June 2010

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WINDSOR-ESSEX PARKWAY

Geotechnical Data Report
Addendum No. 7
Supplementary Geotechnical Investigation

Submitted to:
Mr. Steve Jacobs, P.Eng., Vice-President
URS Canada Inc.
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Markham, Ontario
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REPORT

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Report Number: 07-1130-207-0/09-1132-0080-7000-R02
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1.0 INTRODUCTION

This addendum presents the results of a supplementary geotechnical drilling and testing program for the Windsor-Essex Parkway from the Highway 3 and Highway 401 interchange to the Ojibway Parkway area. The work was undertaken by Golder Associates Ltd. (Golder) working under a subcontract to URS Canada Inc. (URS) on behalf of the Ministry of Transportation Ontario (MTO). This report is Addendum No. 7 to the original Report No. 07-1130-207-0-R01 entitled "Windsor-Essex Parkway, Geotechnical Data Report" dated June 2009.

The supplementary drilling and testing program described herein was conducted in the areas of the east abutment and high fill embankment associated with the proposed bridge over Ojibway Parkway. While this report provides data related to the borehole drilling and sampling, no interpretations are provided with respect to conditions between samples, tests or borehole locations. The stratigraphic boundaries shown on the Record of Borehole sheets are inferred from non-continuous sampling, observations of drilling progress and the results of Standard Penetration Tests. These boundaries, therefore, may represent transitions between soil types rather than exact planes of geological change. Further, subsurface conditions will vary between and beyond the samples and borehole locations. Use of this report is subject to important limitations summarized following the text of this report.

2.0 SITE DESCRIPTION

The proposed Windsor-Essex Parkway (WEP) begins near the existing western terminus of Highway 401 and generally follows the alignments of Highway 3, Huron Church Road and the E.C. Row Expressway to the border crossing plaza site near the Detroit River as illustrated by the Key Plan shown on Figure 1 and Drawings 1 through 6. The alignment of the WEP follows the horizontal alignment of these roadways with some areas within the existing rights-of-way and some parallel to and west/south of the existing roadways.

The site character near the existing terminus of Highway 401 to near the E.C. Row Expressway is generally residential or commercial with low-rise buildings and urban street rights-of-way. The topography in the area is relatively flat with the ground surface elevation gently undulating between about 187 m and 179 m with a general decline from southeast to northwest (toward the river). Within the Highway 3 and Huron Church Road portion of the WEP, the alignment crosses several municipal drains including the Cahill Drain, Lennon Drain and Grand Marais Drain.

Between Huron Church Road and Ojibway Parkway, along the south side of E.C. Row Expressway, the site is characterised by relatively low-lying and flat areas. The topography gently undulates with a topographic relief generally less than 5 m between approximately elevations 179 m and 184 m with a general decline from east to west toward the Detroit River. The ground surface is covered with a mixture of low vegetation and trees.

3.0 INVESTIGATION PROCEDURES

3.1 Drilling and Sampling

The latest phase of the subsurface explorations for the Windsor-Essex Parkway was carried out between April, 20 and 27, 2010. During this time, two sampled deep boreholes (boreholes 346 and 349, 28.4 m and 27.8 m deep, respectively, including rock coring) and two cone penetration tests (CPTs) were advanced within the aforementioned area. At both cone penetration test locations, sampled boreholes (2.7 m and 2.9 m deep, respectively) were drilled to characterize the shallow subsurface conditions adjacent to the CPT locations. Locations of all boreholes and cone penetration tests are shown on Drawings 1 through 6.

Field work was supervised on a full-time basis by members of Golder's staff who located the boreholes, directed the drilling, sampling as well as in situ testing operations and logged the boreholes. All borehole field locations were determined by Golder relative to points staked in the field by Golder using GPS systems and measured references to local landmarks or features. The final borehole locations were surveyed by Callon-Dietz Surveyors. The borehole locations, including UTM NAD83 northing and easting coordinates and ground surface elevations, referenced to geodetic datum, are summarized in Table 1 and shown on Drawings 1 through 6.

The boreholes were advanced using hollow stem augers and mud-rotary drilling using an all-terrain-vehicle-mounted drill rig supplied and operated by a specialist drilling contractor. Samples of the overburden were generally obtained at 0.75 to 1.5 m intervals of depth using either 50 mm outside diameter split-spoon samplers in accordance with the Standard Penetration Test (SPT) procedures (ASTM D1586) or thin-walled tube samplers (ASTM D1587). The Standard Penetration Tests were conducted using a rope and cat-head hammer. In general, the sampling routine in the deep boreholes consisted of a repeating sequence of a split-spoon sample, a field vane shear test and a thin-wall tube sample. In some areas, deviations from this sampling routine were necessary to assure recovery of sufficient thin-wall tube samples from specific depths. In the event that the soil strength was sufficient to prohibit completion of field vane shear tests, split-spoon samples were obtained instead. A bulk sample of the near-surface brown sand was collected from the auger cuttings in borehole 349. Samples of bedrock were obtained in the deep boreholes using ‘NQ’-sized rock core barrels. The soil samples and rock cores were identified in the field, placed in labelled containers and transported to Golder’s laboratories in London and Mississauga for further examination and testing. The Record of Borehole sheets are provided in Appendix A for all boreholes along with the Record of Drillhole sheets for rock coring information. Photographs of the rock core are included in Appendix B.

Water levels in the open boreholes were observed throughout the drilling operations. During drilling near the soil-bedrock interface in the deep boreholes, flowing artesian groundwater conditions were encountered. Four vibrating wire piezometers (VWPs) were installed at depths of about 5.7, 10.6, 15.2 and 23.0 m to measure the in situ pore water pressures within the soil profile and at the overburden-bedrock interface. The deep boreholes were sealed by backfilling with cement-bentonite grout. The shallow CPT boreholes were backfilled with cuttings with bentonite plugs at the surface.

Table 1: Coordinates and Elevations of Borehole Locations

Borehole Location Number	UTM NAD83 Northing (m)	UTM NAD83 Easting (m)	Ground Surface Elevation (m)
BH-346	4,682,152	328,623	179.24
CPT-347	4,682,060	328,643	178.58
CPT-348	4,682,160	328,513	179.15
BH-349	4,682,135	328,496	179.08

3.2 Field Vane Shear Tests

In situ vane shear strength testing was carried out using a shear test device conventional to practice in Ontario where the device is inserted into the ground at depth intervals, where appropriate, from within a conventional borehole. These tests were carried out using the standard vanes turned with a calibrated torque wrench at shear rates such that the times to failure typically ranged from about 110 to 140 seconds.

3.3 In Situ Cone Penetration Tests

Two cone penetration tests (CPT-347 and CPT-348, both advanced to refusal) were completed as part of the supplementary field testing. Both CPTs were pushed from the ground surface with adjacent sampled boreholes drilled to characterize the shallow ground surface conditions.

The CPT is an in situ testing technique for site characterization studies. The CPT consists of a special cone tip equipped with electronic sensing elements to continuously measure tip resistance, local side friction on a steel sleeve behind the conical tip, and porewater pressure. It is pushed at a constant rate into the ground using a drill rig (ASTM D 5778). A continuous stratigraphic profile together with engineering properties, such as undrained shear strength, can be inferred from the results of the CPT.

The CPT equipment was advanced using the hydraulic ram system on the drill rigs. The refusal depths were about 20.9 m and 23.4 m for CPT-347 and CPT-348, respectively. Refusal is defined as sufficient resistance from the CPT and pushing rods to exceed the combined weight and hydraulic capacity of the drilling (pushing) equipment and does not necessarily reflect the CPT tip penetration resistance. Record of Cone Penetration Test sheets are included in Appendix C following the text of this report. Profiles of tip resistance, porewater pressure during pushing and sleeve-friction are presented on these records.

3.4 Laboratory Testing

Upon return of the samples to the Golder laboratories, the following suite of tests was carried out:

- natural soil water content determinations on 40 samples in accordance with ASTM D 2216;
- Atterberg limits determinations on 12 samples in accordance with ASTM D 4318;
- mechanical sieve analyses, with or without hydrometer tests, on 10 samples in accordance with ASTM D 422; and
- oedometer consolidation tests with unload-reload cycles on a total of 6 specimens of clayey silt to silty clay in accordance with ASTM D 2435.

The laboratory test results are presented in Appendix D. Also included in Appendix D is a summary of the coefficient of consolidation (c_v) values calculated by two different methods (see Holtz and Kovacs (1981)[1] for details of these methods) from the oedometer tests:

I. Taylor's Square Root of Time Fitting Method that provides the time required for 90 per cent consolidation (t_{90}); and

II. Casagrande's Logarithm of Time Fitting Method that provides the time required for 50 per cent consolidation (t_{50}).

[1] Holtz, R.D. and Kovacs, W.M. (1981). An Introduction to Geotechnical Engineering. Prentice-Hall, NJ, USA.

4.0 SITE GEOLOGY AND SUBSURFACE CONDITIONS

4.1 Site Geology

The study area is located in the physiographic region of Southwestern Ontario known as the St. Clair Clay Plains. Within this region, Essex County and the southwestern part of Kent County are normally discussed as a subregion known as the Essex Clay Plain. The clay plain was deposited during the retreat of ice sheets (late Pleistocene Era) when a series of glacial lakes inundated the area. In general, the ice sheets deposited till in the area of Windsor and Detroit. Depending on the locations of the glacial ice sheets and depths of water in the ice-contact glacial lakes, the till may have been directly deposited at the contact between the ice sheet and the bedrock or, as the lake levels rose and the ice sheets retreated and floated, the soil and rock debris within and at the base of the ice were deposited through the lake water (lacustrine depositional environment). Glacial till, in its common usage, often indicates a very dense or hard composition resulting from consolidation and densification under the weight of the ice sheet. The mineral soil particles typically have a distribution of grain sizes ranging from cobbles to clay. In many areas of Windsor and Detroit, the soils described as “glacial till” were deposited through water and have a soft to firm consistency as a result.

The major soil stratum in the study area, consisting primarily of silty clay and clayey silt, typically ranging in thickness from about 20 to 35 m, exhibits a till-like structure exemplified by a random distribution of coarser particles within the primarily fine-grained silt and clay deposit (also called “diamict”). In most of the eastern and northern parts of the Windsor metropolitan area below frost depth, the near-surface clay is generally stiff to hard and brown. Underlying this stiff to hard “crust”, the silty clay becomes grey-brown and firm to stiff in consistency. Below the groundwater level, the silty clay becomes soft to firm, particularly in the western and southern areas of metropolitan Windsor.

Surficial layers or pockets of more typical layered lacustrine (lake-deposited) silty clay, silt or sand may be encountered overlying the extensive stratum of “till-like” silty clay. Silt and sand deposits, on the order of 2 m in thickness, can often be found near the ground surface in areas near the western side of Windsor and the southwestern limits of the study area. A relatively thin stratum, on the order of 1 to 6 m in thickness, of very dense or hard basal glacial till or dense silty sand may be found directly overlying the bedrock surface.

4.2 Site Stratigraphy

The detailed subsurface soil, bedrock and groundwater conditions encountered in the boreholes, together with the results of the field and laboratory testing, are shown on the Record of Borehole sheets in Appendix A and the laboratory test results are provided in Appendix D. In general, the encountered soils generally consist of surficial topsoil or fill materials overlying granular deposits, underlain by an extensive deposit of clayey silt to silty clay, which is occasionally interbedded with silty sand or sandy silt deposits, overlying limestone bedrock encountered at a depth of about 23 m.

4.2.1 Topsoil and Fill

Topsoil was encountered at the ground surface in all four boreholes. The topsoil layers were dark brown to black and about 0.3 to 0.9 m thick. Classification of materials identified in this report as topsoil was based solely on visual and textural evidence. Testing of organic content, nutrients, or the topsoil's general suitability as a vegetal growth supporting medium, was not carried out. Therefore, the use of materials classified as topsoil in this report cannot be relied upon for supporting growth of landscaped vegetation (e.g. select grasses).

Fill materials consisting of clayey silt with pieces of brick and glass were identified underneath the surficial topsoil in borehole 346. The fill layer was about 0.7 m thick.

4.2.2 Upper Granular Deposits

Native granular soils consisting of sand and silty sand were encountered in all four boreholes. These soils were overlain by the surficial topsoil or fill materials and underlain by the extensive clayey silt to silty clay deposit. The thickness of the Upper Granular Deposits ranged from 1.1 to 1.6 m. In some instances, classification of this material was based only on visual and textural evidence. The result of grain size distributions determined for a single sample of this material are provided on Figure D-2; however, it is noted that gravel sizes larger than about 40 mm maximum dimension were not recovered by the sampling methods used. Therefore, Figure D-2 is considered representative of the fraction of the deposit smaller than about 25 mm in maximum dimension. The Upper Granular Deposits exhibited N values between 7 and 19 blows per 0.3 m penetration, indicating a loose to compact relative density. Natural water content of the Upper Granular Deposits ranged from about 14 to 25 per cent.

4.2.3 Clayey Silt to Silty Clay Deposit

A thick deposit of clayey silt to silty clay underneath the Upper Granular Deposits and extending down to the bedrock was encountered in the deep boreholes. The shallow boreholes, CPT-347 and CPT-348, were terminated in these deposits. An interbedded layer of silty sand, about 0.9 m thick, was encountered within this material at elevation 161.4 m in borehole 349. The Clayey Silt to Silty Clay Deposit was grey and contained occasional silt partings in the upper 2 to 3 m.

The Clayey Silt to Silty Clay Deposit exhibited N values ranging from 2 blows to 80 blows per 0.3 metre of penetration. Undrained shear strength measured by field vane shear tests in these deposits ranged from about 12 kilopascals (kPa) to over 96 kPa. Generally, the field vane shear strengths indicated a soft to stiff consistency for these deposits. The sensitivity (ratio of undisturbed to remoulded vane shear strength) of the deposits ranged from 1.2 to 3.0.

The natural water content measured on select samples from these deposits ranged between about 8 and 62 per cent but was typically between about 20 and 30 per cent. The higher water contents and generally soft to firm consistency were identified between about elevations 175 m and 170 m in the two deep boreholes. The cone penetration tests, 347 and 348, indicated that this zone of soft to firm consistency generally ranges in elevation from about 175 m to 164 m. Grain size distribution curves for 9 samples of the clayey silt to silty clay deposit are shown on Figure D-3. Atterberg limits testing indicated plastic limits ranging from 13 to 28 per cent, liquid limits ranging from 25 to 59 per cent and plasticity indices from 8 to 36 per cent. The results of the Atterberg limits testing are presented on Figure D-1. The results of the oedometer consolidation tests on 6 specimens of this material are presented in Appendix D following the grain size distribution data.

The presence of cobbles at around elevation 161.4 m within the Clayey Silt to Silty Clay Deposit in borehole 349 was inferred from drilling progress. An inferred boulder was encountered within these deposits at about elevation 159.9 m and cored in borehole 346.

4.2.4 Bedrock

Limestone bedrock of the Hamilton Group (Dundee Formation) or Detroit River Group (Lucas Formation) was encountered in the deep boreholes at about 23 m below the ground surface. The rock was generally light grey and described as fresh and medium strong to strong. Hydrocarbon staining on the rock was observed in both boreholes. It is unknown whether the hydrocarbon odour is from natural sources, though some of the rock formations along the proposed highway are known to contain natural bitumen. Rock quality designation (RQD) values ranged between 29 and 100 per cent and were above 95 per cent below the upper 2.8 m of rock. A description of some of the terms used in the description of the bedrock samples from this site is provided on the Lithological and Geotechnical Rock Description Terminology sheet that precedes the Record of Borehole sheets included with this report.

4.3 Groundwater Conditions

Groundwater measurements using the vibrating wire piezometers are summarized in Table I. A description of the piezometer installations was provided in Section 3.1, above, and details are illustrated on the Record of Borehole sheets.

Groundwater was encountered within the Upper Granular Deposits during drilling in all four boreholes. The encountered ground water level during drilling will not necessarily be representative of actual groundwater conditions due to the low permeability of the cohesive soils, the action of cutting and removal of soils, and the introduction of drilling fluids. Groundwater levels are expected to fluctuate seasonally and are expected to rise during wet periods of the year.

The groundwater in the project area contains dissolved hydrogen sulphide that is liberated from the water on exposure to atmospheric pressure. Hydrogen sulphide gas was noted by its characteristic odour during drilling of boreholes 346 and 349 when artesian water flows were encountered. Concentrations did not exceed health and safety trigger levels of on-site monitoring equipment for the drilling conducted for this report; however, it is known that personnel protective equipment alarms have been triggered during drilling completed for other projects in the vicinity when flowing artesian water has been encountered.

5.0 MISCELLANEOUS

The investigation was carried out using equipment supplied and operated by Lantech Drilling Services Inc. which is an Ontario Ministry of Environment licensed well contractor. The field operations were supervised by Mr. Mr. Chris Collins and Mr. Taner Aktas under the direction of Dr. Storer J. Boone, P.Eng.

The routine laboratory testing was carried out at Golder's London laboratory under the direction of Mr. Chris M. Sewell. The laboratory is an accredited participant in the MTO Soil and Aggregate Proficiency Program and is certified by the Canadian Council of Independent Laboratories for testing Types C and D aggregates.

The oedometer consolidation tests were carried out at Golder's Mississauga laboratory by Ms. Marijana Manojlovic and Mr. Rui Oliveira. In addition to also being a participant in the MTO Soils and Aggregate Proficiency Program, the Mississauga laboratory is an MTO registered laboratory in the Specialty of Soil and Rock Including Testing for Foundation Engineering – Low and High Complexity.

This report was prepared by Mr. Mrinmoy Kanungo, EIT, under the direction of the Project Manager, Dr. Storer J. Boone, P.Eng. and was reviewed by Mr. Fintan J. Heffernan, P.Eng., the Designated MTO Contact and Quality Control Auditor for this assignment.

GOLDER ASSOCIATES LTD.

ORIGINAL SIGNED

Mrinmoy Kanungo, E.I.T.

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Storer J. Boone, Ph.D., P.Eng.
Associate

ORIGINAL SIGNED

Fintan J. Heffernan, P.Eng.
MTO Designated Contact

MK/SJB/FJH/cr

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TABLE I

SUMMARY OF GROUNDWATER LEVELS FROM VIBRATING WIRE PIEZOMETERS IN BH-349

Geotechnical Data Report Addendum No. 7
Windsor-Essex Parkway
Windsor, Ontario

GROUND SURFACE ELEVATION (m)	ENCOUNTERED GROUNDWATER ELEVATION (m)	VWP #	DEPTH OF INSTALLATION (m)	MEASURED GROUNDWATER ELEVATION (m)										
				April 23, 2010			April 24, 2010	April 26, 2010	May 3, 2010	May 10, 2010	May 17, 2010	May 31, 2010	June 2, 2010
				1:21 PM	1:36 PM	3:07 PM							
179.08	177.7	1	5.72	179.74	179.71	179.58	178.29	178.34	178.41	178.63	178.58	178.30	178.27
		2	10.59	179.95	179.96	181.31	178.95	178.91	178.89	179.09	178.98	178.75	178.72
		3	15.16	180.17	180.17	182.42	179.11	179.04	179.02	179.21	179.13	N/A	178.89
		4	23.01	180.47	180.46	183.89	180.09	180.04	179.96	180.03	179.92	179.77	179.75

NOTES:
1. Table to be read in conjunction with accompanying report.
2. The vibrating wire piezometers were installed on April 23, 2010.
3. Artesian water flow encountered at soil-bedrock interface (at about 23 m depth)

Prepared By: MK
Checked By: SJB

IMPORTANT INFORMATION AND LIMITATIONS OF THIS REPORT

Standard of Care: Golder Associates Ltd. (Golder) has prepared this report in a manner consistent with that level of care and skill ordinarily exercised by members of the engineering and science professions currently practising under similar conditions in the jurisdiction in which the services are provided, subject to the time limits and physical constraints applicable to this report. No other warranty, expressed or implied is made.

Basis and Use of the Report: This report has been prepared for the specific site, design objective, development and purpose described to Golder by the Client. The factual data, interpretations and recommendations pertain to a specific project as described in this report and are not applicable to any other project or site location. Any change of site conditions, purpose, development plans or if the project is not initiated within eighteen months of the date of the report may alter the validity of the report. Golder can not be responsible for use of this report, or portions thereof, unless Golder is requested to review and, if necessary, revise the report.

The information, recommendations and opinions expressed in this report are for the sole benefit of the Client. No other party may use or rely on this report or any portion thereof without Golder's express written consent. If the report was prepared to be included for a specific permit application process, then upon the reasonable request of the client, Golder may authorize in writing the use of this report by the regulatory agency as an Approved User for the specific and identified purpose of the applicable permit review process. Any other use of this report by others is prohibited and is without responsibility to Golder. The report, all plans, data, drawings and other documents as well as all electronic media prepared by Golder are considered its professional work product and shall remain the copyright property of Golder, who authorizes only the Client and Approved Users to make copies of the report, but only in such quantities as are reasonably necessary for the use of the report by those parties. The Client and Approved Users may not give, lend, sell, or otherwise make available the report or any portion thereof to any other party without the express written permission of Golder. The Client acknowledges that electronic media is susceptible to unauthorized modification, deterioration and incompatibility and therefore the Client can not rely upon the electronic media versions of Golder's report or other work products.

The report is of a summary nature and is not intended to stand alone without reference to the instructions given to Golder by the Client, communications between Golder and the Client, and to any other reports prepared by Golder for the Client relative to the specific site described in the report. In order to properly understand the suggestions, recommendations and opinions expressed in this report, reference must be made to the whole of the report. Golder can not be responsible for use of portions of the report without reference to the entire report.

Unless otherwise stated, the suggestions, recommendations and opinions given in this report are intended only for the guidance of the Client in the design of the specific project. The extent and detail of investigations, including the number of test holes, necessary to determine all of the relevant conditions which may affect construction costs would normally be greater than has been carried out for design purposes. Contractors bidding on, or undertaking the work, should rely on their own investigations, as well as their own interpretations of the factual data presented in the report, as to how subsurface conditions may affect their work, including but not limited to proposed construction techniques, schedule, safety and equipment capabilities.

Soil, Rock and Groundwater Conditions: Classification and identification of soils, rocks, and geologic units have been based on commonly accepted methods employed in the practice of geotechnical engineering and related disciplines. Classification and identification of the type and condition of these materials or units involves judgment, and boundaries between different soil, rock or geologic types or units may be transitional rather than abrupt. Accordingly, Golder does not warrant or guarantee the exactness of the descriptions.

Special risks occur whenever engineering or related disciplines are applied to identify subsurface conditions and even a comprehensive investigation, sampling and testing program may fail to detect all or certain subsurface conditions. The environmental, geologic, geotechnical, geochemical and hydrogeologic conditions that Golder interprets to exist between and beyond sampling points may differ from those that actually exist. In addition to soil variability, fill of variable physical and chemical composition can be present over portions of the site or on adjacent properties. **The professional services retained for this project include only the geotechnical aspects of the subsurface conditions at the site, unless otherwise specifically stated and identified in the report.** The presence or implication(s) of possible surface and/or subsurface contamination resulting from previous activities or uses of the site and/or resulting from the introduction onto the site of materials from off-site sources are outside the terms of reference for this project and have not been investigated or addressed.

Soil and groundwater conditions shown in the factual data and described in the report are the observed conditions at the time of their determination or measurement. Unless otherwise noted, those conditions form the basis of the recommendations in the report. Groundwater conditions may vary between and beyond reported locations and can be affected by annual, seasonal and meteorological conditions. The condition of the soil, rock and groundwater may be significantly altered by construction activities (traffic, excavation, groundwater level lowering, pile driving, blasting, etc.) on the site or on adjacent sites. Excavation may expose the soils to changes due to wetting, drying or frost. Unless otherwise indicated the soil must be protected from these changes during construction.

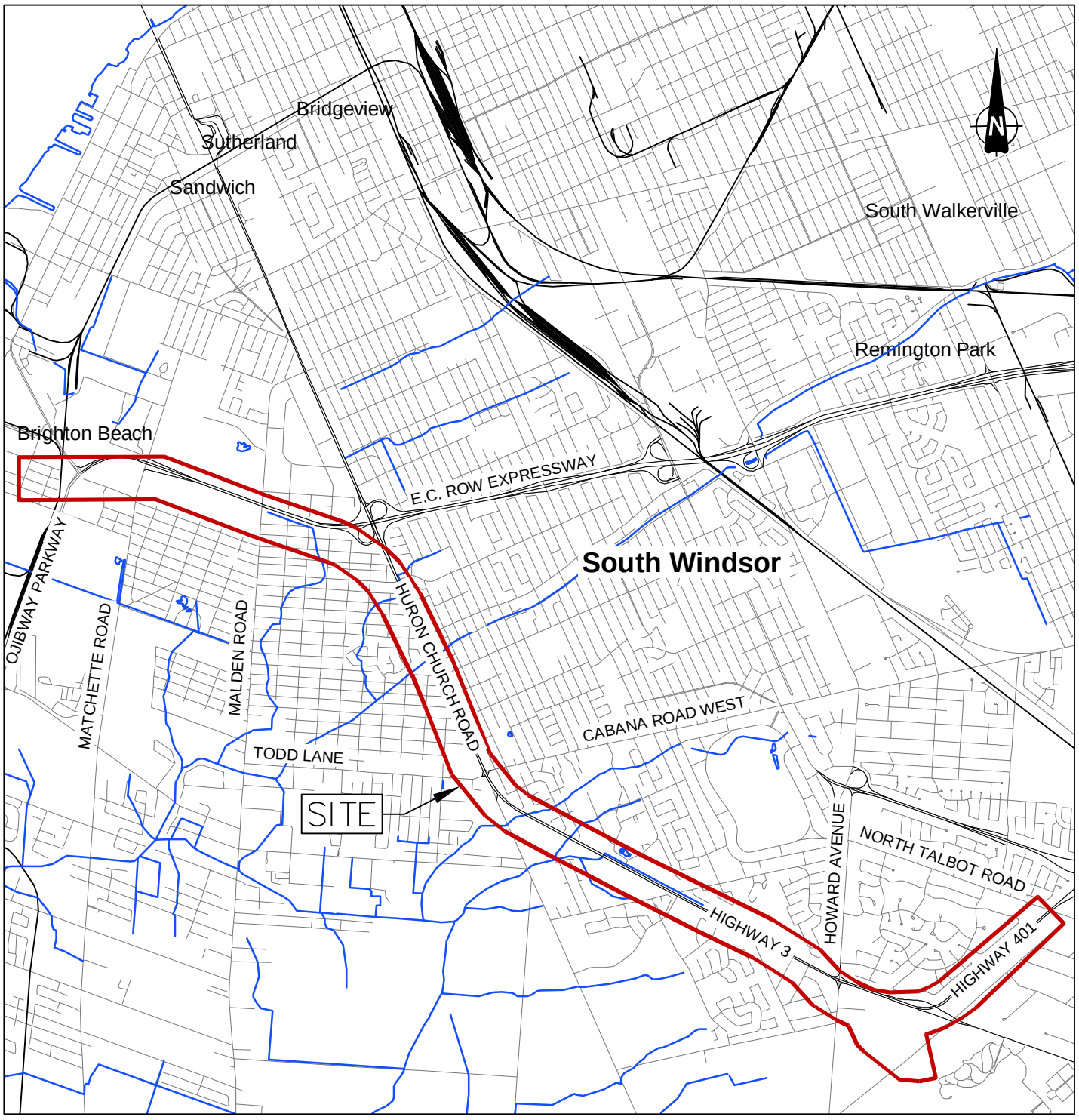
Sample Disposal: Golder will dispose of all uncontaminated soil and/or rock samples 90 days following issue of this report or, upon written request of the Client, will store uncontaminated samples and materials at the Client's expense. In the event that actual contaminated soils, fills or groundwater are encountered or are inferred to be present, all contaminated samples shall remain the property and responsibility of the Client for proper disposal.

Follow-Up and Construction Services: All details of the design were not known at the time of submission of Golder's report. Golder should be retained to review the final design, project plans and documents prior to construction, to confirm that they are consistent with the intent of Golder's report.

During construction, Golder should be retained to perform sufficient and timely observations of encountered conditions to confirm and document that the subsurface conditions do not materially differ from those interpreted conditions considered in the preparation of Golder's report and to confirm and document that construction activities do not adversely affect the suggestions, recommendations and opinions contained in Golder's report. Adequate field review, observation and testing during construction are necessary for Golder to be able to provide letters of assurance, in accordance with the requirements of many regulatory authorities. In cases where this recommendation is not followed, Golder's responsibility is limited to interpreting accurately the information encountered at the borehole locations, at the time of their initial determination or measurement during the preparation of the Report.

Changed Conditions and Drainage: Where conditions encountered at the site differ significantly from those anticipated in this report, either due to natural variability of subsurface conditions or construction activities, it is a condition of this report that Golder be notified of any changes and be provided with an opportunity to review or revise the recommendations within this report. Recognition of changed soil and rock conditions requires experience and it is recommended that Golder be employed to visit the site with sufficient frequency to detect if conditions have changed significantly.

Drainage of subsurface water is commonly required either for temporary or permanent installations for the project. Improper design or construction of drainage or dewatering can have serious consequences. Golder takes no responsibility for the effects of drainage unless specifically involved in the detailed design and construction monitoring of the system.



1 0 1 2

SCALE KM

REFERENCES

DRAWING BASED ON CANMAP STREETFILES V2005.4.

NOTES

THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ACCOMPANYING TEXT.

PROJECT

GEOTECHNICAL DATA REPORT - ADDENDUM NO. 7
WINDSOR ESSEX PARKWAY
WINDSOR, ONTARIO

TITLE

KEY PLAN

Golder Associates
LONDON, ONTARIO

PROJECT No.	09-1132-0080		FILE No.	0911320080-7000-F02001
			SCALE	AS SHOWN REV. 0
CADD	WDF/DCH	June 8/10		
CHECK				

FIGURE 1

Drawing file: 0911320080-7000-F02001.dwg Jun 09, 2010 - 1:54pm

METRIC

DIMENSIONS ARE IN METRES AND/OR MILLIMETRES UNLESS OTHERWISE SHOWN. STATIONS IN KILOMETRES + METRES.

CONT No. –
WP No. –

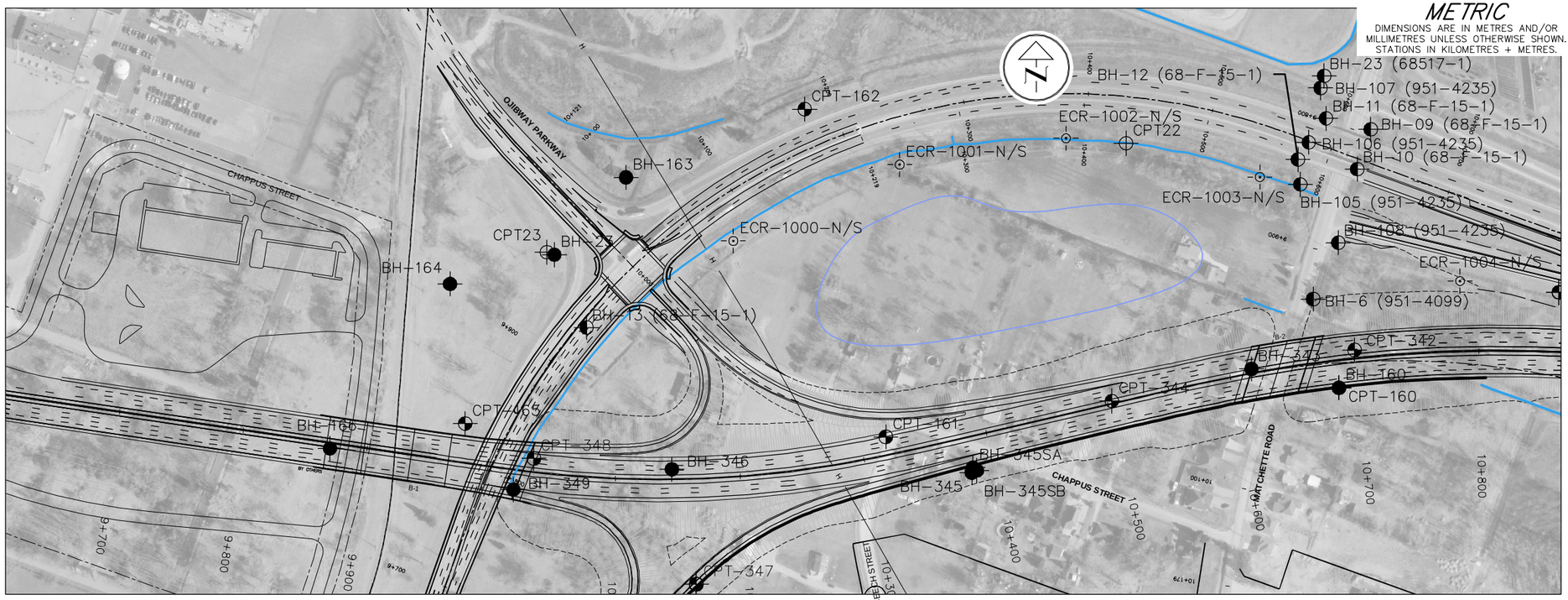
WINDSOR – ESSSEX PARKWAY

Windsor, Ontario

BOREHOLE LOCATION MAP

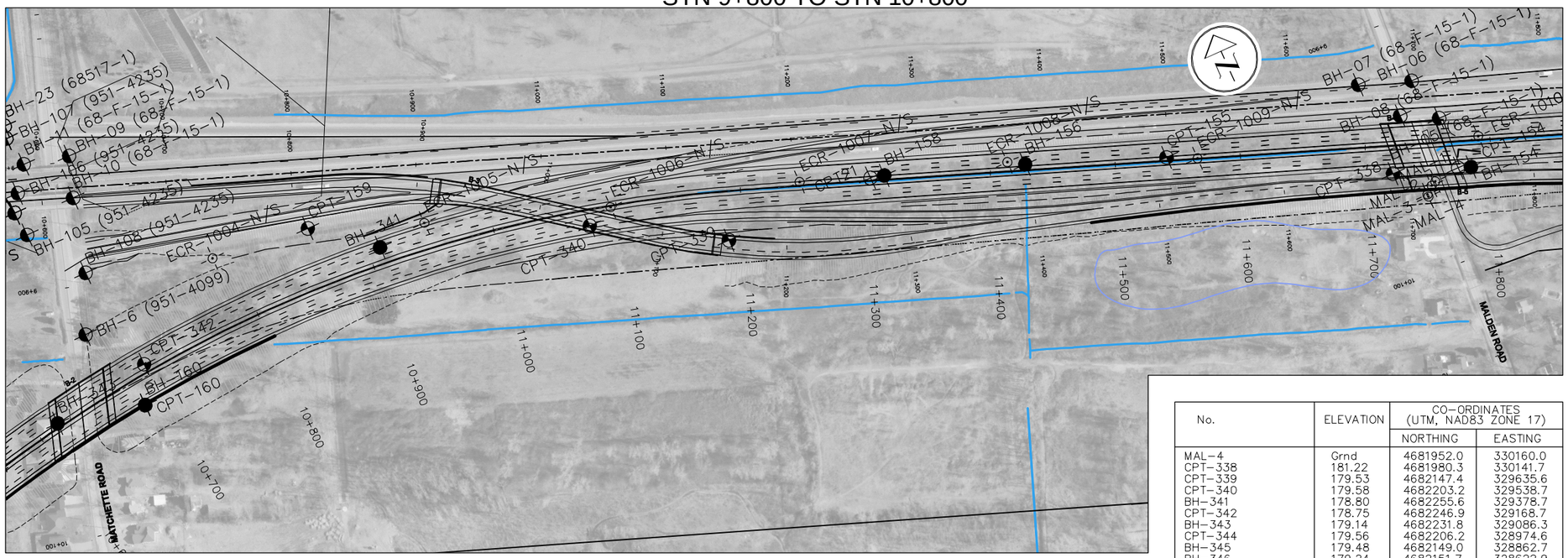
SHEET 1

Golder Associates Ltd.
LONDON, ONTARIO, CANADA



0 80 160

STN 9+800 TO STN 10+800



0 80 160

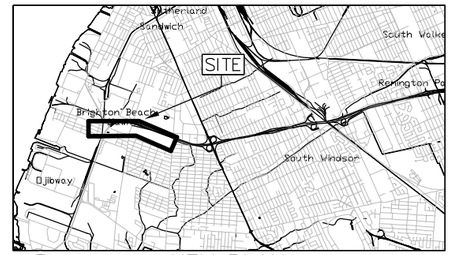
STN 10+800 TO STN 11+800

NOTE

Horizontal and vertical alignment of road ways and general structure alignments shown are based on drawings provided by URS during conceptual design. Final alignments and structure arrangements may differ,

REFERENCE

Base plans provided in digital format by URS.



