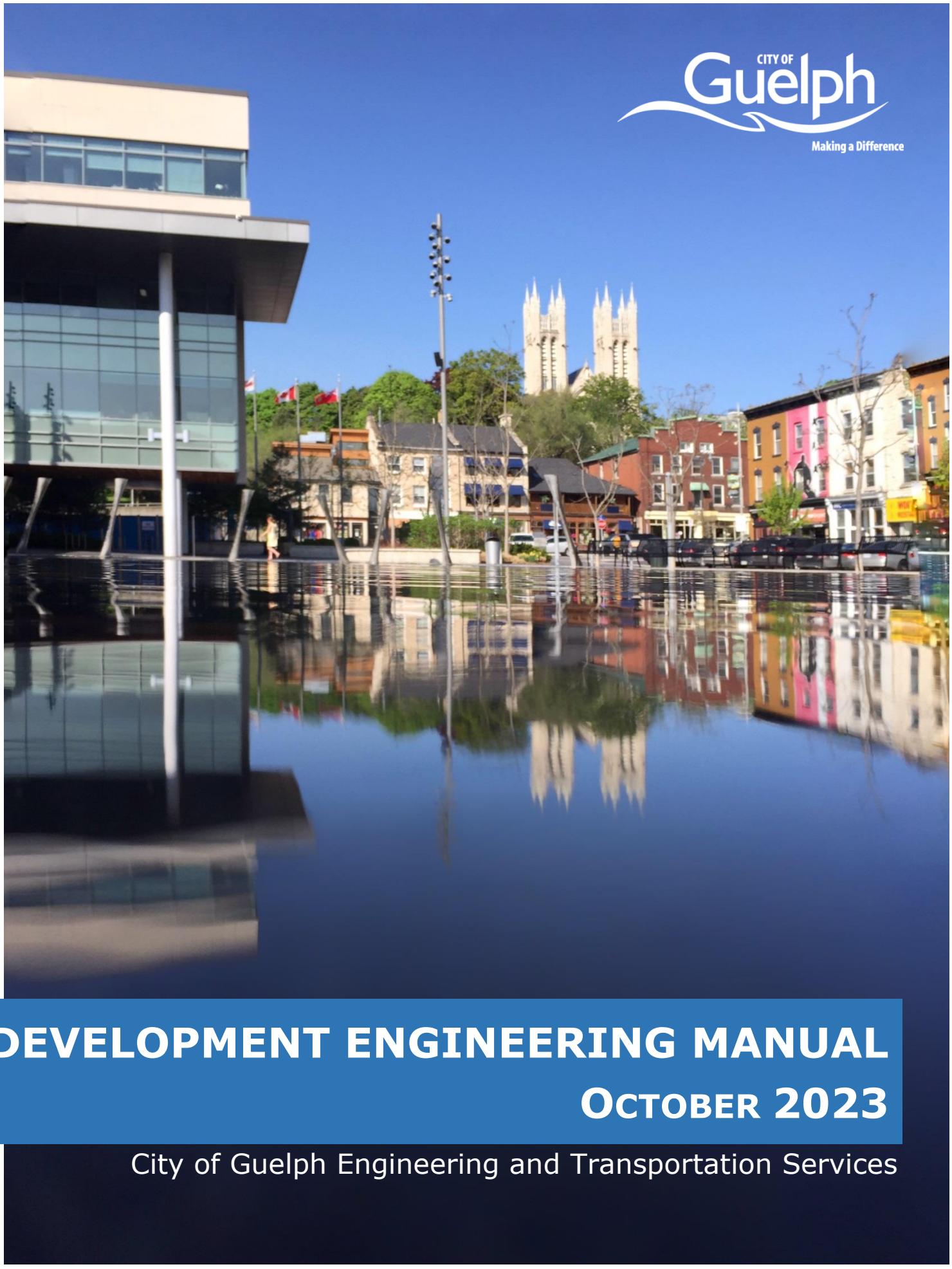

DEVELOPMENT ENGINEERING MANUAL

OCTOBER 2023

City of Guelph Engineering and Transportation Services

Development Engineering Manual

City of Guelph

Engineering and Transportation Services

October 2023

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1.0 Introduction

1.1 Purpose and Background

The City of Guelph (City) Development Engineering Manual (DEM) was prepared to provide guidance related to the engineering aspects of development work. This DEM outlines the City's current engineering requirements, guidelines, specifications, and standards that form the basis for obtaining engineering approvals related to the following development applications:

- Plans of Subdivision;
- Site Plan;
- Zoning By-Law Amendments (ZBA);
- Official Plan Amendments (OPA);
- Plans of Condominium; (Standard, Vacant Land, Common Elements, Conversion)
- Part Lot Control;
- Consents (severances);
- Minor Variances; and
- Site Alteration Permits. (Ref. to Site Alteration By-Law)
- Infill developments for 10 units or less

This DEM outlines specific requirements for development applications that require approval from the City. All sections of the DEM are applicable for Site Plan and Subdivision applications. Other application types listed above must also follow these requirements.

This DEM was prepared by the City's Development Engineering Services team, with input from other City Service Areas, including: Planning, Urban Design and Building Services, Legal and Realty Services, Parks and Recreation, Water Services, and Engineering and Capital Infrastructure Services. The City also gathered input for this DEM from external stakeholders, including developers, home builders, consulting engineers, and external agencies. The DEM works to achieve the City's Strategic Plan overarching goal of Service Excellence by providing a solid foundation for a growing city.

1.2 Intent and Objectives

This DEM is to be used by residents, City staff, and development industry parties such as land developers, builders, consultants, and contractors. The intent of this DEM is to assist the development industry in preparing, and City staff in processing,

engineering submissions that form part of a complete development application. The City acknowledges that all developments are different and have their own unique challenges that can require professional judgment; therefore, this DEM should be viewed as the minimum requirements for the efficient design and approval of development engineering related works.

The key objectives of this DEM are to:

- Document existing process information related to the engineering submission of a development application;
- Outline requirements and standards for the engineering design of new developments within the City;
- Provide guidance and framework for applicants submitting engineering designs and reports in support of development applications;
- Provide guidance to City staff when reviewing and commenting on engineering aspects of a development application; and
- Identify the role and involvement of City departments and external agencies as part of the development engineering review and approval process.

1.3 Current and Future Versions of the DEM

The DEM is a consolidation of past design and development standards.

A detailed revision history for this document is available by contacting City of Guelph Engineering and Transportation Services.

By way of consolidation, the City current's engineering requirements have been included. Future updates to engineering standards may be required from time to time. Accordingly, future versions of this DEM will include Best Practice Updates and Process Information Updates where necessary.

1.3.1 Future Best Practice Updates

The City will seek to update its engineering standards based on current industry practices, new research, lessons learned, etc. Updates will be incorporated into the appropriate location of the document and will be tracked on a revisions summary page. Subsequent versions of this DEM will be released on as needed basis.

1.3.2 Future Process Information Updates

Future versions of this DEM will be updated to provide new or revised Process Information related to the engineering aspects of a development application. Where necessary, future Process Information will explain or elaborate on evolving development engineering roles and procedures such as but not be limited to,

securities, inspections, fees, agreements, or other common and unique requirements for a given development application type (e.g., processes for subdivision or site plan applications).

1.4 Roles and Responsibilities

The City's **Development Planning Services** (Planning, Urban Design and Building Services) staff are responsible for the processing and recommendations/approval (where delegated) of a development application. The lead planner works with other City departments, such as engineering, to ensure the development application meets the requirements for all aspects of the planned development. The overall coordination of the development application file is the responsibility of the lead planner.

The City's **Engineering and Transportation Services** staff are responsible for reviewing and approving engineering aspects of development applications, such as grading and drainage, servicing, stormwater management, noise impacts, traffic impacts, roads, environmental conditions, etc. Engineering and Transportation Services also has the overall responsibility for maintaining and updating this DEM. For questions regarding any aspect of this DEM, please inquire via email to engineering@guelph.ca.

Additional approvals or permits for a development application may be necessary from **External Agencies** such as the Ministry of Transportation Ontario (MTO), the Ontario Ministry of the Environment, Conservation and Parks (MECP), the Grand River Conservation Authority (GRCA), or other agencies. It is the applicant's sole responsibility to obtain any required external approvals/permits. The City may not be able to issue final approval for a development application prior to the applicant receiving required external agency approvals/permits. Information pertaining to the requirements for an external agency permit should be obtained directly from the external agency.

The City has obtained authorization from the Province to review and approve the design requirements for alterations to an existing Municipal Sewage Collection System and Municipal Stormwater Management System by adding, modifying, replacing, or extending Sanitary Sewers, forcemain or Stormwater Management System. The Consolidated Linear Infrastructure Environmental Compliance Approval (CLI-ECA) is issued under section 20.3 of Part II.1 of the Environmental Protection Act, R.S.O. 1990, for a municipal sewage collection system and a municipal stormwater management system.

If it is determined that private infrastructure requires an ECA, it will be the responsibility of the property owner to obtain approvals from the provincial governing body.

1.5 Outline

The remainder of this DEM is organized as follows:

Section 2.0 – Plan of Subdivision - Current Process

- Provides procedural information related to subdivision development and approvals.

Section 3.0 – Site Plan - Current Process

- Provides procedural information related to applying for and obtaining Site Plan Approval

Section 4.0 –Engineering Design Criteria and Standards

- Provides an overview of engineering requirements for preparing a design, including reference to general requirements (environmental and source water) as well as other potentially applicable resources.

Section 5.0 – Plan of Subdivision Engineering Design Criteria and Standards

- Provides Plan of Subdivision specific design requirements for engineering submissions for topics such as roads, sewers, grading, etc.

Section 6.0 – Site Plan Engineering Design Criteria and Standards

- Provides Site Plan specific design requirements for engineering submissions for topics such as servicing, transportation, grading, etc.

Section 7.0 – Figures

Section 8.0 – Appendices

- Additional Tables, Figures, and Templates.

2.0 Plan of Subdivision – Current Process

2.1 General

The Plan of Subdivision approval process is the primary instrument for regulating and providing the supply of residential, industrial and commercial lots and parcels in the Province of Ontario. Section 51(16) of *The Planning Act*, RSO 1990 c.P. 13 allows the owner of land or the owner's authorized agent to apply to the approval authority for approval of a Plan of Subdivision.

Guelph City Council is the approval authority for Plans of Subdivision pursuant to Section 51(6) of The Planning Act. The City's Development Planning section of the Planning, Urban Design and Building Services Department, oversees the administration of subdivision approvals for the City.

The City's Engineering and Transportation Services team is involved in the engineering components of a Plan of Subdivision for the following aspects of the subdivision application:

- Draft Plan
- Detailed Design
- Construction
- Registration

General information regarding each stage under the City's current process is presented in Section 2.2 to 2.12. Detailed information for each step in the subdivision process can be obtained through discussions with the lead planner and development engineering staff (engineering staff).

Applications of Draft Plan of Subdivision received after January 2018 will be required to follow the Assumption Process outlined in the Assumption Guidance Document available online at http://guelph.ca/planning/.

2.2 Pre-Consultation and Application

As per the Pre-Consultation By-law (2015-19937), an applicant is to complete a pre-consultation process with the City prior to formally submitting a development application.

After the pre-consultation meeting, planning staff will provide the applicant with a list of requirements for preparation of an application. The engineering requirements will vary depending on the nature of the application. Further details regarding the requirements for these submissions are provided in Section 4.0.

2.3 Draft Plan of Subdivision

A Draft Plan of Subdivision application for a proposed development is submitted to Planning Services. Once the application package has been deemed complete, the lead planner will circulate it for review to the engineering staff assigned to the file, as well as to other City departments (e.g., Parks Planning). The Draft Plan should show the proposed layout of development, meet planning requirements (e.g., conformity with the Planning Act, Official Plan, etc.), and provide engineering information such as (but not limited to):

- Sanitary, Stormwater and Water Servicing/Capacity
- Stormwater Management
- Existing conditions such as site topography, drainage patterns, seasonal high groundwater level, infiltration testing, geotechnical investigation, slope stability assessment, etc.
- Environmental Site Assessment(s)
- Grading concept
- Road geometrics
- External works (e.g., road improvements, sewer, etc.)
- Noise and Traffic Impacts

Upon completion of the engineering review of the Draft Plan of Subdivision (which may require resubmission by the applicant to address engineering Draft Plan comments), engineering will provide Draft Plan conditions to be incorporated as part of the Draft Plan Approval. These conditions outline work that must be completed by the applicant in accordance with the Subdivision Assumption Guidance Manual.

2.4 Detailed Design

Once an application has received Draft Plan Approval (with the associated conditions), the applicant is required to prepare and submit detailed plans, reports, and designs. The required engineering design documents (reports, drawings, etc.) may include, but are not limited to:

- Stormwater Management & Servicing Reports
- Hydrogeology Report
- Geotechnical Investigation Report and Slope Stability Assessment (as necessary)
- Traffic Impact Study (TIS)
- Detailed Noise Study
- Environmental Implementation Report (EIR)
- Environmental Site Assessment(s)

- Existing Condition and Removal Plan
- General Servicing Plan
- Storm Drainage Area Plan
- Sanitary Drainage Area Plan
- Plan and Profile of all Streets
- Lot Grading and Drainage Plans
- Stormwater and Sanitary Sewer Design Sheets
- Stormwater Management Pond Grading and Details Plan
- Geometric Road Design
- Erosion and Sediment Control Plans
- On Street Parking Plan
- Composite Utilities Plan
- On Street Tree Planting Plan
- Landscape plans

Depending on the nature of the proposed development, additional studies and plans may be required beyond those listed above. The City may determine the need for any submitted plan or report to be peer-reviewed; any such cost shall be born by the applicant. All plans, drawings, and reports prepared for the detailed design should conform to the City's design standards.

All new subdivision development applications will use the Assumption Model: please see the "Assumption Guidance Document".

If the development is not using the Assumption Model, one of the engineering conditions of Draft Plan Approval will require the developer to enter into an Engineering Services Agreement with the City, whereby the developer hires the City to design and construct the subdivision roads and servicing works. The City may retain an engineering consultant for the design and construction administration. The City and the engineering consultant enter into an Agreement for Professional Consulting Services. The Agreement for Professional Consulting Services details the responsibilities of the consultant and the terms of payment. The consultant invoices flow through to the developer via the City and the consultant is paid when the developer pays the City.

2.5 Subdivision Agreement

One of the engineering conditions of Draft Plan Approval is that the developer to enter into a Subdivision Agreement with the City. The Subdivision Agreement contains such information as the developer's financial responsibilities, detail about easements and land conveyances to the City, requirements for building permits and covenants to be registered on title. When the detailed design is acceptable to engineering staff, the Subdivision Agreement is prepared by engineering. A draft of

the Subdivision Agreement is circulated to other City Departments and then the draft is sent to the developer for review. When the Subdivision Agreement is executed by the developer and mortgagee and the developer has provided the required financial security (see Section 2.6) as outlined in the Subdivision Agreement, the Mayor and Clerk will execute the Subdivision Agreement by way of Authorization By-law. The Subdivision Agreement is then registered on title of the subdivision lands.

2.6 Financial Security and other Payments

The type of financial security to be provided to the City depends on the subdivision development model for the application. For developments following the Assumption Model, security requirements are outlined in the City's Assumption Guidance Document (http://guelph.ca/planning/).

For developments not following the Assumption Model, the following is a list of typical Subdivision Agreement financial securities and other payments that are to be provided to the City before the Subdivision Agreement is executed:

- 100% of the cost of the roads and servicing works
- 100% of the cost of all works that are external to the plan of subdivision that are deemed to be the developers responsibility
- Cash-in-lieu of parkland/parkland dedication
- Street tree planting
- Planning processing fee
- Environmental handbook fee
- Hard Services portion of the Development Charges for wastewater services, roads, storm drainage and waterworks

2.7 Development Charges

The City passed its Development Charges By-Law under the Development Charges Act, 1997, which enables the City to collect development charges (DCs). The amount of DCs that are required vary by development type. To determine the applicable DCs, the applicant should use the most current Council-approved DC Background Study and most current version of the DC By-Law.

2.8 Construction

For developments following the Assumption Model, details regarding the construction process are provided in the City's Assumption Guidance Document (http://guelph.ca/planning/).

For developments not following the Assumption Model, once the Engineering Service Agreement, the Agreement for Professional Consulting Services, and the Subdivision Agreement (including provision of financial securities) have been executed, the City tenders the construction of the roads and servicing works. The tender and award process is in accordance with the City's current Purchasing Bylaw. Refer to the City's Linear Infrastructure Standards for construction and warranty details. The City will use the financial security provided by the developer to pay the contractor.

2.9 Registration

Once the developer fulfills all of the conditions of Draft Plan approval, an application can be made to the Planning Department for registration of the Plan of Subdivision. After registration, the lots, blocks and roads are created, and any parcels to be dedicated to the City (e.g., parks, open spaces) are transferred, and easements in favour of the City are conveyed. Registration of the plan of subdivision is required prior to application for a Building Permit (see Section 2.10).

2.10 Building Permits

The Subdivision Agreement outlines the requirements that are to be met before engineering staff can support the release of building permits. Typically, the requirements include such items as the Plan of Subdivision being registered, all easements and conveyances registered, the roads being constructed to a granular base, the servicing works (including stormwater management facilities) constructed and operational, the hydro servicing being complete and the erosion and sediment control measures being in place and inspected by the developer's qualified consultant.

2.11 Model Home Permit

The Subdivision Agreement may contain provision for the developer to construct a model home. Typically, the requirements include such items as Plan of Subdivision being registered, all easements and conveyances registered and the erosion and

sediment control measures are in place and being inspected by the developer's qualified consultant but the requirements do not typically require the roads, servicing and hydro to be complete. There would be no occupancy supported until the remaining building permit conditions are fulfilled. The Developer agrees to assume all risk involved in commencing the model home before every requirement for building permit has been met.

2.12 Foundation Permit

The Subdivision Agreement may contain provision for the developer to construct a foundation only (prior to receipt of a full building permit) at the developers risk. Typically, the requirements include such items as the Plan of Subdivision being registered, all easements and conveyances registered and the erosion and sediment control measures are in place and being inspected by the developer's qualified consultant but the requirements do not typically require the roads, servicing and hydro installation to be complete. The construction of a structure above the foundation would not be supported until the remaining conditions are fulfilled for a full building permit.

2.13 Lot Release and Lot Grading Certification

The Subdivision Agreement will contain provision for the lots to be released from the registered Subdivision Agreement. Applications for lot release can be made to the City's Legal Department after:

- all subdivision building permit conditions have been satisfied;
- the lot grading certificate has been submitted to the City (see Grading Certification Letter template in Appendix C); and
- the lot has been completely sodded.

Notice to Purchasers clauses must remain registered on title.

The lot grading certificate can be prepared by a Professional Engineer or an Ontario Land Surveyor and must certify that the house and the lot grading conform to the overall approved subdivision lot grading and drainage plan.

2.14 Development Engineering Fee

For developments following the Assumption Model, details regarding the development engineering fees are provided in the City's Assumption Guidance Document (http://guelph.ca/planning/).

For developments not following the Assumption Model, the City's development engineering fee schedule is outlined in the Engineering Services Agreement.

2.15 Financial Security Accounting

The City reviews each subdivision account once per year (if possible) by way of an interim or final accounting. The results of each accounting may allow the City to release some or all of the financial security or may require the developer to provide additional financial security based on a current cost-to-complete construction estimate.

3.0 Site Plan – Current Process

3.1 General

The Site Plan approval process is regulated by Section 41 of the *Planning Act*, R.S.O. 1990 and the City's Site Plan By-Law (1995-14866). The General Manager of Planning, Urban Design and Building Services is authorized to require the submission and approval of plans and drawings (including the requirement of agreements) for development prior to the issuance of building permits.

The City's Development Engineering Services team is involved in the engineering aspects of the Site Plan review process, which include:

- Pre-Consultation and Application
- Design Review
- Site Plan Approval

General information regarding each stage under the City's current process is presented in Sections 3.2 to 3.4. Further information regarding the overall Site Plan process can be found in the City's Site Plan Manual, which is administered by Planning Services and can be found at (http://guelph.ca/planning/).

Other applications related to the Site Plan approval process may also be reviewed concurrently, including but not limited to applications for Zoning By-Law Amendment and Lifting of 0.3m Reserves; process and technical requirements described in the DEM for Site Plan applications may also apply to these related applications.

3.2 Pre-Consultation and Application

As per the Pre-Consultation By-law (2015-19937), an applicant is to complete a pre-consultation process with the City prior to formally submitting a development application. As part of the Site Plan approval process, the applicant will participate in a pre-consultation meeting with the City's Site Plan Review Committee. These meetings are held every two weeks. More information regarding the City's pre-consultation and Site Plan process can be found in the Site Plan Manual (http://guelph.ca/planning/).

After the pre-consultation meeting, the applicant will be provided with a list of requirements for preparation of an application. The development engineering requirements will vary depending on the nature of the application, but will typically include:

- Grading and Drainage Plan
- Erosion and Sediment Control Plan
- Site Servicing Plan
- Existing Conditions and Removals Plan
- Traffic Geometric Plan
- Site Plan
- Details Plan
- Functional Servicing Report
- Stormwater Management Report
- Traffic Impact Study
- Cost Estimate for works within the City Right-of-Way
- Cost estimate for works on-site
- Environmental Site Assessment(s)
- Noise Study
- Geotechnical Investigation Report and Slope Stability Assessment (as necessary)
- Hydrogeological Assessment
- Composite Utility Plan (see Section 5.2.4)

Depending on the complexity of the proposed development, additional studies and plans may be required beyond those listed above. The City may determine the need for any submitted plan or report to be peer-reviewed; any such cost shall be born by the applicant. Further details regarding the requirements for these submissions are provided in Section 5.0. The engineering criteria and standards that are to be used in preparation of the Site Plan Application are provided in Section 6.0 of this DEM and City of Guelph Linear Infrastructure Standards.

3.2.1 Infill Developments/Building Permits/10 Units or less

Developments for 10 units or less may not require a site plan approval in accordance with the Planning Act. Development of 10 units or less may require pre-approval from Engineering as per By-Law 2023-20792. Engineering may require items mentioned in Sections 2.4 and 3.2 of the DEM for review and approval. The City will assess requirements for developments for 10 units or less on a case-by-case basis.

3.3 Engineering Design Review

Once an application is submitted and circulated by planning staff, the engineering staff responsible for the file will conduct a detailed review of the applicable engineering requirements and design aspects. The engineering staff will review the

plans for conformance with City standards and will work with the applicant to ensure the plans are completed to the satisfaction of the city.

Engineering staff will coordinate the technical comments from specific engineering divisions (e.g., environmental, infrastructure, etc.), and other City divisions, such as water, wastewater, operations, etc. Engineering staff will provide written comments to the lead planner summarizing their review of the design.

For work to be done within the City's Right-of-Way (i.e., service connection laterals, curb cuts, boulevard work, sidewalk, etc.), the applicant's engineering consultant is required to estimate the cost to construct the works using the City's cost estimate template; see Appendix D for template.

Engineering staff will also advise the developer of any costs for works that are external to the site but are deemed by the City to be the developer's responsibility.

3.4 Site Plan Approval and Site Plan Control Agreement

Engineering final acceptance of the Site Plan will be granted once the on-site estimated cost and estimated cost for right of way work is paid to the City and all site plan comments have been addressed to the satisfaction of the engineering staff and management. On a typical file, once Engineering final acceptance of the Site Plan is granted the applicant will be required to enter into a Site Plan Control Agreement to ensure that the work is carried out in accordance with any conditions that arise from the engineering review (Note: the agreement, which is written by Legal and Realty Services, is coordinated by the Site Plan Coordinator and also includes requirements from other departments).

3.5 Construction of Works Within the City's Right-of-Way for Site Plans

Once the Site Plan Control Agreement is executed and the required funds are provided to engineering staff, the developer or their contractor shall apply to the City for a Street Occupancy Permit which permits the developer's contractor to mobilize on City property, during a specified schedule, in order to construct new infrastructure or modify existing infrastructure within the City's Right-Of-Way in accordance with the approved plans; certain conditions, fees and 100% securities will be required. For further details see The City of Guelph's Street Occupancy Permit webpage.

3.6 Building Permit

When a site is subject to Site Plan Approval, a building permit cannot be issued without Site Plan Approval. Please contact the Site Plan Coordinator for specific information related to your application.

The City can consider issuing Site Alteration Permit (grading and earthworks only) with the understanding that the applicant assumes any risks of starting work prior to final approval. Any changes required to the final design after the work has started, and any costs arising from such changes, will be borne solely by the applicant. For additional information, refer to the Site Plan User Guide (http://guelph.ca/planning/).

3.6.1 Site Plan Approval – When the Application is Part of a Subdivision

Presently, in a new subdivision, the City does not grant Section 41 Site Plan Approval until the associated Subdivision Agreement Conditions related to building permits have been fulfilled ***and*** the site plan meets the requirements of the Zoning By-Law, such as land use, parking, municipal services, etc. and Official Plan policies. Once the Subdivision Agreement Conditions are fulfilled and site plan is in compliance with the relevant policies and regulations, the Planning Department grants Site Plan Approval and the Building Department can issue associated building permits, provided that all other Ontario Building Code related items are satisfied.

3.7 Fees and Securities

The current fee requirements for Site Plan review are provided at http://guelph.ca/planning/.

3.8 As-Recorded Drawings

The applicant shall provide as- recorded drawings for all works completed on City property. The as-recorded drawings shall be certified (stamped, signed and dated) by a Professional Engineer and accompanied with the appropriate certification required for the release of on-site securities, in both AutoCAD and PDF format.

4.0 Engineering Design Criteria and Standards

4.1 Overview

The specific design requirements for engineering submissions made as part of a development application are provided in this DEM in two categories:

- Plan of Subdivision Design Criteria and Standards (see Section 5.0)
- Site Plan Design Criteria and Standards (see Section 6.0)

In general, the City requires that engineering designs comply with City requirements listed below as well as applicable Provincial Standards, guidelines and codes. It is the design engineer's responsibility to ensure that any applicable engineering requirements beyond those outlined in this DEM are adhered to.

Documents beyond this DEM that may be applicable for an engineering design include, but are not limited to, the as amended versions of:

- City of Guelph Official Plan
- City of Guelph By-Laws
- City of Guelph Linear Infrastructure Standards
- Region of Waterloo Design Guidelines and Supplemental Specifications for Municipal Services (DGSSMS)
- Ontario Provincial Standard Specifications and Drawings (OPSS and OPSD)
- GRCA Erosion and Sediment Control Guideline
- MECP Design Criteria for Sanitary Sewers, Storm Sewers and Forcemains for Alterations Authorized under Environmental Compliance Approval
- MECP Design Guidelines for Drinking Water Systems
- MECP Design Guidelines for Sewage Works
- MECP Stormwater Management Planning and Design Manual
- TRCA/CVC Low Impact Development Stormwater Management Planning and Design Guide (2010)
- Ontario Building Code
- City of Guelph Traffic Impact Study Guidelines
- City of Guelph Source Water Protection Plan
- City of Guelph Guidelines for Development of Contaminated or Potentially Contaminated Sites
- City of Guelph Facility Accessibility Design Manual (FADM)
- City of Guelph Site Plan User Guide
- City of Guelph Stormwater Management Master Plan
- City of Guelph Water and Wastewater Servicing Master Plan
- City of Guelph Transportation Master Plan

- City of Guelph Road Ecology Study

As industry design practices evolve and new technical guidance or information become available, the City may request updated practices be implemented into a design. Updated practices will be incorporated into this DEM as part of the next update. Where applicable, the City will post updated guidance documents online (http://guelph.ca/planning).

The design requirements, standards, specifications and guidelines set forth throughout Sections 5.0 and 6.0 of this DEM are intended to represent the City's requirements under normal circumstances. The City notes that the design engineer should use their best professional judgement to find appropriate solutions where abnormal conditions are encountered. If there is a need to deviate from a particular requirement, standard, specification or guideline, the engineer shall provide appropriate justification and the proposed deviation would require City approval.

4.1.1 Other Engineering Documents

For detailed design criteria and specifications related to design and construction of municipal services, the City utilizes the DGSSMS. The primary purpose of the DGSSMS document is to provide design guidelines, material specifications, construction specifications, and Standard Drawings related to design and construction of municipal services (focused on watermains, sanitary sewers, and storm sewers, and stormwater management ponds).

