

Volume 5: Underground Servicing, Grading and Utilities

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1 Purpose

The design information included in this volume is to provide initial clarification on design issues and to delineate specific engineering requirements within the City of Waterloo as it relates to underground servicing, grading, and utilities. All designs must be completed in accordance with applicable provincial standards, guidelines, codes, municipal specifications, policies, by-laws, engineering best management practices, and all applicable legislation. The CELM is not intended to be a complete reference for detailed design. Any questions about these requirements should be referred to City staff at the early stages of the design process.

For grading information regarding parks, open spaces, and trails see Volume 7.

2 DGSSMS

The Region of Waterloo, in conjunction with area municipalities, has prepared the DGSSMS to create a common set of design guidelines and contract specifications for servicing works within the Municipal Right of Way within the region. The City of Waterloo endorses these standards and design works within the City must conform to them. The DGSSMS take precedence over the related OPS documents, and they are to be used in conjunction with the City's design standards as outlined in this manual.

Exceptions to the DGSSMS that are specific to the City of Waterloo are indicated in the DGSSMS where the exceptions apply. It is the Developer Representative's and/or the Project Consultant's responsibility to ensure that the most recent version of the DGSSMS is used.

3 Third-Party Approvals

It is the responsibility of the project engineer to determine the required third-party approvals. Refer to Volume 1 for a list of potential third-party agencies to check for approvals.

Under the Province of Ontario's Municipal Drinking Water Licensing Program, a Form 1 – Record of Watermain's authorized as a Future Alteration must be completed and approved by the City of Waterloo prior to making watermain alterations to the City's drinking water distribution system.

Under the Province of Ontario's new Consolidated Linear Infrastructure - Environmental Compliance Approval (CLI-ECA) program, stormwater and sanitary system alteration applications must be completed and approved by the City of Waterloo prior to making alterations to the City's stormwater and/or sanitary collection systems.

For the purposes of the CLI-ECA submissions, the Owner's Representative is the Director of City Utilities

Direction and resources for all water utilities alterations are available on the [Water utilities alterations](#) page on the City of Waterloo's website.

4 General Servicing

- The City of Waterloo does not guarantee that sufficient servicing capacity is available in existing infrastructure for new developments. Servicing capacity should be verified by the Developer's Representative.
 - For sanitary flows the City can, for a fee, run a scenario on the City's PCSWMM model and confirm the downstream capacity of the existing flow conditions. If preferred the Developer's representative can use an approved method to calculate or model the existing downstream infrastructure to confirm there is adequate capacity available. It should be noted that the City's PCSWMM model is not an all pipes model and the Developer's representative may still be required to review and confirm capacity within some of the local sewers.
 - For storm flows the Developer's representative is required to use an approved method to calculate or model the existing downstream infrastructure to confirm there is adequate capacity available.
- Existing site conditions must be field verified to confirm the location of services available to the property (including pipe invert elevations, MH, valves and other infrastructure) prior to undertaking the engineering design for the project. The City does not guarantee the accuracy of the information presented on any drawings that are obtained from the City or other parties for design purposes.
- The contractor shall ensure locates are completed prior to construction
- Proof of locates from Hydro One, Enova Power Corp., Enbridge, Cable, Bell, other telecommunications companies if applicable, City of Waterloo and Regional Traffic shall be produced for Engineering Services and/or City Utilities Staff upon request
- Site services must not be extended, expanded or connected to other lands without prior written approval of the City
- Show a minimum of one (1) meter clearance from building foundations for all services
- All internal connections and separation of services shall meet minimum MECF requirements
- Provide insulation of services where minimum depth of cover as per DGSSMS cannot be achieved, and indicate insulation details

4.1 Site Plan

- For residential/condominium townhouse developments, in order to comply with the OBC, individual sanitary, storm, and water services must be provided to each unit. In the case of stacked townhouse developments, provide individual sanitary, storm and water services for each set of stacked units.

