



**TOWN OF HALTON HILLS
SUBDIVISION MANUAL**

July, 1999

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1.0 GENERAL INFORMATION

This manual applies to subdivision developments for which Draft Plan approval has been granted or for which Draft Plan approval is imminent. The Developer and/or the Developer's Engineer should familiarize themselves with the contents of this manual. All references made to the Developer's Engineer in this manual shall be understood to apply to the Developer also.

The Developer shall employ at its own expense, a Consulting Engineer, subject to approval of the Town Engineer. The Consulting Engineer shall perform for the Developer the engineering services as outlined in Section 19(1) of the Standard Subdivision Agreement for the Town of Halton Hills. These services are as follows:

- a) Act as the Developer's representative in all matters pertaining to the construction and maintenance timing provisions of the Subdivision Agreement.
- b) Co-ordinate any necessary reports including, but not limited to, preliminary servicing, geotechnical, environmental site assessment and remediation, noise, stormwater management, tree preservation and inventory, siltation and traffic, including the preparation and submission of associated engineering reports.
- c) Prepare co-ordinated engineering designs, including the incorporation of all required geotechnical, environmental, traffic, stormwater management, tree preservation/inventory, noise, siltation and any other relevant aspects for the subject site.
- d) Prepare and supply all required Engineering Drawings and specifications and cost estimates for the proposed public services to the satisfaction of the Town Engineer; and when necessary, the Director of Recreation and Parks.
- e) Obtain all necessary approvals for the subject site prior to the construction of the public services.
- f) Analyse and submit to the Town Engineer, tender results for the construction of the public services and

recommend a preferred contractor for approval.

- g) Submit to the Town, a schedule setting out the proposed order of construction and installation of the public services along with estimated dates of completion. The schedule shall meet with the approval of the Town Engineer before any work commences. Any changes to the schedule shall be subject to approval of the Town Engineer.
- h) Provide the field layout, the contract administration and the full-time supervision and inspection of the construction for all public works within the subject site, in a manner acceptable to the Town Engineer; Supervision as contemplated by this paragraph shall include full time supervision of each and every area, job or location of the Works that may be under construction at any given time.
- i) Maintain records of all phases of the construction to be available to the Town Engineer upon request.
- j) Conduct a pre-construction meeting and henceforth on-site construction meetings on a weekly (or as agreed to) basis during the construction of the public services and prepare and distribute minutes of the meetings to all affected parties.
- k) Prepare Progress Payment Certificates.
- l) Provide final "as constructed" reproducible drawings and on computer disc in a format suitable for use with the Town's current AutoCAD system, inspection and testing reports to the Town Engineer prior to the issuance of the Completion Certificate.
- m) Certify and recommend the acceptability of the works within the context of this Agreement.
- n) Prepare and provide the Town, for each lot or block within the Plan, a certificate of final grade elevations indicating that the lands have been developed in conformity with the overall grading plan prior to Final Acceptance of the works by the Town.

- o) Upon the request of the Town Engineer, supply copies of any or all contracts entered into by or on behalf of the Developer for the construction of the public services together with any or all of the following contract documentation:
 - i) Certificate of Progress Payments;
 - ii) Certificate of substantial performance given pursuant to the Construction Lien Act, 1983;
 - iii) Particulars of publication of the Certificate of Substantial Performance.
- p) Upon request of the Town Engineer, furnish a declaration certifying that there are no lien claims or existing liens pursuant to the Construction Lien Act relating to any of the completed works, or as to the amount of the holdback(s) required by the provisions to that Act in respect of such completed works.
- q) Ensure that the utilities, such as Bell, Gas, Cable T.V., Hydro and others, are located in the road allowance in accordance with the plans approved by the Town Administration. The utility "as constructed" information shall be shown on the "as constructed" drawings.

The Consulting Engineer shall, prior to the commencement of construction of the works, file with the Town Engineer an undertaking in writing, in a form acceptable to the Town Solicitor:

- that he has been engaged by the Developer to perform the services set forth in Section 19(1) of the Standard Subdivision Agreement for the Town of Halton Hills;
- that the works will be constructed in accordance with the contract drawings and specifications and all other provisions of the Subdivision Agreement; and
- that all phases of the works are subject to the

prior written approval of the Town Engineer.

Should the Developer wish to terminate the services of the Consulting Engineer in favour of another at any time during the term of the Subdivision Agreement, the Developer shall do so only with the prior written approval of the Town Engineer. The Consulting Engineer, or the approved replacement, shall continue to be retained until Final Acceptance of the Public Services.

The Town of Halton Hills has jurisdiction over construction and inspection of all lot and area grading, installation of storm sewers and construction of area municipality roads (including sidewalks, walkways, streetlights and boulevard trees) within all road allowances, blocks and/or easements. The Developer shall contact the Town of Halton Hills Deputy Clerk in order to prepare a Development Agreement for the proposed site.

The Regional Municipality of Halton has jurisdiction over construction and inspection of all sanitary sewers and watermains to be installed within all road allowances, blocks and/or easements. The Developer's Engineer shall contact the Region of Halton Public Works Department to obtain copies of Regional Design Guidelines for sanitary sewers and watermains. A separate Development Agreement will be required with the Region of Halton for all Regional works.

The Developer must comply with all design guidelines of other agencies including the Ministry of Transportation of Ontario (M.T.O.), the Ministry of the Environment (M.O.E.), the Ministry of Natural Resources (M.N.R.), the Conservation Authorities and the Utility Companies. The Developer's Engineer shall ensure compliance to all agency guidelines and must obtain all necessary approvals and permits prior to finalization of the Development Agreement. The Development Agreement is required prior to registration of the Draft Reference Plan.

1.1 ENGINEERING DRAWINGS

All elevations shown on the engineering drawings are to be of geodetic origin.

A north arrow shall be referenced on all drawings.

The lot numbering and block identification on all engineering drawings shall be the same as shown on the approved Draft Plan.

All existing services, utilities and abutting properties are to be shown in dotted lines. All proposed services shall be shown with solid lines.

All final drawings must be signed, sealed and dated by a qualified Professional Engineer (P. Eng.).

The Developer's Engineer shall supply to the Town, DXF compatible files of the "As-Constructed" public services in a format suitable for use with the current AutoCAD release. These files shall be submitted on 3.25" disks or compact discs.

1.1.1 Sheet Sizes

Sheet sizes shall be standard A1 drawing sheets 656mm x 984mm (24" x 36") for all engineering submissions. Minimum top, bottom and right hand borders shall be 10 mm ($\approx 3/8"$) and minimum left-hand borders shall be 40 mm ($\approx 1 5/8"$).

Individual Lot Grading drawings required for issuance of a building permit, shall be 216mm x 279mm ($8\frac{1}{2}"$ x 11"), 216mm x 356mm ($8\frac{1}{2}"$ x 14") OR 279mm x 432mm (11" x 17").

1.1.2 Scales

All drawings shall be drawn using metric scales. General Services Plans and Storm Drainage Plans may be drawn at a scale of 1:1000. General Grading Plans, Landscape Plans and Traffic Control Plans shall be drawn at a scale of 1:500. Plan and Profile drawings must be drawn at a scale of 1:500 horizontal and 1:100 vertical.

All special detail drawings shall be drawn at a minimum scale of 1:50.

Individual Lot Grading plans are to be drawn at a minimum scale of 1:250.

1.1.3 Title Blocks

The title block shall be located in the bottom right hand corner of all drawings and shall include the following:

- "Town of Halton Hills" .
- Name of the Development.
- Consulting Engineer's name, address and telephone number.
- Design Engineer's stamp.
- Block reserved for signing by the Town Engineer.
- Drawing title (Street Name, Block or Easement No.) and drawing number.
- Date, initials of designer, draftsman and checker, scale.
- Revision block with spaces for revision number, description, date and initials.

1.1.4 Key Plans

A site key plan for the cover sheet should be provided at a scale of 1:10000. Key plans shall be provided for all General Services Plans and all Plan and Profile Drawings. These key plans shall clearly identify the areas included in each drawing (e.g. highlight the particular area using a rectangle or shading).

1.1.5 Cover Sheets

A cover sheet is to be prepared illustrating a key plan with scale and showing the name of the

subdivision, the name of the Consulting Engineering firm, the Draft Reference Plan number (24T-), lot number, concession number and the Town of Halton Hills. An index should be provided listing the drawings and their location within the submission.

As a minimum, the index shall list the General Above Ground Services Plan, General Underground Services Plan, Grading Plans, Storm Drainage Plans, Plan and Profile Drawings, Composite Utility Plan, Sediment/Erosion Plan, Tree Planting Plan and the Detail Plans.

1.1.6 General Above Ground Services Plans

The reference Geodetic BenchMark shall be identified on the General Services Plans.

A key plan shall be shown on all "General Services Plans" and the area covered by the drawing shall be clearly identified.

A drawing index shall be shown to identify the Plan and Profile drawing number for each street or easement shown.

All road allowances, daylight triangles, lots, blocks, easements and reserves are to be shown and are to be identified in the same manner as shown on the Draft Reference Plan. All street names shall be shown.

The location of proposed street and traffic control signs, pavement markings, hydrants, Canada Post facilities, Bell Canada facilities, and hydro utilities (transformer and street light locations) shall be shown.

All fencing is to be indicated by height and type.

The location of all storm water management facilities shall be shown with reference to detailed drawings at some other location in the drawing submission.

1.1.7 General Underground Services Plans

The reference Geodetic BenchMark shall be identified on the General Services Plans.

A key plan shall be shown on all "General Services Plans" and the area covered by the drawing shall be clearly identified.

A drawing index shall be shown to identify the Plan and Profile drawing number for each street or easement shown.

All storm and sanitary sewers are to be shown. It is not necessary to show the length, grade and the sewer material, however, the sizing, direction of flow and type of the sewer shall be shown.

All manholes will be shown and are to be numbered in accordance with the design calculations. All ditch inlets and catchbasins shall be shown.

All watermains, valves, hydrants and blow-offs shall be shown.

The locations of all service connections shall be shown.

1.1.8 General Storm Drainage Plans

A key plan shall be shown and the area covered by the drawing shall be clearly identified.

Proposed storm sewers, channels, overland flow routes and all areas tributary to each storm sewer inlet, channel or watercourse, including areas for future development and external drainage areas shall be shown.

Storm water management facilities shall be shown with reference to detailed drawings at some other location in the drawing submission.

The plan should illustrate the drainage areas and runoff coefficients as designated in the design calculations.

If a subdivision encroaches on an existing floodplain, the approved fill line development setbacks restrictions must be shown as specified by the local conservation authority.

1.1.9 General Grading Plans

A key plan shall be shown and the area covered by the drawing shall be clearly identified.

General Grading Plans shall show the proposed road, lot and block grading with details where required. The centreline of road shall be shown at 20 metre stations.

The finished floor elevations, footing elevations, the house and grading type and the location of all retaining walls shall be indicated on all General Grading Plans.

The grades at the lot corners and at the top and bottom of all slopes shall be shown. Existing flood lines and top of bank elevations, where applicable, shall be shown in accordance with conservation authority requirements.

The locations of all engineered fill areas shall be clearly indicated on all General Grading Plans.

The existing contour lines and the size and location of all trees, which are to remain following construction, shall be shown.

Lot grading plans shall be prepared in accordance with the criteria outlined in Section 2.4 of this manual. The General Grading Plans, once approved by the Town of Halton Hills, shall constitute the standard to which the lots must be graded. Individual lot grading plans required for building permits must be prepared in compliance with the

approved General Grading Plans.

1.1.10 Plan and Profile Drawings

A key plan shall be shown on all Plan and Profile Drawings and the area covered by the drawing shall be clearly identified.

Plan and Profile drawings are required for all roadways, blocks and easements where services are proposed within the development, for all outfalls external to the proposed development leading to the permanent outlet, for all existing roadways abutting the development from or to which services will be extended and for other areas where utility services are being installed above and below grade.

All road allowances, lots, blocks, easements and reserves are to be shown and are to be identified in the same manner as on the Draft Plan. Lot and block frontages are to be shown. Dimensions of all daylighting requirements must be shown.

All asphalt widths, curb and gutter, sidewalks and walkways shall be shown and dimensioned on the plan portion of the drawing.

All storm sewers shall be illustrated on both the plan and profile portions of the drawing. The sewers shall be described by the size, type and flow direction only on the plan portion, but shall be described by length, grade, material, class of pipe and bedding requirements on the profile portion.

All storm sewer manholes shall be shown on both the plan and profile portions of the drawing. The manholes shall be identified by number and chainage and reference to the applicable Ontario Provincial Standard Drawing (O.P.S.D.) or Town Standard and shall be shown adjacent to each manhole. All invert elevations shall be shown on the profile with reference to the north arrow.

Show the hydraulic grade line (H.G.L.) on the

profile drawing. (See 2.3.1 for design criteria for the H.G.L.)

All catchbasins and ditch inlets shall be shown on the plan portion of the drawing and shall be numbered for ease of reference. Maximum spacing of catchbasins shall be 90 meters.

Safety platforms and drop connections shall be noted for all applicable storm sewer manholes.

Top of grate and invert elevations for all rear lot catchbasins must be indicated. A notation regarding concrete encasement of the storm pipe through the building envelope shall be made on the plan. The offset distance of the storm pipe from the edge of the easement should be indicated.

All sanitary sewers, watermains and appurtenances shall be illustrated on the Plan and Profile drawings in accordance with Region of Halton criteria.

All minimum offset distances from property lines and centre line of road shall be indicated. A minimum 450mm vertical clearance between all services is required.

The location of all storm, water and sanitary service connections shall be shown on the plan portion of the drawing. They need only be dimensioned when the location differs from the standard location shown on the Town of Halton Hills Standard Drawings. All connections to blocks shall be described and dimensioned completely (size, length, grade, invert elevations, materials, class of pipe, bedding, etc.).

The centreline of construction with 20 metre stations noted shall be shown on the plan portion of the drawing.

The original ground at centreline and the proposed centreline road grade shall be plotted on the profile. The proposed centreline road grade shall

be fully described (length, grade, P. I. Elevations, vertical and horizontal curve data, high point and low point chainages).

Details of the gutter grades around all 90-degree crescents, intersections and cul-de-sacs shall be provided on the plan portion of the drawing as a separate detail at a scale of 1:100.

The proposed pavement structure design shall be noted on the plan portion of the drawing.

Special notes necessary for detailed construction procedures or requirements are to be shown. Benching details for non-standard manholes shall also be shown.

All existing services, utilities and features are to be shown on the plan portion of the drawing. Those services and utilities below grade that are critical to the new construction shall also be shown in the profile.

1.1.11 Composite Utility Plan

All proposed locations for utilities shall be shown on the Plan(s) portion of the drawings. This shall include locations for Bell Canada, Union Gas, Halton Hills Hydro (street lights and transformers), Halton Cable Systems and Canada Post facilities as well as street and traffic control signs and pavement markings. The Composite Utility Plan must be signed by all affected utility agencies prior to the Town signing the drawing(s).

