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A ADMINISTRATION - SUBDIVISION

A.1 GENERAL

A.1.1 The Planning Act & Approval Authority

Plans of Subdivision are processed and approved under Section 51 of the Planning Act. Process and circulation requirements are identified in O. Reg. 544/06 of the Planning Act. The City of Kitchener is the delegated approval authority for draft plans of subdivision.

A.1.2 Purpose of Subdivision Control

Plans of Subdivision are required where lands are proposed to be subdivided into two or more lots with the creation of a public right-of-way. Subdivision approval is required to ensure that:

- The land is suitable for its proposed new use;
- The proposal conforms to provincial legislation and policies, regional and local official plans and community plans (if applicable);
- The timing for the consideration for the proposed subdivision is in accordance with the Kitchener Growth Management Strategy;
- The City is protected from developments which are inappropriate and may put an undue strain on City facilities, services or finances;
- The City’s and other agency’s requirements (e.g. street widening, roadway improvement, drainage, servicing, etc.) are implemented;
- The availability of municipal services and other amenities to prospective residents of the subdivision;
- The proposed plan of subdivision is consistent with all relevant Council Policies, and
- The subdivision is consistent with other City documents and plans such as Transportation Master Plan, Healthy Kitchener Plan, the Strategic Plan for the Environment, the Parks Master Plan, Subwatershed plans, Community plans and others.

During the Subdivision Approval process, the City will review and coordinate the following:

- Overall subdivision design;
- Effect on surrounding neighbourhood and land uses;
- Lot sizes;
- Parkland requirement;
- Roadway and emergency access geometry;
- Sidewalk and pedestrian access requirement;
- Sanitary sewer, storm sewer and water services;
- Stormwater Management;
- Utility services and street lighting;
- General grading;
- Streetscape Plan;
- Urban Forest Asset, and
- Environmental Features.
The proposed subdivision should be in keeping with objectives and principles of the City’s Suburban Development and Neighbourhood Mixed Use Centres Design Brief.

The various divisions within the City that are involved in the Subdivision process are:

- Planning - includes Heritage planning and Environmental planning;
- Engineering - includes Development Engineering, Transportation Planning and Asset Management;
- Building;
- Fire;
- Operations includes Sanitary, Storm, Stormwater Management, Roads, Parks, Trails & Urban Forest;
- Kitchener Utilities – includes Water and Gas;
- Operations – includes Sanitary, Storm, Stormwater Management and Roads, and
- Legal.

The various external agencies that maybe involved in the Subdivision process include:

- Grand River Conservation Authority;
- Region of Waterloo;
- Kitchener- Wilmot Hydro;
- Hydro One Networks Inc.;
- Bell Canada;
- Rogers;
- Atria;
- Telus;
- Canada Post;
- Ministry of Transportation;
- Ministry of the Environment;
- Ministry of Natural Resources;
- Municipal Property Assessment Corporation;
- Union Gas Limited;
- Waterloo Catholic District School Board, and
- Waterloo Region District School Board.

A.1.3 Site Alteration and Tree Conservation

Prior to any work taking place on private or public property, the following By-laws have to be taken into consideration:

Site Alteration By-law
The City of Kitchener passed By-law 2010-43 prohibiting or regulating the placing or dumping of fill, the removal of soil and the alteration of the grade of land. Under this By-law ‘site alteration’ activities on properties 0.405 hectares (1 acre) and greater may require a Site Alteration Permit be obtained. Site Alteration Permits are administered by the Engineering Services Department. Additional information can be found at www.kitchener.ca.
Tree Conservation By-law
The City of Kitchener passed By-law 2010-42 prohibiting or regulating the destruction or injuring of tree(s). Under this By-law the destruction or injuring of a tree(s) on properties 0.405 hectares (1 acre) and greater may require a Tree Conservation Permit to be obtained. Tree Conservation Permits are administered by the Planning Department. Additional information can be found at www.kitchener.ca.

A.2 PRE-SUBMISSION CONSULTATION

Pre-submission consultation is a required component of the subdivision process. The City of Kitchener process has three distinct parts: a site walk, a design and vision session, and the Pre-Submission Consultation Meeting. Depending on the complexity of the project and the size of the site, these meetings may take place on the same day, however they usually span 2 or 3 separate sessions. The applicant should contact Planning staff to coordinate this process.

The purpose of the pre-submission meeting is the following:

- Evaluate site context, site conditions, design opportunities and challenges;
- Identify key issues;
- Identify the plans, studies, report and other information required in support of a complete application;
- Discuss the Subdivider’s timing;
- Review pertinent planning documents;
- Discuss special circulation requirements;
- Discuss interrelationship with abutting lands;
- Assist in the completion of the application;
- Discuss the proposed zoning of the lands;
- Determine need for further pre-consultation meetings with affected agencies;
- Applicability of Municipal Class EA requirements, and
- Need for permits from various agencies.

Following the Pre-Submission Consultation Meeting, the applicant will be provided with a signed Record of Pre-Submission Consultation. This Record will include copies of written comments from each participating City department and external agencies, and will also contain a specific list of materials required as part of the ‘complete’ application. For additional details with respect to the Pre-Submission Process please the City of Kitchener website.

A.3 DRAFT PLAN PROCESS

A.3.1 APPLICATION

Following the Pre-Submission Consultation meeting, the applicant, also known as the Subdivider or their delegate, may begin to prepare a complete subdivision submission. For details regarding current submission requirements please see the City of Kitchener website.

Once the application has been received by the Planning Division it will be assigned to a staff member, known as the Planner, who will undertake a review of the submission to ensure that it contains all required information, and may be deemed ‘complete’ in accordance with the Planning Act. The applicant
will be notified within 30 days of submission if additional information or materials are required or if the application has been accepted. A list and description of Reports and Studies commonly required as part of a complete submission are provided in Section A.9 of this manual. For a complete list of all plans, studies and other materials that may be required, please see the City Municipal Plan Schedule.

A.3.2 CIRCULATION

Notice of the proposed application for draft plan approval together with the notice of any associated applications such as applications for Zone Change or Official Plan Amendment, will be circulated by the Planner to property owners within 120 metres of the subject lands, and to all prescribed agencies and City departments.

The City of Kitchener also requires that one or more personalized notice signs and a standard notice sign be posted on the subject lands by the Subdivider. Detailed requirements with respect to notice signs are available from the Planning Division. Erection of these signs should be coordinated with the circulation period.

A.3.3 POST CIRCULATION

Following the preliminary circulation of the subdivision application, the Planner will prepare a post-circulation letter to the Subdivider outlining all comments which have been received from all agencies and City departments together with copies of all circulation correspondence received to date. A post circulation meeting between the Subdivider and City staff may also be arranged at this time. The purpose of this meeting is to discuss issues identified through the preliminary circulation and to explore solutions and methods of resolving issues to the satisfaction of all agencies and public bodies.

A.3.4 NEIGHBOURHOOD INFORMATION MEETING

Depending on the results of the preliminary circulation a neighbourhood information meeting may be warranted. Neighbourhood information meetings may also take place in conjunction with the circulation of the preliminary notice of the application, where the proposed subdivision/zone change application may be perceived as contentious.

This meeting will be coordinated by the Planning Division. The Subdivider is required to attend this meeting and will be asked to make a short presentation and be available to address questions or concerns. Staff from other departments or from outside agencies may also be requested to attend depending on the concerns raised by property owners.

A.3.5 RESOLUTION OF ISSUES

Following the circulation period, any concerns or issues that have been identified must be resolved to the satisfaction of the commenting department or agency. The Planner will help to coordinate the resolution of outstanding issues. This may require additional studies or information from the Subdivider, revisions to the plan, that special conditions be included in the draft approval or other measures. If special conditions are warranted, they will be provided to the Planner by the relevant Department or Agency. Conditions of Draft Approval will be forwarded to the Subdivider prior to the completion of the staff report for their information.

A.3.6 STAFF REPORT FOR DRAFT APPROVAL
Once all City Departments and outside agencies are satisfied with the draft plan, the conditions of draft approval will be finalized. The Planner will present a staff report containing all conditions for consideration at Development and Technical Services Committee (DTS). This meeting represents the statutory public meeting required by the Planning Act. Notice of this meeting will be advertised in the local newspaper (The Record) and will be mailed to interested parties. Owners, residents etc. may contact the City’s Clerks department register as delegations to speak at the statutory public meetings. DTS Committee may recommend that the subject application be approved, refused or deferred. This recommendation will typically be forwarded to the next available Council meeting for their ratification. If Council approves the recommendation, the subject application is considered to be Draft Approved.

A.3.7 POST DRAFT APPROVAL

Following Draft Approval, the Subdivider is required to provide 25 copies of the final plan to the Planning Division to be circulated with the notice of decision in accordance with applicable Planning Act timelines. The Notice of Decision is circulated by Clerks to all interested parties. Should an appeal be received within the allotted 20 day timeframe, the plan will be referred to the Ontario Municipal Board.

The plan is deemed to be draft approved, once the appeal period has lapsed for the proposed subdivision and any related applications (OPA, ZC etc.) the Subdivider may now proceed to start clearing conditions of draft approval for plan registration.

A.3.8 MODIFICATIONS TO DRAFT PLAN

Should the Subdivider wish to modify the plan, they must contact the Planning Division. Depending on the proposed modifications, the Subdivider may want to hold a pre-submission meeting on the proposed modifications. A request for modifications should include:

- a letter outlining the proposed modifications;
- the appropriate number of draft plans (the number of plans may be reduced from what is required for a full submission depending on the modifications);
- a digital submission of the draft plan, and
- the City of Kitchener, the Region of Waterloo and GRCA’s fees for modifications.

The processing of modifications to Draft Approval will depend on whether the modifications are major or minor, whether the plan was draft approved by the Ontario Municipal Board and any other applications submitted to support the modifications. The process for a particular modification will be determined based on the complexity and nature of the modification being sought. The Subdivider should contact the Planning Division in this regard.

A.4 SUBDIVISION AGREEMENT

Following the lapse of the appeal period, the subdivision agreement may be prepared by the City’s Legal Department. If it is known that the development is not imminent or changes may be required to the Draft Approval, the Subdivider may consider deferring the registration of the agreement, pending any expected changes.

The draft subdivision agreement is circulated by the Legal Department to relevant agencies and City departments prior to finalization of the agreement, for their review and comment. Once all parties are satisfied with the contents of the agreement, it may be prepared for final signature. The Subdivider
should contact the Legal Department with respect to this process. Once the Subdivision Agreement has been signed, it may be registered by the City’s Legal Services

A.5 PRE-GRADING REQUEST

It is preferred by the City that area grading occur after registration of the plan of subdivision and approval of the grading drawings. However, the Subdivider may make a request to grade the subdivision lands before the registration of the plan of subdivision has occurred. This request requires the registration of the Subdivision Agreement and can only be permitted after Draft Plan Approval has been granted. The Director of Engineering Services may authorize the pre-grading subject to conditions outlined in the Subdivision Agreement and/or the following:

- The approval of Area Grading Plan which should include the parks and trails, and the Erosion and Siltation Control Plans by Development Engineering and any other applicable regulatory agencies;
- Letter from the Consultant stating erosion and sedimentation controls are in place;
- The approval of an archaeological investigation by the Ministry of Culture, Tourism and Recreation;
- The approval of a Heritage Impact Assessment and/or Conservation Plan by the Director of Planning;
- The approval of a Detailed Vegetation Plan (per: the City’s Tree Management Policy) by Planning and the Department of Community Services;
- Certification that all tree protection is in place has been submitted by the Consultant to Planning and the Department of Community Services;
- Identification of street fronting townhouse blocks, showing the location of the lawn mower easement or identifying that the block will have a walk through to the rear yards;
- That all areas that will not be used for development purposes will be topsoiled and seeded;

Where the property to be graded is adjacent to or is designated under the Ontario Heritage Act or listed on the Heritage Kitchener Inventory of Historic Buildings or listed as a non-designated property of cultural heritage value or interest on the Municipal Heritage Register, pre-grading shall not be authorized until approval is obtained by the Director of Engineering in consultation with the Director of Planning. All pre-grading can commence once Development Engineering has issued a letter to the Subdivider’s Consultants allowing them to pre-grade.

A.6 PRE-SERVICING REQUEST

The Subdivider may proceed to service the proposed subdivision in advance of the registration of the Plan of Subdivision provided a subdivision agreement has been registered on the subject lands. The Subdivider’s Consultant shall make a written request for pre-servicing to Development Engineering. The following must be in place prior to permission being granted for pre-servicing:

- The subdivision agreement or supplementary subdivision agreement is registered;
- Consultant shall enter into an Engineering Agreement with the City and Subdivider for consultant obligations under the proposed works;
- Final approval of any implementing zoning by-law;
- Approval of any required Detailed Vegetation Plan (per: the City’s Tree Management Policy) by Planning and the Department of Community Services;
• Approval of the subdivision plan or draft reference plan showing the final lotting for registration of those lands to be serviced. This plan must be in accordance with the lotting as shown on the approved engineering drawings (The subdivision plan showing the lotting is stamped by the Planner “Approved For Pre-Servicing Only”);

• Approved Servicing plans, Stormwater Management Design and Stormwater Management report by Development Engineering and any other applicable regulatory agencies;

• The lots as shown on the final lotting plan for registration comply with the zoning by-law and any other special conditions contained in the subdivision agreement, and

• Any other relevant conditions for pre-grading in the agreement have been fulfilled.

If Planning is satisfied that the items above and those contained in the subdivision agreement are met, a memo will be forwarded to Development Engineering from Planning providing clearance for pre-servicing. Once Development Engineering is also satisfied, a letter will be issued by Development Engineering staff to the Subdivider’s Consultants allowing them to pre-service. Pre-servicing is at the Subdivider’s risk and is subject to requests to changes based on Development Engineering’s review of the Engineering drawing. All requested changes are at the Subdivider’s expense.

Servicing approvals will expire after two (2) years of the issuance date for the works which have not been completed under the approval. The Consultant will be required to ensure any certificates of approval issued by the Ministry of Environment are up to date.

See Section A.12 for further requirements prior to the start of construction.

A.7 RELEASE FOR REGISTRATION

Following draft approval, the Subdivider will wish to register one or more stages of the plan of subdivision. The Subdivider is required through the Subdivision Agreement and Conditions of Draft Approval to submit a detailed written submission to Planning outlining how all Regional and City of Kitchener pre-registration conditions have been fulfilled. This "Request for Release" will be made up of the following:

• A detailed written submission (usually from a Planning Consultant) outlining how all Conditions of Draft Approval have been satisfied;

• All required agency and City department clearance letters relative to the stage intended to be registered;

• Four (4) copies of the plan signed by the surveyor and Subdivider intended to be registered;

• The Subdivision Registration fee, and

• A digital copy of the plan intended to be registered (this can either be emailed or submitted on a disk).

Once all the conditions have been satisfied as per the registered Subdivision Agreement, Planning will prepare a clearance letter outlining how all conditions related to registration have been fulfilled. The plans will be signed and dated by the Director of Planning once all the conditions have been fulfilled. The Planner shall then deliver the plans to the Registry Office (R.O.) for registration.

The surveyor shall be advised when the plans will be taken to the R.O. and the surveyor is required to be in attendance at the R.O. with all additional documents required for the plans to be registered.
Once the plan of subdivision has been registered, the review of reports and drawings submitted by the Subdivider’s Consultants can be completed by City departments, and approval can be given once the submissions are to the satisfaction of City staff.

A.8 REPORTS AND STUDIES

The following is a list of Reports and Studies commonly required as part of a complete application for a proposed Plan of Subdivision. A complete list of all plans, studies and other materials that may be required can be found in the City Official Plan; Schedule I. Submission requirements will be identified through the Pre-Submission Consultation Meetings and in many cases specific requirements and/or Terms of Reference for the reports and studies will be determined at this time.

A.8.1 Planning Report

All proposed plans of subdivision applications must be accompanied by a Planning Report. This report will briefly describe for review agencies, site orientation, site issues and inter-relationship of site issues. The report also provides a starting point for analysis of the proposal. This report is not to replace any detailed and specific reports identified during the Pre-Submission Consultation. Details with respect to the contents of this report may be found in the Application Form.

A.8.2 Environmental Impact Study (EIS)

With the growing concern for the preservation of natural heritage features and ecological functions and the protection of groundwater resources, there is a need to assess new development and municipal infrastructure projects for environmental impacts both comprehensively and on a project specific basis.

An Environmental Impact Study, if required, shall be prepared by a qualified professional prior to development in order to investigate potential environmental impacts of the proposed undertaking. An Environmental Impact Study will determine whether development may proceed and, if so, will identify actions which could be taken in order of preference to prevent, minimize, mitigate or compensate the environmental impacts of the development.

Any Environmental Impact Study shall be completed in consultation with the appropriate agencies in accordance with City of Kitchener Official Plan, Region of Waterloo Official Plan, Grand River Conservation Authority, Ministry of Natural Resources policies, and/or Federal Department of Fisheries and Oceans policies or legislation.

A.8.3 Geotechnical Investigation and Soils Report

All proposed plans of subdivisions must be accompanied by a Geotechnical Investigation. A geotechnical investigation shall be required to be carried out by a competent consulting engineer in order to assess soil conditions with respect to the proposed infrastructure and building construction.

For the construction of new roads or underground utilities, a geotechnical investigation will be required. The purpose of the investigation will be to determine the type of soil, its engineering properties, bearing capacity, soil permeability, location of groundwater, and to verify whether contamination is present. Soil investigation work is to take place after determining the proposed sewer or watermain alignment, so that the required boreholes and test pits follow the same alignment.
Soil test borings will be placed at suitable spacing to provide adequate representation of the soil conditions. Additional boreholes may be required to establish the water table for storm water management ponds and to design the foundations of outfall structures. In fill areas or areas close to water courses, piles may be required to achieve satisfactory bearing strength to support any proposed infrastructure. Bedrock profiles will be required to be submitted where applicable.

Groundwater monitoring may be required if deemed applicable. Predevelopment groundwater monitoring can be carried out by advancing boreholes including monitoring wells on the site. See Section J.6 for further subdivision ground water requirements. Several seasons of data may be required to finalize recommendations related to groundwater. Upon commencing site development, monitoring wells may have to be relocated to areas such as parks, walkways or street boulevards if longer term monitoring is required. Typically general information from base mapping etc. will not be sufficient.

The soil report will make recommendations for the design of the road base, pipe bedding, construction methods, and soil percolation rates to determine the feasibility of stormwater management infiltration works. One paper copy of the geotechnical report will be submitted together with an electronic copy in PDF format to be catalogued and stored by the City for future reference.

The soils report will include the Urban Forest Soils Report completed by a qualified expert and address all of the requirements of Section M.3.1.

A.8.4 Servicing Design Brief or the Preliminary Servicing Report

The servicing design brief is to be submitted at the time of application for Draft Plan of Subdivision and shall be to the satisfaction of Development Engineering. The intent of this technical report is to evaluate the effects of a proposed change in land use or development on the City’s municipal servicing infrastructure and watercourses. The report should also address the adverse impacts, if any, of providing this servicing on any environmentally sensitive features (e.g., Areas of Natural and Scientific Interest, Environmental Sensitive Areas and hydrologically sensitive areas).

The report shall include a preliminary plan for sanitary sewer servicing, and another separate plan for preliminary storm sewer servicing. Each plan is to include pipe inverts (or obverts), to illustrate how the system will properly drain, and match into existing conditions.

The report shall also outline the design assumptions, overall impact on the trunk and local municipal service capacities, such as: water treatment plants, water distribution systems and pressure zones, pump stations, wastewater treatment plants, trunk sewers and stormwater management facilities, etc. due to the proposed change in land use or development, functionality of proposed and existing services, calculations, supporting documentation and references to previous studies, for each component of the development.

The design brief shall also address servicing conditions of Draft Plan Approval.

A.8.5 Preliminary Grading Plan

All proposed plans of subdivisions must be accompanied by a Preliminary Grading Plan. This plan shall include proposed grades and elevations at key locations to show how the proposed subdivision will meet lot grading and roadway grading requirements. Existing condition elevations are to be shown where matching proposed grades. Cross-sections shall show how the site will be graded.
The design and calculation of overland flow routes are to be included to understand impacts on the proposed and surrounding lands.

A.8.6 Water Distribution Report

The Water Distribution report is to be submitted at the time of application for Draft Plan of Subdivision and shall be to the satisfaction of Kitchener Utilities.

The report shall address water distribution systems, pressure zones, water consumption – estimated consumption, current capacities of trunk systems, phasing, net impact due to the proposed change in land use or development, need for expansion and upgrades.

A.8.7 Stormwater Management (SWM) Report

Refer to Section G Stormwater Management.

A.8.8 Transportation Impact Study (TIS)

Consideration should be given to the impact of new traffic from the proposed subdivision on the adjacent road system. Engineering Services, MTO or the Region of Waterloo may request that a Transportation Impact Study (TIS) or report be undertaken should it be deemed necessary.

The City of Kitchener utilizes the Regional Municipality of Waterloo’s Transportation Impact Study (TIS) Guidelines adopted November 2008.

The Region of Waterloo’s Transportation Impact Study can be found via the Region of Waterloo’s website.

A.8.9 Environmental Site Assessment (ESA) Subdivision

An Environmental Site Assessment (ESA) shall be undertaken when a portion of the site is to be dedicated to the City free of encumbrances and/or when the Region requires land dedication for a road widening. When lands are to be dedicated to the City of Kitchener, a Phase I/II Environmental Site Assessment must be completed in accordance with either CSA Standard Z768-01 or Schedule D of Ontario Regulation 153/04. Depending on the findings of the Phase I ESA, a Phase II ESA and possible record of site condition (RSC) may be required on the portion of the land that is to be dedicated to the City and/or the Region in accordance with Ontario Regulation 153/04. The Building Division may also require a RSC when a property is changing the land use through a Site Plan application, Building Permit, or completing a zone change. Under Ontario Regulation 153/04, a RSC will be required if the proposed development will change the site to a more sensitive land use.

A.8.10 Archaeological Assessment

An Archaeological Assessment of the proposed development may be required from a licensed Archaeologist to conduct an assessment of the site, to ensure preservation or resource removal and documentation of any significant archaeological resources found on site.

A.8.11 Tree Management – At time of Application
The City’s Council-adopted Tree Management Policy is designed to encourage the provision of relevant environmental information and tree data early in the planning process.

Under this policy, studies/plans are required to be submitted and approved: at the time of application for Draft Plan of Subdivision (General Vegetation Overview); prior to commencement of any grading or servicing or prior to the final approval (registration) of the Plan of Subdivision (Detailed Vegetation Plan) whichever comes first; and/or prior to the issuance of building permits for larger residential lots or lots/blocks undergoing a Section 41 approval, or site plan control (Tree Preservation/Enhancement Plan).

A.8.12 Heritage Impact Assessments and Conservation Plan

As part of a complete application for the proposed development, the Subdivider may be required to submit a Heritage Impact Assessment and/or Conservation Plan, in accordance with the requirements of Heritage Planning staff and “Info Sheet #5 Heritage Impact Assessment and Conservation Plans” of the Ministry of Culture’s Ontario Heritage Tool Kit, to the satisfaction of the City of Kitchener’s Director of Planning.

A.8.13 Tree Planting Plan and Urban Forest Soils Report

Refer to Section M, Urban Forest - Tree Planting & Establishment.

A.9 ENGINEERING SUBMISSIONS

All required information listed below must be submitted with each engineering submission or the submission will be returned to the applicant. Each submission must be accompanied by a checklist confirming that the submission has been check for completeness, accuracy, and includes all required items.

A.9.1 First Submission

A complete first submission is required to be submitted by the Consultant to Development Engineering after Draft Approval and shall include the applicable engineering administration fee as specified in the registered subdivision agreement. Any submissions found to be incomplete will be returned to the Consultant. Five complete rolled sets of engineering drawings must be submitted to Development Engineering staff for distribution to the other groups.

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<td>Detail Sheet</td>
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<tr>
<td>General Notes</td>
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<tr>
<td>Tree Planting Plan</td>
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<tr>
<td>On-Street Parking Plan</td>
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<tr>
<td>Traffic Control Plan</td>
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</tbody>
</table>

In addition to the above, one (1) complete copy of the following schedules shall be submitted to Development Engineering:

- **Schedule A** – list of all drawings to be included as part of the Service Agreement
- **Schedule B** – list of all easements to be granted and all property to be conveyed to the City
- **Schedule C** – all lots unsuitable for building purposes
- **Schedule D** – complete detailed cost estimate of all municipal services to be provided
- **Schedule E** – listing all lots proposed to have infiltration measures (soak-away pits)

Two (2) copies of the following:

- Stormwater Management Report;
- Geotechnical Investigation (one (1) copy);
- Design sheets for pipe strength and bedding requirements for both sanitary and storm sewers, and
- Design sheets for both storm sewer and sanitary sewers, including a digital copy of the Excel spreadsheet.
- A letter (one (1) copy) specifying:
  - How the individual grading and servicing draft plan conditions have been addressed
  - Explanation on design software used and any assumptions the software creates
  - Description of specific site design constraints,
  - Signed submission verification checklist to ensure submission is complete and reviewed
  - Requesting permission to service - if applicable
  - Intended construction timing and sequencing

The first submission drawing sets shall be distributed by Development Engineering to Planning, Transportation Planning, Kitchener Utilities and Community Services. The drawings will be reviewed by the various departments and all comments will be sent to Development staff who will consolidate all the comments. A marked up copy of the drawings and/ or reports along with a letter consolidating all comments and issues will be sent to the Consultant by Development staff. The Consultant shall revise the drawings as per City comments and resubmit them to Development Engineering as a second submission. If the Consultant has any questions or concerns regarding the first submission comments and mark ups from the City, a meeting request or discussion can be held with Development staff. If there are no comments or concerns, a letter approving the drawings will be sent to the Consultant.
A.9.2 **Second and Subsequent Submissions**

The second and subsequent submissions shall be a revision of the previous submission based on the City’s comments. The Consultant shall submit the second submission to Development staff as per the Submission Requirements Table (Table 2) once the revisions have been made. After the revisions have been addressed from the first submission, the consultant shall circulate the second submission to all utility companies for comment. As part of the second submission, the consultant shall provide Engineering copies of the letters sent to the utility companies.

A letter from the Consultant addressing the comments and concerns sent by Development Engineering staff as part of the first submission drawings and reports review shall also be submitted with the second submission drawings. This letter shall include a description of any additional changes made by the Consultant.

A.9.3 **Final Submission**

After final approval by the City of the aforementioned submissions, the following is required:

- Two (2) complete sets of drawings;
- Two (2) complete sets of drawings in 11 x 17 format;
- Two (2) mylar sets of grading plans;
- One (1) complete set of sewer design sheets;
- One (1) CD of the digital copy of all drawings in *.TIF or *.PDF format.

The above are required for approval of the engineering drawings. Approved engineering drawings are a single requirement for construction approval. For construction approval requirements refer to Section A.12.

A.9.4 **“As-Recorded” Asset Drawing Submissions**

Upon completion of the construction of the services, the Subdivider’s Consultants shall obtain the “As Recorded” field information and revise the original drawings accordingly. Any changes in the original drawing by the Consultant Engineer or Landscape Architect are subject to the approval by the Director of Engineering Services. For Park Multi-Use Pathways, and Urban Forest Asset, any changes in the original drawing by the Consultant Engineer or Landscape Architect are subject to the approval by the Supervisor of Site Development.

“As-Recorded” and Asset drawings are to accurately reflect, both graphically and numerically, the true conditions of the work described. If items described in the drawings were constructed in variance to the designs illustrated in the approved proposed construction drawings, then the “As Recorded” submissions should be revised and/or edited to accurately reflect how the work in question was actually recorded/built. Text and numerical information included in the drawings shall also be edited as required in conjunction with the graphics in their entirety.

These drawings shall show the location both horizontally and vertically of everything which is on, and under the lands to be accepted by the City.

All municipal services including house connections are to be shown on these plans as required hereinafter.
All service connection inverts at the property line must be shown in table form for each lot and block on its respective plan/profile drawing.

One (1) set of “As Recorded” drawings shall be submitted to Development Engineering for the Manager of Development Engineering’s review. These drawings will be submitted prior to the first Letter of Credit (LOC) Reduction Request. The LOC reduction will not be processed until the as-recorded and asset information has been received and approved by Development Engineering.

Any changes following initial acceptance and prior to final acceptance must be submitted to the Manager of Engineering Services for approval.

If as a result of final acceptance changes are made to the developments recorded As-Recorded condition, a new set of plans showing “As Recorded” details must be submitted to the Director of Engineering Services for approval within four (4) months of final acceptance.

The “As-Recorded” drawings shall be submitted in three media: white paper hardcopy (for review), mylar copy and electronically in a CD as either a *.TIF or *.PDF file.

The white paper hardcopy and the mylar copy “As-Recorded” submission will contain the following listed stand-alone drawings:

- General Plan of Services;
- Streetscape Plan;
- Signal Wiring Plan and Signalized Intersection Plan (as required);
- Sanitary Drainage Plan;
- Storm Drainage Plan;
- Stormwater Management Pond plan;
- Watermain tie-ins;
- Plan and Profile Drawings;
- Street Lighting and Electrical Distribution (as required);
- Detail Sheet;
- As Recorded Tree Planting Plan

In supplement to “As-Recorded” drawings a digital Constructed Asset Data drawing in AutoCAD format must be completed and submitted in a CD to Development Engineering Staff (refer to CAD Standards Manual and Constructed Asset Data Submission Manual under the Development Manual Webpage). The Constructed Asset Data drawing must be completed if corresponding infrastructure was constructed, with the exception of bridges or culverts 3m or greater, which will require an Ontario Structure Inspection Manual (OSIM) standard form (pages 1 and 4 only). Pumping Stations are also an exception and will require a separate form. Both forms can be found on the Development Manual Webpage under the Constructed Asset Data Submission Section.

The Consultant shall refer to the Development Manual webpage to download the latest forms, manuals, and frequently asked questions. Out of date forms and templates will not be accepted.

All digital copies are to be delivered to GIS by Development Engineering staff for final processing.

If any information from any submission is incorrect or incomplete the City reserves the right to reject the submission and the Subdividers shall be required to resubmit the corrected submission prior to acceptance of the Maintenance Package.
Consultants should note the total number of copies to be submitted to Development Engineering. The chart below shows each stage of submission, and the submission requirements, which outlines the medium of submission and where Development Engineering Staff distributes to.

<table>
<thead>
<tr>
<th>Submission Requirements</th>
<th>Hard Paper Copy (for review)</th>
<th>Hard Mylar Copy (Final)</th>
<th>Digital: AutoCAD (Final)</th>
<th>Digital: (*.TIF or *.PDF) (Final)</th>
<th>Digital: Asset Drawing (*.dwg) (Final)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1&lt;sup&gt;st&lt;/sup&gt; Submission</td>
<td>5 sets</td>
<td></td>
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<tr>
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<td></td>
<td>ENG:1</td>
<td></td>
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<tr>
<td></td>
<td></td>
<td>Two sets of lot grading plans</td>
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<tr>
<td>As Recorded Submission</td>
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<td>1 File</td>
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<td>ENG:1 Eng sends to GIS</td>
<td>ENG:1 Eng sends to GIS</td>
<td>ENG:1 Eng sends to GIS</td>
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</table>

A.9.5 **Other Approvals**

Depending on the location of the Subdivision, other permits may be required from Agencies such as: Grand River Conservation Authority (GRCA) (i.e. for Fill Permits), Hydro One, Ministry of Transportation (MTO), Ministry of Natural Resources (MNR), Department of Fisheries and Oceans (DFO), etc. These Agencies may be identified during the Pre-Consultation or Draft Plan Approval and it will be the responsibility of the Subdivider to clear these requirements prior to registration of the plan.

A.10 **PLANS AND DRAWINGS**

A.10.1 **General Drawing Requirements**

All drawings shall have the following:

a) List 30T and 58M numbers if applicable;

b) Legend;

c) All works shall be performed in reference to an official geodetic control monumentation. All drawings referring such work shall also reference the geodetic control used in the subject work;

d) A local benchmark note shall appear in each drawing;

e) Existing information shall be shown in background or light line weight;

f) Proposed information shall be bolded or foreground line weight;

g) North arrow shall be referenced on all drawings;

h) Chainage on a plan-profile shall increase from left to right;
i) Plan and Profile drawings to have a key plan drawn to 1:10000 scale;
j) All drawings are to be stamped and signed by a Professional Engineer;
k) All Lot Grading Plans and Erosion Sedimentation Control Plans shall be certified by the Environmental Consultant as per the Tree Management Policy.

A.10.2 **Draft Plans**

Draft Plans should be prepared in accordance with the guidelines provided on the Plan of Subdivision Application.

A.10.3 **Digital Engineering Submissions**

Digital plan and drawing submissions subject to review and approval by the City shall be in accordance with the COK CAD Standard Manual and COK Constructed Asset Data Submission Manual. Documents that are submitted digitally should not be submitted as hard copies to avoid duplication, unless a hard copy is required as listed below. Engineering will accept the following documents in PDF format:

A.10.3.1 **Site Plans:**

- Environmental Site Assessment
- Environmental Impact Study
- Geotechnical Reports
- MOE Approvals
- Letter of Permissions
- Water Distribution Reports
- Demolition Tracking Sheets
- Environmental Record Request
- Release of Site Request
- Certification Letters

A.10.3.2 **Subdivisions:**

- Engineering Drawings (Digital and Hard Copy required)
- Water Distribution Reports
- Final SWM Reports (Digital and Hard Copy required)
- Geotechnical Reports
- Hydrological Reports
- Archeological Reports
- Environmental Reports
- E & S Inspection Reports
- Daily Inspection Reports
- Test Reports (Ex. Testing of granular materials, asphalt, concrete, etc.)
- External Correspondances (Ex. GRCA, Hydro, etc.)
- Acceptance Letters for above surface items only (Add Electronic Copy Only above the date of the letter)

A.10.3.3 **Requirement for Scanning:**

- Electronic documents and plans/drawings (i.e. dwg, docx,) must be converted directly into a PDF format for submission so the file is word searchable and resolution is maintained. Hand-drawn
plans and manual calculations must be scanned. The use of a scanner to convert an electronically produced document should be avoided. Scanned documents that are prohibitively large may be rejected.

- Plans/ Drawings/Documents must not be skewed.
- Plans/ Drawings Scanned resolutions 1-bit black and white 300 dpi is acceptable. For plans/drawings containing fine lines 400 dpi resolution is required.
- Acceptance Letters scanned resolution: 400 dpi colour.
- Do not reduce the scanned document size, as it renders the document slow to open.
- Scan all documents in full 300 dpi colour. Reports are to be submitted in a PDF format that allows the viewer to open and interact with the word search function.
- All information must be provided in a CD-R and may be used to deliver the final issued documents. If approved by the recipient, large documents can be submitted via SFTP (Secure File Transfer Protocol) provided they do not exceed 5 files and 300mb in total number and size.
- Non-compliant submissions will be returned to the sender.

**NOTE:** Email is not considered a secure form of transmission of information.

### A.10.4 Geodetic Control

Where required, a digital drawing file with the following spatial characteristics shall accompany development applications:

- **Map Projection:** *Universal Transverse Mercator*
- **Horizontal Datum:** *NAD83 Zone 17 North*
- **Horizontal Units:** *Metres*

The graphics in the drawing must be geographically positioned to third order accuracy. The City’s horizontal control network (UTM NAD83) may be used as a control reference and can be acquired from Asset Management staff.

The survey control maps contain the following information for each control point:

a. UTM Northing (e.g. 4759528.620 metres);
b. UTM Easting (e.g. 643968.440 metres);
c. Marker Type (e.g. GPM, SCP, BM);
d. Marker ID (e.g. SCP–517);
e. Elevation (e.g. 179.812), and
f. Description (e.g. North West corner of lot 32 at property line).

Contact the Asset Management staff to confirm Geodetic Control Requirements.

### A.10.5 Drawings Package

The drawings package to be submitted to Development Engineering for distribution to the other departments shall include:

- Title Sheet;
- Existing Conditions and Removals plan;
- Staging plan;
- Erosion and Sedimentation Control plan;
- Lot Grading plans;
- General Plan of Services;
- Approved Tree Planting Plan;
- Signal Wiring Plan and Signalized Intersection Plan;
- Sanitary Drainage Plans;
- Storm Drainage Plans;
- Stormwater Management Pond plan;
- Park and Multi-Use Pathway Development/Grading Plan (as required);
- Plan and Profile Drawings;
- Detail Sheet, and
- General Notes.

A.10.5.1 Title Sheet

The Title Sheet will include the following:

a) Name of the Development;
b) Name of the Subdivider;
c) City of Kitchener logo;
d) Name of the Consulting Engineer;
e) Key Plan at scale of 1:10,000 indicating the location of the proposed development and the proposed new street alignment;
f) Index to each drawing constituting the complete set indicating drawing number and title;
g) Approvals (30T and 58M numbers if applicable), and
h) Submission description i.e. 1st Submission, 2nd Submission, etc.

A.10.5.2 General Plan of Services

To a scale of 1:1,000, unless otherwise approved by the City, showing the following:

a) Roads, blocks, lots and their numbers;
b) Sanitary and storm sewers including pipe diameter and direction of flow and SWM facilities (where applicable);
c) Watermains, hydrants and valves;
d) Maintenance holes and catchbasins;
e) Culverts and easements;
f) Existing street and services surrounding the development and their relation to the proposed work, and
g) Location and description of all available benchmarks.

A.10.5.3 General Notes Sheet

This Sheet shall list the following notes:

- General City of Kitchener design criteria that apply to all sheets. The pertinent notes for the project can be extracted from the design criteria chapter (i.e. lot service, pipe sizes, curb type, catch basin grate type, etc.);
- Special warnings from utility companies and government agencies (i.e. existing structures and buried services), and
• General City policies and by-laws which apply to the construction activity (i.e. hours of work, mud tracking, fire permits, construction access, etc.).

A.10.5.4 Traffic Control Plan

Traffic Control Plan(s) to be drawn to a scale of 1:1,000 or larger and shall show proposed land uses (e.g. Residential, commercial, parks etc.), road layout, sidewalk, bicycle paths, bicycle lanes, multi use trails, entrances to parks and open space areas, signage for bicycle circulation, pedestrian routing, storage and tapers for turn lanes, traffic control signs including stop bars and other painted lines, on-street parking (0.5 parking spaces per lot) and any traffic calming measures (if proposed/required).

A.10.5.5 Urban Forest Asset – Tree Planting Plan

Urban Forest Asset – Street Tree Planting Plan are to demonstrate and provide planting locations for trees within the public realm. This plan must clearly show the soil volumes available to each tree, their species and locations. The Urban Forest Asset – Street Tree Planting Plan is to be a scale of 1:500.

Refer to Section M of this manual for all tree planting and soil habitat soil zone requirements.

A.10.5.6 Signal Wiring Plan and Signalized Intersection Plan

Should traffic signals be required, a separate Signal Wiring Plan; and Signalized Intersection Plan showing location of all poles and mounted hardware, hand wells, ducts/cables, the controller, and full turn lanes (storage and taper). The plans shall be submitted at a scale of 1:500.

A.10.5.7 Staging Plan

If a phase within a plan of subdivision is to be developed in stages, a Staging Plan showing current and future stages is to be prepared at a scale of 1:1,000, unless otherwise approved by the City. The City may request specific scales in order to create composite plans with other developments.

If this information can be clearly shown on the General Plan/Underground Services Plan, the two drawings can be combined.

The Staging Plan’s function must be substantiated with an interim Stormwater Management and Transportation Report (and other reports as required by the City).

Provide a phasing and construction schedule that shows the works required to mitigate sediment contamination of affected creeks, adjacent lands, and storm sewer systems and how they are to be staged.

A.10.5.8 Sanitary Drainage Area Plan

To a scale of 1:1,000, unless otherwise approved by the City, showing the following:

a) Proposed sanitary sewers, maintenance holes and appurtenances, indicating grade, pipe size, length of each section of pipe and direction of flow;

b) Drainage areas within the development and the limits of outside areas within the development and the limits of outside areas draining into the proposed system, and

c) Catchment area in hectares, direction of flow and section population or population density shall be indicated on all drainage areas.
A.10.5.9 **Storm Drainage Area**

Storm drainage plans are to be drawn to a scale of 1:1,000 or larger. If large external drainage areas affect the development, a separate External Drainage Area Plan is to be produced. The Plan is to be produced to a scale of 1:5,000 and is to indicate the total area to be drained by the proposed storm sewers. The Storm Drainage Plan is to be compatible with the Grading Plan and must indicate the following:

a) Existing contours (0.5 m intervals);
b) Drainage patterns of adjacent lands and a breakdown of contributing external areas;
c) The run-off coefficients and area of tributary areas internal and external to the development for each section of the storm sewers within the development;
d) Direction of run-off (overland flow);
e) Street names;
f) Manhole and Catchbasin numbers;
g) Sewer sizes – Diameter and length;
h) Directions of flow in the sewers;
i) Any infrastructure off of the right of way to be accepted by the City e.g.: rear lot catchbasins or swales, on lots, parks or blocks, required to accept storm runoff, and
j) Complete major and minor storm systems.

A.10.5.10 **Park/Multi-Use Pathway Development Plans and Grading Plans**

Park/Multi-Use Pathway Development Plans are to demonstrate that the proposed park facility program, including buffers, can be satisfactorily achieved. Both Park/Multi-Use Pathway Development Plan and Park/Multi-Use Pathway Grading Plan are to be a scale of 1:500. Refer to Section L of this manual for all specific design requirements.

A.10.5.11 **Lot Grading Plans**

Grading plans for all lots and blocks are to be drawn to a scale of 1:500 showing existing contours (0.5 m intervals), established from elevations taken in the field.

Grading plans will only be reviewed in conjunction with the submission of servicing and SWM design details. The overall subdivision grading plan is to include enough elevations and grades on the interior of blocks to illustrate how the surface drainage will be managed/ directed until it is later developed through the Site Plan process. This design must consider drainage impacts from these large contributing block areas during this interim condition period, which could have negative affects to existing/future houses and roads. Positive drainage is required on the block itself to ensure water is not ponding. Where required, catchbasins/ ditch inlets/ hickenbottoms are to be installed on the blocks in order to capture this surface flow before it is directed onto the road. These structures are placed on private property, without easements, connected to the storm services which are to be provided to the block through the road servicing. The structures are temporary, and will be removed when the site is developed.

The City would like to see grading plans without retaining wall construction in new developments. Sometimes it may be necessary to have retaining walls on multiple properties that are reliant on one another. Retaining walls spanning more than one private property are to be avoided if at all possible and shall be considered only if there is a mechanism in place to ensure long-term maintenance and future repairs by the land owners. The Building Division should be contacted where a retaining wall permit is required.
Where a retaining wall is designed adjacent to public property, the wall shall be placed on the private property side of the property line. Retaining walls on or adjacent to public property shall be designed with a minimum design life of 75 years, through an approved wall design sealed, signed, and dated by a qualified Structural Engineer. The construction of the retaining wall shall be inspected and certified by a qualified Structural Engineer. Where the wall is adjacent to a structure or building, a minimum of 1.2 m clearance must be provided between the face of the retaining wall and the face of the building or structure. Retaining walls exceeding 1.0 m in exposed height shall be protected by guards on all open sides where the public has access. Guards shall be installed in the retaining wall as per Standard Drawing 507, OPSD 972.132, OPSD 980.101, or as approved by the Director of Engineering. The Subdivider will be responsible to provide a letter of credit for the retaining wall as outlined in the Development Agreement and shall guarantee the retaining wall for a period of two years after City acceptance of the structural certification.

Retaining walls are to be constructed on private property unless approved otherwise by the Director of Engineering.

Where a retaining wall is on private property a clause shall be included within the Development Agreement which will be registered on title of the affected Lots. Said agreement shall implement the following clause with respect to the retaining wall located on these lots and must be included in all offers of purchase/sale and tenancy agreements:

“Purchasers/tenants are advised that a retaining wall is located at the rear/side of this property. The owner of this property owns his/her section of the retaining wall. The retaining wall is not in public ownership. Monitoring, maintenance, inspection, repair and replacement of this retaining wall, including any associated costs, are the sole responsibility of the property owner. The City of Kitchener has no responsibility for this retaining wall. Should this retaining wall fail, it is the property owner’s responsibility to repair or replace his/her section of the wall, at his/her cost. If the repair and/or failure of the retaining wall is deemed by the City to be a public safety hazard, the city will issue a work order on the affected property. If the repair/replacement of the retaining wall is not started and completed as outlined in the notice, the City will undertake and complete the work. The cost of the work will be added to the property’s taxes.”

**Existing Elevations shall be shown at:**

a) The corners of each lot and block;
b) External elevations extending to a minimum 30m perimeter external to the Plan;
c) Overland flow direction for external drainage;
d) The base of all large trees 10cm or more in diameter plus their drip line, and the composite drip line of all contiguous vegetated areas such as woodlands, hedgerows, etc. (see [Tree Management Policy](#) for specific requirements), and
e) Regular intervals within any woodlands or other natural blocks where deemed necessary to determine the effect of grade change on tree preservation.

**Proposed Elevations shall be shown at:**

a) Intervals along the centreline of all proposed roads (maximum 20.0 m spacing); the slope of each road section is to be noted;
b) All high points (split drainage, rear and side yards, top and bottom of slopes);
c) The corners of each lot and block;
d) The front and rear of each building;
e) 15.0 m intervals along cut-off swales and ditches;
f) The top and bottom elevation of retaining structures;
g) Any other points necessary to properly represent the proposed drainage scheme including tops of catchbasins and bottoms of swales and associated easements;
h) Critical transition points adjacent to walkways or existing lots or (provide section details where useful), and
i) Top of grate elevations for rear yard catchbasins.

Other Required Information shall show:

a) Lot fabric and dimensions;
b) Driveway ramp locations;
c) Easements;
d) Blocks and lot numbers;
e) Surface features including road structures (catchbasins and manholes, fire hydrants, hydro transformers and street lights);
f) Direction of gutter flow at intersections;
g) Direction of overland flow routes including points of outlet and ponding limits for the 100 year event;
h) Label all lots with a drainage type and refer to a detail on the detail drawings;
i) Indicate existing trees and proposed tree saving limits; indicate provisions for the preservation of any existing trees where identified for retention (see requirements of the Tree Management Policy);
j) Detail retaining walls and structures were required, including top of wall and bottom of wall elevations;
k) Show all fencing, easements and noise attenuation structures;
l) Indicate the regulatory flood limits of watercourses;
m) Provide percent grade where swales are at a minimum slope or are otherwise critical, and
n) Specify run vs. rise ratio where slopes are created with a slope greater than 10% (Note: maximum slope = 3:1);
o) Minimum underside of footing elevation for lots close to groundwater;
p) Slopes and slope arrows alongside lot lines;
q) Signature block for City approval within the title block;
r) Environmental Consultant certification as per the Tree Management Policy.

Should there be changes made to the Grading Plan, the consultant shall submit the updated Overall Grading Plan to Engineering for Approval.

A.10.5.12 “Plan and Profile” Drawings

General Requirements

a) All plan and profile drawings are to be drawn at scales of
   i. 1:500 horizontally
   ii. 1:50 vertically
b) The sewer, storm and watermain profiles shall be drawn so that each street and easement may be filed separately;
c) Refer all datum to a bench mark of geodetic origin;
d) Show all existing and proposed lot numbers and blocks;
e) Show all existing and proposed curbs, road allowances and street names and indicate it as such;
f) Show all existing sidewalks, walkways, and trails;
g) Where two or more sheets are required for one street, match lines must be used and there are to be no overlaps or duplication of information;

h) Where intersecting streets are shown on a plan and profile drawing, only the diameter of the pipe and direction of flow of the intersecting sewers are to be shown. This also applies to easements for which a separate plan and profile drawing has been drawn;

i) Pavement designs for the particular roadway are to be indicated on the plan and profile drawing or on the General Notes Plan;

j) The detail information from all the borehole logs is to be plotted on the profile and located on the plan. Borehole information should contain a borehole plot plus a brief description of soils and the water level, and

k) Where roundabouts are provided, a plan and profile drawing shall indicate detailed design dimensions including radius, lane width, etc. The roundabout design shall be in accordance with the Region of Waterloo and the TAC Design Manual.

Plan View

The following information and details are to be included:

a) street names,
b) block/lot number and frontage dimension,
c) block/lot type (single, semi, multiple),
d) servicing locations for storm, sanitary and water,
e) all existing (as needed) and proposed sewers and watermains, manholes, catchbasins,
f) third pipe systems
g) valve chambers,
h) hydrants,
i) sidewalk,
j) centreline chainage (every 20.0 m),
k) road allowance and pavement dimensions,
l) curb radii,
m) easements,
n) reserves,
o) road sections where clarification is required,
p) detail gutter grades on large radius bends and cul-de-sacs (minimum 0.75%),
q) light standard and transformer locations.
r) the type, slope, diameter, grade and inverts of the sewers are to be indicated on the Plan view.

