Trow

GEOTECHNICAL EXPLORATION REPORT

Campbell Heights Lands Servicing – Phase 2

City of Surrey, B.C.

File No.: 071-03420

November 30, 2007

Prepared by:

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1.0 INTRODUCTION

As requested, Trow Associates Inc. (Trow) has carried out a geotechnical assessment for the proposed roadwork and associated utility servicing of the City of Surrey Campbell Heights Phase 2 development. The purpose of this study was to determine the general subsurface soil conditions at the proposed road widening areas, the new road sections, and the associated utility facilities as well as to evaluate the structural integrity of the existing pavement. This report presents the factual results of the field exploration and Benkelman beam testing along with comments and recommendations pertaining to the road structure design and utility construction.

The current scope of work consisted of a field exploration, Benkelman beam testing, engineering analyses and preparation of this report. The work has been performed in general accordance with Trow Proposal (File No. 07Z-0503) dated July 16, 2007 and subsequent Change Order No. 1 dated October 30, 2007. The current scope of work was limited to the evaluation of the geotechnical characteristics of the site, and did not include any environmental or chemical assessments of the soil and groundwater.

A Stage 1 Environmental Assessment is currently being undertaken by Trow and the findings would be submitted under a separate cover. In addition, geotechnical assessment of the existing fill stockpiles within the City of Surrey Stokes Pit is also being undertaken by Trow and the results would be submitted under a separate cover.

Previous geotechnical assessments for Campbell Heights Phase 1 were conducted by Trow in 2004 and relevant information from the previous studies has been used in the current assessment.

2.0 PROPOSED DEVELOPMENT

The proposed Campbell Heights Phase 2 development area has a total size of about 96 hectares. Similar to Phase 1, the proposed Phase 2 development comprises mostly of light commercial/industrial subdivision. Based on the information provided, the proposed road works within the Phase 2 development areas are as follows:

- Widening and upgrading of existing 28 Avenue between 194 Street and 196 Street to major collector standard (12.2m pavement within 22.0m ROW, total length about 400m).
- Interim road widening and upgrading of existing 194 Street between 28 Avenue and 32 Avenue to collector standard (9.0m wide pavement within 20.0m ROW, total length about 800m).
- Construction of new 24 Avenue between approximate 194 Street and 196 Street to 4-lane divided arterial standard (interim 13.5m pavement / ultimate 19.0m pavement within 27.0m ROW, total length about 400m).
- Construction of new 22 Avenue between approximate 194 Street and 195 Street to through collector standard (12.2m pavement within 22.0m ROW, total length about 200m).

- Construction of new 195 Street between 22 Avenue and 32 Avenue to through collector standard (12.2m pavement within 22.0m ROW, total length about 2,000m). North end of the new 195 Street may end as a cul-de-sac at about 200m south of 32 Avenue.
- Construction of new 30 Avenue between 194 Street and 195 Street to collector standard (12.2m pavement within 22.0m ROW, total length about 200m).
- Construction of new 195 Street cul-de-sac from 22 Avenue to approximately 200m south to limited local standard (11.0m pavement within 20.0m ROW).
- Construction of new 25 Avenue cul-de-sac from 195 Street to approximately 100m west to limited local standard (11.0m pavement within 20.0m ROW).

New utility services will also be installed along the above roadways and the design inverts are anticipated to be in the order of about 1 to 3m.

3.0 SITE DESCRIPTION

The subject road sections under the current study are located at the eastern end of Campbell Heights area in southeastern Surrey, at the border of Township of Langley, as shown on the Project Location Key Plan (Drawing No. 071-03420-01) attached in Appendix B.

The area is generally bounded by 20 Avenue to the south, 32 Avenue to the north, 194 Street to the west and 196 Street to the east. Lands to the north of 28 Avenue are mostly undeveloped at present and are generally covered with dense trees/bushes. Lands to the south of 28 Avenue are occupied by the existing Stokes Pit operated by the City of Surrey. Areas south of 24 Avenue within the pit are generally used as landfill sites with height of fill stockpiles in the order of up to about 7 to 8m.

Both of the existing 28 Avenue and 194 Street to be upgraded within the study area contain two asphalt paved traffic lanes with gravel shoulders and/or ditches on both sides of the roads. The current traffic was noted to be light to moderate and comprised generally of commuter traffic with some heavy truck vehicles to and from the Stokes Pit. Visual review of the road pavement indicates that the existing paved surface on 28 Avenue is generally in good condition but that on 194 Street is in relatively poor condition with extensive cracking observed.

4.0 FIELD WORK

The fieldwork for this project was conducted between November 2 and 10, 2007. It initially consisted of Benkelman beam testing at 40m spacing along the outer wheel path of the existing traffic lanes of 28 Avenue and 194 Street within the study area. The beam test was conducted by a technician of Trow, using a single axle dump truck loaded to 80kN on the rear axle. A summary of the measured pavement deflection at each roadway is shown in the two Benkelman Beam test reports attached in Appendix E.

The geotechnical exploration for this project (including that for existing fill stockpile assessment) comprised of the following:

- Drilling of a total of 25 solid stem auger holes (AH-1 to AH-25) with the use of a truck mounted drill rig along existing paved roadways and a track mounted drill rig within the Stokes Pit. Depth of the auger holes ranged from about 3 to 9m.
- Installation of 6 standpipe piezometers to depths of about 6 to 8m for future groundwater level monitoring at AH-1, AH-3, AH-6, AH-8, AH-9 and AH-16.
- Excavation of a total of 15 test pits (TP-1 to TP-15) utilizing a rubber tire backhoe within the Stokes Pit area to depths from about 1 to 3m.
- Hand augering of 3 shallow test holes (HA-1 to HA-3) to depths from about 0.5 to 1m at existing forest area inaccessible by machine to the north of 28 Avenue.

The field exploration was carried out by an engineer of Trow, who located the test holes, logged the subsurface conditions and gathered samples for further classification. Descriptions of the subsurface conditions encountered at the test holes are presented in the attached soil logs in Appendix C.

Upon completion of the fieldwork, the test pits were backfilled with the excavated materials. The auger holes were filled with the auger cuttings and intermittent bentonite seals to meet groundwater protection requirements, with the surface covered with cold patch asphalt where applicable. Backfilling details of the installed standpipe piezometers are shown on the soil logs.

A total of 4 sieve analyses were conducted on soil samples collected from test holes along the existing roadways and at the north end of Stokes Pit outside the fill stockpile areas. The test results are presented in Appendix D.

It should be noted that the test holes indicate subsurface conditions only at the locations of test holes. The precision of the subsurface conditions indicated depends on the methods used, frequency of sampling and the uniformity of the subsurface conditions. The spacing of the test holes, frequency of sampling and the method of exploration have been selected to meet the needs of the project within constraints of the budget and schedule for geotechnical exploration purposes.

5.0 SOIL AND GROUNDWATER CONDITIONS

The following is a generalized summary of the soil profile as encountered in the test holes at the existing roadways to be upgraded and proposed new roadway areas:

Existing 28 Avenue from 194 Street to 196 Street (AH-6 to AH-8)

- 115 to 130mm thick asphalt on the existing pavement underlain by a thin layer of road base (about 50mm thick of sand and gravel with trace silt) overlying a relatively silty subbase (about 200 to 400mm thick of sand and gravel with some silt to silty).

- Native compact sand and gravel with trace of silt and cobbles to full depth of auger holes from about 3 to 7.6m.
- Occasional silt lenses at a depth of about 6.8m at AH-8.
- No seepage at the time of drilling except some wet soils encountered at depths below about 4m.
- Subsequent groundwater reading taken from the installed standpipe piezometers indicated a groundwater table at a depth of 4.1m at AH-6 and 4.3m at AH-8.

Existing 194 Street from 28 Avenue to 32 Avenue (AH-2 to AH-6)

- Relatively thin (25 to 40mm) asphalt on the existing pavement except at 28 Avenue intersection where the asphalt was 115mm thick.
- Underlain by sand and gravel base/subbase with varying silt content from trace to silty and a sandwiched/buried asphalt layer (25 to 40 mm thick) at AH-4 and AH-5.
- Total pavement structure thickness varied from about 300 to 1200mm.
- Native compact sand and gravel with trace to some silt and trace of cobbles below the existing pavement to the full depths of auger holes from about 3 to 7.6m.
- No seepage at the time of drilling except some wet soils encountered at depths below about 3m.
- Subsequent groundwater reading taken from the installed standpipe piezometers indicated a groundwater table at a depth of 3.7m at AH-3 and 4.1m at AH-6.

New 195 Street from 28 Avenue to 32 Avenue and New 30 Avenue from 194 Street to 195 Street (HA-1 to HA-3)

- Surficial organic topsoil with thickness varying from about 75 to 130mm.
- Native compact sand and gravel with trace to some silt and occasional cobbles below the topsoil.
- Graded to fine sand with trace to some silt at a depth of about 1.1m at HA-2.
- Dry within the full depth of the shallow hand auger holes (up to about 1.2m at HA-2).

New 195 Street from 24 Avenue to 28 Avenue, New 24 Avenue from 194 Street to 196 Street and New 25 Avenue Cul-de-Sac (TP-1 to TP-6 and AH-16)

- Approximately 300mm thick of topsoil or sand and gravel fill at the existing ground surface at TP-3, TP-4 and TP-6.
- Native compact sand and gravel to gravely sand with trace of silt and cobbles below the topsoil/fill or at existing ground surface at other test holes.
- Occasional silty seams/pockets within the native soils.
- Slight to moderate seepage at depths of about 2.7m at TP-4 and TP-5 and wet soils at depths below about 1.8m at TP-1 and AH-16.
- Subsequent groundwater reading taken from the installed standpipe piezometer indicated a groundwater table at a depth of 1.8m at AH-16.

New 195 Street from south of 22 Avenue to 24 Avenue and New 22 Avenue from 194 Street to 195 Street (AH-10, AH-19 and AH-25)

- Located within existing fill stockpile areas with total fill thickness from about 5 to 8m.
- Variable fills from sand and silt, organic silt to silt with some sand and gravel as well as some organics, wood and construction debris.
- Variable fill consistency or compactness from soft to stiff or loose to compact.
- Native soils below the surficial fills generally consisted of compact sand and gravel to sand with trace of silt and gravel.
- No seepage encountered within the depth of the three auger holes explored (up to about 9m).

It should be noted that groundwater seepage may vary and fluctuate seasonally and in response to climatic conditions and local land use. It should also be noted that geological conditions are innately variable and the above inferred subsurface stratigraphy should be considered as a generalized profile, as information obtained from the test holes represents discrete subsurface conditions at the test hole locations only. The actual conditions may vary across the site and below the depth explored.

6.0 ROAD WIDENING/UPGRADING RECOMMENDATIONS

6.1 Subgrade Preparation

The following approach is recommended for subgrade preparation at the road widening areas as well as at the proposed new roads:

- Strip existing vegetation, topsoil, organic-rich soils, organic silt, inferior fill and any unsuitable materials.
- Remove vegetation and debris from the ditches to be filled in.
- Conduct additional excavation as necessary to facilitate installation of the minimum recommended pavement structure per Section 6.2.
- Where native compact sand/sand and gravel with trace to some silt is exposed, place pavement subbase layer directly above undisturbed native subgrade.
- Where granular fill is exposed, compact the fill to a minimum 95% Modified Proctor maximum dry density and then proof-roll with a fully loaded dual axle dump truck. Areas exhibiting deflection ("pumping") under wheel load should be over-excavated as necessary and replaced with granular structural fill as described below.
- Where exposed granular fill is wet to saturated and cannot be adequately drained and compacted or the exposed fill contains significant silt content and soft, the inferior fills should be over-excavated to expose the native compact sand/sand and gravel and replaced with granular structural fill as described below. Where deeper inferior fill is encountered such as that within the existing fill stockpile areas, the thickness of over-excavation should be evaluated on site by the geotechnical engineer. For preliminary design purposes, a minimum depth of over-excavation of 600mm below the design subgrade elevation should be allowed.

- The surface of the subgrade should be sloped with a cross-fall of 2% directed toward the shoulder or gutter.
- For concrete sidewalks, subgrade preparation should be done in a similar manner as recommended above. The sidewalk should be underlain by at least 100mm of granular base compacted to a minimum 95% Modified Proctor maximum dry density.
- If the subgrade condition during stripping is found to be significantly different than that as encountered in the test holes, the subgrade should be reviewed and recommendations made by the geotechnical engineer as warranted.

Surface water runoff and shallow groundwater seepage should be diverted away from the construction area. If the exposed subgrade consists of silty soils, which are highly moisture sensitive and prone to disturbance, care should be taken to minimize disturbance of the prepared subgrade. An excavator equipped with a smooth-edge bucket should be used for excavation near the subgrade level for final trimming to minimize disturbance to the competent subgrade soils.

Depending on weather and subgrade conditions, the placement of structural fill for road grade restoration or granular subbase should be done as soon as practical after the excavation to minimize exposure to the environment.

Grade restoration or increase to the design subgrade level should be achieved by placing and compacting free-draining granular structural fill such as 75mm minus pit-run sand and gravel with less than 5% fines content (particles passing the 0.075mm sieve size) over the prepared subgrade soils, as discussed above. The structural fill should be placed in maximum 300mm lifts and compacted to at least 95% Modified Proctor maximum dry density. Field density tests should be conducted to verify that the specified compaction is achieved.

Based on the gradation tests done on the samples collected from the test holes, most of the granular site soils are suitable to be used as structural fill. Care should however be taken during bulk excavation to separate the existing clean granular soils from any intermittent silt layers, which may occur within the granular soils. Additional gradation tests should be conducted at the time of construction to confirm the suitability of on-site granular soils to be used as structural fill.

6.2 New Pavement Structure

With subgrade preparation in the manner recommended above, the minimum recommended pavement structure for the proposed 24 Avenue (from 194 Street to 196 Street) to meet the City of Surrey's minimum standards for Arterial Road is outlined below:

Material	Recommended Minimum Thickness (Arterial Roads)
Asphaltic concrete surface (Hot Mix Asphalt, HMA)	125mm
19mm minus Granular Base (MMCD Sec. 02226.2.10)	100mm
75mm minus Crushed Granular Subbase (MMCD Sec. 02226.2.9)	300mm

Minimum recommended pavement structure for major and through collector roads is as follows:

Material	Recommended Minimum Thickness (Major/Through Collector Roads)
Asphaltic concrete surface (Hot Mix Asphalt, HMA)	100mm
19mm minus Granular Base (MMCD Sec. 02226.2.10)	100mm
75mm minus Crushed Granular Subbase (MMCD Sec. 02226.2.9)	300mm

Minimum recommended pavement structure for limited collector and local roads is as follows:

Material	Recommended Minimum Thickness (Limited Collector and Local Roads)
Asphaltic concrete surface (Hot Mix Asphalt, HMA)	85mm
19mm minus Granular Base (MMCD Sec. 02226.2.10)	100mm
75mm minus Select Granular Subbase (MMCD Sec. 02226.2.8)	300mm

The 125mm/100mm/85mm Hot Mix Asphalt surfacing should be placed in two lifts using a 75mm/50mm/50mm thick Lower Course #1 mix for the bottom lift and a 50mm/50mm/35mm thick Upper Course #1 mix for top lift as per Master Municipal Specifications (MMCD) Section 02512. A tack coat should be applied between the lifts as per MMCD Section 02547.

The road construction materials should be in compliance with the MMCD. Both the base and subbase should be compacted in compliance with the MMCD.

Based on the gradation tests done on the samples collected from the test holes, some of the existing granular site soils are suitable to be reused as Select Granular Subbase and possibly Crushed Granular Subbase (subject to having adequate fractures) but not as Granular Base. Additional sieve tests (and fracture count for Crushed Granular Subbase) would be required at the time of construction to confirm conformance of the on-site materials.

6.3 Existing Pavement Upgrading

A statistical analysis was carried out on the temperature corrected Benkelman beam data obtained from the two subject roadways to be upgraded (28 Avenue and 194 Street) and the results are shown in the attached Benkelman Beam Test Reports in Appendix E. Using a seasonal correction factor of 1.2, the Most Probable Spring Rebound (MPSR) for the combined traffic lanes at each of the roadways is calculated as follows:

Location	MPSR
28 Avenue, from 194 Street to 196 Street	0.82
194 Street, from 28 Avenue to 32 Avenue	2.05

Based on the design criteria for collector roads within industrial zoning as per "City of Surrey Design Criteria Manual" and the design method as per "Guide to the Design of Flexible and Rigid Pavements in Canada – TAC", the design maximum rebound for the two subject collector roads is estimated to be about 1.0mm.

As such, the existing pavement of 28 Avenue with the calculated MPSR of 0.82mm is considered to be structurally adequate to meet the collector standard with no upgrading required. However, for blending and leveling purposes, a nominal 50mm thick asphalt overlay would typically be applied over the full pavement width to the centerline of the pavement. The Hot Mix Asphalt overlay should comply with the MMCD for an Upper Course #1. Prior to overlay, any existing alligator cracks and major distressed areas should be removed to granular base level and patched with Hot Mix Asphalt as per MMCD Section 02512. Any minor cracks should be cleaned and filled in accordance with MMCD Section 02577. The pavement should be cleaned and tack coated as per MMCD Section 02547. It should, however, be noted that more regular maintenance/repair service may be required for the overlaid pavement along 28 Avenue, as the existing pavement structure consists of substandard granular subbase.