4.2 Extending Municipal Infrastructure to Service a Development

When new Municipal Services need to be extended to service new developments, a special servicing agreement would be required including plan and profile design drawings, a cost is applied with the agreement, and a performance security. These securities would be separate from the required site plan securities. Refer to the Fees and Charges By-law for further details.

4.3 Disconnecting Existing Services

- Existing sanitary services must be disconnected at the main. If the existing service is not PVC, a section of PVC pipe is to be connected to the existing pipe with a flexible coupling. The downstream end of the abandoned service shall be capped with a gasketed PVC cap.

The upstream side of the abandoned service shall be plugged with grout or lean-mix concrete.

- Existing water service 50 mm or less in dia. shall be abandoned at the main. If the main stop is found to be leaking at the time of abandonment it must be removed in its entirety.
- Existing water service 100 mm or larger in dia. shall be disconnected at the mechanical joint connection at the watermain. The mechanical joint connection shall be completely removed from the main and any service pipe left in the ground shall be filled with grout to prevent sinkholes
- Tapping sleeve and valves shall be cut out of the watermain and the watermain shall be reinstated with a straight pipe and approved fittings. If the service terminates at the watermain with a mechanical joint (MJ) the service can be disconnected from the tee and a MJ plug placed on the tee. All cut or disconnected pipes must be capped or bulkheaded
- For residential service abandonments, the Building Department shall be informed of all disconnections and shall be on site to complete an inspection during the disconnections. Residential sanitary and water services are to be capped at property line until the development takes place. At that time the water services are to be abandoned properly at the watermain and City Utilities shall be informed of the abandonment and shall be on site to complete an inspection during the disconnections. For ICI service abandonments, Engineering Services and City Utilities Staff shall be informed of all disconnections and shall be on site to complete an inspection during the disconnections
- All service disconnections must be recorded and photographically documented by the contractor or Developer's Representative. A copy must be provided to Engineering Services to confirm the work has been completed as per City standards.
- Only City of Waterloo MECP certified Water Operations Staff are to operate municipal valves
- Alteration to any municipal system will require approval from City Utilities or the MECP, where the MECP Design Criteria is not met.
- When services are being disconnected within the RMOW's ROW they shall be disconnected per RMOW Corridor Management.

5 Watermains

5.1 General Design

- Watermains shall be designed, installed and commissioned as per DGSSMS and / or OBC (as applicable).
- A single water connection to the municipal watermain for each property shall be provided, except in special cases of master planned developments or as required by the OBC where additional connections may be approved by the Director of Engineering Services, if deemed to be beneficial.
- Tracer wire shall be designed, installed and tested as per the City of Waterloo's Tracer Wire Specifications. To access the City of Waterloo's Tracer Wire Specification, refer to the 'Conditions, standards and specifications' section of the [Purchasing page](#) on the City of Waterloo's website.
- A Watermain Alteration Application (Form 1) is required for any water connections greater or equal to 100mm.
- A City certified operator must be present during the live tapping of watermains.

- Siamese connections for sprinkler systems shall be on the building near the main entrance, readily accessible to the fire department, and not more than 45 m from an unobstructed fire hydrant.
- A buried water service shall be separated from the storm sewer and sanitary sewer by 2.5 m horizontally, in accordance with MECF guidelines. The water service pipe may be closer if the following conditions are met:
 - The bottom of the water service pipe at all points is at least 500 mm above the top of the sewer pipe when in a common trench and the water service is placed on a shelf at one side of the trench; and/or
 - The water service pipe is constructed of a single run of pipe with no joints or fittings between the street line and the inside face of the building.
- Minimum 2.0 m of cover over a water service is required. In rare cases where 2.0 m cover cannot be achieved, insulation may be accepted at the discretion of the Director of Engineering Services.
- Watermains and valves around cul-de-sac ends shall be configured as per City's Standard in Standard Drawings.
- For a site with a fire line and a domestic line, one fire service to the site should be proposed and the location of the 'tapping off' of a domestic line indicated. Design must follow CSA plumbing code.
- A fire flow analysis shall be completed for all new developments to ensure capacity is provided for fire flows with adequate residual pressure and acceptable head loss gradients during peak hour under proposed conditions.
- Water Distribution analysis shall be completed for new Subdivision development and large-scale Site Plan developments.
- The Region of Waterloo is responsible for water supply to the City of Waterloo. The Developer's Representative must contact the Region to obtain pressure zone information for watermains within the City of Waterloo.
- All watermain plugs for extensions are to terminate with a temporary hydrant to facilitate swabbing and flushing.
- City Utilities may require an auto-flusher for any dead end watermains. For subdivision projects, refer to DGSSMS Sheet E-T2.