Profile View

a) The type of public service (existing and proposed watermain, sanitary or stormwater), the diameter, length, material grade and class of pipe are to be shown on the profile portion of the drawings only;

b) Where possibility of a conflict with other services exists, connections are to be plotted on the profile (i.e. watermain);

c) Indicate the road profile, existing and proposed. Any structural fill areas are to be hatched in;

d) Provide centreline chainage and elevations. Indicate the elevation at grade changes and provide the slope and length of each section;

e) Provide all vertical curve data on the top of the profile view;

f) Provide existing (as needed) and proposed manhole information, including type which shall be shown in detail on the Detail drawing sheet, pipe inverts at entry and exit, catchbasin lateral inverts, drop structure details. Indicate safety platforms and elevations where required;

g) Provide detailed information for all outfalls external to development, and
h) Borehole data including soils and water table.

A.10.5.13 *Streetlighting and Electrical Distribution Drawings*

To a scale of 1:1,000 showing the following:

a) Roads, lots and their numbers;
b) The position of all new light standards within the development;
c) The position of existing light standards surrounding the development and their relation to the proposed work, and
d) A detail of and tabulated specifications for the type of luminaries proposed.

All streetlighting designs shall be carried out by Kitchener-Wilmot Hydro, with the exception of ornamental lighting. All ornamental lighting designs shall be in accordance with the Kitchener-Wilmot Hydro requirements. All electrical, street and ornamental lighting design will be done with awareness to the proposed street tree locations and the minimum tree planting and soil volume requirements identified in Section M. Temporary hydro pole locations shall be approved by Kitchener-Wilmot Hydro in conjunction with the Engineering Consultant.

A.10.5.14 *Detail Sheet*

These drawing sheets should comprise of detailed drawings of any particular detail referenced on any of the preceding drawings or any additional particular drawing.

Grading details and Engineering details shall be shown on separate drawing sheets. Grading detail drawings shall include details with respect to lot grading type, swales, etc. while Engineering details drawings shall include manhole types, infrastructure details etc.

A.10.5.15 *“As Recorded” Drawings*

As-recorded drawings shall be submitted to Development Engineering along with the Maintenance Package and the drawings shall conform to the following criteria:

a) *“As Recorded” General Servicing Plans*

Prior to initial acceptance of services, the required location plans for “As Recorded” measurements are to be completed and submitted to Development Engineering showing all necessary details for underground service installations.

“As Recorded” General Services Plans are required for the following:

i. **Sanitary Sewers**
   - Engineering consultant is to provide the City with as-recorded inverts at property line.

ii. **Storm Service and Catchbasin**
   - Engineering consultant is to provide the City with as-recorded inverts at property line.
   - Location of service and catchbasin lead tie connections at the main line sewer are to be dimensioned along the mainline sewer from each downstream maintenance hole;
ii. Watermain Valves, Tees and Appurtenances and Water Services

- Location of watermain valve box and valve chambers are to be dimensioned up or down the road from the nearest maintenance hole and an offset distance from the centreline of the road or back of curb;
- Water main stops are to be dimensioned along the alignment of the watermain from the nearest valve and curb stops, and boxes are to be dimensioned from lot corners;
- “As Recorded” watermain obvert elevation at 50.0 m intervals
- The drawings shall incorporate information shown on standard drawings 204, 205 and 206. In addition, the manufacturer, make and model of the following must be provided:
  - Pipe (mains, services & fire hydrant leads)
  - Joint Restrainers
  - Fire Hydrants
  - Valves
  - Curb Stops
  - Main Stops
  - Saddles
  - Wrapping Products (paste, mastic and tape)
  - Anodes
  - Tracer Wire
  - Pipe Fittings
  - Water Boxes (curbstop at mainline)

Where watermains are not within road allowances or near sewers, ties to property corner shall be used.

b) “As Recorded” Drawings

“As Recorded” Drawings constitute the original Engineering Drawings which have been plotted again to show “As Recorded” conditions. The “As Recorded” drawing mylar and a copy of the AutoCAD drawing files on a CD shall be submitted to the City for permanent records.

“As Recorded” Field Survey

The “As Recorded” Records revisions shall be based upon an “As Recorded Records” survey of all the development services and shall include a field check of the following items:

- Location of maintenance holes for utilities;
- Location of catchbasins;
- Location of hydrants;
- Location of valve chambers and valve boxes;
- Location of streetlights;
- Maintenance hole inverts and lid elevations;
- Pipe inverts;
- Distance between maintenance holes;
- Special maintenance hole details;
- Catchbasin inverts.
- Road centreline elevations at 20.0 m intervals
- Location, lid and invert elevations for all rear yard and lot catchbasins, and
- Location of all services to all lots and blocks and location of connections from the nearest downstream maintenance holes.
“As Recorded” Records Drawings

The “As Recorded Records” drawings for all Municipal Services shall incorporate all revisions found in completing the “As Recorded Records” field survey and include a check of the following items and incorporation of the necessary revisions:

- Sewers - Percent grade, pipe size, type, class, bedding and length;
- Invert elevations – sewer at maintenance holes, at plugs for future extensions;
- Top of pipe and/or invert elevations – watermains, where necessary (i.e. Where watermain has been varied from normal depth requirements) in filed, to avoid conflict with other buried services, and
- Obvert of watermain and sanitary sewer at centreline of creek crossing;

Note: Original design information (inverts, grades, etc.) are to be removed from the drawing and replaced by the “As Recorded” Records information:

- Pipe type, class and bedding;
- Service connections at street line – sanitary, storm and water;
- Label “As Recorded Records Drawings” (shown in revisions column with date), and on cover sheet;
- Registered Plan Number is to be shown on plan view of each drawing including general plans;
- Lot and block numbers shall be in conformity with the registered plan;
- Street names shall be in conformity with the registered plan or as approved by the City, and
- Benchmark.

A.11 INDIVIDUAL LOT GRADING PLANS (SITINGS)

Detailed individual Lot Grading Plans (2 copies) must accompany all building permit applications and submitted to the Building division. Building permits will not be issued until the City has approved the subdivision lot grading control Plan.

The individual grading plans must conform to the overall Subdivision Grading Plan, as approved.

Sitings for single homes and semis shall be prepared as one lot per sheet at a scale of 250:1. Sheet size of 8.5" X 14".

Sitings for townhouse blocks shall be prepared as one block per sheet at a scale of 250:1. Sheet size of 11" X 17".

Provide a title block with the name of building / Subdivider / subdivision / registered plan number, lot number and municipal address (if available), architect/designer company, scale of drawing and date of preparation.

The plan is to show the following:

- Elevation of culverts, drainage ditches, sidewalks and easements;
- Location of sump pump and discharge point;
- The existing elevations as per topographical survey indicating existing buildings, drainage patterns and finished first floor elevations for all buildings on adjacent lands;
- The surface runoff for all adjacent and proposed lots uses arrows to show the direction of flow;
e) The house type and elevations of the finished first floor top of foundation wall, basement floor and underside of the footings;

f) The proposed elevations at the lot corners, landings, garage slab and all entrances (indicating the number of risers), the existing roads and catchbasins;

g) The location, length and percent slope of proposed driveways;

h) Type and details of proposed retaining walls, including top and bottom of wall elevations, and

i) Infiltration galleries location, size and details (where infiltration galleries are required on the individual lots).

j) Water Pressure Reducing Valve if applicable.

All elevations are to be referred to a geodetic City benchmark.

For additional information on individual lot grading plans, please visit the Building Division’s website.

**Note:** Lots submitted within unassumed subdivisions must be approved by the Subdivider’s Consultant for conformity with the overall subdivision design. The individual lot grading plans must be stamped with the following wording prior to being reviewed by the City:

“We certify that the proposed grades are correct, and that the lot grading of the subject lot is in conformity to the approved subdivision lot grading plans and City standards and will not adversely affect any adjacent property.”

**A.12 CONSTRUCTION**

Prior to any Servicing works starting on-site, the consultant must receive a servicing approval letter signed by the Manager of Development Engineering. This letter will also provide formal approval of the Subdivider’s contractor, and the Engineering Design. When clearances of the following items have been finalized, the Development Engineering Project Manager will recommend the Manager of Development Engineering to issue the servicing approval letter:

a) Servicing Request Letter Received;

b) Zoning;

c) Draft Plan;

d) Tree Management;

e) Heritage;

f) Lotless Blocks Draft Reference Plan;

g) Draft Subdivision Final Lotting Plan;

h) Entrance Feature Confirmation;

i) Engineering Agreement (Subdivider shall first submit a Consultant Appointment Letter to Engineering appointing a consultant);

j) Registered Subdivision Agreement;

k) Archaeological clearance;

l) Decorative Lighting Confirmation;

m) Approved Parking Plan;

n) Approved Preliminary Tree Planting Plan & Urban Forest Soils Report;

o) MOE Approval for SWM**;

p) MOE Approval for Sewers**;

q) Kitchener Utilities Approved - Form 1 (watermains)**;

r) Region of Waterloo Approved - Form 1 (watermains);
s) GRCA Fill Permit;
t) Other Agency Permits (MNR);
u) Road Closure Permit;
v) Neighbours’ Letters of Permission;
w) Approved SWM Design;
x) Approved Engineering Drawings (see Section A.9.3);
y) Other Project Specific Draft Plan Conditions;
z) Development Charge item (servicing agreements);
aa) Copies of Executed Contract Documents*;
bb) Contractor Insurance Certificate naming City as additionally insured;
c) Contractor WSIB;
d) Certification Letter ESC is in place;
e) Certification Letter Tree Protection is in place;
f) Engineering Fee 100%;
g) 60% Security in place.

Note, not all of the above clearances may apply to all projects. The clearances may occur after or simultaneous to the Final Drawing Submission (see Section A.9.3). Upon receipt and review that everything is in order, the City will then issue a letter approving the contractor and to permit commencement of construction. Prior to the start of construction, the Subdivider's Consulting Engineer shall arrange for a preconstruction meeting with City staff in attendance.

* One (1) complete original set of executed contract documents including tender form and specifications with insurance certificate and City of Kitchener named as additional insured, plus one (1) photo copy of this complete document.

** City signature is required for MOE approvals. Four (4) signed MOE applications as per the MOE submission form for each Storm Sewer, Sanitary Sewer, and Stormwater Management facilities are to be submitted to Development Engineering for sign off.

*** Record of Watermains Authorized as a Future Alteration. The prescribed fee must be payable to the City of Kitchener.

A.12.1 Road Closures/ Detours

Where a development requires the closure of a City street or detouring of traffic, a Road Closure/Detour Work Permit is required prior to commencement of the related works. In order to obtain this permit, the following process will apply:

- Notification to the City’s Traffic Project Coordinator, Transportation Services by the consultant/contractor as early as possible to schedule any road works/impacts on the neighbourhood, and advise of upcoming works (this includes letter of notification to existing adjacent residents);

- Request for road closure/detour to be submitted a minimum of five (5) working days in advance of the closure, and after the initial consultant contact. This should come from the contractor to the Traffic Project Coordinator;

-A Traffic Control Plan shall be submitted for review with five (5) working days notice of road closure. Conditions of the work may be set out by Transportation Planning staff;
- A copy of the contractor’s Insurance certificate to be submitted from Development Engineering staff or the contractor directly, and approved prior to any issuance of a work permit;

- Notification by Transportation Services to Development Engineering Staff of approved road closure/detour plan;

- Notification by Development Engineering staff to Transportation Services staff of approved engineering drawings and servicing approval;

- Finalization of Road Closure/Detour Permit finalized, and permit issued to contractor by Transportation Services.

### A.13 RELEASE OF BUILDING PERMITS

Requests for Building Permits shall be made by the Subdivider to Building staff. Building staff shall issue permits once conditions stated in Part 4 of the signed Subdivision Agreement have been completed by the Subdivider and accepted by the City.

As part of this process, the Consultant will submit two sets of mylars for the approved Lot Grading Control Plan to Development Engineering. These mylars shall be signed by the Manager of Development Engineering (by designated authority from the Director of Engineering Services and Manager shall be a Professional Engineer). One set of the mylars shall be returned to the Consultant while the other set shall be retained for Development Engineering’s records. Development Engineering staff shall take a copy of the mylar and forward it to Building staff in order to release building permits.

### A.14 INSPECTIONS AND TESTING

#### A.14.1 Lot Grading Inspection and Certification

Once the house is fully constructed and the property is fine graded, top-soiled and sodded the Subdivider will secure the services of the Consultant responsible for reviewing all the data and the Consultant will either certify or reject the lot grading upon inspection.

If the inspection reveals any deficiencies, the Subdivider’s Consultant will notify the Subdivider what further work is required. It is the Subdivider’s responsibility to ensure the required work is completed in accordance with their Consultant’s recommendations.

Upon completion of the required work, the Subdivider’s Consultant will re-inspect the property. This process will continue until the Consultant certifies the work conforms to the Detailed Lot Grading Plan.

#### A.14.2 Erosion and Sediment Control Inspection

During active servicing and/or grading construction, all Erosion and Sediment Control Devices are to be inspected by the Consulting Engineer once per week and after each rainfall of 25 mm or greater or significant snow melt. Daily inspections are required during extended rainfall or snow melt periods. These inspections are to ensure that the facilities are in proper working condition and all damaged Erosion and Sediment Control Devices are to be repaired and/or replaced within 48 hours of the inspection. A permanent record of these inspections must be forwarded to the Director of Engineering Services with five (5) days of the inspection.
A.14.3 **Inspection Form**

Daily Inspection and Monitoring reports from the Consulting Engineer shall be submitted to Engineering Services prior to the certification of works. The diary must at a minimum contain the following information:

- Weather Conditions;
- General Progress of Work; where the Contractor is working and what he is doing;
- Equipment being moved or arriving on the job and its purpose;
- Visits to the site by the City or Regional Officials and any specific instruction they may have given;
- Instructions given to the Contractor;
- Contractor’s claims or complaints;
- Compaction efforts for trench backfill, granular road bedding and asphalt;
- Trench conditions;
- All discussions or dealings with Property Subdividers;
- Work performed on the site involving the installation of public utilities;
- Stoppage of work by the Contractor with full description of why the work stopped;
- Extra works and miscellaneous happenings;
- Complete descriptions of how excavations were executed, type of equipment used and difficulties due to either improper equipment or nature of material;
- Indicate where all fill materials came from, such as the lot or station of the cut or name of the borrow site;
- Number of loads of material where possible without consulting with the Weighman on the Contractors records;
- All equipment that is on site must be recorded;
- The actual hours worked;
- The actual hours not worked;
- The actual area of work;
- Location and length of time of any stoppages;
- Particular attention must be taken with watering equipment and the number of loads of water applied per day must be recorded as well as the number of hours the equipment worked;
- The time of arrival and departure of the Consultant’s Inspector, and
- All pertinent information relating to Quality Assurance of the works.

A.14.4 **Inspection Checklist**

The Inspection Checklists shall include:

- Daily Report for full time inspection;
- Part time inspection report;
- Weekly Report;
- Erosion and Sediment Control Inspection Report, and
- Water System Inspection Report.

A.15 **INSPECTION AND LETTER OF CREDIT (LC) REDUCTION PROCESS**

A.15.1 **General**
All subdivisions are subject to two inspections, Initial and Final. Completion of repairs shall not exceed a maximum of six months in order to finalize an acceptance; all deficiencies are to be rectified:

1. **Initial Inspection:**
   - **Purpose** – to ensure all underground services to base asphalt and surface works are built to City of Kitchener standards and to identify any structural or safety deficiencies which have to be rectified immediately at the Subdivider’s expense. It also represents the time from which the Subdivider is responsible for the maintenance of the constructed works until final inspection. This time period is also known as the Maintenance period. The Maintenance period starts the date of confirmation from Development Engineering staff of a satisfactory inspection to the Consultant. The consultant has three months to submit the Initial Acceptance package to Development Engineering or the Initial Acceptance date will be the date the package is received.
   - **Timing** – inspection is performed once the installation of all underground services to base asphalt and/or surface works have been completed and prior to release of building permits (unless 100% Letter of Credit has been posted). Inspection is initiated by the Subdivider’s consultant.

2. **Final Inspection:**
   - **Purpose** – to ensure that all deficiencies or damage that has occurred within the maintenance period, as determined by the City staff, are identified and rectified at the Subdivider’s expense. Once final acceptance has been given, the City assumes the infrastructures within the right of way and is responsible for its maintenance and replacement.
   - **Timing** – Timing – inspection is conducted after a minimum of two year maintenance period, and is initiated by the Subdivider’s consultant.

All inspections shall be coordinated through Development Engineering who will contact the required City Departments (Operations, Community Services, and Kitchener Utilities) regarding inspection times and date requests.

All underground services are accepted on a stage by stage basis while all aboveground infrastructures are accepted on a street by street basis for both initial and final acceptance. If works within that stage or street are not completed within the limits of a street in a stage, then that item will not be accepted at initial inspection or assumed at final inspection.

**NOTE:** With respect to watermain inspections, Kitchener Utilities will charge the Subdivider for each additional inspection over the first four (4) inspections for the same stage. The four inspections is a sum of two (2) initial and two (2) final inspections, not four for each. Please ensure all water valves, water boxes, hydrants etc. are in good working condition prior to requesting inspection of watermain services. The valves/hydrants/etc. can only be operated by Kitchener Utility staff, but a visual inspection can be completed as well as making sure the valve boxes are accessible, keys fit on, hydrants meet the standards (e.g., painting, break away flanges) prior to requesting an inspection of watermain services. During an inspection if it is apparent the contractor/consultant did not review the above mentioned details prior to the inspection, the inspection will not continue. The consultant needs to review the Watermain Inspection Guideline to understand what Kitchener Utilities looks for during an inspection.

Note: Due to winter conditions, no scheduled inspections will be conducted between December 1st and March 1st. Beyond these dates, weather depending, inspections may be arranged at the City’s discretion.
A.15.2 Definitions

A.15.2.1 Underground services to base asphalt

This includes the following:

- Sanitary sewers and its appurtenances;
- Watermains and its appurtenances (valves, hydrants, water boxes);
- Storm sewer and its appurtenances;
- Front yard infiltration galleries (if applicable);
- Base asphalt, and
- Curb and Gutter.

A.15.2.2 Surface works

This includes the following:

- Surface asphalt;
- Driveway ramps;
- Islands including sodding;
- Boulevards including sodding;
- Trees & Soil Habitat Zone;
- Sidewalks;
- Fences;
- Geodetic Monumentation;
- Walkway blocks;
- Traffic signage;
- Noise barriers, and
- Parks and Open Spaces.
- Trails
- Landscaping Works

A.15.3 Initial Inspection and 60% Letter of Credit Reduction Process

Step 1: Subdivider’s inspection

Participants: Subdivider
Consultant
Contractor

Once the underground and/or above ground infrastructures have been installed, the Consultant will inspect said infrastructure for completeness and adherence to the City of Kitchener specifications and standards. Any deficiencies in terms of incompleteness of the works or deviations from the approved plans noted by the Consultant shall be reported to the Subdivider who shall endeavour to hire a qualified contractor to rectify noted deficiencies to the Consultant’s satisfaction.

Once the Consultant is satisfied that all noted deficiencies have been rectified and that the works, especially all sewers, manholes and catchbasins have been parged and cleared of debris, the CCTV can take place, and an inspection request shall be sent via email to Development Engineering Staff.
Step 2A: Underground services to base asphalt and/or Stormwater Management pond onsite inspection

Participants: Consultant
City Staff (Development Engineering, Operations, Kitchener Utilities, Community Services)

Once an email request for an onsite initial inspection has been received by Development Engineering Staff from the Consultant, Development Staff will endeavour to schedule an inspection date and time within two (2) weeks of receiving the request. In the inspection request, the Consultant shall include the following:

- 30T and 58M numbers and name of the Subdivision;
- list of specific items to be inspected on a street by street basis or as per Blocks;
- 8.5” x 11” drawings indicating the limits of the inspection, and
- Meeting location.

Development Engineering Staff will contact the required City Departments (Operations, Community Services, SWM Utility, and Kitchener Utilities) regarding inspection times and date requests. Once a time has been established, an email will be sent by Development Engineering Staff to the Consultant confirming the meeting time and location. Due to Operations’ work schedules, it is preferable to schedule inspections at 8:00 am.

The Consultant and City staff (comprising of Development Engineering Staff and other as required departments) shall meet onsite at the determined time and location and will conduct a visual inspection of the catchbasins, manholes, base asphalt and curb and gutter to ensure that is has been constructed to the City of Kitchener standards and specifications and as per the approved drawings. Deficiencies will be marked in orange paint by City staff. When demarcating curb repairs, the Development Engineering Staff should ensure that there are no sections of curb shorter than 3-4 feet (0.9 m-1.2 m) remaining as a result of curb repair.

All structural and safety deficiencies will be noted by the Consultant and City staff and will need to be rectified prior to City approving works be put onto maintenance. A deficiency list shall be prepared and circulated by the Consultant to the Development Engineering Staff, within five (5) business days, which will be reviewed and agreed to by Development Staff. Any deficiencies of an aesthetic nature may be deferred until final inspection.

Note: all catchbasins, manholes, valve boxes, etc. shall be flush to the base asphalt grade and will be raised once surface asphalt is placed.

The Consultant shall endeavour to coordinate the repairs and deficiencies by a contractor within two (2) months of the deficiencies being noted. Once deficiencies have been repaired, City staff will be invited onsite again to inspect the repairs. If the time taken to repair the deficiencies is greater than two (2) months, then the re-inspection of all the infrastructure item that was repaired (on a street by street basis) is at the discretion of the Development Engineering Staff. This process will continue until the City Staff is satisfied that all structural and safety deficiencies have been rectified.

The consultant shall send an email/letter to Development Engineering Staff, within five (5) business days of the onsite inspection, confirming initial acceptance of inspected works related to their particular department:

- Kitchener Utilities - acceptance of the water distribution system;
- Operations - acceptance of the underground infrastructure and/or SWM pond infrastructure;
- SWM Utility – acceptance of SWM pond infrastructure;
- Engineering – acceptance of CCTV inspection, and above ground infrastructure
- Community Services/Parks - acceptance of walkway blocks, landscaping, SWM pond landscaping, buffers, trees, etc.

In addition to forwarding these emails/letters/Memos to the Consultant, Development Engineering Staff shall also follow up, within five (5) business days of the onsite inspection, with an email confirming in writing that items inspected have been accepted by City staff.

**Note:** Consultants shall include these emails/letters as part of the Maintenance Package to be submitted to the City.

**Step 2B: Surface works onsite inspection**

**Participants:** Consultant  
City Staff (Development Services, Operations, Parks)

Similar to Step 2A however surface works will be inspected. Refer to Section M for the inspection and acceptance for all tree planting and soil habitat zones identified on the Tree Planting Plan.

**Note:** Surface asphalt cannot be placed until the base asphalt and curb and gutter have been given final acceptance inspection clearance from Development Engineering, and 95% house build out is complete for the streets. Prior to placement of surface asphalt, all base asphalt and curb and gutter repairs are to be complete and inspected by Development Engineering. All manholes, catchbasins, valve boxes, etc. have to be raised to surface asphalt grade. During the initial acceptance inspection of the surface asphalt, all structures within the roadway will be checked for proper adjustment including gas valves. Water service curb stops for the empty lots noted during the final acceptance of the underground works will be inspected as part of the surface asphalt initial acceptance, and any related deficiencies will need to be rectified prior to surface asphalt initial acceptance.

**Step 3: Maintenance Package submission by Consultant**

**Participants:** Consultant  
City Staff (Development Services, Administration)

The Consultant shall submit a Maintenance Package, within three (3) months of receiving the emails from Development Engineering Staff confirming that inspected items have been accepted by City Staff. The package shall be sent to Development Engineering Staff with a covering letter which certifies that all the works within the particular phase have been completed to City of Kitchener standards, and lists all the items included. It should be noted that test results shall be submitted via email to Development Engineering Staff as soon as it is available during construction, however, a hardcopy of these results shall be included as part of the Maintenance Package.

If a test result is marginally “out of spec”, Development Engineering Staff may request the Consultant to provide a written explanation from the party responsible for the material testing, indicating what the potential problems could be over the long-term and suggest ways to mitigate (plan of action). Development Engineering Staff will review the explanation to determine whether to accept the works or not. Any future problems would be referred back to the Consultant for resolution.

Refer to the Maintenance Package Check List for instructions on submitting Kitchener Utilities required documentation prior to requesting watermain inspections. In order to assist the Consultant in preparing...
the Maintenance Package, a checklist has been provided and is available on the Development Manual website. A typical package would include, but not limited to, the following:

- Pre-construction test results – Granular sites, mix designs, etc.;
- Sieve analysis and compaction testing of sewer and water main bedding material;
- Sieve analysis and compaction testing of road subgrade and granular base courses;
- Asphalt tests of the base asphalt courses, AC content, compaction, etc.;
- Concrete tests for curb and gutter - air, slump, twenty-eight (28) day strength, etc.;
- Watermain test results including, bacteriological analysis, residual chlorine, leakage/pressure testing, etc.;
- Exfiltration / infiltrations testing of sanitary and storm sewers (air testing preferred for PVC pipes);
- Video inspection is to be provided with the Maintenance Package/ Assumption Package;
- Any outstanding construction inspection reports;
- Any outstanding Erosion & Sedimentation Control Monitoring reports;
- A letter certifying that all of the requirements of the subdivision have been met and that the works have been constructed in accordance to City standards;
- “As Recorded” mylars;
- CD with 1) As-Recorded drawings in *.TIF or *.PDF format, 2) As Recorded drawings in AutoCAD and 3) Constructed Asset Data drawing in AutoCAD SDF format;
- As Recorded sanitary and storm sewer design flow spreadsheets in paper and ".xls" format;
- Representative digital photographs of the water connections, including services to document that wrapping as per Corrosion Protection in the DGSSMS has been completed, upon request by City staff;
- CCTV Inspection Report – Free of deficiencies. Provide with the CCTV Inspection Report a general service plan which highlights and includes the total linear meters of storm (including catch basin leads), sanitary and GWMS sewers.

If the Maintenance Package is sent after three (3) months of the inspection, it is at the City’s discretion whether a re-inspection of all the works will be conducted. Acceptance dates for acceptance packages received after three (3) months of the inspection will be the date the package is received by Development Engineering.

**Note:** the request to reduce the Letter of Credit (LC) cannot be submitted along with the Maintenance Package. See Step 4 and 5 below regarding when it can be submitted

**Step 4: Internal process and approval of Maintenance Package by City Staff**
Participants: City Staff (Development Services, Administration)

Development Engineering Staff will review the Maintenance Package within thirty (30) calendar days of receiving the package for:

- Completeness (Please note, all incomplete packages will be returned to the Consultant);
- Test results meeting City standards, and
- The attached signoffs from all the various City departments.

Development Engineering Staff will attach an “Initial Acceptance” sticker to each request letter documenting the corresponding sign off dates by each of the various internal groups (Operations, Kitchener Utilities, CCTV, and Parks etc.). The accepted package will be submitted to Administration who will put together the initial acceptance letter, obtain the Manager of Development Services signature and send it out to the Consultant and relevant internal groups.
Step 5: Request for Letter of Credit reduction by Consultant
Participants: Consultant
City Staff (Development Services, Administration, Legal Services)

Once the initial acceptance letter has been received by the Consultant, and the As-Recorded information has been approved, the process for requesting the Letter of Credit reduction can commence.

Note: Reductions less than $5000.00 will NOT be processed and will be returned to the Consultant unless otherwise approved by the City prior to the request. Only two (2) Letter of Credit reduction requests can be submitted per stage per year.

The Subdivider may request the Letter of Credit be reduced to 15% of the accepted works, and outstanding underground and aboveground works be adjusted to 110%. The remaining balance of the Letter of Credit will be reduced. The minimum value of a letter of credit to be held shall not be less than $5,000.

In order to reduce the Letter of Credit, the Consultant must provide a Letter of Credit reduction request package which contains the following documentation:

- Written letter requesting the reduction in Letter of Credit;
- Subdivision name including appropriate stage and phase i.e. 30T and 58M
- Initial and Final acceptance summary spreadsheet;
- Detailed background information in the form of an itemized calculation spreadsheet on an item by item, street by street basis; and
- Any acceptance letters pertaining to the specific requested Letter of Credit reduction.

Step 6: Internal Process for Letter of Credit reduction
Participants: City Staff (Administration, Legal Services)

Once Development Administration staff has received the Letter of Credit reduction request package from the Consultant, the package will be reviewed, within ten (10) business days for the following:

- Completeness of package (Please note, incomplete packages will be returned to Consultant.);
- Items being requested for Letter of Credit reduction have been moved to the appropriate “Acceptance Column” in the itemized calculation sheets, and
- All calculations have been checked and verified.

Once review is complete by Administration staff, a memo will be sent to Legal Services, copied to the Subdivider and the Consultant, requesting the Letter of Credit be reduced by the requested amount.

A.15.3.1 100 % Securities Required for Building Permits (Option 1)

Where roads are constructed up to base asphalt and curb & gutter:

1) Consultant sends correspondence to Engineering Staff (email is acceptable) requesting verification of bump up (BU) amount to achieve 100% security for Building Permits.
2) After roads are constructed up to base asphalt and curb & gutter; Consultant sends in a package to Engineering containing: letter (original) requesting Engineering Release hold on Building Permits, last Payment Certificate to contractor confirming over 40% paid, letter or affidavit from contractor (original) stating the amount they have been paid;
iii) Developer deposits security (in a form acceptable to Legal Services) to Legal Services or it is brought in with the request letter from the consultant. Engineering Staff inspects and confirms the works are complete and signs off on request package;
iv) Engineering staff notifies Legal Services of the information in the package and attaches all information needed to have the LC brought down to 60%.
v) Legal Services notifies Engineering and Building Division that City is in a position to release the Engineering hold on Building Permits;
vi) Legal Services returns the 40%.

A.15.3.2 100 % Securities Required for Building Permits (Option 2)

Where roads are NOT constructed up to base asphalt and curb & gutter:

i) Consultant sends correspondence to Engineering Staff (email is acceptable) requesting verification of bump up (BU) amount to achieve 100% security for Building Permits.
ii) Consultant sends in original signed letter requesting BU with calculations for LC to 100%;
iii) Developer deposits security (in a form acceptable to Legal Services) to Legal Services or it is brought in with the request letter from the consultant;
iv) Engineering Staff notifies Legal Services explaining the bump up and to deposit securities until such time as undergrounds receive Initial Acceptance or roads are constructed up to base asphalt and curb & gutter.
v) Legal Services notifies Engineering and Building Division that City is in possession of 100% of the securities for the subdivision and this triggers Building to release the Engineering hold on Building Permits;
vi) Security is held until undergrounds receive Initial Acceptance or roads are constructed up to base asphalt and curb & gutter and the Contractor has been paid.

A.15.4 Final Inspection and remaining Letter of Credit reduction process

Final inspections on items can only be requested at a minimum of two (2) years after the initial acceptance date.

Step 1 & Step 2:
These steps will be similar to Section A.3 above except for CCTV inspections process.

For Final inspection, the Consultant will hire a contractor to flush the pipes and complete a CCTV inspection and corresponding report at the Subdivider’s expense. Development Engineering shall review the video inspection and corresponding report within ten (10) business days of receiving the documents and report all deficiencies. A CD copy of the video along with a deficiency list shall be forwarded to the Consultant by the Development Engineering Staff. A CCTV re-inspection, at the Subdivider’s costs, initiated by the Consultant, will be conducted once all the deficiencies have been addressed. The Development Engineering Technologist will review the re-inspection and all repairs to the deficiencies shall be to the satisfaction of the Engineering Technologist. Refer to E.B.3.6.

An acceptance email / letter shall be sent by the Development staff, to the Consultant to be included in the Assumption Package.

For subdivisions Initially Accepted after June 2010 the new process will apply. For any older subdivisions that were Initially Accepted prior to June 2010 the following will apply. Prior to the final acceptance of the underground services, the consultant shall ensure all as-recorded information has been received by the City, including: mylars, ".tiff" files, AutoCAD files.
Through collaborated efforts the City of Kitchener and the Region of Waterloo ensure water distributions pressures are within an acceptable range. To help ensure new development and future development pressures are adequate, the water pressure model used, requires updated data as new developments advance. Prior to the inspection of the watermain for Final Acceptance, Hydrant Fire Flow Test(s) (B.9.13) results are to be submitted to Kitchener Utilities. The number of tests required (minimum of one) will depend on the development being constructed (i.e. large subdivision with rolling topography vs. final remaining cul-de-sac bulb). Kitchener Utilities should be consulted prior to arranging the tests to determine the extent of the tests needed.

If initial or final acceptance of surface asphalt is requested by the consultant and the underground services have previously been assumed by the City, the surface asphalt acceptance inspection will include inspection for any deficiencies of the underground structures. Any deficiencies noted and related costs will be the responsibility of the Subdivider to rectify, in order to receive surface asphalt acceptance.

Step 3: Assumption Package Submission by Consultant

Participants: Consultant
City Staff (Development Services, Administration)

The Consultant shall submit the Assumption Package, within three (3) months of receiving the emails from Development Engineering, Kitchener Utilities, Operations, and Parks Staff confirming that inspected items have been accepted by City staff. The package shall be sent to Development Engineering Staff with a covering letter which certifies that all the works within the particular phase have been completed to City of Kitchener standards.

A typical Assumption Package would include the following:

- Cover letter requesting final acceptance;
- Certification letter
- The attached signoffs from all the various City departments;
- Letter is to include initial acceptance date;
- Attached copy of initial acceptance letter.

If the Assumption Package is sent three (3) months after the inspection, it is at the City's discretion whether a re-inspection of all the works will be conducted.

Note: the request to reduce the Letter of Credit cannot be submitted along with the Maintenance Package. See Step 4 and 5 below regarding when it can be submitted

Step 4: Internal process and approval of Assumption Package by City Staff

Participants: City Staff (Development Services, Administration)

Development Engineering Staff will review the Assumption Package within thirty (30) business days of receiving the package for:

- Completeness (Please note, all incomplete packages will be returned to the Consultant), and
- The attached signoffs from all the various City departments.

Development Engineering Staff will attach a “Final Acceptance” sticker to each request letter documenting the corresponding sign off dates by each of the various internal groups (Operations, Kitchener Utilities, CCTV, and Parks etc.). The accepted package will be submitted to Administration.
who will put together the final acceptance letter, obtain the Manager of Development Services signature and send it out to the Consultant and relevant internal groups.

**Step 5: Request for Letter of Credit reduction by Consultant**
Participants:  Subdivider’s Consultant  
City Staff (Development Services, Administration, Legal)

Once the final acceptance letter has been received from the Consultant, and the As-Recorded information has been approved, the process for requesting the Letter of Credit reduction can commence similar to Step 5 in Section A.15.3.

The surface asphalt LC calculation is to include: cost of surface asphalt, all estimated costs associated with raising structures and valves located within the pavement, the estimated cost to repair each water service curb stop for the street, the estimated cost to flush the storm sewers of the street twice annually for a span of five (5) years.

**Note:** Reductions less than $5000.00 will NOT be processed and will be returned to the Consultant unless it is approved by the City prior to the request.

**Step 6: Internal Process for LC reduction**
Participants:  City Staff (Administration, Legal)

This step is the same as Step 6 in Section A.15.3 above.

**A.15.5 Stormwater Management Ponds**

Where a new subdivision will outlet to an existing or proposed SWM pond, a cleanout maintenance security will be required, and will form part of the Subdivider’s Letter of Credit. The amount required for the maintenance security will be the Engineer’s estimated cost to clean out the pond two (2) times. Additionally, new subdivisions outletting to an existing SWM pond will be required to add the estimated cost to flush the storm sewers up to the SWM pond two (2) times. The estimated cost will be based on the City’s current sewer flushing rate per meter of pipe.

Where multiple Subdividers are responsible for the maintenance of the same pond, a Subdivider who has reached 95% build out can go through the pond acceptance process, or enter into an agreement with all other Subdividers to be released of their pond maintenance obligations. By entering into the agreement, the Subdividers agree to clean out the absolved Subdivider’s sediment from the pond and pipes. Further, the other Subdividers must have pond maintenance securities posted with the City.

Initial Acceptance of the SWM pond undergrounds forms part of the Initial Acceptance of the road underground services to base asphalt. An as-recorded survey of the SWM pond is required for Initial Acceptance of the SWM pond undergrounds.

The Subdivider shall install all landscaping of SWM areas above the five (5) year storm level in accordance with the approved plan, during the first planting season after occupancy of the first unit.

Initial Acceptance of the SWM pond surface works can take place before 95% of the catchment area is built out, and will be inspected and accepted as a whole with the exception of landscaping below the five (5) year storm level.

Prior to Final Acceptance the following conditions must be met in order:
a) Clean out of the SWM pond at 95% buildout.
b) 2 years of performance monitoring after 95% buildout has been reached and clean out completed. See CCTV Inspection.
c) Satisfactory inspections from Parks, SWM Utility, Operations, and Engineering.

At 95% build out of the catchment area, the pond must be surveyed and cleaned out; except if the survey proves the pond has less than 50% of the allowable sediment accumulation (less than 0.25m or 50% of the pond accumulation design depth, whichever is the least). After the pond has been cleaned out, the minimum two (2) year performance monitoring of the SWM pond can commence. At this point the consultant may request to have the pond cleanout security reduced from two (2) cleanouts, to one (1).

After review of satisfactory monitoring results and prior to Final Acceptance, the pond must be cleaned out (not hold accumulated sediment), and landscaping below the five (5) year storm level can be planted. All items in the SWM Block (underground and surface works) are to be inspected as a whole, for Final Acceptance. SWM pond undergrounds will require an updated CCTV inspection, and as-recorded survey submission at Final Acceptance. Please refer to SWM Pond Final Acceptance Checklist for more details.

Subdivisions within the Doon South and Rosenberg Communities may have SWM infrastructure and monitoring requirements in addition to what is outlined in this manual. The acceptance of these SWM ponds and infiltration facilities (including infiltration facilities on City lands or within City easements on private property) will take place after satisfactory monitoring results are achieved, as described in their Subdivision Agreement, and in accordance with the relevant Sub-Watershed study.

Where SWM facilities require seasonal valve operation, the Subdivider is responsible to operate the valves during the maintenance period, not the City.

Stormwater Management Pond Undergrounds Includes the following:

- Inlet piping and structures (Splitter MHs, Headwalls, etc.) - The inlet is to include all piping/structures within the SWM Block.
- Outlet piping and structures (Weirs, Quantity and Quality control structures, etc.);
- Cooling Trenches;
- Infiltration structures;
- Earth works required within the SWM Block;
- Erosion protection such as gabion mats, rip rap treatment, etc.
- Forebay weir;
- Spillway;
- Maintenance access (including final surface treatment - asphalt/concrete/turfstone).

Stormwater Management Pond Surface Works Includes the following:

- Landscaping above the 5 year water elevation (tree types broken out);
- Landscaping below the 5 year water elevation (tree types/aquatics broken out);
- Sod;
- Seed;
- Topsoil;
- Fine grading;
- Walkways (stone dust/asphalt etc. to be broken out separately);
- Fencing (types to be broken out separately);
- Gates or entrance features;
- Retaining walls (to be avoided where possible);
- Cleanout Maintenance (Letter of Credit includes two cleanouts);
- Monitoring;
- Other infrastructure within the pond.

A.15.6 **Obligations during Maintenance Period**

The Subdivider shall make good in a permanent manner satisfactory to the Development Engineering Staff, any and all damage to the work during the maintenance period. Any deficiencies or defects noted during the maintenance period are the responsibility of the Subdivider and all complaints and concerns will be deferred to the Consultant for resolution. This shall be on an ongoing basis throughout the terms of this agreement. This obligation shall be at an end with respect to each street within the subdivision once all construction of dwellings on such street has been completed with the requisite certification of compliance with the Site Grading Plan for all such dwellings having been provided to the City. The Subdivider on receiving either written or oral notification from the City that works are required, shall immediately undertake such necessary work. If the Subdivider fails to comply, the City may arrange for such work to be undertaken at the expense of the Subdivider. The monies for this work may be drawn from the securities under the subdivision agreement.

It is important to note that the standard maintenance period is 2 years, however this term maybe extended if and where significant deficiencies have existed and been left unattended.

The Subdivider’s obligations include the following:

- Shall maintain or cause to be maintained all underground and surface works and every part thereof in working order and in good repair for a period of not less than two (2) years from the date of the maintenance period acceptance.
- Regardless if the underground sewers have received final acceptance, the Subdivider shall be responsible for sewer flushing maintenance until initial acceptance of the surface asphalt.
- Subdivider will ensure that storm sewer system, which includes catchbasins, manholes, infiltration trenches, soakaway pits and other quality control features, and appurtenances in a satisfactory working condition and free from debris, silt etc. Should the efficiency of the storm sewer become reduced due to building activity the Subdivider shall be responsible for any cleaning, flushing etc. necessary to restore the storm sewer to full capacity for the duration of building activity. If the City determines a Subdivider is not ensuring that the storm sewer is kept free of debris, silt, due to builder activity, a work order will be emailed to the Subdivider. If the storm sewer is not cleaned within five (5) business days, the City will arrange to have the storm sewer cleaned, and the work will be invoiced to the Subdivider.
- The Subdivider shall maintain all road allowances, lots and blocks within the vicinity of the works within the subdivision free of mud, dust, litter, construction debris, construction materials and obstruction that may occur directly or indirectly on account of construction or illegal dumping by others within the subdivision. All subdivision streets will be swept once a month or more frequently as conditions warrant during construction. If on-site building activity warrants, the streets may need to be scraped before they can be swept, and cleaning may be required on a daily basis. The Subdivider will also ensure that abutting streets affected by the subdivision activity are also cleaned when they have been impacted. City staff will inspect the road condition on a periodic basis and/or on a complaint basis. If it is determined by the City that the Subdivider is not adhering to the street sweeping requirements he will be emailed a work order by the City to clean the streets. The
Subdivider will have 48 hours to comply with the work order. Should the City deem it necessary to respond to a cleanup of the subdivision streets and/or abutting streets after having notified the Subdivider, this work will be invoiced to the Subdivider.

- The Subdivider is responsible for the cost of the pavement marking for the initial painting after the placement of base asphalt and again when surface asphalt is placed.
- The Subdivider shall maintain or cause to be maintained, all surface and landscaping works and every part thereof in acceptable order and in good repair for a period of not less than two (2) years from the date of the Maintenance Period Acceptance.
- All storm water management facilities must be inspected within 24 hours after each significant rainfall event (>25 mm) and an inspection report shall be sent to Development Staff for review.
- The Subdivider shall maintain or cause to be maintained, all landscaping works (including boulevards adjacent to open spaces and parks, and street trees) and every part thereof in acceptable order and in good repair for a period of not less than two (2) years from the date of the Maintenance Period Acceptance to the satisfaction of the City. It is recognized that within a subdivision, there may be a variety of Maintenance Period Acceptance dates.
- The Subdivider shall meet all of tree planting requirements identified in Section M of this manual.

The City’s obligations include the following:

- Respond and carry out emergency repairs on an as needed basis at the Subdivider’s expense, and the Subdivider will be notified of these repairs within 24 hours;
- Responsible for the operation of all water valves and the supply and erection of all traffic operation devices (street signs, stop signs, pavement markings, etc.), and
- Once streets, sidewalks, walkway, and trails have been put on maintenance after initial inspection, the City assumes winter snow removal.

A.15.7 Typical deficiencies

Below is a list of typical deficiencies that could be requested for repair or replacement (Note: deficiencies are not limited to the items listed below):

<table>
<thead>
<tr>
<th>Table 3: Typical Deficiencies</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Items</strong></td>
</tr>
</tbody>
</table>
| Sidewalks | • Cracks  
• Heaving  
• marks in the surface of the concrete e.g.: names, footprints, scratches etc. as per OPS 351.07.09  
• - 2001Amending O.Reg 239/02 |
| Boulevards | • dead grass  
• stones/ rocks in the boulevards  
• settlement  
• Topsoil Thickness |
| Curb and gutter | • cracks  
• heaving  
• gouges deeper than 1 inch in the face of the curb |
| Driveway ramps | settlement in the top of the driveway ramp and the sidewalk or curb greater than 19mm  
|               | cracking, spalling, blisters, popouts, flaking/scaling |
| Base asphalt & surface asphalt | cracks in the asphalt such as progressive edge cracking, alligator 
|                               | bleeding  
|                               | grass/ weeds growing at the edge of the asphalt between the curb and asphalt  
|                               | dips in the asphalt  
|                               | rutting  
|                               | corrugations/shoving  
|                               | pot holes  
|                               | ravelling  
|                               | polished aggregates |
| Sanitary pipes & Storm pipes | As per NASSCO’s Pipeline Assessment & Certification Program  
| Trees | wounds  
|       | trees planted too deep or high  
|       | poor tree vigor due to inadequate watering  
|       | mulching deficiencies (i.e. volcano, insufficient depth, etc.) |
| Watermains | cracks  
|           | fractures  
|           | leaks  
|           | valve boxes broken  
|           | wrong number of turns on valve boxes, hydrants etc.  
|           | tracer wire  
|           | colouring |

**A.16 FEES AND SECURITIES**

**A.16.1 Cost Estimate**

An itemized cost estimate for the construction of all works in the standard form is required along with a breakdown of any items designated to be cost-shared.

A proposed construction schedule for all construction activities is to be provided to the Development Engineering staff. During the progress of the work, any revisions to the original schedule shall be forwarded to the City.
A.16.2 Engineering Fees

The total Subdivision Engineering fees for services provided by the City are to be determined as a percentage of the final estimated construction costs. The percentage to be used is stated in the Subdivision Agreement. These fees shall cover City staff review, processing and inspection time.

Initially the Consultant will determine the preliminary construction cost estimate at the time of first Engineering drawing submission. One half of the percentage of this cost estimate will be submitted to Development Engineering Staff, in the form of a cheque made payable to the Corporation of the City of Kitchener along with the first submissions drawings.

Prior to final approval of the Engineering drawings, the Consultant shall provide a final estimated construction cost. The remaining Engineering fees to be submitted to Development Staff is calculated as the percentage of the final estimated cost less the Engineering fee paid upon first submission.

A.16.3 Parkland Dedication - Cash in Lieu

Refer to Council Approved Parkland Dedication Policy. Lands acceptable to Community Services must be dedicated to the City for park purposes, free and clear of any encumbrance. Undeveloped land, stormwater management facilities or hazard lands will not be accepted as parkland dedication as such lands cannot be developed for active park purposes and may be unsafe for recreational uses. Lands must be dedicated upon registration of the plan of subdivision.

Details regarding the development of Parklands and Multi-Use Pathways can be found in Section L of this Manual.

In cases where parkland dedication is impractical, cash in lieu of parkland dedication may be acceptable. This is at the discretion of the City in accordance with the Planning Act. The Subdivider is responsible to provide the City with a valuation report from a competent and qualified appraiser approved by the City.

A.16.4 Perpetual Maintenance Fees

The City shall collect ‘Perpetual Maintenance Fees’ from Subdividers when a Subdivision Agreement is entered into for landscape design elements placed on City Property. These ‘Fees’ are required to offset costs of long-term maintenance, potential removal, and/or replacement. Maintenance Fees will be applied to design elements in the landscape, including but not limited to, subdivision entry features/walls, decorative perimeter fencing, and planted traffic islands.

The ‘Fee’ will be held specifically to pay for maintenance, removal and/or replacement of those elements ultimately assumed by the City. The ‘Fee’ amount is based upon the type of materials utilized in the construction of the element. The ‘Fee’ will be collected as cash or certified cheque, and will be non-refundable. The City will have the ability to remove the design element in the event that, after assumption of the Subdivision, the design element maintenance costs are exceeded. Warning clauses in purchase and sale agreements are necessary to ensure the future Homeowner is made aware of this.

Any of these elements must be itemized separately within the landscape cost estimates.

The Subdivider is required to maintain these landscape elements until until the subdivision servicing is completed and all lots within the subdivision are sold. At that time the City will assume maintenance responsibility.
All tree planting for landscape design elements will meet all tree and soil habitat zones requirements identified in Section M of this Manual.

The Subdivider shall pay the City the estimated cost to maintain the feature for 5 years following the acceptance by the City, AND half the cost to replace the feature (based on installation cost).

The City has the option to remove if we so desire in future.

A.16.5 Insurance

The Contract Document shall include: all addenda and the Form of Tender, an insurance certificate addressed to the City of Kitchener with five (5) million dollars liability insurance with the City (and other affected local authorities and Consulting Engineer all named as additional insured), contain a 30 day written cancellation notice, and Workplace Safety and Insurance Board.