A copy of the DGSSMS can be found at (http://guelph.ca/business/bids-and-tenders/).

The City of Guelph also provides engineering requirements via its Linear Infrastructure Standards document. These standards provide specifications and details related to a range of topics including: curb and gutter, sidewalks, sewers, catch basins, pipes, roads, traffic signals and signs, etc. This document also contains the City's Standard Drawings that should be consulted when preparing detailed engineering designs.

A copy of the Linear Infrastructure Standards can be found at (http://guelph.ca/business/bids-and-tenders/).

There may be some instances where requirements in the DGSSMS and Linear Infrastructure Standards provide conflicting information. In these instances, the design engineer should contact engineering staff to determine the appropriate design criteria.

Section 5.0 is organized to show the criteria and standards for a Plan of Subdivision application, and Section 6.0 is organized to show the criteria and standards for a

Site Plan application. The criteria and standards for other development applications such as OPA, ZBA, Plan of Condominium, Part Lot Control, minor variance, severance, and site alteration can vary depending on the nature of the application. As a result, applicants should refer to the requirements throughout Sections 5.0 and 6.0 where needed for these types of applications and should discuss the requirements with the engineering staff assigned to the file during pre-consultation.

4.1.2 Secondary Plan Areas

4.1.2.1 Guelph Innovation District

The Guelph Innovation district (GID) is a portion of the City bounded by York Road, Victoria Road South, the York-Watson Industrial Park and the City's southern boundary, south of Stone Road East, for which a Secondary Plan was prepared and approved. More information regarding the Secondary Plan process and documents can be found on the City's website.

Development in this area shall be in accordance with the Secondary Study reports, and the DEM requirements, as appropriate.

4.1.2.2 Clair-Maltby

The Clair-Maltby lands are a portion of the City bounded by Clair Road, Victoria Road, Maltby Road and the eastern limits of the Southgate Business Park, for which a Secondary Plan was prepared and approved. More information regarding the Secondary Plan process and documents can be found on the City's website.

Development in this area shall be in accordance with the Secondary Study reports, and the DEM requirements, as appropriate.

4.2 General Engineering Requirements

The information provided in the following subsections applies to all types of development applications.

4.2.1 Environmental Engineering

Due to previous and current land uses, several properties within the City may be contaminated, posing a risk to human health and/or the environment. Contamination may preclude or delay development of a property for a particular use. The City works to ensure that a development is suitable for the proposed use and safe for the public. Therefore, as a minimum the City will require that as part of development application, the applicant either complete a Site-Specific Questionnaire (SSQ) or a Phase One Environmental Site Assessment (ESA). The

minimum requirement depends on the nature of the development application. Detailed descriptions of these requirements as well as other environmental engineering requirements (e.g., risk assessment, remediation, etc.) are outlined in the Council endorsed Guidelines for Development of Contaminated or Potentially Contaminated Sites, which is provided at (https://guelph.ca/city-hall/planning-and-development/how-to-develop-property/development-applications-guidelines-fees/).

4.2.2 Source Water Protection

Starting July 1, 2016, all planning and building permit applications in vulnerable areas such as in Well Head Protection Areas or Intake Protection Zones will require screening for potential drinking water threats and review against Guelph-specific policies in the Grand River's Source Protection Plan.

Every development application must be reviewed under the policies of the Source Protection Plan prior to submission in accordance with the requirements of Section 59 of the Clean Water Act, 2006 (CWA) and in accordance with the City of Guelph policies, Section 8, Grand River Source Protection Plan. If the applicant does not require a Prohibition or Risk Management Plan no further action is needed. If the applicant is proposing an activity that requires a Risk Management Plan, the details of your Risk Management Plan must satisfy policy requirements and receive mutual agreement between the applicant and the Risk Management Officer before the development application is accepted and building permit issued. If the applicant proposes to undertake an activity that is prohibited by policies in the Source Protection Plan, the development application will not be accepted and the building permit will not be issued.

For additional information, please visit the website (http://guelph.ca/sourcewater/) or contact the Source Water Protection (SWP) Program Coordinator and/or the Risk Management Official.

4.2.3 Development Agreements

Depending on the nature of an application, the City may require an applicant to enter into a development agreement to ensure certain items are completed as part of the development. For example, where an application has been made for a zoning by-law amendment but the installation of local services (in accordance with the local services policy detailed in the City's development charge background study) will be required by the proposed development, the City may require the applicant to enter into a development agreement before approval of the application can be recommended to Council. As an alternative to entering into a development agreement, a holding zone may be considered in situations where services required by a development are not available at the time of application. The purpose of a development agreement for this example is to ensure that local services required

by any proposed land uses will be provided at no cost to the City and available prior to actual development of the lands. Without this assurance, planning applications may be considered premature, and staff may recommend refusal.

The City will execute development agreements upon approval of the related application(s) by Council and become binding at that time. They may also be registered on title to the lands. Such an agreement does not necessarily replace and may be in addition to other agreements that may be required as part of the development approval process (e.g. Site Plan Control agreements, Subdivision agreements, and agreements required as a condition of a Consent).

4.2.4 Noise Control

Noise is characteristic of many human activities however the proliferation of this noise has potential to negatively affect quality of life and public health. The City of Guelph strives to find compatibility between land uses that are noise sensitive and land uses that are sources of noise such as roads, railways, aircraft, employment areas and equipment for building facilities. This objective is achieved through planning policies, the DEM, the Guelph Noise Control Guidelines and other provincial regulations as required.

Consideration of noise in the planning of new communities, the redevelopment and intensification of older communities, and the growth of business and industry, will contribute to improved and more livable and healthy environments. Information regarding noise study requirements is provided in the Guelph Noise Control Guidelines, which are available at (http://guelph.ca/planning/).

4.2.5 Construction Temporary Dewatering

Construction dewatering will need to be outlined in a dewatering plan in accordance with the MECP and those details are to be shared with the City prior to final approval and/or at the time of application for a Street Occupancy Permit. Furthermore, the applicant is responsible to get any necessary permits (Permit to Take Water [PTTW]) and/or registration (Environmental Activity and Sector Registry [EASR]) with the MECP for the proposed construction dewatering prior to any work being permitted.

4.2.6 Infrastructure in Existing Right of Way

4.2.6.1 CLI ECA Requirements

Alteration to existing City owned infrastructure may require an update to the City's Consolidated Linear Infrastructure Environmental Compliance Approvals (CLI-ECAs). Developments that require extension, replacement or modification of the

City's authorized system shall require review and approval of appropriate documents, and completion of the required alteration application(s).

Developments subject to Planning Act application submission shall follow the appropriate application process for review and approval of required documents. Applications not subject to Planning Act application submission may be required to follow alternative submission and review requirements.

4.2.6.2 Structural Tiebacks

Proposed structural tiebacks should appear on the shoring drawings to best demonstrate the relationship to other proposed or existing underground features. Drawings are to include an inset showing the profile view of the structural tiebacks, noting elevations. The City will require the removal of all tiebacks from the City's right of way.

4.2.6.3 Construction within the Right of Way

Construction works within an existing City owned right-of-way may require a "Street Occupancy Permit" as detailed on the City website.

4.2.7 Servicing Capacity

All new development shall meet the Guelph Zoning Bylaw (2023)-20790 Part C Section 4.10 and have adequate and available servicing. Applicants are able to request an Engineering Servicing Capacity Modelling Check for water supply and distribution system capacity and sanitary sewer wastewater collection system downstream capacity. Please see the City of Guelph User Fees By-Law, Appendix A, Table 3 for fee details and the "Application for Servicing Capacity Check" on the City's website.

Water supply and distribution system capacity shall be based on flows calculated as per the Water and Wastewater Servicing Master Plan (March 2023), Volume II – TM 5 "Design Criteria, Level of Service, and Sensitivity".

Sanitary capacity shall be based on flows calculated as per DEM Section 5.6. Determination of sanitary sewer capacity will be completed as per the City's Sanitary Capacity Assessment Framework, as found in DEM Appendix E.

4.2.8 Stormwater Management Criteria

Criteria for stormwater management for all construction applications (including greenfield and infill) shall be identified based on the SWM MP document within Appendix F – "Stormwater Design Criteria and Targets"; Table 4.2 and Figure 4.2 from the document are included in the DEM Appendix G for convenience.

In addition to the criteria and targets outlined in the SWM MP Appendix F, the following conditions are to be applied:

4.2.8.1 General SWM Criteria Conditions:

- Sites that do not have a positive outlet must be designed to provide storage on site for twice the five-year design storm runoff volume.
- On site control and storage (roof top/parking lot/ponds/superpipes) may be required to attenuate flows.
- For commercial, institutional, and high-density residential developments, excess runoff for the two-year design storm is to be stored underground or on roof tops (no surface ponding).
- Excess runoff from the five-year design storm may pond in areas of least anticipated use to a maximum depth of 0.3m; ponding of the five-year design storm is not permitted within critical access areas, within pedestrian or cycling areas, within a 0.3m freeboard to building entrances, or within any public road right-of-way.
- Major storms are to be routed overland to the City's right-of-way without exceeding a maximum parking lot pond depth of 0.3m. Sites which cannot meet these criteria are required to provide storage within the site for twice the five-year design storm runoff volume.
- Quality control facilities are required to remove suspended solids (oil and grit) from areas draining driveways and parking lots.
- Existing overland drainage patterns from adjoining properties must be maintained and shown on the submitted drawing.

4.2.8.2 Torrance Creek SWM Criteria Conditions:

- The stormwater design must reflect SWM criteria set forth in the "Torrance Creek Subwatershed Study Management Strategy – Revised January 1999" concerning quantity, quality, and water balance objectives.

4.2.8.3 Southgate SWM Criteria Conditions:

- Stormwater criteria is to be based upon the South Guelph Secondary Plan Area Scoped EIS - dated November 1998, LGL Project TA2166 (City ID#2284) and Grading, Servicing and Stormwater Management Report for Southgate Business Park, IBI Group - Revised date 16th January 2012 (City ID#2513).

4.2.8.4 HCBP Phase 1 Pond 1, Phase 1 Pond 2, & Phase 2 Pond 4 SWM Criteria Conditions:

- Municipal Ponds & stormwater conveyance channels are designed up to and including the 100-year design storm. HCBP storm sewers within the right-of-way have been designed with a Runoff Co-efficient C=0.75 – 5yr Guelph design storm.
- Additional stormwater management design information is available in the following documents: Hanlon Creek Business Park Stormwater Management Design Report (January 2009), Hanlon Creek Business Park Environmental Implementation Report (February 2009), and supplemental documentation to the EIR dated 9th July 2010 and Geotech Report HCBP Ph1 dated 29th January 2008. Electronic copies of these documents are available from the City web page.
- The majority of the Blocks will have a split lot grading design (with exception of Block 4 which is graded to flow rear to front) so that the direction of the stormwater runoff from the fronts of the lots is to the road network while the back portion of the lots is drained toward the rear lot swales. The flow is then directed to the storm sewer system or channel conveyance system which outlet to the proposed SWM facilities. (AECOM Canada Ltd. – City of Guelph. Hanlon Creek Business Park Stormwater Management Report – Ponds 1, 2, 3 and 4, January 2009.)
- Post to pre-development water balance must be maintained as per the site specific "Block by Block recharge rate targets" (mm/yr) as presented on Figure 17 of Appendix XII, Environmental Implementation Report (February 2009). The Developer's engineer must demonstrate that recharge targets will be met at site plan approval.
- Existing on-site interim infiltration galleries to be properly abandoned during site development as appropriate.
- Roof runoff must be directed to infiltration systems (i.e. infiltration galleries, bio-retention basins, rain gardens, grassed swales, vegetated filter strips, etc.) to encourage groundwater recharge and to meet recharge targets.
- Infiltration devices are acceptable in soils with percolation rates of at least 15 mm/hr for the drainage of grassed and roofed areas. For less permeable soils, an overflow and/or under-drain connection to the storm conveyance system must be provided.
- Infiltration devices must be designed to fully infiltrate within a 24-48 hour period.
- Municipal SWM Ponds are designed to provide an enhanced level of water quality treatment.
- Infiltration systems should be located at a minimum of 4.0 metres from any building foundation and 2.0 metres away from any property line.

4.2.8.5 Hanlon Industrial Business Park SWM Criteria Conditions:

- SWM requirements for the Hanlon Industrial Business Park are governed by a specific set of guidelines developed by Knox, Martin, Kretch Limited in 1979 (based upon the 100yr Hanlon Design Storm 1 m3/min/ha). A copy of these guidelines is available upon request.

4.3 On-Site and Excess Soils Management

The Ontario Ministry of the Environment, Conservation and Parks on December 4, 2019, adopted Ontario Regulation 406/19: On-Site and Excess Soil Management under the Environmental Protection Act to better manage and reuse excess soil generated from projects throughout Ontario. The Regulation lays out handling and storage requirements for soil on-site, as well as transportation and reuse requirements for excess soil. The Regulation also establishes clear generic quality standards for the reuse of excess soil, as well as site specific risk-based standards. This regulation shall be followed by the proponent.

Note: This Regulation is based on environmental soil quality, and it does not consider the hydrogeological and geotechnical requirements or planting suitability of the soil for reuse. This Regulation applies to all construction projects that generate excess soil (as defined under O.Reg.406/19), and will affect municipalities, developers, contractors, property owners and engineering consulting firms, among others.

For more information on City and Ministry's requirements on excess soils, please refer to O.Reg 406/19., LIS SP-25.

5.0 Plan of Subdivision Engineering Design Criteria and Standards

5.1 Plan of Subdivision Design Requirements

This subsection sets out the requirements for the engineering design submission for a Plan of Subdivision application. Each submission with a design component must be stamped and endorsed by a Professional Engineer licensed to work in Ontario (P. Eng).

This subsection is organized with the requirements for the following:

- Drawings and Plans
- Grading and Drainage (including Sediment and Erosion Control)
- Storm Sewer Design Criteria
- Sewers and Maintenance holes
- Sanitary Servicing
- Sanitary Sewer Design Criteria
- Stormwater Management
- Watermains and Fire Hydrants
- Road Geometrics
- Transportation Engineering

The detailed engineering design submissions shall be submitted on a USB drive and shall include digital (PDF) copies of all documents including design sheets (in PDF and Excel format). In addition, hard copy submittals shall consist of:

- six (6) sets of detailed engineering drawings
- two (2) sets of sanitary sewer and storm sewer calculation sheets
- two (2) copies of the final survey plan
- two (2) copies of stormwater management report and a digital copy of the model (if applicable)
- two (2) copies of Traffic Impact Study
- two (2) copies of Environmental Implementation Report
- two (2) copies of any other applicable engineering report (as determined with engineering staff)

5.2 Drawing and Plan Requirements

For detailed design drawings and plans submitted to the City as part of an application, the City requires the applicant to use the City's Drafting and Design

Standards (available under separate cover via the engineer assigned to the file), which provide specifications for symbols, line types, title blocks, etc. Additional drawing requirements for subdivision engineering submissions are provided below.

5.2.1 Drawing Requirements

1. All drawings shall be signed, sealed, and dated by an engineer registered by Professional Engineers of Ontario.
2. Indicate the north arrow.
3. Show the standard City title block, including a table for a list of revisions above the title block.
4. Show a key plan on the standard City title block.
5. Show legend.
6. Refer all data (Geodetic) to a standard City benchmark.
7. Show all existing property lines, curb lines, right-of-way, easements, street lines, and intersection improvements and road widenings as required by the City's Official Plan.
8. Show the direction of flow, diameter of pipe, maintenance holes, culverts, road catchbasins and rear yard catchbasins (if applicable) for all existing and proposed sewers.
9. Show all existing and proposed watermain sizes, along with valves and hydrants.
10. Show all existing and proposed sewer sizes and maintenance holes.
11. Show all existing and proposed catch basins and indicate as such.
12. Show all existing services, utilities and abutting property limits.
13. Show all existing and proposed lot numbers and blocks.
14. All storm drainage areas and run-off coefficients to be indicated on a print of the storm drainage area plan. Areas to be indicated in hectares.
15. All sanitary drainage areas and sanitary coefficients to be indicated on a print of the sanitary drainage area plan. Areas to be indicated in hectares.
16. Storm and sanitary services must be provided for all lands which are to be registered.
17. All sewers to be terminated at the subdivision limits where outside drainage areas are to be considered in the design of same.

5.2.2 General Plan of Services

All general plans must be drawn at a scale 1:1,000 or 1:750 Metric and include:

1. Clear identification of property lines and ROW limits including any proposed road widenings, sight triangles (see Section 6.2.4.1) and 0.3 metre reserves adjacent to or on the site property line radii at intersections.
2. Abutting roads including the location of all existing surface features (i.e. edges of pavement and shoulders, curbs, traffic islands, utility poles, hydrants, bus shelters, mail boxes, sidewalks, ditches, culverts, catch basins).
3. All existing access/driveway entrances to the site and the adjacent properties, including those of properties on the opposite side of the road.
4. Existing and proposed buildings, structures, and retaining walls.
5. Existing and proposed above ground servicing features, including but not limited to the following: maintenance holes, catchbasins, ditches, embankments, hydrants, valve boxes and chambers, curbs, sidewalks and walkways, and fences.
6. Existing and proposed above ground features, including but not limited to light poles, hydro/Bell/cable poles, pedestals and transformers, fire hydrants.
7. Existing and proposed underground services including, but not limited to sanitary sewers, storm sewers, foundation drains, watermain, all service lateral including identification of length of pipe segment, diameter, slopes and direction of flow.
8. Design engineers shall locate driveways away from proposed services (sanitary, storm and water) for all new single detached, semi-detached and on-street townhouses.
9. Proposed curb and sidewalk depression locations.
10. Noise mitigation (barriers, berms, etc.)

5.2.3 Plans and Profiles

Where an engineer is preparing a Plan and Profile drawing for a subdivision application, include the following:

1. All plans and profiles must be drawn at scales of 1:500 horizontally, and 1:50 vertically.
2. Show all relevant horizontal and vertical curve information on the drawings, such as proposed centerline road grade, chainage, intersection and vertical curve data (for layout purposes).

3. Show all existing sewers, watermains, curbs, sidewalks, etc. and labeled as "existing" or "Ex".
4. Show existing ground over centerline of road.
5. Show storm sewers, sanitary sewers, watermains.
6. All sewers 750 mm in diameter or larger shall be shown with two lines in the plan view.
7. Show servicing connections and driveways in the plan.
8. Show maintenance holes, road catchbasins and connections including rear yard catchbasins and connections.
9. Show hydrants, valves and other appurtenances on the watermain .
10. All maintenance holes shall be numbered. Sanitary maintenance hole numbers shall be distinguished from storm maintenance holes by the suffix "A", (e.g. MH 1A).
11. Maintenance holes details such as diameter of base, top of grate elevation, drop structure, benching requirements, and safety gratings shall be shown.
12. Show 100 Year Hydraulic Grade Line (HGL), if foundation drains are connected to the storm sewers or foundation drain collection system.
13. Show sewer inverts at maintenance holes.
14. Show seasonal high groundwater elevation in the profile
15. Show basement floor elevations in the profile.
16. The profile portion of the drawing shall be a vertical projection of the plan portion, wherever possible.
17. Show typical road cross-sections with pavement design.
18. All existing and proposed basement elevations must be shown in the profile.
19. If the plans are amended or altered after the City has approved them, the date of same shall be prominently noted in the table for the list of revisions in the title block, and resubmitted for approval.
20. Show a standard note warning Contractors to satisfy themselves on the whereabouts of existing underground services and utilities.
21. Design engineer shall locate driveways away from proposed services (sanitary, storm and water).
22. Standard maintenance hole safety platforms shall be used in any maintenance hole greater than 5 m in depth.

5.2.4 Composite Utility Plan

5.2.4.1 Introduction

In order to ensure that conflicts are avoided among utilities, street trees, municipal services and driveways, the Consulting Engineer shall be responsible for preparing the Composite Utility Plans (CUP). The CUP shall indicate the location of all underground and aboveground services, utilities, regulatory signs and street trees.

This section provides guidelines for the preparation of CUP as well as the submission and acceptance requirements.

5.2.4.2 Information to be included on the CUP

1. The CUP shall be prepared at a scale of 1:250 or 1:500
2. The following utilities, services and appurtenances shall be shown on the CUP:
    a) Storm and sanitary sewers, catchbasins including rear yard CB and maintenance holes in the road ROW
    b) Watermains, watermain valves, valve chambers, hydrants and water service curb stops
    c) Underground boulevard services, such as:
        i) service connections
        ii) rear yard catchbasin leads
        iii) all utility route locations (such as utility service connections, traffic signal cables, etc.)
    d) Aboveground services, structures and utilities such as:
        i) bridges, culverts, sewers and outfalls
        ii) curb and gutter
        iii) trees
        iv) driveway locations
        v) hydro poles, light standards (poles) and guy wires
        vi) traffic signals
        vii) transformers
        viii) pedestals, junction boxes, major utility hubs/vaults, street light disconnection boxes, flush to grade handwells and handholds
        ix) all easements

x) walkways and sidewalks

xi) all fences and retaining walls

xii) Canada Post community mailboxes

xiii) regulatory signs

xiv) Noise mitigation (barriers, berms, etc.)

3. Other drawing requirements include:

   a) CUP to be prepared in accordance with DEM 5.2

   b) Typical street cross-sections including widths, depths and locations of offsets of utility/telecom trenches

   c) Utility structure details showing dimensions of underground and aboveground units (pedestals, flush to grade vaults and boxes, walk-in cabinets (WIC), outside plant interfaces (OPI) and maintenance holes)

   d) Clearly indicate the type of utility units and models

   e) Clearly indicate utility spacing

   f) Utility offsets to be included and clearly labelled

   g) Lot and/or house numbers as available

   h) Legend showing meaning of symbols

   i) Extended title block for approval by utilities

5.2.4.3 Submission and Acceptance

1. Initiation of CUP preparation shall be as soon as practicable in the detailed engineering design process. Coordination of preliminary hydro design during draft plan process may avoid conflicts during later stages of design.
2. Completed CUP shall be signed by each Utility before submission to the City. Alternatively, the consultant preparing the CUP shall submit a "Reliance Letter" to indicate that the City is authorized to rely on all information provided, and that the design is completed in consultation and accordance with the utility agencies represented on the plan.
3. Final submission CUP shall be submitted for review by the City no later than the submission of detailed engineering drawings for final acceptance.
4. The City must be made aware of all major utility hubs prior to acceptance of engineering drawings.
5. The Owners and their Developers/Builders/Agents shall display copies of the accepted CUPs in their sales offices for viewing by potential homebuyers.

5.3 Grading and Drainage

Following is a list of grading and drainage standards for subdivision detailed design. In addition, lot grading details are provided in the following figures:

- Figure 1 Front Lot Drainage details
- Figure 2 Rear Lot Drainage details
- Figure 3 Rear Lot Drainage Walkout details

1. All back yard catchbasins to be installed with frame and grate as per the Linear Infrastructure Standards standard drawing 2-15.
2. A flat area having a width of 0.6 m shall be provided at the boundary limits of adjacent developed properties so that the existing boundary elevations shall be maintained.
3. Show a standard note warning Contractors to satisfy themselves on the whereabouts of existing underground services and utilities on all Plan and Profile drawings.
4. Subdivision plot plans should closely match the approved grading and drainage plan for the subdivision. Subdivision plot plans must be certified by a Professional Engineer or OLS, containing the following elevations:
   a) Lot corner grades
   b) High point grades
   c) Swale grades, slopes, location, width or approximate width
   d) Top of Foundation, Underside of footing and Basement floor elevation.
5. On all lots where the maximum depth of the house exceeds 9.0 m, the specified house grade shall be increased by 0.02 m for each metre of house depth over 9.0 m.
6. Existing trees shall be preserved, where identified, as per the Tree Preservation Plan.
7. Show existing contours at 0.5 m intervals over the entire subdivision and sufficient area of adjacent lands to establish the overall drainage pattern.
8. Show proposed elevations at lot corners and high/low points. Existing ground elevations can be shown by contours.
9. Show specified house grade (i.e., highest ground elevation at outside wall).
10. Show proposed road grades, lengths and elevations on all streets with symbols at grade changes indicating direction of slope.
11. Indicated all semi-detached lots with "S" on the plan.

12. Show proposed elevations along the boundary of all blocks abutting single detached and semi-detached lots in the subdivision.
13. Show location of any proposed rear yard catchbasins and the top of grate elevations.
14. Show location of any proposed retaining walls with proposed top of wall elevation and ground elevation at bottom of wall at appropriate intervals with sections.
15. Show the location of all existing and proposed electrical transformers, telephone and cable boxes, streetlights, road catchbasins, rear yard catchbasins and hydrants.
16. Show all existing and proposed easements, including ownership, with the subdivision.
17. All elevations shall be referred to a City Benchmark and shall be in geodetic metric datum.
18. The proposed elevation of the property line abutting the street line shall be 2% higher than the curb.
19. The desirable grade of ditches and swales is 2.0%.
20. The desirable surface grade is 2.0%; the maximum grade is 5%.
21. The grading design park blocks on the subdivision Grading Plans shall be as follows:
    a) Minimum slope = 2%
    b) Maximum slope = 5%
    c) Park Block drainage shall be self-contained, with overland flow directed to adjacent roads or another outlet as accepted by the City Engineer. A minimum depth of 300 mm of topsoil shall be provided in a park block. Park grading and grading of lots adjacent to parks shall be reviewed by Parks Planning department.
22. The maximum grade of a landscaped slope is 3:1 (H:V). The slope shall commence at least 5.0m from the rear wall of any dwelling unit.
23. Driveways shall have a minimum slope of 2% and a target maximum slope of 5%; however, the City can consider accepting up to 8% on a case-by-case basis. Show the location and slope of driveways on the Grading Plan.
24. Rear yards which drain through abutting lower back-to-front type lots are permitted where:
    a) A maximum of five rear yards or 0.1 ha may drain to a single swale;

b) sufficient fall shall be available between the adjacent streets to achieve desired grades for swales and yards;

c) cut-off swales along the rear lot lines shall direct runoff from the upper lots into the lower lot side yard swales.

25. Grading onto adjacent lands will require written consent from the property owner. A copy of this letter shall be submitted with the engineering submission.

26. Grading and drainage certification, in the form of a lot-specific grading certificate, shall be provided by the builder to the City upon completion of construction.

27. Yard surfaces shall have a minimum slope of 2%.

28. Drainage flows must be directed away from houses/buildings.

29. Drainage must be contained within the site boundaries and directed to an accepted outlet.

30. Swales to be designed to safely convey overland flows to an accepted outlet system.

31. Major flow route must be designed to safely convey flows on Road's ROW above minor storm to an accepted outlet.

32. Drainage flows that are carried around houses should be confined in swales located as far from the house as possible.

33. Driveways are not permitted as outlets for drainage swales.

34. A desirable swale depth in 230 mm. Swale depths should be a minimum of 150 mm. The actual swale depth depends on location and safety consideration, but should not exceed 1 m.

35. Swale Grades:

a) Minor swales (providing drainage for up to 5 lots) should have a minimum grade of 2%.

b) Major swales (providing drainage for more than 5 lots) should have a minimum grade of 2% for the first 5 lots (from the high end of the swale furthest from the catch basin) and 1% thereafter.

36. The maximum allowable flow in a side yard swale should be that from three back yards.

37. The maximum flow in rear yard swales should be that from 10 to 20 backyards, depending on lot size and grade. The maximum length of a rear yard swale without outlet should be 150 m. The maximum area contributing to the rear

yard swale should be 1 hectare. The maximum flow in rear yard swales (that discharge to the road allowance) is that from three back yards.

38. The maximum depth of ponding at a catchbasin until it overflows to another outlet is 0.3 m.

39. No front yard catchbasins should be used.

40. The maximum side slope on swales should be 3 horizontal to 1 vertical (3H:1V). The maximum slope of embankments between properties should also be 3H:1V. Failing this, a retaining wall should be designed.

41. Indicate with "Ex" when the final lot elevations are the same as existing lot elevations.

42. All catchbasin leads should be located to a minimum of 0.6 m from the lot line with catchbasin leads constructed on one lot.