For 194 Street, the calculated MPSR of 2.05mm is much higher than the maximum design rebound value of 1.0mm. Visual observations made during the beaming revealed significant distress in the majority of this road section. In addition, the test holes advanced along the road indicated that the existing relatively thin asphalt pavement structure was founded overtop of a layer of buried asphalt, which may likely be the major cause of the pavement distress. As such, conventional asphalt overlay is considered not feasible/practical for the rehabilitation of this section of road and it is recommended that the existing pavement be reconstructed with the minimum pavement structure as outlined above.

Subgrade preparation for the new pavement structure should also follow that as previously recommended. The new construction should include removal of the buried asphalt layer.

7.0 UNDERGROUND UTILITIES

It is considered feasible using standard construction practices for the installation of the proposed underground utilities with typical invert depths in the order of 1 to 3m below the existing grade. The soil and groundwater conditions encountered should generally be conducive to allowing excavation with standard trench shoring box, dewatering and backfill practices for installation of the proposed utilities.

7.1 Excavation and Dewatering

The composition and consistency of the soils at the site are such that suitably equipped hydraulic excavators should be able to dig these materials. For denser soils at depth, the soil may require some ripping prior to excavation. In addition, the excavation may encounter some cobbles and boulders.

The sidewalls of unsupported trench excavations should generally be cut no steeper than 1H:1V (Horizontal:Vertical) within the surficial fill and native compact sand/sand and gravel. However, flatter slopes may be required for trench stability and worker safety purposes within loose or soft soils prone to caving and sloughing or where significant zones of groundwater seepage are encountered.

If open cut slopes are considered impractical or undesirable, appropriate trench shoring/bracing methods should be employed such as standard trench boxes, meeting Work Safe BC requirements and the requirements of other applicable authorities. The shoring should be installed to the top of the trench immediately after excavation. It is estimated that during shoring installation, the fills at the surface and the underlying native sand/sand and gravel would likely stand up vertically in the trench for short time period during excavation under dry condition. However, some sloughing may occur if there is groundwater seepage.

As previously noted, where the bottom of the proposed utility trench excavation is above or slightly below the groundwater table, some groundwater seepage should be expected in the trench excavation, and conventional sump pumping methods would be sufficient to handle possible seepage volumes to allow pipe installation and backfill placement to occur in dry conditions. Where the bottom of the trench excavation is well below the groundwater level, an effective dewatering system would be required. The dewatering method used would need to be selected in response to actual groundwater conditions encountered during construction. The design, operation, and maintenance of a dewatering system should be the responsibility of the contractor.

7.2 Trench Backfill

Trench backfill placed above the pipe zone and up to the underside of the new pavement section should be as specified in MMCD Standard Detail Drawing Number G4 for utility trenches. This

requires granular backfill compacted to at least 95% Modified Proctor maximum dry density, similar to the structural fill as previously discussed. Based on the gradation tests, most of the existing on-site granular soils are suitable to be reused as trench backfill, provided that the silt layers, if encountered, are separated from the clean native sand/sand and gravel during excavation.

The asphalt pavement structure to be restored after the trench backfilling should follow that as previously recommended for the road widening.

7.3 Seismic Considerations

A preliminary seismic response assessment of the native soils encountered at the test holes revealed that they have a low potential for liquefaction during the design earthquake as per the 2006 BC Building Code. The compacted trench fill is also judged to be non-liquefiable. As such, liquefaction induced ground deformation is anticipated to be minimal for utilities founded on native compact soils or structural fill.

Where the utilities are founded on extensive thickness of existing soft or loose fills, such as that at existing fill stockpile areas, significant ground deformation may occur as a result of a major earthquake. If required, the magnitude of movement would be assessed on a site specific basis when design details regarding the site grading and utilities are available.

8.0 CLOSURE

Please be advised that the contents of this report are based on the information provided to Trow by R.F. Binnie and Associates Ltd. and our understanding of the proposed development as described in this report. If the development plans change, or if during construction the soil conditions are noted to be different than those described in this report, Trow must be notified immediately and the recommendations on the geotechnical aspects of the proposed development should be reviewed.

Also note that this report was prepared for the exclusive use of The City of Surrey and their designated consultants or agents, and may not be used by other parties without written consent of Trow. An "Interpretation and Use of Study and Report Instructions" is attached in Appendix A. These instructions form an integral part of this report and should be included with any copies of this report.

We trust that this report will meet your present requirements. Please contact the undersigned if you have any questions, or require further assistance.

Prepared by:
TROW ASSOCIATES INC.

James Lau, P.Eng.
Senior Engineer

Reviewed by:

Ben Weiss, P.Eng.
Senior Engineer

APPENDIX A

INTERPRETATION AND USE OF STUDY
AND REPORT

INTERPRETATION & USE OF STUDY AND REPORT

1. STANDARD OF CARE

This study and Report have been prepared in accordance with generally accepted engineering consulting practices in this area. No other warranty, expressed or implied, is made. Engineering studies and reports do not include environmental consulting unless specifically stated in the engineering report.

2. COMPLETE REPORT

All documents, records, data and files, whether electronic or otherwise, generated as part of this assignment are a part of the Report which is of a summary nature and is not intended to stand alone without reference to the instructions given to us by the Client, communications between us and the Client, and to any other reports, writings, proposals or documents prepared by us for the Client relative to the specific site described herein, all of which constitute the Report.

IN ORDER TO PROPERLY UNDERSTAND THE SUGGESTIONS, RECOMMENDATIONS AND OPINIONS EXPRESSED HEREIN, REFERENCE MUST BE MADE TO THE WHOLE OF THE REPORT. WE CANNOT BE RESPONSIBLE FOR USE BY ANY PARTY OF PORTIONS OF THE REPORT WITHOUT REFERENCE TO THE WHOLE REPORT.

3. BASIS OF THE REPORT

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

4. USE OF THE REPORT

The information and opinions expressed in the Report, or any document forming the Report, are for the sole benefit of the Client. NO OTHER PARTY MAY USE OR RELY UPON THE REPORT OR ANY PORTION THEREOF WITHOUT OUR WRITTEN CONSENT. WE WILL CONSENT TO ANY REASONABLE REQUEST BY THE CLIENT TO APPROVE THE USE OF THIS REPORT BY OTHER PARTIES AS "APPROVED USERS". The contents of the Report remain our copyright property and we authorise only the Client and Approved Users to make copies of the Report 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 the Report, or any portion thereof, available to any party without our written permission. Any use which a third party makes of the Report, or any portion of the Report, are the sole responsibility of such third parties. We accept no responsibility for damages suffered by any third party resulting from unauthorised use of the Report.

5. INTERPRETATION OF THE REPORT

a. Nature and Exactness of Descriptions: Classification and identification of soils, rocks, geological units, contaminant materials, building envelopment assessments, and engineering estimates have been based on investigations performed in accordance with the standards set out in Paragraph 1. Classification and identification of these factors are judgmental in nature and even comprehensive sampling and testing programs, implemented with the appropriate equipment by experienced personnel, may fail to locate some conditions. All investigations, or building envelope descriptions, utilizing the standards of Paragraph 1 will involve an inherent risk that some conditions will not be detected and all documents or records summarising such investigations will be based on assumptions of what exists between the actual points sampled. Actual conditions may vary significantly between the points investigated and all persons making use of such documents or records should be aware of, and accept, this risk. Some conditions are subject to change over time and those making use of the Report should be aware of this possibility and understand that the Report only presents the conditions at the sampled points at the time of sampling. Where special concerns exist, or the Client has special considerations or requirements, the Client should disclose them so that additional or special investigations may be undertaken which would not otherwise be within the scope of investigations made for the purposes of the Report.

b. Reliance on Provided information: The evaluation and conclusions contained in the Report have been prepared on the basis of conditions in evidence at the time of site inspections and on the basis of information provided to us. We have relied in good faith upon representations, information and instructions provided by the Client and others concerning the site. Accordingly, we cannot accept responsibility for any deficiency, misstatement or inaccuracy contained in the report as a result of misstatements, omissions, misrepresentations or fraudulent acts of persons providing information.

c. To avoid misunderstandings, Trow Associates Inc. (Trow) should be retained to work with the other design professionals to explain relevant engineering findings and to review their plans, drawings, and specifications relative to engineering issues pertaining to consulting services provided by Trow. Further, Trow should be retained to provide field reviews during the construction, consistent with building codes guidelines and generally accepted practices. Where applicable, the field services recommended for the project are the minimum necessary to ascertain that the Contractor's work is being carried out in general conformity with Trow's recommendations. Any reduction from the level of services normally recommended will result in Trow providing qualified opinions regarding adequacy of the work.

6.0 ALTERNATE REPORT FORMAT

When Trow submits both electronic file and hard copies of reports, drawings and other documents and deliverables (Trow's instruments of professional service), the Client agrees that only the signed and sealed hard copy versions shall be considered final and legally binding. The hard copy versions submitted by Trow shall be the original documents for record and working purposes, and, in the event of a dispute or discrepancy, the hard copy versions shall govern over the electronic versions. Furthermore, the Client agrees and waives all future right of dispute that the original hard copy signed version archived by Trow shall be deemed to be the overall original for the Project.

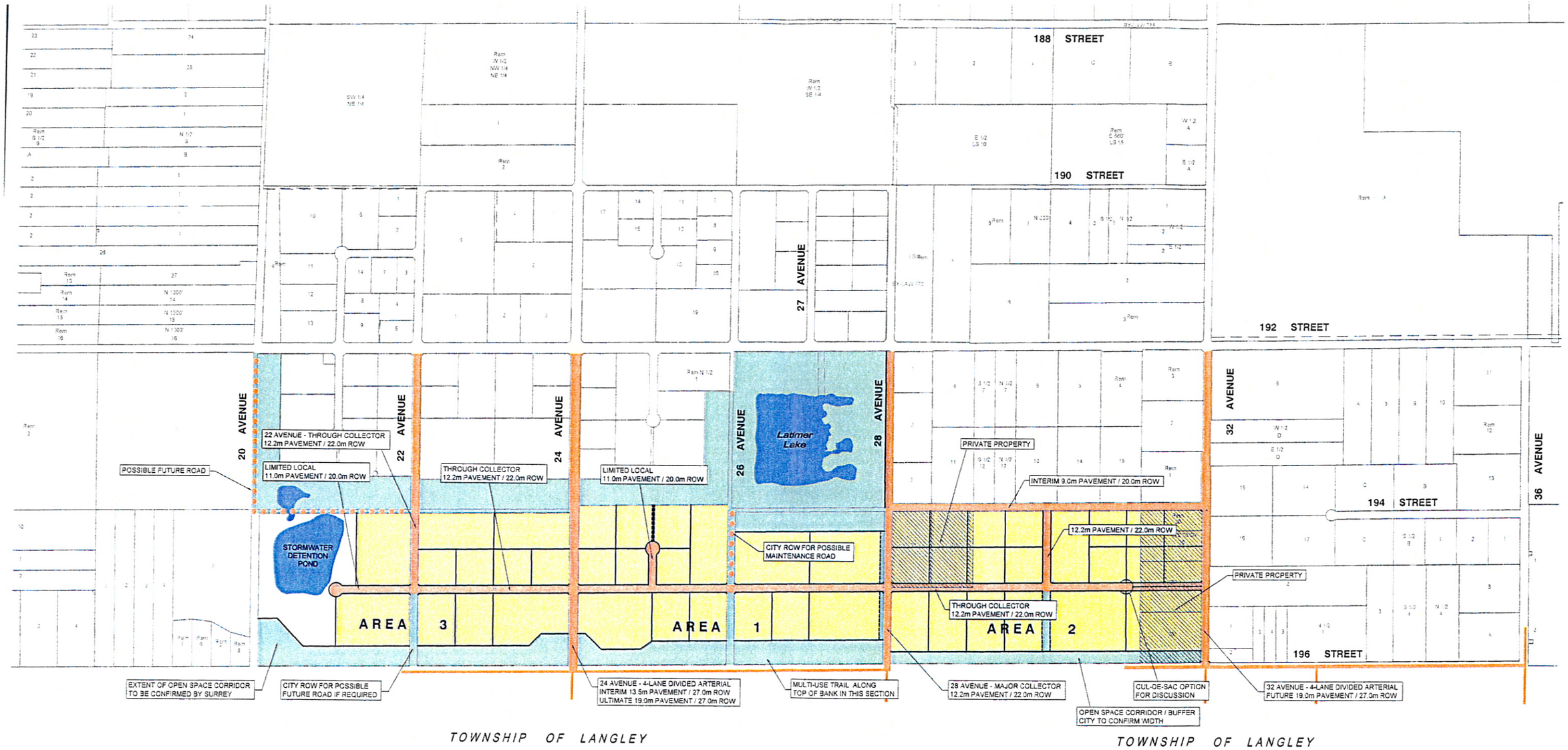
The Client agrees that both electronic file and hard copy versions of Trow's instruments of professional service shall not, under any circumstances, no matter who owns or uses them, be altered by any party except Trow. The Client warrants that Trow's instruments of professional service will be used only and exactly as submitted by Trow.

The Client recognizes and agrees that electronic files submitted by Trow have been prepared and submitted using specific software and hardware systems. Trow makes no representation about the compatibility of these files with the Client's current or future software and hardware systems.

APPENDIX B

KEP PLAN (DWG 071-03420-01)

TEST HOLE LOCATION PLAN (DWG 071-03420-02)
(SHEETS 1 AND 2)



REFERENCE DRAWING:
R.F. Binnie & Associates Ltd. - Campbell Heights, Drawing No. 07130-CLL1 - Conceptual Lot Layout / Road Network, Dated May 15, 2007

Trow 50 YEARS

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DFTR.	RK
DSGN.	RK
CHK.	JL

REVISIONS

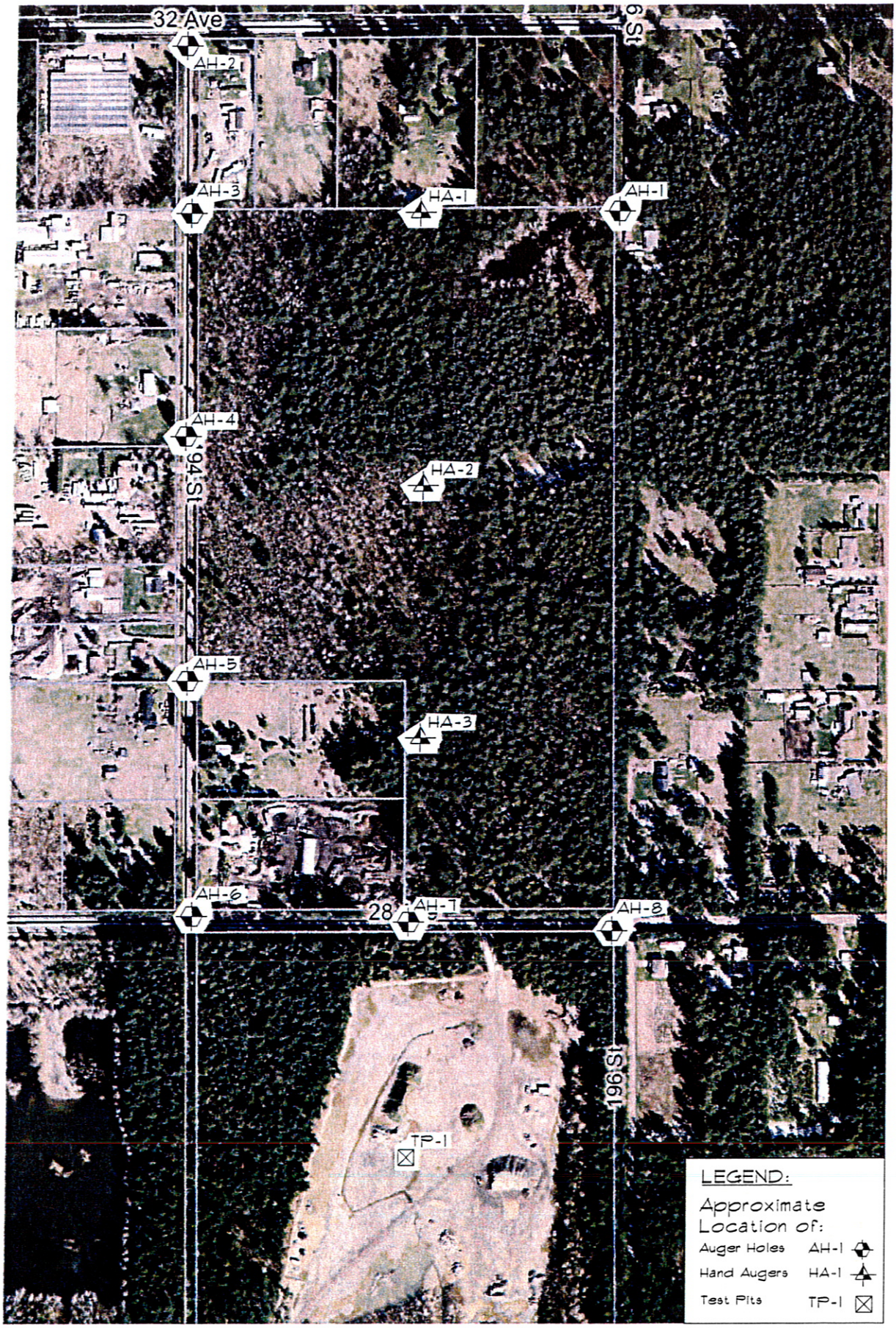
No.	DESCRIPTION	DATE

CLIENT	R.F. Binnie & Associates Ltd.
PROJECT	Campbell Heights Development Phase 2, Surrey, BC
PROJECT NO.	071-03420