In addition to the above, the Engineering Consultant shall submit an insurance certificate addressed to the City of Kitchener with: five (5) million dollars liability insurance with the City (and other affected local authorities named as additional insured), 30 day written cancellation notice, described for the particular project.

A.16.6 Security Requirements

The Subdivider shall deposit with Development Engineering security in the amount of 60% of the total estimated construction costs of all the works, including the Consultant engineering fee and contingencies costs plus applicable taxes, in the form of:

- An irrevocable Letter of Credit satisfactory to the City Treasurer from any financial institution approved by the City Treasurer in accordance with City Policy or
- Cash or
- Certified cheque.

When a cash deposit is given, the City Treasurer shall deposit same in a chartered Bank or subject to Section 286(1)(b) of the Municipal Act, 2001, as amended, in any similar financial institution.

Should the Subdivider fail to complete the works or fail to pay for works completed, the City shall draw upon the deposited security for the purpose of paying these costs.

The Development Engineering staff shall, from time to time, review the security deposited by the Subdivider and the City may, from time to time, demand an increase in the sums deposited in accordance with the increase in the actual cost of performing the works required. The Subdivider shall deposit such further and other sums as the City deems reasonably necessary to ensure the completion of the outstanding works.

A.16.6.1 Security Reductions

Security Reductions may be requested throughout the construction of the subdivision. Each reduction must be made in writing to the City and include the Subdivider’s Statutory Declaration of payment of accounts and the Consultant’s statement of work completed. Security reduction will not be utilized until inspections of the works have been completed and any deficiencies repaired to the satisfaction of the City.
A.16.6.2  Letters of Credit

Initial Reduction

The initial reduction of the Letter of Credit shall be to 15% of the total value or to $5,000, whichever is the greater and shall occur after initial acceptance of works. Only two (2) reductions to the Letter of Credit per stage will be permitted a year. A fee of $1,000 will be applied for each additional Letter of Credit reduction after the permitted yearly amount.

For further information, please see Section A. 15 of the Manual.

Final Reduction

The final reduction of the Letter of Credit shall be to zero dollars and shall occur after Final acceptance has been issued by the City.
B ADMINISTRATION – SITE PLAN

B.1 GENERAL

The City of Kitchener has a formal Site Plan Control process, pursuant to Section 41 of the Ontario Planning Act. The information contained within this section of the Development Manual provides an overview of the process and references key documents. For engineering requirements for Site Plans please review to the Site Grading, Erosion Control, Servicing & Stormwater Management Guidelines.

Purpose of Site Plan Control

Site Plan Control is a tool used to encourage high quality site and exterior building design. It is used to achieve appropriate siting and massing of a development on a site and to ensure safety, accessibility, attractiveness and compatibility of a development with the site context and overall urban landscape. It is also used by the City to secure land for road widenings and implement sustainable streetscape improvements in public boulevards adjoining development sites. To a large extent the Site Plan Control strategy is one of the key mechanisms for implementing the City's policies.

Site Plan Control is the process that is used to control or regulate the various features on the site of an actual development. Site Plan Control ensures that City, Regional, Provincial and other agency standards and requirements are met. Site Plan Control is intended to improve the efficiency of land use and servicing and create a more attractive form of development.

Site Plan Control applies to construction, development and re-development on all lands within the corporate boundaries of the City of Kitchener, with some exceptions. Applicants should check with the Planning Division of the Development and Technical Services Department to determine whether a proposal is subject to Site Plan Control.

Site Plan Control provides the opportunity for the Province, Region, City and other agencies to participate in the overall design of developments within the community and set out minimum conditions in order to achieve the following:

- Maintaining consistent standards (Provincial, Regional, Municipal, and other agencies);
- Compliance with municipal by-laws, policies, regulations, standards and guidelines (i.e. Zoning, Official Plan, Heritage Conservation Districts, other government agencies, Urban Design Manual, engineering standards, etc.);
- Construction and maintenance of development as approved;
- Preservation and enhancement of the natural qualities of the site;
- Compatibility with the character of abutting and/or adjacent uses;
- Control the placement and provisions of required services;
- To provide for the optimum utilization of community facilities and services;
- Ensuring safe and efficient vehicular and pedestrian access;
- Minimizing land use incompatibility;
- Providing functional and attractive on-site facilities;
- Integrating with the City's heritage character and unique physical setting;
- Ensuring a high quality of building massing and architectural design;
- Adequate provision and maintenance of site-specific facilities required by the development or redevelopment;
- Appropriate location and adequacy of services and utilities;
• Compatibility of design between sites and minimization of any adverse impacts of the development or redevelopment on adjacent properties;
• To secure necessary lands for the widening or improvements to streets and intersections;
• To secure necessary pedestrian, public transit or cycling facilities;
• To ensure the development or redevelopment is completed and maintained in accordance with the approved plans and design;
• To ensure that the development is compatible with natural heritage features and cultural heritage features on site or on adjacent lands;
• To ensure facilities are designed to have regard for barrier free and universal accessibility;
• To ensure development or redevelopment incorporates Crime Prevention Through Environmental Design (CPTED) principles.

These "quality control" conditions allow City staff to review and approve applications to ensure installation and maintenance. For a list of information and materials that may be required to process an application, refer to the following:
• Schedule I, City of Kitchener Official Plan;
• Section 19.0, City of Kitchener Urban Design Manual;
• Building location and site design;
• Building massing and exterior design including character, scale, and appearance;
• Driveway opening and closing;
• Cash in lieu of parkland dedication;
• Parking;
• Traffic study;
• CPTED report;
• Curbing and traffic direction signs;
• Loading and parking facilities for vehicles and bicycles;
• Site lighting;
• Emergency vehicle routes and associated signage;
• Fire flow demand analysis;
• Pedestrian access including all walkways, ramps and their proposed surfacing and accessibility details;
• Landscaping for the site and for the protection of adjoining lands;
• Refuse and other waste and recycling material storage and collection areas;
• Grading and servicing;
• Storm water management design and/or contribution;
• Erosion and sedimentation control;
• Noise studies;
• Geotechnical reports and environmental reports;
• Presence of septic systems;
• City or Regional road widening;
• Sustainable design elements within the adjoining right-of-way such as trees, landscaping, paving, street furniture, accessibility, ramps, waste and recycling containers and bicycle parking facilities;
• Cost Estimates and Letters of Credit, and
• Retention of consultants.

Where applicable, development cannot proceed without a site plan agreement being registered on title against the land.

Legislative Authority
Section 41 of the Planning Act, R.S.O. 1990 provides for a municipality to implement Site Plan Control. The City of Kitchener has passed By-law 86-137 designating all lands within the boundaries of the City of Kitchener as a Site Plan Control Area.

Site Alteration By-law

The City of Kitchener passed By-law 2010-43 prohibiting or regulating the placing or dumping of fill, the removal of soil and the alteration of the grade of land. Under this By-law ‘site alteration’ activities on properties 0.405 hectares (1 acre) and greater may require a Site Alteration Permit be obtained. Site Alteration Permits are administered by the Engineering Services Department. Additional information can be found at www.kitchener.ca.

Tree Conservation By-law

The City of Kitchener passed By-law 2010-42 prohibiting or regulating the destruction or injuring of tree(s). Under this By-law the destruction or injuring of a tree(s) on properties 0.405 hectares (1 acre) and greater may require a Tree Conservation Permit to be obtained. Tree Conservation Permits are administered by the Planning Department. Additional information can be found at www.kitchener.ca.

B.2 PRE-SUBMISSION CONSULTATION

A Pre-Submission Consultation Meeting is required prior to the acceptance of a Site Plan application.

The purpose of this meeting is to identify any studies, reports or plans that will be required to commence processing of the development application(s), and to provide information required to aid in the processing of an application. A Pre-Submission Consultation Meeting may address more than one application provided they are in relation to the same development project.

Pre-Submission consultation does not imply or suggest any decision or approval whatsoever on behalf of City Staff or the City of Kitchener. Further, participating in pre-submission consultation does not allow the Subdivider, applicant, client and/or consultants to undertake any construction or preparatory work on site, including clearing of trees or vegetation and grading.

A Pre-Submission Consultation meeting is required prior to submission of a Site Plan Application unless the Director of Planning or his / her delegate waives the requirement where it has been determined that no reasonable purpose would be served by such a meeting due to the nature of the application. If the requirement for a Pre-submission Consultation Meeting has been waived, the Director or his / her delegate will issue a Waiver of Pre-Consultation.

Pre-Submission Consultation Meetings will be scheduled approximately ten (10) days after the meeting request has been accepted for Site Plan and thirty (30) days for any other application. Please note that staff reserves the right to determine whether sufficient information has been provided to conduct a Pre-Submission Consultation Meeting. Should additional information be required staff will contact the Subdivider/applicant.

The schedule of meeting dates for a Pre-Submission Consultation Meeting for Site Plan can be viewed on the City of Kitchener website.

To request a Pre-Submission Consultation Meeting contact the Program Assistant (Site Development) at 519-741-2316.
Note: Pre-Submission meetings will not be booked until sufficient information has been provided to planning staff. While efforts will be made to book a meeting on your preferred date, meetings will be booked on a first come first serve basis.

Pre-Submission Consultation Meeting Process

Once the Pre-Submission Consultation Meeting request has been accepted a meeting date will be booked. The proposal will be circulated to relevant City departments and external agencies for review. At the meeting, discussion of the proposal will be undertaken outlining what studies, reports and plans are required and to identify any issues that are to be resolved prior to the Site Plan Application stage.

Within approximately ten (10) business days of the Pre-Submission Consultation Meeting, staff will provide the applicant and/or Subdivider with a signed Record of Pre-Submission Consultation. The Record will contain a list of information and material that will be required to process the subject application(s).

Applications for Site Plan Approval must be accompanied by a signed copy of the Record of Pre-Submission Consultation, along with all required information and materials in order to be deemed a ‘Complete Application.’

Please refer to the Pre-Submission Consultation Meeting Application form for a complete listing of submission requirements and fees.

B.3 SITE PLAN APPROVAL PROCESS

Following a Pre-Submission Consultation Meeting, application for Site Plan Approval can be made provided a ‘complete application’ is submitted and accepted by staff.

There are six (6) types of Site Plan Applications:

1. Full Site Plan:

This type of application is required for proposals for facilities or matters pursuant to Section 41 of The Planning Act, R.S.O. 1990 c.P.13 (i.e., widenings, access ramps, curbing, traffic direction signs, surfacing of loading, parking and access areas, walkways, lighting, landscaping, storage and collection areas, drainage and sewage easements, or grading) requiring a Development Agreement being registered against title prior to the issuance of any building permits.

2. Major Change to an Approved Site Plan:

This type of application is required for proposals which have an approved site plan or involve lands for which a Section 41 Development Agreement is already registered against title, and which are in substantial compliance with a previously approved site plan. In limited situations, previous site plan agreements may be required to be released from title in favour of registering a new site plan agreement on title.

3. Minor Change to an Approved Site Plan:

This type of application is required for proposals which have an approved site plan or involve lands for which a Section 41 Development Agreement is already registered against title, and which are in
substantial compliance with a previously approved site plan. In limited situations, previous site plan agreements may be required to be released from title in favour of registering a new site plan agreement on title.

4. **Stamped Plan Approval:**

This type of application is for proposals involving minor expansions or minor additions to an existing building or a street-fronting development (such as street-fronting townhouses).

Stamped Plan Approval may require that certain conditions be met prior to final approval being granted and/or where there is an existing Site Plan Agreement registered on title, the applicant/Subdivider may be required to re-satisfy certain conditions of approval.

Where development requires stamped plan approval within an approved plan of subdivision (i.e. for street townhouses), a letter of compliance from the Engineering Consultant to the satisfaction of the Director of Engineering is required. This letter is intended to be an acknowledgement that an approved engineering plan for servicing, grading and driveway locations is in place and will be adhered to (an example of this letter is provided in the Site Plan Application).

5. **Housekeeping / As Built Revision:**

This type of application is required where Site Plan Approval has been previously granted, and where upon final inspection it is found that the development has not been built to plan. A Housekeeping or As Built Revision to the approved plan may be required to recognize the ‘as built’ condition. Consideration of this type of application is at the discretion of the Supervisor of Site Development. Generally any changes contemplated for housekeeping or as built changes to the approved site plan, must be extremely minor.

6. **Deemed Not Development:**

This type of application pertains to proposals which do not constitute development as defined by the Planning Act, but where it may be beneficial to formally document minor site works. An application is required to formally deem the works not development.

**Site Plan Review Committee (SPRC):**

Applications for a Full Site Plan or a Major Revision to a Site Plan will be reviewed and considered at a meeting with the City's Site Plan Review Committee (SPRC). SPRC meetings are held Wednesdays at 9:30 am and 11:00 am. The Committee must have the required documentation at least eighteen (18) business days prior to the scheduled meeting to allow for circulation to City departments and external agencies.

The schedule of Site Plan Review Committee meeting dates can be viewed on the City of Kitchener website.

Site Plan applications subject to the Public Participation Policy are required to submit documentation at least 29 business days prior to the scheduled meeting. The Public Participation Policy applies to new commercial development within areas designated Planned Commercial Campus, Mixed Use Node, or other commercial areas deemed appropriate. The policy requires that the application be circulated for information and comment to all immediately adjacent low rise residential property Subdividers, and where applicable, Neighborhood Associations.
A full site plan application takes approximately six to eight (6-8) weeks to reach ‘Approval in Principle’.

If the Property owner changes Agents during the Site Plan Approval process, a notice in writing must be forwarded to the Planner assigned to the project prior to further transactions occurring.

At the SPRC meeting staff and external agencies provide the applicant/Subdivider with their comments related to the proposed development and resolve outstanding issues. If it is determined that the development can proceed, the Supervisor of Site Development will grant ‘Approval in Principle’ and outline the Conditions Required for Issuance of Site Plan Approval as well as the Conditions of Development to be incorporated into the Section 41 Development Agreement.

Once the Supervisor of Site Development has granted ‘Approval in Principle’ the applicant will be formally advised, in writing, as to the final disposition of the proposed development. This ‘Approval in Principle’ letter will outline all of the Conditions and any additional approvals required for issuance of Site Plan Approval.

The City of Kitchener Site Plan Review process has many components that are reviewed and may be required for each individual development. This may include the need to prepare a Parkland Dedication Plan, specific Urban Design Guidelines, Digital Submission Requirements, Letter of Credit Policy and so on.

**Failure to comply with the submission requirements will delay the acceptance and processing of a site plan application.**

Questions pertaining to the site plan application process may be made in person at: Development & Technical Services Department, Planning - 6th Floor, 200 King Street West, Kitchener, Ontario or by telephone (519) 741-2426.

Please refer to the Site Plan Application form for a complete listing of submission requirements and fees.

**B.4 CONDITIONS REQUIRED FOR ISSUANCE OF SITE PLAN APPROVAL**

Please refer to the City of Kitchener website for the standard list of potential conditions that may be required prior to issuance of Site Plan Approval:

In addition, special conditions pertinent to the proposed development may also be added.

Once all of the ‘Conditions Required for Issuance of Site Plan Approval’ have been completed, Site Plan Approval will be granted.

**B.5 SECTION 41 DEVELOPMENT AGREEMENT**

Please refer to the City of Kitchener website for an example Section 41 Development Agreement listing all potential conditions that may pertain to a development:

In addition, special conditions pertinent to the proposed development may also be added.

**B.6 BUILDING PERMITS**
A Building Permit shall not be issued until all ‘Conditions Required for Issuance of Site Plan Approval’ have been completed, Site Plan Approval is granted by the Supervisor of Site Development and the Section 41 Development Agreement is executed and registered on title. If a Section 41 Development Agreement is not required, then a building permit shall not be issued until all ‘Conditions Required for Issuance of Site Plan Approval’ are fulfilled and Site Plan Approval is granted.

If there are no conditions pertaining to the development, then a building permit may be issued once Site Plan Approval has been granted or the application is ‘Deemed Not Development’ by the Supervisor of Site Development. Refer to the Building Division website for their criteria and possible additional requirements prior to release of building permits (e.g. Building staff may require a grading plan although other divisions may not).

B.7 HERITAGE IMPACT ASSESSMENTS AND CONSERVATION PLANS

Prior to Site Plan Approval for the proposed development, the Subdivider is required to submit a Heritage Impact Assessment and/or Conservation Plan, in accordance with the requirements of Heritage Planning staff and “Info Sheet #5 Heritage Impact Assessment and Conservation Plans” of the Ministry of Culture’s Ontario Heritage Tool Kit, to the satisfaction of the City of Kitchener’s Director of Planning.

B.8 GENERAL INFORMATION:

If no other time frame is spelled out in the Site Plan Agreement, formal Engineering approval must be received prior to Site Plan Approval being granted and thus issuance of a Building Permit for the site. Further, detailed Engineering review will not commence until “Approval in Principle” is granted due to potentially significant revisions/changes to the site plan.

All Engineering drawings submitted to Development Engineering for review and approval must reflect the site plan that was Approved in Principle by the Supervisor of Site Development.

Engineer of record must provide certification of works prior to change or Owner(s) must provide written commitment from any new Engineer of record to certify installations installed to date. If City staff find deficiencies in the construction, a fee as per the City’s approved Fee Schedule will be charged to the owner for any subsequent inspections as required.

Multiple Unit Identification Sign – this may be required by The City’s Chief Fire Prevention Officer if there are multiple buildings or multi-tenants buildings on a property. The Emergency Service Policy is available at on the City of Kitchener Website.

Kitchener Utilities - Kitchener Utilities is responsible for water connections within the right of way and approval of water meter locations as per the Policy for Properties requiring multiple meters. Submission of proof of approval from Kitchener Utilities shall be submitted to Development Engineering where required.

Region of Waterloo - The Region of Waterloo is responsible for trunk water and wastewater systems on Regional Roads. Any site development which impacts Regional facilities must be reviewed by the Region and approval provided to the Director of Engineering.
Grand River Conservation Authority (GRCA) – If development is proposed within an area regulated by the GRCA, a Fill, Construction and Alteration to Waterways Permit from the GRCA may be required.

Utilities - The Subdivider is responsible for the coordination of telephone, cable TV, fibre optics, etc. for the Site. The infrastructure shall be accurately represented in the utilities drawings.

Ministry of Transportation (MTO) - a Building / Land Use Permit from the Ministry of Transportation may be required for certain development applications.

Regional Conditions - The Region may impose conditions with respect to Section 41 (8) of the Planning Act relating to access to and from Regional road; off-street loading, parking and access driveways; lot grading and drainage; salt management, sidewalks, stormwater management, environmental issues (Phase I / II ESA's) and widenings of Regional roads.

Cost Estimate / Letter of Credit - A cost estimate for 100% of the total cost of all “site development works” may be required to be submitted to the City. The cost estimate shall include materials, installations, removals, closures and restorations, project management / co-ordination, and site supervision, inspection and certification of all site development works. In conjunction with the cost estimate, a Letter of Credit may be required to be posted with the City of Kitchener. Please refer to The City of Kitchener Letter of Credit for Site Development Works Policy.

Letter of Certification – A letter of certification is required by the Professional Engineer who completed the grading and Stormwater Management design for the site prior to release of the letter of credit. Once the Site Works Notification Form is submitted to Engineering Services a site inspection will be completed to confirm the site was built as per the design. If City staff find deficiencies in the construction, a fee, as defined by the City’s approved fee schedule will be charged to the Subdivider for any subsequent inspections as required. Please refer to The City of Kitchener Letter of Credit for Site Development Works Policy.

### B.9 ENGINEERING REQUIREMENTS FOR SITE PLAN APPROVAL

#### B.9.1 Report Formats/Submission Requirements

The City of Kitchener Report Formats / Submission Requirements are listed in the Site Grading, Erosion Control, Servicing & Stormwater Management Guidelines.

#### B.9.2 Purpose

The following information is to be included as part of the submission requirement to be provided to the City of Kitchener – Engineering Services in order to satisfy the Grading, Servicing and Stormwater Management conditions as stated in the Section 41 Development Agreement.

#### B.9.3 Engineer’s Qualifications

A “registered” Professional (Civil) Engineer, specializing in Municipal/Hydrology must endorse all design drawings and reports for Grading, Erosion and Sedimentation Control, Site Servicing and Stormwater Management. A “registered” Professional Engineer must endorse any geotechnical analysis. If a hydrogeological analysis is required, a P.Eng or P.Geo. specializing in hydrogeological studies must endorse the work. All engineers must be operating under a Certificate of Authorization issued by the Professional Engineers of Ontario.
All drawings and reports prepared by the professional engineer are to be sealed, signed and dated.

As the grading and stormwater management designs are inter-related it is recommended that the engineer and/or engineering firm that designed the site grading also develop the stormwater management scheme.

B.9.4 Coordination of Drawings

It is imperative that the engineer responsible for stormwater management coordinate all related drawings, details and specifications through the prime consultant to ensure they are compatible with the approved site plan, architectural plans, and landscaping plans, etc. Drawings that are not compatible with the other disciplines may result in undue delays in clearing the conditions of the Development Agreement.

Where a Landscape Plan and a Grading Plan is submitted, a Landscape Architect will be required to sign off on the Grading, Stormwater Management, and Erosion and Sedimentation Control plans as well as any plans with grading or erosion notes on it in order to ensure coordination between the drawings. Conversely, the Landscape Plan will need to be signed by the Consulting Engineer responsible for the grading. Drawing submissions without signatures will not be accepted by Development Engineering staff.

B.9.5 Submission Requirements

Submission Requirements are available in the Site Grading, Erosion Control, Servicing & Stormwater Management Guidelines.

B.9.6 Site Servicing Plan

Prior to Site Plan Approval for the proposed development, the Subdivider agrees to submit a detailed site servicing plan, which illustrates the location of all existing and proposed storm, sanitary, and water services on site to the street sewer or main. Along with the Site Servicing Plan, all sewer design sheets are required for the development up to the street sewer or main. For developments which are implementing stormwater management measures the servicing plan shall show the entire storm system within the site. Termination of existing service connections and/or installation of new service connections will be completed, at the Subdivider's expense, by the City unless otherwise specified by Engineering Services. An application for the termination and/or installation of services and/or inspection fees is to be made to Engineering Services. Upon receipt of all funds for the service connections and/or inspection fees, a work order will be generated authorizing the work to proceed.

For a complete list of the requirements refer to the Site Grading, Erosion Control, Servicing & Stormwater Management Guidelines.

B.9.7 Grading and Drainage Control

Prior to Site Plan Approval for the proposed development, the Subdivider agrees to prepare a detailed Grading and Drainage Control Plan, including infiltration of rooftop runoff where soil conditions permit, showing drainage details for the subject property, abutting properties and public rights-of-way so as to ensure compatible drainage, and to show thereon all existing and proposed connections to the municipal storm sewer, and all detailed erosion and siltation control features; all to the satisfaction of the City's
Within six (6) months of occupancy, or as soon as weather conditions permit, of the proposed development the Subdivider agrees to complete the site grading and drainage scheme in accordance with the Grading and Drainage Control Plan that was approved by the City.

For the life of the proposed development the Subdivider agrees that the City shall not release this Section or any of the conditions related to site works required to be maintained for the life of the proposed development. The Subdivider further agrees to maintain the grading and drainage scheme in a state acceptable to the City's Engineering Services or the City’s Chief Building Official.

The applicant shall review existing development agreements to determine their effects upon the subject site.

The Subdivider shall not permit any grading or change in elevation or contours of the land which could result in the obstruction of natural or artificial drainage courses, discharge of surface water on adjacent lands or public highways or a detrimental visual or physical impact in adjacent properties or drainage to sanitary sewers.

Where the proposed grading or change in elevation will change the natural drainage pattern, the Applicant has to provide clear evidence that these changes will not result in the blockage of natural drainage, ponding of water on adjacent properties or the discharge of surface water on the adjacent properties or highways. All surface water collected on the site must be discharged to an outlet approved by the Agency having jurisdiction. The capacity of this outlet will need to be verified by the Consultant and submitted to the City.

For a complete list of the submission requirements refer to the Site Grading, Erosion Control, Servicing & Stormwater Management Guidelines.

B.9.8 **Environmental Impact Study (EIS)**

An Environmental Impact Study (i.e. Environmental Impact Statement or Environmental Implementation Report) may be required to identify and evaluate the potential effects of a proposed development or site alteration on elements of the Greenslands Network (as identified within the Region of Waterloo Official Plan) and / or Natural Habitat Network (as identified within the City of Kitchener Official Plan), and recommend means of preventing, minimizing or mitigating these impacts, as well as enhancing or restoring the quality and connectivity of elements of the Networks.

An Environmental Impact Study may also be used to interpret the boundaries of these elements. The Province, Region, City and the Grand River Conservation Authority (GRCA) will co-ordinate the requirements for the preparation of Environmental Impact Studies.

Note, the term “Environmental Implementation Report” is the term for the combined “Preliminary SWMP” and EIS/GVO required in areas of the City where subwatershed studies have been completed, and / or where community plans reference / require such a “combined” supporting study.

B.9.9 **Stormwater Management (SWM)**

In order to satisfy site plan conditions, a detailed Stormwater Management Report complete with the required drawings and a Stormwater Management Plan will be required. For a complete list of the...
applicable studies and policies which dictate the stormwater management criteria for each development area refer to the Site Grading, Erosion Control, Servicing & Stormwater Management Guidelines. MOE Certificate of Approvals are required if a development is zoned industrial, or directly discharges to a watercourse.

B.9.10 Contribution

Where a development lies within a part of the City identified for Community Infrastructure Levy (CIL) contribution through the annual Stormwater Management audit. The rate per hectare will be implemented at time of payment after the development application has been accepted by the City.

B.9.11 Environmental Site Assessment (ESA) Site Plan

An Environmental Site Assessment shall be undertaken for the Site when a portion of the site is to be dedicated to the City free of encumbrances and/or when the Region requires land dedication for a road widening. When lands that are to be dedicated to the City of Kitchener, a Phase I/II Environmental Site Assessment must be completed in accordance with either CSA Standard Z768-01 or Schedule D of Ontario Regulation 153/04. The Building Division may also require a RSC when a property is changing the land use through a Site Plan application, Building Permit. Under Ontario Regulation 153/04, a RSC will be required if the proposed development will change the site to a more sensitive land use.

B.9.12 Geotechnical Investigation

A geotechnical investigation shall be required to be carried out by a competent consulting engineer in order to assess soils condition with respect to the proposed infrastructures and building construction. The geotechnical report will need to identify if the soils are conducive to infiltration of clean roof water (15 mm/hr required).

B.9.13 Fire Flow Analysis

The Fire Flow Analysis Report is to demonstrate that the fire load for the development, including existing buildings, will not exceed the water available for fire protection from the municipal distribution system.

The following is the minimum requirements of the Fire Flow Analysis Report for review by Kitchener Utilities:

- Site plan detailing the water service, nearest municipal hydrants on the street, test hydrants, private hydrants, etc.;
- Description of the building construction materials and intended use;
- Calculation of fire load of the entire site development including new and existing buildings (summary only for sprinkler calculations);
- Details of hydrant fire flow test including time and date of test, persons conducting test, residual and pito pressure readings, graph of results (minimum three flow points plus static pressure), clear sketch of flow and residual test hydrant locations;
- Use metric units (L/min for flow and kPa for pressure);
- Due to the possibility of discoloured water, notify Kitchener Utilities or any key customers in the area if completing a private hydrant flow test. Plot the fire load on the hydrant fire flow test results graph. For sprinkler systems, provide the envelope of flow and pressure requirements including simultaneous fire department needs at private and municipal fire hydrants;
- List the application of codes, standards and/or guidelines used in the report preparation. The minimum requirements must satisfy the latest edition of the Ontario Building Code. The Fire Underwriters Survey is also an acceptable standard;
- Unless otherwise demanded by sprinklered system, the fire load must be supplied by the water distribution at a minimum pressure of 140 kPa in the main at the fire hydrant (municipal or private) to provide fire protection. This minimum pressure must be available on the day of the year with the maximum system demand;
- If the fire load is within 70kPa of the water pressure available, the City of Kitchener reserves the right to request additional flow tests, hydraulic calculations, computer modelling, etc., to ensure that the water distribution system can satisfy the fire flow during the maximum day system demand;
- Signed by an individual deemed competent to perform fire flow calculations such as a Professional Engineer. In doing so, this individual is attesting that:
  - The fire flow analysis is representative of the building to be constructed. Subsequent modification of the building will require the resubmission of the fire flow analysis.
  - All codes, standards and guidelines used in the report have been applied appropriately,
- If the proposed development is adjacent to a relatively large municipal watermain and the fire load is comparatively small, then the applicant may submit an abbreviated Fire Flow Analysis Report. This condensed report would comply with the above conditions excluding any computer modelling or hydrant flow test requirement, for consideration to waive a full fire flow analysis.

### B.10 ENGINEERING REQUIREMENTS FOR SITE PLAN APPROVAL

Refer to Procedure for Off-Site Works Permit By Private Contractors (Appendix D).
C ROADS

C.1 GENERAL

The geometric design of municipal roads shall conform with standards set out in the latest edition of the “Geometric Design Guide for Canadian Roads and Streets” issued by the Transportation Association of Canada (TAC), and the Ontario Provincial Standards (OPS), or as amended herein. The City of Kitchener prefers a grid network pattern for the transportation network system.

Generally, roads are classified as local, minor collector, major collector or secondary arterial as defined in the City of Kitchener’s Official Plan.

Arterial roads are intended to distribute large volumes of traffic between other Arterial Roads and Major Collector Roads. The primary purpose of Arterial Roads is to carry through traffic within and between municipalities.

Collector Roads provide for both traffic service and land access. The primary traffic service function is to carry traffic between Local Streets, other Collector Roads and the Arterial Road system.

Local Road's generally serve only the abutting properties and are not intended to carry through traffic.

C.2 GEOMETRIC STANDARDS

<table>
<thead>
<tr>
<th></th>
<th>Local Road</th>
<th>Minor Collector Road</th>
<th>Major Collector Road</th>
<th>Secondary Arterial Road</th>
</tr>
</thead>
<tbody>
<tr>
<td>AADT</td>
<td>Up to 2,000</td>
<td>2,000 - 8,000</td>
<td>8,000 - 12,000</td>
<td>12,000 - 20,000</td>
</tr>
<tr>
<td>R.O.W. (minimum)</td>
<td>18.0m</td>
<td>20.0 - 26.0m</td>
<td>20.0 - 26.0m</td>
<td>30.0 - 35.0m</td>
</tr>
<tr>
<td>Pavement Width</td>
<td>9m*</td>
<td>10.4*</td>
<td>12.4 - 15.4*</td>
<td>10.0 - 18.0</td>
</tr>
<tr>
<td>Minimum Grade</td>
<td>0.5%</td>
<td>0.5%</td>
<td>0.5%</td>
<td>0.5%</td>
</tr>
<tr>
<td>Maximum Grade</td>
<td>8.0%</td>
<td>6.0%</td>
<td>6.0%</td>
<td>5.0%</td>
</tr>
<tr>
<td>Maximum Grade for Through Roads at Intersection</td>
<td>3.5%</td>
<td>3.0%</td>
<td>3.0%</td>
<td>3.0%</td>
</tr>
<tr>
<td>Vertical alignment/ cross slope at intersection</td>
<td>In accordance with Transportation Association of Canada geometric design criteria</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Maximum Grade for Stop Roads at Intersection</td>
<td>2.5%</td>
<td>1.5%</td>
<td>1.5%</td>
<td>1.5%</td>
</tr>
<tr>
<td>Minimum Curb Radius at Intersection with Arterial Road****</td>
<td>9.0m</td>
<td>9.0m</td>
<td>9.0m</td>
<td>15.0m</td>
</tr>
<tr>
<td>Minimum Curb Radius at Intersection with Collector Road****</td>
<td>9.0m</td>
<td>9.0m</td>
<td>9.0m</td>
<td>15.0m</td>
</tr>
<tr>
<td>Minimum Curb Grade</td>
<td>0.5%</td>
<td>0.5%</td>
<td>0.5%</td>
<td>0.5%</td>
</tr>
<tr>
<td>Minimum Curb Grade at</td>
<td>0.8%</td>
<td>0.8%</td>
<td>0.8%</td>
<td>0.8%</td>
</tr>
</tbody>
</table>
### Table 4: GEOMETRIC STANDARDS

<table>
<thead>
<tr>
<th></th>
<th>Local Road</th>
<th>Minor Collector Road</th>
<th>Major Collector Road</th>
<th>Secondary Arterial Road</th>
</tr>
</thead>
<tbody>
<tr>
<td>Radius of Intersections</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cul-de-Sac Minimum Outside Curb Radius (distance from the centre of the cul-de-sac bulb to the curbface on the outside circumference cul-de-sac)</td>
<td>15.5m</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>Minimum Centreline Radius</td>
<td>60m**</td>
<td>80m</td>
<td>115-185m</td>
<td>185-400m</td>
</tr>
<tr>
<td>Design Speed</td>
<td>50km/h</td>
<td>50 - 60km/h</td>
<td>50 - 60km/h</td>
<td>60 - 80km/h</td>
</tr>
<tr>
<td>Vertical Curve Min. sight stopping distance</td>
<td>85m</td>
<td>85m</td>
<td>85m</td>
<td>85-140m</td>
</tr>
<tr>
<td>LVC = KA (MUTC) K. for Sag K. for Crest</td>
<td>12 8</td>
<td>20</td>
<td>20</td>
<td>9 or 16, 13 or 36</td>
</tr>
<tr>
<td>Horizontal Curve Minimum Sight Stopping Distance</td>
<td>85m</td>
<td>85m</td>
<td>85m</td>
<td>85-140m</td>
</tr>
<tr>
<td>Maximum Superelevation</td>
<td>N/A</td>
<td>N/A</td>
<td>As Required</td>
<td>As Required</td>
</tr>
<tr>
<td>Intersection Angle</td>
<td>70-110° at local, 80-100° at collector and arterial***</td>
<td>80-100°***</td>
<td>80-100°****</td>
<td>90°</td>
</tr>
<tr>
<td>Minimum Intersection Spacing Between Adjacent Intersections measured from centreline to centreline of the intersections</td>
<td>60.0m</td>
<td>60.0m</td>
<td>60.0m</td>
<td>200.0m</td>
</tr>
</tbody>
</table>

* Measured curbface to curbface.
** Except at 90° corners for crescents and courts.
*** All streets are to intersect at 90° unless existing road alignments or property restrictions require otherwise.
**** All bus routes have to have a minimum 12.0 m curb radius regardless of road classification.

### C.3 ROAD PAVEMENT DESIGN

The pavement design for arterial roads will be considered on an individual basis. The composition and construction thickness of the road pavement shall be designed based upon the following factors as outlined in the geotechnical soils report:
Mechanical analysis of the subgrade soil;
- Drainage;
- Frost susceptibility, and
- The future volume and class of traffic expected to use the pavement.

Pavements shall be designed for a minimum ADT - 1000 vehicles and an anticipated life of 25 years.

<table>
<thead>
<tr>
<th></th>
<th>Surface Course</th>
<th>Binder Course*</th>
<th>Base</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Local</strong></td>
<td>40 mm HL3</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>60 mm HL4*</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>150 mm Granular ‘A’</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>400 mm Granular ‘B’</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Collector</strong></td>
<td>40 mm HL3</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>60 mm HL4*</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>150 mm Granular ‘A’</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>450 mm Granular ‘B’</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Local, Collector and Arterial (Industrial)</strong></td>
<td>40 mm HL3</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>100 mm HL4</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>150 mm Granular ‘A’</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>450 mm Granular ‘B’</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Arterial</strong></td>
<td>40 mm HL3</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>100 mm HL4</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>150 mm Granular ‘A’</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>450 mm Granular ‘B’</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

The above are minimum design requirements. The Subdivider is required to engage a Geotechnical Consultant with experience in pavement design to confirm the minimum design based on results of the geotechnical investigation.

On roads that are designated Arterial, a concrete edge strip or "kill strip" shall be constructed as per Region of Waterloo Standard Drawing 211, Boulevard Concrete Edge Strip Detail.

* On roads designated as transit routes, the base course asphalt thickness shall be a minimum 100 mm.

Bus bays shall be in accordance with the TAC Geometric Design Guidelines for Canadian Roads.

**C.4 TRAFFIC CALMING**

The primary function of Traffic Calming measures are to reduce speeds, deter non-residential traffic from the area and reduce the incidence of collisions, thereby increasing safety for all users within the right-of-way. In addition, well-designed and landscaped Traffic Calming measures can enhance a neighbourhood’s appearance and the quality of life for its residents.

The City of Kitchener Traffic Calming Policy approved by the City Council encourages Subdividers to incorporate traffic calming measures in new plans of development. For new subdivisions, some traffic calming measures that can be incorporated are curb extensions, raised crosswalks, median islands and roundabouts.
C.5 ROUNDABOUTS

At intersections where traffic signals are warranted, the Regional Municipality of Waterloo roundabout policy and related process is applicable and the City of Kitchener will consider the installation of roundabouts at these locations.

All Collector / Arterial Roads intersecting with other Collector/Arterial should be considered for the installation of a roundabout. All roundabouts are to be designed by a qualified roundabout design engineer.

Prior to the undertaking of a detailed Intersection Control Study (ICS) to determine the feasibility of a roundabout, an initial Screening must be completed. The Initial Screening shall involve the following:

- Determine the scope of the intersection improvements to implement the traffic signals and other turning lanes and scope of work to implement a roundabout;
- Complete a Traffic Flow worksheet and preliminary lane configuration for the proposed roundabout;
- Develop a preliminary cost estimate to implement each of the traffic control alternatives (roundabouts and signals), and
- Develop a 20-year injury collision costs and implementation costs for each alternative, adjusted to Present Value and compare the results.

The design of roundabout shall include a property line setback from the back of the curb with adequate space to locate utilities in their standard location.

The Region of Waterloo includes information on roundabouts on their website.

The Region of Waterloo Roundabout Feasibility Initial Screening is available on their website:

C.6 ROAD ALLOWANCE CROSS SECTION

The typical road allowance cross-section shall be as per standard drawing 101 ‘20.0 Minor Collector’. Details shall be provided for any approved special provisions required due to unique physical conditions on the site or for existing or future design conditions such as retaining walls, slope protection, culverts, bridges or special crossfall conditions.

C.7 ROAD SUB-DRAINS

In general, sub-drains will be required to run continuous along both sides of all roads, as per OPSD 216.021. Perforated PVC sub-drain shall be 150mm in diameter, and below road base. However, Development Engineering staff will consider reducing sub-drain requirements for a particular development where a Geotechnical engineering consultant indicates that there will be no adverse effects to the road either during or after construction.

In all cases, sub-drains will be required for a minimum length of 3.0 m on the upstream side of all catchbasins.

Refer to the DGSSMS Section B.4.4.7 for more information regarding sub-drains.
C.8 **INTERSECTION VISIBILITY**

Transportation Engineering staff in consultation with Development Engineering staff may require the dedication of property for intersection daylighting triangles if deemed necessary. For further information refer to the City of Kitchener Zoning By-law 85-1 - Section 5.3 ‘Prohibited Obstructions in Corner Visibility Triangle’, Section 5.9 ‘Reduction in Regulations Resulting from Street Widening’ and Section 5.9A ‘Regulations from Daylight Corners’.

C.9 **CURBS**

Barrier curb with standard gutter as shown on Ontario Provincial Standard Drawing OPSD 600.040 shall be used on all streets including cul-de-sacs islands except with reverse slope gutter. Saw cutting of curb or entrance depressions will be allowed. "Capping" of curb depressions will not be permitted. All depressions not used as property entrances shall be replaced with full barrier type curbing. Granular A is to be compacted 150mm past the back of curb. Concrete barrier curb with standard gutter shall have additional width where sidewalk is adjacent to curb or concrete driveway ramps, as per OPSD 600.040.

Mountable curbs with standard gutter as per OPSD 600.060 may be used along the outer radius in the bulb section of the cul-de-sacs. Mountable curbing may also be used in specific situations and/or areas approved by Development Engineering staff in consultation with Transportation Engineering staff.

C.10 **BOULEVARDs**

For boulevards where trees will be planted, as identified on the Tree Planting Plan the approved topsoil will be installed to a depth of 450mm per the requirements of Section M of the manual and sodded with No. 1 nursery sod. All construction debris and surplus granular material will be removed to the required depth and replaced with parent material compacted to 85% proctor. For boulevards where trees will not be planted, at least 150mm of topsoil will be placed in the boulevard and sodded with No. 1 nursery sod.

C.11 **SIDEWALKS**

Concrete sidewalks within the City of Kitchener are to be constructed as per OPSD 310.010 and their locations are to be constructed to the following minimum standards in accordance with OPSS 351:

- 1.5m width, with adjacent boulevard;
- 2.0m curb face;
- Minimum depth of 150mm Granular ‘A’;
- Concrete sidewalk to be 125mm thick across boulevards, residential driveways and adjacent to curbs;
- At intersections with Regional Roads a minimum of 200mm thick concrete shall be used for wheel chair ramps and sidewalks;
- For sidewalks in business parks/industrial areas, please refer to the City of Kitchener Sidewalk Policy;
- Intersection ramps shall be in accordance with Standard Drawing 116 or conform to Standard Drawing 117 Curb and Gutter with Adjacent Sidewalk;
- Sidewalks at driveway ramps within Commercial and Industrial areas shall be a minimum of 200 mm thick concrete as per OPSD 310.01; Where trees have been identified on the Tree Planting Plan.
Plan the required root pathways will be placed in the parent material prior to the installation of sidewalks to meet all of the requirements of the Tree Planting Plan and Section M of this manual.

Concrete sidewalks are required:

- Along both sides of all roads;
- Along both sides of all roads within the Downtown Districts, with the exception of public lanes;
- Along both sides of a cul-de-sac and the perimeter of the cul-de-sac bulb;
- Sidewalks are not required on designated scenic roads, and
- For roadways contained within a Heritage Conservation District, sidewalks shall be provided in accordance with the respective District approved policies.

For further information and sidewalk accessibility requirements please refer to the City of Kitchener Sidewalk Policy and the City of Kitchener Barrier Free Accessibility Guidelines.

C.12 WALKWAYS

All Walkway Blocks shall be a minimum of 6.0 m in width unless otherwise noted. The Subdivider will construct a 1.5 m wide by 125 mm thick concrete walkway to City of Kitchener current specifications over a minimum 150 mm compacted Granular "A" base. On both sides of the concrete sidewalk the Subdivider will place a minimum 150 mm of the specified topsoil material and fine grade to achieve positive drainage in accordance with the Approved Grading Plan, and sod using No. Nursery grown sod. At the property lines both sides, the Subdivider will construct on Walkway Block property a 1.2 m high galvanized chain link fence consisting of the specified materials including terminal posts and line posts cast into poured in place concrete footings, top and bottom horizontal railing, No. 9 gauge galvanized wire mesh with 38 mm x 38 mm openings. (Refer to Standard Drawings 111 Public Walkway Details and 507 Chainlink Walkway Details.)

For walkways longer than 30 m, with a slope of 1% or less, a 2% crossfall should be considered to help facilitate drainage.

C.12.1 Walkways – Emergency Access

All Walkway – Emergency Access Blocks shall be a minimum of 6.0 m in width unless otherwise noted. The Subdivider will construct a minimum 4 m wide emergency vehicle carriageway. The carriageway will consist of a 1.5 m wide by 125 mm thick concrete walkway to City of Kitchener current specifications over a minimum 300 mm compacted Granular "A" base, and on both sides, a 1.25 m wide hot laid asphalt paved driving surface consisting of a 50 mm thick HL4 binder course and 40 mm thick HL3 wearing course to achieve a total 90 mm pavement over a minimum 300 mm compacted Granular “A” base. Both sides of the carriageway the Subdivider will place a minimum 150 mm of the specified topsoil material and fine grade to achieve positive drainage in accordance with the Approved Grading Plan, and sod using # 1 Nursery grown sod. At the property lines both sides, the Subdivider will construct on Walkway – Emergency Access Block property a 1.2 m high galvanized chain link fence consisting of the specified materials including terminal posts and line posts cast into poured in place concrete footings, top and bottom horizontal railing, No. 9 gauge galvanized wire mesh with 38 mm x 38 mm openings. At the property line at both street frontages of the Walkway – Emergency Access Block, the Subdivider will install two of the specified Standard Park Gates cast into poured in place concrete footings, to achieve
the locking vehicle barrier with minimum 1.5 m – maximum 1.8 m clear space centered on the concrete sidewalk. (Refer to Standard Drawings 114 Walkway – Emergency Access Details.)

C.13  **MULTI-USE TRAILS**

For details regarding the multi-use trails, refer to Section L.16.

C.14  **BIKE LANE (ON ROAD)**

Bicycle lanes shall have the same structural standard as the road base. Bicycle lanes are to be a 1.5 m lane in addition to the normal road cross-section designated by appropriate markings, as per the City of Kitchener’s current Bikeway Study. During the final design, the bicycle circulation signage and markings will be determined by Transportation Engineering staff in accordance with the City of Kitchener’s current Bikeway Study.

C.15  **CUL-DE-SACS**

All local roads which permanently terminate at one end (dead end streets) shall be provided with a turning circle (cul-de-sac) of sufficient area to enable the turning of garbage trucks, snow removal equipment and emergency vehicles. A road allowance with a 20.0 m radius will be required for a cul-de-sac with a pavement radius of 15.5 m. Cul-de-sacs shall be in conformance with the Emergency Services Policy.

Where an emergency access is required in accordance with the provision of the Emergency Services Policy, the emergency access shall be constructed as per Section C.12.1, Walkways - Emergency Access.

C.16  **INTERSECTIONS**

Refer to the latest edition of the “Geometric Design Guide for Canadian Roads and Streets” issued by the Transportation Association of Canada (TAC), section 2.3.2.3 Vertical Alignment and Cross Slope for requirements regarding intersection drainage and intersection cross falls.

C.17  **ON-STREET PARKING**

Design has to adhere to the City of Kitchener’s On-Street Parking Policy. An On-Street Parking Plan may be required in support of an application for a Plan of Subdivision in accordance with the Design Brief for Suburban Development and Neighbourhood Mixed Use Centres.

C.18  **TRAFFIC CONTROL – SIGNS AND PAVEMENT MARKINGS**

C.18.1  **Street Name and Rural Street Signs**
The City is responsible for approving, supplying and installing all street name signs while the Subdivider is responsible for the costs. An invoice will be sent to the Subdivider by the City after the installation of the street name signs.

C.18.2 Traffic, Pedestrian and Bicycle Control Signs

The City is responsible for supplying and installing all traffic, pedestrian and bicycle control signs where required while the Subdivider is responsible for the costs. An invoice will be sent to the Subdivider by the City after the installation of these signs.

C.18.3 Open Space Signs

The City is responsible for supplying and installing interpretive and regulatory signage related to the public use of woodlands, stormwater facilities, trails and open space while the Subdivider is responsible for the costs. An invoice will be sent to the Subdivider by the City after the installation of the open space signs.

C.18.4 Pavement Markings

The City is responsible for supplying and installing all temporary and permanent pavement markings required for roads and bicycle lanes while the Subdivider is responsible for the costs. An invoice will be sent to the Subdivider by the City after the installation of the pavement markings.

C.18.5 Traffic Signals

The Region of Waterloo is responsible for the design and installation of all traffic signals.

C.19 DRIVEWAY ENTRANCES

The Subdivider shall be required to provide for the excavation, paving and maintenance in good condition, until Final Acceptance, of each driveway from the travelled portion of the road to the lot line if there is no sidewalk. If there is sidewalk, the limit shall be from the travelled portion of the road to the sidewalk (ramp). All driveway ramps in new development shall be constructed of concrete. Where there is no curb and gutter on the road, or where there is no sidewalk, asphalt or concrete pavement can be used for the ramp construction.

Residential ramps are to be concrete and in accordance with Standard Drawing 109, whereas commercial and industrial entrances are to be in accordance with OPSD 350.010.

Where paired driveways are constructed between two adjoining properties, the curb cut-out shall be continuous (i.e. where the barrier curb is less than 1 meter between driveways).

Where a driveway ramp is located on a stubbed street, a minimum of 6m between the ramp and dead-end-barricade is to be provided for snow maintenance, and this area must be included within the phase of the project and within the registered Plan of Subdivision. The number of lots allowed to front onto a stub street shall not exceed one per side. Any
temporary roads or turning circles must be contained within the subject registered Plan of Subdivision.

The following minimum standards apply to driveway entrances:

a) Concrete (City of Kitchener Standard Specifications applies to this item)
   i) Residential – 150 mm concrete and 150 mm Granular ‘A’ base, Commercial & Industrial – 200 mm concrete and 200 mm Granular ‘A’ base.

