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 AND DESIGN REPORT

Date: December 5, 2013
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Final Foundation Investigation and Design Report

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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. Unsampled 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 till 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 4). 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-4, 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 4). 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.

5 DISCUSSION AND RECOMMENDATIONS

5.1 GENERAL

A foundation investigation was carried for a proposed grade raise as identified in the RFP. The purpose of this investigation was to determine the subsurface conditions in the area of the grade raise in order to provide recommendations for the grade raise and embankment widening.

As previously noted, 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.

The proposed grade raise will be located between Stations 18+700 and 19+700 in the Township of Gladman. The existing highway embankment currently supports two lanes of undivided highway, running in an approximately north-south direction. The highway embankment passes through a low lying wetland area. Based on the data obtained during the foundation investigation, the embankment is generally constructed of granular (sand and gravel) fill, with zones of rock fill. Presently, the embankment sideslopes are generally at an angle of 2.3:1 to 2.7:1 (H:V). For information purposes, typical cross sections of the existing embankment along this section of highway are shown on Figure SK-6a and SK-6b in Appendix 4. For discussion purposes, it is assumed that the grade raise will be up to 1 m over the full extent of the limits with existing vertical splined into the existing grade outside of the limits.

It is understood that it has been proposed to raise the grade along his section of highway by up to 1 m. To carry out the grade raise, the embankment must be widened on both sides. The relationship between the existing highway centreline and the grade at the borehole locations is shown on Drawing Nos. 2 to 6, Appendix 3.

Based on the information obtained during the foundation investigation, the native subgrade soils generally consist of sands with varying amounts of silt and gravel; however, pockets of silt and clayey silt were encountered at Borehole Nos. 2 and 13. To the left and right (west and east) of the existing embankment, deposits of organic material (peat) of significant thickness (between 0.6 and 6.8 m thick) were encountered along this section of highway right of way. The information from this foundation investigation has been supplemented with data from the pavement (geotechnical) investigation also carried out by LVM | Merlex. Additionally, for visualization purposes, a sketch illustrating the inferred extent of the peat deposit is provided on Figure SK-5, Appendix 4. Details on pavement design are contained in the Pavement Design Report prepared by LVM | Merlex, Reference 12/09/12193.

5.2 EMBANKMENT WIDENING CONSIDERATIONS

The native soils between Stations 18+700 to 19+700, adjacent to the embankment generally consist of a deposit of peat overlying sand till with varying silt and gravel content.

To the left (west) of the embankment, the peat deposit was encountered consistently between Stations 18+700 to 19+700 to depths of 0.6 to 2.9 below existing grade, except at Stations 19+400 and 19+600 (Borehole No. 15 and 19, respectively), where peat was not encountered. However, to the right of the existing embankment, the peat deposit was somewhat discontinuous and generally encountered from Station 18+700 to 18+825, Station 18+925 to 18+975, and from Station 19+100 to 19+425, except at one geotechnical borehole advanced at Station 19+400. From Station 18+825 to 18+925, Station 18+975 to 19+100, and Station 19+425 to 19+700, the native materials, at existing grade, generally consisted of the sand till. Pockets (layers) of peat were also encountered below the embankment fills at Borehole Nos. 9 and 13 that were advanced through the embankment.

5.2.1 Swamp (Peat) Excavations

The grade raise along this section of highway will involve widening the embankment to the left and right (approximately 3 m on each side). Consequently, the embankment slope widening will extend over the peat deposit. It is recommended that the peat be removed from below the area of embankment widening. The peat should be removed down to native mineral soil.

The embankment widening through the swamp areas should be carried out as per OPSD 203.020. To carry out the widening, the existing foreslope should be excavated starting at the existing shoulder rounding, and should be cut back at an angle of 1H:1V to existing grade (i.e. top of the swamp (peat deposit). From this point, the excavation should be advanced vertically downward to the underside of the peat deposit (i.e. top of native mineral soils). The depth of the peat deposit varies along this section of Highway 11. At the borehole locations, the peat extended to maximum depths of 6.5 m on the right (Elevation 283.6 m, Station 18+700) and 6.8 m on the left (Elevation 284.3 m, Station 18+650).

Due to the depth of the peat deposit (up to 6.8 m at borehole locations) and the shallow groundwater table, there is a potential for construction difficulties. As such, it is recommended that, where the peat is removed, the embankment widening be constructed of rock fill up to a minimum 500 mm above existing ditch grade (i.e. top of the peat deposit) or top of free water level, whichever is higher. The peat excavation and backfilling may be carried out in a submerged condition eliminating the requirement for dewatering.

All excavations along the existing foreslope must be carried out in narrow ‘windows’, some 1.5 to 2 m wide, and backfilled immediately to maintain stability of the excavated foreslope. The excavation must be followed up immediately with backfilling and at no time should the width of excavation exceed 3 m (longitudinally). If delays develop in the excavation and simultaneous backfilling operations, due to breaks, equipment breakdown, delays in material supply, etc., the

excavation must be backfilled immediately to preserve stability (integrity) of the existing embankment.

During excavation and backfilling, minor distortion or localized sloughing of the existing embankment's vertically excavated face may develop. Therefore, traffic and construction equipment must be kept back from the zone of influence at the top of the excavation. This zone of influence is described as the area defined by a line drawn from the proposed base of excavation up at a 45° angle to where it intersects the existing shoulder/lane.

When the depth of peat excavation exceeds some 3 m the zone of influence will encompass the existing shoulder (assuming a 3 m wide shoulder). When the excavation extends below some 3 m, below ditch elevation, the zone of influence will encompass the near lane and single lane traffic control will have to be implemented. If the depth of excavation approaches or exceeds a depth of some 7 m than the zone of influence will approach the second lane and traffic will have to be detoured onto the far shoulder area. Additionally, excavation and backfilling operations should be carried out on one side of the embankment at a time.

The embankment should be continually monitored by a qualified geotechnical engineer when the depth of excavation exceeds 3 m. The excavation methodology may have to be revised depending upon the actual conditions encountered on site at the time the work is carried out.

Slopes along the rock fill embankment should be established at a maximum angle of 1.25H:1V. The surface of the rock fill layer should be properly chinked and a Class II Geotextile, with a FOS of 105 to 210, placed over the surface. Above existing grade, the embankment should be constructed to match the existing embankment (i.e. granular fill). Slopes in the granular fill should be established at an angle of 3H:1V, as per OPSD 200.010, up to the underside of the pavement structure.

5.2.2 Non-Swamp (Peat) Excavations

As noted, the peat deposit was generally not encountered to the right (east) of the existing highway embankment between Station 18+825 to 18+925, Stations 18+975 to 19+100 and Stations 19+425 to 19+700, based on the foundation boreholes advanced for this foundation investigation and supplemented by geotechnical borehole data (see Figure SK-5).

Where peat is not encountered at the toe of the existing embankment, the grade raise and widening can be constructed to match the existing embankment. Generally, the embankment is constructed of granular fill material. However, rock fill was encountered in the embankment at Borehole Nos. 4, 5, 8, and 17.

Where rock fill was encountered, the widening can be constructed of rock fill to match the existing rock fill embankment. Slopes in the rock fill embankment can be established at a minimum angle of 1.25H:1V. At the horizontal transition from rock fill to granular fill, the rock fill should be properly chinked and a Class II Geotextile, with a FOS of 105 to 210, placed over the surface of the rock fill.

Embankment side slopes in earth and granular fill should be established at an angle of 3H:1V, as per OPSD 200.010, up to the underside of the pavement structure. Embankment fill within the depth of frost penetration (2.0 m at this location) must be OPSS 1010 Select Subgrade Material (SSM) quality or better.

5.2.3 Peat Below the Existing Embankment

A layer of amorphous peat was encountered below the embankment fills at Borehole Nos. 9 and 13. At these locations, the peat layer was approximately 1.3 and 0.6 m thick, respectively. A layer of peat was also encountered in a geotechnical borehole at Station 19+450. No significant distortions were observed at these locations. However, it is unknown if any corrective actions have been undertaken at these locations and the recent profile survey indicates a slight sag, starting at Station 19+090 and increasing to a sag of some 200 mm vertically at a location approximately 40 m up chainage from Borehole 9. There is a similar shallow sag in the centreline profile in the area at and north of Borehole 13. If the peat layer is left in place, the new loads associated with the grade raise fill (±1 m) will result in compression of the peat deposit, and localized differential settlement of the embankment. In general, it is possible to develop a very approximate **estimate** of the magnitude of consolidation of a peat deposits as a percentage of the equivalent height of the applied granular fill load, up to 50% of the thickness of the peat layer. In consideration of the current moisture condition of the peat at these locations (which was measured at 202 to 358%), and the fact that the existing embankment has preloaded the peat, it is estimated that a 1 m grade raise will result in consolidation of the peat layer of approximately 25 to 35% of the peat layer thickness. As such, differential settlements of the road surface in the order of 150 up to possibly 450 mm (depending upon lateral and transverse extent of peat) should be anticipated in the vicinity of Borehole Nos. 9 and 13 if the peat deposit is left in place.

In order to reduce the risk of settlement where peat was encountered below the existing embankment, the peat layer could be removed through excavation. As it is understood that the grade raise is not to be constructed at this time, LVM | Merlex therefore recommends that a series of probes be advanced in the areas where peat was encountered below the embankment to more fully delineate the lateral and longitudinal extent of the peat layer prior to the future detailed design stage for the grade raise.

5.2.4 Slope Stability

The embankment height and composition varies along the highway alignment. Stability analyses, using the GEO-SLOPE computer program, Slope/W (GeoStudio 2007, Version 7.17, Geo-Slope International Ltd.), was carried out for representative cross sections at Stations 18+700 (right of centreline), 19+000 (right and left of centreline), 19+300 (right of centreline), and 19+400 (right of centreline) for embankments constructed using rock fill or granular/earth fill. Standard embankment slopes of 1.25H:1.0V were assumed in rock fill, while standard embankment slopes of 3H:1V were assumed for the granular/earth fills. For the purposes of these analyses, the materials were modelled using the following parameters;

MATERTIAL TYPE	UNIT WEIGHT (kN/m³)	FRICTION ANGLE (°)	SHEAR STRENGTH (kPa)
Embankment Fill	20	30	-
Rock Fill	18.5	43	-
Loose Embankment Fill	17.5	28	-
Peat	10	-	20
Clayey Silt	16.5	-	20
Silty Sands (Till)	18.5	30	-

The unit weights and friction angles for the slope calculations are based on general representative values for the various soil types, obtained through laboratory testing and tactile analysis. The results of the analyses indicated a factor of safety for the new embankment of greater than 1.3 (see Figure Nos. S-1 to S-4, Appendix 5). Results of the stability analyses are summarized in the following table:

FIGURE NO.	LOCATION	FINAL EMBANKMENT FACTOR OF SAFETY
S-1	Sta. 18+700 – Rt	1.988
S-2	Sta. 19+000 – Rt	2.112
S-3	Sta. 19+000 – Lt	3.529
S-4	Sta. 19+300 – Rt	1.992
S-5	Sta. 19+400 – Rt	1.697

Lower factors of safety will occur during excavation and backfilling as discussed in Section 5.2.1. Short term stability should not be an issue if construction is carried out as described above. The long term stability of the new embankment will not be an issue provided it is properly constructed.

5.3 EXCAVATION, DEWATERING, AND EMBANKMENT RECONSTRUCTION

All excavations greater than 1.2 m in depth must, at a minimum, be sloped or shored in accordance with the Occupational Health and Safety Act Regulations for Construction Projects. The embankment material, above the water table, is considered a Type 3 soil as defined in the Occupational Health and Safety Act and Regulations for Construction Projects.

Since no workers will be required to enter or work within the area of influence of the excavation, steeper temporary excavation slopes can be used in the construction of the embankment widening in swamp areas, as previously noted. However, it is imperative that the construction be carried out as a simultaneous excavation and backfilling operation, in narrow windows to maintain the integrity of the existing embankment.

If required (i.e. if open excavations to remove the peat layers below the embankment are used in area of Borehole Nos. 9 and 13), temporary open excavations above the groundwater table, could be cut back at an angle of 1H:1V, provided they are monitored continuously, however, below the groundwater table, the side slopes will have to be cut back to an angle of 2H:1V, possibly shallower, depending upon the Contractors' chosen method of controlling the groundwater. Excavations for peat removal should be maintained in a dewatered condition

during excavation and backfilling and every reasonable effort must be made to prevent disturbing (piping/boiling) at the founding subgrade. Groundwater control, in accordance with OPSS 518, will be required to maintain a stable subgrade during excavation and backfilling.

5.4 CONSTRUCTION CONCERNS

No major issues are anticipated with construction of the grade raise and embankment widening, provided it is carried out in general conformance with the procedures discussed above. It is emphasized that the peat excavations must be carried out in narrow windows (2 to 3 m maximum width) and backfilled immediately to maintain the stability of the embankment.

6 STATEMENT OF LIMITATIONS

The design recommendations given in this geotechnical report are applicable only to the project described in the text and only if constructed substantially in accordance with details of alignment and elevations stated in the report. Since all details of the design may not be known, in our analysis certain assumptions had to be made. The actual conditions may however, vary from those assumed, in which case changes and modifications may be required to our geotechnical recommendations. We recommend, therefore, that we be retained and provided the opportunity during the design stage to review the design drawings, site survey information, proposed elevations, etc. to verify that they are consistent with our recommendations or the assumptions made in our analysis. It is further recommended that we be retained to review the final design drawings and specifications relative to the geotechnical recommendations.

If, during construction, conditions in the field vary from those assumed at the design stage, an engineer from this office must be notified immediately.

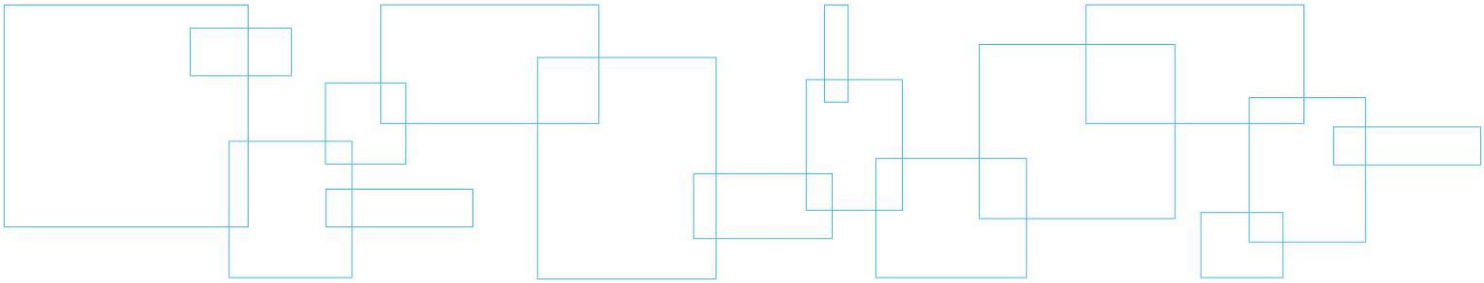
Proper subgrade preparation, groundwater control, compaction, etc. are all critical aspects of the bearing capacity of native soils. It must be noted that different aspects of the geotechnical design are based on the assumption that LVM | MERLEX will be retained during site preparation and construction of the proposed works to ensure that both the geotechnical site characteristics and the construction operations/techniques are consistent with our recommendations. Should LVM | MERLEX not be involved during the full construction phase, our liability is strictly limited to the factual information contained herein only.

The comments in this report are intended solely for the guidance of the design engineer and address the geotechnical conditions only. The number of boreholes required to determine the localized conditions between boreholes directly affecting construction costs, equipment, scheduling, etc. would in fact be greater than what has been carried out for design purposes. Therefore, contractors bidding on this project or undertaking this work should make their own interpretations of the factual borehole results and carry out further work as they deem necessary to assess the scope of the project.

Section 5 of this reported is intended for the use of the client and the design team only and is not intended to be included in the tender documents. Inclusion of the factual information (Sections 1 to 5 inclusive) in the tender documents is furnished merely for the general information of bidders and is not in any way warranted or guaranteed by or on behalf of the owner or the owner's consultants and its subconsultants or the consultants' or subconsultants' employees, and neither the owner nor its consultants or its employees shall be liable for any representations negligent or otherwise contained in the documents.

Appendix 1 Key Plan

Drawing No. 1 Key Plan



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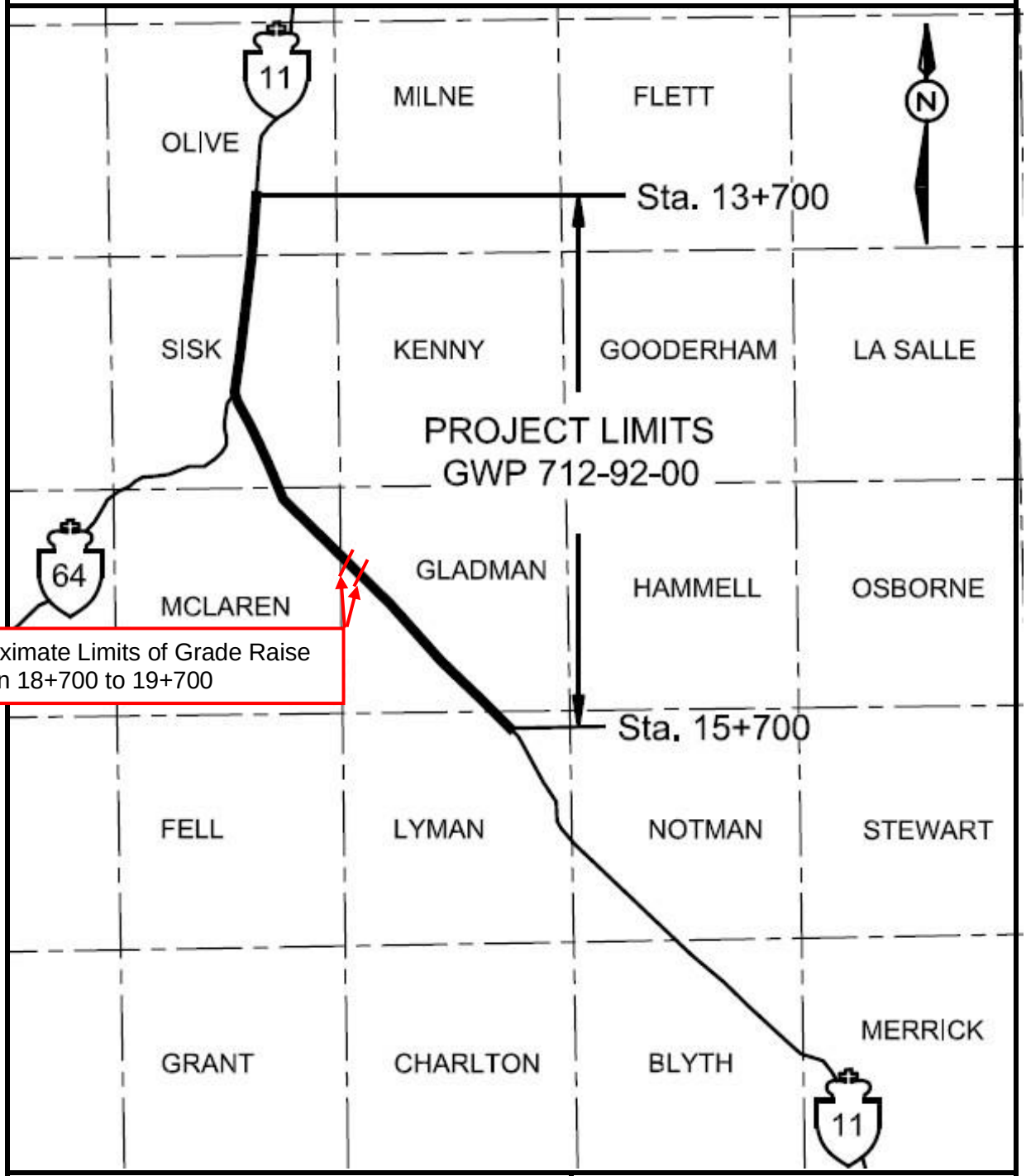
KEY PLAN

Drawing No. 1

NOT TO SCALE



FINAL
FOUNDATION INVESTIGATION
AND DESIGN 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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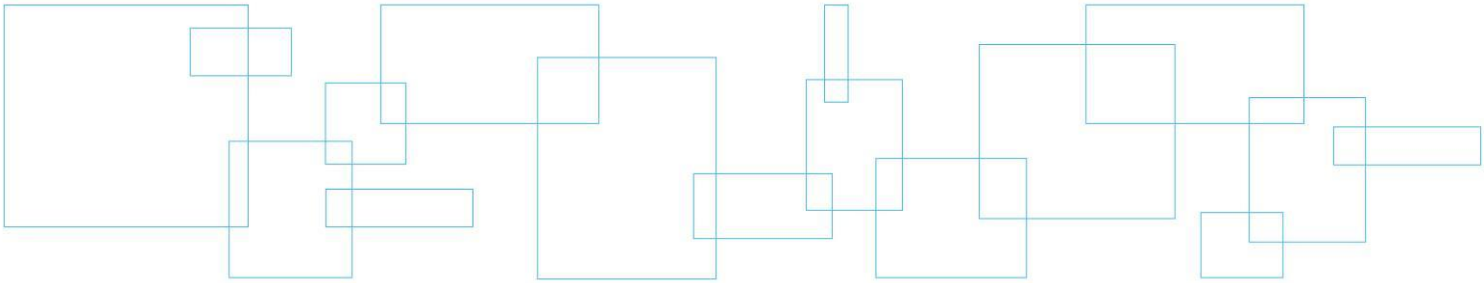
Appendix 2 Subsurface Data

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



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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.