TITLE: PROJECT LOCATION KEYPLAN SHOWING SITE LAYOUT

DATE	SCALE:	DWG NO.
2007-Nov-29	Approx 1:10000	071-03420-01

Nov 29, 2007 - 2:42pm L:\2007\071-03420 & Campbell Heights Phase 2, Surrey\4.0 Project Engineer's File\Keyplan Plan\Location Plan.dwg



Trow 50 YEARS TROW ASSOCIATES INC.	CLIENT: R.F. Binnie & Associates Ltd.				TITLE: Test Hole Location Plan (Sheet 1)		
	PROJECT: Campbell Heights Development Phase 2, Surrey, BC						
	PROJECT NO. 071-03420	DFTR. RK	DSGN. RK	CHK. JL	DATE 2007-Nov-29	SCALE: Approx 1:5000	DWG NO. 071-03420-02

Trow 50 YEARS TROW ASSOCIATES INC.	CLIENT: R.F. Binnie & Associates Ltd.				TITLE: Test Hole Location Plan (Sheet 2)		
	PROJECT: Campbell Heights Development Phase 2, Surrey, BC						
	PROJECT NO. 071-03420	DFTR. RK	DSGN. RK	CHK. JL	DATE 2007-Nov-29	SCALE: Approx 1:5000	DWG NO. 071-03420-02

APPENDIX C

AUGER HOLE LOGS (AH-1 to AH-25)

TEST PIT LOGS (TP-1 to TP-15)

HAND AUGER LOGS (HA-1 to HA-3)

Augerhole no. : AH-1

Equipment : TRUCK MOUNTED SOLID STEM AUGER RIG

Location : (See Test Hole Location Plan)

Method of Sampling: GRAB SAMPLE

Ground Water Elevation : 4.3m depth
(at time of investigation)

depth, ft.	depth, m	Geodetic elevation	symbol	Description	sample no.	water content %	Remarks: Standpipe Piezometer
0	0			Asphalt (25mm)			Hole annulus capped with flush mount well cover
				Compact, damp, brown, SAND, some gravel, trace to some silt (Base / Sub-base)	Sa1		
5	1						Hole annulus backfilled with bentonite from Ø.3 to 1.2m
	2			Compact, moist, greyish brown, SAND and GRAVEL, medium to coarse grained, trace of silt	Sa2		
10	3						Hole annulus backfilled with filter sand
	4			-becomes wet at 4.3m			
15	5				Sa3		
20	6						
	7				Sa4		Slotted piezometer tip set between depths of 6.1 & 7.6m
25	8			End of test hole at 7.6m			
30	9						
	10						

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Campbell Heights Development Phase 2 Surrey, BC	Augerhole No. AH-1	Logged by: RK Sheet: 1 of 1	Date of Drilling: 2007-Nov-2 Ref No. 07I-03420

Augerhole no. : AH-2

Equipment : TRUCK MOUNTED SOLID STEM AUGER RIG

Location : (See Test Hole Location Plan)

Method of Sampling: GRAB SAMPLE

Ground Water Elevation : Not Encountered
(at time of investigation)

depth, ft.	depth, m	Geodetic elevation	symbol	Description	sample no.	water content %	Remarks
0	0			Asphalt (40mm)	Sa1		
				Compact, damp, brown, gravelly SAND, trace to some silt (Base / Sub-base)			
5	1				Sa2		
	2			Compact, moist, greyish brown, SAND and GRAVEL, trace of silt, medium to coarse grained	Sa3		
10	3			End of test hole at 3.0m			
	4						
15	5						
	6						
20	7						
	8						
25	9						
30	10						

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Campbell Heights Development
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Augerhole No.	Logged by: RK	Date of Drilling: 2007-Nov-2
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Augerhole no. : AH-3

Equipment : TRUCK MOUNTED SOLID STEM AUGER RIG

Location : (See Test Hole Location Plan)

Method of Sampling: GRAB SAMPLE

Ground Water Elevation : 3.7m depth
(at time of investigation)

depth, ft.	depth, m	Geodetic elevation	symbol	Description	sample no.	water content %	Remarks
0	0			Asphalt (40mm)	Sa1		Standpipe Piezometer: Hole annulus capped with flush mount well cover
				Compact, damp, brown, SAND and GRAVEL, some silt to silty (Base)	Sa2		
	1			Compact, damp, light brown, SAND, some silt and gravel (Sub-base)	Sa3		Hole annulus backfilled with bentonite from Ø.3 to 1.2m
5				Compact, damp to moist, brownish grey to grey, SAND and GRAVEL, trace of silt, occasional cobbles			
	2				Sa4		
10	3			-becomes wet at 3.4m			Hole annulus backfilled with filter sand
	4				Sa5		
15	5				Sa6		
20	6						
	7			-some silt at 7.0m			Slotted piezometer tip set between depths of 6.1 & 7.6m
25	8			End of test hole at 7.6m			
30	9						
	10						

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Campbell Heights Development Phase 2 Surrey, BC	Augerhole No. AH-3	Logged by: RK Sheet: 1 of 1	Date of Drilling: 2007-Nov-2 Ref No. 07I-03420

Augerhole no. : AH-4

Equipment : TRUCK MOUNTED SOLID STEM AUGER RIG

Location : (See Test Hole Location Plan)

Method of Sampling: GRAB SAMPLE

Ground Water Elevation : 3.0m depth
(at time of investigation)

depth, ft.	depth, m	Geodetic elevation	symbol	Description	sample no.	water content %	Remarks
0	0			Asphalt (20mm)	Sa1		
				Compact, damp, brown, SAND and GRAVEL, some silt to silty (Base)	Sa2		
	1			Asphalt (40mm)	Sa1		
5				Compact, damp to moist, brown, SAND and GRAVEL, trace of silt, (Base / Sub-base)			
	2			Compact, moist, light brown, SAND and GRAVEL, trace to some silt, occasional cobbles to cobbley, becomes rusty brown and wet at 2.7m			
10	3			End of test hole at 3.0m			
	4						
15	5						
	6						
20	7						
25	8						
	9						
30	10						

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Campbell Heights Development Phase 2 Surrey, BC	Augerhole No. AH-4	Logged by: RK Sheet: 1 of 1	Date of Drilling: 2007-Nov-2 Ref No. 071-03420

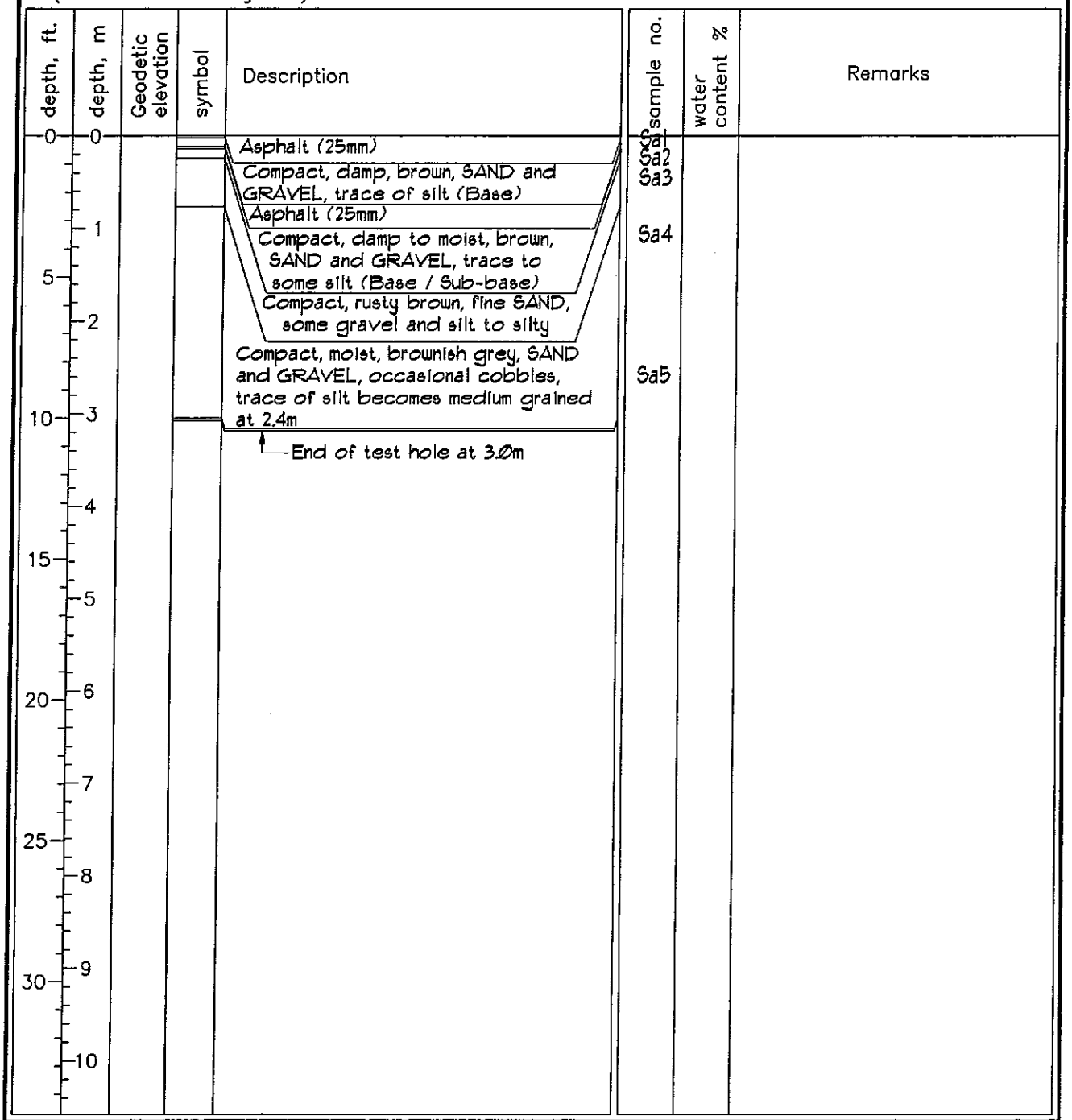
Augerhole no. : AH-5

Equipment : TRUCK MOUNTED SOLID STEM AUGER RIG

Location : (See Test Hole Location Plan)

Method of Sampling: GRAB SAMPLE

Ground Water Elevation : Not Encountered
(at time of investigation)



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Campbell Heights Development Phase 2 Surrey, BC	Augerhole No. AH-5	Logged by: RK Sheet: 1 of 1	Date of Drilling: 2007-Nov-2 Ref No. 07I-03420

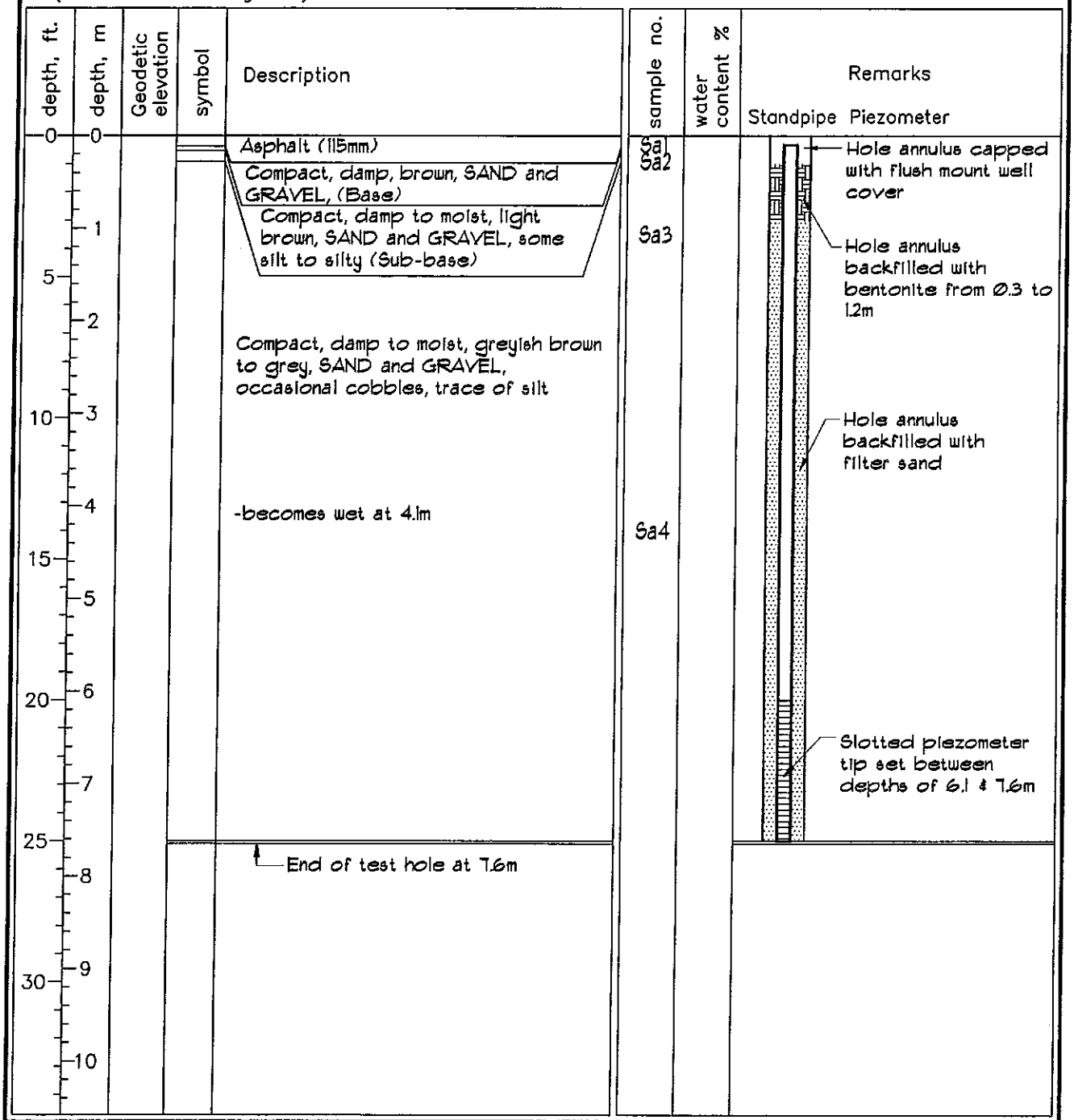
Augerhole no. : AH-6

Equipment : TRUCK MOUNTED SOLID STEM AUGER RIG

Location : (See Test Hole Location Plan)

Method of Sampling: GRAB SAMPLE

Ground Water Elevation : 4.1m depth
(at time of investigation)



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Campbell Heights Development Phase 2 Surrey, BC	Augerhole No. AH-6	Logged by: RK Sheet: 1 of 1	Date of Drilling: 2007-Nov-2 Ref No. 07I-03420

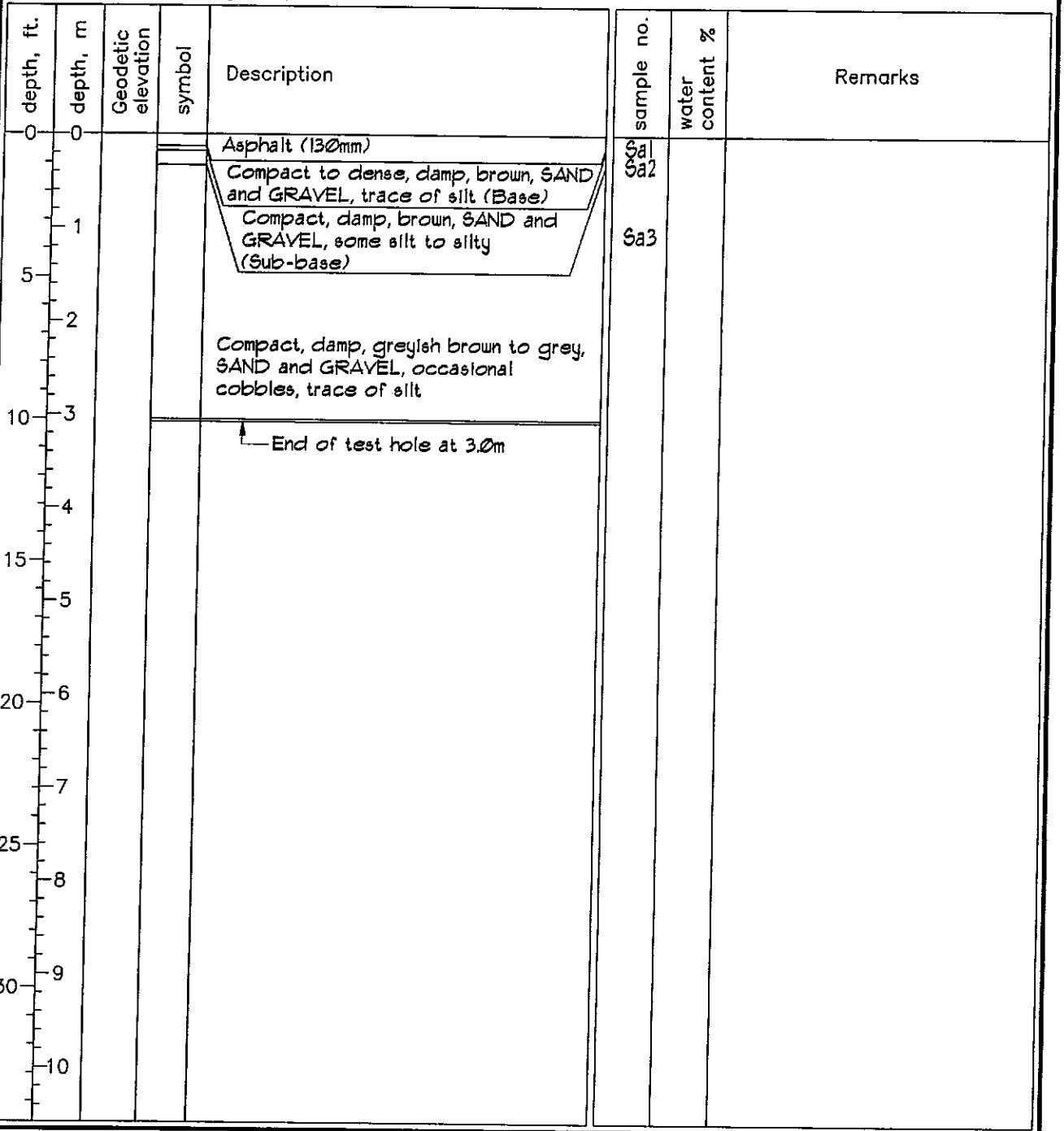
Augerhole no. : AH-7

Equipment : TRUCK MOUNTED SOLID STEM AUGER RIG

Location : (See Test Hole Location Plan)