C.20 NOISE ATTENUATION

As required, a Noise Study must be prepared by a Consultant who is currently registered on the Region of Waterloo’s list of Pre-qualified Consultants for Noise Studies. If the Noise Study was not prepared by a Pre-qualified Consultant, the Consultant’s declaration must be co-signed by a Consultant who is registered on the List.

All reports must follow the Regional Guidelines “Implementation Guidelines for Noise Policies” (Regional Municipality of Waterloo, 1999) and the Environmental Noise Guideline, Stationary and Transportation Sources – Approval and Planning, Publication NPC-300 put out by the Ministry of the Environment (MOE). In addition the Ministry of the Environment requires the use of the Ontario Road Noise Analysis Method for Environment and Transportation (ORNAMENT) to assess the noise impact from existing roadways on planned residential land uses, to assess the noise impact of roadway projects, to establish the ambient noise sources, and for compliant investigation.

C.20.1 General Philosophy of Noise Attenuation

The Environmental Protection Act empowers local municipalities to regulate or prohibit the emissions of sounds or vibrations. Municipal by-laws can prescribe maximum permissible levels of sound or vibration and prescribe procedures for determining the levels of sounds or vibrations.


For further detail refer to the Regional Municipality of Waterloo Requirements.

C.20.2 Noise Barriers

The maximum barrier wall height shall be 2.4 m; total barrier height may be increased by use of a berm and wall combination; barrier heights greater than 2.4 m require approval by the City.

The minimum noise barrier wall height shall be 1.8 m.

The minimum density of the noise barrier wall shall be 20 kg/m² with no holes or gaps.

Noise barrier walls are to be Durisol Precast Noise Barrier, grey stone face finish, or approved equivalent, complete with anti-graffiti coating. Consultants may contact the Development Project Manager for more detail or a sample design.
Noise barrier walls are to be constructed on private property unless approved otherwise by the Director of Engineering. The Subdivider will be responsible to provide a letter of credit for the noise barrier wall as outlined in the Development Agreement and shall guarantee the noise barrier wall for a period of two years after City acceptance of the Engineering Consultant certification. The construction of the noise barrier wall shall be inspected and certified by the Engineering Consultant.

Where berms are utilized as a noise barrier, the berm will be located entirely on the Subdividers property; a chain link security fence will be located on the public side of the property line at the base of the berm. Where the noise barrier is a combination of berm and wall, the berm will be located entirely on the Subdivider’s side of the property line; the wall will be located at the top of the berm; the wall will have a minimum height of 1.8 m. The maintenance of the noise wall will become the responsibility of the resident once the Subdivider’s warranty period has been met. Berms adjacent to Municipal land will have a side slope no steeper than 3:1 (horizontal : vertical) unless otherwise approved by the City.

Where a noise barrier wall is needed adjacent to a City roadway, the wall shall be placed 150mm on the private property side of the property line.

Where the wall is on private property adjacent to public property, the Subdivider shall enter into an Agreement with the City of Kitchener which shall be registered on title of Lots immediately upon registration of the subdivision. Said agreement shall implement the following clause with respect to the noise barrier wall located on these lots and must be included in all offers of purchase/sale and tenancy agreements.

“Purchasers/tenants are advised that a noise barrier wall is located at the rear/side of this property. The owner of this property also owns his/her section of the noise barrier wall. The noise barrier wall is not in public ownership. Monitoring, maintenance, inspection, repair and replacement of this noise barrier wall, including any associated costs, are the sole responsibility of the property owner. The City of Kitchener is in no way responsible for this noise barrier wall. Should this noise barrier wall fail, it is the property owner’s responsibility to repair or replace his/her section of the wall, at his/her cost. If the property owner fails to maintain the noise barrier wall, the City of Kitchener will notify the requirement to repair in writing. If the property owner does not comply with the City’s request, the City will correct the deficiency and bill the property owner accordingly”.

C.21 ENTRANCE FEATURES

The City of Kitchener encourages entrance features. A Subdivider may submit for approval a design proposal for entrance features which may consist of walls, gates, fences, trees, shrubs, flowers and other related components. The Subdivider will be required to enter into an agreement with the City for the construction and maintenance of entrance features within the Subdivision Agreement.

The Subdivider shall maintain the entrance feature indemnifying the City for all claims until the development has been assumed or as otherwise specified in the Agreement.

The Subdivider shall provide a payment for perpetual maintenance fees and securities in accordance with the Subdivision Agreement.

The City reserves the right to remove all or any element of the entrance feature at its discretion.
Entrance features may be located within the public road allowance in centre median islands only or on a separate block adjacent to daylighting triangles. The features shall be designed to maintain proper sight distances and turning movements at driveway assesses and intersections. The design of the entrance feature shall be submitted for approval to the City. Refer to the City of Kitchener, Urban Design Manual for further design details.

All tree planting for entrance features will meet all tree and soil habitat zone requirements identified in Section M of this Manual.

**C.22 FENCING**

Fencing shall conform to the City of Kitchener Fence By-laws 88-5, 2001-211, 2001-242 and Zoning By-law 85-1 and Chapter 630 of the City of Kitchener Municipal Code, and Section C of the City of Kitchener Urban Design Manual.

**C.23 STREETSCAPE AND LANDSCAPING**

All tree planting will meet all tree and soil habitat zone requirements identified in Section M of this Manual.

A Streetscape Plan may be required in support of an application for a Plan of Subdivision in accordance with the Design Brief for Suburban Development and Neighbourhood Mixed Use Centres.

**C.24 UTILITY INSTALLATION**

Location and installation details for utilities must be approved by the City prior to the installation.

All utility trenches within the road allowance are to be backfilled and compacted to 95% Standard Proctor Density.

The Subdivider is responsible to ensure that there is no conflict of plants and appurtenances with other utilities, driveways, tree planting pits, etc.

A Streetscape Plan may be required in support of an application for a Plan of Subdivision in accordance with the Design Brief for Suburban Development and Neighbourhood Mixed Use Centres which would identify the location of all street furniture, driveway cut locations, entrance features, street trees, utility locations, traffic calming features and fencing/landscaping details for corner lots.

**C.25 INSPECTION AND TESTING**

The following are the minimum tests required for roadway construction:

i) Sieve Analysis shall be performed in order to assure that the granular base courses meet the current City of Kitchener specifications. Representative samples are to be obtained by the Consultant prior to and during the road construction operation.
ii) "Density Tests" shall be performed in order to assure that the granular base courses have been properly compacted to the current City of Kitchener Standard Specifications. Density Tests on the road subgrade shall be performed as directed by the geotechnical engineer.

iii) A "Proof Roll" of the road subgrade shall be performed under the supervision of the geotechnical engineer to assure unsuitable road subgrade material is removed, refer to City of Kitchener Standard Specifications.

iv) "Asphalt Tests" shall be performed in order to assure that the binder and surface asphalt meets the current City of Kitchener Standard Specifications and design mixture tolerances.

v) "Concrete Tests" shall be performed on curbs, sidewalks and driveway ramps in order to assure that the concrete meets the current City of Kitchener Standard Specifications.
D WATERMAINS

The City of Kitchener’s Development Manual is to be read in conjunction with the Region of Waterloo and Area Municipal Design Guidelines and Supplemental Specifications for Municipal Services (DGSSMS). In the case that the Development Manual differs from the DGSSMS, the Development Manual will supersede the DGSSMS.

Section D, Watermains, of the Development Manual has been structured to match the section headings of the DGSSMS. The underlined portion of the following Section D headings matches that of the DGSSMS (eg. D.B.2.1.1 would be Section B.2.1.1 of the DGSSMS).

The Safe Drinking Water Act, 2002, section 12 requires that “No person shall operate a municipal drinking-water system or a regulated non-municipal drinking water system unless the person holds a valid operator’s certificate issued in accordance with the regulations”. Only certified City of Kitchener Utilities operators can operate the drinking water system, once bacteriological testing is complete and the new watermain is connected to the municipal system.

Watermains and appurtenances shall be constructed on all streets within the plan of subdivision. They shall be designed and constructed in accordance with the most recently revised specifications of the DGSSMS and Development Manual.

A separate water service connection shall be provided from the watermain to the edge of the street allowance for each property within the plan of subdivision.

All watermains, appurtenances and service connections shall be guaranteed for a minimum period of two (2) years after initial acceptance by the City.

The initial acceptance of the watermain system shall only take place after the base course of asphalt has been installed on the roads and all applicable water valve boxes have been raised to base asphalt grade.

D.1 DESIGN GUIDELINES

The Region of Waterloo and Area Municipal Design Guidelines and Supplemental Specifications for Municipal Services (DGSSMS) Part B – Design Guidelines shall form the basis of the design criteria except as extended or amended herein. The following outlines the supplementary design criteria to be applied to the design of Watermain works for development in the City of Kitchener.

D.B Watermain Design Guidelines

D.B.2 Watermains

D.B.2.1 Watermain Classification – Region of Waterloo

D.B.2.1.1 General – Refer to DGSSMS
D.B.2.1.2 Regional Watermains – Refer to DGSSMS
D.B.2.1.3 Local Watermains – Refer to DGSSMS
D.B.2.1.4 Connection to Regional Watermains – Refer to DGSSMS
D.B.2.2 Water Demand

D.B.2.2.1 Definitions – Refer to DGSSMS
D.B.2.2.2 Domestic – Refer to DGSSMS
D.B.2.2.3 Fire Flow – Refer to DGSSMS
D.B.2.2.4 Design Period – Refer to DGSSMS
D.B.2.2.5 Peaking Factors – Refer to DGSSMS

D.B.2.3 Hydraulic Analysis

D.B.2.3.1 Friction Factors – Refer to DGSSMS
D.B.2.3.2 Nominal vs. Actual Diameter – Refer to DGSSMS
D.B.2.3.3 Capacity – Refer to DGSSMS
D.B.2.3.4 Maximum Velocity – Refer to DGSSMS
D.B.2.3.5 Transient Pressure – Refer to DGSSMS

D.B.2.4 Pressure

D.B.2.4.1 Pressure Zone Delineation – Refer to DGSSMS
D.B.2.4.2 Boundary Conditions – Refer to DGSSMS
D.B.2.4.3 Preferred Pressure Range – Refer to DGSSMS
D.B.2.4.4 Minimum Pressure – Refer to DGSSMS
D.B.2.4.5 Maximum Pressure – Refer to DGSSMS
D.B.2.4.6 In-Line Booster Pumps – Refer to DGSSMS
D.B.2.4.7 Individual Pressure Reducing Devices – Refer to DGSSMS
D.B.2.4.8 Design Pressure Location – Refer to DGSSMS

D.B.2.5 Pipework

D.B.2.5.1 Material – Refer to DGSSMS
D.B.2.5.2 Location – Refer to DGSSMS
D.B.2.5.3 Diameter

The City of Kitchener does not accept 250 mm, 350 mm or 400 mm size watermain piping in any new construction attached to the water distribution system.

D.B.2.5.4 Depth of Cover – Refer to DGSSMS
D.B.2.5.5 Vertical Connections to Existing System – Refer to DGSSMS
D.B.2.5.6 High Points – Refer to DGSSMS
D.B.2.5.7 Minimum Slope – Refer to DGSSMS
D.B.2.5.8 Dead-end Mains – Refer to DGSSMS
D.B.2.5.9 Minimum Clearance to Sewers – Refer to DGSSMS
D.B.2.5.10 Thrust Restraint – Refer to DGSSMS
D.B.2.5.11 Soil Settlement Area – Refer to DGSSMS

D.B.2.6 Water Quality

D.B.2.6.1 Minimum Chlorine Residual – Refer to DGSSMS
D.B.2.6.2 Design Considerations – Refer to DGSSMS
D.B.2.7 Hydrants
For hydrant installation refer to City of Kitchener Standard Drawing 203

D.B.2.7.1 Maximum Spacing – Refer to DGSSMS
D.B.2.7.2 Lead Size – Refer to DGSSMS
D.B.2.7.3 Location – Refer to DGSSMS
D.B.2.7.4 Bends – Refer to DGSSMS
D.B.2.7.5 Minimum Clearance – Minimum offset clearance from the back of curb to the face of a hydrant shall be a minimum of 1.0m.

D.B.2.8 Isolating Valving

D.B.2.8.1 Size – Refer to DGSSMS
D.B.2.8.2 Location
Road levellers shall not be installed. The valve box must be raised to the road/ground surface.

D.B.2.8.3 Maximum Spacing – Refer to DGSSMS
D.B.2.8.4 Valve Chambers – Refer to DGSSMS
D.B.2.8.5 Minimum Clearance – Refer to DGSSMS

D.B.2.9 Combination Air & Vacuum Release Valves

D.B.2.9.1 Utilisation – Refer to DGSSMS
D.B.2.9.2 Watermain Profile – Refer to DGSSMS
D.B.2.9.3 Sizing – Refer to DGSSMS

D.B.2.1 Drain Chambers

D.B.2.10.1 Utilisation – Refer to DGSSMS
D.B.2.10.2 Location – Refer to DGSSMS

D.B.2.11 Flushing and Swabbing Ports

D.B.2.11.1 Utilisation – Refer to DGSSMS

D.B.2.12 Services

D.B.2.12.1 Sizing – Refer to DGSSMS
D.B.2.12.2 Location
Service boxes should be located at the street property line. Where the water distribution system has been assumed by the City, the Kitchener Utilities is responsible for water services up to the property line, after which the water service between the property line and the building becomes the responsibility of the Homeowner.

Service boxes shall be installed at the intersection of the middle of the property frontage and the property line.
Stop and Drain type curb stop service connections are not permitted within the City of Kitchener.

*D.B.2.12.3 Number of Services Per Property* – Refer to DGSSMS

*D.B.2.12.4 Restraints* – Refer to DGSSMS

*D.B.2.12.5 Bends* – Refer to DGSSMS

*D.B.2.12.6 Valving* – Refer to DGSSMS

*D.B.2.12.7 Metering*

Refer to Kitchener Utility Forms for standard meter set drawings. Kitchener Utilities does not permit the installation of water meters in chamber (pits), see Kitchener Utilities Policies for Meter Pits. For properties requiring multiple meters, see Properties Requiring Multiple Meters.

*D.B.2.12.8 Allowance for Future Servicing* – Refer to DGSSMS

*D.B.2.12.9 Electrical Grounding* – Refer to DGSSMS

**D.B.2.13 Geotechnical Report**

*D.B.2.13.1 Requirements* – Refer to DGSSMS

**D.B.2.14 Corrosion Report**

*D.B.2.14.1 Non-Metallic Watermain* – Refer to DGSSMS

*D.B.2.14.2 Metallic Watermain* – Refer to DGSSMS

*D.B.2.15 Watermain Identification* – Refer to DGSSMS

**D.2 MATERIAL SPECIFICATIONS**

The Region of Waterloo and Area Municipal Design Guidelines and Supplemental Specifications for Municipal Services (DGSSMS) Part C – Material Specifications shall form the basis for material selection except as extended or amended herein. The following outlines the supplementary specifications to be applied to the design and construction of Watermain works for development in the City of Kitchener.

**D.C WATERMAIN MATERIAL SPECIFICATIONS**

**D.C.2 Watermain**

**D.C.2.1 Watermain Pipe**

*D.C.2.1.1 Ductile Iron Pipe* – Refer to DGSSMS

*D.C.2.1.2 Concrete Pressure Pipe*

Concrete pressure pipe may only be used on a case by case basis if approval is obtained from the Director of Development Engineering Services.

*D.C.2.1.3 Polyvinyl Chloride Pipe (PVC)* – Refer to DGSSMS

*D.C.2.1.4 High Density Polyethylene Pipe (HDPE)* – Refer to DGSSMS
D.C.2.2 **Valves**

**D.C.2.2.1 Gate Valves** – Refer to DGSSMS

**D.C.2.2.2 Combination Air and Vacuum Release Valves** – Refer to DGSSMS

**D.C.2.3 Tapping Sleeves** – Refer to DGSSMS

**D.C.2.4 Valve Chambers** – Refer to DGSSMS

**D.C.2.5 Line Closure Couplings** – Refer to DGSSMS

**D.C.2.6 Flange Adaptors** – Refer to DGSSMS

**D.C.2.7 Valve Boxes** – Refer to DGSSMS

**D.C.2.8 Hydrants**

The hydrants shall be painted with a high gloss exterior paint over a quick dry oxide primer. The barrel shall be painted yellow and the bonnet and hose nozzle caps red. Storz connections shall be painted black.

The watermain diameter in inches to which the hydrant is connected shall be painted in black letters 200mm high on the face of the hydrant barrel immediately below the pumper nozzle.

**D.C.2.9 50mm and Smaller Service Connections**

**D.C.2.9.1 Service Pipe** – Refer to DGSSMS

**D.C.2.9.2 Minimum Size** – Refer to DGSSMS

**D.C.2.9.3 Service Saddles** – Refer to DGSSMS

**D.C.2.9.4 PVC Tapped Couplings** – Refer to DGSSMS

**D.C.2.9.5 Main Stops** – Refer to DGSSMS

**D.C.2.9.6 Union Couplings** – Refer to DGSSMS

**D.C.2.9.7 Curb Stops** – Refer to DGSSMS

**D.C.2.9.8 Service Boxes**

Note: DGSSMS requirement for frost collars where service box is located within a driveway.

Approved boxes for 25 mm curb stops – Refer to DGSSMS -

Approved boxes for 38 mm and 50 mm curb stops including stainless steel rods, are:

- Mueller A-728 (modified to operate with same key as for A-726 box), and
- Cambridge Brass series 161-1.

**D.C.2.10 Temporary Watermains**

All fittings on the temporary watermain shall be copper or PVC.

**D.C.2.11 Metal Items**
D.C.2.11.1 Bolts, Nuts and Washers – Refer to DGSSMS
D.C.2.11.2 Cast Iron – Refer to DGSSMS
D.C.2.11.3 Galvanizing – Refer to DGSSMS

D.C.2.12 Petrolatum Tape Systems – Refer to DGSSMS

D.C.2.13 Anodes – Refer to DGSSMS

D.C.2.14 Tracer Wire – Refer to DGSSMS

D.C.2.15 Warning Tape – Refer to DGSSMS

D.C.2.16 Easements

City of Kitchener requires 5.0 m or 2 times the depth (where depth is from the proposed final grade to the invert rounded up to the nearest half meter), whichever is the greater.

D.3 CONSTRUCTION SPECIFICATIONS

The Region of Waterloo and Area Municipal Design Guidelines and Supplemental Specifications for Municipal Services (DGSSMS) Part D – Construction Specifications shall form the basis for construction except as extended or amended herein. The following outlines the supplementary specifications to be applied to the design and construction of Watermain works for development in the City of Kitchener.

D.D WATERMAIN CONSTRUCTION SPECIFICATIONS

D.D.2 Watermains

D.D.2.1 Ontario Provincial Standard Specifications – Refer to DGSSMS

D.D.2.2 Project Coordination

D.D.2.2.1 Notification of Operating Authority – Refer to DGSSMS
D.D.2.2.2 Notification of Local Water Users – Refer to DGSSMS
D.D.2.2.3 Shutting Down or Charging Mains – Refer to DGSSMS
D.D.2.2.4 Water Interruption – Refer to DGSSMS
D.D.2.2.5 Requirements Outside of Contract Limits – Refer to DGSSMS
D.D.2.2.6 Measurement and Payment – Refer to DGSSMS

D.D.2.3 Temporary Water Distribution System

D.D.2.3.1 General – Refer to DGSSMS
D.D.2.3.2 Layout Plan – Refer to DGSSMS
D.D.2.3.3 Minimum Diameter – Refer to DGSSMS
D.D.2.3.4 Location – Refer to DGSSMS
D.D.2.3.5 Isolation Valves – Refer to DGSSMS
D.D.2.3.6 Source Water Connection – Refer to DGSSMS
D.D.2.3.7 Pressure Testing and Leakage – Refer to DGSSMS
D.D.2.3.8 Chlorine Residual and Bacteriological Testing – Refer to DGSSMS
D.D.2.3.9 Service Connections – Refer to DGSSMS
D.D.2.3.10  
Operation – Refer to DGSSMS

D.D.2.3.11  
Off-hours Corrective Action – Refer to DGSSMS

D.D.2.3.12  
Relocation of the Temporary Distribution System – Refer to DGSSMS

D.D.2.3.13  
Measurement and Payment – Refer to DGSSMS

D.D.2.4  
Source Water Connection for New Water System

D.D.2.4.1  
Connection Plan – Refer to DGSSMS

D.D.2.4.2  
Physical Separation – Refer to DGSSMS

D.D.2.4.3  
Use of Fire Hydrants – Refer to DGSSMS

D.D.2.4.4  
Temporary Connection and Backflow Preventer – Refer to DGSSMS

D.D.2.4.5  
Connection Point Relocation – Refer to DGSSMS

D.D.2.4.6  
Measurement and Payment – Refer to DGSSMS

D.D.2.5  
Watermain Installation

The watermain shall be installed in accordance with AWWA C600 for Ductile Iron (DI) and AWWA C605 and OPSS 441 for Polyvinyl Chloride (PVC).

This shall include the joining and placing of the pipe and fittings in the trench to proper line and grade.

D.D.2.5.1  
Pipeline Layout Drawings – Refer to DGSSMS

D.D.2.5.2  
Watermain Layout Tolerance – Refer to DGSSMS

D.D.2.5.3  
Joint and Pipe Deflection – Refer to DGSSMS

D.D.2.5.4  
Joint and Thrust Restraint – Refer to DGSSMS

D.D.2.5.5  
Tracer Wire – Refer to DGSSMS

D.D.2.5.6  
Corrosion Protection – Refer to DGSSMS

D.D.2.5.7  
Bolts, Nuts and Washers – Refer to DGSSMS

D.D.2.5.8  
Warning Tape – Refer to DGSSMS

D.D.2.5.9  
Measurement and Payment – Refer to DGSSMS

D.D.2.5.10  
Method of Construction

Pipe shall be laid with the bell or pre-coupled ends facing in the direction of laying, unless directed otherwise by the Kitchener Utilities Engineer. Where pipe is laid on a grade greater than 10%, the laying shall proceed up-grade with the bell end at the higher end of each length of pipe.

D.D.2.5.11  
Layout of Line

The Contractor will be provided with property corners and an elevation bench mark from which he will be entirely responsible for the accuracy of the work, both as to location and elevation according to the plans and profiles. The Contractor shall give the Subdivider sufficient notice when setting out work so that lines and grades can be checked by the Subdivider before actual construction is commenced.

The minimum depth for watermains and water services to the curb stop shall be as per the DGSSMS.

If the Contractor uses batter boards for layout, the Contractor shall supply, erect and maintain approved batter boards and site rails to ensure accurate grade and line of the pipes. At least three (3) batter boards shall be used at all times. Alternatively, laser or total station may be utilized for layout.

D.D.2.5.12  
Joining Pipe and Fittings
Pipe shall, in general, be joined in strict conformance with the recommendations of the manufacturer of the pipe in use, and as herein specified. The Contractor shall provide and maintain bracing or chain blocks to prevent "creep" until the pipe is anchored and fixed.

a) Push-on Joints

For ductile iron pipe, the socket and the spigot are to be wiped clean and a film of lubricant applied to the gasket bulb seating area in the socket. The gasket is to be inserted with the bulb entering first. Lubricant is to be applied to the inside surface of the gasket and outside surface of the spigot. The spigot is to be placed in the socket and the pipe forced into the socket until the first painted stripe disappears.

For PVC pipe, the ball area and gasket must be clean and factory installed gaskets must not be tampered with or altered. Apply lubricant to bevelled spigot end only. Push lubricated end past gasket until reference line is even with bell.

b) Mechanical Joints

Place the gland and rubber gasket over the plain end of the pipe and then insert the plain end into the bell until the spigot is firmly seated in the bell. The gasket is then pushed into position so that it is evenly seated in the socket. The gland is moved into position against the face of the gasket. Bolts are inserted and tightened. All nuts shall be tightened with a suitable (preferably "torque limiting") wrench. Nuts spaced 180 degrees apart, shall be tightened alternatively, in order to produce equal pressure on all parts of the gland.

The torque for various sizes of bolts shall be as follows:

<table>
<thead>
<tr>
<th>Size in Millimetres</th>
<th>Range of Torque in Newtons/Metre</th>
</tr>
</thead>
<tbody>
<tr>
<td>16</td>
<td>61 - 81</td>
</tr>
<tr>
<td>19</td>
<td>102 - 122</td>
</tr>
<tr>
<td>25</td>
<td>136 - 163</td>
</tr>
<tr>
<td>31</td>
<td>163 - 203</td>
</tr>
</tbody>
</table>

For PVC pipe, use plain rubber tip gaskets (not lead tip). Do not use bevelled pipe ends.

**D.D.2.6 Hydrant, Valve and Chamber Installation**

**D.D.2.6.1 Setting of Hydrants**

Refer to Standard Drawing 203 for standard hydrant installation (including tracer wire).

**D.D.2.6.2 Valves** – Refer to DGSSMS

**D.D.2.6.3 Minimum Clearance** – Refer to DGSSMS

**D.D.2.6.4 Chambers** – Refer to DGSSMS

**D.D.2.6.5 Valve Box and Chamber Lid Adjustment** – Refer to DGSSMS

**D.D.2.6.6 Bolts, Nuts and Washers** – Refer to DGSSMS

**D.D.2.6.7 Measurement and Payment** – Refer to DGSSMS
D.D.2.7  Service Connections

D.D.2.7.1  Installation

Approved Service Saddles as per the DGSSMS must be used with all PVC mains and as per the following Schedule with Ductile Iron (DI) mains:

Table 6: SERVICE SIZING

<table>
<thead>
<tr>
<th>Diameter of DI Watermain</th>
<th>Service Size</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>25mm</td>
</tr>
<tr>
<td>100mm</td>
<td>S.S.</td>
</tr>
<tr>
<td>150mm</td>
<td>N.R.</td>
</tr>
<tr>
<td>200mm</td>
<td>N.R.</td>
</tr>
</tbody>
</table>

S.S.: Indicates where service saddle is to be used.
N.R.: Indicates where service saddle is not required, but may be used.

In the event that water service boxes must be raised beyond the extension height, only screwed couplers will be accepted to install extensions. Extensions utilising set screws or other means will not be accepted.

Services shall be installed perpendicular to the watermain. Bends shall not be installed without the written approval of the Kitchener Utilities Engineer. Gooseneck bends shall not be considered bends and therefore are exempt, no approval shall be necessary.

D.D.2.7.2  Tapping for Connections 100mm and Larger – Refer to DGSSMS
D.D.2.7.3  Thrust Restraint – Refer to DGSSMS
D.D.2.7.4  Measurement and Payment – Refer to DGSSMS

D.D.2.8  Commissioning

D.D.2.8.1  General – Refer to DGSSMS
D.D.2.8.2  Swabbing – Refer to DGSSMS
D.D.2.8.3  Hydrostatic Pressure Test – Refer to DGSSMS
D.D.2.8.4  Disinfection – Refer to DGSSMS
D.D.2.8.5  De-chlorination – Refer to DGSSMS
D.D.2.8.6  Chlorine Residual & Bacteriological Testing – Refer to DGSSMS
D.D.2.8.7  Final Connection to Existing Water System – Refer to DGSSMS
D.D.2.8.8  Tracer Wire Conductivity Test – Refer to DGSSMS
D.D.2.8.9  Valve Positioning – Refer to DGSSMS
D.D.2.8.10 Measurement and Payment – Refer to DGSSMS

D.D.2.9  Material Handling

This shall include all loading, hauling, stringing, storing and handling of pipe, valves, fittings, or other material required for the construction of watermains.

D.D.2.9.1  Loading and Unloading
As per manufacturer’s instructions.

**D.D.2.9.2 Storing**

As per manufacturer’s instructions.

**D.D.2.9.3 Basis of Payment**

The Contractor shall supply all materials, furnish all facilities for handling, and shall provide a suitable place for storage of all construction materials at no expense to the City. All work prescribed in this article, except for granular backfill materials, shall not be paid for directly, but shall be included as part of the unit prices for watermain construction.

**D.D.2.10 Clearing**

As per OPS 201.

**D.D.2.10.1 Method of Construction**

In all cases where cultivated shrubbery or trees are encountered on the right-of-way, Planning staff shall have the right to determine which trees or shrubs must be removed to allow the work to be completed safely. All corn, cane or other growing crops, that are cut on the right-of-way, shall be gathered and stacked in orderly piles along the right-of-way so that the spoil pile can be placed between the stacks and the open ditch; or shall be disposed of otherwise, at the direction of the Planning staff in consultation with Development Engineering staff. Where large trees are cut on the right-of-way, they shall be cut close to the ground so that the remaining stumps will not extend more than 150 mm above the ground surface level. The trunks shall be stripped of all leaves and branches. The branches and leaves removed from such trees shall be disposed of as directed by the Planning staff, and the remaining logs shall be cut into suitable lengths and placed in orderly piles along the edge of the right-of-way. Under no circumstances shall brush and/or other debris be left onsite or placed within the trench limits. All work related to tree removals shall be done in accordance with standard safety procedures, and all necessary approvals for said removal shall be obtained from Planning staff.

**D.D.2.11 Trenching**

The maximum width of the trench from the bottom of the trench to the top of the pipe shall be no greater than 750 mm plus the outside diameter of the barrel of the pipe being installed. Where the Contractor excavates the trench wider than this maximum, the Contractor may, at no expense to the City, be required to provide the next adequate bedding class or a stronger class of pipe.

All excavated material shall be piled in a manner such that it will not endanger the work nor obstruct sidewalks and driveways. Hydrants under pressure, valve pit covers, valve boxes or other utility controls shall be left unobstructed and accessible until the work is completed. Gutters shall be kept clear, or other satisfactory provisions made for street drainage, and any watercourses shall not be obstructed. Appropriate erosion control methods shall be used to protect existing watercourses.
E  SANITARY SEwers

The City of Kitchener’s Development Manual is to be read in conjunction with the Region of Waterloo and Area Municipal Design Guidelines and Supplemental Specifications for Municipal Services (DGSSMS). In the case that the Development Manual differs from the DGSSMS, the Development Manual will supersede the DGSSMS.

Section E, Sanitary Sewers, of the Development Manual has been structured to match the sections headings of the DGSSMS. The underlined portion of the following Section E headings matches that of the DGSSMS (eg. E.B.3.1.1 would be Section B.3.1.1 of the DGSSMS).

Sanitary sewers designed and constructed in accordance with the most recently revised specifications of the City of Kitchener Development Manual shall be required in all residential subdivisions unless specifically exempted from this requirement by the City. All sanitary sewers shall be designed in such a manner and be of adequate size and depth to provide for the service of adjacent lands where so required by the Director of Engineering Services. A lateral sewer connection from the sewer main to the edge of the road allowance shall be constructed for each property in the plan of subdivision.

All sanitary sewers, appurtenances and connections shall be guaranteed for a minimum period of two (2) years after initial inspection and acceptance of all underground services by the City, but shall not be released from the maintenance period until the sewers have been inspected by video inspection and finally accepted by the City.

Prior to commencement of the maintenance period for sanitary connections, invert elevations at the property line in table form shall be provided to Development Engineering staff.

E.1  DESIGN GUIDELINES

The Region of Waterloo and Area Municipal Design Guidelines and Supplemental Specifications for Municipal Services (DGSSMS) Part B – Design Guidelines shall form the basis of the design criteria except as extended or amended herein. The following outlines the supplementary design criteria to be applied to the design of Sanitary Sewer works for development in the City of Kitchener.

E.B  SANITARY DESIGN GUIDELINES

E.B.3  Sanitary

E.B.3.1  Pipework

E.B.3.1.1  Design Flow – Refer to DGSSMS
**E.B.3.1.2 Flow Calculations**

E.B.3.1.2.1 Residential

<table>
<thead>
<tr>
<th>Zoning Category</th>
<th>People/hectare</th>
</tr>
</thead>
<tbody>
<tr>
<td>R1</td>
<td>Not Serviceable</td>
</tr>
<tr>
<td>R2</td>
<td>36</td>
</tr>
<tr>
<td>R3</td>
<td>72</td>
</tr>
<tr>
<td>R4</td>
<td>143</td>
</tr>
<tr>
<td>R5</td>
<td>143</td>
</tr>
<tr>
<td>R6</td>
<td>196</td>
</tr>
<tr>
<td>R7</td>
<td>312</td>
</tr>
<tr>
<td>R8</td>
<td>387</td>
</tr>
<tr>
<td>R9</td>
<td>775</td>
</tr>
</tbody>
</table>

E.B.3.1.2.2 Industrial – Refer to DGSSMS

E.B.3.1.2.3 Commercial – Refer to DGSSMS

E.B.3.1.2.4 Schools – Refer to DGSSMS

E.B.3.1.2.5 Other Miscellaneous Average Flow rates – Refer to DGSSMS

E.B.3.1.2.6 Infiltration – Refer to DGSSMS

Note: person Per Unit (ppu) densities are not to be used for sanitary flow calculations.

Should the design flow of proposed sewers, using flow from zoning calculations result in undersized downstream sewers that were designed using different methodology; the City may consider evaluating the downstream sewers with alternative design standard methodologies.

**E.B.3.1.3 Design Flow Calculations** – Refer to DGSSMS

Note: trunk sewers to be designed to maximum 85% of full pipe capacity. Local sewers are not to be designed over 95% of full pipe capacity.

**E.B.3.1.4 Minimum Pipe Size** – Refer to DGSSMS

**E.B.3.1.5 Manning’s “n”** – Refer to DGSSMS

**E.B.3.1.6 Pipe Slope** – Refer to DGSSMS

**E.B.3.1.7 Flow Velocities** – Refer to DGSSMS

All sanitary sewers shall be designed to have a minimum flow velocity, when flowing full, of at least 0.8 m/s.

Velocities in sanitary sewers shall not be greater than 3 m/s.

**E.B.3.1.8 Selection of Bedding and Class of Pipe – Rigid Pipe** – Refer to DGSSMS

**E.B.3.1.9 Selection of Bedding and Class of Pipe – Flexible Pipe**

Refer to DGSSMS.
**E.B.3.1.10**  **Pipe Depth** – Refer to DGSSMS

Maximum Pipe Depth – The maximum pipe depth over sanitary sewers is 9.0 m unless approved by the Director of Engineering.

**E.B.3.1.12**  **Industrial Area Requirements**

Vitrified clay pipe (VC) is not allowed in Industrial areas. The preferred pipe is Polyvinyl Chloride (PVC) however Polyethylene pipe (PE) can be used upon approval by the Director of Engineering Services.

**E.B.3.2**  **Maintenance Holes**

**E.B.3.2.1**  **Structure** – Refer to DGSSMS and OPSD 701.01. Pre-benching is preferred in new development

**E.B.3.2.2**  **Spacing** – Refer to DGSSMS

**E.B.3.2.3**  **Size** – Refer to DGSSMS

**E.B.3.2.4**  **Drop Inlet Structures**

The City of Kitchener allows external drop inlets.

**E.B.3.2.5**  **Safety Grates** – Refer to DGSSMS

**E.B.3.2.6**  **Minimum Invert Drop** – Refer to DGSSMS

**E.B.3.2.7**  **Location** – Refer to DGSSMS

**E.B.3.2.8**  **Watertight Lids** – Refer to DGSSMS

**E.B.3.2.9**  **Flow Direction Changes** – Refer to DGSSMS

**E.B.3.3**  **Services**

All sanitary sewer connections shall be inspected and tested at the same time as the sanitary sewer mains. All abandoned services are to be capped at the main with a pre-manufactured end cap.

All sanitary sewer connections shall be guaranteed for a period of two (2) years. This guarantee period shall commence at the same time that the sanitary sewer mains are placed on Maintenance Guarantee.

**E.B.3.3.1**  **Minimum Diameter** – Refer to DGSSMS

**E.B.3.3.2**  **Location** – Refer to DGSSMS

**E.B.3.3.3**  **Slope** – Refer to DGSSMS

**E.B.3.3.4**  **Depth** – Refer to DGSSMS

**E.B.3.3.5**  **Connections to Maintenance Holes** – Refer to DGSSMS

**E.B.3.4**  **Curvilinear Sewers** – Refer to DGSSMS

**E.B.3.5**  **Geotechnical Report**

**E.B.3.5.1**  **Soil Tests**

Soil test borings shall be placed at intervals not exceeding seventy five (75.0 m) metres or as required by the Director of Engineering Services and to a depth of not less than one and one half (1.5 m) metres.
below the deepest proposed structure, where applicable. If the depth of the proposed structure is unknown, then the soil test borings shall be completed to a depth no less than four and one half (4.5 m) metres below the proposed pavement grade. Soil classifications, moisture content, etc., shall be recorded and noted on the plans and profiles submitted for acceptance. Where poor or unstable soil conditions have been noted, additional borings shall be taken to establish the boundaries of this soil (on the street allowance).

On smaller projects a minimum of two mechanical analysis will be required.

All tests shall be conducted by a recognized soils laboratory certified by the Canadian Council of Independent Labs (CCIL) and copies of such tests shall be submitted to the Development and Technical Services Division.

**E.B.3.6 Inspection and Testing**

"The following inspection and testing work shall be carried out during and after construction of services.

i) "Sieve Analysis" of the pipe bedding material to assure that the material meets City of Kitchener Standard Specifications. Representative samples are to be obtained by the Consultant prior to and during construction operations.

ii) "Density Tests" shall be performed to assure that the pipe bedding material has been compacted properly.

iii) "Density Tests" shall be performed on the backfill material to ensure proper compaction.

iv) All sewers, maintenance holes must be flushed and cleaned prior to testing. A mandrel test shall be performed on all flexible pipe sanitary sewer mains and force mains in accordance with the latest OPSS 410 standard.

v) All sanitary sewers shall be tested for "Exfiltration or Infiltration" to assure that all joints and manholes are properly installed in accordance to the latest OPSS 410 standard.

vi) Flushing and CCTV Inspections are required for initial and final acceptance of the undergrounds. The flushing and CCTV inspection shall be as per OPSS 409, OPSS 410 and Section E.B.3.6.1. The CCTV inspection shall include all sanitary mains. The CCTV inspection reports submitted to the City shall be free of defects and debris. The consultant shall ensure that all sewers lengths are inspected and accounted for. Include with the CCTV Inspection Report, a general service plan which highlights the inspected sanitary sewer.

vii) Full time inspection of all underground work during construction.

viii) Physical/Visual inspection of all work after construction to ensure all defects are rectified prior to the City's inspections. The consultant's inspector is responsible for the following: To bring the general site servicing drawing and/or the as recorded drawings to the inspection; to provide all labour and equipment to assist City staff during the inspection and to ensure all structures have been pre-inspected and all imperfect work has been rectified by the contractor. Failure to comply with any of the above will result in cancellation of the inspection and a charge to the Developer.
ix) All sanitary sewers and maintenance holes and catchbasins must be flushed and cleaned prior to testing. A mandrel test shall be performed on all flexible pipe sewer mains and forcemains in accordance with the latest OPSS 410 standard.

x) If any issues (Such as cracks, breaks, blockages, sags etc.), are encountered with the lateral service connections within the public road allowance after final acceptance has been granted and within two years of the occupancy date, the City shall require that the Subdivider contact its agents and rectified the matter immediately at the Subdivider’s cost.

The City of Kitchener, acting reasonably, may require the Subdivider to complete sanitary sewer lateral CCTV Video Inspections, of certain portions of the development that are suspected of sanitary or storm sewer lateral damages (e.g. cracks, breaks, blockage, sags, etc.), such as:

- Infiltration determined by the municipality as a result of sanitary flow monitoring of the development, in combination with evidence from the Subdivider’s videos of the sanitary sewer line, and/or
- Suspect slope challenges of less than 2% on the sanitary sewer lateral due to other services adjacent to it; and/or
- Sewage back-up complaints received from Lot/Block owners in the development.

If the municipality determines through the sewer lateral videos that there is damage to one or more sewer laterals within the public road allowance, then the Subdivider will be required to complete the work to repair the damage to the satisfaction of the Director of Engineering, prior to final acceptance and the City taking ownership of the infrastructure.

E.B.3.6.1 CCTV Inspection (Storm and Sanitary)

The developer’s consultant shall ensure that the Equipment Operators are fully conversant with all aspects of sewer inspections and capable of accurate observation and reporting of all conditions found. All Operators must possess PACP certification. Upon request by Development Engineering, a copy of each pipeline inspector’s certification document must be provided.

The internal pipe inspection shall be carried out using specifically designed cameras, video recording equipment and synchronized computer data recording. A continuous visual record of the internal condition of the piping system shall be provided on a new DVD in a compressed Mpeg format, with a playback visual resolution equivalent to the camera’s recording resolution. These DVDs will also include the associated PDF report of the inspections and will be forwarded to the City of Kitchener as they are completed for review. At the end of the contract the Contractor will provide a separate database for each sewer type (sanitary, storm) in PACP format which will contain all inspection data collected during the contract.

E.B.3.6.1.2 Camera Equipment

Camera equipment shall consist of a self-contained, closed-circuit pan and tilt video camera and monitoring unit (OPSS 409). The unit shall have an adjustable lighting system capable of providing a clear monitor picture and a minimum illumination level of 100- foot candles. The camera travel speed shall be as per OPSS 409. CCTV videos not meeting the camera speed will be rejected.

E.B.3.6.1.3 Digital Images/Instant Photos
The inspection unit shall be equipped with all equipment required for recording and producing colour digital still image captures of the inspection video image appearing on the operator's monitor during the course of the inspection.

**E.B.3.6.1.4 Cleaning/Flushing Precautions**

During cleaning operations, satisfactory precautions shall be taken to ensure that the water flow volumes and pressures created do not damage or cause flooding of any public or private property, while still ensuring satisfactory cleansing of the interior of the pipe for inspection. When possible, the flow of sewage in the sewer shall be utilized to aid in the cleaning process. A maximum pressure of 1800psi shall be used in all locations to prevent damage to the sewer lines or flooding into private structures. It shall be at the Contractor's discretion and judgment that flow volumes and cleaning pressures are adjusted appropriately for the age, condition, and circumstances of the inspection site. If in the Contractor's opinion "normal" cleaning procedures cannot be undertaken, or satisfactory results cannot be achieved in any section of sewer, the CCTV contractor must report the findings to the engineering consultant and City's staff.

**E.B.3.6.1.5 Material Removal**

Debris such as dirt, sand, rocks, grease, and other solid or semi-solid materials, which is a result of cleaning or construction activities, shall be removed at the downstream manhole of the section being cleaned. Passing material from manhole to manhole will not be permitted due to risk of line plugging. This material shall be removed using the vacuum system on a combination unit.

**E.B.3.6.1.6 Material Disposal**

Upon request, the Contractor shall provide a Ministry of Environment approved dump-site for all material removed from the sewers during the cleaning operation.

**E.B.3.6.1.7 Re-Inspection**

If in the opinion of the City of Kitchener, re-inspection of the sewer is required as a result of inadequate cleaning, camera travel speed, quality of the CCTV video and inspection reports, the Contractor shall re-clean and re-inspect the sewer at no cost to the City.

**E.B.3.6.1.8 Flow Control and Bypass Pumping**

When interruption of sewer line flows are necessary to effectively conduct the inspection operations, the CCTV Contractor shall, subject to the approval of the City, control flows using plugging and blocking methods. The City reserves the right, when necessary, to request bypass and de-watering of a sewer to be viewed to ensure that the full diameter of the pipe is visible. The CCTV Contractor may also be required to conduct some CCTV inspection during non-peak flow periods; as such this will result in some work being required at late night time periods outside of established high flow periods.

**E.B.3.6.1.9 Manhole Inspections**

The CCTV Contractor will not be responsible for inspection or condition reporting of manholes during the performance of this contract, with the exception of reporting blockages or obstructions which may be deemed as potentially causing any flow restriction or backups.

**E.B.3.6.1.10 Hard Copy Report**
All reports will be submitted in English and be in a computer-generated, typed-format which is bound with a presenting outer cover. The following information will be required to appear on the Front Cover of the Report.

1st Line  City of Kitchener  
2nd Line  Consultant's Name  
3rd Line  Developer's Name  
4th Line  Subdivision's Name or Project Name, Phase, Stage, 30T# and 58M#  
5th Line  Sewer Type (Sanitary or Storm Video Inspection)  
6th Line  Report Number #  
7th Line  Date of Report DD/MM/YYYY  

E.B.3.6.1.11 DVD with Video

The DVD and case are to be attached to the inside of each hard copy report. The following information will be required to appear on the DVD:

1st Line  City of Kitchener Sanitary Sewer Video Inspection  
2nd Line  Report No.  
3rd Line  Subdivision Name Phase, Stage, 30T# and 58M#  

E.B.3.6.1.12 Sewer Inspection Screen Information

While the camera is stationary, at the beginning of the section, the following should appear on the screen:

1st Line  From M.H.# to M.H.# (Structure Number from drawings)  
2nd Line  Street Name  
3rd Line  Distance from center of manhole base  
4th Line  Flow Direction - North, South, East, West  
5th Line  Size of pipe, type of pipe, (IIMS Pipe Structure #)  
6th Line  Date of inspection (MM/DD/YY)  

While the camera is travelling the following information must appear at the bottom left hand of the screen.

1st Line  From M.H.# to M.H.# (Structure number from drawings)  
2nd Line  Street Name  
3rd Line  Distance from center of manhole base in meters  

E.B.3.6.1.13 Defect Coding

When a defect is encountered during the inspection the camera shall be stopped for a reasonable period of time and the defect code will be displayed at the top left hand corner of the screen. These defects will be coded at time of inspection in strict adherence to PACP v6 codes. A complete list of codes can be provided upon request.

E.B.3.7 Easements
City of Kitchener requires 5.0 m wide or two (2) times the depth (where depth is from the proposed final grade to the invert rounded up to the nearest half meter), whichever is the greater.

E.2 MATERIAL SPECIFICATIONS

The Region of Waterloo and Area Municipal Design Guidelines and Supplemental Specifications for Municipal Services (DGSSMS) Part C – Material Specifications shall form the basis for material selection except as extended or amended herein. The following outlines the supplementary specifications to be applied to the design and construction of Sanitary Sewer works for development in the City of Kitchener.

E.C SEWER MATERIAL SPECIFICATIONS

E.C.3 Sewers

E.C.3.1 Pipe Materials

Refer to the DGSSMS and the Ontario Building Code for acceptable materials.

E.C.3.2 Cast Iron Maintenance Hole Lids – Refer to DGSSMS
E.C.3.3 Cast Iron Catchbasin Frames and Grates – Refer to DGSSMS
E.C.3.4 Maintenance Hole and Catchbasin Adjustment Units – Refer to DGSSMS
E.C.3.5 Slotted Pipe Drain – Refer to DGSSMS
E.C.3.6 Flexible Couplings – Refer to DGSSMS
E.C.3.7 Watertight Connectors – Refer to DGSSMS

E.3 CONSTRUCTION SPECIFICATIONS

The Region of Waterloo and Area Municipal Design Guidelines and Supplemental Specifications for Municipal Services (DGSSMS) Part D – Construction Specifications shall form the basis for construction except as extended or amended herein. The following outlines the supplementary specifications to be applied to the design and construction of Sanitary Sewer works for development in the City of Kitchener.

E.D SEWER CONSTRUCTION SPECIFICATIONS

E.D.3 Sewers

E.D.3.1 Ontario Provincial Standard Specifications – Refer to DGSSMS
E.D.3.2 Sewer Installation – Refer to DGSSMS
E.D.3.3 Maintenance Hole and Catchbasin Installation – Refer to DGSSMS
E.D.3.4 Service Connections – Refer to DGSSMS
E.D.3.5 Commissioning – Refer to DGSSMS
F  STORM SEWERS

The City of Kitchener’s Development Manual is to be read in conjunction with the Region of Waterloo and Area Municipal Design Guidelines and Supplemental Specifications for Municipal Services (DGSSMS). In the case that the Development Manual differs from the DGSSMS, the Development Manual will supersede the DGSSMS.

Section F, Storm Sewers, of the Development Manual has been structured to match the sections headings of the DGSSMS. The underlined portion of the following Section F headings matches that of the DGSSMS (eg. E.B.4.1 would be Section B.4.1 of the DGSSMS).

Storm sewers designed and constructed in accordance with the most recently revised specifications of the City of Kitchener Development Manual shall be required on every street within all plans of residential subdivision. All storm sewers shall be designed in such a manner and be of adequate size and depth to provide for the development of lands lying upstream within the watershed and/or to provide for the drainage of such areas as may be designated by the Director of Engineering Services. All storm drainage shall be conveyed to an outlet considered adequate in the opinion of the Director of Engineering Services.

Any channel improvements, bridges, culverts and all other drainage structures or improvements shall be designed and constructed in accordance with the specifications and to the approval of the Director of Engineering Services.