43. Front Lot Drainage – specified house grades should be a minimum of 0.6 m higher than the low lot corner or a minimum of 0.45 m higher than the high lot corner, both at the street line, whichever gives the highest specified house grade. These dimensions are to be increased by 0.02 m for each metre of frontage over 16.5 m.

44. Back Lot Drainage – specified house grades should be a minimum of 0.45 m higher than the high lot corner at the street line.

45. Split Lot Drainage – specified house grades should be a minimum of 0.15 m above the high lot line elevation.

46. Show all required noise mitigation (barriers, berms, etc.), including top and bottom of barrier elevations.

5.3.1 Retaining Wall Criteria

The use of retaining walls shall be avoided, wherever possible. Where required, retaining walls shall conform to the following requirements:

1. Retaining walls are generally required where 3:1 slope cannot be achieved.
2. All retaining walls over 1.0 m in height must be designed by a Professional Engineer and may require a building permit.
3. Retaining walls shall be located on private property with a minimum setback of 150 mm from the property line.
4. A minimum setback of 1.0 m shall be maintained from the tiebacks (if required) to the foundation of any structure and underground services.
5. Drainage swale may be required along top and bottom of retaining wall to divert flows to an acceptable outlet.

6. All structural drawings shall be signed and stamped by a Professional Structural Engineer (P.Eng.) for the design and structural stability of the retaining walls.
7. Proposed retaining walls adjacent to existing residential properties shall not exceed 1.0 m in exposed height.

5.3.2 Erosion and Sediment Control Requirements

1. All sediment and erosion control devices must be designed in accordance with the current "Greater Golden Horseshoe Area Conservation Authorities" Erosion and Sediment Control Guideline for Urban Construction.
2. Additional sediment and erosion control information is provided in the Linear Infrastructure Standards (General Conditions and Standard Drawings).
3. Mud Mats shall be constructed as per City standards provided in the Linear Infrastructure Standards.
4. Construction access roads must have appropriate signage signifying trucks to use the route. The route must also have erosion and sediment control, including silt sacks in catch basins.
5. All erosion and sediment control plans must specify how ground is to be stabilized in order to keep dust to a minimum.
6. A haulage route must be provided on the plans to designate truck traffic to drop off zones and material stockpiles.

5.4 Sewers and Maintenance Holes

The design of sewers and maintenance holes shall meet the requirements of all provincial and municipal guidelines or standards. Additionally, refer to DGSSMS and the City's Linear Infrastructure Standards.

5.4.1 Sewers

Following is a list of general requirements for sewers that are applicable to both storm and sanitary sewers in the City (unless otherwise specified).

1. Project the maintenance hole location perpendicular to the centreline chainage and indicate the maintenance holes at this particular chainage in the profile view.
2. All maintenance hole details are to be shown on the plan view and must be drawn at a scale of 1:50 in relationship to the north arrow, and be referred to a City Standard.

3. Show all existing and proposed sewer lengths, sizes, types, grades and maintenance holes in metric units. The elevations are to be shown to the nearest millimeter (mm).
4. All sewers to be terminated at the subdivision limits where outside drainage areas are to be considered in the design of same. All sewers to be designed so that they extend at least half-way across the frontage and/or flankage of any block in the subdivision.
5. Show the direction of flow for all existing and proposed sewers.
6. Show all existing and proposed catchbasins and double catchbasins, and indicate them as such, including the top of grate elevation at proposed catchbasins (i.e. T/g=_____).
7. Single catch basins shall have a lead of 250mm in diameter with a minimum slope of 1.0%.
8. Double catch basins shall have a lead of 300mm in diameter with a minimum slope of 1.0%.
9. Show all house connections, indicating them as single or double, as the case may be, by using the symbol "S" or "D" (per the Linear Infrastructure Standards).
10. All maintenance holes must be indicated by proper symbols and labels (see Section 5.2). Valve chambers shall be designated V.C._____ using numbers. Valves shall be designated with the letter "V". Catchbasins shall be numbered consecutively designated as CB_____.
11. In all plans and profiles, the type of bedding for the sewers must be shown, along the bottom of the profile.
12. Sewer connection angles:
    a) No sewer pipes greater than 375 mm diameter may be turned at 90 degrees.
    b) No acute interior angles will be allowed in any case.
13. The following minimum allowances should be made for hydraulic losses incurred at maintenance holes: 40-degree turn – 0.03 m loss, 90 degree turn – 0.06 m loss.
14. Hydraulic calculations will be required for all Junction and Transition Storm Maintenance holes and should be submitted to the City, when required.
15. All maintenance holes shown in the profile must indicate all existing and proposed inverts with each having reference to the north arrow.

16. All storm outfalls which empty into a ditch or watercourse must blend with the flow of same.

17. A detail must be shown for all maintenance holes when:

    a) Benching differs from that shown on the Standard Drawing in the Linear Infrastructure Standards.

    b) Structural design details shall be submitted for all cast-in-place maintenance holes.

18. Sanitary sewer maintenance holes must be located at least 1.5 meters from the curb.

19. Infrastructure shall not be placed in easements; dedicated city-owned blocks may be considered. All servicing blocks must be a minimum of 8 m wide. Actual width will vary depending on the size and depth of the sewer(s).

20. Sanitary sewers are to be located on centerline of road to allow houses on both sides of the road to be serviced with approximately the same lengths of laterals.

21. Sanitary and storm services are to have a minimum slope of 2.0% and a maximum slope of 8.0%. Sanitary service pipes are to be green in colour and 100mm in diameter, and storm service pipes are to have a 100mm wide red stripe painted along the entire length along the top of the pipe and be 150mm in diameter.

22. A minimum cover of 2.7 m (from future road grade) is required to the top outside edge of the pipe barrel for the storm and sanitary sewers. Piping must be insulated if minimum burying depth cannot be achieved.

23. The minimum storm sewer size shall be 300 mm in diameter and the minimum sanitary sewer size shall be 200 mm in diameter. The first leg of all subdivision sanitary sewers shall have a minimum grade of 1.00%. All storm and sanitary sewers, other than the first legs, shall have minimum grades as follows:

Sanitary:	Pipe Diameter	Minimum Slope
	200 mm and up	0.50%
Storm:	Pipe Diameter	Minimum Slope
	300 mm	0.50%
	375 mm	0.45%
	450 mm	0.40%
	525 – 900 mm	0.35%
	> 900 mm	minimum velocity = 1.2 m/second

24. The minimum acceptable velocity is 0.60 m/second (m/s) in any pipe (except for > 900 mm storm pipe as noted above). The maximum acceptable velocity in sanitary sewers is 3 m/s and the maximum acceptable velocity in storm sewers is 6 m/s.

25. No decrease in pipe size from a larger size upstream to a smaller size downstream will be allowed regardless of increase in grade.

26. Anchors/Restraints

    a) Sanitary and storm sewers on 20 percent slope or greater shall be anchored securely with concrete anchors or equal.

    b) Anchors and anchorage spacing shall be designed by a Licensed Engineering Practitioner based on sewer material, anchor type and site conditions. Recommended maximum anchorage spacing is 11 m on grades between 20 percent and up to 35 percent, 7.3 m on grades between 35 percent and up to 50 percent, and 4.9 m on grades that exceed 50 percent.

    c) Where velocity in sanitary and storm sewers approach or exceed 3 m/s due to steep grades and providing a drop maintenance hole is not possible, receiving sewers shall be designed for protection against maximum scouring velocity and erosion control measures, that are acceptable to the City shall be taken.

27. As per DGSSMS Section B.4.2.11, blind connections using factory made tees are permitted for:

    a) Services less than 200mm, or

    b) Services less than one third (33%) of the diameter of the main line sewer, or

    c) Catch basin leads within road allowances.

5.4.2 Maintenance Holes

Maintenance holes are an essential element of any sewer system and generally are used to serve the following purposes:

- Access for inspection and maintenance
- For most junctions with lateral sewers
- For grade or alignment changes
- For accommodating changes in pipe sizes

Following is a list of general requirements for maintenance holes that are applicable to both storm and sanitary sewers in the City (unless otherwise specified).

1. Sanitary sewer maintenance holes are to be designed as follows:

a) Maintenance holes should be used at all junctions, changes in horizontal alignment, changes in grade and changes in pipe size.

b) Desirable maintenance hole spacing is 90 m.

2. Storm sewer maintenance holes are to be designed as follows:

a) Maintenance holes should be used at all changes in horizontal alignment

b) Maintenance holes should be used at all changes in grade/slope except for special designs in large size pipes.

c) Maintenance holes should be used in all changes in pipe sizes except for special designs in large size pipes.

d) Maintenance hole lids are to be in accordance with OPSD 401.010 Type A.

e) Maintenance holes shall be spaced as follows:

Table 5-1 Maintenance Hole Spacing

Diameter	Desirable Spacing
300 mm to 750 mm	90 m
825 mm to 1200 mm	120 m
1350 mm to 1800 mm	215 m
2000 mm and up	305 m

3. Minimum Invert Drop

a) Where pipes enter and leave inline or at angles between 0° to 45°, the minimum drop from invert to invert across the maintenance hole shall be 0.030 m.

b) Where pipes enter and leave at angles between 45° to 90°, the minimum drop from invert to invert across the maintenance hole shall be 0.060 m.

4. Safety Grates (Refer to OPSD 404.020)

a) For maintenance hole depths between 5.0 and 10.0 m, a safety grate must be installed at the mid-point.

b) For maintenance hole depths between 10.0 and 15.0 m, a safety grate must be installed at the third points.

5. Drop Structures

a) A drop inlet structure shall be provided in accordance with MECP Design Guidelines and OPSD 1003.010 and OPSD 1003.020.

b) Drop structures are required for an invert difference of 0.61 m or greater.

6. Services are to connect directly to the main sewer.

5.4.3 Head Walls

As per DGSSMS, Section B.4.2.13, head walls shall be used for 525 mm diameter and larger sewers, permanent pool or submerged conditions.

- For outlets 450 mm diameter and smaller or driveway culverts, use OPSD 801.020.
- Four outlets 525 mm diameter to 900 mm diameter, use OPSD 804.03 or OPSD804.04.
- For outlets greater than 900 mm in diameter, use OPSD 804.04.
- A handrail as per OPSD 980.101 shall be installed around headwalls 0.6 m or larger in height.

5.5 Storm Sewer Design Criteria

Storm sewers shall be designed to service all the lands within a proposed development as well as any external drainage areas that drain to the development lands.

Storm sewers shall be designed based on the Rational Method and the storm sewer design sheets shall be completed and submitted in accordance with the sample design sheet attached as Appendix A. An electronic copy of the spread sheet in Excel format shall be submitted to the City for approval of the design.

All storm sewers are to be designed using the 5-year design storm outlined on the City of Guelph Intensity-Duration Frequency Curves and shall operate without surcharge. Parks and single detached residential shall use a 10-minute time of concentration. All other land uses shall use a 5-minute time of concentration.

A 100-year Hydraulic Grade Line (HGL) analysis shall be performed when foundation drains are connected to the storm sewer. The basement slab elevations shall be set minimum 0.5 m above the 100 Year HGL and shall be indicated on the plan and profile drawings. The minimum basement slab elevations shall be shown on all lots where HGL is above obvert of the pipe. A spreadsheet or equivalent method using computer modelling (PCSWMM or MIDUSS) shall be used that includes design information including storm sewer sizes, lengths and inverts, tailwater elevations, flow, and velocities to calculate the losses that will occur through the storm sewer system. The use of modelling software requires prior consultation and approval by the City.

Inlet control devices (ICDs) shall not be allowed to control flow into the sewer.

5.5.1 Storm Sewer Flows

The designed flow shall be computed on the standard City of Guelph design sheet according to the Rational Method equation as follows:

$Q = KCIA$

Where:

Q = Design flow (m3/sec)

K = Conversion factor (0.00278)

C = Runoff Coefficient

I = Rainfall intensity (mm/hour)

A = Contributing drainage area (ha)

Storm sewers shall be designed to flow at a maximum of 95% full flow design capacity of the pipe size, while trunk sewers (1200mm diameter and larger) are to be designed to 85% of full flow design capacity.

Note: when calculating capacity, a roughness coefficient of 0.013 is to be used for all smooth-walled pipes, and roughness coefficient of 0.024 is to be used for all corrugated pipe.

5.5.1.1 Rainfall Intensity

The intensity of rainfall shall be determined based on City of Guelph IDF data has been updated in accordance with the City's Stormwater Management Master Plan using the following rainfall intensity equation and parameters:

$I = A(tc)^B$

Where:

I = Rainfall Intensity (mm/hr)

A & B = Parameters as per Table 1

tc = Initial time of concentration (min)

Table 5-2 Rainfall Intensity Parameters

Return Period	A	B
2-year	475.61	-0.738
5-year	632.75	-0.741
10-year	721.92	-0.736
25-year	822.74	-0.725
50-year	893.80	-0.719
100-year	953.29	-0.711

Table 5-3 Rainfall Distribution for Regional Storm (Hurricane Hazel 1954)

Regional Storm Rainfall Distribution

DT (min)	60	120	180	240	300	360	420	480	540	600
600	2.028	2.028	2.028	2.028	2.028	2.028	2.028	2.028	2.028	2.028
1200	2.028	2.028	2.028	2.028	2.028	2.028	2.028	2.028	2.028	2.028
1800	2.028	2.028	2.028	2.028	2.028	2.028	2.028	2.028	2.028	2.028
2400	2.028	2.026	2.026	2.026	2.028	2.026	6.000	4.000	6.000	13.000
	17.000	13.000	23.000	13.000	13.000	53.000	38.000	13.000	Depth = 285.0mm	

5.5.1.2 Runoff Coefficients

Runoff Coefficients shall be determined from the following types of land uses within the drainage area:

Table 5-4 Runoff Coefficients

Land Use		Runoff Coefficient	Percentage Impervious
- Minimum storm drainage runoff coefficients with 10 minute entry times:			
Parks	> 4 hectares	0.2	0%
	< 4 hectares	0.25	7%
Single Family residential	> 18m frontage	0.55	50%
	12 to 18m frontage	0.60	60%
	< 12m frontage	0.65	65%
- Minimum storm drainage runoff coefficients with 5 minute entry times:			
Semi-detached		0.70	70%
Maisonettes, townhouses etc.		0.75	80%
Apartments		0.75	80%
Schools		0.75	80%
Churches		0.75	80%
Industrial		0.9	100%
Commercial, Highway Commercial		0.9	100%
Heavily developed areas		0.9	100%

Runoff coefficients shall be verified based on regulations in the Zoning Bylaw. The percentage impervious shall be calculated based on corresponding runoff coefficient using following relationship:

$$C = 0.2(1 - I) + 0.9I$$

Therefore,

$$I = \frac{C - 0.2}{0.7}$$

Where,

C = Runoff Coefficient

I = Impervious ratio

5.5.2 Foundation Drains

Foundation drains shall be connected by gravity to the storm sewer system. Where a gravity connection to the storm sewer is not available or HGL criteria cannot be achieved to protect basements flooding, the following alternatives are acceptable to the City:

1. The drain shall discharge to a watertight sump. Flow collecting in the sump shall be pumped to the surface rear yard;
2. The drain shall discharge to a foundation drain collector (third pipe) by gravity.

Foundation drain collector systems shall be designed on the basis of a continuous flow rate of 0.075 litres per second per residential lot plus infiltration. The minimum foundation drain collector diameter shall be 200 mm. Material and bedding standards applicable to foundation drain collectors shall be in accordance with City of Guelph Standard Drawings.

5.5.3 Roof Leaders

All roof leaders that discharge to the ground via splash pads shall have flows directed away from the building onto grass filter strips or infiltration galleries.

All roof leaders shall discharge to the elevation of the splash pad, not exceeding 100mm above grade.

5.6 Sanitary Sewer Design Criteria

Sanitary sewer capacity will be calculated by using the Manning's formula. Sanitary sewers in new development (greenfield) greater than 450mm diameter shall be designed no more than 70% full (design flow/full flow, Q/Qf); sewers in new development (greenfield) equal to or less than 450mm diameter shall be designed no more than 60% full. Infill development or existing infrastructure sewer sizing is to be designed to eliminate full pipe conditions (i.e. no surcharging). Deviations from this approach may be considered but will require consultation with the City for operational considerations. Sanitary sewers shall be designed with a full flow velocity of not less than 0.6 m/s and a maximum velocity of 3 m/s. In all cases the actual flow velocity is to be calculated and the slope increased to achieve adequate flushing velocity for subcritical flows with no surcharge conditions.

1. Residential sanitary design flow shall be calculated based on population using the below parameters.
    a) Average daily sewage flow of 300 L/person/day

b) Peaking Factor (PF) calculated according to the Harmon Formula with a minimum PF of 2 and a maximum PF of 4

c) Residential unit densities shall be: 3.4 people per unit (ppu) for all single detached and semi-detached units, 2.45 ppu for all townhouse and similar units, and 1.86 ppu for all apartment units including all accessory residential dwelling units

d) Inflow and infiltration assumption of 0.25 L/s/ha is to be added

e) Some site specific factors may require additional calculations as directed by City staff

2. Sanitary design flows from non-residential land uses shall be determined using recommended parameters as listed in the MECP "Design Criteria for Sanitary Sewers, Storm Sewers and Forcemains for Alterations Authorized under an Environmental Compliance Approval", (May 31, 2023 or current). As appropriate for the proposed development, additional parameters from the Region of Waterloo and Area Municipalities "Design Guidelines and Supplemental Specifications for Municipal Services (DGSSMS, January 2021, or current), or calculated actual flows, may be applied with justification, where design flow higher than the MECP Design Criteria are warranted.

   a) Peaking Factor (PF) calculated as per MECP Design Criteria

   b) Inflow and infiltration assumption of 0.25 L/s/ha is to be added

   c) Some site specific factors may require additional calculations as directed by City staff

3. Minimum sanitary sewer diameter is 200 mm.
4. A roughness coefficient of 0.013 to be used for all pipe sizes and types.
5. Unless otherwise specified in the Official Plan, all development applications must receive sanitary services via City infrastructure (i.e., no private services such as septic are allowed).
6. Designs must be completed in a manner that eliminates any potential surcharging in the sanitary system.
7. Sanitary and Storm calculations to be made on City Design Sheets and submitted so that each sheet may be filed separately, in both PDF and Microsoft Excel formats.
8. All developments shall be designed such that any new building is constructed at such an elevation that the lowest level of the new building can be serviced with a gravity connection to the sanitary sewer.

5.7 Stormwater Management

Stormwater management is generally comprised of lot level source control, conveyance control and end-of-pipe control. The City encourages at-source lot level control using low impact development (LID) best management practices, where appropriate.

The minor flow (i.e. 5-year return period) stormwater management system comprising street gutters, catchbasins and storm sewers is discussed in Section 5.5.

The major flow is overland flow in excess of the minor system capacity during periods of surcharging or higher intensity events. The major system overland flow route to the stormwater management (SWM) facilities shall be designed to safely convey the 100-year storm and Regional Storm (Hurricane Hazel) overland flow. The major system inherently comprises the minor system, as well as the overland route followed by runoff not captured by the minor system.

In practice, streets act as components of the major system during severe floods since they transport the runoff in excess of the storm sewer capacity.

5.7.1 Water Quantity Control Criteria

Water quantity control shall be designed as per the Stormwater Management Criteria listed in Section 4.2.8.

5.7.2 Water Quality Control Criteria

All developments shall provide as a minimum the Enhanced level of protection (i.e. 80% TSS removal). Water quality control shall be designed as per the Stormwater Management Criteria listed in Section 4.2.8.

5.7.3 Oil and Grit Separators

All Oil and Grit Separators (OGS) shall be verified by the Canadian Environmental Technology Verification (ETV) program.

All stormwater management facilities (i.e. dry pond, wet pond, and wetland) require a forebay for quality control, OGS products are only permitted as a pre-treatment device. For small development sites ≤ 2ha where a water quality control pond/wetland is not feasible OGS units are permitted as part of a treatment train approach, OGS units operating alone will be considered as capable of achieving a TSS removal efficiency of 50%.

5.7.4 Erosion Control Criteria

For all development sites the minimum erosion control requirement is extended detention of the 4 hour, 25mm Chicago distribution rainfall event for 24 hours.

5.7.5 Thermal Impacts

Assessing, preventing and mitigating thermal impacts on the receiving Stormwater system shall be considered as an integral part of stormwater management. The Hanlon Creek Subwatershed and the Clythe Creek Subwatershed support cold water fish habitat therefore developments in these subwatersheds are required to assess the thermal impact and implement thermal preventive and mitigation measures.

Preventive measures include reduction of runoff and increase infiltration at lot level, use of thermal conductive pipe material (i.e. concrete pipes) for better heat exchange between subsoil and storm runoff, and minimize direct sun exposure to the stormwater management pond, with pond orientation, pond shape, planting, shading trees etc.

Mitigation measures should be implemented in conjunction with the preventive measures. Examples of mitigation include mid draw outlets and cooling trenches. A mid draw outlet can be effective for deeper stormwater management ponds (i.e. greater than 3m deep). A mid draw outlet could help by releasing cooler water and avoid releasing potential high concentrations of chlorides at the bottom of the pond.

Cooling trench:

- Buried in the ground with deep cover (approximately 2m) to provide cooling during and between events by allowing the flow to mix with cooler groundwater.
- Large surface areas of solid media and/or long contact times are required as transfer of heat to ground and groundwater is slow.
- Trench should be installed perpendicular to the groundwater flow.
- Outlet invert must be designed above the seasonal high groundwater to continue natural flow path of groundwater towards the receiving water bodies.
- Trench sizing should provide approximately the same volume as the runoff being treated to capture the heat in the 25mm runoff event.

5.7.6 Water Balance Criteria

Water balance analysis is required for all developments to maintain predevelopment recharge rate, volume and hydroperiods at post development conditions.

A site-specific monthly water balance analysis shall be conducted based on available local meteorological data such as, precipitation, temperature and sunshine

hours, etc., to estimate changes in evapotranspiration, recharge and runoff volume caused by the alteration made in canopy cover, percent impervious, depression storage, and rate of runoff at post-development conditions.

Site-specific monthly water balance calculations shall be completed using the water balance method developed by Thornthwaite and Mather (1956) as documented in the MECP Stormwater Management Planning and Design Manual (2003), as updated from time to time.

Low Impact Development (LID) best management practices (BMP) shall be used to mitigate the development's impact on the water balance and mimic pre-development recharge.

5.7.7 Infiltration Policy

The use of infiltration practices to reduce runoff and restore natural hydrologic processes is crucial to improving the City of Guelph's Natural Heritage System and Water Resource System, maintaining the viability of local stormwater infrastructure, and contributing to climate change adaptation and mitigation strategies. Determining the appropriate application of infiltration is imperative to ensuring the long-term health of the groundwater.

Infiltration within development applications shall be determined in consultation with the Stormwater Management Master Plan, March 2023, Appendix E – Infiltration Policy Recommendations (November 2022).

5.7.8 Infiltration Testing

Infiltration tests are to be conducted in the field (in-situ). Laboratory tests or grain size analysis are not an acceptable alternative to infiltration field testing

It is recommended that soil evaluation and investigation be conducted following development of a concept plan or early in the development of a preliminary plan to identify suitable areas for infiltration. The approximate location of the BMPs should be shown on the proposed development plan and serve as the basis for the location and number of tests to be performed onsite. If a later proposed site layout plan causes potential BMP locations to be eliminated or relocated, the designer must revisit the proposed layout and grading plan and adjust the development plan as necessary.

The use of soil borings as a substitute for test pits is strongly discouraged, as visual observation is narrowly limited in a soil boring and the soil horizons cannot be observed in-situ, but must be observed from the excavated borings. Test pits should provide information related to conditions at least 1.5m below proposed bottom elevation of the infiltration BMP.

A minimum of one on-site infiltration test shall be conducted at the proposed bottom elevation of each infiltration BMP. In addition, one on-site infiltration test shall be conducted at every other soil horizon encountered within 1.5 meters below the proposed bottom elevation.

One of the following methods are to be used to determine the field saturated hydraulic conductivity (Ks):

- Guelph Permeameter method (Constant head well permeameter method)
- Constant head double-ring infiltrometer method

For further details please see the multi-step infiltration testing protocol as documented in the Credit Valley Conservation (CVC) Authority Low Impact Development Stormwater Management Planning and Design Guide, "APPENDIX C-SITE EVALUATION AND SOIL TESTING PROTOCOL FOR STORMWATER INFILTRATION CREDIT VALLEY CONSERVATION (CVC) AUTHORITY STORMWATER MANAGEMENT CRITERIA".

5.7.9 Low Impact Development Implementation

Low impact development (LID) and Green Infrastructure (GI) are acceptable ways of meeting water balance and stormwater management infiltration targets. There are multiple external design guides that provide detailed guidance for the pre-design, design, construction, inspection, operations, and maintenance of LID and GI features. When proposing these within development applications, the following documents should be referenced:

1. Sustainable Technologies Evaluation Program (TRCA/CVC/LSRCA) https://wiki.sustainabletechnologies.ca
    a) LID Stormwater Management Planning and Design Guide (2010)
    b) Low Impact Development Stormwater Management Practice Inspection and Maintenance Guide (2016)
    c) Low Impact Development Construction Guide (2012)
2. ASCE/ T&DI/ ICPS 68-18 Permeable Interlocking Concrete Pavement (North American Standard) (2018)
3. NSC/CSA W200 Design of Bioretention Systems – Canadian Standards Association (2018)
4. NSC/CSA W201 Construction of Bioretention Systems - Canadian Standards Association (CSA)

Where variations are identified between cited reference documents, site-specific justification shall be provided within the design.

Details of the approvals, assumption, operations and maintenance, and implementation of LID and GI features can be found in the Stormwater Management Master Plan, March 2023, Appendix G – LID Implementation Strategy.

Types and locations of LID and GI permitted within the City of Guelph are outlined in the Stormwater Management Master Plan, March 2023, Appendix G – LID Implementation Strategy in Table 2.1 and Table 2.2.

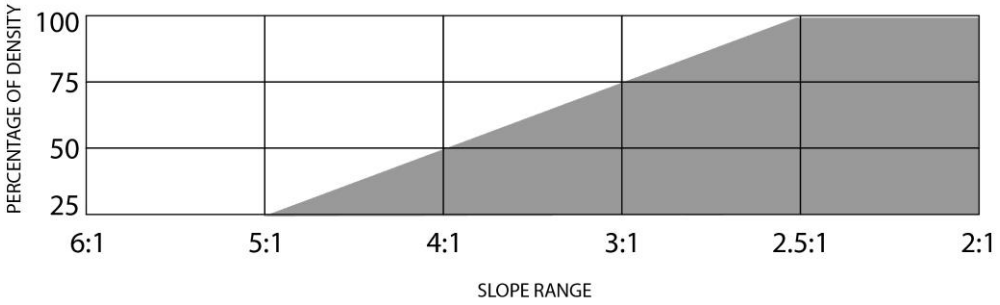
The following design parameters are to be considered for LID/GI design:

1. LID and GI features should be located at lot level and distributed to maintain natural hydrological cycle.
2. LID and GI features should be maintained for small areas (<2 ha).
3. LID and GI footprints shall not cross property boundaries.
4. Maintain a minimum 1.0m separation from the seasonal high groundwater level.
5. An overflow bypass or flow splitter should be incorporated in the design.
6. Maintain a minimum 5.0m setback distance from building foundations; mounding calculations may also be required to set larger setbacks as appropriate.
7. Maintain a minimum 1.2m depth of cover to protect from frost action.
8. Surface-based infiltration basins should not exceed maximum 0.6m in storage depth to avoid compaction of the surrounding soil due to the weight of water in the feature. All infiltration-based features should be designed to mitigate soil compaction to ensure long-term viability of design infiltration rates.

5.7.10 Stormwater Management Pond Design Requirements:

1. Stormwater management for subdivisions should be designed consistent with the MECP Stormwater Management Planning and Design Manual, March 2003 (or updated versions), and the City's Stormwater Management Master plan
2. Where trees are to be planted, they must be planted at a minimum rate of 1 tree (40 mm cal.) per 50 square metres. The density of shrub plantings, for safety purposes, shall vary depending on the degree of slope. Shrub plantings shall prevent public access on all 2H:1V slopes and discourage access on all 3H:1V slopes.
3. 100% density equals 1 shrub per square metre, 25% density equals 1 shrub per 4 square metres. The purpose of the bar scale is not to encourage repetitive landscape design but to act as a relative guide to associate plant densities with the appropriate slope.