5.2 Metering

- The water meter must be installed in the building as close as possible to where the service enters the building. In circumstances where this is not possible, the maximum distance the meter can be from where the service enters the building is 2 m.
- The City of Waterloo supplies all water meters for development (once per site, replacement meters at the Developer's cost). The City installs meters up to and including 50 mm in size; larger meters are provided by City Utilities at the Developer's cost. The developer's contractor will install all larger water meters as soon as possible and ensure City inspection of installation.
- Remote readers for water meters are to be installed on the outside face of the building.
- A Water Meter Chamber is required when there are multiple buildings on one site.
- A Water Meter Chamber will be required if the length of a watermain greater than 50 mm in size (whether domestic and/or fire), is equal to or exceeds 100 m in length from the property line to the building.
- To allow City Utilities access to the meter, bulk meters required for larger buildings shall be located in a mechanical room with exterior access where possible. If exterior access

is not feasible, the access to the mechanical room must be from a common area within the building. If this is not possible, a Water Meter Chamber will be required.

- Water Meter Chambers are installed, owned and maintained by the developer/property owner. They City requires access to maintain the meter.

5.3 Hydrants

- Refer to the DGSSMS for municipal fire hydrant type, spacing, location, and clearances.
- The Developer may be required to install a private or municipal fire hydrant to accommodate a proposed development.
- A private or municipal hydrant may also be required when the site is across the street from the hydrant line on a major arterial/regional road.
- The minimum flow rate shall be in accordance with DGSSMS.
- Internal private fire hydrants shall be designed and installed in accordance with the OBC.
- Hydrants shall be located within 90 m horizontally of any portion of a building perimeter that is required to face a street. Additional fire hydrants may be required at the discretion of the Director of Engineering Services.
- The maximum distance from the principal entrance of any building, or unit in the case of townhouse blocks, to a municipal or private hydrant shall not exceed 90 m.
- Municipal hydrants shall be painted as follows:
 - Barrel – Yellow (Hydrant Yellow – No. 036A0536)
 - Storz cap – Gloss Black
 - Bonnet (NFPA 291)
 - < 500 usgpm – Red (Safety Red – No. 2591)
 - 500- 999 usgpm – Orange (Safety Orange – No. 2590)
 - 1000 – 1499 usgpm – Green (Emerald Green – No. CIR001)
 - ≥ 1500 usgpm – Blue (National Blue – No. 036A0196)
- Private hydrants shall be painted red.

5.4 Flushing, Swabbing and Testing Requirements

- Water connections and service testing and commissioning shall comply with Section D.2.8 of the DGSSMS.
- The trench shall be backfilled between joints before hydrostatic testing to prevent movement of pipe
- All control valves shall be fully closed and opened under system water pressure to ensure proper operation
- With the exception of the laboratory submissions, certification shall be completed by the consultant indicating the tests were completed, passed and submitted to the Manager of Water Operations. For capital projects, the consultant shall also provide certification to the City's Project Manager.