1.1.12 Landscape Plans

Existing and proposed street trees and shrubs, proposed earth berms and landscape buffer areas shall be shown on the Landscape Plans. Grading, fencing and walkways shall also be shown.

Landscape Plans may be required on an individual site basis for Parkland facilities, community parks, storm water management facilities and open spaces.

1.1.13 Detail Plans

Detail drawings of special features shall be included and properly referenced as part of the drawing package.

Town of Halton Hills Standard Drawings should be included in the drawing package.

It is not necessary to include copies of the O.P.S.D. provided all pertinent drawings have been referenced by number on the Plan and Profile drawings.

1.1.14 Other Plans

Sediment Control Plans shall be prepared as per recommendations presented in the Siltation and/or the Stormwater Management Implementation Report.

Fencing Plans shall be established on a site by site basis as required. All fencing locations and requirements with respect to parks, open spaces, walkways and storm water management facilities shall be indicated on the Fencing Plan.

1.2 PRE-CONSTRUCTION AGREEMENTS

1.2.1 Subdivision Agreements

Prior to construction, an executed Subdivision Agreement between the Developer and the Town of Halton Hills must be in place. The Developer shall make arrangements with the Town's Deputy Clerk to negotiate the terms of the Subdivision Agreement.

Financial security in accordance with the Agreement must be deposited with the Town to guarantee the completion of the public services.

Area pre-grading may be done prior to signing a

Subdivision Agreement providing silt controls are in place to the satisfaction of the Town Engineer.

1.2.2 Condominium Agreements

A Condominium Agreement must be entered into by the Developer to cover the works to be carried out on the site. The Owner shall make arrangements with the Town's Agreement Implementation Committee to determine the terms of the Condominium Agreement.

Financial security in accordance with the Agreement must be deposited with the Town to guarantee the completion of the public services.

1.2.3 Pre-servicing Agreements

In some circumstances, the Town Council may authorise the signing of a Pre-servicing Agreement with the Developer. It should be noted that the Town of Halton Hills does not promote this type of agreement.

In the event that a Pre-servicing Agreement is authorized by Town Council, the Developer must subsequently enter into a Subdivision Agreement. Financial securities must be in place prior to any site construction.

A Subdivision Agreement must be entered into before Building Permits will be issued.

1.2.4 Model Home Agreement

The Developer will be required to enter into a Model Home Agreement for all proposed model homes to be used for marketing. The Developer shall contact the Town of Halton Hills to negotiate the terms of the Model Home Agreement.

1.2.5 Other Requirements

Upon signing of the necessary agreements and prior to the start of construction, the following additional information must be submitted by the Developer to the Town:

- Two sets of all construction specifications and contract documents to the Town Engineer for reference and information purposes.
- Written confirmation from all utility authorities (Halton Hills Hydro, Bell Canada, Union Gas, Halton Cable Systems) that satisfactory arrangements have been made for the installation of underground services.
- Insurance policies or certificates of insurance naming the Town and other affected authorities as co-insured.
- Worker's Compensation Board Clearance letter from the proposed Contractor.
- The contractor's list of suppliers.
- The schedule for the Pre-construction Meeting and the Site Meetings to be held during the construction period.
- All other information specified in the Subdivision Agreement, as a requirement prior to commencement of construction or other information required by the Town Engineer.

1.3 ACCEPTANCE OF PUBLIC SERVICES

1.3.1 Inspection of Public Services

Prior to inspection, the Developer's Engineer must ensure all services have been built to Town standards. Upon the completion of the installation of all public services, the Developer's Engineer shall schedule an inspection with the Town. All services shall be cleaned prior to inspection. Representatives shall be present from the Town, the Developer's Engineer and the Contractor.

Inspections shall be carried out between the period May 1 to October 31 of a given year.

Letter of Credit reductions shall not be authorized until all inspections of the public services have been carried out to the satisfaction of the Town Engineer. Letter of Credit reductions will apply in accordance with Section 4.2 of this manual.

Inspections shall be scheduled for the purposes of issuing an Underground Completion Certificate and a Completion Certificate (Maintenance) for all public services constructed (including storm sewers), for approving lot grading, for approving concrete and asphalt works, for tree planting and for Final Acceptance of public services. Interim inspections may be required to assess emergency and/or unforeseen situations.

1.3.2 Issuance of Completion Certificates

When the public services are completed and cleaned to the satisfaction of the Developer's Engineer, the Town shall be advised and an inspection shall be requested. The Town shall carry out the inspection in conjunction with the Developer's Engineer and the Contractor and provide a list of deficiencies to the Developer's Engineer. Once the deficiencies have been corrected to the satisfaction of the Town Engineer, a report shall be brought to Council;

- a) for the issuance of an Underground Completion Certificate and,

b) for the issuance of a Completion Certificate thus recommending a date for the commencement of the Maintenance Period.

Letter of Credit reductions will apply in accordance with Section 4.2 of this manual.

1.3.3 Maintenance Period

Upon the issuance of the Completion Certificate, the public services within the subdivision enter into a two-year Maintenance Period. During this time, the Developer is responsible for the maintenance of all public services. Near the end of the Maintenance Period, the public services shall be re-inspected and all deficiencies shall be corrected. Representatives shall be present from the Town, the Developer's Engineer and the Contractor. When the Developer's Engineer is satisfied that the work is complete and acceptable, he shall advise the Town and request a final inspection.

In accordance with Section 21 of the standard Development Agreement, if, in the opinion of the Town Engineer, it is necessary to make emergency repairs immediately to remediate damage or hardship to persons or property, the Town may enter the development site and make any repairs deemed necessary by the Town Engineer. The cost of any emergency repairs shall be borne by the Developer as invoiced by the Town. Unpaid invoiced amounts will be deducted from the Developer's Letter of Credit.

All lot grading shall be certified by the Developer's Engineer prior to Final Acceptance of the public services.

The Developer's Engineer shall make arrangements to have the storm sewer system camera inspected prior to Final Acceptance. The camera results must be satisfactory to the Town Engineer.

When all work is completed to the satisfaction of the Town Engineer, a report shall be forwarded to Council recommending Final Acceptance of the works.

Letter of Credit reductions will apply in accordance with Section 4.2 of this manual.

Similarly, the Region of Halton will carry out an inspection of the Regional Services for Regional Final Acceptance.

The Town of Halton Hills will provide snowplowing services during the Maintenance Period at no cost to the Developer providing the roads are in suitable condition for the provision of these services. The Town of Halton Hills will also pay for street lighting energy consumption costs during the Maintenance Period.

1.3.4 Final Acceptance

Upon approval from the Town Council for Final Acceptance of the subdivision, the Town will assume all public services installed as part of the subdivision agreement.

Upon Final Acceptance, all remaining securities held by the Town will be returned to the Developer.

1.4 SECURITY REQUIREMENTS

1.4.1 Subdivision

A detailed, itemized cost estimate shall be submitted by the Developer and approved by the Town as an Appendix of the Subdivision Agreement in which the estimated cost of the public services is outlined. The Developer must furnish the Town of Halton Hills with Financial Securities to cover 100 per cent of the cost of construction (including the cost of all public services, engineering and contingency fees, off-site services and Goods and Services Tax where applicable). No work may commence on the site until the Securities are in place with the Town.

Periodic reductions in the Securities may be

authorized upon the completion of various stages of the subdivision. (Reductions are outlined in Section 4.2 of this manual).

1.4.2 Condominium

A detailed, itemized cost estimate shall be submitted by the Developer and approved by the Town as an Appendix of the Condominium Agreement in which the estimated cost of all private site servicing works and any necessary public services is outlined. The Developer is required to deposit Financial Securities to cover 100 per cent of the cost of constructing these private and public services (including engineering and contingency fees, off-site services and Goods and Services Tax where applicable). No work may commence on the site until the Securities are in place with the Town.

Reductions in the Securities will not be authorized until completion of the site works. (Reductions are outlined in Section 4.2 of this manual).

1.4.3 Pre-servicing

Under circumstances where this type of agreement is authorized, the Developer is required to deposit Financial Securities to cover the cost of one of the following options, at the discretion of the Town Engineer:

- 10 per cent of the value of all on-site works plus 100 per cent of the value of all off-site works.

No work may commence on the site until the Securities are in place with the Town.

No periodic reductions will be authorized for Pre-servicing securities. When the Developer enters into a Subdivision Agreement with the Town, adjustments to the Securities shall be made at that time.

2.0 DESIGN GUIDELINES AND SPECIFICATIONS

It should be noted that whenever possible, the Ontario Provincial Standard Drawings (O.P.S.D.) shall be used for design and construction. Town of Halton Hills Standard Drawings shall apply for local conditions and where no comparable O.P.S.D. is available. All standards shall be appropriately noted on the pertinent engineering drawings.

The Consulting Engineer and/or the Developer shall ensure that the necessary Ontario Provincial Standard Specifications (O.P.S.S.) and the O.P.S.D.s are specified in the contract documents for the contractor.

2.1 ROADS

The Transportation Section of the Town of Halton Hills Official Plan shall determine Road classifications. All roads shall be laid out such that vehicular and pedestrian safety is maximized. The road layout shall clearly indicate the characteristics and nature of a particular street's function.

2.1.1 Geometric Design Standards

Roads shall be divided into two types; residential and industrial; and into three classifications - arterial, collector and local. For the classification of a particular road, the Developer and/or the Developer's Engineer should contact the Town of Halton Hills Engineering and Public Works Department.

Residential roads shall be classified according to expected traffic volumes and the intended use of the road. Industrial roads will be classified by the length of the road, the expected traffic volume and the expected amount of heavy truck traffic.

The Geometric Design will be in accordance with the Town of Halton Hills Standards. Table 1 shows the geometric design standards for the various classifications of roads in Halton Hills.

Standard road cross sections shall be as shown in the Town of Halton Hills Standard Drawings, (400 Series).

2.1.2 Pavement Design

Pavement design shall be in accordance with the Geotechnical Report prepared by a qualified Geotechnical Engineer. The pavement design shall be based on a mechanical analysis of the soil, the California Bearing Ratio (C.B.R.) of the soil, drainage factors, frost susceptibility and the road classification and anticipated traffic usage for the proposed site. Detailed information for the Terms of Reference of a geotechnical report is provided in Section 3.6.1 of this manual.

The following minimum construction standards apply:

Hot Mix Asphalt	HL3 (top course)	40 mm
	HL8 (base course)	50 mm
M.T.O. Granular Material "A"		150 mm
	(Type 2) "B"	<u>300 mm</u>
Minimum Total Thickness		540 mm

Note that this is the minimum requirement only and all pavement designs must comply with the approved geotechnical report.

The Developer's Engineer shall be responsible for approving the source of supply and the quality of all materials supplied by the Contractor. Testing of all granular materials at designated pits and in-situ verification tests shall be performed by the Developer's Engineer. Copies of all materials results shall be submitted to the Town of Halton Hills Engineering and Public Works Department for the Town's records.

Prior to the placement of asphalt pavement, the

Developer's Engineer must submit the proposed pavement mix design to the Town of Halton Hills Engineering and Public Works Department for approval.

2.1.3 Design Elements

The current issue of the T.A.C. Manual of Geometric Design Standards for Canadian Roads or the M.T.O. Manual for Geometric Design Standards for Ontario Highways should be used for basic road design elements, whichever is appropriate.

Horizontal radii alignment is to conform to the guidelines shown in Table 1. In general, 9.14 metre (30-foot) lots shall not be permitted where 90° bends, or less, are proposed.

Bulbs are not permitted at 90° road bends. Asphalt width may be extended maximum 1.0 metre through the 90° bend.

All points of vertical grade change in excess of 1% shall be designed with vertical curves as outlined in the current Ministry of Transportation publications. The minimum vertical curves are outlined in Table 1.

For any street intersection, the normal cross-fall of the major through street shall be maintained over the normal cross-fall of the minor stop-controlled street. A 1 to 2% backfall shall be provided at the centre line of road and gutters for the minor street at all intersections. This backfall shall continue to the end of the curb return radii to facilitate proper drainage of the intersection. In general, single catchbasins will be required at the end of the curb return for drainage. All catchbasins shall be located at the lowest grade points in the intersections and shall be at the terminal end of any radius but not in the area of a pedestrian access.

All curves at the street line must be shown on the plan indicating the radius.

The curb return radii at the street intersections shall comply with the following dimensions:

<u>INTERSECTING STREETS</u>	<u>CURB RETURN RADII</u>
Local residential streets	8.0 m
Local industrial and Collector streets	10.0 m
Collector/primary arterial and Secondary arterial	15.0 m

Where two different classifications of roads intersect, the curb return radii of the higher classification road shall govern.

Truck turning templates shall be employed for intersection design on roads that have a significant volume of heavy truck traffic.

Daylighting at all intersections shall be included in the road allowances to provide for consistent boulevard widths. The daylighting shall be included on the Draft Reference Plan and on all engineering drawings and shall be as follows:

<u>Road Type</u>	<u>Daylight Triangle</u>
Local to Local Roads (20m to 20m R.O.W.)	4.5 m x 4.5 m
Local or Collector to Collector Roads (20m or 26m to 26m R.O.W.)	7.0 m x 7.0 m
Local or Collector to Regional or M.T.O. Roads (20m or 26m to 26m + R.O.W.)	12.0 m x 12.0 m

Permanent cul-de-sacs shall be as detailed in the

Town of Halton Hills Standard Drawings. Minimum gutter grade of 1% shall be maintained along the flow line of all gutters. The road grade for the cul-de-sac shall be designed such that drainage is directed toward the neck of the cul-de-sac. Catchbasins shall be located in this area on both sides of the street. Proper drainage details shall be provided for all cul-de-sacs.

For permanent cul-de-sacs longer than 90 metres a centre median must be provided to ensure at least one lane of traffic remains clear for access of emergency vehicles. This is preferable to an emergency access across a block since the emergency access may not always be available during the winter.

Temporary turning circles are required where the road is to be extended in the future and the lands required to allow for the turning circle must be provided to the Town by way of a temporary easement. A temporary turning circle is to have complete services to the outer street line of the circle. Turning circles are to have a minimum grade of 0.75% around the curb and gutter.

Temporary turning circles shall be constructed as per Town of Halton Hills Standard 408. Lots adjacent to temporary turning circles shall not receive building permits until such time as the road is extended.

The location of all utilities within road allowances shall conform to Town of Halton Hills Standard Drawings. Utility design drawings shall be submitted to the Town of Halton Hills Engineering and Public Works Department for approval.

2.1.4 Construction Requirements

All construction shall conform to all applicable Town of Halton Hills by-laws.

The road allowance shall be cleared and grubbed of all trees and shrubs not to be included in the final landscaping. Any additional obstructions, which may impede the proper installation of roads, services and other works, must also be cleared prior to the commencement of construction.

Topsoil must be stripped from all right-of-way widths and stockpiled at locations approved by the Town of Halton Hills Engineering and Public Works Department.

