 2012 and March 20th, 2013 during which time twenty-two (22) sampled boreholes were advanced. For the purposes of design of the proposed grade raise, boreholes were advanced

through the existing road embankment and along the east (right) and west (left) toes of the embankment sideslopes.

The field investigation was carried out using both a muskeg bombardier rig and a truck mounted CME drill rig equipped with hollow stem augers, standard augers, and routine geotechnical sampling equipment. Soil samples were obtained at the borehole locations at regular intervals of depth using the standard 50 mm O.D. split spoon sampler advanced in accordance with the Standard Penetration Test (SPT) procedures (ASTM D-1586). The SPT method involves advancing a 50 mm O.D. split spoon sampler with the force of a 63.5 kg hammer freely dropping 760 mm mounted in a trip (automatic) hammer. The number of blows per 300 mm penetration was recorded as the “N” value. When cohesive deposits were encountered, the in-situ strength was measured using an “N” size field vane, vane collar, and calibrated torque meter. All samples taken during this investigation were stored in labeled airtight containers for transport to the LVM North Bay laboratory for visual examination and select laboratory testing.

At locations where auger refusal was met along the embankment, either on rock fill or assumed bedrock, unsampled holes were advanced at each of the borehole locations. The unsampled holes were advanced using a Hydrotrack HCR9-E5 drill rig to further delineate the underlying stratigraphy.

Groundwater conditions in the open boreholes were observed during the advancement of and immediately following completion of the individual boreholes. All open boreholes were backfilled upon completion with compacted auger cuttings in the general order they were removed and, where necessary, bentonite pellet backfill was added to the boreholes to bring them up to grade. At the boreholes advanced through the paved portion of the roadway embankment, the upper portion of the hole was backfilled with an asphalt cold patch to seal the existing asphalt surface and prevent ingress of moisture.

The field work for this investigation was conducted under the full time direction of an LVM senior field technician, who was responsible for locating the boreholes, clearing the borehole locations of underground services, in-situ sampling and testing operations, logging of the boreholes, labeling and preparation of samples for transport to our North Bay laboratory, plus overall drill supervision. All samples were visually examined in the LVM North Bay laboratory for textural classification to confirm the field classifications. Laboratory testing of select samples included routine testing for natural moisture contents, particle size analysis, plasticity index (Atterberg Limits), as well as specific gravity. The results of the laboratory testing are presented on the individual Record of Borehole Sheets (Appendix 2), with a summary of results presented on the laboratory sheets in Appendix C (Figures Nos. L-1 to L-9).

The locations of the individual boreholes were determined in the field using highway chainage/stationing (established by others) and offsets relative to highway centreline. The MTO co-ordinates, northing and easting, were then established for the boring locations. Elevations contained in this report are referenced to geodetic datum.

4 SUBSURFACE CONDITIONS

Details of the subsurface conditions revealed by the investigation program are presented on the enclosed Record of Borehole Logs (Appendix 2) and on Drawing Nos. 2 to 6 (Appendix 3). It should be noted that the stratigraphic delineation presented on the borehole logs and soil strata plot have been interpreted by LVM from the results of non-continuous sampling, response to drilling progress, SPT and Dynamic Cone Penetration Test (DCPT) results, plus field observations at the time of drilling. Typically such boundaries represent transitions from one zone to another and are not an exact demarcation of a specific geological unit. Additional consideration should therefore be given to the fact that subsurface conditions may vary markedly between adjacent boreholes and beyond any specific boring location, and are shown on the drawings for illustration purposes only.

4.1 GRADE RAISE, STATIONS 18+700 TO 19+700, TWP OF GLADMAN

A plan and profile illustrating the borehole locations and stratigraphic sequences is provided on Drawing Nos. 2 to 6, inclusive, Appendix 3. During the course of the exploration program, twenty-two (22) sampled boreholes were put down along the proposed alignment, with Borehole Nos. 1, 4, 5, 8, 9, 12, 13, 16, 17, 20, 21 and 22, advanced through the embankment. Borehole Nos. 3, 7, 11, 15, and 19 were advanced to the left (west) of centreline, and Boreholes Nos. 2, 6, 10, 14, and 18 were advanced to the right (east) of the existing embankment along the toe of the slope. At the time the field work was completed, the ground surface elevations at the borehole locations ranged from Elevation 289.1 to 293.9 m for the boreholes advanced at the embankment toe, and ranged from Elevation 290.8 to 294.7 m for the boreholes advanced through the embankment.

4.1.1 Pavement Structure

The existing pavement structure was determined at the boreholes advanced through the embankment. The pavement structure was confirmed to vary somewhat along the alignment, and generally consisted of an asphalt layer approximately 50 to 125 mm thick over a layer of Reclaimed Asphalt Pavement (RAP) ranging from about 125 to 300 mm thick. A layer of crushed gravel (base) approximately 100 to 400 mm thick was also encountered below the asphalt and/or RAP as part of the pavement structure at several of the embankment borehole locations. Borehole No. 9 was advanced through the highway shoulder, and the shoulder pavement structure at this location consisted of a layer of crushed gravel (base) approximately 125 mm thick.

4.1.2 Embankment Fill

Underlying the pavement structure, the boreholes advanced through the embankment encountered a deposit of fill consisting of brown sand trace to some silt some gravel to gravelly. The natural moisture content for samples of the embankment fill material ranged from 2 to 15%. Particle size analyses carried out on five (5) samples of this deposit indicated 19 to 31% gravel size particles, 52 to 73% sand size particles, and 7 to 18% silt and clay size particles (Figure

No. L-1, Appendix 3). Organics (peat) were encountered mixed with the fill at the bottom of this stratum at Borehole No. 1. This material was encountered to depths of 2.4, 2.1, 3.4, 1.2, 1.8, 1.4, 1.4, and 0.9 m below grade at Borehole Nos. 9, 12, 13, 16, 17, 20, 21, and 22, respectively (Elevations 288.6, 289.0, 287.6, 289.7, 289.2, 290.6, 292.5, and 293.8 m, respectively). Auger refusal was encountered in this deposit at depths of some 4.4, 1.1, 0.9, and 1.4 m below grade at Borehole Nos. 1, 4, 5, and 8, respectively (Elevations 286.6, 289.9, 289.9, and 289.4 m, respectively). A hydrotrack probe was advanced past the auger refusal depth into the silty sand stratum, at Borehole No. 1.

4.1.3 Rock Fill

Underlying the embankment fill at Borehole Nos. 4, 5, 8, and 17, a deposit of rock fill was encountered. Unsamped hydrotrack holes were advanced through the rock fill to determine the vertical extent of the rock fill. At Borehole No. 8, the rock fill deposit was determined to consist of cobble/boulder size rock with sand infilling the voids. The rock fill deposit was encountered to depths of 3.4, 4.3, 3.6, and 2.4 m below grade at Borehole Nos. 4, 5, 8, and 17, respectively (Elevations 287.6, 286.5, 287.2, and 288.6 m, respectively).

4.1.4 Fill

At Borehole Nos. 3, 6, 10, and 15, a layer of brown sand fill, trace silt, trace gravel to gravelly sand, some silt was encountered. A high concentration of cobble and boulder size rock pieces was encountered within this fill at Borehole No. 3. This material was mixed with peat at Borehole No. 15. The natural moisture content measured on samples of the granular portion of this deposit was in the order 15 to 30%. A particle size analysis carried out on a typical sample of this material (Borehole No. 3, Sample 2a) indicated 34% gravel size particles, 52% sand size particles, and 14% silt and clay size particles (Figure No. L-2, Appendix 3). The fill was encountered to depths of 0.9, 0.8, and 0.9 m below grade at Borehole Nos. 3, 10, and 15, respectively (Elevations 289.0, 289.7, and 289.0 m, respectively). Auger refusal on assumed bedrock was encountered at a depth of 0.5 m below grade at Borehole No. 6 (Elevation 289.5 m).

4.1.5 Peat

A deposit of black amorphous to fibrous peat was encountered at the ground surface at Borehole Nos. 2, 7, 11, 14, and 19, and underlying the embankment fill at Borehole Nos. 9, and 13 and the fill at Borehole Nos. 3 and 10. At Borehole No. 18, a layer of peat mixed with sand approximately 300 mm thick was penetrated at surface. The natural moisture contents of this peat deposit ranged from 29 to 836%. The consistency of this deposit, as indicated by in-situ vane shear strengths of 12 to greater than 100 kPa was predominantly soft with some stiff zones (see Figure No. L-8, Appendix 3). Auger refusal on assumed boulders in the underlying silty sand fill or possibly bedrock, was encountered in this deposit at depths of 2.8, and 3.4 m below grade at Borehole Nos. 7 and 10, respectively (Elevations 287.8, and 287.1 m, respectively). This peat deposit was encountered to depths of 6.5, 2.9, 3.7, 1.9, 4.0, 2.4, and

0.6 m below grade at Borehole Nos. 2, 3, 9, 11, 13, 14, and 19, respectively (Elevations 283.6, 287.0, 287.3, 287.9, 287.0, 287.4, and 289.9 m, respectively).

4.1.6 Clayey Silt

Underlying the peat at Borehole No. 2, a layer of grey clayey silt trace sand was penetrated extending to a depth of 7.7 m below grade (Elevation 282.4 m). The natural moisture content measured on samples of this material was approximately 40%. A grain size and hydrometer analysis carried out on a sample of this deposit, indicated 0% gravel size particles, 3% sand size particles, 69% silt size particles, and 28% clay size particles (Figure No. L-3, Appendix 3). Atterberg Limits testing carried out on a sample of this deposit indicated a Plastic Limit of 22% and a Liquid Limit of 30% and Plasticity Index of 8 (Figure No. L-7, Appendix 3). Based on the particle size analysis and Atterberg Limit test results, this deposit is classified as clayey silt of low plasticity (CL).

4.1.7 Silt

Underlying the peat at Borehole No. 13, a deposit of grey silt some sand some clay was penetrated. The natural moisture content of this deposit was about 21%. Grain size and hydrometer analyses carried out on a sample of this deposit indicated 0% gravel size particles, 11% sand size particles, and 75% silt size particles and 14% clay size particles (Figure No. L-3, Appendix 3). Atterberg Limits testing was carried out on one (1) sample of this deposit, indicated a Plastic Limit of 19% and a Liquid Limit of 23% (Figure No. L-7, Appendix 3). Based on the particle size analysis and Atterberg Limit test results, this deposit was described as non-plastic silt (ML). Auger refusal on assumed boulders in the silty sand till deposit was encountered at a depth of 5.4 m below grade (Elevation 285.6 m) in this borehole.

4.1.8 Silty Sand (Till)

A deposit consisting of heterogeneous mix of sands with variable silt and gravel content, generally described as a silty sand till, was proven underlying the clayey silt at Borehole No. 2, the peat at Borehole Nos. 3, 9, 11, 14, 18, and 19, the embankment fill at Borehole No. 12, 16, 20, 21 and 22, the rock fill at Borehole No. 17, the fill at Borehole Nos. 1 and 15, and the silt deposit at Borehole No. 13. This deposit had an apparent till structure. The natural moisture content measured on samples of this deposit ranged from 7 to 36%. Gradation analyses were carried out on thirteen (13) samples of this deposit, the results of which indicated 0 to 40% gravel size particles, 38 to 89% sand size particles, and 11 to 60% silt and clay size particles (Figure No. L-5 and L-6, Appendix 3). Based on SPT 'N' values of 3 to greater than 100 blows per 300 mm penetration, the compactness of this deposit was described as very loose to very dense, generally dense. Auger refusal was encountered in this deposit at depths of 9.3, 7.6, 4.5, 4.2, 3.5, 2.4, 1.3, and 8.6 m below grade at Borehole Nos. 2, 3, 11, 14, 15, 18, 19, and 22, respectively (Elevations 280.8, 282.3, 285.3, 285.6, 286.4, 286.7, 289.2, and 286.1 m, respectively). Auger refusal was encountered in this deposit at some embankment boreholes, however, unsampled hydrotrack probes could generally be advanced past auger refusal in this

deposit suggesting that auger refusal was encountered on boulders within the dense till. However, refusal on bedrock was confirmed at Borehole Nos. 9, 12, and 20. This deposit was proven to extend to depths of 6.1, 5.0, 6.6, 9.1, 4.8, and 7.3 m below grade at Borehole Nos. 1, 9, 12, 17, 20, and 21, respectively (Elevations 284.9, 286.0, 284.5, 281.9, 287.2, and 286.6 m, respectively). Borehole No. 13 and 16 were terminated in this deposit at depths of 10.7 and 11.6 m below grade, respectively (Elevation 280.3 and 279.3 m, respectively).

4.1.9 Bedrock

Unsampled hydrotrack probes were advanced to bedrock at Borehole Nos. 1, 4, 5, 8, 9, 12, 17, 20, and 21. The top of bedrock was inferred by the response of the drilling equipment. Boreholes were terminated in bedrock at depths of 10.7, 6.1, 7.3, 6.1, 7.6, 11.6, 11.6, 8.5, and 10.7 m below grade at Borehole Nos. 1, 4, 5, 8, 9, 12, 17, 20, and 21 (Elevations 280.3, 284.9, 283.5, 284.7, 283.4, 279.5, 279.4, 283.5, and 283.2 m, respectively).

4.2 GROUNDWATER DATA

Measurements of the groundwater level and cave-in levels were undertaken, where possible, in the open boreholes during the advance of the individual borings and upon completion of the field work. These levels are recorded on the individual Record of Borehole Log Sheets (Appendix B). The water levels in the boreholes advanced at the toe of the embankment were generally at or near surface, see Table 4-1.

Table 4-1 – Ground Water Data

| BOING ID (BH NO.) | GROUND SURFACE ELEVATION (m) | GROUNDWATER DEPTH (m) | GROUNDWATER ELEVATION (m) |
|----------------------|---------------------------------|--------------------------|------------------------------|
| 01 | 291.0 | 1.1 | 289.9 |
| 02 | 289.8 | -0.3* | 290.1 |
| 03 | 289.9 | 3.2 | 286.7 |
| 04 | 291.0 | DRY | - |
| 07 | 289.8 | 0.2 | 289.6 |
| 08 | 290.8 | DRY | - |
| 09 | 291.0 | DRY | - |
| 10 | 290.5 | 1.1 | 289.4 |
| 11 | 289.8 | 0 | 289.8 |
| 12 | 291.1 | DRY | - |
| 13 | 291.0 | 3.1 | 287.9 |
| 14 | 289.8 | 1.6 | 288.2 |
| 15 | 289.9 | 0.6 | 289.3 |
| 16 | 290.9 | 2.0 | 288.9 |
| 17 | 291.0 | DRY | - |
| 18 | 289.1 | -0.1* | 289.2 |
| 19 | 290.5 | -0.1* | 290.6 |
| 20 | 292.0 | DRY | - |
| 21 | 293.9 | 3.4 | 290.5 |
| 22 | 294.7 | 5.8 | 288.9 |

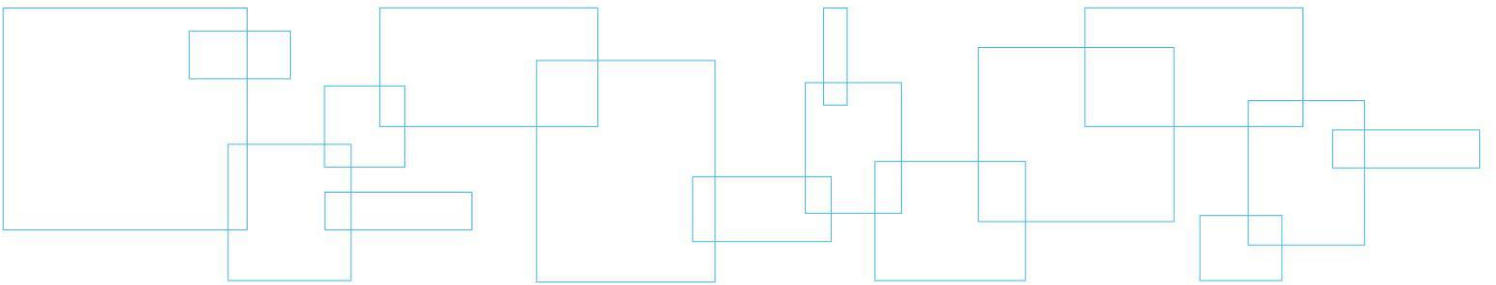
*A negative depth indicates water level encountered above ground surface.

The groundwater and surface water levels will fluctuate seasonally/yearly.

Appendix 1 Key Plan

Drawing No. 1

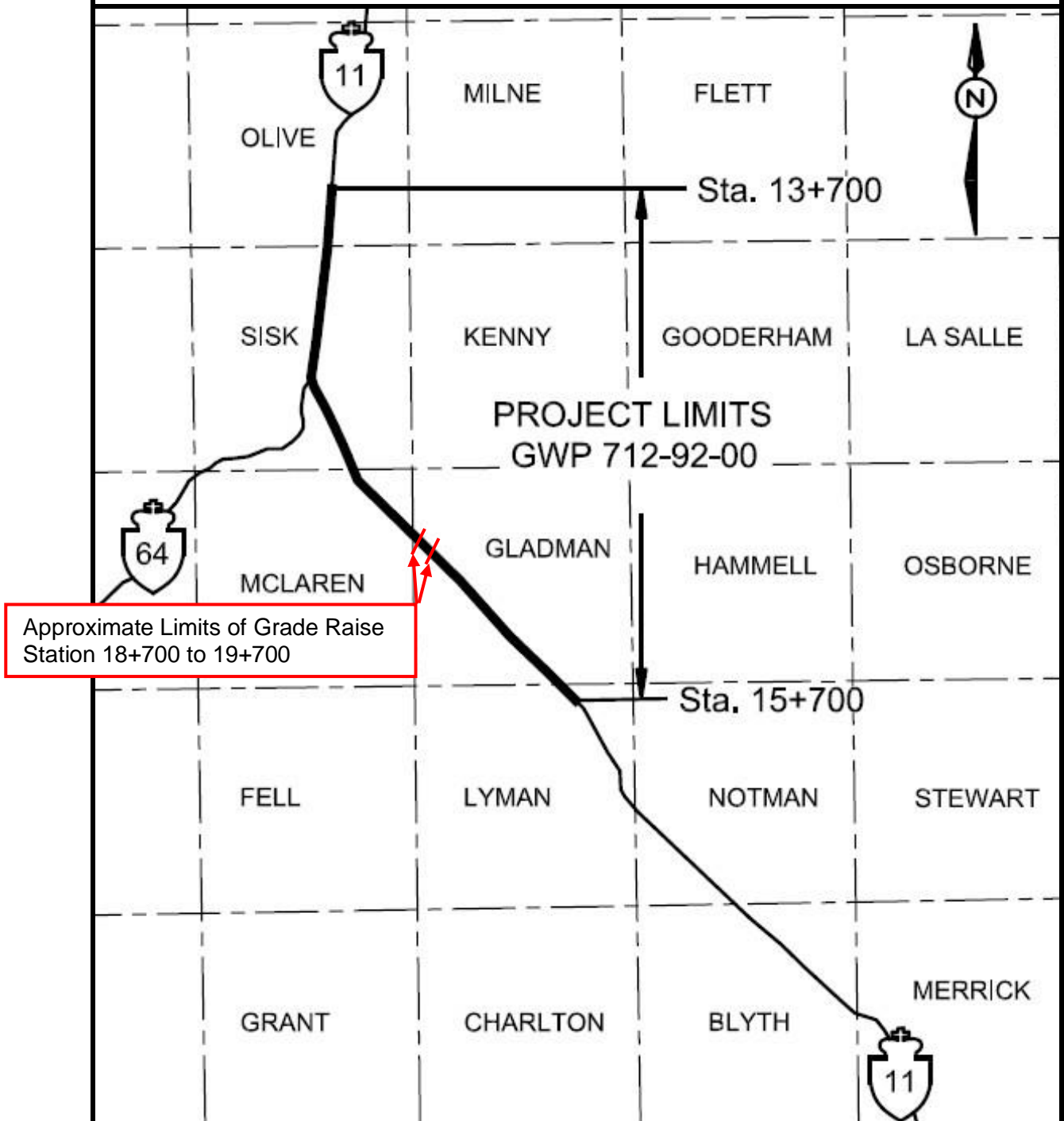
Key Plan



KEY PLAN

Drawing No. 1

NOT TO SCALE



**FINAL
FOUNDATION INVESTIGATION REPORT
GWP 712-92-00**

Highway 11, From 19.0 km South
of Highway 64, Northerly 28.8 km

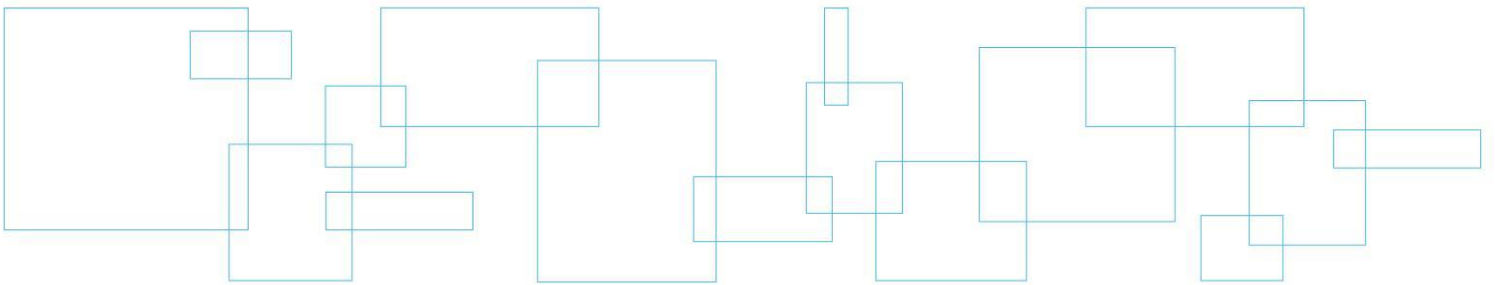
MEL Ref. No.: 12/09/12193

December 2013

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Appendix 2 Subsurface Data

| | |
|------------------------|-----------------------------------|
| Enclosure No. 1 | List of Abbreviations and Symbols |
| Enclosure Nos. 2 to 23 | Record of Borehole Sheet |



LIST OF ABBREVIATIONS & DESCRIPTION OF TERMS

The abbreviations and terms, used to describe retrieved samples and commonly employed on the borehole logs, on the figures and in the report are as follows:

1. ABBREVIATIONS

| | |
|-----|--|
| AS | Auger Sample |
| CS | Chunk Sample |
| DS | Denison type sample |
| FS | Foil Sample |
| NFP | No Further Progress |
| PH | Sampler advanced by hydraulic pressure |
| PM | Sampler advanced by manual pressure |
| RC | Rock core with size & percentage of recovery |
| SS | Split Spoon |
| ST | Slotted Tube |
| TO | Thin-walled, open |
| TP | Thin-walled, piston |
| WS | Wash Sample |

2. PENETRATION RESISTANCE/"N"

Dynamic Cone Penetration Test (DCPT):

A continuous profile showing the number of blows for each 300 mm of penetration of a 50 mm diameter 60° cone attached to AW rod driven by a 63 kg hammer falling 760 mm.