All storm sewers, appurtenances and connections shall be guaranteed for a minimum period of two (2) years after initial inspection and acceptance of all underground services by the City, but shall not be released from the maintenance period until the sewers have been inspected and finally accepted by the City.

Prior to commencement of the maintenance period for storm connections, invert elevations at the property line in table form must be provided to Development Engineering staff.

F.1  DESIGN GUIDELINES

The Region of Waterloo and Area Municipal Design Guidelines and Supplemental Specifications for Municipal Services (DGSSMS) Part B – Design Guidelines shall form the basis of the design criteria except as extended or amended herein. The following outlines the supplementary design criteria to be applied to the design of Storm Sewer works for development in the City of Kitchener.

F.B  STORM DESIGN GUIDELINES

F.B.4  Storm

F.B.4.1  General – Refer to DGSSMS

F.B.4.2  Pipework

F.B.4.2.1  Design Flow Calculations

Note: trunk sewers to be designed to maximum 85% of full pipe capacity. Local sewers are not to be designed over 95% of full pipe capacity.
F.B.4.2.1.1 Rainfall Intensity

Values of rainfall intensity (I) shall be determined by:

\[ I = \frac{A}{(T_c + B)^c} \]

where \( A, B, \) & \( C \) are defined as follows:

i) The existing City of Kitchener IDF curves, for return periods ranging from 2 years to 100 years and with a duration less than 6 hours.

<table>
<thead>
<tr>
<th>Return Period</th>
<th>A</th>
<th>B</th>
<th>C</th>
</tr>
</thead>
<tbody>
<tr>
<td>25mm</td>
<td>509</td>
<td>6</td>
<td>0.7989</td>
</tr>
<tr>
<td>2 Year</td>
<td>743</td>
<td>6</td>
<td>0.7989</td>
</tr>
<tr>
<td>5 Year</td>
<td>1593</td>
<td>11</td>
<td>0.8789</td>
</tr>
<tr>
<td>10 Year</td>
<td>2221</td>
<td>12</td>
<td>0.9080</td>
</tr>
<tr>
<td>25 Year</td>
<td>3158</td>
<td>15</td>
<td>0.9355</td>
</tr>
<tr>
<td>50 Year</td>
<td>3886</td>
<td>16</td>
<td>0.9495</td>
</tr>
<tr>
<td>100 Year</td>
<td>4688</td>
<td>17</td>
<td>0.9624</td>
</tr>
</tbody>
</table>

ii) For design storms with a duration of 6 hours or more.

<table>
<thead>
<tr>
<th>Return Period</th>
<th>A</th>
<th>B</th>
<th>C</th>
</tr>
</thead>
<tbody>
<tr>
<td>2 Year</td>
<td>521.3</td>
<td>3.75</td>
<td>0.7400</td>
</tr>
<tr>
<td>5 Year</td>
<td>1371.0</td>
<td>12.90</td>
<td>0.8400</td>
</tr>
<tr>
<td>10 Year</td>
<td>1471.9</td>
<td>11.44</td>
<td>0.8225</td>
</tr>
<tr>
<td>25 Year</td>
<td>1499.1</td>
<td>9.63</td>
<td>0.7963</td>
</tr>
<tr>
<td>50 Year</td>
<td>1498.1</td>
<td>8.38</td>
<td>0.7775</td>
</tr>
<tr>
<td>100 Year</td>
<td>1479.1</td>
<td>7.20</td>
<td>0.7613</td>
</tr>
</tbody>
</table>

\( T_c \) (time of concentration) and inlet time shall conform to the latest Ministry of the Environment’s guidelines.

F.B.4.2.2 Minimum Pipe Size – Refer to DGSSMS
F.B.4.2.3 Manning’s “n” – Refer to DGSSMS
F.B.4.2.4 Pipe Slope
The minimum slope for the first reach of permanent dead end sewer shall be 1%, where connecting into existing infrastructure. For slopes on sewers other than the first permanent dead end reach, use Ministry of the Environment Design Guidelines.

**F.B.4.2.5 Flow Velocities**

All storm sewers shall be designed to have a minimum flow velocity, when flowing full, of at least 0.8 m/s. Velocities in storm sewers shall not be greater than 6 m/s.

**F.B.4.2.6 Selection of Bedding and Class of Pipe – Rigid Pipe** – Refer to DGSSMS

**F.B.4.2.7 Selection of Bedding and Class of Pipe – Flexible Pipe** – Refer to DGSSMS

**F.B.4.2.8 Pipe Depth** – Refer to DGSSMS

**F.B.4.2.9 Curvilinear Sewers** – Refer to DGSSMS

**F.B.4.2.10 Elliptical Sewers** – Refer to DGSSMS

**F.B.4.2.11 Blind Connections** – Refer to DGSSMS

**F.B.4.2.12 Safety/Rodent Grates** – Refer to DGSSMS

**F.B.4.2.13 Head Walls**

Refer to DGSSMS. A chain link fence as per OPSD 972.102 and OPSD 972.130 shall be installed around headwalls 0.6 m or higher in height.

**F.B.4.3 Maintenance Holes**

**F.B.4.3.1 Structure** – Refer to DGSSMS. All catchbasin manholes and manhole structures are to be benched regardless of pipe diameter. Pre-benching is preferred in new development.

**F.B.4.3.2 Spacing** – Refer to DGSSMS

**F.B.4.3.3 Size** – Refer to DGSSMS

**F.B.4.3.4 Tee Maintenance Holes** – Refer to DGSSMS and OPSD 707.010.

**F.B.4.3.5 Drop Inlet Structures**

The City of Kitchener allows external drop inlets.

**F.B.4.3.6 Location** – Refer to DGSSMS

**F.B.4.3.7 Safety Grates** – Refer to DGSSMS

**F.B.4.3.8 Minimum Invert Drop** – Refer to DGSSMS

**F.B.4.3.9 Flow Direction Changes** – Refer to DGSSMS

**F.B.4.4 Catchbasins**

**F.B.4.4.1 Minimum Lead Size** – Refer to DGSSMS

**F.B.4.4.2 Spacing** – Refer to DGSSMS

**F.B.4.4.3 Intersection Location** – Refer to DGSSMS

**F.B.4.4.4 Flow Direction Changes** – Refer to DGSSMS

**F.B.4.4.5 Double Catchbasin** – Refer to DGSSMS
F.B.4.4.6 Catchbasin with Curb Inlet Overflow – Refer to DGSSMS. Refer to City of Kitchener Standard Drawing #309 & #310. Curb inlets to be installed in low points where double catchbasins are required as per DGSSMS.

F.B.4.4.7 Sub-drains - Refer to DGSSMS and Section C.7 Road Sub-Drains

F.B.4.4.8 Slotted Pipe Drain – Refer to DGSSMS

F.B.4.4.9 Rear Yard Drainage – Refer to DGSSMS and OPSD 705.030 & 705.040.

F.B.4.4.10 Frames and Grates

Catchbasin frames and grates shall conform to the City of Kitchener Standards. Curb inlet overflows shall be installed in sags. Refer to DGSSMS B.4.4

F.B.4.5 Services

F.B.4.5.1 Minimum Diameter

Single storm sewer services, a minimum of 150 mm in diameter, shall be provided for each dwelling unit in a residential subdivision.

F.B.4.5.2 Location – Refer to DGSSMS

F.B.4.5.3 Slope – Refer to DGSSMS

F.B.4.5.4 Flow Direction Changes – Refer to DGSSMS

F.B.4.5.5 Depth – Refer to DGSSMS

F.B.4.6 Geotechnical Report – Refer to DGSSMS

F.B.4.6.1 Soil Tests

Soil test borings shall be placed at intervals not exceeding seventy five (75 m) metres or as required by the Director of Engineering Services and to a depth of not less than one and one half (1.5 m) metres below the deepest proposed structure, where applicable. If the depth of the proposed structure is unknown, than the soil test borings shall be completed to a depth no less than four and one half (4.5 m) metres below the proposed pavement grade. Soil classifications, moisture content, etc., shall be recorded and noted on the plans and profiles submitted. Where poor or unstable soil conditions have been noted, additional borings shall be taken to establish the boundaries of this soil (on the street allowance).

On smaller projects a minimum of two mechanical analysis tests will be required.

F.B.4.7 Open Ditch and Culvert Design

The minimum allowable culvert size shall be 450 mm in diameter.

F.B.4.8 Easements

City of Kitchener requires 5. 0m or 2 times the depth (where depth is from the proposed final grade to the invert rounded up to the nearest half meter), whichever is the greater.
F.2 MATERIAL SPECIFICATIONS

The Region of Waterloo and Area Municipal Design Guidelines and Supplemental Specifications for Municipal Services (DGSSMS) Part C – Material Specifications shall form the basis for material selection except as extended or amended herein. The following outlines the supplementary specifications to be applied to the design and construction of Storm Sewer works for development in the City of Kitchener.

F.C SEWER MATERIAL SPECIFICATIONS

F.C.3 Sewers

F.C.3.1 Pipe Materials

Refer to the DGSSMS and the Ontario Building Code for acceptable materials. PVC profile pipe is not permitted for City infrastructure.

F.C.3.2 Cast Iron Maintenance Hole Lids – Refer to DGSSMS
F.C.3.3 Cast Iron Catchbasin Frames and Grates – Refer to DGSSMS
F.C.3.4 Maintenance Hole and Catchbasin Adjustment Units – Refer to DGSSMS
F.C.3.5 Slotted Pipe Drain – Refer to DGSSMS
F.C.3.6 Flexible Couplings – Refer to DGSSMS
F.C.3.7 Watertight Connectors – Refer to DGSSMS

F.3 CONSTRUCTION SPECIFICATIONS

The Region of Waterloo and Area Municipal Design Guidelines and Supplemental Specifications for Municipal Services (DGSSMS) Part D – Construction Specifications shall form the basis for construction except as extended or amended herein. The following outlines the supplementary specifications to be applied to the design and construction of Storm Sewer works for development in the City of Kitchener.

F.D SEWER CONSTRUCTION SPECIFICATIONS

F.D.3 Sewers

F.D.3.1 Ontario Provincial Standard Specifications – Refer to DGSSMS
F.D.3.2 Sewer Installation – Refer to DGSSMS
F.D.3.3 Maintenance Hole and Catchbasin Installation – Refer to DGSSMS
F.D.3.4 Service Connections – Refer to DGSSMS
F.D.3.5 Commissioning – Refer to DGSSMS
F.D.3.6 Inspection and Testing

The following inspection and testing work shall be carried out during and after construction of services.

i) "Sieve Analysis" of the pipe bedding material to assure that the material meets City of Kitchener Specifications. Representative samples are to be obtained by the Consultant prior to and during construction operations.
ii) "Density Tests" shall be performed to ensure that the pipe bedding material has been compacted properly.

iii) "Density Test" shall be performed on the backfill material to ensure proper compaction.

iv) All storm sewer and maintenance holes must be flushed and cleaned prior to testing. A mandrel test shall be performed on all flexible pipe sewer mains, forcemains and catchbasin leads greater than 2 m in accordance to the latest OPSS 410 standard.

v) All storm sewers, including catchbasin leads, shall be tested for "Exfiltration or Infiltration" to assure that all joints and manholes are properly installed in accordance to the latest OPSS 410 standard.

vi) Flushing and CCTV Inspections are required for initial and final acceptance of the storm sewers. The flushing and CCTV inspection shall be as per OPSS 409, OPSS 410 and Section E.B.3.6.1. The CCTV inspection shall include all mains, catchbasin leads greater than 2 meters in length and rear yard leads. The CCTV inspection reports submitted to the City shall be free of defects, debris and soil materials. The consultant shall ensure that all sewers lengths are inspected and accounted for. Include with the CCTV Inspection Report, a general service plan which highlights the inspected storm sewer.

vii) Full time inspection of all work during construction.

viii) Physical/Visual inspection of all work after construction to ensure all defects are rectified prior to the City's inspections. The consultant's inspector is responsible for the following: To bring the general site servicing drawing and/or the as recorded drawings to the inspection; to provide all labourer and equipment to assist City staff during the inspection and to ensure all structures have been pre-inspected and all imperfect work has been rectified by the contractor. Failure to comply with any of the above will result in cancellation of the inspection and a charge to the consultant engineering.

ix) If any issues (Such as cracks, breaks, blockages, sags etc.), are encountered with the lateral service connections within the public road allowance after final acceptance has been granted and within two years of the occupancy date, the City shall require that the Subdividers contact its agents and rectified the matter immediately at the Subdivider’s cost.

The City of Kitchener, acting reasonably, may require the Subdivider to complete storm sewer lateral CCTV Videos Inspections, of certain portions of the development that are suspected of storm sewer lateral damages (e.g. cracks, breaks, blockage, sags, etc.), such as:

- Infiltration determined by the municipality as a result of flow monitoring of the development, in combination with evidence from the Subdivider’s videos of the storm sewer line, and/or

- Suspect slope challenges of less than 2% on the storm sewer lateral due to other services adjacent to it; and/or

- Sewer back-up complaints received from Lot/Block owners in the development.

If the municipality determines through the sewer lateral videos that there is damage to one or more sewer laterals within the public road allowance, then the Subdivider will be required to complete the
work to repair the damage to the satisfaction of the Director of Engineering, prior to final acceptance and the City taking ownership of the infrastructure.

**F.D.3.6.1 CCTV Inspection (Storm)**

Refer to CCTV sections E.B.3.6.1
G STORMWATER MANAGEMENT

G.1 INTRODUCTION

The City of Kitchener has adopted a Watershed Planning Process for development within the City. As part of this process, the City of Kitchener Stormwater Management Policy documents primary goals and objectives for stormwater management within the City of Kitchener. Although the context has a different focus, the Stormwater Management Policy, *Purpose and Objectives* remain relevant to the purpose of the Development Manual for Stormwater Infrastructure Design.

This section has been prepared as a companion component to the “City of Kitchener Stormwater Management Policy Development, 2001” and the “Design Principles for Stormwater Management Facilities, 1996” to:

- Outline criteria to be used to design storm drainage infrastructure within the City of Kitchener;
- Specify storm drainage criteria to be applied to all storm infrastructure design including municipal projects and new land development, as well as re-development of existing lands;
- Specify design guidelines for storm drainage design and reporting at various stages of the land development process, and
- Provide reference and context to applicable Federal, Provincial, and Municipal policies and regulations which must be considered when planning or designing storm drainage systems.

There are several companion documents which support this document, including the Stormwater Management Policy, Stormwater Management Facilities Policy, City of Kitchener Official Plan, as well as numerous Federal and Provincial publications.

The most notable documents are:

- The City of Kitchener Stormwater Management Policy, 2001;
- Urban Drainage Policy - City of Kitchener;
- The City of Kitchener Sewage System By-law: Chapter 930 of the Municipal Code;
- Stormwater Management Planning and Design Manual, MOE, 2003;
- Ontario Ministry of Natural Resources Natural Hazards Technical Guides, 2001;
- Erosion and Sediment Control Guideline for Urban Construction, GHHA CA, December 2006;

The Developer is responsible for obtaining all other necessary permits and approvals from some or all of the following agencies:

- Grand River Conservation Authority;
- Region of Waterloo;
- Ontario Ministry of Transportation;
- Ontario Ministry of the Environment;
- Ontario Ministry of Natural Resources;
- Federal Department of Fisheries and Oceans, and
- Environment Canada (federal).
When designing the storm systems and the stormwater management facilities, the criteria within the relevant following Watershed Studies and/or Master Drainage Plans are to be adhered to:

- Alder Creek Watershed Study and Upper Strasburg Creek Subwatershed Plan update;
- Blair, Bechtel and Bauman Creek Subwatershed Plan;
- Detweiler Drainage Study;
- Doon South Creek Sub-Watershed Management Plan;
- Idlewood Creek Master Drainage Plan;
- Laurel Creek Watershed Study;
- Laurentian West Master Drainage Plan;
- Melitzer Creek Master Drainage Plan;
- Strasburg Creek Master Watershed Plan – September 1996;
- Blair, Bechtel and Bauman Creek Subwatershed Plan;
- Strasburg Creek Master Watershed Plan (1991) and Implementation Report (1996);
- Upper Blair Creek Functional Drainage Study;
- Upper Shoemaker Creek Watershed Study;
- Upper Strasburg Creek Subwatershed Plan;
- Or any new (Sub)watershed Study or Master Drainage Plan applicable to lands with the City of Kitchener.

Reference should be made to the “Schneider Creek Floodline Mapping Study”, completed on behalf of the Grand River Conservation Authority (GRCA), in conjunction with the abovementioned studies, for supplementary details regarding Stormwater Management criteria for those watersheds which are tributaries of the Schneider Creek.

All users of the City of Kitchener Development Manual Stormwater Management Design are required to use the most recent updates to the companion documents that support this document and the list of studies contained herein. The City of Kitchener will update the City of Kitchener Development Manual Stormwater Management Design periodically, as required.

G.2 STORMWATER MANAGEMENT DESIGN CRITERIA

G.2.1 Minor System

The minor system (ditches, sewers, etc.) shall be designed according to the following design principles and criteria. Section F of the City of Kitchener Development Manual provides design guidelines for storm sewers.

G.2.1.1 Storm Sewers

Approved Master Drainage Plans (MDP’s) and/or Subwatershed Plans, which have established storm sewer sizing criteria other than 1 in 5 year return storm event standard will govern (ref. Figure J.2.1). In the absence of approved MDP’s, storm sewers shall be designed to a minimum 1 in 5 year return storm event. Trunk sewers to be designed to maximum 85% of full pipe capacity. Local sewers are not to be designed over 95% of full pipe capacity. For any storm sewer to be assumed by the City the minimum allowable pipe diameter for the storm mains is 300 mm.
Flows to receiving existing storm systems shall not be increased from pre-development flows.

G.2.1.2  **Inlet Systems - Catchbasins**

The minor system shall be designed so that conveyance capacity complements inlet capacity. Undersizing the inlet capacity can lead to under-utilized storm sewers and frequent roadway flooding, whereas oversizing the inlet capacity can lead to sewer system surcharging. As a minimum requirement, the City requires that double catchbasins be installed at all low points in the road and single catch basins at low grade points at intersections (refer to Section F of the City of Kitchener Development Manual).

Catchbasin frames and covers shall conform to OPSD 400.02 for local roads and for arterial roads.

G.2.1.3  **Foundation Drains**

Foundation drains are to be connected to a storm sewer where present, and not to a sanitary sewer.

Foundation drains using sump pumps shall use a ‘gooseneck’ connection and shall be pumped over the foundation wall and connected to the storm sewer connection.

G.2.1.4  **Roof Leaders**

Roof leaders should not be connected to storm sewers.

Within new developments, the roof leader will discharge to grade except where roof leaders are connected to infiltration galleries. The disconnection of roof leaders from storm sewer connections for all redevelopment applications shall be encouraged where it will not negatively impact adjacent properties.
Where discharge to vegetated areas is not possible, the City shall have discretion on how to effectively address roof leaders. Refer to Section J.5 of the Development Manual for roof leader standards.

**G.2.1.5 Lot Grading**

New subdivisions shall be graded in accordance with the City of Kitchener Development Manual Section J. Grading around houses and buildings shall direct water away from the structure. Drainage between houses is to be in defined swales located typically on lot lines. Lot grading shall be in accordance with City of Kitchener Development Lot Grading Standard Drawings.

When rear yard catchbasins are installed to capture surface drainage, the City may elect in certain instances, (like abutting City-owned lands and areas with substantial external drainage), to maintain these catchbasins and associated storm sewers. In these cases, easements must be provided by the Subdivider to the City. Rear yard catchbasins are to be designed in accordance with the City of Kitchener Development Manual Section F.

In order to protect private property and public safety in situations where the lead from rear lot catchbasins may have collapsed or where the catchbasin has become obstructed or plugged, the proposed lowest adjacent opening elevation (i.e. basement window sill) shall always be above the maximum ponding level above the catchbasin, at which point there would be overland relief. Maximum desirable ponding level above a rear lot catch basin is 0.3 m.

**G.2.1.6 Outlet Treatment**

All storm sewer outfalls shall be designed to prevent erosion. Where discharging to a watercourse it should blend into the natural surroundings, in an environmentally acceptable and aesthetically pleasing manner, given the size and location.

An access road with a minimum width of 4.0 m and cross fall of 2% shall be provided to outfalls.

Outfalls shall be provided with safeguards to prevent entry by unauthorized personnel into the outfall. Current City Standards use the Ontario Provincial Standard Drawings (OPSD), which shall be followed to determine what outfall sizes require grating to prevent unauthorized entry.

The invert of the outlet shall be located above the receiving watercourse five (5) year flood elevation (or where not available, the approved otherwise high water level), and the invert of the overflow weir shall be above the less frequent design storm flood elevation (eg. 100yr storm event) of the receiving watercourse. The highest design storm water elevation within the pond shall be below the underside of footing elevations of the surrounding buildings. Pipe exit velocities shall not impart additional erosion potential to the streambed or banks. The outfall shall be adequately protected from erosive forces in the receiving watercourse to prevent scouring and undermining.

The outlet should be positioned no greater than 45 degrees in order to minimize the outlet angle to normal creek flow and the outlet should be, if possible, located flush with the creek bank for minor creeks with no valley flow and at the intersection of the overbank area/valley wall for major creeks. Reference Section K “Erosion and Sediment Control” of the Development Manual and the Erosion and Sediment Control Guidelines published by the Grand River Conservation Authority and the Greater Golden Horseshoe Area Conservation Authorities (“Erosion & Sediment Control Guidelines for Urban Construction, December 2006”).
Storm sewer outfalls to regulated watercourses require a permit from the Grand River Conservation Authority, who must be consulted on this matter. Storm sewer outfall design is to be submitted to the City as part of the full engineering submission.

G.2.1.7 Swales

The maximum runoff typically allowed in a swale between two buildings and within rear lot swales is based on the grading guidelines of Section J within the City of Kitchener’s Development Manual. Any swale deemed “significant” by City staff, which may require future maintenance, may be acquired as a permanent easement by the City and designated as an overland flow route. Swales conveying 0.7 m$^3$/s or more for the 100-year storm shall be considered significant by the City. This flow rate is based on a 1.0 m wide grassed swale with 3:1 side slopes flowing at a depth of 0.3 m at a slope of 2%. The City, on a case-by-case basis, may consider a swale to be significant. Easements should be a minimum width of 5.0 m, when swales are considered significant, to allow the City access for maintenance.

G.2.2 Major System

G.2.2.1 Roadway Conveyance

Major roadways and local streets often convey runoff during severe storm events and, as such, shall be incorporated as elements of the major drainage system. For new development, road grades shall be constructed to provide positive conveyance to major watercourses or storm sewer inlets. The depth and extent of street flooding in new developments, including all road classifications, shall be limited to 0.15m above the centerline elevation in order to protect property and public safety, and allow emergency vehicle access.

The roadway major system interface between existing and proposed development shall, whenever possible, be positively graded to convey roadway overland drainage to the flow capacity of the existing roadway system while maintaining roadway flooding depths to the foregoing standards. Should overland flows from the proposed development be above the existing receiving overland flow system, storage of overland flow or other methods of reducing flows to the receiver flow capacity will be required. Should a positively graded major system interface not be possible under normal site grading conditions, as demonstrated by the Subdivider, then alternative grading and/or methods of conveying the overland flow such as, but not restricted to, sag roadways (saw tooth grading), overland relief points and enlarged storm sewers, shall be reviewed with the City. It shall be demonstrated to the City that street flooding depths are maintained at/or below the foregoing roadway standards.

Road reconstruction projects within the City of Kitchener shall not negatively impact the existing overland flow system. Should road reconstruction projects propose to increase pavement area resulting in overland flow depths above acceptable guidelines, alternative forms of stormwater management should be investigated such as minor system or off-line storage.

G.2.2.2 Overland Flow Routes

All overland flow from rear yards shall be conveyed to roadways via swales or rear yard catch basins with connecting leads. The overland flow routes, through and from lots, shall be designed such that water levels remain below the finished yard grade adjacent to the swale. All overland flow routes shall be designed to convey the 100 year event within the confines of the overland flow route easement and shall maintain flow velocities below the erosion threshold for the swale. The detailed design must show how the overland flow route will convey the flows within the subdivision and all contributing upstream areas. Overland flow routes are to be identified during the preliminary stormwater management design
Roads that are proposed to be used as an overland flow route shall be designed as stated within the foregoing Section G.2.2.1.

Overland flow routes such as natural channel systems shall adhere to the criteria outlined within Section G.4.

G.2.2.3 Roadway Crossings

Waterway openings for culverts and bridge crossings shall be designed in accordance with the Ministry of Transportation Ontario (MTO) policies and guidelines outlined in below.

<table>
<thead>
<tr>
<th>Road Classification</th>
<th>Design Capacity Return Frequency (yr.)</th>
<th>Total Span (^2)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Bridge and Culverts</td>
<td>Up to 6.0 m</td>
</tr>
<tr>
<td>Trunk Urban Arterial</td>
<td>50 year</td>
<td>100 year</td>
</tr>
<tr>
<td>Rural Arterial Collector</td>
<td>25 year</td>
<td>50 year</td>
</tr>
<tr>
<td>Local</td>
<td>10 year</td>
<td>25 year</td>
</tr>
<tr>
<td>Temporary Detours</td>
<td>1 to 5 year</td>
<td>1 to 10 year</td>
</tr>
</tbody>
</table>

1. Road classifications are defined as follows (Note: more detailed description provided in the governing MTO Drainage Manual):

   Trunk Arterial Road - a road under Provincial jurisdiction which provides inter-regional or provincial service.
   Arterial Road - a road primarily for through traffic.
   Collector Road - a road whose function is to collect and distribute traffic between Local, Collector & Arterial.
   Local Road - a road primarily for access to property.

2. For purposes of selecting design flood criteria, total span is defined as the sum of the individual clear spans or diameters, measured parallel to the centreline of roadway in the case of a bridge, and a perpendicular to the longitudinal axis in the case of a culvert.

Arterial and collector roadways in new developments should be, where possible, the only road classifications permitted to cross a watercourse having a drainage area in excess of 125 ha. Spacing and location of roadway crossings other than arterial or collector roads may be considered by the City when documented within the Stormwater Management Plan. Freeboard and clearance (as defined in the governing MTO manuals and the Ontario Bridge Code) requirements for watercourse crossings should be based on current MTO criteria.

Culvert replacements may require a Class Environmental Assessment as outlined within the MEA Municipal Class Environmental Assessment document, October 2000, as amended in 2007.

G.3 Watercourse Systems (in Relation to Stormwater Outlets)
Where a project will outlet directly to a watercourse, "No Dumping" fish style plates in accordance with CKSS 353.02.07 are to be placed in the concrete curb adjacent to the roadway catchbasins. The City will distribute the plates to the Developer or Contractor. The plates are to be installed behind catchbasins and catchbasin manholes at surface asphalt installation.

Where watercourse alterations are proposed as part of a development, the design of such alterations shall consider and incorporate the following:

G.3.1 **Design Approach and Principles**

Channel design is to be based on natural channel forming processes to achieve a dynamically stable system. The channel evaluation methodology and design approach is to be consistent with the most current Provincial guidelines (ref. Ontario Ministry of Natural Resources Natural Hazards Technical Guides, March 2003 and “Adaptive Management of Stream Corridors in Ontario”, MNR, 2001).

Alteration to a regulated watercourse will require a permit from the Grand River Conservation Authority (Development, Interference with Wetlands and Alterations to Shorelines and Watercourses) and potentially clearance/authorization from the Federal Department of Fisheries and Oceans (Fisheries Act) and Ontario Ministry of Natural Resources (Lakes and Rivers Improvement Act).

Remedial works shall incorporate fish habitat protection/mitigation or compensation in accordance with the requirements of the Federal Department of Fisheries and Oceans (DFO) and Ontario Ministry of Natural Resources (MNR), related to stream type and significance.

Remedial works shall incorporate the requirements of the governing Official Plan (Region of Waterloo and/or City of Kitchener), as well as the requirements of provincial Ministries and other public agencies for the protection of natural heritage features and ecological functions such as:

- City of Kitchener;
- Regional Municipality of Waterloo;
- The Grand River Conservation Authority;
- Ontario Ministry of Natural Resources;
- Transport Canada for Navigable Waters Permit;
- Fisheries and Oceans Canada, and
- Ontario Ministry of Tourism, Culture and Recreation.

G.3.2 **Setbacks**

The size of setbacks from the watercourse edge to developable lands is typically a function of the significance of the valley form, the sensitivity of the watercourse and the type of development (building or other).

The Grand River Conservation Authority requires that setbacks from watercourse shorelines, and/or wetlands be established through watershed; subwatershed studies (Comprehensive EIS), scoped EIS or through a full EIS. The Grand River Conservation Authority may establish setbacks using “Technical Guide, River and Stream Systems: Erosion Hazard Limit OMNR 2002” to define the erosion hazard limit using stable slope allowances. Consultants should be aware that watercourse setbacks will typically be
established by the Conservation Authority using the greater of the fisheries, valley and floodplain setbacks. Further guidance on establishing setbacks is provided within the Grand River Conservation Authority policies relating to Ontario Regulation 150/06.

G.3.3 Access/Maintenance

Prior to Draft Plan Approval the developer/consultants must demonstrate that the storm drainage is directed to a legal outlet and that easements have been obtained if appropriate. Land dedication for watercourses adjacent to private land in new developments may require fencing to prevent human access and encroachment. The need for the fencing or demarcation requirements shall be assessed on a development-by-development basis based on the Environmental Impact Study or the General Vegetation Overview recommendations. Should fencing be required, it shall be on public property, 150 mm from the property line. Private access gates to creek block areas are not allowed.

Natural channel design shall consider channel maintenance requirements by incorporating access routes. Access routes may be located within the appropriate top of bank setback limit or adjacent to the low flow area in appropriately designated areas.

G.4 WATERCOURSE/CHANNEL DESIGN

Watercourse/Channel Design should be applied and/or considered under the following circumstances:

- Channel realignment;
- Watercourse erosion/stabilization works, and
- New creek corridors.

Watercourse/channel design involves numerous disciplines such as qualified geomorphologists, water resources engineers, terrestrial specialists and fisheries biologists to interpret existing watercourse/channel conditions and to develop, through an integrated design approach, a ‘successful’ channel design. The watercourse/channel design has to incorporate hydrology, stream hydraulics, fluvial morphology and fisheries habitat assessment. Each discipline has to determine design parameters which will be beneficial in the integrated design approach. Design approaches should consider the following characteristics as a guideline (not exhaustive) to developing a watercourse/channel design:

**Physical (Watershed and Watercourse/Channel) Characteristics**

- Run-off characteristics;
- Flow regimes;
- Channel geometry;
- Floodplains;
- Alignment and meandering;
- Bed-forms, riffles and pools;
- Slopes;
- Soils;
- Erosions and tractive forces;
- Channel roughness, and
- Light penetration.

**Chemical Characteristics**
• Sediment load;
• Suspended sediment;
• pH;
• Hardness;
• Temperature;
• Dissolved oxygen;
• Nutrient levels, and
• Toxic substances.

**Biological Characteristics**

• Fisheries and fish habitat (including habitat potential);
• presence of plants and macroscopic animal life;
• other terrestrial, riparian characteristics, and
• Stream bank cover.

There are numerous guidelines which consider the foregoing characterization in developing a natural channel design, such as the following examples:

• 1994 MNR Natural Channel Design Manual;
• Dr. Dave Rosgen, Applied River Morphology, 1994;
• Dr. William Annable, Morphologic Relationships of Rural Watercourses in Southern Ontario and Selected Field Methods in Fluvial Geomorphology, August 1996;
• Dr. Robert Newbury, Canadian Stream Reference Book (Ongoing);
• 2001 MNR, and

The Consultants should demonstrate that due care has been taken in establishing the watercourse / channel design to the satisfaction of the City of Kitchener’s Director of Engineering.

**G.4.1 Design Documentation for Watercourse/Channel Design**

The following is considered a minimum for documentation of watercourse / channel design and is not intended to be exhaustive:

• The Consultant should provide the background existing and proposed hydrologic data.
• The Consultant should provide plans outlining the following:
  a. existing and proposed plan and profile;
  b. existing and proposed channel sections;
  c. details for proposed typical channel sections;
  d. sediment and erosion controls;
  e. staging plans;
  f. seeding and landscaping plan, and
  g. floodline delineation – existing and proposed.
• The Consultant should document how the proposed watercourse/channel design matches and/or enhances existing watercourse/channel characteristics.
• The Consultant should document how the proposed watercourse /channel will function within the watercourse block/valley system.
• The Consultant should document existing and proposed watercourse channel hydraulics, including storage discharge relationships.
The Consultant should document potential impacts on both the existing terrestrial and fisheries conditions.
The Consultant should provide a monitoring program outlining monitoring requirements for the various design disciplines.

In addition to the watercourse/channel design, the following should be incorporated:

- Access will be required consisting of a 4.0 m wide with cross fall not to exceed 4%;
- Special consideration must be given to the vegetation; landscape plan must be designed by a member of OALA in good standing;
- Area must be posted as naturalized area and wording within the purchase and sales agreement should reflect this requirement, and
- No access gates permitted directly from private properties.

G.5 STORMWATER QUANTITY AND QUALITY CONTROLS

Current stormwater management practice advocates the consideration of Stormwater Management Practices (SWMP’s) on a hierarchical basis, whereby more pro-active techniques are considered first. The SWMP’s are grouped under the following headings in order of preferred application:

1. Lot Level Techniques and Source Controls
2. Transport or Conveyance Controls
3. End-of-Pipe Controls

The philosophy behind this hierarchy is that stormwater management techniques are usually more effective when applied at the source. The City of Kitchener supports Source Control and Water Balancing using available appropriate stormwater management techniques, such as infiltration technologies.

The City of Kitchener supports the progressive implementation of a wide range of stormwater management techniques. This range is expected to increase and change over time, as long-term monitoring results indicating the level of success of various techniques, become available. The Region of Waterloo may have some criteria and restriction within a specific area (e.g. due to it being a wellhead protection area) that could affect the applicability of the stormwater management techniques being proposed. Please refer to the Region’s website for further information.

The City of Kitchener supports the integration of stormwater management facilities with passive recreational opportunities, where the intended function of either is not impaired in accordance with the Parkland Dedication Policy—i.e. stormwater management facilities will not be considered as part of parkland dedication. Where proposed, a review of the potential for integration of such facilities with recreational use will be review between the City and the Consultant and may be reviewed at a neighbourhood meeting as part of the planning process with the general public.

The following table provides the current perspective of the City of Kitchener regarding available stormwater management practices, as well as special supporting documentation which is required for implementation of each technique.
## Table 11: COMPREHENSIVE LIST OF AVAILABLE SWMP’s

<table>
<thead>
<tr>
<th>Stormwater Management Technique</th>
<th>City of Kitchener Perspective</th>
<th>Special Supporting Documentation Required to Verify Suitability</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Lot Level Techniques and Source Controls</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Green roofs, biofilters</td>
<td>On a case-by-case basis</td>
<td>Yes</td>
</tr>
<tr>
<td>• reduced lot grades</td>
<td>Not currently endorsed (ref. Lot Grading Standard)</td>
<td>N/A</td>
</tr>
<tr>
<td>• roof leader discharge to surface</td>
<td>Encouraged</td>
<td>Address winter icing concerns</td>
</tr>
<tr>
<td>• roof leader discharge to infiltration facilities</td>
<td>Encouraged</td>
<td>Geotechnical and on-site soil assessment</td>
</tr>
<tr>
<td>• rear yard ponding</td>
<td>Discouraged in residential land use due to maintenance and impacts on use of rear yards, including West Nile Virus (WNV)</td>
<td></td>
</tr>
<tr>
<td>• rooftop storage</td>
<td>Acceptable for commercial, industrial or multi residential buildings. Green roofs can be discussed with the City.</td>
<td>Maintenance agreement and restrictive covenant with owner to prevent alteration to system</td>
</tr>
<tr>
<td>• parking lot storage</td>
<td>Acceptable to a maximum of 0.3m ponding depth</td>
<td></td>
</tr>
<tr>
<td>• porous pavement</td>
<td>Not currently endorsed</td>
<td>N/A</td>
</tr>
<tr>
<td>• pervious pavement</td>
<td>Not currently endorsed</td>
<td>N/A</td>
</tr>
<tr>
<td><strong>Conveyance Controls</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• pervious pipe systems</td>
<td>Not currently endorsed</td>
<td>N/A</td>
</tr>
<tr>
<td>• pervious catchbasins</td>
<td>Not currently endorsed</td>
<td>N/A</td>
</tr>
<tr>
<td>• grassed swales</td>
<td>Encouraged where applicable</td>
<td>N/A</td>
</tr>
<tr>
<td>• oversized pipes (Superpipes)</td>
<td>Appropriate in redevelopment of existing areas</td>
<td>Need to demonstrate no other suitable alternative</td>
</tr>
<tr>
<td><strong>End-of-Pipe Controls</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Structural</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• wetlands</td>
<td>Applicable for water quality/quantity treatment</td>
<td>SWM report</td>
</tr>
<tr>
<td>• hybrids</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• wet ponds</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• dry ponds</td>
<td>Applicable for water quantity</td>
<td>SWM report</td>
</tr>
</tbody>
</table>
Table 11: COMPREHENSIVE LIST OF AVAILABLE SWMP’s

<table>
<thead>
<tr>
<th>Stormwater Management Technique</th>
<th>City of Kitchener Perspective</th>
<th>Special Supporting Documentation Required to Verify Suitability</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>control only</td>
<td></td>
</tr>
<tr>
<td>• infiltration facilities</td>
<td>Encouraged</td>
<td>Geotechnical and on-site soil assessment, SWM report</td>
</tr>
<tr>
<td>• Community infiltration</td>
<td>Encouraged</td>
<td>Geotechnical and on-site soil assessment, SWM report</td>
</tr>
<tr>
<td>facilities</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• filter strips</td>
<td>Part of ‘Treatment ‘Train’ only</td>
<td>N/A</td>
</tr>
<tr>
<td>• buffer strips</td>
<td>Part of ‘Treatment ‘Train’ only</td>
<td>N/A</td>
</tr>
<tr>
<td>• sand filters</td>
<td>Limited application</td>
<td>Geotechnical and maintenance assessment</td>
</tr>
<tr>
<td>• oil/grit separators</td>
<td>Part of ‘Treatment ‘Train’ only</td>
<td></td>
</tr>
<tr>
<td></td>
<td>– generally only for areas less than 2 hectares</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Applicable primarily for quality control for Commercial/Industrial land use, quantity control needs to be addressed</td>
<td></td>
</tr>
<tr>
<td>Non-Structural</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cash-in-Lieu of On-Site Stormwater Management</td>
<td></td>
<td>Most recent approved SWM Policy and Audit (and Implementation Procedures).</td>
</tr>
</tbody>
</table>

G.5.1.1 Source Controls

As noted, the City of Kitchener supports the implementation of source controls where feasible. The feasibility and overall benefit to be derived from implementing source controls would typically be determined in a Subwatershed Study or other form of Master Plan. Where such studies do not exist or are not applicable to the proposed development, the Consultant shall consider the application of source controls as a Best Management Practice (BMP).

Reduced Lot grading

The City of Kitchener currently does not endorse reduced lot grading.

Roof Leader Discharge to Surface/Infiltration facilities

Roof leader discharge shall be directed to surface except where infiltration galleries are required. The Stormwater Management Planning and Design Manual, MOE 2003 (MOE 2003 guidelines) describe the possibility of roof leader discharge to ponding areas. The City of Kitchener does not endorse ponding areas for roof leader discharge, due to lot grading standards and West Nile Virus concerns, however soakaway pits are applicable in areas where infiltration is required. Subwatershed Studies or Master Plans may establish the feasibility of soakaway pits and should be followed in establishing subdivision
detail design to the satisfaction of City staff. Soakaway pits identified within Subwatershed Studies or Master Plans may be used to serve residential lots, commercial and industrial lands. Front yard infiltration facilities will only be constructed under a City easement and be maintained by the City where a Subwatershed Study or Master Plan has determined this to be mandatory requirement of development. All other infiltration facilities are to be located in rear yards, and have to be maintained by the property owner. Water going into the soakaway pits is typically only roof drainage, therefore, no pre-treatment is required. Where roof drainage is not directed to soakaway pits, roof leaders shall discharge to the surface using splash pads.

All infiltration galleries must be protected during construction. It is recommended that infiltration galleries be installed after foundation and brick work unless there are safety concerns with excavations.

Where redevelopment is proposed, and where roof leaders within the existing development are currently directly connected to storm sewers, the roof leaders within the redevelopment shall be disconnected from the storm sewers, where this will not adversely impact neighbouring properties.

**Rooftop Storage**

Rooftop storage is accepted within the City of Kitchener for large flat rooftop commercial, industrial, multi-residential and institutional buildings for reducing post-development flow rates to storm sewer systems. The City of Kitchener would require rooftop storage designs be completed in accordance with MOE 2003 guidelines. Green roof technologies may be discussed with City staff, but it should be noted that this technology is not considered typical rooftop storage.

**Parking Lot Storage**

Commercial, industrial, multi-residential and institutional developments have used parking lot storage to control post development flows to receiving storm sewer systems. Parking lot storage design shall be in accordance with the MOE 2003 guidelines, with ponding depths a maximum of 0.30 m. Ponding depths within loading bay areas should be designed to a maximum of 0.30 m.

**G.5.1.2 Conveyance Controls**

**Enhanced Grassed Swales**

The City supports the use of enhanced grassed swales, where applicable, for stormwater quality treatment, provided that minimum length, velocity, flow depth and slope criteria are met for full functionality. The MOE 2003 guidelines provide design criteria for enhanced grass swales and should be incorporated into the swale design.

**Oversized (Super) Pipes**

Super pipes provide subsurface storage to reduce post development peak flow rates to receiving storm sewer systems. The City of Kitchener may permit the use of oversized pipes on private properties to provide quantity control only for redevelopment, infill areas, and some smaller developments, when no other practical alternative exists. The Consultant shall incorporate the MOE 2003 guidelines into the super pipe design.

**G.5.1.3 End-of-Pipe Techniques**

**Wetlands**

Constructed wetlands based on suitable soil conditions are suitable for providing stormwater quality control/enhancement for drainage areas 5 ha or greater in size. The MOE 2003 guidelines shall be adhered to in developing the wetland design. The application of BMP’s would typically be developed
through a Subwatershed Study and the detailed design established through a Stormwater Management Plan for proposed development.

**Wet Ponds**
Wet ponds are similar to wetlands, but typically are less land intensive. Wet ponds also require a minimum 5 ha drainage area to function effectively. Subwatershed plans typically provide the required guidelines for the Stormwater Management Practices in conjunction with the MOE 2003 guidelines, but should a subwatershed plan not exist, the MOE 2003 guidelines shall be followed.

**Dry Ponds**
Dry ponds only provide erosion and flood control. Dry ponds do not have a permanent pool component, therefore, any water quality protection/enhancement, would only be as a function of the facility’s detention time and therefore would not be considered as effective as a wetland or wet pond. The MOE 2003 guidelines provide design criteria for dry ponds, which should be incorporated into dry pond designs.

**Hybrid Wet Pond/Wetland**
Hybrid wet pond/wetland systems consist of a wet pond, in series with a wetland. The permanent pool is approximately 50% within each element. The hybrid requires a forebay sized only to serve the wet pond. The MOE 2003 guidelines design criteria for hybrid wet pond/wetland systems should be followed.

**Infiltration Methods (General)**
In general, there are areas within the City of Kitchener where stormwater infiltration is critical to maintain downstream ecosystem integrity and groundwater regimes. The application of this best management practice would typically be the subject of a subwatershed study or other form of detailed local master plan. Infiltration is required on all sites where soils permit greater than or equal to 15 mm/hr percolation rate.

Developments located within such areas shall provide site-specific soils investigations, confirming the potential effectiveness of infiltration techniques and the impacts on groundwater recharge and quality.

The Subdivider is encouraged to consider infiltration methods only where soil conditions permit. In either event, should the Subdivider propose infiltration methods as part of the stormwater management plan, the potential impacts to the groundwater shall be clearly demonstrated in terms of quantity; this may require the implementation of a ground- and/or surface water monitoring program.

**Infiltration Facilities**
Infiltration facilities, which typically can be implemented for small drainage areas (< 2 ha) and are suited for residential, commercial and industrial land use. Infiltration systems are best suited for high density housing such as townhouses, where several homes can drain to one trench. Townhouse condominium complexes will require infiltration trench maintenance requirements and ownership details to be included within the property title agreement. Soil conditions should provide suitable infiltration capacity. The Ministry of the Environment 2003 guidelines should be incorporated into the infiltration system design.

**Filter Strips**
Filter strips are only considered appropriate for low-density development, roads and small drainage areas (< 2 ha). Vegetated filter strips should be located adjacent to watercourses and drainage swales, as these systems can receive the sheet flow produced by the filter strip. The Ministry of the Environment 2003 guidelines should be adhered to in the design of the filter strip.

**Buffer Strips**
Buffer strips comprise of natural or naturalized areas located between development and the receiving water system or natural area. Buffer strips should be established and defined at the subwatershed planning level, through an Environmental Impact Study or other stormwater assessment processes, with input from the Grand River Conservation Authority, City and provincial agencies such as Ministry of Natural Resources.

**Sand Filters**
Sand filters shall be limited to a drainage area less than 5 ha. Sand filters shall require a form of pre-treatment and shall not be used as a stand-alone SWMP. The type of filter shall consider the surrounding soil condition and the possibility of being connected to the proposed storm system. The Ministry of the Environment 2003 guidelines outline the conditions and criteria for filters.

**Oil/Grit Separators**
Oil/grit separators are most appropriate for commercial/industrial land use and shall not be used as a standalone Stormwater Management Plan, but rather part of a “treatment train” approach to achieve the required water quality treatment. Oil/grit separators typically serve drainage areas under 2 ha and are predominantly encouraged by the City to be used for spill control. In situations that involve spill management controls, effluent from oil/grit separators is governed by the Sewer Use By-Law. Oil/grit separators are also appropriate for providing water quality control for redevelopment, or infill areas which typically have space limitations. The Ministry of the Environment 2003 guidelines shall be followed in incorporating an oil/grit separator as part of the water quality protection for a site. Oil/grit separator manufacturer’s technical guidelines shall be consulted in the sizing of a unit.

The type of Oil/Grit Separator unit that is currently accepted by the City of Kitchener is Stormceptor unless approved otherwise by the Director of Engineering. Further any proposed unit is required to meet a monitoring program to the satisfaction of the Director of Engineering. Failure to comply with the program or failure to meet the program will result in the removal of the proposed unit. All works and related costs of the removal and of such unit, and replacement with an approved unit, will be responsibility of the property owner.

**G.5.1.4 Cash-in-Lieu for Infill and Redevelopment**
Cash-in-lieu for infill and redevelopment would involve a Developer providing a designated financial contribution towards off-site stormwater management infrastructure, elsewhere in the City, in lieu of providing on-site stormwater management. The prerequisites to such an approach include a low sensitivity receiver, or limited rehabilitation opportunity and typically small or infill development form. This cash-in-lieu is only for providing for off-site water quality through the construction of centralized facilities. On-site water quantity has to be addressed by the Consultant.

To determine the cash-in-lieu, refer to:
- Stormwater Management Policy Development, TSH, 2001, and
- Most recent Council approved City-Wide Stormwater Annual Audit Report.

For exemptions to the cash-in-lieu, refer to the City of Kitchener Downtown Core Area Map on the City of Kitchener website.

**G.5.2 Spill Prevention and Control**
Spill prevention and control measures shall be implemented for all industrial and commercial developments that process, store or refine liquid products that would be considered a contaminant within the receiving stormwater system, to ensure that spills or leaks do not impact downstream water quality. The information shall be included as part of the Site Stormwater Management Plan. Please review the
Source water protection policy within the Regional Official Plan to ensure the proposed measures are being adhered to the Region of Waterloo’s criteria.

Examples of spill controls used for the prevention of the discharge of pollutants to the stormwater system are:

- Oil/grit separators;
- Spill containment tanks;
- Stormwater facility shutoff valves;
- Vehicle loading area covering;
- Vehicle loading procedures, and
- External storage area containment.

In addition to Ontario Regulation 224/07, both the Region of Waterloo and the City of Kitchener require that industrial and commercial developments develop a spill prevention and control plan incorporating appropriate preventative spill measures, identification of spill areas, material handling procedures and spill response procedures.

G.6 STORMWATER MANAGEMENT FACILITY DESIGNS

In accordance with the Stormwater Management Policy, SWM facilities are to be centralized to provide a more cost effective approach through lower capital costs and long term maintenance costs. New subdivisions are to take into consideration upstream developable lands, future road widenings, and future roads, with coordinated efforts between all affected land owners. SWM facilities and related sewers should be designed to accommodate post development flows from the surrounding undeveloped lands within the overall catchment area, such that when the surrounding subdivisions within said catchment area develop, additional ponds are not required. After 95% build out of a Subdivider's Plan of Subdivision is achieved and all SWM conditions have been met, the Subdivider can be released from the maintenance responsibilities of such facility.