6 Sanitary

6.1 General Design

- New sanitary sewers within the municipal right-of-way shall be designed and constructed in accordance with DGSSMS, MECP Guidelines and OPS specifications

- All services from the property line to 1.0 m outside the building envelope, more specifically both “private sewers” and “building sewers” as defined in the OBC, shall be designed using MECP Guidelines and satisfy OBC requirements for cleanouts and maintenance holes.
- Building and private sewers will be inspected by Engineering Services Staff, and building drains will be reviewed by Municipal Building Officials to confirm compliance with the applicable guidelines.
- Field verification of the location and invert elevations of the proposed connection point is a required part of the engineering design.
- One sanitary connection is permitted per property as per by-law 2020-058.
- No foundation drain or subsoil drainage pipe shall connect to a sanitary service
- Drainage works within 1.0 m of the building envelope are “Building Drains” and are to be designed and constructed in accordance with the requirements of the OBC
- In instances where the “Building Drain” is sized per OBC Fixture Counts and is larger than what is calculated based on population, the sewer must be reduced in size at the first private onsite maintenance hole downstream of the building.
- Sanitary sewers shall not be used for construction dewatering unless written authorization is obtained from the Director of Engineering Services, in consultation with Manager of Wastewater Operations
- The Developer shall assume full responsibility for having assured that the building grades and internal sanitary drainage systems are such to allow gravity connection to the municipal sewers
- Design flow calculations shall be completed on sewer design sheets and included with the development application. Refer to the DGSSMS or MECP Design Guidelines for example design sheets.
- Population densities for sanitary sewer capacity calculations are to be based on the current Development Charges Background Study.
- Minimum pipe size for a sanitary mainline required on City of Waterloo roads is a 200 mm diameter, unless otherwise specified in the Sanitary Master Plan or by the Director of Engineering Services.
- For Site development connections, private sanitary sewer mains shall be connected to a municipal maintenance hole if possible. If not possible a maintenance hole at property line may be required at the discretion of the City.
- Ensure sanitary service for all industrial/commercial sites are connected to a sanitary maintenance hole within the right-of-way. If not possible a maintenance hole at property line will be required.
- All proposed mainline sewers, with lateral connections, are to end with a maintenance hole in order to provide access for clean-out. Inlet and outlet pipes, including outlets for future extensions, shall be securely set into the concrete base of the structure and walls using pipe seals so that the structure is watertight. The outlet for future extension is to have a watertight plug installed.
- If an existing sanitary sewer network is proposed to be included as part of the servicing design, a CCTV inspection of the existing system in an acceptable format consistent with City of Waterloo’s CCTV Inspection Specifications – Sanitary and Storm Sewers, including, but not limited to, the pipe, and structures shall be completed to verify the existing system is functioning as per existing design and in good working condition. The City of Waterloo’s CCTV Inspection Specification can be located on the [Purchasing](#) page of the City’s website.

6.2 Maintenance Holes

- MH's, including any appurtenances (i.e., drop structures, safety grates etc.) shall be designed and installed as per the DGSSMS, MECP Guidelines and using OPS specifications for construction.
- A MH at property line may be required at the discretion of the City
- As per the OBC, an inspection MH is required on a building sewer or private sewer within a maximum of 30 m from the building.
- If a MH is required in an area of stormwater ponding, a watertight lid shall be installed
- Connection to an existing MH within the right-of-way shall be made by coring and installation of a watertight 'kor-N-seal' boot or equivalent as per DGSSMS

7 Storm

7.1 General Design

- All services from the property line to 1.0 m outside the building envelope, more specifically both "private sewers" and "building drains" as defined in the OBC, shall be designed using MECP Guidelines and satisfy OBC requirements for cleanouts and maintenance holes.
- Building and private sewers as noted above will be inspected by Engineering Services staff, and building drains will be inspected by the Building Department to confirm compliance with the applicable guidelines noted above.
- The Developer shall assume full responsibility for having assured that the building grades and internal storm drainage systems are such to allow gravity connection to the municipal sewers, with the exception of foundation drainage systems.
- All municipal storm sewers shall be designed to accommodate the 5-year storm event without surcharging, unless directed otherwise by the Director of Engineering
- Design flow calculations shall be completed on sewer design sheets and included with the development application. Refer to the DGSSMS or MECP Design Guidelines for example design sheets.
- A minimum of 150 mm clearance is required between outside pipe barrels at all sewer pipe crossings where the diameter of the pipe crossing over is less than or equal to 1,000 mm. Where the diameter of the pipe crossing over is greater than 1,000 mm, the required pipe bedding will govern the required clearance.
- Provide a safety/rodent grate on all storm sewer inlets and outlets
- One storm connection is permitted per property, as per the conditions outlined in By-law 2020-058.
- Building sump pumps shall be discharged to a landscaped surface where adequate drainage is provided. Where no such surface is available, written authorization must be obtained from the Director of City Utilities to provide storm piping to connect sump pump drains to direct drainage to municipal storm servicing.
- Storm sewers shall not be used for construction dewatering unless written authorization is obtained from the Director of Engineering Services in consultation with Manager of Stormwater Operations.
- All proposed mainline sewers, with service lateral connections, are to end at maintenance holes or catch basins in order to provide access for clean-out. Inlet and outlet pipes, including outlets for future extensions, shall be securely set into the concrete base of the