Rough grading to the specified grade for all travelled road portions shall be done to conform to the approved drawings. Rough grading of all lots and easements must be done prior to the placement of granular materials on the roadways. Fill material to be placed in lifts not exceeding 150 mm. The subgrade for all roads shall be properly shaped and compacted to 95% Standard Proctor Maximum Dry Density (S.P.M.D.D.) prior to the placement of any granular base course materials.

Prior to any granular material being placed on the subgrade, the Developers Soil Consultant, Consulting Engineer, and Town's Engineering Representative shall review the results of proof rolling the subgrade. The Soils Consultant is required to certify the subgrade in writing prior to any granular material being placed. This procedure is also required to be completed on each pertinent lift of granulars that are placed on the road prior to placing any asphalt pavement.

Test results shall be submitted to the Town of Halton Hills Engineering and Public Works Department and all compaction shall be certified by the Developer's Engineer.

All local, collector and arterial roads will be required to have continuous subdrains if stipulated in the geotechnical report. Subdrains shall be 100 mm diameter, corrugated, perforated polyvinyl chloride (P.V.C.) pipe, wrapped in filter cloth and installed as per O.P.S.D. 207.44.

No surface course asphalt shall be placed until the following conditions have been met:

- a minimum period of one year has passed since the placement of the base course asphalt;
- 85% of the dwellings with frontage on the street have been completed to the final grading and topsoil stage;
- all service connections have been installed;
- all underground utilities and ducts which must cross roadways have been installed;
- all undeveloped lots have been rough graded and seeded in accordance with the approved lot grading plan; and
- approval from the Town of Halton Hills Engineering and Public Works Department has been received in writing.

In accordance with Ontario Provincial Standards and Specifications, prior to hot asphalt being placed, the following conditions must be met:

- the air temperature at the surface of the road must be at a minimum of 7 degrees Celsius and rising;
- the road must be dry, clean and have no standing water present; and

- sufficient tack coat must be applied to cover the entire base course asphalt.

If it becomes necessary to cut through an existing Town road, the Developer's Engineer will ensure the backfill material is properly compacted and the surface pavement is restored to its original condition immediately following the completion of the backfilling operations.

Any construction required within existing Town rights-of-way shall comply with the terms established by the Town of Halton Hills Permit for Construction/Excavation of Public Highways.

Full road closures for periods longer than 30 days shall require the passing of a by-law by Council prior to the onset of construction. Road Closures, detours or traffic disruptions for less than 30 days shall require notice to the Town of Halton Hills Engineering and Public Works Department, not less than 7 days prior to the start of construction.

Applications for Construction/Excavation Permits shall be made at least 21 days prior to the start date for construction.

The Developer's Engineer must contact the appropriate governing agency for roads not under Town jurisdiction.

The Fire and Police Departments, the two School Board Transportation Offices and the Ambulance Service must be notified by the Developer's Engineer in the event of a detour and/or road closure.

2.1.5 Concrete Curb and Gutter

Curb and gutter for residential and industrial development shall be two-stage, concrete construction in accordance with O.P.S.D 600.07.

Islands and medians shall be constructed using

concrete barrier curb as per O.P.S.D. 600.08 and/or 600.11.

Full stage curb and gutter may be authorized by the Town of Halton Hills for certain projects or for replacement sections. In such a case, the curb and gutter shall be built in accordance with O.P.S.D. 600.04.

The Town may request curb for rural subdivisions where road curves are deemed severe or for the facilitation of road drainage. Curb and gutter for rural subdivisions shall be constructed as per O.P.S.D. 600.10.

The concrete used for all curb and gutter shall have 28-day strength of 30 Mpa and have air entrainment of 5% to 8%. The Developer's Engineer shall ensure the concrete is appropriately tested and that the test results achieve the above criteria. The Developer's Engineer shall ensure the Town receives copies of all test results.

The adjustment to finished grade of all catchbasin frames shall be completed at the same time the curb and gutter is to be constructed.

Reinforcing steel shall be placed in the curb and gutter at the locations specified in the detailed standard drawings.

Driveway depressions shall be formed in the curb according to the locations shown on the standard detail drawings. It may be necessary to adjust driveways depending upon specific field conditions. If the driveway depression is improperly located, then that section of depressed curb shall be broken out and replaced with a normal curb and gutter section. The proper driveway depression shall be made by cutting the back of the curb with a curb cutting machine. The curb cut may be done providing the existing section is free of cracks and other defects and the entrance is to a single-family dwelling.

Concrete works shall be inspected and a deficiency report shall be submitted to the Town. All deficiencies shall be repaired to the satisfaction of the Town of Halton Hills Engineering and Public Works Department prior to the issuance of a Completion Certificate or to Final Acceptance.

Asphalt gutters, concrete outlets and asphalt spillways shall be constructed as per O.P.S.D.s 601.01, 604.01, 604.02, 605.01-605.04, respectively.

2.1.6 Sidewalks and Walkways

Sidewalks shall be constructed as per O.P.S.D. 310.01 with ramps as per O.P.S.D. 310.03. Walkways shall be constructed in accordance with Town of Halton Hills Standard Drawing 207.

Sidewalks are usually not required on cul-de-sacs, they are required on one side only for crescents and on both sides of all other streets as deemed necessary by the Town Engineer.

Sidewalks shall have crossfall of 2% to 4% towards the curb. Variations to the norm may be authorized where site conditions will not accommodate the 2% to 4% crossfall.

Sidewalks shall be 125 mm thick at all locations except driveways. Additional concrete is required at driveways for a thickness of 175 mm. Sidewalks required through commercial and industrial entrances shall be 175 mm thick with a 150mm x 150mm thick wire mesh.

The concrete used for all sidewalk and walkways shall have 28 day strength of 30 Mpa and have air entrainment of 5% to 8%. The Developer's Engineer shall ensure the concrete is appropriately tested and that the test results achieve the above criteria. The Developer's Engineer shall ensure the Town receives copies of all test results.

Concrete works shall be inspected and a deficiency

report shall be submitted to the Town. All deficiencies shall be repaired to the satisfaction of the Town of Halton Hills Engineering and Public Works Department prior to the issuance of a Completion Certificate or to Final Acceptance.

Walkways shall be illuminated as per Town of Halton Hills Standard Drawing 610. Further specifications pertaining to lighting can be found in Section 2.7 of this manual.

2.1.7 Driveways

The Developer is responsible for the grading, placement of gravel and paving of driveways from the curb to the sidewalk or from the curb to the street line where no sidewalk exists.

The maximum permissible driveway grade is 8%. This maximum is considered extreme and should be employed only in circumstances where physical conditions restrict the use of lesser grades. The minimum permissible driveway grade is 2%. The construction of reverse driveways is not permitted.

The depths of the granular and asphalt materials to be used for driveways shall be addressed in the geotechnical report. The minimum requirements are as follows:

SINGLE-FAMILY URBAN RESIDENTIAL

- 65 mm HL3 surface course asphalt
- 150 mm Granular 'A' or
130 mm crushed limestone (20 mm)

SINGLE-FAMILY RURAL RESIDENTIAL

- 65 mm HL3 surface course asphalt
- 200 mm Granular 'A' or
175 mm crushed limestone (20 mm)

COMMERCIAL, LIGHT INDUSTRIAL

- 40 mm HL3 surface course asphalt
- 50 mm HL8 base course asphalt
- 225 mm Granular 'B' & 150 mm Granular 'A' or
300 mm crushed limestone (20 mm)

Variations to the above must be approved by the Town of Halton Hills Engineering and Public Works Department based upon a written recommendation from the Developer's Consulting Engineer.

The width and location of driveway depressions for single-family residential driveways shall be as detailed on the Town of Halton Hills Standard Drawings. The location of the dwelling's garage and the projected traffic volume of the road shall be the governing factors in driveway depression location. The minimum driveway width shall be 4.0 metres.

The width and location of all other driveways shall be as shown on the approved engineering drawings. Commercial driveways shall be constructed as per Town of Halton Hills Standard Drawing 413.

Rural driveway entrances must be built as per Town of Halton Hills Standard Drawing 413. All rural driveway entrances must be constructed with a minimum 7.3 metre long, 450 mm diameter corrugated steel culvert (C.S.P.) and concrete headwalls as per Town Standard #305.

All driveways shall be located a minimum of 1.5 metres from light poles, Hydro transformers, catchbasins, hydrants, watermain valves, water service valve boxes, Bell and cable T.V. junction boxes, side lot lines and other driveways wherever possible. Where frontage limitations exist, variations may be approved.

Driveway locations for corner lots shall be offset a minimum of 4.5 metres from either end of the curb radii and a minimum 1.0 metre from the side lot line. Driveways shall not be located such that

traffic flow will be impeded. For instance, a driveway may not be located such that it will provide blockage for a queue at stop signs or signals.

2.1.8 Boulevards

All boulevard areas are to be graded according to the details as shown on the Town of Halton Hills Standard Drawings for Typical Cross-sections (402 to 406). Boulevards shall be graded at 2% to 4% from the street line to the back of curb.

Street trees shall be planted in the boulevards based on one tree per frontage and two trees for side yards (frontage) of corner lots. Where space limitations prohibit the placement of street trees for certain lots, the tree shall be placed elsewhere in the subdivision at the discretion of the Town of Halton Hills Engineering and Public Works Department. All trees are to be constructed in accordance with the Town of Halton Hills Standard Drawing #605.

All debris and construction materials shall be removed from the boulevard areas upon completion of the base course asphalt placement. It is the Developer's responsibility to ensure the boulevards are maintained in a clean condition until all construction within the road allowance has been completed.

Screened, weed-free topsoil shall be placed on all boulevard areas that are scheduled for sodding. The minimum depth of topsoil required is 100 mm.

No. 1 nursery sod shall be used for the sodding of all boulevard areas.

Boulevards may be constructed to an alternative design if urban guidelines have been approved by the Town.

2.1.9 Fencing

Fencing is required for the enclosure of storm water management facilities in urban settings, walkways, for separation of neighbourhood parks, schools and industrial lands from residential properties, for the delineation of conservation authority lands and for certain retaining wall applications.

All fences shall be constructed as per O.P.S.D. 900.01. All fences shall be 1.5 metre high, black vinyl clad chain link fence unless otherwise noted on the approved engineering drawings. All components including the top rails, line and end posts and the mesh, shall be black, vinyl clad. The mesh size shall be 38 mm (1½"). Post dimensions, spacing and locations are outlined in O.P.S.D. 900.01.

Fences shall be located on the property line or entirely within the residential lots at the discretion of the Town Engineer.

Gates shall be constructed as per O.P.S.D. 900.03.

Noise fences shall be constructed as deemed necessary by the Noise Impact Study. Acoustic fences shall be constructed as per manufacturer's instructions under the supervision of the Developer's Engineer.

The Developer may install wooden fencing subject to approval from the Town of Halton Hills Engineering and Public Works Department.

Fencing for walkways shall be installed as per Town of Halton Hills Standard Drawing 207 and O.P.S.D. 900.01.

Fencing for the enclosure of stormwater management facilities may be excused, dependent upon grading and planting of the side slopes.

2.1.10 Retaining Walls

Retaining walls less than 1.2 metres (4 feet) shall be constructed as per the manufacturer's specifications and to the satisfaction of the Town Engineer.

Retaining walls higher than 1.2 metres shall require the submission of a Soil Stability Report from a qualified Geotechnical Engineer and must be designed by a qualified Professional Engineer.

Retaining walls to be constructed from gabion basket or "Unilock" type stone systems shall be constructed as per manufacturer's specifications and the Geotechnical Engineer's recommendations. Retaining wall installation must be certified by the Geotechnical Engineer.

2.2 STORM SEWERS

The location of the storm sewer line shall generally be 1.0 metre south or west of the centreline of road for Local roads and 2.25 metres south or west of the centreline of road for Collector and Industrial roads.

The minimum depth of the storm sewer from the finished road grade to the obvert of the sewer pipe shall be 1.5 metres or at a sufficient depth to accommodate foundation drains or other necessary connections. Extra depth sewers shall require proper shoring or trench box installation methods to ensure appropriate safety procedures are followed.

Private control manholes are required for storm service connections to industrial and commercial lots. Control manholes shall be located at property line.

2.2.1 Materials

Storm sewers shall be constructed of concrete pipe. Polyvinyl chloride (P.V.C.) pipe may be substituted for storm sewers 375 mm in diameter and less upon approval from the Town of Halton Hills Engineering and Public Works Department. The type and classification of all storm sewer pipe and the type

of sewer bedding must be clearly indicated on all profile drawings for each length of sewer.

All P.V.C. storm pipes shall meet the Canadian Standard Association requirement as per OPSS 1841. The basic material used in the manufacture of the pipe shall conform to ASTM D-3034 and OPSS 1841.

Corrugated steel pipe (CSP) culverts shall be minimum 16 gauge (16 mm thickness) or as required relative to the loading and application.

Concrete pipe shall conform to current CSA Specifications for the particular classes shown below:

- Non-reinforced Concrete Pipe; CSA Standard A257.1-M1982, Class 1, 2 and 3.
- Reinforced Concrete Pipe; CSA Standard A257.2-M1982, Strength Classification 50-D, 65-D, 100-D and 140-D.

All concrete sewer pipe shall have rubber gasket joints.

2.2.2 Bedding

The class of pipe and the type of bedding shall be selected to suit the loading and proposed construction conditions as outlined in the Geotechnical report. In general, the bedding shall conform to O.P.S.D. 802.010 and 802.030 and the recommendations of the Geotechnical report. Variations from these standards must be approved by the Town of Halton Hills Engineering and Public Works Department. It is the responsibility of the Developer's Consulting Engineer to ensure proper bedding procedures are being undertaken by the Contractor.

All storm sewer appurtenances (i.e. manholes,

catchbasins), shall be surrounded by a minimum of 1.5 m of approved, compacted, granular backfill. All granular material shall be compacted to 100% Standard Proctor Maximum Dry Density (S.P.M.D.D.) in lifts not exceeding 200 mm. All sewer and servicing trenches shall be backfilled with select native material compacted to 98% Standard Proctor Density.

2.2.3 Manholes

Manholes shall be located at each change in grade, alignment or pipe material type, at all pipe junctions, the beginning or end of all radius pipe sections, at the end of all sewer lines and at regular intervals along the pipe to permit entry for sewer maintenance.

The maximum spacing between manholes shall be as follows:

<u>Pipe Size</u>	<u>Maximum Manhole Spacing</u>
300 mm	95 metres
375 mm to 750 mm	100 metres
825 mm to 1200 mm	125 metres
1200 mm & over	150 metres

Pre-cast concrete manholes shall be used for most new developments within the Town of Halton Hills. Precast manholes shall conform to current ASTM specifications C-478 M.

Manholes shall be constructed as per O.P.S.D. 701.030 to 701.060 inclusive. The Developer's Engineer shall verify site specific soil conditions, loading and other pertinent factors to determine the structural suitability of each manhole. Any deviations from the standard drawings and/or any poured in place manholes must be designed and detailed separately on the engineering drawings by the Developer's Engineer and are subject to approval from the Town of Halton Hills Engineering and Public Works Department.