Plotted as —●—●—●—●—

Standard Penetration Test (SPT) or "N" Values

The number of blows of a 63 kg hammer falling 760 mm required to advance a 50 mm O.D. drive open sampler 300 mm.

3. SOIL DESCRIPTION

a) *Cohesionless Soils:*

| "N" (blows/0.3 m) | Relative Density |
|-------------------|------------------|
| 0 to 4 | very loose |
| 4 to 10 | loose |
| 10 to 30 | compact |
| 30 to 50 | dense |
| over 50 | very dense |

b) *Cohesive Soils:*

| Undrained Shear Strength (kPa) | Consistency |
|--------------------------------|-------------|
| Less than 12 | very soft |
| 12 to 25 | soft |
| 25 to 50 | firm |
| 50 to 100 | stiff |
| 100 to 200 | very stiff |
| over 200 | hard |

3. SOIL DESCRIPTION (Cont'd)

c) *Method of Determination of Undrained Shear Strength of Cohesive Soils:*

+ 3.2 - Field Vane test in borehole.
The number denotes the sensitivity to remoulding.

D - Laboratory Vane Test

" - Compression test in laboratory

For a saturated cohesive soil the undrained shear strength is taken as one-half of the undrained compressive strength.

4. TERMINOLOGY

Terminology used for describing soil strata is based on the proportion of individual particle sizes present in the samples (please note that, with the exception of those samples subject to a grain-size analysis, all samples were classified visually and the accuracy of visual examination is not sufficient to determine exact grain sizing):

| | |
|---------------------------------|---------------|
| Trace, or occasional | Less than 10% |
| Some | 10 to 20% |
| With | 20 to 30% |
| Adjective (i.e. silty or sandy) | 30 to 40% |
| And (i.e. sand and gravel) | 40 to 60% |

Terminology for cobbles and/or boulders frequency is an estimate based on drill response and field observations:

| | |
|------------|---|
| Occasional | Obstructions encountered in borehole, however advance is not severely impeded |
| Numerous | Obstructions appear essentially continuous over drilled length |

5. LABORATORY TESTS

| | |
|----|-----------------------|
| P | Standard Proctor Test |
| A | Atterberg Limit Test |
| GS | Grain Size Analysis |
| H | Hydrometer Analysis |
| C | Consolidation |

SAMPLE DESCRIPTION NOTES:

1. **FILL:** The term fill is used to designate all man-made deposits of natural soil and/or waste materials. The reader is cautioned that fill materials can be very heterogeneous in nature and variable in depth, density and degree of compaction. Fill materials can be expected to contain organics, waste materials, construction materials, shot rock, rip-rap, and/or larger obstructions such as boulders, concrete foundations, slabs, abandoned tanks, etc.; none of which may have been encountered in the borehole. The description of the material penetrated in the borehole therefore may not be applicable as a general description of the fill material on the site as boreholes cannot accurately define the nature of fill material. During the boring and sampling process, retrieved samples may have certain characteristics that identify them as 'fill'. Fill materials (or possible fill materials) will be designated on the Borehole Logs. If fill material is identified on the site, it is highly recommended that testpits be put down to delineate the nature of the fill material. However, even through the use of testpits defining the true nature and composition of the fill material cannot be guaranteed. Fill deposits often contain pockets or seams of organics, organically contaminated soils or other deleterious material that can cause settlement or result in the production of methane gas. It should be noted that the origins and history of fill material is frequently very vague or non-existent. Often fill material may be contaminated beyond environmental guidelines and the material will have to be disposed of at a designated site (i.e. registered landfill). Unless requested or stated otherwise in this report, fill material on this site has not been tested for contaminants however, environmental testing of the fill material can be carried out at your request. Detection of underground storage tanks cannot be determined with conventional geotechnical procedures.
2. **TILL:** The term till indicates a material that is an unstratified, glacial deposit, heterogeneous in nature and, as such, may consist of mixtures and pockets of clay, silt, sand, gravel, cobbles and/or boulders. These heterogeneous deposits originate from a geological process associated with glaciation. It must be noted that due to the highly heterogeneous nature of till deposits, the description of the deposit on the borehole log may only be applicable to a very limited area and therefore, caution must be exercised when dealing with a till deposit. When excavating in till, contractors may encounter cobbles/boulders or possibly bedrock even if they are not indicated on the borehole logs. It must be appreciated that conventional geotechnical sampling equipment does not identify the nature or size of any obstruction.
3. **BEDROCK:** Auger refusal may be due to the presence of bedrock, but possibly could also be due to the presence of very dense underlying deposits, boulders or other large obstructions. Auger refusal is defined as the point at which an auger can no longer be practically advanced. It must be appreciated that conventional geotechnical sampling equipment does not differentiate between nature and size of obstructions that prevent further penetration of the boring below grade. Bedrock indicated on the borehole logs will be labeled 'possibly' or 'probable' etc. based on the response of the boring and sampling equipment, surrounding topography, etc. Bedrock can be proven at individual borehole locations, at your request, by diamond core drilling operations or, possibly, by testpits. It must also be appreciated that bedrock surfaces can be, and most times are, very erratic in nature (i.e. sheer drops, isolated rock knobs, etc.) and caution must be used when interpreting subsurface conditions between boreholes. A bedrock profile can be more accurately estimated, at the clients' request, through a series of closely positioned unsampled auger probes combined with core drilling.
4. **GROUNDWATER:** Although the groundwater table may have been encountered during this investigation and the elevation noted in the report and/or on the record of boreholes, it must be appreciated that the elevation of the groundwater table will fluctuate based upon seasonal conditions, localized changes, erratic changes in the underlying soil profile between boreholes, underlying soil layers with highly variable permeabilities, etc. These conditions may affect the design and type and nature of dewatering procedures. Cave-in levels recorded in borings give a general indication of the groundwater level in cohesionless soils however, it must be noted that cave-in levels may also be due to the relative density of the deposit, drilling operations etc.

METRIC

| | | | | | | | |
|-----------|---------------------------|------------------|----------|------------------|--|------------------|------------|
| REFERENCE | 12/09/12193 | DATUM | Geodetic | LOCATION | N 5171374.9 E 285826.4 - Township of Gladman | ORIGINATED BY | JL |
| PROJECT | GWP 712-92-00, Highway 11 | | | BOREHOLE TYPE | Truck Mounted CME 45B - Hollow Stem Augers | COMPILED BY | AT |
| CLIENT | AECOM Inc. | DATE (Started) | | 2012 December 13 | | TIME (Completed) | 2:35:00 PM |
| | | DATE (Completed) | | 2012 December 13 | | | |
| | | | | | | CHECKED BY | MAM |

[illegible]

MEL-GEO 12193 - BOREHOL LOGS.GPJ MEL-GEO.GDT 13/12/5



METRIC

RECORD OF BOREHOLE NO. 01

REFERENCE 12/09/12193 DATUM Geodetic LOCATION N 5171374.9 E 285826.4 - Township of Gladman ORIGINATED BY JL

PROJECT GWP 712-92-00, Highway 11 BOREHOLE TYPE Truck Mounted CME 45B - Hollow Stem Augers COMPILED BY AT

CLIENT AECOM Inc. DATE (Started) 2012 December 13 TIME (Completed) 2:35:00 PM CHECKED BY MAM

DATE (Completed) 2012 December 13

| SOIL PROFILE | | | SAMPLES | | | GROUND WATER CONDITIONS | ELEVATION SCALE | DYNAMIC CONE PENETRATION RESISTANCE PLOT | | | | | PLASTIC LIMIT w _p | NATURAL MOISTURE CONTENT w | LIQUID LIMIT w _L | UNIT WEIGHT γ | REMARKS & GRAIN SIZE DISTRIBUTION (%) |
|---------------|------------------------------|-------------|---------|------|------------|----------------------------|-----------------|---|----|----|----|-----|------------------------------------|-------------------------------------|-----------------------------------|---------------------|---|
| ELEV DEPTH | DESCRIPTION | STRATA PLOT | NUMBER | TYPE | "N" VALUES | | | 20 | 40 | 60 | 80 | 100 | | | | | |
| | Continued from Previous Page | | | | | | | | | | | | | | | | |
| 280.3 | BEDROCK | | | | | | | | | | | | | | | | |
| 10.7 | End of Borehole | | | | | | | | | | | | | | | | |



METRIC

RECORD OF BOREHOLE NO. 02



REFERENCE 12/09/12193 DATUM Geodetic LOCATION N 5171386.4 E 285838.0 - Township of Gladman ORIGINATED BY JL

PROJECT GWP 712-92-00, Highway 11 BOREHOLE TYPE Track Mounted CME 45B - Hollow Stem Augers COMPILED BY AT

CLIENT AECOM Inc. DATE (Started) 2013 March 12 TIME CHECKED BY MAM

DATE (Completed) 2013 March 12 (Completed) 11:00:00 AM

| SOIL PROFILE | | | SAMPLES | | | GROUND WATER CONDITIONS | ELEVATION SCALE | DYNAMIC CONE PENETRATION RESISTANCE PLOT | | PLASTIC LIMIT w_p | NATURAL MOISTURE CONTENT w | LIQUID LIMIT w_L | UNIT WEIGHT γ | REMARKS & GRAIN SIZE DISTRIBUTION (%) |
|--------------|---|-------------|---------|------|------------|-------------------------|-----------------|--|----|--|---------------------------------|-----------------------|-------------------------|---------------------------------------|
| ELEV DEPTH | DESCRIPTION | STRATA PLOT | NUMBER | TYPE | "N" VALUES | | | 20 | 40 | | | | | |
| 290.1 | Water Surface | | | | | | | | | | | | | |
| 0.0 | 300 mm Free Water | | | | | | | | | | | | | |
| 289.8 | | | | | | | | | | | | | | |
| 0.3 | PEAT - black fibrous peat trace wood | | 1 | SS | 1 | | | | | | | | 531 | |
| | | | 2 | SS | PM | | | | | | | | 532 | |
| | | | 3 | SS | PM | | | | | | | | 454 | |
| | | | 4 | SS | PM | | | | | | | | 780 | |
| | | | 5 | SS | PM | | | | | | | | 834 | |
| | | | 6 | SS | WH | | | | | | | | 836 | |
| | | | 7 | SS | WH | | | | | | | | 591 | |
| 283.6 | CLAYEY SILT - grey clayey silt trace sand (very loose) | | 8 | SS | WH | | | | | | | | | 0 3 69 28 |
| 282.4 | SAND - grey sand some to with silt some gravel (dense) | | 9 | SS | 38 | | | | | | | | | |
| 280.8 | Auger Refusal | | | | | | | | | | | | | |
| 9.3 | | | | | | | | | | | | | | |
| COMMENTS | | | | | | | | $+3, \times 3$: Numbers on right refer to Sensitivity Numbers on left refer to values greater than 120 kPa \circ 3% STRAIN AT FAILURE | | WATER LEVEL RECORDS Date (dd/mm/yy)/Time Water Depth (m) Cave In (m) 1) 13/3/12 10:55:00 AM 0 ∇ 8.1 ∇ 2) - ∇ - 3) - ∇ - | | | | |

The stratification lines represent approximate boundaries. The transition may be gradual.

MEL-GEO 12193 - BOREHOLE LOGS.GPJ MEL-GEO.GDT 13/12/15

METRIC

RECORD OF BOREHOLE NO. 03



REFERENCE 12/09/12193 DATUM Geodetic LOCATION N 5171441.8 E 285752.0 - Township of Gladman ORIGINATED BY JL

PROJECT GWP 712-92-00, Highway 11 BOREHOLE TYPE Track Mounted CME 45B - Hollow Stem Augers COMPILED BY AT

CLIENT AECOM Inc. DATE (Started) 2013 March 12 TIME CHECKED BY MAM

DATE (Completed) 2013 March 12 (Completed) 1:45:00 PM

| SOIL PROFILE | | | SAMPLES | | | GROUND WATER CONDITIONS | ELEVATION SCALE | DYNAMIC CONE PENETRATION RESISTANCE PLOT | | | | | PLASTIC LIMIT w_p | NATURAL MOISTURE CONTENT w | LIQUID LIMIT w_L | UNIT WEIGHT γ | REMARKS & GRAIN SIZE DISTRIBUTION (%) |
|--------------|--|-------------|---------|------|------------|-------------------------|--|--|----|----|-----|--|------------------------|---------------------------------|-----------------------|-------------------------|---------------------------------------|
| ELEV DEPTH | DESCRIPTION | STRATA PLOT | NUMBER | TYPE | "N" VALUES | | | SHEAR STRENGTH kPa | | | | | | | | | |
| | | | | | | | 20 | 40 | 60 | 80 | 100 | 20 | 40 | 60 | | | |
| 289.9 | Ground Surface | | | | | | | | | | | | | | | | |
| 0.0 | FILL - grey gravelly sand some silt high concentration of cobbles/boulders | | 1 | SS | 22 | | | | | | | | | | | | |
| 289.0 | | | | | | | | | | | | | | | | | |
| 0.9 | PEAT - black fibrous peat trace wood pieces | | 2 | SS | 5 | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | |
| | | | 3 | SS | 2 | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | |
| | | | 4 | SS | WH | | | | | | | | | | | | |
| 287.0 | | | | | | | | | | | | | | | | | |
| 2.9 | SAND - grey sand trace silt to silt and sand (compact) | | 5 | SS | 18 | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | |
| | | | 6 | SS | 11 | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | |
| | | | 7 | SS | 10 | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | |
| | | | 8 | SS | 29 | | | | | | | | | | | | |
| 282.3 | | | | | | | | | | | | | | | | | |
| 7.6 | Auger Refusal End of Borehole | | | | | | | | | | | | | | | | |
| COMMENTS | | | | | | | + 3, X 3 : Numbers on right refer to Sensitivity Numbers on left refer to values greater than 120 kPa O 3% STRAIN AT FAILURE | | | | | WATER LEVEL RECORDS Date (dd/mm/yy)/Time Water Depth (m) Cave In (m) 1) 13/3/12 1:35:00 PM 3.2 4.1 2) - - 3) - - | | | | | |

The stratification lines represent approximate boundaries. The transition may be gradual.



METRIC

RECORD OF BOREHOLE NO. 04



REFERENCE 12/09/12193 DATUM Geodetic LOCATION N 5171452.7 E 285763.0 - Township of Gladman ORIGINATED BY JL

PROJECT GWP 712-92-00, Highway 11 BOREHOLE TYPE Truck Mounted CME 45B - Hollow Stem Augers COMPILED BY AT

CLIENT AECOM Inc. DATE (Started) 2012 December 5 TIME (Completed) 8:50:00 AM CHECKED BY MAM

DATE (Completed) 2012 December 5

| SOIL PROFILE | | | SAMPLES | | | GROUND WATER CONDITIONS | ELEVATION SCALE | DYNAMIC CONE PENETRATION RESISTANCE PLOT | | | | | PLASTIC LIMIT NATURAL MOISTURE CONTENT LIQUID LIMIT | | | UNIT WEIGHT γ | REMARKS & GRAIN SIZE DISTRIBUTION (%) | |
|--------------|--|-------------|---------|------|------------|-------------------------|-----------------|--|----|----|----|-----|---|---|----------------|----------------------|---------------------------------------|--|
| ELEV DEPTH | DESCRIPTION | STRATA PLOT | NUMBER | TYPE | "N" VALUES | | | 20 | 40 | 60 | 80 | 100 | W _p | W | W _L | | | |
| 291.0 | Ground Surface | | 1 | SS | 23 | | 290 | | | | | | | | | | | |
| 0.0 | 100 mm Asphalt 275 mm RAP 400 mm Crushed Gravel FILL - brown sand trace gravel trace silt | | 2 | SS | 94/50 mm | | 289 | | | | | | | | | | | |
| 289.9 | Auger Refusal on Rock fill Auger Probe advanced at Station 18+801 at 6.0 m Rt of CL Auger Refusal 1.0 m Auger Probe advanced at Station 18+803 at 5.8 m Rt of CL Auger Refusal 1.1 m Unsampled hydrotrack hole advanced past auger refusal ROCK FILL | | | | | | 288 | | | | | | | | | | | |
| 1.1 | | | | | | | 287 | | | | | | | | | | | |
| 287.6 | BEDROCK | | | | | | 286 | | | | | | | | | | | |
| 3.4 | Unsampled Hydrotrack probe advanced through bedrock | | | | | | 285 | | | | | | | | | | | |
| 284.9 | End of Borehole | | | | | | | | | | | | | | | | | |
| 6.1 | | | | | | | | | | | | | | | | | | |

| COMMENTS | | WATER LEVEL RECORDS | |
|---|--|-----------------------|-----------------|
| The stratification lines represent approximate boundaries. The transition may be gradual. | + 3, × 3 : Numbers on right refer to Sensitivity Numbers on left refer to values greater than 120 kPa ○ 3% STRAIN AT FAILURE | Date (dd/mm/yy)/Time | Water Depth (m) |
| | | 1) 12/12/5 8:45:00 AM | DRY |
| | | 2) | - |
| | | 3) | - |

MEL-GEO 12193 - BOREHOL LOGS.GPJ MEL-GEO.GDT 13/12/5

METRIC**RECORD OF BOREHOLE NO. 05**

REFERENCE 12/09/12193 DATUM Geodetic LOCATION N 5171518.2 E 285686.9 - Township of Gladman ORIGINATED BY JL

PROJECT GWP 712-92-00, Highway 11 BOREHOLE TYPE Truck Mounted CME 45B - Hollow Stem Augers COMPILED BY AT

CLIENT AECOM Inc. DATE (Started) 2012 December 13 TIME (Completed) 1:40:00 PM CHECKED BY MAM

DATE (Completed) 2012 December 13

| SOIL PROFILE | | | SAMPLES | | | GROUND WATER CONDITIONS | ELEVATION SCALE | DYNAMIC CONE PENETRATION RESISTANCE PLOT | | | | | PLASTIC LIMIT NATURAL MOISTURE CONTENT LIQUID LIMIT | | | UNIT WEIGHT γ | REMARKS & GRAIN SIZE DISTRIBUTION (%) |
|--------------|---|-------------|---------|------|------------|-------------------------|-----------------|--|----|----|----|-----|---|---|----------------|-------------------------|---------------------------------------|
| ELEV DEPTH | DESCRIPTION | STRATA PLOT | NUMBER | TYPE | "N" VALUES | | | 20 | 40 | 60 | 80 | 100 | W _p | W | W _L | | |
| 290.8 | Ground Surface | | 1 | AS | | | | | | | | | | | | | |
| 0.0 | 100 mm Asphalt 250 mm RAP FILL - brown sand trace silt trace gravel | | | | | | | | | | | | | | | | |
| 289.9 | | | 2 | SS | 50/100 mm | | | | | | | | | | | | |
| 0.9 | Auger Refusal | | | | | | | | | | | | | | | | |
| | Auger Probe advanced at Station 18+902 at 5.5 m Lt of CL Auger Refusal 0.9 m | | | | | | | | | | | | | | | | |
| | Unsampled hydrotrack hole advanced past auger refusal | | | | | | | | | | | | | | | | |
| | ROCK FILL | | | | | | | | | | | | | | | | |
| 286.5 | | | | | | | | | | | | | | | | | |
| 4.3 | BEDROCK | | | | | | | | | | | | | | | | |
| | Unsampled Hydrotrack probe advanced through bedrock | | | | | | | | | | | | | | | | |
| 283.5 | | | | | | | | | | | | | | | | | |
| 7.3 | End of Borehole | | | | | | | | | | | | | | | | |

| COMMENTS | WATER LEVEL RECORDS | | |
|---|----------------------|-----------------|-------------|
| | Date (dd/mm/yy)/Time | Water Depth (m) | Cave In (m) |
| + 3, \times 3 : Numbers on right refer to Sensitivity Numbers on left refer to values greater than 120 kPa ○ 3% STRAIN AT FAILURE | 1) | - | - |
| | 2) | - | - |
| | 3) | - | - |

The stratification lines represent approximate boundaries. The transition may be gradual.

MEL-GEO 12193 - BOREHOLE LOGS.GPJ MEL-GEO.GDT 13/12/5



METRIC**RECORD OF BOREHOLE NO. 06**

REFERENCE 12/09/12193 DATUM Geodetic LOCATION N 5171527.9 E 285696.8 - Township of Gladman ORIGINATED BY JL

PROJECT GWP 712-92-00, Highway 11 BOREHOLE TYPE Track Mounted CME 45B - Hollow Stem Augers COMPILED BY AT

CLIENT AECOM Inc. DATE (Started) 2013 January 10 TIME (Completed) CHECKED BY MAM

DATE (Completed) 2013 January 10

| SOIL PROFILE | | | SAMPLES | | | GROUND WATER CONDITIONS | ELEVATION SCALE | DYNAMIC CONE PENETRATION RESISTANCE PLOT | | | | | PLASTIC LIMIT NATURAL MOISTURE CONTENT LIQUID LIMIT | | | UNIT WEIGHT γ | REMARKS & GRAIN SIZE DISTRIBUTION (%) |
|--------------|--|-------------|---------|------|------------|-------------------------|-----------------|--|----|----|----|-----|---|---|----------------|----------------------|---------------------------------------|
| ELEV DEPTH | DESCRIPTION | STRATA PLOT | NUMBER | TYPE | "N" VALUES | | | 20 | 40 | 60 | 80 | 100 | W _p | W | W _L | | |
| 290.0 | Ground Surface | | | | | | | | | | | | | | | | |
| 0.0 | FILL - brown sand trace silt trace gravel | | 1 | SS | 15 | | | | | | | | | | | | |
| 289.5 | | | | | | | | | | | | | | | | | |
| 0.5 | Auger Refusal Auger Probe advanced 2 m north of BH No 6 Auger Refusal 0.6 m Auger Probe advanced at 3 m south of BH No 6 Auger Refusal 0.5 m | | | | | | | | | | | | | | | | |

COMMENTS

The stratification lines represent approximate boundaries. The transition may be gradual.