ENCLOSURE NO.: 2 (Pg. 1 of 2)

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

ELEV / DEPTH	DESCRIPTION	STRATA PLOT	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES "N" VALUES	GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT (20 40 60 80 100) / SHEAR STRENGTH kPa (○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE × LAB VANE) (20 40 60 80 100)	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L WATER CONTENT (%) (20 40 60)	UNIT WEIGHT γ kN/m³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA (SI CL)
291.0	Ground Surface										
0.0	125 mm Asphalt 300 mm RAP FILL - brown sand trace to some silt some to with gravel		1	AS							
	(loose/compact)		2	SS	11	▽	290				
			3	SS	8						28 60 (12)
	brown --- grey		4	SS	6		289				
	cobble/boulder		5	SS	6		288				20 73 (7)
	black organics mixed with fill at bottom of stratum		6	SS	23		287		90		
286.6											
4.4	Auger Refusal Unsampled hydrotrack probe advanced past auger refusal SANDS - sands occasional cobbles/boulders (very dense)						286				
284.9							285				
6.1	BEDROCK Unsampled Hydrotrack probe advanced through bedrock						284				
							283				
							282				

Continued Next Page

COMMENTS

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

WATER LEVEL RECORDS

Date (dd/mm/yy)/Time	Water Depth (m)	Cave In (m)
1) 12/12/13 2:25:00 PM	1.1 ▽	1.4 ▨
2)	- ▽	-
3)	- ▼	-

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

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METRIC

RECORD OF BOREHOLE NO. 01

L|V|M

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 / SHEAR STRENGTH kPa	PLASTIC LIMIT / NATURAL MOISTURE CONTENT / LIQUID LIMIT / WATER CONTENT (%)	UNIT WEIGHT	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV / DEPTH	DESCRIPTION	STRATA PLOT	NUMBER	TYPE	"N" VALUES			20 40 60 80 100	20 40 60	γ kN/m^3	GR SA (SI CL)
	Continued from Previous Page							○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL × LAB VANE	w_P w w_L		
280.3	BEDROCK										
10.7	End of Borehole										

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ENCLOSURE NO.: 3 (Pg. 1 of 1)

METRIC

RECORD OF BOREHOLE NO. 02

LVM

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 (Completed) 11:00:00 AM CHECKED BY MAM

DATE (Completed) 2013 March 12

ELEV / DEPTH	DESCRIPTION	STRATA PLOT	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES "N" VALUES	GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT (20 40 60 80 100) / SHEAR STRENGTH kPa (○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE × LAB VANE)	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L — WATER CONTENT (%)	UNIT WEIGHT γ kN/m³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA (SI CL)
290.1	Water Surface					▽					
0.0 / 289.8	300 mm Free Water						290				
0.3	PEAT - black fibrous peat trace wood		1	SS	1			3	531		
			2	SS	PM		289	2	532		
			3	SS	PM		288	3	454		
			4	SS	PM				780		
			5	SS	PM		287	2	834		
			6	SS	WH		286	2	836		
			7	SS	WH		285	2	591		
283.6							284	4			
6.5	CLAYEY SILT - grey clayey silt trace sand (very loose)		8	SS	WH		283				0 3 69 28
282.4											
7.7	SAND - grey sand some to with silt some gravel (dense)		9	SS	38	▨	282				
280.8							281				
9.3	Auger Refusal										

COMMENTS

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

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)	- ▼	-

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ENCLOSURE NO.: 4 (Pg. 1 of 1)

METRIC

RECORD OF BOREHOLE NO. 03

L|V|M

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 (Completed) 1:45:00 PM CHECKED BY MAM

DATE (Completed) 2013 March 12

ELEV / DEPTH	DESCRIPTION	STRATA PLOT	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES "N" VALUES	GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT / SHEAR STRENGTH kPa (○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE × LAB VANE)	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L / WATER CONTENT (%)	UNIT WEIGHT γ kN/m³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA (SI CL)
289.9	Ground Surface										
0.0	FILL - grey gravelly sand some silt high concentration of cobbles/boulders		1	SS	22						
289.0							289				
0.9	PEAT - black fibrous peat trace wood pieces		2	SS	5			+ 4			34 52 (14)
			3	SS	2		288	+ 4	332		
			4	SS	WH			+ 3	538		
287.0							287				
2.9	SAND - grey sand trace silt to silt and sand (compact)		5	SS	18	▽					0 40 57 3
			6	SS	11	▩	286				
							285				
			7	SS	10						0 89 (11)
							284				
			8	SS	29		283				
282.3											
7.6	Auger Refusal End of Borehole										

COMMENTS

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

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)	- ▼	-

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ENCLOSURE NO.: 5 (Pg. 1 of 1)

METRIC

RECORD OF BOREHOLE NO. 04

LVM

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

ELEV / DEPTH	DESCRIPTION	STRATA PLOT	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES "N" VALUES	GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT (20 40 60 80 100) / SHEAR STRENGTH kPa (○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE × LAB VANE) (20 40 60 80 100)	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L — WATER CONTENT (%) (20 40 60)	UNIT WEIGHT γ kN/m³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA (SI CL)
291.0	Ground Surface										
0.0	100 mm Asphalt 275 mm RAP 400 mm Crushed Gravel FILL - brown sand trace gravel trace silt		1	SS	23				○		
289.9			2	SS	94/50 mm		290		○		
1.1	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						289				
287.6							288				
3.4	BEDROCK Unsampled Hydrotrack probe advanced through bedrock						287				
284.9							286				
6.1	End of Borehole						285				

COMMENTS

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

WATER LEVEL RECORDS

Date (dd/mm/yy)/Time	Water Depth (m)	Cave In (m)
1) 12/12/5 8:45:00 AM	DRY	0.9
2)	-	-
3)	-	-

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ENCLOSURE NO.: 6 (Pg. 1 of 1)

METRIC

RECORD OF BOREHOLE NO. 05

LVM

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

ELEV / DEPTH	DESCRIPTION	STRATA PLOT	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES "N" VALUES	GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT / SHEAR STRENGTH kPa (○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE × LAB VANE) 20 40 60 80 100	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L WATER CONTENT (%) 20 40 60	UNIT WEIGHT γ kN/m³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA (SI CL)
290.8	Ground Surface										
0.0	100 mm Asphalt 250 mm RAP FILL - brown sand trace silt trace gravel		1	AS					○		
289.9			2	SS	50/100 mm		290		○		
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						289				
286.5							288				
4.3	BEDROCK Unsampled Hydrotrack probe advanced through bedrock						287				
283.5							286				
7.3	End of Borehole						285				
							284				

COMMENTS

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

WATER LEVEL RECORDS

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

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

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ENCLOSURE NO.: 7 (Pg. 1 of 1)

METRIC

RECORD OF BOREHOLE NO. 06

LVM

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 20 40 60 80 100 / SHEAR STRENGTH kPa ○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE × LAB VANE 20 40 60 80 100	PLASTIC LIMIT w_P NATURAL MOISTURE CONTENT w LIQUID LIMIT w_L WATER CONTENT (%) 20 40 60	UNIT WEIGHT γ kN/m³	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV / DEPTH	DESCRIPTION	STRATA PLOT	NUMBER	TYPE	"N" VALUES						GR SA (SI CL)
290.0	Ground Surface										
0.0 289.5	FILL - brown sand trace silt trace gravel		1	SS	15				○		
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, ×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 - BOREHOL LOGS.GPJ MEL-GEO.GDT 13/12/5

L|V|M
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ENCLOSURE NO.: 8 (Pg. 1 of 1)

METRIC

RECORD OF BOREHOLE NO. 07

LVM

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

ELEV / DEPTH	DESCRIPTION	STRATA PLOT	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES "N" VALUES	GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT / SHEAR STRENGTH kPa (○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE × LAB VANE) 20 40 60 80 100	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L — WATER CONTENT (%) 20 40 60	UNIT WEIGHT γ kN/m³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA (SI CL)
289.8	Ground Surface										
0.0	PEAT - black fibrous peat with wood pieces mixed with sand at surface		1	SS	2	▽					
							289				
			2	SS	PM			+2	408		
	layer of coarse wood pieces		3	SS	26	▨	288		271		
287.8											
2.0	Auger Refusal End of Borehole										

COMMENTS

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

WATER LEVEL RECORDS

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)	- ▼	-

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

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ENCLOSURE NO.: 9 (Pg. 1 of 1)

METRIC

RECORD OF BOREHOLE NO. 08

LVM

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

DATE (Completed) 2012 December 4

ELEV / DEPTH	DESCRIPTION	STRATA PLOT	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: "N" VALUES	GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT / SHEAR STRENGTH kPa (○ UNCONFINED, ● QUICK TRIAXIAL, + FIELD VANE, × LAB VANE)	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L / WATER CONTENT (%)	UNIT WEIGHT γ kN/m³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA (SI CL)
290.8	Ground Surface										
0.0	50 mm Asphalt 125 mm Crushed Gravel 275 mm Asphalt FILL - brown sand trace silt trace gravel occasional cobbles and boulders		1	SS	24		290		○		
			2	SS	86	▨			○		
289.4							289				
1.4	Auger Refusal Unsampled hydrotrack hole advanced past auger refusal FILL - Sands occasional cobble/boulder size rock						288				
287.2							287				
3.6	BEDROCK Unsampled Hydrotrack probe advanced through bedrock						286				
284.7							285				
6.1	End of Borehole										

COMMENTS

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

WATER LEVEL RECORDS

Date (dd/mm/yy)/Time	Water Depth (m)	Cave In (m)
1) 12/12/4 11:18:00 AM	DRY ▽	1.1 ▨
2)	- ▽	-
3)	- ▼	-

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

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ENCLOSURE NO.: 10 (Pg. 1 of 1)

METRIC

RECORD OF BOREHOLE NO. 09

LVM

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 (Completed) 12:40:00 PM CHECKED BY MAM

DATE (Completed) 2012 December 13

ELEV / DEPTH	DESCRIPTION	STRATA PLOT	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES "N" VALUES	GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT (20 40 60 80 100) / SHEAR STRENGTH kPa (○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE × LAB VANE) (20 40 60 80 100)	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L — WATER CONTENT (%) (20 40 60)	UNIT WEIGHT γ kN/m³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA (SI CL)
291.0	Ground Surface										
0.0	125 mm Crushed Gravel FILL - brown sand some gravel some silt (compact)		1	AS							
			2	SS	15		290				
			3	SS	16		289				19 63 (18)
288.6											
2.4	PEAT - black amorphous peat with wood pieces		4	SS	2				355		
			5	SS	2		288		358		
287.3											
3.7	SAND - brown sand some silt to silty with gravel (compact/very dense)		6	SS	24		287				23 39 (38)
			7	SS	61						25 55 17 3
286.0							286				
5.0	Auger Refusal Unsampled hydrotrack hole advanced past auger refusal BEDROCK						285				
							284				
283.4											
7.6	End of Borehole										

COMMENTS

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

WATER LEVEL RECORDS

Date (dd/mm/yy)/Time	Water Depth (m)	Cave In (m)
1) 12/12/13 12:30:00 PM	DRY	4.4
2)	-	-
3)	-	-

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ENCLOSURE NO.: 11 (Pg. 1 of 1)

METRIC

RECORD OF BOREHOLE NO. 10

LVM

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 (Completed) 2:05:00 PM CHECKED BY MAM

DATE (Completed) 2013 January 10

ELEV / DEPTH	DESCRIPTION	STRATA PLOT	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES "N" VALUES	GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT (20 40 60 80 100) / SHEAR STRENGTH kPa (○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE × LAB VANE) (20 40 60 80 100)	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L WATER CONTENT (%) (20 40 60)	UNIT WEIGHT γ kN/m³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA (SI CL)
290.5	Ground Surface										
0.0	150 mm silty organics										
	FILL - brown sand trace silt trace gravel		1	SS	5		290		○		
289.7											
0.8	PEAT - black fibrous peat		2	SS	WH	▽		+2	○ 93		
			3	SS	2		289	+2	○ 321		
			4	SS	WH	▨	288	+2	○ 517		
	stone in tip of spoon		5	SS	25/25 mm				○ 382		
287.1											
3.4	Auger Refusal End of Borehole										

COMMENTS

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

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)	- ▼	-

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

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ENCLOSURE NO.: 12 (Pg. 1 of 1)

METRIC

RECORD OF BOREHOLE NO. 11

LVM

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

ELEV / DEPTH	DESCRIPTION	STRATA PLOT	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES "N" VALUES	GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT / SHEAR STRENGTH kPa (○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE × LAB VANE) 20 40 60 80 100	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L WATER CONTENT (%) 20 40 60	UNIT WEIGHT γ kN/m³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA (SI CL)
289.8	Ground Surface										
0.0	PEAT - black fibrous peat		1	SS	WH			+3	○		
			2	SS	PM		289		○ 188		
287.9			3	SS	6			+2	○ 628		
1.9	SAND - grey sand some to with silt some to with gravel						288				
	(dense/very dense)		4	SS	30				○		30 42 (28)
							287				
			5	SS	33				○		
							286				
			6	SS	54				○		
285.3											
4.5	Auger Refusal End of Borehole										

COMMENTS

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

WATER LEVEL RECORDS

Date (dd/mm/yy)/Time	Water Depth (m)	Cave In (m)
1) 13/3/13 9:58:00 AM	0	3
2)	-	-
3)	-	-

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

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ENCLOSURE NO.: 13 (Pg. 1 of 2)

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 CHECKED BY MAM

DATE (Completed) 2012 December 5

ELEV / DEPTH	DESCRIPTION	STRATA PLOT	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES "N" VALUES	GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT (20 40 60 80 100) / SHEAR STRENGTH kPa (○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE × LAB VANE) (20 40 60 80 100)	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L WATER CONTENT (%) (20 40 60)	UNIT WEIGHT γ kN/m³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA (SI CL)
291.1	Ground Surface										
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		291		○		
			2	SS	86		290		○		
			3	SS	27				○		31 52 (17)
289.0							289				
2.1	SAND - grey sand with silt with gravel trace organics (compact/dense)		4	SS	3				○		
			5	SS	7		288		○		
			6	SS	16		287		○		
			7	SS	37				○		22 52 (26)
284.5			8	SS	36		286		○		
6.6	Auger Refusal Unsampled hydrotrack hole advanced past auger refusal BEDROCK						285		○		
							284				
							283				
							282				
	Continued Next Page										

COMMENTS

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

WATER LEVEL RECORDS

Date (dd/mm/yy)/Time	Water Depth (m)	Cave In (m)
1) 12/12/5 11:10:00 AM	DRY	1.7
2)	-	-
3)	-	-

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

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METRIC

RECORD OF BOREHOLE NO. 12

L|V|M

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 CHECKED BY MAM

DATE (Completed) 2012 December 5

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT 20 40 60 80 100 / SHEAR STRENGTH kPa ○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL × LAB VANE 20 40 60 80 100	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L WATER CONTENT (%) 20 40 60	UNIT WEIGHT γ kN/m³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA (SI CL)
ELEV / DEPTH	DESCRIPTION	STRATA PLOT	NUMBER	TYPE	"N" VALUES						
	Continued from Previous Page										
	BEDROCK						281				
							280				
279.5											
11.6	End of Borehole										

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

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ENCLOSURE NO.: 14 (Pg. 1 of 2)

METRIC

RECORD OF BOREHOLE NO. 13

LVM

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

ELEV / DEPTH	DESCRIPTION	STRATA PLOT	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES "N" VALUES	GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT (20 40 60 80 100) / SHEAR STRENGTH kPa (○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE × LAB VANE) (20 40 60 80 100)	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L — WATER CONTENT (%) (20 40 60)	UNIT WEIGHT γ kN/m³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA (SI CL)
291.0	Ground Surface										
0.0	125 mm Asphalt 300 mm RAP FILL - brown sand some silt some to with gravel (loose/compact)		1	AS							
			2	SS	13		290				
			3	SS	14		289				
			4	SS	8		288				23 60 (17)
287.6			5	SS	7	▽			202		
3.4	PEAT - black amorphous peat										
287.0			6	SS	12		287		236		0 11 75 14
4.0	SILT - grey silt some sand (very dense)		7	SS	65	▨					0 11 (89)
285.6							286				
5.4	Auger Refusal Unsampled hydrotrack hole advanced past auger refusal SILT/SANDS - silts/sands occasional cobbles/boulders (very dense)						285				
							284				
							283				
							282				

Continued Next Page

COMMENTS

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

WATER LEVEL RECORDS

Date (dd/mm/yy)/Time	Water Depth (m)	Cave In (m)
1) 12/12/13 11:03:00 AM	3.1 ▽	4.8 ▨
2)	- ▽	-
3)	- ▼	-

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

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METRIC

RECORD OF BOREHOLE NO. 13

L|V|M

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 20 40 60 80 100 / SHEAR STRENGTH kPa ○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL × LAB VANE 20 40 60 80 100	PLASTIC LIMIT w_P NATURAL MOISTURE CONTENT w LIQUID LIMIT w_L WATER CONTENT (%) 20 40 60	UNIT WEIGHT γ kN/m³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA (SI CL)
ELEV / DEPTH	DESCRIPTION	STRATA PLOT	NUMBER	TYPE	"N" VALUES						
	Continued from Previous Page										
280.3	Probably sands (very dense drilling)										
10.7	End of Borehole										

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

ENCLOSURE NO.: 15 (Pg. 1 of 1)

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 (Completed) 11:55:00 AM CHECKED BY MAM