structure and walls using pipe seals so that the structure is watertight. The outlet for future extension is to have a watertight plug installed.

- If an existing storm sewer network is proposed to be included as part of the servicing design, a CCTV inspection of the existing system in an acceptable format consistent with City of Waterloo's CCTV Inspection Specifications – Sanitary and Storm Sewers, including, but not limited to, the pipe, structures, orifice controls and oil/grit separators shall be completed to verify the existing system is functioning as per existing design and in good working condition. The City of Waterloo's CCTV Inspection Specification can be located on the [Purchasing](#) page of the City's website.

7.1.1 Site Plan

- Should site specific drainage patterns require multiple connections to City infrastructure for a single property, this will only be permitted with City approval through the site plan review process.
- Private storm mains for site development connections shall be connected to a municipal maintenance hole or catchbasin maintenance hole (CBMH) if possible. If not possible a maintenance hole at property line may be required at the discretion of the City.

7.1.2 Subdivision

- Where external drainage areas are included in the subdivision sewer design, the sewer must extend to the subdivision limits abutting the properties containing this external drainage area. This may require a rear yard catchbasin and/or storm sewer easement.
- Storm sewers are required on all streets within a subdivision. Sewers must extend at least halfway across the frontage or flankage of every lot and block within the subdivision.

7.2 Maintenance Holes and Catchbasins

- MHs and CBs, including any appurtenances (i.e., drop structures, safety grates etc.) shall be designed and constructed as per the DGSSMS, MECP Guidelines and OPS specifications.
- As per the OBC, an inspection MH is required on a building sewer or private sewer within a maximum of 30 m from the building.
- MHs and CBs are to be set to base asphalt grade until surface asphalt is placed.
- Temporary asphalt or concrete curbs are to be provided adjacent to CB frame and grates along the curb line until surface asphalt is placed.
- Where the 5-year storm flows to a ditch inlet exceed 0.1 cms, the structure shall be sized for the design flow, otherwise use the standard inlet grate
- Maximum allowable contributing impervious drainage area to a CB shall not exceed 0.14ha otherwise a double catchbasin (DCB) shall be provided
- CBs shall not be located within driveway ramps or approaches
- Refer to the DGSSMS for accepted frame and covers for all new MHs within the municipal roadway. All other maintenance holes outside the municipal roadway to be fitted with frame and covers per OPSD 401.010 Type "A".
- Refer to the DGSSMS for accepted frame and grates for CBs and CBMHs.

7.2.1 Capital Projects

- Temporary curbs adjacent to CB frame and grates are to be asphalt. Concrete temporary curbs are not permitted.

- When additional inlet capacity is required, such as in areas of heavy mature tree growth or when significant overland flow routes are present, the frame and grate to be used is OPSD 400.080. Note this frame and grate requires 600x825 structures.

7.3 Service Connections

- Single storm service connections (150 mm in diameter) shall be provided for each dwelling unit in the subdivision
- Park Blocks may require storm sewer connections at the discretion of the Manager of Stormwater Operations.
- Service connection to a CB within the right-of-way will require the CB to be replaced with a CBMH
- No gravity connections of foundation drains will be allowed to the storm sewer system
- Foundation drainage may be directed to a sump pump and pumped to the storm service connection or to ground where subsurface/ surface conditions permit. Under no circumstances should sump pumps be allowed to discharge to the sanitary sewer.
- Basement floor elevations must be constructed a minimum 0.6m above the seasonally high groundwater elevation. For developments constructed within the groundwater elevation, basements must be waterproofed and designed to withstand hydrostatic pressures from groundwater. The City does not support year-round permanent dewatering.
- Roof leaders should be directed above ground on pervious surfaces (e.g., Grass), or to a soakaway pit or drywell.