+ 3, X 3 : Numbers on right refer to Sensitivity
Numbers on left refer to values greater than 120 kPa

○ 3% STRAIN AT FAILURE

WATER LEVEL RECORDS

| Date (dd/mm/yy)/Time | Water Depth (m) | Cave In (m) |
|----------------------|-----------------|-------------|
| 1) | - | |
| 2) | - | |
| 3) | - | |

MEL-GEO 12193 - BOREHOLE LOGS.GPJ MEL-GEO.GDT 13/12/5



METRIC

RECORD OF BOREHOLE NO. 07



REFERENCE 12/09/12193 DATUM Geodetic LOCATION N 5171584.5 E 285611.6 - Township of Gladman ORIGINATED BY JL

PROJECT GWP 712-92-00, Highway 11 BOREHOLE TYPE Truck Mounted CME 45B - Hollow Stem Augers COMPILED BY AT

CLIENT AECOM Inc. DATE (Started) 2013 March 12 TIME (Completed) 3:25:00 PM CHECKED BY MAM

DATE (Completed) 2013 March 12

| SOIL PROFILE | | SAMPLES | | | GROUND WATER CONDITIONS | ELEVATION SCALE | DYNAMIC CONE PENETRATION RESISTANCE PLOT | | | | | PLASTIC LIMIT w_p | NATURAL MOISTURE CONTENT w | LIQUID LIMIT w_L | UNIT WEIGHT γ | REMARKS & GRAIN SIZE DISTRIBUTION (%) |
|--------------|---|-------------|--------|------|-------------------------|-----------------|--|----|----|----|----|------------------------|---------------------------------|-----------------------|-------------------------|---------------------------------------|
| ELEV DEPTH | DESCRIPTION | STRATA PLOT | NUMBER | TYPE | | | "N" VALUES | 20 | 40 | 60 | 80 | | | | | |
| 289.8 | Ground Surface | | | | | | | | | | | | | | | |
| 0.0 | PEAT - black fibrous peat with wood pieces mixed with sand at surface | | 1 | SS | 2 | | | | | | | | | | | |
| | | | 2 | SS | PM | | | | | | | | | | | |
| | layer of coarse wood pieces | | 3 | SS | 26 | | | | | | | | | | | |
| 287.8 | Auger Refusal End of Borehole | | | | | | | | | | | | | | | |
| 2.0 | | | | | | | | | | | | | | | | |

| COMMENTS | | WATER LEVEL RECORDS | |
|--|-----------------------|---------------------|-------------|
| + 3, x 3 : Numbers on right refer to Sensitivity Numbers on left refer to values greater than 120 kPa ○ 3% STRAIN AT FAILURE | Date (dd/mm/yy)/Time | Water Depth (m) | Cave In (m) |
| | 1) 13/3/12 3:15:00 PM | 0.2 | 1.8 |
| | 2) | - | - |
| | 3) | - | - |

The stratification lines represent approximate boundaries. The transition may be gradual.

MEL-GEO 12193 - BOREHOLE LOGS.GPJ MEL-GEO.GDT 13/12/5



METRIC

RECORD OF BOREHOLE NO. 08



REFERENCE 12/09/12193 DATUM Geodetic LOCATION N 5171596.0 E 285623.5 - Township of Gladman ORIGINATED BY JL

PROJECT GWP 712-92-00, Highway 11 BOREHOLE TYPE Truck Mounted CME 45B - Hollow Stem Augers COMPILED BY AT

CLIENT AECOM Inc. DATE (Started) 2012 December 4 TIME (Completed) 11:20:00 AM CHECKED BY MAM

| SOIL PROFILE | | | SAMPLES | | | GROUND WATER CONDITIONS | ELEVATION SCALE | DYNAMIC CONE PENETRATION RESISTANCE PLOT | | | | | PLASTIC LIMIT NATURAL MOISTURE CONTENT LIQUID LIMIT | | | UNIT WEIGHT γ | REMARKS & GRAIN SIZE DISTRIBUTION (%) | |
|--------------|--|-------------|---------|------|------------|-------------------------|-----------------|--|----|----|----|-----|---|---|----------------|----------------------|---------------------------------------|--|
| ELEV DEPTH | DESCRIPTION | STRATA PLOT | NUMBER | TYPE | "N" VALUES | | | 20 | 40 | 60 | 80 | 100 | W _p | W | W _L | | | |
| 290.8 | Ground Surface | | 1 | SS | 24 | | 290 | | | | | | | | | | | |
| 0.0 | 50 mm Asphalt 125 mm Crushed Gravel 275 mm Asphalt FILL - brown sand trace silt trace gravel occasional cobbles and boulders | | 2 | SS | 86 | | 289 | | | | | | | | | | | |
| 289.4 | Auger Refusal | | | | | | 288 | | | | | | | | | | | |
| 1.4 | Unsampled hydrotrack hole advanced past auger refusal FILL - Sands occasional cobble/boulder size rock | | | | | | 287 | | | | | | | | | | | |
| 287.2 | BEDROCK | | | | | 286 | | | | | | | | | | | | |
| 3.6 | Unsampled Hydrotrack probe advanced through bedrock | | | | | 285 | | | | | | | | | | | | |
| 284.7 | End of Borehole | | | | | | | | | | | | | | | | | |
| 6.1 | | | | | | | | | | | | | | | | | | |

| | | | | | | |
|----------|--|----|------------------------|-----------------|-------------|--|
| COMMENTS | + 3, × 3 : Numbers on right refer to Sensitivity Numbers on left refer to values greater than 120 kPa | | WATER LEVEL RECORDS | | | |
| | ○ 3% STRAIN AT FAILURE | | Date (dd/mm/yy)/Time | Water Depth (m) | Cave In (m) | |
| | | | 1) 12/12/4 11:18:00 AM | DRY | 1.1 | |
| | | | 2) | - | - | |
| | | 3) | - | - | | |

The stratification lines represent approximate boundaries. The transition may be gradual.

MEL-GEO 12193 - BOREHOL LOGS.GPJ MEL-GEO.GDT 13/12/5

METRIC

RECORD OF BOREHOLE NO. 09



REFERENCE 12/09/12193 DATUM Geodetic LOCATION N 5171661.4 E 285547.3 - Township of Gladman ORIGINATED BY JL

PROJECT GWP 712-92-00, Highway 11 BOREHOLE TYPE Track Mounted CME 45B - Hollow Stem Augers COMPILED BY AT

CLIENT AECOM Inc. DATE (Started) 2012 December 13 TIME 12:40:00 PM CHECKED BY MAM

DATE (Completed) 2012 December 13

| SOIL PROFILE | | | SAMPLES | | | GROUND WATER CONDITIONS | ELEVATION SCALE | DYNAMIC CONE PENETRATION RESISTANCE PLOT | | | | | PLASTIC LIMIT w _p | NATURAL MOISTURE CONTENT w | LIQUID LIMIT w _L | UNIT WEIGHT γ | REMARKS & GRAIN SIZE DISTRIBUTION (%) |
|--------------|---|-------------|---------|------|------------|-------------------------|-----------------|--|----|----|----|-----|---------------------------------|-------------------------------|--------------------------------|------------------|---------------------------------------|
| ELEV DEPTH | DESCRIPTION | STRATA PLOT | NUMBER | TYPE | "N" VALUES | | | 20 | 40 | 60 | 80 | 100 | | | | | |
| 291.0 | Ground Surface | | | | | | | | | | | | | | | | |
| 0.0 | 125 mm Crushed Gravel | | 1 | AS | | | | | | | | | | | | | |
| | FILL - brown sand some gravel some silt (compact) | | 2 | SS | 15 | | | | | | | | | | | | |
| | | | 3 | SS | 16 | | | | | | | | | | | | |
| 288.6 | PEAT - black amorphous peat with wood pieces | | 4 | SS | 2 | | | | | | | | | | | | |
| 2.4 | | | 5 | SS | 2 | | | | | | | | | | | | |
| 287.3 | SAND - brown sand some silt to silty with gravel (compact/very dense) | | 6 | SS | 24 | | | | | | | | | | | | |
| 3.7 | | | 7 | SS | 61 | | | | | | | | | | | | |
| 286.0 | Auger Refusal | | | | | | | | | | | | | | | | |
| 5.0 | Unsampled hydrotrack hole advanced past auger refusal | | | | | | | | | | | | | | | | |
| | BEDROCK | | | | | | | | | | | | | | | | |
| 283.4 | End of Borehole | | | | | | | | | | | | | | | | |
| 7.6 | | | | | | | | | | | | | | | | | |

| COMMENTS | | WATER LEVEL RECORDS | |
|--|--|-------------------------|-----------------|
| + 3, × 3 : Numbers on right refer to Sensitivity Numbers on left refer to values greater than 120 kPa ○ 3% STRAIN AT FAILURE | | Date (dd/mm/yy)/Time | Water Depth (m) |
| | | 1) 12/12/13 12:30:00 PM | 4.4 |
| | | 2) | - |
| | | 3) | - |

The stratification lines represent approximate boundaries. The transition may be gradual.

MEL-GEO 12193 - BOREHOLE LOGS.GPJ MEL-GEO.GDT 13/12/15



METRIC

RECORD OF BOREHOLE NO. 10



REFERENCE 12/09/12193 DATUM Geodetic LOCATION N 5171672.9 E 285559.0 - Township of Gladman ORIGINATED BY JL

PROJECT GWP 712-92-00, Highway 11 BOREHOLE TYPE Track Mounted CME 45B - Hollow Stem Augers COMPILED BY AT

CLIENT AECOM Inc. DATE (Started) 2013 January 10 TIME CHECKED BY MAM

DATE (Completed) 2013 January 10 (Completed) 2:05:00 PM

| SOIL PROFILE | | | SAMPLES | | | GROUND WATER CONDITIONS | ELEVATION SCALE | DYNAMIC CONE PENETRATION RESISTANCE PLOT | | | | | PLASTIC LIMIT NATURAL MOISTURE CONTENT LIQUID LIMIT | | | UNIT WEIGHT γ | REMARKS & GRAIN SIZE DISTRIBUTION (%) |
|--------------|---|---------------------------|---------|------|------------|-------------------------|--|--|----|----|----|---|---|---|----------------|----------------------|---------------------------------------|
| ELEV DEPTH | DESCRIPTION | STRATA PLOT | NUMBER | TYPE | "N" VALUES | | | 20 | 40 | 60 | 80 | 100 | W _p | W | W _L | | |
| 290.5 | Ground Surface | | | | | | | | | | | | | | | | |
| 0.0 | 150 mm silty organics | | 1 | SS | 5 | | | | | | | | | | | | |
| | FILL - brown sand trace silt trace gravel | | | | | | | | | | | | | | | | |
| 289.7 | 0.8 | PEAT - black fibrous peat | 2 | SS | WH | | | | | | | | | | 93 | | |
| | | | | | | | | | | | | | | | | | |
| | | | 3 | SS | 2 | | | | | | | | | | 321 | | |
| | | | | | | | | | | | | | | | | | |
| | | | 4 | SS | WH | | | | | | | | | | 517 | | |
| | | | | | | | | | | | | | | | | | |
| 287.1 | stone in tip of spoon | | 5 | SS | 25/25 mm | | | | | | | | | | 382 | | |
| 3.4 | Auger Refusal End of Borehole | | | | | | | | | | | | | | | | |
| COMMENTS | | | | | | | + 3, X 3 : Numbers on right refer to Sensitivity Numbers on left refer to values greater than 120 kPa O 3% STRAIN AT FAILURE | | | | | WATER LEVEL RECORDS | | | | | |
| | | | | | | | | | | | | Date (dd/mm/yy)/Time Water Depth (m) Cave In (m) 1) 13/1/10 2:00:00 PM 1.1 2.5 2) - - 3) - - | | | | | |

The stratification lines represent approximate boundaries. The transition may be gradual.



METRIC

RECORD OF BOREHOLE NO. 11



REFERENCE 12/09/12193 DATUM Geodetic LOCATION N 5171728.3 E 285472.4 - Township of Gladman ORIGINATED BY JL

PROJECT GWP 712-92-00, Highway 11 BOREHOLE TYPE Track Mounted CME 45B - Hollow Stem Augers COMPILED BY AT

CLIENT AECOM Inc. DATE (Started) 2013 March 13 TIME (Completed) 10:10:00 AM CHECKED BY MAM

DATE (Completed) 2013 March 13

| SOIL PROFILE | | | SAMPLES | | | GROUND WATER CONDITIONS | ELEVATION SCALE | DYNAMIC CONE PENETRATION RESISTANCE PLOT | | | | | PLASTIC LIMIT w_p | NATURAL MOISTURE CONTENT w | LIQUID LIMIT w_L | UNIT WEIGHT γ | REMARKS & GRAIN SIZE DISTRIBUTION (%) |
|---------------|---|-------------|---------|------|------------|----------------------------|-----------------|---|----|----|----|-----|---------------------------|---------------------------------------|--------------------------|----------------------------|---|
| ELEV DEPTH | DESCRIPTION | STRATA PLOT | NUMBER | TYPE | "N" VALUES | | | 20 | 40 | 60 | 80 | 100 | | | | | |
| 289.8 0.0 | Ground Surface PEAT - black fibrous peat | | 1 | SS | WH | | | | | | | | | | | | |
| | | | 2 | SS | PM | | | | | | | | | | | | |
| | | | 3 | SS | 6 | | | | | | | | | | | | |
| 287.9 1.9 | SAND - grey sand some to with silt some to with gravel (dense/very dense) | 4 | SS | 30 | | | | | | | | | | | | | |
| | | 5 | SS | 33 | | | | | | | | | | | | | |
| | | 6 | SS | 54 | | | | | | | | | | | | | |
| 285.3 4.5 | Auger Refusal End of Borehole | | | | | | | | | | | | | | | | |

| COMMENTS | | WATER LEVEL RECORDS | |
|--|--|-----------------------|-----------------|
| + 3, × 3 : Numbers on right refer to Sensitivity Numbers on left refer to values greater than 120 kPa ○ 3% STRAIN AT FAILURE | | Date (dd/mm/yy)/Time | Water Depth (m) |
| | | 1) 13/3/13 9:58:00 AM | 0 |
| | | 2) | - |
| | | 3) | - |

The stratification lines represent approximate boundaries. The transition may be gradual.

MEL-GEO 12193 - BOREHOLE LOGS.GPJ MEL-GEO.GDT 13/12/15

METRIC

| | | | | | | | |
|-----------|---------------------------|------------------|----------|-----------------|--|------------------|-------------|
| REFERENCE | 12/09/12193 | DATUM | Geodetic | LOCATION | N 5171739.6 E 285484.4 - Township of Gladman | ORIGINATED BY | JL |
| PROJECT | GWP 712-92-00, Highway 11 | | | BOREHOLE TYPE | Truck Mounted CME 45B - Hollow Stem Augers | COMPILED BY | AT |
| CLIENT | AECOM Inc. | DATE (Started) | | 2012 December 5 | | TIME (Completed) | 11:20:00 AM |
| | | DATE (Completed) | | 2012 December 5 | | | |
| | | | | | | CHECKED BY | MAM |

| SOIL PROFILE | | | SAMPLES | | | GROUND WATER CONDITIONS | ELEVATION SCALE | DYNAMIC CONE PENETRATION RESISTANCE PLOT | PLASTIC LIMIT w _p | NATURAL MOISTURE CONTENT w | LIQUID LIMIT w _L | UNIT WEIGHT γ kN/m ³ | REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA (SI CL) | | | | | |
|--|--|-------------|---------|------|------------|----------------------------|---------------------------|---|---|-------------------------------------|-----------------------------------|--|--|-------------------|--------------|--|------------------|--|
| ELEV DEPTH | DESCRIPTION | STRATA PLOT | NUMBER | TYPE | "N" VALUES | | | SHEAR STRENGTH kPa | | | | | | WATER CONTENT (%) | | | | |
| | | | | | | | | ○ UNCONFINED | | | | | | | + FIELD VANE | | ● QUICK TRIAXIAL | |
| 291.1 | Ground Surface | | | | | | 20 | 40 | 60 | 80 | 100 | | | | | | | |
| 0.0 | 100 mm Asphalt 200 mm RAP 300 mm Crushed Gravel FILL - brown sand some silt some gravel to gravelly (very loose/very dense) | | 1 | SS | 30 | | | | | | | | | | | | | |
| | | | 2 | SS | 86 | | | | | | | | | | | | | |
| | | | 3 | SS | 27 | | | | | | | | | | | | | |
| 289.0 | | | | | | | | | | | | | | | | | | |
| 2.1 | SAND - grey sand with silt with gravel trace organics (compact/dense) | | 4 | SS | 3 | | | | | | | | | | | | | |
| | | | 5 | SS | 7 | | | | | | | | | | | | | |
| | | | 6 | SS | 16 | | | | | | | | | | | | | |
| | | | 7 | SS | 37 | | | | | | | | | | | | | |
| | | | 8 | SS | 36 | | | | | | | | | | | | | |
| 284.5 | | | | | | | | | | | | | | | | | | |
| 6.6 | Auger Refusal Unsampled hydrotrack hole advanced past auger refusal BEDROCK | | | | | | | | | | | | | | | | | |
| Continued Next Page | | | | | | | | | | | | | | | | | | |
| COMMENTS | | | | | | | + 3 , × 3 : | | Numbers on right refer to Sensitivity Numbers on left refer to values greater than 120 kPa | | WATER LEVEL RECORDS | | | | | | | |
| | | | | | | | ○ 3% STRAIN AT FAILURE | | | | | | | | | | | |
| The stratification lines represent approximate boundaries. The transition may be gradual | | | | | | | Date (dd/mm/yyyy)/Time | | Water Depth (m) | | Cave In (m) | | | | | | | |
| | | | | | | | 1) 12/12/5 11:10:00 AM | | DRY | | 1.7 | | | | | | | |
| | | | | | | | 2) | | - | | - | | | | | | | |
| | | | | | | | 3) | | - | | - | | | | | | | |

METRIC

RECORD OF BOREHOLE NO. 12

REFERENCE 12/09/12193 DATUM Geodetic LOCATION N 5171739.6 E 285484.4 - Township of Gladman ORIGINATED BY JL

PROJECT GWP 712-92-00, Highway 11 BOREHOLE TYPE Truck Mounted CME 45B - Hollow Stem Augers COMPILED BY AT

CLIENT AECOM Inc. DATE (Started) 2012 December 5 TIME (Completed) 11:20:00 AM

DATE (Completed) 2012 December 5 CHECKED BY MAM

| SOIL PROFILE | | | SAMPLES | | | GROUND WATER CONDITIONS | ELEVATION SCALE | DYNAMIC CONE PENETRATION RESISTANCE PLOT | | | | | PLASTIC LIMIT NATURAL MOISTURE CONTENT | | | LIQUID LIMIT | UNIT WEIGHT γ | REMARKS & GRAIN SIZE DISTRIBUTION (%) |
|---------------|------------------------------|-------------|---------|------|------------|----------------------------|-----------------|---|----|----|----|-----|--|---|----------------|-----------------|----------------------------|---|
| ELEV DEPTH | DESCRIPTION | STRATA PLOT | NUMBER | TYPE | "N" VALUES | | | 20 | 40 | 60 | 80 | 100 | W _p | W | W _L | | | |
| | Continued from Previous Page | | | | | | | | | | | | | | | | | |
| | BEDROCK | | | | | | 281 | | | | | | | | | | | |
| | | | | | | | 280 | | | | | | | | | | | |
| 279.5 | | | | | | | | | | | | | | | | | | |
| 11.6 | End of Borehole | | | | | | | | | | | | | | | | | |

MEL-GEO 12193 - BOREHOLE LOGS.GPJ MEL-GEO.GDT 13/12/5

METRIC

| | | | | | | | |
|-----------|---------------------------|-------|----------|------------------|--|------------------|-------------|
| REFERENCE | 12/09/12193 | DATUM | Geodetic | LOCATION | N 5171806.8 E 285409.9 - Township of Gladman | ORIGINATED BY | JL |
| PROJECT | GWP 712-92-00, Highway 11 | | | BOREHOLE TYPE | Truck Mounted CME 45B - Hollow Stem Augers | COMPILED BY | AT |
| CLIENT | AECOM Inc. | | | DATE (Started) | 2012 December 13 | TIME (Completed) | 11:15:00 AM |
| | | | | DATE (Completed) | 2012 December 13 | CHECKED BY | MAM |

| SOIL PROFILE | | | SAMPLES | | | GROUND WATER CONDITIONS | DYNAMIC CONE PENETRATION RESISTANCE PLOT | | | | PLASTIC LIMIT w _p | NATURAL MOISTURE CONTENT w | LIQUID LIMIT w _L | UNIT WEIGHT γ kN/m ³ | REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA (SI CL) | | | |
|---|---|-------------|---------|------|------------|----------------------------|---|---|------------|--|------------------------------------|-------------------------------------|-----------------------------------|--|--|-------------------|-------------|--|
| ELEV DEPTH | DESCRIPTION | STRATA PLOT | NUMBER | TYPE | "N" VALUES | | SHEAR STRENGTH kPa | | | | | | | | | WATER CONTENT (%) | | |
| 291.0 | Ground Surface | | | | | | ○ UNCONFINED | + | FIELD VANE | | | | | | | | | |
| 0.0 | 125 mm Asphalt 300 mm RAP | | 1 | AS | | | ● QUICK TRIAXIAL | × | LAB VANE | | | | | | | | | |
| | FILL - brown sand some silt some to with gravel | | | | | | | | | | | | | | | | | |
| | (loose/compact) | | | | | | | | | | | | | | | | | |
| | | | 2 | SS | 13 | | | | | | | | | | | | | |
| | | | 3 | SS | 14 | | | | | | | | | | | | | |
| | | | 4 | SS | 8 | | | | | | | | | | | | | |
| 287.6 | | | 5 | SS | 7 | | | | | | | | | | | | | |
| 3.4 | PEAT - black amorphous peat | | | | | | | | | | | | | | | | | |
| 287.0 | | | 6 | SS | 12 | | | | | | | | | | | | | |
| 4.0 | SILT - grey silt some sand (very dense) | | | | | | | | | | | | | | | | | |
| | | | 7 | SS | 65 | | | | | | | | | | | | | |
| 285.6 | | | | | | | | | | | | | | | | | | |
| 5.4 | Auger Refusal | | | | | | | | | | | | | | | | | |
| | Unsamped hydrotrack hole advanced past auger refusal | | | | | | | | | | | | | | | | | |
| | SILT/SANDS - silts/sands occasional cobbles/boulders | | | | | | | | | | | | | | | | | |
| | (very dense) | | | | | | | | | | | | | | | | | |
| Continued Next Page | | | | | | | | | | | | | | | | | | |
| COMMENTS | | | | | | | + ³ , × ³ : Numbers on right refer to Sensitivity Numbers on left refer to values greater than 120 kPa | | | | | | | WATER LEVEL RECORDS | | | | |
| | | | | | | | ○ 3% STRAIN AT FAILURE | | | | | | | Date (dd/mm/yy)/Time | | Water Depth (m) | Cave In (m) | |
| | | | | | | | | | | | | | | 1) 12/12/13 11:03:00 AM | | 3.1 | ▽ 4.8 | |
| | | | | | | | | | | | | | | 2) - | | - | ▽ - | |
| The stratification lines represent approximate boundaries. The transition may be gradual. | | | | | | | | | | | | | | 3) - | | - | ▼ - | |