DATE (Completed) 2013 January 15

ELEV / DEPTH	DESCRIPTION	STRATA PLOT	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES "N" VALUES	GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT / SHEAR STRENGTH kPa (○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE × LAB VANE)	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L / WATER CONTENT (%)	UNIT WEIGHT γ kN/m³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA (SI CL)
289.8	Ground Surface							20 40 60 80 100	20 40 60		
0.0	PEAT - black fibrous peat		1	SS	3						
							289				
			2	SS	WH						
			3	SS	WH	▽	288				
287.4											
2.4	SAND - grey sand some silt some gravel (compact/dense)		4	SS	14						
			5	SS	41		287				
			6	SS	50/75 mm		286				
285.6											
4.2	Auger Refusal End of Borehole										

198 205 722 (WATER CONTENT (%))

+4 +3 (SHEAR STRENGTH kPa)

COMMENTS

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

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)	- ▼	-

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

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ENCLOSURE NO.: 16 (Pg. 1 of 1)

METRIC

RECORD OF BOREHOLE NO. 15

LVM

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 / SHEAR STRENGTH kPa	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L / WATER CONTENT (%)	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV / DEPTH	DESCRIPTION	STRATA PLOT	NUMBER	TYPE	"N" VALUES						
289.9	Ground Surface										
0.0	FILL - brown sand and gravel mixed with peat		1	AS							
			2	SS	7	▽					
289.0							289				
0.9	SAND - grey sand some to with silt trace to with gravel occasional cobbles and boulders		3	SS	20						4 61 30 5
			4	SS	84/225 mm		288				
			5	SS	31		287				
286.4			6	SS	50/100 mm						
3.5	Auger Refusal End of Borehole										

DYNAMIC CONE PENETRATION RESISTANCE PLOT: 20 40 60 80 100

SHEAR STRENGTH kPa: ○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE × LAB VANE; 20 40 60 80 100

WATER CONTENT (%): 20 40 60

UNIT WEIGHT γ kN/m^3

REMARKS & GRAIN SIZE DISTRIBUTION (%): GR SA (SI CL)

COMMENTS

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

$+^3, \times^3$: 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) 13/3/13 11:25:00 AM	0.6 ▽	0.7 ▨
2)	- ▽	-
3)	- ▼	-

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

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ENCLOSURE NO.: 17 (Pg. 1 of 2)

METRIC

RECORD OF BOREHOLE NO. 16

LVM

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

ELEV / DEPTH	DESCRIPTION	STRATA PLOT	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES "N" VALUES	GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT / SHEAR STRENGTH kPa (○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE × LAB VANE)	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L / WATER CONTENT (%)	UNIT WEIGHT γ kN/m³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA (SI CL)
290.9	Ground Surface										
0.0	100 mm Asphalt 125 mm RAP FILL - brown sand some silt some gravel		1	SS	26				○		
			2	SS	16		290		○		
289.7											
1.2	SAND - brown sand some silt with gravel to gravelly (compact/very dense)		3	SS	22	▽	289		○		21 54 (25)
			4	SS	68	▨	288		○		
			5	SS	20				○		
286.6			6	SS	67		287		○		34 55 (11)
4.3	Auger Refusal Unsampled hydrotrack hole advanced past auger refusal SANDS - sands occasional cobbles/boulders (very dense)						286 285 284 283 282 281				
	Continued Next Page										

COMMENTS

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

WATER LEVEL RECORDS

Date (dd/mm/yy)/Time	Water Depth (m)	Cave In (m)
1) 12/12/5 1:12:00 PM	2 ▽	2.8 ▨
2)	- ▽	-
3)	- ▼	-

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

L|V|M
120 Progress Court, North Bay, On P1A 0C2 Phone: (705)476-2550 Fax: (705)476-8882 Email: northbay@lvm.ca

METRIC

RECORD OF BOREHOLE NO. 16

LVM

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 20 40 60 80 100 / SHEAR STRENGTH kPa ○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL × LAB VANE 20 40 60 80 100	PLASTIC LIMIT w_P NATURAL MOISTURE CONTENT w LIQUID LIMIT w_L WATER CONTENT (%) 20 40 60	UNIT WEIGHT γ kN/m³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA (SI CL)
ELEV / DEPTH	DESCRIPTION	STRATA PLOT	NUMBER	TYPE	"N" VALUES						
	Continued from Previous Page										
279.3	Probably sands (very dense drilling)						280				
11.6	End of Borehole										

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

ENCLOSURE NO.: 18 (Pg. 1 of 2)

METRIC

RECORD OF BOREHOLE NO. 17

LVM

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

ELEV / DEPTH	DESCRIPTION	STRATA PLOT	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES "N" VALUES	GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT (20 40 60 80 100) / SHEAR STRENGTH kPa (○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE × LAB VANE) (20 40 60 80 100)	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L — WATER CONTENT (%) (20 40 60)	UNIT WEIGHT γ kN/m³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA (SI CL)
291.0	Ground Surface										
0.0	125 mm Crushed Gravel 225 mm RAP FILL - brown sand some silt some gravel (compact)		1	AS					○		
			2	SS	19		290		○		
289.2			3	SS	18				○		
1.8	ROCK FILL - rock fill						289				
288.6			4	SS	~~50/75 mm~~				○		
2.4	Auger Refusal Unsampled hydrotrack hole advanced past auger refusal SANDS - sands occasional cobbles/boulders (very dense)						288				
							287				
							286				
							285				
							284				
							283				
281.9							282				
9.1	BEDROCK Unsampled Hydrotrack probe advanced through bedrock Continued Next Page										

COMMENTS

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

WATER LEVEL RECORDS

Date (dd/mm/yy)/Time	Water Depth (m)	Cave In (m)
1) 12/12/12 3:10:00 PM	DRY	1.9
2)	-	-
3)	-	-

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

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METRIC

RECORD OF BOREHOLE NO. 17

L|V|M

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 / SHEAR STRENGTH kPa	PLASTIC LIMIT / NATURAL MOISTURE CONTENT / LIQUID LIMIT	UNIT WEIGHT	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV / DEPTH	DESCRIPTION	STRATA PLOT	NUMBER	TYPE	"N" VALUES			20 40 60 80 100	w_P w w_L	γ	
	Continued from Previous Page							○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL × LAB VANE	WATER CONTENT (%)	kN/m³	GR SA (SI CL)
	BEDROCK						280	20 40 60 80 100	20 40 60		
279.4											
11.6	End of Borehole										

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

ENCLOSURE NO.: 19 (Pg. 1 of 1)

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 (Completed) 3:20:00 PM CHECKED BY MAM

DATE (Completed) 2013 January 15

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT / SHEAR STRENGTH kPa	PLASTIC LIMIT / NATURAL MOISTURE CONTENT / LIQUID LIMIT / WATER CONTENT (%)	UNIT WEIGHT	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV / DEPTH	DESCRIPTION	STRATA PLOT	NUMBER	TYPE	"N" VALUES						
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		289				
			2	SS	26		288				
			3	SS	26		287				
286.7			4	SS	50/125 mm						
2.4	Auger Refusal End of Borehole										

DYNAMIC CONE PENETRATION RESISTANCE PLOT: 20 40 60 80 100

SHEAR STRENGTH kPa: ○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL × LAB VANE; 20 40 60 80 100

PLASTIC LIMIT w_P NATURAL MOISTURE CONTENT w LIQUID LIMIT w_L

WATER CONTENT (%): 20 40 60

UNIT WEIGHT γ kN/m^3

REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA (SI CL)

COMMENTS

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

$+^3$, $\times^3$: 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 3:10:00 PM	-0.1	2.4
2)	-	-
3)	-	-

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

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ENCLOSURE NO.: 20 (Pg. 1 of 1)

METRIC

RECORD OF BOREHOLE NO. 19

LVM

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

ELEV / DEPTH	DESCRIPTION	STRATA PLOT	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: "N" VALUES	GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT / SHEAR STRENGTH kPa (○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE × LAB VANE)	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L / WATER CONTENT (%)	UNIT WEIGHT γ kN/m^3	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA (SI CL)
290.5	Ground Surface										
0.0	PEAT - black peat		1	AS							
289.9							290				
0.6	SAND - grey sand with silt trace gravel		2	SS	60/100 mm						
289.2			3	SS	50/75 mm						
1.3	Auger Refusal End of Borehole										

DYNAMIC CONE PENETRATION RESISTANCE PLOT: 20 40 60 80 100

SHEAR STRENGTH kPa: 20 40 60 80 100

WATER CONTENT (%): 20 40 60

COMMENTS

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

$+^3$, $\times^3$: 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) 13/3/13 12:48:00 PM	-0.1	1.2
2)	-	-
3)	-	-

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

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ENCLOSURE NO.: 21 (Pg. 1 of 1)

METRIC

RECORD OF BOREHOLE NO. 20

LVM

REFERENCE 12/09/12193 DATUM Geodetic LOCATION N 5172032.7 E 285212.2 - 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) 3:50:00 PM CHECKED BY MAM

DATE (Completed) 2012 December 5

ELEV / DEPTH	DESCRIPTION	STRATA PLOT	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES "N" VALUES	GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT (20 40 60 80 100) / SHEAR STRENGTH kPa (○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE × LAB VANE) (20 40 60 80 100)	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L — WATER CONTENT (%) (20 40 60)	UNIT WEIGHT γ kN/m³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA (SI CL)
292.0	Ground Surface										
0.0	50 mm Asphalt 100 mm Crushed Gravel 150 mm Asphalt 250 mm RAP FILL - brown sand some silt some gravel (compact)		1	SS	25						
			2	SS	13		291				
290.6											
1.4	SAND - grey sand some to with silt trace to with gravel (dense/very dense)		3	SS	12						
			4	SS	61		290				
			5	SS	45		289				
			6	SS	91/250 mm		288				
287.2			7	SS	50/75 mm						
4.8	Auger Refusal Unsampled hydrotrack hole advanced past auger refusal BEDROCK						287				
							286				
							285				
283.5							284				
8.5	End of Borehole										

COMMENTS

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

WATER LEVEL RECORDS

Date (dd/mm/yy)/Time	Water Depth (m)	Cave In (m)
1) 12/12/5 3:45:00 PM	DRY	4.2
2)	-	-
3)	-	-

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

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ENCLOSURE NO.: 22 (Pg. 1 of 2)

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

ELEV / DEPTH	DESCRIPTION	STRATA PLOT	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES "N" VALUES	GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT (20 40 60 80 100) / SHEAR STRENGTH kPa (○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE × LAB VANE) (20 40 60 80 100)	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L — WATER CONTENT (%) (20 40 60)	UNIT WEIGHT γ kN/m³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA (SI CL)
293.9	Ground Surface										
0.0	125 mm Asphalt 250 mm RAP FILL - brown sand some silt some gravel (loose)		1	AS			293	○	○		
292.5			2	SS	6						
1.4	SAND - grey sand some silt to silty some gravel to gravelly (compact/very dense)		3	SS	17		292		○		14 59 (27)
			4	SS	27				○		
			5	SS	35	▽	291		○		
			6	SS	70	▨	290		○		40 40 (20)
			7	SS	64		289		○		10 61 23 6
287.6			8	SS	50/75 mm		288		○		6 38 (58)
6.3	Auger Refusal Unsampled hydrotrack hole advanced past auger refusal SANDS - sands occasional cobbles/boulder						287				
286.6											
7.3	(very dense) BEDROCK Unsampled Hydrotrack probe advanced through bedrock						286				
							285				
	Continued Next Page						284				

COMMENTS

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

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)	- ▼	-

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

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METRIC

RECORD OF BOREHOLE NO. 21

L|V|M

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 / SHEAR STRENGTH kPa	PLASTIC LIMIT / NATURAL MOISTURE CONTENT / LIQUID LIMIT	UNIT WEIGHT	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV / DEPTH	DESCRIPTION	STRATA PLOT	NUMBER	TYPE	"N" VALUES			20 40 60 80 100	w_P w w_L	γ	
	Continued from Previous Page							○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL × LAB VANE	WATER CONTENT (%)	kN/m³	GR SA (SI CL)
								20 40 60 80 100	20 40 60		
283.2	BEDROCK										
10.7	End of Borehole										

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

ENCLOSURE NO.: 23 (Pg. 1 of 1)

METRIC

RECORD OF BOREHOLE NO. 22

LVM

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 / SHEAR STRENGTH kPa / WATER CONTENT (%)	UNIT WEIGHT	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV / DEPTH	DESCRIPTION	STRATA PLOT	NUMBER	TYPE	"N" VALUES			20 40 60 80 100 — ○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE × LAB VANE; PLASTIC LIMIT w_P — NATURAL MOISTURE CONTENT w — LIQUID LIMIT w_L; 20 40 60	γ kN/m³	GR SA (SI CL)
294.7	Ground Surface									
0.0	150 mm Ashalt 200 mm RAP FILL - brown sand some silt some gravel		1	AS	30		294	○		
293.8	(compact)									
0.9	SAND - grey sand some to with silt some to with gravel (compact/very dense)		2	SS	23			○		
			3	SS	24		293	○		
			4	SS	87/225 mm			○		
			5	SS	50/75 mm		292	○		
			6	SS	71		291	○		
			7	SS	64	▽	290	○		
			8	SS	50/125 mm		289	○		
						▨	288			
			9	SS	68		287	○		
286.1										
8.6	Auger Refusal End of Borehole									

COMMENTS

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

WATER LEVEL RECORDS

Date (dd/mm/yy)/Time	Water Depth (m)	Cave In (m)
1) 12/12/6 11:15:00 AM	5.8 ▽	7.1 ▨
2)	- ▽	-
3)	- ▼	-

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

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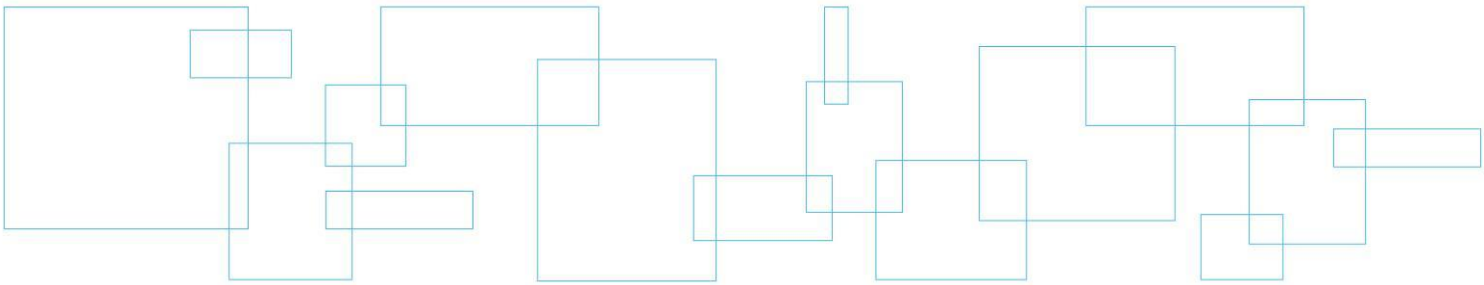
Appendix 3 Borehole Plan and Lab Data

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



LVM | MERLEX

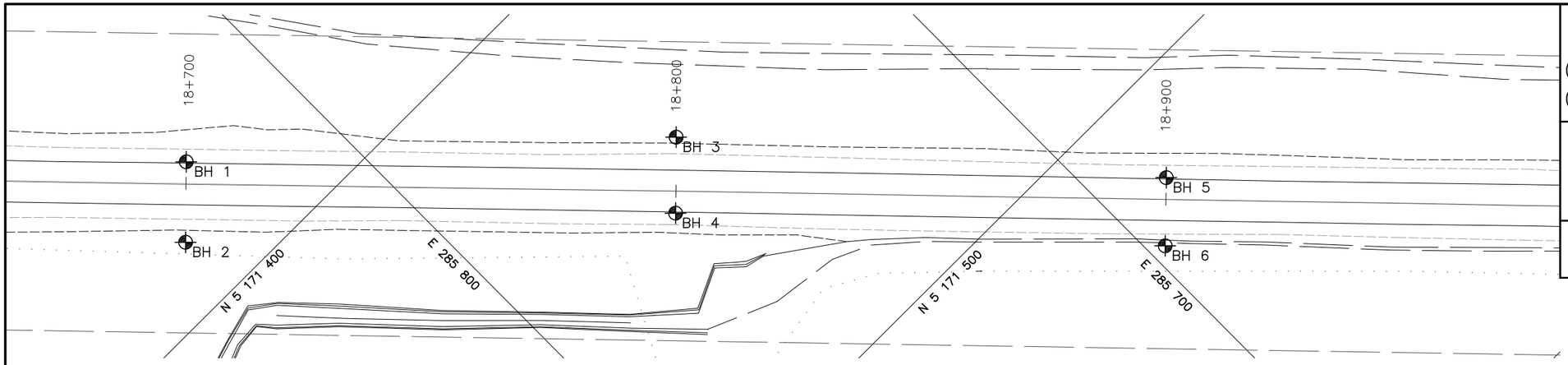
CONT No XXXX–XXXX
GWP No 712–92–00

N

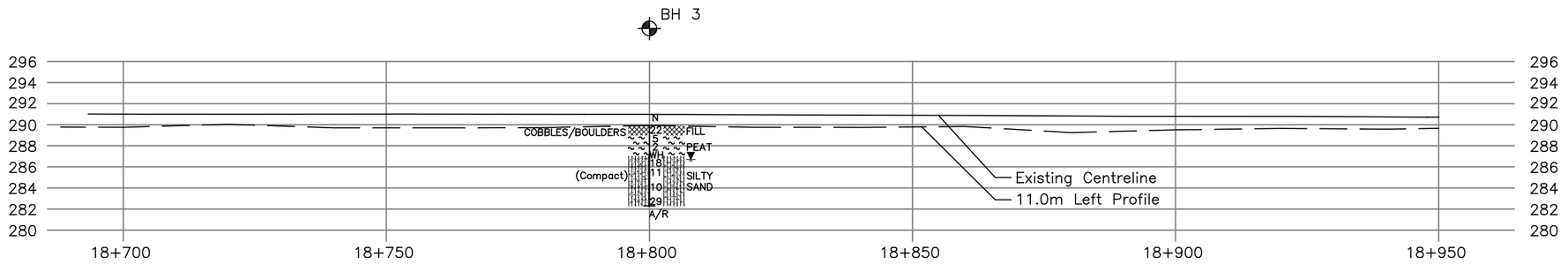
HWY 11 – Proposed Grade Raise
Sta 18+700 to 19+700
Township of Gladman
BOREHOLE LOCATIONS & SOIL STRATA