Reference shall be made on all profile drawings to

the size and type of all storm manholes.

Manhole frames and lids shall conform to O.P.S.D. 401.01, type A and shall have the word "STORM" cast in the lid. Manhole steps shall be as per O.P.S.D. 405.010 and 405.020. Safety platforms, for manholes with depths in excess of 5 metres, shall conform to O.P.S.D. 404.020.

Precast, reinforced, concrete manhole tees for pipes 1200 mm in diameter and more shall be in accordance with O.P.S.D. 707.010.

Concrete cradles shall be poured to the first joint of all concrete sewer pipes entering and exiting the catchbasins and manholes.

Flex joints shall be installed where plastic pipes are entering and exiting the catchbasins and manholes.

Approved pre-cast, concrete adjustment units ("Moduloc") shall be permitted to a maximum height of 300 mm from the top of the manhole to the underside of the manhole frame. Adjustments greater than 300 mm shall require the addition of a pre-cast, concrete section.

In the design of all manholes the following features must apply:

- Chamber openings shall be located at the upstream side of the manhole at all sewer junctions or on the side parallel to the direction of flow for straight run sections.
- The flow direction (benching) at acute angles shall not be permitted in any manhole.
- The obverts of the upstream pipes of a manhole shall not be lower than the obverts of the outlet pipe.

- For sewer pipes 900 mm in diameter and over, the maximum change in flow direction shall be 45°.
- Drop structures as per O.P.S.D. 1003.01 or O.P.S.D. 1003.02 shall be placed in all inlet pipes where the difference between the obvert of the inlet and outlet pipes exceeds 0.9 metres.
- Benching of all storm sewer manholes shall be to the spring line of the outlet pipe and as per O.P.S.D. 701.021.
- The minimum width of benching for all manholes is 300 mm.

For roads that are to remain with base course asphalt over the winter, the manholes shall be left at base course grade to prevent damage to snow removal equipment.

2.2.4 Catchbasins

The type, location and spacing of catchbasins shall depend upon the drainage design established by the Developer's Engineer. The type and location shall be influenced by the lot grades and areas, pavement widths, road grades and intersection locations.

In general, catchbasins shall be located upstream of all walkways and pedestrian crossings and at street intersections. Catchbasins shall not be located in driveway depressions.

Single catchbasins are generally used when the total length of drainage is less than 95 metres irrespective of the major-minor system analysis. Double catchbasins are typically required when the

catchbasin intercepts flow from more than one direction. All catchbasins shall be constructed as per O.P.S.D. 705.010 or O.P.S.D. 705.020.

Rear lot catchbasins should be avoided wherever possible. In cases where they are required, the lead from the rear lot catchbasin to the street storm sewer system shall be concrete-encased through the building envelope of the adjacent houses. A storm easement between the houses shall be required for maintenance purposes by the Town of Halton Hills.

Rear lot catchbasins shall not drain more than 3 lots consecutively in any direction.

Street catchbasins shall have frames and grates as per O.P.S.D. 400.01 and rear lot catchbasins shall have frames and grates as per O.P.S.D. 400.02.

Filter cloth silt protection shall be provided for all street catchbasins until the Completion Certificate has been issued.

Flow restrictors may be required in some catchbasins for water quantity control. These restrictors require individual design by the Developer's Engineer and should be addressed in the Storm Water Management Report submitted to the Town of Halton Hills for approval.

The minimum size of catchbasin connections for single and rear lot catchbasins shall be 250 mm diameter pipe. The minimum size of catchbasin connections for double catchbasins shall be 300 mm diameter pipe. Catchbasin connections shall be PVC pipe DR 35 or concrete pipe Class 3. Catchbasin connections shall have a minimum 2% slope except as otherwise noted on the drawings.

Approved pre-cast, concrete adjustment units ("Moduloc") shall be permitted to a maximum height of 300 mm from the top of the catchbasin to the underside of the catchbasin frame. Adjustments greater than 300 mm shall require the addition of a

pre-cast, concrete section.

For roads that are to remain with base course asphalt over the winter, catchbasins shall be ramped to prevent damage to snow removal equipment.

2.2.5 Subdrains

Road subdrains shall be required as stipulated in the geotechnical report.

Subdrains shall be constructed 3 metres on the upstream side of single catchbasin and on both sides for double catchbasin with 100mm corrugated steel pipe wrapped with perforated polyvinyl-chloride (P.P.C.) pipe and wrapped in filter cloth.

The location of all subdrains shall be determined by the Town Engineer in conjunction with the Developer's Engineer on a site specific basis. Subdrain inverts should be maintained at least 0.5 metres below subgrade level and should follow the grade of the road.

2.2.6 Other Structures

Other structures shall include inlet and outlet structures, open channels and gabion structures. Full details of all structures shall be provided on the engineering drawings. The details shall include the existing topography, the proposed grading and the required protective measures to be undertaken to minimize erosion. The necessary erosion protection shall be based upon the flow velocities at the inlets and outlets and the existing watercourse, the soil type and the site conditions.

Inlet and outlet structures shall be fully designed by the Developer's Engineer. Where ditch inlets are used, they shall comply with O.P.S.D. 705.030 and O.P.S.D. 705.040 with grates as per O.P.S.D. 403.01. Where outlet structures require concrete headwalls, they shall be constructed as per O.P.S.D. 804.04

with grating as per O.P.S.D. 804.05.

Open channels shall be designed with respect to the Storm Water Management Implementation Report as submitted by the Developer's Engineer and approved by the Town of Halton Hills Engineering and Public Works Department. Maximum side slopes of 3:1 shall be permitted for open channel design. The invert of all open channels shall be sodded to a height of 1.0 metre with No. 1 nursery sod over minimum 100 mm screened topsoil.

River run stone or Terrafix products may be employed for erosion protection as per the Storm Water Management Implementation Report.

Gabion baskets used for inlet, outlet or open channel construction shall be done in accordance with the manufacturer's instructions and guidelines. The Developer's Engineer shall ensure that proper construction procedures are followed.

Filter fabric, where required, shall be "Terrafix - Type 270R" or an approved equivalent filter material. The filter fabric must meet the requirements of Class II, O.P.S.S. 1860.07.02. The need for filter fabric shall be indicated on all appropriate engineering drawings.

2.2.7 Storm Drain Connections

Storm service connections for single family dwellings shall be single, 125 mm (5"), white PVC pipe from the sewer pipe to the street line and shall have a minimum grade of 1%. Typically, storm service connections are marked with a 50 mm x 100 mm (2" x 4") piece of wood painted white and placed at the street line.

2.2.8 Roof Leaders

Roof leaders shall be discharged to the ground via splash pads and/or extensions as per Town of Halton

Hills Standard 502. Flows shall be directed away from all buildings such that ponding or seepage into the weeping tile system is avoided. Roof leaders shall not be connected directly to the storm or sanitary sewer systems under any circumstances.

Flat roofs used for commercial/industrial buildings may be used for storage of storm water. Detention roof hoppers requiring fewer or smaller roof leaders may be employed. These measures are subject to approval by the Town of Halton Hills Engineering and Public Works Department as part of the submitted Storm Water Management Report for the given site.

2.2.9 Construction Requirements

Construction of all storm sewers and appurtenances shall be done in accordance with Ontario Provincial Standard Specifications and Drawings unless otherwise noted on the approved engineering drawings.

2.3 STORM WATER MANAGEMENT

The Developer's Engineer shall prepare and submit for approval by the Town of Halton Hills Engineering and Public Works Department, a detailed Storm Water Management (SWM) Implementation Report that addresses the impact of the proposed development on the receiving watercourse in terms of water quality and quantity, erosion protection and sediment control. The design of the stormwater management facilities shall comply with the Ministry of Environment Stormwater Management Practices Planning and Design Manual 1994 edition. Any updates to this manual shall supersede the 1994 manual.

The Storm Water Management Implementation Report shall be based on the Master Drainage Plan or the Subwatershed Plan for the area in which the subject site is located.

The storm drainage system shall be designed such that:

- flood damage is minimized;

- hazards under long term storm conditions are limited;
- a reasonable degree of safety and convenience for pedestrian and vehicular traffic is provided by the removal of lot and street runoff under short term storm conditions; and
- the impact on downstream watercourses from the proposed development is minimized in accordance with approved storm water management practices.

The storm drainage system shall be designed to service the entire development area to the maximum future development potential as established in the Town of Halton Hills Official Plan. The design must include allowances for inflows from adjacent subdivisions and lands external to the proposed plan. The runoff coefficients and area quantities of all external drainage areas should be shown on the overall storm design plan.

Storm water quality shall be governed by the Ministry of Natural Resources through the Federal Fisheries Act.

The designed storm drainage system shall meet the requirements of the Town of Halton Hills Engineering and Public Works Department, the Ministry of Environment, the Ministry of Natural Resources and the appropriate Conservation Authorities.

The storm drainage system must comply with the Master Drainage Plan or the Subwatershed Plan for the area in which the development site is located.

Blocks are required for overland flow routes and storm water management facilities and structures. Drainage easements are required for storm sewer pipes through private property and for rear lot catchbasins.

The minimum width for drainage easements for pipes up to 750 mm in diameter shall be 5.0 metres. For pipes 750 mm in

diameter to 1500 mm in diameter, the easement shall be 6.0 metres. For pipes greater than 1500 mm in diameter, the easement shall be the greater of 6.0 m or 3 times the outside dimension of the pipe. Where deeper sewer pipes are involved, easement widths in excess of the minimum may be required to accommodate appropriate side slope restrictions within the sewer trench.

Where two pipes are to be located on one easement, the minimum width of the easement shall be one-half the trench width required for the larger pipe plus one-half the trench width required for the smaller pipe plus the separation distance between the pipes, rounded up to the next 1.0 m increment.

Construction operations shall be carried out such that erosion and sedimentation are minimized. Specific controls are outlined in Section 2.5 of this Manual.

The following localized flow restrictions shall apply for the indicated industrial areas in the Town of Halton Hills:

- flow restriction based on a runoff coefficient of 0.58 and a time of concentration (T_c) of 45 minutes for 10 year storm for the west portion of Drainage Area 10 (Armstrong/Sinclair Industrial);
- maximum flow rate of 2.0 cfs/acre for the east portion of Drainage Area 10 (Armstrong/Sinclair Industrial); and
- Quality Control measures are required for the Acton North Industrial area.
- restrictions and requirements outlined in the Georgetown West and Georgetown South Master Drainage Plan Update Study.

2.3.1 Design Criteria

All sewers and drainage ditches, including external

areas draining through the site, shall be designed using the Rational Method. Larger drainage areas may require the use of computerised simulation models.

For evaluating overland flow and routing in street gutters, the Town of Halton Hills Engineering and Public Works Department requires the Developer's Engineer to use either the SWMM or OTTSWMM model. These models employ rigorous hydraulic computations for both overland and pipe flows and also have the capability for modelling water quality.

The OTTSWMM computer model can specifically model minor/major systems and can indicate the amount of street flooding and sewer surcharging which may occur for a given storm event.

In the event that surcharging occurs, the EXTRAN computer model can be used to determine the elevation of the hydraulic grade line. The EXTRAN model is compatible with the OTTHYMO and OTTSWMM models.

In developing a Master Drainage Plan, the Town of Halton Hills Engineering and Public Works Department requires the Developer or the Developer's Consultant to use either the HYMO or OTTHYMO model. The OTTHYMO model provides output, which is compatible with the SWMM model.

The HEC2 model may be employed for analysing "backwater" effects in existing and/or proposed channels, culverts and bridges.

Any potential increases in runoff rates as a result of new development must be controlled according to the approved Master Drainage or Subwatershed Plans. Where downstream constraints exist, a drainage report shall be prepared which explains how runoff rates will be controlled to satisfy the constraints. Post-development runoff in excess of the 5 year storm up to and including the 100 year storm for the major system shall not exceed the pre-development runoff for the same storm.

The minor system refers to the storm sewers and shall be designed to accommodate flows from a 5 year storm without surcharge.

The hydraulic grade line (H.G.L.) shall be calculated using 100 year flows in the minor system to ensure no basement flooding will occur. At least one of the following conditions must be met in the evaluation of the H.G.L.:

- The H.G.L. elevation must be at or below the storm sewer obvert elevation;
- The H.G.L. elevation must be minimum 0.30 metres below any adjacent basement floor elevations.

If the latter condition cannot be met, a sump pump shall be required for any dwelling, which may be affected.

The major system refers to the above-ground drainage features of the site. Street grading must provide a continuous gradient to direct street flows to a safe outlet at low points. Outlets can include walkways, open sections of roads leading to valleys, parks or open spaces designed to receive the flows.

Where runoff rates exceed the design capacity of the minor system, they shall be conveyed via streets and swales to an appropriate outlet. The combined overland flow system and the minor system shall be designed to convey a minimum 100 year storm. This design level should prevent flooding of private property and allow maximum road flooding and surface detention as indicated in Table 2.

Culverts and bridges shall be designed in accordance with current Ministry of Transportation of Ontario guidelines. The following chart provides the major flood frequencies for sizing of culverts and bridges.

<u>Road Classification</u>	<u>Design Flood Frequency</u>	
	<u>Culverts (up to 6.0 m span)</u>	<u>Bridges (over 6.0 m span)</u>
Arterial	1:50	1:100
Collector	1:25	1:50
Urban Local	1:25	1:50
Rural Local	1:25	1:25
Driveway	1:2 to 1:5	1:5 to 1:10

Backwater effects must be determined for the 1:100 year and Regional storm flows as part of the design of culverts and bridges.

The minimum size of driveway culvert is to be 450mm.

Watercourses with drainage areas of 1 km² or more shall be designed to convey the greater of the Regional or the 100 year storm. Appropriate erosion protection shall be employed for all watercourses where necessary. Specific erosion control measures are outlined in Section 2.5 of this Manual.

2.3.2 Design Procedures

The Rational Method shall be used for the design of the storm sewer system for areas not exceeding 25 hectares. Larger drainage areas may require the use of computerised simulation models.

The Rational Method uses the following formula:

$$Q = \frac{CIA}{360}, \text{ where}$$

Q = flow in metres³ per second

C = dimensionless runoff coefficient

I = average rainfall intensity in millimetres per hour

A = area in hectares.

The rainfall intensity shall be determined using Town of Halton Hills Standard 105.

The runoff coefficients to be used with the Rational Method for storm sewer design are as follows:

Parks (> 4.0 ha.)	0.20
Parks (4.0 ha. And less)	0.25
Single Family Residential	0.40 - 0.45
Semi-detached Residential	0.60
Townhouses, Apartments	0.75
Schools, Churches	0.75
Industrial	0.75
Commercial	0.90
Paved Areas	0.90 - 0.95

The inlet entry time of 10 minutes at the head of the system must be used unless large external drainage areas exist. Calculation using the Airport formula will also be acceptable.

The area values to be used for calculation in the Rational Method are those areas outlined on the General Storm Plan.

The calculations resulting from the above formula will provide expected flow rates for the given areas. These flow rates can then be used to determine the necessary pipe sizes for the storm sewer system.