COVERAGE INTENSITY OF SHRUB PLANTINGS



4. Designed pedestrian access areas shall not exceed a maximum side slope of 6H:1V. Note: the City's Parks Department requires slopes (running slope and cross slope) on all trails/ pathways, including trails/pathways within stormwater management areas, to meet City of Guelph FADM guidelines under sections 4.1.4 ACCESSIBLE ROUTES, PATHS & CORRIDORS and 4.1.9 RAMPS. A copy of the FADM is available on the City's website.
5. Fencing of stormwater management facilities shall be discouraged; however, it may be required as determined by the City.
6. Notwithstanding the criteria above, in the case of headwall designs, the depth of water related to adjoining side slopes may vary and a guard is required for safety purposes.
7. That in all cases, implementation of these principles shall have regard for approved Watershed, Sub-Watershed and Master Drainage Plans.
8. A Landscape Plan of the stormwater management facilities must be prepared to the satisfaction of the Deputy Chief Administrative Officer (DCAO) of Public Services prior to the registration of the Plan of Subdivision. All landscaping shall be installed at the developers cost, in accordance with the approved plan, during the first planting season after occupancy of the first unit. The remainder of the planting shall commence at such time as required by the DCAO of Public Services. The developer shall maintain the planting for a period of two year from the completion of final planting. Landscape plans are to be prepared by a Certified Landscape Architect acceptable to the City.
9. In the event that a community trail has been identified and/or required by the City in the vicinity or adjacent to a stormwater management pond, they shall be implemented above the maximum extended detention level or 5-year storm level, whichever is greater, to prevent frequent flooding. Trails shall have a minimum width of 3.0 m and the trail shall have asphalt surfacing. A 0.6 m wide mowed grass strip shall be provided along the trail edge on both sides for regular trail maintenance/ turf mowing.

10. To enhance user comfort and safety, a 3.0 m zone on each side of the community trail shall be designed in such a way that sightlines are preserved. If barriers are required, they must not interfere with visibility or create entrapment areas. In situations where a community trail is designed within the maximum peak flow depth zone the 3.0 m separation above the trail shall have a maximum slope of 3H:1V. Below the trail, the 3.0 m separation shall have a maximum slope of 6H:1V. This zone shall be planted with low ground covers (see Figure 5).
11. Deciduous trees should be planted at a minimum distance of 1.5 m from the edge of the trail/stormwater management route. Offset plant material a minimum of 1 m from all stormwater management infrastructure (e.g. pipes, infiltration galleries, rip rap swales, etc. Offset trees sufficiently from the trail/stormwater management route to ensure that mature tree canopies will not conflict with service vehicle access. The planting of coniferous trees within this zone is not permitted.
12. Maintenance access requirements are to be determined on a site-by-site basis; however, the following general criteria are recommended. Controlled maintenance access routes shall be provided to both inlet and outlet structures and forebays. A minimum 4.0 m wide surface with 6.0 m wide clear area to accommodate maintenance vehicles with a minimum 10m turning radius (inside radius) and a flat 10 m loading area is required. Maintenance access routes shall not exceed a maximum longitudinal slope of 10H:1V. The design of maintenance routes and loading areas shall be to the approval of the Operations Department. Should the access also be used as a community trail then the maximum longitudinal slope shall not exceed 20H:1V.
13. Prior to the Operations Department accepting the stormwater management pond as shown on the approved landscape plan, the developer agrees to erect one or more information signs at a public access point(s) detailing the purpose of the pond, phone number or further information and any other relevant information to be approved by the DCAO of Public Services, all at the cost of the developer.
14. To prevent surcharging of storm sewers upstream, pond inlet inverts shall not be lower than the maximum extended detention level (see Figure 6).
15. Minimize the number of inlets/forebays to one (1) where possible.
16. Signage templates are provided in Appendix B. Inquiries regarding signage requirements should be direct to Park Planning.
17. The City's minimum allowable orifice size is 75 mm.
18. When seasonal high groundwater level is higher or lower than the proposed permanent pool level of stormwater management ponds; a Clay Liner shall be proposed to maintain the permanent pool level in the stormwater management

pond. The Clay Liner shall be extended to the permanent pool or the seasonal high groundwater level (whichever is higher) +0.5m. The thickness of the Liner shall be prescribed by a qualified Geotechnical Engineer.

5.8 Hydrogeological Assessment

For an application to be considered complete, the hydrogeological assessment must include a minimum of four seasons of data in order to capture the seasonal variations in groundwater.

The City defines seasonal high groundwater as per R.R.O. 1990, Reg 358, SEWAGE SYSTEMS: "high groundwater table" means the highest elevation at which there is physical evidence that the soil has been saturated with water.

The methodology acceptable for determining the seasonal high groundwater is to pick the maximum/highest peak value.

The City may require additional monitoring wells/Piezometers at required locations and depths during review of the application.

During application processing and review, the groundwater data must continue to be collected. Prior to application approval, the seasonal high groundwater and design must be updated with this new data. This will ensure that we have more than one year of data informing the seasonal high elevations before application approval.

5.9 Ground Water Separation

5.9.1 Residential

During detailed design, the seasonal high groundwater elevation can be shown on a groundwater flow/elevation/contour plan and shall be shown on the plan and profile drawings.

All residential buildings with below-grade living areas (finished or unfinished) shall be sited such that the basement floor elevation is a minimum 0.5 metres higher than the seasonal high groundwater elevation.

1. Where a 0.5 m separation above the seasonal high groundwater elevation cannot be achieved the developer shall install OBC compliant waterproofing as approved by the City of Guelph Chief Building Official (CBO) at the time of building permit application. Where OBC compliant waterproofing is required, residential buildings shall be serviced by gravity sewer.

2. Where basement floor elevations are above and within 0.5 metres of the seasonal high groundwater elevation, on a case-by-case basis the developer may be permitted to provide a foundation enhanced dampproofing system to the satisfaction of the city, subject to eligibility based on:

    a) a minimum of 3 years of continuous groundwater monitoring showing declined and/or stabilized seasonal high groundwater level, and

    b) review of suitable hydraulic conductivity of the soils (documented recommendation of civil/geotechnical/hydrogeological professionals, under stamp, that enhanced dampproofing is appropriate given the soil conditions)

3. When enhanced dampproofing is used, the following considerations shall be included:

    a) a dampproofing detail shall be provided, including commentary on how this detail provides foundation protection over and above OBC-compliant dampproofing.

    b) In addition, filter cloth shall be installed on the drainage weeping tile.

    c) Incorporate a granular base below the concrete floor slab consisting of compacted 20 mm (3/4 inch) clear, crushed stone or equivalent free-draining material with a minimum thickness of 150 mm to minimize any potential buildup of water pressure.

    d) Ensure that foundation wall backfill is uniformly compacted as necessary (without impacting the stability of the foundation walls) to ensure that uncontrolled settlements and ponding areas do not occur next to the foundation wall. It is expected that any such occurrences will be remediated by the developer in a timely manner, and that the final grading certificates will confirm that minimum City of Guelph grading standards are met.

    e) Ensure sump pumps that have a surface discharge point onto finished grade in rear yards are diverted beyond the foundation wall backfill zone– typically set approximately 2.4 m away from the basement foundation wall. The discharge point must incorporate provisions to prevent soil erosion.

    f) Install two weeping tile monitoring ports for each residence at locations approved by the CBO. The monitoring ports are to be constructed of vertical risers connected to the exterior weeping tile system with Y-connectors, which allow for camera access to inspect the condition of the weeping tiles and provide maintenance access in the event that a sediment build-up or accumulation occurs within the weeping tiles. A cap is to be placed at the surface access for each monitoring port to prevent the introduction of obstructions from the surface.

g) The developer agrees to implement ongoing water level monitoring during construction through the use of data loggers to validate the water level data. The developer shall submit an annual summary report to the City each year during construction and following the first year after full build-out, to provide a record of the seasonal peaks, typical water levels and trends in the water levels as a direct result of construction activity at the site. If the results of the monitoring identify an area of concern, the developer will be responsible to implement any appropriate mitigation measures to the City's satisfaction.

5.9.2 Sanitary Sewers and Maintenance Holes

Sanitary Sewer systems which are installed lower than 0.6m below the seasonal high groundwater level shall be designed to minimize infiltration.

1. The Sewer pipes, pipe joints, and connections shall be designed to withstand a pressure of at least 45 psi without leakage.
2. The sanitary maintenance holes shall be externally wrapped with Waterproof membrane placed externally around all precast joints, including joints below the maintenance hole frame and cover, with a minimum 300mm wide strip.
3. Buoyancy of Sewers and maintenance holes shall be considered in the design, and where required, adequate provision shall be made to prevent flotation.

Where the seasonal high groundwater level is unknown, sewers shall be designed with assumption that they are installed 0.6 m below seasonal high groundwater level.

5.10 Watermains and Fire Hydrants

The design of watermains shall meet the requirements of all provincial and municipal guidelines or standards (see Linear Infrastructure Standards). Following is a list of the City's general requirements for watermains:

1. Show all existing and proposed watermain sizes, valves and hydrants and other utilities.
2. Thrust blocks or anchor blocks are required at all changes in direction, horizontal or vertical, and at all dead ends and tees as per City standards (see Linear Infrastructure Standards).
3. Where possible, hydrants should be located at/near a high point in elevation.

4. All new developments within the City Boundary, unless exempt in the Official Plan, are required to be serviced with domestic water. Private wells are not permitted.
5. Watermains to be located 3.0 m (2.5 m on 8.8 m roadways) east or north from the centreline of road.
6. Under normal conditions, watermains shall cross above sewers with sufficient vertical separation to allow for proper bedding and structural support of the watermain and sewer main. When it is not possible for the watermain to cross above the sewer, the watermain passing under a sewer shall be protected by providing:
    a) A vertical separation of at least 0.5 metres between the invert of the sewer and the crown of the watermain.
    b) Adequate structural support for the sewers to prevent excessive deflection of joints and settling.
    c) That the length of water pipe shall be centred at the point of crossing so that the joints will be equidistant and as far as possible from the sewer.
7. The minimum watermain size is 150 mm on local streets.
8. Fire hydrants must be within a 75 m radius of each other and maximum distance of 150 m apart measured along centreline of roads. Hydrant valves should be at least 0.5 m behind the back of curb. Top of flange elevations for all hydrants must be indicated on plan view of drawings.
9. Watermains to have a minimum of 2.0 m cover to outside top of pipe as measured from the centreline profile grade or existing ground cover, whichever is greater.
10. When watermains "tee" intersect, two valves are required. When watermains cross intersect, three valves are required. Valves shall be placed in the smaller of the intersecting pipes.
11. Valve chambers are required for valves greater than 300 mm unless direct buried butterfly valves are approved.
12. Where streets are to be extended in the future, a valve and blow-off shall be installed plus one pipe length beyond the valve, are all to be installed inside the Subdivision Boundaries.

5.11 Roads

Standard Drawings with design information for varying right-of-way width road cross sections are provided in the Linear Infrastructure Standards. Following is a list of the City's road design requirements for new subdivisions:

1. Show all the existing and proposed curbs, road allowances, and street names indicating them as such.
2. Show all relevant horizontal and vertical curve information on the drawings (for layout purposes). All curves at the street line must be marked showing the radius and centerline radii.
3. Maximum allowable road grades are as follows:

Pavement Width	Maximum Grade Allowable
8.4 and 8.8 m Local Residential	8%
10m Collector	6%
15 m Collector	5%
Industrial	4%
Cul-de-sac (downgrade from intersecting street)	3%

4. The minimum allowable grade for any road is 0.50%, except for turning circles where the minimum grade is 1.0% (to ensure that the grade around the longest curb is at least a minimum of 0.50%).
5. The maximum allowable road grade is 5% along properties with less than 12 m of frontage.
6. Any change in grade greater than 1.5% (algebraic) requires a vertical curve. Minimum vertical curvature at a crest is K = 7, and at a sag is K = 6 for local roads. The minimum vertical curvature at a crest is K = 15, and at a sag is K = 10 for a collector road.
7. The distance between vertical P.I.'s, the elevation of P.I.'s, and the percentage grade of the tangents must be shown in profile.
8. The maximum allowable drainage path to a catch basin is as follows:

Pavement Width (m)	Maximum Spacing (m)**
8.4 and 8.8m	90m
10m	80m
15m	60m

**Where the road grade exceeds 5%, the maximum spacing is reduced to 75% of the above distances.

9. A grade of 0.5% backfall on all road profiles should be provided where internal streets intercept with all collector and main roads wherever it is feasible to do so.
10. Street line elevations are to be shown at all subdivision limits.
11. A double catch basin is required where drainage is received from more than one direction as at a low point.
12. Sidewalk must be 1.5 m from the street line. Sidewalk "fillets" to be constructed at all "T" and "+" intersections where fillet radius is less than 0.5m. Standard ramps shall be placed where sidewalks intersect with curbs.
13. All roads shall have a 2% crossfall.
14. Paved temporary turning circles are required where the road is to be continued in the future. A temporary turning circle will have a radius of 9 m and complete services to 1.5 m back of the edge of pavement.
15. Where a road is not to be extended in the future (ie. Cul-de sac) the property line radius is 18.5 m.
16. All existing and proposed services, curbs and sidewalks must be dimensioned within the street line.
17. Road stations shall be in kilometres and must be shown in the plan view at a maximum spacing of 20 m and designated as 0 + 100 etc. (i.e. 1 km = 1 +100).
18. For roundabout designs, please refer to TAC Manual "Canadian Roundabout Design guide, January 2017."
19. Simplified minimum geometric design criteria is provided in Table 2. For complete design criteria please refer to the Transportation Association of Canada (TAC) manual.

Table 5-5 Subdivision Geometric Design Criteria

Road Class (o)	Pavement Width (j) (k)	Allowable Grade (f) (g) (i)	Minimum Centerline Radius	Min SSSD	Minimum Tangent @ Intersection (h) (l)	Minimum Tangent Between Curves	Property Line Radius @ Intersection (e)	R.O.W. Width
Local	8.4, 8.8, 10	0.5-8.0	18 (b)	65	10	15 (c)	8	17, 18, 20
Collector	10	0.5-6.0	140	85	25	30	8	20.0

20.Table 5-5 Notes:

a) A cul-de-sac shall not exceed 150-metres in length without an emergency access - roads greater than 300-metres in length require dual access.

b) The change in direction (delta angle) for a curve less than 70 meters in radius shall be 90-degrees where possible - the maximum deviation from 90-degrees shall not exceed 10-degrees. The beginning of the curve shall be a minimum of 30-metres from an intersection, measured from the property line.

c) A tangent is only required between curves if one of the curves has a center line radius of less than 70-metres or between two reverse curves.

d) The property line radius of a cul-de-sac bubble shall be 18.5 meters.

e) Governed by the major road.

f) Maximum downgrade into a cul-de-sac is 3% - the minimum centreline grade on a cul-de-sac bubble shall be a minimum of 1%.

g) Maximum grade on any road having lots fronting on it with less than 12.0 meters frontages is 6%.

h) Streets shall intersect at 90 degrees where possible the maximum deviation from 90 degrees shall not exceed 10 degrees.

i) Any change in grade greater than 1.5 % requires a vertical curve-the minimum length of each grade is 10-meters.

j) Except at the terminus of a road where a cul-de-sac bubble is provided, the sides of roads shall be parallel with no bubbles.

k) Pavement width is measured from back to back of curb.

l) Tangent at intersection includes the property line radius at the intersection.

m) Sidewalks: required on 1 side of street for 18 or 17 m R.O.W, required on 2 sides of street for 20 m R.O.W.

5.12 Subdivision Transportation Engineering

As the specifics of a proposed development become known, it is necessary to examine its impacts on the transportation system. In most cases, the onus is on the developer to conduct a Transportation Impact Study (TIS) to address the transportation-related issues of the development and obtain approval of the TIS from City staff. The scope of the TIS depends on the nature of the proposed development. Therefore, the developer is required to develop the TIS Terms of

Reference (scope) in consultation with the City's Transportation Engineer. The City's TIS Guidelines, which provide the requirements for transportation engineering design considerations, is available at (http://guelph.ca/wp-content/uploads/TrafficImpactStudyGuidelines.pdf).

6.0 Site Plan Engineering Design Criteria and Standards

6.1 General

This subsection provides the requirements for the engineering design submission for a Site Plan application. Engineering requirements for site plan submission may include items not specific in the following subsections: refer to appropriate section of the DEM and other documents for requirements where necessary. All submitted engineering plans and report shall be consistent with the DEM. This subsection is organized with the requirements for the following:

- Engineering Plans
- Grading and Drainage
- Sediment and Erosion Controls
- Servicing
- Stormwater Management
- Transportation Engineering

6.2 Engineering Plans

6.2.1 Grading and Drainage Plan

The Grading and Drainage Plan (GP-1) must be stamped and endorsed by a Professional Engineer licensed to work in Ontario (P. Eng), except for on-street townhouse applications, which may also be endorsed and sealed by an Ontario Land Surveyor (OLS). The GP-1 Drawing should include but not be limited to the following information (if applicable; to be determined during the pre-consultation meeting):

- Road and road widenings (as required by the City's official plan), curb, sidewalk, boulevard and/or ditch
- 0.3 metre reserves
- Existing and proposed elevations at property/block/lot line, 10 m beyond property line as well as appropriate intervals throughout the site
- Finished floor, underside of footing and basement floor elevation
- Swales, ditches and channels
- Roof water leader discharge points
- Applicable stormwater management devices and/or areas
- Side Slopes

- Retaining walls, including top and bottom of wall elevations
- Catchbasins
- Culverts
- Erosion and sediment control
- Snow storage area (can also be shown on the overall Site Plan)
- Existing and proposed easements, including those required for pedestrian access
- Noise mitigation (barriers, berms, etc.), including top and bottom of barrier elevations

6.2.2 Site Servicing Plan

The Site Servicing Plan (SSP-1) must be stamped and signed by a P. Eng. The SSP-1 Drawing should include but not be limited to the following information (if applicable; to be determined during the pre-consultation meeting):

- Road, curb, sidewalk, boulevard and/or ditch
- Existing and proposed site services, including a crossing chart where new services are proposed to cross existing mains or utilities
- Existing and proposed watermain, sanitary and storm sewers within right-of-way and on private property
- Maintenance holes, catchbasins, water valves and fire hydrants
- Culverts
- Applicable stormwater management devices and/or areas
- New fire hydrants are to be located on the City boulevard/right-of-way instead of on private property if the location will satisfy Ontario Building Code requirements for protection of the building. Note that fire hydrants within the right-of-way must be independently serviced directly from the watermain, as per City Standards.
- Cross sections within the ROW showing existing and proposed service laterals, infrastructure, and utilities.
- Noise mitigation (barriers, berms, etc.)

Note: Vacant land condominium developments will also require the submission of plan and profile drawings as well as supporting sanitary and storm sewer design sheets.

6.2.3 Traffic Geometric Plan:

The Traffic Geometric Plan (TGP-1) must be stamped and endorsed by a P. Eng. The TGP-1 Drawing should include the following information (if applicable as determined during the pre-consultation meeting):

- Existing and proposed structures and parking lots/roads

- Existing and proposed curb cuts/fill
- Dimensions of all access widths, depths and radii
- Dimension of parking spaces (typical) and aisle widths
- On-site vehicle turning movements (AutoTURN), for site-specific appropriate vehicle types (e.g, garbage trucks, delivery trucks, etc.)
- Fire truck route turning movement
- Full road width and accurate traffic control signs and pavement markings fronting the site
- Location of all existing above grade utilities within the right-of-way
- Illustrate stopping sight distance and visibility triangle for corner properties (see Section 6.2.4.1)
- Show sight distance from stop control for right, left and crossing movements for corner properties
- Drive thru stacking
- Curb cuts and/or curb fills by City contractor
- Transit stops, shelters, concrete pads and laybys fronting the site
- Existing and future access points on the opposite side of the street from the development

6.2.4 Composite Utility Plan

When a Composite Utility Plan (CUP) is required, it shall be completed as per the requirements listed in Section 5.2.4.

6.3 Design Requirements

6.3.1 Grading and Drainage

The following grading and drainage requirements apply to site plan designs:

1. The proposed elevation of the property line abutting the street line shall be 2% higher than the curb, if there is a curb, or 2% higher than the centreline of the road measured from the edge of pavement
2. The desirable grade of ditches and swales is 2.0%; the minimum grade is 0.5%
3. The desirable surface grade is 2%; the minimum grade is 1%
4. The maximum grade of a landscaped slope is 3H:1V
5. The desirable driveway slope is 4%; the maximum slope is 5%
6. All retaining walls over 1.0 m in height must be designed by a Professional Engineer and will require a separate building permit

7. Retaining walls shall be located on private property at the property line. If these walls are greater than 0.6 m in exposed height, they require the addition of a fence or handrail as required in the Ontario Building Code.
8. Proposed retaining walls adjacent to existing residential properties shall not exceed 1.0 m in exposed height without the written permission of the General Manager/City Engineer
9. Grading onto adjacent lands will require written consent from the property owner - a copy of this letter shall be submitted with the engineering submission
10. Grading and drainage certification, in the form of a site-specific grading certificate, shall be provided to the City by the consultant upon completion of construction
11. All elevations shall be referred to a City Benchmark and shall be in geodetic metric datum
12. For developments in an Industrial Park, engineering staff may require the erection of guard rails by the developer on the lands abutting drainage ditches, which provide ingress and egress to the property
13. Engineering staff may require that entrance culverts and associated headwalls up to and including 36-inch diameter be installed at the cost of the applicant.

6.3.2 Sediment and Erosion Controls

The following sediment and erosion control requirements apply to site plan designs:

1. All sediment and erosion control devices must be designed in accordance with current "Greater Golden Horseshoe Area Conservation Authorities" Erosion and Sediment Control Guideline for Urban Construction
2. Additional sediment and erosion control information is provided in the Linear Infrastructure Standards (General Conditions and Standard Drawings)
3. Refer to Mud Mat details in Section 5.3.2, and within the City's Linear Infrastructure Standards
4. Construction access roads must have appropriate signage signifying trucks to use the route. The route must also have erosion and sediment control, including silt sacks in catch basins
5. Every effort to be made to locate the construction or temporary access in the location of the future driveway access. Locating the access in the future permanent access would ensure that the City's requirements have been met because the permanent access locations would have been previously reviewed. If a construction access were to be temporarily provided at a different location,

the proponent requires approval by City. The following items are to be provided for the City's approval:

a) Construction access to be designed and installed in conforming to the Development Engineering Manual (DEM) Access Design conditions. Plan to be submitted depicting distance from intersections and driveway accesses, access width etc.

b) Sight distance analysis in accordance with the Transportation Association of Canada (TAC) Geometric Design Guide for Canadian Roads at the proposed access and vehicles approaching the proposed access

c) Appropriate signage and or pavement markings to be provided in support of the construction access. All accesses shall maintain the safety, function, and efficiency of the City's roadways including sidewalks and Multi Use Pathways

6. All erosion and sediment control plans must specify how grounds are to be stabilized in order to keep dust to a minimum.
7. A haulage road must be provided on the plans to designate truck traffic to drop off zones and material stockpiles.

6.3.3 Servicing Requirements

The applicant shall ensure that the required service capacity for storm, sanitary, and water is adequate and available for the proposed development. This information should be shown in the Functional Servicing Report and/or Servicing Plan.

Depending on the nature of the Site Plan, the requirements below may be further supplemented by the subdivision servicing design criteria provided in Section 5.0 of this DEM (e.g., sewers design). Further servicing requirements for Site Plan applications are provided below:

1. The design of sewers and watermains shall meet the requirements of all applicable Provincial and municipal guidelines or standards.
2. The owner/applicant is directly responsible for obtaining all necessary approvals required by the MECP for onsite servicing and stormwater management.
3. Unless specified below or by City Staff, property service connections shall be as per DGSSMS B.2.12.3.
4. Servicing Plan shall identify all site servicing requirements, including service laterals, internal servicing, and all valves and appurtenances needed; reference to required bedding materials identified within the Geotechnical Report for all underground infrastructure.

5. Piping burying depth should be: water 2.0 m; sanitary and storm 2.7 m to top of pipe.
6. A sanitary maintenance hole is required at the property line.
7. A stormwater maintenance hole is required at the property line.
8. For watermain servicing, a water valve or curbstop is required at the property line.
9. Design engineer shall locate driveways away from proposed services (sanitary, storm and water) for residential developments.
10. Minimum grade of first leg of on-site sanitary sewers are 2.0%.
11. Minimum grade on storm sewers is 0.5%.
12. Sanitary flow shall be calculated as per Section 5.6.
13. All properties may only have 1 connection to the City watermain. Refer to the City of Guelph Backflow Prevention By-law for further details administered by the Building Department (http://guelph.ca/living/environment/water/drinking-water/backflow-prevention/). Where bulk metering is required:
    a) All water including that to supply fire suppression and hydrants must be bulk metered.
    b) The water meter shall be located within a meter chamber at property line if the distance from property line to point of entry of the water service to the building is greater than 30m or a mechanical room designed to house and facilitate installation of required meter will be permitted if this distance is less than 30m.
    c) No Tee fitting or connections are permitted prior to the water meter.
    d) For details on meter specifications see Appendix F. For details on cost, and chamber or mechanical room layout specs contact the City.
14. Work may be required within the City's right-of-way to support the proposed development. This work could involve, but is not limited to, municipal servicing connections, curb cuts and/or fills, driveway accesses, turning lanes, sidewalks, boulevard restorations, traffic control signals, traffic control signage, roadside ditches and culverts related to immediate access and other requirements of the site. To determine the costs for work within the right-of-way applicants must complete a detailed cost estimate using the City of Guelph template that can be provided by engineering staff. After final review and approval of the site plan submission, applicants will be required to pay, as a deposit, the approved estimated amount. The applicant must provide additional funds based on the tendered costs before the City constructs the work. Engineering Services staff will tender, project manage and inspect the work constructed within the right-of-

way. The applicant must pay actual costs including project management and inspection.

6.3.4 Stormwater Management

Specific areas of the City are subject to specific Stormwater Management Criteria limiting the outflow of stormwater to a specified rate and requiring the design of a stormwater management system by a Professional Engineer. In other areas of the City, a stormwater management system designed by a Professional Engineer may be required as determined by engineering staff. To obtain site-specific stormwater criteria for a proposed development, the applicant must contact the City's engineering staff directly. Staff will prepare a memorandum outlining the stormwater criteria requirements for the proposed development.

The stormwater management design shall be summarized in a Stormwater Management Report. Detailed design requirements for stormwater management are provided in Section 5.7. In addition to the requirements of Section 5.7, the report must be stamped and endorsed by a P. Eng. and shall include the following information (if applicable; to be determined during the pre-consultation meeting):

- Hydrologic and hydraulic modeling (using MIDUSS or PCSWMM). Rational Method may be used for sites less than 2 hectares.
- Storm drainage catchment area plan.
- Schematic for stormwater model.
- Hydrogeological report (if infiltration is proposed).
- Stage-storage calculations.
- Quality and quantity control device specifications and sizing.
- Water budget with infiltration calculations, where applicable.
- Stormwater quantity management strategies can be accommodated within parking areas to a limit of 0.3 m in depth.
- Rooftop runoff shall be considered as clean stormwater and shall be infiltrated where appropriate.
- The Professional Engineer who designed the stormwater management system shall certify to the City that they supervised the construction of the stormwater management system and that the stormwater management system was built as approved by the City and that it is functioning properly; and the drawing showing the sewers, catch basins and watermain that is external to a building shall be dated, signed and stamped by a Professional Engineer.

6.3.5 Site Plan Transportation Engineering

The following transportation engineering information is for use in addition to the information provided in Section 5.11. Please refer to the City's Transportation

Master Plan for roadway improvements such as roadway widening to accommodate active transportation facilities, cross-section design, roadway widening and intersection improvements, etc.