If a new Subdivision will outlet to an existing downstream SWM facility, the Subdivider must be responsible for the maintenance, performance (quality and quantity), and plantings of such facility until 95% of the Subdivider's Plan of Subdivision is built out and all SWM conditions including monitoring have been met.

G.6.1 New Development and Redevelopment

The following design guidance is considered to complement the Ministry of the Environment Stormwater Management Planning & Design Manual, March 2003 as well as the City of Kitchener's standards, “Stormwater Management Facilities” provided in the “City of Kitchener, Urban Design Standards and Policies Manual”.

1. Facility Storage Requirements

Permanent pool volume and quality control (including extended detention) requirements shall be based on the MOE Stormwater Management Planning & Design Manual, or as specified within Master Servicing Plans, Master Drainage Plans or Master Stormwater Management Plans.

Quantity control shall be based on criteria established in Master Servicing Plans, Master Drainage Plans or Subwatershed reports. Should no documentation exist to establish the level of quantity control, discussion with the City will be required to determine the requirements.
The minimum pond (dry ponds, wet ponds and constructed wetlands) length-to-width ratio is 3:1, in accordance with the Ministry of the Environment Stormwater Management Planning & Design Manual, March 2003.

2. **Forebay**

Where groundwater interference or contamination is determined to be an issue, lining will be required (as recommended by a geotechnical consultant). The Consultant shall outline how access to the forebay is to be provided for the purpose of maintenance. In addition, the Consultant should determine sediment removal frequency and how sediment removal would be conducted (i.e. equipment, forebay design). Prior to sediment removal, the forebay is to be dewatered. Dewatering procedures shall be provided as part of the Operation and Maintenance Manual.

3. **Standard Water Depths**

Refer to the City of Kitchener’s standards, “Stormwater Management Facilities” provided in the “City of Kitchener, Urban Design Standards and Policies Manual”.

4. **Bermin**

Bermining around the perimeter of a facility shall be designed with a minimum top width of 1.5 m (where trail or maintenance access is not located on berm). The top of bermin elevation shall be established at a minimum 0.3 m above the 100 year storm quantity control water level or the highest water level. Geotechnical considerations should be discussed in the design of the facility bermining. Retaining walls within the stormwater block are typically not acceptable to the City, since the land designated for stormwater management systems should be established on the basis of no man-made retaining systems, although in special circumstances such as stormwater management retrofits, the City may consider the use of retaining walls.

Turfstone in the SWM block is only to be utilized under the five (5) year stormwater storage elevation. Where residential lots back onto a SWM facility, a 1.2 m chainlink fence shall be provided between the lots and the SWM block.

5. **Inlet Structures**

Headwalls and grating shall conform to OPSD. A geodetic monument shall be established on the top of the inlet concrete headwall to assist in monitoring future water levels. The monument shall have horizontal and vertical controls in accordance with City standards.

Erosion protection shall be provided between the inlet headwall and forebay bottom to prevent localized scouring. Erosion protection shall match the headwall width at the inlet and shall extend a minimum 1.5 m on either side of the headwall at the forebay bottom. Protection material shall consist of rip rap or river stone underlain with geotextile or other erosion protection schemes. The protection size and depth may be based on engineering consultant recommendations and subject to review and acceptance by the City.

6. **Outlet Structures**

The minimum allowable diameter for an outlet orifice is 75mm (minimum 50mm orifice if protected with a perforated riser pipe design with smaller perforations). Reverse slope pipe or perforated riser pipe outlet
structures shall be used for both constructed wetland and wet pond facilities unless the Consultant can demonstrate to the City and approval agencies that alternative outlet structures could be used. No geotextile wrapping is required for these structures. Refer to the Ministry of the Environment Stormwater Management Planning & Design Manual, March 2003 for design guidelines. For stormwater management facilities located downstream of areas with a high susceptibility for the occurrence of spills, a shut-off on the outlet structure may be required. Maintenance pipes shall be installed to allow the facility to drain by gravity flow whenever possible. Maintenance access roadways shall provide access to outlet structures.

A weir outfall/spillway shall be considered for discharge of less frequent events in combination with the ditch inlet type of structure. Spillway erosion protection shall be consistent with attributes described herein. Erosion protection for outfalls shall generally consist of a combination of rip rap or river stone and vegetation, with the size and depth of stone based on consultant and / or City recommendations and subject to City approval. Outfalls to Environmentally Significant Areas are discouraged and in the rare instances when required they may require site-specific treatment as dictated by the City and the Grand River Conservation Authority and / or as stipulated within Master Servicing Plans, and/or Environmental Reports.

7. Emergency Overflow Spillway

Each stormwater management facility shall provide an emergency overflow spillway to allow drainage to safely exit the facility should the outfall structure fail to function or should the storm event have a frequency lower than the 100 year or maximum design storm return period. The overflow spillway shall convey the Regional Event or design storm event post-development controlled peak flow whichever is the greater. An additional 0.3 m freeboard is required above the maximum peak flow flood level as per the City of Kitchener Urban Design Standards and Policies.

The design of the spillway shall be based on calculations provided by the Consultant and are subject to review and approval by the City Engineer. Erosion protection shall be provided on the entirety of the spillway. Erosion protection may consist of a soil reinforcement system with a natural vegetated surface treatment or alternative protection measures as specified within the consultant recommendations and approval by the City. When access roads cross the top of the spillway, the surface treatment and base will be consistent with the maintenance access road design. Side slopes at the top of the spillway shall be 3:1 maximum, and shall have a maximum slope of 10%, if used as an access roadway.

8. Maintenance Access Roadways

Refer to the City of Kitchener’s standards, “Stormwater Management Facilities” provided in the “City of Kitchener, Urban Design Standards and Policies Manual”. Maintenance access roadways shall have a minimum width of 4.0 m; 300 mm compacted Granular "A"; 50 mm HL4 binder course and 40 mm HL3 surface course asphalt.

9. Sediment Drying Area

A sediment drying area can be provided immediately adjacent to the maintenance access road and to the sediment forebay to facilitate ease of access for sediment removal from the forebay and sediment storage. The area should be graded to allow positive drainage to the forebay at a minimum slope of 2.0%. The sediment drying area shall be designed to facilitate a 1.0 m maximum storage depth and an angle of repose of 4:1 of the excavated sediment. The drying area shall be rehabilitated at the time of maintenance.
10. *Major System Flow Routes*

Major system flow routes shall be designed to safely convey the 100 year peak overland flow into the facility, but should not be directed into the sediment forebay area. Overland flow routes shall be flat bottomed channels with maximum 3:1 side slopes, maximum flow depth of 0.3 m and 0.1 m of freeboard. Overland flow routes should be designed using standard hand calculations and/or hydraulic analytical techniques acceptable to the City. Overland flow route erosion protection may consist of a soil reinforcement system with a natural vegetated surface treatment, based on the engineering consultant and/or the City’s recommendations, and subject to City approval.

11. *Existing Groundwater Elevation*

Within the stormwater block, at least one borehole shall be located near the centre of the block as part of the geotechnical investigation, to assess the nature of existing soils and the groundwater elevation. The groundwater elevation shall be compared to the proposed permanent pool water elevation within the facility. Where soil conditions are very permeable and the groundwater elevation is below the permanent pool water level, lining of the permanent pool area with an impermeable material may be required to ensure permanent pool levels are maintained. A liner may also be required when groundwater contamination may be a result of the permeable soils and the water quality within the stormwater management facility. The type and thickness of lining material shall be based on geotechnical recommendations; however, a clay liner is preferred over synthetic materials for stormwater management facilities.

If a plastic or man-made liner is proposed a rock layer is required over the liner as a warning to avoid damage to the liner during cleanout. Rock layer shall be constructed 400 mm thick with 150 – 200 mm diameter round stone, and a concrete sump provided in the forebay to facilitate forebay dewatering.

Where the groundwater elevation is above the permanent pool water elevation, an investigation shall be undertaken to assess the impacts of a localized reduction in groundwater levels, potential impacts to groundwater aquifer systems and flow regimes, watercourse baseflow quantity and temperature, and to assess potential slope stability and groundwater seepage concerns within the facility. The groundwater assessment will consider implications to include existing data collected from source water protection plans. The scope of this investigation will be determined based on site specific conditions. The consultant shall consider all feasible design alternatives to limit or negate any impact to local groundwater levels to the satisfaction of the City.

12. *Land Requirements*

The City shall require that the design of stormwater blocks consider the stormwater management function and integration into surrounding land uses.

The City prefers the use of centralized end-of-pipe systems rather than smaller distributed systems. However, the feasibility of implementing a centralized system is dependent upon such factors as the need for up-front planning, development phasing, and the cost to small developments.

13. *As-Constructed Requirements*

This shall include monitoring requirements as determined by the applicable Subwatershed study or Watershed study or by Engineering staff. An as-constructed topographic survey incorporated into the stormwater facility engineering plans shall be provided along with the engineering calculations to determine and verify the following:
permanent pool volume;
active storage volume;
berm construction, and
inlet and outfall structure details.

The Consultant shall certify that the stormwater management facility has been constructed and is operating in general conformance with the consultant’s plans and design report. Should the City or consultant determine that the facility is not performing according to the Engineer’s design, the Consultant shall provide recommendations for the constructed facility to be retrofitted by the Developer. The consultant should circulate the as-constructed survey, stormwater management certification and excel spreadsheet documenting as-built information to Development Engineering staff.

G.6.2 Temporary Stormwater Facilities

In development situations where the ultimate downstream facilities have not been constructed and/or where trunk sewers have not been completed to convey storm drainage to the ultimate facility, an interim or temporary on-site facility(ies) may be considered by the City. Temporary facilities shall provide an equivalent level of quality and quantity control as per the ultimate facility. Temporary facilities shall remain in place until the ultimate facilities and trunk sewers are constructed and approved by the City.

Site plan or subdivision agreements will be established to require the Developers to be solely responsible for maintenance and operation of temporary facilities, as well as any works associated with decommissioning of the temporary facility, including possible disposal of collected sediments according to Provincial guidelines and regulations. The cost for a temporary stormwater facility including its removal shall be borne solely by the developer.

The design criteria may be modified from those for ultimate/permanent facilities, as follows for temporary facilities:

- 3:1 max. side slopes from facility bottom to top of berm, and
- facility perimeter to be fenced with 1.8 m chain link on all sides with lockable access gate in accordance with OPSD.

G.6.3 Infill Developments

All new development regardless of location or size will have some impact on the runoff regime (quality/quantity). The impacts though can be more or less depending on the sensitivity of the receiver. Medium and large greenfield developments will, in all cases, be accompanied by stormwater management plans which either prescribe on-site measures or some form of centralized management strategy. Smaller greenfield settings and infill developments within existing urban areas need to consider their location in the drainage network, size relative to the balance of the existing developed area and the nature of the receiving system. These factors tend to direct the Developer for an infill development to the specific form of stormwater management.

Prior to finalizing the Preliminary Stormwater Management Report for new stormwater management facilities, the consultant is to contact the City to obtain pond identification number(s) and include this information in the title of the report.
Analytical methods can be subdivided into two categories, hydrology and hydraulics, representing the establishment of flows and flow levels, respectively. Hydrology typically precedes the determination of hydraulics for all new development and redevelopment, as flows are required to establish the hydraulic characteristics of open and closed systems.

For both hydrology and hydraulics, there are numerous available analytical methods. The analytic methods provided in this document represent established techniques that are considered acceptable by the City of Kitchener. The Consultant is not limited to the methods herein, although discussion with the City of Kitchener and review agencies would be required to confirm the appropriateness of using alternative hydrologic and hydraulic analytical techniques, prior to their use.

G.7.1 Hydrology

G.7.1.1 Rainfall

Intensity – Duration – Frequency (IDF)

The most recent IDF Curves/Hyetographs for the design storm events shall be used to design storm infrastructure.

G.7.1.2 Rational Method

The City of Kitchener will not accept the Rational Method. The Rational Method is a conservative approach calculation with many assumptions built in. The Rational Method provides the designer with a peak discharge value, but does not provide a time series of flow or flow volume. The City of Kitchener must ensure the specific flow restrictions proposed on the site work with the entire modeling system.

G.7.1.3 Event Based Hydrologic Models

Single Event Modeling

A list of event based hydrologic models considered appropriate has been provided below. The list will be periodically reviewed (every 5 years) to include either new hydrologic models or models considered appropriate at the time of preparation. Should a Consultant wish to use another model, documentation as to the validity of the model should be provided to City staff for review prior to use.

LIST OF APPROVED HYDROLOGIC MODELS

1. SWMHYMO/OTTHYMO
2. VISUAL OTTHYMO
3. SWMM
4. XP-SWMM
5. MIKE SWMM
6. MOUSE (DHI)
7. HSPF/WINHSPF
8. GAWSER
9. MIDUSS

LIST OF APPROVED HYDRAULIC MODELS
1. XP-SWMM
2. SWMM
3. MOUSE (DHI)
4. HEC-RAS (If HEC-2 used, it should be converted to HEC-RAS)
5. Flow Master
6. Culvert Master

Both the Flood Plain Management in Ontario Technical Guidelines, Ontario Ministry of Natural Resources, 2001 and the Drainage Management Manual Parts 3 and 4, Ministry of Transportation, 1997 provide general guidelines on the selection of hydrologic models. The Ministry of Transportation document lists the characteristics of each model, from which the Consultant can evaluate the appropriateness of certain event based hydrologic models.

Sound hydrologic modelling standards of practice should be followed in developing an event based hydrologic model. The following standards of practice are intended to guide general model preparation for most hydrologic programs and techniques, however, this list should not be considered exhaustive:

- The modeller should provide the purpose for developing the hydrologic model, such as determining flow rates, runoff volumes, flow routing effects for proposed development, existing land use conditions etc.
- The modeller should provide the study objectives and how they relate to the hydrologic modelling.
- The modeller should provide the model selection criteria and how the model matches the criteria.
- The modeller should provide the basis for the storm design information, outlining how the design storm has been selected.
- The modeller should provide drainage area plans outlining both internal and external catchments, modelling schematics and tables providing drainage area parameters.
- Background information on the selection of the drainage area parameters should be provided to assist the City in understanding on the assumptions leading to the drainage area parameters.
- Background data on overland and minor storm systems should be provided with plans clearly presenting and labelling both systems.
- Data should be provided on routing through natural and manmade storage systems, with detailed plans and calculations outlining how the stage/discharge relationship has been developed.
- Sensitivity analysis should be conducted on a minimum number of parameters which varies with model complexity.
- Verification or validation of results should be provided through various methods such as calibration to recorded streamflow, unit flow rates and runoff volume comparisons using the techniques such as the MTO index method or equivalent. The application of the validation technique (number and type) will depend on the availability of data and the sensitivity of the analysis.
- The modeller should provide all input and output details in a logical manner, with an explanation for potential errors.

**Continuous Event Modelling**

Continuous models differ from event based hydrologic models in that rather than using a synthetic design storm based on IDF data, a long term time series of historical meteorological data is used for the input driving function. In addition to historical rainfall data, continuous models typically require seasonal state variables. Continuous models are usually more complex than event based hydrologic models, as typically the models consider more processes including temperature, evapotranspiration, snow conditions and groundwater. Notwithstanding, the modelling standards of practice for event based hydrologic models also apply to continuous models. Continuous models are typically used but are not
limited to higher level studies such as watershed and subwatershed studies. Continuous modelling may also be used for studies with a scope requiring historical data inclusion.

In addition to the standards of practice for event based hydrologic models, the Consultant should demonstrate that the historical meteorological time series selected has been obtained from the nearest rainfall gauge to the Consultant’s study area. This will often lead to a trade-off between duration of record and proximity. Typically, the minimum duration for meaningful continuous simulation is 20 to 25 years. Historical rainfall data is available from the City, Grand River Conservation Authority and Environment Canada.

The Consultant in selecting a continuous hydrologic model usually intends to develop frequency flows for the historical data period. The Consultant should specify the assumptions and methodology for determining the frequency flows and typical year hydrographs. The Consultant should provide validation of the selected probability distribution by using statistical tests.

The Consultant should select the continuous model giving consideration to development and/or redevelopment characteristics to the satisfaction of the City. In addition approval agencies (i.e. Grand River Conservation Authority, MNR, MTO and others) other than the City should be consulted to determine modelling requirements.

G.7.2 Hydraulic Capacity

Drainage systems can be subdivided into both closed and open systems. The hydraulic capacity of the receiving minor and major storm system is to be determined to verify that drainage can be safely conveyed as proposed. For each system various analytical techniques can be employed. The Consultant is not limited to the methods herein, although discussion with the City and review agencies (Conservation Authorities, Ministry of Natural Resources, Ministry of Transportation and others) would be required to confirm the appropriateness of using alternative hydraulic analytical techniques.

The hydraulic capacity of a storm system can be determined through hydraulic modelling and for certain applications through the use of standard ‘hand calculations’. As for hydraulic modelling, standards of practice relate to the use of various techniques. The following standards of practice are intended to provide direction:

- The Consultant should clearly identify the study objectives and how they relate to the hydraulic modelling.
- The Consultant should provide the purpose for the hydraulic modelling.
- The modeller should provide the model selection criteria and how the model matches the criteria.
- The Consultant should provide plans clearly presenting the closed and/or open hydraulic system.
- For plans describing open systems, the Consultant should note cross-sections, study limits, land use, crossing details, spill areas, ineffective flow areas, and flooding limits and elevations for the appropriate design event(s).
- For plans describing closed systems such as storm sewers, the Consultant should note the storm sewer network details including manhole numbers, storm sewer size, length, study limits, land use, slope, and sewer and ground elevations.
- For combined hydrologic/hydraulic models such as SWMM, the Consultant should provide plans that not only describe the closed system but also the contributing drainage areas and overland flow system.
- For all hydraulic models, the Consultant should provide the downstream and, if applicable, the upstream boundary conditions for each storm modeled and the assumptions used to define the boundary conditions.
• For all hydraulic models, the Consultant should document the parameters established for hydraulic losses such as Manning’s ‘n’, inlet and outlet losses and other appropriate losses.

• The Consultant should summarize the selection of procedures for determining the computed energy grade line and water surface elevations.

• The Consultant should document the hydraulic results in summary form for the relevant storm events.

• The Consultant should prepare the model of an open system such that it fully contains the modeled flows without exceeding the hydraulic cross-section. Should it not be possible to contain the flows within the defined geometry of the open storm system, the Consultant should provide details on the spill characteristics. In the event of a spill, a rationale should be provided on whether or not to include a flow loss in the calculation.

• The Consultant should document potential impacts on existing infrastructure and possible mitigative measures.

• Sensitivity analysis should be conducted on a limited number of parameters depending on the model type and complexity.

• The Consultant should, if possible, verify hydraulic results for an existing closed/open storm system by documenting historical flood elevations for specific storm events and comparing the hydraulic modelling results to the historical data; calibration of losses should be included, if sufficient data exists.

• The Consultant should provide the input and output data in a logical manner with an explanation of the potential error.

The hydraulic capacity of storm sewers is to be determined using the Region of Waterloo and Area Municipal Design Guidelines and Supplemental Specifications for Municipal Services (DGSSMS) storm sewer design sheet and the MOE design guidelines. In addition the Consultant should document, in both plans and text, the hydrology for the storm sewer design. The storm sewer design should be conducted using the City of Kitchener’s 5 year IDF storm data of the City’s approved storm event for the study area (regardless of the return period used previously to size downstream storm sewers).

G.8 FLOOD MANAGEMENT

All newly developing or redeveloping areas must assess their potential impacts on local and regional flooding, and mitigate accordingly. In areas where no watershed plan has been completed, it is the policy of the City of Kitchener to require that runoff peak flows are controlled to pre-development levels or less. In certain site-specific circumstances, the City may require that post development flows be controlled to less than pre-development levels. As such, discussion regarding the over-control of post development flows would be required with the City.

Where Subwatershed or Master Drainage Plans have been completed, the Consultant will be required to comply with the recommendations of the specific plan. Any variations will need to be appropriately supported by detailed analysis and also be approved by any agencies having jurisdiction.

Sizing flood management controls (i.e. stormwater management quantity control facilities) is typically an iterative procedure. The Consultant should develop a stage / storage / discharge curve for a stormwater management control facility by determining the required runoff volume to be detained for various storm events.

The procedure for runoff determination typically requires the modeller to use either an event based or a continuous hydrologic model. The modeller should determine which modelling methodology to use. The first step in methodology selection should be whether or not a Subwatershed, Master Drainage Plan or
similar previous study has been completed and the type of modelling used. If no previous study has established the modelling requirements, the following should be considered in selection of a methodology:

- The sensitivity of the watercourse from fisheries and erosion perspectives;
- The availability of stream flow data, and
- The potential for stormwater management long-term monitoring.

In providing the City of Kitchener details on flood management, the Consultant should follow standard codes of practice. The following standards are intended as a guide of requirements; however, this list should not be considered exhaustive:

- The Consultant shall provide the background hydrology behind the pre-development, post-development and controlled post-development scenarios (ref. hydrologic modelling Section G.7.1.3);
- The Consultant shall provide a table on the stage/storage/discharge relationship of the flood control facility. Methodology of determining the relationship shall be provided;
- The Consultant shall provide cross-sections of the facility and details of the inlet(s) and outlet(s);
- The facility shall have an overflow weir which is typically required for flows greater than the controlled storm events;
- The facility shall have a maintenance access for both the inlet(s) and outlet(s), and
- The Consultant shall provide landscaping details.

G.9 STORMWATER MANAGEMENT EROSION CONTROL/ GEOMORPHOLOGY

Depending on the downstream water level and the nature of the soil strata affected, stream banks can be subject to increased erosion. In these cases the Consultant(s) will be required to provide appropriate protection in accordance with the appropriate Watershed, Subwatershed or Master Drainage Plan, as well as the Stormwater Management Planning and Design Manual, Ministry of the Environment, 2003 (Section 3.4)

In areas where no Subwatershed Plan exists, it shall be the responsibility of the Consultant to provide adequate erosion protection in accordance with the Grand River Conservation Authority and Provincial Guidelines, unless it can be demonstrated through appropriate modelling and/or analysis that stream stability will not be adversely affected by the proposed development.

Erosion control and management involves one of the following:

- Extended Detention storage for the “Simplified or Detailed Design Approach” or the 25 mm storm event as outlined in the Provincial Guidelines (ref. Stormwater Management Planning and Design Manual, Ministry of the Environment, 2003), in the absence of specific direction from a Subwatershed or Watershed Plan.
- Assessment of downstream erosion susceptibility and critical flow values in conjunction with event modelling.
- Assessment of downstream erosion critical velocity or shear forces in conjunction with continuous simulation techniques (duration analysis).

In areas where the downstream receiving watercourse is determined to be unstable, or where control / over control of flow rates is ineffective or not feasible, design of channel alterations may be considered,
subject to design in accordance with natural channel design principles (ref. Ontario Ministry of Natural Resources Natural Hazards Technical Guidelines, March 2006).

Storm sewer outfalls in watercourses should be provided with proper protection against erosion which includes appropriate bank scouring protection on either side of the outfall and watercourse. When storm sewer outfalls outlet to steep and/or deep valleys, drop structures should be designed in such a manner as to provide integral bank stability. Such local erosion protection measures should be designed so as not to interfere with the watercourse forming processes of the receiving watercourse system or the system’s ecological features or functions.

The Consultant should consider the following standard codes of practice in providing erosion control documentation:

- The Consultant shall provide the rationale and background information for the methodology used in assessing the required erosion controls.
- The Consultant shall provide downstream erosion threshold parameters based upon field investigation and background information.
- The Consultant shall demonstrate how the erosion controls have adequately addressed downstream erosion conditions.
- The Consultant shall, in the case of an erosion control stormwater management facility, provide:
  (i) Stage-storage-discharge details and calculations;
  (ii) Outlet control details;
  (iii) Facility plan and cross-sections, and
  (iv) Watercourse configuration at outlet.
- The Consultant shall document any proposed mitigation measures and provide the calculations performed in determining the measures.

G.10 QUALITY MANAGEMENT

Water quality treatment will be required for all new development within the City of Kitchener unless it has been determined that cash-in-lieu is appropriate or development is within the City of Kitchener downtown core exemption area. Water quality treatment performance shall conform to Provincial requirements (ref. Stormwater Management Planning and Design Manual, MOE, 2003; Water Management Policies, Guidelines Provincial Water Quality Objectives (Blue Book), MOE, 1994, Stormwater Management policy, Subwatershed reports). In areas where a Watershed, Subwatershed or Master Drainage Plan has been prepared and approved, the guidelines and criteria cited within the plan shall be adopted by the Consultant.

Specific guidelines for Stormwater Management application have been developed by the Province based on the type of fisheries habitat downstream of the proposed development. Three levels of protection are given, with the goal of maintaining or enhancing existing aquatic habitat, based on the suspended solids removal performance developed through continuous simulation modelling for the different end-of-pipe stormwater management facilities. These levels of protection are based on a general relationship between the end-of-pipe stormwater management facilities’ long-term suspended solids removal and the lethal and chronic effects of suspended solids on aquatic life. The levels of protection correspond to the following long-term suspended solids removal:

- **Enhanced** protection corresponds to the end-of-pipe storage volumes required for the long-term removal of 80% of suspended solids.
- **Normal** protection corresponds to the end-of-pipe storage volumes required for the long-term removal of 70% of suspended solids.
- **Basic** protection corresponds to the end-of-pipe storage volumes required for long-term removal of 60% of suspended solids. There are no creek systems in the City of Kitchener where a basic water quality level of protection would be deemed appropriate.

The following shall be considered general guidelines in providing stormwater quality management for the City’s review; however, it should not be considered exhaustive:

- The Consultant must provide the background hydrologic data for the stormwater quality management control being proposed.
- The Consultant must indicate the criteria that the quality management control is being developed from, whether it is Ministry of the Environment 2003 guidelines, a Subwatershed Study or other.
- The Consultant must provide plans of the quality management measure(s) with cross-sections of the facility(ies), details of inlets, outlets, maintenance access, berm construction and landscaping.
- The Consultant must provide calculations for stormwater quality control facilities such as the following:
  - volumetric sizing
  - stage/storage/discharge relationship
  - volume calculations at various facility stages
  - outlet control calculations – drawdown time
  - forebay dispersion length
  - minimum forebay deep zone bottom width
  - length/width ratios
  - maintenance requirements
- The Consultant must provide dimensions for all facility attributes and provide verification that the facility meets minimum Ministry of the Environment 2003 guidelines.
- The Consultant must provide a landscape plan for all applicable facilities, which would include background text and comparison to Ministry of the Environment 2003 guidelines and Urban Design Guidelines.
- The Consultant must provide soils information for the facility site and, in the case of proposed infiltration, document the quantity and quality impacts to groundwater recharge.
- The Consultant must minimize external drainage area overland flow impacts on the proposed stormwater quality control facility.
- The Consultant must indicate proposed flow by-pass conditions and impacts on stormwater quality.
- The Consultant must provide a maintenance and operation manual with the detail design of the facility, which outlines requirements for the City.
- The Consultant must develop a monitoring program for all applicable stormwater quality control facilities, which not only fulfills Ministry of the Environment requirements, but also the requirements of the City, the Grand River Conservation Authority and other relevant approval agencies.
- The Consultant must address winter operations for the proposed stormwater quality control facility (ref. Stormwater Management Planning and Design Manual, MOE, 2003).

**G.11 MONITORING**

**G.11.1 Introduction**

All land use change without (and often with) mitigation works, causes an impact to the runoff regime. Stormwater management measures are intended to reduce or eliminate adverse impacts to surface water, groundwater and receiving systems resulting from changes to runoff quality and quantity. The
theoretical performance and function of stormwater management works has been relatively well documented. However, unique conditions are associated with each development, such as: topography, land use, soils, groundwater levels, design approach, construction methods, etc. All of these factors can combine to reduce the predictability of the performance of stormwater management infrastructure, leading to the need for at least a minimum level of monitoring, prior to, and possibly after, assumption by the City.

G.11.2  **Purpose**

The purpose of the Monitoring Plan is to:

1. Evaluate the performance and effectiveness of the Stormwater and Environmental Management System (i.e. design and stormwater quantity and quality mitigation techniques). This does not include the storm sewer system.
2. Provide the necessary information to adjust and/or optimize the plan recommendations through a process of Adaptive Environmental Management. Adaptive Environmental Management is a process of monitoring various environmental parameters established within a monitoring plan for a development site. Based on monitoring results, necessary adjustments to the site’s environmental management controls would be made to meet the environmental objectives for the site by the Developer until Final acceptance by the City of Kitchener.

G.11.3  **Types of Monitoring Plans**

Generally, there are two types of monitoring. The first is a “Development level” plan prepared for a single development and its associated infrastructure. The details of this type of plan would be part of the Preliminary and Detailed Stormwater Management Design Reports and may be discussed in an EIS. The scope is normally limited to direct on-site infrastructure that is part of the development, however off-site monitoring may be required to determine the effectiveness of the stormwater management infrastructure and possible impacts on the receiving system. This type of monitoring plan and implementation is paid for by the Subdivider.

The second type of monitoring would be part of a Master Planning document, such as a Watershed Plan, Subwatershed Plan, Master Drainage Plan or Class Environmental Assessment. Its scope typically includes numerous environmental indicators and infrastructure elements as determined through consultation with stakeholders and agencies. Such a plan is normally paid for by the Development Community. The monitoring recommendations contained within these Master Planning documents will provide direction for “System Level” as well as “Development Level” monitoring programs.

G.11.4  **Process/Protocol**

Each Consultant will be responsible to ensure that a Monitoring Plan is in place, and is satisfactory to the City. In the event that the subject development is part of an area where a Master Plan has been completed, the Consultant shall document how the subject development, its infrastructure and its Development Impact Monitoring Plan complies within the Master Plan recommendations. Monitoring plans shall be established for all greenfield developments. Where the subject development is ‘non-greenfield’ (i.e. typically infill or ‘brownfield’) and is not part of an area covered by a Master Monitoring Plan, the Consultant shall consult with Development Engineering and Environmental Planning staff during the pre-consultation stage to determine if monitoring is required. The monitoring plan should be established to determine the potential development impacts on-site and within the receiving system to the satisfaction of Development Engineering and Environmental Planning staff. It should be noted that
monitoring plans for infill development shall not be as extensive as required for ‘greenfield’ development. Costs of the monitoring program would be borne entirely by the developer.

The Subdivider’s Consultant, who shall be a qualified Professional Engineer or Environmental Professional acceptable to the City as appropriate will be responsible to prepare and submit at a minimum, annual reports, or as required by Master Monitoring Plan (as outlined in e.g. Watershed, Subwatershed or Master Drainage Plan), to demonstrate that the monitoring has been completed to the satisfaction of Engineering and Environmental Planning staff. More frequent reporting may be required to monitor the performance of the stormwater management infrastructure.

G.11.5 Monitoring Periods

Important factors for development impact monitoring include pre-construction, during construction and post-construction or substantially developed requirements. Subdivision Agreements and/or supporting studies to Development Applications detail the time periods for, and frequency of, monitoring. The monitoring plan will need to be detailed in the Preliminary and Detailed Stormwater Management Report.

G.11.6 What is Monitored

The actual specifics of what is monitored, and the length of the monitoring program, relate largely to the characteristics of the development and in-situ conditions, including the sensitivity of the local receiving system and the availability of existing information. While not intended to be exhaustive or mandatory, the following general list provides some guidance. The ultimate decision with regard to monitoring scope requirements rests with Development Engineering and Environmental Planning staff and commenting agencies, through the review of the Preliminary and Detailed Stormwater Management Reports and EIS where applicable. DFO will require monitoring plans should a project constitute a Harmful Alteration, Disruption or Destruction (HADD) of fish habitat and are typically a minimum length of two (2) to three (3) years.

Table 12: SWM Pond Monitored Parameters

<table>
<thead>
<tr>
<th>Hydrometeorologic</th>
<th>Fluvial Geomorphology</th>
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</thead>
<tbody>
<tr>
<td>• Rainfall - Continuous</td>
<td>• Stream Cross-sections (Controls)</td>
</tr>
<tr>
<td>• Streamflow - Storm Response</td>
<td>• Sediment Transport – (Substrate Composition)</td>
</tr>
<tr>
<td>• Groundwater - Levels</td>
<td>• Erosion pins (Tractive Force, Critical Shear Stress)</td>
</tr>
<tr>
<td>• Baseflow – Flow Rate (Spot)</td>
<td>• Bank Properties (Height, Angle, Material, Vegetation, Root Depth, Undercuts and In-situ Shear Strength)</td>
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<tr>
<td></td>
<td>• Long Profile Survey (Energy Gradient, Top and Bottom Riffles, Max Pool Depth)</td>
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<tr>
<th>Water Quantity</th>
<th>Natural Heritage System</th>
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<tr>
<td>• Inflow/Outflow at stormwater management facilities – Wet Event Response, Facility Storage-Discharge Relationship</td>
<td></td>
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<tr>
<td></td>
<td>• Community Structure/Health – Ecological Integrity, Habitat Boundary Integrity, Problem Species, Overall Species and</td>
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<table>
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<tr>
<th>Water Quality &amp; Aquatic Habitat</th>
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<tr>
<td>• Benthic Invertebrates – Community Structure</td>
</tr>
<tr>
<td>• Water Temperature – Continuous</td>
</tr>
<tr>
<td>• Surface and Groundwater</td>
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</tbody>
</table>
Chemistry – Standard Parameters including Nutrients, Metals and Bacteria
• Sediment- Total Suspended Solids
• Fisheries- presence/absence, relative abundance
• Stream baseflow and related groundwater systems;

Habitat Diversity, Buffer Effectiveness, Human Activity Impacts
Local Hydrology, Hydrogeology (ground and surface water levels, soil etc.)

Monitoring requirements should follow the recommendations of the relevant Watershed study, or Subwatershed study. In the absence of this type of study, monitoring shall include the water quality parameters as noted in the most recent Stormwater Annual Audit Report from the City. When the recommendations of the relevant Watershed study or Subwatershed study do not include the water quality parameters as noted in the most recent Stormwater Annual Audit, then those parameters are to be added to the scope of monitoring. Reporting shall be on a yearly basis and 4 hardcopies shall be provided to the City as well as a digital submission. The digital submission may require entering the water quality results in a spreadsheet or database, the format of which will be provided by the City.

G.11.7 Enforcement

As part of the requisite development agreements, the City will hold a portion of the Letter of Credit as security to ensure that the whole of the monitoring program is completed, as detailed in the accompanying Stormwater Management Report. Should the Consultant's annual reporting not be considered appropriate or compliant, the City may exercise the Letter of Credit and have the monitoring program completed by accredited professionals. The securities may also be used by the City to adjust channels and stormwater management facilities to the satisfaction of the City, Grand River Conservation Authority and the Department of Fisheries and Oceans.

G.12 ENGINEERING SUBMISSIONS

The Engineering submissions that relate to Stormwater Management are:

• Preliminary Stormwater Management report;
• Final Design - Stormwater Management report;
• detailed Stormwater Management facility engineering drawings;
• MOE Application for Stormwater Management facilities;
• Electronic submission of as-recorded Stormwater Management Pond Details, and
• Operations and Maintenance Manual.

G.12.1 Stormwater Management Report

The Stormwater Management Report shall include the following list of items viewed as a generic list applicable to both preliminary and detailed stormwater management reports.

1. Plans showing:
   (a) Project name and pond ID number(s) (as applicable);
   (b) 30T or 58M numbers (if subdivisions);
   (c) Lot and road layout with land use;
   (d) Elevations at key points (in a contour map);
   (e) any surveyed constraint lines (e.g. top of bank, floodlines, wetlands);
(f) minor drainage system, with storm sewers, manholes, catchbasins;
(g) major drainage system with overland flow routes at key points;
(h) Overland flow routes;
(i) details of stormwater management practices, e.g. storage facilities, and
(j) erosion and sediment controls.

2. Descriptions of:
   (a) receiving system and outlet including confirmation of legal status;
   (b) classification of site and downstream aquatic habitat per DFO/MNR/MOE guidelines;
   (c) SWM criteria for quantity, quality, flooding and erosion control;
   (d) hydraulic analysis, as required of floodplains for major flow elements;
   (e) design of SWMPs to meet applicable criteria, policies and guidelines;
   (f) erosion and sediment control plan describing existing site conditions, erosion potential, down
      gradient risk assessment, and anticipated erosion and sediment controls, including staging
   (g) maintenance and monitoring

3. Tables showing:
   (a) hydrologic parameters for existing and future land use;
   (b) pre and post-development peak flows and volumes at all outlets;
   (c) stage/storage/discharge relationships for SWMPs, and
   (d) overland flow depths and velocities at key points on roads and at outfalls.

4. Figures/drawings showing:
   (a) general location plan
   (b) drainage catchment areas for existing and future land use including all external areas
   (c) details of overland flow routes
   (d) details of SWMP facility appurtenances (inlets and outlets)
   (e) details of erosion and sediment controls
   (f) schematic of computer models

Note: all plans and reports are to be stamped and signed by a Professional Engineer licensed in Ontario

Software

The MIDUSS software shall be the preferred software for hydrologic modelling however other software
may be used based on discussions with Development Engineering staff.

Water Balance (Groundwater)

As required by applicable subwatershed studies to ensure post development infiltration targets are met
as specified in the appropriate Master Drainage Plan or Subwatershed Study. An as-recorded drawing
shall be provided to the satisfaction of the Director of Engineering.

G.12.1.1 Preliminary Stormwater Management Report

Preliminary stormwater management reports precede detailed stormwater management reports and
typically are a level of detail below the detailed stormwater management reports. Preliminary stormwater
management reports should be provided at the time of Draft Plan of Subdivision Application for the
review and approval of Development Engineering staff.
The Consultant, before submitting a detailed stormwater management report, should receive approval of the submitted preliminary Stormwater Management report from the City, Grand River Conservation Authority and Region.

G.12.1.2 Final Design – Stormwater Management Report

The outline for a detailed stormwater management report is the same as the preliminary stormwater management report outline, but with proposed design detail documentation. The Detailed Final SWM report is submitted with the first Engineering Submission for the review and approval of Development Engineering staff.

G.12.2 Ministry of the Environment Applications for Stormwater Management facilities

The Consultant shall prepare and submit to Development Engineering four (4) copies of the MOE applications for Storm services and SWM facilities along with the cheque for the application. The applicant on this form shall be the Subdivider and their signature(s) and company information shall be incorporated with the application.

Submit checklist with each application.

G.12.3 Design tracking spreadsheet

The design tracking spreadsheet is an excel spreadsheet that documents as-constructed information regarding the SWM facility. It shall be filled in by the Consultants and submitted along with the request for initial acceptance to Development Engineering as a hardcopy and in a CD.

G.12.4 Operations and Maintenance Manual

The submission of the Final Design – Stormwater Management Report must be accompanied by a separate “Operations and Maintenance Manual”, which will outline the operational and maintenance procedures required to ensure the proper functioning of the facility as defined within the report. This Manual is to be followed by the Developer during the maintenance period and then the City of Kitchener after final acceptance of the pond. The Consultant, in addition to reviewing materials herein and the Ministry of the Environment 2003 guidelines, may also review the document Stormwater Management Facility Sediment Maintenance Guide, 1999 by Greenland International Consulting Inc. for typical operations and maintenance requirements. The following provides the minimum requirement for the format and content of the Operations & Maintenance Manual:

(a) Expected Facility Performance

The expected quantity and quality performance of the facility under varying conditions such as dry weather conditions, winter conditions, frequent rainstorms and rainfall events exceeding the design capacity, shall be addressed.

(b) Safety

Safety hazard aspects related to drowning, trapping, contamination, noxious weed growth, West Nile Virus and odours shall be considered and appropriate measures taken in the design and maintenance program.
(c) **Sediment frequency removal**

Shall address:
- Method of removal of sediments and how often;
- Method of restabilization of all disturbed areas, and
- Method of disposal of sediment which shall be in accordance with Ministry of the Environment standards.

(d) **Inspections**

- This section shall consider all phases of operation, the safety of the public, property damage and the performance of the facility with respect to the "Design Objectives" and include proposed, frequency of inspection and action to be taken with respect to certain findings, and
- Inspection of all structures and how often (minimum of once annually).

(c) **Scheduled Maintenance**

A list shall be prepared of each activity and the frequency of regular maintenance to be performed. This list shall include but not be limited to:

(i) **Materials** - Estimate the quantities of materials such as aggregates, topsoil, plantings, paint, concrete, etc.

(ii) **Parts** - Estimate the life expectancy and/or identify benchmark parameters, which indicate the time for replacement of parts.

(iii) **Specialized Equipment** - Identify the need and frequency for the use of specialized Maintenance equipment.

(iv) **Seasonal Preparation** - Identify any precautionary measures necessary to protect the facility from the elements, such as winterization.

(f) **Unscheduled Maintenance**

Although each facility should operate uninterrupted with a comprehensive preventative maintenance program, there may be unexpected failures. Every effort shall be made to identify potential unscheduled events and plan a strategy of action. This discipline, although general, shall consider potential failure events, determine whether it is to be considered an emergency, identify who should be notified during regular hours and after regular hours and what actions should be taken in the interim.

(g) **Monitoring and History**

The "Operations and Maintenance Manual" shall discuss the performance parameters to be monitored, and also outline the equipment requirements and detailed procedure for monitoring the effectiveness of the facility. In addition, the program shall describe the acceptability range of values measured, trigger limit(s) which when exceeded require immediate attention because of regulatory or safety considerations, the format for logging the measured values and methods for analysis of the recorded data.

(h) **Report**

The "Operations and Maintenance Manual" shall be used as the basis for performance monitoring during the specified maintenance period (typically two years duration). In the absence of this information,
monitoring shall include the water quality parameters as noted in the latest City Stormwater Annual Audit Report. The engineering consultant shall formally request in writing to the Manager of Development Engineering commencement of the monitoring program, attaching confirmation the catchment area is 95% built out. The Manager of Development Engineering will formally agree in writing.

(i) **Cost**

The "Operations and Maintenance Manual" shall include a breakdown of estimated annual maintenance and operating costs.

**G.12.5 Watershed/Subwatershed Plan**

Refer to the City of Kitchener Official Plan, and the Region of Waterloo Official Plan, for general guidance on minimum terms of reference for a Watershed/Subwatershed Plan. Watershed/Subwatershed Plans shall reflect and include the unique characteristics, opportunities and constraints of specific subwatershed systems.
H STREETLIGHTING

Within the City of Kitchener streetlighting design is completed by Kitchener-Wilmot Hydro (KW Hydro), with the exception of Ornamental Streetlighting Design.

The installation of the streetlighting system must be completed by KW Hydro or an approved Contractor at the Subdivider’s cost and energized prior to occupancy.

H.1 ORNAMENTAL STREETLIGHTING

Within residential subdivision, Subdividers have the opportunity to request ornamental streetlighting as an alternative to the standard municipality approved streetlighting equipment. The Subdivider shall confirm whether ornamental lighting will be used for the subdivision prior to servicing. The City has established a standard for ornamental roadway streetlighting in new plans of subdivision regarding illumination levels and equipment.

The following conditions and responsibilities between the City, Kitchener-Wilmot Hydro Inc., and Subdividers shall apply.

H.1.1 Approval

Consent

- The Subdivider will obtain consent from the City for installation of the approved ornamental streetlighting equipment.
- The Subdivider will show proof of consent to Kitchener-Wilmot Hydro Inc., after which, street lighting design will proceed based on use of City approved ornamental streetlighting.
- One factor that will determine if ornamental lighting would be permitted will be the type of lighting that has been installed in adjacent plans of subdivision (if present). The intent being that on connecting streets, between plans of subdivision, the lighting style will be consistent. The use of standard or ornamental roadway lighting throughout the development will be as directed by the City having jurisdiction. Where possible, Subdividers are encouraged to work together and proposals for lighting for adjacent plans must be submitted to Kitchener-Wilmot Hydro Inc. for review.

H.1.2 Financial

Initial Capital Cost

The Subdivider will be responsible for 100% of the capital cost for ornamental street lighting equipment as well as any additional engineering design costs, including extra poles for closer spacing.

Maintenance

- In view of the substantially higher capital cost of the upgraded ornamental street lighting equipment and increased maintenance costs over the normal City approved standard, Subdividers are required to contribute a one-time cash contribution towards future maintenance and replacement costs. The contribution will be equal to 10% of the capital equipment cost plus applicable taxes for such equipment or minimum of $2,000.00, whichever is the greater, prior to Initial Acceptance of the subdivision stage underground services. The contribution will be paid directly to the City.
Subdivider will include, along with payment, copies of all invoicing from the streetlighting supplier. Proof of payment is to be submitted to KW Hydro before streetlighting system energization authorization will be given.

- The City will fund 100% of all maintenance costs for streetlighting within its jurisdiction after each subdivision development’s streetlighting electrical system is energized.
- The Subdivider will fund 100% of all maintenance costs prior to electrical energization of the subdivision streetlight system. This includes costs due to theft, vandalism, and damage caused by construction.
- In observance of item H.1.2. above, Kitchener-Wilmot Hydro Inc. will, if so requested by the Subdivider, perform any required ornamental streetlight maintenance. Costs relating to such maintenance will be charged on a time and material basis to the Subdivider. Replacement equipment for emergency maintenance purposes shall be billed to the Subdivider.

H.1.3 Design

Equipment Selection

Selection of ornamental streetlighting equipment will be limited to the City’s approved equipment as described in Item H.1.5. Substitutions of equipment will not be accepted unless approved in writing by the City.

Subdivider Responsibilities

The Subdivider shall provide the streetlighting photometric design layout of the development and supply drawings thereof to Kitchener-Wilmot Hydro Inc. which detail:

a. Luminaire mechanical and electrical details.
b. Pole construction and installation details.
c. Overall layout and dimensional locations of all poles and luminaries along roadway allowance. Locations are to be reviewed and approved by the Subdivider in regard to location conflicts with driveways, services and other street furniture.
d. Light level calculations to confirm that the roadway and intersection lighting levels will meet the City’s standard. See attached Tables 1 & 2 for recommended values from ANSI/IESNA RP-8-00. Note that Kitchener-Wilmot Hydro Inc. will designate the road and pedestrian conflict area classification for each street within the development and indicate the light level to be achieved. It is the City’s intent to illuminate the areas using the minimum lamp wattage that will achieve the desired level at a reasonable luminaire spacing of approximately 35.0 – 45.0 metres. Over-illumination of areas, in view of luminaire wattage standardization by the Subdivider, will not be permitted.
e. The preferred layout of poles and luminaries is on both sides of the roadway in a staggered pattern. Exceptions shall be on divided median roadways and at intersections.

KW Hydro Responsibilities

Kitchener-Wilmot Hydro Inc. will be responsible for:

a. Underground cable design and layout.
b. Streetlighting control system design.
c. Co-ordination of fixture or pole locations with the electrical distribution locations in consideration with item H.1.3. above.
H.1.4 Construction

Purchase, Shipping and Storage of Streetlighting Equipment

a. Subdividers will be responsible for purchase and storage of ornamental streetlighting equipment associated with each stage of subdivision development.
b. The Subdivider will confirm with the equipment supplier the information needed to purchase the required ornamental streetlighting equipment for each development. Information will include manufacturer, model number, style and quantities.
c. The equipment referred to in item H.1.4.a. above shall include (but not necessarily be limited to) poles, luminaries and support brackets.
d. The Subdivider will store and make accessible, all equipment in a secure location on the subdivision development site. Kitchener-Wilmot Hydro Inc. will not transport any Subdivider purchased equipment from locations remote from the development site. Disposal of equipment packaging material shall be the responsibility of the Subdivider.
e. Poles and fixtures should not be shipped to Kitchener-Wilmot Hydro Inc. unless special arrangements are made in advance. In this case, a fee of 10% of the shipment invoice will be applied.

Installation

a. Kitchener-Wilmot Hydro Inc. or its approved contractor will make all necessary installations of equipment associated with streetlighting on the public right-of-way within the development.
b. The Subdivider shall make all necessary installations of lighting as required in the following areas:
   i) Public walkways;
   ii) Parks, and
   iii) Privately owned lands or developments.
c. Kitchener-Wilmot Hydro Inc. will be responsible for:
   i) Obtaining poles and fixtures from the secured on site storage area;
   ii) Installing poles and fixtures;
   iii) Installing underground cable and controls, and
   iv) Connecting and energizing fixtures.
d. The Subdivider shall co-ordinate other construction activities of the development with installation of the streetlighting system.