Ground Water Elevation : Not Encountered
(at time of investigation)

Method of Sampling: GRAB SAMPLE



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Campbell Heights Development Phase 2 Surrey, BC	Augerhole No. AH-7	Logged by: RK	Date of Drilling: 2007-Nov-2
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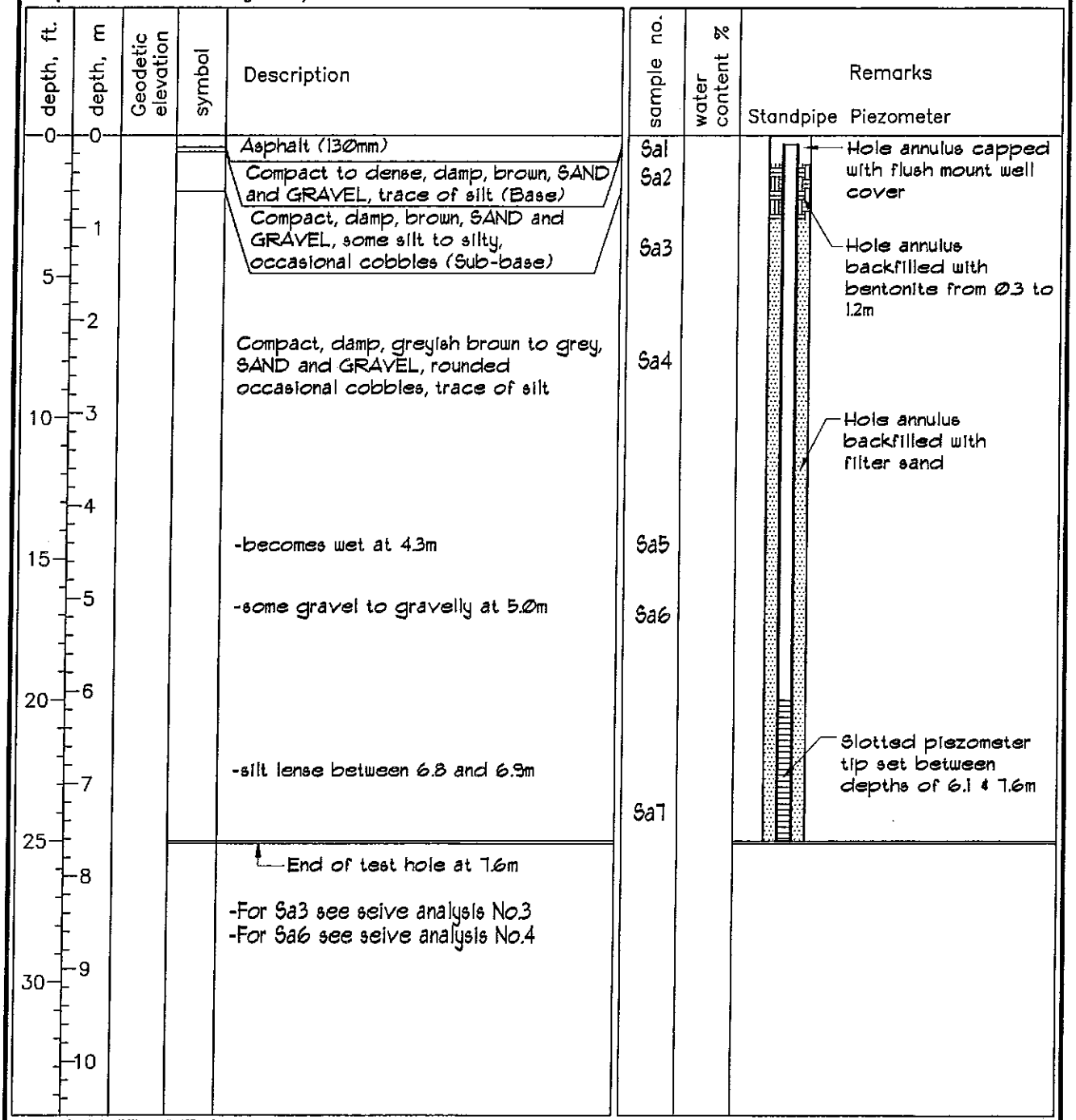
Augerhole no. : AH-8

Equipment : TRUCK MOUNTED SOLID STEM AUGER RIG

Location : (See Test Hole Location Plan)

Method of Sampling: GRAB SAMPLE

Ground Water Elevation : 4.3m depth
(at time of investigation)



R.F. Binnie and Associates Ltd.	TROW ASSOCIATES INC.		
Campbell Heights Development Phase 2 Surrey, BC	Augerhole No. AH-8	Logged by: RK Sheet: 1 of 1	Date of Drilling: 2007-Nov-2 Ref No. 07I-03420

Augerhole no. : AH-9

Equipment : TRACK MOUNTED SOLID STEM AUGER RIG

Location : (See Test Hole Location Plan)

Method of Sampling: GRAB SAMPLE

Ground Water Elevation : 2.6m depth
(at time of investigation)

depth, ft.	depth, m	Geodetic elevation	symbol	Description	sample no.	water content %	Remarks Standpipe Piezometer
0	0			Compact, moist, grey, SAND trace of gravel, trace of silt, becomes wet at 1.8m	Sa1		Hole annulus capped with flush mount well cover
5	1						Hole annulus backfilled with bentonite from 0.3 to 1.2m
	2			Firm, moist, brown, SILT lense	Sa2 Sa3	42	
10	3			Compact, moist, grey, SAND, trace of gravel some silt at top 0.3m, becomes wet at 2.6m -some gravel between 3.4 and 4.0m	Sa4		Hole annulus backfilled with filter sand
15	4				Sa5		
	5				Sa6		Slotted piezometer tip set between depths of 4.6 & 6.1m
20	6			End of test hole at 6.1m -For Sa1 see selve analysis No.2			
25	7						
30	8						
	9						
	10						

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Campbell Heights Development Phase 2 Surrey, BC	Augerhole No. AH-9	Logged by: RK Sheet: 1 of 1	Date of Drilling: 2007-Nov-5 Ref No. 07I-03420

Augerhole no. : AH-10

Equipment : TRACK MOUNTED SOLID STEM AUGER RIG

Location : (See Test Hole Location Plan)

Method of Sampling: GRAB SAMPLE

Ground Water Elevation : Not Encountered
(at time of investigation)

depth, ft.	depth, m	Geodetic elevation	symbol	Description	sample no.	water content %	Remarks
0	0			Loose to compact, moist, brownish grey, silty SAND and GRAVEL (FILL)	Sa1	20	
				Firm to stiff, moist, brown, SILT, trace to some sand, trace of gravel (FILL)	Sa2	20	
5	1						
	2			Firm / compact, dark brown, organic SILT and SAND, trace to some gravel, trace of roots, occasional wood debris (FILL)	Sa3	22	
10	3				Sa4	16	
	4			Firm, moist, grey SILT (FILL)	Sa5	42	
					Sa6	37	
15	5			Firm to stiff, grey, SILT, some sand and gravel, occasional wood debris (FILL)	Sa7	24	
				Soft to firm, dark brown, SILT, some organic silt and wood debris (FILL)	Sa8	32	
					Sa9	23	
20	6			Firm to stiff, grey, SILT, some sand to sandy trace to some gravel, trace of debris (FILL)			
	7				Sa10	15	
25	8						
				Compact to dense, grey, SAND, trace of gravel	Sa11		
30	9						
				End of test hole at 9.1m			
	10						

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Campbell Heights Development Phase 2 Surrey, BC	Augerhole No. AH-10	Logged by: RK Sheet: 1 of 1	Date of Drilling: 2001-Nov-5 Ref No. 01-03420

Augerhole no. : AH-11

Equipment : TRACK MOUNTED SOLID STEM AUGER RIG

Location : (See Test Hole Location Plan)

Method of Sampling: GRAB SAMPLE

Ground Water Elevation : Not Encountered
(at time of investigation)

depth, ft.	depth, m	Geodetic elevation	symbol	Description	sample no.	water content %	Remarks
0	0			Loose, damp, brown, SAND, some organics, silt and gravel, (Topsoil)			
	1			Firm to stiff, moist, brown, SILT, some sand and gravel			
5	2			Compact, brown, SAND and GRAVEL, becomes grey at 1.8m			
10	3			End of test hole at 3.0m			
15	5						
20	6						
25	8						
30	9						
	10						

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Campbell Heights Development Phase 2 Surrey, BC	Augerhole No. AH-11	Logged by: RK Sheet: 1 of 1	Date of Drilling: 2007-Nov-5 Ref No. 071-03420

Augerhole no. : AH-12

Equipment : TRACK MOUNTED SOLID STEM AUGER RIG

Location : (See Test Hole Location Plan)

Method of Sampling: GRAB SAMPLE

Ground Water Elevation : Not Encountered
(at time of investigation)

depth, ft.	depth, m	Geodetic elevation	symbol	Description	sample no.	water content %	Remarks
0	0			Loose, damp, dark brown, organic SILT and SAND, trace to some gravel, (Topsoil)			
				Mixed layer of: firm to stiff / compact, moist, brown, SILT and SAND, some gravel, trace debris and wood (FILL)	Sa1	14	
	1				Sa2	28	
5				Compact, moist, grey, SAND, trace to some silt, trace of gravel (FILL)	Sa3	13	
	2				Sa4	12	
				Compact / firm to stiff, brownish grey, SAND and SILT, trace to some gravel (FILL)	Sa5		
10	3			Compact, grey, SAND, trace to some gravel			
				End of test hole at 3.0m			
15	4						
	5						
20	6						
	7						
25	8						
30	9						
	10						

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Campbell Heights Development Phase 2 Surrey, BC	Augerhole No. AH-12	Logged by: RK Sheet: 1 of 1	Date of Drilling: 2007-Nov-5 Ref No. 07I-03420

Augerhole no. : AH-13

Equipment : TRACK MOUNTED SOLID STEM AUGER RIG

Location : (See Test Hole Location Plan)

Method of Sampling: GRAB SAMPLE

Ground Water Elevation : Not Encountered
(at time of investigation)

depth, ft.	depth, m	Geodetic elevation	symbol	Description	sample no.	water content %	Remarks
0	0			Firm / loose to compact, dark brown, organic SILT and SAND (Topsoil)			
				Loose to compact, brown, SAND (FILL)	Sa1	20	
5	1			Mixed, stiff / compact, moist, grey, SILT and SAND, some gravel, trace of wood debris (FILL)			
	2			-becomes wet at 2.1m			
10	3				Sa2	19	
				Compact, moist, grey, SAND, trace of gravel	Sa3		
15	4						
	5			End of test hole at 4.5m			
20	6						
	7						
25	8						
	9						
30	10						

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Campbell Heights Development
Phase 2
Surrey, BC

Augerhole No. AH-13

Logged by: RK

Sheet: 1 of 1

Date of Drilling: 2007-Nov-5

Ref No. 071-03420

Augerhole no. : AH-14

Equipment : TRACK MOUNTED SOLID STEM AUGER RIG

Location : (See Test Hole Location Plan)

Method of Sampling: GRAB SAMPLE

Ground Water Elevation : Not Encountered
(at time of investigation)

depth, ft.	depth, m	Geodetic elevation	symbol	Description	sample no.	water content %	Remarks
0	0			Compact, brown, gravelly SAND, some silt to silty, trace to some asphalt, brick, and debris (FILL)	Sa1	9	
5	1						
	2			-becomes wet at 2.3m	Sa2	22	
10	3			Firm to stiff, moist, grey, SILT, some debris (FILL)			
	4			Compact, moist, brownish grey, fine SAND, trace to some silt and debris, occasional pockets of silt (FILL)	Sa3	22	
15	5			Firm to stiff, moist, grey, SILT, some sand and gravel, occasional debris and organics (FILL)	Sa4	22	
20	6						
	7			Compact, moist, grey, SAND, trace of silt and gravel	Sa5		
25	8			End of test hole at 7.6m			
30	9						
	10						

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Campbell Heights Development Phase 2 Surrey, BC	Augerhole No. AH-14	Logged by: RK Sheet: 1 of 1	Date of Drilling: 2007-Nov-5 Ref No. 07I-03420

Augerhole no. : AH-15

Equipment : TRACK MOUNTED SOLID STEM AUGER RIG

Location : (See Test Hole Location Plan)

Method of Sampling: GRAB SAMPLE

Ground Water Elevation : Not Encountered
(at time of investigation)

depth, ft.	depth, m	Geodetic elevation	symbol	Description	sample no.	water content %	Remarks
0	0			Compact, moist, brownish grey, SAND and GRAVEL, trace of silt (FILL)			
				Moist to wet, brown, WOOD DEBRIS, trace to some sand and gravel (FILL)	Sa1	102	
	1			Compact, moist, grey, SAND and GRAVEL, trace to some silt (FILL)	Sa2	17	
5				Firm / compact, grey and brown, SILT and SAND, some gravel and debris (FILL)	Sa3	13	
	2						
				Compact, moist, brownish grey, SAND and GRAVEL, some silt, occasional wood debris and asphalt (FILL)	Sa4	7	
10	3						
				Compact, moist, grey, fine SAND, trace of debris (FILL)	Sa5	26	
	4			Firm, moist, grey, SILT, trace of black organic silt in pockets (FILL)			
15				Firm / compact, grey, SILT and SAND, trace of debris (FILL)	Sa6	10	
	5			Firm, moist, grey, SILT, trace of wood debris and gravel, occasional pockets of organic silt (FILL)	Sa7	15	
20	6						
				Firm to stiff / compact, moist grey, SILT and SAND, trace of gravel (FILL)	Sa8	13	
25	7						
	8						
				Compact, moist greyish brown, SAND and GRAVEL, trace of silt	Sa9		
30	9			End of test hole at 9.1m			
	10						

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Campbell Heights Development Phase 2 Surrey, BC	Augerhole No. AH-15	Logged by: RK Sheet: 1 of 1	Date of Drilling: 2007-Nov-5 Ref No. 071-03420

Augerhole no. : AH-16

Equipment : TRACK MOUNTED SOLID STEM AUGER RIG

Location : (See Test Hole Location Plan)

Method of Sampling: GRAB SAMPLE

Ground Water Elevation : 1.8m depth
(at time of investigation)

depth, ft.	depth, m	Geodetic elevation	symbol	Description	sample no.	water content %	Remarks (Standpipe Piezometer)
0	0			Compact, moist, brownish grey, SAND and GRAVEL, trace of silt	Sa1		Hole annulus capped with flush mount well cover
	1			Loose to compact, moist, grey, SAND and GRAVEL, trace of silt and occasional cobbles	Sa2		Hole annulus backfilled with bentonite from 0.3 to 1.2m
5	2			Compact, moist, grey, gravelly SAND, trace of silt -becomes wet at 1.8m	Sa3		
10	3						Hole annulus backfilled with filter sand
	4			-becomes brownish at 4.0m	Sa4		
15	5			-rusty brown seam between 4.6 and 4.9m -becomes light brown, fine grained with trace to some silt at 5.3m	Sa5		Slotted piezometer tip set between depths of 4.6 & 6.1m
20	6			End of test hole at 6.1m	Sa6		
25	7						
30	8						
	9						
	10						

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Campbell Heights Development Phase 2 Surrey, BC	Augerhole No. AH-16	Logged by: RK Sheet: 1 of 1	Date of Drilling: 2007-Nov-6 Ref No. 071-03420

Augerhole no. : AH-17

Equipment : TRACK MOUNTED SOLID STEM AUGER RIG

Location : (See Test Hole Location Plan)