7.3.1 Capital Projects

- As per the City's Encroachment Policy (report PWS 2006-74.1), roof leaders and sump pump outlets draining directly onto the City's right of way or in such a way as to create a safety issue in the winter will be disconnected at the cost of the homeowner during construction activities.

8 Grading

This section pertains to general grading for Site Plans, Subdivisions, and Capital Works. For grading specific to transportation, refer to Volume 4. For grading specific to parks, open spaces, and pathways refer to Volume 7.

8.1 General

Refer to Table V5-1 below as a guide in planning the various types of lot grading unless severe existing conditions require special consideration. In those situations, specific lot grading criteria will be prepared for that development:

TABLE V5-1 LOT GRADING & DRAINAGE CRITERIA

Driveways	Optimum Gradient	4.0 %
	Minimum Gradient	2.0 %
	Maximum Gradient	8.0 %
	Maximum Cross Slope	5.0 %
Parking Areas	Minimum Slope	1.0%
	Maximum Slope	5.0%
Barrier Free Parking	Maximum Slope	5.0%
	Preferred Slope	2.0%
Boulevards	Minimum Slope	2.0%
	Maximum Slope	4.0 %
From House to Side Lot Lines	Optimum Slope	4.0 %
Usable Yard Adjacent to Dwelling Unit	Minimum Gradient	2.0 %
	Maximum Gradient	5.0 %
	Minimum Usable Length	6 m (Subdivision)
Embankments	Maximum Slope	4:1
Swales	Minimum Gradient	2.0 %
	Maximum Gradient	5.0 %
	Maximum Side Slope	4:1
	Minimum Depth	0.15 m
	Maximum Depth	0.50 m
Front Yards	Preferred Maximum Slope	10%

- Proper drainage should not cause damage or adverse effects to any adjacent property including roads and public lands. The intent of the lot grading criteria is to provide for positive drainage away from buildings and permit the reasonable use of the property.
- Grading on adjacent lands will only be considered with written permission from the applicable landowner
- Impacts to existing vegetation should be minimized
- Backyard is designated as the area from the rear foundation of house to rear property line
- The proposed driveway entrances shall be as far away as possible from intersections
- For driveways on regional roads the region's standards will take precedence. In the absence of a guideline from the Region, the City's standards will govern.
- Designer shall ensure embankments designed match proposed grades to existing grades at property line and maintain positive drainage

- Hydro transformer concrete pad shall be placed at an elevation outside of the 100-year ponding limits
- Cross sections may be required at the discretion of the City to clarify the proposed grading, particularly in relation to adjacent properties, proposed elevations on paved areas, around proposed buildings, along swales, along roadways, parking areas, driveways, catchbasin rim elevations and any other elevations necessary to establish the grading and drainage patterns for the development.

8.1.1 Site Plan

- All sites must be graded to match existing elevations at the property limits, to provide positive drainage from the site and to convey surface runoff to approved locations at controlled rates
- Existing drainage patterns must be considered and respected in the design of infill development
- All existing ground elevations at the property boundary to be maintained, unless encroachment is allowed in writing

8.1.1.1 Underground Parking and Exterior Driveway Ramps

- A means of winter electrical heating or thermal-exchange closed loop deicing to be included on all exposed ramps regardless of slope
- Maximum ramp grade: 10.0 %
- A transition grade shall be provided on a ramp and shall not exceed a maximum 6.0 % slope for a minimum distance of 3.66 m
- The grade of the entrance/exit shall be a maximum 4.0 % for a distance of 7.62 m from the nearest edge of the street
- Grade of aisle ramp of driveway adjacent to a parking control device shall be maximum 4.0 % for a minimum distance of 9.1 m on the approach to such devices
- Underground parking structure setbacks per the City of Waterloo's Urban Design Manual