H.1.5 Material Selection

The specifications below are the approved ornamental streetlighting equipment for the City of Kitchener. The Subdivider is to confirm all ordering information with the manufacturer before purchase.

Luminaire

Manufacturer: King Luminaire Inc.
Style: Washington – K118R
Optical System: External Optics Rippled Polycarbonate globe
IES Lighting Classification: Type II
Wattage: HPS-70W or HPS-100W (to suit road classification)
Lamp Socket Type: Mogul
Input Voltage: 120 Volts AC
Ballast Type: CWI constant wattage isolated secondary
Wiring Accessories: Quick disconnect wiring harness
Globe Ring Assembly: “Rotolock” tool free globe removal c/w globe hanger and globe hanger hook
Pole Adapters: K5 / K9 Capital (for use on single pole top locations to accept a 7 inch OD tenon)
K16 Capital (for use with poles having KA65 Lansing twin arms and single locations on Hydro poles (using K69S brackets with 3.5 inch OD tenons)
Ornamental Accessories: GR General Electric Ring (gold), and #1 Top Finial (gold)
Paint Colour: Black

Pole
Manufacturer: King Luminaire
Type: KT14 Talisman, KT13 Talisman (for twin arm)
Finish: E10 Eclipse Etched Finish
Colour: Midnight Lace E-10

Bracket
Manufacturer: King Luminaire
Twin Arms: KA65-Lansing Arm
Single Arm: K69-S (for mounting on KW Hydro poles)

Recommended Values from ANSI/IESNA RP-8-00

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<th>Pedestrian Conflict Area</th>
<th>Pavement Classification (Minimum Maintained Average Values)</th>
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<th>Veiling Luminance Ratio $L_{vmax}/L_{avg}$</th>
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<tr>
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</table>

Table 14: Recommended Illuminance for the Intersection of Continuously Lighted Urban Streets from ANSI/IESNA RP-8-00 (Based on the values in Table 1 for R2 and R3 pavement classifications)
I  NATURAL GAS

In the City of Kitchener, Kitchener Utilities is responsible for natural gas servicing, except for a portion of the Pioneer Tower east area, where Union Gas has jurisdiction.

I.1  NATURAL GAS SERVICING DESIGN

All design and installation shall be the responsibility of Kitchener Utilities and all associated construction costs to the property line shall be borne by the City. The Subdivider is responsible to contact Kitchener Utilities to co-ordinate the design in advance of the first submission.

In no case shall a gas service or main be placed within 2.0 m of other parallel-aligned water and sewer mains or services in accordance with the Public Utilities Act, unless prior approval is received from the Director of Engineering Services.

Kitchener Utilities is responsible for maintenance of gas services to the meter outlet.

I.2  EASEMENTS

The minimum easement width required for a single pipe shall be 4.0 m, regardless of construction method. For more than one (1) pipe, the width of the easement shall be determined by the Director of Engineering Services.

I.3  TIMING OF INSTALLATION

Kitchener Utilities is responsible for the installation of the gas main within the right of way. The Consultant shall contact Kitchener Utilities regarding timing of installation of gas main prior to commencement of building construction.
J LOT GRADING

J.1 PURPOSE

The purpose of Lot Grading is to ensure individual parcels or properties are designed to minimize the impact precipitation events have on that parcel or property and the surrounding area. The design is based on an overall stormwater management and grading plan and interpolated by the designer at an individual lot level.

The design shall:

- Follow the Drainage Act;
- Ensure surface drainage from or on adjacent lands is accommodated or not adversely affected;
- Grading, drainage and building construction should be such that unanticipated stormwater does not enter the sanitary sewer system;
- Grading and drainage on lands developed should be congenial with nature and thus preserve the natural terrain as much as possible, and
- Grading and drainage schemes shall include erosion and sediment control measures. Refer to Section K of the Development Manual.

J.2 GENERAL

Lots, including drainage ditches and swales, are to be completely top soiled and sodded with a minimum 150mm of topsoil. The soil depth for all tree planting areas will meet the requirements of the Tree Planting Plan and the requirements of Section M of the manual.

All surface drainage, including downspout discharge, shall be diverted away from the building(s), including adjacent existing or future buildings.

Grade areas to:

- Provide proper surface drainage and maximum usable land area;
- Preserve existing trees where possible; and
- Direct flows away from buildings.

Front yard grades shall be:

- Minimum yard slope of 2.0%;
- Optimum yard slope of 4.0%, and
- Maximum yard slope of 6.0%;

Rear yard grades shall be:

- A minimum of 6m of the rear lot area from the back of the house shall be graded between 2% to maximum 6%.

From House to Side Lot Lines grades shall be:

- Minimum slope of 2.0% (always away from the house), and
- Optimum slope of 4.0%.

Driveway grades shall be:

- Minimum driveway slope of 2.0%;
- Optimum driveway slope of 4.0%, and
- Maximum driveway slope of 8.0%.

**Walkway grades shall be:**
- Minimum cross slope of 2.0% (where gradient is less than 2.0%), and
- Maximum walkway gradient and cross slope of 5.0% (combined).

**Paved Utility Areas** are required for the placement of Hydro boxes, cable/telephone boxes and are located in the City Right of Way and shall be installed by the Utility. The Paved Utility Area grades shall be:
- Minimum paved utility area slope of 0.5%;
- Optimum paved utility area slope of 1.0%, and
- Maximum paved utility area slope of 6.0%.

**Lot grading** shall be designed in accordance with the following City of Kitchener Standard Drawings:
- Lot Drainage Type ‘A’ (Standard Drawing 400)
- Lot Drainage Type ‘B’ (Standard Drawing 401)
- Lot Drainage Type ‘C’ (Standard Drawing 402)
- Lot Drainage Type ‘D’ (Standard Drawing 403)

**J.3 REAR YARD CATCHBASINS**

- The maximum distance from the swale high point to the rear yard catchbasin shall be the lesser of 50.0m or three (3) single family lots, unless otherwise approved by the Director of Engineering Services;
- Rear yard catchbasins shall not have sumps;
- Rear yard catchbasins and outlet pipes shall be located entirely on one (1) lot, and
- Easement requirements for rear yard catchbasins and leads shall be as per the table below.

<table>
<thead>
<tr>
<th>Size of Pipe</th>
<th>Minimum Width of Easement</th>
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<tbody>
<tr>
<td>250mm to 375mm</td>
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<tr>
<td>450mm to 1500mm</td>
<td>6.0m</td>
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<td>1650mm and up</td>
<td>6.0m plus 3 times O.D. of Pipe</td>
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</table>

**J.4 SWALES**

Swale grades shall be:
- Minimum longitudinal swale slope of 2.0%;
- Maximum longitudinal swale slope of 8.0%;
- Optimum side slope of 6:1; and
- Maximum side slope of 3:1.

**Swale Length:**
- The maximum length of a swale shall not exceed 50.0m.
Swale Depth:
- Minimum swale depth is 150mm.

A cross-section of a swale is provided on Standard Drawing 404.

J.5  **ROOF LEADERS AND SUMP PUMPS**

Roof drain connections to storm laterals are expressly prohibited. Roof drains should discharge to the front of the building to grade, with flows directed away from the building foundations and without erosion or inconvenience to others, except where infiltration facilities are connected. Unless otherwise approved by the City Engineer, run-off from roof drains shall flow across pervious ground surfaces prior to entering the storm systems.

**Note:** All foundation drainage must be directed to sump pumps and discharged to grade or a storm lateral if so installed.

J.6  **GROUNDWATER**

Minimum 0.6m separation is required between the underside of the footing to seasonally high groundwater elevation. Third pipe ground water collection systems are not allowed to be installed to lower existing groundwater elevations to achieve the required groundwater separation.

Subdivision applications are to demonstrate difference of elevation between seasonally high groundwater elevations to the underside of footing elevations. This is to be submitted at time of Draft Plan and updated during detailed design (minimum two year groundwater elevation monitoring at time of detailed design submission, however some sites may require additional monitoring requirements).

Where lots are proposed within an area of concern, the geotechnical consultant shall provide the minimum underside of footing elevation for those lots, and is to be shown on the lot grading plan. A letter is required from the geotechnical consultant certifying the minimum elevations as correct.

Infiltration systems that will be assumed by the City are to be accepted as a whole for the subdivision after 95% build out, or as outlined in the Subdivision Agreement.
K EROSION AND SEDIMENT CONTROL

K.1 EROSION AND SEDIMENT CONTROL

Erosion control is a preventative measure and is defined by keeping soil on the project site through reduced grading of areas, timely re-vegetation, cover and erosion protection. Sediment control is a mitigation measure which stops silt migration once it has commenced. A multi-barrier approach is preferred.

To this end, soil erosion and sediment movement must be minimized and controlled in accordance with the latest requirements of the GRCA and the City of Kitchener (Refer to “Erosion and Sediment Control Guideline for Urban Construction”, The Greater Golden Horseshoe Area Conservation Authorities, December 2006).

All activities on the site shall be conducted in a logical sequence to minimize the area of bare soil exposed at any one time.

All erosion and sediment controls are temporary applications constructed prior to any land grading or disruption activities on the site. They shall be inspected and maintained by the Subdivider’s Consultant for the duration of the construction period, including building construction or until the site is stabilized.

Based on the above, no silt can leave the site or impact any waterways, wetlands or environmentally significant lands that cross or are adjacent to the site. At a minimum, silt fence shall be erected along the property limits. Mud mats will be required at construction access points to limit the amount of silt and dirt entering the roadway. The silt fence shall be maintained throughout the year and replaced on a need to basis.

All disturbed ground left inactive shall be stabilized by seeding, sodding, mulching or covering, or other equivalent control measure. The period of time of inactivity shall not exceed 30 days, unless otherwise authorized by the Director of Development Engineering.

Winter grading may be permitted at the sole discretion of the Director of Development Engineering; however, a sediment and erosion control plan shall be submitted to the Director of Engineering Services.

All Erosion and Sediment Control Facilities are to be inspected by the Consultant once a week, after each rainfall in excess of 25 mm and after a significant snowmelt. Daily inspections are required during extended rainfall or snow melt periods. These inspections are to ensure that the facilities are in proper working condition and all damaged Erosion and Sediment Control facilities are to be repaired and/or replaced within 48 hours of the inspection. A permanent record of these inspections must be forwarded to the Development Engineering staff within five (5) days of the inspection. Please see City of Kitchener website for a sample Inspection and Monitoring Sheet.

Sediment basins are a permitted sediment control measure within the Grand River Conservation Authority watershed. Guidelines for use of sediment basins are contained within the “Erosion and Sediment Control Guideline for Urban Construction”, The Greater Golden Horseshoe Area Conservation Authorities, December 2006. All sediment basins are subject to review and approval by the Grand River Conservation Authority. Should the sediment barrier be breached, the Consultant shall contact the City and Grand River Conservation Authority immediately and a restoration plan shall be proposed within 24 hours.
K.2 TOPSOIL STOCKPILE PROTECTION

Topsoil stockpiles containing more than 100 m$^3$ of material shall be located a minimum of 10.0 m away from the roadway, drainage channel or an occupied residential lot, and a minimum of 2.5 m from the property lines. The maximum side-slopes for topsoil stockpiles shall be 1.5 horizontal to 1.0 vertical. The stockpiles shall be protected by heavy duty silt fence (OPSD 219.130) for stockpiles as per the Grand River Conservation Authority ESC Guidelines.

Topsoil Stockpiles can be located on blocks owned by the Developer. The topsoil has to be removed and block graded to approved grades prior to conveyance to the City. Topsoil Stockpiles can also be located on private lands between houses and on rear yards.

Runoff from all topsoil stockpiles shall be controlled by a sediment control fence or other approved devices.
L PARKS AND MULTI-USE PATHWAYS

L.1 GENERAL

Parks and Multi-Use Pathways are an essential component of the urban area. They provide opportunities for both residents and visitors to explore other aspects of daily life and to have social, educational, and recreational experiences in a designated outdoor setting.

The City will pursue high quality and innovative park design that balances functional use, urban form and aesthetic benefits, community safety, accessibility, integration with nature and operational requirements to ensure long term sustainability. Parks will be designed and developed to support the City’s urban design objectives set out in the Municipal Plan/Official Plan and the Urban Design Manual, and in accordance with park design principles and parameters established in the Design Brief for Suburban Development and Neighbourhood Mixed Use Centres.

All new subdivisions require a pre-consultation meeting where the design features for the park(s), trail(s) and open space facilities will be part of the discussion. City staff from both the Department of Infrastructure Services and the Department of Community Services along with the Developer and their Agents are to be present at these meetings prior to developing any design drawings for the above noted.

All new subdivision park(s), trail(s) and open space facilities design drawings will be subject to the review and approval of the Supervisor of Site Plan Development in consultation with the Supervisor of Design and Development and identified herein as the “City”. For all tree planting requirements for parks refer to Section M – Urban Forest – Tree Planting & Establishment section of the manual.

L.2 PARK AND MULTI-USE PATHWAY DEVELOPMENT WORKS TO BE COMPLETED BY THE DEVELOPER (NEIGHBOURHOOD PARKS)

Grading

- Rough Grading of Park Blocks;
- Erosion Control on Park Blocks;
- Rough Grading of Multi-Use Pathway corridors;
- Erosion Control on Multi-Use Pathway corridors, and
- Vegetation protection.

Topsoil and Fine Grading of Park Blocks

- Materials and Testing;
- Drainage, and
- Sports Field soil mix, grading.

Excavation, sub grade granular, grading of Multi-Use Pathways

- Materials and Testing, and
- Drainage.

Multi-Use Pathway Surfacing
- Fine grading prep for asphalt;
- Asphalt surfacing (DC eligible), and
- Signage, gates, vehicle controls.

**Park Block Site Servicing**

- Storm Drainage;
- Sanitary Sewer;
- Water Service, and
- Electrical Service.

**Park Facility Development**

- Parking lots, grading, paving, curbs;
- Park trails and walkways, grading and paving (paving DC eligible);
- Play area surfacing and play structures (DC eligible);
- Sports field structures;
- Washroom/Change facilities;
- Walkway and Sports Field lighting;
- Garbage and Recycling facilities, and
- Benches, gates, signage.

**Park Seeding and Sodding**

- Seed/sod bed prep;
- Materials and testing;
- Watering;
- Maintenance, and
- Warranties.

**Park Planting**

- Materials and Testing
- Planting bed/tree pit preparation
- Maintenance and replacements
- Warranties

**Other Park Features and Fixtures**

- As per approved park and Multi-Use Pathway plans.

**Heritage Conservation Requirements**

**Naturalization**

- Woodland;
- Meadow, and
- Wetland.
L.3  PARK CLASSIFICATIONS

(Note: Park Classifications are subject to change to ensure conformity with the Parks Master Plan scheduled for completion and approval in 2010.)

Each park will be unique in its size, context, and use; however, the City of Kitchener has identified nine classifications of parks, each with specific programming and facilities. These classifications are Greens, Tot Lot, Neighbourhood Park, Neighbourhood Sportsfields, District Sportsfields, District Natural Area, City-Wide Facility, City Natural Park and Regional Park. The classification of each park into one of these categories is based on a combination of the following criteria:

<table>
<thead>
<tr>
<th>Table 16: PARK CLASSIFICATION</th>
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</thead>
<tbody>
<tr>
<td>Category</td>
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<tr>
<td>-----------</td>
</tr>
<tr>
<td>Greens</td>
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<tr>
<td>Tot Lot</td>
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<tr>
<td>Neighbourhood Park</td>
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<tr>
<td>Category</td>
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<td>--------------------------</td>
</tr>
<tr>
<td>Neighbourhood Sportsfields</td>
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<tr>
<td>District Sportsfields</td>
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<tr>
<td>Category</td>
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</tbody>
</table>
| District Natural Area     | Natural heritage features conserved from development but integrated into the urban landscape | Up to 50 ha  | Based on location and availability of qualifying lands   | Up to 15 km          | • Picnic areas as appropriate given natural heritage features and functions to be protected  
  • Multi-Use Pathway systems  
  • Interpretative signs and programs  
  • Playground structures in non-sensitive areas  
  • Rest areas  
  • Open play spaces  
  • Parking if appropriate |
| City-Wide Facility        | Lands needed to support major activity facility resources                | 20.0 ha to 50.0 ha | As facility development warrants                          | Primarily City with secondary service to Region | • Auditoriums  
  • Major sports facilities for competitive sports and spectators  
  • Specialized community centres and seniors centres  
  • Major performing arts and cultural facilities  
  • Large parking facilities |
| Natural Park              | Natural heritage features conserved from development but integrated into the urban landscape | 50 ha to 200 ha | Based on availability and quality of lands for this function | Primarily City with secondary Regional servicing | • Wildlife and plant species protection zones as appropriate given natural heritage features and functions to be protected  
  • Multi-Use Pathway linkages  
  • Interpretative areas and programs  
  • Hiking  
  • Fishing  
  • Picnic areas as appropriate given natural heritage features and functions to be protected  
  • Non-user access zones |
### Table 16: PARK CLASSIFICATION

<table>
<thead>
<tr>
<th>Category</th>
<th>Purpose</th>
<th>Size</th>
<th>Supply Level Guideline</th>
<th>Service Area</th>
<th>Permitted Uses</th>
</tr>
</thead>
<tbody>
<tr>
<td>Regional Park</td>
<td>Lands that support activities and facilities that serve participants on a Regional basis, often conservation lands</td>
<td>Over 50.0 ha</td>
<td>Based on regional facility development needs and open space lands quality and availability</td>
<td>Region</td>
<td>• Picnic areas and trails&lt;br&gt;• Play areas and structures&lt;br&gt;• Outdoor recreational pools&lt;br&gt;• Recreational sportsfields&lt;br&gt;• Natural areas and interpretative activities&lt;br&gt;• Picnic Sites&lt;br&gt;• Boating and canoeing&lt;br&gt;• Fishing&lt;br&gt;• Hiking&lt;br&gt;• Secondary facilities including tennis, volleyball, etc.&lt;br&gt;• Parking and roadways</td>
</tr>
</tbody>
</table>

These parks have both common and park specific requirements as outlined in the following sections.

#### L.4 COMMON PARK AND MULTI-USE PATHWAY REQUIREMENTS

A base level of development will include rough and fine grading, topsoil, site services (water, electrical, and storm drainage systems), fencing, identification and regulatory signage, and seeding/sodding with appropriate seed mix to provide regulatory maintained turf areas and other landscape features as required.

All parks will include a pedestrian circulation system including a major paved asphalt walkway at a minimum of 3.0 m in width connecting the main (pedestrian) entrances to the main features and/or facilities within the park. This main walkway may also serve as a multi-use trail and maintenance vehicle access route.

A minimum of one vehicular access for maintenance is required for each park, and will require a curb cut. These vehicles may use the major pathway.

#### L.5 PARK BLOCK MINIMUM REQUIREMENTS BY DEVELOPER
L.5.1 Park Grading

The City will require that land conveyed for parkland is generally flat, well-drained developable land of a suitable shape with no constraints to active park use. All park blocks identified as parkland dedication in the approved Draft Plan of Subdivision shall be graded in a manner which facilitates its intended use by the public for the play and recreation activities. This includes the requirement that all park blocks shall be graded at a minimum 1% slope and maximum 5% slope.

Steep slopes, up to a maximum of 20% (5:1), may be considered in limited areas provided that the total length of the slope does not exceed 3.0 m and these steeper slopes do not compromise the intended use of the park block for the play and recreation activities required.

Steep slopes may also be considered where this is a requirement to achieve the appropriate landform for the specific recreational activity proposed within the park (such as tobogganing, mountain biking etc.).

Lands which include slopes in excess of the maximums identified above shall not be considered acceptable as parkland dedication within a Plan of Subdivision. The Subdivider is required to ensure that the park blocks identified in the Draft Plan of Subdivision may be graded to meet these requirements. Park blocks received as parkland dedication, which are not intended to be graded, such as woodlands, hedgerows or cultural heritage landscapes may not be subject to these grading requirements.

Drainage swales or other storm water management requirements servicing the subdivision shall not be located on lands received as parkland dedication unless directly related to the park function. Overland flow routes identified in the plan of subdivision shall not be located on lands identified as park dedication. Grading of all park blocks received as parkland dedication shall meet with the approval of the City.

L.5.2 Park Servicing

All park blocks shall be provided with servicing appropriate to the size of the park and the type of use. Minimum standards of servicing shall be:

- All park blocks shall have a storm sewer connection and catch basins (minimum of one) appropriate to the size and use of the park.
- All parks of 0.5 ha or more shall be provided with a 50 mm minimum water service to the property line at its primary street frontage and extend the water line to the parks services as per the approved park design drawings.
- City, District and Regional Parks require a 150 mm water service complete with backflow device, shut-off valve or curb stop, as per OPSD 1104.020, located at the property line. This will facilitate the future addition of an irrigation system, drinking fountain, water play feature, or service building. Each water service pipe diameter shall be identified on the Park Servicing Plans. Water meter chambers to be provided, in order to accommodate water service equipment to meet the requirements of Kitchener Utilities.
- All parks of 5.0 ha or more shall have an electrical service of 200 amps minimum provided to an appropriate location within the park, including rigid sceptre conduit at a minimum depth of 1000 mm for all conductors.
- All parks of 5.0 ha or more shall have a sanitary sewer connection to an appropriate location within the park of a size and design which will meet the intended public use of the park and its facilities.

L.5.3 Topsoil and Seeding/Sodding
All park blocks shall be inspected and certified by the Grading Consultant to the City following rough grading and prior to topsoil placement and fine grading.

These specifications may vary for sportsfield areas and shall be confirmed prior to completing detailed park plans and specifications. Developer to confirm with the Supervisor of Design and Development required depths of topsoil.

All park blocks shall be seeded in conformance with the specifications and warranties for seeding and sodding provided herein and to the satisfaction of the Supervisor of Design and Development.

L.5.4  Tree Planting

For all tree planting requirements and standards for parks refer to Section M – Urban Forest – Tree Planting.

L.6  MULTI-USE PATHWAYS

The developer is required to design, engineer and construct all Multi-Use Pathways included in the approved Draft Plan of Subdivision at the same time as grading and servicing of the associated stage of development or within one year of registration. Conditions of draft plan approval will be added in this regard.

The approved Multi-Use Pathways and Trails Master Plan (2012) will guide the planning and development of a comprehensive multi-use pathway network in Kitchener.

Multi-Use Pathways shall be graded and constructed for that stage of the subdivision by the developer within one year of registration or servicing whichever occurs first.

The developer shall ensure that all tree protection fencing and siltation control fencing is located in such a manner as will allow the grading, construction and surfacing of the Multi-Use Pathways as an integral part of the subdivision grading process.

All detailed grading and construction details for Multi-Use Pathways shall be approved by the City.

Multi-Use Pathways are both a recreational facility and a non-vehicular traffic route providing city wide, off road transportation routes for walking and cycling. Multi-Use Pathways shall be fully accessible and barrier free.

Multi-Use Pathways connect parks and open space within subdivisions and provide connections to other neighbourhoods of the city.

Multi-Use Pathways also serve as maintenance vehicle access routes through parkland.

These trails shall be located throughout the City, including Parks, stormwater management lands or other lands which facilitate the development of the city wide Multi-Use Pathway system. Trails shall be identified for all new development, as approved by the City.

The trails shall be designed in accordance with the following requirements:

L.6.1  Grade
• 5% maximum;
• 8% maximum, limited distances only in areas of steep slopes where 5% max. not possible, and
• Primary accessible trail routes shall be 5% maximum.

L.6.2 Cross Slope

• 2% preferred;
• 2% maximum where trail grade exceeds 4%, and
• 4% maximum.

L.6.3 Width

• Rough grading – 4.0 wide;
• Trail surface – 3.0 m wide, and
• 0.5 m width min. either side of trail surface graded at 2% to 4%.

L.7 PARKS FACILITIES

Park Facility Standards are currently in development through the Parks Master Plan and will form part of the Development Manual upon adoption by the City.

L.7.1 Parking Areas

Criteria

Any off-street parking is to be designed in accordance with current Zoning by-laws and Urban Design Manual.

Parking is typically required within District, City and Regional Parks, within the park.

Parking areas are to be paved and have continuous concrete curb, and located conveniently adjacent to the active facilities.

Each parking lot is to be accessed by a driveway adequate for two-way traffic (min 7.6 m at the property line).

Each parking space is to be delineated by line paintings.

Parking areas shall be illuminated to the lighting standards set out in the Urban Design Manual.

Design Requirements

The minimum required number of parking spaces to be provided per park is as follows:

• 40 per ball field;
• 40 per soccer field, and
• Parking for all other parks facilities will be as per the zoning by-law or as directed by the City.
Where parkland abuts a school, the number of paved parking spaces to be provided for the park may be adjusted with approval of the City.

Where possible, drainage for the parking areas is to be by means of overland flow using a vegetated swale as part of the storm water management plan for the Park. Erosion protection is required at the entrance to the swale at the edge of the parking lot.

L.8 ACCESSIBILITY

In keeping with the spirit of the Accessibility for Ontarians with Disabilities Act, the City of Kitchener will be expecting facilities and park designs to be sensitive towards groups with disabilities. Designs will be considered on a site-by-site basis in order to evaluate the need and application of “accessible designs”. The City may consider a special, dedicated facility within a park to accommodate a variety of users.

L.8.1 Trails and Walkways

Parkland and park facilities will be designated to provide barrier free access to wheelchair users and others with mobility limitations. Each park will attempt to contain a pedestrian system of walkways, trails, bridges and ramps to provide continuous direct access from the access or entry point at the edge of the park or parking lot to the park facilities. The primary accessible route to the park facilities shall be at a maximum grade of 5%.

L.8.2 Playground Equipment

The design of play areas is to include consideration for accessible paths to the play area from the rest of the park, as well as accessible surfacing to access the play equipment.

As a minimum, playground equipment will be selected to allow for children who are wheelchair users to have access to the play equipment be means of a ramp or transfer platform used with the assistance of a parent or caregiver. Specific play components will take into consideration the needs of limited-mobility users, other special needs, and age groups.

L.8.3 Other Features and Fixtures

The selection of site furnishings (e.g. picnic tables), hardware (e.g. door handles) and fixtures (e.g. drinking fountains) will be based on ease of use for a wide range of capabilities and age groups.

L.9 NATURALIZATION OF PARKLANDS AND OPEN SPACES

As a departure from conventional turf-dominated green space design and maintenance, urban naturalization is an ecologically-based approach to landscape management that seeks to restore environmental integrity to the urban landscape.

L.9.1 Concept and Principles of Naturalization

Urban naturalization, also known as natural landscaping or naturescaping, creates environmentally sound, sustainable landscapes through the use of plant species native to the region. In comparison to conventional landscaping, natural landscapes are inherently low maintenance; self-renewing and can help foster a new relationship of urban environmental stewardship.
Naturalization is a process of ecological restoration that involves returning an altered or degraded site to a more natural condition through the use of trees, shrubs and flowers that are native to the area. In North America, native plant species are defined as those that existed in an ecological area prior to European settlement.

The Society for Ecological Restoration defines ecological restoration as the process of assisting the recovery and management of ecological integrity. Ecological integrity includes a critical range of variability in biodiversity, ecological processes and structures, regional and historical context, and sustainable cultural practices.

L.9.2 Naturalization Design

Naturalization is not a technique that is appropriate in all locations and instances. Where it is determined to be appropriate, design and layout will take into consideration light availability, aesthetics, safety and site location. Planting density may not have to be high, as natural succession of the plant communities will ultimately make up the vegetation. As well, the overall planting should be designed to minimize maintenance.

Additionally, the following should be considered:
- select plants native to Kitchener where possible
- select plants that produce native seeds, nuts and fruits for diverse food sources throughout the year;
- combine plants to provide horizontal and vertical density, with well-developed tree canopies, understorey trees and shrubs and low groundcovers for refuge from predators and weather;
- encourage integrated pest management (IPM) practices to reduce pesticide, herbicide and chemical fertilizer use;
- reflect human intention and direction, or “perceived care” in the design; and
- acceptable planting times depending on plant species, type of stock, climate and weather.

L.9.3 Naturalization Maintenance Plan

All planting shall include a full maintenance program to ensure success. The maintenance plan should include identified watering cycles, mulching, weed or invasive species removal, and tree stake removal. Additionally, if special maintenance requirements exist such as prescribed burns for prairie naturalization or mowing late in the season to accommodate monarch butterflies feeding on milkweed before their annual migration, then, they too will need to be identified.

L.9.4 Naturalization Monitoring Plan

Project monitoring is required to monitor the success of the project (plant mortality, volunteer labour, naturalization techniques) given the environmental stresses of the urban environment such as soil contamination, invasive non-native plants, road salt and auto exhaust. The reintroduction of native plant communities can be difficult and may require the careful choice and mixing of native and non-native species in order to be successful.

A minimum two-year guarantee period is required for all plantings from the date of installation / acceptance. Inspections shall be carried out at least once per month during the growing season from June 1 to October 31.

L.9.5 Naturalization Signage
Interpretive signage is required to identify the naturalization area, inform the public about the benefits of naturalization and to let people know that the changes to the landscape are intentional and managed.

**L.10 DEVELOPER BUILT PARK AND MULTI-USE PATHWAY PROCESS**

**Time Frame**

**REQUIREMENTS FOR DRAFT PLAN SUBMISSION**

1. The Developer shall retain the services of a Landscape Architect, Grading/Servicing Engineer and a Lighting Engineer/Consultant.
2. Initial consultation with City staff, Developer, Landscape Architect, Grading/Servicing Engineer and the Lighting Engineer/Consultant to review park(s) size, trail(s) and open space facilities location, configuration, zoning, etc.
3. Preliminary park and community trail concept plan and park development budget shall be submitted by Landscape Architect, Grading/Servicing Engineer and Lighting Engineer/Consultant to the satisfaction of the City as part of a complete application.

**PRIOR TO OR AT TIME OF REGISTRATION OF THE APPLICABLE STAGE OF SUBDIVISION**

4. Finalization of park and community trail concept plan and park and trail development budget by Landscape Architect, Grading/Servicing Engineer and the Lighting Engineer/Consultant to the satisfaction of the City.
5. The park and trail block conveyed to the City of Kitchener free and clear of encumbrances.

**WITHIN ONE YEAR OF REGISTRATION OR SERVICING WHICHEVER OCCURS FIRST**

6. Park and Trail Tender drawings and specifications submitted by the Landscape Architect, Grading/Servicing Engineer and the Lighting Engineer/Consultant to the satisfaction of the City.
7. Purchase Order to Developer (value not exceeding park and trail development budget)
8. Contract administration of park and trail development by Landscape Architect, Grading/Servicing Engineer, and the Lighting Engineer/Consultant including regular on-site monitoring and inspections.
9. Certification by Landscape Architect, Grading/Servicing Engineer, and the Lighting Engineer/Consultant of project completion to City of Kitchener design standards.
10. Initial Acceptance of Developer Build park development by City (start of warranty period)

**DURING WARRANTY PERIOD**

11. Guarantee/Maintenance of all park and trail development works for a period of two years by Developer from date of Certification of Project Completion by Landscape Architect, Grading/Servicing Engineer, and the Lighting Engineer/Consultant.
12. Developer to submit invoice for substantial completion to the City of Kitchener for park and trail development.

**FINAL ACCEPTANCE**

14. Landscape Architect, Grading/Servicing Engineer and the Lighting Engineer/Consultant to provide end of warranty inspection and to co-ordinate warranty corrections with Contractor(s).
15. Landscape Architect, Grading/Servicing Engineer and the Lighting Engineer/Consultant to provide Certificate of Warranty Clearance for City review and acceptance.
16. Submission of as-built drawings by the Landscape Architect, Grading/Servicing Engineer and the Lighting Engineer/Consultant
17. Final Acceptance of Developer Build park development by City (end of warranty period/final payment)
L.11 SPECIFIC PARK AND MULTI-USE PATHWAY CONSTRUCTION REQUIREMENTS

L.11.1 General

When these specifications/standards are referenced for construction; substitute “Developer” for “contractor”. Alternatively the following sections present the Developer’s responsibilities.

L.11.2 Setting Out

The setting out of work shall rest solely with the Developer who will be responsible for same. Prior to commencement of work on site, it is the responsibility of the Developer to become directly acquainted with the site, to carefully examine the location of the proposed work, to verify existing grades, site conditions including vegetation, property limits and easement lines, levels, and dimensions as indicated on the drawings and report in writing immediately to the City and the Consultant, any errors discrepancies and conditions which are at variance with drawings and specifications.

Failure to do so will imply acceptance by the Developer of surfaces and site conditions and no claim made thereafter for damages or extras resulting from such discrepancies will be accepted.

Prior to commencing any excavation work verify on the site all underground services, such as water lines, sewers, electrical cables, telephone, gas and other utility lines and have such services located/staked on the site by the appropriate authorities. The Developer is responsible for damage or relocation incurred during the execution of the project.

The Developer is responsible for damage caused to the surrounding facilities. Facilities damaged by the Developer shall be repaired to the approval of the Supervisor of Design and Development, at the Developer’s expense.

Meet and blend smoothly with existing grades at the project boundaries where required.

L.11.3 Clearing

Clear site of all rubbish, rocks, boulders, tree stumps and other useless materials and debris, remove from site and dispose of unless instructed otherwise.

Cut all dead trees and remove stumps and roots to a minimum depth of 600 mm below proposed finished grade. In all areas of adjacent to living tree and shrub roots, use Hydro Vac Excavation only to a depth of 600 mm.

L.11.4 Site Protection

General

The Developer is to be fully responsible to ensure that all erosion and sedimentation resulting from the proposed works, dewatering operations, etc., is controlled and contained within the work site to the satisfaction of the Supervisor of Design and Development and / or Grand River Conservation Authority.

Any clean-up or damage costs resulting from the Developer’s failure to control erosion or siltation will be completely at the Developer’s expense.
At all times, the Developer shall prevent entry of sediment to watercourses. Controls shall include, but not be limited to, the following:

- Runoff from construction materials and stockpiles shall be contained and discharged so as to prevent entry of sediment to watercourses.
- Erosion and sedimentation control measures shall be placed in watercourses as directed by the Grading Consultant and/or Grand River Conservation Authority.
- A dedicated stockpile area(s) shall be prepared prior to dredging. The stockpile area(s) shall be adequately sized to account for spreading of wet sediments and shall be determined in consultation with the Supervisor of Design and Development.
- Silt fences shall be installed along the perimeter of the stockpile site. Silt fences shall be installed across truck access routes to the stockpile at the end of the work day.
- All conventional and in-water sediment control fence shall be installed as per any drawings approved by the City and the Grand River Conservation Authority. All sediment and erosion control measures shall remain in place until authorized for removal by the Supervisor of Design and Development.

**Silt Fence**

Silt fence is to be as per OPS – 219.130 to prevent any soil from eroding from regraded or disturbed areas during construction. For this fence the “Control Measure Support” is to be Paige Wire Fencing.

This fence is to be installed by the Developer and inspected and approved by the Grading Consultant prior to the start of any site grading. After approval, the silt fence is to be maintained intact by the Developer until the grass cover is well established and approved by the Grading Consultant. The fence shall be entrenched and backfilled to stop any erosion.

The Developer is responsible to remove silt fence and restore and reseed disturbed areas as required upon final acceptance.

**L.11.5 Tree and Shrub Protection**

Tree and Shrub Protection shall be designed in accordance with industry standards and submitted to the Supervisor of Design and Development for review and approval.

Developer is responsible to remove tree and shrub protection upon final acceptance by the Supervisor of Design and Development.

**L.11.6 Topsoil Stripping**

All areas designed for paving or the construction of structures shall be stripped of all topsoil and organic matter to its full depth taking care not to contaminate it with any sub-soil.

All stripped topsoil is to be used for the park and shall be stockpiled in areas so designated by the Developers Grading Consultant and shall be for park purposes only.

Stockpile topsoil in loose layers, not exceeding 225 mm in depth, total height of stockpile not to exceed 4500 mm. The stockpiles shall be protected by heavy duty silt fence (OPSD 219.130) for stockpiles as per the Grand River Conservation Authority ESC Guidelines.

Topsoil will be re-used for landscape work, unless specified otherwise.
Commence topsoil stripping only after designated areas have been cleared of scrub, weeds, brush stumps, rocks and other deleterious materials. Such materials shall be removed from the site and disposed of by the contractor.

L.11.7  Rough Grading

After stripping of topsoil, do all necessary rough grading, excavating, and filling, where required, to establish the sub-grade under all areas as shown on the approved Park & Trail Grading Drawings.

Level of sub-grade shall be to the depths specified on the approved Park & Trail Grading Drawings, after compaction of sub-grade and of materials placed thereon.

Remove all soft and unstable areas in sub-grade to approved depth and backfill with clean fill material which will meet the compaction requirements.

Establish and maintain sub-grade parallel to finished grade and shape to allow adequate surface runoff and prevent ponding, scouring and erosion.

Provide for uniform slopes between points for which finished grades are shown on the approved Park & Trail Grading Drawings. Meet and blend with existing grades in a smooth manner. Establish smoothly rounded grades at top and toe of slopes and banks. Do not grade when soil is wet or frozen.

Preparation of sub-grade:

- Scarify sub-grade on which topsoil is to be placed, to the minimum depths specified, and
- Scarify sub-grades under areas which are to be raised by placing fill to minimum depth of 75 mm to provide a good bond and prevent slipping of fill.

L.11.8  Filling

Fill material shall be clean, free of topsoil, organic matter and debris, and shall be approved by the Supervisor of Design and Development before placing. On site excavated material may be used for filling when approved by the Supervisor of Design and Development. Testing of proposed fill materials may be required by the Grading Consultant.

Where required, supply and spread approved fill materials to raise existing grades to the specified level, as shown on the drawings.

Place fill in loose layers, not exceeding 150 mm in depth and compact each layer to a minimum dry density of ninety-eight percent (98%) of the maximum Standard Proctor Density, before placing subsequent layers.

The surface shall be shaped at all times to ensure adequate surface runoff and prevent ponding and scouring.

L.11.9  Excavation

Before proceeding with excavating work for paving and footings, the areas shall be staked out and approval obtained from the Grading Consultant.
Excavate where required to the minimum specified depths to establish the sub-grade under all paving where shown on drawings.

Prepare and compact final sub-grades as shown on drawings.

The excavations for footings shall be carried to undisturbed soil, to depths as shown on drawings.

All excavations shall be sufficiently shored and braced to prevent caving-in and support existing structures, roads, services, etc., in accordance with the Ontario Occupation Health & Safety Act.

Warning signs and protection barriers shall be erected in accordance with local regulations.

The Contractor is responsible for all damage and subsequent repair to underground utilities and structures resulting from Contractor’s operations.

All excavations shall be protected from freezing and water. Provide and operate as many pumps as are necessary to keep excavations free of water at all times.

All excavated material shall be removed and disposed of as directed, unless approved by the Grading Consultant for filling or backfilling.

L.11.10 Backfilling

This shall include the backfilling around new structures with granular materials and/or other approved fill.

Remove all debris, rubbish, shoring, etc., from excavation before backfilling.

Backfill material shall be clean, free from debris, organic matter, and other deleterious material, and shall not be placed over frozen or wet soil.

Backfill material shall be placed in 150 mm lifts and each layer consolidated to ninety-eight percent (98%) Standard Proctor Density.

The Developer will be responsible for making good any subsequent settlement of fill and work placed on top of it.

L.11.11 Compaction

Compact sub-grade under all paving where specified uniformly and adequately to ninety-eight percent (98%) minimum Standard Proctor Density.

Sub-grade under landscaped areas (planting and grass) shall meet eight-five percent (85%) Standard Proctor Density. Developers Grading Consultant to provide written certification for all area compaction levels to the City.

L.11.12 Topsoiling and Grading

Criteria
All areas designated for parkland, which are not identified as tree habitat zones, are to have a minimum of 300 mm of topsoil. All tree habitat zones will have the required soil volumes and depth identified on the Tree Planting Plan and meet all of the requirements in Section M of this manual.

Topsoil stripped from the area surrounding the park shall not be stockpiled on the Park or Trail site. The Supervisor of Design and Development requires topsoil testing to the City’s satisfaction at the expense of the Developer.

All park blocks shall be graded at a minimum 1% slope and maximum 5% slope. Steeper slopes, up to a maximum of 20% (5:1), may be considered in limited areas provided that the total length of the slope does not exceed 3.0 meters and these steeper slopes do not compromise the intended use of the park block for the play and recreation activities required.

Match with surrounding grades.

Spreading of topsoil, rough grading, fine grading and seed bed preparation (including removal of all stones 25 mm in size and debris) are to be completed and certified prior to seeding/sodding by either the Grading Consultant or the Landscape Architect Consultant.

Topsoil shall be stabilized within the construction year’s growing season.

Testing

Test topsoil for N, P, K, Mg, soluble salt content, organic matter, pH Value, and agricultural herbicide residue. Topsoil shall be with the specifications outlined in Table 17.

<table>
<thead>
<tr>
<th>% Sand</th>
<th>Silt Loam</th>
<th>Loam</th>
</tr>
</thead>
<tbody>
<tr>
<td>55 - 80%</td>
<td>0 - 35%</td>
<td>30 - 55%</td>
</tr>
<tr>
<td>% Silt</td>
<td>% silt will make up the remainder of the mix</td>
<td></td>
</tr>
<tr>
<td>% Clay</td>
<td>8 - 20%</td>
<td>0 - 25%</td>
</tr>
<tr>
<td>Screening</td>
<td>≥ 7.5 cm mesh</td>
<td></td>
</tr>
<tr>
<td>% rocks &amp; sticks</td>
<td>Maximum 10%</td>
<td></td>
</tr>
<tr>
<td>pH</td>
<td>5.5 to 7.5</td>
<td></td>
</tr>
<tr>
<td>% organic content</td>
<td>48% (determined by oven-dried weight)</td>
<td></td>
</tr>
<tr>
<td>Phosphorus(P)</td>
<td>20 - 40 ppm</td>
<td></td>
</tr>
<tr>
<td>Potassium (K)</td>
<td>100 - 200 ppm</td>
<td></td>
</tr>
<tr>
<td>Calcium (Ca)</td>
<td>1,500 - 4,000 ppm</td>
<td></td>
</tr>
<tr>
<td>Magnesium (Mg)</td>
<td>100 - 300 ppm</td>
<td></td>
</tr>
<tr>
<td>Sulphur (S)</td>
<td>20 - 100 ppm</td>
<td></td>
</tr>
<tr>
<td>Sodium (Na+)</td>
<td>&lt; 200 ppm</td>
<td></td>
</tr>
<tr>
<td>Total Salts E.C.</td>
<td>&lt;0.25 mS/cm</td>
<td></td>
</tr>
<tr>
<td>Herbicides</td>
<td>Testing will identify any growth inhibiting herbicides present in the soil.</td>
<td></td>
</tr>
<tr>
<td>CEC (Cation Exchange Capacity)</td>
<td>8 - 15 centimoles/kilogram</td>
<td>10 - 20 centimoles/kilogram</td>
</tr>
</tbody>
</table>

Submit two (2) copies of soil analysis and recommendations for corrections to the Park Design Staff.
Inspection and testing of topsoil will be carried out by a certified testing laboratory. Testing costs associated with conveyance of parkland are the Developer’s responsibility.

Materials

All topsoil to be obtained from stockpiles, or supplied by the Contractor, shall be a fertile, friable natural loam containing four percent (4%) minimum organic matter for clay loams and two percent (2%) minimum organic matter for sandy loams with acidity range of 5.5 pH to 7.5 pH and shall be capable of sustaining vigorous plant growth. It shall be free of any admixture of sub-soil, clay lumps, stones, and roots and other extraneous matter and shall be free of weeds and weed seeds.

L.11.13 Topsoil Spreading and Fine Grading

The sub grade shall be certified by the Grading Consultant for rough grading, prior to spreading topsoil.

Spread topsoil to the following depths:

- 300 mm to 600 mm for all areas to be seeded and sodded;
- All tree habitat zones will have the required soil volumes and depth identified on the Tree Planting Plan and meet all of the requirements in Section M of this manual;
- Depth indicated is compacted depth;
- Spread topsoil on prepared sub-grade of the work site;
- Fine grade topsoil to produce a smooth even surface free from debris, sod, stones greater than 25mm and roots;
- Compact to 85% Standard Proctor Density, and
- Meet and match all existing turf areas, curbs, manholes and catchbasin frames in a smooth uniform line.

L.11.14 Site Servicing

Water

All Parks require a minimum 50 mm service and each City, District and Regional Park requires a 150 mm service complete with backflow device, shut-off valve or curb stop, as per OPSD 1104.020, located at the property line. This will facilitate the future addition of an irrigation system, drinking fountain, water play feature, or service building. Each water service pipe diameter shall be identified on the Park Servicing Plans. Water meter chambers to be provided in order to accommodate water service equipment.

Irrigation Standards and Specifications

Refer to the Landscape Ontario Irrigation Commodity Group standard specifications. All irrigation proposed within the Park should follow the Turf and Landscape Irrigation Best Management Practice and follow the practice guideline. For design, contracting and management, individuals shall be required to have obtained the certification specific to their field:

The certifications include:

- Certified Irrigation Designer (CID);
- Certified Irrigation Contractor (CIC);
- Certified Landscape Irrigation Auditor (CLIA);
- Certified Landscape Irrigation Manager (CLIM), and
- Certified Golf Irrigation Auditor (CGIA).

A listing of certified individuals can be found on The Irrigation Association’s website.

**Drainage**

All drainage associated with park amenities and open space shall conform to City of Kitchener Lot Grading and Drainage standards.

Active parkland is to be conveyed in a condition where no surface water can be left standing and in accordance with a Park & Trail Grading Plan and Storm Water Management Plan. The Developer will be responsible for all costs associated with installing a drainage system to meet City approval.

The preliminary park drainage system required for conveyance is to be designed with the overall subdivision drainage taking advantage of nearby street sewers where possible.

Park and open space property is not to be used for draining private properties.

The Developer is required to install a storm service connection to all Parks. The connection shall be sized for the gross park drainage to the satisfaction of the City. All drainage is to be designed to encumber the site as little as possible recognizing that park amenities require excavation. Drainage from adjacent lands is not to be outlet into Park land unless adequate conveyance through the park is provided to the satisfaction of the City.

The entrances to the park or open space are to be clear of sewer appurtenances.

**Electrical**

All Parks require a minimum 110 amp/120V service connection installed within a 100mm conduit. For parks greater than 5 ha a 200 amp 220 volt service connection will be required. The service shall be installed to a location approved by the City and identified on the approved Park drawings.

**L.11.15 Parking Areas**

**Materials** - to be as specified in a geotechnical report for a specific location or as follows:

**Light Duty Asphalt** for parking areas and driveways with continuous concrete curb.

<table>
<thead>
<tr>
<th>Material</th>
<th>Thickness (mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>HL3</td>
<td>30</td>
</tr>
<tr>
<td>HL4</td>
<td>40</td>
</tr>
<tr>
<td>Granular ‘A’</td>
<td>150</td>
</tr>
<tr>
<td>Granular ‘B’</td>
<td>300</td>
</tr>
</tbody>
</table>

**Heavy Duty Asphalt** is to be used in heavy traffic service driveways and fire routes with continuous concrete curb.

<table>
<thead>
<tr>
<th>Material</th>
<th>Thickness (mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>HL3</td>
<td>40</td>
</tr>
<tr>
<td>HL8</td>
<td>50</td>
</tr>
<tr>
<td>Granular ‘A’</td>
<td>150</td>
</tr>
</tbody>
</table>
Granular ‘B’ - 300 mm

Gravel Surface with continuous concrete curb
Base: 300 mm Granular ‘B’ or 300 mm of 50 mm crusher run.
Surfacing: 150 mm of Granular ‘A’.

Layout and Drainage

- All parkland parking to be off-street, unless approved by the City;
- Minimum setback from street line 3.0 m;
- 90° entrance drive with clear visibility;
- Provide a minimum of 1 barrier free space per 20 regular spaces;
- Drive aisle width - 7.3 m for double loaded aisle and 6.7 m for single loaded aisle;
- Backup aisle at end of lot minimum, 1.5 m depth;
- Minimum 3 m clearance at end of parking lot for snow storage;
- Where parking abuts a walkway at a right angle, walkway is to be a minimum of 1.8 m wide, and
- Sheet drainage to adjacent parkland if feasible or a swale along edge of parking lot leading to a
  catch basin.

L.11.16 Planting

For all tree planting in parks refer to Section M – Urban Forest – Tree Planting & Establishment and the
accompanying document Tree Planting & Establishment – Best Management Practices. All planting
plans shall be prepared by a Landscape Architect and approved by the City. All plantings to be in
accordance with the Canadian Standards for Nursery Stock (current Standards) as prepared by the
Canadian Nursery Trades Association. Workmanship is to meet standards of Ontario Landscape
Contractors Association and the City of Kitchener's Best Management Practices.