METRIC

RECORD OF BOREHOLE NO. 13

REFERENCE 12/09/12193 DATUM Geodetic LOCATION N 5171806.8 E 285409.9 - Township of Gladman ORIGINATED BY JL

PROJECT GWP 712-92-00, Highway 11 BOREHOLE TYPE Truck Mounted CME 45B - Hollow Stem Augers COMPILED BY AT

CLIENT AECOM Inc. DATE (Started) 2012 December 13 TIME (Completed) 11:15:00 AM CHECKED BY MAM

DATE (Completed) 2012 December 13

| SOIL PROFILE | | | SAMPLES | | | GROUND WATER CONDITIONS | ELEVATION SCALE | DYNAMIC CONE PENETRATION RESISTANCE PLOT | | | | | PLASTIC LIMIT w_p | NATURAL MOISTURE CONTENT w | LIQUID LIMIT w_L | UNIT WEIGHT γ | REMARKS & GRAIN SIZE DISTRIBUTION (%) |
|--------------|--|-------------|---------|------|------------|-------------------------|-----------------|--|----|----|----|-----|------------------------|---------------------------------|-----------------------|-------------------------|---------------------------------------|
| ELEV DEPTH | DESCRIPTION | STRATA PLOT | NUMBER | TYPE | "N" VALUES | | | 20 | 40 | 60 | 80 | 100 | | | | | |
| | Continued from Previous Page Probably sands (very dense drilling) | | | | | | | | | | | | | | | | |
| 280.3 | | | | | | | | | | | | | | | | | |
| 10.7 | End of Borehole | | | | | | | | | | | | | | | | |

MEL-GEO 12193 - BOREHOLE LOGS.GPJ MEL-GEO.GDT 13/12/5



METRIC

RECORD OF BOREHOLE NO. 14



REFERENCE 12/09/12193 DATUM Geodetic LOCATION N 5171816.4 E 285420.2 - Township of Gladman ORIGINATED BY JL

PROJECT GWP 712-92-00, Highway 11 BOREHOLE TYPE Track Mounted CME 45B - Hollow Stem Augers COMPILED BY AT

CLIENT AECOM Inc. DATE (Started) 2013 January 15 TIME 11:55:00 AM CHECKED BY MAM

DATE (Completed) 2013 January 15

| SOIL PROFILE | | | SAMPLES | | | GROUND WATER CONDITIONS | ELEVATION SCALE | DYNAMIC CONE PENETRATION RESISTANCE PLOT | | | | | PLASTIC LIMIT w_p | NATURAL MOISTURE CONTENT w | LIQUID LIMIT w_L | UNIT WEIGHT γ | REMARKS & GRAIN SIZE DISTRIBUTION (%) |
|--------------|---|-------------|---------|------|------------|-------------------------|-----------------|--|----|----|----|-----|--|---------------------------------|-----------------------|-------------------------|---------------------------------------|
| ELEV DEPTH | DESCRIPTION | STRATA PLOT | NUMBER | TYPE | "N" VALUES | | | 20 | 40 | 60 | 80 | 100 | | | | | |
| 289.8 | Ground Surface | | | | | | | | | | | | | | | | |
| 0.0 | PEAT - black fibrous peat | | 1 | SS | 3 | | | | | | | | | | 198 | | |
| | | | 2 | SS | WH | | | | | | | | | | 205 | | |
| | | | 3 | SS | WH | | | | | | | | | | 722 | | |
| 287.4 | | | | | | | | | | | | | | | | | |
| 2.4 | SAND - grey sand some silt some gravel (compact/dense) | | 4 | SS | 14 | | | | | | | | | | | | |
| | | | 5 | SS | 41 | | | | | | | | | | | | |
| | | | 6 | SS | 50/75 mm | | | | | | | | | | | | |
| 285.6 | | | | | | | | | | | | | | | | | |
| 4.2 | Auger Refusal End of Borehole | | | | | | | | | | | | | | | | |
| COMMENTS | | | | | | | | + 3, x 3 : Numbers on right refer to Sensitivity Numbers on left refer to values greater than 120 kPa ○ 3% STRAIN AT FAILURE | | | | | WATER LEVEL RECORDS Date (dd/mm/yy)/Time Water Depth (m) Cave In (m) 1) 13/1/15 11:46:00 AM 1.6 1.7 2) - - 3) - - | | | | |

The stratification lines represent approximate boundaries. The transition may be gradual.



METRIC

RECORD OF BOREHOLE NO. 15



REFERENCE 12/09/12193 DATUM Geodetic LOCATION N 5171874.8 E 285336.0 - Township of Gladman ORIGINATED BY JL

PROJECT GWP 712-92-00, Highway 11 BOREHOLE TYPE Track Mounted CME 45B - Hollow Stem Augers COMPILED BY AT

CLIENT AECOM Inc. DATE (Started) 2013 March 13 TIME (Completed) 11:35:00 AM CHECKED BY MAM

DATE (Completed) 2013 March 13

| SOIL PROFILE | | | SAMPLES | | | GROUND WATER CONDITIONS | ELEVATION SCALE | DYNAMIC CONE PENETRATION RESISTANCE PLOT | | | | | PLASTIC LIMIT NATURAL MOISTURE CONTENT LIQUID LIMIT | | | UNIT WEIGHT γ | REMARKS & GRAIN SIZE DISTRIBUTION (%) |
|--------------|---|-------------|---------|------|------------|-------------------------|-----------------|---|----|----|----|-----|--|-----|-------|----------------------|---------------------------------------|
| ELEV DEPTH | DESCRIPTION | STRATA PLOT | NUMBER | TYPE | "N" VALUES | | | 20 | 40 | 60 | 80 | 100 | w_p | w | w_L | | |
| 289.9 | Ground Surface | | 1 | AS | | | | | | | | | | | | | |
| 0.0 | FILL - brown sand and gravel mixed with peat | | 2 | SS | 7 | | | | | | | | | | | | |
| 289.0 | | | | | | | | | | | | | | | | | |
| 0.9 | SAND - grey sand some to with silt trace to with gravel occasional cobbles and boulders | | 3 | SS | 20 | | | | | | | | | | | | |
| | | | 4 | SS | 84/225 mm | | | | | | | | | | | | |
| | | | 5 | SS | 31 | | | | | | | | | | | | |
| 286.4 | | | 6 | SS | 50/100 mm | | | | | | | | | | | | |
| 3.5 | Auger Refusal End of Borehole | | | | | | | | | | | | | | | | |
| COMMENTS | | | | | | | | $+3, \times 3$: Numbers on right refer to Sensitivity Numbers on left refer to values greater than 120 kPa \bigcirc 3% STRAIN AT FAILURE | | | | | WATER LEVEL RECORDS Date (dd/mm/yy)/Time Water Depth (m) Cave In (m) 1) 13/3/13 11:25:00 AM 0.6 ∇ 0.7 ∇ 2) - ∇ - 3) - ∇ - | | | | |

The stratification lines represent approximate boundaries. The transition may be gradual.



| | | | | | | | |
|-----------|---------------------------|-------|----------|------------------|--|------------------|------------|
| REFERENCE | 12/09/12193 | DATUM | Geodetic | LOCATION | N 5171885.9 E 285348.1 - Township of Gladman | ORIGINATED BY | JL |
| PROJECT | GWP 712-92-00, Highway 11 | | | BOREHOLE TYPE | Truck Mounted CME 45B - Hollow Stem Augers | COMPILED BY | AT |
| CLIENT | AECOM Inc. | | | DATE (Started) | 2012 December 5 | TIME (Completed) | 1:22:00 PM |
| | | | | DATE (Completed) | 2012 December 5 | CHECKED BY | MAM |

MEL-GEO 12193 - BOREHOL LOGS.GPJ MEL-GEO.GDT 13/12/5



METRIC

RECORD OF BOREHOLE NO. 16

REFERENCE 12/09/12193 DATUM Geodetic LOCATION N 5171885.9 E 285348.1 - Township of Gladman ORIGINATED BY JL

PROJECT GWP 712-92-00, Highway 11 BOREHOLE TYPE Truck Mounted CME 45B - Hollow Stem Augers COMPILED BY AT

CLIENT AECOM Inc. DATE (Started) 2012 December 5 TIME (Completed) 1:22:00 PM CHECKED BY MAM

DATE (Completed) 2012 December 5

| SOIL PROFILE | | | SAMPLES | | | GROUND WATER CONDITIONS | ELEVATION SCALE | DYNAMIC CONE PENETRATION RESISTANCE PLOT | | | | | PLASTIC LIMIT NATURAL MOISTURE CONTENT | | | UNIT WEIGHT γ kN/m ³ | REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA (SI CL) |
|---------------|--------------------------------------|-------------|---------|------|------------|----------------------------|-----------------|---|----|----|----|-----|--|---|----------------|---|--|
| ELEV DEPTH | DESCRIPTION | STRATA PLOT | NUMBER | TYPE | "N" VALUES | | | 20 | 40 | 60 | 80 | 100 | W _p | W | W _L | | |
| | Continued from Previous Page | | | | | | | | | | | | | | | | |
| 279.3 | Probably sands (very dense drilling) | | | | | | 280 | | | | | | | | | | |
| 11.6 | End of Borehole | | | | | | | | | | | | | | | | |

MEL-GEO 12193 - BOREHOLE LOGS.GPJ MEL-GEO.GDT 13/12/5



| | | | | | | | |
|-----------|---------------------------|------------------|----------|------------------|--|------------------------|-----|
| REFERENCE | 12/09/12193 | DATUM | Geodetic | LOCATION | N 5171953.2 E 285273.6 - Township of Gladman | ORIGINATED BY | JL |
| PROJECT | GWP 712-92-00, Highway 11 | | | BOREHOLE TYPE | Truck Mounted CME 45B - Hollow Stem Augers | COMPILED BY | AT |
| CLIENT | AECOM Inc. | DATE (Started) | | 2012 December 12 | | TIME | |
| | | DATE (Completed) | | 2012 December 12 | | (Completed) 3:55:00 PM | |
| | | | | | | CHECKED BY | MAM |

MEL-GEO 12193 - BOREHOL LOGS.GPJ MEL-GEO.GDT 13/12/5

METRIC

RECORD OF BOREHOLE NO. 17



REFERENCE 12/09/12193 DATUM Geodetic LOCATION N 5171953.2 E 285273.6 - Township of Gladman ORIGINATED BY JL

PROJECT GWP 712-92-00, Highway 11 BOREHOLE TYPE Truck Mounted CME 45B - Hollow Stem Augers COMPILED BY AT

CLIENT AECOM Inc. DATE (Started) 2012 December 12 TIME (Completed) 3:55:00 PM CHECKED BY MAM

DATE (Completed) 2012 December 12

| SOIL PROFILE | | | SAMPLES | | | GROUND WATER CONDITIONS | ELEVATION SCALE | DYNAMIC CONE PENETRATION RESISTANCE PLOT | | | | | PLASTIC LIMIT NATURAL MOISTURE CONTENT LIQUID LIMIT | | | UNIT WEIGHT γ | REMARKS & GRAIN SIZE DISTRIBUTION (%) |
|--------------|------------------------------|-------------|---------|------|------------|-------------------------|-----------------|--|----|----|----|-----|---|-----|-------|----------------------|---------------------------------------|
| ELEV DEPTH | DESCRIPTION | STRATA PLOT | NUMBER | TYPE | "N" VALUES | | | 20 | 40 | 60 | 80 | 100 | w_p | w | w_L | | |
| | Continued from Previous Page | | | | | | | | | | | | | | | | |
| 279.4 | BEDROCK | | | | | | 280 | | | | | | | | | | |
| 11.6 | End of Borehole | | | | | | | | | | | | | | | | |

MEL-GEO 12193 - BOREHOLE LOGS.GPJ MEL-GEO.GDT 13/12/5

METRIC

RECORD OF BOREHOLE NO. 18



REFERENCE 12/09/12193 DATUM Geodetic LOCATION N 5171963.7 E 285284.9 - Township of Gladman ORIGINATED BY JL

PROJECT GWP 712-92-00, Highway 11 BOREHOLE TYPE Track Mounted CME 45B - Hollow Stem Augers COMPILED BY AT

CLIENT AECOM Inc. DATE (Started) 2013 January 15 TIME CHECKED BY MAM

DATE (Completed) 2013 January 15 (Completed) 3:20:00 PM

| SOIL PROFILE | | SAMPLES | | | GROUND WATER CONDITIONS | ELEVATION SCALE | DYNAMIC CONE PENETRATION RESISTANCE PLOT | | | | | PLASTIC LIMIT NATURAL MOISTURE CONTENT | | | UNIT WEIGHT γ | REMARKS & GRAIN SIZE DISTRIBUTION (%) |
|---------------|---|-------------|--------|------|----------------------------|--|---|----|----|----|---|--|----------------|---|----------------------------|---|
| ELEV DEPTH | DESCRIPTION | STRATA PLOT | NUMBER | TYPE | | | "N" VALUES | 20 | 40 | 60 | 80 | 100 | W _p | W | | |
| 289.1 | Ground Surface | | | | | | | | | | | | | | | |
| 0.0 | 300 mm sand and gravel mixed with peat SAND - grey sand some silt some gravel (compact) | | 1 | SS | 5 | | | | | | | | | | | |
| | | | 2 | SS | 26 | | | | | | | | | | | |
| | | | 3 | SS | 26 | | | | | | | | | | | |
| 286.7 | Auger Refusal End of Borehole | | 4 | SS | 50/125 mm | | | | | | | | | | | |
| 2.4 | | | | | | | | | | | | | | | | |
| COMMENTS | | | | | | + 3, X 3 : Numbers on right refer to Sensitivity Numbers on left refer to values greater than 120 kPa O 3% STRAIN AT FAILURE | | | | | WATER LEVEL RECORDS | | | | | |
| | | | | | | | | | | | Date (dd/mm/yy)/Time 1) 13/1/15 3:10:00 PM 2) 3) | | | | | Water Depth (m) -0.1 - - |

The stratification lines represent approximate boundaries. The transition may be gradual.

MEL-GEO 12193 - BOREHOLE LOGS.GPJ MEL-GEO.GDT 13/12/15



METRIC

RECORD OF BOREHOLE NO. 19



REFERENCE 12/09/12193 DATUM Geodetic LOCATION N 5172021.4 E 285200.0 - Township of Gladman ORIGINATED BY JL

PROJECT GWP 712-92-00, Highway 11 BOREHOLE TYPE Track Mounted CME 45B - Hollow Stem Augers COMPILED BY AT

CLIENT AECOM Inc. DATE (Started) 2013 March 13 TIME (Completed) 12:58:00 PM CHECKED BY MAM

DATE (Completed) 2013 March 13

| SOIL PROFILE | | | SAMPLES | | | GROUND WATER CONDITIONS | ELEVATION SCALE | DYNAMIC CONE PENETRATION RESISTANCE PLOT | | | | | PLASTIC LIMIT NATURAL MOISTURE CONTENT | | | UNIT WEIGHT γ | REMARKS & GRAIN SIZE DISTRIBUTION (%) |
|---------------|--|-------------|---------|------|--------------|----------------------------|-----------------|---|----|----|----|-----|--|---|----------------|----------------------------|---|
| ELEV DEPTH | DESCRIPTION | STRATA PLOT | NUMBER | TYPE | "N" VALUES | | | 20 | 40 | 60 | 80 | 100 | W _p | W | W _L | | |
| 290.5 | Ground Surface | | | | | | | | | | | | | | | | |
| 0.0 | PEAT - black peat | | 1 | AS | | | | | | | | | | | | | |
| 289.9 | | | | | | | | | | | | | | | | | |
| 0.6 | SAND - grey sand with silt trace gravel | | 2 | SS | 60/100 mm | | | | | | | | | | | | |
| 289.2 | | | | | | | | | | | | | | | | | |
| 1.3 | Auger Refusal End of Borehole | | 3 | SS | 50/75 mm | | | | | | | | | | | | |

| COMMENTS | | WATER LEVEL RECORDS | |
|---|--|------------------------|-----------------|
| The stratification lines represent approximate boundaries. The transition may be gradual. | + 3, X 3 : Numbers on right refer to Sensitivity Numbers on left refer to values greater than 120 kPa O 3% STRAIN AT FAILURE | Date (dd/mm/yy)/Time | Water Depth (m) |
| | | 1) 13/3/13 12:48:00 PM | -0.1 |
| | | 2) | - |
| | | 3) | - |

MEL-GEO 12193 - BOREHOLE LOGS.GPJ MEL-GEO.GDT 13/12/15



METRIC

| SOIL PROFILE | | | SAMPLES | | | GROUND WATER CONDITIONS | DYNAMIC CONE PENETRATION RESISTANCE PLOT | | | | PLASTIC LIMIT w _p | NATURAL MOISTURE CONTENT w | LIQUID LIMIT w _L | UNIT WEIGHT γ kN/m ³ | REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA (SI CL) | | | |
|---|---|-------------|---------|------|------------|----------------------------|---|--|--------------|--|------------------------------------|-------------------------------------|-----------------------------------|--|--|-------------------|--|--|
| ELEV DEPTH | DESCRIPTION | STRATA PLOT | NUMBER | TYPE | "N" VALUES | | SHEAR STRENGTH kPa | | | | | | | | | WATER CONTENT (%) | | |
| | | | | | | | ○ UNCONFINED | | + FIELD VANE | | | | | | | | | |
| 292.0 | Ground Surface | | | | | | | | | | | | | | | | | |
| 0.0 | 50 mm Asphalt 100 mm Crushed Gravel 150 mm Asphalt 250 mm RAP | | 1 | SS | 25 | | | | | | | | | | | | | |
| | FILL - brown sand some silt some gravel (compact) | | 2 | SS | 13 | | | | | | | | | | | | | |
| 290.6 | | | | | | | | | | | | | | | | | | |
| 1.4 | SAND - grey sand some to with silt trace to with gravel (dense/very dense) | | 3 | SS | 12 | | | | | | | | | | | | | |
| | | | 4 | SS | 61 | | | | | | | | | | | | | |
| | | | 5 | SS | 45 | | | | | | | | | | | | | |
| | | | 6 | SS | 91/250 mm | | | | | | | | | | | | | |
| | | | 7 | SS | 50/75 mm | | | | | | | | | | | | | |
| 287.2 | Auger Refusal | | | | | | | | | | | | | | | | | |
| 4.8 | Unsampled hydrotrack hole advanced past auger refusal BEDROCK | | | | | | | | | | | | | | | | | |
| 283.5 | | | | | | | | | | | | | | | | | | |
| 8.5 | End of Borehole | | | | | | | | | | | | | | | | | |
| COMMENTS | | | | | | | + ³ , × ³ : Numbers on right refer to Sensitivity Numbers on left refer to values greater than 120 kPa ○ 3% STRAIN AT FAILURE | | | | WATER LEVEL RECORDS | | | | | | | |
| The stratification lines represent approximate boundaries. The transition may be gradual. | | | | | | | Date (dd/mm/yy)/Time | | | | Water Depth (m) | | Cave In (m) | | | | | |
| | | | | | | | 1) 12/12/5 3:45:00 PM | | | | DRY | | 4.2 | | | | | |
| | | | | | | | 2) | | | | - | | - | | | | | |
| | | | | | | | 3) | | | | - | | - | | | | | |

METRIC

RECORD OF BOREHOLE NO. 21



REFERENCE 12/09/12193 DATUM Geodetic LOCATION N 5172100.0 E 285137.7 - Township of Gladman ORIGINATED BY JL

PROJECT GWP 712-92-00, Highway 11 BOREHOLE TYPE Truck Mounted CME 45B - Hollow Stem Augers COMPILED BY AT

CLIENT AECOM Inc. DATE (Started) 2012 December 12 TIME 2012 December 12 (Completed) 2:12:00 PM CHECKED BY MAM

| SOIL PROFILE | | | SAMPLES | | | GROUND WATER CONDITIONS | ELEVATION SCALE | DYNAMIC CONE PENETRATION RESISTANCE PLOT | | | | | PLASTIC LIMIT w _p | NATURAL MOISTURE CONTENT w | LIQUID LIMIT w _L | UNIT WEIGHT γ | REMARKS & GRAIN SIZE DISTRIBUTION (%) |
|--------------|---|-------------|---------|------|------------|-------------------------|-----------------|--|----|----|----|-----|---|-------------------------------|--------------------------------|------------------|---------------------------------------|
| ELEV DEPTH | DESCRIPTION | STRATA PLOT | NUMBER | TYPE | "N" VALUES | | | 20 | 40 | 60 | 80 | 100 | | | | | |
| 293.9 | Ground Surface | | | | | | | | | | | | | | | | |
| 0.0 | 125 mm Asphalt 250 mm RAP | | 1 | AS | | | | | | | | | | | | | |
| | FILL - brown sand some silt some gravel (loose) | | 2 | SS | 6 | | | | | | | | | | | | |
| 292.5 | | | | | | | | | | | | | | | | | |
| 1.4 | SAND - grey sand some silt to silty some gravel to gravelly (compact/very dense) | | 3 | SS | 17 | | | | | | | | | | | 14 59 (27) | |
| | | | 4 | SS | 27 | | | | | | | | | | | | |
| | | | 5 | SS | 35 | | | | | | | | | | | | |
| | | | 6 | SS | 70 | | | | | | | | | | | 40 40 (20) | |
| | | | 7 | SS | 64 | | | | | | | | | | | 10 61 23 6 | |
| 287.6 | | | 8 | SS | 50/75 mm | | | | | | | | | | | 6 38 (58) | |
| 6.3 | Auger Refusal | | | | | | | | | | | | | | | | |
| | Unsampled hydrotrack hole advanced past auger refusal | | | | | | | | | | | | | | | | |
| 286.6 | SANDS - sands occasional cobbles/boulder | | | | | | | | | | | | | | | | |
| 7.3 | (very dense) BEDROCK | | | | | | | | | | | | | | | | |
| | Unsampled Hydrotrack probe advanced through bedrock | | | | | | | | | | | | | | | | |
| | Continued Next Page | | | | | | | | | | | | | | | | |
| COMMENTS | | | | | | | | + 3, × 3 : Numbers on right refer to Sensitivity Numbers on left refer to values greater than 120 kPa ○ 3% STRAIN AT FAILURE | | | | | WATER LEVEL RECORDS Date (dd/mm/yy)/Time Water Depth (m) Cave In (m) 1) 12/12/12 2:00:00 PM 3.4 4.2 2) - - 3) - - | | | | |

The stratification lines represent approximate boundaries. The transition may be gradual.