KEY PLAN

LEGEND

- Borehole – Current Investigation
- Borehole – Previous Investigations
- Borehole – Pavement Holes
- Borehole and Cone Penetration Test
- Cone Penetration Test

No.	ELEVATION	CO-ORDINATES (UTM, NAD83 ZONE 17) NORTHING	EASTING
BH23	178.92	4682323.0	328529.0
BH-154	180.87	4681959.9	330200.6
BH-156	179.52	4682106.6	329876.3
BH-158	179.30	4682144.3	329769.9
BH-160	178.51	4682216.8	329156.2
BH-163	178.77	4682384.7	328586.3
BH-164	179.06	4682299.7	328445.6
BH-166	179.00	4682168.3	328349.6
BH-23 (68517-1)	178.92	4682465.8	329144.3
BH-6 (951-4099)	178.79	4682287.6	329135.6
BH-105 (951-4235)	179.05	4682379.2	329125.0
BH-106 (951-4235)	184.35	4682412.8	329132.0
BH-107 (951-4235)	178.97	4682456.2	329141.5
BH-108 (951-4235)	178.50	4682332.6	329155.7
BH-05 (68-F-15-1)	180.69	4682005.8	330193.3
BH-06 (68-F-15-1)	180.75	4682042.1	330185.3
BH-07 (68-F-15-1)	180.53	4682056.5	330145.1
BH-08 (68-F-15-1)	180.93	4682020.2	330165.6
BH-09 (68-F-15-1)	178.46	4682423.2	329181.5
BH-10 (68-F-15-1)	178.55	4682391.3	329170.8
BH-11 (68-F-15-1)	178.46	4682431.9	329145.8
BH-12 (68-F-15-1)	178.37	4682399.1	329123.4
BH-13 (68-F-15-1)	178.43	4682264.9	328554.7
CPT-20	179.76	4681775.0	329868.0
CPT-21	179.89	4682147.0	329759.0
CPT-22	178.89	4682412.0	328986.0
CPT-23	178.93	4682325.0	328523.0
CPT-154	180.75	4681963.3	330191.0
CPT-155	179.69	4682065.8	329981.7
CPT-159	178.77	4682292.8	329332.1
CPT-160	178.51	4682216.8	329156.2
CPT-161	179.06	4682177.6	328793.9
CPT-162	178.99	4682439.2	328729.1
CPT-165	178.98	4682188.2	328457.7
ECR-1000-N/S	Grnd	4682334.0	328672.0
ECR-1001-N/S	Grnd	4682395.0	328805.0
ECR-1002-N/S	Grnd	4682416.0	328938.0
ECR-1003-N/S	Grnd	4682385.0	329093.0
ECR-1004-N/S	Grnd	4682302.0	329253.0
ECR-1005-N/S	Grnd	4682259.0	329419.0
ECR-1006-N/S	Grnd	4682210.0	329560.0
ECR-1007-N/S	Grnd	4682167.0	329706.0
ECR-1008-N/S	Grnd	4682114.0	329864.0
ECR-1009-N/S	Grnd	4682055.0	330004.0
ECR-1010-N/S	Grnd	4681980.0	330216.0
MAL-1	Grnd	4681961.0	330170.0
MAL-2	Grnd	4681959.0	330166.0
MAL-3	Grnd	4681954.0	330160.0

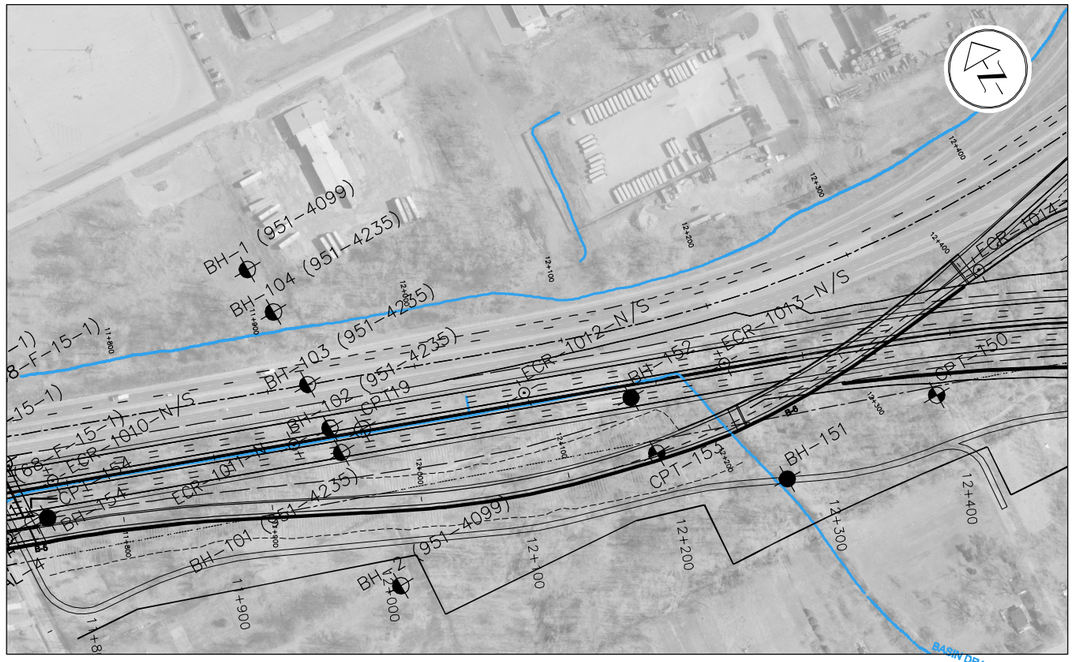
No.	ELEVATION	CO-ORDINATES (UTM, NAD83 ZONE 17) NORTHING	EASTING
MAL-4	Grnd	4681952.0	330160.0
CPT-338	181.22	4681980.3	330141.7
CPT-339	179.53	4682147.4	329635.6
CPT-340	179.58	4682203.2	329538.7
BH-341	178.80	4682255.6	329378.7
CPT-342	178.75	4682246.9	329168.7
BH-343	179.14	4682231.8	329086.3
CPT-344	179.56	4682206.2	328974.6
BH-345	179.48	4682149.0	328862.7
BH-346	179.24	4682151.7	328622.9
CPT-347	178.58	4682059.9	328642.6
CPT-348	179.15	4682160.4	328512.5
BH-349	179.08	4682135.5	328496.2

Geocres No. 40J6-27

HWY. 401		PROJECT NO. 09-1132-0080		DIST. WEST
SUBM'D. SJB	CHKD.	DATE: June 8/10		SITE:
DRAWN: WDF/DCH	CHKD.	APPD.		DWG. 1

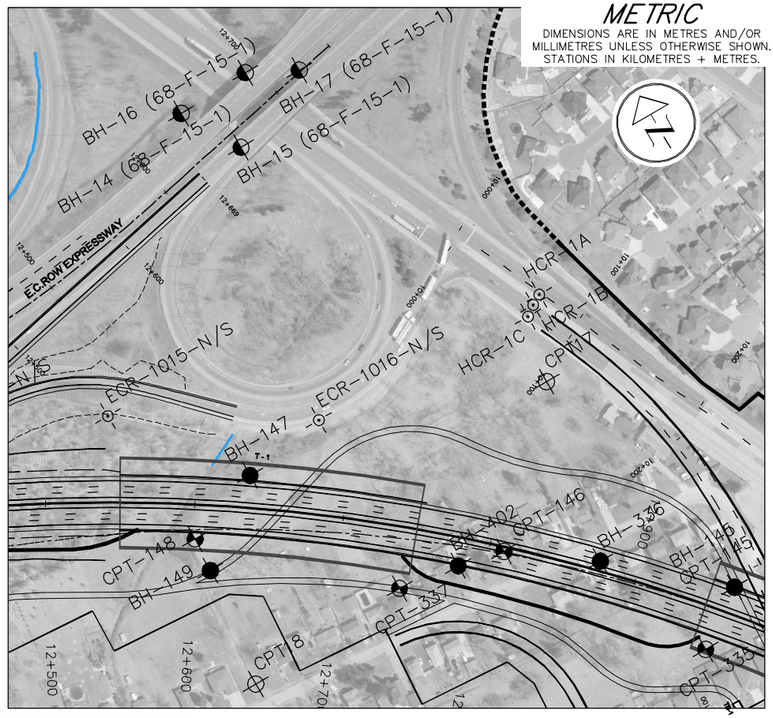
PLOT DATE: June 09, 2010
FILENAME: N:\active\2009\1132 - Geotechnical\1132-0000\09-1132-0080 URS - W-E PARKWAY OWNERS ENG - WINDSOR\Drafting\AutoCAD files\09113200B0-7000-D0

MINISTRY OF TRANSPORTATION, ONTARIO



0 80 160

STN 11+800 TO STN 12+450



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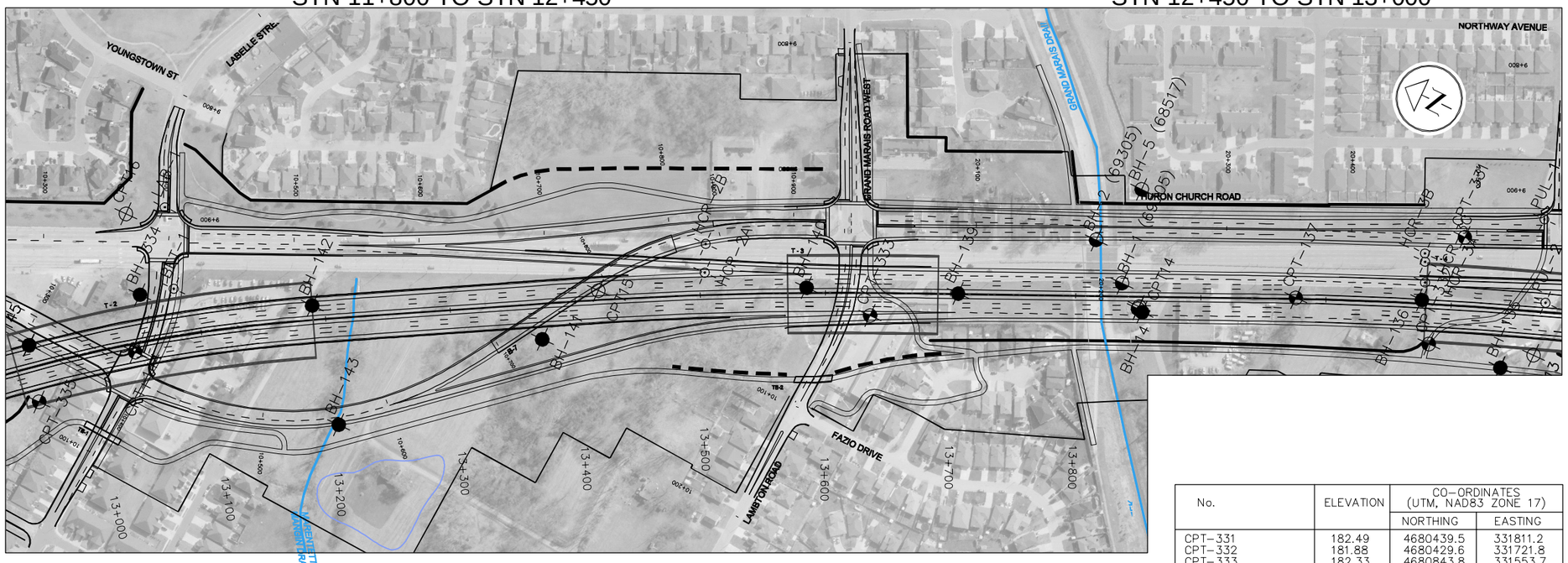
STN 12+450 TO STN 13+000

NOTE

Horizontal and vertical alignment of road ways and general structure alignments shown are based on drawings provided by URS during conceptual design. Final alignments and structure arrangements may differ.



0 80 160

STN 13+000 TO STN 14+200

REFERENCE

Base plans provided in digital format by URS.

No.	ELEVATION	CO-ORDINATES (UTM, NAD83 ZONE 17)	
		NORTHING	EASTING
CPT-331	182.49	4680439.5	331811.2
CPT-332	181.88	4680429.6	331721.8
CPT-333	182.33	4680843.8	331553.7
BH-334	181.81	4681379.6	331322.2
CPT-335	182.27	4681416.4	331210.7
BH-336	182.40	4681502.9	331179.1
CPT-337	181.49	4681554.3	331053.5
BH-402	181.54	4681547.8	331095.1

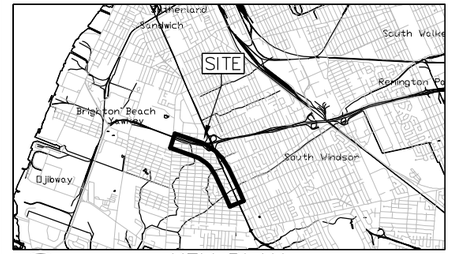
CONT No. –
WP No. –

WINDSOR – ESSSEX PARKWAY
Windsor, Ontario

BOREHOLE LOCATION MAP

SHEET 2

Golder Associates Ltd.
LONDON, ONTARIO, CANADA



KEY PLAN

SCALE 1.5 0 1.5 3 KM

LEGEND

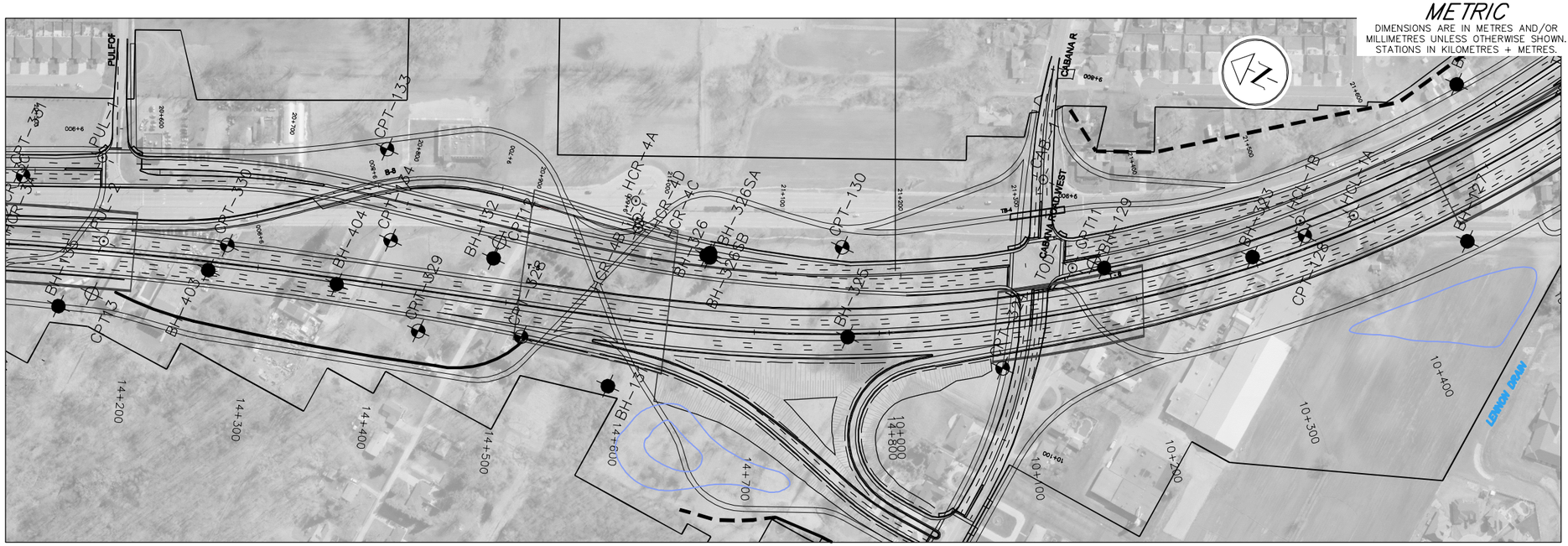
- Borehole – Current Investigation
- Borehole – Previous Investigations
- Borehole – Pavement Holes
- Borehole and Cone Penetration Test
- Cone Penetration Test

No.	ELEVATION	CO-ORDINATES (UTM, NAD83 ZONE 17)	
		NORTHING	EASTING
BH14	182.06	4680648.0	331648.0
BH-39	182.30	4680787.5	331599.3
BH-140	182.00	4680899.3	331552.4
BH-141	181.72	4681073.1	331425.8
BH-142	181.11	4681251.2	331372.6
BH-143	181.26	4681191.8	331295.2
BH-145	182.21	4681442.8	331248.2
BH-147	180.83	4681670.0	331004.6
BH-149	180.98	4681628.0	330949.6
BH-151	180.35	4681734.8	330642.9
BH-152	180.16	4681834.3	330579.3
BH-14 (68-F-15-1)	182.45	4681903.1	331085.9
BH-15 (68-F-15-1)	182.67	4681863.3	331109.2
BH-16 (68-F-15-1)	182.88	4681905.2	331136.8
BH-17 (68-F-15-1)	183.18	4681888.6	331168.9
BH-5 (68517)	181.51	4680689.7	331736.7
BH-1 (69305)	181.87	4680677.3	331662.2
BH-2 (69305)	181.87	4680705.6	331684.8
BH-1 (951-4099)	182.61	4682037.3	330399.7
BH-2 (951-4099)	181.20	4681802.3	330382.8
BH-101 (951-4235)	178.48	4681899.5	330393.0
BH-102 (951-4235)	181.46	4681917.5	330394.5
BH-103 (951-4235)	183.10	4681950.3	330396.0
BH-104 (951-4235)	182.43	4682003.9	330400.6
CPT-14	182.06	4680652.0	331651.0
CPT-15	182.13	4681049.0	331480.0
CPT-16	181.93	4681417.0	331376.0
CPT-17	182.05	4681625.0	331208.0
CPT-18	180.65	4681547.0	330938.0
CPT-19	181.23	4681906.0	330413.0
CPT-137	181.38	4680541.5	331710.2
CPT-144	181.34	4681363.6	331279.2
CPT-145	182.21	4681442.8	331248.2
CPT-146	181.85	4681540.8	331126.5
CPT-148	180.72	4681651.5	330951.4
CPT-150	180.85	4681733.4	330757.6
CPT-153	180.99	4681793.3	330575.8
ECR-1011-N	Grnd	4681920.0	330368.0
ECR-1012-N/S	Grnd	4681873.0	330519.0
ECR-1013-N/S	Grnd	4681823.0	330645.0
ECR-1014-N/S	Grnd	4681792.0	330824.0
ECR-1015-N/S	Grnd	4681752.0	330942.0
ECR-1016-N/S	Grnd	4681679.0	331063.0
HCR-1A	Grnd	4681678.0	331233.0
HCR-1B	Grnd	4681674.0	331226.0
HCR-1C	Grnd	4681669.0	331219.0
HCR-2A	Grnd	4680978.0	331529.0
HCR-2B	Grnd	4680987.0	331550.0
LAB-1	Grnd	4681391.0	331394.0
BET-1	Grnd	4681357.0	331338.0

Geocres No. 40J6-27

HWY. 401		PROJECT NO. 09-1132-0080	DIST. WEST
SUBM'D. SJB	CHKD.	DATE: May 13/10	SITE:
DRAWN: WDF	CHKD.	APPD.	DWG. 2

PLOT DATE: June 09, 2010
FILENAME: N:\active\2009\1132 - Geotechnical\1132-0000\09-1132-0080 URS - W-E PARKWAY OWNERS ENG - WINDSOR\Drafting\AutoCAD files\09113200801-7000-002001.dwg



NOTE

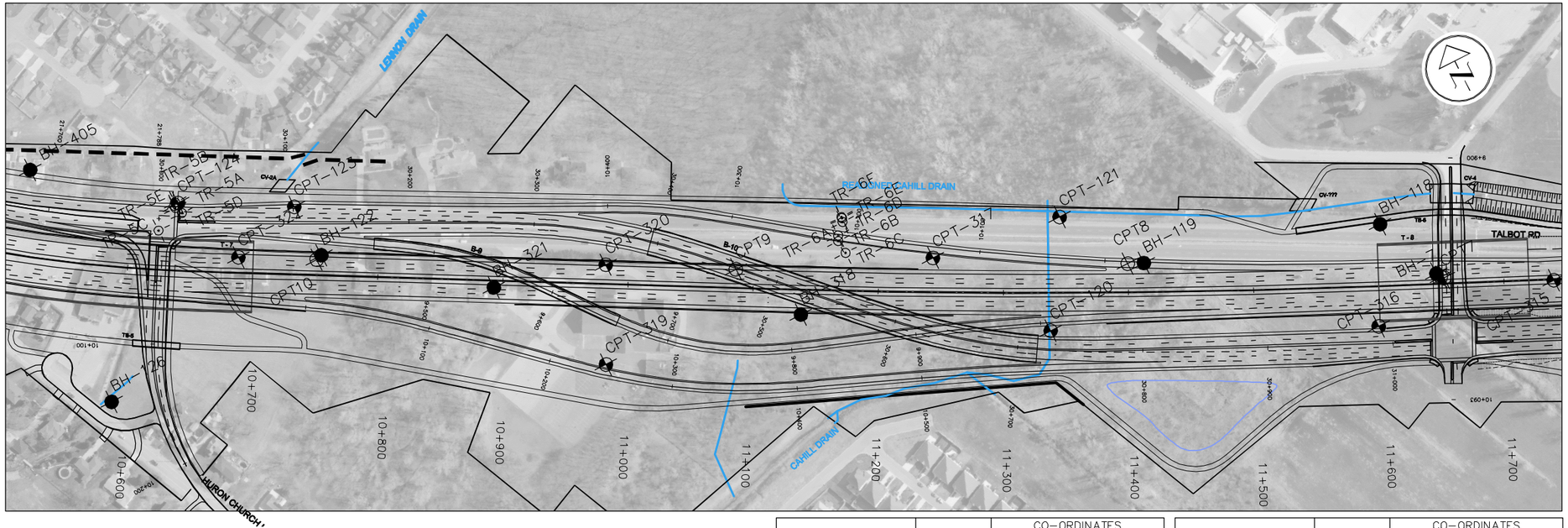
Horizontal and vertical alignment of road ways and general structure alignments shown are based on drawings provided by URS during conceptual design. Final alignments and structure arrangements may differ.

0 80 160

STN 14+200 TO STN 14+800 and STN 10+000 TO STN 10+500

REFERENCE

Base plans provided in digital format by URS.



0 80 160

STN 10+500 TO STN 11+750

No.	ELEVATION	CO-ORDINATES (UTM, NAD83 ZONE 17) NORTHING	EASTING
CPT-315	184.31	4678800.6	333406.3
CPT-316	182.99	4678831.3	333265.0
CPT-317	182.64	4679041.7	332972.4
BH-318	182.29	4679049.3	332857.8
CPT-319	183.71	4679084.5	332701.0
CPT-320	183.50	4679155.5	332737.0
BH-321	183.14	4679179.9	332649.0
CPT-322	181.50	4679294.0	332478.2
BH-323	181.30	4679521.4	332167.6
CPT-324	180.85	4679664.9	332002.7

No.	ELEVATION	CO-ORDINATES (UTM, NAD83 ZONE 17) NORTHING	EASTING
BH-325	180.80	4679787.7	331972.9
BH-326	181.78	4679917.6	331984.5
BH-326SA	181.58	4679915.6	331987.4
BH-326SB	181.70	4679914.3	331984.0
CPT-328	181.64	4680024.3	331862.9
CPT-329	181.98	4680100.8	331832.3
CPT-330	182.05	4680268.1	331829.9
BH-403	182.58	4680273.4	331805.4
BH-404	181.69	4680175.7	331838.6
BH-405	181.82	4679431.8	332361.6

CONT No. –
WP No. –

WINDSOR – ESSSEX PARKWAY

Windsor, Ontario

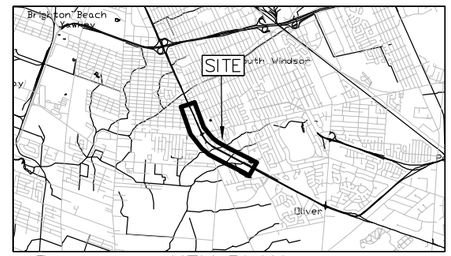
BOREHOLE LOCATION MAP

SHEET 3

Golder Associates Ltd.
LONDON, ONTARIO, CANADA

METRIC

DIMENSIONS ARE IN METRES AND/OR MILLIMETRES UNLESS OTHERWISE SHOWN. STATIONS IN KILOMETRES + METRES.



KEY PLAN

LEGEND

- Borehole – Current Investigation
- Borehole – Previous Investigations
- Borehole – Pavement Holes
- Borehole and Cone Penetration Test
- Cone Penetration Test

No.	ELEVATION	CO-ORDINATES (UTM, NAD83 ZONE 17) NORTHING	EASTING
BH7	183.17	4678848.0	333325.0
BH-118	182.66	4678903.5	333302.9
BH-119	182.50	4678961.6	333120.6
BH-122	181.66	4679265.4	332537.9
BH-126	180.61	4679237.2	332335.5
BH-127	181.27	4679370.9	332251.6
BH-129	180.78	4679625.1	332109.7
BH-131	180.80	4679944.8	331856.4
BH-132	181.47	4680070.8	331910.3
BH-135	182.02	4680369.9	331728.7
BH-136	181.75	4680449.5	331751.3
CPT-7	183.18	4678844.0	333327.0
CPT-8	182.48	4678967.0	333109.0
CPT-9	182.32	4679105.0	332828.0
CPT-10	181.81	4679264.0	332533.0
CPT-11	180.91	4679634.0	332110.0
CPT-12	181.61	4680072.0	331924.0
CPT-120	184.49	4678947.2	333029.8
CPT-121	181.97	4679024.8	333077.4
CPT-123	181.60	4679309.7	332536.3
CPT-124	181.51	4679354.6	332455.0
CPT-128	180.87	4679490.6	332200.8
CPT-13	182.08	4680350.0	331749.0
CPT-130	180.82	4679821.8	332036.1
CPT-133	181.64	4680184.7	331953.4
CPT-134	181.36	4680151.4	331888.7
CAB-1	Grnd	4679699.0	332153.0
HCL-1A	Grnd	4679462.0	332232.0
HCL-1B	Grnd	4679499.0	332210.0
HCR-3A	Grnd	4680453.0	331765.0
HCR-3B	Grnd	4680463.0	331786.0
HCR-3C	Grnd	4680460.0	331780.0
HCR-4A	Grnd	4679987.0	332000.0
HCR-4B	Grnd	4679976.0	331981.0
HCR-4C	Grnd	4679977.0	331985.0
HCR-4D	Grnd	4679980.0	331988.0
PUL-1	Grnd	4680388.0	331851.0
PUL-2	Grnd	4680359.0	331791.0
TOD-1	Grnd	4679648.0	332099.0
TR-5A	Grnd	4679352.0	332451.0
TR-5B	Grnd	4679356.0	332453.0
TR-5C	Grnd	4679342.0	332431.0
TR-5D	Grnd	4679346.0	332454.0
TR-5E	Grnd	4679354.0	332451.0
TR-6A	Grnd	4679092.0	332913.0
TR-6B	Grnd	4679088.0	332911.0
TR-6C	Grnd	4679077.0	332912.0
TR-6D	Grnd	4679100.0	332921.0
TR-6E	Grnd	4679103.0	332922.0
TR-6F	Grnd	4679104.0	332922.0

Geocres No. 40J6-27

HWY. 401	PROJECT NO. 09-1132-0080		DIST. WEST
SUBM'D. SJB	CHKD.	DATE: May 13/10	SITE:
DRAWN: WDF	CHKD.	APPD.	DWG. 3

PLOT DATE: June 09, 2010
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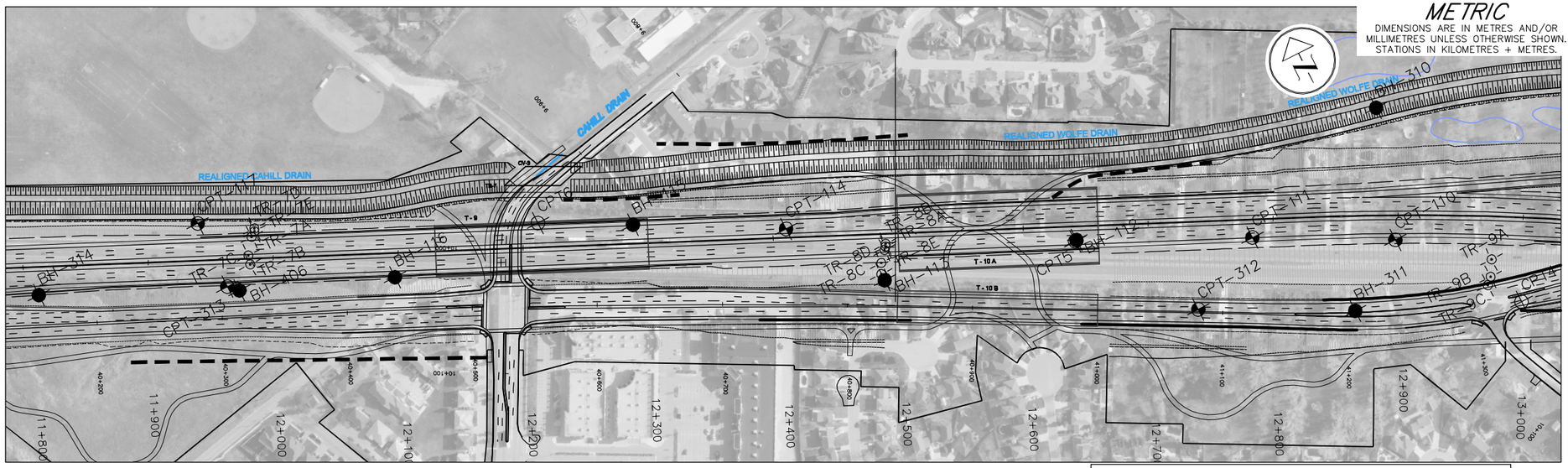
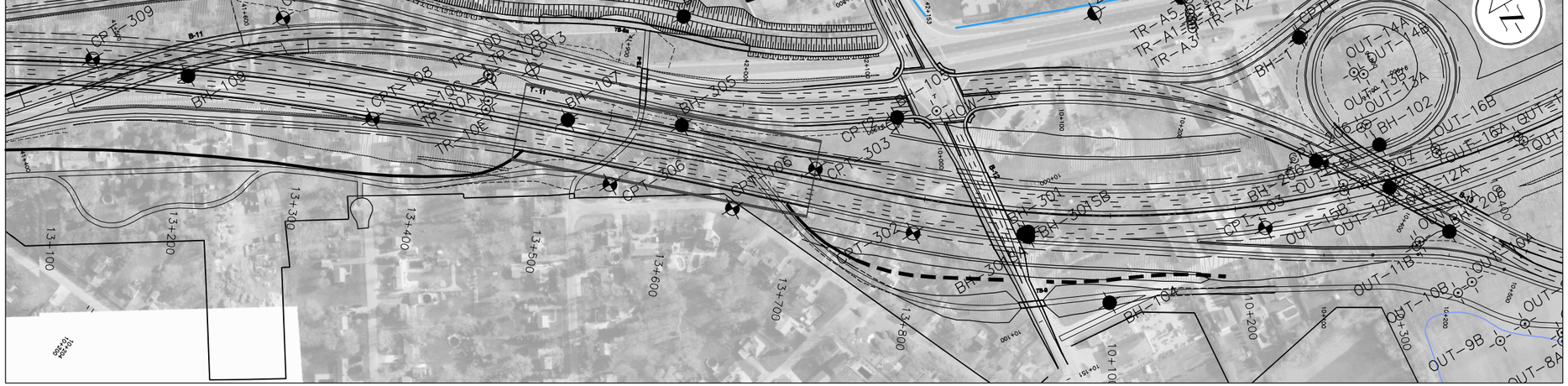
MINISTRY OF TRANSPORTATION, ONTARIO



0 80 160

STN 11+750 TO STN 13+050



0 80 160

STN 13+050 TO STN 13+848 and STN 10+000 TO STN 10+450

LEGEND

- Borehole – Current Investigation
- Borehole – Previous Investigations
- Borehole – Pavement Holes
- Borehole and Cone Penetration Test
- Cone Penetration Test

REFERENCE

Base plans provided in digital format by URS.