Manning's Formula shall be used to determine the capacity of all storm sewers. The capacity of the sewer shall be determined on the assumption that the pipe is flowing full. The calculated pipe capacities must satisfy the maximum and minimum flow velocities and the required flow rates as determined from the Rational Method.

The minimum acceptable flow velocity is 0.90 m/s and the maximum acceptable flow velocity is 5.00 m/s.

Manning's Formula is as follows:

$$Q = \frac{1}{n} \times A \times R^{2/3} \times S^{1/2} , \text{ where}$$

- Q = flow in metres³ per second
n = Manning's roughness coefficient (units are factored into the value to allow for Q to be in metres³ per second)
A = cross-sectional area in metres²
R = hydraulic radius (cross-sectional area in metres² divided by the wetted perimeter in metres)
S = percent slope (metres per metre)

NOTE: for full flowing pipes, 'R' becomes simplified to $0.25 \times D$.

Typical Manning's roughness coefficients to be used are 0.011 for plastic pipes, 0.013 for concrete pipes and 0.024 for corrugated metal pipes.

The minimum design grades for storm sewers shall be 0.5%.

All storm sewer design calculations should be submitted on a Storm Sewer Design Chart (SSDC) as illustrated in Figure 1. These sheets are available from the Town of Halton Hills Engineering and Public Works Department upon request.

The Developer's Engineer is required to submit an outline of the proposed erosion and sediment control plan to minimize potential water quality problems. Measures employed to improve water quality during construction are generally site specific. The erosion and sediment control plan may require the use of some or all of the following measures:

- sediment traps or temporary retention ponds;
- seeding of topsoil stock piles;
- limited stripping of development lands; and
- vegetative buffer zones.

2.4 LOT GRADING

The design of the grading for all developments is of major concern to the municipality to ensure that proper lot drainage is achieved. The Developer's Engineer shall be responsible for monitoring the grading of all lots from the design stage through to the issuance of a Lot Grading Certificate. Remedial measures required to alleviate ponding problems due to improper grading shall be carried out under direction from the Town of Halton Hills Engineering and Public Works Department.

All grading deficiencies must be corrected prior to Final Acceptance of the public services.

The General Grading Plans should indicate the type of grading chosen for each individual lot and block.

2.4.1 Overall Lot Grading Design

Proposed elevations shall be shown for all lot corners and points of grade change. On large blocks, proposed elevations shall be shown at 15 metre intervals along the frontage and at appropriate intervals along the sides and rear of the block to sufficiently illustrate the grading in relation to adjacent lands and house types.

The direction of the surface runoff on all lots shall be indicated by means of an arrow.

Wherever possible, the use of rear yard catchbasins shall be avoided. Rear yard catchbasins must be shown including the rim elevation and the invert elevation of the outlet pipe.

Lot grading shall be designed in accordance with Town of Halton Hills Standard 504a, 504b and 504c. The Town reserves the right to refuse any house type which does not conform to these standards or which is incompatible with the general lot grading for the

development.

The drainage of all the lands within the subdivision limit shall be provided for internally with drainage over adjacent lands being permitted in exceptional cases only and at the discretion of the Town Engineer.

Grading along the subdivision limits shall be controlled such that no disturbances with the adjoining lands are observed.

The lot grading design shall consider existing drainage problems on adjacent properties that can best be resolved by permitting drainage through the proposed subdivision.

The front yards of all lots shall be graded to drain towards the street.

The lot grading design shall provide for the temporary drainage of all blocks of land within the subdivision that are to be developed in the future according to the Official Plan.

The maximum flow allowable to any side yard swale shall be the flow from 3 rear yards [in one direction].

The maximum area contributing to a rear yard swale that may be discharged to a rear lot catchbasin shall be that of 3 rear yards. The minimum grade of 2% shall be maintained for all swales.

The minimum depth of any swale shall be 300 mm. The maximum depth of a rear yard swale shall be 750 mm and of a side yard swale shall be 450 mm.

The maximum side slope of any swale shall be 3:1.

Rear yard catchbasins and outlet pipes shall be located entirely on the same lot. Typically, outlet pipes for rear yard catchbasins shall be located 0.35 metres from the lot line (refer to Town of Halton Hills Standard Drawing #306). An easement

shall be required for all pipes draining rear yard catchbasins.

The Developer's Engineer shall ensure the necessary setback requirements and footing locations can be accommodated on all lots containing rear yard catchbasins and storm pipes.

2.4.2 Individual Lot Grading Design

Individual lot grading designs are not required until applications for building permits are made.

Individual lot grading design must be in conformance with the approved General Grading Plans. They must indicate as a minimum, all side slopes and swales, 3:1 slopes with top and bottom of slope elevations, finished floor elevations, lot corner elevations, any retaining walls and associated fencing, driveway grades and all grades necessary to satisfy Town of Halton Hills Standards 504a, b and c.

Individual lot grading drawings shall be submitted on 8 ½" x 11" , 8 ½" x 14" , or 11" x 17" sheets, shall be drawn at a scale of 1:250 and shall be submitted in triplicate.

All boulevard areas shall be graded with a slope of 2% to 5% from the street line to the back of curb. All water boxes, manhole covers, valve boxes, etc. shall be set flush with the finished sod surface.

Driveways are not to be used for drainage outlets. Minimum and maximum permissible driveway grades are 2% and 8% respectively.

All rear yard drainage shall be directed away from houses in defined swales that outlet at the curb, the sidewalk or a catchbasin.

2.4.3 Inspection and Certification

The Developer's Engineer shall provide a certificate of final grade for each lot or block within the registered plan, which certifies said lots or blocks have been graded in conformity with the approved General Grading Plans.

The Developer's Engineer shall ensure the following procedures have been undertaken prior to issuance of a grading certificate.

- The Town has been advised that the Developer's Engineer has visited the site and is assured the lots to be certified have been graded and sodded in accordance with the General Grading Plan. This shall be completed after sodding and not later than two (2) months after placement of sod. Ground elevations adjacent to all structures must be compatible with the grading of the remainder of the lot or block.
- The Developer's Engineer shall arrange for a meeting with a representative of the Town of Halton Hills Engineering and Public Works Department immediately following the above-mentioned site visit. The purpose of the meeting is to visit the site and review each lot in the registered plan and to agree on those lots, which can be certified by a visual inspection. Further, this inspection is to reveal those lots, which require additional surveying or other work to permit lot certification. The Developer's Engineer may then certify all lots for which the grading has been agreed upon.
- The Developer's Engineer will re-survey those lots which cannot be verified by a visual inspection and/or, if necessary require the builder to perform further work to allow lot certification. This work shall commence within two (2) weeks of the initial inspection. Note that failure on the part of the builder to

remedy grading deficiencies as directed by the Developer, shall become the Developer's responsibility.

Lot grading certificates will be accepted by the Town of Halton Hills Engineering and Public Works Department following the inspection and certification of the lots in the field. This in no way relieves the Developer of his responsibility to correct any grading deficiencies that may arise prior to Final Acceptance of the subdivision.

The Developer's Engineer shall submit individual grading certificates.

2.5 EROSION AND SEDIMENT CONTROL

A Siltation Report outlining the potential problem areas and the proposed solutions must be submitted to the Town of Halton Hills Engineering and Public Works Department for approval prior to registration. A detailed Sediment Control Plan must also be submitted for approval as part of the engineering design drawing package and must illustrate the recommendations of the Siltation Report.

The following procedures may form part of the erosion and sediment control measures:

- install sediment controls and silt ponds prior to stripping topsoil as per sediment control plan;
- schedule construction in stages to control the amount of exposed areas;
- install silt traps for rear lot and temporary catchbasins;
- monitor and maintain sediment controls as necessary;

- store equipment and hazardous materials away from watercourses.

2.5.1 Agency Requirements

Erosion and sediment control shall be undertaken in compliance with the requirements of the Town of Halton Hills, the Credit Valley, Halton Region or Grand River Conservation Authorities and the Ministry of Natural Resources.

Any necessary permits must be obtained by the Developer's Engineer prior to the commencement of construction.

Periodic meetings and/or inspections may be requested from any of the above agencies with the Developer's Engineer and the Contractor to ensure the maintenance of the installed control measures.

2.5.2 Location of Controls

In-stream controls may include rock check dams, sediment traps and basins, channel diversions and cofferdams.

Rock check dams are to be employed for minor tributaries and roadside ditches.

Sediment traps and basins are to be used as temporary measures and are usually situated where a proposed storm water management pond is to be located.

Channel diversions are used on minor tributaries and streams and involve the use of de-watering (pumping) practices. Cofferdams shall be employed for larger scale projects on major tributaries. De-watering and a temporary sediment pond are also required for cofferdams. The construction of channel diversions

and cofferdams shall generally comply with the Credit Valley Conservation Authority's Sediment Control Guidelines for Development.

Off-stream controls may include catchbasin controls, sediment control fence, stockpiles, sediment ponds, buffer zones, seeding and mulching and capping of storm sewers.

Catchbasin sediment traps shall be installed on existing rear lot or temporary catchbasins to limit the accumulation of silt.

Sediment control fence shall be installed along the limits of the proposed development. The method of installation varies with climatic conditions. Where the limit of development extends to the top of a steep embankment, protection of the valley areas shall be done to the satisfaction of the Conservation Authorities.

The location of all stockpiles shall be indicated on the Sediment Control Plan. Fill material shall not be stockpiled within 5.0 metres of the limit of development. Sediment control fence may be required around the perimeter of stockpiles and shall be installed at the discretion of the Town of Halton Hills Engineering and Public Works Department.

Buffer zones shall be used as setbacks from the limit of development to the location of sediment control fence. Typically, a 5.0 metre buffer zone shall be employed.

Seeding and mulching shall be carried out for all lots and Blocks, which will be developed in the future. If growth is not observed within three weeks from the date of placement, the Developer's Engineer will ensure the areas are reseeded and mulched.

Storm sewers outfalls shall be capped (bulkheads) when it is impractical to install sediment ponds or at the first manhole upstream of a storm water management pond. Periodic removal of accumulated

sediment may be required to ensure proper sediment control is maintained. The Developer's Engineer shall inspect any capped storm sewers on a regular basis.

Permanent sediment controls shall include revegetation of all exposed lands and sodding of channel and ditch inverts.

2.6 TRAFFIC SIGNS AND PAVEMENT MARKINGS

The proposed location and type of all traffic signs and pavement markings shall be indicated on the Plan and Profile Drawings. Where larger volume collector roads are required in a subdivision, a separate Traffic Control Plan shall be provided specifying the type and layout of all traffic control devices and street lighting.

Any deviations or substitutions from the following specifications for traffic control device usage, layout or materials must be reviewed and approved by the Town of Halton Hills Engineering and Public Works Department prior to installation.

2.6.1 Street Name Signs

The same message shall be displayed on both sides of the street name sign. The sign messages shall be white lettering on a green background. The lettering and background shall be made from Scotchlite reflective sheeting, Engineering Grade (as manufactured by 3M Canada Limited). The letters shall be cut from white Scotchlite and applied by vacuum heat applicator. All letters shall be uppercase and 100 mm in height. Proper spacing must be adhered to in order that the message will be legible and to accommodate possible end bracket mounting.

The street name sign blades shall be extruded aluminium manufactured from 50S T6C aluminium alloy. The blades shall be 200 mm in height and a minimum of 600 mm in length. Street name signs shall be

mounted on dedicated galvanized steel 'U' channel or round posts. Where the through road has a good sight view of the intersecting minor street, the street name blades may be mounted atop the stop sign post with SU brackets.

Street name signs may be constructed to an alternative design if specific urban design guidelines have been approved by the Town.

2.6.2 Traffic Control Signs

All Stop, Yield and Keep Right signs shall be made from Scotchlite reflective sheeting, High Intensity Grade (as manufactured by 3M Canada Limited), with a durability rating of 10 years. The colour, shape and size of all traffic control signs shall conform to the Ontario Manual of Uniform Traffic Control Devices (M.U.T.C.D.) and/or relevant editions of the Ontario Traffic Manual.

For urban and/or residential applications, the Ra-1 Stop Sign, the Ra-2 Yield Sign and the Rb-25 Keep Right Sign shall be used.

For rural area applications and at intersections with Collector or Arterial Roads, an oversize Ra-101 stop sign is to be utilized.

All traffic control signs shall be mounted on galvanised steel 'U' channel, 100 mm x 100 mm (4" x 4") wood posts or concrete street light poles [where suitably located].

The location and use of all traffic control signs shall be to the satisfaction of the Town Engineer.

2.6.3 Pavement Markings

All transverse markings (stop bars, crosswalks) and symbols (arrows) shall be comprised of a two-component, extruded cold plastic durable pavement marking material such as Lafrentz " System 400" or an approved equivalent.

Longitudinal markings (lane lines, yellow directional dividing lines) may be the same material as indicated above or consist of hot applied thermoplastic marking material such as Lafrentz " Series 300" or an approved equivalent.

Preformed plastic marking tape such as 3M " Stamark" brand or an approved equivalent, may only be used if it is applied as an inlay in conjunction with the top course asphalt paving operations.

Temporary pavement markings using reflective traffic paint shall be applied and maintained on base course asphalt when and where deemed necessary by the Town Engineer.

Pavement marking layout shall conform to the Ontario M.U.T.C.D. or Book 11 of the Ontario Traffic Manual and as further directed by the Town of Halton Hills Engineering and Public Works Department.

The following pavement marking policy is in effect in the Town of Halton Hills:

- stop bars shall only be applied for minor road approaches facing a Stop sign condition at collector and arterial roads and the line stroke shall be 450 mm in width; and
- crosswalks (single line 100 mm in width) need only be applied in conjunction with and parallel to the above at collector roads; crosswalks shall not be marked across through roadways (at intersections or mid-block), unless otherwise directed by the Town Engineer.

2.7 STREET LIGHTING

2.7.1 Design and Approvals

Street lighting design in the Town of Halton Hills

shall be based on the *Illuminating Engineering Society of North America's American National Standard Practice for Roadway Lighting, ANS/IES RP-8, 1983.*

The goal of Roadway Lighting design in the Town of Halton Hills is to provide uniform distribution of lighting at a level that is adequate and comfortable for the intended purpose. All street lighting design in the Town of Halton Hills shall be designed by a qualified Professional Engineer using the luminance and illuminance method as described in RP-8 (1983), in addition to the Town of Halton Hills equipment standards and specifications.

Roadway illumination specifications given in the following sections are to be used for the different street classifications shown, utilizing the pole and bracket sizes specified for each luminaries wattage as shown in Standard Drawings 604 and 604a. Variations in road cross sections, vertical alignment and intersections must be dealt with on an individual design basis. Specific lighting design layout and the associated calculations shall be submitted to Halton Hills Hydro (Engineering Dept.) for review before approval by the Town.