METRIC

RECORD OF BOREHOLE NO. 21

REFERENCE 12/09/12193 DATUM Geodetic LOCATION N 5172100.0 E 285137.7 - Township of Gladman ORIGINATED BY JL

PROJECT GWP 712-92-00, Highway 11 BOREHOLE TYPE Truck Mounted CME 45B - Hollow Stem Augers COMPILED BY AT

CLIENT AECOM Inc. DATE (Started) 2012 December 12 TIME (Completed) 2:12:00 PM CHECKED BY MAM

DATE (Completed) 2012 December 12

| SOIL PROFILE | | | SAMPLES | | | GROUND WATER CONDITIONS | ELEVATION SCALE | DYNAMIC CONE PENETRATION RESISTANCE PLOT | | | | | PLASTIC LIMIT w _p | NATURAL MOISTURE CONTENT w | LIQUID LIMIT w _L | UNIT WEIGHT γ | REMARKS & GRAIN SIZE DISTRIBUTION (%) |
|---------------|------------------------------|-------------|---------|------|------------|----------------------------|-----------------|---|----|----|----|-----|------------------------------------|-------------------------------------|-----------------------------------|---------------------|---|
| ELEV DEPTH | DESCRIPTION | STRATA PLOT | NUMBER | TYPE | "N" VALUES | | | 20 | 40 | 60 | 80 | 100 | | | | | |
| | Continued from Previous Page | | | | | | | | | | | | | | | | |
| 283.2 | BEDROCK | | | | | | | | | | | | | | | | |
| 10.7 | End of Borehole | | | | | | | | | | | | | | | | |

MEL-GEO 12193 - BOREHOLE LOGS.GPJ MEL-GEO.GDT 13/12/5



METRIC

RECORD OF BOREHOLE NO. 22



REFERENCE 12/09/12193 DATUM Geodetic LOCATION N 5172129.7 E 285122.5 - Township of Gladman ORIGINATED BY JL

PROJECT GWP 712-92-00, Highway 11 BOREHOLE TYPE Truck Mounted CME 45B - Hollow Stem Augers COMPILED BY AT

CLIENT AECOM Inc. DATE (Started) 2012 December 6 TIME (Completed) 11:25:00 AM CHECKED BY MAM

DATE (Completed) 2012 December 6

| SOIL PROFILE | | | SAMPLES | | | GROUND WATER CONDITIONS | ELEVATION SCALE | DYNAMIC CONE PENETRATION RESISTANCE PLOT | | | | | PLASTIC LIMIT w _p | NATURAL MOISTURE CONTENT w | LIQUID LIMIT w _L | UNIT WEIGHT γ | REMARKS & GRAIN SIZE DISTRIBUTION (%) |
|--------------|--|-------------|---------|------|------------|-------------------------|-----------------|--|----|----|----|-----|---------------------------------|-------------------------------|--------------------------------|------------------|---------------------------------------|
| ELEV DEPTH | DESCRIPTION | STRATA PLOT | NUMBER | TYPE | "N" VALUES | | | 20 | 40 | 60 | 80 | 100 | | | | | |
| 294.7 | Ground Surface | | | | | | | | | | | | | | | | |
| 0.0 | 150 mm Asphalt 200 mm RAP | | 1 | AS | 30 | | | | | | | | | | | | |
| | FILL - brown sand some silt some gravel | | | | | | | | | | | | | | | | |
| 293.8 | (compact) | | 2 | SS | 23 | | | | | | | | | | | | |
| 0.9 | SAND - grey sand some to with silt some to with gravel | | | | | | | | | | | | | | | | |
| | (compact/very dense) | | 3 | SS | 24 | | | | | | | | | | | | |
| | | | 4 | SS | 87/225 mm | | | | | | | | | | | | |
| | | | 5 | SS | 50/75 mm | | | | | | | | | | | | |
| | | | 6 | SS | 71 | | | | | | | | | | | | |
| | | | 7 | SS | 64 | | | | | | | | | | | | |
| | | | 8 | SS | 50/125 mm | | | | | | | | | | | | |
| | | | 9 | SS | 68 | | | | | | | | | | | | |
| 286.1 | Auger Refusal End of Borehole | | | | | | | | | | | | | | | | |
| 8.6 | | | | | | | | | | | | | | | | | |

| COMMENTS | | WATER LEVEL RECORDS | |
|--|--|------------------------|-----------------|
| + 3, × 3 : Numbers on right refer to Sensitivity Numbers on left refer to values greater than 120 kPa ○ 3% STRAIN AT FAILURE | | Date (dd/mm/yy)/Time | Water Depth (m) |
| | | 1) 12/12/6 11:15:00 AM | 5.8 |
| | | 2) | - |
| | | 3) | - |

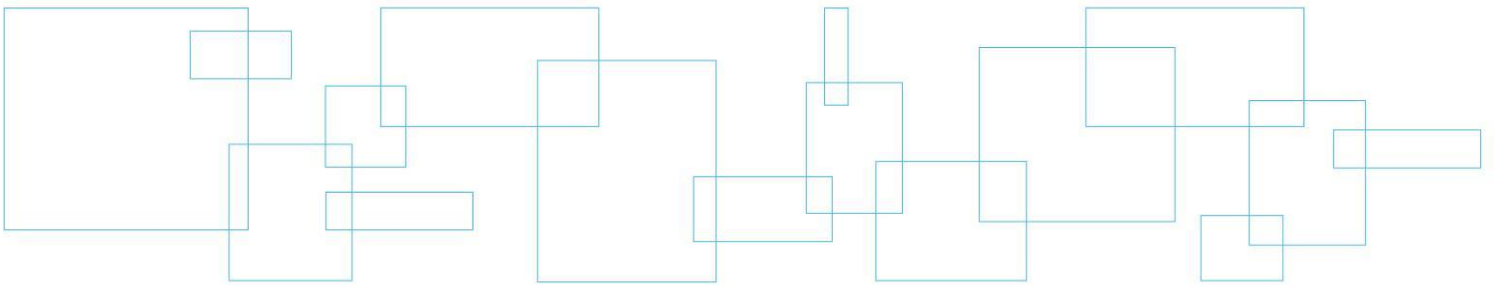
The stratification lines represent approximate boundaries. The transition may be gradual.

MEL-GEO 12193 - BOREHOLE LOGS.GPJ MEL-GEO.GDT 13/12/5



Appendix 3 Borehole Plan and Lab Data

Drawing Nos. 2 to 6: Borehole Location and Soil Strata
Figure Nos. L-1 to L-6: Grain Size Distribution Curves
Figure No. L-7: Atterberg Limits Sheet
Figure No. L-8: Shear Strength Chart
Figure No. L-9: Lab Test Summary Sheet



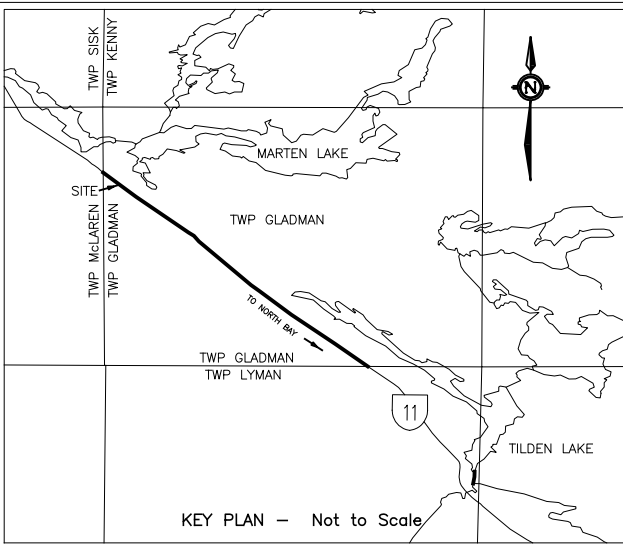
CONT No XXXX-XXXX
GWP No 712-92-00



HWY 11 – Proposed Grade Raise
Sta 18+700 to 19+700
Township of Gladman
BOREHOLE LOCATIONS & SOIL STRATA

Drawing
2

LVM | MERLEX



LEGEND

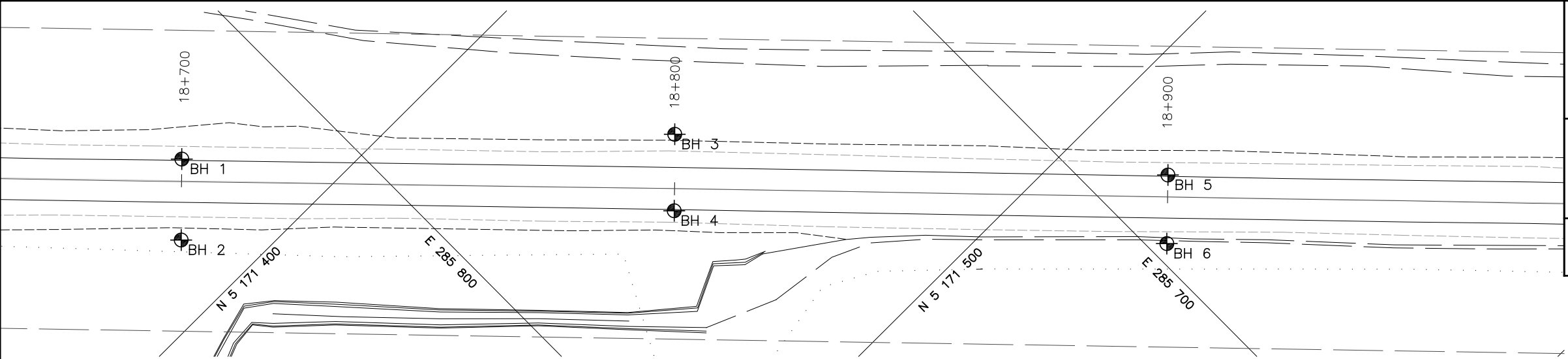
- Borehole
- N Blows/0.3 m (Std Pen Test, 475 J/blow)
- DCPT Blows/0.3 m (60° Cone, 475 J/blow)
- Water Level at Time of Investigation
- A/R Auger Refusal at Elevation
- E/S End of Sampling

| Borehole No. | Elev. | O/S | Co-ordinates | |
|----------------|-------|---------|--------------|----------|
| | | | Northerly | Easterly |
| Borehole No. 1 | 291.0 | 4.4m Lt | 5171374.9 | 285826.4 |
| Borehole No. 2 | 289.8 | 12m Rt | 5171386.4 | 285838.0 |
| Borehole No. 3 | 289.9 | 11m Lt | 5171441.8 | 285752.0 |
| Borehole No. 4 | 291.0 | 4.5m Rt | 5171452.7 | 285763.0 |
| Borehole No. 5 | 290.8 | 4.4m Lt | 5171518.2 | 285686.9 |
| Borehole No. 6 | 290.0 | 9.5m Rt | 5171527.9 | 285696.8 |

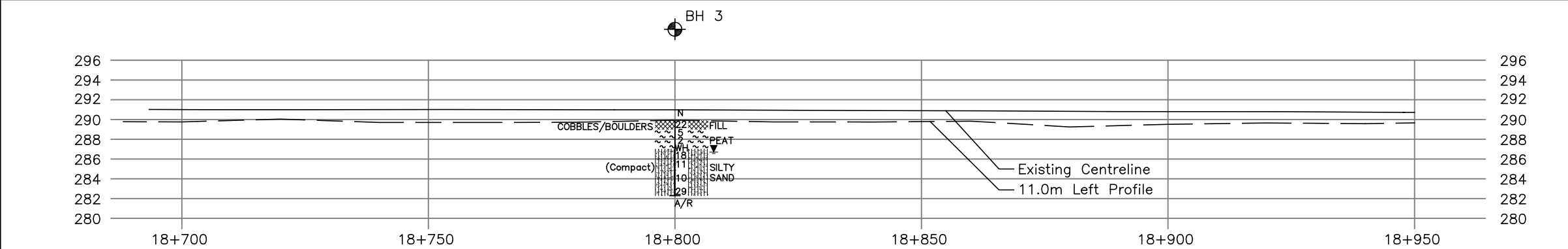
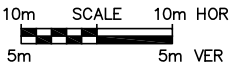
NOTE 1: This drawing is for subsurface information only. Surface details and features are for conceptual illustration. The proposed structure location is shown for illustration purposes only and may not be consistent with the final design configuration as shown elsewhere in the Contract Documents.

NOTE 2: The boundaries between soil strata have been established at the borehole locations only. The boundaries illustrated and stratigraphy between boreholes on this drawing are assumed based on borehole data and may vary. They are intended for design only.

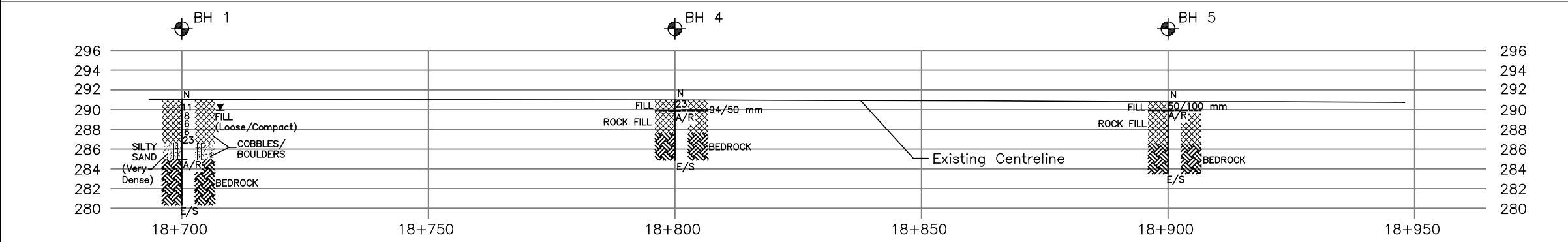
| REVISIONS | DATE | BY | DESCRIPTION |
|--|----------|-----------------|---------------|
| | May 2013 | MCM | REVISION 1 |
| | Dec 2013 | RG | Final |
| | | | |
| HWY No. 11 – Gladman Twp – Grade Raise Section | | | LVM REF 12193 |
| SUBM'D | | GEOCRES 31L-174 | SITE |
| DRAWN IK | CHK AT | DATE April 2013 | DWG 2 |



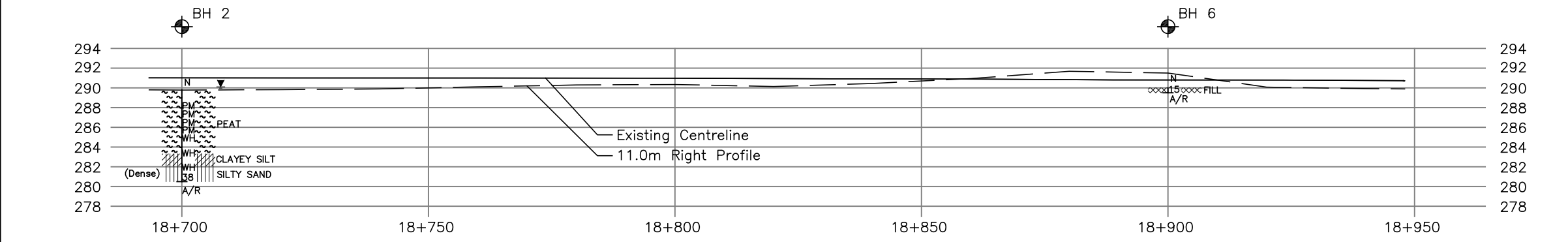
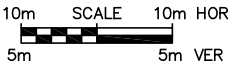
PLAN



LEFT SIDE PROFILE



CENTRE PROFILE



RIGHT SIDE PROFILE



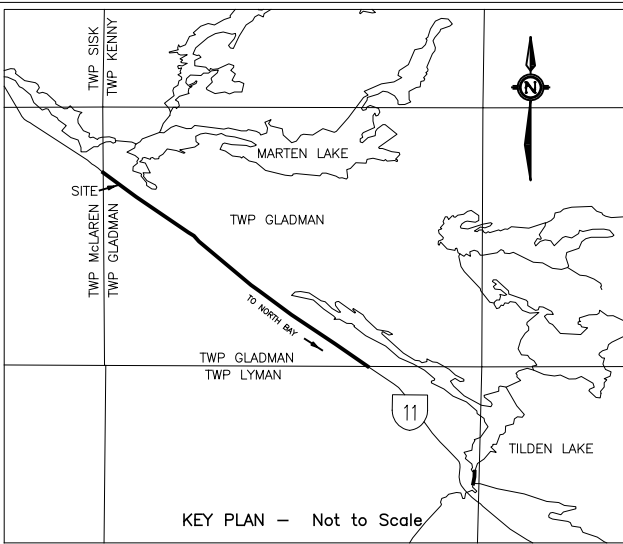
CONT No XXXX-XXXX
GWP No 712-92-00



HWY 11 – Proposed Grade Raise
Sta 18+700 to 19+700
Township of Gladman
BOREHOLE LOCATIONS & SOIL STRATA

Drawing
3

LVM | MERLEX



LEGEND

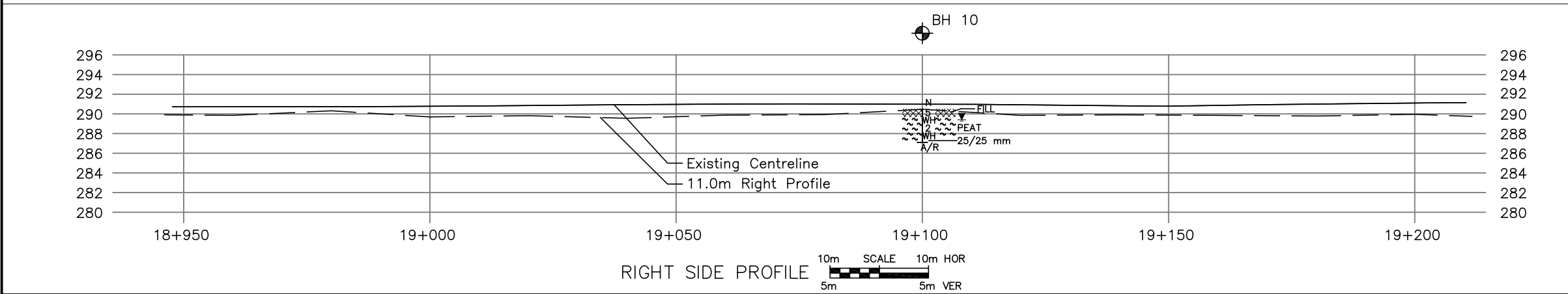
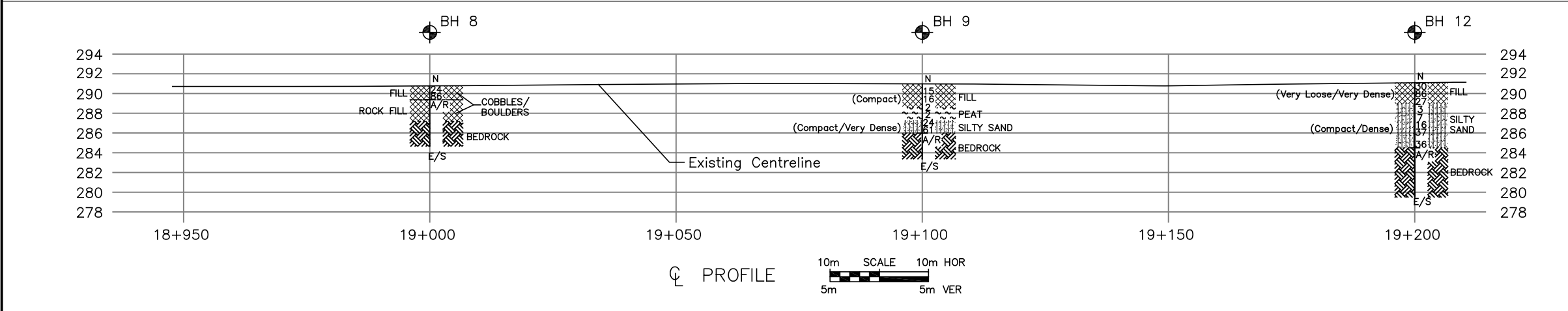
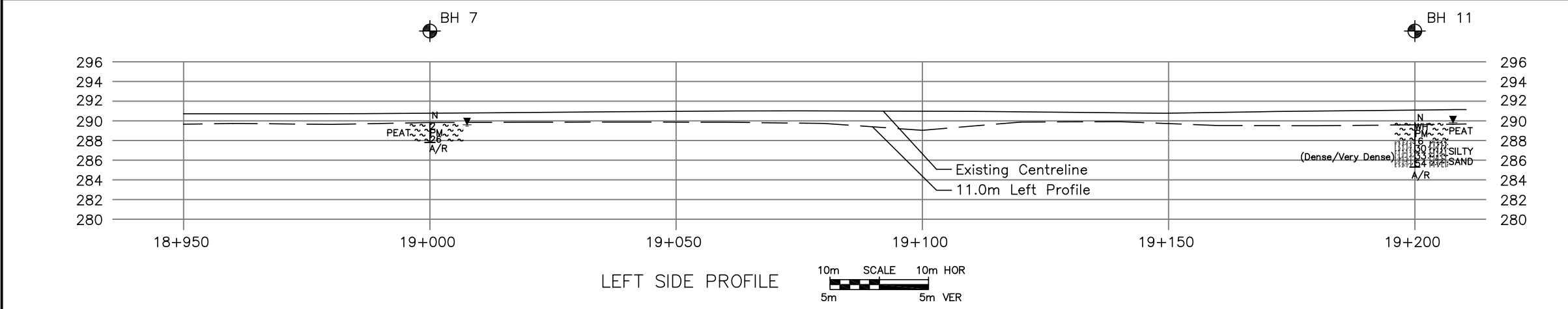
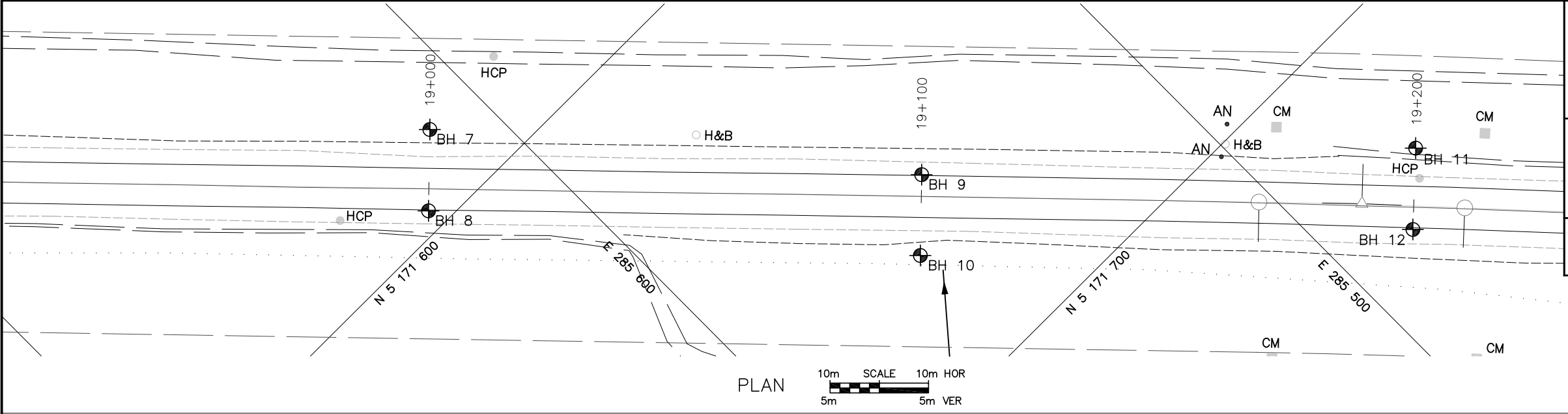
- Borehole
- N Blows/0.3 m (Std Pen Test, 475 J/blow)
- DOPT Blows/0.3 m (60° Cone, 475 J/blow)
- Water Level at Time of Investigation
- A/R Auger Refusal at Elevation
- E/S End of Sampling

