



OAKVILLE

DEVELOPMENT ENGINEERING PROCEDURES AND GUIDELINES

Town of Oakville
Development Services, Transportation and Engineering Department

TOWN OF OAKVILLE

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Prepared for:

Town of Oakville
Development Services Section, Transportation and Engineering Department
1225 Trafalgar Road, Oakville, Ontario, L6H 0H3

Version	Date	Title	Updates Completed by	Comment
Final Draft Version 1.0	May 2023	Development Engineering Procedures and Guidelines Manual V1.0	Matrix Solutions Inc. 3001-6865 Century Ave Mississauga, ON L5N 7K2	Issued for public review period
Final Version 2.0	September 2023	Development Engineering Procedures and Guidelines Manual V2.0	Matrix Solutions Inc. 3001-6865 Century Ave Mississauga, ON L5N 7K2	Issued for Town Posting

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1 OVERVIEW OF MANUAL

This Development Engineering Procedures and Guidelines Manual (the Development Engineering Manual) has been prepared by the Town of Oakville (the Town) Development Services Section (within the Transportation and Engineering Department), with assistance from the Design and Construction, Transportation Planning, Roads and Works, and Parks and Open Space departments, for reference and direction to consulting engineers, planners, developers, architects, and others involved in land-development-related projects within the Town.

The intent of the Development Engineering Manual is to assist the development industry in preparing and processing engineering drawing, report, and agreement submissions.

It is expected that all landowners, consultants, and others who engage in design, build, or construction services, will adhere to the procedures and guidelines outlined in the Development Engineering Manual and to Town standards.

The Development and Engineering Manual was updated and reorganized in 2023, incorporating criteria and standards previously or concurrently prescribed outside of this document, to provide a more consolidated reference.

The Development and Engineering Manual identifies:

- the various Town departments, permits, and by-laws and outside agencies involved in the engineering approval process (Section 2)
- the general design criteria for subdivision development engineering, including storm drainage, lot grading, and roads (Section 3)
- subdivision engineering submission and drafting requirements (Section 4)
- construction procedures and materials (Section 5)
- subdivision administration agreements and the assumption process (Section 6)
- site plan general requirements, including design criteria, submission requirements, site development agreements, and site inspection approval (Section 7).

2 POLICIES AND JURISDICTIONS

2.1 Town of Oakville Department Jurisdictions

2.1.1 Transportation and Engineering Department

The Transportation and Engineering Department advises the Planning and Development Council on planning and engineering matters related to the physical development of the Town, in conjunction with associated economic, social, and environmental matters.

The responsibilities of the Transportation and Engineering Department include engineering issues related to:

- approval of subdivision engineering designs (road/grading/storm)
- subdivision and condominium agreement preparation, plan registration, and assumption by-laws
- site plan review and approval of engineering items
- approval of stormwater management (SWM) reports and design
- special studies (environmental assessments)
- approval of grading and drainage for all building permits
- comments for land severance and Committee of Adjustment
- comments for draft plan of subdivision/condominium
- comments for part lot control exemptions
- comments for zoning and/or Official Plan amendments
- approval of development-related studies, such as noise, geotechnical, SWM, subwatershed, environmental implementation/impact, environmental audit, functional servicing, and traffic impact
- approval of Site Alteration Permits and Pool Enclosure Permits
- review and enforcement of tree protection
- inspection and monitoring of subdivision construction.

The Transportation and Engineering Department provides engineering support and advice to the Planning Services Department and provides liaison with other departments within the Town regarding development-related issues (see Sections 2.1.2 to 2.1.7).

The Development Engineering Section review process encompasses the approval of all servicing designs for residential, commercial, institutional, and industrial projects. The areas of engineering concern include:

- general site servicing
- lot grading and drainage
- availability of services
- municipal road design and improvements
- required road widenings
- site access safety
- local traffic impacts
- SWM (volume and quality of stormwater runoff)
- noise attenuation
- tree protection.

The following planning applications require an engineering review:

- watershed studies
- zoning amendments
- Official Plan amendments/secondary plans
- plan of subdivision/condominium
- Committee of Adjustment
- part lot control exemptions
- commercial and industrial site plan
- land division (controlled by the Regional Municipality of Halton [Halton Region])
- minor variances
- building permits.

The Transportation and Engineering Department also responds to citizen concerns for grading and drainage regarding private property and offers direction and advice to citizens (as requested) for remedial action.