8.1.2 Subdivision

- Drainage features should be designed so that one property does not accept an unreasonably larger amount of runoff than the others to the satisfaction of the City's review engineer
- There shall be a minimum 0.6 m wide surface at 2.0 % slope away from the house along both sides of the building except where side yard setbacks from lot lines do not permit. This requirement is needed for easy access to the rear of the house.
- The maximum slope between houses in any direction shall be 4:1. If these grades cannot be met, steps and/or retaining walls shall be provided.
- Maximum grade within a 2 m easement for municipal and gas use shall not exceed 4.0 %
- Lots having less than 1.2 m side yard setbacks shall have split lot drainage unless approved by the Director of Engineering Services
- Lot grading shall be designed in accordance with City of Waterloo Standard Details X (Lot Drainage Type 'A', Lot Drainage Type 'B', Lot Drainage Type 'C', Lot Drainage Type 'D')
- Where feasible, storm drainage is to be self-contained within development and/or phase limits
- No front yard catchbasins shall be allowed. Side-split lots shall be in general conformance with the lot grading criteria.
- Typical toe of slopes for walkout and back-split lots shall be designed at 22 m from front property line, based on a 6 m setback with a 16 m building length

- An adjacent property is deemed to be vacant when, at the time of the final grading and landscaping of the subject lot, the adjacent lot is still unsold, excavations for the foundation have not begun, or final grading and sod are not anticipated for some time. Once the vacant lot is developed, any disturbance to adjacent properties shall be the responsibility of that builder to restore it to its previous condition.
- Except where underground infiltration systems are employed (including clean water collection systems) the grading plan should indicate that all roof leaders/ downspouts be directed to the front of the property where possible. Roof leaders/ downspouts should be extended a minimum 0.6 m away from the building's edge and a maximum of 2.0 m from the front property line directing flows away from the building without negatively impacting adjacent properties, sidewalks, or walkways. All discharge should be directed to a pervious surface with the use of a concrete splash pad.

8.1.3 Parks and Open Space

Finished site grades shall meet the approved grading plan(s) and must blend appropriately onto surrounding properties. All drainage shall be accommodated on the site or as approved by the Development Engineering Landscape Architect and/or Development Engineering Project Manager.

New Park/open space developments should be designed to enhance water quality and habitat by creating and/or maintaining features such as swales, wetlands and depressions which foster improved water quality, flow attenuation, groundwater recharge and ecological sustainability without comprising the aesthetic quality and safety in the open space.

Drainage from surrounding areas will not be accepted on park/open space lands. All park/ open space drainage shall be properly mitigated on site wherever possible and, if not possible, directed to an on-site catch basin connected to the storm sewer.

Surface drainage flows shall be indicated on all working drawings.

Slopes on any ground surface shall never be more than 25% slope. Acceptable surface runoff grades are as follows:

- Sports Fields Min. 1.5%, Max. 2%
- Overland Drainage Swales Min. 2%
- Berms or other slopes Max. 25%

8.1.4 Capital Projects

- When matching into existing driveways and boulevards, improvements to lessen slopes to meet the maximums listed above should be taken. Where this is not feasible, the new grading shall not be steeper than the existing grades.

8.2 Swales

- Refer to Table V5-1: Lot Grading & Drainage Criteria above
- Minimum longitudinal grade: 2.0 %
- The alignment of a swale should not change more than 45°
- The alignment of swales conveying runoff from more than 2 lots shall not change more than 45°. If this occurs, additional catchbasins shall be installed to maintain objectives stipulated elsewhere in this specification

- No plants, shrubs, trees, gardens, structures, retaining walls, etc., shall be permitted within the flow channel of any traditional open channel swale. Engineered bioswales may have plantings within the flow channel which shall be reviewed and approved by the City prior to implementation.