Drawing 2

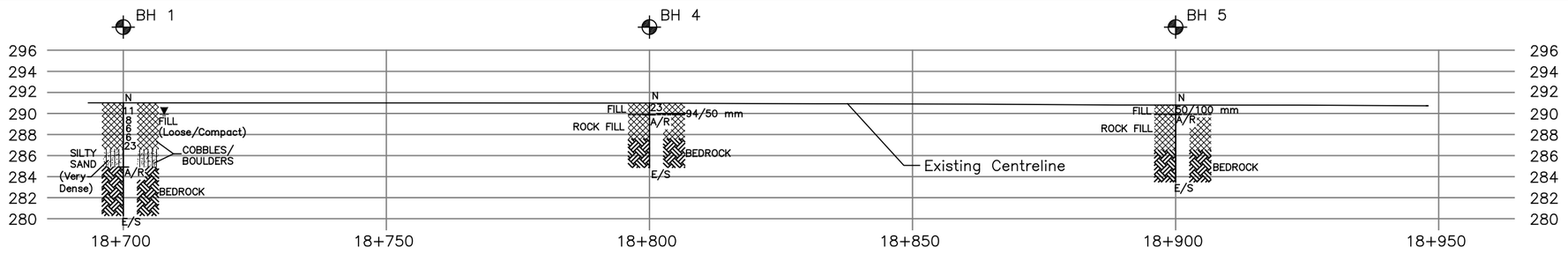
L|V|M | MERLEX



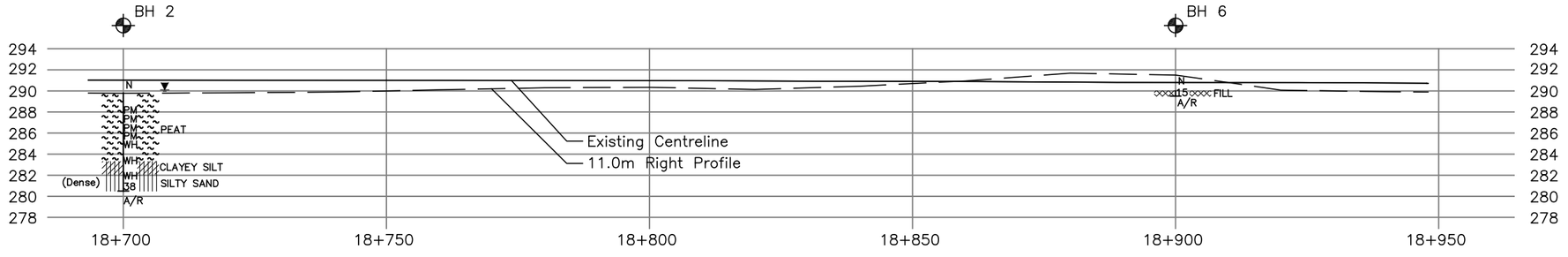
PLAN 10m SCALE 10m HOR 5m 5m VER



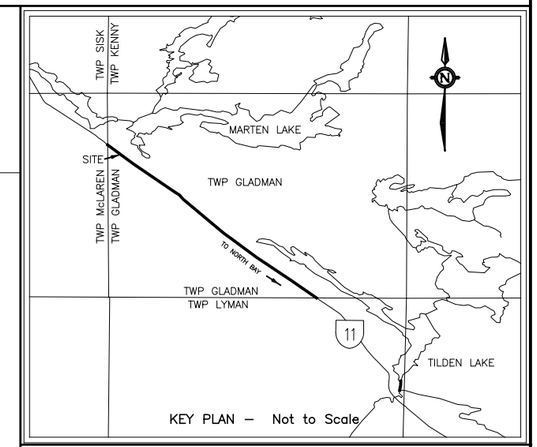
LEFT SIDE PROFILE 10m SCALE 10m HOR 5m 5m VER



℄ PROFILE 10m SCALE 10m HOR 5m 5m VER



RIGHT SIDE PROFILE 10m SCALE 10m HOR 5m 5m VER



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

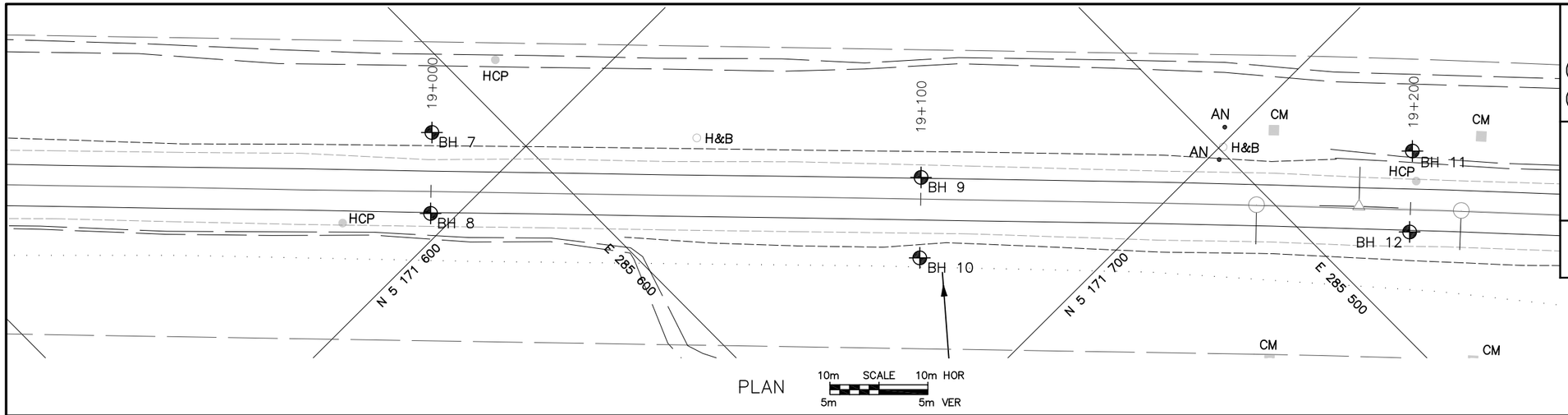
HWY No. 11 – Gladman Twp – Grade Raise Section			LVM REF 12193
SUBM'D		GEOCRES 31L–174	SITE
DRAWN IK	CHK AT	DATE April 2013	DWG 2

CONT No XXXX–XXXX
GWP No 712–92–00

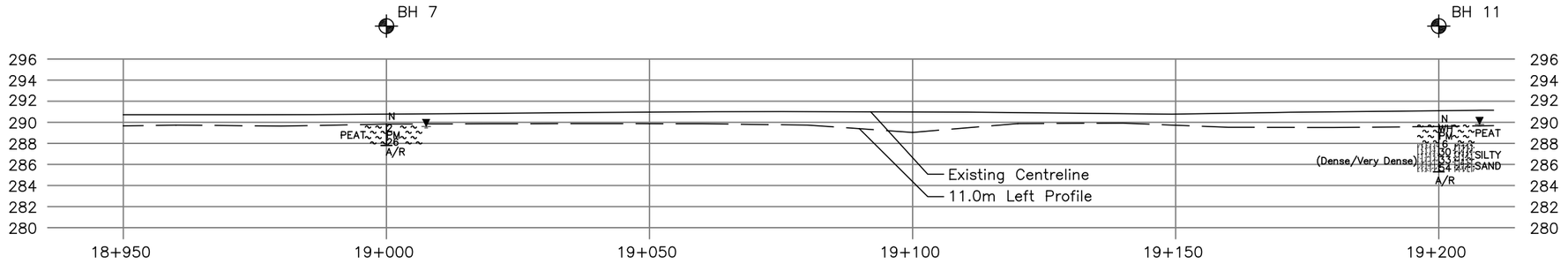
HWY 11 – Proposed Grade Raise
Sta 18+700 to 19+700
Township of Gladman
BOREHOLE LOCATIONS & SOIL STRATA

Drawing 3

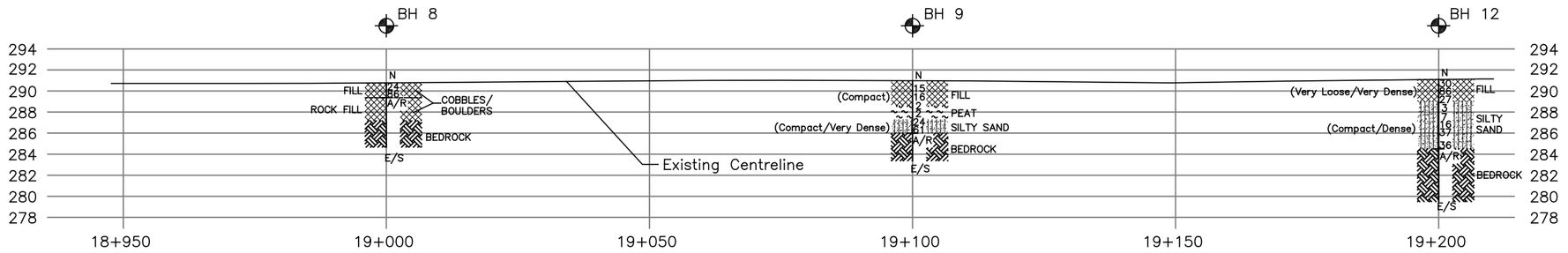
L|V|M | MERLEX



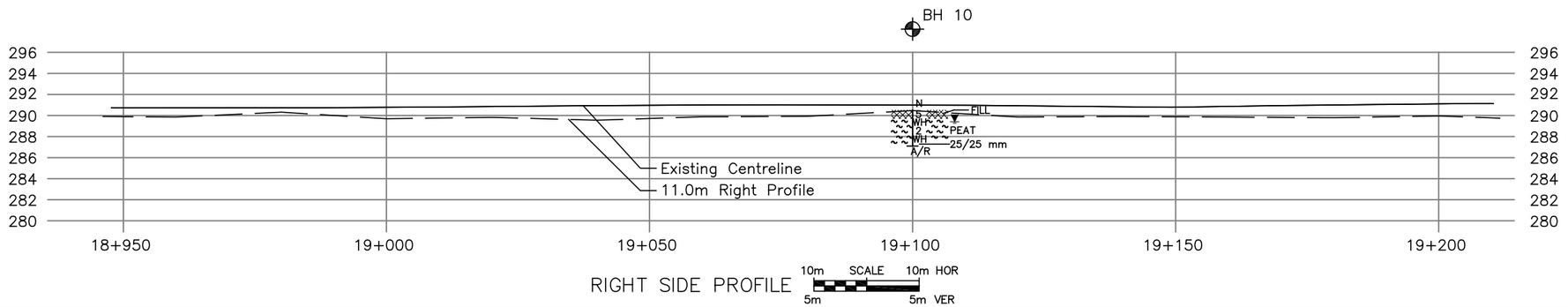
PLAN 10m SCALE 10m HOR 5m 5m VER



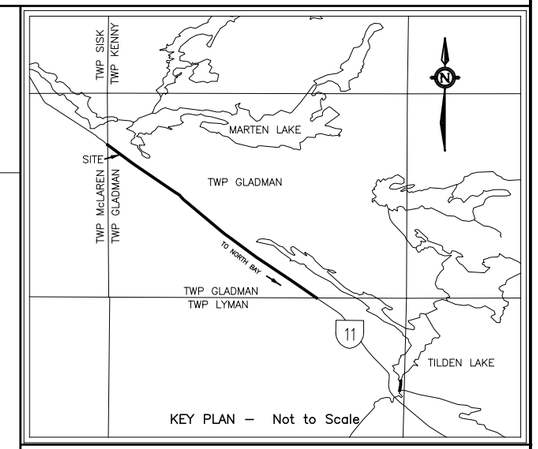
LEFT SIDE PROFILE 10m SCALE 10m HOR 5m 5m VER



℄ PROFILE 10m SCALE 10m HOR 5m 5m VER



RIGHT SIDE PROFILE 10m SCALE 10m HOR 5m 5m VER



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. 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

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REVISIONS	DATE	BY	DESCRIPTION
	May 2013	MCM	REVISION 1
	Dec 2013	RG	Final

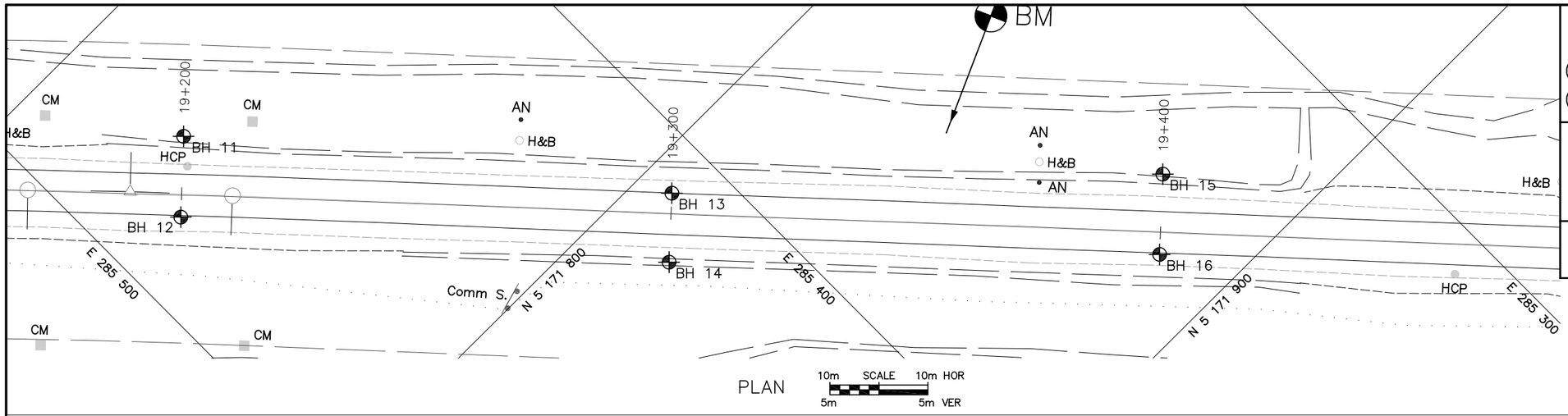
HWY No. 11 – Gladman Twp – Grade Raise Section			LVM REF 12193
SUBM'D		GEOCRES 31L–174	SITE
DRAWN IK	CHK AT	DATE April 2013	DWG 3

CONT No XXXX–XXXX
GWP No 712–92–00

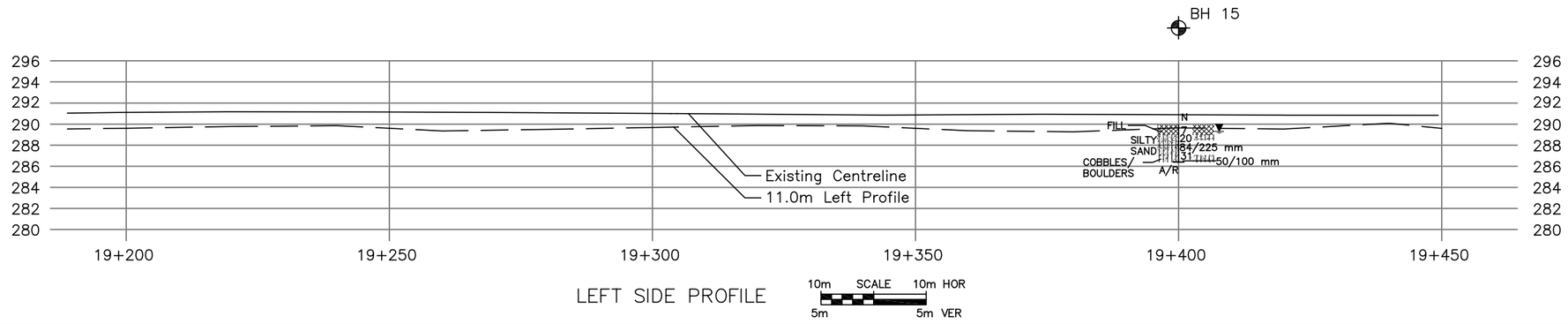
HWY 11 – Proposed Grade Raise
Sta 18+700 to 19+700
Township of Gladman
BOREHOLE LOCATIONS & SOIL STRATA

Drawing 4

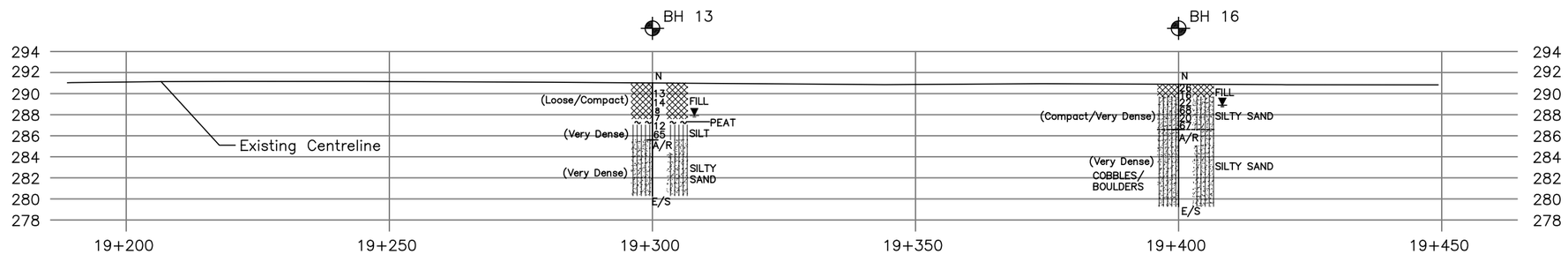
L|V|M | MERLEX



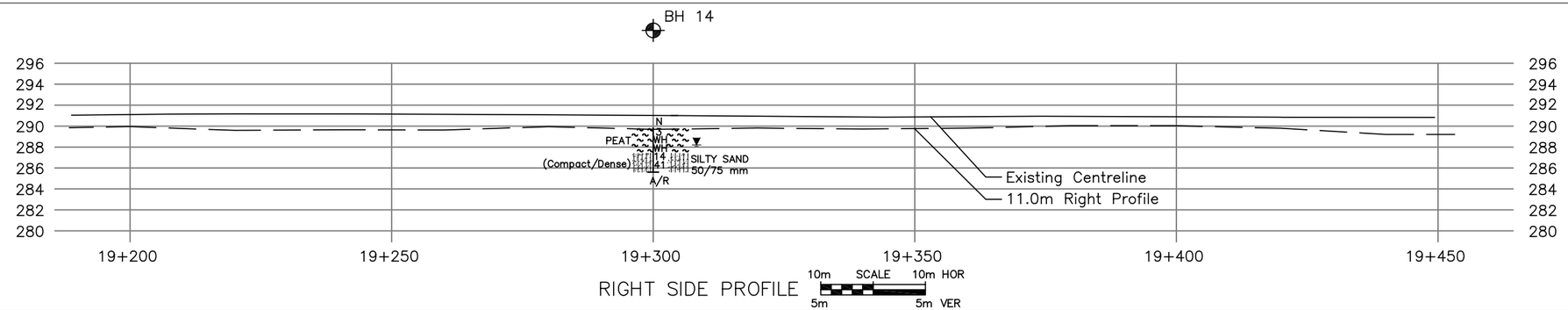
PLAN 10m SCALE 10m HOR 5m 5m VER



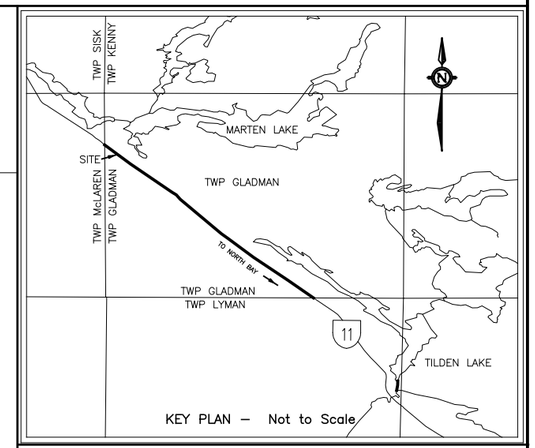
LEFT SIDE PROFILE 10m SCALE 10m HOR 5m 5m VER



℄ PROFILE 10m SCALE 10m HOR 5m 5m VER



RIGHT SIDE PROFILE 10m SCALE 10m HOR 5m 5m VER



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. 13	291.0	4.1m Lt	5171806.8	285409.9
Borehole No. 14	290.1	10m Rt	5171816.4	285420.2
Borehole No. 15	290.3	12m Lt	5171874.8	285336.0
Borehole No. 16	290.9	4.4m Rt	5171885.9	285348.1