6.3.5.1 Sight Triangles

In addition to the requirements outlined in the TIS, City engineering staff have adopted the use of the Transportation Association of Canada (TAC) Stopping Sight Distance (3-second rule) for evaluation of sight triangles at intersections and access points for new developments. Sight triangles ensure sufficient distance is provided for the driver of a vehicle to perceive potential conflicts and carryout the necessary action to avoid the conflict and negotiate the intersection safely. The size of a sight triangle (or daylight/visibility triangle) is a function of the intersection angle and features of the intersecting roadways including the number and width of travel lanes, the design speeds, and the right-of-way widths.

The City requires that the sight triangle for each intersection for a new development be evaluated using the TAC 3-second rule and that the site plan be designed to accommodate the necessary sight triangle(s) based on the TAC 3-second rule. However, a sight triangle reduction may be considered for those areas identified as Urban Growth Centres (including downtown and intensification corridors/nodes) and intersections listed in Table 3 below provided the *proponent demonstrates* that the intersection is not prone to collisions as a result of smaller sight triangles and the land is not required for utility/traffic signal equipment. In these cases, the proponent's consultant should provide a professional engineering opinion on the appropriate size of sight triangle. The final dimensions of a daylight triangle are subject to the minimum requirements outlined in the Zoning By-Law, as amended, measured from property lines, and must be reviewed and approved by City staff.

Intersections Subject to Further Consideration for Sight Triangle:

- Gordon Street and Kortright Road
- Gordon Street and Edinburgh Road
- Gordon Street and Arkell Road
- Gordon Street and Clair Road
- Gordon Street and Poppy Drive
- Starwood Road and Watson Parkway
- Stevenson Street and Eramosa Road
- Victoria Road and Grange Road
- Victoria Road and York Road
- Victoria Road and College Avenue
- Victoria Road and Stone Road
- Victoria Road and Arkell Road
- Victoria Road and Clair Road

- Woodlawn Road and Woolwich Street

When designing the sight line triangle, the following must be incorporated into the site plan submission:

1. Per Section 4.6 of the City's Zoning By-Law, nothing above 0.8 m in height (measured from adjacent road pavements) shall be located within the sight triangle as calculated for the following:
   a) stopping sight distance
   b) sight distance from stop control for right, left and crossing movements
2. All calculations as well as the sight triangles shall be shown on the Traffic Geometrics Plan.

6.3.5.2 Vehicle Parking Design

Off-street parking, as required in Section 4.13 of Guelph's Comprehensive Zoning By-law, must be provided in accordance with the applicable specifications contained in Table 4 below. See Figure 7 illustrating these specifications. The parking space dimensions apply only to surface, non-structured parking facilities; module dimensions required for the development of structured parking facilities shall be determined in consultation with the General Manager/City Engineer. For design details for accessible parking, refer to the City of Guelph Facility Accessibility Design Manual.

Table 6-1 Dimensions for Parking

Angle of Parking One or Two Way	Stall Depth *	Stall Width *	Double Module Width	Single Module Width
90 Degree	5.5 m	2.75 m	18.0 m	12.0 m
180 Degree (parallel)	6.5 m	2.6 m	*9.2 m * 11.3 m	*6.6 m *8.7 m

* Stall width and/or depth may vary throughout the City. Refer to current zoning by-law.

On-street parallel parking on arterial or collector roads should have a minimum of 15 m setback from the near side of an intersection, and a minimum of 9 m setback from the far side of the intersection (measured from the end of curb return). A greater setback may be required for adequate sight distances and/or higher operating speeds.

6.3.5.3 Ramps Leading to Underground Parking

For any ramps leading to underground parking, the following design criteria must be met.

1. Consider a maximum ramp grade of 12%.
2. For any steep ramp, transition areas at the top and bottom of the ramp should be at least 6m in length with half of the ramp grade.
3. As per City's "2015 Facility Accessibility Design Manual", a minimum of 2.75m vertical clearance must be provided for accessible parking spaces.
4. Ensure adequate sightlines at entrance/exit.
5. Provide heated ramp when the slope is greater than 8%.

6.3.5.4 Access Design

Access to and from residential, commercial, industrial and institutional areas must be provided in accordance with the applicable specifications contained in Tables 5 and 6. Figures 8 and 9 illustrate the terms used in this section. Separation distances between access driveways from intersections, as well as other driveways are controlled to minimize traffic congestion and conflict points. Specific design dimensions promote safe, convenient access to and from these areas.

Table 6-2 Layout of Accesses

Access Classification	Roadway Classification	Throat Width (W) or Lane Width (LW)	Radius (R) *	Distance Between Accesses (S) **
Multi-Residential	Local/Collector	6.0m	7.0m	17m
	Arterial	7.5m	7.0m	25m
Low Volume Commercial & Institutional	Local/Collector	7.5m	9.0m	23-30m
	Arterial	8.0m	9.0m	60m
High Volume Commercial & Institutional	Collector	8.0m	12.0m	60m
	Collector (divided access)	3.0m left 3.6m through 3.6m right 1.2m island	12.0m	60m
	Arterial	9.0m	12.0m	100m
	Arterial (divided access)	3.0m left 3.6m through 3.6m right 1.2m island	12.0m	100m
Industrial	Collector & Arterial	9.0m (max. 15.0m)	12.0m	40-60m

* These measurements are the minimum curb line radii. Access radii cannot extend beyond the limit of a line drawn from the side yard property line perpendicular to the street right-of-way.

** Distance between accesses is also applicable for accesses on opposite sides of a street.

Table 6-3 Number and Location of Accesses

Access Classification	Roadway Classification	Distance from Non-Signalized Intersection (D)	Distance from Signalized Intersection (D)
Multi-Residential	Local/Collector	15m	30m*
	Arterial	30m	60m**
Low Volume Commercial and Institutional (2-way access)	Local/Collector	30m	30m
	Arterial	60m	60m***
High Volume Commercial and Institutional	Collector/Arterial	60m	60m***
Industrial	Collector/Arterial	30m	60m***

* Multi-Residential of up to 30 units

** Multi-Residential of over 30 units

*** Full movement accesses will not be allowed within 100 m of a signalized intersection on arterial roadways. Site specific turning movement restrictions will be determined by City staff upon application.

Note: Should a site require a right in/out access, the layout shall be designed to effectively prohibit left-turn movements by following these criteria:

1. Install a raised concrete center island (minimum 1 m wide) on adjacent roadway. The island must extend 25 m away from the access curb returns.
2. If a raised concrete island is deemed unfeasible due to physical constraints, a raised concrete channelized island is required at the access with the following features.
   a) Minimum curb readii: 15 m
   b) Maximum travel lane width: 3.5 m
   c) Minimum width along adjacent roadway: 12 m
   d) Minimum raised concrete channelized median size: 36 sq.m

6.3.5.5 Additional Transportation Engineering Requirements

In addition to the general requirements above, the following principles shall apply to site plan design:

1. A minimum clearance of 1.5m is required from an access to the outside edge of any above ground utility structures.
2. The proposal of a new loading space or loading dock will not be permitted where the turning movement of the truck requires driving the vehicle in a reverse motion within the road right of way.
3. The minimum number of spaces in a queuing lane shall be as per the Zoning By-Law Section 5.14:
    a) Restaurant - 10 spaces
    b) Retail/Financial/Other - 3 spaces
    c) Car wash, automatic - 10 spaces
    d) Car wash, self-serve - 2 spaces
4. Minimum size of queuing space is 2.7 m wide by 6 m long.
5. Private access road exceeding 90m to 150m in length, must have a turn around area for fire trucks. Private access roads exceeding 150m in length must have a secondary access or an emergency access designed to meet or exceed the standards set out in the current Ontario Building Code and to the satisfaction of the General Manager/City Engineer. All distances shall be measured from the property line.
6. Site plan applications shall have regard for measures that support Transportation Demand Management principles set out in the Official Plan (Chapter 8) and the Guelph Wellington Transportation Strategy.

7.0 Figures

N.T.S.

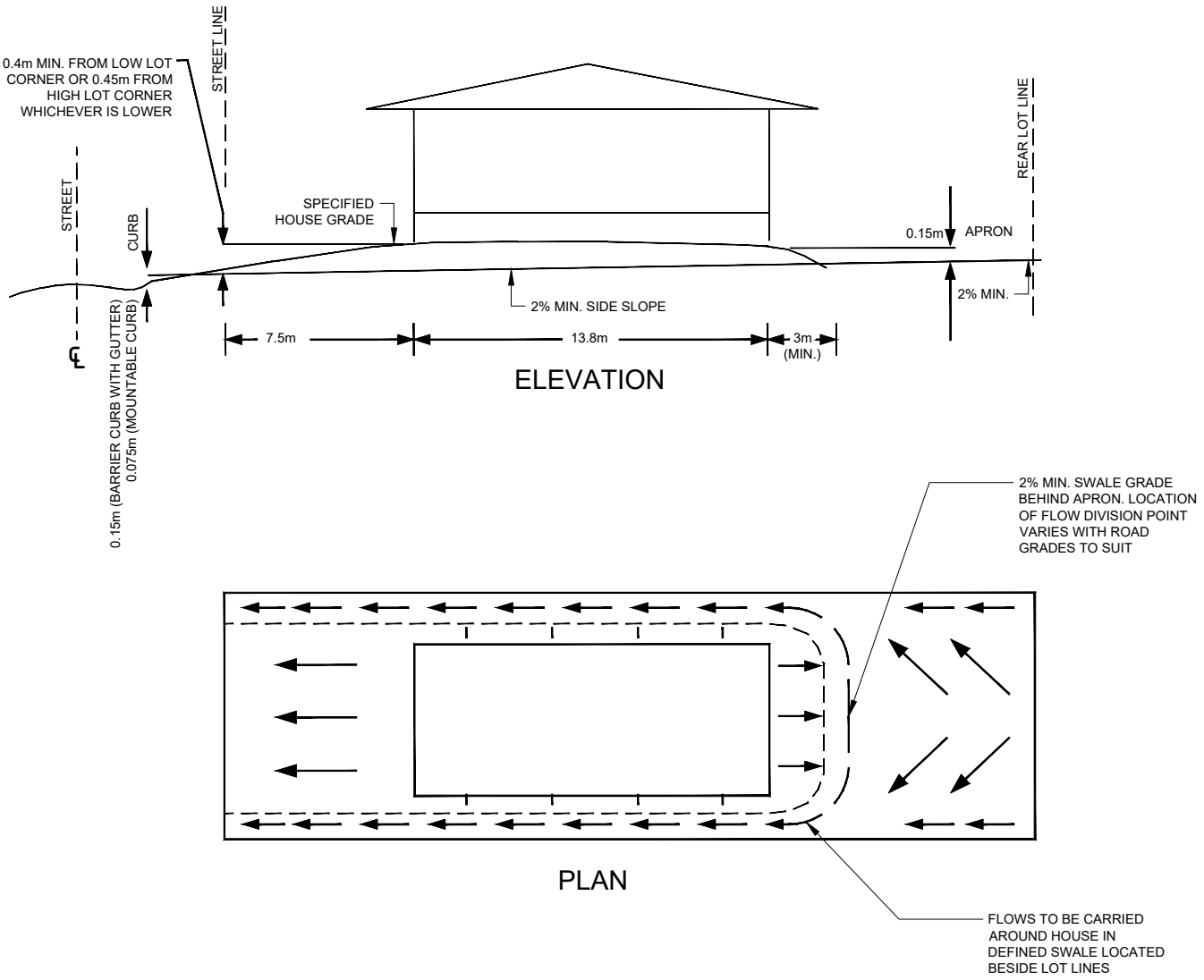
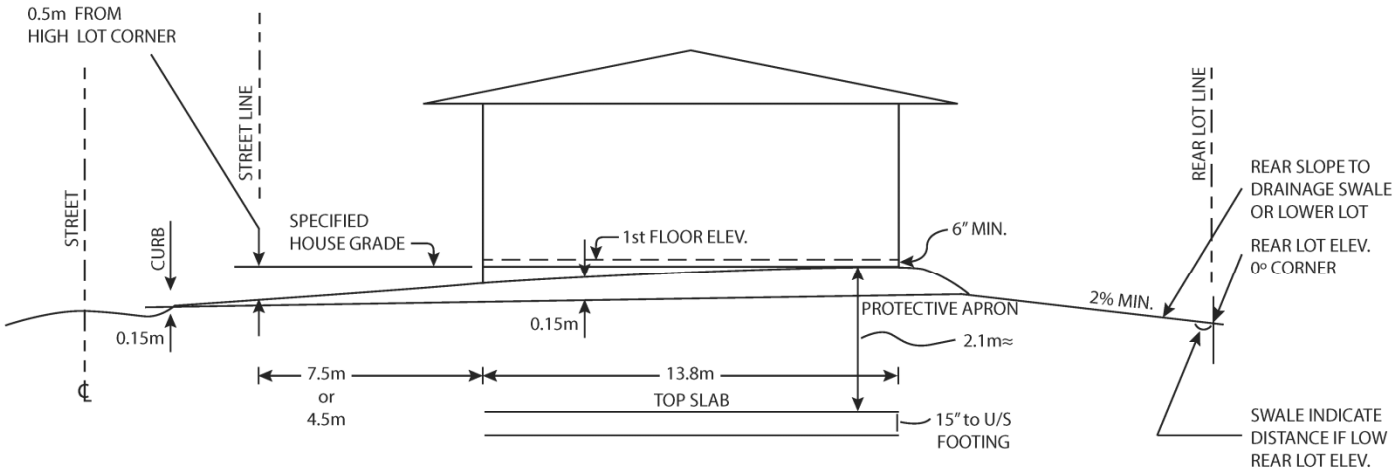
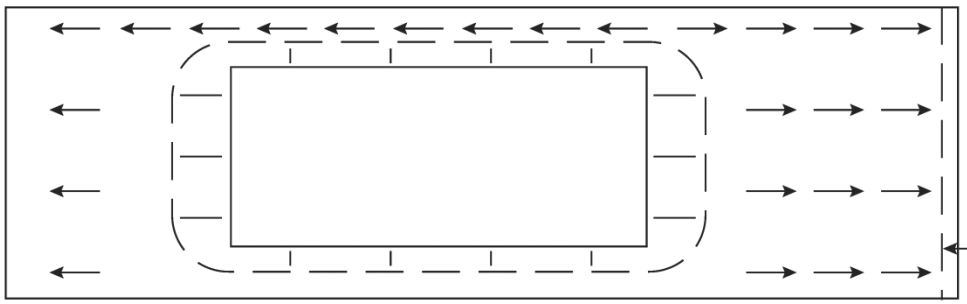


Figure 1
Front Lot Drainage Details

N.T.S





NOTE:
IF ATTACHED GARAGE CONSTRUCTED, THEN REAR YARD SLOPE MAY COMMENCE AT REAR GARAGE WALL.

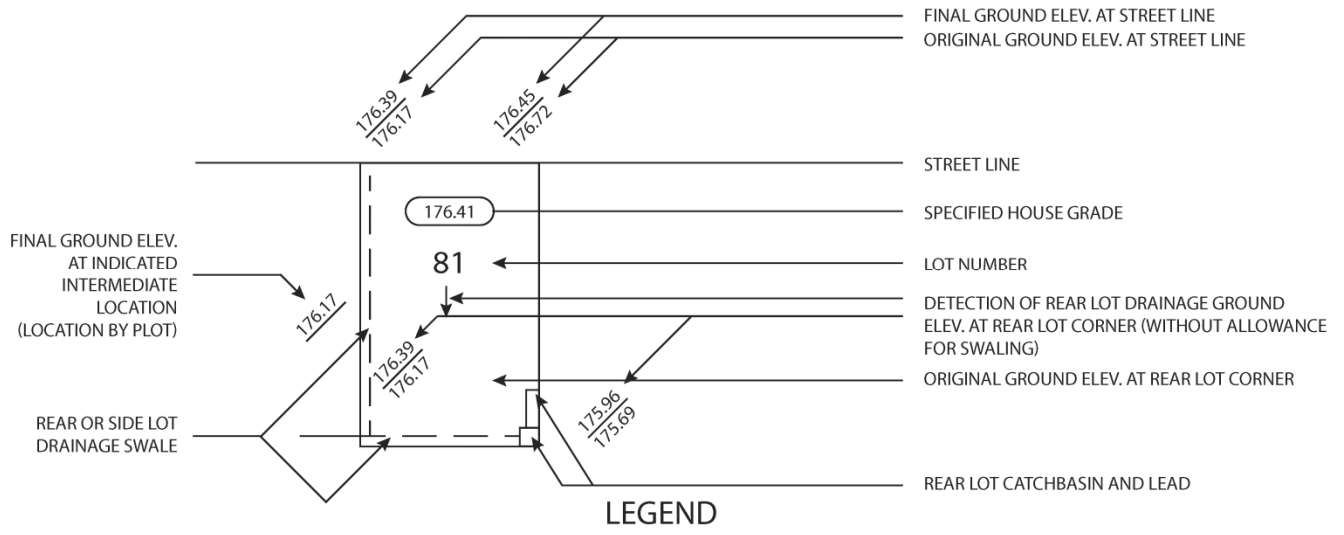
PLAN

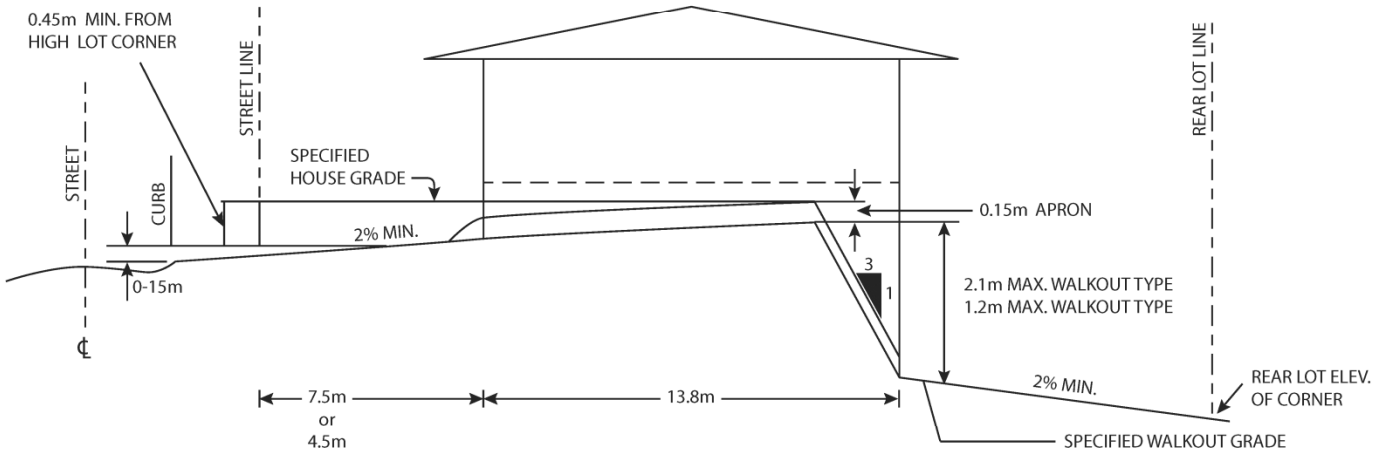
SWALE IF REQUIRED. 2% MIN. SLOPE UNLESS OTHERWISE INDICATED

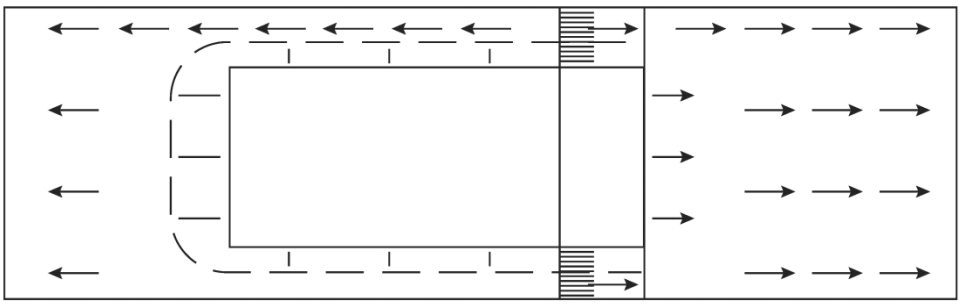
1m MIN.

Figure 2
Rear Lot Drainage Details

N.T.S

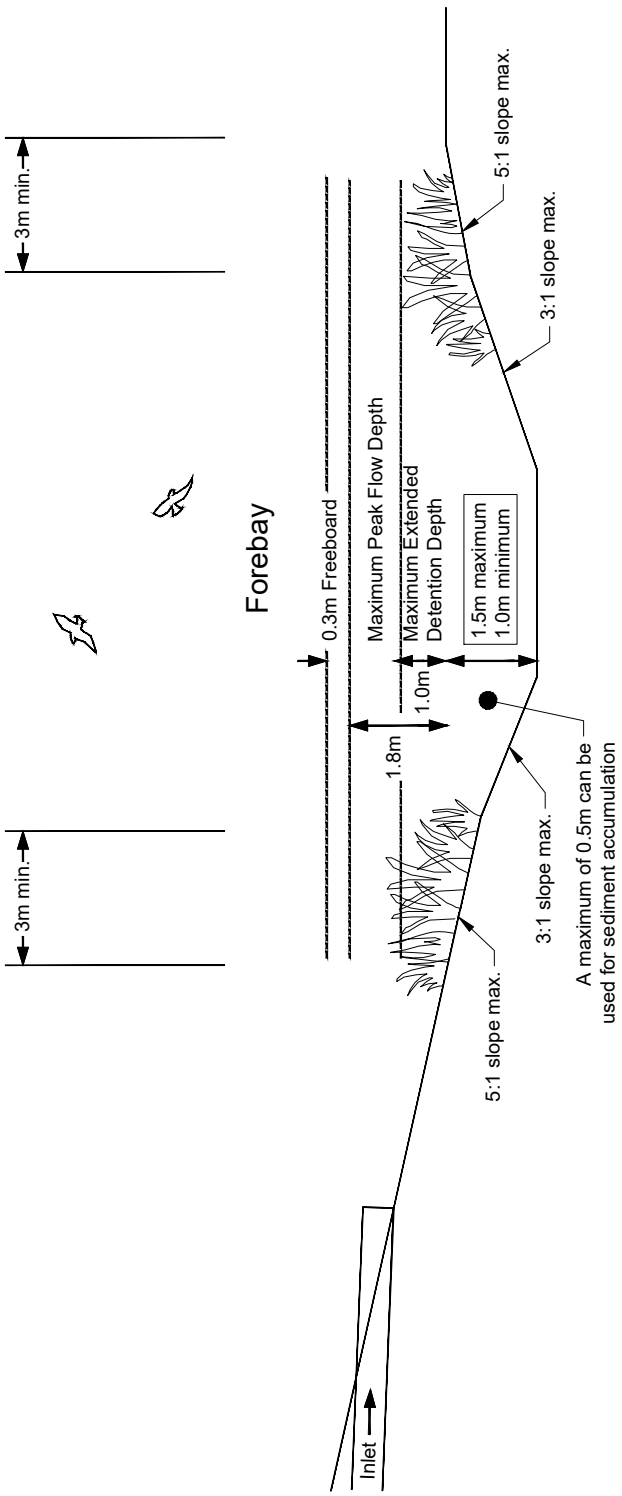






PLAN

Figure 3
Rear Lot Drainage Walkout Details



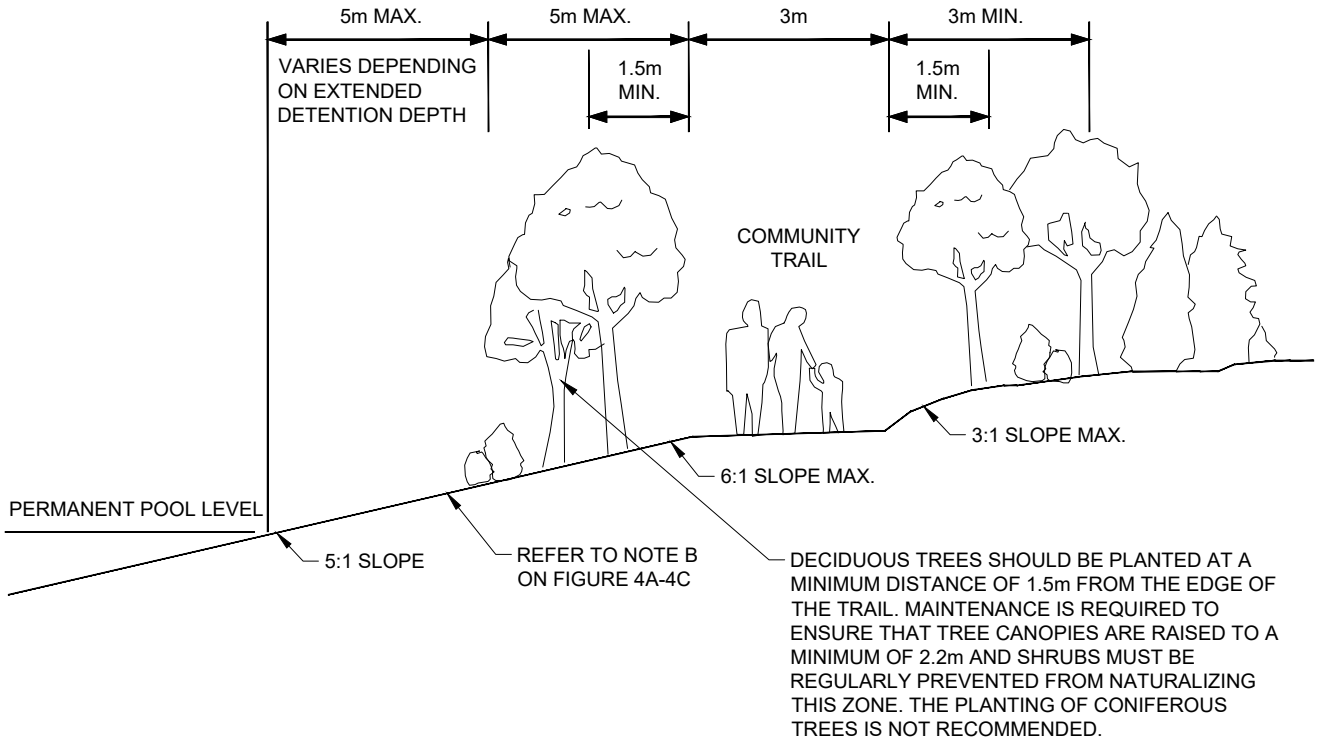
Note:

1. In order to prevent surcharging of storm sewers upstream, storm sewer pond inlet inverts shall not be lower than the maximum extended detention level.
2. Forebays shall not exceed 33% of the total permanent pool surface area. Excluding maintenance access routes. All access to forebays shall be discouraged through the shrub plantings.

Figure 4
Forebay Detail

CITY OF Guelph
Making a Difference

N.T.S.



TO ENHANCE USER COMFORT AND SAFETY, A 3.0m ZONE ON EACH SIDE OF THE COMMUNITY TRAIL SHALL BE DESIGNED IN SUCH A WAY THAT SIGHTLINES ARE PRESERVED. IF BARRIERS ARE REQUIRED, THEY MUST NOT INTERFERE WITH VISIBILITY OR CREATE ENTRAPMENT AREAS. IN SITUATIONS WHERE A COMMUNITY TRAIL IS DESIGNED WITHIN A MAXIMUM PEAK FLOW DEPTH ZONE, THE 3.0m SEPARATION ABOVE THE TRAIL SHALL HAVE A MAXIMUM SLOPE OF 3:1. BELOW THE TRAIL, THE 3.0m SEPARATION SHALL HAVE A MAXIMUM SLOPE OF 6:1. THIS ZONE SHALL BE PLANTED WITH LOW GROUND COVERS.

Figure 5
Community Trail Schematic

N.T.S.