L.11.17 Sodding

Delivery and Storage

Schedule delivery in order to keep storage on the job site to a minimum without causing delays.

Deliver, unload and store sod on pallets.

Deliver sod to site within 24 hours of being cut and lay sod within 36 hours of being cut.

Do not deliver small, irregular or broken pieces of sod.

During dry weather, protect sod from drying and water sod as necessary to ensure its vitality and prevent
dropping of soil in handling. Sod which dries out will be rejected.

Scheduling of Work

Schedule sod laying to coincide with topsoil operations. Do not begin to install sod without inspection
and approval of topsoil preparation. Two (2) working days notice is required for an inspection. Topsoil to
be free of stones, debris and weeds and fine graded to grades indicated on plan prior to start of sodding
operation.
Acceptance

Sodded areas will be accepted at the end of the maintenance period provided that:

- Sod is properly established;
- Turf is free of bare or dead spots and weeds, and
- Sodded areas have been cut within 24 hours prior to acceptance inspection.

Materials

Turf grass nursery sod: specially sown and cultivated in nursery field all in compliance with the specifications of the latest issue of the Nursery Sod Growers Association of Ontario for (A) Number One Kentucky Bluegrass-Fescue Sod.

Sodding

Sodding during dry weather is acceptable only if sufficient and continuous watering is assured.

Where slippage of sod is likely to occur because of the degree of slope, pegging is required. When sod is established, drive pegs flush with sod.

Prior to laying sod, apply herbicide according to the City policy and manufacturer’s specifications or cultivate to a depth of 100 mm and remove weeds. Do not apply herbicides immediately prior to installing sod.

Lay sod even with adjoining landscape areas. The rows shall have staggered joints. Butt sections closely without overlapping or leaving gaps between sections. Cut out irregular or thin sections.

Provide close contact between sod and soil by means of light roller. Heavy rolling to correct irregularities in grade is not permitted.

Water sod immediately after laying to obtain moisture penetration into top 150 mm of topsoil.

Provide adequate protection of sodded areas against erosion and other damage. Remove this protection after sod has become established.

Maintenance

It is the Developer’s / Subdivider’s responsibility to maintain the sodded areas in good condition until the Final Acceptance of the project. Maintenance includes but is not limited to weeding, fertilizing as required by soil tests, cutting as required to maintain sod at a maximum height of 60 mm and watering.

Water sodded areas to sustain prosperous growth and prevent deterioration. Developer / Subdivider is responsible for supplying water to the site at the contractors’ cost.

L.11.18 Seeding

Grass Seed Mixtures
**Outfield Mix**

‘Sports Turf’ by Pickseed Canada Inc., Box 304, Lindsay, Ontario, K9V 4S3, Tel: (705) 878-9240, Fax: (705) 878-9249.

For sports fields and high traffic areas that require deep roots, and wear resistance.

Contents:
- 25% Indigo Kentucky bluegrass
- 25% Touchdown Kentucky bluegrass
- 25% Jasper Creeping Red fescue
- 25% Cutter Perennial ryegrass

Seeding rate: 1.5 kg/100 sq.m. or 3 lbs/1000 sq.ft.

**Park Mix**

For general parkland areas with normal foot traffic (such as around sports fields) on a regular maintenance schedule.

Contents:
- 20% Beyond bluegrass
- 20% Nu Blu bluegrass
- 25% Top Gun perennial fescue
- 25% J-2 chewings fescue
- 10% Jamestown 2

Seeding rate: 1.8 kg/100 sq.m. or 4 lbs/1000 sq.ft.

**Low Mow**

‘Lowgrow’ by Pickseed Canada Inc., Box 304, Lindsay, Ontario, K9V 4S3, Tel: (705) 878-9240, Fax: (705) 878-9249.

For areas where a lower and slower grass requiring less mowing is desirable.

Contents:
- 100% Perennial ryegrass

Seeding rate: 6 to 7 lbs. per 1000 sq.ft.

**No Mow Mix**

‘Nature’s Blanket’ by Pickseed Canada Inc., Box 304, Lindsay, Ontario, K9V 4S3, Tel: (705) 878-9240, Fax: (705) 878-9249.

For areas which do not require regular maintenance and which are not subject to a great deal of foot traffic.

Contents:
- 30% Mustang Tall fescue (turf-type)
35% Spartan Hard fescue  
15% Strawberry clover  
3% Arrow mixed colours  
17% Pickseed 14 species Wildflower blend

Seeding rate: 15 – 25 kg/ha.

**Naturalization Mixes**

Refer to Naturalization Section L.15 for design criteria.

Seed mixes to be created on a site-by-site basis recognizing the following criteria:
- Water regime;
- Soil conditions;
- Human activity;
- Existing vegetation;
- Salt tolerance;
- Sunlight availability;
- Erosion control requirement, and
- Active or passive naturalization.

Installer to provide the Supervisor of Design and Development with the packing receipts verifying the species content, percentages and supplier.

Seeding rate: specific to the proposed mix.

Use on-site seed bank material where appropriate.

**Interim Seeding**

All interim seeding placed for quick cover must be compatible with, but not jeopardize the survival of the approved seeding mix. The interim mix must consist of no-maintenance, native, non-invasive herbaceous species. Annual rye and winter wheat may be suitable.

**Product Handling**

Use all means necessary to protect material before, during and after installation. Provide adequate protection to material which may deteriorate if exposed to elements.

Installer to provide the Supervisor of Design and Development the packing receipts verifying the species content, percentages and supplier.

In the event of damage or rejection, make immediate repairs or replace materials at no extra cost to the City.

**Delivery and Packaging**

**Fertilizer**
Packaged in waterproof bags, with a label clearly indicating net mass, analysis and manufacturer. Store on pallets and protect from the elements.

**Grass Seed**

Grass Seed packaged and labelled clearly indicating:

- Analysis of seed mixture;
- Percentage of pure seed;
- Year of production;
- Net mass;
- Date tagged and location;
- Percentage germination, and
- Name and address of distributor.

**Site Conditions**

Immediately after seeding, erect snow fencing to protect seeded areas from traffic until seed is established.

Contractor is responsible for maintaining snow fencing until project is accepted.

Clean-up immediately any soil or debris spilled onto pavement or concrete.

**Maintenance (Prior to Acceptance)**

Maintain all seeded areas until acceptance of seeding work. Maintenance includes, but is not limited to, weeding, fertilizing as required by soil tests, cutting as required to maintain grass at a maximum height of 60 mm and watering. Grass is to be cut regularly during the maintenance period as required to maintain the maximum height acceptable.

Water seeded areas to sustain its prosperous growth and prevent deterioration. The Developer is responsible for supplying water to the site.

Keep soil moist during germination period and adequately water grassed areas until accepted by the Supervisor of Design and Development.

Apply water to ensure moisture penetration of 75 to 100 mm. Control watering to prevent washouts.

Cut grass when it reaches height of 60 mm. Do not cut more than 33% of blade at any one mowing. After acceptance period, request inspection by the City immediately after cutting grass.

Maintain grassed areas free of pests and disease, using pesticides in accordance with city policy.

Reseed areas which show root growth failure, deterioration, bare or thin spots, or which have been damaged by any means, including replacement operations.

Apply herbicide when it will not cause damage to new grass or other plants. Use products only in accordance with City policies.
Contractor is to provide four (4) applications of fertilizer in the 24 months of maintenance. The timing of fertilizing will depend on when seeding is completed. If seeding is completed in the spring, the second application of fertilizer is to be applied in late June or early July as weather permits. Coverage is not to exceed 3 kg per 100 m$^2$ to be applied evenly and water in well. The third application of fertilizer is to be applied in September or October, weather permitting. The forth application of fertilizer is to be applied in late June or early July as weather permits.

If seeding is applied in early August, the second application of fertilizer will occur in September or October, weather permitting, and the third application in the following spring as weather permits. The forth applications of fertilizer will occur in September or October, weather permitting.

Acceptance

All seeded areas shall meet the following:

- A full growing season has passed;
- There are no invasive species present;
- Seeded areas are properly established and the germination reflects the seed composition, including cover crop, grass and forb species;
- Installer to provide the City the packing receipts verifying the species content, percentages and supplier;
- Turf areas are free of eroded, bare or dead spots and free of noxious weeds, and
- No surface soil is visible when grass has been cut to height of 60 mm.

To meet Acceptance, the following activities shall be required:

- Repair all eroded areas with topsoil;
- Re-seed bare areas;
- Over-seeding if the cover crop, grass and/or forb species have not established;
- Weed control (manual or non-chemical methods only) will be required in areas where non-native or invasive species have established. The use of any other method is at the discretion of the Supervisor of Design and Development, and
- Inspected and Approved by the Supervisor of Design and Development.

Materials

**Fertilizer:** complete commercial fertilizer as recommended by soil test, minimum of 50% of elements derived from organic sources.

**Grass Seed:** Canadian No. 1 seed mixture in accordance with the Canadian Seeds Act, having minimum purity of 97% and germination of 75%.

**Mulch:** The hydraulic mulch material shall be capable of dispersing rapidly in water to form a homogeneous slurry and remain in such a state when agitated or mixed with other materials. When applied, the hydraulic mulch shall be capable of forming an absorptive mat, which will allow moisture to percolate into the underlying soil. It shall contain no growth of germination inhibiting factors. The mulch shall be dry, free of weeds and all other foreign material and shall be supplied in packages labelled to indicate weight.
The hydraulic mulch shall be a mixture consisting of cellulose pulp and natural sun dried plant fibres processed in lengths 15 mm minimum and 25 mm maximum.

**Water:** Potable, free of impurities that would inhibit germination.

**Workmanship**

Keep site well drained.

Clean up immediately, soil, mulch or other debris spilled onto pavement, dispose of deleterious materials.

Take reasonable care to prevent contamination by seeding slurry of structures, signs, guide rails, fences and utilities.

When contamination occurs, remove seeding slurry to satisfaction of the Supervisor of Design and Development.

**Preparation of Surfaces**

All areas to be seeded and mulched shall be fine graded to a uniform surface and the surface materials shall be loosened to a depth of 25 mm whether or not topsoil has been applied. These areas shall be so maintained until they are seeded and mulched. Stones and all other surface litter shall be removed and disposed of offsite by the Contractor.

Obtain Supervisor of Design and Development approval of seed bed preparation including topsoil grades, and depth before starting seeding. No seeding will be accepted unless seed bed preparation has been inspected and approved prior to completion of work.

**Timing of work**

Seed area during early spring or after 15th of August to September 15th.

Apply when winds less than 10 km/h using equipment suitable for area involved to the approval of the Supervisor of Design and Development.

Measure quantities of material by mass or mass-calibrated volume measurement to the satisfaction of the Supervisor of Design and Development.

Seed, fertilizer and hydraulic mulch shall be thoroughly mixed in a water slurry and be distributed uniformly over the surface area via an approved hydraulic mulcher.

The Contractor shall measure the quantities of each of the materials to be charged into the hydraulic mulcher, either by weight or by a system of mass calibrated volume measurements. After charging, no water or other material shall be added to the mixture in the hydraulic mulcher.

**L.12**  **MULTI-USE PATHWAYS**
The developer is required to design, engineer and construct all Multi-Use Pathways, including finished surfacing, which have been identified in the approved Draft Plan of Subdivision. See Standard Drawings 503, 504, & 505.

L.12.1 **Excavation**

The existing topsoil layer shall be removed to the depth required to reach underlying granular or other soils which can be compacted to a minimum of 95% Standard Proctor Density. A minimum excavation depth of 300 mm is required to provide for granular base course material installation. Unsuitable soil shall be removed to additional depths as required and replaced with engineered fill, compacted to 95% Standard Proctor Density. Granular Base Course shall be a minimum of 300 mm Granular “A”.

Excavation shall not be permitted in woodlands or other areas where damage to tree roots or other vegetation would occur. Filling only with an approved trail surfacing detail may be acceptable or required in these locations.

L.12.2 **Drainage**

Concentrated surface runoff shall not be directed across or along the trail surface. Swales or culverts shall be provided within the trail corridor.

L.12.3 **Surfacing**

"Transportation Trails" and trails with slopes in excess of 5% or slopes that will have possible erosion problems are to be asphalted.

"Recreational Trails" are to have a stone dust surface.

"Transportation Trails and Recreational Trails are identified/defined in the Trails and Parks Master Plan. The sub-grade shall be compacted to 95% Standard Proctor Density except in woodlands. Granular base of a minimum of 300 mm granular ‘A’ shall be required. Surface of HL3 asphalt, 70 mm min. depth in all areas outside of woodlands. Other surfacing shall be required within woodlands or other natural areas as required. All Multi-Use Pathway details shall be approved by the Supervisor of Design and Development. Areas adjacent to trails shall be re-vegetated as soon as practical to prevent erosion.

L.12.4 **Signage**

All Multi-Use Pathways shall be provided with signage acceptable to the Supervisor of Design and Development.

L.12.5 **Barriers**

Bollards and standard park gates are required at all intersections with roadways or other vehicle routes to control traffic and promote user safety.

L.13 **PARK AND MULTI-USE PATHWAY RELEASES**

Release for Park and Multi-Use Pathway requirements may only be applied for upon 100% completion as certified by the Grading/Servicing Engineer, Landscape Architect, and Lighting Engineer/Consultant.
Any request for release must be supported by the following documentation, which certifies that the park and community development works have been completed in accordance with the approved plans:

a) A Park and Multi-Use Pathway Grading/Surfacing and a Servicing Site Development Works Notification form from the Engineering Consultant who prepared the plan(s)

b) A Park and Multi-Use Pathway Facility Completion Notification form from the Landscape Architect who prepared the Park Development Landscape Plan.

c) A Park and Multi-Use Pathway Site Development Works Notification form from the Lighting Engineer/Consultant who prepared the Lighting Plan.

These forms must be sent to:

Supervisor of Design and Development
Parks Operations
Community Services Department
82 Chandler Drive
Kitchener ON N2E 1G6

With a copy to:
Supervisor of Site Plan Development, Planning Division
Development and Technical Services
200 King St. W.
Kitchener City Hall
Kitchener, Ontario
N2G 4G7

Upon receipt of the four above noted forms, the City may make an inspection to verify that the Park and Multi-Use Pathway Site Development Works are installed in accordance with the approved plans. Should the City find any discrepancies and/or deficiencies, an inspection report will be issued to the owner and the appropriate consultant(s). Any revisions to the approved park development plan, site and trail grading, planting and landscaping, park facility and servicing plans, tree management and/or lighting plans require approval from the City prior to installation of the works.

Upon completion of the items outlined in the inspection report, the applicant shall notify the City for further inspection in order to obtain a final release.

If more than one (1) inspection must be carried out to obtain a complete release of the security for site development works, it will be at cost of $280.00 per inspection and paid in advance.

All site development works are to be maintained and all plant material is to be in a healthy vigorous state for approval. A landscape contractor’s plant material guarantee is not acceptable to receive release related to dead or poor condition plant material.

Substantial and final acceptance of the park and Multi-Use Pathway site development works by the City may occur between May 1st and October 31st only. Due to environmental conditions, final inspection and/or acceptance of the installation of plant material, sodding and/or seeding may not be possible between November 1st and April 30th. Consequently between these months, it may not be possible to
make any releases to ensure satisfactory completion of the installation of plant material, sodding and/or seeding.

The City will not release any of the park and Multi-Use Pathway works until the City has received all required Park and Multi-Use Pathway Site Development Works Notification forms from the designated professionals, to the Supervisor of Design and Development, giving complete certification of the site, and the City is in complete agreement with the certification.

With the final acceptance of the above noted notification forms As-Built drawings are to be prepared and sealed by the developer’s Grading/Servicing Engineer, Landscape Architect and the Lighting Engineer/Consultant. Two (2) hard copy sets (Mylar) and one digital file in dwg. format (not read only) is required by the Supervisor of Design and Development.
M URBAN FOREST – TREE PLANTING & ESTABLISHMENT

M.1 GENERAL

Trees on City lands (residential streets, active parkland, and natural areas) are recognized as one of Kitchener’s corporate assets. In contrast to other assets, trees increase in value as they grow, providing the maximum economic, social and environmental benefits at maturity. Recognizing this, these Best Management Practices place a priority on the planting of large (≥ 60 cm) and medium (≥ 40 cm) stature trees (Table M.1) and the required soil volume to maximize community benefits while minimizing long-term costs. For more information and additional tools refer to the City of Kitchener Urban Forest Website. This section (M), Urban Forest – Tree Planting & Establishment identifies the minimum requirements for tree planting and soil habitat zones for all City lands managed by Operations, Infrastructure Services Department. Where a discrepancy exists between these standards and another City document, the standards in this section will always be viewed as Operations’ minimum standards and requirements.

<table>
<thead>
<tr>
<th>Table 18: MATURE TREE SIZE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Diameter at maturity</td>
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<tr>
<td>------------------------</td>
</tr>
<tr>
<td>Large Stature Trees (LST)</td>
</tr>
<tr>
<td>Medium Stature Trees (MST)</td>
</tr>
<tr>
<td>Small Stature Trees (SST)</td>
</tr>
</tbody>
</table>

Note: Tree stature refers to the mature size of the tree, and not species of trees, recognizing that trees adapt to the site conditions they are growing in (e.g. dwarf cedar trees growing on Niagara escarpment). To maximize community benefits, these standards place a priority on the planting of large and medium stature trees with the required soil volume (Refer to Table M.2 – Minimum Soil Volumes for Mature Trees - Soil Habitat Zones).

M.2 URBAN FOREST REQUIREMENTS

Minimum Quantities, Tree Size, Soil Volumes, Cash-in-Lieu, Species Diversity

The City of Kitchener has set minimum requirements for all tree planting on City lands. Tree size, soil volumes, cash-in-lieu payments and species diversity requirements are the same for all developments. The number of trees required and their locations varies by the type of development and land use, refer to M.2.1 to M.2.5 for specific requirements.

M.2.1 New Residential (post 1980) - Street Tree Planting Minimum Requirements

The Developer will provide at least 1 tree and the required soil habitat zone for each residential unit built (single, semi-detached, townhouses). At least 30% of the trees will be large stature trees, and 50% will be medium stature trees, while no more than 20% will be small stature.

For new development, where the front and side lot setback is ≥ 4.5 m, the City will permit up to 25% of the required trees to be planted on active parkland to achieve a mature tree canopy of 40 to 60% (See M.2.3).
Where the front and side lot setbacks are < 4.5 m, the City will consider other planting options on public and private lands, with the first priorities being active parkland, school properties and other public lands. All tree planting on private lands must include a restrictive covenant or equivalent to protect the tree and soil habitat zone.

M.2.2 **Old Residential (pre 1980) - Street Tree Planting Minimum Requirements**

Refer to the City of Kitchener’s Operations Tree Planting & Establishment Best Management Practices Manual for more information (available on the City of Kitchener website).

M.2.3 **Multi-Residential and Lot-less Blocks - Street Tree Planting Minimum Requirements**

The minimum requirement for multi-residential lots and lot-less blocks will be for the Developer/Builder to construct 1 medium stature street tree and the required soil volume (e.g. boulevard and front yard soil habitats) for every 10 lineal meters of road right-of-way frontage.

The Developer/Builder will be required to achieve optimal street tree plantings beyond the minimum requirement, where conditions exist and upon review of the detailed site plan proposed i.e. where soil habitats supporting large stature trees are achievable, the Developer/Builder will be required to construct large stature street tree plantings.

M.2.4 **New Development – Active Parkland Minimum Requirements**

The Developer will provide the required number of trees and soil habitat zone to achieve at least 40% mature tree canopy cover within the active parkland. Where all of the required residential trees cannot be planted within the road right-of-way, the City may consider plans that increase the mature tree canopy cover from 40% up to a maximum of 60%.

The tree planting plan for active parkland will ensure that at least 75% of the trees are large stature, that no more than 20% of the trees are medium stature and no more than 5% are small stature trees.

For staged developments, where the active parkland is in future stages, the Developer may carry forward deficient tree targets from the residential streets to future stages that contain active parkland.

M.2.5 **Letter of Credit**

As part of the Letter of Credit submitted to Engineering and required at the time of underground servicing, the Developer will identify the full estimated value of the required large, medium and small stature trees. The calculated value, shown at a per-tree rate, will include: consultant fees, supply of approved soils, installation of soil habitat zones, 50 mm wire basket trees, root pathways, and two years of maintenance that produces a healthy and vigorously growing tree that no longer requires supplementary watering.

M.2.6 **Cash-in-Lieu Payments**

Where the Developer cannot meet the minimum targets for tree planting on residential streets and active parkland, the City will accept a cash-in-lieu payment for the value of the tree/s, required soil volume/s, installation and maintenance costs established through the Letter of Credit process for large, medium and small stature trees.
Where the cash-in-lieu payment is greater than 20% of the minimum target, the Developer will demonstrate to the City that all planting options have been considered before the City will accept the cash-in-lieu payment. Cash-in-lieu payments to the City will be made at the time of Initial Acceptance of the street trees.

M.2.7 Minimum Soil Volumes

For trees to provide the maximum benefits to the community over their lifecycle (50+ years), the minimum required soil volume and quality must be provided. Large stature trees (LST) require 45m$^3$ of viable soil to grow to maturity, while medium stature trees (MST) require 28m$^3$. With the large scale earth moving that occurs today prior to residential development, the functional and physical characteristics of the soil that sustained growth prior to development must be re-established after development for healthy and vigorous tree growth to occur. Starting at the Draft Plan Review Stage, the Developer’s Landscape Architect will identify the tree planting requirements and work with the project’s planners, engineers and all utilities to achieve the minimum tree planting requirements and required soil volumes.

All proposed tree planting on lands managed by Operations will include the minimum soil volumes required. For trees planted in groups or continuous soil trenches, a percentage of the required soil volumes may be shared. The soil volumes required for individual trees and trees planted in groups are provided in Table M.2 below. Any tree planting requirements for City lands that are planted on other lands will require these minimum soil volumes.

| Table 18: MINIMUM SOIL VOLUMES FOR MATURE TREES – SOIL HABITAT ZONES |
|-------------------------------------------------|------------------|-----------------|------------------|
| Diameter at Maturity                            | LARGE STATURE TREES (LST) | MEDIUM STATURE TREES (MST) | SMALL STATURE TREES (SST) |
| Minimum Soil Volume required for Single Trees    | ≥ 60 cm (24") | ≥ 40 cm (16") | ≤ 20 cm (8") |
| Minimum Soil Volume Per Tree Where Soil Volumes are Shared | ≥ 45m$^3$ | ≥ 28m$^3$ | ≥ 17m$^3$ |
| Allowable Shared Soil Volume                     | ≥ 30 m$^3$ | ≥ 18.5 m$^3$ | ≥ 11 m$^3$ |

A soil volume calculator is available for download on the city website.

M.2.8 Soil and Topsoil Depth

For all boulevards where trees are planted, the minimal soil depth will be 450 mm, and all other soil habitat zones (public/private front lawn, cul-de-sac, active parkland) associated with tree planting will be 900 mm. Where soil habitats zones (e.g. boulevard and front lawn) must be connected to achieve the required soil volumes, root pathways or Silva Cells will be used to provide a functional connection between the two areas. Refer to section M4 and the following details UF.3.1/3.2/3.3 for more information.

The City’s minimum standard for topsoil in the soil habitat zones is 450 mm. Topsoil is permitted to a maximum depth of 900mm within these zones. The soil habitat zones (public/private front lawn, cul-de-sac, active parkland) is required to have the subsoil to be mechanically scarified to a depth of 900mm.
prior to the placement of topsoil. If the subsoil material (B Horizon) is not suitable for use as soil habitat
the City may require topsoil be installed for the entire soil habitat zone. Prior to topsoil placement all soil
habitat zones the subsoil must be free of construction material larger than 50mm diameter, debris,
garbage, rocks and wood.

M.2.9  Urban Forest Soils Report

The Developer’s Consultants will provide a soils report that describes the physical and functional
characteristics of the lands to be developed prior to any area grading, using the standards set in the Field
Manual for Describing Soils in Ontario. The field work and reporting will be carried out by a qualified
Pedologist or equivalent. Where appropriate, the Soils of Waterloo County will be referenced providing
the historical context of the characteristics of the soils. Using the mapping available (Scale 1:20,000) in
the Soils of Waterloo County, minimum of 2 soil samples of the surface soil (A Horizon) and
subsurface (B Horizon) will be taken per polygon based on the size of the polygon and experience of
the qualified Pedologist. Each sample point will be geo-referenced in the field and a map of the soil
points will be included in the report, along with a shapefile. For each sample point, the field sheet in the
Field Manual for Describing Soils in Ontario will be used. Soil samples will be taken at each sample point
and all of the required tests identified in Table 5 will be taken and sent to an accredited soil testing
facility. The soils report will provide a description of the soils within the developable lands prior to
development based on the sample plots and laboratory results.

<table>
<thead>
<tr>
<th>Table 19: SOIL ASSESSMENT &amp; SPECIFICATIONS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sandy Loam</td>
</tr>
<tr>
<td>% Sand</td>
</tr>
<tr>
<td>% Silt</td>
</tr>
<tr>
<td>% Clay</td>
</tr>
<tr>
<td>Screening</td>
</tr>
<tr>
<td>% rocks &amp; sticks</td>
</tr>
<tr>
<td>pH</td>
</tr>
<tr>
<td>% organic content</td>
</tr>
<tr>
<td>Phosphorus(P)</td>
</tr>
<tr>
<td>Potassium (K)</td>
</tr>
<tr>
<td>Calcium (Ca)</td>
</tr>
<tr>
<td>Magnesium (Mg)</td>
</tr>
<tr>
<td>Sulphur (S)</td>
</tr>
<tr>
<td>Sodium (Na+)</td>
</tr>
<tr>
<td>Total Salts E.C.</td>
</tr>
<tr>
<td>Herbicides</td>
</tr>
<tr>
<td>CEC (Cation Exchange Capacity)</td>
</tr>
</tbody>
</table>

The Urban Forest Soils Report respond includes at a minimum the following items:
- Characterization of the depths and types of A & B Horizon soils observed onsite;
- Identify deficiencies:
  - In A Horizon soil properties (compared against Table 19)
  - In A Horizon volume, as compared to the preliminary volumes found by the PTPP.
• Recommendations for A Horizon soil improvement (if required), which may include:
  ▪ A Horizon soil quality amendments
    • At stockpile
    • At time of front yard soil habitat installation
  ▪ A Horizon volume solutions e.g. acquire suitable soils off site
• Specific recommendations if any required, for the retrieval and storage of A Horizon soils, including recommendations if any required e.g. mixing operations at the storage pile that may be necessary to achieve A Horizon soils that are ready to be relocated to tree planting locations;
• Specific recommendations if any required related to the site’s A Horizon soil material properties e.g. moisture content and texture, for the purpose of informing fill and compaction operations of A Horizon soils into the front yard and boulevard soil habitats, in order to achieve suitable conditions for root development.

Based on the characteristics of the existing soils the Urban Forest Soils Report will identify the depths of both Horizon A and Horizon B existing onsite, quality of material based on Table 19 and general recommendations for any future amendments to meet Table 19 requirements. The Developer’s Consultants will identify the acceptable range and depth of topsoil that will be used in the soil habitat zones for trees. The Developer’s Consultant will also identify how the Horizon A material will be stored and installed in the soil habitat zones to maintain the physical and chemical characteristics. The Urban Forest Soils Report shall be submitted with the Preliminary Tree Planting Plan, to the satisfaction of the City of Kitchener’s Director of Operations.

M.2.10 Species Diversity & Selection

Species diversity and selection are key elements in the creation of a sustainable urban forest. Recognizing that cities are cultural creations, a sustainable urban forest that maximizes community benefits for the lowest cost, supports the planting of native and non-native species in the appropriate location. No one genus can exceed 20% of the total planted trees. Long-term social, environmental and economic benefits will be considered along with long-term costs, with a focus on the planting of large and medium stature trees. The mature size/stature of a tree is dependent on the species and the available soil habitat zone. The Landscape Architect will identify the total number of large, medium and small stature trees included within the subdivision. City of Kitchener Operations Urban Forest Staff will review and approve the species selection and the stature designation of the trees for each project. The City may request changes and substitutions through the design of the tree plans.

M.3 PRE CONSTRUCTION PROCESS

Submissions & Approvals

For additional information refer to the following details in Appendix C and the City of Kitchener’s Operations Tree Planting & Establishment Best Management Practices Manual.

M.3.1 Draft Plan Review

At the time of Draft Plan Review, the Developer’s Consultants will provide a Preliminary Tree Planting Plan showing how the minimum tree planting requirements, of 1 tree per residential unit (or other stated requirement), will be prepared for review and comment by Operations. The Urban Forest Soils Report shall be submitted with the Preliminary Tree Planting Plan.
This plan, drawn at a scale of 1:1000, will include road, lot, driveway and boulevard layout information. Using the standardized colour coding system, the plan will identify all of the potential large, medium and small stature tree locations based on soil volume requirements and the proposed layout of the subdivision. From this information the Developer’s Landscape Architect will identify the potential locations and quantities for large, medium and small stature trees on the plan and in the Minimum Requirements Table M.4. Where the proposed tree planting quantities are below the minimum standards or where it is being proposed that the required trees along the City road right-of-way will be planted in other locations, the consultant will provide sufficient information to show how the required targets will be met.

<table>
<thead>
<tr>
<th>Table 20: Tree Planting Requirement Summary</th>
</tr>
</thead>
<tbody>
<tr>
<td>(Requirement to be included on all Tree Plans)</td>
</tr>
<tr>
<td>Subdivision Name:</td>
</tr>
<tr>
<td>Subdivision Number:</td>
</tr>
<tr>
<td>Number of Stages:</td>
</tr>
<tr>
<td>Stages on Plan:</td>
</tr>
<tr>
<td>Proposed Residential Lots:</td>
</tr>
<tr>
<td>Total Number of Trees Required:</td>
</tr>
<tr>
<td>Total Number of Trees Provided:</td>
</tr>
<tr>
<td>Total number of Street Trees</td>
</tr>
<tr>
<td>Total number of Park/Open Space Trees</td>
</tr>
<tr>
<td>Total Number of Large Stature Trees (LST)</td>
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<tr>
<td>Total Number of Medium Stature Trees (MST)</td>
</tr>
<tr>
<td>Total Number of Small Stature Trees (SST)</td>
</tr>
</tbody>
</table>

As the design evolves, the Conceptual Tree Planting Plan will be used to inform the design team and all utilities groups about the minimum tree planting requirements, while also ensuring that the identified large and medium stature tree planting locations and soil habitat zones are protected wherever possible.

**M.3.2 Engineering & Utility Design**

**Street Tree Planting Plan – 1st Submission**

At the time of the 1st submission of the detailed engineering drawings, the consultant will provide the City with a Tree Planting Plan (TPP) for review and comment by Operations. Based on the Preliminary Tree Planting Plan and refinements of the design, the STPP will be drawn at a scale of 1:500 using the City standard template for the tree related infrastructure. The drawing will show all of the soil habitat zones for large, medium and small stature trees. The drawing will also show the proposed: road, lot, driveway, boulevard, proposed known utility locations (sanitary, water, storm, hydro, front yard infiltration facilities, telecommunications, and gas layout information) along with the all known proposed aboveground infrastructure (all street furniture including sidewalks, driveways, community mailbox locations, telecommunication pedestals, utility structure/buildings, streetlight poles, conduits, ductwork, hydro
As part of their 1st engineering submission, the engineering consultant will incorporate A and B Horizon soil management planning results into the standard Lot Grading cross-section and plan details, such that the relevant Section M changes including the new soil habitat horizon requirements are accommodated.

“A Horizon” soil material will conform to Table 19: Soils Assessment & Specifications. The upper 450 mm of front yard and boulevard soil habitats will be constructed of A Horizon soil material as outlined in the Urban Forest Soils Report. The Developers Consultant will calculate and identify on a street by street basis the volume of A Horizon topsoil material required to construct the front yard and boulevard soil habitats.

Street Tree Planting Plan - 2nd Submission
As part of the 2nd engineering submission, the landscape architectural consultant will submit the Street Tree Planting Plan - 2nd Submission. The Plan will identify the soil habitat zones for large, medium and small stature trees and identify species, quantities, condition and sizes of proposed plantings, as well as identifying large, medium and small stature quantities achieved overall. The Plan will also show proposed subdivision infrastructure layers that potentially affect street tree planting locations, including: roads, on-street parking, lotting, driveways, boulevards, sidewalks and front yard infiltration galleries if any; proposed servicing including sanitary and storm sewer, gas, hydro and water; and also show proposed above ground subdivision infrastructure, including community mailbox locations, bus/transportation stops, telecommunication pedestals, utility structures/buildings, streetlighting poles and hydro vaults.

Street Tree Planting Plan - 3rd Submission (if required)
As part of the 3rd engineering submission and if it is required, the landscape architectural consultant will submit the Street Tree Planting Plan - 3rd Submission. The Plan will address review comments from the 2nd Submission Plan as well as adding any new information not available at the time of the 2nd Submission e.g. hydro infrastructure.

Approved Street Tree Planting Plan
The landscape architectural consultant will continue to submit Street Tree Planting Plans to coincide with engineering submissions where these are revised and may affect the Street Tree Planting Plan, until the City’s Development Engineering advises that the Plan has been accepted. At this point the approved plan will become the Approved Street Tree Planting Plan.

The Approved Street Tree Planting Plan will guide the construction of soil habitats, root pathways and street tree installations and will also guide inspections for Initial and Final Acceptance.

As-Recorded Street Tree Planting Plan
Street trees are considered one of the assets that the City of Kitchener is required to include in their reporting of municipal assets to the federal government. In addition, street trees are part of the urban infrastructure fabric compiled from Subdivider submission requirements and mapped by the City’s GIS Division.

As-Recorded Street Tree Planting Plans will be a requirement for achieving Final Acceptance on a street-by-street basis. The Subdivider’s consultant team are required to submit these because a number of actions during the build-out of a stage of subdivision may cause acceptable deviations from the Approved Street Tree Planting Plan, including:

• Driveways not constructed according to plan at the decision of individual builders, necessitate street tree relocations;
• Changes to the location of other municipal infrastructure and utilities approved after the Approved Street Tree Planting Plan is achieved;
• Subdivider’s contractor responds to homeowner requests for new tree plantings that were not approved;
• During the time between the Subdivider achieving the Approved Street Tree Planting Plan and the street tree planting within a given stage of subdivision, street trees may be planted in locations not previously approved, and existing boulevard trees forming a part of the Approved Street Tree Planting Plan may have previously been removed, and;
• Other changes which may occur during the planning and construction of stages of subdivision, following approval of the street tree planting plan e.g. Modifications to the Approved Draft Plan of Subdivision, etc.

Prior to Final Acceptance of the Servicing, the consultant will provide the City with the SMTPP for approval by Operations. Prior to approval the proposed tree species will be shown for all large, medium and small stature trees complete with the soil volumes to be provided for each tree. All underground infrastructures including installed utility crossings are to be shown in their design or as-recorded locations. This drawing must be signed and sealed by the Developer’s Landscape Architect. Prior to issuance of building permits, the Developer will provide to the City evidence of having entered into contractual arrangement for the provision of water and all other requirements of the maintenance period for all trees planted on public and private property as part of the approved TPP (refer Section M.5.2).

<table>
<thead>
<tr>
<th>Table 21: SUBMISSION REQUIREMENTS</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>I</strong> Preliminary Tree Planting Plan</td>
</tr>
<tr>
<td>Copies</td>
</tr>
<tr>
<td>Timing</td>
</tr>
<tr>
<td>Review \ Approval</td>
</tr>
<tr>
<td>Soil Habitat Zones (Large, Medium &amp; Small Stature Trees)</td>
</tr>
<tr>
<td>Letter of Credit</td>
</tr>
<tr>
<td>Urban Forest Soils Report</td>
</tr>
<tr>
<td>Utilities</td>
</tr>
<tr>
<td>Root Pathways</td>
</tr>
<tr>
<td>Tree species</td>
</tr>
</tbody>
</table>
M.4 CONSTRUCTION & MATERIALS

M.4.1 Creation of Soil Habitat Zones, Root Pathways, Soils, Tree Planting

During the construction stage the Developer’s Engineer will ensure that all parties are aware of the requirements of the Approved Tree Planting Plan. Prior to installation of any sidewalks and landscape works, the Developer’s Engineer will also ensure that all parties and subcontractors are aware of the tree locations, required root pathways, and soil habitat zones.

The Developer’s Engineer and Landscape Architect will oversee and inspect all aspects of the work, including the removal of the parent material/construction debris from the soil habitat zones, and installation of the approved topsoil, root pathways, and tree planting. Through the Initial and Final Acceptance Certificates, the Developer’s Landscape Architect will verify that all work and materials meet the required standards (Refer to M.5 for more information).

Root pathways will be installed prior to the construction of the sidewalk. For the standard root pathway detail using Big “O” drainage pipe, five sections of pipe extending 300 mm beyond the edge of the sidewalk will be spaced 900 mm apart from the centre of the proposed tree. Placed at the top surface of the parent material (C Horizon) below the sidewalk, the areas around the pipe will be backfilled with parent material. The required 150 mm of granular ‘A’ material for the sidewalk will be placed on top. Where construction debris or excess granular ‘A’ has contaminated the parent material, the contaminated material will be removed before the Big ‘O” drainage pipe is installed. Refer to UF.3.2 in Appendix C for more information.

M.4.2 ‘A’ Horizon Soil Habitat – Boulevard

The excavation for the soil habitat zone in the boulevard will be to a depth of 450 mm, with 1:1 slopes at the edge of the roadway and sidewalk. The boulevard will be backfilled with 450 mm of approved topsoil (A horizon material) in maximum 300 mm lifts and compacted to maximum 85%, minimum 78% Standard Proctor Density (SPD). Refer to UF.3.4 in Appendix C for more information. Compaction testing of each 300 mm lift of soil shall be completed by the Developer under the supervision of the Developer’s Consultant, at their discretion and expense, to ensure that the methods and equipment employed are achieving the required compaction results. The City may require testing, at their discretion and expense, where it appears that compaction requirements are not being met. In cases where these compaction tests fail, all costs of excavation, replacement of soil and all testing shall be at the Developer’s expense. No B Horizon Soil Habitat is required for the boulevard areas. Stockpiled ‘A’ Horizon material is to be made available to contractors and home builders for the construction of front yard and boulevard soil habitats.

M.4.3 ‘B’ Horizon Soil Habitat – Front Yard

Excavation/scarification of the front yard soil habitat zone will be to a minimum depth of 900mm and maintain a minimum of 1000mm from the edge of any building foundation. This soil habitat zone is separated into two distinct zones. The lower 450 mm is to the B Horizon soil (or B Horizon zone). The B Horizon zone can be prepare by excavating to a minimum depth of 450 mm and back filling with approved B Horizon material or by scarifying the existing material in the area to a minimum depth of 450 mm prior to backfilling the upper zone. Scarification must be completed mechanically to the full 450mm depth to remove/release the compaction as a result of the area grading and house construction. The approved subsoil (B Horizon) will be compacted to maximum 85%, minimum 78% Standard Proctor Density (SPD) with the final surface level and scarified to remove crusting. Refer to UF.3.4 in Appendix C for more information. Compaction testing of the B horizon soil shall be completed by the Developer under the supervision of the Developer’s Consultant, at their discretion and expense, to ensure that the
methods and equipment employed are achieving the required compaction results. The City may require testing, at their discretion and expense, where it appears that compaction requirements are not being met. In cases where these compaction tests fail, all costs of excavation, replacement of soil and all testing shall be at the Developer’s expense. The upper zone will be a minimum depth of 450 mm and consist of all A Horizon material.

M.4.4 ‘A’ Horizon Soil Habitat – Front Yard

The ‘A’ Horizon front yard soil habitat zone will be to a minimum depth of 450 mm. Prior to backfilling this zone the lower 450mm B Horizon Soil Habitat Zone must be prepared and all construction debris and garbage removed. The approved topsoil (A Horizon) will be installed in maximum 300 mm lifts and compacted to maximum 85%, minimum 78% Standard Proctor Density (SPD). Refer to UF.3.4 in Appendix C for more information. Compaction testing of each 300 mm lift of soil shall be completed by the Developer under the supervision of the Developer’s Consultant, at their discretion and expense, to ensure that the methods and equipment employed are achieving the required compaction results. The City may require testing, at their discretion and expense, where it appears that compaction requirements are not being met. In cases where these compaction tests fail, all costs of excavation, replacement of soil and all testing shall be at the Developer’s expense.

The Developer’s Landscape Architect will randomly sample 5% of the soil habitat zones once the topsoil has been placed. Samples of the topsoil will be taken and submitted to an accredited lab for testing. Refer to details in Appendix C for more information. Where the test results are not within the allowable parameters, the Developer’s Landscape Architect will notify Operations in writing and propose remedial action to correct the deficiencies and ensure that all of the soil habitat zones meet the requirements.

The Developer’s Landscape Architect will mark all approved tree planting locations prior to any planting. All trees planted will be 50 mm wire basket; the same species and cultivar identified on the Approved Tree Planting Plan and approved by the Developer’s Landscape Architect prior to planting. Refer to UF.4.1/4.2 in Appendix C for more information.

M.5 POST CONSTRUCTION PROCESS

(Initial Acceptance, Maintenance & Warranty, Final Acceptance)

M.5.1 Initial Acceptance

The Developer’s Landscape Architect will request an inspection for Initial Acceptance after all required tree works are completed, and during the active growing season (June 1st to September 30th). Initial Acceptance will be provided on a street by street basis. Prior to the site meeting the Developer’s Landscape Architect will provide the Initial Acceptance Certificate (UF.1.2) signed and dated stating that all required work regarding the urban forest asset has been completed to the Operations’ approved standards and the approved drawings. Certification of front yard and boulevard soil habitats and root pathways by the engineering consultant is a requirement for Initial Acceptance of street trees.

With the submission of the Initial Acceptance Certificate the Developer’s Landscape Architect will also identify in writing whether this part of the development meets the minimum tree planting requirements. Where the minimum requirements have not been met, the Developer’s Landscape Architect will identify the required cash-in-lieu payment.
The Developer’s Landscape Architect will set up a site inspection which will include the Developer’s Landscape Architect and the City’s Operations Representative and Engineering Representative.

The Site Inspection Form (UF.1.1) and checklist will direct the field inspection. Following the field inspection, the Operations Representative will indicate whether the Initial Acceptance will be: 1) Accepted, or 2) Rejected. Where the Initial Acceptance is rejected, the Developer’s Landscape Architect will correct all of the required deficiencies prior to requesting another inspection.

When all issues have been addressed, the City will approve the Initial Acceptance Certificate (refer to UF.1.2) and the project will move to the warranty/maintenance period. The date of Initial Acceptance will be the date of a satisfactory inspection. With approval of Initial Acceptance, the Developer may request that the Letter of Credit value be reduced (see Section A.15) and will receive reimbursement for the value of soil habitat excavation and installation of the topsoil and the root pathways. The value to supply and install the tree and two years maintenance will be held until the Final Acceptance Certificate has been approved.

**M.5.2 Maintenance & Warranty**

The Developer will provide all required maintenance to ensure that after the two year establishment period, all trees are healthy, growing vigorously and have a fully established root system that no longer requires regular, supplementary watering. The Developer will be responsible for the maintenance and related costs until Final Acceptance of the trees. The City will be responsible for maintenance after Final Acceptance of the trees.

Through the development of a community stewardship watering program or scheduled maintenance the Developer will ensure all trees are watered on a weekly basis, and provided with 25 gallons (95 litres) of water per week. All planted trees will receive supplementary watering from the first day of May to the last day of September. Additional weekly watering and/or an increased watering may be required if drought conditions exist.

The Developer’s Maintenance Contractor will also inspect and maintain all of the planted trees after the first growing season. This will include the inspection of the tree stakes, any corrective maintenance, removal of broken or dead branches, the maintenance of the mulched area including the correction of mulch deficiencies (removal of volcano mulching, topping up low mulch, etc.), and the approved educational material will be left with each resident. All maintenance work will be done to the City of Kitchener – Operations Standards.

Prior to Final Acceptance, the Developer’s Maintenance Contractor will carry out all of the required work for the first growing season, and all tree stakes will be removed. After the completion of the first year of maintenance, and during the active growing season June 1st to September 30th, the Developers Landscape Architect will complete an inspection of all trees using the Site Inspection Report (UF 1.1), and provide a written report to Operations concerning the maintenance, health and vigour of the trees.

The maintenance period will cover two full growing seasons,

**M.5.3 As-Recorded Submission**

The Subdivider is required to submit As-Recorded Plans to the City’s Manager of Development Engineering prior to the Final Acceptance of the street trees. The As-Recorded Plan will be prepared in accordance with the City of Kitchener’s Constructed Asset Data Submission template package, available for download on the City website. All plans will be submitted in digital format.
Point features are required for each street tree planted. The As-Recorded plan must provide the following information for each tree.

### Table 22: Street Tree Constructed Asset Data Requirements

<table>
<thead>
<tr>
<th>ATTRIBUTE</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>SPECIES_NAME</td>
<td>COMMON NAME</td>
</tr>
<tr>
<td>PLANTED_BY</td>
<td>CONTRACTOR WHO PLANTED THE TREE</td>
</tr>
<tr>
<td>MONTH_PLANTED</td>
<td>MONTH</td>
</tr>
<tr>
<td>YEAR_PLANTED</td>
<td>YEAR</td>
</tr>
<tr>
<td>STOCK_TYPE</td>
<td>WIRE BASKET, 30 GALLON POT, BARE ROOT ETC.</td>
</tr>
<tr>
<td>STOCK_SIZE</td>
<td>50MM, 45MM, 40MM, 250CM ETC.</td>
</tr>
<tr>
<td>DIAMETER_BREAST_HEIGHT (DBH)</td>
<td>MEASUREMENT 1.37M ABOVE GRADE IN CENTIMETERS</td>
</tr>
<tr>
<td>TREE_HEIGHT</td>
<td>TOTAL TREE HIEGHT MEASUREMENT IN METERS</td>
</tr>
<tr>
<td>CROWN_WIDTH1</td>
<td>WIDTH IN METERS NORTH-SOUTH AXIS</td>
</tr>
<tr>
<td>CROWN_WIDTH2</td>
<td>WIDTH IN METERS EAST-WEST AXIS</td>
</tr>
<tr>
<td>BRANCH_HEIGHT</td>
<td>METERS ABOVE GRADE &lt;1.2M, 1.2 TO 2.4M, 2.4 TO 3.6M OR &gt;3.6M</td>
</tr>
</tbody>
</table>

### M.5.4 Final Acceptance

After two full growing seasons from the Initial Acceptance the Developer's Landscape Architect will request an inspection for Final Acceptance during the active growing season (June 1st to September 30th).

Prior to the site meeting, the Developer’s Landscape Architect will provide the Final Acceptance Certificate (UF.1.3) signed and dated stating that all of the trees as per the plan are established, healthy and growing vigorously, no longer require supplementary watering, and all other requirements during the warranty period have been carried out. Assessment of plant vigour will be based, in part, on evidence of regular watering throughout the warranty period and the extent of new growth which is consistent with this regular watering.

At Final Acceptance, all street trees must meet the following acceptance criteria:

- All staking materials to be removed.
- Organic mulch placed a minimum of 50 mm deep over the tree pit. No mulch is to be in contact with the trunk of the tree as per the City Standard Planting Details.
- Planting depth to be completed in accordance with the City Standard Planting Details and relative to finished grade and elevation of topmost structural root, in accordance with Canadian Nursery Trades Association standards.
- Trees to have proper form and branching for the species.
- All dead wood shall be pruned and removed prior to inspection.
- All suckering and adventitious growth to be removed prior to inspection.
- Trees must show evidence of continuous growth and establishment since the Initial Acceptance.
- Trees shall be in good general health, free of mechanical bark damage, no evidence of disease and overall structurally sound.

The Developer’s Landscape Architect will set up a site inspection, which will include the Developer’s Landscape Architect and Operations Representative and Engineering Representative.

The Site Inspection Form (UF.1.1) and checklist will direct the final field inspection. Following the field
inspection the Operations Representative will indicate whether the Final Acceptance will be: 1) Accepted, or 2) Rejected. Where the Final Acceptance is rejected, the Developer’s Landscape Architect will correct all of the required deficiencies prior to requesting another inspection.

When all issues have been addressed, the City will approve the Final Acceptance Certificate and the City will assume full responsibility for the trees on City lands and their maintenance. With the approval of Final Acceptance, the Developer may request to have the remaining amount (value of the supply and install of the trees and two years maintenance) of the Letter of Credit reduced (see Section A.15). Where trees have been planted on other public or private lands, the Developer’s Consultant will inform the owners that the trees are now their responsibility.