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REVISIONS

DATE	BY	DESCRIPTION
May 2013	MCM	REVISION 1
Dec 2013	RG	Final

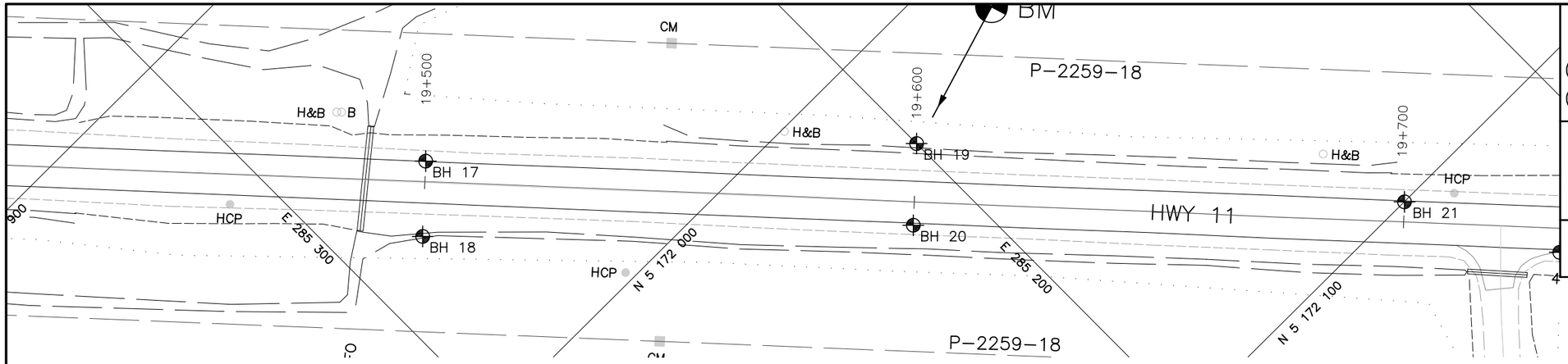
HWY No. 11 – Gladman Twp – Grade Raise Section			LVM REF 12193
SUBM'D		GEOCRES 31L–174	SITE
DRAWN IK	CHK AT	DATE April 2013	DWG 4

CONT No XXXX–XXXX
GWP No 712–92–00

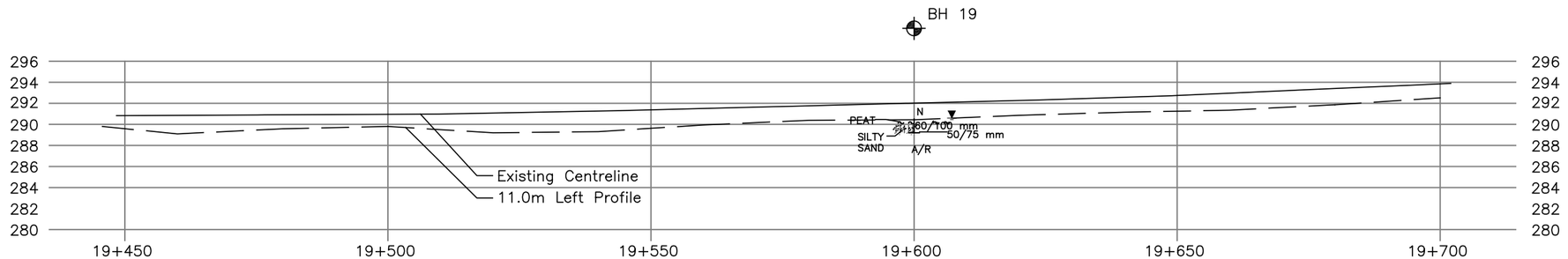
HWY 11 – Proposed Grade Raise
Sta 18+700 to 19+700
Township of Gladman
BOREHOLE LOCATIONS & SOIL STRATA

Drawing 5

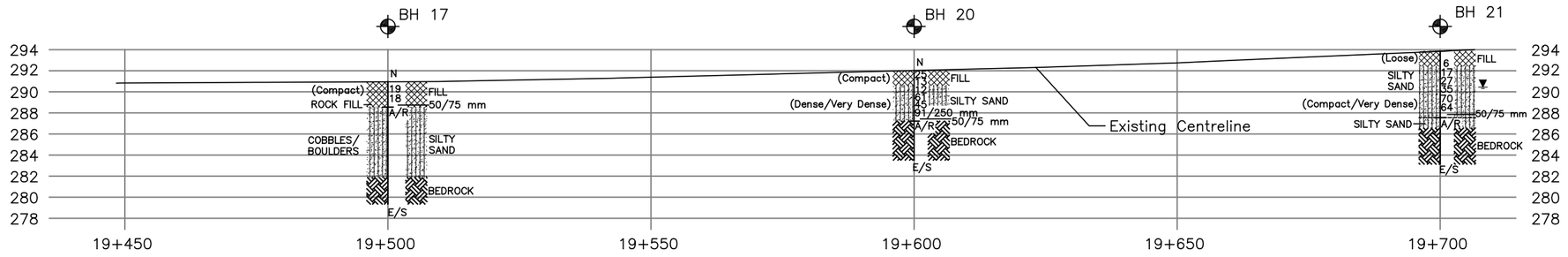
L|V|M | MERLEX



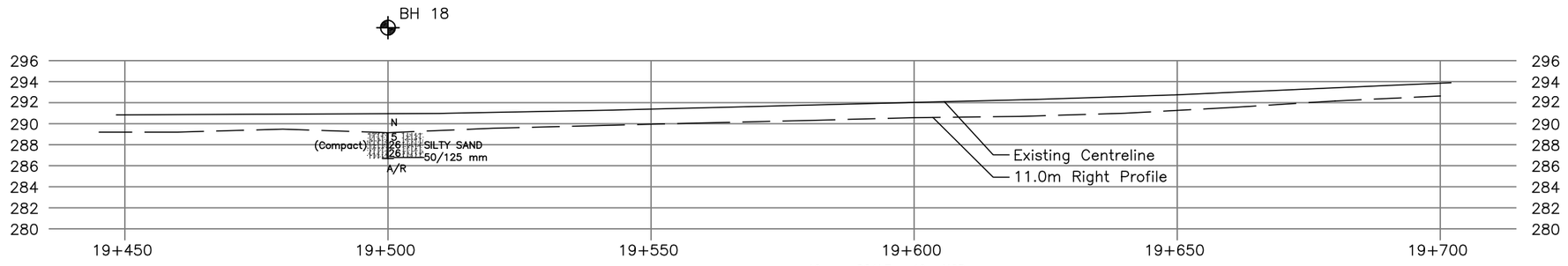
PLAN 10m SCALE 10m HOR 5m 5m VER



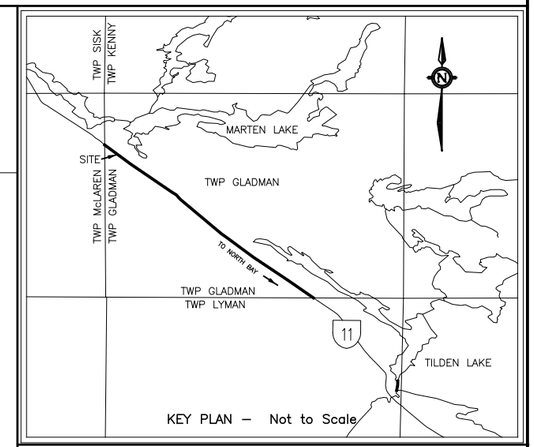
LEFT SIDE PROFILE 10m SCALE 10m HOR 5m 5m VER



℄ PROFILE 10m SCALE 10m HOR 5m 5m VER



RIGHT SIDE PROFILE 10m SCALE 10m HOR 5m 5m VER



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. 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

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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

N

HWY NO. 11
Township of Gladman

BOREHOLE LOCATIONS & SOIL STRATA

Drawing 6

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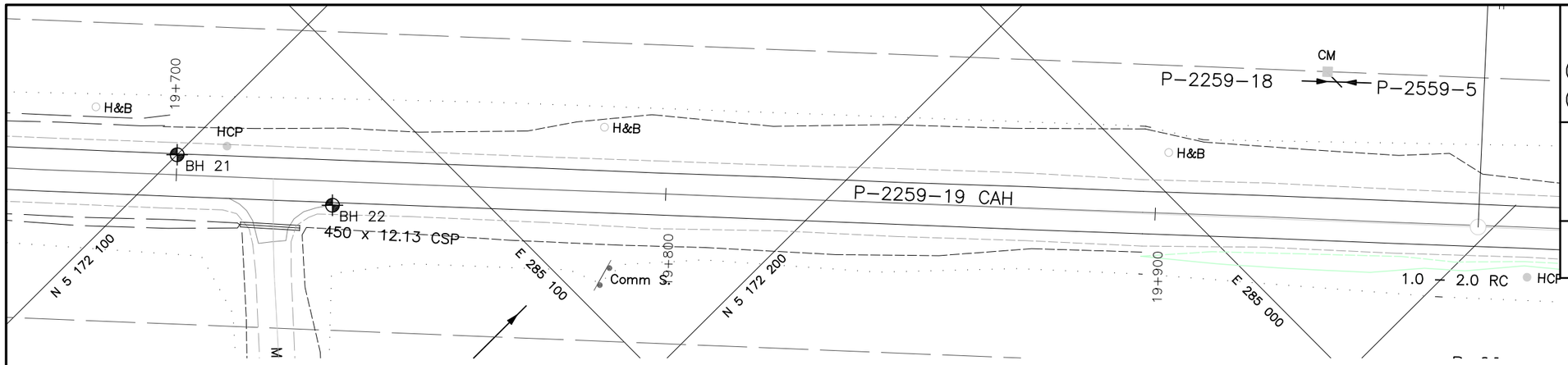
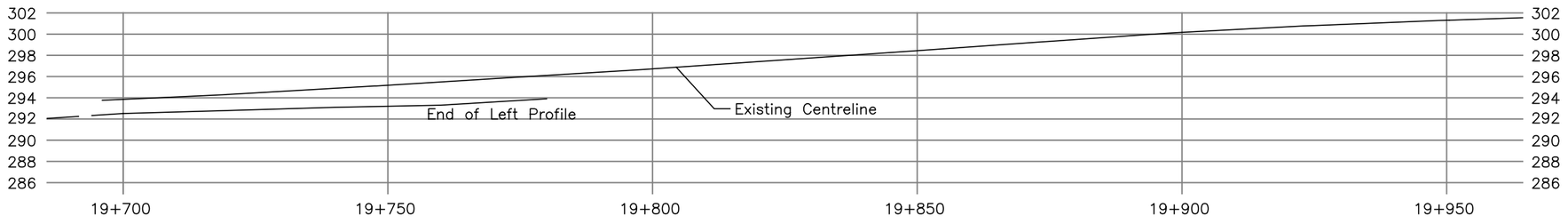
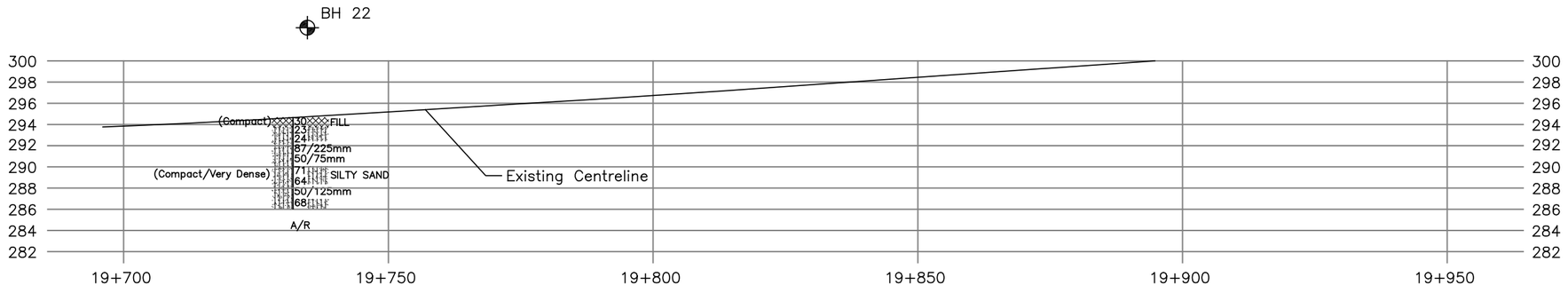


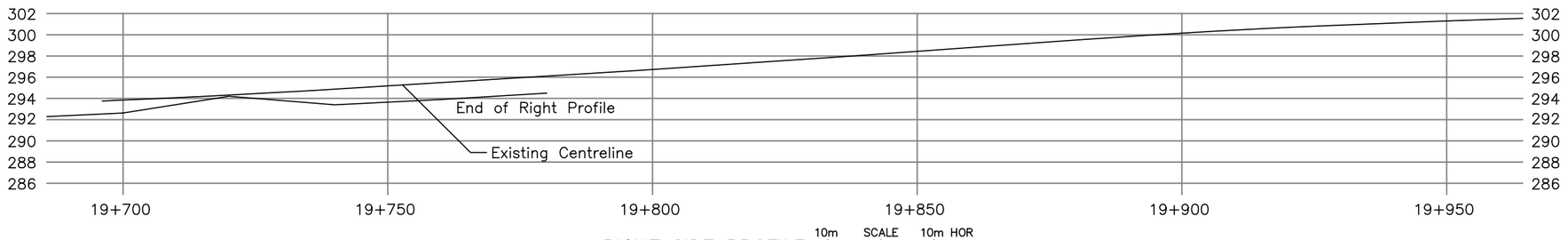
PLAN 10m SCALE 10m HOR 5m 5m VER



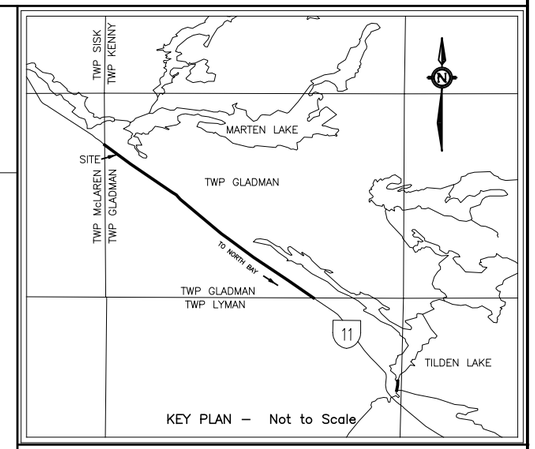
LEFT SIDE PROFILE 10m SCALE 10m HOR 5m 5m VER



℄ PROFILE 10m SCALE 10m HOR 5m 5m VER



RIGHT SIDE PROFILE 10m SCALE 10m HOR 5m 5m VER



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. 22	294.7	4.9m Rt	5172129.7	285122.5

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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

Reference No.: 12/09/12193
Date: December 2013

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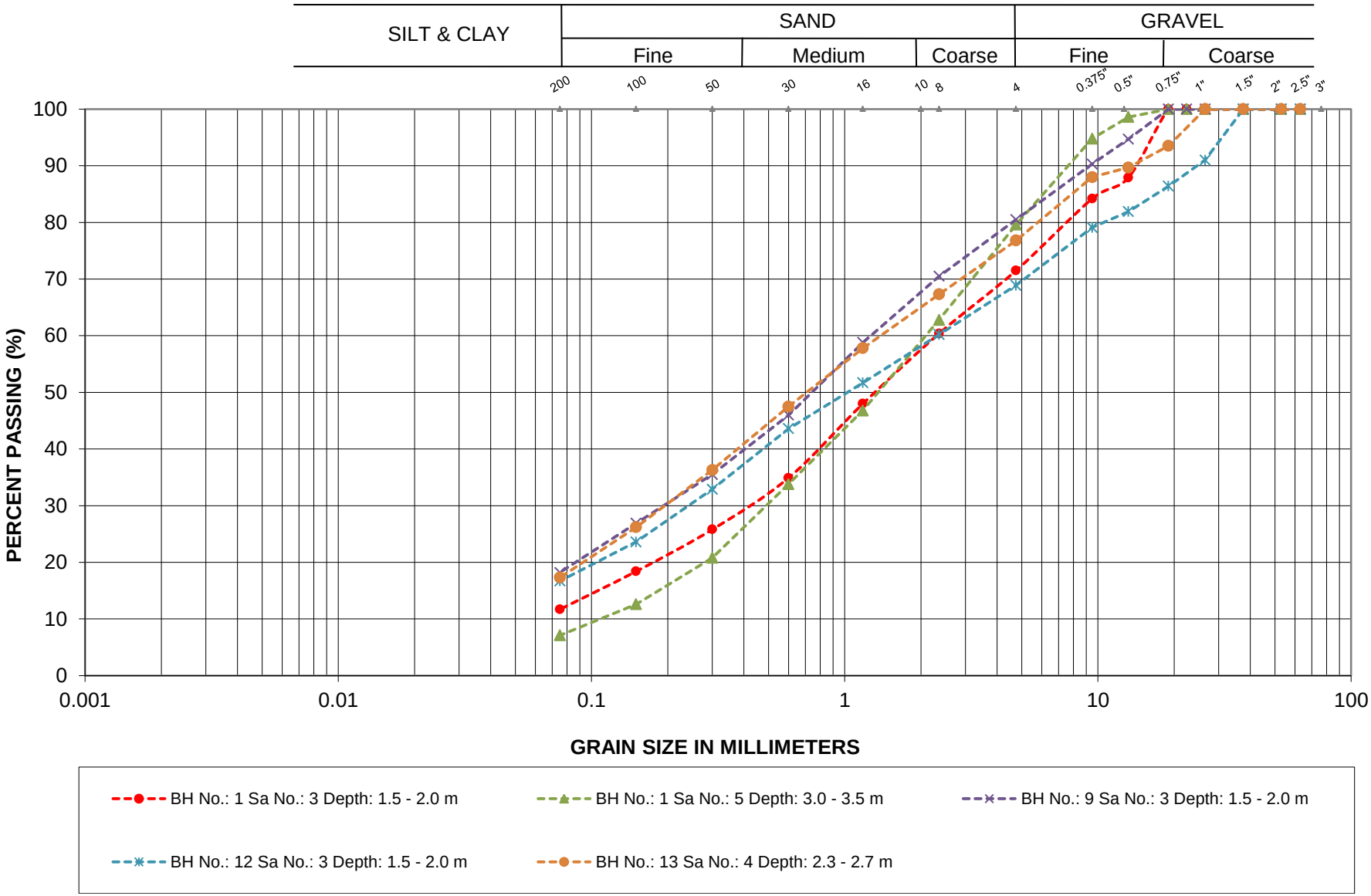
GRAIN SIZE ANALYSIS