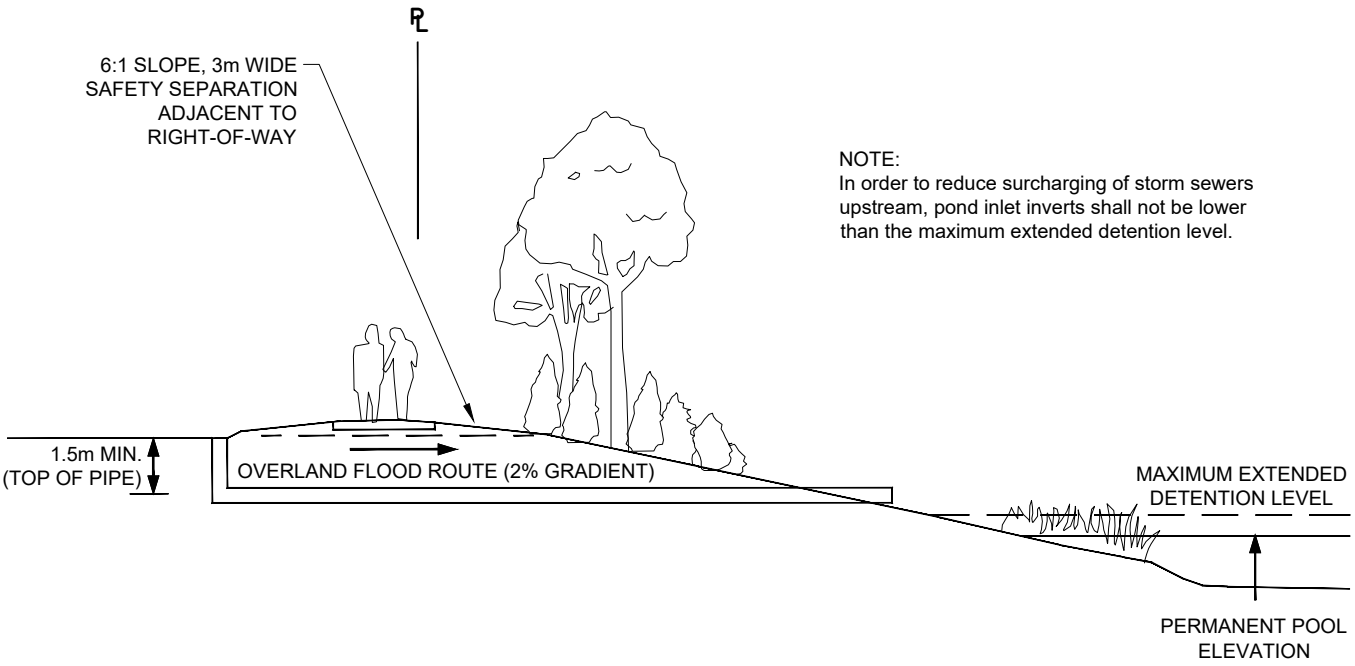


Figure 6
Pond Inlet Schematic

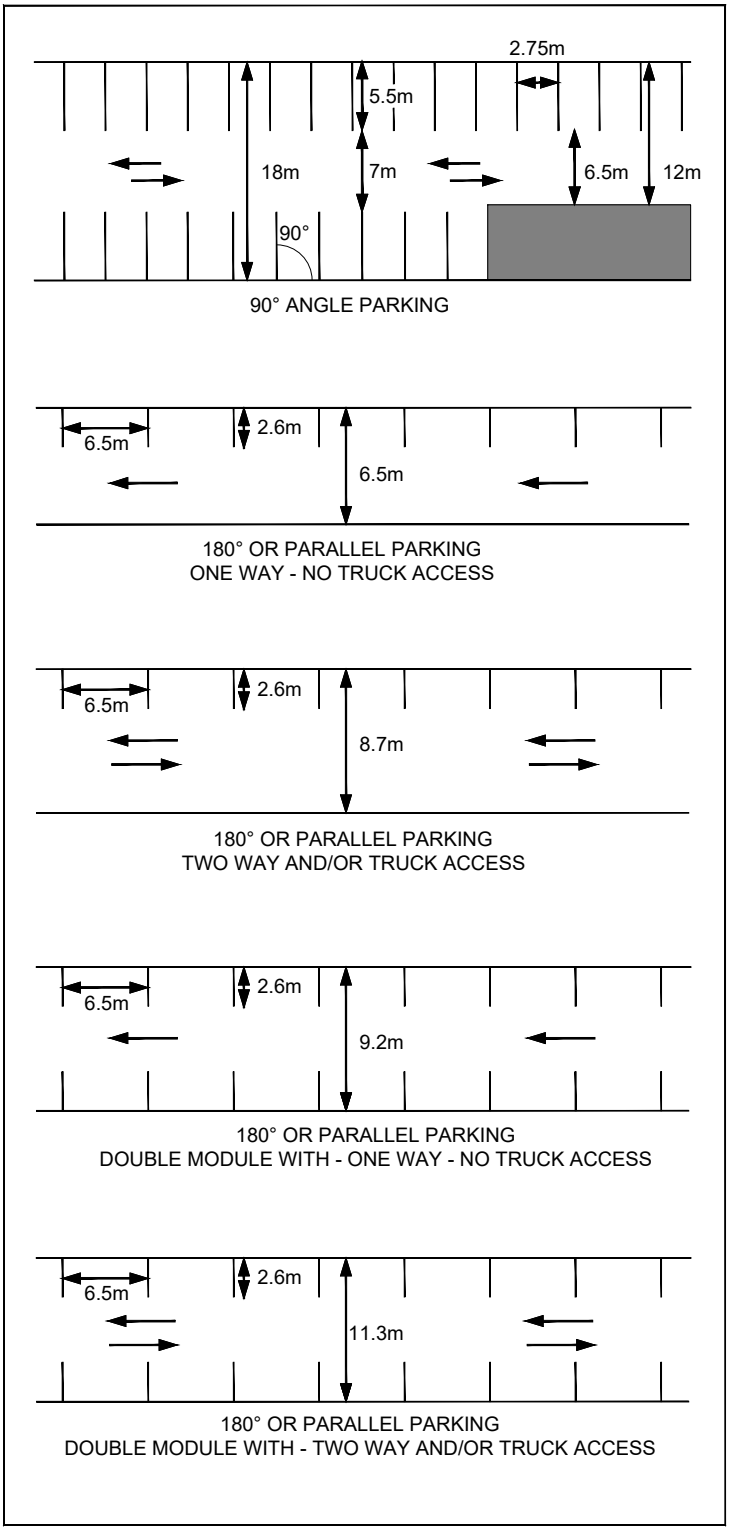


Figure 7
Parking Design Requirements

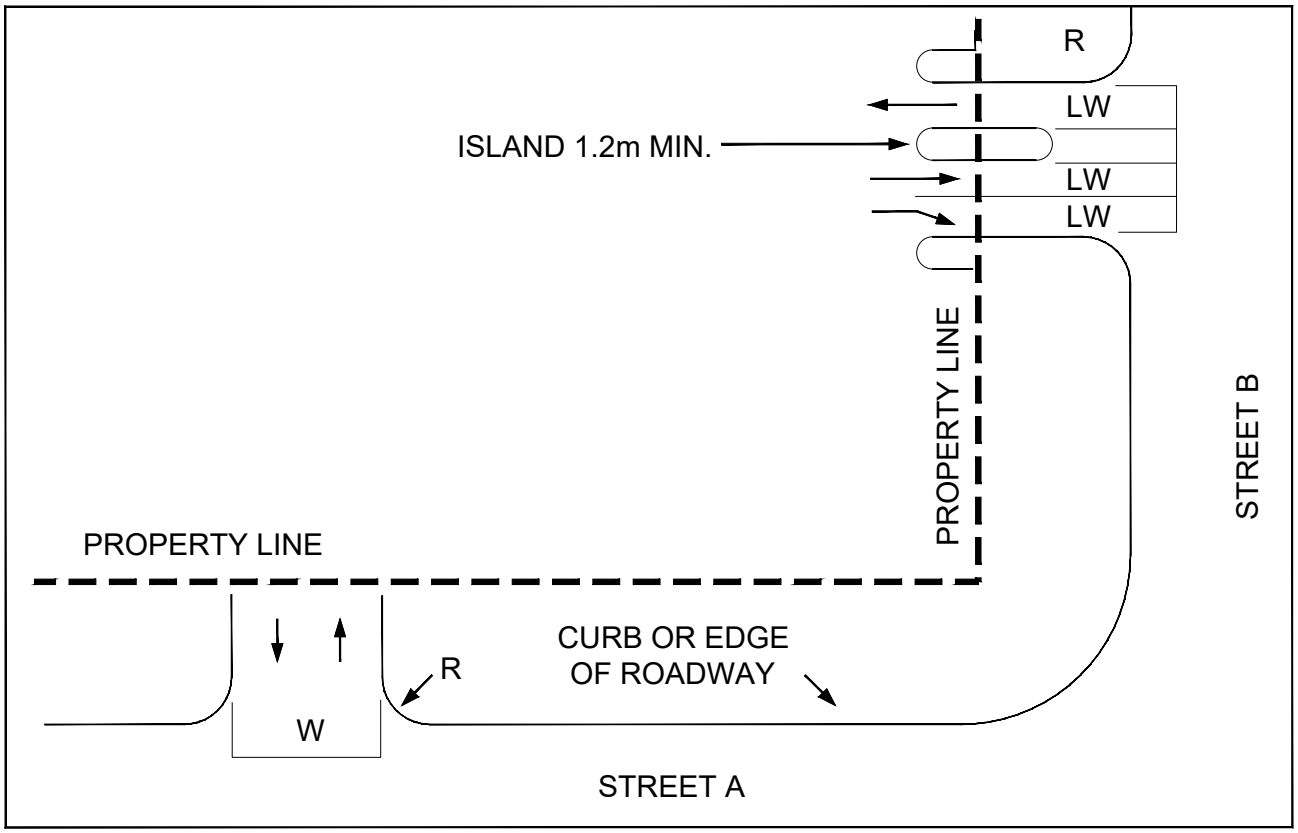


Figure 8
Access Details 1

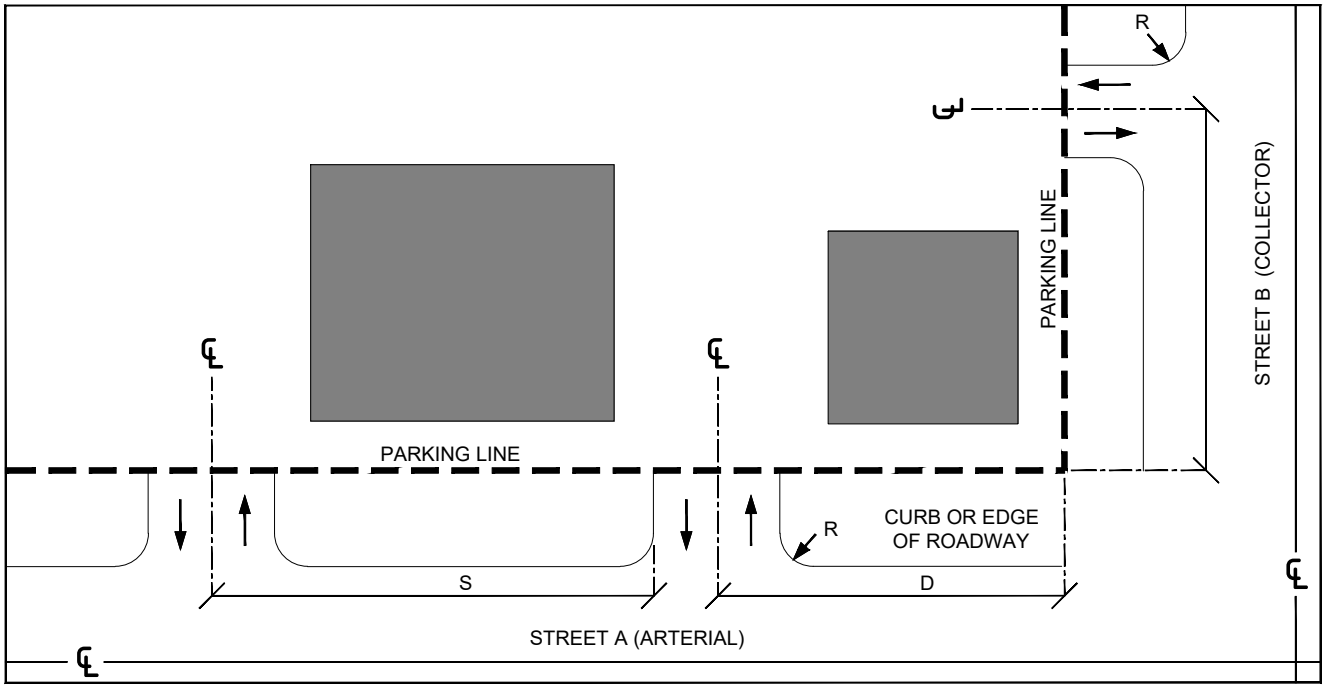


Figure 9
Access Details 2

8.0 Appendices

Appendix A – Sewer Design Sheet Samples (Sanitary and Storm)

Appendix B – Sign Templates & Details

Appendix C – Grading Certificate Templates

Appendix D – Site Plan Cost Estimate Template

Appendix E – Capacity Check Assessment Framework

Appendix F – City of Guelph Meter Chamber Specification

Appendix G – Stormwater Design Criteria and Targets

Appendix A
Sewer Design Sheet Samples

Project: _____
Designed by: _____
Date: _____

City of Guelph
Sanitary Sewer Design Sheet

LINE & LOCATION				RESIDENTIAL					ICI				FLOW CALCULATIONS							SANITARY SEWER DESIGN						
Street	Catchment ID	Maintanence Hole		Residential Area	Single & Semi Units	Townhome Units	Appartment Units	Total Residential Population	Area	Unit Sewage Flow	Flow Unit	Total Area	Resiential Peaking Factor	Population Flow	ICI Peaking Factor	ICI Flow	Extraneous Flow	Peak Design Flow	Cumulative Flow	Pipe Length	Proposed Pipe Dia.	Slope of the Sewer	Capacity Full	Full Velocity	Actual Velocity	Capacity Ratio
		From	To	A				P	A			A	M	Q_p	M	Q_i	Q_e	Q_d	Q_c	L	D	S	Q	V_f	V_a	
				(ha)					(ha)			(ha)		(L/s)		(L/s)	(L/s)	(L/s)	L/s	(m)	(mm)	(%)	(L/s)	(m/s)	(m/s)	(%)

* ICI columns may vary based off of site specific requirements

Sanitary Sewer Design Sheet
Parameters and Equations

Population Density - DEM Section 5.6.1.c.
A summary can be seen within the table below.

	pp/u
Singles and Semis	3.4
Townhomes	2.45
Appartments	1.86

Residential Peaking Facor - DEM Section 5.6.1.b.

$$M = 1 + \frac{14}{4 + \sqrt{P}}$$

where P is population in thousands
Minimum PF = 2
Maximum PF = 4

Population Flow - DEM Section 5.6.1.

$$Q_p = \frac{PqM}{86.4}$$

Where as per DEM Section 5.6.1.a, q is the average daily per capita flow of 300 L/cap/
where P is the population in thousands

ICI Flows and Peaking Factors - DEM Section 5.6.2.
Please refer to section 5.6 of the DEM.

Extraneous Flow Coefficient - DEM Sections 5.6.1. and 5.6.2.
Extraneous flows as per DEM Section 5.6.1.d of 0.25 L/s/ha, not
included in areas that do not contribute flows (grassy areas, parks, etc.)

Extraneous Flow - DEM Sections 5.6.1. and 5.6.2.

$$Q_e = IA$$

Peak Design Flow - DEM Section 5.6.

$$Q_d = Q_p + Q_e + Q_i$$

Capacity Full - DEM Section 5.6.

$$Q = \pi(\frac{d}{2})^2 * V_f$$

Full Velocity - DEM Sections 5.6.

$$V_f = Q\pi d^2$$

where:
Minimum Velocity = 0.6 m/s
Maximum Velocity = 3.0 m/s
n is the roughness coefficent of 0.013 (DEM Section 5.6 item #4)

Actual Velocity - DEM Section 5.6.

$$V_a = \left(\frac{d}{4} * \left(\frac{1 - sin\theta}{\theta}\right)\right)^{2/3} * \frac{S^{0.5}}{n}$$

where:
Minimum Velocity = 0.6 m/s
Maximum Velocity = 3.0 m/s
n is the roughness coefficent of 0.013 (DEM Section 5.6 item #4)
Actual velocities to be established, not theoretical full pipe conditions.
Required to help prevent operational problems including solids
seposition and H2S generation.

Capacity Ratio - DEM Section 5.6.

$$\text{Capacity Ratio} = \frac{Q_e}{Q}$$

For sewers greater than 450mm diameter:
Design flow at maximum 70% full and trigger upsizing at 80% full
For sewers equal or less than 450mm diameter:
Design flow at maximum 70% full and trigger upsizing at 70% full

Project: ____________________

Designed by: ____________________

Date: ____________

City of Guelph

Storm Sewer Design Sheet

5 year Storm	
A	632.75
B	-0.741

LINE & LOCATION				TRIBUTARY AREA			ACCUM. "AxC"	CONCENTRATION TIME			Design frequency (Return Period)	Rainfall Intensity	Total Runoff Q=kACi	STORM SEWER DESIGN						
Street	Catchment ID	Maintanence Hole		Incremental Area	Run-off Coefficient	Incremental "AxC"		Inlet	In Pipe	Total				Pipe Material	Pipe Length	Proposed Pipe Dia.	Slope of the Sewer	Capacity	Velocity Full	Percentage Capacity
		From	To	A	C	AC	AC	T_c	T_p	T		I	Q		L	D	S	Qf	Vf	
				(ha)		(ha)	(ha)	(min)	(min)	(min)	year	(mm/h)	(m^3/s)		(m)	(mm)	(%)	(m^3/s)	(m/s)	(%)

Storm Sewer Design Sheet
Parameters and Equations

Runoff Coefficients - DEM Section 5.5.1.3

Surface Character	Runoff Coeff.	Surface Character	Runoff Coeff.
Parks*		semi-detached	0.70
greater than 4 hectares	0.20	townhouses	0.75
less than 4 hectares	0.25	apartments	0.75
Single family residentiall*		schools	0.75
greater than 18m frontage	0.55	churches	0.75
12 to 18m frontage	0.60	industrial	0.90
less than 12m froontage	0.65	commercial	0.90
		heavily developed areas	0.90
		pavement & roof	0.90

The percent impervios (I) can be calculated based on the corresponding runoff coefficient using the following relationships:

$$I = \frac{C - 0.2}{0.7}$$

Where,

$$C = 0.2(1 - I) + 0.9I$$

Concentration Time - DEM Section 5.5

Inlet (T_c): Parks and single detatched residentioal shall use a rainfall intensity based off a 10 minute entry time.
All other land uses shall use a rainfall intensity based on a 5 minute time of entry.
For downstream storm sewers, inlet time is taken from the previous total time in concentration.
If there are multiple inlets, the maximum time in concentration is used.

In Pipe (T_p): $T_p = \frac{L}{V_f/60}$

Total (T): $T_c = Tc + Tp$

Rainfall Intensity - DEM Section 5.5.1.1

Intensity is calculated using the following formula

$$I = AT_c^B$$

Rainfall is calculated based off the design frequency, in standard cases the City of Guelph requires storm sewers to be designed using the 5 year design storm outlined on the City of Guelph Intensity-Duration Curves shall operate without surcharge.
The intensity duration frequency curve can be found in the City's DEM Section 5.5.1.2. Parameters for each rainfall event are as follows.

Design Year	A	B
2	475.61	-0.738
5	632.75	-0.741
10	721.92	-0.736
25	822.74	-0.725
50	893.8	-0.719
100	953.29	-0.711

Total Runoff - DEM Section 5.5.1

$$Q = kCIA$$

Where, k is the converstion factor (0.00278)

Capacity - DEM Section 5.5

$$Q_f = \frac{\pi d \left(\frac{d}{4}\right)\left(\frac{d}{4}\right)^{2/3} S^{0.5}}{n}$$

Where n is the roughness coefficient, as per DEM Section 5.5.1, the value is to be as follows

Concrete, PVC, HDPE n = 0.013
Corrugated Steel Pipe (CSP) n = 0.024

Velocity Full - DEM Section 5.4.1 items 20 and 21

$$V_f = \frac{Q_f}{\pi d^2/4}$$

Note: the following standards apply as per the DEM

Min. Velocity 0.600 m/s for pipes < 825mm
Min. Velocity 1.200 m/s for pipes > 900mm
Max. Velocity 6.000 m/s

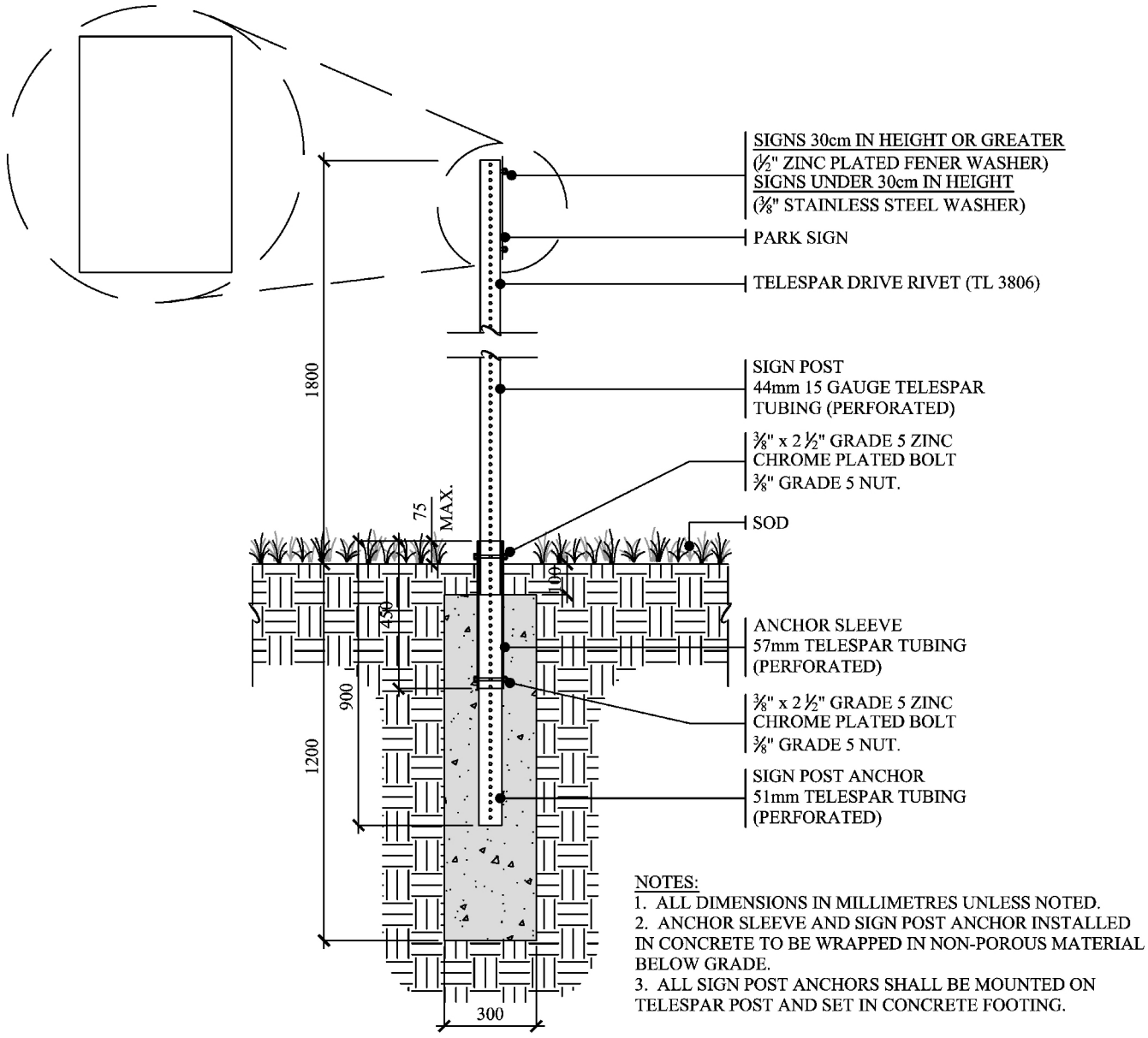
Percentage Full - DEM Section 5.5

$$Percentage\ Full = \frac{Q_f}{Q}$$

Note: As per DEM Section 5.5.1:

Maximum allowable capacity of storm sewers are to be 95%.
Maximum allowable capacity of trunk sewers (1200mm diameter or larger) are to be designed to 85%.

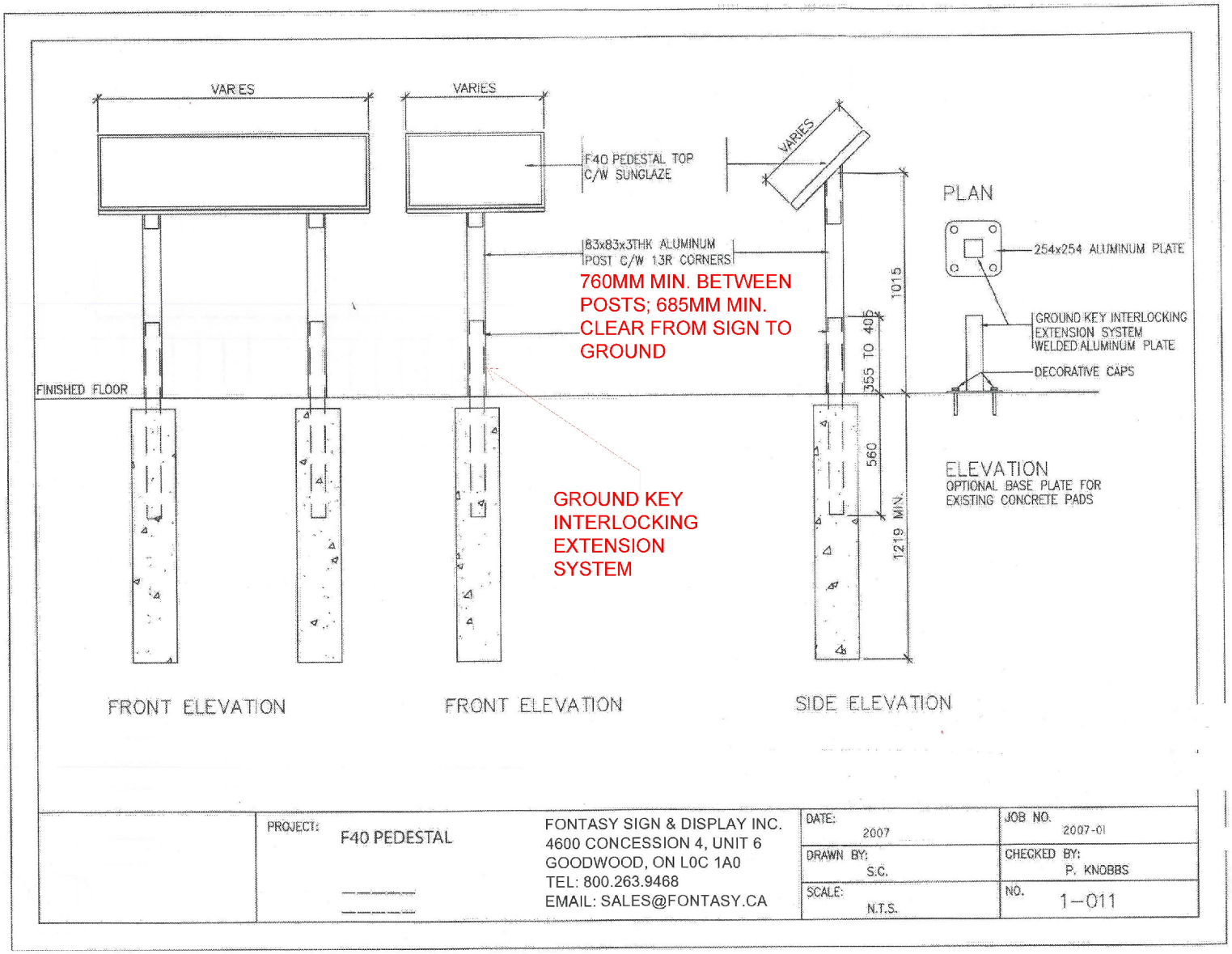
Appendix B
Sign Templates & Details



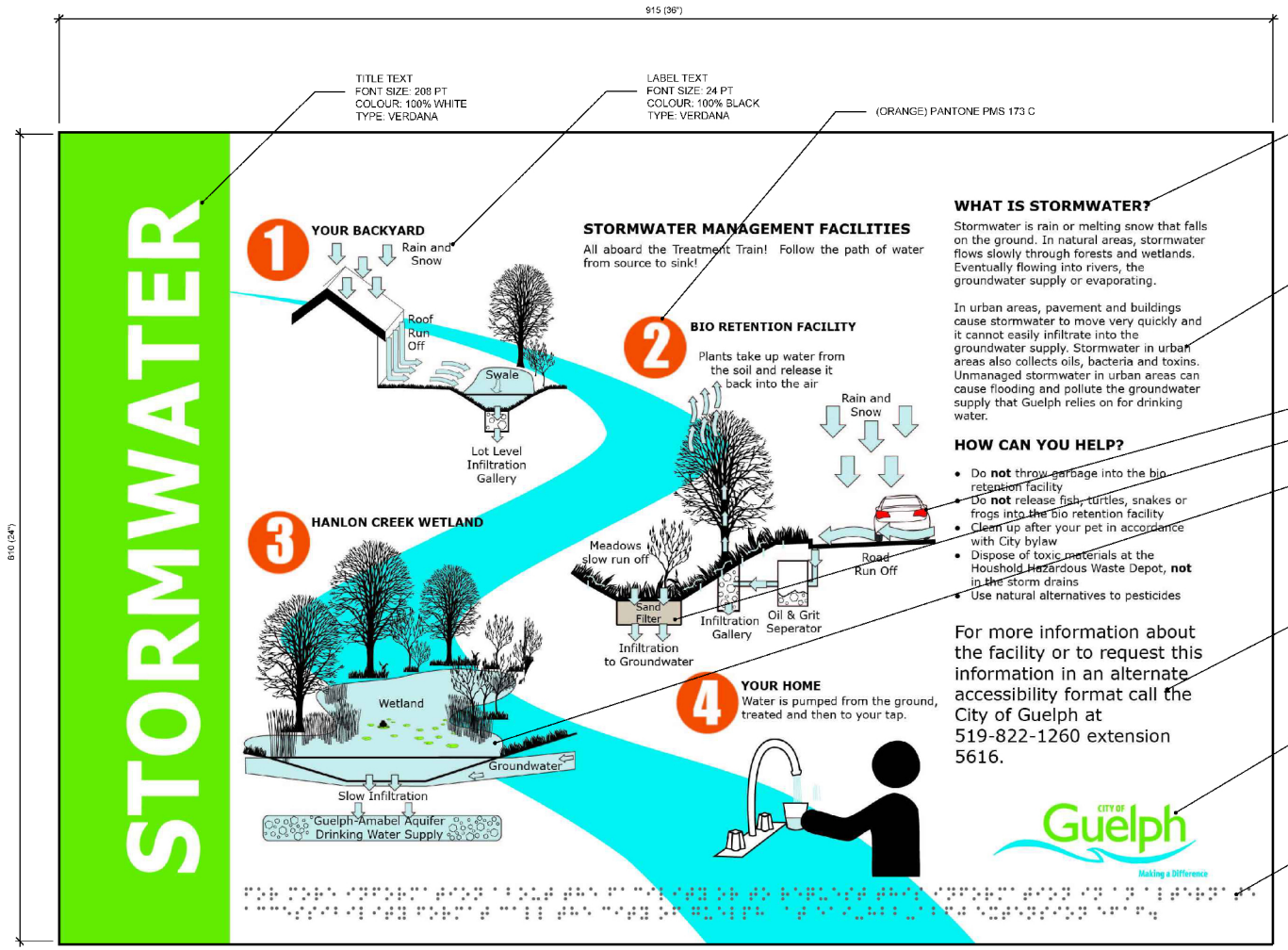
NOTES:
1. ALL DIMENSIONS IN MILLIMETRES UNLESS NOTED.
2. ANCHOR SLEEVE AND SIGN POST ANCHOR INSTALLED IN CONCRETE TO BE WRAPPED IN NON-POROUS MATERIAL BELOW GRADE.
3. ALL SIGN POST ANCHORS SHALL BE MOUNTED ON TELESPAR POST AND SET IN CONCRETE FOOTING.