NOTE

Horizontal and vertical alignment of road ways and general structure alignments shown are based on drawings provided by URS during conceptual design. Final alignments and structure arrangements may differ.

No.	ELEVATION	CO-ORDINATES (UTM, NAD83 ZONE 17)	
		NORTHING	EASTING
BH-301	186.25	4677712.2	335231.1
BH-301SA	186.30	4677708.5	335233.0
BH-301SB	186.45	4677711.9	335235.1
CPT-302	186.26	4677756.9	335154.9
CPT-303	186.02	4677840.3	335113.1
BH-304	188.00	4677998.2	335082.8
BH-305	185.86	4677923.8	335038.1
CPT-306	186.02	4677911.6	334964.7
CPT-307	186.43	4678157.2	334805.1
BH-308	185.41	4678306.4	334724.2
CPT-309	185.31	4678204.8	334657.1
BH-310	185.05	4678398.7	334482.8
BH-311	184.85	4678261.8	334394.2
CPT-312	185.22	4678319.9	334283.0
CPT-313	184.04	4678688.4	333599.7
BH-314	183.07	4678750.8	333462.3
BH-406	184.17	4678681.4	333607.0

No.	ELEVATION	CO-ORDINATES (UTM, NAD83 ZONE 17)	
		NORTHING	EASTING
TR-7A	Grnd	4678715.0	333635.0
TR-7B	Grnd	4678696.0	333624.0
TR-7C	Grnd	4678703.0	333626.0
TR-7D	Grnd	4678720.0	333640.0
TR-7E	Grnd	4678718.0	333639.0
TR-8A	Grnd	4678478.0	334083.0
TR-8B	Grnd	4678480.0	334084.0
TR-8C	Grnd	4678468.0	334074.0
TR-8D	Grnd	4678476.0	334081.0
TR-8E	Grnd	4678460.0	334070.0
TR-9A	Grnd	4678249.0	334510.0
TR-9B	Grnd	4678237.0	334503.0
TR-9C	Grnd	4678232.0	334498.0
TR-A1	Grnd	4677790.0	335431.0
TR-A2	Grnd	4677793.0	335432.0
TR-A3	Grnd	4677787.0	335430.0
TR-A4	Grnd	4677801.0	335436.0
TR-A5	Grnd	4677798.0	335434.0
TR-A6	Grnd	4677809.0	335439.0
TR-A7	Grnd	4677794.0	335434.0

METRIC

DIMENSIONS ARE IN METRES AND/OR MILLIMETRES UNLESS OTHERWISE SHOWN. STATIONS IN KILOMETRES + METRES.

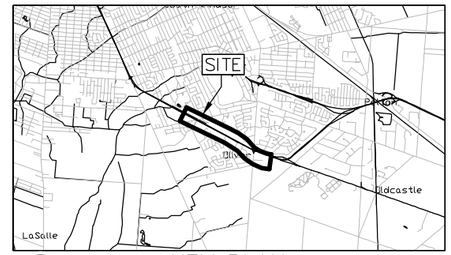
CONT No. –
WP No. –

WINDSOR – ESSSEX PARKWAY
Windsor, Ontario

BOREHOLE LOCATION MAP

SHEET 4

Golder Associates Ltd.
LONDON, ONTARIO, CANADA



KEY PLAN

SCALE 1.5 0 1.5 3 KM

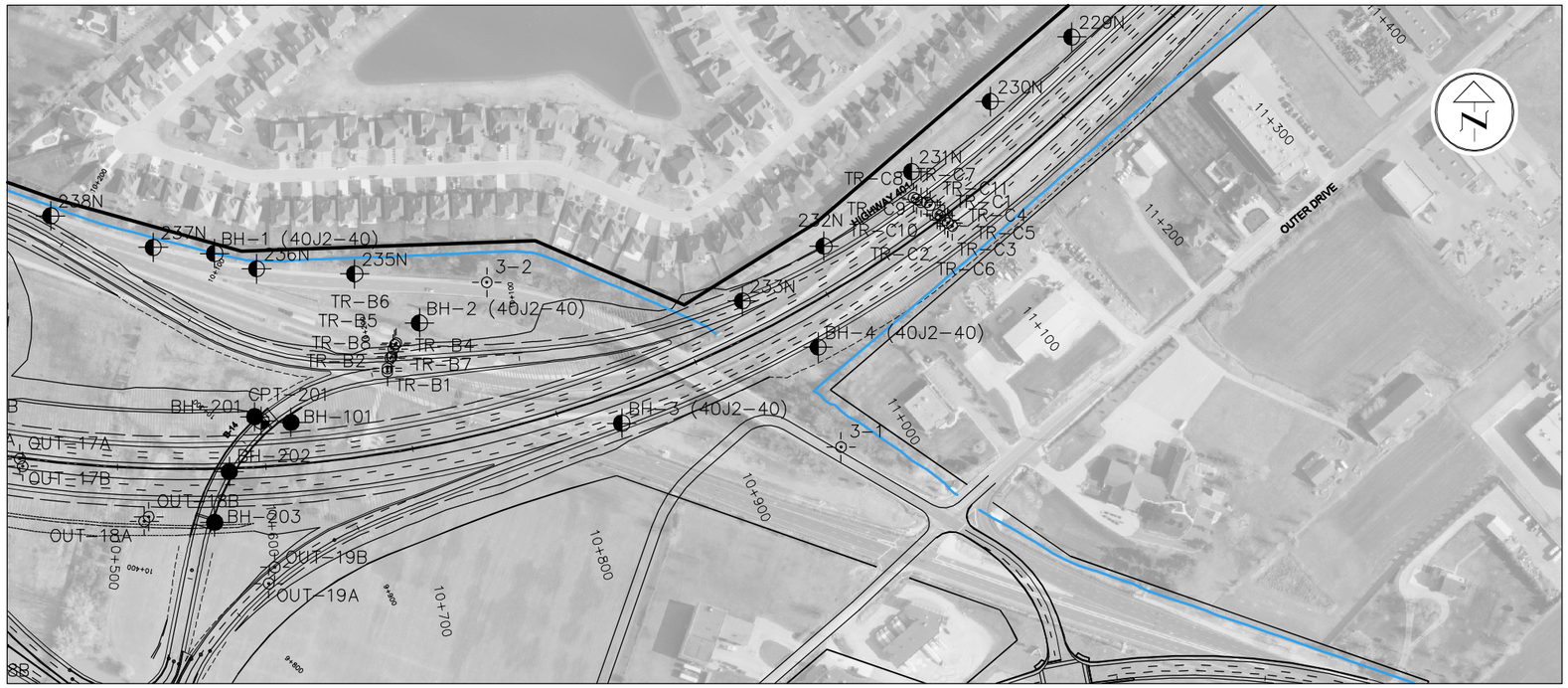
No.	ELEVATION	CO-ORDINATES (UTM, NAD83 ZONE 17)	
		NORTHING	EASTING
237N	187.77	4677724.5	335702.0
238N	187.82	4677745.8	335632.9
239N	187.56	4677771.9	335553.8
240N	187.42	4677789.2	335503.3
241N	187.24	4677812.8	335434.4
242N	187.05	4677836.5	335368.3
BH-1	186.70	4677738.0	335500.0
BH-102	186.60	4677631.8	335512.7
BH-104	186.15	4677630.3	335263.1
BH-105	186.16	4677843.2	335190.1
BH-107	185.85	4677973.1	334961.3
BH-109	185.30	4678155.0	334716.3
BH-112	184.58	4678413.3	334221.3
BH-113	184.41	4678454.5	334070.3
BH-115	183.79	4678585.3	333911.1
BH-116	183.64	4678634.3	333722.5
BH-206	186.48	4677645.8	335462.4
BH-207	186.89	4677598.1	335502.7
BH-208	186.88	4677543.9	335526.5
CPT1	186.69	4677739.0	335502.0
CPT2	186.35	4677841.0	335185.0
CPT3	185.91	4678022.0	334957.0
CPT4	185.09	4678208.0	334516.0
CPT5	184.69	4678413.0	334220.0
CPT6	184.08	4678621.0	333844.0
CPT-103	186.30	4677620.0	335400.7
CPT-106	185.72	4677846.1	335039.9
CPT-108	185.60	4678051.6	334826.8
CPT-110	184.82	4678297.8	334448.6
CPT-111	184.92	4678351.4	334347.6
CPT-114	184.21	4678526.7	334018.6
CPT-117	183.29	4678744.1	333601.5
CPT-206	186.48	4677642.5	335465.8
HOW-1	Grnd	4677832.0	335220.0
OUT-10A	Grnd	4677500.0	335522.0
OUT-10B	Grnd	4677498.0	335508.0
OUT-11A	Grnd	4677549.0	335502.0
OUT-11B	Grnd	4677547.0	335498.0
OUT-12A	Grnd	4677598.0	335512.0
OUT-12B	Grnd	4677599.0	335507.0
OUT-13A	Grnd	4677651.0	335512.0
OUT-13B	Grnd	4677651.0	335507.0
OUT-14A	Grnd	4677692.0	335524.0
OUT-14B	Grnd	4677687.0	335530.0
OUT-15A	Grnd	4677619.0	335472.0
OUT-15B	Grnd	4677614.0	335470.0
OUT-16A	Grnd	4677603.0	335549.0
OUT-16B	Grnd	4677607.0	335550.0
TR-10A	Grnd	4678018.0	334914.0
TR-10B	Grnd	4678036.0	334925.0
TR-10C	Grnd	4678032.0	334925.0
TR-10D	Grnd	4678036.0	334924.0
TR-10E	Grnd	4678013.0	334909.0

Geocres No. 40J6–24

HWY. 401	PROJECT NO. 09-1132-0080		DIST. WEST
SUBM'D. SJB	CHKD.	DATE: May 13/10	SITE:
DRAWN: WDF	CHKD.	APPD.	DWG. 4

PLOT DATE: June 09, 2010
FILENAME: N:\active\2009\1132 - Geotechnical\1132-0000\09-1132-0080 URS - W-E PARKWAY OWNERS ENG - WINDSOR\Drafting\AutoCAD files\09113200B0-7000-002001.dwg

MINISTRY OF TRANSPORTATION, ONTARIO



0 80 160

STN 10+450 TO 11+300

0 80 160

STN 10+350 TO STN 10+650

METRIC

DIMENSIONS ARE IN METRES AND/OR MILLIMETRES UNLESS OTHERWISE SHOWN. STATIONS IN KILOMETRES + METRES.

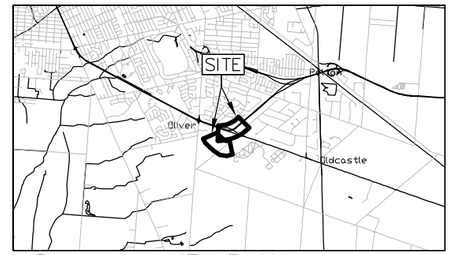
CONT No. –
WP No. –

WINDSOR – ESSSEX PARKWAY
Windsor, Ontario

BOREHOLE LOCATION MAP

SHEET 5

Golder Associates Ltd.
LONDON, ONTARIO, CANADA



KEY PLAN

SCALE 1.5 0 1.5 3 KM

LEGEND

- Borehole – Current Investigation
- Borehole – Previous Investigations
- Borehole – Pavement Holes
- Borehole and Cone
- Cone Penetration Test

No.	ELEVATION	CO-ORDINATES (UTM, NAD83 ZONE 17)	
		NORTHING	EASTING
OUT-1	Grnd	4677342.0	336010.0
OUT-2	Grnd	4677343.0	336008.0
OUT-1A	Grnd	4677211.0	335844.0
OUT-1B	Grnd	4677209.0	335837.0
OUT-2A	Grnd	4677241.0	335801.0
OUT-2B	Grnd	4677246.0	335804.0
OUT-3A	Grnd	4677272.0	335764.0
OUT-3B	Grnd	4677269.0	335759.0
OUT-4A	Grnd	4677302.0	335724.0
OUT-4B	Grnd	4677309.0	335727.0
OUT-5A	Grnd	4677332.0	335684.0
OUT-5B	Grnd	4677326.0	335678.0
OUT-6A	Grnd	4677363.0	335642.0
OUT-6B	Grnd	4677368.0	335646.0
OUT-7A	Grnd	4677394.0	335601.0
OUT-7B	Grnd	4677389.0	335597.0
OUT-8A	Grnd	4677423.0	335561.0
OUT-8B	Grnd	4677429.0	335564.0
OUT-9A	Grnd	4677450.0	335542.0
OUT-9B	Grnd	4677448.0	335518.0
OUT-17A	Grnd	4677582.0	335612.0
OUT-17B	Grnd	4677577.0	335614.0
OUT-18A	Grnd	4677540.0	335696.0
OUT-18B	Grnd	4677543.0	335699.0
OUT-19A	Grnd	4677498.0	335780.0
OUT-19B	Grnd	4677509.0	335784.0
TR-B1	Grnd	4677641.0	335860.0
TR-B2	Grnd	4677643.0	335860.0
TR-B3	Grnd	4677364.0	335857.0
TR-B4	Grnd	4677656.0	335864.0
TR-B5	Grnd	4677659.0	335865.0
TR-B6	Grnd	4677660.0	335866.0
TR-B7	Grnd	4677650.0	335862.0
TR-B8	Grnd	4677651.0	335863.0
TR-C1	Grnd	4677746.0	336233.0
TR-C2	Grnd	4677747.0	336231.0
TR-C3	Grnd	4677741.0	336238.0
TR-C4	Grnd	4677743.0	336236.0
TR-C5	Grnd	4677741.0	336238.0
TR-C6	Grnd	4677739.0	336241.0
TR-C7	Grnd	4677755.0	336220.0
TR-C8	Grnd	4677758.0	336215.0
TR-C9	Grnd	4677757.0	336217.0
TR-C10	Grnd	4677755.0	336224.0
TR-C11	Grnd	4677753.0	336226.0

No.	ELEVATION	CO-ORDINATES (UTM, NAD83 ZONE 17)	
		NORTHING	EASTING
229N	187.34	4677866.4	336321.6
230N	187.37	4677822.9	336266.7
231N	187.06	4677775.6	336213.6
232N	186.75	4677725.4	336154.5
233N	186.39	4677688.5	336099.5
235N	188.50	4677706.7	335837.9
236N	187.56	4677710.1	335771.8
237N	187.77	4677724.5	335702.0
238N	187.82	4677745.8	335632.9
BH-1 (40J2-40)	187.20	4677720.4	335743.5
BH-2 (40J2-40)	186.60	4677673.6	335881.7
BH-3 (40J2-40)	187.80	4677606.0	336018.1
BH-4 (40J2-40)	187.20	4677657.3	336150.5
BH-201	187.67	4677610.4	335770.5
BH-202	187.31	4677573.5	335753.3
BH-203	187.23	4677539.3	335743.5
BH-101	187.37	4677606.6	335794.9
CPT-201	187.67	4677607.5	335774.9
3-1	Grnd	4677590.0	336166.0
3-2	Grnd	4677701.0	335927.0

NOTE

Horizontal and vertical alignment of road ways and general structure alignments shown are based on drawings provided by URS during conceptual design.
Final alignments and structure arrangements may differ.

REFERENCE

Base plans provided in digital format by URS.

NO.	DATE	BY	REVISION

Geocres No. 40J6-27

HWY. 401	PROJECT NO. 09-1132-0080		DIST. WEST
SUBM'D. SJB	CHKD.	DATE: May 13/10	SITE:
DRAWN: WDF	CHKD.	APPD.	DWG. 5

PLOT DATE: June 09, 2010
FILENAME: N:\active\2009\1132 - Geotechnical\1132-0000\09-1132-0080 URS - W-E PARKWAY OWNERS ENG - WINDSOR\Drafting\AutoCAD files\09113220080-7000-D

METRIC
DIMENSIONS ARE IN METRES AND/OR MILLIMETRES UNLESS OTHERWISE SHOWN.
STATIONS IN KILOMETRES + METRES.

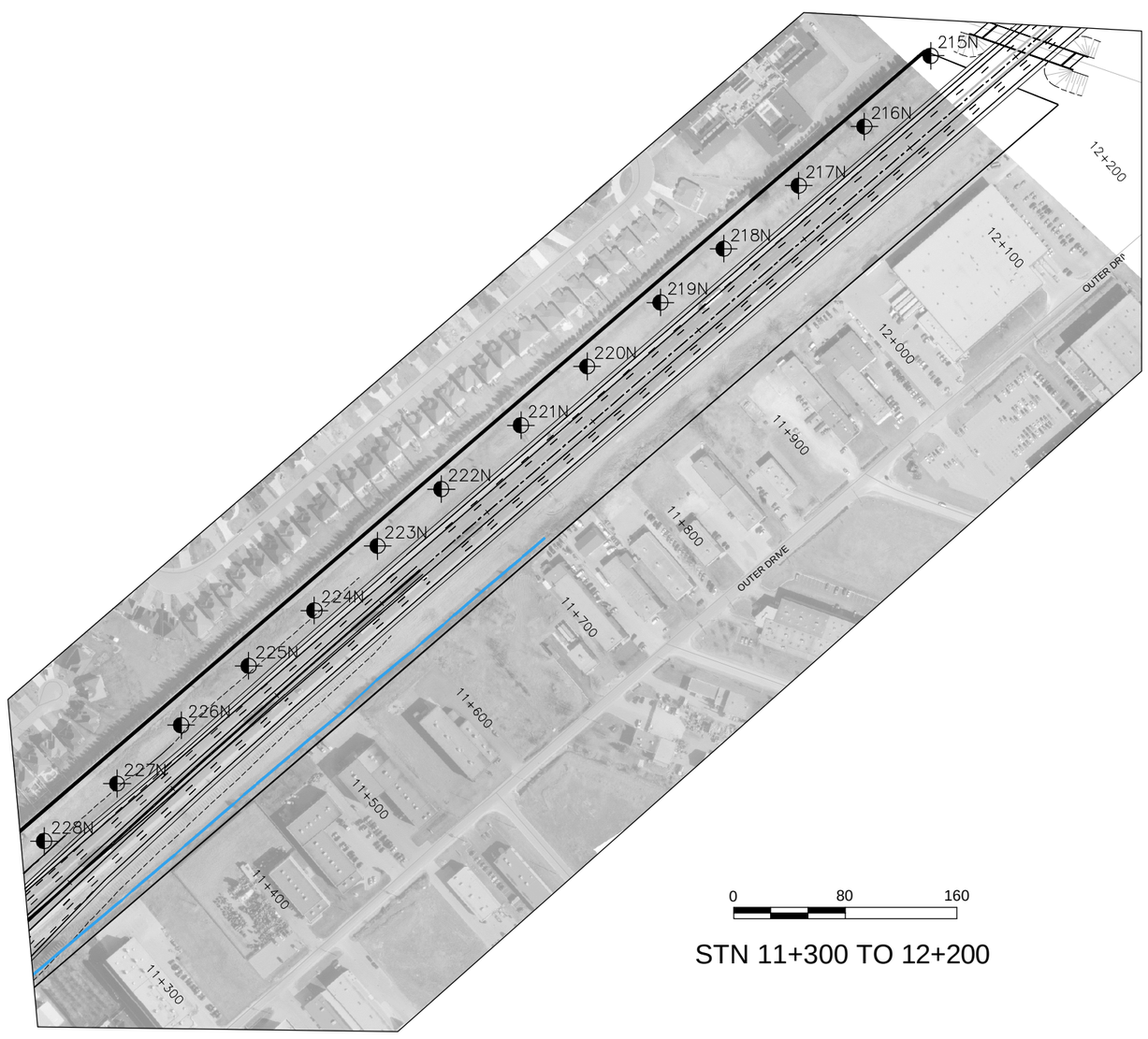
CONT No. –
WP No. –

WINDSOR – ESSSEX PARKWAY
Windsor, Ontario

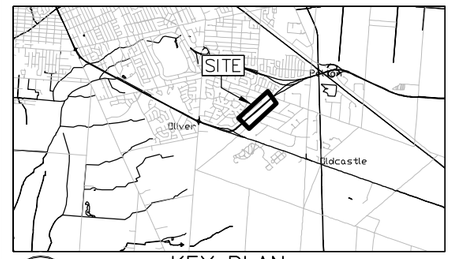
BOREHOLE LOCATION MAP

SHEET 6

Golder Associates Ltd.
LONDON, ONTARIO, CANADA



STN 11+300 TO 12+200



KEY PLAN

LEGEND

- Borehole – Current Investigation
- Borehole – Previous Investigations
- Borehole – Pavement Holes
- Borehole and Cone
- Cone Penetration Test

No.	ELEVATION	CO-ORDINATES (UTM, NAD83 ZONE 17)	
		NORTHING	EASTING
215N	189.69	4678473.3	337006.7
216N	189.29	4678422.6	336959.2
217N	189.25	4678380.3	336912.2
218N	189.13	4678335.0	336858.4
219N	189.03	4678296.5	336813.1
220N	188.85	4678250.7	336760.7
221N	188.81	4678208.5	336713.2
222N	188.49	4678162.8	336656.1
223N	188.24	4678122.1	336610.5
224N	188.32	4678075.8	336565.2
225N	188.09	4678036.1	336518.1
226N	187.72	4677993.6	336469.8
227N	187.61	4677951.7	336423.8
228N	187.41	4677910.5	336371.5

NOTE
Horizontal and vertical alignment of road ways and general structure alignments shown are based on drawings provided by URS during conceptual design.
Final alignments and structure arrangements may differ.

REFERENCE
Base plans provided in digital format by URS.

NO.	DATE	BY	REVISION

Geocres No. 40J6-27

HWY. 401		PROJECT NO. 09-1132-0080		DIST. WEST
SUBM'D. SJB	CHKD.	DATE: May 13/10		SITE:
DRAWN: WDF	CHKD.	APPD.		DWG. 6

LIST OF ABBREVIATIONS

The abbreviations commonly employed on Records of Boreholes, on figures and in the text of the report are as follows:

I. SAMPLE TYPE

AS	Auger sample
BS	Block sample
CS	Chunk sample
SS	Split-spoon
DS	Denison type sample
FS	Foil sample
RC	Rock core
SC	Soil core
ST	Slotted tube
TO	Thin-walled, open
TP	Thin-walled, piston
WS	Wash sample

II. PENETRATION RESISTANCE

Standard Penetration Resistance (SPT), N:

The number of blows by a 63.5 kg. (140 lb.) hammer dropped 760 mm (30 in.) required to drive a 50 mm (2 in.) split spoon sampler for a distance of 300 mm (12 in.)

Dynamic Cone Penetration Resistance; N_d:

The number of blows by a 63.5 kg (140 lb.) hammer dropped 760 mm (30 in.) to drive uncased a 50 mm (2 in.) diameter, 60º cone attached to "A" size drill rods for a distance of 300 mm (12 in.).

PH: Sampler advanced by hydraulic pressure
PM: Sampler advanced by manual pressure
WH: Sampler advanced by static weight of hammer
WR: Sampler advanced by weight of sampler and rod

Piezo-Cone Penetration Test (CPT)

A electronic cone penetrometer with a 60° conical tip and a project end area of 10 cm^2 pushed through ground at a penetration rate of 2 cm/s. Measurements of tip resistance (Q_t), porewater pressure (PWP) and friction along a sleeve are recorded electronically at 25 mm penetration intervals.

III. SOIL DESCRIPTION

(a) Cohesionless Soils

Density Index (Relative Density)	N Blows/300 mm or Blows/ft.
Very loose	0 to 4
Loose	4 to 10
Compact	10 to 30
Dense	30 to 50
Very dense	over 50

(b) Cohesive Soils

Consistency	c_u, s_u kPa	c_u, s_u psf
Very soft	0 to 12	0 to 250
Soft	12 to 25	250 to 500
Firm	25 to 50	500 to 1,000
Stiff	50 to 100	1,000 to 2,000
Very stiff	100 to 200	2,000 to 4,000
Hard	over 200	over 4,000

IV. SOIL TESTS

w	water content
w_p	plastic limit
w_l	liquid limit
C	consolidation (oedometer) test
CHEM	chemical analysis (refer to text)
CID	consolidated isotropically drained triaxial test[1]
CIU	consolidated isotropically undrained triaxial test with porewater pressure measurement[1]
D_R	relative density (specific gravity, G_s)
DS	direct shear test
M	sieve analysis for particle size
MH	combined sieve and hydrometer (H) analysis
MPC	Modified Proctor compaction test
SPC	Standard Proctor compaction test
OC	organic content test
SO_4	concentration of water-soluble sulphates
UC	unconfined compression test
UU	unconsolidated undrained triaxial test
V	field vane (LV-laboratory vane test)
γ	unit weight

Note: 1 Tests which are anisotropically consolidated prior to shear are shown as CAD, CAU.

LIST OF SYMBOLS

Unless otherwise stated, the symbols employed in the report are as follows:

I. General

π	3.1416
ln x,	natural logarithm of x
$\log_{10}$	x or log x, logarithm of x to base 10
g	acceleration due to gravity
t	time
F	factor of safety
V	volume
W	weight

II. STRESS AND STRAIN

γ	shear strain
Δ	change in, e.g. in stress: $\Delta\sigma$
ε	linear strain
ε_v	volumetric strain
η	coefficient of viscosity
v	poisson's ratio
σ	total stress
σ'	effective stress ($\sigma' = \sigma - u$)
σ'_{vo}	initial effective overburden stress
$\sigma_1, \sigma_2, \sigma_3$	principal stress (major, intermediate, minor)
σ_{oct}	mean stress or octahedral stress $= (\sigma_1+\sigma_2+\sigma_3)/3$
τ	shear stress
u	porewater pressure
E	modulus of deformation
G	shear modulus of deformation
K	bulk modulus of compressibility

III. SOIL PROPERTIES

(a) Index Properties

$\rho(\gamma)$	bulk density (bulk unit weight*)
$\rho_d(\gamma_d)$	dry density (dry unit weight)
$\rho_w(\gamma_w)$	density (unit weight) of water
$\rho_s(\gamma_s)$	density (unit weight) of solid particles
γ'	unit weight of submerged soil ($\gamma' = \gamma - \gamma_w$)
D_R	relative density (specific gravity) of solid particles ($D_R = \rho_s/\rho_w$) (formerly G_s)
e	void ratio
n	porosity
S	degree of saturation

(a) Index Properties (continued)

w	water content
w_l	liquid limit
w_p	plastic limit
I_p	plasticity index = $(w_l - w_p)$
w_s	shrinkage limit
I_L	liquidity index = $(w - w_p)/I_p$
I_C	consistency index = $(w_l - w)/I_p$
e_{max}	void ratio in loosest state
e_{min}	void ratio in densest state
I_D	density index = $(e_{max} - e)/(e_{max} - e_{min})$ (formerly relative density)

(b) Hydraulic Properties

h	hydraulic head or potential
q	rate of flow
v	velocity of flow
i	hydraulic gradient
k	hydraulic conductivity (coefficient of permeability)
j	seepage force per unit volume

(c) Consolidation (one-dimensional)

C_c	compression index (normally consolidated range)
C_r	recompression index (over-consolidated range)
C_s	swelling index
C_a	coefficient of secondary consolidation
m_v	coefficient of volume change
c_v	coefficient of consolidation
T_v	time factor (vertical direction)
U	degree of consolidation
σ'_p	pre-consolidation pressure
OCR	over-consolidation ratio = σ'_p/σ'_{vo}

(d) Shear Strength

τ_p, τ_r	peak and residual shear strength
ϕ'	effective angle of internal friction
δ	angle of interface friction
μ	coefficient of friction = tan δ
c'	effective cohesion
c_u, s_u	undrained shear strength ($\phi = 0$ analysis)
p	mean total stress $(\sigma_1 + \sigma_3)/2$
p'	mean effective stress $(\sigma'_1 + \sigma'_3)/2$
q	$(\sigma_1 + \sigma_3)/2$ or $(\sigma'_1 + \sigma'_3)/2$
q_u	compressive strength $(\sigma_1 + \sigma_3)$
S_t	sensitivity

Notes: 1 $\tau = c' + \sigma' \tan\phi'$

2 shear strength = (compressive strength)/2

* density symbol is ρ. Unit weight symbol is γ where $\gamma = \rho g$ (i.e. mass density x acceleration due to gravity)

LITHOLOGICAL AND GEOTECHNICAL ROCK DESCRIPTION TERMINOLOGY

WEATHERING STATE

Fresh: no visible sign of weathering.

Faintly weathered: weathering limited to the surface of major discontinuities.

Slightly weathered: penetrative weathering developed on open discontinuity surfaces but only slight weathering of rock material.

Moderately weathered: weathering extends throughout the rock mass but the rock material is not friable.

Highly weathered: weathering extends throughout rock mass and the rock material is partly friable. Completely weathered: rock is wholly decomposed and in a friable condition but the rock texture and structure are preserved.

BEDDING THICKNESS

Description	Bedding Plane Spacing-
Very thickly bedded	>2 m
Thickly bedded	0.6 m to 2m
Medium bedded	0.2 m to 0.6m
Thinly bedded	60 m to 0.2 m
Very thinly- bedded	20 mm to 60 mm
Laminated	6 mm to 20 mm
Thinly laminated	< 6 mm

JOINT OR FOLIATION SPACING

Description	Spacing
Very wide	> 3 m
Wide	I – 3 m
Moderately close	0.3 – I m
Close	50 – 300 mm
Very close	< 50 mm

GRAIN SIZE

Term	Size*
Very Coarse Grained	> 60 mm
Coarse Grained	2 – 60 mm
Medium Grained	60 microns – 2 mm
Fine Grained	2 – 60 microns
Very Fine Grained	< 2 microns

Note: *Grains >60 microns diameter are visible to the naked eye.

CORE CONDITION

Total Core Recovery (TCR)
The percentage of solid drill core recovered regardless of quality or length, measured relative to the length of the total core run.

Solid Core Recovery (SCR)
The percentage of solid drill core, regardless of length, recovered at full circumference, measured relative to the length of the total core run.

Rock Quality Designation (RQD)
The percentage of solid drill core, greater than 100 mm length, recovered at full diameter, measured relative to the length of the total core run. RQD varies front 0% for completely broken core to 100% for core in solid sticks.

DISCONTINUITY DATA

Fracture Index

A count of' the number of discontinuities (physical separations) in the rock core, including both naturally occurring fractures and mechanically induced breaks caused by drilling.

Dip with Respect to (W.R.T.) Core Axis

The angle of the discontinuity relative to the axis (length) of the core, In a vertical borehole a discontinuity with a 90' angle is horizontal.