Method of Sampling: GRAB SAMPLE

Ground Water Elevation : Not Encountered
(at time of investigation)

depth, ft.	depth, m	Geodetic elevation	symbol	Description	sample no.	water content %	Remarks
0	0			Compact, damp to moist, brownish grey, SAND and GRAVEL, some silt (FILL)			
	1			Firm to stiff / compact, damp, grey, SILT and SAND, some gravel, trace to some debris, occasional cobbles (FILL)	Sa1	15	
5							
	2			Firm to stiff, moist, grey, SILT (FILL)	Sa2	32	
10	3						
	4			Firm to stiff, moist, grey, SILT, some sand and gravel, occasional debris, brick, and asphalt (FILL)	Sa3	15	
15	5				Sa4	16	
20	6			Compact to dense, moist to wet, grey, SAND, trace of silt and gravel			
	7			-becomes brown with trace to some silt at 6.7m	Sa5		
25	8			End of test hole at 7.6m			
30	9						
	10						

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Campbell Heights Development Phase 2 Surrey, BC	Augerhole No. AH-17	Logged by: RK Sheet: 1 of 1	Date of Drilling: 2007-Nov-6 Ref No. 071-03420

Augerhole no. : AH-18

Equipment : TRACK MOUNTED SOLID STEM AUGER RIG

Location : (See Test Hole Location Plan)

Method of Sampling: GRAB SAMPLE

Ground Water Elevation : 5.5m depth
(at time of investigation)

depth, ft.	depth, m	Geodetic elevation	symbol	Description	sample no.	water content %	Remarks
0	0			Loose to compact, moist, brown, SAND and GRAVEL, trace of silt (FILL)			
				Soft to firm / loose to compact, damp, greyish brown, SILT and SAND, some gravel, trace to some debris (FILL)	Sa1	12	
5	1						
	2			Compact, moist, grey, silty, fine SAND (FILL)			
				Soft to firm / loose to compact, damp, greyish brown, SILT and SAND, some gravel, trace to some debris (FILL)	Sa2	12	
10	3						
				Firm, moist, grey, sandy SILT, some gravel, trace to some wood debris (FILL)	Sa3	21	
	4						
15				Firm, moist, grey, brown and black, SILT, organic SILT and fiberous PEAT, trace of sand, interlayered (FILL)	Sa4	44	
	5			-becomes wet with some roots			
20	6			Compact, damp to moist, grey, fine SAND, trace to some gravel from 7.2m			
	7				Sa5		
25				End of test hole at 7.6m			
	8						
30	9						
	10						

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Campbell Heights Development Phase 2 Surrey, BC	Augerhole No. AH-18	Logged by: RK Sheet: 1 of 1	Date of Drilling: 2007-Nov-6 Ref No. 071-03420

Augerhole no. : AH-19

Equipment : TRACK MOUNTED SOLID STEM AUGER RIG

Location : (See Test Hole Location Plan)

Method of Sampling: GRAB SAMPLE

Ground Water Elevation : Not Encountered
(at time of investigation)

depth, ft.	depth, m	Geodetic elevation	symbol	Description	sample no.	water content %	Remarks
0	0			Organic SILT, ROOTS, and ORGANICS (Topsoil)			
	1			Firm / compact, moist, brown, SILT and SAND, some gravel, trace to some debris (FILL)	Sa1	14	
5	2				Sa2	12	
10	3			Compact / firm, moist, grey, SAND and SILT, some gravel, occasional asphalt and debris (FILL)	Sa3	23	
	4				Sa4	17	
15	5			Compact, moist, grey, SAND, trace of gravel and silt	Sa5		
20	6			End of test hole at 6.1m			
25	7						
	8						
30	9						
	10						

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Campbell Heights Development Phase 2 Surrey, BC	Augerhole No. AH-19	Logged by: RK Sheet: 1 of 1	Date of Drilling: 2007-Nov-6 Ref No. 07-03420

Augerhole no. : AH-20

Equipment : TRACK MOUNTED SOLID STEM AUGER RIG

Location : (See Test Hole Location Plan)

Method of Sampling: GRAB SAMPLE

Ground Water Elevation : Not Encountered
(at time of investigation)

depth, ft.	depth, m	Geodetic elevation	symbol	Description	sample no.	water content %	Remarks
0	0						
				Firm / compact, damp, brown, SILT and SAND, some gravel, trace to some debris, occasional cobbles, wood debris from 2.0 to 2.1m (FILL)	Sa1	15	
5	1						
	2			Compact, damp, brown, SAND and GRAVEL, trace to some silt and debris (FILL)	Sa2	19	
10	3			Soft, damp, black, organic SILT, some sand, wood debris, and organics (FILL)	Sa3	128	
	4			WOOD CHIPS (FILL)			
				Mixed, firm / compact, moist, black, brown, and grey, SILT and SAND, trace to some gravel and organics, occasional wood debris (FILL)	Sa4	16	
15	5						
				Firm to stiff / compact, moist, grey, SILT and SAND, some gravel, trace of organics, and wood debris (FILL)	Sa5	24	
20	6						
	7			Stiff to very stiff, moist, grey, SILT, some sand, trace to some gravel and debris (FILL)	Sa6	17	
25	8						
				Stiff, moist, grey, SILT and SAND, some gravel, occasional wood debris (FILL)	Sa7	21	
30	9						
	10						
				Continued on Next Page	Sa8	17	

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Campbell Heights Development Phase 2 Surrey, BC	Augerhole No. AH-20	Logged by: RK Sheet: 1 of 2	Date of Drilling: 2007-Nov-6 Ref No. 071-03420

Augerhole no. : AH-20

Equipment : TRACK MOUNTED MINI AUGER DRILL RIG

Location : (See Test Hole Location Plan)

Method of Sampling: GRAB SAMPLE

Ground Water Elevation : Not Encountered
(at time of investigation)

depth, ft.	depth, m	Geodetic elevation	symbol	Description	sample no.	water content %	Remarks
30	10			Continued From Previous Page Stiff, moist, grey, SILT and SAND, some gravel, occasional wood debris (FILL)	Sa8	17	
35	11						
	12				Sa9	16	
40							
	13			Compact to dense, moist, grey, SAND, trace of silt, trace to some gravel from 13.1m	Sa10		
45	14			End of test hole at 13.7m			
50	15						
	16						
55	17						
	18						
60	19						

UMA Engineering Ltd.	TROW ASSOCIATES INC.		
Geotechnical Engineering Services 2007 Drainage Upgrade Program East Richmond, BC	Augerhole No. AH-20	Logged by: RK Sheet: 2 of 2	Date of Drilling: 2007-Nov-6 Ref No. 07-03342

Augerhole no. : AH-21

Equipment : TRACK MOUNTED SOLID STEM AUGER RIG

Location : (See Test Hole Location Plan)

Method of Sampling: GRAB SAMPLE

Ground Water Elevation : Not Encountered
(at time of investigation)

depth, ft.	depth, m	Geodetic elevation	symbol	Description	sample no.	water content %	Remarks
0	0			Compact, moist, dark brown, SAND, some organics, gravel, and rootlets, trace to some silt (FILL)	Sa1	15	
					Sa2	??	
	1			Compact, brown, SAND and GRAVEL, trace of silt (FILL)	Sa3	29	
5	2			Compact / stiff to firm, dark brown, organic SILT, some sand and gravel, trace to some rootlets and debris, occasional cobbles (FILL)	Sa4	??	
10	3						
	4				Sa5	26	
15	5						
				Firm to stiff, moist, grey, SILT, trace to some sand, gravel, and debris, occasional sandy seams (FILL)	Sa6	17	
20	6						
	7				Sa7	14	
25	8						
					Sa8	16	
30	9						
	10			Compact, moist, brown, SAND, some gravel, trace of silt, less gravel with depth	Sa9		

Continued on Next Page

R.F. Binnie and Associates Ltd.	TROW ASSOCIATES INC.		
Campbell Heights Development Phase 2 Surrey, BC	Augerhole No. AH-21	Logged by: RK Sheet: 1 of 2	Date of Drilling: 2007-Nov-7 Ref No. 07I-03420

Augerhole no. : AH-21

Equipment : TRACK MOUNTED MINI AUGER DRILL RIG

Location : (See Test Hole Location Plan)

Method of Sampling: GRAB SAMPLE

Ground Water Elevation : Not Encountered
(at time of investigation)

depth, ft.	depth, m	Geodetic elevation	symbol	Description	sample no.	water content %	Remarks
30				Continued From Previous Page			
	10			Compact, moist, brown, SAND, trace of silt and gravel	Sa9		
35							
	11			End of test hole at 10.7m			
40							
	12						
	13						
45							
	14						
	15						
50							
	16						
55							
	17						
	18						
60							
	19						

UMA Engineering Ltd.	TROW ASSOCIATES INC.		
Geotechnical Engineering Services 2001 Drainage Upgrade Program East Richmond, BC	Augerhole No. AH-21	Logged by: RK Sheet: 2 of 2	Date of Drilling: 2001-Nov-1 Ref No. 01I-03342

Augerhole no. : AH-22

Equipment : TRACK MOUNTED SOLID STEM AUGER RIG

Location : (See Test Hole Location Plan)

Method of Sampling: GRAB SAMPLE

Ground Water Elevation : Not Encountered
(at time of investigation)

depth, ft.	depth, m	Geodetic elevation	symbol	Description	sample no.	water content %	Remarks
0	0			Firm to stiff, moist, brown to brownish grey, SILT, some sand to sandy, trace to some gravel, trace of roots, trace of asphalt pieces (FILL)	Sa1	20	
5	1			-becomes stiff to very stiff			
	2			Seam of firm, dark brown, organic SILT (FILL)	Sa2	18	
10	3			Stiff, moist, brownish grey, SILT, some sand to sandy, trace to some gravel becomes firm to stiff at 3.0m (FILL)	Sa3	18	
15	4				Sa4	18	
	5						
20	6				Sa5	17	
	7			Seam of stiff / compact, brown, SILT and SAND (FILL)			
25	8			Stiff, moist, brownish grey, SILT, some sand to sandy, trace to some gravel, occasional thin sand seams and asphalt chunks (FILL)	Sa6	13	
30	9						
	10				Sa7	14	

Continued on Next Page

RF. Binnie and Associates Ltd.	TROW ASSOCIATES INC.		
Campbell Heights Development Phase 2 Surrey, BC	Augerhole No. AH-22	Logged by: RK	Date of Drilling: 2001-Nov-7
		Sheet: 1 of 2	Ref No. 01I-03420

Augerhole no. : AH-22

Equipment : TRACK MOUNTED MINI AUGER DRILL RIG

Location : (See Test Hole Location Plan)

Method of Sampling: GRAB SAMPLE

Ground Water Elevation : Not Encountered
(at time of investigation)

depth, ft.	depth, m	Geodetic elevation	symbol	Description	sample no.	water content %	Remarks
30				Continued From Previous Page			
	10			Stiff, moist, brownish grey, SILT, some sand to sandy, trace to some gravel, occasional thin sand seams and asphalt chunks (FILL)	Sa7	14	
35	11			Compact, moist, grey, SAND, trace of silt and gravel			
					Sa8		
40	12			End of test hole at 10.7m			
	13						
45	14						
	15						
50	16						
55	17						
	18						
60	19						

UMA Engineering Ltd.

TROW ASSOCIATES INC.

Geotechnical Engineering Services
2001 Drainage Upgrade Program
East Richmond, BC

Augerhole No.	Logged by: RK	Date of Drilling: 2001-Nov-7
AH-22	Sheet: 2 of 2	Ref No. 01-03342

Augerhole no. : AH-23

Equipment : TRACK MOUNTED SOLID STEM AUGER RIG

Location : (See Test Hole Location Plan)

Method of Sampling: GRAB SAMPLE

Ground Water Elevation : Not Encountered
(at time of investigation)

depth, ft.	depth, m	Geodetic elevation	symbol	Description	sample no.	water content %	Remarks
0	0			Loose to compact, damp, dark grey, SAND, some silt and gravel (FILL)	Sa1 Sa2		
				Loose to compact, damp, brown, SAND and GRAVEL, trace of silt (FILL)	Sa3	20	
5	1			Loose to compact, damp, dark grey, SAND and GRAVEL to gravelly SAND, trace to some silt and debris (FILL)			
	2			Compact, damp, grey, SAND, some silt to silty, trace to some gravel, trace of debris (FILL)	Sa4	13	
10	3			Firm / loose to compact, damp to moist, grey, SILT and SAND, trace to some gravel, trace of debris (FILL)			
				Compact, dark grey, fine SAND (FILL)			
	4			Soft to firm, dark brown organic SILT (FILL)			
				Mixed layers of: Firm / compact, grey, sandy SILT, silty SAND, and SILT and SAND, trace to some gravel, occasional thin peat / organic silt seams and cobbles (FILL)	Sa5	16	
15	5						
				Firm to stiff, damp, brown, SILT, trace to some sand, trace of organic silt (FILL)	Sa6	18	
20	6						
	7			Mixed layers of: firm to stiff / compact, grey, SILT and SAND, some gravel, trace of debris (FILL)	Sa7	18	
25	8						
					Sa8	22	
30	9						
	10			Compact to dense, moist, rusty brown, SAND and GRAVEL, trace to some silt	Sa9		

Continued on Next Page

R.F. Binnie and Associates Ltd.	TROW ASSOCIATES INC.		
Campbell Heights Development Phase 2 Surrey, BC	Augerhole No. AH-23	Logged by: RK Sheet: 1 of 2	Date of Drilling: 2007-Nov-7 Ref No. 07I-03420

Augerhole no. : AH-23

Equipment : TRACK MOUNTED MINI AUGER DRILL RIG

Location : (See Test Hole Location Plan)

Method of Sampling: GRAB SAMPLE

Ground Water Elevation : Not Encountered
(at time of investigation)

depth, ft.	depth, m	Geodetic elevation	symbol	Description	sample no.	water content %	Remarks
30				Continued From Previous Page			
	10			Mixed layers of: firm to stiff / compact, grey, SILT and SAND, some gravel, trace of debris (FILL)			
				Compact to dense, moist, rusty brown, SAND and GRAVEL, trace to some silt	Sa9		
35	11			Compact to dense, moist, brown, SAND and GRAVEL, trace of silt			
	12						
40				End of test hole at 10.7m			
	13						
45	14						
	15						
50							
	16						
55	17						
	18						
60							
	19						

UMA Engineering Ltd.	TROW ASSOCIATES INC.		
Geotechnical Engineering Services 2007 Drainage Upgrade Program East Richmond, BC	Augerhole No. AH-23	Logged by: RK Sheet: 2 of 2	Date of Drilling: 2007-Nov-7 Ref No. 07I-03342

Augerhole no. : AH-24

Equipment : TRACK MOUNTED SOLID STEM AUGER RIG

Location : (See Test Hole Location Plan)

Method of Sampling: GRAB SAMPLE

Ground Water Elevation : Not Encountered
(at time of investigation)

depth, ft.	depth, m	Geodetic elevation	symbol	Description	sample no.	water content %	Remarks
0	0			Firm to stiff, damp to moist, brown, SILT, trace to some sand, trace of organics and roots, occasional cobbles and thin sandy seams (FILL	Sa1	10	
	1						
5	2				Sa2	22	
10	3						
	4				Sa3	20	
15	5			End of test hole refusal on concrete obstruction at 5.2m			
20	6						
	7						
25	8						
	9						
30	10						

R.F. Binnie and Associates Ltd.	TROW ASSOCIATES INC.		
Campbell Heights Development Phase 2 Surrey, BC	Augerhole No. AH-24	Logged by: RK Sheet: 1 of 1	Date of Drilling: 2007-Nov-6 Ref No. 071-03420

Augerhole no. : AH-25

Equipment : TRACK MOUNTED SOLID STEM AUGER RIG

Location : (See Test Hole Location Plan)

Method of Sampling: GRAB SAMPLE

Ground Water Elevation : Not Encountered
(at time of investigation)

depth, ft.	depth, m	Geodetic elevation	symbol	Description	sample no.	water content %	Remarks
0	0			Compact, moist, grey, SAND and GRAVEL, trace of silt, occasional cobbles (FILL)	Sa1		
	1						
5				Soft to firm, moist, black, organic SILT (FILL)			
				Compact, moist, grey, silty SAND (FILL)			
	2			Firm, dark brown, organic SILT (FILL)			
				ORGANICS, pine needles and rootlets, some sand (FILL)	Sa2	33	
10	3			Soft / loose, moist to wet, grey, SILT and SAND, trace to some gravel and organics (FILL)			
				Stiff / compact, brown and grey, SILT and SAND (FILL)	Sa3	62	
	4			Firm, black, organic SILT, some wood debris (FILL)			
15				Soft, brown, fiberous PEAT, organic SILT, and WOOD DEBRIS, trace of sand (FILL)	Sa4	21	
	5			Firm, moist, dark grey, SILT, some sand and gravel (FILL)			
				Soft to firm, moist, grey SILT (FILL)			
20	6			Soft, moist, black, organic SILT and WOOD DEBRIS (FILL)			
				Firm, moist, grey, SILT, trace to some sand, occasional pockets of organic silt (FILL)	Sa5	23	
25	7						
	8			Compact to dense, moist, grey SAND and GRAVEL, trace of silt	Sa6		
30	9			End of test hole at 9.1m			
	10						