2.7.2 Approved Street Lighting Equipment

Shop drawings must be provided for all poles, brackets and luminaries for approval before installation will commence. The following listing outlines illumination material supply requirements in the Town of Halton Hills:

Luminaires

70 watt, 120 volt, HPS Cobra Head luminaire, complete with integral ballast, receptacle for photo control and factory set lamp socket to provide IES Type 2 medium semi-cutoff photometric distribution.

- Powerlite: Catalogue No. R47G70S4Y2MSRCS
- Cooper Lighting: Catalogue No. OVZ70SC22E4

- Landmark Lighting: Catalogue No. C13-562E2

100 watt, 120 volt, HPS Cobra Head luminaire, complete with integral ballast, receptacle for photo control and factory set lamp socket to provide IES Type 2 medium semi-cutoff photometric distribution.

- Powerlite: Catalogue No. R47G10S4Y2MSRCS

- Cooper Lighting: Catalogue No. OVZ10SC22E4

- Landmark Lighting: Catalogue No. C13-56212

150 watt, 120 volt, HPS Cobra Head luminaire, complete with integral ballast, receptacle for photo control and factory set lamp socket to provide IES Type 2 medium semi-cutoff photometric distribution.

- Powerlite: Catalogue No. R47G15S4Y2MSRCS

- Cooper Lighting: Catalogue No. OVZ15SC22E4

- Landmark Lighting: Catalogue No. C13-56262

250 watt, 120 volt, HPS Cobra Head luminaire, complete with integral ballast, receptacle for photo control and factory set lamp socket to provide IES Type 2 medium semi-cutoff photometric distribution.

- Powerlite: Catalogue No. R47G25S4Y2MSRCS

- Cooper Lighting: Catalogue No. OVZ25SC22E4

- Landmark Lighting: Catalogue No. C13-56232

100 watt, 120 volt, HPS Decorative (Lantern style) black luminaire side mounted on scroll arm (as per Standard Drawing alternatives) complete with integral ballast, receptacle for photo control and factory set lamp socket to provide IES Type 2 medium semi-cutoff

photometric distribution.

- Powerlite: Catalogue No. NLS10S4YA2W3RCS ('Nostalgia') or ('Georgian' - 1999)

- Cooper Lighting: Catalogue No. SDL10SN222-18S

150 watt, 120 volt, HPS Decorative (Lantern style) black luminaire side mounted on scroll arm (as per Standard Drawing alternatives) complete with integral ballast, receptacle for photo control and factory set lamp socket to provide IES Type 2 medium semi-cutoff photometric distribution.

- Powerlite: Catalogue No. NLS15S4YA2W3RCS ('Nostalgia') or ('Georgian' - 1999)

- Cooper Lighting: Catalogue No. SDL15SN222-18S

70 watt, 120 volt, HPS square 'Shoebox' (Walkway/Pathway) luminaire with dark brown (bronze), complete with integral ballast, receptacle for photo control and factory set lamp socket to provide IES Type 1 or Type 2 medium cutoff photometric distribution.

- Powerlite: (compact Riviera) Catalogue No. CRE70S4Y1RA3CS

- Cooper Lighting: (Concourse III) Catalogue No. UCS70SC22D4V with CA40BZ arm

- Holophane: Catalogue No. PARK070HP12ASHABZPR c/w PARKBA4BZ arm

Appropriate HPS lamps and photo-control cells must be supplied and installed for each suitable type and wattage of Luminaire approved above.

Poles

Conventional streetlight poles must be direct embedded round straight-tapered, centrifugally cast (spun),

reinforced concrete of Class 'B' design strength, having a standard gray mold finish. The three sizes specified for use in Halton Hills are 8.38 m (27.5 ft.), 9.91 m (32.5 ft.) and 11.43 m (37.5 ft.). The approved suppliers of conventional or decorative concrete poles are:

- StressCrete Ltd. (Burlington)
- Utility Structures Inc. (Nepean)
- Sky Cast Inc. (Guelph)

A Decorative pole and associated bracket approved for use in the Town of Halton Hills (as shown in Standard 604a), shall be a direct embedded, octagonal - sided, straight tapered spun reinforced concrete pole of Class 'B' design strength, with a polished "midnight lace" (black) finish and the single specified size of 7.62 m (25 ft.). The decorative bracket shall be a "Springdale" Victorian style aluminum bracket of 1.8 m (6 ft.) length constructed to properly accommodate attachment to the supplied pole and for side-mount luminaire entry.

Brackets

Conventional streetlight arms for Cobra Head luminaires shall be tapered elliptical aluminum brackets in two standard sizes - 1.8 m (6 ft.) brackets for 8.38 m poles and 2.4 m (8 ft.) brackets for both other longer standard Town pole sizes. A larger 3.0 m (10 ft.) tapered elliptical bracket or even longer Traffic (SMA) brackets, if deemed appropriate, may be used where lighting installations have been approved for mounting on poles located at greater offset distances from roadway edge (e.g. existing hydro poles). The approved suppliers of mounting brackets are:

- Powerlite Inc. (Dorval)
- StressCrete Ltd. (Burlington)
- USS Manufacturing Inc. (Renfrew)

Stock Supply for Decorative Lighting

The Developer shall supply spare Decorative streetlighting equipment for the Town to stock for purposes of repair / maintenance in the following quantity ranges, based on number of decorative streetlights installed (for each luminaire wattage) per each subdivision:

Minimum supply: one complete pole, bracket and luminaire
10 - 15 streetlights: above with one 'ballast kit'
16 - 20 streetlights: above with second 'ballast kit'
21 - 30 streetlights: above with another complete luminaire
31 - > streetlights: above with a fourth 'ballast kit' and a second pole / bracket

An alternative arrangement may be considered by the Town wherein the Developer forwards a set amount of equivalent funding in lieu of the required level of spare equipment supply.

2.7.3 Design Classifications

The following outlines lighting equipment parameters utilizing Cobra Head streetlights for each of the specified Town standard road allowance classifications. Street light pole layout may feature one-sided or staggered arrangement in order to maximize performance for prevailing location conditions.

Urban Local - Residential (2 Lane)

- 70 watt HPS, 8.5 m pavement width on 20 m ROW, 8.38m pole at 2.0 m behind curb.

Urban Collector - Residential (2 Lane)

- 150 watt HPS, 12.0 m pavement width on 26 m ROW, 9.91 m

pole at 2.0 m behind curb.

Urban Collector - Residential (4 Lane)

- 250 watt HPS, 14.0 m pavement width on 26 m ROW, 11.43 m pole at 2.0 m behind curb.

Urban Arterial - Undivided (4 Lane)

- 250 watt HPS, 14.0 m pavement width on 26 m ROW, 11.43 m pole at 2.0 m behind curb.

Hamlet Local - Residential

- 70 watt HPS, 7.5 m pavement width on 20 m ROW, 8.38 m pole at 2.0 m behind curb.

Rural Estate - Residential

- 100 watt HPS, 6.5 m pavement width on 20 m ROW, 9.91 m pole at 2.2 m from E/P.

Urban Industrial

- 150 watt HPS, 10.0 m pavement width on 26 m ROW, 9.91 m pole at 2.0 m behind curb.

Rural Industrial

- 100 watt HPS, 8.5 m pavement width on 26 m ROW, 9.91 m pole at 2.2 m from E/P.

The following outlines lighting equipment parameters utilizing decorative streetlights for each of the specified Town standard road allowance classifications. Decorative pole, luminaire and bracket alternatives approved for use in Halton Hills is shown in the Standard Drawings. Street light pole layout may feature one-sided or staggered arrangement in order to maximize performance for prevailing location conditions.

Urban Local, Hamlet Local or Rural Estate - Residential

- 100 watt HPS, on 7.62 m poles - pavement widths and pole offsets for each cross section as listed above in Section 2.1.

Urban Collector - Residential (2 Lane)

- 150 watt HPS, 12.0 m pavement width on 26 m ROW, 7.62 m pole at 2.0 m behind curb.

Rural Estate Subdivision Lighting

Illumination will normally be installed at intersections. The Town will determine in each individual case whether additional streetlights shall be installed due to vertical and/or horizontal curvatures warranting lights.

Walkway / Multi-Use Path Lighting

The following criteria should be used in the illumination design for walkways or multi-use pathways:

70 w HPS 'Shoe-box' style of luminaires on 3.66 square metal poles on concrete footings, in accordance with installation specifications in Standard Drawing 610 and illuminance levels outlined in Table 4 of ANSI / IES RP-8.

2.7.4 Installation Details

Streetlight installation system's power is supplied from distribution transformers serving residential or commercial loads. Streetlights are to be connected in parallel from the 120 volt secondary supply with all luminaires being individually controlled by a photo eye cell. Each pole must have a 10 amp fuse kit supplied and connected in the circuit at the pole hand hole. Each streetlighting circuit shall be fused at the transformer by a 60 amp, 600 volt separable fused secondary cable connector kit (fuse sizing to be confirmed by Halton Hills Hydro on an individual basis). Poles should be placed a minimum of 3.0 m from

hydro transformers. Pole locations should be adjacent side lot lines, whenever practicably possible, without significantly compromising the designed illumination level.

The 120 volt cable assemblies from the transformer poles to the pole hand holes shall consist of two copper conductor #8 AWG Type NMC (600 volt rating) in PVC insulation and jacket with accompanying #8 AWG copper ground wire, all run through buried 50 mm 'DB2' PVC duct in the utility trench - in accordance with 'Halton Hills Hydro Duct Installation Specification' , dated June 1998 (as amended).

Riser conductor from the pole hand hole to the luminaire shall be #12 AWG TWU solid copper. All connections should be completed in the luminaire and at the hand hole with final connection at the transformer vault being made by Halton Hills Hydro at the Developer's cost. Cable splices will be permitted in the pole hand holes only.

The Town will require inspection services performed at the Developers expense for streetlight plant installation, to be coordinated and undertaken by Halton Hills inspectors. The Developer shall be responsible for the payment of all hydro streetlighting connection and for all repairs / maintenance costs associated with the streetlight network until Final Acceptance approval of the subdivision.

2.8 LANDSCAPING

All new developments in the Town of Halton Hills must have landscaping components, which are part of the required public services. The landscaping features will include as a minimum, street tree planting and parks, and in some cases buffer areas for aesthetic or separation of land use purposes.

The landscape design shall comply with the current criteria and guidelines of the Town of Halton Hills Recreation and Parks Department.

2.8.1 Street Tree Planting

The Developer must provide trees for planting along all road allowances in the development in accordance with the specifications established in the Subdivision Agreement. The Developer is responsible for ensuring that living trees are present at the time of assumption. Any trees which have not survived prior to assumption shall be replaced by the Developer at the Developer's cost.

Trees shall be located as per the Town of Halton Hills typical road sections. Trees shall be supplied based on one tree per lot excepting corner lots; corner lots shall have one tree supplied along the frontage and one or more as space permits along the side yard road allowance.

Where the location of utility services and/or appurtenances prohibit the planting of street trees, an alternate location may be chosen. Typically, trees will be alternatively located along corner lot side yards.

Trees shall be located a minimum of 20 metres from Stop signs or intersections.

All plant materials shall meet the horticultural standards of the Canadian Nursery Trades Association with respect to grading and quality. They shall be nursery grown, under proper cultural practices as recommended by the Canadian Nursery Trades Association.

All trees shall be planted in accordance with Town of Halton Hills Standard Drawing 605. The species of trees acceptable for planting are provided with this drawing and a detailed list can be provided by the Town of Halton Hills Engineering and Public Works Department.

Nomenclature of specified plants shall conform to the International code of Nomenclature for Cultivated Plants and shall be in accordance with

the approved scientific names given in the latest edition of Standardised Plant Names.

The use of "collected plants" will not be permitted unless approved by the Town. Any plants dug from native stands, wood lots, orchards or neglected nurseries and which have not received proper cultural maintenance as advocated by the Canadian Nursery Trades Association, shall be designated as "collected plants".

The minimum tree size shall be 2.0 metres in height and 50 mm diameter trunk. Trees shall not show signs of physical damage, insects, pests or diseases and must have at least three quarters of their root systems intact.

Trees shall be densely foliated when in leaf and have a healthy, well developed root system. Pruning wounds shall show vigorous bark on all edges and all parts shall be moist and show live, green cambium tissues when cut.

All plant materials shall conform to the measurements specified in the planting list. Larger plants may be used upon approval by the Town. If larger plants are used, the ball of earth shall be increased in proportion to the size of the plant.

All plants shall be measured when the branches are in their normal position. Where trees are measured by calliper, reference is made to the diameter of the trunk measured 0.3 metre above ground as the tree stands in the nursery.

Wrapping material for tree trunks shall be a first quality burlap 150 mm to 250 mm in width, or a heavy waterproof crepe paper 150 mm in width.

The main stem of each tree having a calliper of 50 mm or greater shall be wrapped. The wrapping shall be applied in a spiral manner with overlap, each time starting at grade and extending upwards to just above the second branches. All wrapping shall be neat and snug and held in place by suitable cord.

For better protection the trunks shall be sprayed with a wettable powder of a long residual insecticide before applying the wrapping.

Anchors required for the support of large shrubs and trees shall be metal "T" bars or approved equal.

Wires for fastening to "T" bars shall be pliable No. 11 gauge galvanised iron wire.

New black rubber hose, two-ply, reinforced and 13 mm in diameter, or an approved equal, shall be used encase wires where they circle the trunk or branches.

All excavated materials from planting beds shall be removed from the site unless they are approved for use as fill materials on the site where filling is required.

Planting pits for 50 mm trees shall be 230 mm to provide proper clearance around the root ball. Pits shall be deep enough to allow a minimum depth of 150 mm of planting soil mixture under the root ball.

Plants shall be set in partly filled pits or beds of prepared soil mixture at which time all burlap, ropes and wires shall be pulled away from the top of the ball. A layer of loose unfrozen soil mixture at least 150 mm deep shall be placed under each plant.

Bare root plants shall be placed so that their roots lie in their natural position. Soil mixture shall be backfilled in layers not exceeding 150 mm in depth. Each layer shall be firmly tamped in place in such a manner that the plant retains its vertical position. Particular care shall be taken to ensure that no air pockets remain under or around the roots. The soil mixture shall be thoroughly watered when the hole is half full, and again when full.

Trees shall be planted during the spring or fall dormant season and must be planted in unfrozen ground. Trees shall not be planted until the boulevards have had the topsoil placed and have been

sodded.

Each plant other than those in planting beds shall have an earth saucer at its base, which shall have a diameter as large as the excavated area. The saucer shall be constructed such that water is retained around the plant's roots.

The planting soil mixture for the filling of planting pits and planting beds shall consist of five parts topsoil and one part peat moss. 0.6 kg of bonemeal per cubic metre of soil mixture shall be added unless otherwise specified.

All ingredients shall be thoroughly mixed prior to backfilling. Topsoil shall not be mixed while in a frozen or muddy condition.

All plants shall be pruned after planting. The amount of pruning shall be limited to the minimum necessary to remove dead or injured branches and to compensate for the loss of roots as a result of transplanting operations. Pruning shall be done in such a manner as to preserve the natural character of the plants. Leaders shall not be removed. Only clean, sharp tools shall be used. All cuts shall be clean and flush leaving no stubs. Cuts, bruises or scars on the bark shall be traced back to living tissue and removed. The affected areas shall be shaped such that water is retained and all treated areas shall be painted with an approved paint.