Description and Notes

An abbreviated description of the discontinuities, whether naturally occurring separations such as fractures, bedding planes and foliation planes or mechanically induced features caused by drilling such as ground or shattered core and mechanically separated bedding or foliation surfaces. Additional information concerning the nature of fracture surfaces

Abbreviations

B – Bedding
FO - Foliation Schistosity
CL - Cleavage
SH - Shear Plane Zone
VN - Vein
F - Fault
CO - Contact
J - Joint
FR - Fracture
M F - Mechanical Fracture
II - Parallel To
⊾ - Perpendicular To

P - Polished
S - Slickensided
SM - Smooth
R - Ridged / Rough
ST - Stepped
PL - Planar
FL - Flexured
UE - Uneven
W - Wavy
C - Curved

APPENDIX A

Record of Borehole Sheets

Golder Associates
London, Ontario

RECORD OF BOREHOLE No 346

1 OF 3

METRIC

PROJECT 09-1132-0080-7000
W.P.
LOCATION N 4682151.7 ;E 328622.9
ORIGINATED BY TA
DIST WEST HWY 401 / 3
BOREHOLE TYPE POWER AUGER, MUD ROTARY WITH HQ TRICONE, NQRC
COMPILED BY AG
DATUM GEODETIC
DATE April 20, 2010 - April 21, 2010
CHECKED BY

ELEV / DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"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 (%) (10 20 30)	UNIT WEIGHT γ kN/m³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
179.24	GROUND SURFACE										
0.00	TOPSOIL, clayey Black						179				
0.25 / 178.33	FILL, clayey silt, some sand, some gravel, with pieces of brick and glass										
0.91	SILTY SAND, trace gravel Compact Brown		1	SS	14	▽	178				
177.11			2	SS	18						
2.13	CLAYEY SILT, trace sand, with silt partings Firm to stiff Grey		3	SS	9		177				
175.58			4	SS	4		176				
3.66	SILTY CLAY, trace sand, trace gravel Soft to firm Grey		5	SS	5		175				0 1 68 31
			6	SS	5		174	2.1	42		
			7	TO	PH						
			8	SS	4		173	2.9			
170.93			9	TO	PH		172				3 17 39 41 Oedometer
8.31	CLAYEY SILT, trace to some sand, trace gravel Soft to very stiff Grey		10	SS	3		171	1.5			1 21 36 42
							170	2.8			
			11	TO	PH		169				0 11 43 46 Oedometer
							168	2.2			
			12	SS	3		167		40		
								2.2			
			13	TO	PH		166				5 24 44 27 Oedometer
							165	1.7			

Continued Next Page

+ 3, × 3: Numbers refer to Sensitivity

○ 3% STRAIN AT FAILURE

Golder Associates
London, Ontario

RECORD OF BOREHOLE No 346

2 OF 3

METRIC

PROJECT 09-1132-0080-7000
W.P.
LOCATION N 4682151.7 ;E 328622.9
ORIGINATED BY TA
DIST WEST HWY 401 / 3
BOREHOLE TYPE POWER AUGER, MUD ROTARY WITH HQ TRICONE, NQRC
COMPILED BY AG
DATUM GEODETIC
DATE April 20, 2010 - April 21, 2010
CHECKED BY

ELEV / DEPTH	DESCRIPTION	STRAT 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
	CLAYEY SILT, trace to some sand, trace gravel Soft to very stiff Grey		14	SS	5		164	+ 1.3	○		
			15	TO	PH		163		○		
							162	+ 1.6			
			16	TO	PH		161				
159.90								+ 1.3			
19.34	BOULDERS AND COBBLES (inferred), no core recovery		17	SS NQ RC	50/ 0mm		160				
158.30							159				
20.94	CLAYEY SILT, trace to some sand, trace gravel Soft to very stiff Grey		18	SS	19		158		○		
157.45											
21.79	SILTY CLAY, some sand, trace gravel Hard Grey		19	SS	80		157		○		
156.15											
23.09	LIMESTONE Slightly weathered to fresh, medium strong to strong, thinly laminated, fine to medium grained, faintly porous Light grey (FOR DETAILED DESCRIPTIONS REFER TO RECORD OF DRILLHOLE)		20	NQ RC			156	T.C.R. (%) 76 / S.C.R. (%) 39 / R.Q.D. (%) 31			
			21	NQ RC			155	31 / 21 / 29			
			22	NQ RC			154	99 / 99 / 99			
			23	NQ RC			153	100 / 99 / 100			
150.82							152				
							151				
28.42	END OF BOREHOLE Groundwater encountered at about elev. 177.7m during drilling on April 20, 2010. Water level in casing measured at 0.93m above ground surface following drilling April 21, 2010.										

+ 3, × 3: Numbers refer to Sensitivity
○ 3% STRAIN AT FAILURE

PROJECT: 09-1132-0080

RECORD OF DRILLHOLE: 346

SHEET 3 OF 3

LOCATION: N 4682151.7 ;E 328622.9

DRILLING DATE: April 20, 2010 - April 21, 2010

DATUM: GEODETIC

INCLINATION: -90° AZIMUTH: ---

DRILL RIG: MOBILE B-57

DRILLING CONTRACTOR: LANTECH DRILLING SERVICES INC.

JN - Joint, FLT - Fault, SHR- Shear, VN - Vein, CJ - Conjugate; BD- Bedding, FO- Foliation, CO- Contact, OR- Orthogonal, CL - Cleavage; PL - Planar, CU- Curved, UN- Undulating, ST - Stepped, IR - Irregular; PO- Polished, K - Slickensided, SM- Smooth, Ro - Rough; Br - Broken Rock

NOTE: For additional abbreviations refer to list of abbreviations & symbols.

DEPTH SCALE METRES	DRILLING RECORD	DESCRIPTION	SYMBOLIC LOG	ELEV. / DEPTH (m)	RUN No.	PENETRATION RATE (m/min)	COLOUR % RETURN / FLUSH	ELEVATION	RECOVERY: TOTAL CORE %	RECOVERY: SOLID CORE %	R.Q.D. %	FRACT. INDEX PER 0.3	DISCONTINUITY DATA: DIP w.r.t. CORE AXIS	DISCONTINUITY DATA: TYPE AND SURFACE DESCRIPTION	HYDRAULIC CONDUCTIVITY k, cm/sec	DIAMETRAL POINT LOAD INDEX (MPa)	NOTES WATER LEVELS INSTRUMENTATION
		ROCK SURFACE		156.15													
24	ROTARY DRILL / NQ ROCK CORE	**LIMESTONE**, slightly weathered to fresh, medium strong to strong, thinly laminated, fine to medium grained, faintly porous, light grey, fossiliferous, occastional stylolites Zones of broken (possibly mechanically) core between elev. 155.9m and 155.7m and between elev. 155.3m and 154.7m Clay infill (about 50mm thick) at elev. 155.3m		23.09	1			156 155						FR, UN, Ro Stn FR, UN, Ro Stn			
25					2			154						FR, UN, Ro Stn			
26		**LIMESTONE**, fresh, medium strong to strong, thinly laminated, fine to medium grained, slightly porous to vuggy porous, light grey, occassional stylolites, with hydrocarbon staining between elev. 153.5m and 152.8m and between elev. 151.1m and 150.8m.		153.55 25.69	3			153									
27								152									
28					4			151									
				150.82													
		END OF BOREHOLE		28.42													
29																	
30																	
31																	
32																	
33																	
34																	
35																	
36																	
37																	
38																	

DEPTH SCALE

1 : 75

Golder Associates

LOGGED: TA

CHECKED:

LDN_ROCK_03 09-1132-0080-7000-ROCK.GPJ GLDR_LDN.GDT 09/06/10 DATA INPUT: AG

Golder Associates
London, Ontario

RECORD OF BOREHOLE No 349

1 OF 3

METRIC

PROJECT 09-1132-0080-7000 | W.P. | LOCATION N 4682135.5 ;E 328496.2 | ORIGINATED BY TA

DIST WEST HWY 401 / 3 | BOREHOLE TYPE POWER AUGER, MUD ROTARY WITH HQ TRICONE, NQRC | COMPILED BY AG

DATUM GEODETIC | DATE April 22, 2010 - April 23, 2010 | CHECKED BY

ELEV / DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"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 (%) (10 20 30)	UNIT WEIGHT γ kN/m³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
179.08	GROUND SURFACE					WL - VWP4	180				
0.00	TOPSOIL, sandy to clayey, Dark brown					WL - VWP3, WL - VWP2	179				
178.17						WL - VWP1					
0.91	SAND, fine to medium, trace to some silt, Loose to compact, Brown		1	SS	7		178		○		
176.95			2	SS	19				○		1 94 (5)
2.13	CLAYEY SILT, trace sand, with silt partings, Soft to stiff, Grey		3	SS	11		177		○		
			4	SS	6	GROUT	176		⊢○⊣		0 3 74 23
			5	SS	7		175		○		
			6	SS	3				○		
173.59							174				
5.49	SILTY CLAY, trace sand, Soft to firm, Grey		7	TO	PH	VWP 1		1.8	⊢○ 52, 59		0 7 28 65 Oedometer
			8	SS	3		173		○ 42		
			9	TO	PH		172	2.4			
			10	SS	2		171	1.5	⊢○ 62, 51		
169.63							170				
9.45	CLAYEY SILT, trace sand, Soft to stiff, Grey							2.5			
			11	TO	PH	VWP 2	169		⊢○⊣		2 12 52 34 Oedometer
							168	2.0			
			12	SS	5		167		○		
								3.0			
			13	TO	PH		166				

Continued Next Page

+ 3, × 3: Numbers refer to Sensitivity ○ 3% STRAIN AT FAILURE

Golder Associates
London, Ontario

RECORD OF BOREHOLE No 349

2 OF 3 **METRIC**

PROJECT 09-1132-0080-7000 | LOCATION N 4682135.5 ;E 328496.2 | ORIGINATED BY TA

W.P. | DIST WEST HWY 401 / 3 | BOREHOLE TYPE POWER AUGER, MUD ROTARY WITH HQ TRICONE, NQRC | COMPILED BY AG

DATUM GEODETIC | DATE April 22, 2010 - April 23, 2010 | CHECKED BY

ELEV / DEPTH	DESCRIPTION	STRAT PLOT	SAMPLES: NUMBER	TYPE	"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
	CLAYEY SILT, trace sand Soft to stiff Grey						165	1.2			
			14	TO	PH	VWP 3	164				3 24 45 28 Oedometer
							163	1.6			
			15	SS	10		162	1.5			
161.40											
17.68	SILTY SAND, some gravel, some clay below 18.08m, with cobbles Compact Grey		16	SS	11		161				
160.49						GROUT					
18.59	CLAYEY SILT, trace to some sand, some gravel, with sand and gravel layers						160	>95.8			
			17	SS	8		159	2.3			
			18	TO	PH		158				
							157	2.1			
156.07			19	SS	20						
23.01	LIMESTONE, faintly weathered to fresh, medium strong to strong, thinly laminated, fine to medium grained, faintly porous to vuggy porous in sections Light grey		20	NQ RC		VWP 4	156	T.C.R. (%) 100			
			21	NQ RC			155	S.C.R. (%) 93			
			22	NQ RC			154	R.Q.D. (%) 92			
			23	NQ RC			153	82 / 74 / 75			
151.29							152	100 / 92 / 98			
27.79	END OF BOREHOLE Groundwater encountered at about elev. 177.7m during drilling on April 22, 2010.							98 / 98 / 98			

VWP1 - Water level measured at elev. 178.27m on June 2, 2010.
VWP2 - Water level measured at elev. 178.72m on June 2, 2010.
VWP3 - Water level measured at elev. 178.89m on June 2, 2010.
VWP4 - Water level measured at elev. 179.75m on June 2, 2010.
For details of measured water levels, see Table I following the text of the report.

Bulk sample obtained from about elev. 177.9m to 177.1m.

$+^3, \times^3$: Numbers refer to Sensitivity ○ 3% STRAIN AT FAILURE

LDN_MTO_06 09-1132-0080-7000.GPJ LDN_MTO.GDT 09/06/10

PROJECT: 09-1132-0080

RECORD OF DRILLHOLE: 349

SHEET 3 OF 3

LOCATION: N 4682135.5 ;E 328496.2

DRILLING DATE: April 22, 2010 - April 23, 2010

DATUM: GEODETIC

INCLINATION: -90° AZIMUTH: ---

DRILL RIG: MOBILE B-57

DRILLING CONTRACTOR: LANTECH DRILLING SERVICES INC.

JN - Joint, FLT - Fault, SHR- Shear, VN - Vein, CJ - Conjugate; BD- Bedding, FO- Foliation, CO- Contact, OR- Orthogonal, CL - Cleavage; PL - Planar, CU- Curved, UN- Undulating, ST - Stepped, IR - Irregular; PO- Polished, K - Slickensided, SM- Smooth, Ro - Rough; Br - Broken Rock

NOTE: For additional abbreviations refer to list of abbreviations & symbols.

DEPTH SCALE METRES	DRILLING RECORD	DESCRIPTION	SYMBOLIC LOG	ELEV. / DEPTH (m)	RUN No.	PENETRATION RATE (m/min)	COLOUR % RETURN / FLUSH	ELEVATION	RECOVERY: TOTAL CORE %	RECOVERY: SOLID CORE %	R.Q.D. %	FRACT. INDEX PER 0.3	DISCONTINUITY DATA: DIP w.r.t. CORE AXIS	DISCONTINUITY DATA: TYPE AND SURFACE DESCRIPTION	HYDRAULIC CONDUCTIVITY k, cm/sec	DIAMETRAL POINT LOAD INDEX (MPa)	NOTES WATER LEVELS INSTRUMENTATION
		ROCK SURFACE		156.07													
24	ROTARY DRILL / NQ ROCK CORE	**LIMESTONE**, faintly weathered to fresh, medium strong to strong, thinly laminated, fine to medium grained, faintly porous to vuggy porous in sections, light grey, fossiliferous, occassional stylolites Clay infill (about 64mm thick) at elev. 153.6m Hydrocarbon staining between elev. 156.1m and 154.9m and between elev. 152.8m and 151.3m.		23.01	1			156 155						FR, UN, Ro Stn FR, UN, Ro Stn			
25					2			154									
26					3			153									
27					4			152									
				151.29													
28		END OF BOREHOLE		27.79													
29																	
30																	
31																	
32																	
33																	
34																	
35																	
36																	
37																	
38																	

LDN_ROCK_03 09-1132-0080-7000-ROCK.GPJ GLDR_LDN.GDT 09/06/10 DATA INPUT: AG

DEPTH SCALE

1 : 75

Golder Associates

LOGGED: TA

CHECKED:

Golder Associates
London, Ontario

RECORD OF BOREHOLE No CPT-347

1 OF 1

METRIC

PROJECT 09-1132-0080-7000
W.P.
DIST WEST HWY 401 / 3
DATUM GEODETIC
LOCATION N 4682059.9 ;E 328642.6
BOREHOLE TYPE POWER AUGER, HOLLOW STEM
DATE April 22, 2010
ORIGINATED BY TA
COMPILED BY AG
CHECKED BY

ELEV / DEPTH	DESCRIPTION	STRAT 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 (%) (10 20 30)	UNIT WEIGHT γ kN/m³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
178.58	GROUND SURFACE										
0.00	TOPSOIL, sandy Black										
0.25	SAND, fine to medium, some silt Loose Brown		1	SS	9		178		○ at 20		
177.21						▽					
1.37	CLAYEY SILT, trace sand Firm to stiff Grey		2	SS	9		177		○ at 20		
175.84			3	SS	7		176		○ at 20		
2.74	END OF BOREHOLE Groundwater encountered at about elev. 177.2m during drilling on April 22, 2010.										

$+^3, \times^3$: Numbers refer to Sensitivity ○ 3% STRAIN AT FAILURE

Golder Associates
London, Ontario

RECORD OF BOREHOLE No CPT-348

1 OF 1

METRIC

PROJECT 09-1132-0080-7000 | W.P. | LOCATION N 4682160.4 ;E 328512.5 | ORIGINATED BY TA

DIST WEST | HWY 401 / 3 | BOREHOLE TYPE POWER AUGER, SOLID STEM | COMPILED BY AG

DATUM GEODETIC | DATE April 27, 2010 | CHECKED BY

ELEV / DEPTH	DESCRIPTION	STRAT 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 (%) (10 20 30)	UNIT WEIGHT γ kN/m³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
179.15	GROUND SURFACE									
0.00	TOPSOIL, sandy Dark brown						179			
0.27	SAND, fine to medium Loose to compact Brown		1	SS	14	▽			○	
							178			
177.32			2	SS	9				○ ○	
1.83	CLAYEY SILT, some sand, trace gravel Stiff Grey						177			
176.25			3	SS	8				○	
2.90	END OF BOREHOLE Groundwater encountered at about elev. 177.8m during drilling on April 27, 2010.									

$+^3, \times^3$: Numbers refer to Sensitivity ○ 3% STRAIN AT FAILURE

LDN_MTO_06 09-1132-0080-7000.GPJ LDN_MTO.GDT 09/06/10

APPENDIX B

Rock Core Photographs

Photo 1: BH-346 – Rock Core. Elevation 156.15 metres to 150.82 metres

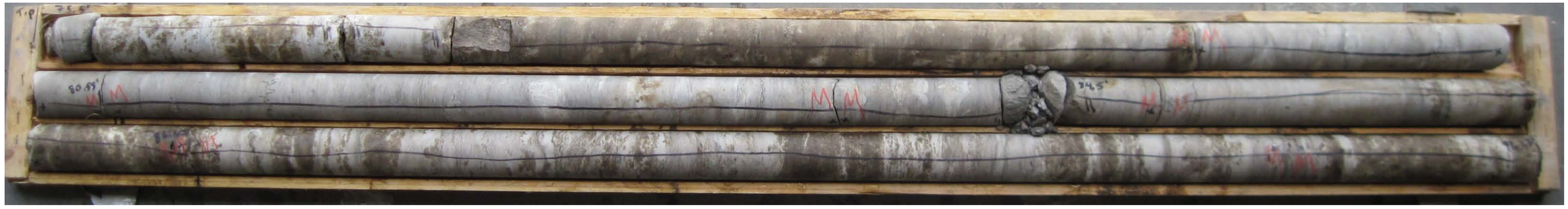


Photo 2: BH-349 – Rock Core. Elevation 156.07 metres to 151.29 metres

APPENDIX C

Record of Cone Penetration Test Sheets

PROJECT: 09-1132-0080

RECORD OF CONE PENETRATION TEST CPT-347

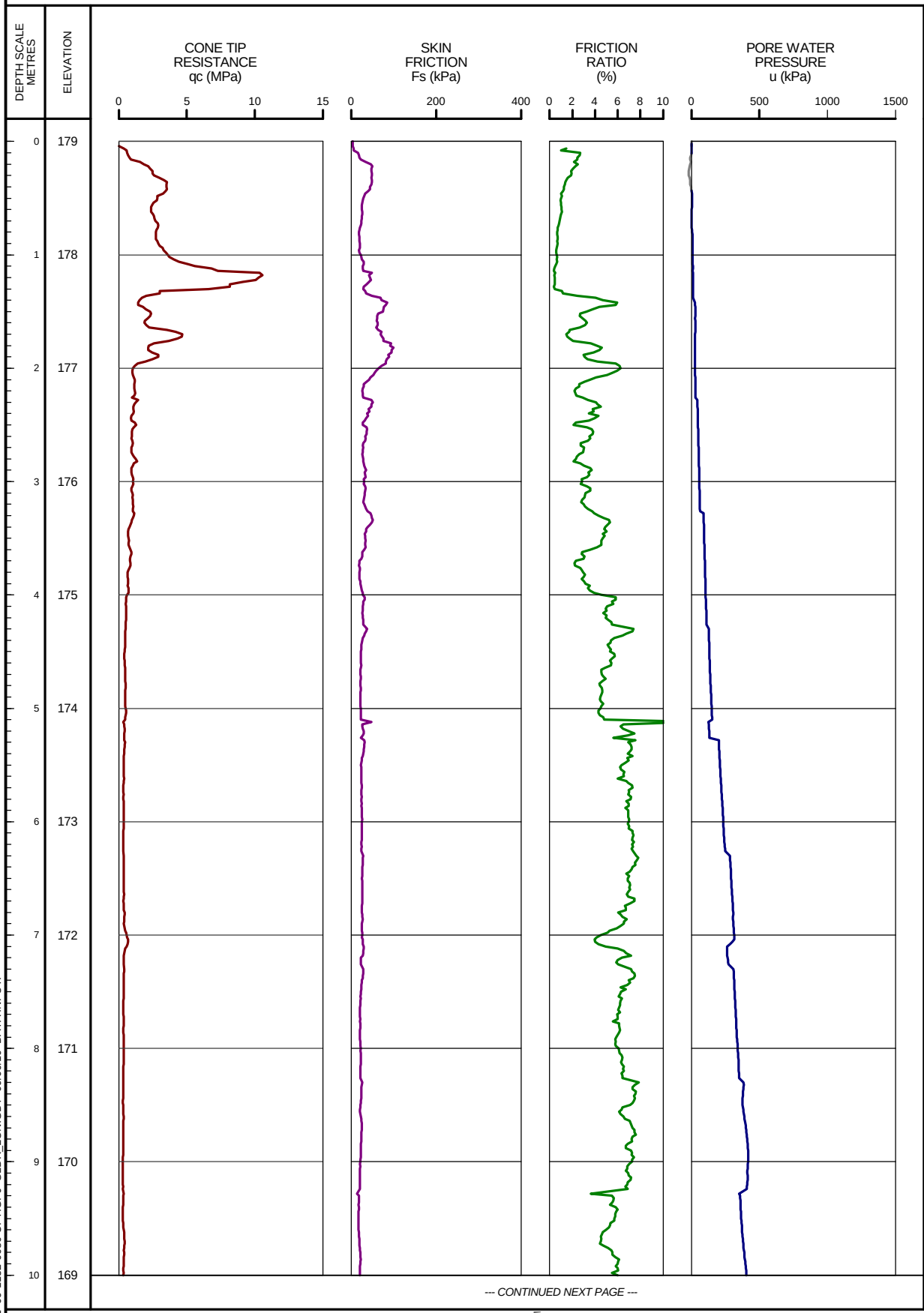
SHEET 1 OF 3

LOCATION: N 4682059.9 ;E 328642.6

TEST DATE: April 26, 2010

DATUM: GEODETIC

GROUND SURFACE ELEVATION: 178.58m PREDRILL DEPTH: 0.00m CORRECTION FACTOR A: 0.6 CORRECTION FACTOR B: 0.013



GENERAL NOTES AND OBSERVATIONS

CPT PUSHED FROM SURFACE. FOR SOIL PROFILE, SEE RECORD OF ADJACENT SHALLOW BOREHOLE NO. CPT-347.

--- CONTINUED NEXT PAGE ---

DEPTH SCALE

1 : 50

Golder Associates

OPERATOR: TA

CHECKED:

LDN_CPT_01 09-1132-0080-CPT.GPJ GLDR_LON.GDT 09/06/10 DATA INPUT:

PROJECT: 09-1132-0080

RECORD OF CONE PENETRATION TEST CPT-347

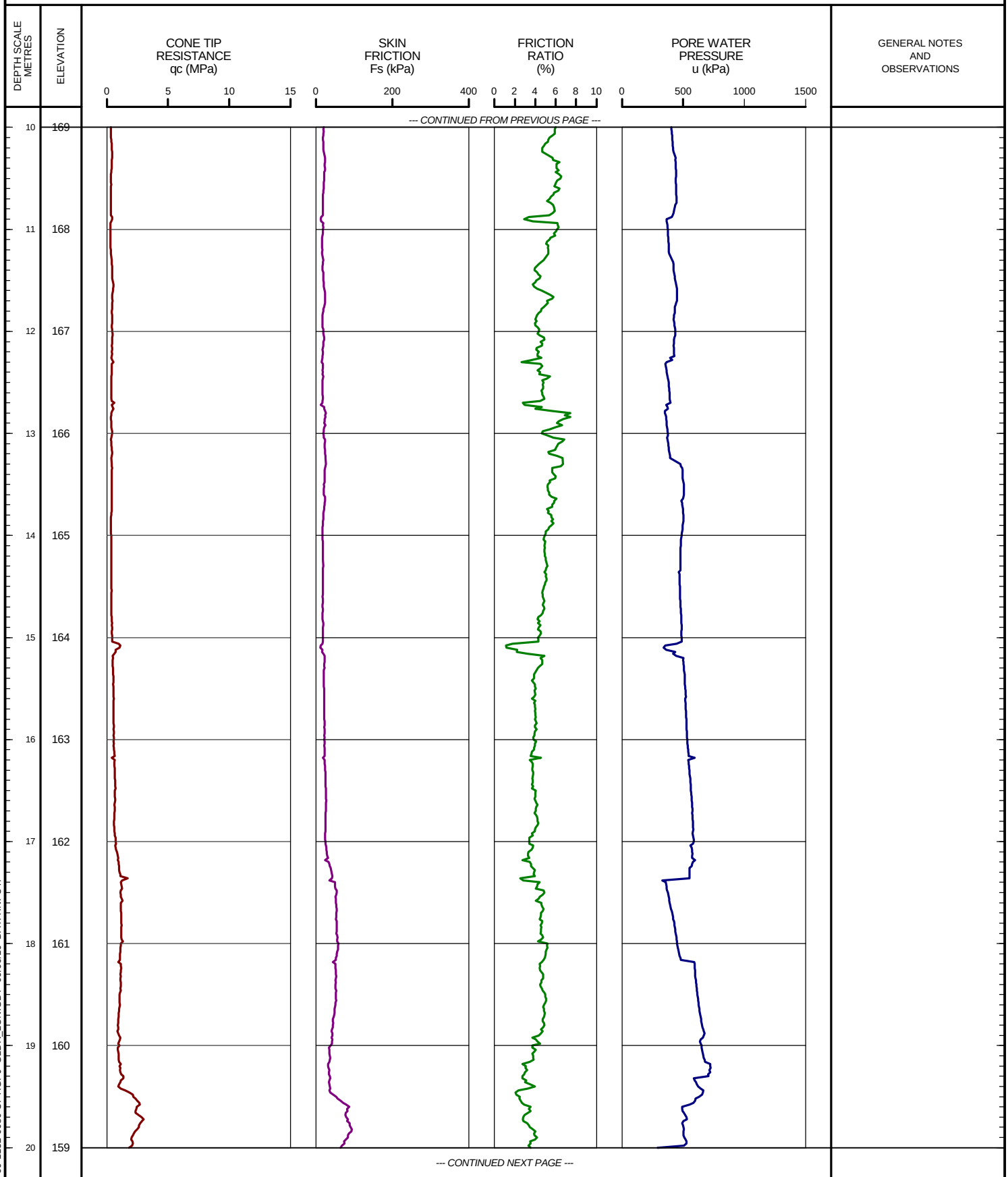
SHEET 2 OF 3

LOCATION: N 4682059.9 ;E 328642.6

TEST DATE: April 26, 2010

DATUM: GEODETIC

GROUND SURFACE ELEVATION: 178.58m PREDRILL DEPTH: 0.00m CORRECTION FACTOR A: 0.6 CORRECTION FACTOR B: 0.013



DEPTH SCALE

1 : 50

Golder Associates

OPERATOR: TA

CHECKED:

LDN_CPT_01 09-1132-0080-CPT.GPJ GLDR_LON.GDT 09/06/10 DATA INPUT:

PROJECT: 09-1132-0080

RECORD OF CONE PENETRATION TEST CPT-347

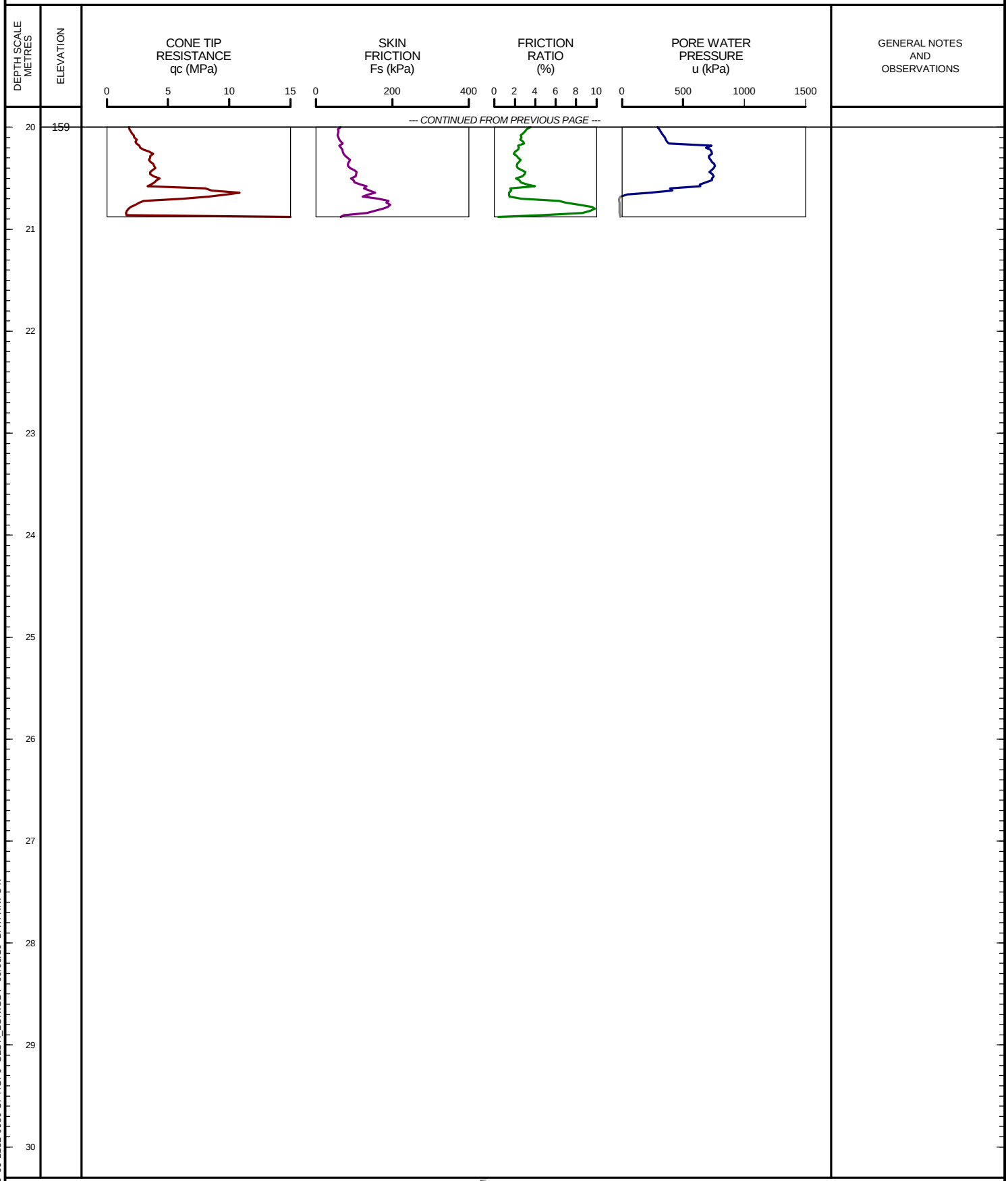
SHEET 3 OF 3

LOCATION: N 4682059.9 ;E 328642.6

TEST DATE: April 26, 2010

DATUM: GEODETIC

GROUND SURFACE ELEVATION: 178.58m PREDRILL DEPTH: 0.00m CORRECTION FACTOR A: 0.6 CORRECTION FACTOR B: 0.013



DEPTH SCALE

1 : 50

Golder Associates

OPERATOR: TA

CHECKED:

LDN_CPT_01 09-1132-0080-CPT.GPJ GLDR_LON.GDT 09/06/10 DATA INPUT:

PROJECT: 09-1132-0080

RECORD OF CONE PENETRATION TEST CPT-348

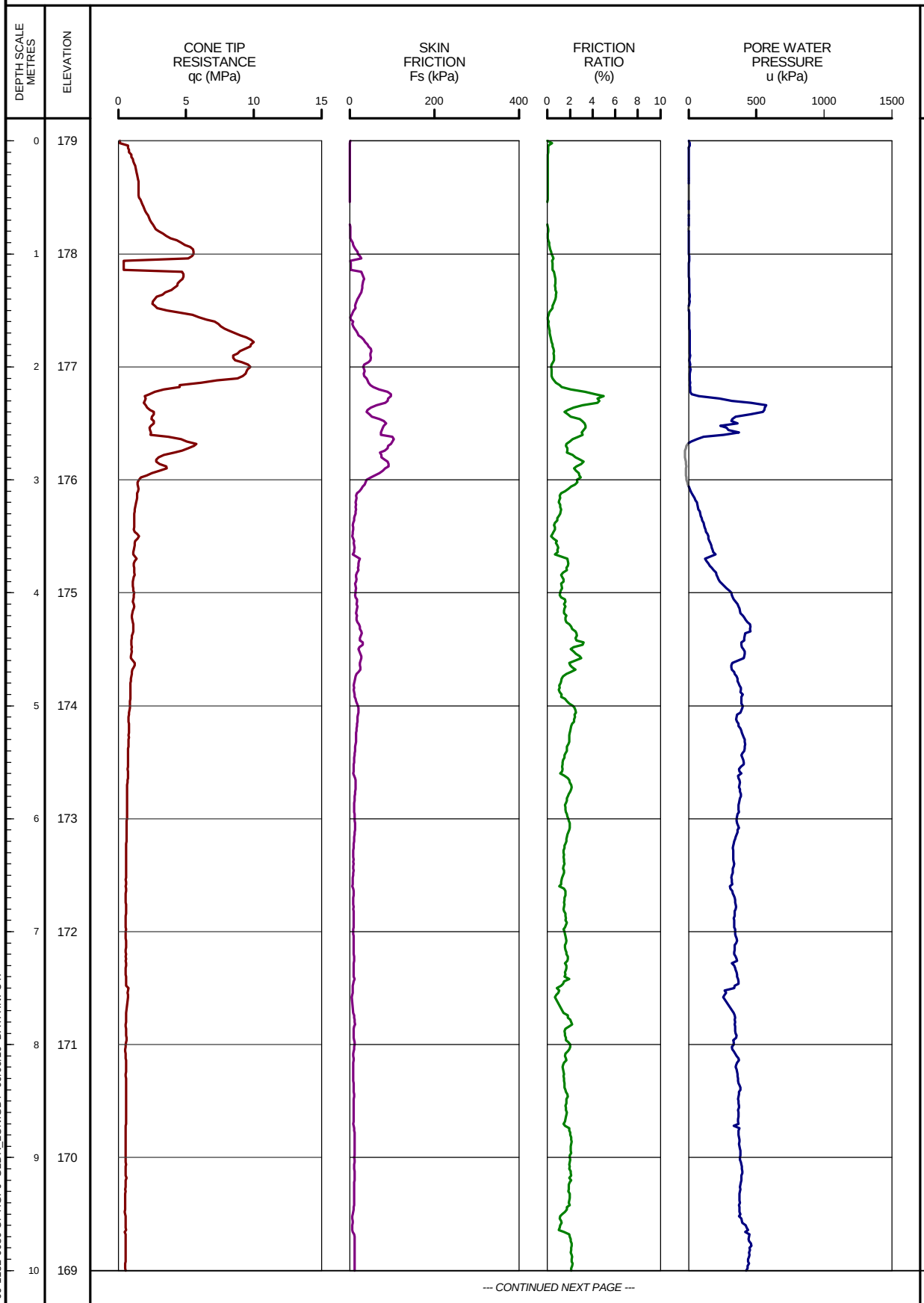
SHEET 1 OF 3

LOCATION: N 4682160.4 ;E 328512.5

TEST DATE: April 26, 2010

DATUM: GEODETIC

GROUND SURFACE ELEVATION: 179.15m PREDRILL DEPTH: 0.00m CORRECTION FACTOR A: 0.584 CORRECTION FACTOR B: 0.012



GENERAL NOTES AND OBSERVATIONS

CPT PUSHED FROM SURFACE. FOR SOIL PROFILE, SEE RECORD OF ADJACENT SHALLOW BOREHOLE NO. CPT-348.