| Borehole No. | Elev. | O/S | Co-ordinates | |
|-----------------|-------|---------|--------------|----------|
| | | | Northerly | Easterly |
| Borehole No. 7 | 290.8 | 12m Lt | 5171584.5 | 285611.6 |
| Borehole No. 8 | 290.8 | 4.5m Rt | 5171596.0 | 285623.5 |
| Borehole No. 9 | 291.0 | 4.4m Lt | 5171661.4 | 285547.3 |
| Borehole No. 10 | 290.8 | 12m Rt | 5171672.9 | 285559.0 |
| Borehole No. 11 | 290.1 | 12m Lt | 5171728.3 | 285472.4 |
| Borehole No. 12 | 291.1 | 4.5m Rt | 5171739.6 | 285484.4 |

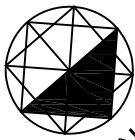
NOTE 1: This drawing is for subsurface information only. Surface details and features are for conceptual illustration. The proposed structure location is shown for illustration purposes only and may not be consistent with the final design configuration as shown elsewhere in the Contract Documents.

NOTE 2: The boundaries between soil strata have been established at the borehole locations only. The boundaries illustrated and stratigraphy between boreholes on this drawing are assumed based on borehole data and may vary. They are intended for design only.

| REVISIONS | DATE | BY | DESCRIPTION | |
|--|----------|-----------------|-------------|---------------|
| | May 2013 | MCM | REVISION 1 | |
| | Dec 2013 | RG | Final | |
| | | | | |
| HWY No. 11 – Gladman Twp – Grade Raise Section | | | | LVM REF 12193 |
| SUBM'D | | GEOCRES 31L-174 | | SITE |
| DRAWN IK | CHK AT | DATE April 2013 | | DWG 3 |



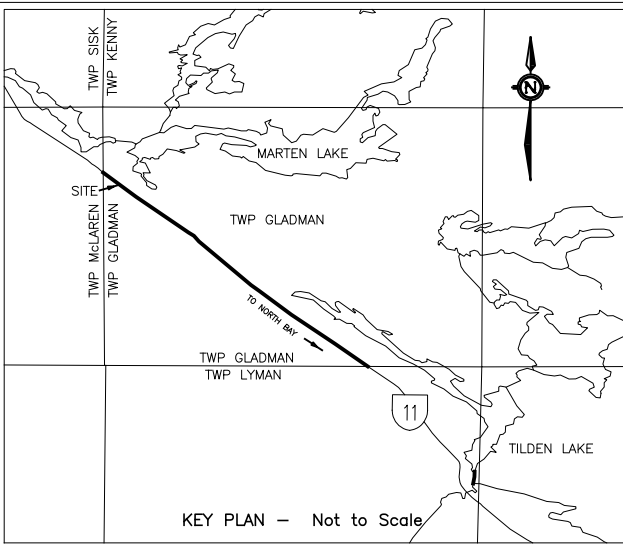
CONT No XXXX-XXXX
GWP No 712-92-00



HWY 11 – Proposed Grade Raise
Sta 18+700 to 19+700
Township of Gladman
BOREHOLE LOCATIONS & SOIL STRATA

Drawing
5

LVM | MERLEX



LEGEND

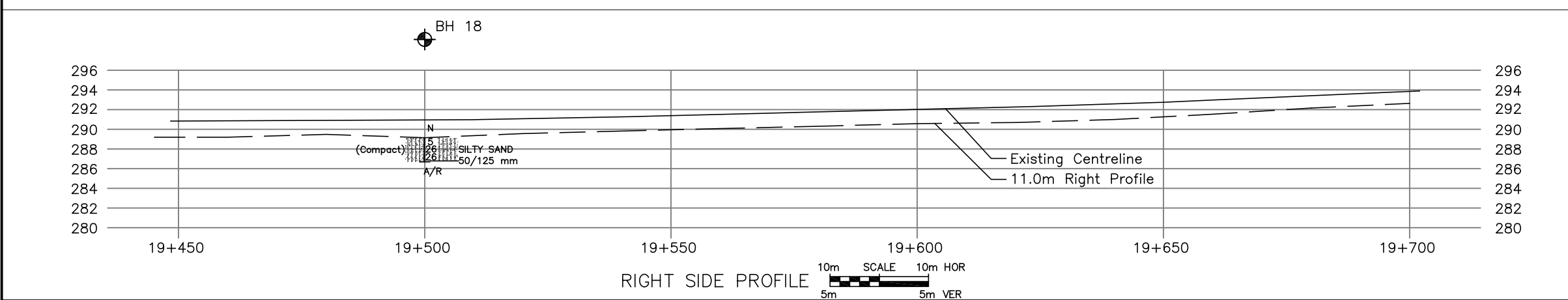
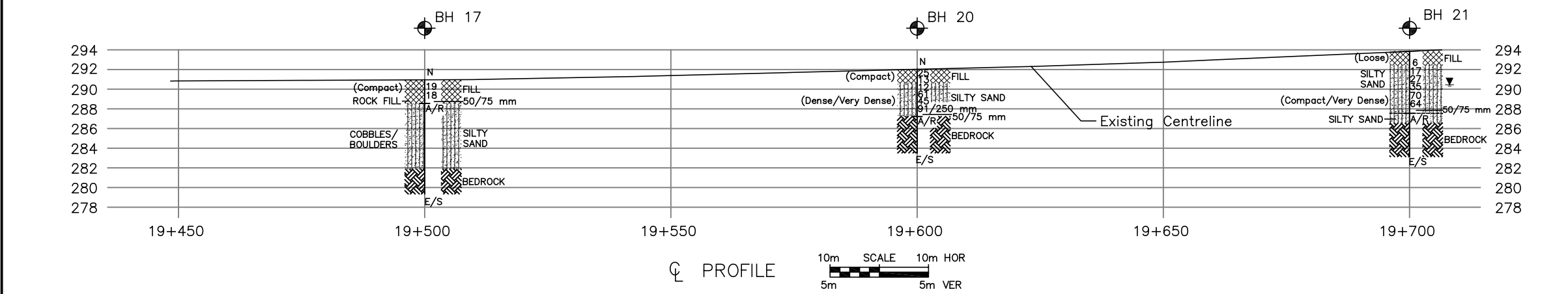
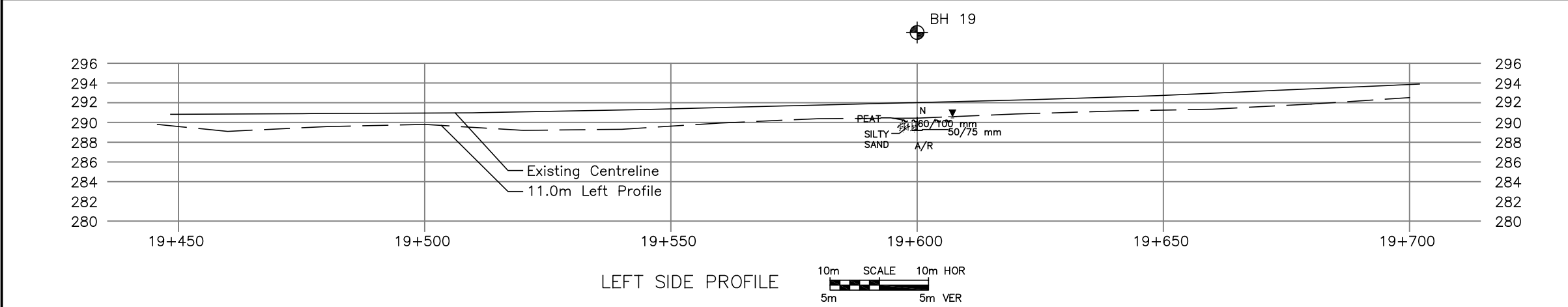
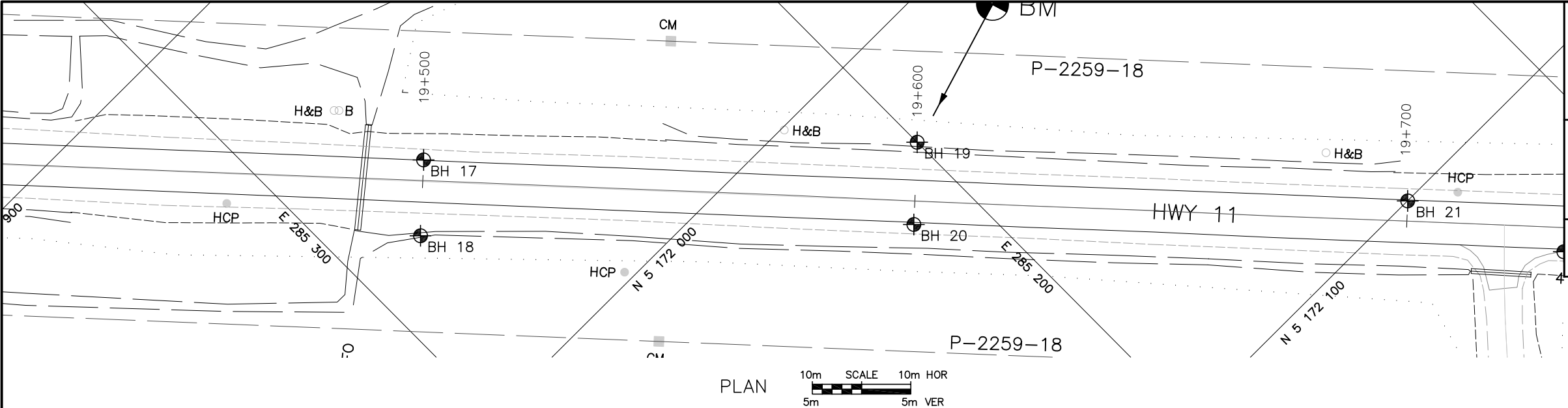
- Borehole
- N Blows/0.3 m (Std Pen Test, 475 J/blow)
- DOPT Blows/0.3 m (60° Cone, 475 J/blow)
- Water Level at Time of Investigation
- A/R Auger Refusal at Elevation
- E/S End of Sampling

| Borehole No. | Elev. | O/S | Co-ordinates | |
|-----------------|-------|---------|--------------|----------|
| | | | Northerly | Easterly |
| Borehole No. 17 | 291.0 | 4.4m Lt | 5171953.2 | 285273.6 |
| Borehole No. 18 | 289.5 | 11m Rt | 5171963.7 | 285284.9 |
| Borehole No. 19 | 290.8 | 12m Lt | 5172021.4 | 285200.0 |
| Borehole No. 20 | 292.0 | 4.7m Rt | 5172032.7 | 285212.2 |
| Borehole No. 21 | 293.9 | 4.1m Lt | 5172100.0 | 285137.7 |

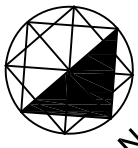
NOTE 1: This drawing is for subsurface information only. Surface details and features are for conceptual illustration. The proposed structure location is shown for illustration purposes only and may not be consistent with the final design configuration as shown elsewhere in the Contract Documents.

NOTE 2: The boundaries between soil strata have been established at the borehole locations only. The boundaries illustrated and stratigraphy between boreholes on this drawing are assumed based on borehole data and may vary. They are intended for design only.

| | | | | |
|--|----------|-----------------|-------------|-------|
| REVISIONS | DATE | BY | DESCRIPTION | |
| | May 2013 | MCM | REVISION 1 | |
| | Dec 2013 | RG | Final | |
| | | | | |
| | | | | |
| | | | | |
| HWY No. 11 – Gladman Twp – Grade Raise Section | | | LVM REF | 12193 |
| SUBM'D | | GEOCRES 31L-174 | SITE | |
| DRAWN IK | CHK AT | DATE April 2013 | DWG 5 | |



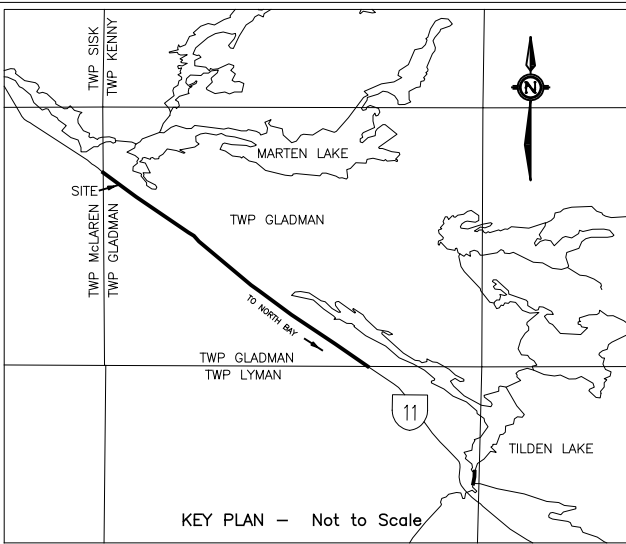
CONT No XXXX-XXXX
GWP No 712-92-00



HWY NO. 11
Township of Gladman
BOREHOLE LOCATIONS & SOIL STRATA

Drawing
6

LVM | MERLEX



KEY PLAN - Not to Scale

LEGEND

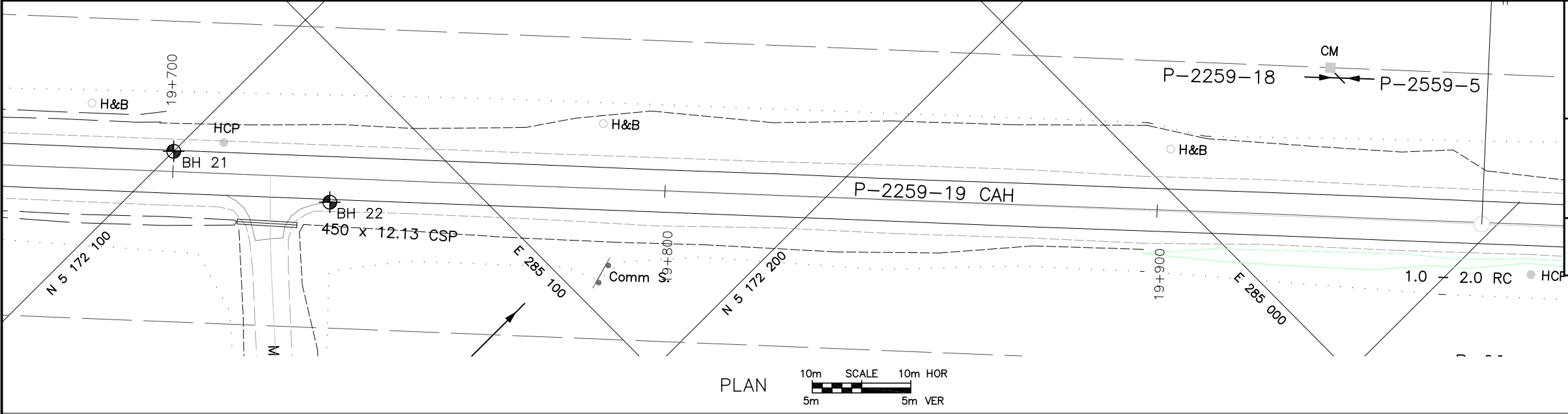
- Borehole
- Blows/0.3 m (Std Pen Test, 475 J/blow)
- DOPT Blows/0.3 m (60° Cone, 475 J/blow)
- Water Level at Time of Investigation
- A/R Auger Refusal at Elevation
- E/S End of Sampling

| Borehole No. | Elev. | O/S | Co-ordinates | |
|-----------------|-------|---------|--------------|----------|
| | | | Northerly | Easterly |
| Borehole No. 22 | 294.7 | 4.9m Rt | 5172129.7 | 285122.5 |

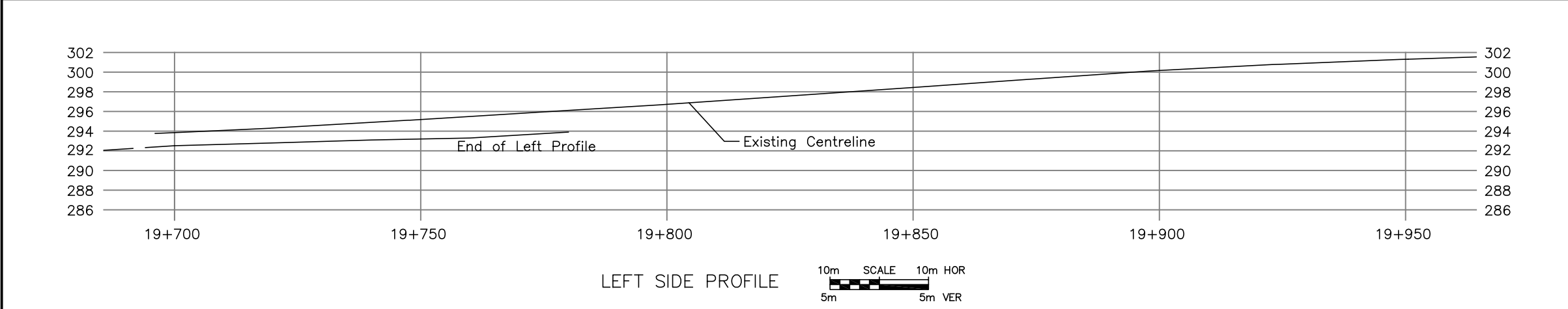
NOTE 1: This drawing is for subsurface information only. Surface details and features are for conceptual illustration. The proposed structure location is shown for illustration purposes only and may not be consistent with the final design configuration as shown elsewhere in the Contract Documents.

NOTE 2: The boundaries between soil strata have been established at the borehole locations only. The boundaries illustrated and stratigraphy between boreholes on this drawing are assumed based on borehole data and may vary. They are intended for design only.