The layout of the trees shall be approved by the Town Engineer as part of the Engineering design drawing submissions.

2.8.2 Park Lands

The Developer's Engineer shall prepare a detailed grading plan for all lands to be dedicated for park purposes. This plan should be submitted for approval by the Town of Halton Hills Engineering and Public Works Department and the Recreation and Parks Department as part of the engineering drawing

package. The plan should show existing and proposed contours, the proposed drainage pattern and any existing trees and features that will remain.

Parklands shall be fine graded in accordance with the approved grading plan. All graded areas shall be covered with a minimum 100 mm of screened, clean topsoil and shall be sodded or seeded and mulched relative to the terms of the Subdivision Agreement.

Building materials and equipment shall not be stored on proposed parkland and the parkland shall not be used as a dump site. The Developer is responsible for ensuring all debris is removed and disposed of prior to seeding or sodding of the parkland.

The Developer is responsible for the watering, maintenance, fertilizing and mowing of the parklands until the Town of Halton Hills Engineering and Public Works Department is satisfied that sufficient sod growth has occurred.

2.8.3 Buffer Areas

Buffer areas shall be designed on a site specific basis. They may be required to separate lands of different land uses or strictly for aesthetic purposes. Detailed requirements for buffer areas shall be provided by the Town of Halton Hills when necessary.

2.9 BENCHMARKS

2.9.1 General Information

A minimum of two Benchmarks shall be installed to establish a network of Second Order Geodetic Bench Marks in the Town of Halton Hills. It is the preference of the Town of Halton Hills Engineering and Public Works Department to have Benchmarks installed internal to the subject development site. All fieldwork shall be carried out in accordance with the information in this section of the manual.

The procedures outlined here follow those recommended by the Federal Government Surveys and Mapping Branch (Ottawa), published 1978.

Pre-numbered Benchmark plates shall be used. These Benchmark plates are available for purchase from the Town of Halton Hills Engineering and Public Works Department.

The Benchmark plate location and elevation shall be documented and signed by the Developer's Engineer or his agent for verification and shall be approved by the Town of Halton Hills Survey Coordinator. The Bench Mark data then becomes the property of the Town of Halton Hills Engineering and Public Works Department following an on-site inspection and acceptance by the Town of Halton Hills Survey Coordinator.

For further information regarding Benchmark criteria, reference should be made to the Town of Halton Hills Benchmark Manual 1990.

3.0 ENGINEERING SUBMISSION REQUIREMENTS

After Draft Approval has been granted, engineering design submissions should be submitted simultaneously to the Town of Halton Hills and the Regional Municipality of Halton for comments. The Developer's Engineer should contact the Region of Halton Public Works Department for the necessary submission requirements relating to regional works.

All submissions are to include the items stated within the the 'engineering submssion requirements' and are to be submitted in their entirety by one agent of the Developer in one complete package. Any incomplete submissions delivered to the Town, shall be returned immediately.

One copy of the contract documents, including a blank tender form, shall be submitted prior to the Engineering Department giving their approval to commence work.

The Developer's Engineer's fee to be included in the summary of Schedule "C" shall be in accordance with the schedule for Consulting Engineers' fees as prepared by the Association of Professional Engineers of Ontario. This fee shall be for design, layout and general supervision of the proposed subdivision. That portion of the Engineer's design fee, which had been paid at the time of final submission, may be deducted from the total amount shown in the summary of Schedule "C", thus reducing the financial requirements.

3.1 BLOCKS, EASEMENTS AND RESERVES

Blocks, easements and/or reserves required by utility agencies or conservation authorities shall be indicated on the Draft Reference Plan.

All descriptions, easements and deeds are to be based on lot and plan numbers after registration in the simplest form possible.

3.1.1 Blocks

Blocks shall be required for all overland flow routes and storm water management facilities and

structures. Blocks may also be required for open space areas and park lands. All blocks must be shown on the Draft Reference Plan and the dedication of such to the Town of Halton Hills shall be made prior to signing the Subdivision Agreement.

Blocks required for regional works shall be indicated on the Draft Reference Plan as per Region of Halton guidelines.

3.1.2 Easements

Drainage easements are required for underground storm sewer pipes through private property and for rear lot catchbasins. Requirements for easement sizes are outlined in Section 2.3 of this manual. All easements must be shown on the Draft Reference Plan and the dedication of such to the Town of Halton Hills shall be made prior to signing the Subdivision Agreement.

Easements required for regional works shall be indicated on the Draft Reference Plan as per Region of Halton guidelines.

3.1.3 Reserves

300 mm reserves shall be required across boundary right-of-ways to control access to the proposed site. All reserves must be shown on the Draft Reference Plan and the dedication of such to the Town of Halton Hills shall be made prior to signing the Subdivision Agreement.

Reserves required by the Region of Halton shall be indicated on the Draft Reference Plan as per Regional guidelines.

3.2 FIRST SUBMISSIONS

3.2.1 Drawings

The first submission to the Town of Halton Hills Engineering and Public Works Department shall include two copies of the following drawings:

- Cover Sheet
- General Above Ground Services Plans
- General Underground Services Plans
- General Storm Plan
- General Grading Plans
- Plan and Profile Drawings
- Landscape Plans
- Miscellaneous and Standard Detail Plans
- Storm Water Management, Erosion and Sediment Control, Fencing Plans and Traffic Control Plans, as required.

One copy of the Landscape Plans should also be submitted to the Town of Halton Hills Parks and Recreation Department for comments.

3.2.2 Schedules

One copy of the following schedules must be submitted with the engineering package:

- Schedule A - Legal Description
- Schedule B - Proposed Plan of Subdivision
- Schedule C - Cost Estimate of Public Services
- Schedule E - Engineering Drawings
- Schedule G - Easements
- Schedule H - Fencing

The specific description of each schedule is provided in the standard Town of Halton Hills Subdivision Agreement.

3.2.3 Reports, Calculations and Additional Information

Two copies of the following reports and studies (as required on a site specific basis) must be submitted:

- Geotechnical Report
- Traffic Impact Study
- Noise Impact Study
- Tree Preservation and Inventory
- Storm Water Management Implementation Report
- Siltation Report
- Environmental Site Assessment Report

The terms of reference for the above reports are outlined in Section 3.6 of this manual.

The Developer's Engineer shall submit one copy of the design sheets for pipe strength and bedding requirements and one copy of the pavement design sheets dependent upon the recommendations of the Geotechnical Report.

3.3 SECOND SUBMISSIONS

3.3.1 Drawings and Documents

The following drawings and documents are required by the Town of Halton Hills Engineering and Public Works Department as part of the second submission:

- two complete sets of drawings as listed in the first submission;
- one complete set of the schedules as listed in the first submission;
- one original and two copies of M.O.E. applications for storm sewers duly signed by the Developer's Engineer (it should be noted that the application will not be forwarded to the

M.O.E. until the Town is satisfied with the storm sewer design);

- two copies of all agreements, deeds and grants of easements with the associated reference plans.

Subsequent submissions, if required, shall include the above-noted drawings and documents requiring revisions only. Any submission after the fourth submission, a cost of \$1,000.00 per submission will be required from the developer prior to the review of the drawings by the Engineering Department.

Revisions to the preliminary reports shall be completed prior to the final submission stage.

3.4 FINAL SUBMISSIONS

3.4.1 Final Drawings and Documentation

The following plans and documents are required for the final submission to the Town of Halton Hills Engineering and Public Works Department:

- two complete Subdivision Agreements properly signed and executed by the Developer;
- two copies of the proposed Reference Plan;
- three complete sets of all drawings listed in the first submission and in Schedule E of the Subdivision Agreement (reduced to 8½" x 14");
- two copies of all schedules as listed in the first submission;
- descriptions and elevations of the two permanent second order Bench Marks installed per phase of subdivision;
- two copies of all deeds conveying lands to the

Town and all grants of easements to the Town properly executed by the Developer and the mortgagee(s).

3.4.2 Final Storm Drainage Calculations

Two copies of the Storm Sewer Design Chart (S.S.D.C.) and the General Storm Plan reflecting the necessary revisions shall be submitted. The Developer's Engineer shall ensure that all changes to the storm sewer design have been made to the corresponding S.S.D.C., the Storm Plan and all Plan and Profile drawings.

3.4.3 Final Reports

Two copies of the final reports shall be submitted for each of the reports listed in the first submission. All necessary revisions requested in the first submission must be included in the final reports.

3.4.4 Agency Approvals

All agency approvals are required prior to registration of the plan.

The Developer or the Developer's Engineer shall submit evidence in writing to the Town of Halton Hills Engineering and Public Works Department that arrangements have been made with Bell Canada, Halton Hills Hydro and Halton Cable Systems for the installation of their utilities in the prescribed locations shown on the typical road cross-sections.

The Developer or the Developer's Engineer must submit evidence in writing to the Town of Halton Hills Engineering and Public Works Department that arrangements have been made with Halton Hills Hydro for the installation of street lighting.

The Developer or the Developer's Engineer must submit evidence in writing to the Town of Halton Hills Engineering and Public Works Department that arrangements have been made with Canada Post for the installation of postal facilities to service the proposed subdivision.

The Developer's Engineer shall submit two copies of all necessary approvals from the M.T.O., M.O.E, M.N.R., C.V.C.A, H.R.C.A., G.R.C.A. and any other approval agency as required.

3.5 "AS-CONSTRUCTED" DRAWINGS

Upon completion of the construction of the services, the Developer's Engineer shall obtain the "as-constructed" field information and revise the original drawings accordingly. "As-constructed" drawings must be submitted and approved by the Town of Halton Hills Engineering and Public Works Department prior to the acceptance of public services. Any changes in the design or location of services shall be incorporated on the drawing originals by the Developer's Engineer.

Following the addition and/or revision of any information on the original drawings, the Developer's Engineer shall submit the drawings on reproducible mylar or vellum, to the Town of Halton Hills for safekeeping.

The Developer's Engineer shall supply to the Town, DXF compatible files of the "As-constructed" public services in a format suitable for use with the current AutoCAD release. These files shall be submitted on 3.25" disks or compact discs.

3.6 REPORTS AND STUDIES

The terms of reference outlined in the following sections are standard terms of reference. It may be necessary to make revisions to the satisfaction of the Town Engineer on a site specific basis.

3.6.1 Geotechnical Reports

The existing soil conditions for the proposed site shall be identified and discussed. An analysis of the soil properties regarding their suitability for the proposed development shall be furnished. Recommendations with respect to compaction of the existing soils, use of native material and/or importing backfill material shall be provided.

A borehole analysis shall be performed to provide representative base information on the existing soils. The borehole analysis shall include figures showing borehole locations and results which indicate the various soil elements and depths.

Recommendations shall be provided regarding the sewer bedding and backfill materials required and the necessary the depth of materials for road construction.

Recommendations regarding the potential impact of groundwater on construction, the need for subdrains and design information for building foundations shall be included in the report.

Recommendations for the proposed asphalt mix design shall be provided. The road classification and expected traffic volumes should be considered when making recommendations for asphalt depths.

3.6.2 Traffic Impact Studies

The existing condition of the subject property and the surrounding road network used for access shall be identified and discussed. Intersection and driveway sight distance requirements, geometric alignment deficiencies, parking requirements, vehicle operating speeds and collision data shall be reviewed and assessed where applicable.

A study area for the traffic impact assessment shall be identified. The study area must be in conformance with any Master Transportation Studies or Reports.

Traffic information relative to the existing road network within the study area shall be collected and analysed. Traffic peaks relative to the development of the site and road network shall be evaluated and existing highway capacity and level of service shall be determined and analysed.

The proposed road network for the development shall be evaluated. Recommendations shall be included for the internal road system with respect to sight distance, geometric alignment, parking, vehicle speed, pedestrian and bicycle movements and proposed utilization of traffic control devices.

Trip generation rates, trip distribution, modal split and trip assignments shall be calculated to determine post development traffic patterns and to determine the projected levels of service for the study area's road network. This analysis shall be undertaken for each major phase of the proposed development for the subject property.

Potential development impacts of each phase of the development on the external road system and major intersections within the study area shall be assessed through appropriate capacity analysis.

The impacts of other known developments planned in the study area should be accounted for in the horizon assessment considering all current available information.

Any geometric improvements or upgrading of traffic control devices, which may be required or recommended, for the existing road network as a result of each phase of the development shall be identified.

3.6.3 Noise Impact Studies

The existing noise conditions of the proposed site and the surrounding area shall be identified and discussed. In particular, the noise levels resulting from large volume highways and/or railways in the

immediate vicinity of the site shall be assessed.

An analysis of the effect of neighbouring noise levels on the proposed subdivision shall be provided. Recommendations for noise abatement measures shall be presented and the lots and/or blocks requiring these measures shall be indicated. Figures showing the location of all noise abatement measures shall be included in the report.

3.6.4 Tree Inventories

A plan illustrating the existing trees on the subject site shall be provided. Trees shall be indicated with reference to the size (height, diameter of trunk), number, species and existing condition. Trees, which are designated as a "protected species" by the applicable Conservation Authority, shall be indicated as such on the plan.

The inventory shall address the need for tree removal during the construction period and the method for protecting trees that are to remain.

3.6.5 Storm Water Management Implementation Reports

Development constraints and/or design criteria which are to be applied to the design of the site drainage system shall be identified. This may include limited flow culverts, channels, erosion zones, peak flows, runoff volumes and any environmental concerns.

Preliminary designs shall be prepared and alternative methods of creating the preferred drainage option shall be evaluated, including alternative outfall locations and alternative on-site minor and major flow routes.

A preferred, site-specific drainage system shall be selected and the major and minor flow drainage boundaries within the site shall be defined.

Hydrologic parameters shall be established or identified (rainfall distributions, intensities, return periods, impervious coefficients) for calculation of the major and minor storm flows in the post developed state.

A preliminary cost estimate for the drainage works shall be prepared and the need for and magnitude of capital contributions from adjacent landowners shall be investigated.

The requirement for staging the construction of the drainage system shall be determined.

A schedule shall be prepared outlining the maintenance requirements of the proposed storm water management facilities.

A design brief shall be prepared which includes:

- design criteria for drainage system components;
- delineation of major and minor subcatchment areas;
- calculation of major and minor storm flows;
- justification of the selected computational procedure;
- sizing of major and minor system components;
- design calculations for specific structures;
- design calculations for sediment control works;
- comparison of pre and post development peak flows at outlet points from the development for a full range of design rainfall events.

3.6.6 Siltation Reports

Potential erosion and sedimentation problem areas within the subject property shall be identified and discussed. The report shall address the methods of silt control on the site throughout all phases of construction.

A maintenance schedule for the proposed sediment control measures shall be prepared.

An overall erosion and sediment control plan for the site shall be prepared. The plan shall indicate the proposed locations of all sediment controls and the location of any necessary silt fence.