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

EMBANKMENT FILL

LVM | MERLEX

FIGURE L-1

Reference No.: 12/09/12193
Date: December 2013

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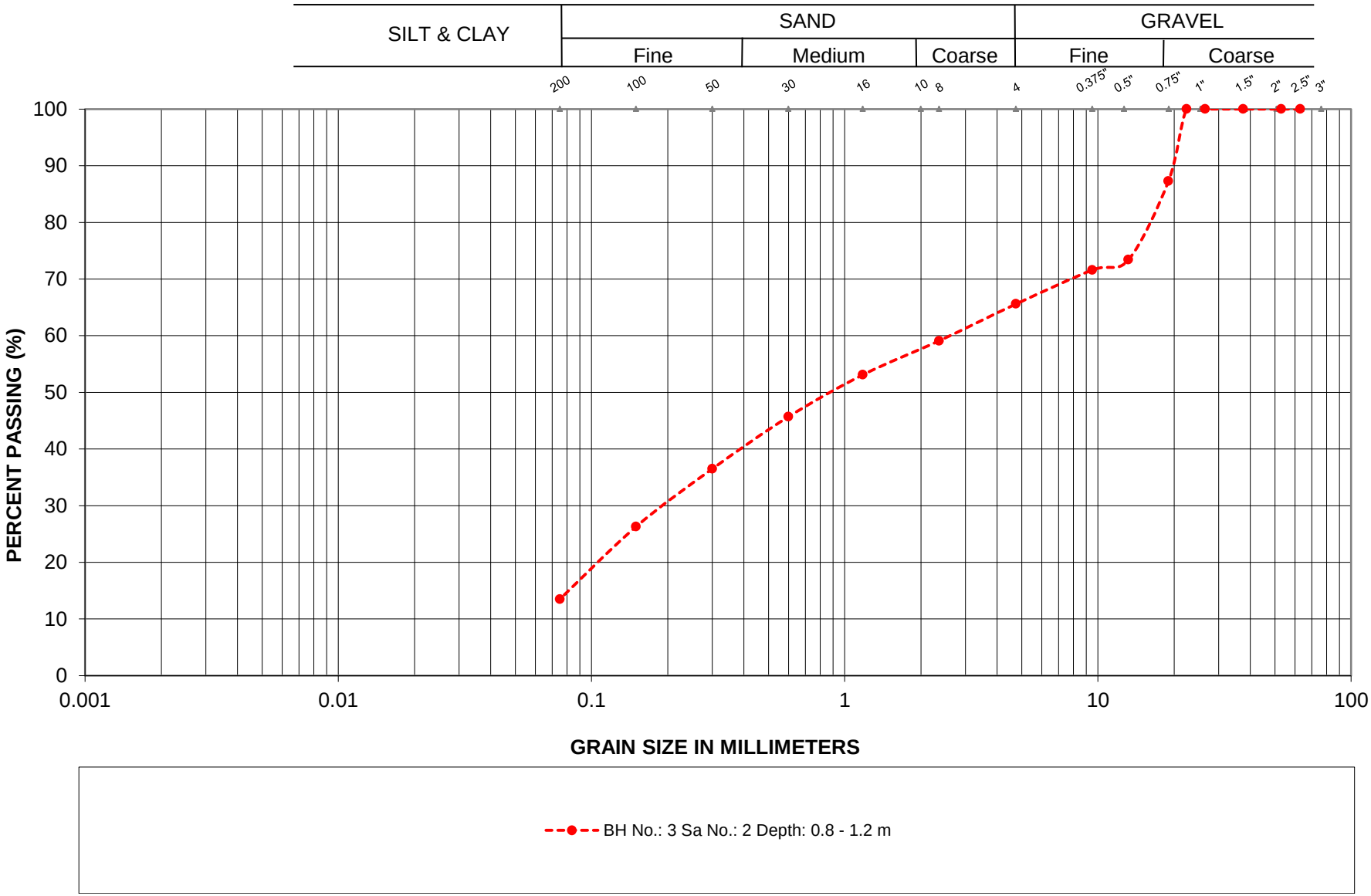
GRAIN SIZE ANALYSIS



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

FILL

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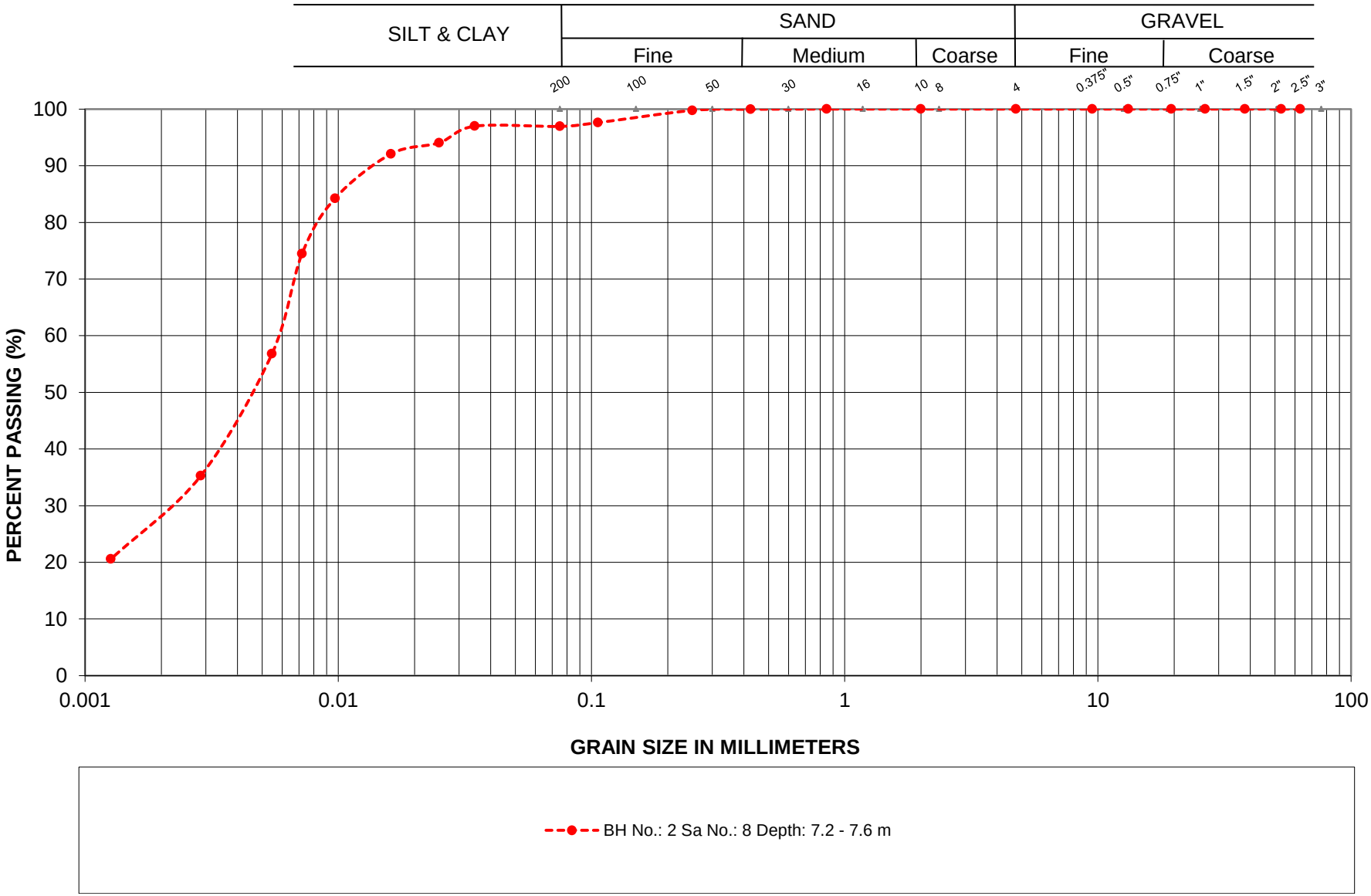
FIGURE L-2

Reference No.: 12/09/12193
Date: December 2013

LVM | MERLEX

GRAIN SIZE ANALYSIS



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

CLAYEY SILT

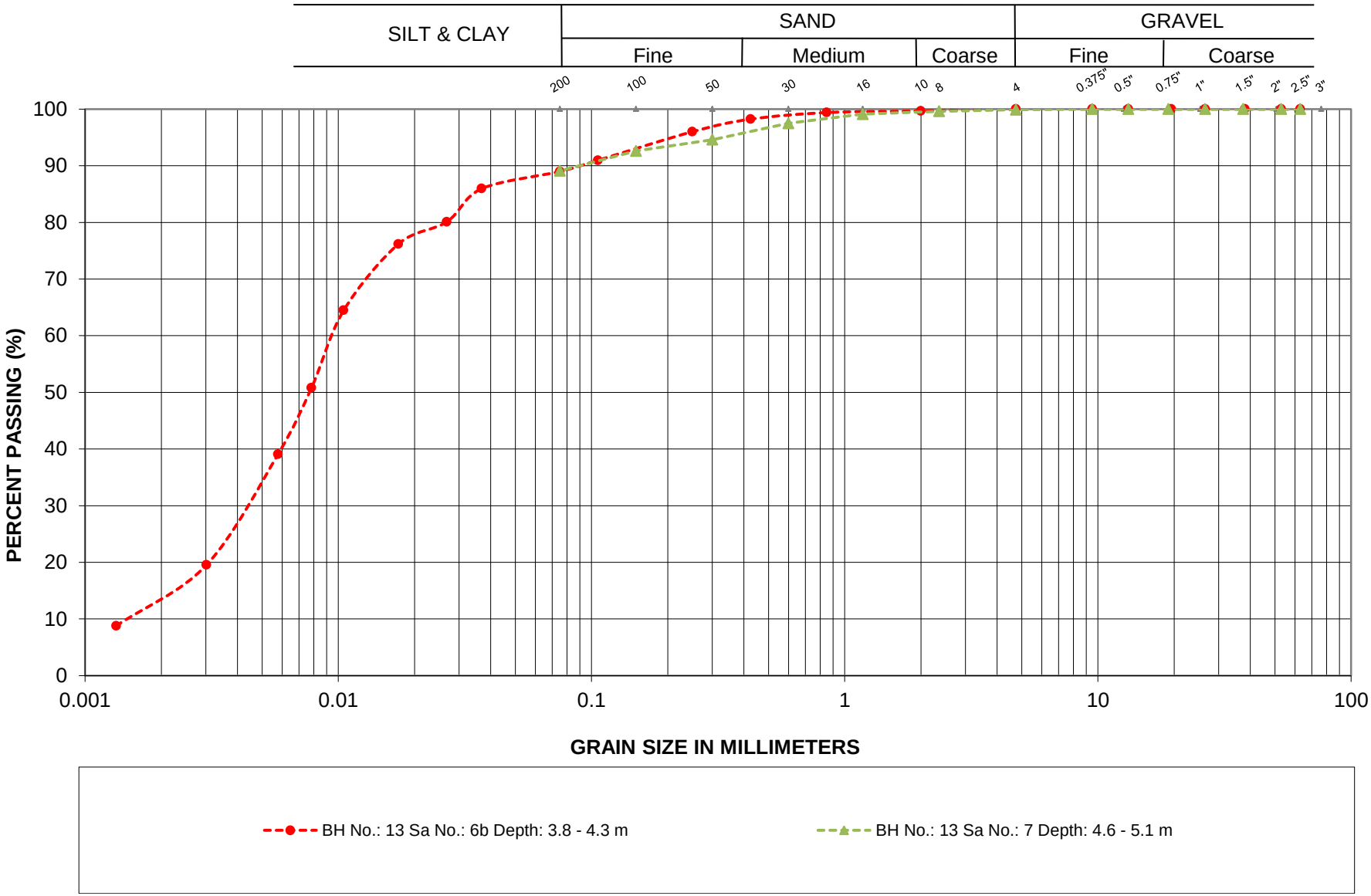
LVM | MERLEX

FIGURE L-3

Reference No.: 12/09/12193
Date: December 2013

LVM | MERLEX

GRAIN SIZE ANALYSIS



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

SILT

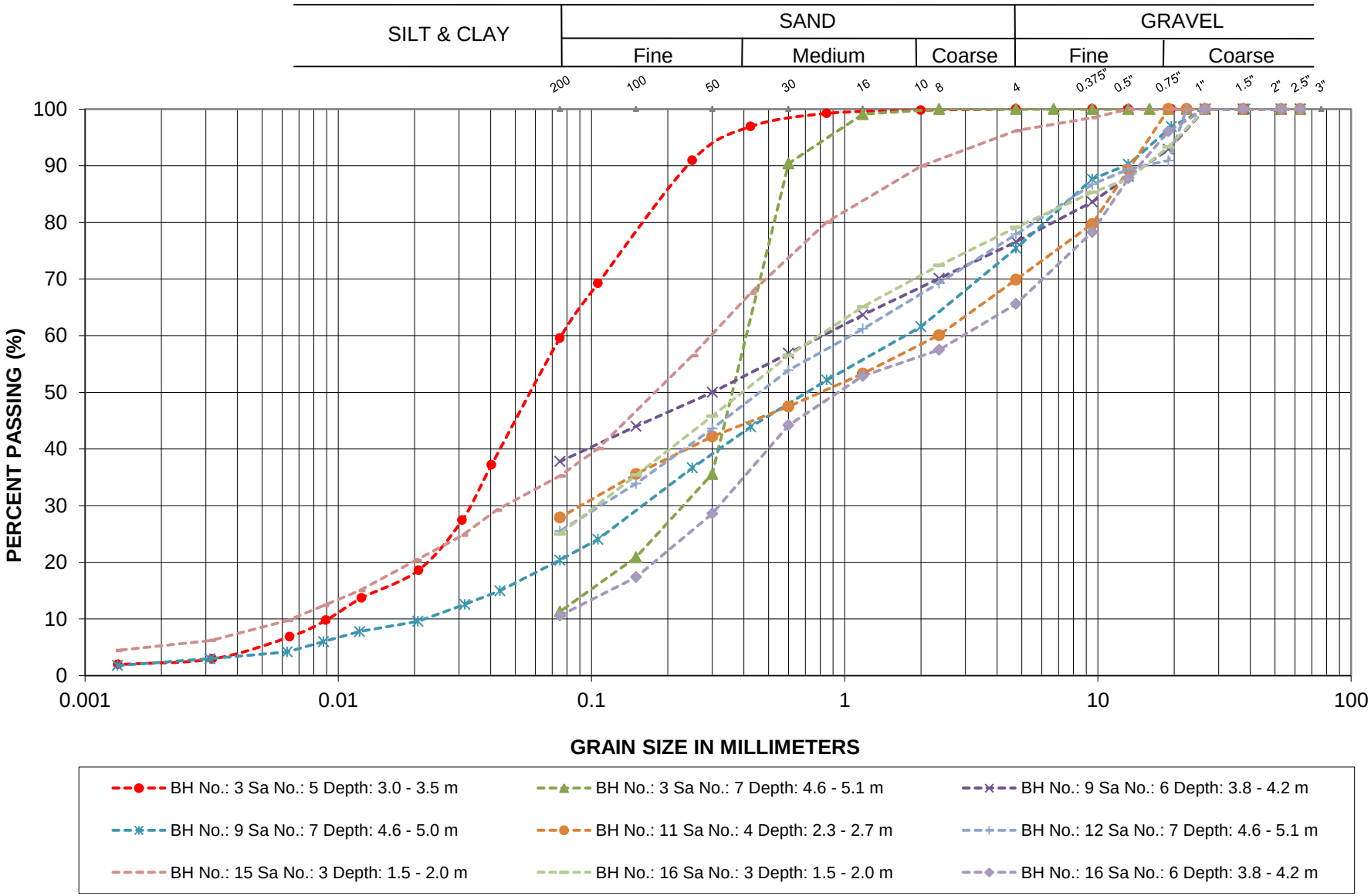
LVM | MERLEX

FIGURE L-4

Reference No.: 12/09/12193
Date: December 2013

LVM | MERLEX

GRAIN SIZE ANALYSIS



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

SILTY SAND

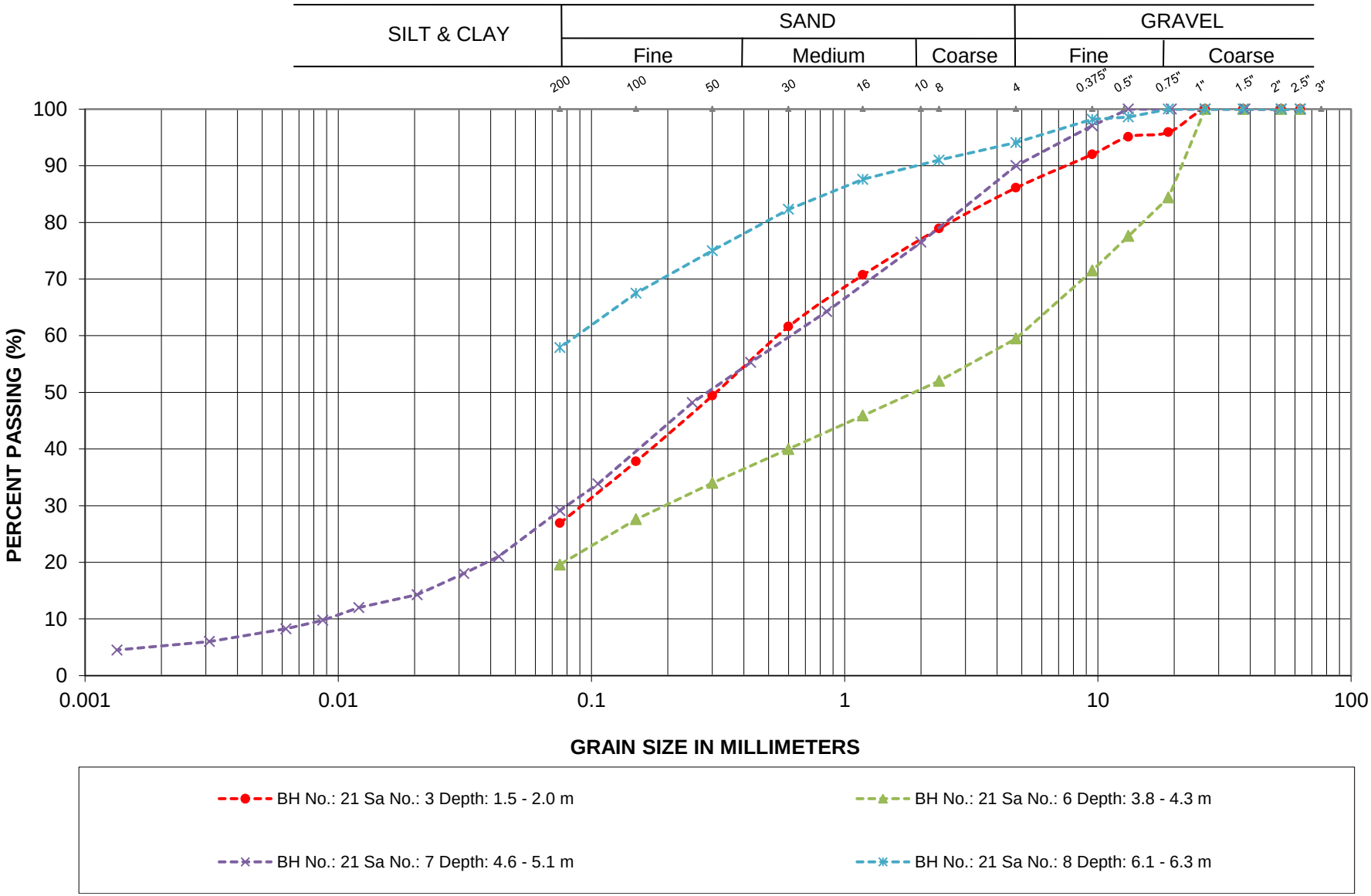
LVM | MERLEX

FIGURE L-5

Reference No.: 12/09/12193
Date: December 2013

LVM | MERLEX

GRAIN SIZE ANALYSIS



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

SILTY SAND

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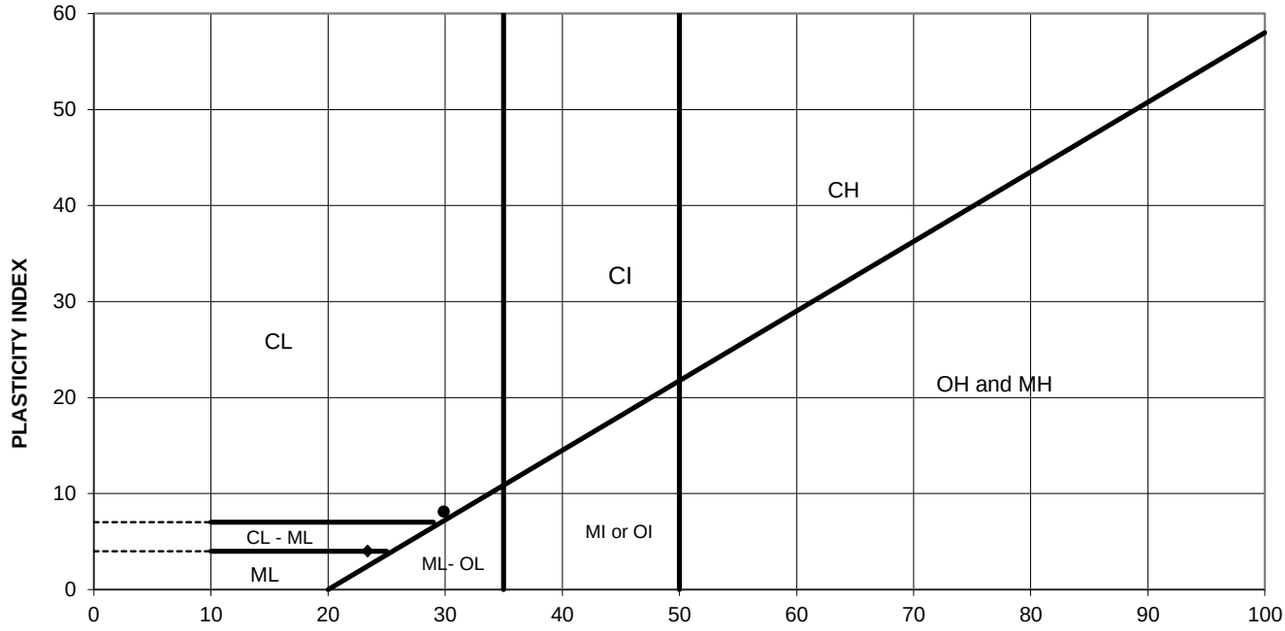
FIGURE L-6