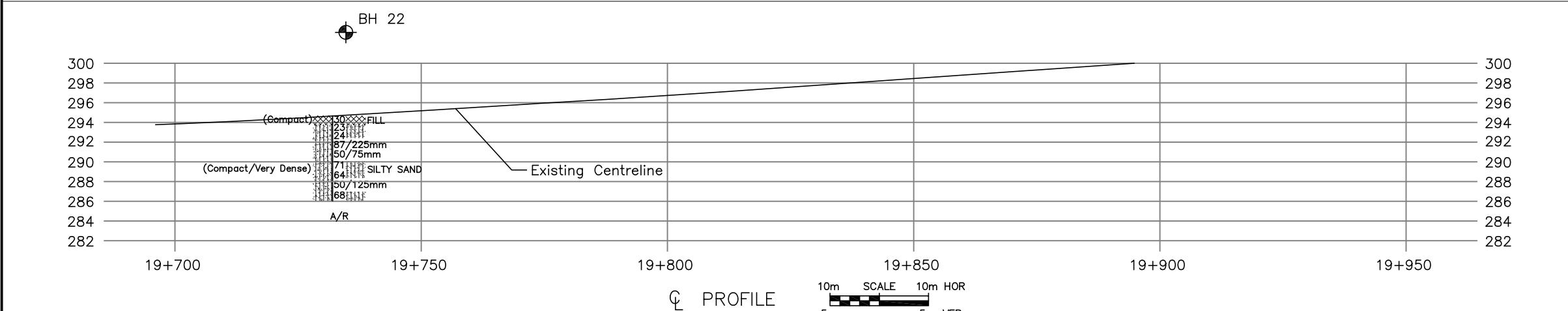
| REVISIONS | DATE | BY | DESCRIPTION | |
|--|----------|-----------------|-----------------|-------|
| | May 2013 | MCM | REVISION 1 | |
| | Dec 2013 | RG | Final | |
| | | | | |
| HWY No. 11 - Gladman Twp - Grade Raise Section | | | LVM REF | 12193 |
| SUBM'D | | GEOCRES 31L-174 | | SITE |
| DRAWN IK | | CHK AT | DATE April 2013 | DWG 6 |



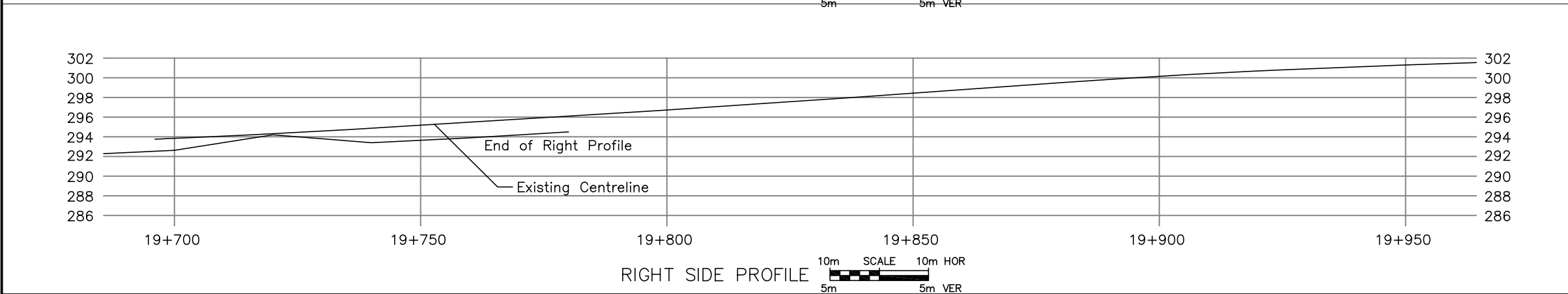
PLAN



LEFT SIDE PROFILE

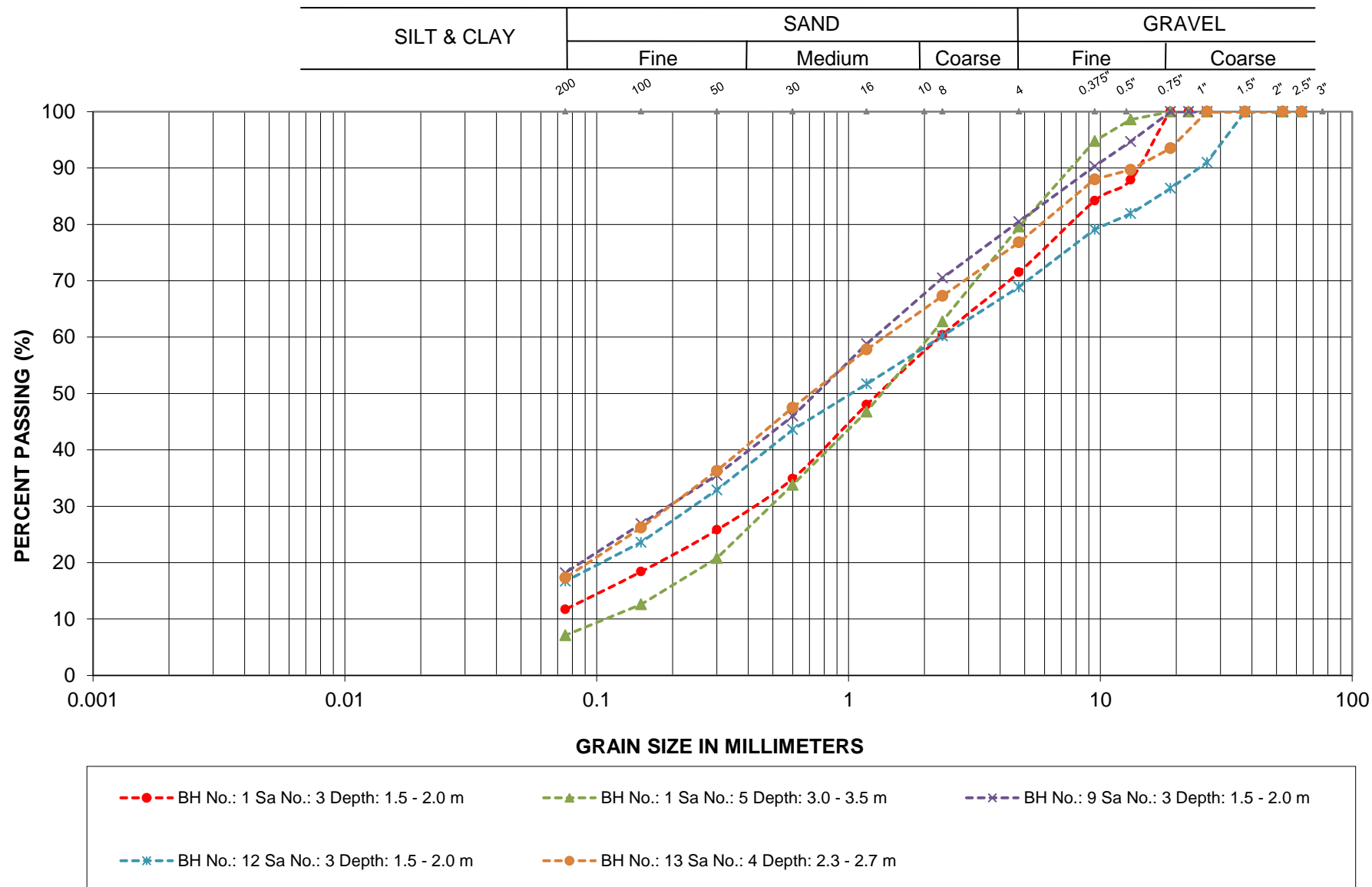


CL PROFILE



RIGHT SIDE PROFILE

GRAIN SIZE ANALYSIS



G.W.P.: 712-92-00

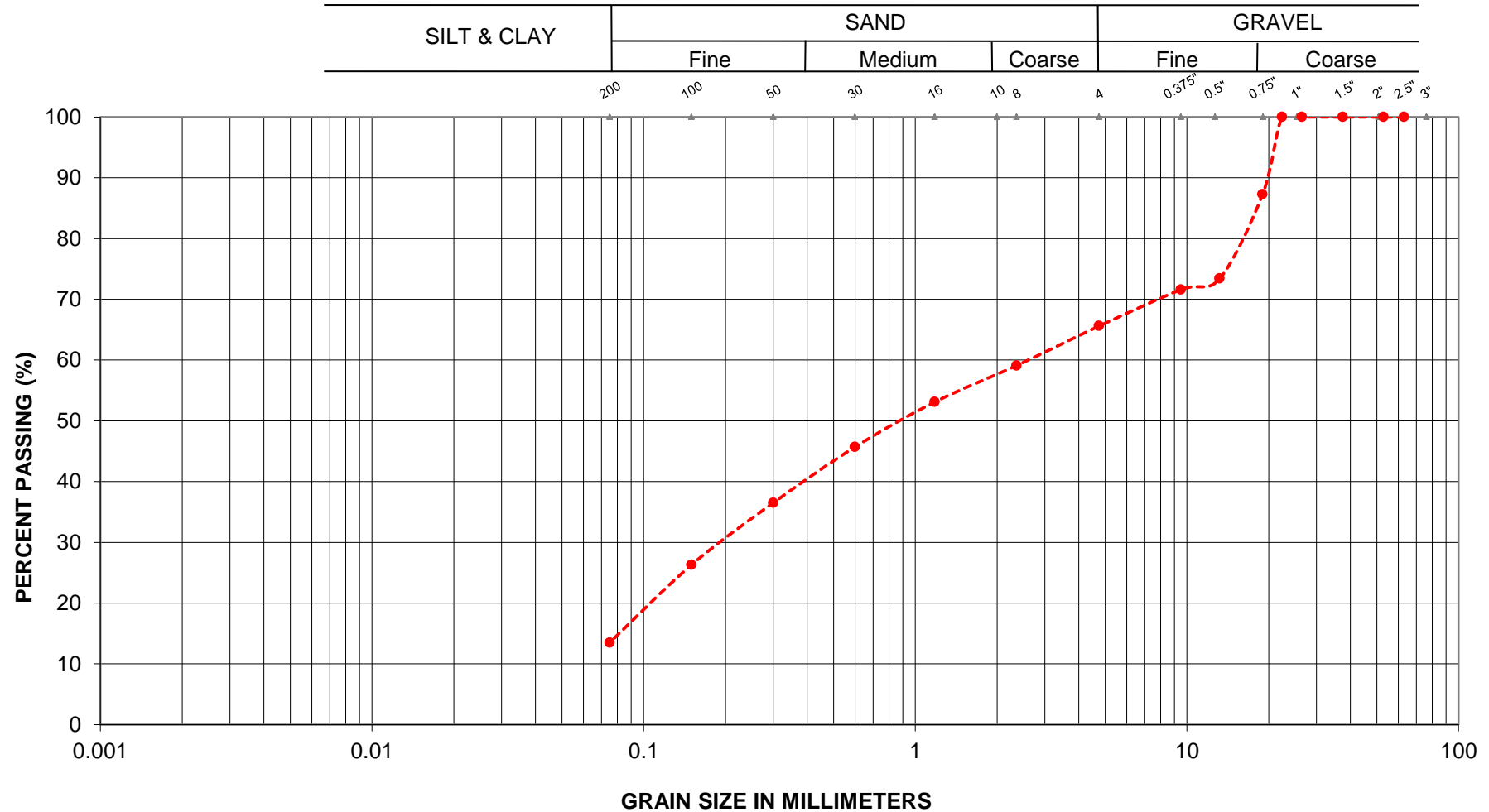
LOCATION: Hwy 11, Station 18+700 to 19+700

EMBANKMENT FILL

LVM | MERLEX

FIGURE L-1

GRAIN SIZE ANALYSIS

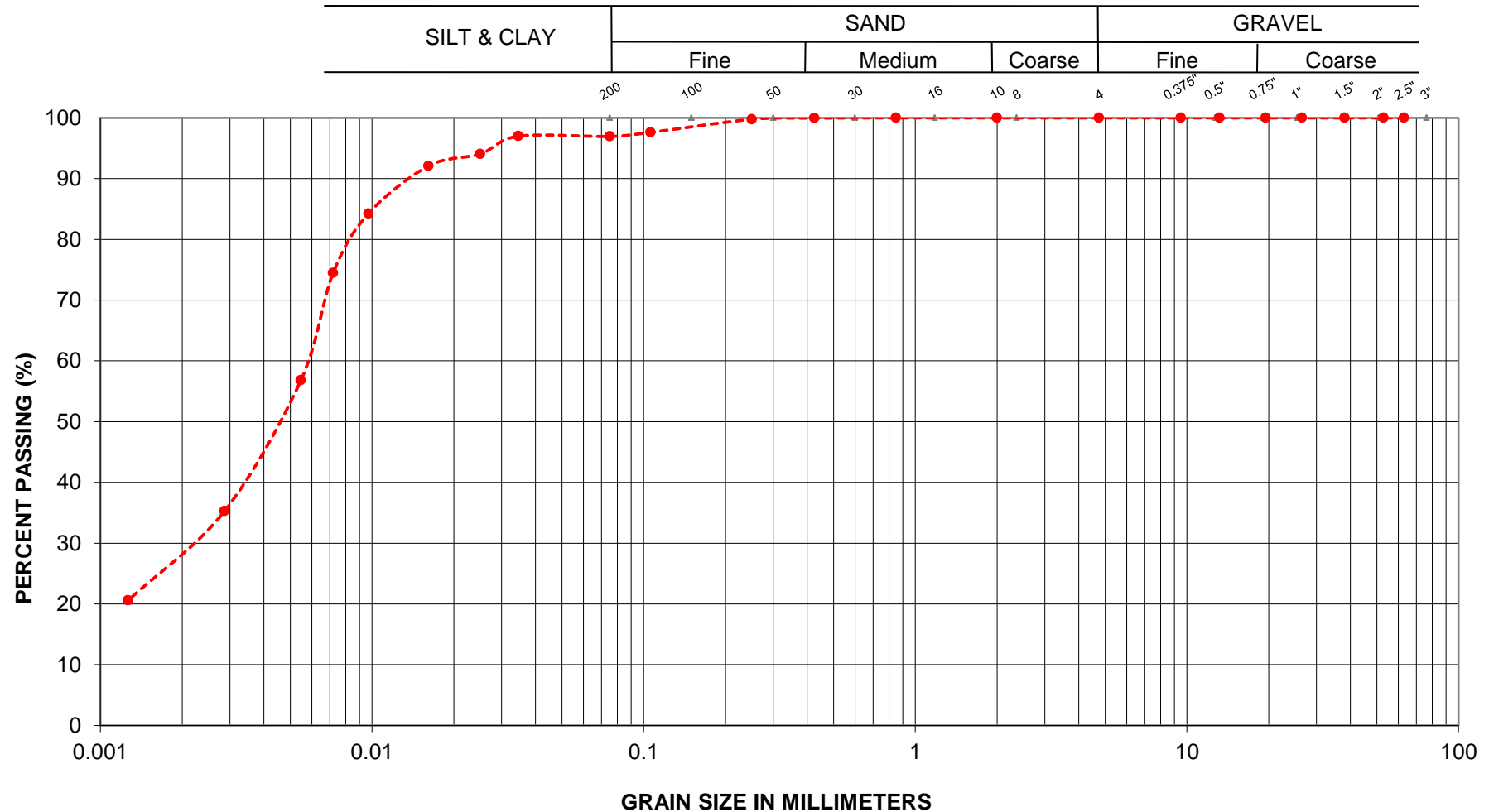


---●--- BH No.: 3 Sa No.: 2 Depth: 0.8 - 1.2 m

G.W.P.: 712-92-00
LOCATION: Hwy 11, Station 18+700 to 19+700

FILL

GRAIN SIZE ANALYSIS



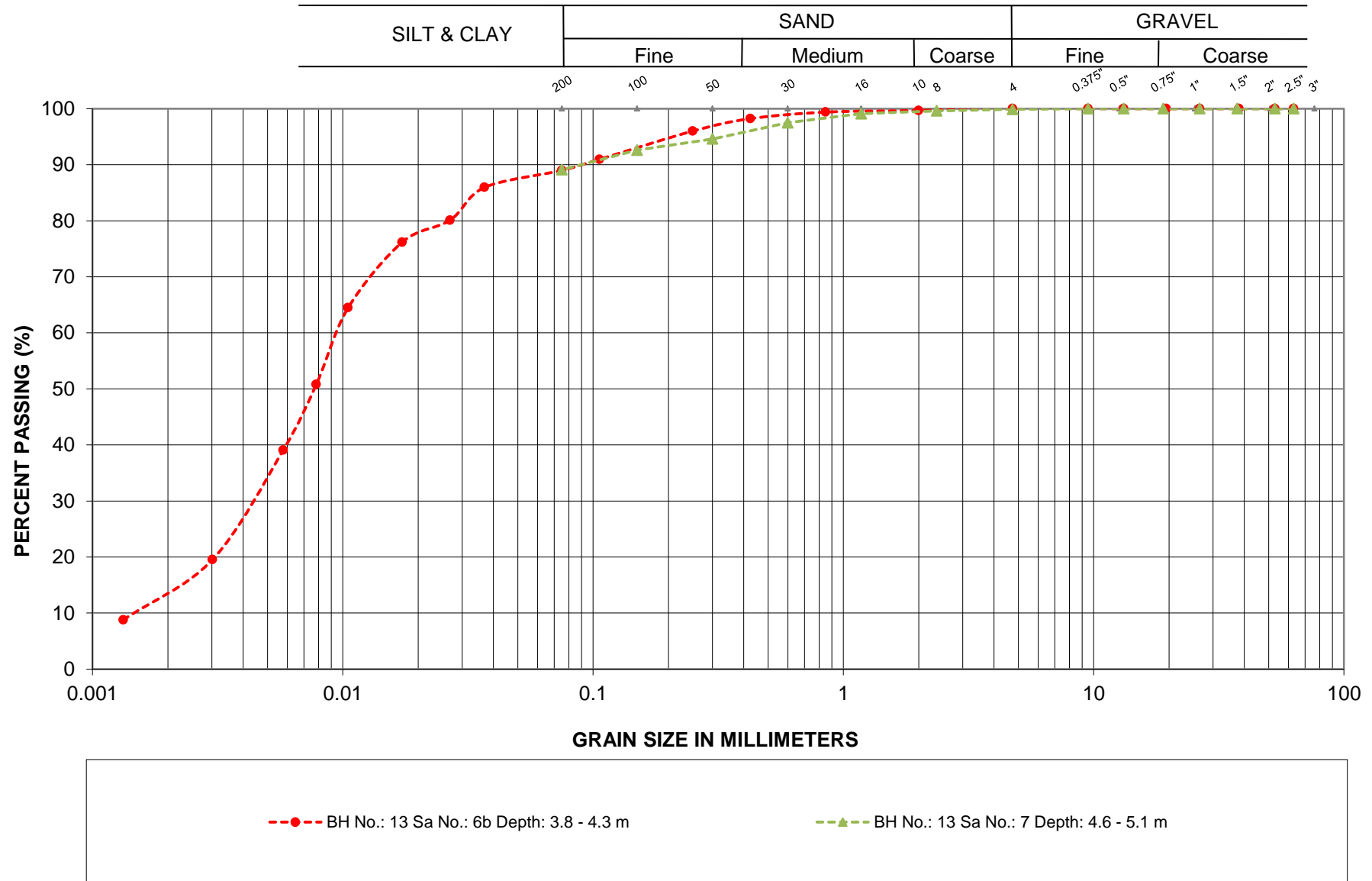
G.W.P.: 712-92-00
LOCATION: Hwy 11, Station 18+700 to 19+700