--- CONTINUED NEXT PAGE ---

DEPTH SCALE

1 : 50

Golder Associates

OPERATOR: TA

CHECKED:

LDN_CPT_01 09-1132-0080-CPT.GPJ GLDR_LON.GDT 09/06/10 DATA INPUT:

PROJECT: 09-1132-0080

RECORD OF CONE PENETRATION TEST CPT-348

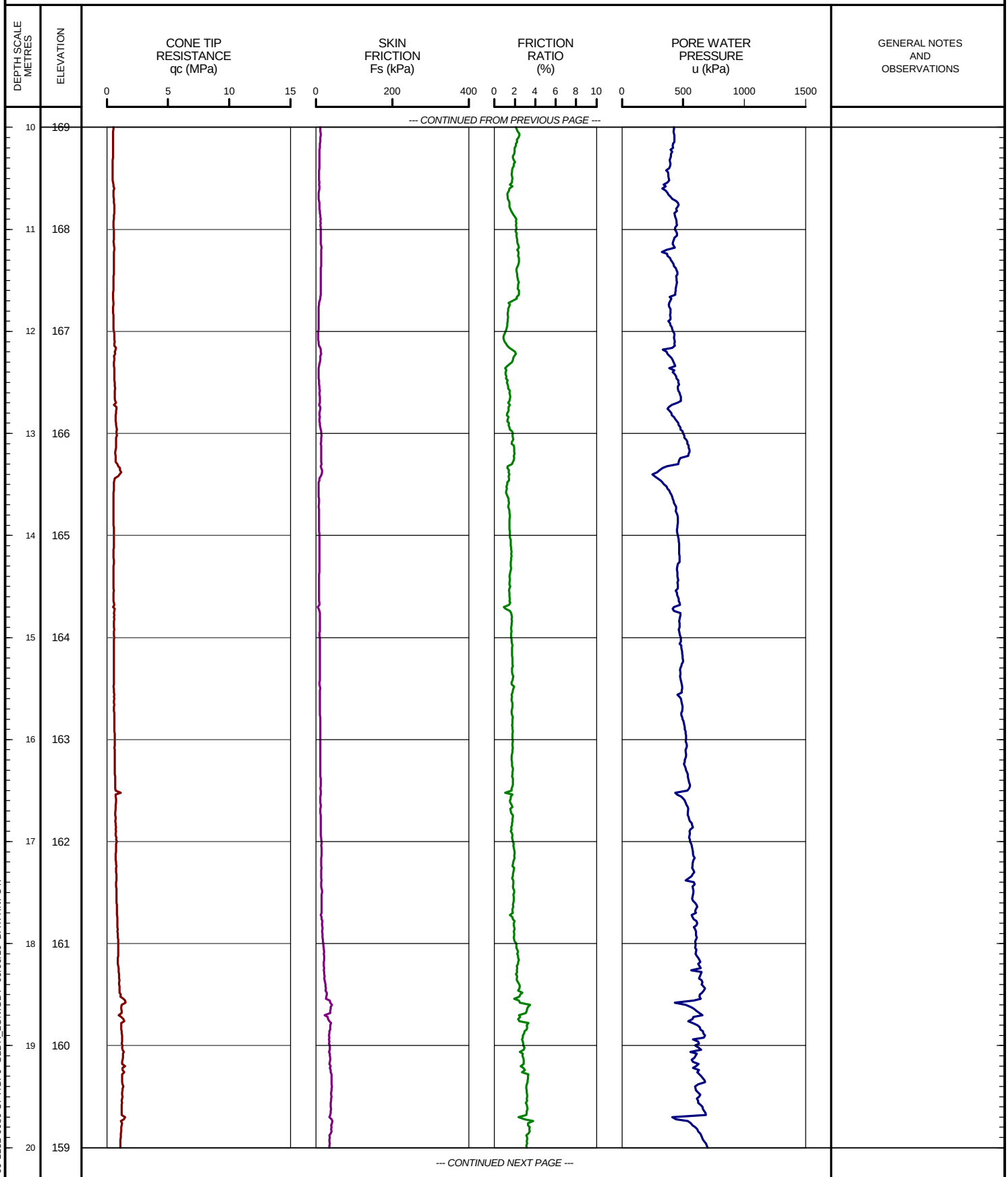
SHEET 2 OF 3

LOCATION: N 4682160.4 ;E 328512.5

TEST DATE: April 26, 2010

DATUM: GEODETIC

GROUND SURFACE ELEVATION: 179.15m PREDRILL DEPTH: 0.00m CORRECTION FACTOR A: 0.584 CORRECTION FACTOR B: 0.012



DEPTH SCALE

1 : 50

Golder Associates

OPERATOR: TA

CHECKED:

LDN_CPT_01 09-1132-0080-CPT.GPJ GLDR_LON.GDT 09/06/10 DATA INPUT:

PROJECT: 09-1132-0080

RECORD OF CONE PENETRATION TEST CPT-348

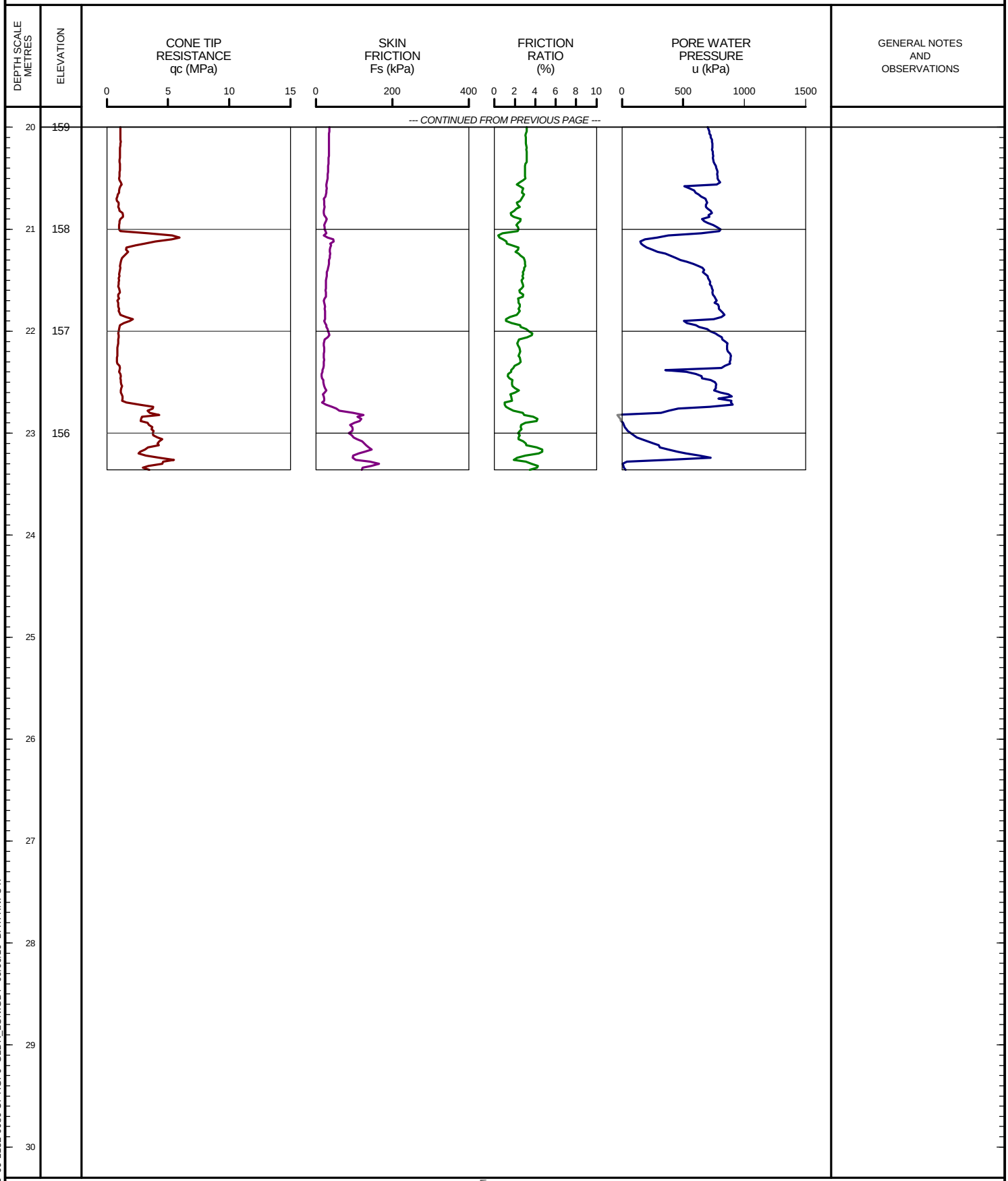
SHEET 3 OF 3

LOCATION: N 4682160.4 ;E 328512.5

TEST DATE: April 26, 2010

DATUM: GEODETIC

GROUND SURFACE ELEVATION: 179.15m PREDRILL DEPTH: 0.00m CORRECTION FACTOR A: 0.584 CORRECTION FACTOR B: 0.012



DEPTH SCALE

1 : 50

Golder Associates

OPERATOR: TA

CHECKED:

LDN_CPT_01 09-1132-0080-CPT.GPJ GLDR_LON.GDT 09/06/10 DATA INPUT:

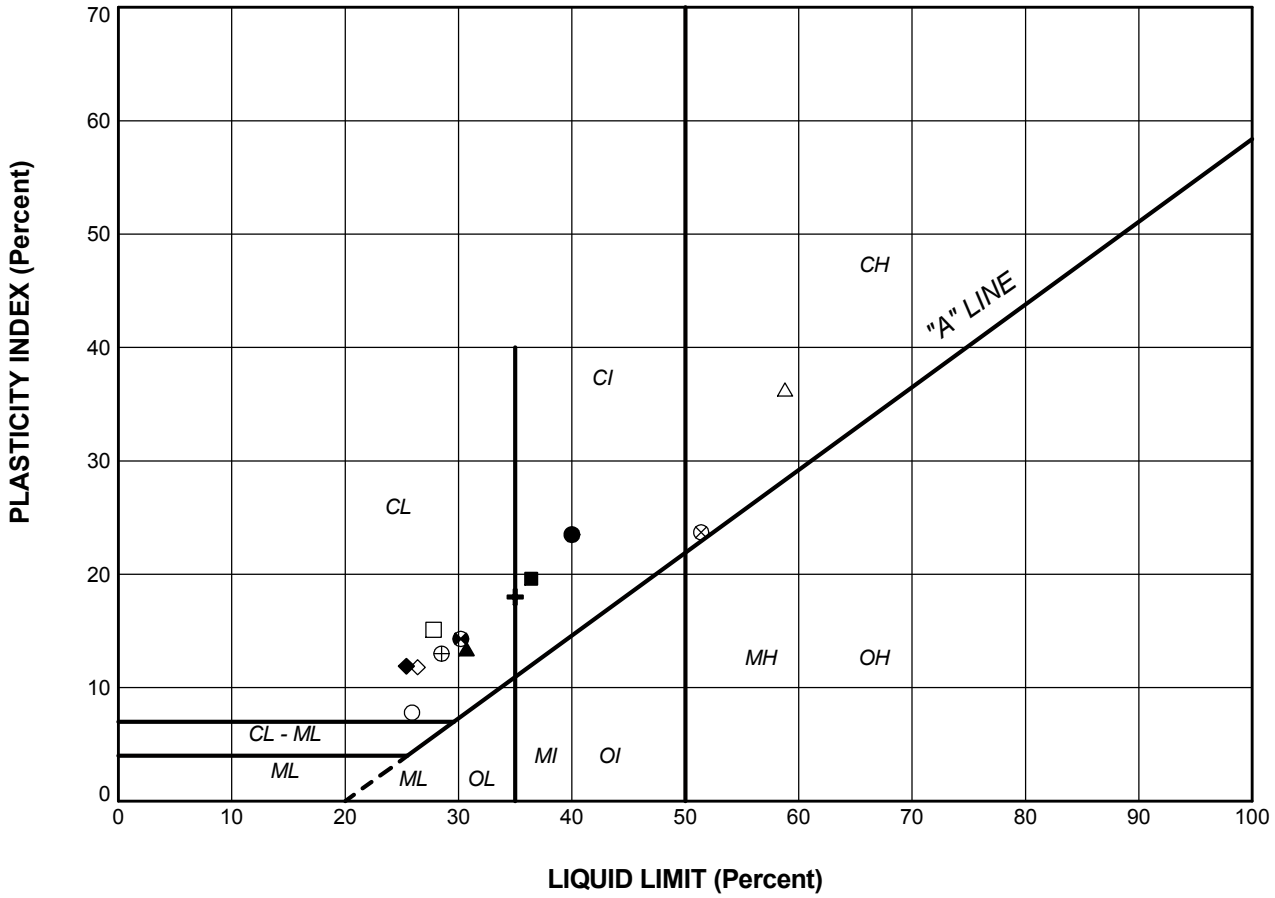
APPENDIX D

Laboratory Test Results

LABORATORY TEST DATA SUMMARY
Windsor-Essex Parkway

BOREHOLE	SAMPLE	Depth	Natural Water Content	Gravel	Sand	Silt	Clay	<75μm	Liquid Limit	Plastic Limit	Plasticity Index	Wet Unit Weight	Specific Gravity
No.	No.	(m)	(%)	(%)	(%)	(%)	(%)	(%)	(%)	(%)	(%)	(kN/m^3)	
BH-346	1b	0.91	15.7										
BH-346	2	1.52	22.1										
BH-346	3	2.29	26.0										
BH-346	4	3.05	25.1										
BH-346	5	3.81	31.8	0	1	68	31		40.0	16.5	23.5		
BH-346	6	4.57	38.0										
BH-346	8	5.79	42.2										
BH-346	9	7.32	32.2	3	17	39	41		36.4	16.8	19.6	18.79	2.77
BH-346	10	8.84	28.4	1	21	36	42		30.7	17.3	13.4		
BH-346	11	10.36	28.5	0	11	43	46		35.0	17.0	18.0	19.44	2.77
BH-346	12	11.89	40.4										
BH-346	13	13.41	20.5	5	24	44	27		25.4	13.5	11.9	20.76	2.74
BH-346	14	14.94	20.2										
BH-346	15	16.46	26.0										
BH-346	18	20.88	28.6						26.4	14.6	11.8		
BH-346	19	22.40	18.8										
BH-349	1	0.76	18.9										
BH-349	2	1.52	25.0	1	94			5					
BH-349	3	2.29	25.3										
BH-349	4	3.05	24.5	0	3	74	23		25.9	18.1	7.8		
BH-349	5	3.81	27.0										
BH-349	6	4.57	34.8										
BH-349	7	5.49	51.8	0	7	28	65		58.8	22.5	36.3	17.02	2.74
BH-349	8	6.10	42.4										
BH-349	10	8.84	62.4						51.4	27.7	23.7		
BH-349	11	10.36	25.4	2	12	52	34		28.5	15.5	13.0	19.08	2.74
BH-349	12	11.89	8.3										
BH-349	14	14.94	20.9	3	24	45	28		27.8	12.7	15.1	20.50	2.73
BH-349	15	16.46	23.4										
BH-349	16a	17.98	19.2										
BH-349	16b	18.08	16.6										
BH-349	17	19.51	15.1						30.2	15.9	14.3		
BH-349	19	22.56	17.3										
CPT-347	1	0.76	21.0										
CPT-347	2	1.52	23.6										
CPT-347	3	2.29	23.9										
CPT-348	1	0.76	14.1										
CPT-348	2a	1.52	23.7										
CPT-348	2b	1.83	21.6										
CPT-348	3	2.29	25.2										

Prepared By: MK
Checked By: SJB



SOIL TYPE
C = Clay
M = Silt
O = Organic

PLASTICITY
L = Low
I = Intermediate
H = High

LEGEND

SYMBOL	BOREHOLE	SAMPLE	LL(%)	PL(%)	PI
●	346	5	40.0	16.5	23.5
■	346	9	36.4	16.8	19.6
▲	346	10	30.7	17.3	13.4
✚	346	11	35.0	17.0	18.0
◆	346	13	25.4	13.5	11.9
◇	346	18	26.4	14.6	11.8
○	349	4	25.9	18.1	7.8
△	349	7	58.8	22.5	36.3
⊗	349	10	51.4	27.7	23.7
⊕	349	11	28.5	15.5	13.0
□	349	14	27.8	12.7	15.1
◓	349	17	30.2	15.9	14.3

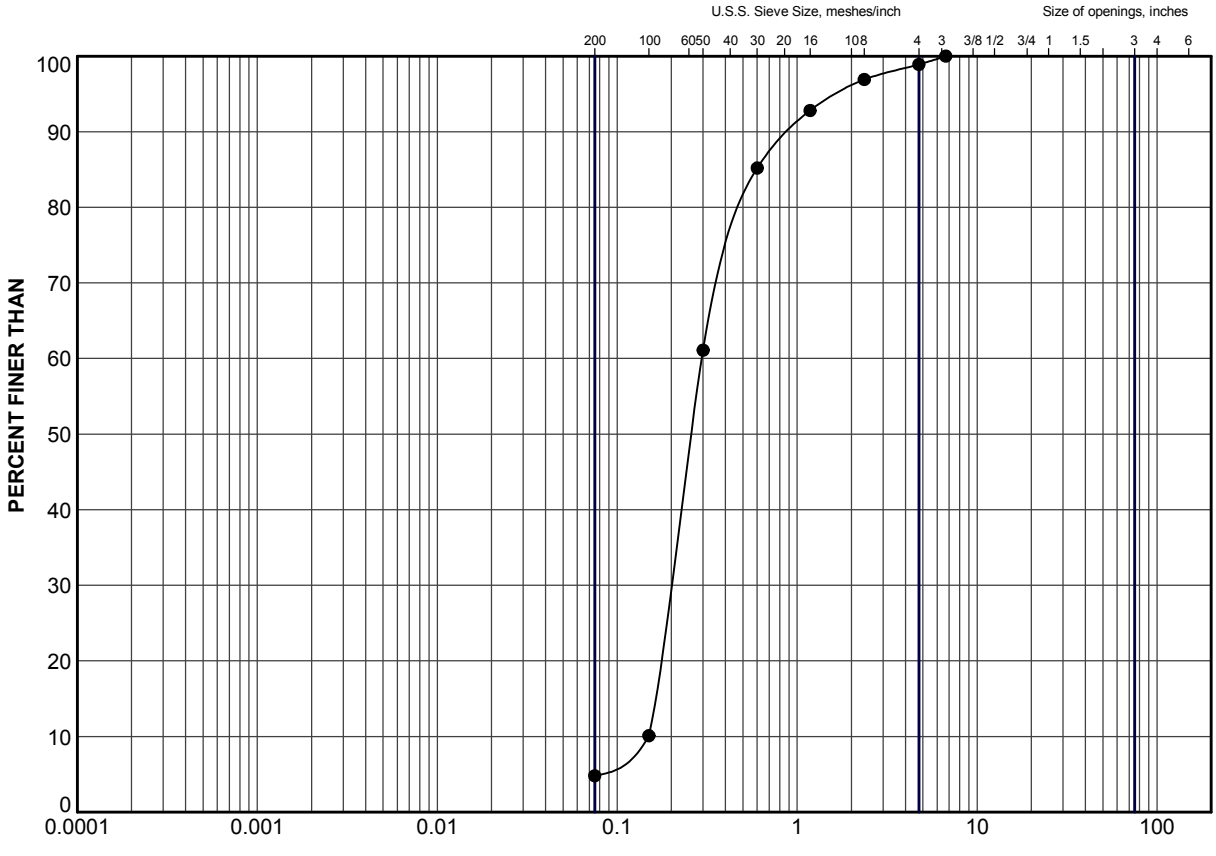
PROJECT
GEOTECHNICAL DATA REPORT - ADDENDUM NO. 7
WINDSOR-ESSEX PARKWAY
WINDSOR, ONTARIO

TITLE
PLASTICITY CHART

Golder Associates
LONDON, ONTARIO

PROJECT No.			09-1132-0080	FILE No 0911320080-7000-R020D1
			SCALE N/A	REV.
DRAWN	AG	June 8/10		
CHECK			**FIGURE D-1**	

MTO_PI GLDR_LDN.GDT



LEGEND

SYMBOL	BOREHOLE	SAMPLE	ELEV (m)
●	349	2	177.6

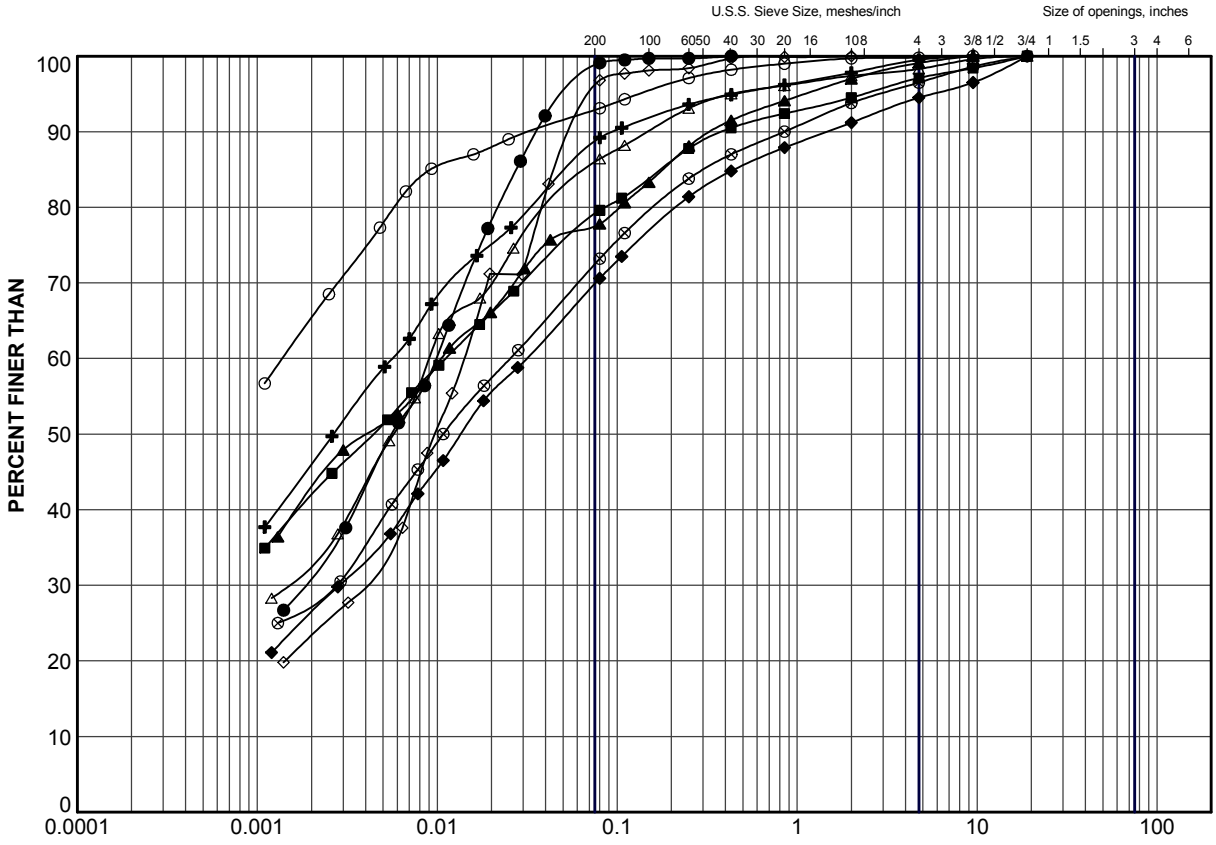
PROJECT
GEOTECHNICAL DATA REPORT - ADDENDUM NO. 7
WINDSOR-ESSEX PARKWAY
WINDSOR, ONTARIO

TITLE
GRAIN SIZE DISTRIBUTION
UPPER GRANULAR DEPOSITS

Golder Associates
LONDON, ONTARIO

PROJECT No.		09-1132-0080	FILE No0911320080-7000-R020D2
			SCALE N/A REV.
DRAWN	AG	June 8/10	
CHECK			**FIGURE D-2**

LDN_MTO_NEW GLDR_LDN.GDT



LEGEND

SYMBOL	BOREHOLE	SAMPLE	ELEV (m)
●	346	5	175.4
■	346	9	171.9
▲	346	10	170.4
✚	346	11	168.9
◆	346	13	165.8
◇	349	4	176.0
○	349	7	173.6
△	349	11	168.7
⊗	349	14	164.1

PROJECT
GEOTECHNICAL DATA REPORT - ADDENDUM NO. 7
WINDSOR-ESSEX PARKWAY
WINDSOR, ONTARIO

TITLE
GRAIN SIZE DISTRIBUTION
CLAYEY SILT TO SILTY CLAY DEPOSIT

Golder Associates
LONDON, ONTARIO

PROJECT No.		09-1132-0080	FILE No.0911320080-7000-R020D3
			SCALE N/A REV.
DRAWN	AG	June 8/10	
CHECK			**FIGURE D-3**

LDN_MTO_NEW GLDR_LDN.GDT

CONSOLIDATION TEST SUMMARY

FIGURE BH 346 SA 9 OED A

SAMPLE IDENTIFICATION

Project Number	09-1132-0080	Sample Number	9
Borehole Number	346	Sample Depth, m	7.3-7.8

TEST CONDITIONS

Test Type	Standard	Load Duration, hr	24
Oedometer Number	10		
Date Started	4/26/2010		
Date Completed	5/13/2010		

SAMPLE DIMENSIONS AND PROPERTIES - INITIAL

Sample Height, cm	2.54	Unit Weight, kN/m^3	18.79
Sample Diameter, cm	6.36	Dry Unit Weight, kN/m^3	14.21
Area, cm^2	31.72	Specific Gravity, measured	2.77
Volume, cm^3	80.57	Solids Height, cm	1.329
Water Content, %	32.17	Volume of Solids, cm^3	42.16
Wet Mass, g	154.33	Volume of Voids, cm^3	38.41
Dry Mass, g	116.77	Degree of Saturation, %	97.8

TEST COMPUTATIONS

Pressure kPa	Corr. Height cm	Void Ratio	Average Height cm	t_{90} sec	c_v cm^2/s	mv m^2/kN	k cm/s
0.00	2.540	0.911	2.540				
4.69	2.538	0.910	2.539	21	6.51E-02	1.68E-04	1.07E-06
9.52	2.536	0.908	2.537	735	1.86E-03	1.47E-04	2.67E-08
19.22	2.527	0.902	2.532	558	2.44E-03	3.61E-04	8.62E-08
38.57	2.508	0.887	2.517	289	4.65E-03	4.03E-04	1.84E-07
77.27	2.478	0.864	2.493	505	2.61E-03	3.04E-04	7.77E-08
38.82	2.484	0.869	2.481				
19.22	2.493	0.876	2.489				
4.69	2.513	0.891	2.503				
9.52	2.509	0.888	2.511	1185	1.13E-03	3.18E-04	3.51E-08
19.25	2.502	0.883	2.506	540	2.47E-03	2.79E-04	6.74E-08
38.62	2.492	0.875	2.497	558	2.37E-03	2.20E-04	5.10E-08
77.39	2.473	0.860	2.482	331	3.95E-03	1.92E-04	7.42E-08
154.67	2.429	0.828	2.451	540	2.36E-03	2.21E-04	5.11E-08
309.21	2.315	0.742	2.372	1297	9.20E-04	2.92E-04	2.63E-08
617.88	2.180	0.641	2.247	1162	9.22E-04	1.71E-04	1.54E-08
1235.80	2.061	0.551	2.121	667	1.43E-03	7.59E-05	1.06E-08
2477.09	1.954	0.470	2.008	577	1.48E-03	3.40E-05	4.94E-09
1235.80	1.961	0.475	1.957				
309.21	2.014	0.515	1.987				
77.39	2.087	0.570	2.050				
19.25	2.165	0.629	2.126				
4.69	2.223	0.673	2.194				

Note:
k calculated using cv based on t_{90} values.