ATTERBERG LIMITS TEST RESULTS

FIGURE L-7

ATTERBERG INDICES



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

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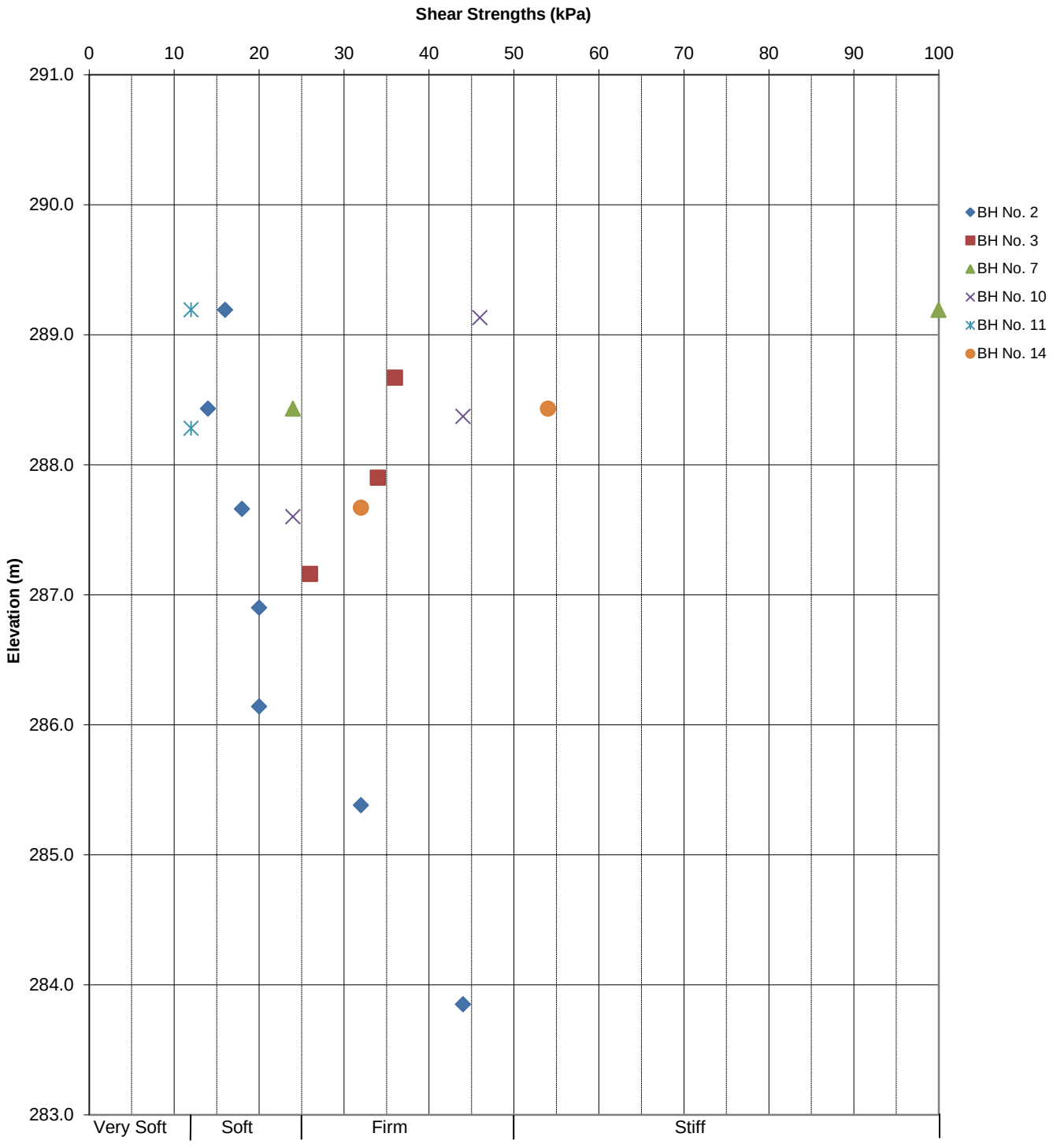
IN-SITU SHEAR STRENGTHS	Figure No. L-8

In-Situ Shear Strengths vs. Depth



Project: 12/09/12193
G**WP:** 712-92-00

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Date: December 2013
Checked:MAM

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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							

LVM | MERLEX

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			

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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			

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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 (%)				
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			

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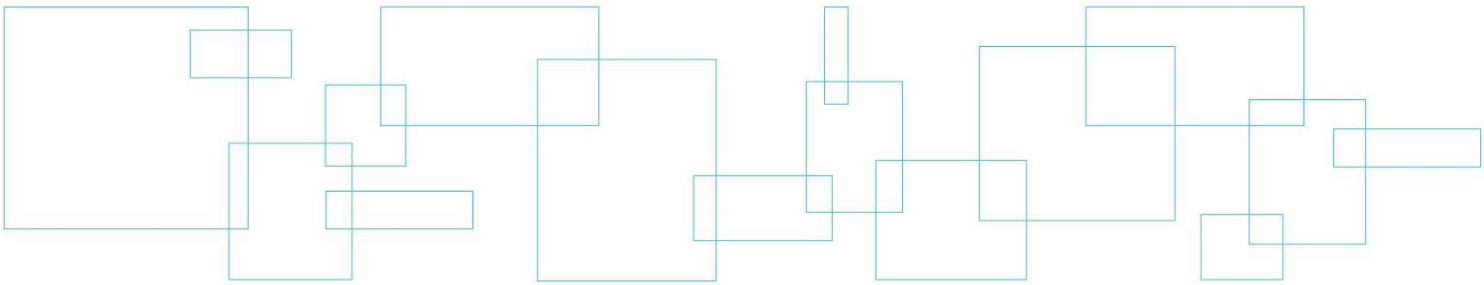
Laboratory Tests - Summary Sheet

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 (%)				
21	1	0.0					4.5							
	2	0.8					8.1				6			
	3	1.5	14	59	27		9.1				17			
	4	2.3					9.2				27			
	5	3.1					10.2				35			
	6	3.8	40	40	20		7.3				70			
	7	4.6	10	61	23	6	23.1				64			
	8	6.1	6	38	58		10.7				50/75 mm			
22	1	0.0					8.7				30			
	2	0.8					7.7				23			
	3	1.5					7.9				24			
	4	2.3					10.0				87/225mm			
	5	3.1					12.4				50/75 mm			
	6	3.8					12.6				71			
	7	4.6					15.6				64			
	8	6.1					7.2				50/125 mm			
	9	7.6					8.7				68			

Appendix 4 Geotechnical Data

Sketch No. SK-5:	Profile Sketch
Sketch Nos. SK-6a and SK-6b	Typical Cross Sections



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REF.: 12193

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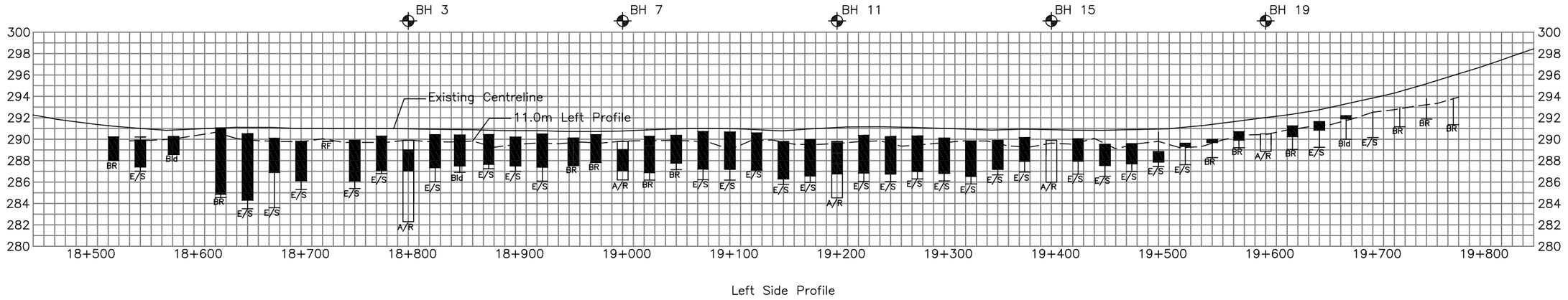
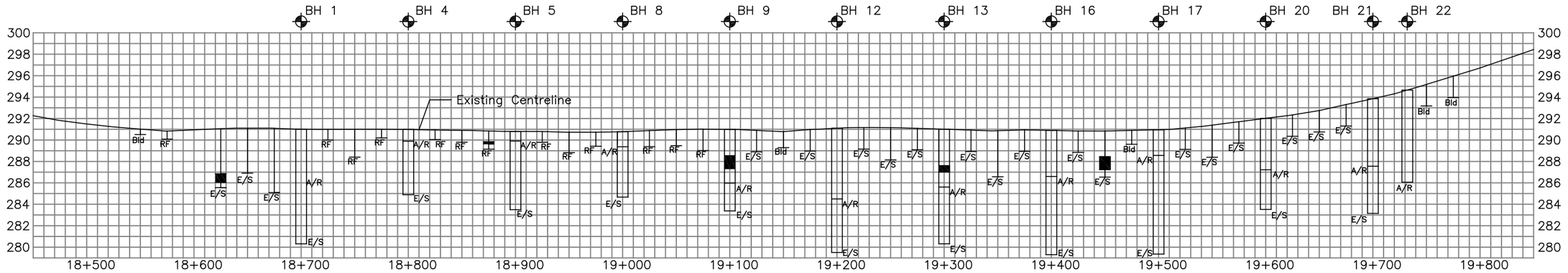
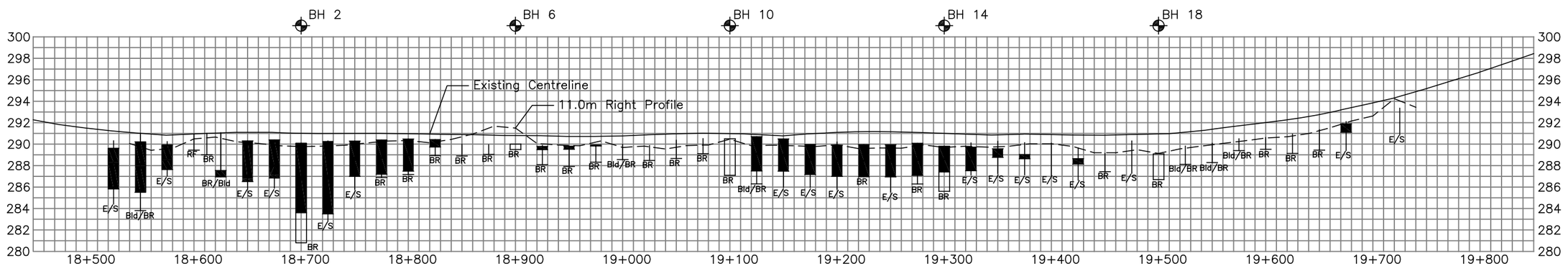


Left Side Profile



℄ Profile



Right Side Profile

METRIC

Dimensions are in meters and/or millimeters unless otherwise shown. Stations are in kilometers + meters.

Legend

- Peat Depths at Boring Locations
- E/S End of Sample
- BR Bedrock
- Bld Boulders
- RF Rock Fill
- A/R Auger Refusal

Ver: 5m 0 10m

Hor: 50m 0 100m

Geotecnical Investigation
Highway 11 Rehabilitation - Grade Raise

FIGURE SK-5

REF.: 12193

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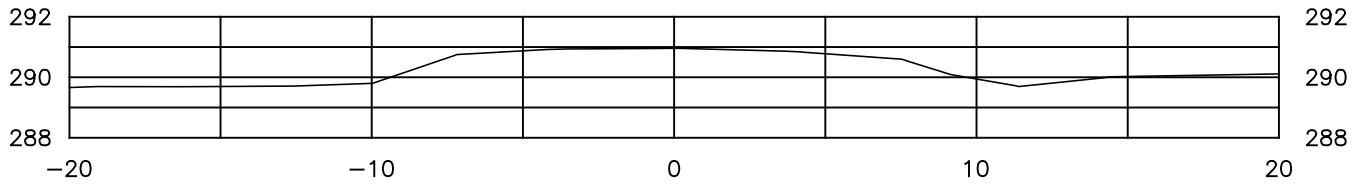
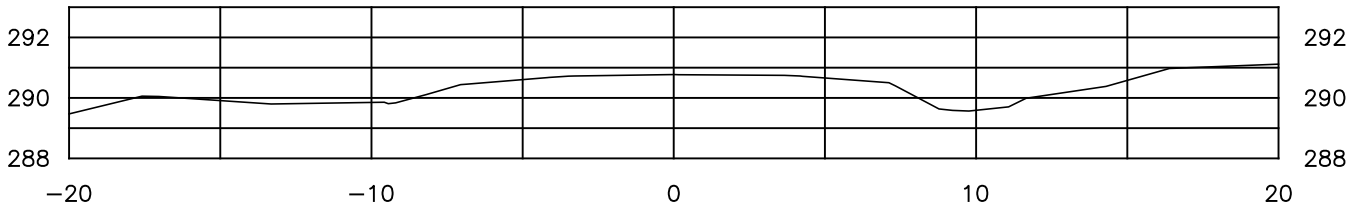
Typical Cross Sections
(Existing Embankment)



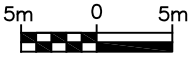
Section at 18+700



Section at 19+000

METRIC

Dimensions are in meters and/or millimeters unless otherwise shown. Stations are in kilometers + meters.



Geotecnical Investigation
Highway 11 Rehabilitation - Grade Raise

FIGURE SK-6a

REF.: 12193

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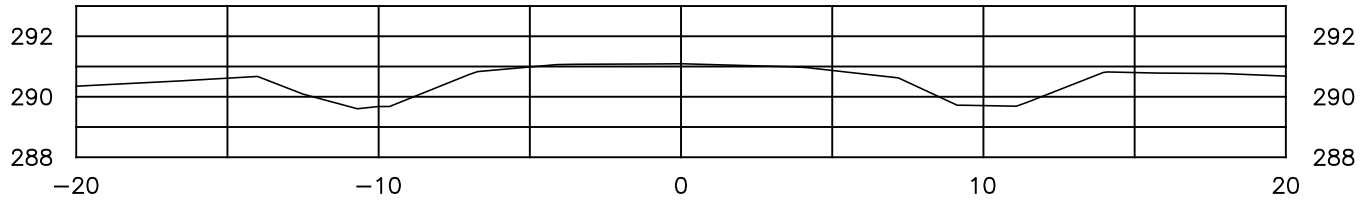
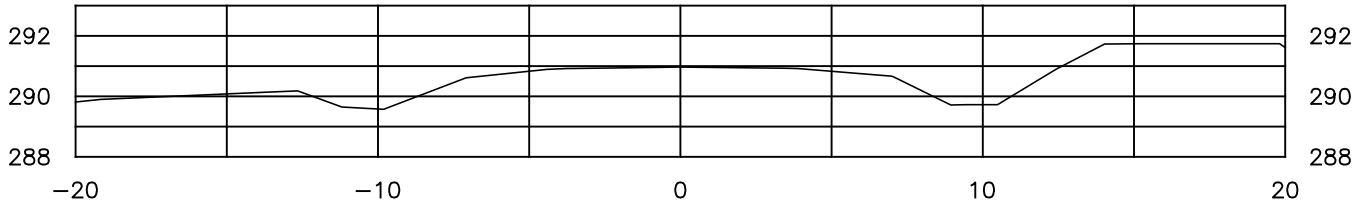
Typical Cross Sections
(Existing Embankment)



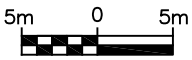
Section at 19+300



Section at 19+400

METRIC

Dimensions are in meters and/or millimeters unless otherwise shown. Stations are in kilometers + meters.