8.2.1 Subdivision

- In cases where sideyard swales are proposed with their centerline on a common property line, and the adjacent property is vacant, the swale must be installed to the property line by the builder. This grading is required in order to:
 - provide for proper drainage of completed lots when they border vacant lots
 - ensure that neighbouring lots are constructed to match the proposed drainage design
 - minimize or eliminate grading activity on completed lots when vacant lots are finally built upon
 - limit the construction impacts to new homeowners
- Drainage flows that are carried around houses are to be confined in defined swales located as far from the house as possible
- The maximum allowable drainage area of a side yard swale or a rear yard swale that discharges directly to a road allowance is four (4) backyards or 750 m², whichever is less
- The maximum allowable length of a rear yard swale is 60 m
- The maximum drainage area contributing to the rear yard catchbasin shall be 2000 m²
- Rear yard catchbasins are not permitted in new subdivisions unless proven necessary and agreed to by engineering services. Where required rear yard catchbasins are to be located entirely within one lot, not on the common lot line. A 3.0 m easement will be required for maintenance purposes.

8.3 Retaining Walls

- If the average yard slope exceeds 6.0 %, a retaining wall or 4:1 slopes will be required to reduce the grade to an acceptable amount (An exception will be made for where noise attenuation berms are required)
- All retaining walls over 1.0 m in height must be designed by a Professional Engineer
- The retaining wall must comply with the Ontario Building Code (OBC)
- All retaining walls falling under the OBC definition of “buildings” will require a building permit from Building Standards
- All retaining walls are to be constructed of poured-in-place concrete, precast concrete or stone as approved by Engineering Services
- Retaining walls shall be designed and constructed entirely on one property so that tie backs or wall footings do not cross boundaries
- A guard rail is required for any retaining wall exceeding 1.0 m in exposed height where the public has access to open space at the top of the retaining wall adjacent to:
 - Public property
 - Access to a building
 - Private property to which the public is admitted
 - Or as otherwise specified in the OBC
- Provide a detailed cross section schematic of all retaining walls. The cross section must contain the following information:
 - Wall width
 - Handrail

- Property Line
- Drainage Outlet
- Provide a detailed design drawing showing the design and location of all retaining walls. The detail must contain the following information:
 - Proposed product/material the walls will be constructed of
 - The minimum and maximum proposed height(s) of the walls
 - The maximum width of capping proposed on top of the wall and maximum proposed base of wall
 - Drainage/backfill, including geotextile
 - Tiebacks, footing
 - Cross-section detailing the proposed wall
 - Fastening details of the fence or handrail of the wall (if applicable)
 - A note that the final design must be stamped by a Professional Engineer
 - The landscape and engineering plans must show to scale the accurate widths of any proposed retaining walls
 - Top and bottom wall elevations

8.3.1 Site Plan

- Proposed retaining walls may not encroach within the minimum landscape buffer
- In the case where an encroachment on the adjacent property is inevitable, a written consent of the property owner shall be obtained

9 Other

9.1 Canada Post Facilities Design Criteria

- The number and location of units for mail delivery must be approved by Canada Post and the City
- Land use signs must be posted on-site prior to the issuance of building permit. Warning clauses are required in the purchase and sale agreements for lots adjacent to Canada Post facilities.
- The permanent and temporary location shall be clearly shown on the approved engineering drawings.
- Temporary and permanent Canada Post facilities may not be placed in front of parks and open space blocks, including, but not limited to storm water management blocks, channel and buffer blocks.
- Under extenuating circumstances, the City may, at its discretion, waive this requirement allowing mailboxes to be integrated into the park or open space setting with planting.
- An enhanced standard to create a mailbox area will be required as part of the landscape submission with all costs borne by the Developer.
- Lay-by lanes are required in rural and/or urban developments with central mailing facilities. Where postal facilities abut a municipal sidewalk, a concrete pad (OPSD 310.010) is required between the curb and municipal sidewalk immediately adjacent to the postal pad.
- Temporary facilities in a location approved by Canada Post and the City are to be installed once occupancy has begun. The locations must be kept clear of all construction materials.
- All Canada Post pads are required to drain towards the road with a maximum slope of 2.0%