R.F. Binnie and Associates Ltd.	TROW ASSOCIATES INC.		
Campbell Heights Development Phase 2 Surrey, BC	Augerhole No. AH-25	Logged by: RK Sheet: 1 of 1	Date of Drilling: 2007-Nov-7 Ref No. 07I-03420

Test Pit no. : TP-1

Equipment : RUBBER TIRED BACKHOE

Location : *(See Test Hole Location Plan)*

Method of Sampling: GRAB SAMPLE

Ground Water Elevation : 1.2m depth
(at time of investigation)

depth, ft.	depth, m	Geodetic elevation	symbol	Description	sample no.	water content %	Remarks
0	0			Compact, damp to moist, brown, SAND and GRAVEL, occasional cobbles, trace of silt	Sa1		
	1			Compact, moist to wet, grey, SAND, some gravel to gravelly, occasional small pockets of brown silt	Sa2		
5	2			Compact, wet, grey, SAND, trace to some gravel, trace of silt	Sa3		
				End of test pit at 2.4m sides caving			
10	3						
	4						
15	5						
20	6						
	7						
25	8						
	9						
30	10						

R.F. Binnie and Associates Ltd.	TROW ASSOCIATES INC.		
Campbell Heights Development Phase 2 Surrey, BC	Test Pit No. TP-1	Logged by: RK Sheet: 1 of 1	Date of Drilling: 2007-Nov-9 Ref No. 071-03420

Test Pit no. : TP-2

Equipment : RUBBER TIRED BACKHOE

Location : (See Test Hole Location Plan)

Method of Sampling: GRAB SAMPLE

Ground Water Elevation : 1.3m depth
(at time of investigation)

depth, ft.	depth, m	Geodetic elevation	symbol	Description	sample no.	water content %	Remarks
0	0			Compact, damp to moist, brown, SAND and GRAVEL, occasional cobbles, trace of silt	Sa1		
	1						
5				Compact, moist to wet, grey, SAND, some gravel to gravelly, occasional small pockets of brown silt	Sa2		
	2						
10	3			End of test pit at 3.0m sides caving			
	4						
15							
	5						
20	6						
	7						
25							
	8						
30	9						
	10						

R.F. Binnie and Associates Ltd.	TROW ASSOCIATES INC.		
Campbell Heights Development Phase 2 Surrey, BC	Test Pit No. TP-2	Logged by: RK Sheet: 1 of 1	Date of Drilling: 2007-Nov-9 Ref No. 071-03420

Test Pit no. : TP-3

Equipment : RUBBER TIRED BACKHOE

Location : (See Test Hole Location Plan)

Method of Sampling: GRAB SAMPLE

Ground Water Elevation : Not Encountered
(at time of investigation)

depth, ft.	depth, m	Geodetic elevation	symbol	Description	sample no.	water content %	Remarks
0	0			Topsoil, moss, and roots			
				Compact, moist, brown, SAND and GRAVEL, trace of silt and rootlets	Sa1		
	1			Compact, moist, grey, SAND and GRAVEL to gravelly SAND trace of silt, less gravel with depth, occasional small pockets of brown silt			
5					Sa2		
	2				Sa3		-Slight seepage at 2.0m
					Sa4		
10	3						
				End of test pit at 3.4m			
	4						
15							
	5						
20	6						
	7						
25							
	8						
	9						
30							
	10						

R.F. Binnie and Associates Ltd.	TROW ASSOCIATES INC.		
Campbell Heights Development Phase 2 Surrey, BC	Test Pit No. TP-3	Logged by: RK Sheet: 1 of 1	Date of Drilling: 2007-Nov-9 Ref No. 071-03420

Test Pit no. : TP-4

Equipment : RUBBER TIRED BACKHOE

Location : (See Test Hole Location Plan)

Method of Sampling: GRAB SAMPLE

Ground Water Elevation : Not Encountered
(at time of investigation)

depth, ft.	depth, m	Geodetic elevation	symbol	Description	sample no.	water content %	Remarks
0	0			Compact to dense, damp, brown, SAND and GRAVEL, trace to some silt, (Roadbase)	Sa1		
					Sa2		
	1			Compact, moist, grey, SAND and GRAVEL, some gravel below 0.8m			
5							
	2				Sa3		
				-slight seepage at 2.1m	Sa4		-Slight seepage at 2.1m
10	3			End of test pit at 3.0m			
	4						
15							
	5						
20	6						
	7						
25							
	8						
30	9						
	10						

R.F. Binnie and Associates Ltd.

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Campbell Heights Development
Phase 2
Surrey, BC

Test Pit No.	Logged by: RK	Date of Drilling: 2001-Nov-9
TP-4	Sheet: 1 of 1	Ref No. 011-03420

Test Pit no. : TP-5

Equipment : RUBBER TIRED BACKHOE

Location : (See Test Hole Location Plan)

Method of Sampling: GRAB SAMPLE

Ground Water Elevation : Not Encountered
(at time of investigation)

depth, ft.	depth, m	Geodetic elevation	symbol	Description	sample no.	water content %	Remarks
0	0			Compact, moist, brownish grey, SAND and GRAVEL to gravelly SAND, trace of silt			
	1				Sa1		
5				Compact, moist, grey, gravelly SAND, trace of silt			
	2				Sa2		
				Compact, wet, grey, SAND and GRAVEL, moderate seepage at 2.1m			-Slight seepage at 2.1m
10	3				Sa3		
				End of test pit at 3.4m			
	4						
15							
	5						
20	6						
	7						
25							
	8						
	9						
30							
	10						

R.F. Binnie and Associates Ltd.	TROW ASSOCIATES INC.		
Campbell Heights Development Phase 2 Surrey, BC	Test Pit No. TP-5	Logged by: RK Sheet: 1 of 1	Date of Drilling: 2007-Nov-9 Ref No. 071-03420

Test Pit no. : TP-6

Equipment : RUBBER TIRED BACKHOE

Location : (See Test Hole Location Plan)

Method of Sampling: GRAB SAMPLE

Ground Water Elevation : Not Encountered
(at time of investigation)

depth, ft.	depth, m	Geodetic elevation	symbol	Description	sample no.	water content %	Remarks
0	0			Loose to compact / firm, brown, SILT, SAND and ORGANICS, (Topsoil)	Sa1		
				Compact, damp, brown, SAND, some silt, trace of gravel and organics			
	1			Compacct, damp to moist, brownish grey, SAND and GRAVEL, trace of silt, occasional cobbles, becomes grey and gravelly to some gravel at 1.6m	Sa2		
5	2				Sa3		
					Sa4		
10	3			End of test pit at 3.4m			
	4			-For Sa2 see selve analysis No.1			
15	5						
20	6						
	7						
25	8						
	9						
30	10						

R.F. Binnie and Associates Ltd.	TROW ASSOCIATES INC.		
Campbell Heights Development Phase 2 Surrey, BC	Test Pit No. TP-6	Logged by: RK Sheet: 1 of 1	Date of Drilling: 2007-Nov-9 Ref No. 071-03420

Test Pit no. : TP-1

Equipment : RUBBER TIRED BACKHOE

Location : (See Test Hole Location Plan)

Method of Sampling: GRAB SAMPLE

Ground Water Elevation : Not Encountered
(at time of investigation)

depth, ft.	depth, m	Geodetic elevation	symbol	Description	sample no.	water content %	Remarks
0	0			Compact, damp to moist, brown, SAND and GRAVEL, some silt to silty, trace of debris, occasional cobbles (FILL)	Sa1		
	1			Soft to firm, dark brown to black, ORGANICS and organic SILT (FILL)			
5	2			End of test pit at 1.2m			
10	3						
	4						
15	5						
20	6						
	7						
25	8						
	9						
30	10						

R.F. Binnie and Associates Ltd.	TROW ASSOCIATES INC.		
Campbell Heights Development Phase 2 Surrey, BC	Test Pit No. TP-1	Logged by: RK Sheet: 1 of 1	Date of Drilling: 2007-Nov-9 Ref No. 071-03420

Test Pit no. : TP-8

Equipment : RUBBER TIRED BACKHOE

Location : *(See Test Hole Location Plan)*

Method of Sampling: GRAB SAMPLE

Ground Water Elevation : Not Encountered
(at time of investigation)

depth, ft.	depth, m	Geodetic elevation	symbol	Description	sample no.	water content %	Remarks
0	0			Compact, damp, brown, SAND and GRAVEL, some silt, trace of debris, occasional cobbles (FILL)	Sa1		
	1			Stiff / compact, brownish grey, SILT and SAND, some debris and organics (FILL)			
5				End of test pit at 0.9m			
	2						
10	3						
	4						
15							
	5						
20	6						
	7						
25							
	8						
30	9						
	10						

R.F. Binnie and Associates Ltd.	TROW ASSOCIATES INC.		
Campbell Heights Development Phase 2 Surrey, BC	Test Pit No. TP-8	Logged by: RK Sheet: 1 of 1	Date of Drilling: 2007-Nov-9 Ref No. 071-03420

Test Pit no. : TP-9

Equipment : RUBBER TIRED BACKHOE

Location : (See Test Hole Location Plan)

Method of Sampling: GRAB SAMPLE

Ground Water Elevation : Not Encountered
(at time of investigation)

depth, ft.	depth, m	Geodetic elevation	symbol	Description	sample no.	water content %	Remarks
0	0			Compact to dense, damp to moist, brown, SAND and GRAVEL, some silt (FILL)	Sa1	42	
	1			Stiff / compact to dense, brown, SILT, SAND and GRAVEL, trace to some debris (FILL)	Sa2	23	
5	2			Stiff / compact to dense, brown, SILT and SAND, trace to some debris (FILL)			
				End of test pit at 1.2m			
10	3						
	4						
15	5						
20	6						
	7						
25	8						
30	9						
	10						

R.F. Binnie and Associates Ltd.	TROW ASSOCIATES INC.		
Campbell Heights Development Phase 2 Surrey, BC	Test Pit No. TP-9	Logged by: RK Sheet: 1 of 1	Date of Drilling: 2007-Nov-9 Ref No. 071-03420

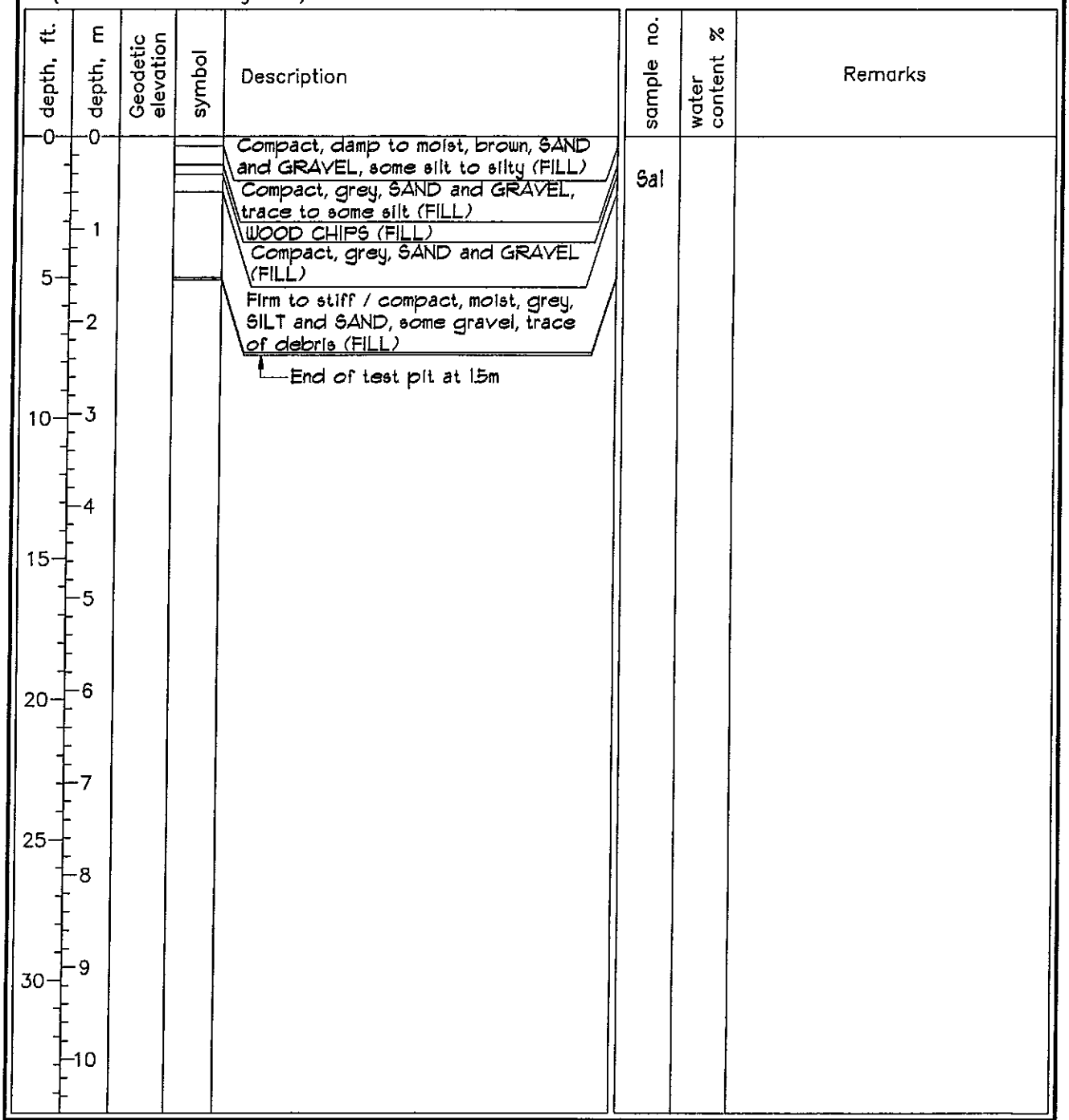
Test Pit no. : TP-10

Equipment : RUBBER TIRED BACKHOE

Location : (See Test Hole Location Plan)

Method of Sampling: GRAB SAMPLE

Ground Water Elevation : Not Encountered
(at time of investigation)



R.F. Binnie and Associates Ltd.	TROW ASSOCIATES INC.		
Campbell Heights Development Phase 2 Surrey, BC	Test Pit No. TP-10	Logged by: RK Sheet: 1 of 1	Date of Drilling: 2007-Nov-9 Ref No. 071-03420

Test Pit no. : TP-11

Equipment : RUBBER TIRED BACKHOE

Location : (See Test Hole Location Plan)

Method of Sampling: GRAB SAMPLE

Ground Water Elevation : Not Encountered
(at time of investigation)

depth, ft.	depth, m	Geodetic elevation	symbol	Description	sample no.	water content %	Remarks
0	0			Firm / compact, damp to moist, brown, SILT, SAND and GRAVEL, some wood debris (FILL)	Sa1		
				Compact, brown, SAND and GRAVEL, trace to some debris (FILL)	Sa2	13	
5	1			Firm to stiff / compact, brown, SILT and SAND, some gravel and wood debris (FILL)			
	2			End of test pit at 1.7m			
10	3						
	4						
15	5						
20	6						
	7						
25	8						
30	9						
	10						

R.F. Binnie and Associates Ltd.	TROW ASSOCIATES INC.		
Campbell Heights Development Phase 2 Surrey, BC	Test Pit No. TP-11	Logged by: RK Sheet: 1 of 1	Date of Drilling: 2007-Nov-9 Ref No. 071-03420

Test Pit no. : TP-12

Equipment : RUBBER TIRED BACKHOE

Location : (See Test Hole Location Plan)

Method of Sampling: GRAB SAMPLE

Ground Water Elevation : Not Encountered
(at time of investigation)

depth, ft.	depth, m	Geodetic elevation	symbol	Description	sample no.	water content %	Remarks
0	0			Compact to dense, greyish brown, SAND and GRAVEL, some silt, trace to some concrete and brick debris, trace organics at 0.6m (FILL)	Sa1		
	1				Sa2	13	
5					Sa3	21	
	2			Compact, greyish brown, SAND, GRAVEL and ORGANICS, some silt to silty (FILL)			
				End of test pit at 2.4m			
10	3						
	4						
15							
	5						
20	6						
	7						
25							
	8						
30	9						
	10						

R.F. Binnie and Associates Ltd.

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Campbell Heights Development
Phase 2
Surrey, BC

Test Pit No.	Logged by: RK	Date of Drilling: 2001-Nov-9
TP-12	Sheet: 1 of 1	Ref No. 071-03420

Test Pit no. : TP-13

Equipment : RUBBER TIRED BACKHOE

Location : (See Test Hole Location Plan)

Method of Sampling: GRAB SAMPLE

Ground Water Elevation : Not Encountered
(at time of investigation)

depth, ft.	depth, m	Geodetic elevation	symbol	Description	sample no.	water content %	Remarks
0	0			Compact to dense / stiff, brown, SAND, GRAVEL and SILT (FILL)	Sa1	9	
				Stiff, damp, brown, SILT, some sand and gravel (FILL)			
	1			End of test pit at 0.9m			
5	2						
10	3						
	4						
15	5						
20	6						
	7						
25	8						
30	9						
	10						

R.F. Binnie and Associates Ltd.