SAMPLE DIMENSIONS AND PROPERTIES - FINAL

Sample Height, cm	2.22	Unit Weight, kN/m^3	20.29
Sample Diameter, cm	6.36	Dry Unit Weight, kN/m^3	16.24
Area, cm^2	31.72	Specific Gravity, measured	2.77
Volume, cm^3	70.51	Solids Height, cm	1.329
Water Content, %	24.96	Volume of Solids, cm^3	42.16
Wet Mass, g	145.91	Volume of Voids, cm^3	28.36
Dry Mass, g	116.77		

Prepared By: LFG

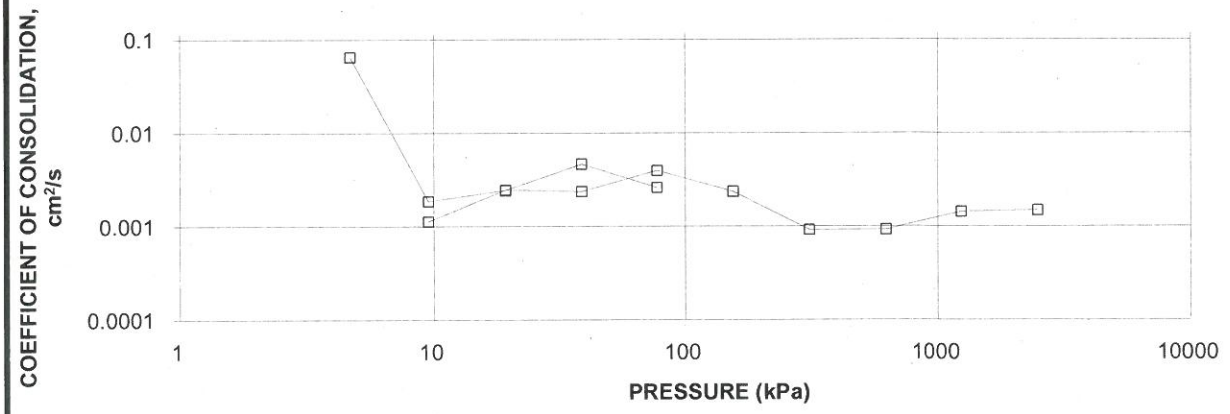
Golder Associates

Checked By: SJB

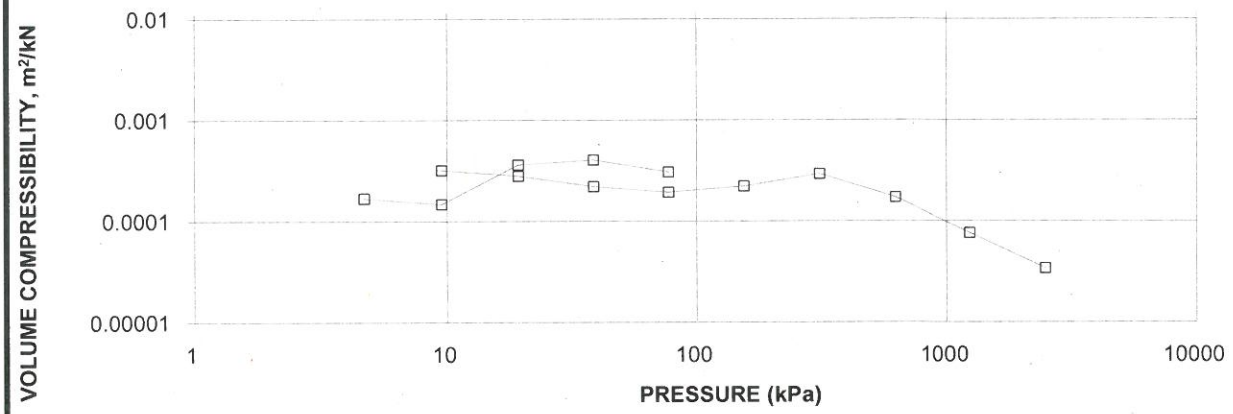
CONSOLIDATION TEST SUMMARY

FIGURE BH 346 SA 9 OED B

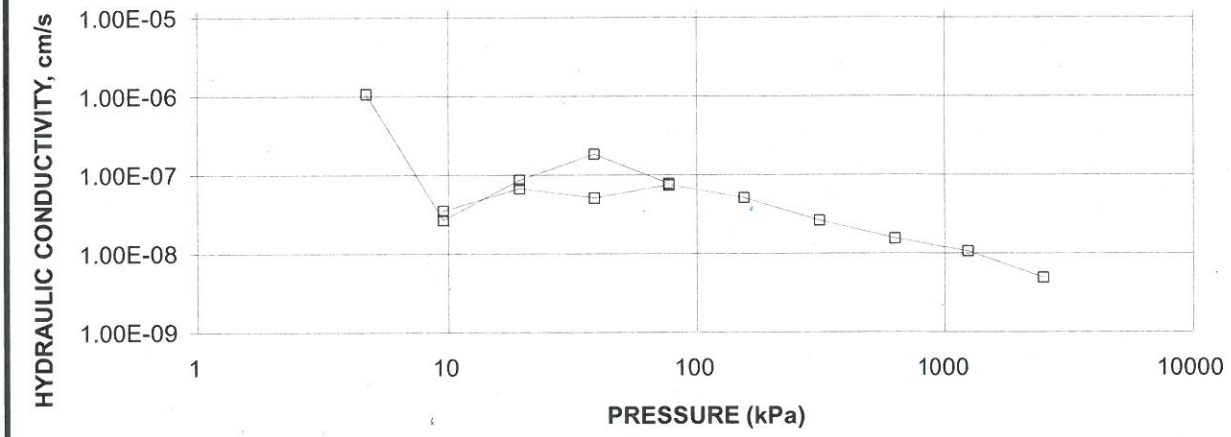
CONSOLIDATION TEST
C_V cm²/s VS PRESSURE (kPa)
BH 346 SA 9



CONSOLIDATION TEST
M_V m²/kN vs PRESSURE (kPa)
BH 346 SA 9



CONSOLIDATION TEST
HYDRAULIC CONDUCTIVITY vs PRESSURE
BH 346 SA 9



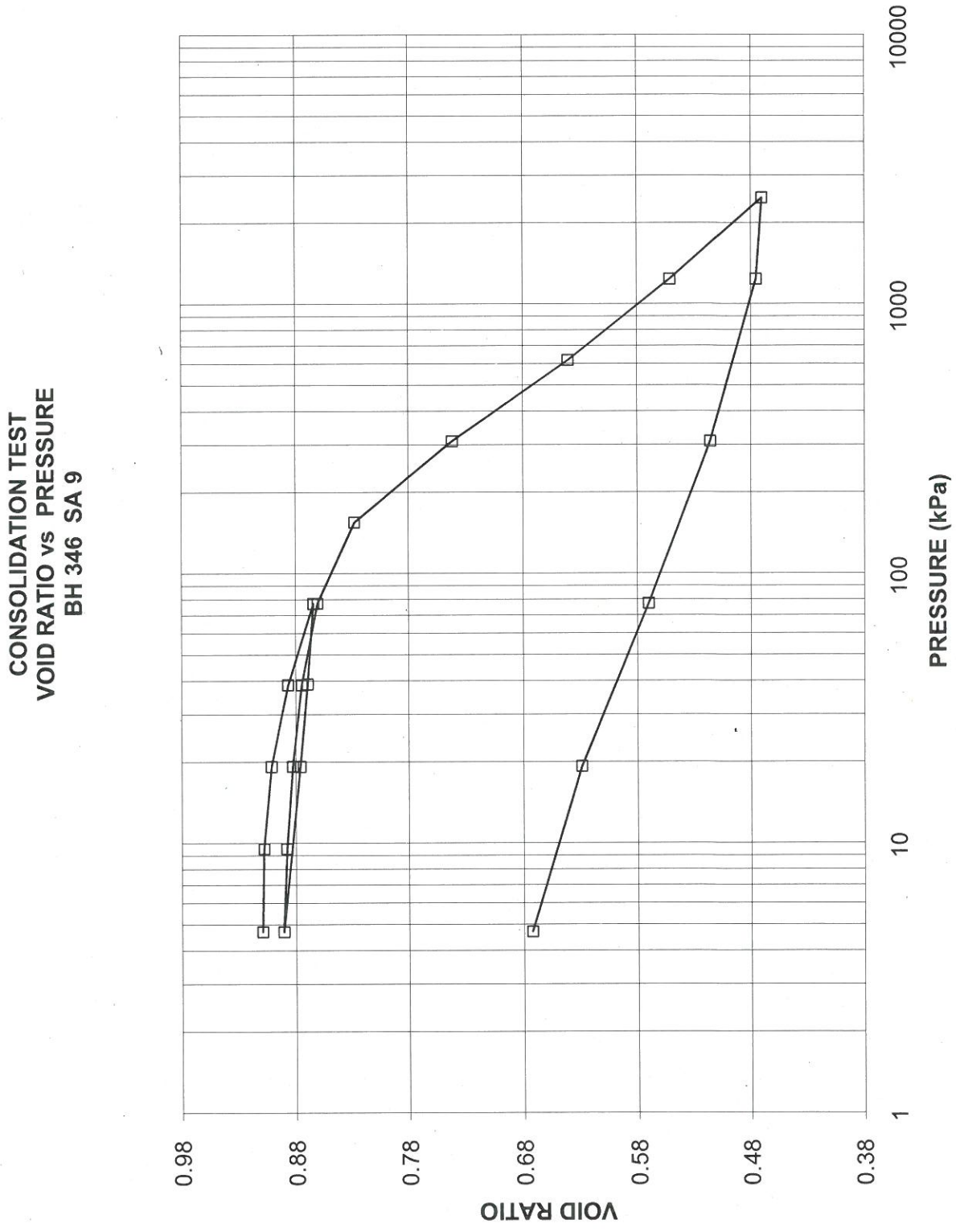
Project No. 09-1132-0080
Prepared By: LFG

Golder Associates

Checked By: SJB

CONSOLIDATION TEST
VOID RATIO VS LOG PRESSURE

FIGURE BH 346 SA 9 OED C



Project No. 09-1132-0080

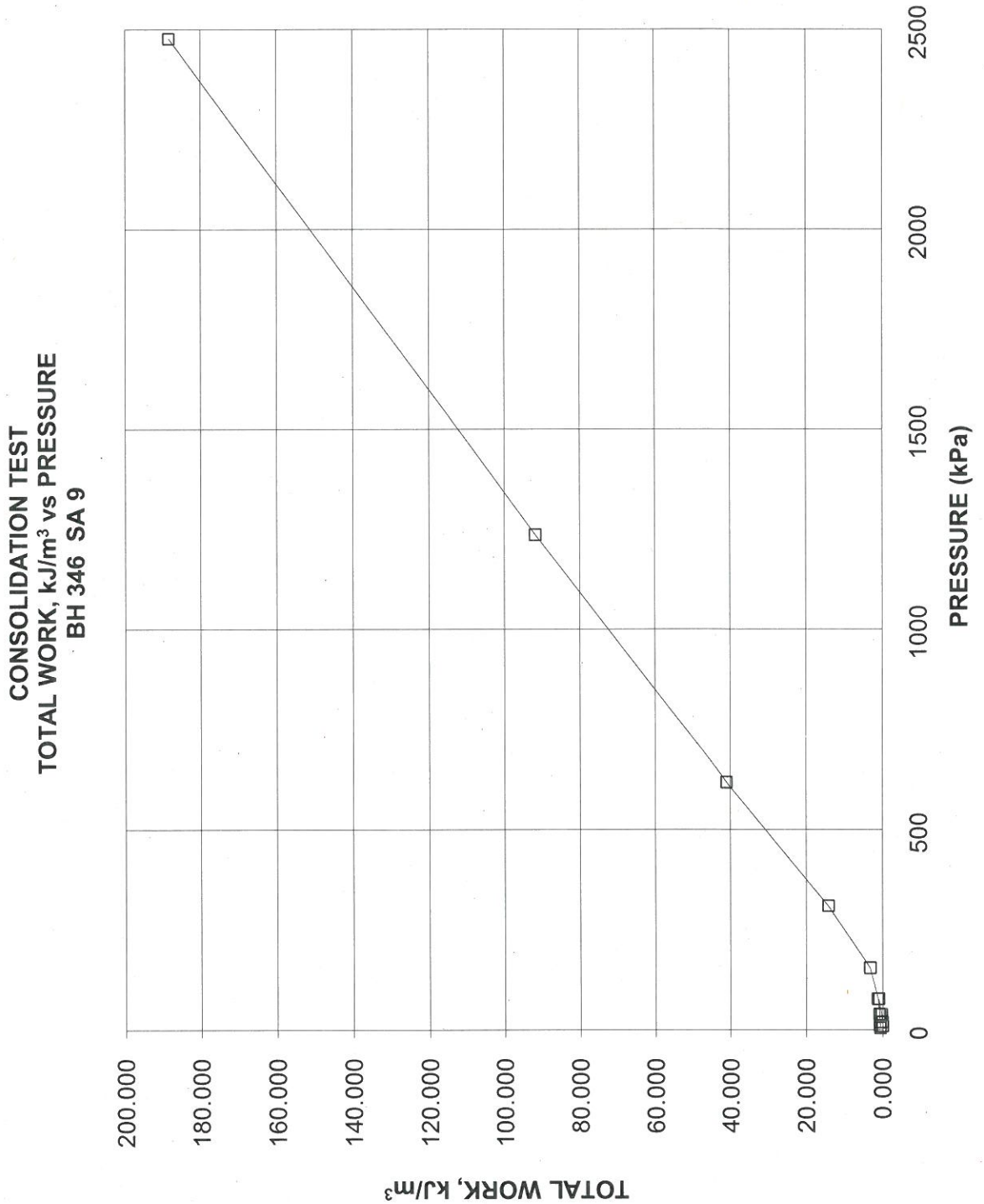
Prepared By: LFG

Golder Associates

Checked By: SJB

CONSOLIDATION TEST
TOTAL WORK VS PRESSURE

FIGURE BH 346 SA 9 OED D



Project No. 09-1132-0080

Prepared By: LFG

Golder Associates

Checked By: SJB

CONSOLIDATION TEST SUMMARY

FIGURE BH 346 SA 11 OED A

SAMPLE IDENTIFICATION

Project Number	09-1132-0080	Sample Number	11
Borehole Number	346	Sample Depth, m	10.4-10.8

TEST CONDITIONS

Test Type	Standard	Load Duration, hr	24
Oedometer Number	3		
Date Started	4/27/2010		
Date Completed	5/16/2010		

SAMPLE DIMENSIONS AND PROPERTIES - INITIAL

Sample Height, cm	2.54	Unit Weight, kN/m^3	19.44
Sample Diameter, cm	6.32	Dry Unit Weight, kN/m^3	15.13
Area, cm^2	31.32	Specific Gravity, measured	2.77
Volume, cm^3	79.56	Solids Height, cm	1.41
Water Content, %	28.47	Volume of Solids, cm^3	44.31
Wet Mass, g	157.68	Volume of Voids, cm^3	35.25
Dry Mass, g	122.74	Degree of Saturation, %	99.1

TEST COMPUTATIONS

Pressure kPa	Corr. Height cm	Void Ratio	Average Height cm	t_{90} sec	c_v cm^2/s	mv m^2/kN	k cm/s
0.00	2.540	0.795	2.540				
4.88	2.537	0.793	2.538	290	4.71E-03	2.82E-04	1.30E-07
9.65	2.529	0.787	2.533	1307	1.04E-03	6.60E-04	6.73E-08
19.71	2.518	0.780	2.523	1109	1.22E-03	4.30E-04	5.13E-08
39.12	2.497	0.765	2.507	634	2.10E-03	4.18E-04	8.61E-08
78.25	2.468	0.745	2.482	623	2.10E-03	2.91E-04	5.98E-08
39.12	2.474	0.748	2.471				
19.71	2.480	0.753	2.477				
4.88	2.494	0.763	2.487				
9.65	2.493	0.762	2.493	346	3.81E-03	1.57E-04	5.85E-08
19.47	2.489	0.759	2.491	581	2.26E-03	1.60E-04	3.56E-08
39.07	2.479	0.752	2.484	540	2.42E-03	1.93E-04	4.58E-08
78.24	2.464	0.742	2.471	317	4.08E-03	1.50E-04	6.00E-08
155.37	2.422	0.712	2.443	505	2.51E-03	2.15E-04	5.28E-08
313.01	2.331	0.647	2.376	1014	1.18E-03	2.28E-04	2.64E-08
626.36	2.233	0.578	2.282	694	1.59E-03	1.23E-04	1.92E-08
1250.71	2.132	0.507	2.182	463	2.18E-03	6.38E-05	1.36E-08
2499.28	2.039	0.441	2.085	277	3.33E-03	2.94E-05	9.57E-09
1250.71	2.044	0.445	2.041				
313.01	2.087	0.475	2.066				
78.24	2.143	0.515	2.115				
19.71	2.196	0.553	2.170				
4.88	2.235	0.580	2.216				

Note:
k calculated using cv based on t_{90} values.

SAMPLE DIMENSIONS AND PROPERTIES - FINAL

Sample Height, cm	2.24	Unit Weight, kN/m^3	20.90
Sample Diameter, cm	6.32	Dry Unit Weight, kN/m^3	17.19
Area, cm^2	31.32	Specific Gravity, measured	2.77
Volume, cm^3	70.02	Solids Height, cm	1.41
Water Content, %	21.60	Volume of Solids, cm^3	44.31
Wet Mass, g	149.25	Volume of Voids, cm^3	25.70
Dry Mass, g	122.74		

Prepared By: LFG

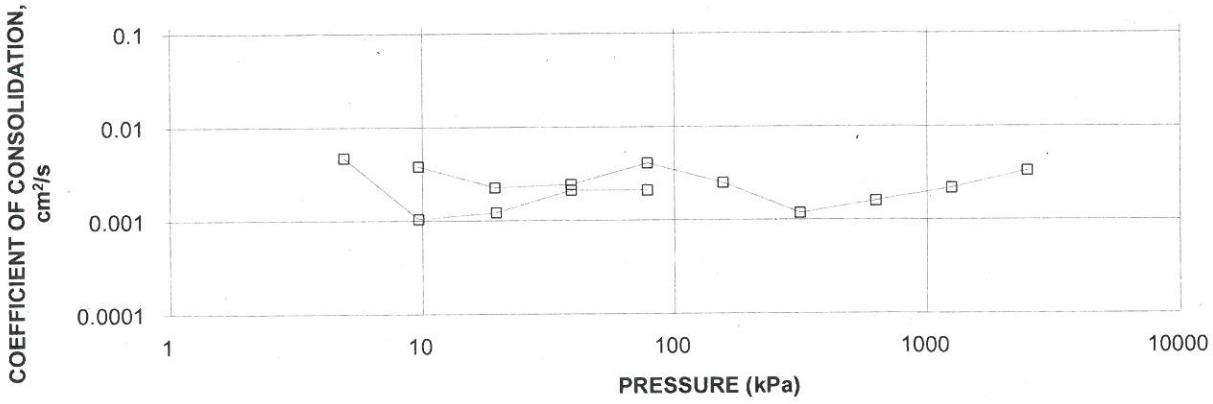
Golder Associates

Checked By: SJB

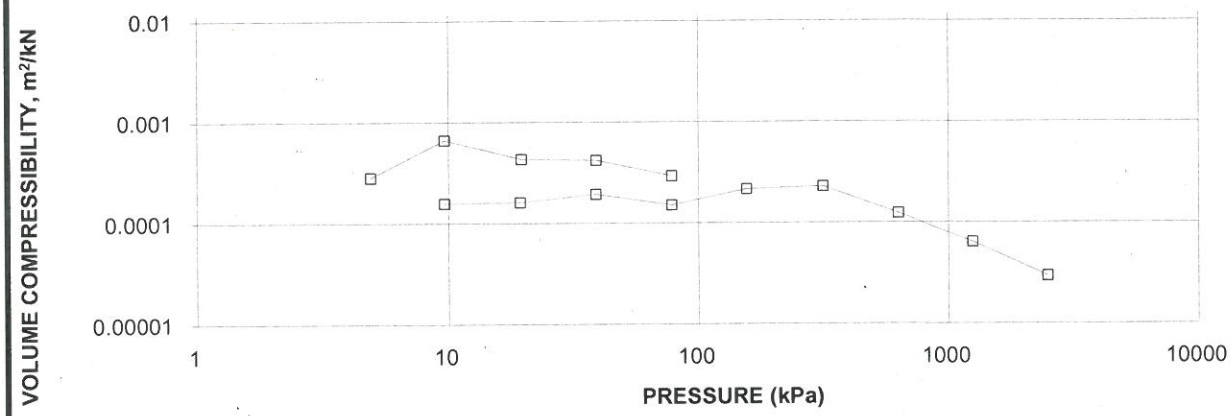
CONSOLIDATION TEST SUMMARY

FIGURE BH 346 SA 11 OED B

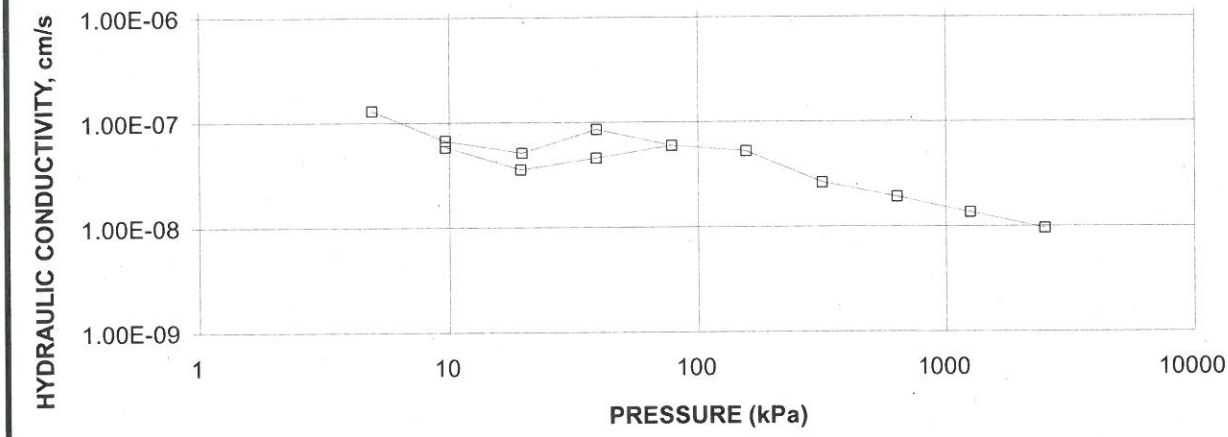
CONSOLIDATION TEST
C_V cm²/s VS PRESSURE (kPa)
BH 346 SA 11



CONSOLIDATION TEST
M_V m²/kN vs PRESSURE (kPa)
BH 346 SA 11



CONSOLIDATION TEST
HYDRAULIC CONDUCTIVITY vs PRESSURE
BH 346 SA 11



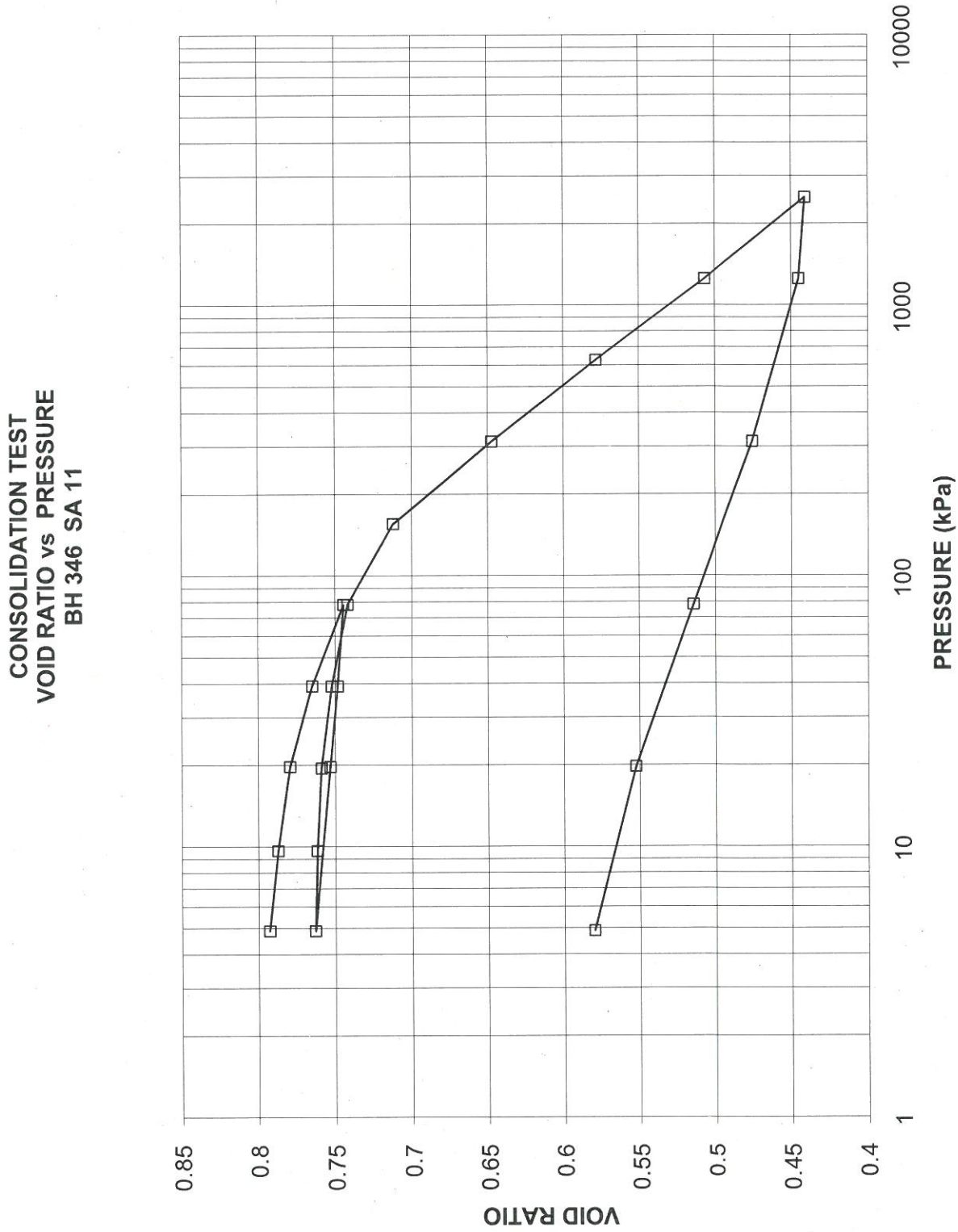
Project No. 09-1132-0080
Prepared By: LFG

Golder Associates

Checked By: SJB

CONSOLIDATION TEST
VOID RATIO VS LOG PRESSURE

FIGURE BH 346 SA11 OED C



Project No. 09-1132-0080

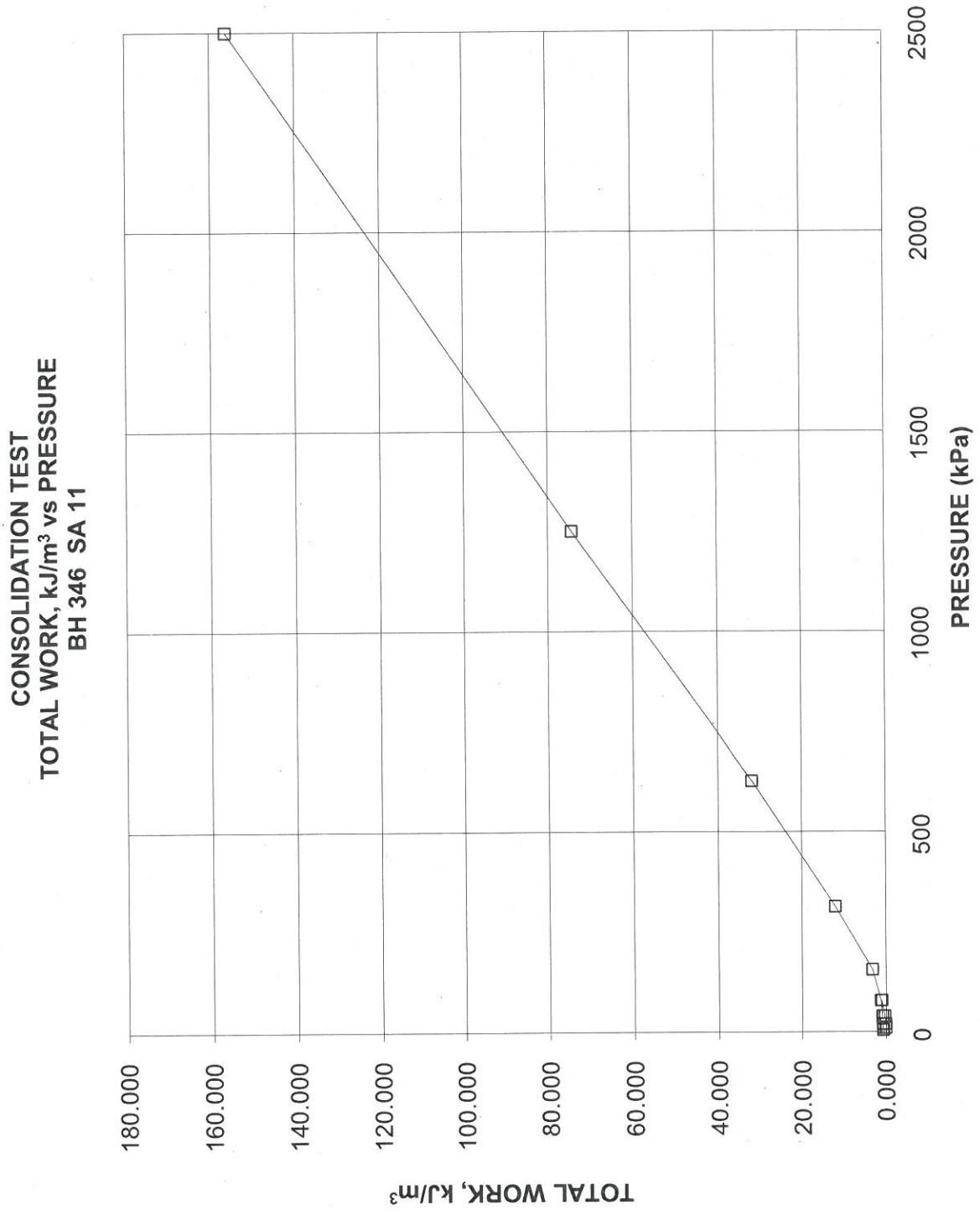
Prepared By: LFG

Golder Associates

Checked By: SJB

CONSOLIDATION TEST
TOTAL WORK VS PRESSURE

FIGURE BH 346 SA11 OED D



Project No. 09-1132-0080

Prepared By: LFG

Golder Associates

Checked By: SJB

CONSOLIDATION TEST SUMMARY

FIGURE BH 346 SA 13 OED A

SAMPLE IDENTIFICATION

Project Number	09-1132-0080	Sample Number	13
Borehole Number	346	Sample Depth, m	13.4-13.9

TEST CONDITIONS

Test Type	Standard	Load Duration, hr	24
Oedometer Number	2		
Date Started	4/27/2010		
Date Completed	5/16/2010		

SAMPLE DIMENSIONS AND PROPERTIES - INITIAL

Sample Height, cm	2.55	Unit Weight, kN/m^3	20.76
Sample Diameter, cm	6.32	Dry Unit Weight, kN/m^3	17.23
Area, cm^2	31.37	Specific Gravity, measured	2.74
Volume, cm^3	79.84	Solids Height, cm	1.632
Water Content, %	20.50	Volume of Solids, cm^3	51.19
Wet Mass, g	169.03	Volume of Voids, cm^3	28.64
Dry Mass, g	140.27	Degree of Saturation, %	100.4

TEST COMPUTATIONS

Pressure kPa	Corr. Height cm	Void Ratio	Average Height cm	t_{90} sec	c_v cm^2/s	mv m^2/kN	k cm/s
0.00	2.545	0.560	2.545				
4.80	2.527	0.549	2.536	2774	4.92E-04	1.47E-03	7.10E-08
9.62	2.518	0.543	2.522	2940	4.59E-04	7.66E-04	3.45E-08
19.43	2.502	0.533	2.510	1270	1.05E-03	6.45E-04	6.64E-08
39.05	2.477	0.518	2.489	1162	1.13E-03	4.97E-04	5.50E-08
78.25	2.443	0.497	2.460	1127	1.14E-03	3.43E-04	3.82E-08
39.05	2.446	0.499	2.444				
19.43	2.453	0.503	2.449				
4.80	2.466	0.511	2.460				
9.62	2.461	0.508	2.463	821	1.57E-03	4.48E-04	6.88E-08
19.59	2.456	0.505	2.458	1014	1.26E-03	2.01E-04	2.49E-08
39.05	2.450	0.501	2.453	623	2.05E-03	1.17E-04	2.35E-08
77.63	2.439	0.494	2.444	522	2.43E-03	1.14E-04	2.71E-08
155.73	2.397	0.469	2.418	505	2.45E-03	2.09E-04	5.02E-08
312.10	2.339	0.433	2.368	759	1.57E-03	1.47E-04	2.26E-08
624.16	2.274	0.394	2.306	540	2.09E-03	8.07E-05	1.65E-08
1249.34	2.207	0.352	2.240	359	2.96E-03	4.27E-05	1.24E-08
2497.92	2.131	0.306	2.169	252	3.96E-03	2.38E-05	9.21E-09
1249.34	2.141	0.312	2.136				
312.10	2.171	0.330	2.156				
77.63	2.210	0.354	2.190				
19.59	2.250	0.379	2.230				
4.80	2.282	0.398	2.266				

Note:
k calculated using cv based on t_{90} values.