CITY OF GUELPH SIGN POST DETAIL

Appendix B
Sign Post Detail



Appendix B
Sign Elevations



SUPPORT TYPE: F40 PESESTAL

1 / LP-7 STORMWATER EDUCATIONAL SIGN GRAPHIC N.T.S.

NOTES:
1. SIGN TO BE SUNGLAZE ENAMEL TYPE SIGN MOUNTED ON F40 TYPE PEDESTAL BY FONTASY SIGN & DISPLAY INC. T: 1.800.263.9468 OR APPROVED ALTERNATE.
2. CONTRACTOR TO CONTACT ABOUD & ASSOCIATES INC. T.519.822.6839 FOR DIGITAL GRAPHICS FILE.
3. SIGN LAYOUT TO COMPLY WITH CITY OF GUELPH "CORPORATE IDENTITY GUIDELINES".
4. FINAL GRAPHIC, COLOURS AND TEXT TO BE APPROVED IN WRITING BY CITY PRIOR TO MANUFACTURING OR INSTALLATION OF SIGN.
5. CONTRACTOR TO PROVIDE LANDSCAPE ARCHITECT WITH PROOF SUPPLIED BY MANUFACTURER FOR REVIEW PRIOR TO MANUFACTURING OF SIGN.

Appendix B
Stormwater Educational Sign Graphic

CITY OF Guelph
Making a Difference

300mm x 450mm ALUMINUM SIGN COMPLETE WITH 38mm RADIUS CORNERS

8mm TEXT HEIGHT - VERDANA FONT WHITE LETTERING ON ROYAL BLUE BAND

BLACK BORDER AS PER CITY LOGO COLOURS, 10mm WIDE PAINTED ONTO WHITE BACKGROUND

BLACK SYMBOL

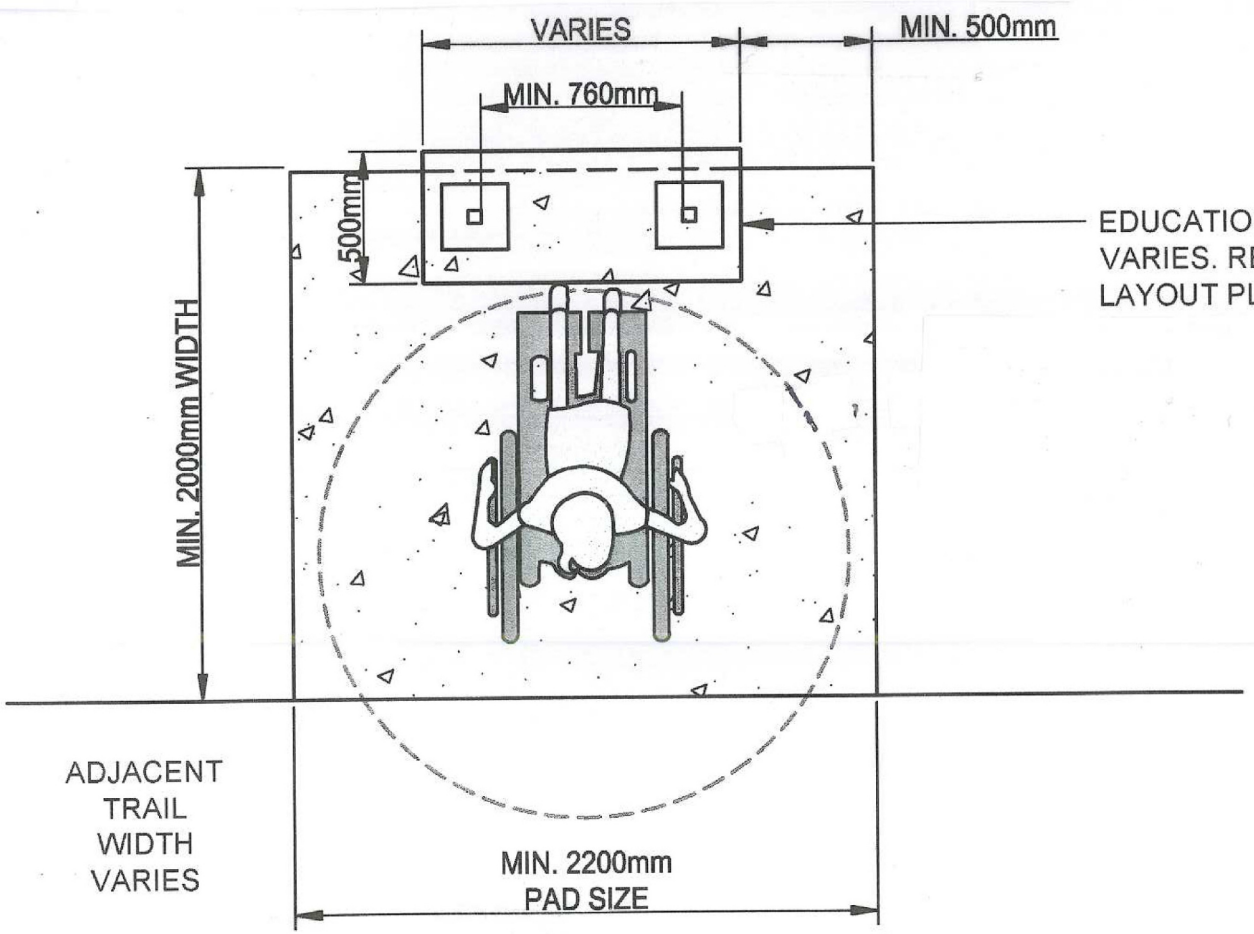
RED CIRCLE AND CROSSING

NOTES:

1. THE BACKGROUND, BORDER AND LETTERING SHALL ALL BE ON ONE COATING LAYER; NO TRANSFERS ALLOWED. USE REFLECTIVE COATING.
2. INSTALL SIGN AS SOON AS STORMWATER FACILITY CONSTRUCTION IS COMPLETE, PRIOR TO FIRST HOME OCCUPANCY.
3. SIGN PROOF TO BE APPROVED BY CITY PRIOR IN WRITING PRIOR TO FABRICATION AND INSTALLATION.

Appendix B

SWM Facility Environmentally Sensitive Area



NOTES:

1. ALL PADS TO HAVE A MAX 2% SLOPE.

EDUCATIONAL SIGNAGE ACCESSIBLE CONCRETE PAD LAYOUT

N.T.S.

Appendix B

Accessible Concrete Pad Layout

Appendix C
Grading Certificate Templates

Final Lot Grading and Drainage Certificate

Date:

File:

MUNICIPAL ADDRESS:
PIN:
Being LOT/BLOCK:
REGISTERED PLAN:

The undersigned (a Professional Engineer or Ontario Land Surveyor, licensed in the Province of Ontario) hereby certifies to the Corporation of the City of Guelph (the City) that the fine grading including topsoil and/or sod on the above-noted property has been constructed, in general conformance with the overall Approved Grading Plan referred to in the Subdivision Agreement registered against the title of the said property.

The undersigned further certifies to the City that:

1. The final grading of the above referenced property has been completed in substantial compliance with the overall Approved Grading Plan described in the Subdivision Agreement.

2. The grade elevation of all lot boundaries, corners, and transitional change points of the property are in substantial conformance with the overall Approved Grading Plan.

3. The lot has been graded to provide positive drainage in the front, rear and side yard in substantial conformance with the overall Approved Grading Plan.

4. The location of drainage swales, be it in the rear and/or side yard of the property are in substantial conformance with the overall Approved Grading Plan.

This certificate is given and delivered to the City in full knowledge that the City relies on this certification in providing a release of the applicable Subdivision Agreement affecting this property. This certification shall not relieve the Builder/Developer of his responsibility to correct any lot settlements or deficiencies that may occur.

PROFESSIONAL: _____

Signature, Seal, and Date

FIRM: _____

Company Name and Address

Standard Grading Certification Letter

Date:

File:

DEVELOPMENT APPLICATION TYPE:
MUNICIPAL ADDRESS:
PIN:
Being LOT/BLOCK:
REGISTERED PLAN:

The undersigned (a Professional Engineer or Ontario Land Surveyor, licensed in the Province of Ontario) hereby certifies to the Corporation of the City of Guelph (the City) that they have reviewed the final fine grading on above-noted site and have viewed the finished building thereon and do hereby certify that the grading is in general conformity with the Approved Plans referred to in the registered agreement.

Also, we hereby certify:

1. The final grading of the above referenced property has been completed in substantial compliance with the overall Approved Grading Plan described in the Subdivision Agreement.

2. The grade elevation of all lot boundaries, corners, and transitional change points of the property are in substantial conformance with the overall Approved Grading Plan.

3. All infrastructure structures, valves and appurtenances present on the property have been adjusted to the final grade, are uncovered and in a clean condition.

This certificate is given and delivered to the City in full knowledge that the City relies on this certification. This certification shall not relieve the Builder/Developer of his responsibility to correct any grading deficiencies that may occur.

PROFESSIONAL: _____

Signature, Seal, and Date

ENGINEERING FIRM: _____

Company Name and Address

Appendix D
Site Plan Cost Estimate Template

Developer's Site Service Estimate

This is an estimate only.
Applicant / Owner is responsible
for actual cost which may be
more or less than this estimate.

Location:						
Preparer:						
Date:						
Site Plan #:						
Item No.	**Spec. No.**	**Item Description**	**Estimated Quantity**	**Unit**	**Rate**	**Subtotal**
		SECTION 'A' - SITE WORKS AND REMOVALS				
1.0	OPSS 706	Traffic and pedestrian control	1.00	l.s.		
2.0		Bonding		l.s.		
3.0	OPSS 180 OPSS 510	Removals including disposal off-site: Asphalt pavement of all types to max. 200mm including saw cutting.		m^2		
4.0	OPSS 180 OPSS 510	Removals including disposal off-site: Concrete curb and gutter (all types)		m		
5.0	OPSS 180 OPSS 510	Removals including disposal off-site: Concrete sidewalk, ramps and driveways		m^2		
6.0	OPSS 180 OPSS 510	Removals including disposal off-site: Boulevards, excavated to 150mm		m^2		
		TOTAL SECTION 'A'				$ -
		SECTION 'B' - WATER SERVICE				
1.0	SS-200	Supply and install __[diameter]mm __[material: copper, PVC] water service as per drawing and specifications including all connections and curb stop, tap by qualified contractor.		m		
2.0	SS-200	Supply and install __[diameter]mm __[item: curb stop, water valve, tapping T and valve] at __[location: main, property line] as per specifications including all connections, tap by qualified contractor.		each		
3.0	SS-200	Plug existing __[diameter]mm water service at main, including cutting and removing curb stop box and rod at property line and abandoning remaining non-live water service in right-of-way.		each		
		TOTAL SECTION 'B'				$ -
		SECTION 'C' - SANITARY SEWERS				
1.0	SS-100	Supply and install __[diameter]mm __[material] sanitary service lateral as per instruction and drawings including connection to existing main by coring and boot.		m		
2.0	SS-100	Supply and install __[diameter]mm __[type: precast, doghouse] sanitary MH as per instruction and drawings including connections.		each		
3.0	SS-100	Provisional: Cap and plug existing sanitary lateral at property		each		
		TOTAL SECTION 'C'				$ -
		SECTION 'D' - STORM SEWERS				
1.0	SS-100	Supply and install __[diameter]mm __[material] storm service as per instruction and drawings including connection to existing main by coring and boot.		m		
2.0	SS-100	Supply and install __[diameter]mm __[type: precast, doghouse] storm MH as per instruction and drawings including connections.		each		
3.0	SS-100	Provisional: Cap and plug existing storm lateral at __[location: main, property line]		each		

Developer's Site Service Estimate

This is an estimate only.
Applicant / Owner is responsible
for actual cost which may be
more or less than this estimate.

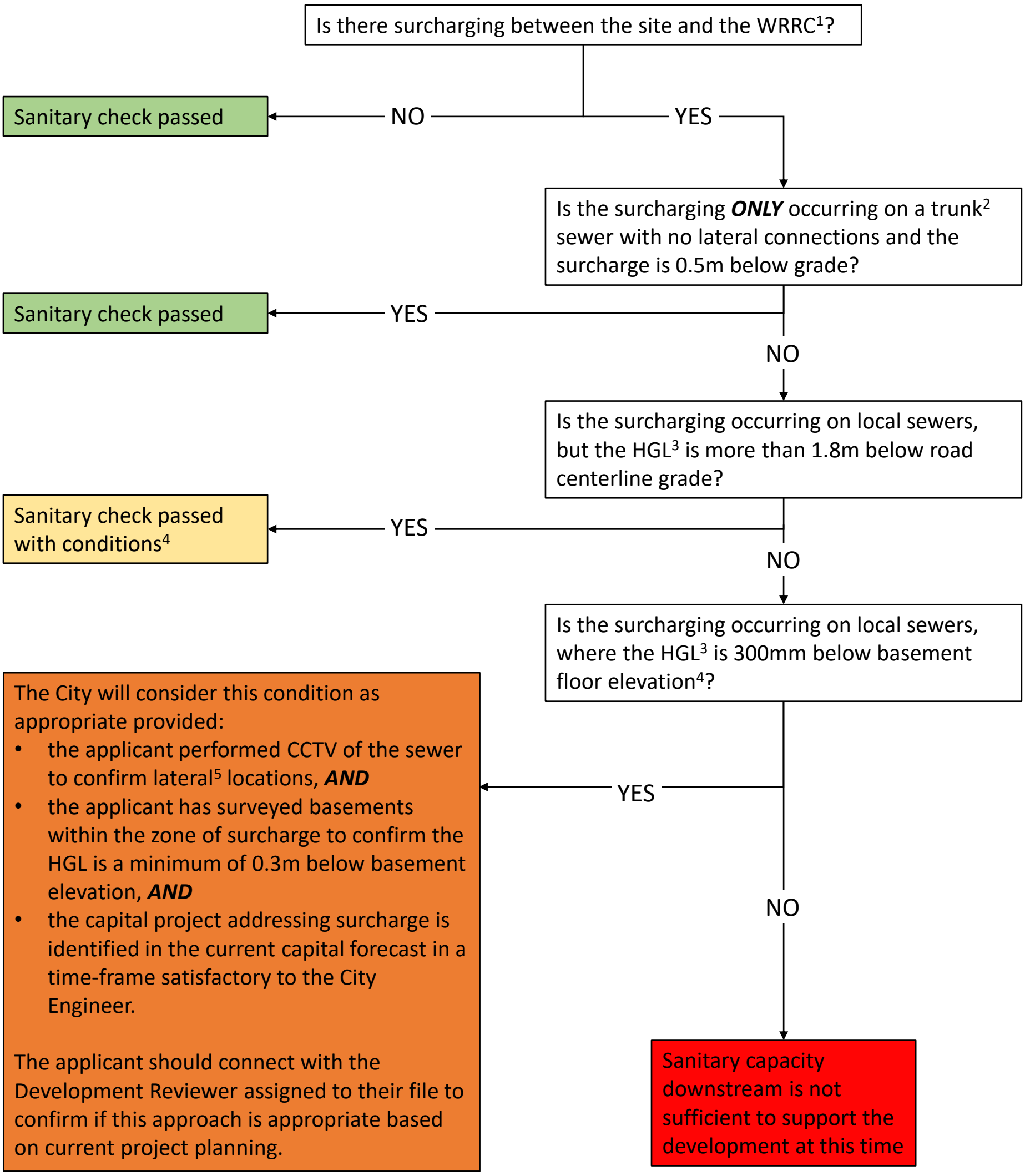
Location:						
Preparer:						
Date:						
Site Plan #:						
Item No.	**Spec. No.**	**Item Description**	**Estimated Quantity**	**Unit**	**Rate**	**Subtotal**
		TOTAL SECTION 'D'				$ -
		SECTION 'E' - ROAD WORKS				
1.0	SS-16 OPSS904 OPSS1350	Concrete curb and gutter		metre		
2.0		Granular 'A', 175mm		tonne		
3.0		HL-8, __[depth]mm (Road restoration)		tonne		
4.0		HL-3, __[depth]mm (Road restoration)		tonne		
5.0						
6.0						
7.0	SS-16 OPSS904 OPSS1350	Provisional: Concrete barrier curb (driveway)		m		
8.0	SS-17 SS-27 OPSS904 OPSS1350	Concrete sidewalk -1.5 metres width		m^2		
9.0	SS-20 OPSS521	Supply and place screened topsoil and nursery sod		m^2		
10.0		Line painting restoration		ls		
		TOTAL SECTION 'E'				$ -
		SECTION 'F' - GENERAL AND PROVISIONAL				
1.0		Supply and place imported Granular 'B', as directed		tonne		
2.0	OPSS 510/314, SP32/34	Restidential entrance (200mm Granular 'A', 50mm HL-3F) including excavation and compaction		m^2		
3.0	OPSS 510/314, SP32/33	Commercial entrance (300mm Granular 'A', 50mm HL-8, 40mm HL-3F) including excavation and compaction		m^2		
4.0		Supply and install non shrink fill, 10MPa concrete (utilities)		m^3		
5.0		Hold / support utility pole		each		
6.0		Temporary asphalt curb and gutter (hot mix)		m		
7.0		Streetsweeping, including only hours spent on-site		hr		
8.0		Winter heat for asphalt		tonne		
9.0		Winter heat for concrete curb, including blankets as required		m		

This is an estimate only.
Applicant / Owner is responsible
for actual cost which may be
more or less than this estimate.

Location:						
Preparer:						
Date:						
Site Plan #:						
Item No.	**Spec. No.**	**Item Description**	**Estimated Quantity**	**Unit**	**Rate**	**Subtotal**
10.0		Winter heat for concrete sidewalk, including blankets as required		m2		
11.0		Removals including disposal off-site: Breaking out frost		m^3		
12.0		Removals including disposal off-site: Breaking out rock		m^3		
13.0		Foreman rate, including pick-up truck		hr		
14.0		Operator rate		hr		
15.0		Labourer rate, including vehicle (if required)		hr		
16.0		CCTV camera footage & review (to be completed by City of Guelph Operations Department). **Required on all applications proposing to reuse sanitary and/or storm laterals.**		each		
17.0		2x City News ads (an ad two weeks prior to and one week prior to construction). **Required on all arterial road (lane reductions, turning restrictions and closures), closures or reductions affecting Highway access and major road detours.**		each		
18.0		Weekly rate for additional adult school crossing guards, as required (to be determined by Traffic Department).		ls		
		TOTAL SECTION 'F'				$ -
		SECTION 'G' - ALLOWANCES				
1.0	Reg. 153/04	Soil Sampling - characterization of type		allow		
2.0		Hydrovac to expose existing utilities and disposal (As Directed)		allow		
3.0	SSP4	Equipment Time &Material, Subcontractor Allowance		allow		
		TOTAL SECTION 'G'				$ -
		SUBTOTAL ALL SECTIONS				$ -
		Contingency			15%	$ -
		Engineering Services: Inspection & Admin.			10%	$ -
		Traffic Services			5.3%	$ -
		Water Services			5.3%	$ -
		TOTAL ALL SECTIONS				$ -

Appendix E
Capacity Check Assessment Framework

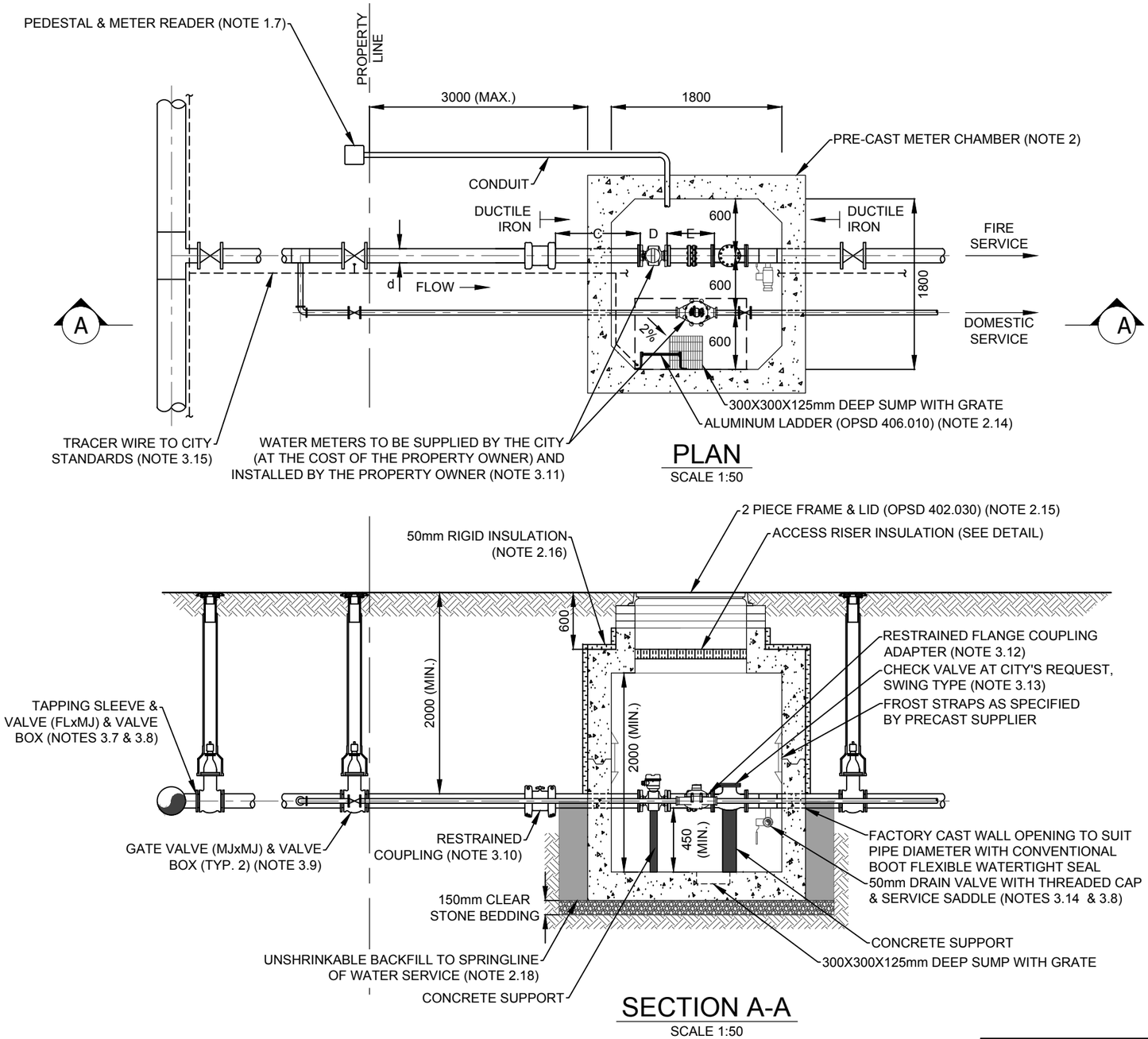
Sanitary Capacity Assessment Framework



Footnotes:
1 Water Resource Recovery Centre
2 Trunk sewers, for the purposes of this process, shall be defined as sewers 450mm in diameter or greater and with no lateral connections directly to properties
3 Hydraulic Grade Line in the 25YR Wet Weather Event, using the City's hydraulic model
4 Basement level is assumed to be 1.8m below grade, as measured from the centreline of the road. Applicant must demonstrate that there are no buildings/properties within surcharged segment that have reverse slope driveways or have a property grade lower than the road grade.
5 Applicant must perform individual survey of each lateral connection and demonstrate they are below HGL at basement connection with 300mm of freeboard

Notes:
*all questions refer to the existing pipe network, wet weather flow scenario with the proposed development flow in the City's hydraulic model
** surcharging means, for the purposes of this framework, when the HGL is above the obvert of the pipe

Appendix F
City of Guelph Meter Chamber Specification



METER TYPE:	ABB MAG METER		
SERVICE DIAMETER (mm)	C (mm) (MIN. 5d)	D (mm)	E (mm) (MIN. 2d)
100	500	250	200
150	750	300	300
200	1000	350	400
250	1250	450	500
300	1500	500	600