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Campbell Heights Development
Phase 2
Surrey, BC

Test Pit No.	Logged by: RK	Date of Drilling: 2007-Nov-9
TP-13	Sheet: 1 of 1	Ref No. 071-03420

Test Pit no. : TP-14

Equipment : RUBBER TIRED BACKHOE

Location : (See Test Hole Location Plan)

Method of Sampling: GRAB SAMPLE

Ground Water Elevation : Not Encountered
(at time of investigation)

depth, ft.	depth, m	Geodetic elevation	symbol	Description	sample no.	water content %	Remarks
0	0			Compact to dense, brown, SAND and GRAVEL (FILL)			
	1			Stiff, damp, light brown, SILT, some sand and gravel (FILL)			
5	2			End of test pit at 1.2m			
10	3						
	4						
15	5						
20	6						
	7						
25	8						
	9						
30	10						

R.F. Binnie and Associates Ltd.	TROW ASSOCIATES INC.		
Campbell Heights Development Phase 2 Surrey, BC	Test Pit No. TP-14	Logged by: RK Sheet: 1 of 1	Date of Drilling: 2007-Nov-9 Ref No. 071-03420

Test Pit no. : TP-15

Equipment : RUBBER TIRED BACKHOE

Location : (See Test Hole Location Plan)

Method of Sampling: GRAB SAMPLE

Ground Water Elevation : Not Encountered
(at time of investigation)

depth, ft.	depth, m	Geodetic elevation	symbol	Description	sample no.	water content %	Remarks
0	0			Compact, grey and brown, SAND and GRAVEL, some silt, trace to some debris (FILL)	Sa1	33	
	1			Soft, moist, grey SILT (FILL)			
5	2			End of test pit at 1.2m			
10	3						
	4						
15	5						
20	6						
	7						
25	8						
	9						
30	10						

R.F. Binnie and Associates Ltd.	TROW ASSOCIATES INC.		
Campbell Heights Development Phase 2 Surrey, BC	Test Pit No. TP-15	Logged by: RK Sheet: 1 of 1	Date of Drilling: 2007-Nov-9 Ref No. 071-03420

Augerhole no. : HA-1

Equipment : HAND AUGER

Location : (See Test Hole Location Plan)

Method of Sampling: GRAB SAMPLE

Ground Water Elevation : Not Encountered
(at time of investigation)

depth, ft.	depth, m	Geodetic elevation	symbol	Description	sample no.	water content %	Remarks
0	0			Loose / firm, moist, dark brown to black, organic SAND and SILT (Topsoil 130mm)	Sa1	12	
	1			Compact, damp to moist, light brown SAND and GRAVEL, trace to some silt			
5	2			End of hand auger at 0.7m refusal on cobble			
10	3						
	4						
15	5						
20	6						
	7						
25	8						
30	9						
	10						

R.F. Binnie and Associates Ltd.

TROW ASSOCIATES INC.

Campbell Heights Development
Phase 2
Surrey, BC

Augerhole No. HA-1

Logged by: RK

Sheet: 1 of 1

Date of Drilling: 2007-Nov-10

Ref No. 071-03420

Augerhole no. : HA-2

Equipment : HAND AUGER

Location : *(See Test Hole Location Plan)*

Method of Sampling: GRAB SAMPLE

Ground Water Elevation : Not Encountered
(at time of investigation)

depth, ft.	depth, m	Geodetic elevation	symbol	Description	sample no.	water content %	Remarks
0	0			Loose / firm, moist, dark brown to black, organic SAND and SILT (Topsoil 15mm)	Sa1	32	
	1			Compact, damp to moist, light brown fine SAND, some silt to silty, soome organics, less silt with depth	Sa2		
5	2			Compact, damp, brown, fine SAND, trace to some silt			
				End of hand auger at 1.2m			
10	3						
	4						
15	5						
	6						
20	7						
25	8						
	9						
30	10						

RF. Binnie and Associates Ltd.	TROW ASSOCIATES INC.		
Campbell Heights Development Phase 2 Surrey, BC	Augerhole No. HA-2	Logged by: RK Sheet: 1 of 1	Date of Drilling: 2007-Nov-10 Ref No. 071-03420

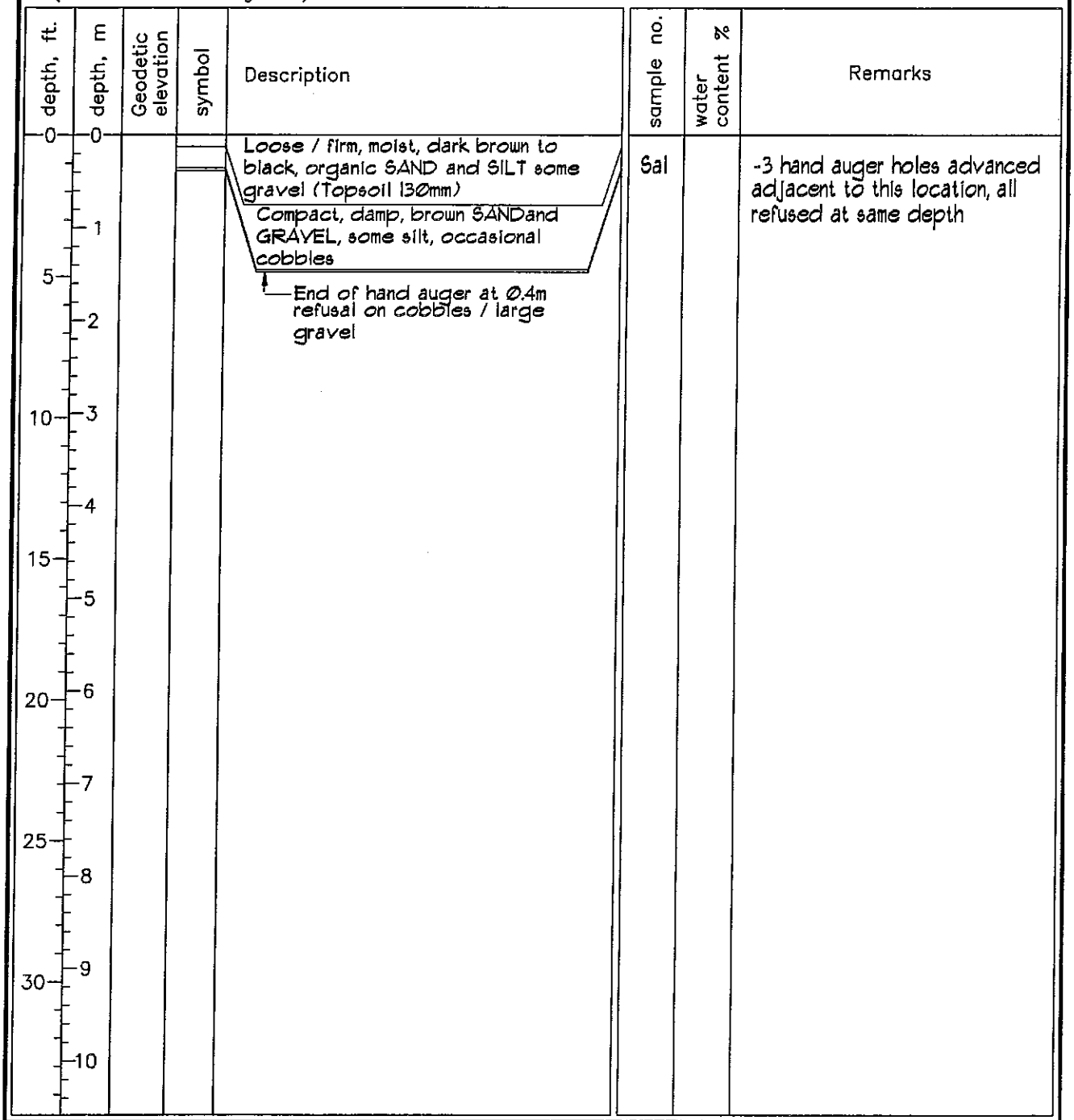
Augerhole no. : HA-3

Equipment : HAND AUGER

Location : *(See Test Hole Location Plan)*

Method of Sampling: GRAB SAMPLE

Ground Water Elevation : Not Encountered
(at time of investigation)



R.F. Binnie and Associates Ltd.	TROW ASSOCIATES INC.		
Campbell Heights Development Phase 2 Surrey, BC	Augerhole No. HA-3	Logged by: RK Sheet: 1 of 1	Date of Drilling: 2007-Nov-10 Ref No. 071-03420

APPENDIX D

SIEVE ANALYSIS REPORTS (Nos. 1 to 4)

Trow

Sieve Analysis Report

Project Number: 071-03420
Client: R.F. Binnie & Associates Ltd.

To: R.F. Binnie & Associates Ltd.
#101- 19232 Enterprise Way
Surrey, BC
V3S 6J9

Attn: Mr. John Paley, P.Eng.

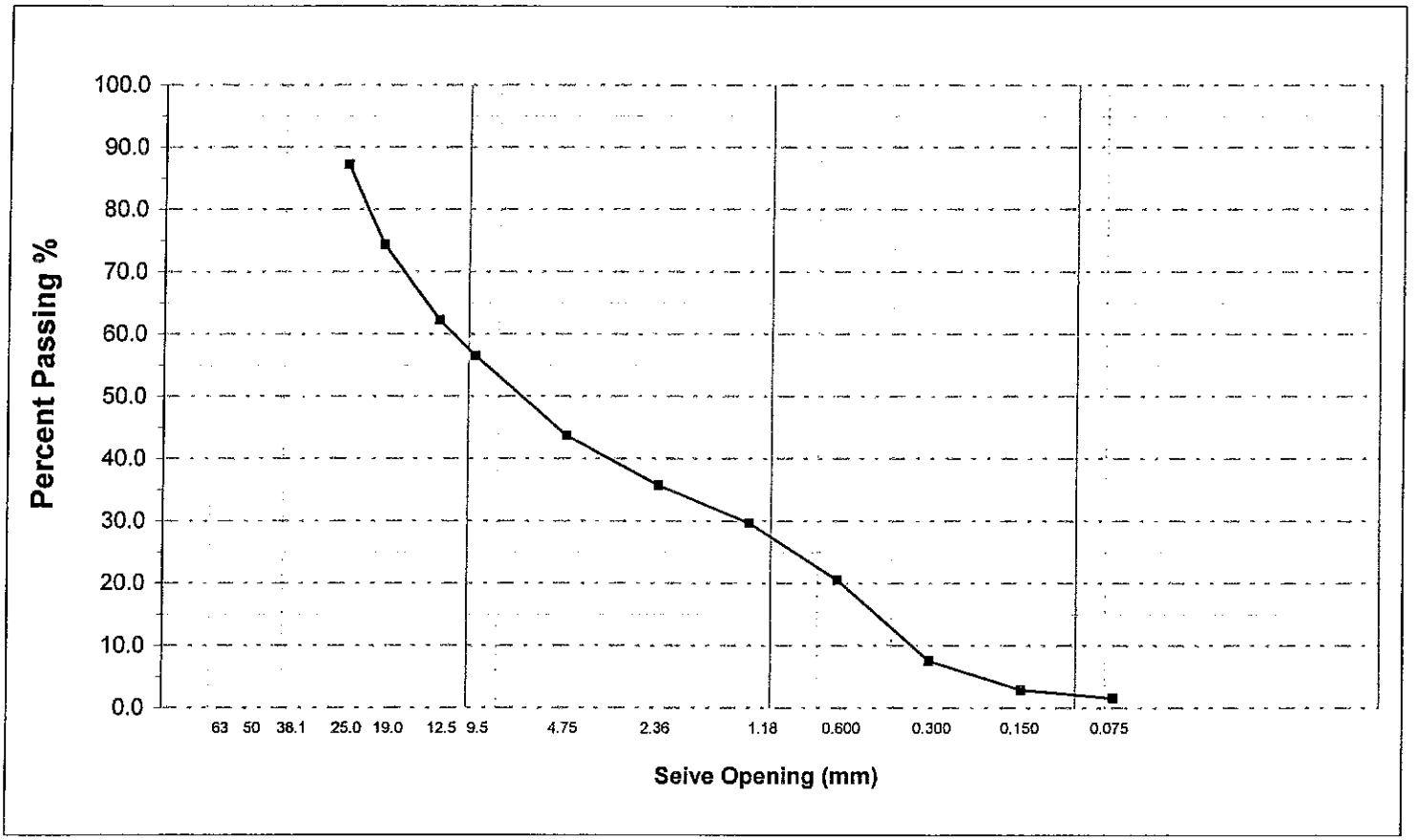
Project: Campbell Heights Development - Phase 2
Geotechnical Services

Surrey, BC

Test No.: 1 Date Received: 2007-Nov-9 Date Tested: 2007-Nov-27 Date Sampled: 2007-Nov-9

Source: TP-6 0.7m
Material Type: SAND and GRAVEL; trace of silt

Sampled By: R. Korhonen
Tested By: E. Relao
Test Method: Washed



	GRAVEL SIZES							SAND SIZES AND FINES						
Seive	3"	2"	1 1/2"	1"	3/4"	1/2"	3/8"	No.4	No.8	No.16	No.30	No.50	No.100	No.200
Seive Size (mm)	75	50	38.1	25.0	19.0	12.5	9.5	4.75	2.36	1.18	0.600	0.300	0.150	0.075
Percent Passing %		100	90.97	87.2	74.3	62.2	56.5	43.7	35.7	29.7	20.5	7.6	2.9	1.6

Moisture Content: 3.5 %

Comments: Test Method: ASTM C136, C117

Date Printed:11/29/2007

Trow

Sieve Analysis Report

Project Number: 071-03420
Client: R.F. Binnie & Associates Ltd.

To: R.F. Binnie & Associates Ltd.
#101- 19232 Enterprise Way
Surrey, BC
V3S 6J9

Attn: Mr. John Paley, P.Eng.

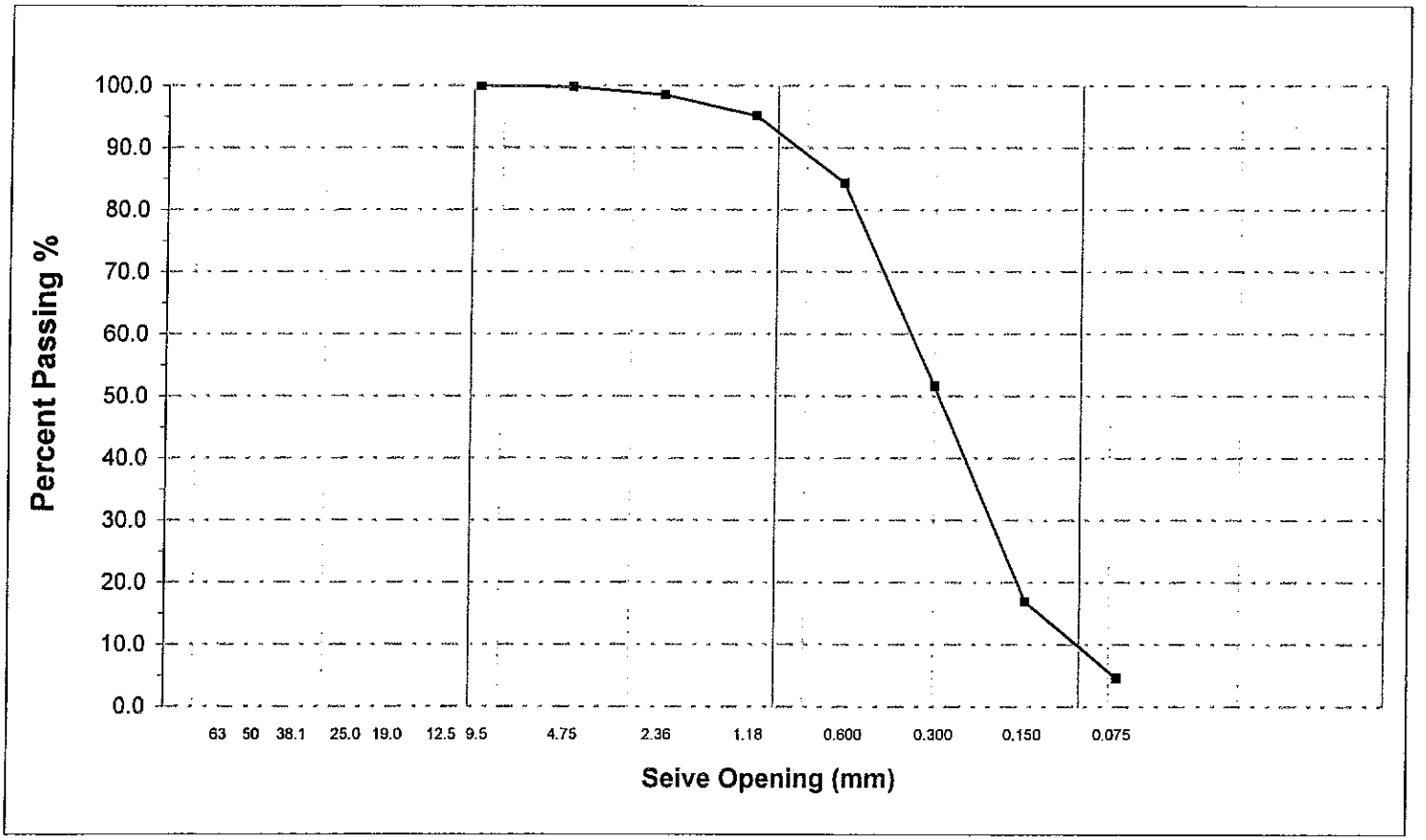
Project: Campbell Heights Development - Phase 2
Geotechnical Services

Surrey, BC

Test No.: 2 Date Received: 2007-Nov-7 Date Tested: 2007-Nov-7 Date Sampled: 2007-Nov-5

Source: AH-9 0.7m
Material Type: SAND; trace of silt and gravel

Sampled By: R. Korhonen
Tested By: E. Relao
Test Method: Washed



	GRAVEL SIZES							SAND SIZES AND FINES						
Seive	3"	2"	1 1/2"	1"	3/4"	1/2"	3/8"	No.4	No.8	No.16	No.30	No.50	No.100	No.200
Seive Size (mm)	75	50	38.1	25.0	19.0	12.5	9.5	4.75	2.36	1.18	0.600	0.300	0.150	0.075
Percent Passing %							100.0	99.8	35.7	95.1	84.3	51.6	16.9	4.6

Moisture Content: 4.9 %

Comments: Test Method: ASTM C136, C117

Date Printed:11/29/2007

Trow

Sieve Analysis Report

Project Number: 071-03420
Client: R.F. Binnie & Associates Ltd.