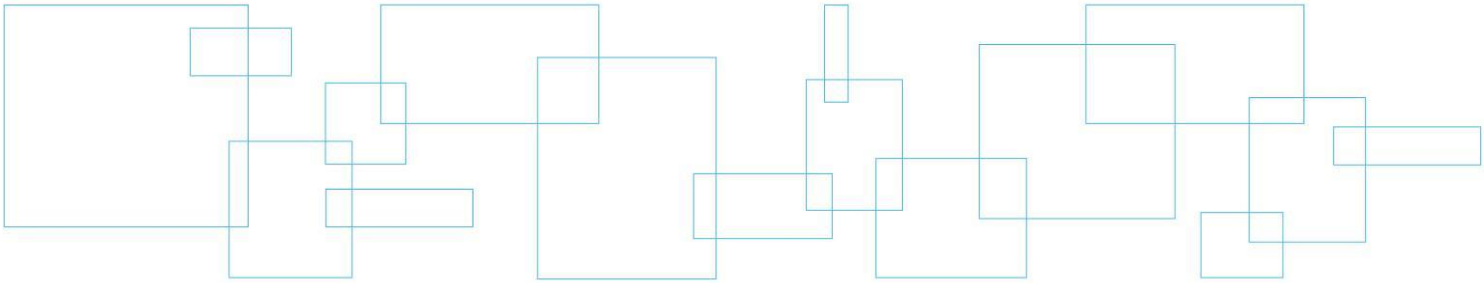


Geotecnical Investigation
Highway 11 Rehabilitation - Grade Raise

FIGURE SK-6b

Appendix 5 Design Data

Figure Nos. S-1 to S-5: Slope Stability



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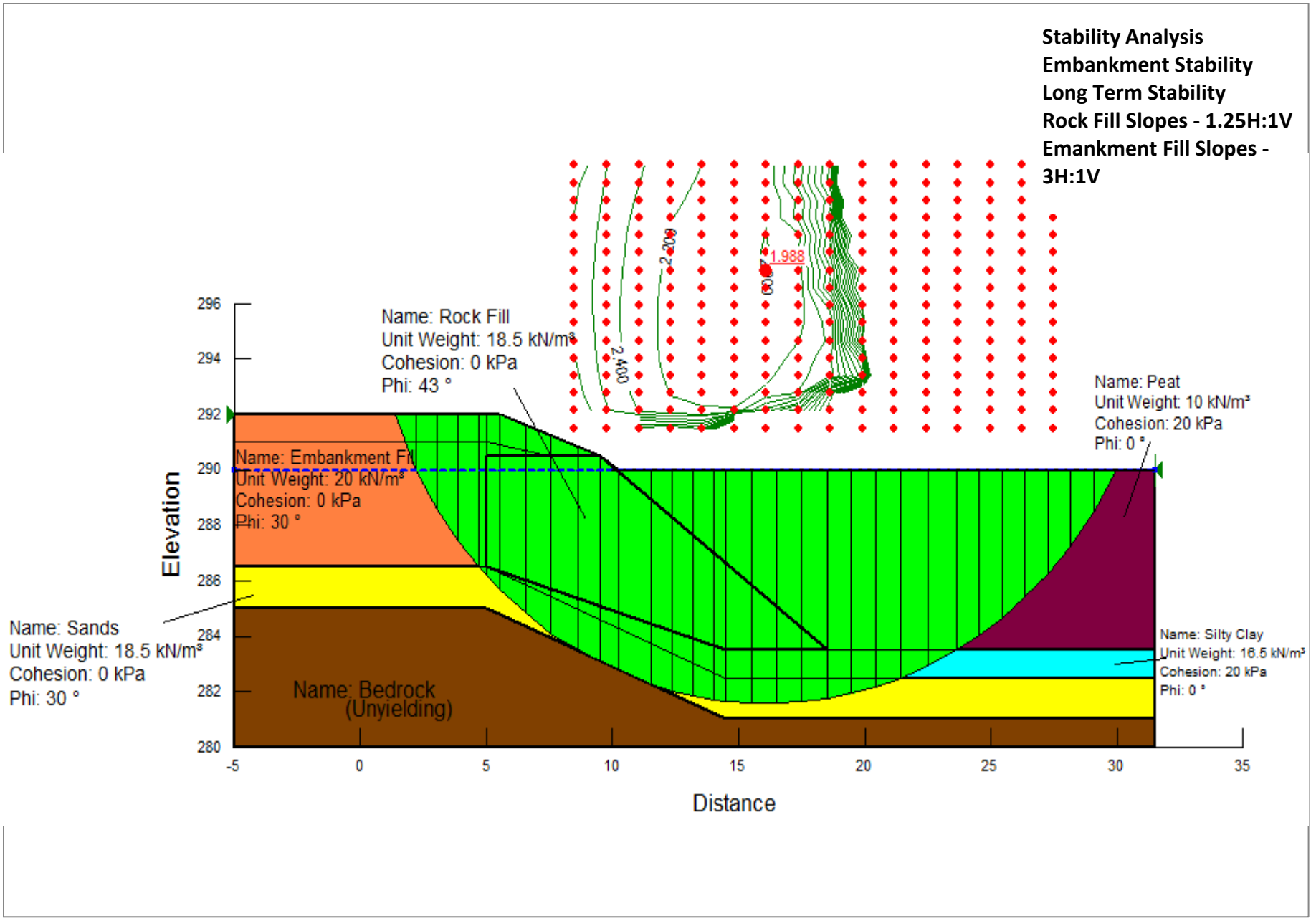


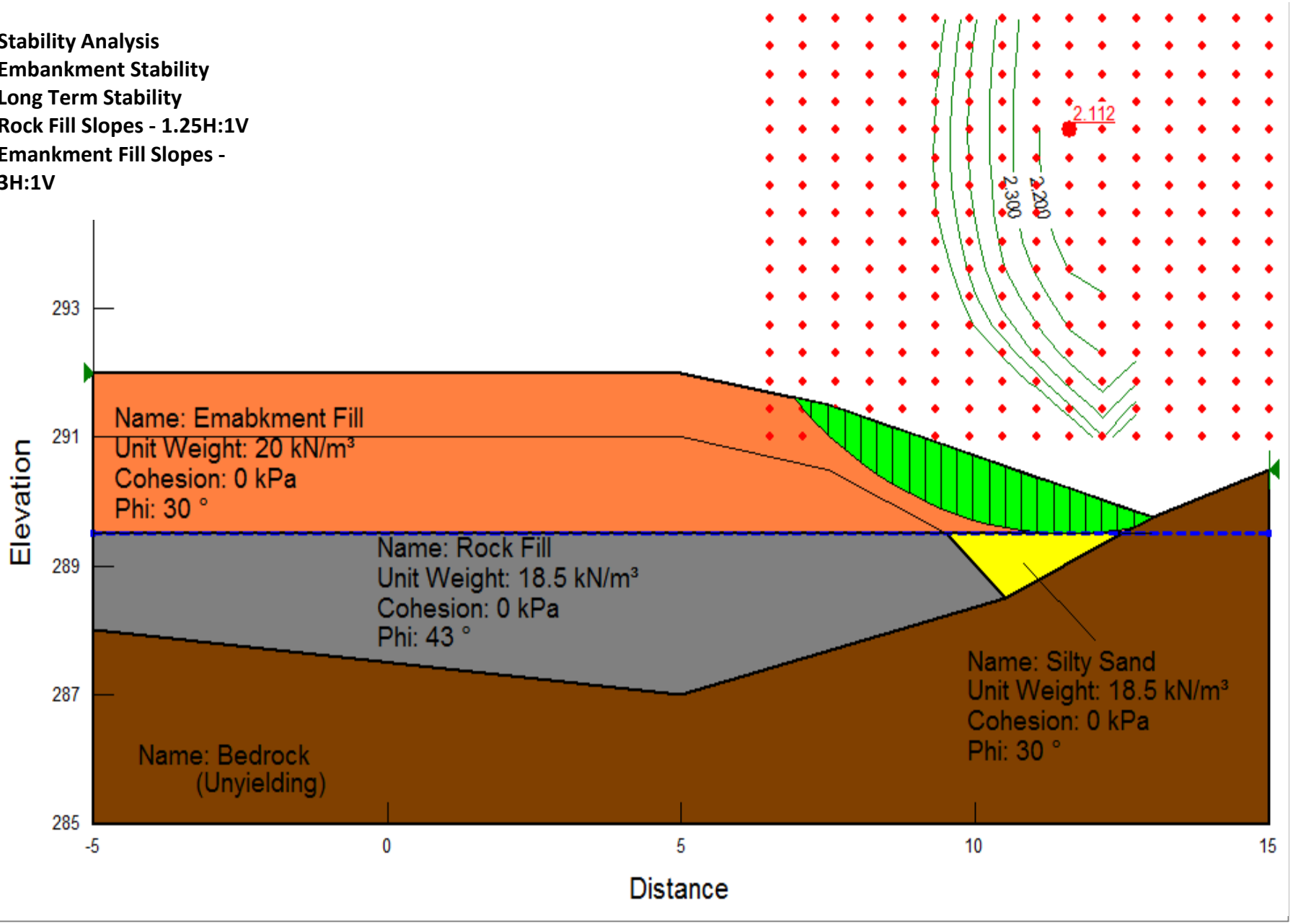
Station 18+700
Finished Embankment
TWP of Gladman

Project: G.W.P 712-92-00
Location: Hwy 11, Grade Raise

Figure No. S-1

LVM | MERLEX

Stability Analysis
Embankment Stability
Long Term Stability
Rock Fill Slopes - 1.25H:1V
Emankment Fill Slopes - 3H:1V

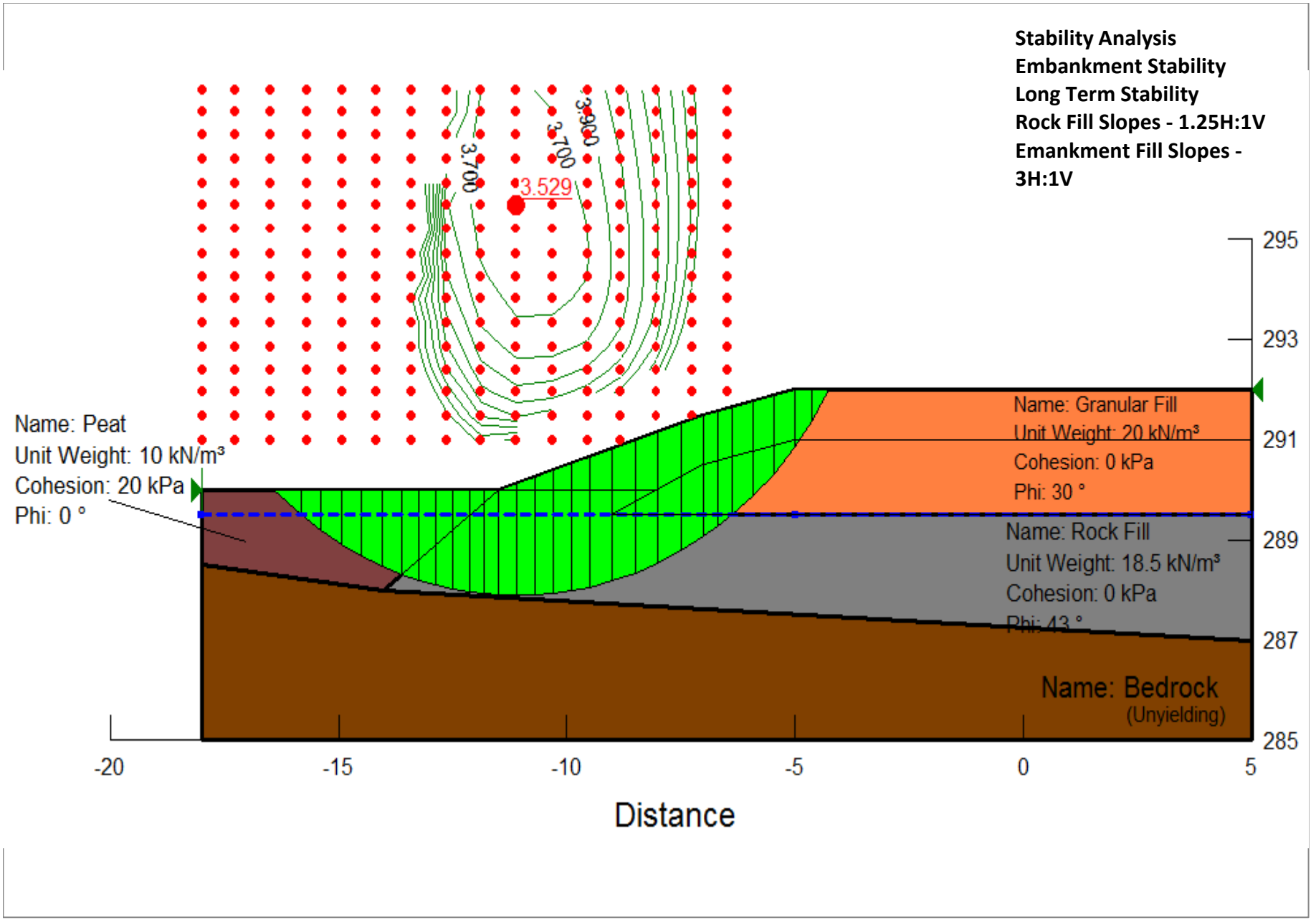


Station 19+000
Finished Embankment
TWP of Gladman

Project: G.W.P 712-92-00
Location: Hwy 11, Grade Raise

Figure No. S-2

LVM | MERLEX



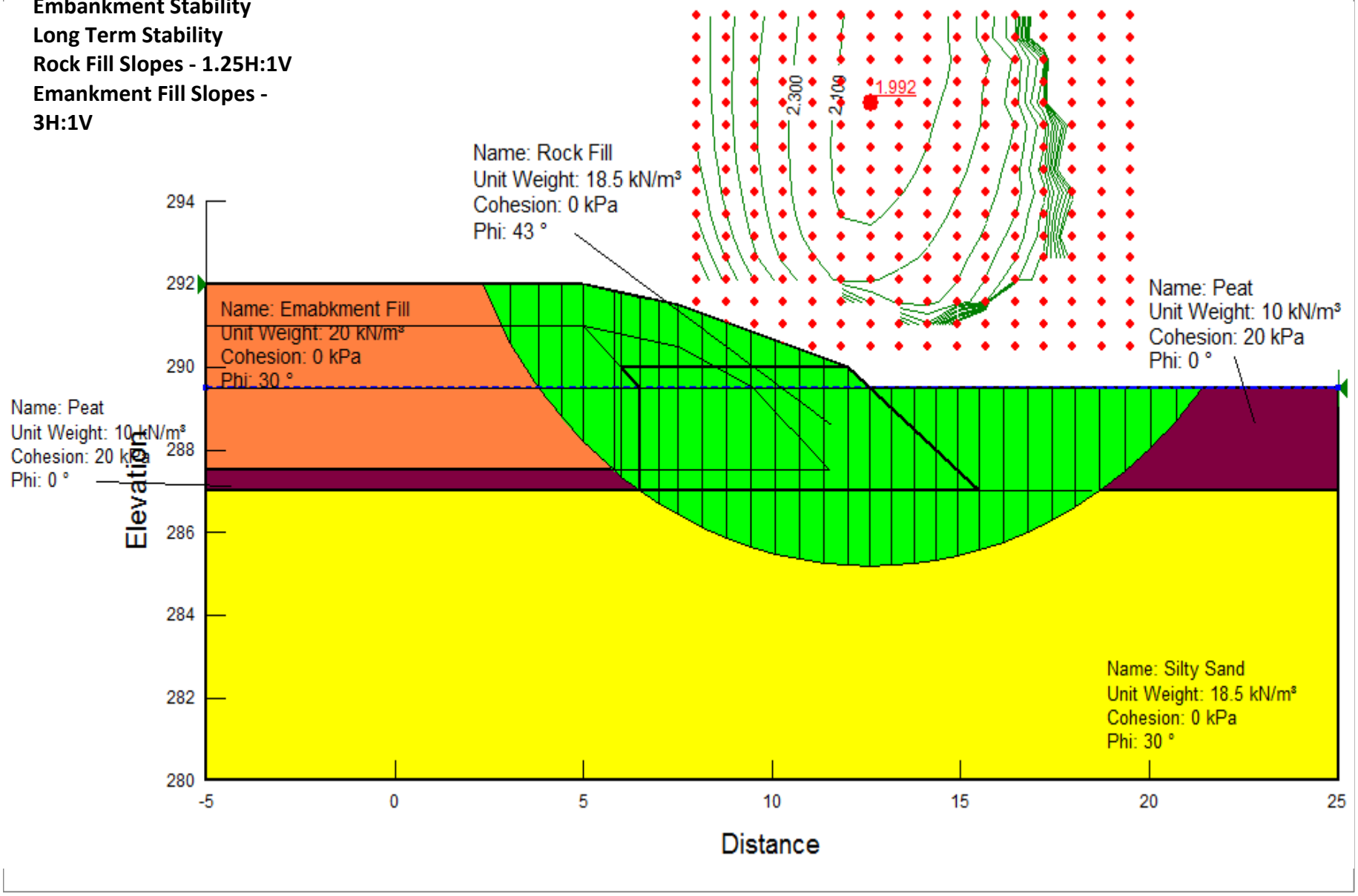
Station 19+000
Finished Embankment
TWP of Gladman

Project: G.W.P 712-92-00
Location: Hwy 11, Grade Raise

Figure No. S-3

LVM | MERLEX

Stability Analysis
Embankment Stability
Long Term Stability
Rock Fill Slopes - 1.25H:1V
Emankment Fill Slopes - 3H:1V

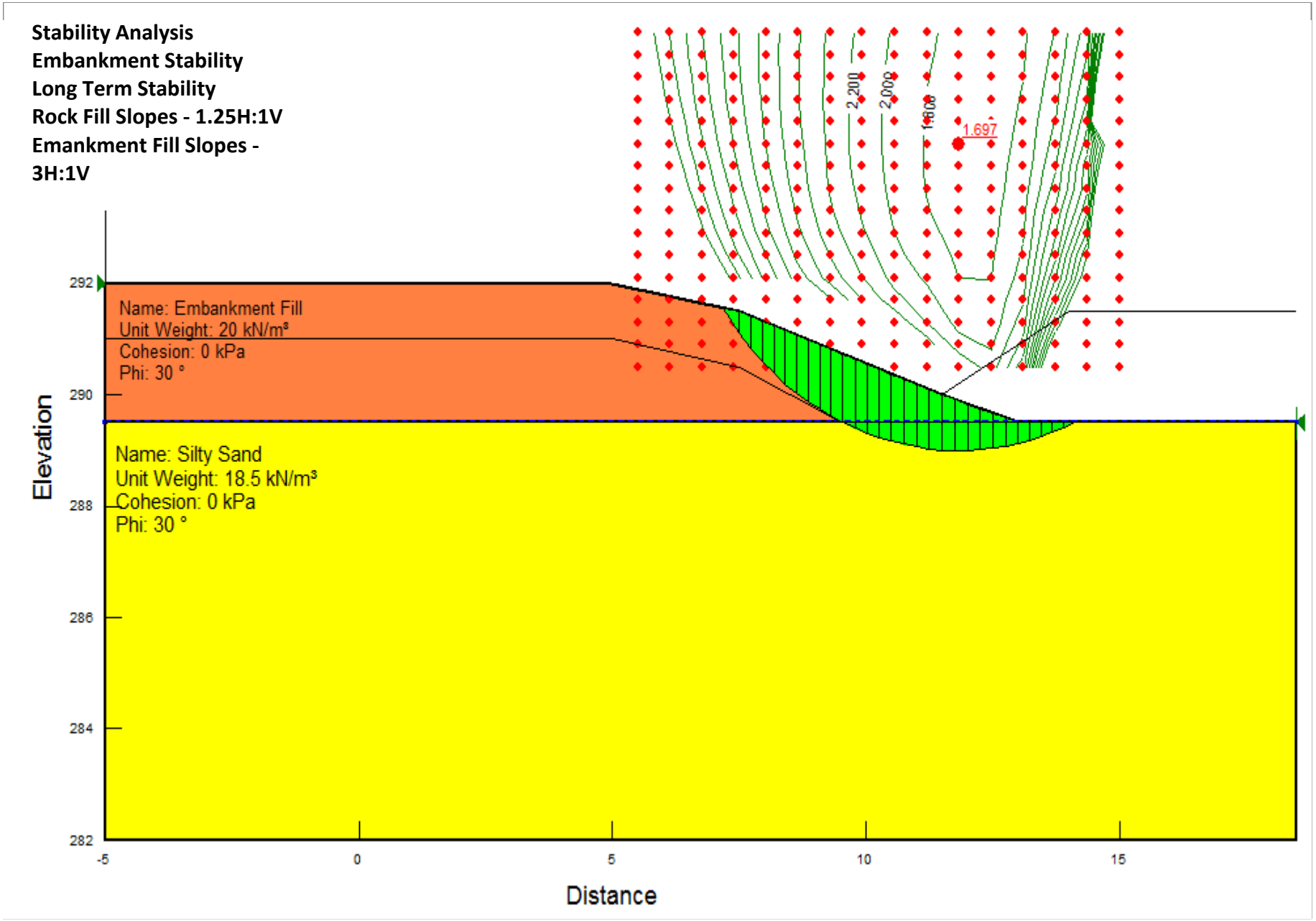


Station 19+300
Finished Embankment
TWP of Gladman

Project: G.W.P 712-92-00
Location: Hwy 11, Grade Raise

Figure No. S-4

LVM | MERLEX



Station 19+400
Finished Embankment
TWP of Gladman

Project: G.W.P 712-92-00
Location: Hwy 11, Grade Raise

Figure No. S-5