REFER TO NOTES FIGURE A3

CITY OF Guelph

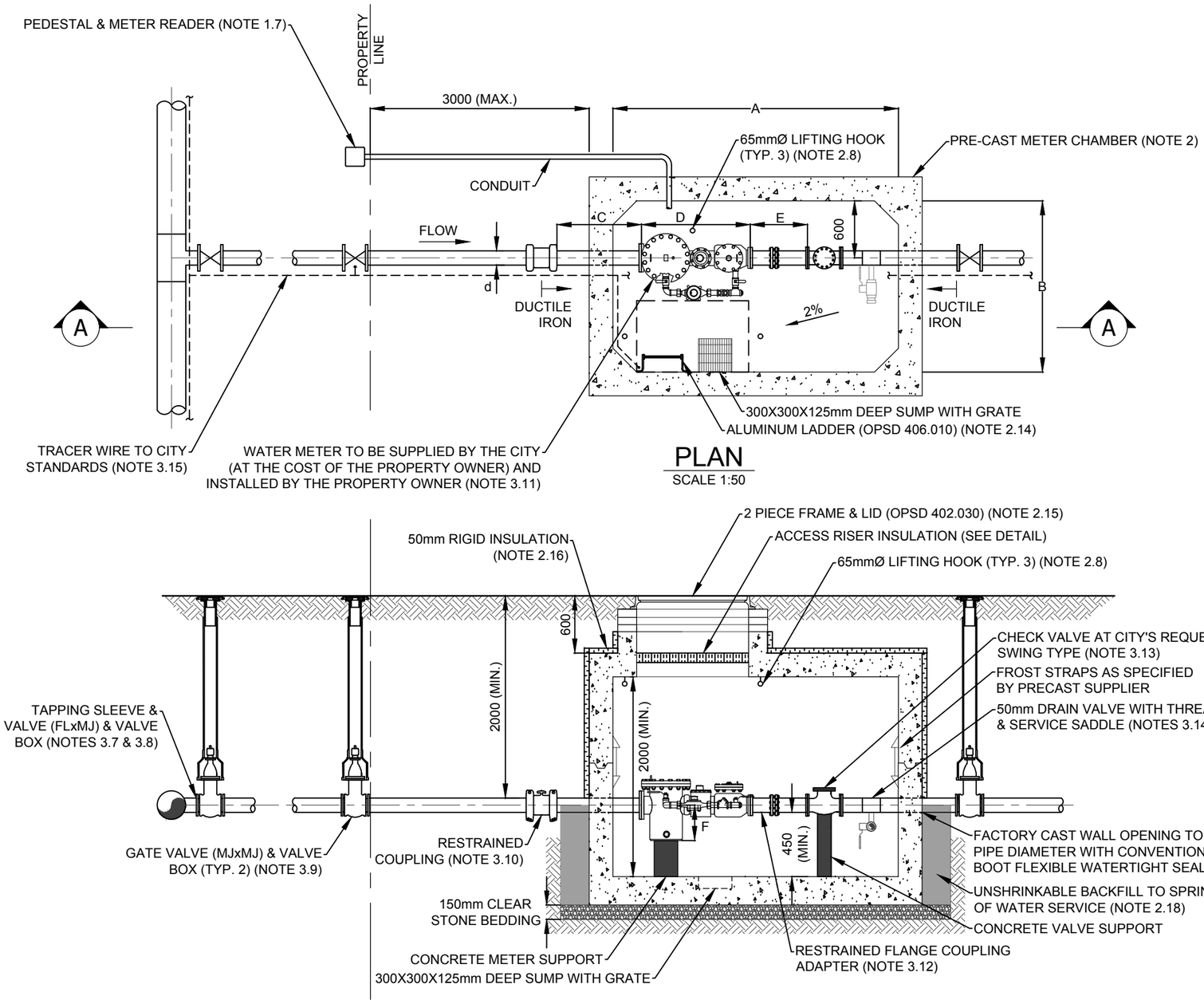
ENGINEERING SERVICES

Figure Title

METER CHAMBERS FOR 100mm TO 300mm DIA. WATER SERVICES

CHAMBER PLAN AND SECTION
ABB MAG METER & NEPTUNE T-10

Drawn	Checked	Date	Figure No.
MM	JLP	FEBRUARY 2020	**A1/A3**
Scale 1:50		BURNSIDE	



PLAN

SCALE 1:50

SERVICE DIAMETER (mm) (d)	INTERIOR CHAMBER DIMENSIONS (MINIMUM)		
	A (mm) (NO CHECK VALVE)	A (mm) (CHECK VALVE)	B (mm)
100	2400	2400	1800
150	2400	3000	1800
200	3000	3400	2000
250	3400	4100	2000

METER TYPE:	PROTECTUS III			
SERVICE DIAMETER (mm) (d)	C (mm) (MIN. 4d)	D (mm)	E (mm) (MIN. 4d)	F (mm)
100	400	838	400	254
150	600	1143	600	281
200	800	1346	800	300
250	1000	1727	1000	376

SECTION A-A

SCALE 1:50

REFER TO NOTES FIGURE A3

CITY OF Guelph

ENGINEERING SERVICES

Figure Title

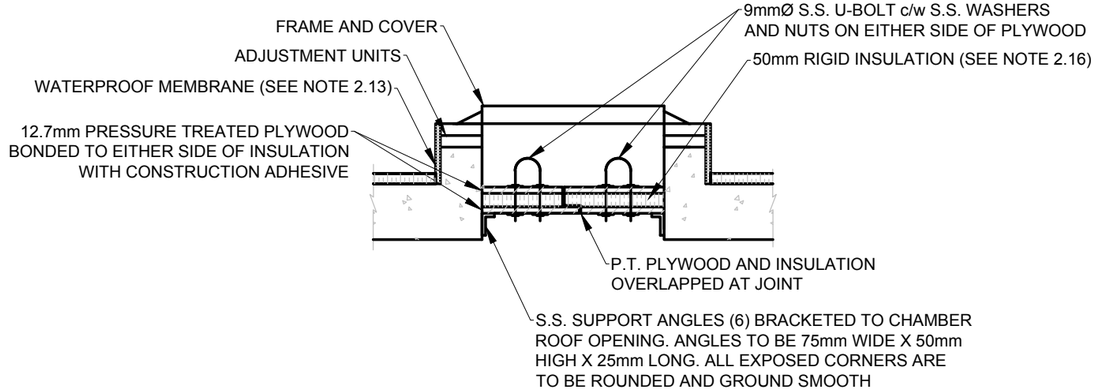
METER CHAMBERS FOR 100mm TO 250mm DIA. WATER SERVICES

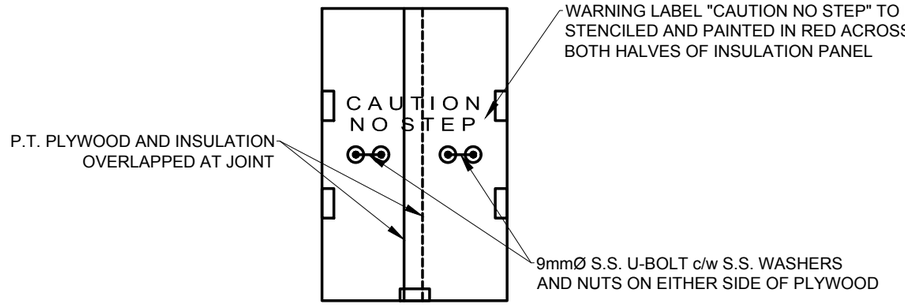
CHAMBER PLAN AND SECTION PROTECTUS III

Drawn	Checked	Date	Figure No.
MM	JLP	FEBRUARY 2020	**A2/A3**
Scale 1:50		BURNSIDE	

NOTES:

1. GENERAL:
   - 1.1. ALL MEASUREMENTS ARE NOMINAL AND IN MILLIMETRES (mm) UNLESS OTHERWISE NOTED.
   - 1.2. INTERIOR CHAMBER DIMENSIONS AS NOTED ARE MINIMUM DIMENSIONS FOR EACH WATER SERVICE DIAMETER.
   - 1.3. DIMENSIONS “C” AND “E” FOR THE STRAIGHT LENGTHS UPSTREAM AND DOWNSTREAM OF THE METER ARE MINIMUM LENGTHS FOR EACH METER TYPE AND SERVICE DIAMETER AND MUST BE ADHERED TO.
   - 1.4. NO OTHER PIPING OR FITTINGS SHALL BE INSTALLED IN THE CHAMBER THAT MAY INTERFERE WITH THE CLEAR SPACE IN FRONT OF THE WATER METER OR THE OPERATIONS OF VALVES OR THAT MAY OBSTRUCT THE METER OR VALVES IN ANY WAY.
   - 1.5. MINIMUM SURFACE GRADE AT METER CHAMBER LOCATION TO BE 1.0%.
   - 1.6. BACK-FLOW PREVENTER MAY BE REQUIRED. CONSULT WITH BUILDING SERVICES.
   - 1.7. METER READER TO BE MOUNTED TO A 100mmX100mm PRESSURE TREATED POST IN AN ACCESSIBLE LOCATION NO GREATER THAN 9.0m FROM THE CHAMBER.
2. PRE-CAST CHAMBER:
   - 2.1. PRE-CAST SECTIONS TO BE AS PER OPSS 1351 AND CSA A257.4.
   - 2.2. SUPPLIER OF PRE-CAST CHAMBER MUST VERIFY SITE CONDITIONS. THE REQUIRED SOIL BEARING CAPACITY MUST BE INSPECTED, AND THE REQUIRED BEARING CAPACITY MUST BE CONFIRMED BY A LICENSED SOIL ENGINEER.
   - 2.3. CONCRETE FOR PRE-CAST CHAMBER TO BE 35 MPa.
   - 2.4. REINFORCEMENT FOR PRE-CAST CHAMBER MUST SHALL BE TO THE LATEST VERSION OF APPLICABLE CSA STANDARDS.
   - 2.5. PRE-CAST CHAMBER SHALL BE DESIGNED BY A PROFESSIONAL ENGINEER LICENSED IN ONTARIO.
   - 2.6. ALL CONCRETE SHALL BE C-1 EXPOSURE CLASS.
   - 2.7. LOADING REQUIREMENTS FOR PRE-CAST CHAMBER:
     - 2.7.1. SUPERIMPOSED DEAD LOAD FROM SOIL COVER = 13.2kPA; LIVE LOAD = CSA S6-14, CANADIAN HIGHWAY BRIDGE DESIGN CODE (CHBDC), CL-625-ONT TRUCK LOADING.
     - 2.7.2. SIDE WALL LOADING-TYPICAL: SURCHARGE LIVE LOAD = CHBDC CL-625-ONT TRUCK LOADING.
     - 2.7.3. CHAMBER TO RESIST UPLIFT FROM EXTERNAL GROUNDWATER ELEVATION AT FINISHED GRADE. ONLY MASS OF CHAMBER, SOIL ON ROOF, AND SOIL DIRECTLY ABOVE BASE SLAB TOE PROJECTION MAY BE USED TO RESIST HYDROSTATIC UPLIFT.
   - 2.8. LIFTING HOOKS SHALL INSTALLED ON THE UNDERSIDE OF THE CHAMBER CEILING AT THE LOCATIONS AS INDICATED ON THE DRAWING. EACH LIFTING HOOK IS TO HAVE A 65mmØ EYE AND IS TO BE SUITABLE FOR LIFTING A WATER METER WITH A MASS OF UP TO 410 kg. ALL EXPOSED METAL SHALL BE STAINLESS STEEL OR HOT DIP GALVANIZED AFTER FABRICATION. LIFTING HOOKS AND ANCHORAGE SHALL BE COORDINATED WITH THE CHAMBER STRUCTURAL DESIGN AND DESIGNED BY A PROFESSIONAL ENGINEER LICENSED IN ONTARIO.
   - 2.9. FLOOR TO SLOPE TO SUMP ≈ 2%.
   - 2.10. ALL MORTAR MIX TO BE 1:3.
   - 2.11. ALL JOINTS AND LIFT HOLES IN CHAMBER SECTIONS TO BE FILLED WITH MORTAR BEFORE BACKFILLING.
   - 2.12. ALL EXTERIOR AND INTERIOR BRICKWORK AND FRAME ADJUSTMENT RINGS TO BE PARGED TO A MINIMUM 15 mm THICKNESS.
   - 2.13. ALL JOINTS, RISER SECTIONS, AND FRAME ADJUSTMENT RINGS SHALL BE SEALED ON THE OUTSIDE WITH WATERPROOF MEMBRANE "MEL-ROL" BY W.R. MEADOWS , “BLUESKIN WP200” BY HENRY OF MILTON, ONTARIO, OR APPROVED EQUAL. EXTEND COMPLETELY AROUND ALL RISER SECTION JOINTS WITH A MINIMUM 300mm WIDE STRIP.
   - 2.14. ALUMINUM LADDER AS PER OPSD 406.010 AT 300mm CENTRE TO CENTRE WITH FIRST STEP TO BE 300mm BELOW FRAME.
   - 2.15. THE WORDS "WATER METER" SHALL BE CAST ONTO THE SURFACE OF THE CHAMBER COVER USING MINIMUM 50 mm HIGH LETTERS.
   - 2.16. ALL INSULATION TO BE RIGID TYPE EXPANDED STYRENE INSULATION (DOW HI-100 OR APPROVED EQUAL). ALL CHAMBER INSULATION TO BE INSTALLED WITH CONSTRUCTION ADHESIVE AND TAPCON ANCHORS AT MAX 600mm SPACING IN ALL DIRECTIONS (MINIMUM 2 ANCHORS PER SHEET OF INSULATION) WITH PROTECTION BOARD (CEMENT BOARD) AND WATERPROOFING.
   - 2.17. CHAMBER TO BE PLACED ON 150mm CLEAR-STONE BEDDING WRAPPED ON ALL SIDES IN FILTER CLOTH (TERRAFIX 270R OR APPROVED EQUAL).
   - 2.18. CHAMBER EXCAVATION TO BE BACKFILLED WITH UNSHRINKABLE FILL ON ALL SIDES TO THE SPRINGLINE OF THE WATER SERVICE. INSTALL POLYETHELYNE BOND BREAKER BETWEEN UNSHRINKABLE FILL AND WATERMAIN / APPURTENANCES. BACKFILL REMAINDER OF EXCAVATION WITH GRANULAR B TYPE II COMPACTED TO 98% SPMDD.
3. WATERMAIN PIPING AND APPURTENANCES:
   - 3.1. WATERMAIN PIPING THROUGH CHAMBER (FROM FIRST JOINT OUTSIDE OF CHAMBER AND THROUGH CHAMBER) TO BE DUCTILE IRON (DI) TO ANSI/AWWA C150, C110 AND/OR C115.
   - 3.2. PIPE FLANGES AND JOINTS TO BE COMPATIBLE IN EVERY RESPECT WITH FLANGES AND JOINTS OF FITTINGS AND APPURTENANCES.
   - 3.3. ALL JOINTS SHALL BE RESTRAINED.
   - 3.4. ALL METAL PIPE AND FITTINGS TO BE COMPLETELY PROTECTED WITH DENSO PASTE, DENSO MASTIC AND DENSO TAPE (OR APPROVED EQUAL) INSTALLED ACCORDING TO MANUFACTURERS RECOMMENDATIONS.
   - 3.5. PROVIDE CONCRETE SUPPORTS AS INDICATED ON DRAWING.
   - 3.6. POLYETHYLENE BOND BREAKER TO BE USED BETWEEN CONCRETE AND PIPE / FITTINGS/APPURTENANCES.
   - 3.7. TAPPING VALVE AND VALVE BOX TO BE AS PER CITY OF GUELPH LINEAR INFRASTRUCTURE STANDARDS. VALVE TO BE FLANGE X MECHANICAL JOINT RESTRAINED AND SUITABLE FOR USE WITH TAPPING SLEEVE.
   - 3.8. SERVICE SADDLES TO BE AS PER CITY OF GUELPH LINEAR INFRASTRUCTURE STANDARDS.
   - 3.9. GATE VALVES AND VALVE BOXES TO BE AS PER CITY OF GUELPH LINEAR INFRASTRUCTURE STANDARDS. GATE VALVES TO BE MECHANICAL JOINT X MECHANICAL JOINT RESTRAINED.
   - 3.10. RESTRAINED COUPLING TO BE TO BE SMITH-BLAIR 470 SERIES, GEORG FISCHER MULTI/JOINT 3000 PLUS, ROMAC ALPHA, HYMAX GRIP OR APPROVED EQUAL. COUPLING SHALL BE SUITABLE FOR PIPE MATERIALS AND DIAMETERS USED.
   - 3.11. THE CITY WILL DETERMINE WATER METER SIZE BASED ON INFORMATION PROVIDED BY APPLICANT. CONSULT WITH WATER SERVICES.
   - 3.12. RESTRAINED FLANGE COUPLING ADAPTOR TO BE SMITH BLAIR 911, GEORG FISCHER MULTI/JOINT 3057, ROMAC ALPHA FC, HYMAX GRIP FLANGE ADAPTOR OR APPROVED EQUAL.
   - 3.13. A CHECK VALVE IS REQUIRED AT THE CITY'S REQUEST FOR EXISTING LOOPED SYSTEMS AND FUTURE PLANNED LOOPED SYSTEMS. TO BE SWING TYPE BY MUELLER CANADA (OR APPROVED EQUAL).
   - 3.14. DRAIN VALVE TO BE 50mm THREADED, STAINLESS STEEL, SPRING RETURN 1000 WAG BALL VALVE (OR APPROVED EQUAL) WITH PTFE SEALS AND SEATS, WITH 50mm SERVICE SADDLE (REFER TO CITY OF GUELPH LINEAR INFRASTRUCTURE STANDARDS FOR APPROVED SERVICE SADDLE PRODUCT LIST). DRAIN VALVE DISCHARGE TO BE FITTED WITH A THREADED CAP/PLUG.
   - 3.15. TRACER WIRE TO BE 8 GAUGE TWU MULTI-STRAND COPPER WIRE TO BE INSTALLED IN ACCORDANCE WITH CITY STANDARDS SD-54a AND SD-54b.
4. OPTIONS:
   - 4.1. IF OWNER REQUIRES A WATER METER BY-PASS, THIS WILL REQUIRE A SPECIAL DESIGN TO BE PREPARED BY A PROFESSIONAL ENGINEER RETAINED BY THE OWNER. THE DESIGN MUST BE APPROVED BY THE CITY. A SECOND WATER METER WILL BE REQUIRED ON THE BY-PASS LINE; NO UNMETERED BY-PASSES WILL BE PERMITTED.
   - 4.2. OWNER MAY INSTALL A SAMPLE LINE FROM THE DRAIN VALVE TO THE SURFACE. DETAILS MUST BE PROVIDED BY THE OWNER AND APPROVED BY THE CITY.





ACCESS RISER INSULATION DETAIL

N.T.S.

CITY OF Guelph

ENGINEERING SERVICES

Figure Title

METER CHAMBERS FOR 100mm TO 300mm DIA. WATER SERVICES

CHAMBER NOTES AND DETAILS

Drawn	Checked	Date	Figure No.
MM	JLP	FEBRUARY 2020	A3/A3
Scale: 1:50		BURNSIDE	

Appendix G
Stormwater Design Criteria and Targets

Table 4.2: Proposed Stormwater Criteria

Policy Area	Location†	Infiltration / Water Balance	Quality	Quantity	Erosion	Additional Information
1	Hanlon Industrial Business Park	Recharge Volume (acre feet) = 5-year peak flow (ft^3/s) x 0.035	• Limit sediment pond discharge to 0.015 ft^3/s per square foot of pond surface area • Enhanced level of quality treatment*	• Storm outlet rate is: 0.014 m^3/s – 100yr Hanlon Design Storm • Control peak flow post to pre for all design events (2 through 50 year)	Control 90th percentile event or Extended detention of the 4 hour, 25mm Chicago distribution rainfall event for 24 hours	Appendix A1
2	HCBP Pond 1	Block-by-block recharge rates to be met	Enhanced level of quality treatment*	Control peak flow post to pre for all design events (2-100 year)	Control 90th percentile event or Extended detention of the 4 hour, 25mm Chicago distribution rainfall event for 24 hours	Appendix A2
3	HCBP Pond 2 & 4	Block-by-block recharge rates to be met	Enhanced level of quality treatment*	• Control peak flow post to pre for all design events (2-100 year) • 100-year design storm runoff limited to 180 L/s/ha through on-site controls	Control 90th percentile event or Extended detention of the 4 hour, 25mm Chicago distribution rainfall event for 24 hours	Appendix A3
4	Hanlon Creek Subwatershed	• No urban drainage permitted to the headwaters of Tributary E or F, except lands that have positive drainage outlet, unless a pilot scale demonstrates effectiveness over five years. • Areas adjacent to Clair Road can drain into greenway system of Upper Hanlon area subject to the same design criteria. • Areas south of Clair Road but isolated from direct outlet must rely on infiltration/evaporation. • Remaining areas per Policy Area 12 (City-Wide)	• Implement thermal preventive and mitigation measures to maintain cold water fish habitat • Achieve specified water chemistry targets • Enhanced level of quality treatment*	• See infiltration requirements • Control peak flow post to pre for all design events (2-100 year) after achieving infiltration requirements	Control 90th percentile event or Extended detention of the 4 hour, 25mm Chicago distribution rainfall event for 24 hours	Appendix A4
5	Torrance Creek Subwatershed	• Zone 1: Zero runoff requirement (1:100 year volume captured, all water infiltrates) • Zone 2 & 3: Infiltration target of between 100 and 150mm/yr	Enhanced level of water quality treatment*	• Control peak flow post to pre for all design events (2-100 year) • 1:100 year flow controlled to pre-development levels in Zones 2 and 3 • If no positive outlet, must provide on-site storage for twice the 5-year design storm runoff volume • Commercial, industrial, and high density residential: store excess runoff for 2-year storm underground or on rooftops	Control 90th percentile event or Extended detention of the 4 hour, 25mm Chicago distribution rainfall event for 24 hours	Appendix A5
6	Guelph Downtown - The Ward	Per Policy Area 13 (City-Wide)	• Implement thermal preventive and mitigation measures to maintain cool water fish habitat • Enhanced level of water quality treatment*	Control post-development flows up to the 100-year event to the 2-year pre-development flows	Control 90th percentile event or Extended detention of the 4 hour, 25mm Chicago distribution rainfall event for 24 hours	Appendix A6
7	Guelph Innovation District	27mm capture in infiltrative LID BMPs	• Implement thermal preventive and mitigation measures to maintain cool water fish habitat	• 27 mm volume control on-site • Unitary storage and discharge rates for 25-year and 100-year events	Additional controls not required due to infiltration volume	Appendix A7

			• Enhanced level of water quality treatment* • Recommended retrofit of SWMF 38			
8	Clair-Maltby	20 mm captured within LID BMPs	• Implement thermal preventive and mitigation measures to maintain cool or coldwater fish habitat (per study criteria) • 20mm capture within LID BMPs • 100mm capture in Community Park	• 20 mm captured within LID BMPs with remaining drainage conveyed to designated surface water capture areas sized to capture Regional Storm • Small developments (<5ha) draining to Maltby Road: capture and control Regional Storm • Community Park: LID BMPs to capture 100-year storm	Control 90th percentile event or Extended detention of the 4 hour, 25mm Chicago distribution rainfall event for 24 hours	Appendix A8
9A	Guelph Downtown – Dublin/Gordon	Per Policy Area 13 (City-Wide)	• Implement thermal preventive and mitigation measures to maintain cool water fish habitat • Enhanced level of water quality treatment*	Overcontrol stormwater to a 5-year pre-development condition for major and minor flows	Control 90th percentile event or Extended detention of the 4 hour, 25mm Chicago distribution rainfall event for 24 hours	Appendix A6
9B	Guelph Downtown – Quebec/ Macdonell	Per Policy Area 13 (City-Wide)	• Implement thermal preventive and mitigation measures to maintain cool water fish habitat • Enhanced level of water quality treatment*	Limit post-development peak runoff to the 25-year pre-development peak flow	Control 90th percentile event or Extended detention of the 4 hour, 25mm Chicago distribution rainfall event for 24 hours	Appendix A6
10	Clythe Creek Subwatershed	Per Policy Area 13 (City-Wide) or as updated per the forthcoming Clythe Creek Subwatershed Update (pending)	• Thermal preventive and mitigation measures for coldwater habitat • Enhanced level of water quality treatment*	Control peak flow post to pre for all design events (2-100 year)	Control 90th percentile event or Extended detention of the 4 hour, 25mm Chicago distribution rainfall event for 24 hours	Appendix A9
11	Mill Creek Subwatershed	Maintain existing recharge and discharge characteristics	• Thermal preventive and mitigation measures for coldwater habitat • Enhanced level of water quality treatment*	Control peak flow and volumes post to pre for all design events (2-100 year)	Maintain/reduce existing erosion rates or Control 90th percentile event or Extended detention of the 4 hour, 25mm Chicago distribution rainfall event for 24 hours	Appendix A10
12	Southgate and Irish Creek Subwatershed	• Minimum groundwater recharge target of 300 mm/year • Quantity and proportion of runoff to Wetlands B and E should be maintained • Runoff quantities to Wetlands A-H should be maintained	• Enhanced level of water quality treatment	Retain and infiltrate up to Regional Storm Event	Control 90th percentile event or Extended detention of the 4 hour, 25mm Chicago distribution rainfall event for 24 hours	Appendix A11
13	City-Wide (all areas where site-specific studies have not been completed)	• Maintain predevelopment recharge rate, volume and hydroperiods at post-development conditions • Provide a minimum of 5mm of volume control	• Thermal preventive and mitigation measures for cool water habitat per Figure 4.1 • Enhanced level of water quality treatment*	Control peak flow post to pre for all design events (2-100 year)	Control 90th percentile event or Extended detention of the 4 hour, 25mm Chicago distribution rainfall event for 24 hours	Appendix A12

* Each appendix contains added detail from what is included in the table. Proponents and City staff are directed to refer to the appropriate appendix for full description of requirements.

TOWNSHIP OF GUELPH/ERAMOSA

TOWNSHIP OF PUSLINCH

TOWN OF MILTON

Woodlawn Road West
Woodlawn Road East
Woolwich Street
Elmira Road North
Speedvale Avenue West
Speedvale Avenue East
Victoria Road North
Ingersoll Road North
Silvercreek Parkway North
Edinburgh Road North
Willow Road
Eramosa Road
Stevenson Street North
Paisley Road
Hadati Creek
Watson Parkway North
Hanlon Expressway
Wellington Street West
Clythe Creek
York Road
College Avenue West
Stone Road West
Stone Road East
Downey Road
Harlon's Creek
Edinburgh Road South
Southgate Drive
Gordon Street
Victoria Road South

Legend

- Municipal Boundary
- Rivers
- Road Centreline

Policy Area:

- Policy Area 1: Hanlon Industrial Business Park
- Policy Area 2 & 3: Hanlon Creek Business Park Ponds 1, 2 & 4
- Policy Area 4: Hanlon Creek Subwatershed
- Policy Area 5: Torrance Creek Subwatershed
- Policy Area 6: The Ward
- Policy Area 7: Guelph Innovation District
- Policy Area 8: Clair-Maltby
- Policy Area 9A: Guelph Downtown - Dublin/Gordon
- Policy Area 9B: Guelph Downtown - Quebec/ Macdonell
- Policy Area 10: Clythe Creek Subwatershed
- Policy Area 11: Mill Creek Subwatershed
- Policy Area 12: Southgate and Irish Creek Subwatershed
- Policy Area 13: City-Wide

LOCATOR MAP

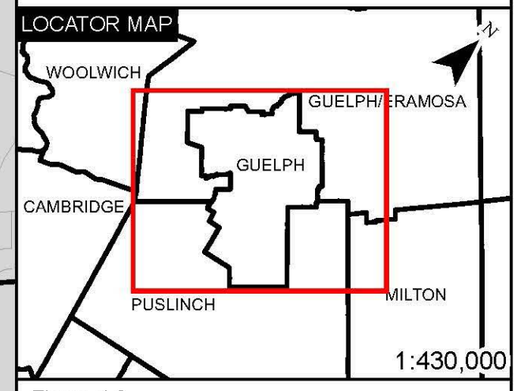


Figure 4.2

Stormwater Control Criteria

Date: 2022-11-09
Projection: NAD83_UTM_Zone_17N
Data Source: City of Guelph, GRCA, Natural Resource Solutions
Created by: A.V.

0 1 2
Kilometres

Aquafor Beech Limited