To: R.F. Binnie & Associates Ltd.
#101- 19232 Enterprise Way
Surrey, BC
V3S 6J9

Attn: Mr. John Paley, P.Eng.

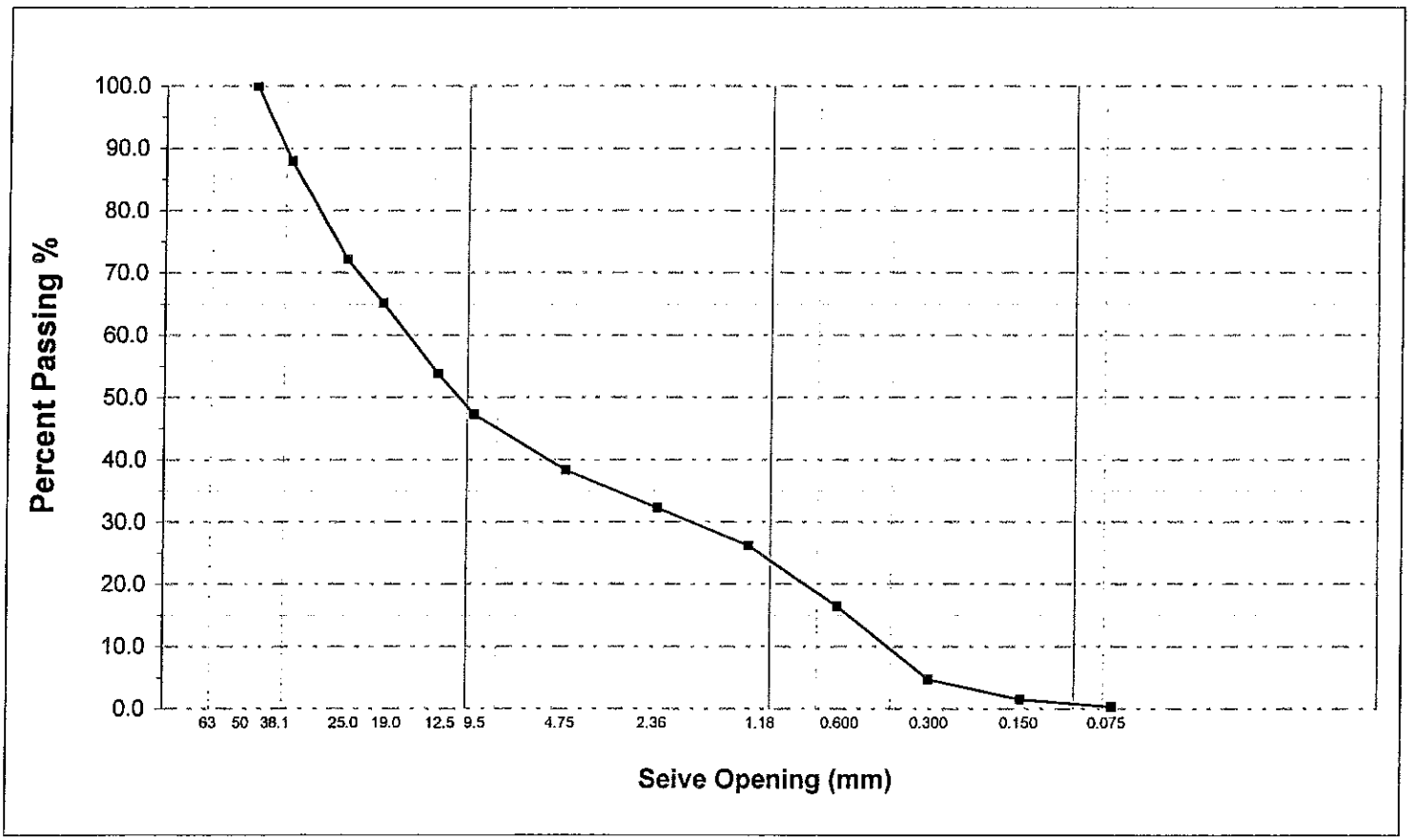
Project: Campbell Heights Development - Phase 2
Geotechnical Services

Surrey, BC

Test No.: 3 Date Received: 2007-Nov-2 Date Tested: 2007-Nov-27 Date Sampled: 2007-Nov-2

Source: AH-8 1.2m
Material Type: GRAVEL and SAND; trace of silt

Sampled By: R. Korhonen
Tested By: E. Relao
Test Method: Washed



	GRAVEL SIZES							SAND SIZES AND FINES						
Seive	3"	2"	1 1/2"	1"	3/4"	1/2"	3/8"	No.4	No.8	No.16	No.30	No.50	No.100	No.200
Seive Size (mm)	75	50	38.1	25.0	19.0	12.5	9.5	4.75	2.36	1.18	0.600	0.300	0.150	0.075
Percent Passing %		100	87.9	72.16	65.2	53.8	47.3	38.3	32.2	26.2	16.5	4.7	1.5	0.3

Moisture Content: 7.6 %

Comments: Test Method: ASTM C136, C117

Date Printed:11/29/2007

Trow

Sieve Analysis Report

Project Number: 071-03420
Client: R.F. Binnie & Associates Ltd.

To: R.F. Binnie & Associates Ltd.
#101- 19232 Enterprise Way
Surrey, BC
V3S 6J9

Attn: Mr. John Paley, P.Eng.

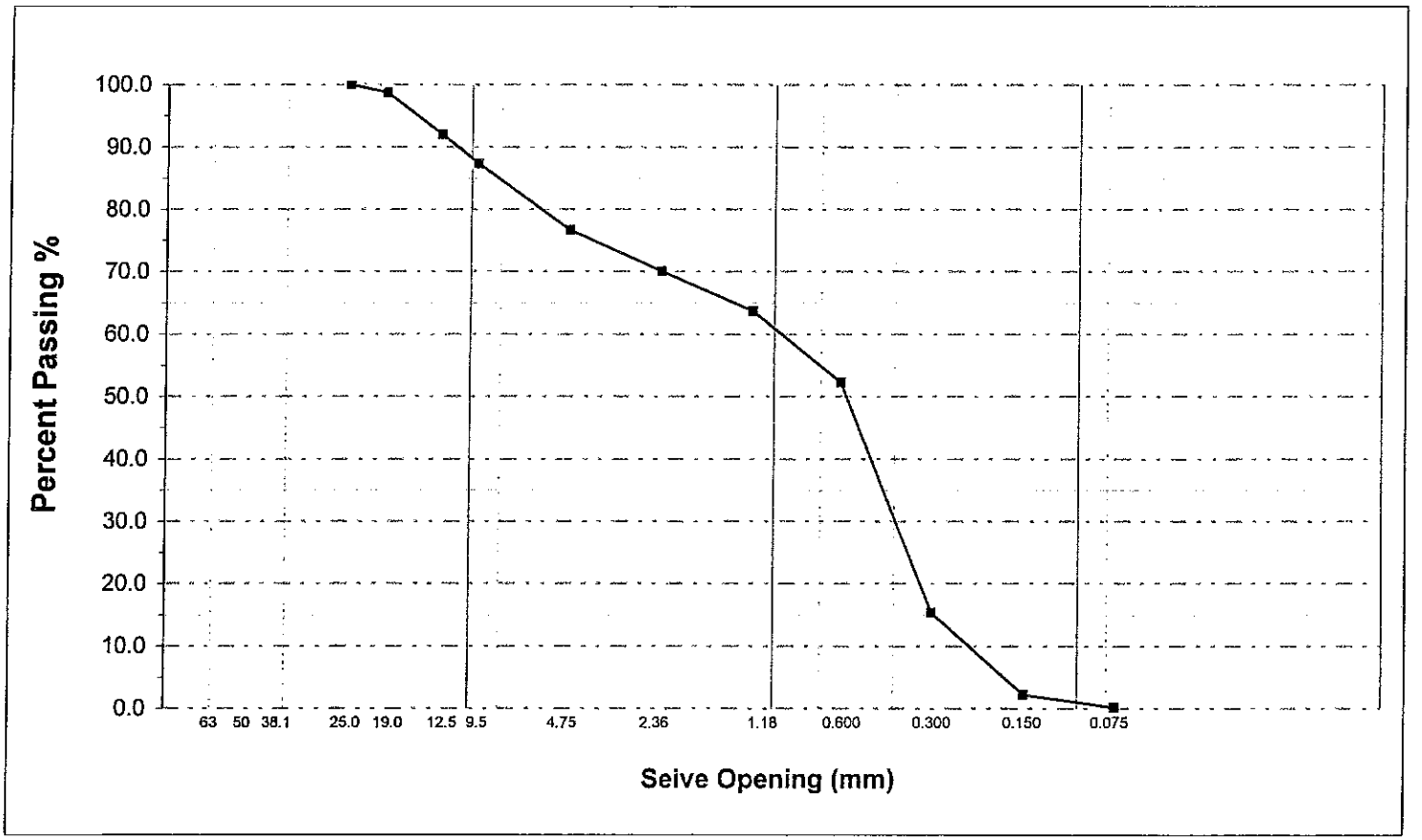
Project: Campbell Heights Development - Phase 2
Geotechnical Services

Surrey, BC

Test No.: 4 Date Received: 2007-Nov-2 Date Tested: 2007-Nov-27 Date Sampled: 2007-Nov-2

Source: AH-8 5.2m
Material Type: Gravelly SAND, trace of silt

Sampled By: R. Korhonen
Tested By: E. Relao
Test Method: Washed



	GRAVEL SIZES							SAND SIZES AND FINES						
Seive	3"	2"	1 1/2"	1"	3/4"	1/2"	3/8"	No.4	No.8	No.16	No.30	No.50	No.100	No.200
Seive Size (mm)	75	50	38.1	25.0	19.0	12.5	9.5	4.75	2.36	1.18	0.600	0.300	0.150	0.075
Percent Passing %				100	98.7	92.0	87.3	76.7	70.1	63.7	52.3	15.4	2.2	0.2

Moisture Content: 16.9 %

Comments: Test Method: ASTM C136, C117

Date Printed:11/29/2007

APPENDIX E

BENKELMAN BEAM TEST REPORTS

- 28 AVENUE: 194 STREET to 196 STREET

- 194 STREET: 28 AVENUE to 32 AVENUE

Benkelman Beam Test Report

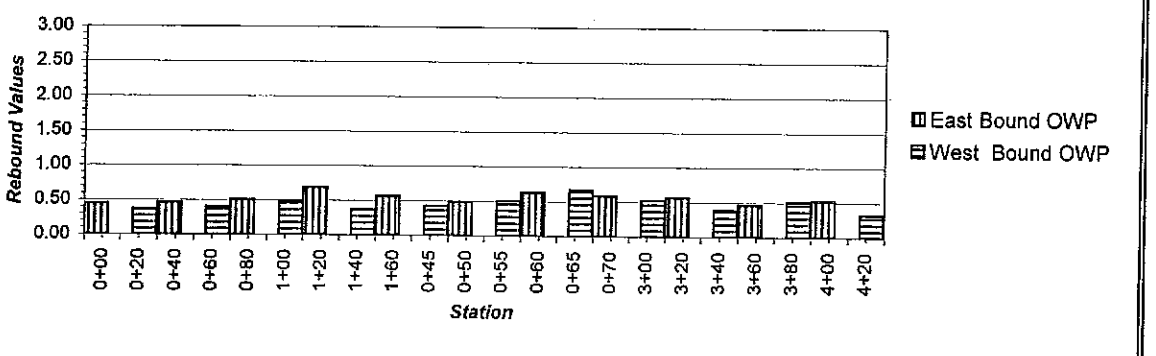
Client :	R.F Binnie & Associates Ltd	**Surface :**	Asphalt
File :	071-03420	**Surface Temperature :**	3.0 °C 37.4 °F
Project :	Canpbell Heights - Phase 2	**Truck Rear Axle Weight :**	18000 lb
Location:	28 Avenue, Surrey, BC	**Date Tested :**	November 2, 2007
From:	194 Street to 196 Street (Sta 0+00 194 St Intersection)		

Station	Remarks	East Bound OWP	East Bound IWP		West Bound OWP	West Bound IWP	Remarks
0+00		0.45			0.37		194 Street Intersection
0+20							
0+40		0.47					
0+60					0.41		
0+80		0.51					
1+00					0.49		
1+20		0.69			0.37		
1+40							
1+60		0.57					
0+45					0.43		
0+50		0.49					
0+55					0.51		
0+60		0.63			0.67		
0+65							
0+70		0.59					
3+00					0.53		
3+20		0.57					
3+40					0.39		
3+60		0.47					
3+80					0.51		
4+00		0.53					
4+20					0.33		196 Street Intersection

STATISTICAL SUMMARY	East Bound OWP	East Bound IWP		West Bound OWP	West Bound	Combined
Number of Tests	11			11		22
Average Rebound (mm)	0.54			0.45		0.49
Standard Deviation (mm)	0.07			0.10		0.10
Most Probable Rebound (mm)	0.69			0.65		0.69
Spring Rebound Factor	1.2			1.2		1.2
Most Probable Spring Rebound Value (mm)	0.83			0.78		0.82

Surface Defects

AC Alligator Cracks	RU Rutting	LC Longitudinal Cracks	W Washboarding
EC Edge Cracks	R Ravelling	OC Occasional Cracks	RP Random Patch
TC Transverse	OL Overlay	UT Utility Trench (Patch)	FC Frequent Cracks
EA Exposed Aggregate			



Benkelman Beam Test Report

Client :	R.F Binnie & Associates Ltd	**Surface :**	Asphalt
File :	071-03420	**Surface Temperature :**	3.0 °C 37.4 °F
Project :	Canpbell Heights - Phase 2	**Truck Rear Axle Weight :**	18000 lb
Location:	194 Street, Surrey, BC	**Date Tested :**	November 2, 2007
From:	28 Ave to 32 Ave (Sta 0+00 @ 28 Ave Intersection)		

Station	Remarks	North Bound			South Bound		Remarks
		OWP	IWP		OWP	IWP	
0+10	EC / AC / FC	0.57					28 Avenue Intersection
0+30					1.17		EC / FC
0+50	EC / AC / FC	0.89					
0+70					0.85		EC / AC / FC
0+90	EC / AC / FC	1.29					
1+10					1.29		EC / AC / FC
1+30	EC / AC / FC	0.73					
1+50					1.01		EC / AC / FC
1+70	EC / AC / FC	1.11					
1+90					0.95		EC / FC
2+10	EC / AC / FC	1.61					
2+30					1.35		EC / AC / FC
2+50	EC / AC	0.93					
2+70					1.13		EC
2+90	EC / AC / FC	0.87					
3+10					1.03		EC / FC
3+30	EC / FC	0.97					
3+50					1.73		EC / FC
3+70	EC / FC	1.31					
3+90					1.63		EC / FC
4+10	EC	1.21					
4+30					0.79		EC
4+50	EC	1.01					
4+70					0.79		EC
4+90	EC / FC	1.29					
5+10					1.21		EC / FC
5+30	EC / FC	1.11					
5+50					0.95		EC
5+70	EC	0.69					
5+90					1.13		EC / FC
6+10	EC	0.75					
6+30					0.99		EC
6+50	RP / EC	0.85					
6+70					1.31		EC / FC
6+90	EC / FC	1.79					
7+10					1.79		EC / FC
7+30	EC	0.65					
7+50					0.67		EC
7+70	EC	0.69					
7+90					1.13		EC / FC
8+10							32 Avenue Intersection

STATISTICAL SUMMARY	North Bound			South Bound		Combined
	OWP	IWP		OWP		
Number of Tests	20			20		40
Average Rebound (mm)	1.01			1.14		1.08
Standard Deviation (mm)	0.33			0.31		0.33
Most Probable Rebound (mm)	1.66			1.75		1.71
Spring Rebound Factor	1.2			1.2		1.2
Most Probable Spring Rebound Value (mm)	2.00			2.10		2.05

Surface Defects

AC Alligator Cracks
EC Edge Cracks
TC Transverse
EA Exposed Aggregate
RU Rutting
R Ravelling
OL Overlay
LC Longitudinal Cracks
OC Occasional Cracks
UT Utility Trench (Patch)
W Washboarding
RP Random Patch
FC Frequent Cracks