CLAYEY SILT

LVM | MERLEX

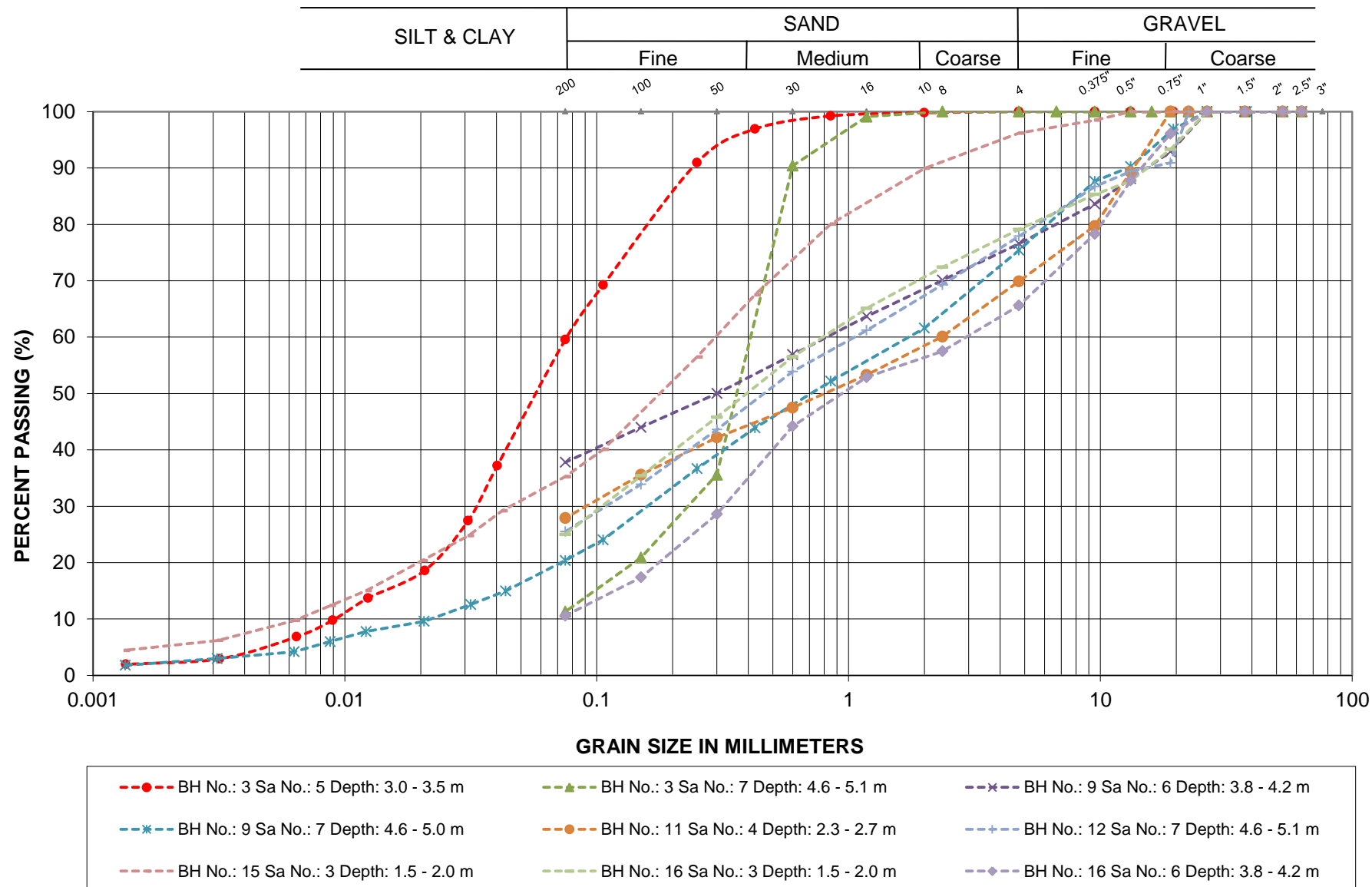
FIGURE L-3

GRAIN SIZE ANALYSIS



G.W.P.: 712-92-00
LOCATION: Hwy 11, Station 18+700 to 19+700

SILT

GRAIN SIZE ANALYSIS

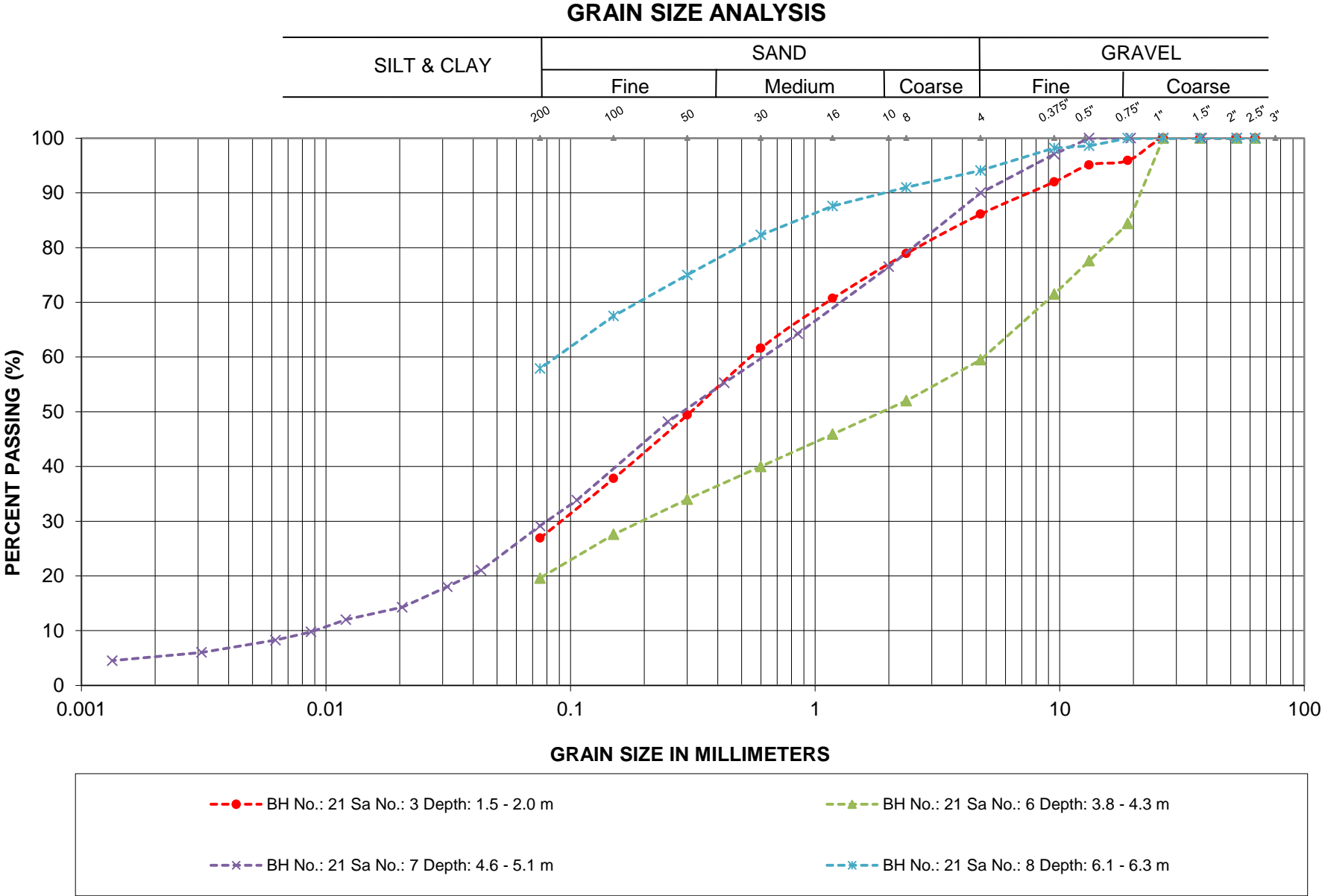
G.W.P.: 712-92-00

LOCATION: Hwy 11, Station 18+700 to 19+700

SILTY SAND

LVM | MERLEX

FIGURE L-5

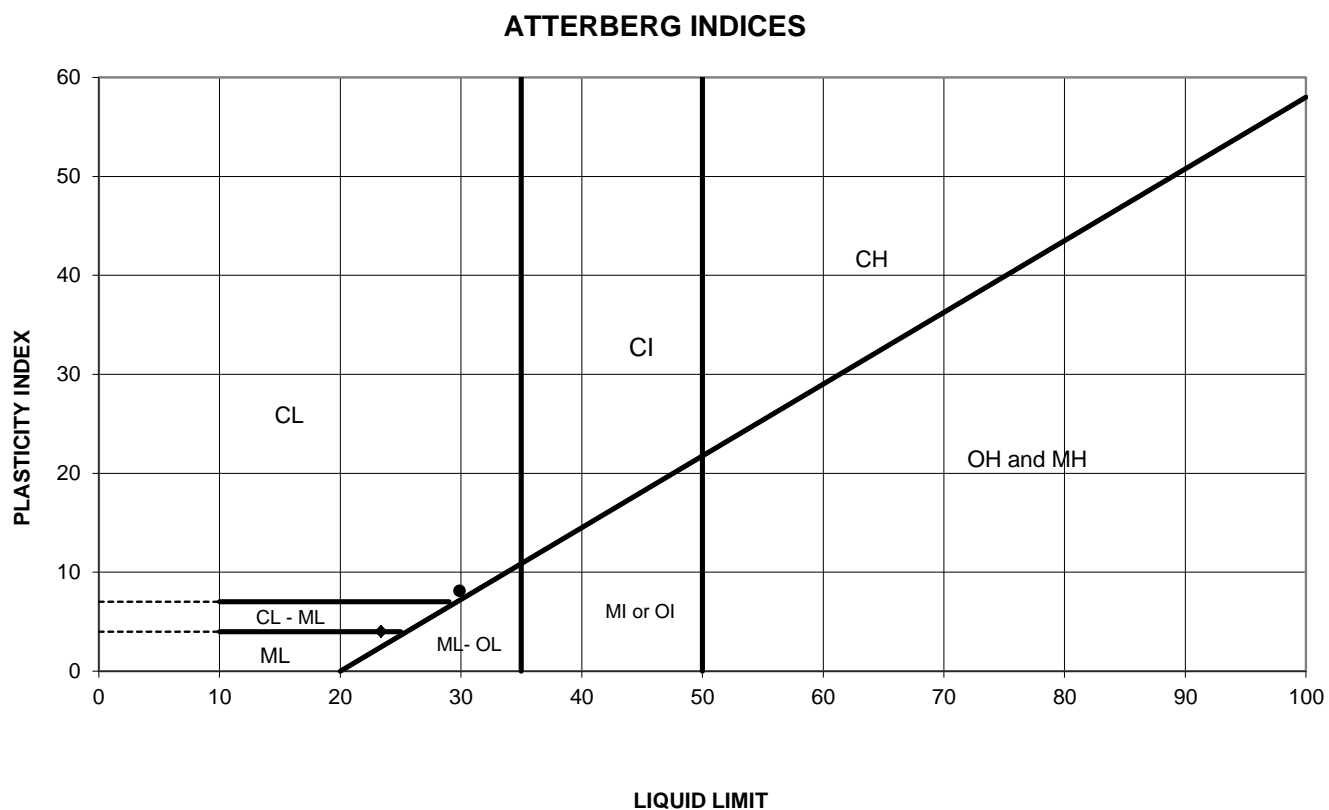


G.W.P.: 712-92-00
LOCATION: Hwy 11, Station 18+700 to 19+700

SILTY SAND

ATTERBERG LIMITS TEST RESULTS

FIGURE L-7



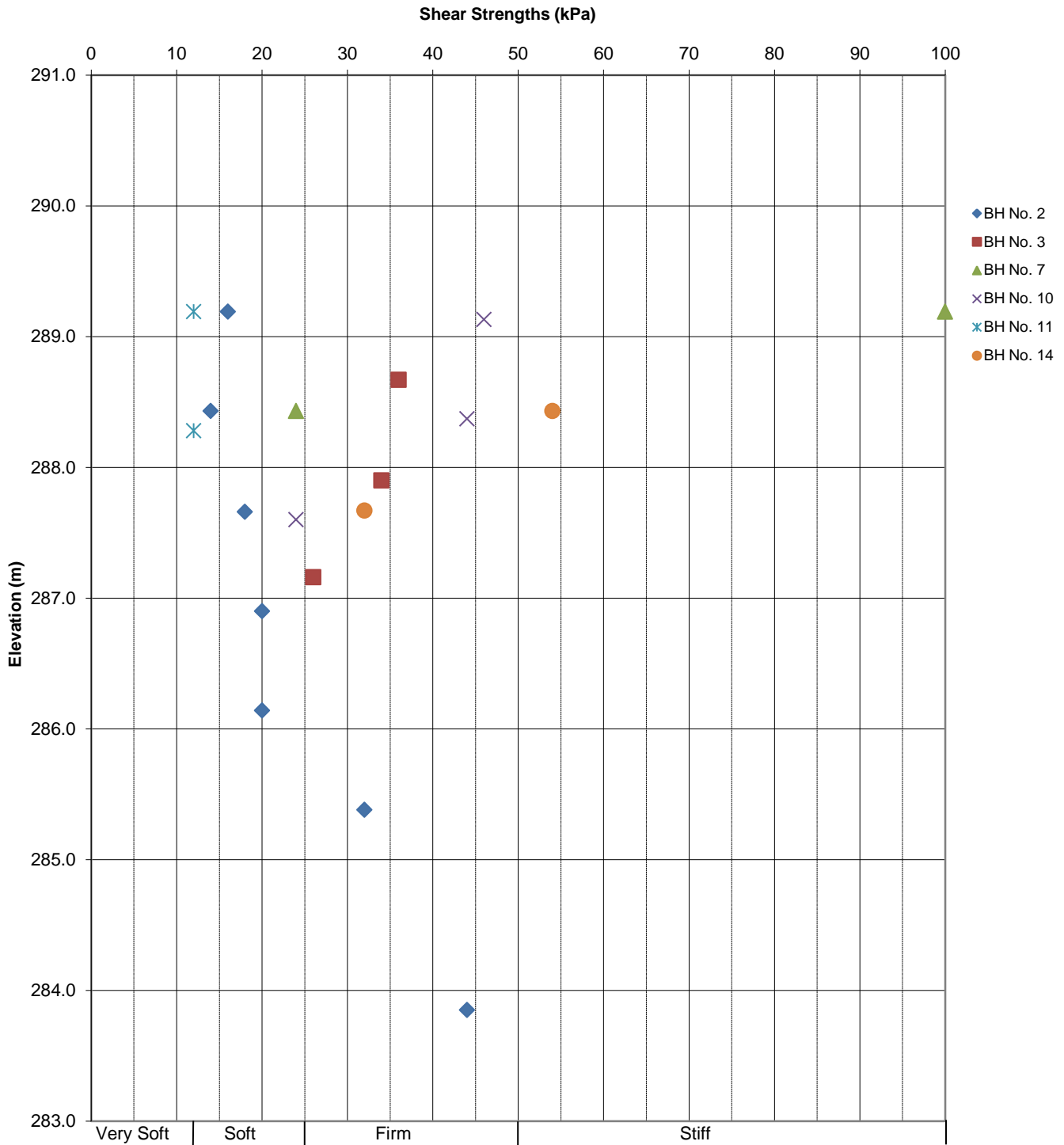
| SYMBOL | BH | Sa. No. | Depth(m) | Elev.(m) | Liquid Limit | Plastic Limit | Plasticity Index | NMC % |
|--------|----|---------|----------|----------|--------------|---------------|------------------|-------|
| ● | 2 | 8 | 7.4 | 282.7 | 29.9 | 21.8 | 8.1 | 40.2 |
| ◆ | 13 | 6b | 4.1 | 286.9 | 23.4 | 19.4 | 4.0 | 20.6 |

Date: Dec-13
Project: Hwy 11
G.W.P: 712-92-00

Prep'd: AT
Chkd: MAM
Ref. No.: 12/09/12193

LVM | MERLEX

In-Situ Shear Strengths vs. Depth



Laboratory Tests - Summary Sheet

| Borehole No. | Sample No. | Depth | Grain Size Analysis | | | | NMC | Atterberg Limits | | | SPT 'N' | USCS | Unit Weight (kN/m3) | Remarks |
|--------------|------------|-------|---------------------|---------------|---------------|---------------|-------|------------------|--------|--------|----------|------|---------------------|---------|
| | | | Gravel Size (%) | Sand Size (%) | Silt Size (%) | Clay Size (%) | | LL (%) | PL (%) | IP (%) | | | | |
| 1 | 1 | 0.0 | | | | | 4.4 | | | | | | | |
| | 2 | 0.8 | | | | | 6.7 | | | | 11 | | | |
| | 3 | 1.5 | 28 | 60 | 12 | | 11.8 | | | | 8 | | | |
| | 4 | 2.3 | | | | | 10.1 | | | | 6 | | | |
| | 5 | 3.1 | 20 | 73 | 7 | | 13.1 | | | | 6 | | | |
| | 6a | 3.8 | | | | | 46.5 | | | | 23 | | | |
| | 6b | 3.8 | | | | | 90.0 | | | | 23 | | | |
| | | | | | | | | | | | | | | |
| 2 | 1 | 0.3 | | | | | 531.0 | | | | 1 | | | |
| | 2 | 1.1 | | | | | 532.0 | | | | PM | | | |
| | 3 | 1.8 | | | | | 454.0 | | | | PM | | | |
| | 4 | 2.6 | | | | | 780.0 | | | | PM | | | |
| | 5 | 3.4 | | | | | 834.0 | | | | PM | | | |
| | 6 | 4.1 | | | | | 836.0 | | | | WH | | | |
| | 7 | 5.6 | | | | | 591.0 | | | | WH | | | |
| | 8 | 7.2 | 0 | 3 | 69 | 28 | 40.2 | 29.9 | 21.8 | | WH | | | |
| | 9 | 8.7 | | | | | 15.0 | | | | 38 | | | |
| 3 | 1 | 0.0 | | | | | 20.0 | | | | 22 | | | |
| | 2 | 0.8 | 34 | 52 | 14 | | 42.2 | | | | 5 | | | |
| | 3 | 1.5 | | | | | 332.0 | | | | 2 | | | |
| | 4 | 2.3 | | | | | 538.0 | | | | WH | | | |
| | 5 | 3.1 | 0 | 40 | 57 | 3 | 16.5 | | | | 18 | | | |
| | 6 | 3.8 | | | | | 26.0 | | | | 11 | | | |
| | 7 | 5.3 | 0 | 89 | 11 | | 18.3 | | | | 10 | | | |
| | 8 | 6.9 | | | | | 13.5 | | | | 29 | | | |
| 4 | 1 | 0.0 | | | | | 8.1 | | | | 23 | | | |
| | 2 | 0.8 | | | | | 7.6 | | | | 94/50 mm | | | |
| 5 | 1 | 0.0 | | | | | 5.4 | | | | | | | |

Laboratory Tests - Summary Sheet

| Borehole No. | Sample No. | Depth | Grain Size Analysis | | | | NMC | Atterberg Limits | | | SPT 'N' | USCS | Unit Weight (kN/m3) | Remarks |
|--------------|------------|-------|---------------------|---------------|---------------|---------------|-------|------------------|--------|--------|-----------|------|---------------------|---------|
| | | | Gravel Size (%) | Sand Size (%) | Silt Size (%) | Clay Size (%) | | LL (%) | PL (%) | IP (%) | | | | |
| | 2 | 0.8 | | | | | 7.3 | | | | 50/100 mm | | | |
| 6 | 1 | 0.0 | | | | | 25.4 | | | | 15 | | | |
| 7 | 1 | 0.0 | | | | | 28.8 | | | | 2 | | | |
| | 2 | 0.8 | | | | | 408.0 | | | | PM | | | |
| | 3 | 1.5 | | | | | 271.0 | | | | 26 | | | |
| 8 | 1 | 0.0 | | | | | 6.8 | | | | 24 | | | |
| | 2 | 0.8 | | | | | 10.3 | | | | 86 | | | |
| 9 | 1 | 0.0 | | | | | 2.8 | | | | | | | |
| | 2a | 0.8 | | | | | 7.6 | | | | 15 | | | |
| | 2b | 0.8 | | | | | 9.7 | | | | 15 | | | |
| | 3 | 1.5 | 19 | 63 | 18 | | 11.2 | | | | 16 | | | |
| | 4a | 2.3 | | | | | 14.9 | | | | 2 | | | |
| | 4b | 2.3 | | | | | 355.0 | | | | 2 | | | |
| | 5 | 3.1 | | | | | 358.0 | | | | 2 | | | |
| | 6 | 3.8 | 23 | 39 | 38 | | 10.9 | | | | 24 | | | |
| | 7 | 4.6 | 25 | 55 | 17 | 3 | 8.9 | | | | 61 | | | |
| 10 | 1 | 0.0 | | | | | 14.6 | | | | 5 | | | |
| | 2 | 0.8 | | | | | 93.0 | | | | WH | | | |
| | 3 | 1.5 | | | | | 321.0 | | | | 2 | | | |
| | 4 | 2.3 | | | | | 517.0 | | | | WH | | | |
| | 5 | 3.1 | | | | | 382.0 | | | | 25/25 mm | | | |
| 11 | 1 | 0.0 | | | | | 76.8 | | | | WH | | | |
| | 2 | 0.8 | | | | | 188.0 | | | | PM | | | |
| | 3 | 1.5 | | | | | 628.0 | | | | 6 | | | |
| | 4 | 2.3 | 30 | 42 | 28 | | 8.8 | | | | 30 | | | |
| | 5 | 3.1 | | | | | 10.4 | | | | 33 | | | |
| | 6 | 3.8 | | | | | 14.2 | | | | 54 | | | |

Laboratory Tests - Summary Sheet

| Borehole No. | Sample No. | Depth | Grain Size Analysis | | | | NMC | Atterberg Limits | | | SPT 'N' | USCS | Unit Weight (kN/m3) | Remarks |
|--------------|------------|-------|---------------------|---------------|---------------|---------------|-------|------------------|--------|--------|-----------|------|---------------------|---------|
| | | | Gravel Size (%) | Sand Size (%) | Silt Size (%) | Clay Size (%) | | LL (%) | PL (%) | IP (%) | | | | |
| 12 | 1 | 0.0 | | | | | 5.9 | | | | 30 | | | |
| | 2 | 0.8 | | | | | 5.1 | | | | 86 | | | |
| | 3 | 1.5 | 31 | 52 | 17 | | 7.0 | | | | 27 | | | |
| | 4 | 2.3 | | | | | 11.8 | | | | 3 | | | |
| | 5 | 3.1 | | | | | 13.0 | | | | 7 | | | |
| | 6 | 3.8 | | | | | 19.1 | | | | 16 | | | |
| | 7 | 4.6 | 22 | 52 | 26 | | 7.2 | | | | 37 | | | |
| | 8 | 6.1 | | | | | 13.3 | | | | 36 | | | |
| 13 | 1 | 0.0 | | | | | 3.1 | | | | | | | |
| | 2 | 0.8 | | | | | 1.8 | | | | 13 | | | |
| | 3 | 1.5 | | | | | 11.5 | | | | 14 | | | |
| | 4 | 2.3 | 23 | 60 | 17 | | 10.2 | | | | 8 | | | |
| | 5a | 3.1 | | | | | 12.8 | | | | 7 | | | |
| | 5b | 3.1 | | | | | 202.0 | | | | 7 | | | |
| | 6a | 3.8 | | | | | 236.0 | | | | 12 | | | |
| | 6b | 3.8 | 0 | 11 | 75 | 14 | 20.6 | 23.4 | 19.4 | | 12 | | | |
| | 7 | 4.6 | 1 | 11 | 89 | | 21.0 | | | | 65 | | | |
| 14 | 1 | 0.0 | | | | | 198.0 | | | | 3 | | | |
| | 2 | 0.8 | | | | | 205.0 | | | | WH | | | |
| | 3 | 1.5 | | | | | 722.0 | | | | WH | | | |
| | 4 | 2.3 | | | | | 15.7 | | | | 14 | | | |
| | 5 | 3.1 | | | | | 16.2 | | | | 41 | | | |
| | 6 | 3.8 | | | | | 10.8 | | | | 50/75 mm | | | |
| 15 | 1 | 0.0 | | | | | 30.5 | | | | | | | |
| | 2 | 0.3 | | | | | 20.9 | | | | 7 | | | |
| | 3 | 1.1 | 4 | 61 | 30 | 5 | 14.8 | | | | 20 | | | |
| | 4 | 1.8 | | | | | 12.7 | | | | 84/225 mm | | | |

Laboratory Tests - Summary Sheet

| Borehole No. | Sample No. | Depth | Grain Size Analysis | | | | NMC | Atterberg Limits | | | SPT 'N' | USCS | Unit Weight (kN/m ³) | Remarks |
|--------------|------------|-------|---------------------|---------------|---------------|---------------|------|------------------|--------|--------|-----------|------|----------------------------------|---------|
| | | | Gravel Size (%) | Sand Size (%) | Silt Size (%) | Clay Size (%) | | LL (%) | PL (%) | IP (%) | | | | |
| 15 | 5 | 2.6 | | | | | 11.2 | | | | 31 | | | |
| | 6 | 3.4 | | | | | 7.7 | | | | 50/100 mm | | | |
| 16 | 1 | 0.0 | | | | | 6.6 | | | | 26 | | | |
| | 2 | 0.8 | | | | | 4.8 | | | | 16 | | | |
| | 3 | 1.5 | 21 | 54 | 25 | | 12.0 | | | | 22 | | | |
| | 4 | 2.3 | | | | | 14.1 | | | | 68 | | | |
| | 5 | 3.1 | | | | | 10.3 | | | | 20 | | | |
| | 6 | 3.8 | 34 | 55 | 11 | | 10.6 | | | | 67 | | | |
| 17 | 1 | 0.0 | | | | | 5.4 | | | | | | | |
| | 2 | 0.8 | | | | | 7.4 | | | | 19 | | | |
| | 3 | 1.5 | | | | | 6.3 | | | | 18 | | | |
| | 4 | 2.3 | | | | | 7.0 | | | | 50/75 mm | | | |
| 18 | 1a | 0.0 | | | | | 35.5 | | | | 5 | | | |
| | 1b | 0.0 | | | | | 11.4 | | | | 5 | | | |
| | 2 | 0.8 | | | | | 8.7 | | | | 26 | | | |
| | 3 | 1.5 | | | | | 12.7 | | | | 26 | | | |
| | 4 | 2.3 | | | | | 6.8 | | | | 50/125 mm | | | |
| 19 | 0 | 1.0 | | | | | 78.3 | | | | | | | |
| | 0.6 | 2.0 | | | | | 19.7 | | | | 60/100mm | | | |
| | 1.2 | 3.0 | | | | | 9.7 | | | | 50/75 mm | | | |
| 20 | 0 | 1.0 | | | | | 5.2 | | | | 25 | | | |
| | 0.8 | 2.0 | | | | | 8.7 | | | | 13 | | | |
| | 1.5 | 3.0 | | | | | 16.7 | | | | 12 | | | |
| | 2.3 | 4.0 | | | | | 8.4 | | | | 61 | | | |
| | 3.1 | 5.0 | | | | | 12.1 | | | | 45 | | | |
| | 3.8 | 6.0 | | | | | 6.5 | | | | 91/250 mm | | | |
| | 4.6 | 7.0 | | | | | 11.5 | | | | 50/75 mm | | | |

Laboratory Tests - Summary Sheet

[illegible]