3.6.7 Environmental Site Assessment and Remediation Report

This report shall assess real property to be conveyed to the Town to ensure that such property is free of contamination. If contamination is found, the consultant will determine its nature and the requirements for its removal and disposal at the Developers expense. Prior to the registration of the plan, the Developer's Engineer shall certify that all properties to be conveyed to the Town are free of contamination.

4.0 DEVELOPMENT AGREEMENT ADMINISTRATION

The Developer and the Developer's Engineer shall ensure their familiarity with the terms of the Subdivision Agreement and shall be responsible for all items outlined therein. In particular, with respect to contract administration, the Developer and the Developer's Engineer shall acquaint themselves with the Subdivision Agreement.

4.1 BUILDING PERMITS

4.1.1 Completion of Underground Services

Prior to the issuance of building permits, the construction of all underground services shall be completed. The system must be fully operational and must have been inspected and approved by Town staff. Underground services shall include the construction of the roads granular base, asphalt, curbs, walkways, street signs, light poles, and all storm sewer and drainage systems including adequate outfalls, and the installation and connection to the

main sewer line of all necessary storm water management structures and facilities, road base, base asphalt, curbs, walkways, street signs, stop signs and light poles.

The underground cable installations for Halton Hills Hydro are expected to be completed prior to the placement of base curb and gutter and base asphalt. Street lights shall be installed and shall be operational.

4.1.2 Maintenance/Inspection of Sediment Controls

All sediment controls are expected to be maintained and periodically inspected throughout the construction period. Prior to the issuance of building permits, the Developer's Engineer shall ensure that all sediment control features have been installed properly and that they are functional following the construction of the underground public services.

The Developer's Engineer shall schedule an inspection with a representative from the Town of Halton Hills Engineering Department to inspect all sediment controls. The Engineering shall provide authorization to the Building Department for issuance of permits following the inspection of the sediment controls.

4.2 SECURITY REDUCTION REQUIREMENTS

4.2.1 Entering Into a Subdivision Agreement

The Developer will be required to post securities in the amount of 100% for the proposed works to be done,

or

The Developer will be required to post securities in the amount of 25% for the proposed works to be done, until registration, then post 25% of the proposed works of the work done plus 100% of outstanding work to be completed.

4.2.2 Issuance of Underground Completion Certificate

An Underground completion certificate will be issued when an inspection by the Developer's Engineer and Town staff has been carried out, the Developer's Engineer has certified in writing that certain public services have been satisfactorily completed and all noted deficiencies have been repaired. Also, a statutory declaration that all accounts relative to the installation of said public services have been paid.

Then, securities may be reduced to 10% for completed underground public works, 25% for completed above ground public works, and 100% will be retained for outstanding public works to be completed.

4.2.3 Issuance of Completion Certificate (Maintenance Period)

The Developer may apply to the Town of Halton Hills for a further reduction in securities at the time the Developer is applying for an Above Ground Completion Certificate, to an amount no less than 5% of all underground works completed, 10% for all above ground works completed, and 100% securities retained for all outstanding works to be completed for the duration of the Maintenance Period. No reductions in securities will occur until an inspection by the Developer's Engineer and Town staff has been conducted and all noted deficiencies have been repaired. A statutory declaration indicating all outstanding invoices to date have been paid must be submitted to the Town prior to security reduction. No further reductions in securities shall permit the security held by the Town to fall to an amount less than \$5,000.00.

The Developer shall maintain all of the public services for which security was taken for the full duration of the Maintenance Period. The Maintenance Period shall consist of a minimum period of two (2) years from the date of the issuance of the Completion Certificate or until Final Acceptance,

whichever is later in time.

4.2.4 Final Acceptance

Prior to Final Acceptance, the Town of Halton Hills Engineering Department shall inspect the public services for which security is held and all defects disclosed through such inspection shall be remedied by the Developer at the Developer's expense.

Following written certification from the Developer's Engineer that all deficiencies have been remedied, the Town of Halton Hills Council may approve Final Acceptance of the subdivision by means of a by-law.

All remaining securities for the subject subdivision shall be released upon Final Acceptance by Council.

4.3 ISSUANCE OF COMPLETION CERTIFICATES

Prior to issuance of an Underground and/or Completion Certificate for the public services, the Developer shall:

- arrange for an inspection by the Town of all public services and correct all deficiencies to the satisfaction of the Town;
- furnish the Town with a statutory declaration that all accounts for work and materials, taxes, levies, fees and all other costs and expenses have been paid, except statutory holdbacks, and that there are no claims for liens or otherwise for work done or materials supplied for the Developer; and
- supply one (1) reproducible mylar or vellum copy and one DXF compatible file copy on a 3.25" disk or computer disc in a format suitable for use with the current AutoCAD release, of the "As-Constructed" engineering drawings for the public services.

4.3.1 Inspection of Public Services

Prior to inspection, the Developer's Engineer must ensure all services have been built to Town standards. Upon the completion of the installation of all public services, the Developer's Engineer shall schedule an inspection with the Town. All services shall be cleaned prior to inspection. The Town reserves the right to cancel the inspection if the public services have not been properly cleaned. A representative from the Town, the Developer's Engineer and the Contractor shall be present for the inspection.

Prior to the issuance of an underground completion certificate, a manual inspection is required of the Storm Sewer system. Prior to Final Assumption, a camera inspection is required of the Storm Sewer system.

The Town shall provide the Developer's Engineer with a list of deficiencies. Once the deficiencies have been corrected to the satisfaction of the Town Engineer, a report shall be sent to Council to recommend a date for the commencement of the Maintenance Period. A Completion Certificate may be issued at that time.

4.3.2 Temporary Works

Temporary works such as bulkheads that were required for the completion of public services shall be removed prior to the issuance of the Completion Certificate.

Temporary cul-de-sacs shall be maintained at the Developer's expense until Final Acceptance of the subdivision or until such time as the permanent road extension has been constructed at the discretion of the Town Engineer.

Temporary storm water management structures and facilities shall be maintained at the Developer's expense until Final Acceptance of the subdivision or

until such time as stipulated in the Subdivision Agreement.

4.4 ACCEPTANCE OF PUBLIC SERVICES

The Developer is responsible for the maintenance of all public services until Final Acceptance by the Town of Halton Hills.

Two (2) years after the issuance of the Completion Certificate, the Developer may request the Town to accept the public services.

Prior to Final Acceptance of the public services, the Developer shall:

- arrange for a final inspection by the Town of all public services and correct all deficiencies to the satisfaction of the Town;
- furnish the Town with a statutory declaration that the Developer has paid all accounts that are payable in connection with the works and that there are no outstanding claims relating to the works; and
- furnish the Town with a statutory declaration from a registered Ontario Land Surveyor, stating that all standard iron bars shown on the registered plan have been found or replaced and that the limits of all sewer easements have been barred within the developed lands, at a date not earlier than one (1) month prior to the application by the Developer for Final Acceptance.

4.4.1 Inspection of Public Services

Prior to Final Acceptance, the Developer' Engineer shall request a final inspection of all public services by the Town of Halton Hills Engineering Department and shall correct all deficiencies to the

satisfaction of the Town.

Public services will only be accepted on the basis of a satisfactory inspection made by the Town. Such inspections shall be conducted between the period of May 1st to October 31st in any given year. At the Towns discretion, some inspections outside of said time period may be undertaken.

4.4.2 Storm Water Management Facilities

Storm water management structures and facilities shall be fully operational and without functional problems as certified by the Developer's Engineer, at the time the Developer makes a request for Final Acceptance. Prior to Final Acceptance all facilities shall be inspected and all deficiencies shall be corrected.

Maintenance of storm water management facilities prior to Final Acceptance shall be at the expense of the Developer.

4.4.3 Utility Installations

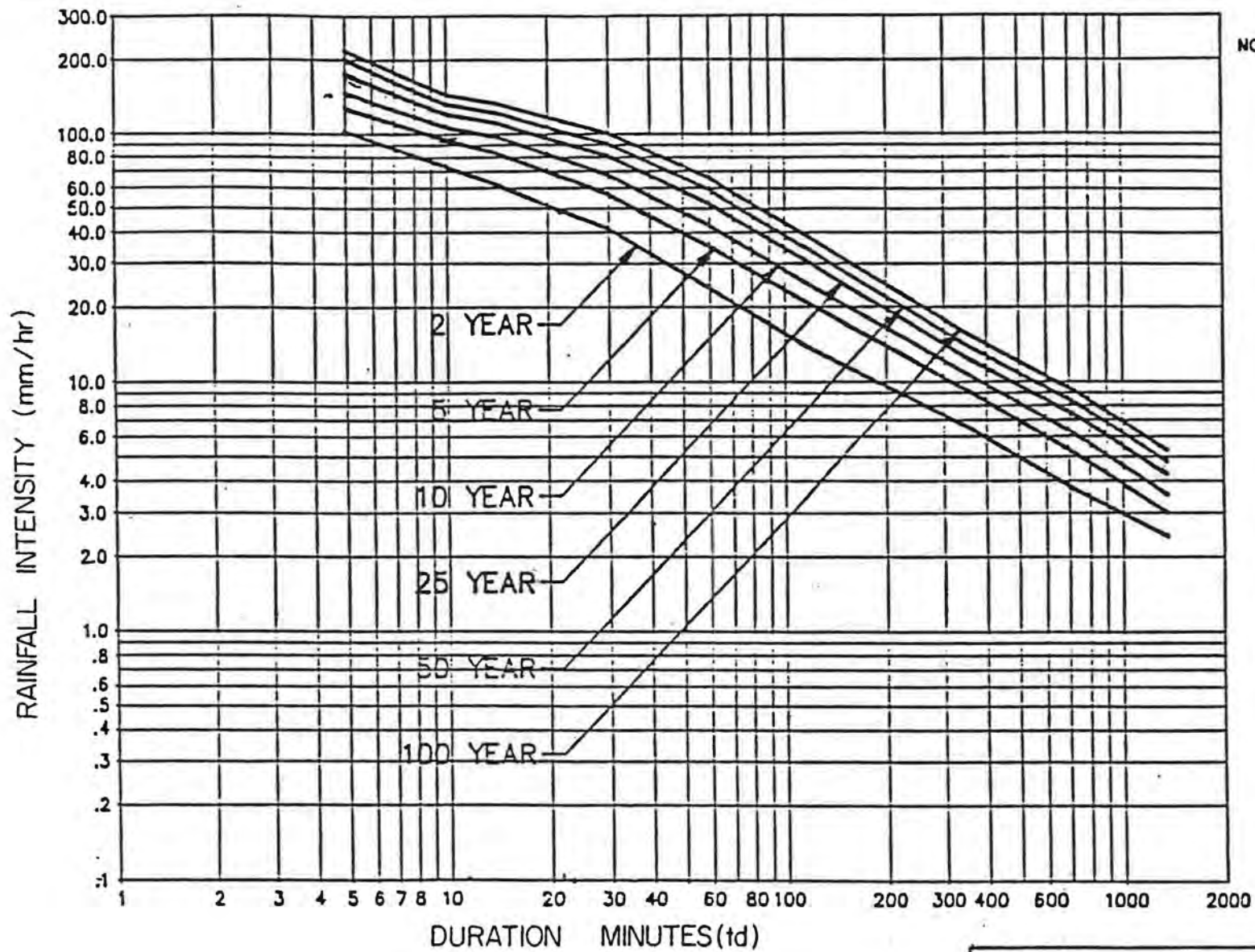
Prior to Final Acceptance, the Developer's Engineer shall provide to the Town of Halton Hills Engineering Department written confirmation from all utility agencies that all utility installations have been properly completed and are free of deficiencies.

TABLE 1: GEOMETRIC DESIGN ELEMENTS


GEOMETRIC DETAIL	PRIMARY ARTERIAL	SECONDARY ARTERIAL	COLLECTOR	LOCAL INDUSTRIAL	LOCAL
Minimum Right of Way (Metres)	35	30	26	26	20
Number of Lanes	2-5	2-5	2-4	2-4	2
Design Speed (kph)	90	80	70	60	60
Posted Speed (kph)	80	70	60	50	50
Minimum Stopping Sight Distance (Meters)	170	140	110	85	85
Minimum Vertical K Value ***(SAG)	20	20	15	10	10
Minimum Vertical K Value ***(CREST)	55	35	22	15	15
Min. Horizontal Radius (metres)	350	300	160	160	80'
Pavement Crossfall (%)	2.0	2.0	2.0	2.0	2.0
Min. Grade (%)	0.5	0.5	0.5	0.5	0.5
Max. Grade (%)	6.0	6.0	6.0	6.0	6.0
Max. Grade for Through Roads at Intersections (%)	2.0	2.0	3.0	3.0	3.5
Max. Grade for Stop Roads at Intersections (%)	1.0	1.0	1.5	1.5	2.0
Intersection Angle (degrees)	85-90	85-90	85-90	80-90	70-90
Minimum Tangent Length of Intersection (metres)	75	75	60	60	30
Minimum Tangent Length between Reverse Curves (metres)	130	130	60	60	10

TABLE 2: MAXIMUM ACCEPTABLE DEPTHS OF FLOODING

LOCATION	STORM RETURN FREQUENCY (YEARS)		
	5	25	100
Walkways, Open Spaces	Minor surface flow up to 25 mm deep on walkways	As required for overland flow outlets	As required for overland flow outlets
Local Roads	1.0 m wide in gutters from face of curb or 0.10 m deep at low point catchbasins	0.10 m above crown	0.20 m above crown
Industrial and/or Collector Roads	1.0 m wide in gutters from face of curb or 0.10 m deep at low point catchbasins	Up to crown	0.10 m above crown
Arterial Roads	1.0 m wide in gutters from face of curb or 0.10 m deep at low point catchbasins	One lane must remain clear	Up to crown
Private Property	Minor ponding in swales	No structural damage Temporary ponding in yard areas 150mm below building openings; no basement flooding	No structural damage from overland flow
Public Property	Minor ponding in swales or ditches	No structural damage; temporary ponding in flat areas; no erosion	No structural damage; ponding in flat areas; some erosion



NOTE: For area \leq 20 ha

 TOWN OF HALTON HILLS

SHORT DURATION RAINFALL
INTENSITY-DURATION-FREQUENCY

DRAWN GDM CHK'D: *Ted*
DATE: 88-06-01

COUNCIL APPROVAL: _____ 88-06-13

Date: _____

Town of Halton Hills
P.O. Box 128
1 Halton Hills Drive
Halton Hills (Georgetown)
Ontario, L7G 5G2

Attention: Martin P. Bateson, CET
Development Approvals Coordinator

Dear Sir:

Re: Name of Subdivision
Registered Plan Number
Lot(s) Number

I, _____, a Consulting Engineer in the Province of Ontario, do hereby certify that Lot(s) No. _____, in Registered Plan No. _____, has been completed in a satisfactory manner and in accordance with the approved lot grading plans and Town of Halton Hills engineering standards.

Yours Truly,

Signature

** TO BE COMPLETED ON COMPANY LETTERHEAD **