SAMPLE DIMENSIONS AND PROPERTIES - FINAL

Sample Height, cm	2.28	Unit Weight, kN/m^3	22.15
Sample Diameter, cm	6.32	Dry Unit Weight, kN/m^3	19.21
Area, cm^2	31.37	Specific Gravity, measured	2.74
Volume, cm^3	71.59	Solids Height, cm	1.632
Water Content, %	15.30	Volume of Solids, cm^3	51.19
Wet Mass, g	161.73	Volume of Voids, cm^3	20.40
Dry Mass, g	140.27		

Prepared By: LFG

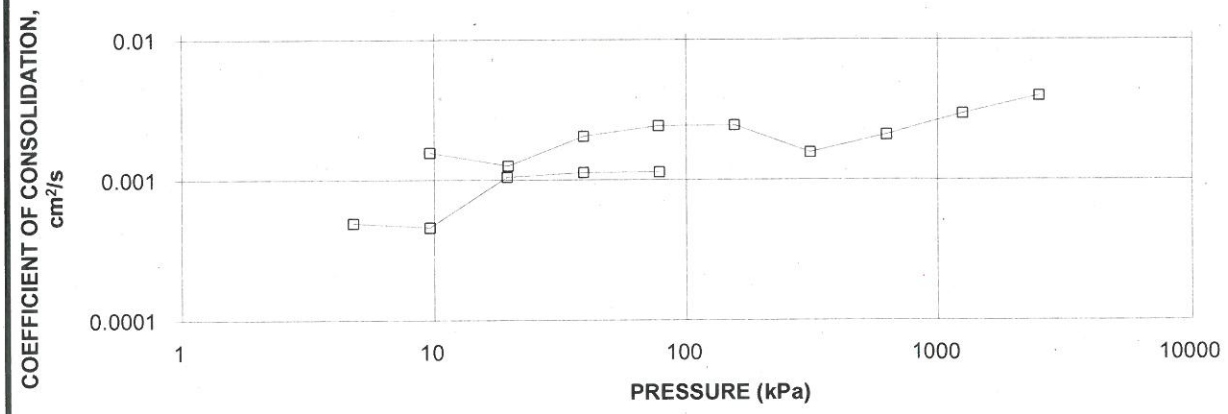
Golder Associates

Checked By: SDB

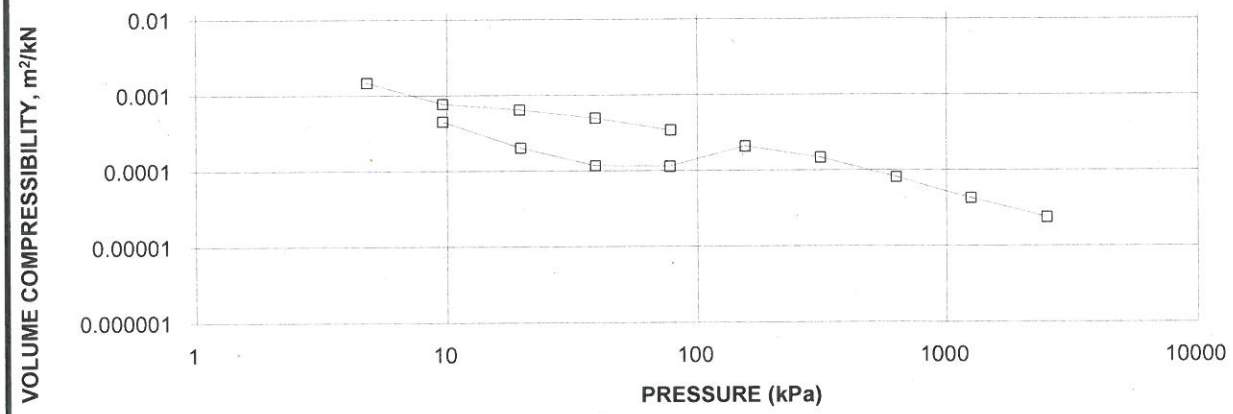
CONSOLIDATION TEST SUMMARY

FIGURE BH 346 SA 13 OED E

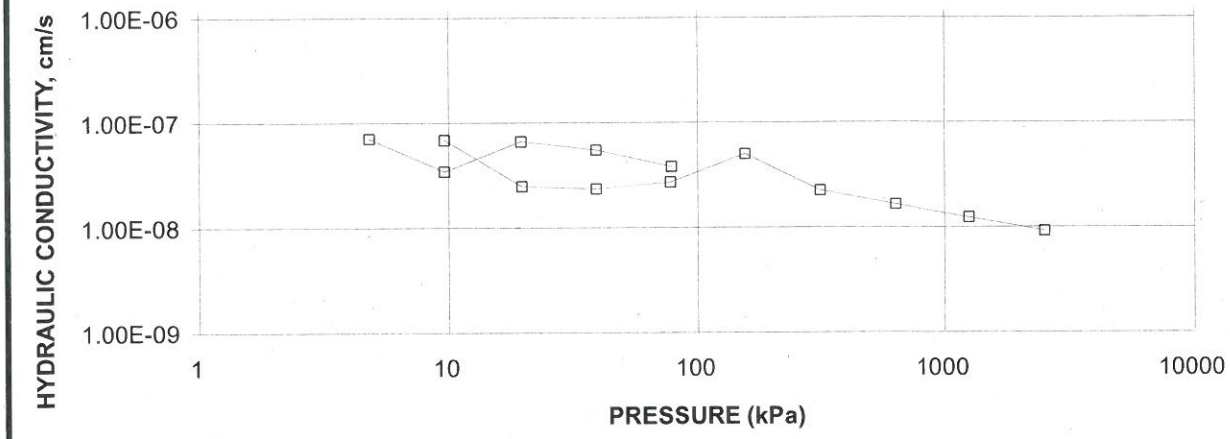
CONSOLIDATION TEST
C_V cm²/s VS PRESSURE (kPa)
BH 346 SA 13



CONSOLIDATION TEST
M_V m²/kN vs PRESSURE (kPa)
BH 346 SA 13



CONSOLIDATION TEST
HYDRAULIC CONDUCTIVITY vs PRESSURE
BH 346 SA 13



Project No. 09-1132-0080

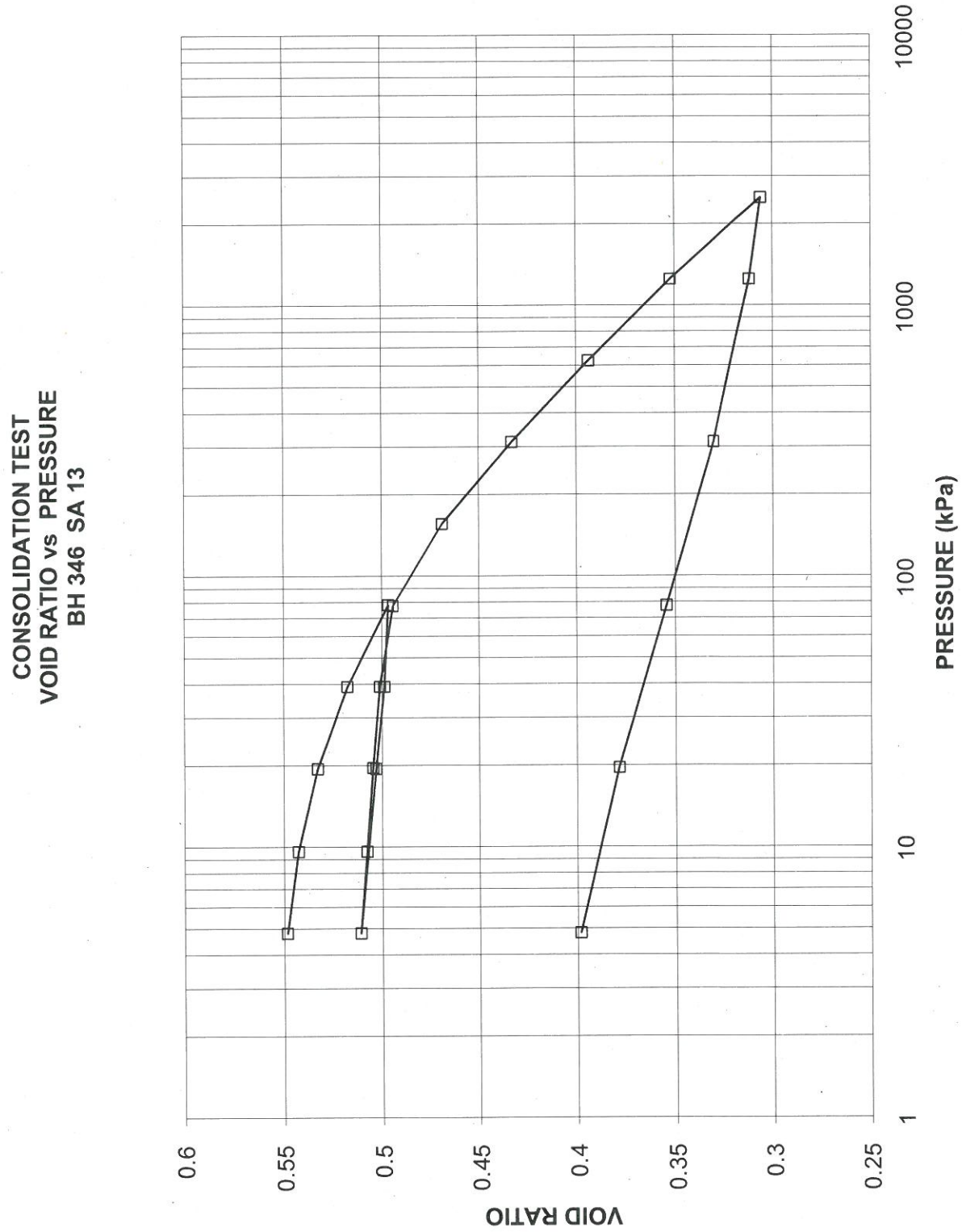
Prepared By: LFG

Golder Associates

Checked By: SJB

CONSOLIDATION TEST
VOID RATIO VS LOG PRESSURE

FIGURE BH 346 SA 13 OED C



Project No. 09-1132-0080

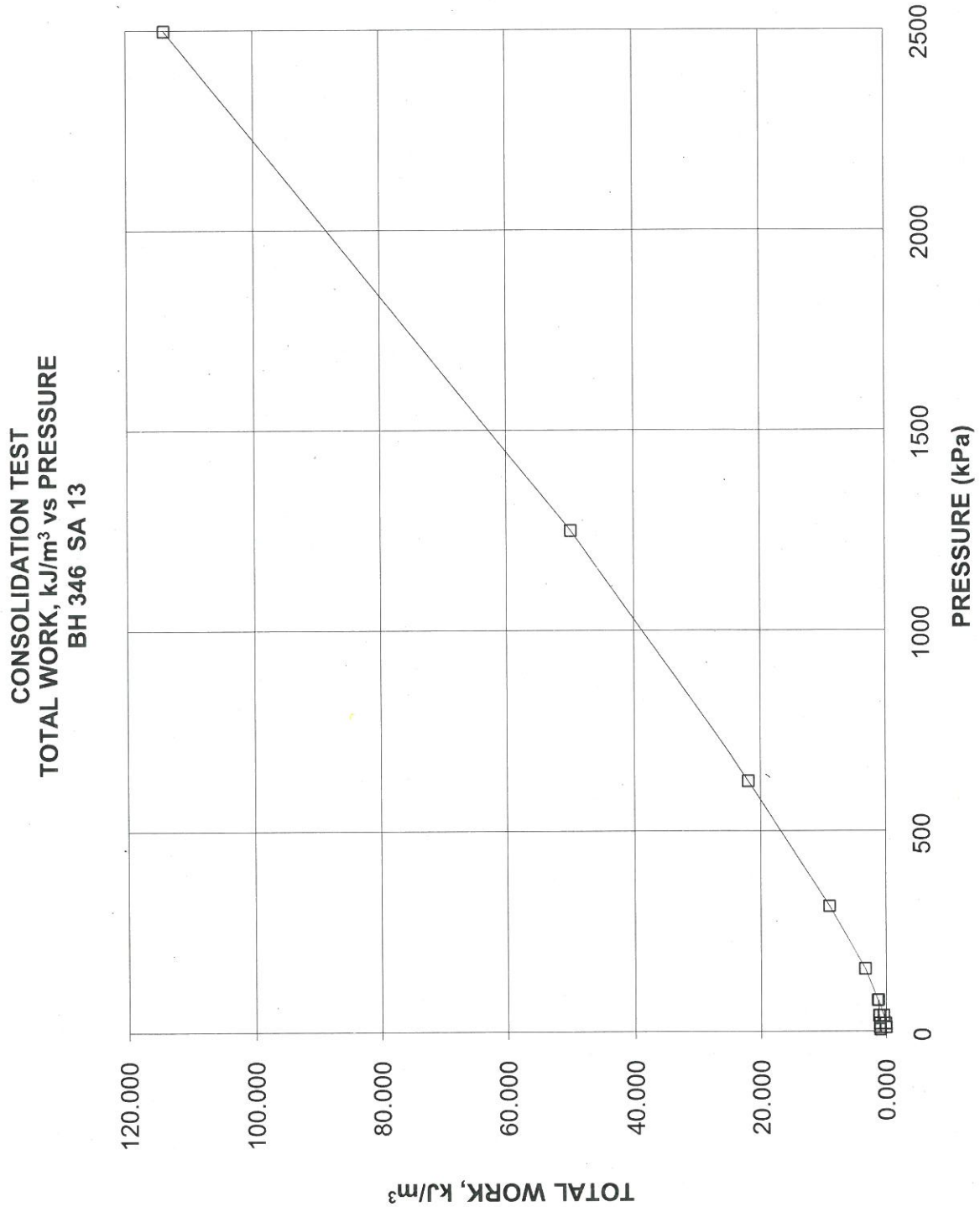
Prepared By: LFG

Golder Associates

Checked By: SJB

CONSOLIDATION TEST
TOTAL WORK VS PRESSURE

FIGURE BH 346 SA 13 OED D



Project No. 09-1132-0080

Prepared By: LFG

Golder Associates

Checked By: SJB

CONSOLIDATION TEST SUMMARY

FIGURE BH 349 SA 7 OED A

SAMPLE IDENTIFICATION

Project Number	09-1132-0080	Sample Number	7
Borehole Number	349	Sample Depth, m	5.5-5.9

TEST CONDITIONS

Test Type	Standard	Load Duration, hr	24
Oedometer Number	11		
Date Started	5/4/2010		
Date Completed	5/23/2010		

SAMPLE DIMENSIONS AND PROPERTIES - INITIAL

Sample Height, cm	2.54	Unit Weight, kN/m^3	17.02
Sample Diameter, cm	6.31	Dry Unit Weight, kN/m^3	11.21
Area, cm^2	31.27	Specific Gravity, measured	2.74
Volume, cm^3	79.43	Solids Height, cm	1.060
Water Content, %	51.77	Volume of Solids, cm^3	33.14
Wet Mass, g	137.82	Volume of Voids, cm^3	46.29
Dry Mass, g	90.81	Degree of Saturation, %	101.6

TEST COMPUTATIONS

Pressure kPa	Corr. Height cm	Void Ratio	Average Height cm	t_{90} sec	c_v cm^2/s	mv m^2/kN	k cm/s
0.00	2.540	1.397	2.540				
4.89	2.539	1.396	2.539	1	1.37E+00	8.86E-05	1.19E-05
9.57	2.538	1.395	2.538	43	3.18E-02	7.57E-05	2.36E-07
19.52	2.534	1.391	2.536	163	8.36E-03	1.62E-04	1.33E-07
39.17	2.504	1.363	2.519	205	6.56E-03	6.01E-04	3.87E-07
19.50	2.513	1.371	2.508				
9.57	2.519	1.377	2.516				
4.91	2.521	1.379	2.520				
9.57	2.520	1.378	2.521	216	6.24E-03	5.07E-05	3.10E-08
19.74	2.516	1.374	2.518	368	3.65E-03	1.74E-04	6.24E-08
39.38	2.504	1.363	2.510	305	4.38E-03	2.41E-04	1.03E-07
78.38	2.478	1.338	2.491	645	2.04E-03	2.63E-04	5.27E-08
156.54	2.423	1.286	2.450	693	1.84E-03	2.78E-04	5.00E-08
313.17	2.283	1.154	2.353	1135	1.03E-03	3.52E-04	3.56E-08
626.50	2.087	0.969	2.185	1984	5.10E-04	2.46E-04	1.23E-08
1252.53	1.916	0.808	2.001	1185	7.17E-04	1.07E-04	7.55E-09
2506.45	1.759	0.660	1.837	1070	6.69E-04	4.92E-05	3.23E-09
1252.53	1.787	0.686	1.773				
313.17	1.880	0.773	1.833				
78.38	1.993	0.880	1.936				
19.74	2.105	0.986	2.049				
4.89	2.182	1.059	2.144				

Note:
k calculated using cv based on t_{90} values.
Specimen swelled under 10kPa

SAMPLE DIMENSIONS AND PROPERTIES - FINAL

Sample Height, cm	2.18	Unit Weight, kN/m^3	18.46
Sample Diameter, cm	6.31	Dry Unit Weight, kN/m^3	13.05
Area, cm^2	31.27	Specific Gravity, measured	2.74
Volume, cm^3	68.23	Solids Height, cm	1.060
Water Content, %	41.45	Volume of Solids, cm^3	33.14
Wet Mass, g	128.45	Volume of Voids, cm^3	35.09
Dry Mass, g	90.81		

Prepared By: LFG

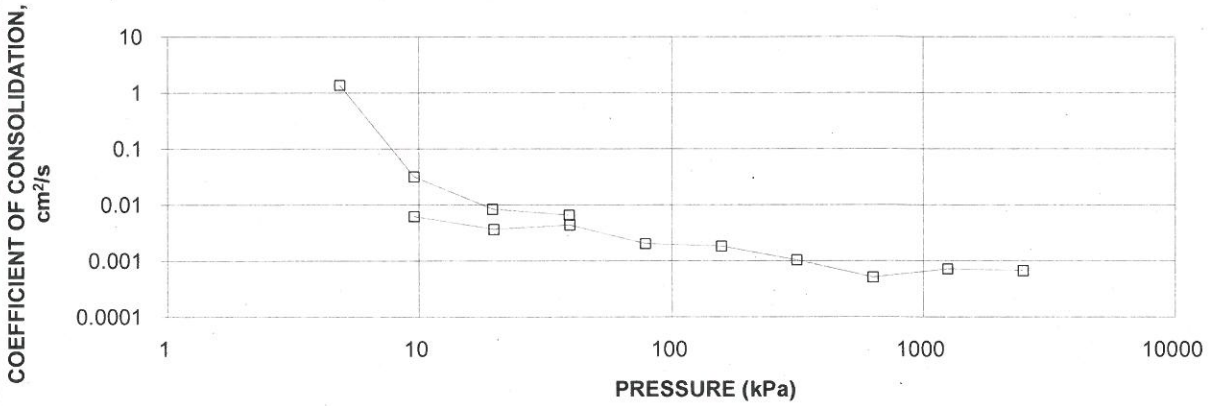
Golder Associates

Checked By: SJB

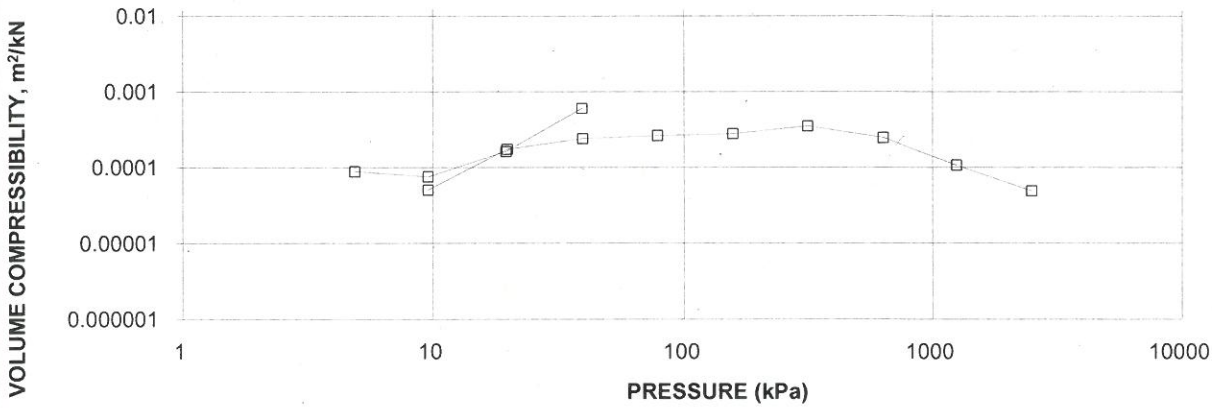
CONSOLIDATION TEST SUMMARY

FIGURE BH 349 SA 7 OED B

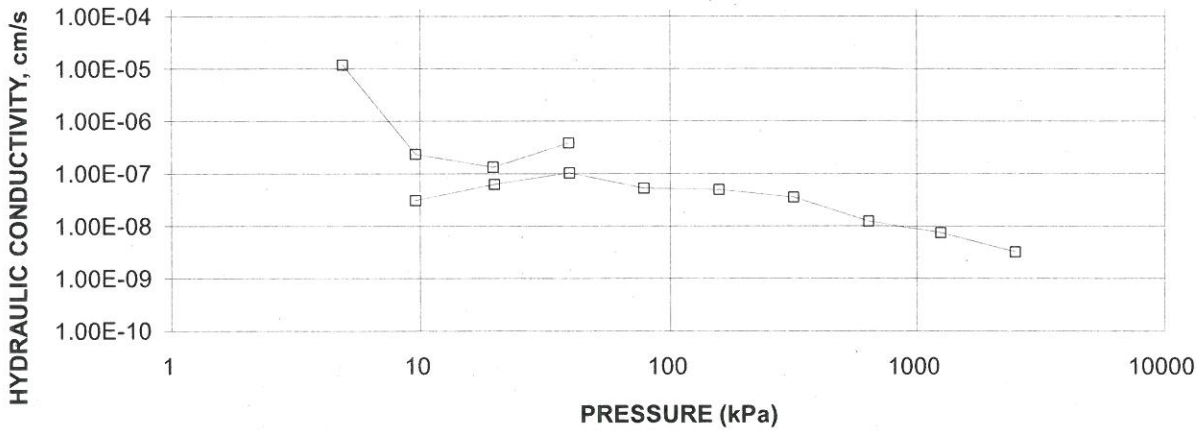
CONSOLIDATION TEST
C_v cm²/s VS PRESSURE (kPa)
BH 349 SA 7



CONSOLIDATION TEST
M_v m²/kN vs PRESSURE (kPa)
BH 349 SA 7



CONSOLIDATION TEST
HYDRAULIC CONDUCTIVITY vs PRESSURE
BH 349 SA 7



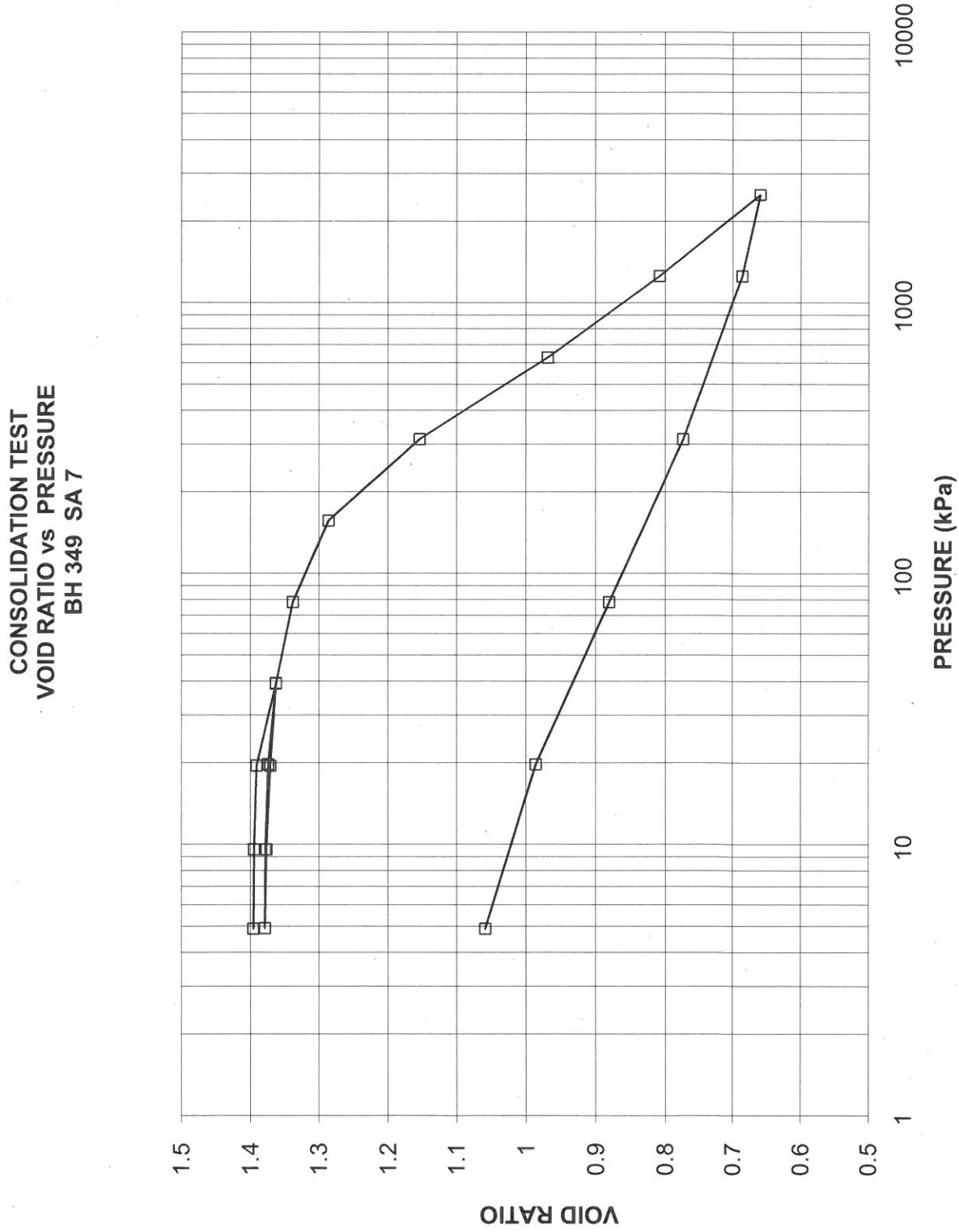
Project No. 09-1132-0080
Prepared By: LFG

Golder Associates

Checked By: SJB

CONSOLIDATION TEST
VOID RATIO VS LOG PRESSURE

FIGURE BH 349 SA 7 OED C



Project No. 09-1132-0080

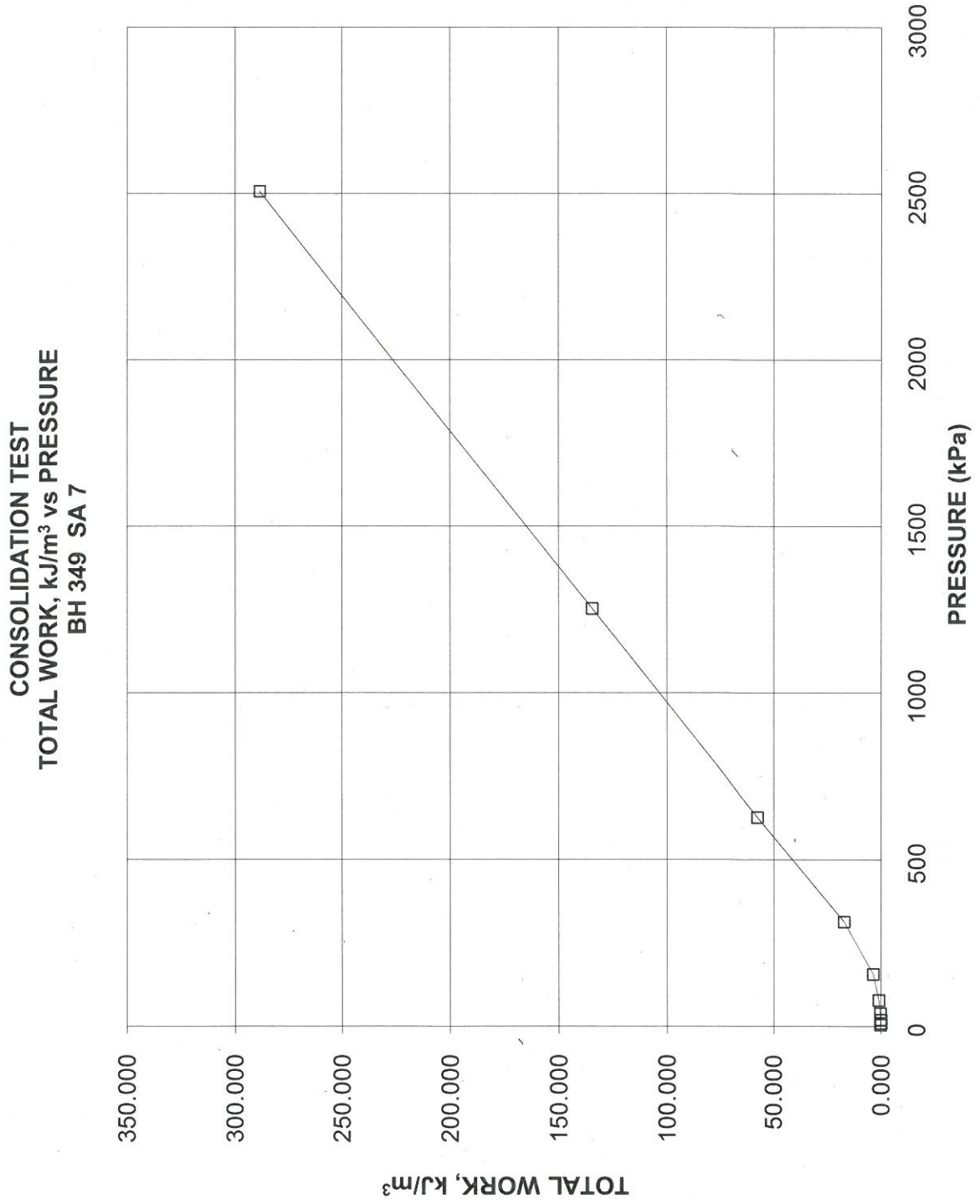
Prepared By: LFG

Golder Associates

Checked By: SJB

CONSOLIDATION TEST
TOTAL WORK VS PRESSURE

FIGURE BH 349 SA 7 OED D



Project No. 09-1132-0080

Prepared By: LFG

Golder Associates

Checked By: SJB

CONSOLIDATION TEST SUMMARY

FIGURE BH 349 SA 11 OED A

SAMPLE IDENTIFICATION

Project Number	09-1132-0080	Sample Number	11
Borehole Number	349	Sample Depth, m	10.4-10.8

TEST CONDITIONS

Test Type	Standard	Load Duration, hr	24
Oedometer Number	5		
Date Started	5/6/2010		
Date Completed	5/27/2010		

SAMPLE DIMENSIONS AND PROPERTIES - INITIAL

Sample Height, cm	1.90	Unit Weight, kN/m^3	19.08
Sample Diameter, cm	6.34	Dry Unit Weight, kN/m^3	15.22
Area, cm^2	31.52	Specific Gravity, measured	2.74
Volume, cm^3	59.89	Solids Height, cm	1.076
Water Content, %	25.35	Volume of Solids, cm^3	33.93
Wet Mass, g	116.53	Volume of Voids, cm^3	25.96
Dry Mass, g	92.96	Degree of Saturation, %	90.8

TEST COMPUTATIONS

Pressure kPa	Corr. Height cm	Void Ratio	Average Height cm	t_{90} sec	c_v cm^2/s	mv m^2/kN	k cm/s
0.00	1.900	0.765	1.900				
4.78	1.880	0.747	1.890	375	2.02E-03	2.21E-03	4.38E-07
9.58	1.869	0.736	1.874	346	2.15E-03	1.21E-03	2.54E-07
19.37	1.853	0.721	1.861	311	2.36E-03	8.66E-04	2.00E-07
38.86	1.831	0.701	1.842	205	3.51E-03	5.94E-04	2.04E-07
77.80	1.803	0.675	1.817	145	4.83E-03	3.80E-04	1.80E-07
38.82	1.806	0.678	1.804				
9.59	1.823	0.693	1.814				
4.78	1.826	0.696	1.824				
9.59	1.824	0.694	1.825	178	3.97E-03	2.19E-04	8.51E-08
19.14	1.820	0.691	1.822	217	3.24E-03	2.26E-04	7.18E-08
38.82	1.811	0.682	1.815	190	3.68E-03	2.41E-04	8.67E-08
77.88	1.799	0.671	1.805	202	3.42E-03	1.63E-04	5.46E-08
155.42	1.759	0.634	1.779	267	2.51E-03	2.71E-04	6.67E-08
310.02	1.689	0.569	1.724	304	2.07E-03	2.39E-04	4.85E-08
620.41	1.616	0.501	1.652	217	2.67E-03	1.24E-04	3.23E-08
1241.70	1.547	0.437	1.581	167	3.17E-03	5.85E-05	1.82E-08
2482.39	1.476	0.371	1.511	135	3.59E-03	3.01E-05	1.06E-08
1241.70	1.489	0.383	1.482				
310.02	1.516	0.408	1.502				
77.88	1.555	0.445	1.536				
19.14	1.598	0.484	1.576				
4.78	1.633	0.517	1.615				

Note:
k calculated using cv based on t_{90} values.

SAMPLE DIMENSIONS AND PROPERTIES - FINAL

Sample Height, cm	1.63	Unit Weight, kN/m^3	21.88
Sample Diameter, cm	6.34	Dry Unit Weight, kN/m^3	17.71
Area, cm^2	31.52	Specific Gravity, measured	2.74
Volume, cm^3	51.47	Solids Height, cm	1.076
Water Content, %	23.55	Volume of Solids, cm^3	33.93
Wet Mass, g	114.85	Volume of Voids, cm^3	17.54
Dry Mass, g	92.96		

Prepared By: LFG

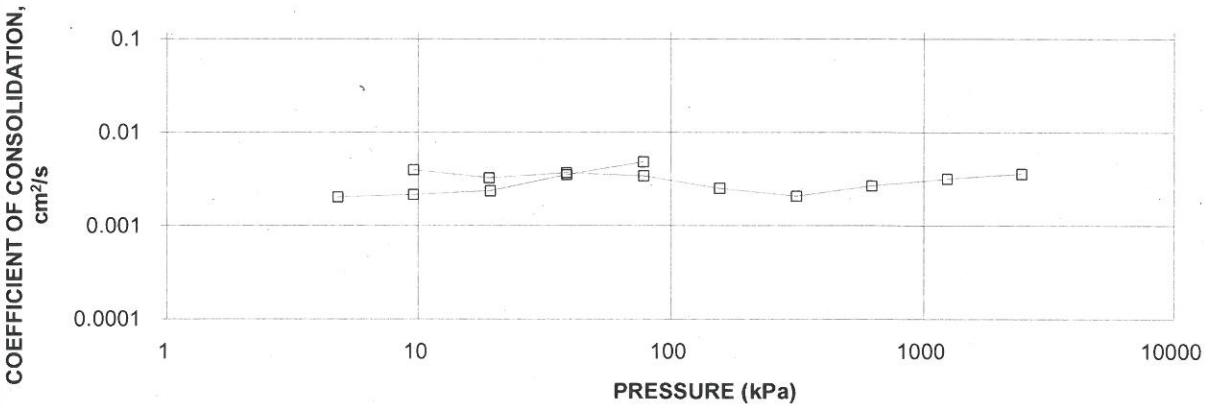
Golder Associates

Checked By: SJB

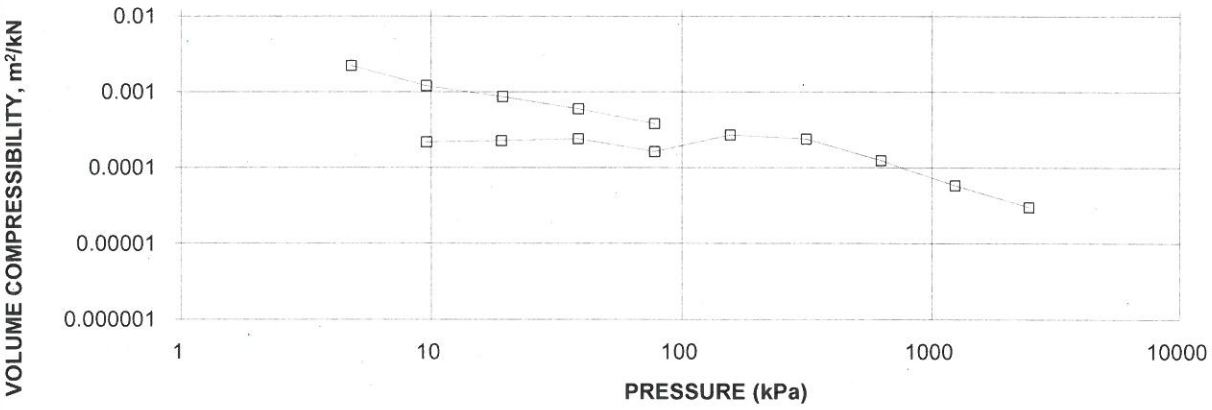
CONSOLIDATION TEST SUMMARY

FIGURE BH 349 SA 11 OED B

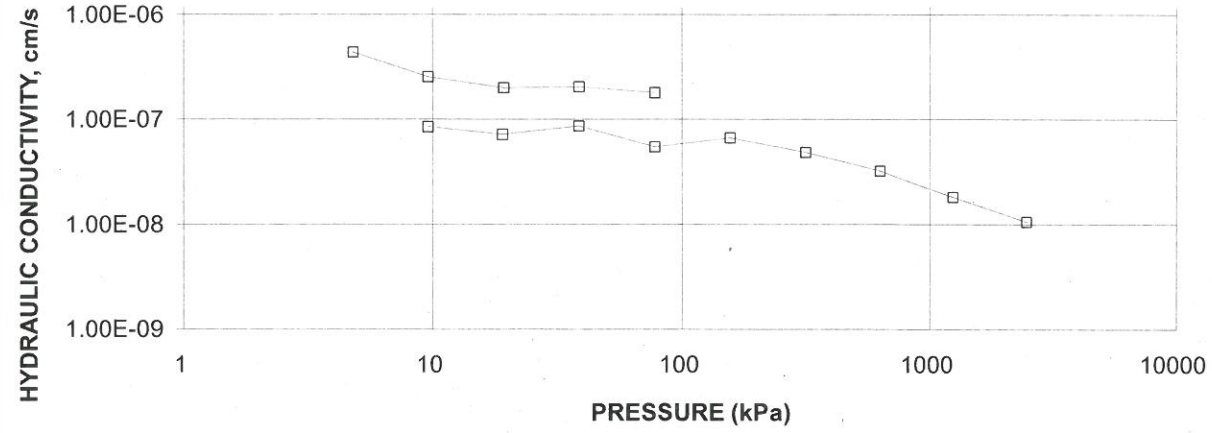
CONSOLIDATION TEST
C_v cm²/s VS PRESSURE (kPa)
BH 349 SA 11



CONSOLIDATION TEST
M_v m²/kN vs PRESSURE (kPa)
BH 349 SA 11



CONSOLIDATION TEST
HYDRAULIC CONDUCTIVITY vs PRESSURE
BH 349 SA 11



Project No. 09-1132-0080

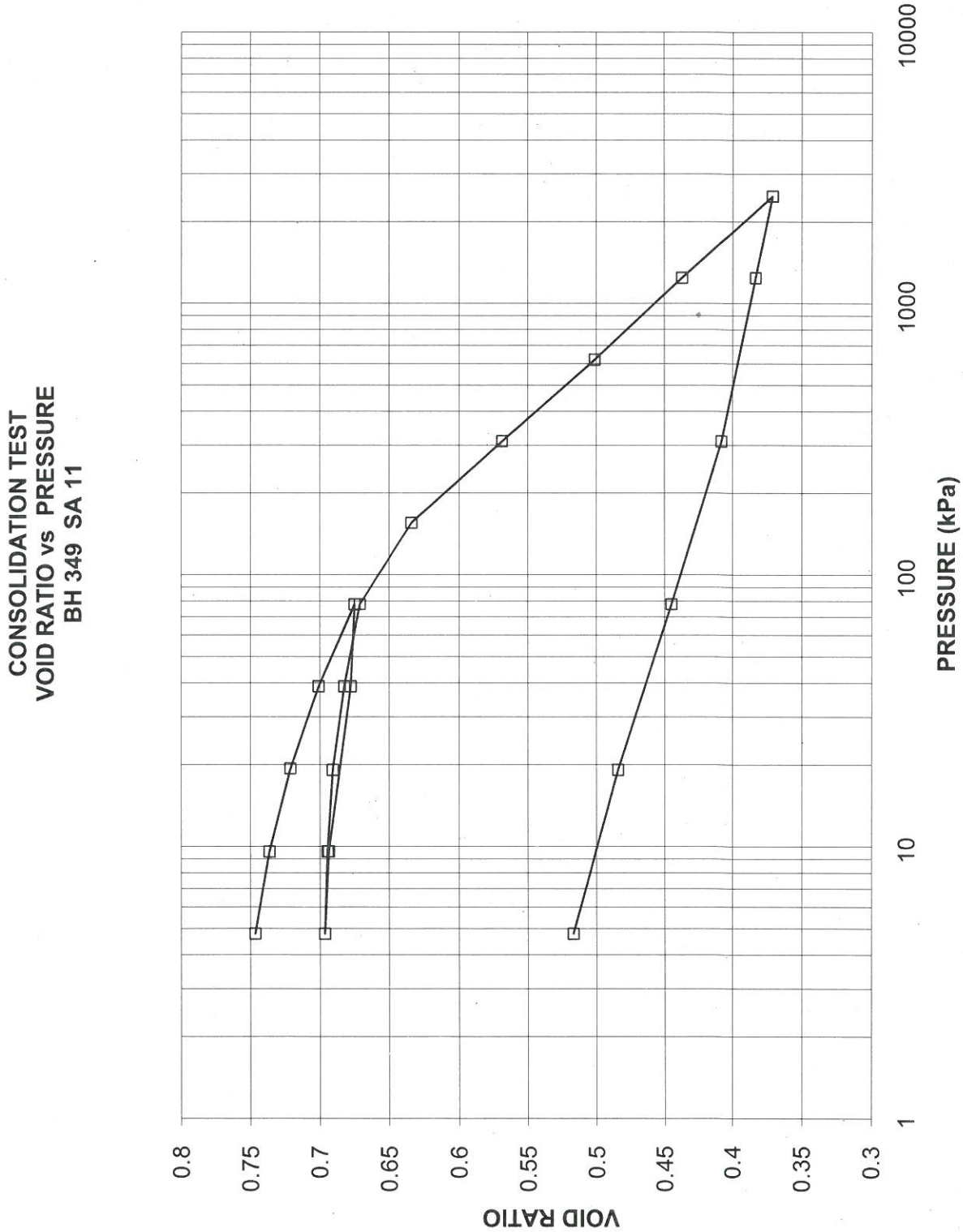
Prepared By: LFG

Golder Associates

Checked By: SJB

CONSOLIDATION TEST
VOID RATIO VS LOG PRESSURE

FIGURE BH 349 SA 11 OED C



Project No. 09-1132-0080

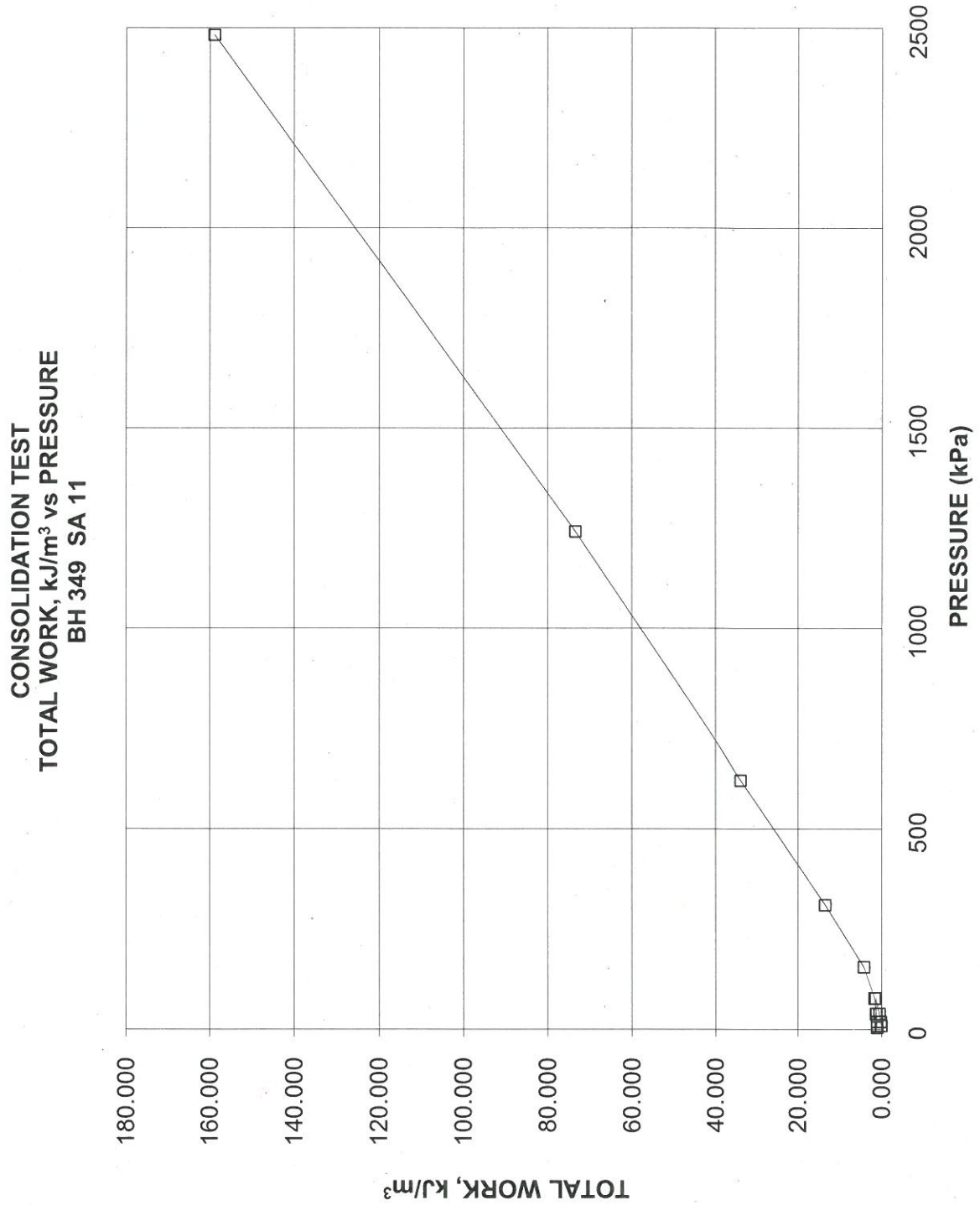
Prepared By: LFG

Golder Associates

Checked By: SJB

CONSOLIDATION TEST
TOTAL WORK VS PRESSURE

FIGURE BH 349 SA 11 OED D



Project No. 09-1132-0080

Prepared By: LFG

Golder Associates

Checked By: SJB

CONSOLIDATION TEST SUMMARY

FIGURE BH 349 SA 14 OED A

SAMPLE IDENTIFICATION

Project Number	09-1132-0080	Sample Number	14
Borehole Number	349	Sample Depth, m	14.9-15.4

TEST CONDITIONS

Test Type	Standard	Load Duration, hr	24
Oedometer Number	4		
Date Started	5/7/2010		
Date Completed	5/27/2010		

SAMPLE DIMENSIONS AND PROPERTIES - INITIAL

Sample Height, cm	2.54	Unit Weight, kN/m^3	20.50
Sample Diameter, cm	6.34	Dry Unit Weight, kN/m^3	16.95
Area, cm^2	31.57	Specific Gravity, measured	2.73
Volume, cm^3	80.19	Solids Height, cm	1.608
Water Content, %	20.93	Volume of Solids, cm^3	50.77
Wet Mass, g	167.61	Volume of Voids, cm^3	29.42
Dry Mass, g	138.6	Degree of Saturation, %	98.6

TEST COMPUTATIONS

Pressure kPa	Corr. Height cm	Void Ratio	Average Height cm	t_{90} sec	c_v cm^2/s	mv m^2/kN	k cm/s
0.00	2.540	0.579	2.540				
4.84	2.504	0.557	2.522	1561	8.64E-04	2.94E-03	2.49E-07
9.58	2.494	0.551	2.499	1470	9.01E-04	8.39E-04	7.40E-08
19.47	2.477	0.540	2.485	1135	1.15E-03	6.65E-04	7.52E-08
38.76	2.450	0.524	2.464	1307	9.85E-04	5.45E-04	5.26E-08
77.76	2.418	0.504	2.434	821	1.53E-03	3.28E-04	4.92E-08
155.17	2.369	0.473	2.393	623	1.95E-03	2.49E-04	4.75E-08
77.76	2.376	0.478	2.373				
19.47	2.391	0.487	2.384				
4.77	2.411	0.499	2.401				
9.56	2.405	0.495	2.408	866	1.42E-03	4.68E-04	6.52E-08
19.34	2.400	0.492	2.402	602	2.03E-03	1.89E-04	3.77E-08
38.81	2.391	0.487	2.396	540	2.25E-03	1.76E-04	3.88E-08
77.62	2.380	0.480	2.386	482	2.50E-03	1.17E-04	2.86E-08
155.14	2.360	0.468	2.370	290	4.11E-03	1.01E-04	4.07E-08
310.14	2.309	0.436	2.335	653	1.77E-03	1.29E-04	2.24E-08
621.08	2.245	0.396	2.277	560	1.96E-03	8.13E-05	1.56E-08
1239.69	2.179	0.355	2.212	317	3.27E-03	4.18E-05	1.34E-08
2479.89	2.098	0.305	2.139	581	1.67E-03	2.58E-05	4.22E-09
1239.69	2.108	0.311	2.103				
310.14	2.138	0.330	2.123				
77.62	2.178	0.355	2.158				
19.47	2.218	0.379	2.198				
4.84	2.255	0.402	2.236				

Note:
k calculated using cv based on t_{90} values.

SAMPLE DIMENSIONS AND PROPERTIES - FINAL

Sample Height, cm	2.25	Unit Weight, kN/m^3	22.09
Sample Diameter, cm	6.34	Dry Unit Weight, kN/m^3	19.10
Area, cm^2	31.57	Specific Gravity, measured	2.73
Volume, cm^3	71.17	Solids Height, cm	1.608
Water Content, %	15.66	Volume of Solids, cm^3	50.77
Wet Mass, g	160.30	Volume of Voids, cm^3	20.40
Dry Mass, g	138.6		

Prepared By: LFG

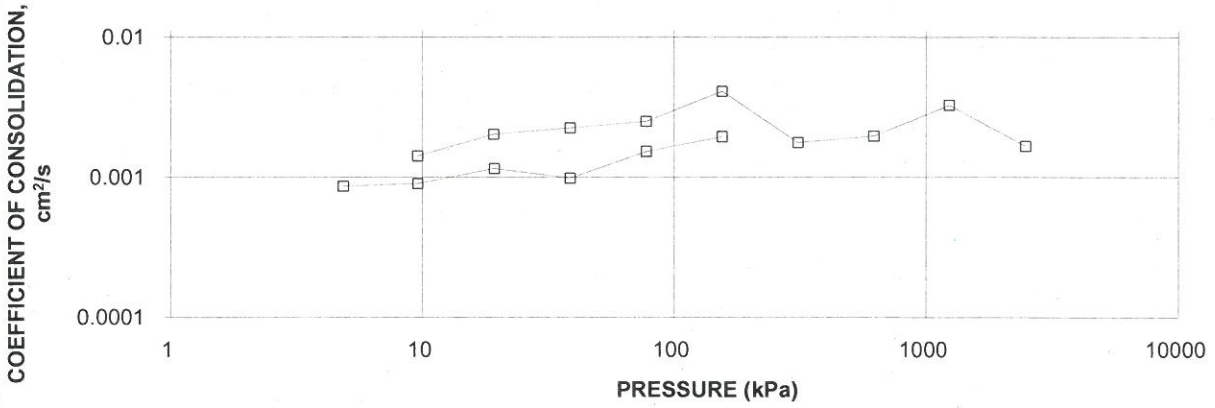
Golder Associates

Checked By: SJB

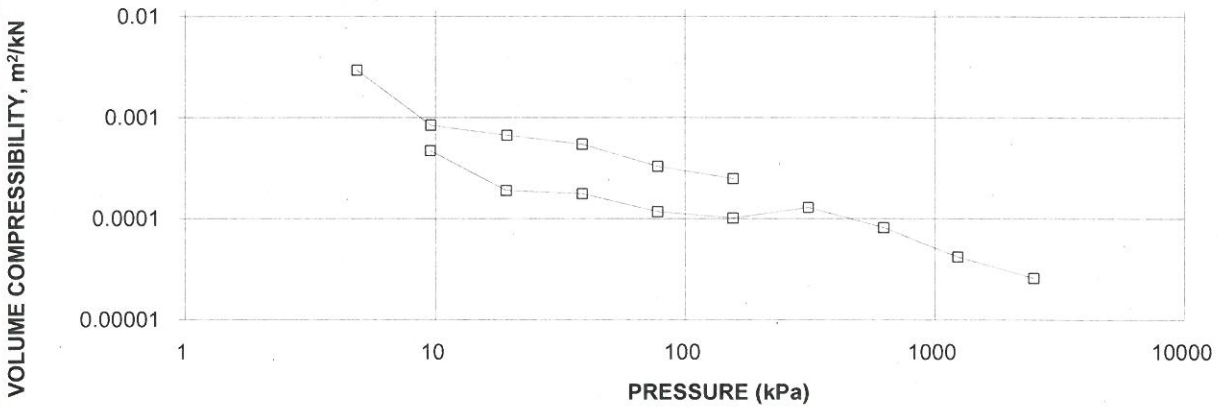
CONSOLIDATION TEST SUMMARY

FIGURE BH 349 SA 14 OED B

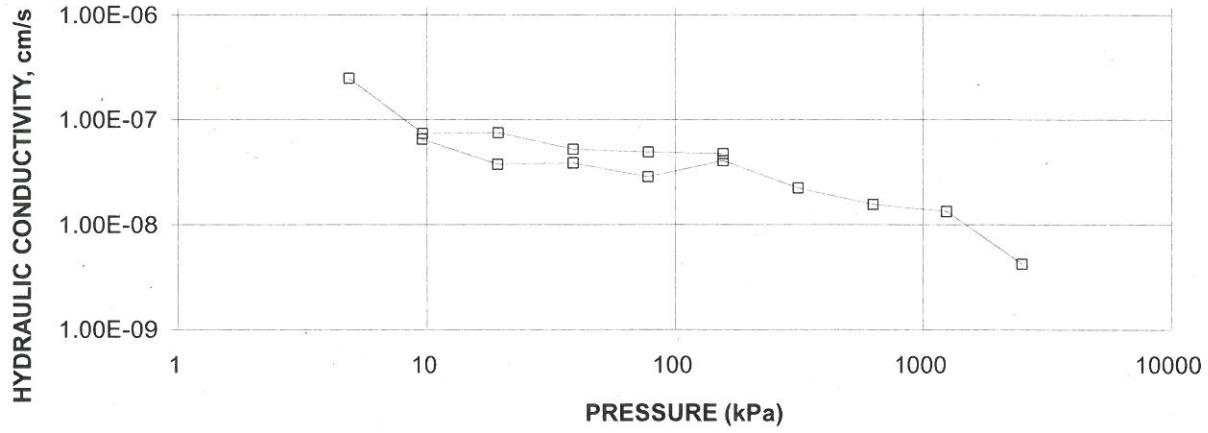
CONSOLIDATION TEST
C_V cm²/s VS PRESSURE (kPa)
BH 349 SA 14



CONSOLIDATION TEST
M_V m²/kN vs PRESSURE (kPa)
BH 349 SA 14



CONSOLIDATION TEST
HYDRAULIC CONDUCTIVITY vs PRESSURE
BH 349 SA 14



Project No. 09-1132-0080

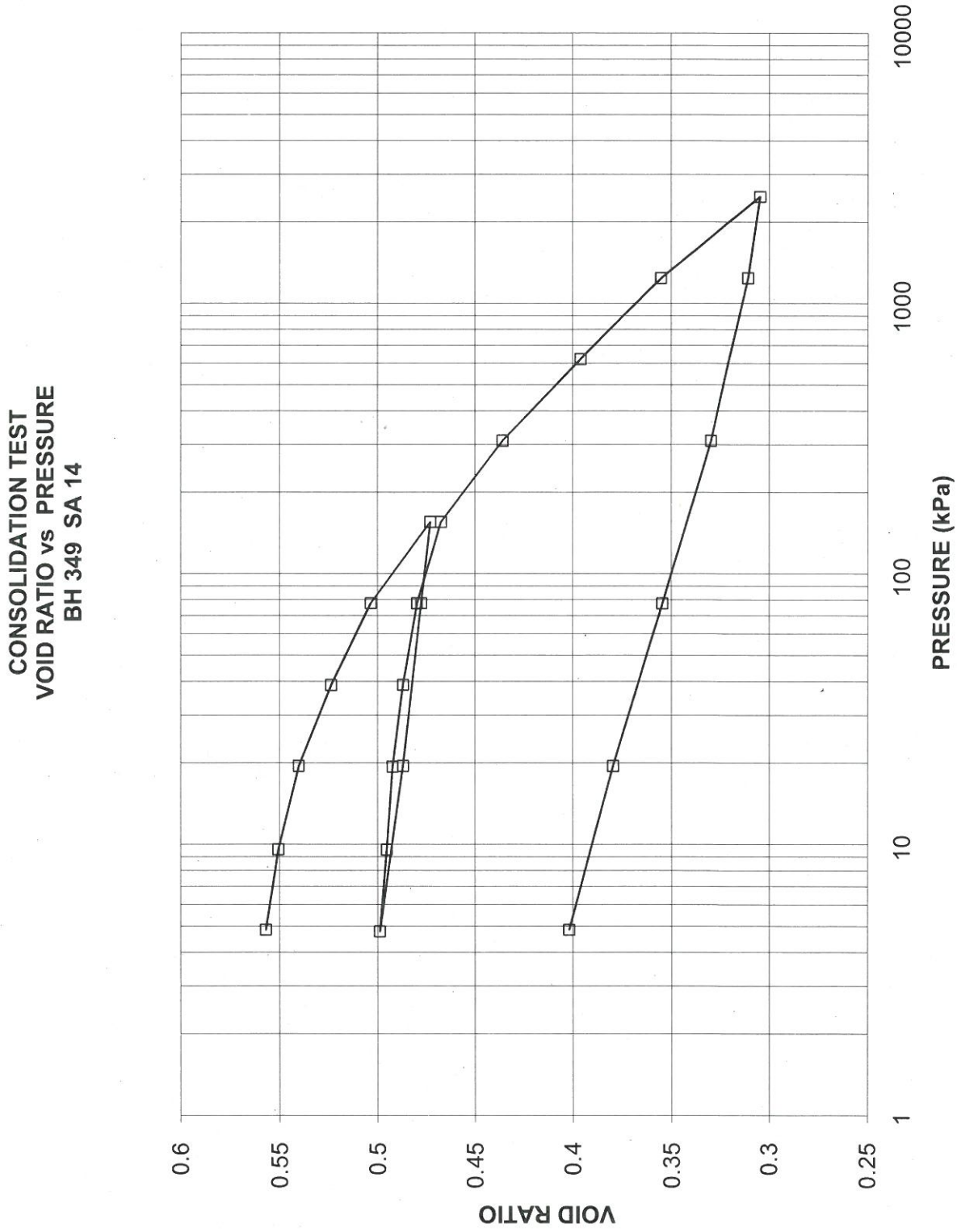
Prepared By: LFG

Golder Associates

Checked By: SJB

CONSOLIDATION TEST
VOID RATIO VS LOG PRESSURE

FIGURE BH 349 SA 14 OED C



Project No. 09-1132-0080

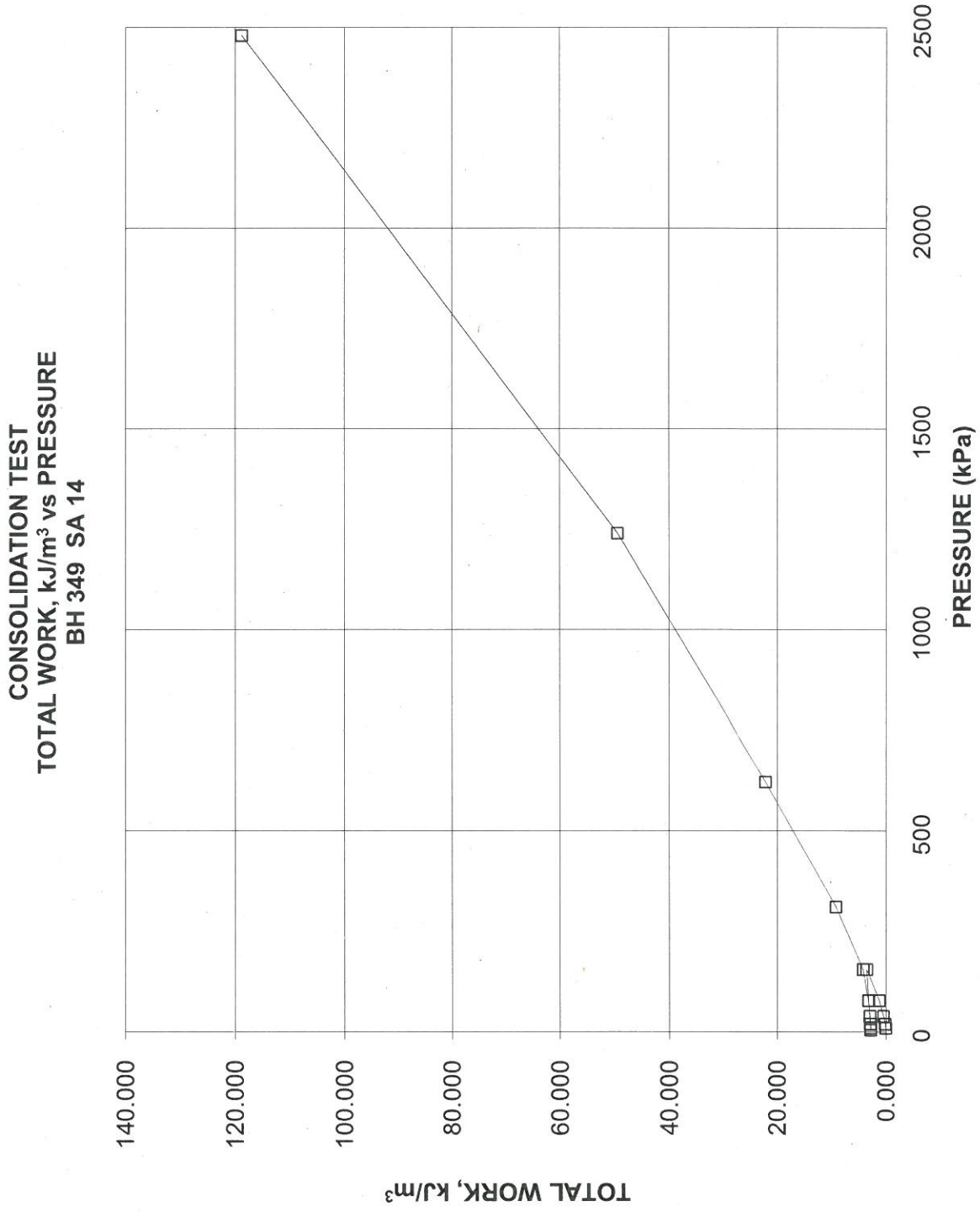
Prepared By: LFG

Golder Associates

Checked By: SJB

CONSOLIDATION TEST
TOTAL WORK VS PRESSURE

FIGURE BH 349 SA 14 OED D



Project No. 09-1132-0080

Prepared By: LFG

Golder Associates

Checked By: SJS

APPENDIX D
COEFFICIENT OF CONSOLIDATION VALUES

Borehole No.	Sample No.	Depth (m)	Pressure (kPa)	Average Height (cm)	t_{90} (sec)	c_v (based on t_{90}) (cm^2/sec)	t_{50} (sec)	c_v (based on t_{50}) (cm^2/sec)
346	9	7.3-7.8	9.52	2.537	735	1.86E-03	480	6.60E-04
			19.22	2.532	558	2.44E-03	228	1.38E-03
			38.57	2.517	289	4.65E-03	174	1.79E-03
			77.27	2.493	505	2.61E-03	168	1.82E-03
			9.52	2.511	1185	1.13E-03	456	6.81E-04
			19.25	2.506	540	2.47E-03	186	1.66E-03
			38.62	2.497	558	2.37E-03	162	1.90E-03
			77.39	2.482	331	3.95E-03	141	2.15E-03
			154.67	2.451	540	2.36E-03	162	1.83E-03
			309.21	2.372	1297	9.20E-04	420	6.60E-04
			617.88	2.247	1162	9.22E-04	300	8.29E-04
			1235.8	2.121	667	1.43E-03	237	9.35E-04
			2477.09	2.008	577	1.48E-03	156	1.27E-03
346	11	10.4-10.8	4.88	2.538	290	4.71E-03	87	3.65E-03
			9.65	2.533	1307	1.04E-03	516	6.12E-04
			19.71	2.523	1109	1.22E-03	306	1.02E-03
			39.12	2.507	634	2.10E-03	234	1.32E-03
			78.25	2.482	623	2.10E-03	222	1.37E-03
			19.47	2.491	581	2.26E-03	162	1.89E-03
			39.07	2.484	540	2.42E-03	102	2.98E-03
			78.24	2.471	317	4.08E-03	126	2.39E-03
			155.37	2.443	505	2.51E-03	180	1.63E-03
			313.01	2.376	1014	1.18E-03	240	1.16E-03

Borehole No.	Sample No.	Depth (m)	Pressure (kPa)	Average Height (cm)	t_{90} (sec)	c_v (based on t_{90}) (cm^2/sec)	t_{50} (sec)	c_v (based on t_{50}) (cm^2/sec)
			626.36	2.282	694	1.59E-03	144	1.78E-03
			1250.71	2.182	463	2.18E-03	129	1.82E-03
			2499.28	2.085	277	3.33E-03	87	2.46E-03
346	13	13.4-13.9	4.8	2.536	2774	4.92E-04	840	3.77E-04
			9.62	2.522	2940	4.59E-04	810	3.87E-04
			19.43	2.510	1270	1.05E-03	570	5.44E-04
			39.05	2.489	1162	1.13E-03	432	7.06E-04
			78.25	2.460	1127	1.14E-03	306	9.74E-04
			9.62	2.463	821	1.57E-03	210	1.42E-03
			19.59	2.458	1014	1.26E-03	240	1.24E-03
			39.05	2.453	623	2.05E-03	156	1.90E-03
			77.63	2.444	522	2.43E-03	156	1.89E-03
			155.73	2.418	505	2.45E-03	240	1.20E-03
			312.1	2.368	759	1.57E-03	252	1.10E-03
			624.16	2.306	540	2.09E-03	162	1.62E-03
			1249.34	2.240	359	2.96E-03	108	2.29E-03
			2497.92	2.169	252	3.96E-03	75	3.09E-03
349	7	5.5-5.9	19.52	2.536	163	8.36E-03	78	4.06E-03
			9.57	2.521	216	6.24E-03	78	4.01E-03
			19.74	2.518	368	3.65E-03	126	2.48E-03
			39.38	2.510	305	4.38E-03	180	1.72E-03
			78.38	2.491	645	2.04E-03	165	1.85E-03
			156.54	2.450	693	1.84E-03	195	1.52E-03

Borehole No.	Sample No.	Depth (m)	Pressure (kPa)	Average Height (cm)	t_{90} (sec)	c_v (based on t_{90}) (cm^2/sec)	t_{50} (sec)	c_v (based on t_{50}) (cm^2/sec)
			313.17	2.353	1135	1.03E-03	480	5.68E-04
			626.5	2.185	1984	5.10E-04	510	4.61E-04
			1252.53	2.001	1185	7.17E-04	312	6.32E-04
			2506.45	1.837	1070	6.69E-04	246	6.76E-04
349	11	10.4-10.8	4.78	1.890	375	2.02E-03	168	1.05E-03
			9.58	1.874	346	2.15E-03	216	8.01E-04
			19.37	1.861	311	2.36E-03	102	1.67E-03
			38.86	1.842	205	3.51E-03	108	1.55E-03
			77.8	1.817	145	4.83E-03	81	2.01E-03
			9.59	1.825	178	3.97E-03	42	3.91E-03
			19.14	1.822	217	3.24E-03	75	2.18E-03
			38.82	1.815	190	3.68E-03	39	4.16E-03
			77.88	1.805	202	3.42E-03	60	2.67E-03
			155.42	1.779	267	2.51E-03	87	1.79E-03
			310.02	1.724	304	2.07E-03	114	1.28E-03
			620.41	1.652	217	2.67E-03	60	2.24E-03
			1241.7	1.581	167	3.17E-03	34	3.62E-03
			2482.39	1.511	135	3.59E-03	24	4.69E-03
349	14	14.9-15.4	9.58	2.499	1470	9.01E-04	780	3.94E-04
			19.47	2.485	1135	1.15E-03	600	5.07E-04
			38.76	2.464	1307	9.85E-04	480	6.23E-04
			77.76	2.434	821	1.53E-03	342	8.53E-04
			155.17	2.393	623	1.95E-03	288	9.80E-04

APPENDIX D
COEFFICIENT OF CONSOLIDATION VALUES

Borehole No.	Sample No.	Depth (m)	Pressure (kPa)	Average Height (cm)	t_{90} (sec)	c_v (based on t_{90}) (cm^2/sec)	t_{50} (sec)	c_v (based on t_{50}) (cm^2/sec)
			19.34	2.402	602	2.03E-03	150	1.90E-03
			38.81	2.396	540	2.25E-03	168	1.68E-03
			77.62	2.386	482	2.50E-03	102	2.75E-03
			155.14	2.370	290	4.11E-03	96	2.88E-03
			310.14	2.335	653	1.77E-03	198	1.36E-03
			621.08	2.277	560	1.96E-03	165	1.55E-03
			1239.69	2.212	317	3.27E-03	99	2.43E-03
			2479.89	2.139	581	1.67E-03	144	1.56E-03

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