The Permits, Inspections and Road Corridor Section of the Transportation and Engineering Department comprises field staff who perform inspections related to the compliance of constructed private and municipal infrastructure and the impacts to existing Town assets and other private property. Permits are issued for site alteration, pool installation, driveway, road cut, and all related tree protection. A permit is required for any proposed construction or modification works within the limits of an existing Town right-of-way (ROW). This applies to driveway widenings and utility installations. A permit is also required for sign placement on municipal property.

2.1.2 Building Services Department

The Building Services Department informs the Transportation and Engineering Department when an application for a building permit for a single-lot residential property is received and ensures that an approach to a lot grading plan is provided for review.

2.1.3 Parks and Open Space Department

Approval is required from the Parks and Open Space Department for:

- any works on lands dedicated for park, open space, park walkways, valley lands, and green space
- tree preservation plan approvals (only on existing, assumed parkland or open space)
- streetscape approvals, including tree planting, fencing, landscape screening, boulevard and traffic island improvements (same as above; only on existing, assumed municipal ROWs).

2.1.4 Roads and Works Operations Department

Roads and Works Operations Department maintain and operate municipal infrastructure once assumed. The department is involved in developing standards and infrastructure review and inspections for assumption.

2.1.5 Legal Services Department

Agreements are drafted by the Legal Services Department and commented on by the Development Services Section for any changes or additional provisions that are required.

The Development Services Section then forwards the agreement to the Clerk's Department for approval by Town Council.

2.1.6 Clerk's Department

Town Council, through the Clerk's Department, approves agreements. Recommendation for approval of an agreement is forwarded to Halton Region for approval through the Clerk's Department. A by-law for approval of assumption is provided by the Clerk's Department and approved by Town Council. The Clerk's Department provides the Transportation and Engineering Department with the assumption by-law and associated documentation.

2.1.7 Finance Department

The Finance Department is responsible for the collection and administration of development charges relating to all site plan and subdivision developments. These securities are placed in the form of letters of credit, cash deposits, and cash-in-lieu.

The Town has formulated a development charge structure through a by-law that imposes growth-related net capital costs against land, as is allowed for under the *Development Charges Act* of 1989. New property owners are required to finance the growth-related net capital cost to the level of service currently enjoyed by the existing Town residents. The current by-law amends all previous by-laws. This by-law will be frequently reviewed and revised to reflect the required fee structure.

Levies are to be paid to the Finance Department at the time of building permit issuance. The amount owing would be the rate at the time of permit issuance.

2.2 Town of Oakville By-laws

There are various by-laws that are applicable to subdivision and site plan construction within Oakville. Relevant by-laws are listed below; however, it is the consultant/owner's responsibility to confirm if any by-laws have been updated/revised or added.

- **Noise Restrictions - Noise & Hours of Work:** **By-law No. 2008-098**
- **Fouling of Highways:** **By-law No. 1972-108**
- **Dumping of Garbage:** **By-law No. 1991-027**
- **Signs on Public and Private Property:** **By-law No. 2018-153**
- **Municipal Right of Way By-Law:** **By-law No. 2009-072**
- **Subdivision and Condominium Agreements Processing Fees:** **By-law No. 2011-137**
- **Municipal Tree Protection:** **By-law No. 2009-025**
- **Site Alteration:** **By-law No. 2003-021**
 - ✦ The Site Alteration By-law regulates the placement, removal, and any type of disturbance of soil on all sites in Oakville associated with all types of building or construction activity. Refer to Section 2.2.1 (Site Alteration By-law No. 2003-021) for additional information.
- **Use of Municipal Storm Sewers:** **By-law No. 2009-031**
 - ✦ The Use of Municipal Storm Sewers By-law regulates the protection of municipal storm sewers on all sites in Oakville associated with all types of building or construction activity. Refer to Section 2.2.2 (Use of Municipal Storm Sewers By-law No. 2009-031) for additional information.

2.2.1 Site Alteration By-law No. 2003-021

To meet the Town's Site Alteration By-law at all times, a Site Alteration Permit shall be obtained prior to the placement, removal, or any type of disturbance of soil on all sites in the Town associated with all types of building or construction activity.

A Site Alteration Permit application shall identify the area of land to be disturbed, the impacts of the altered drainage pattern, the erosion and siltation control method, the extent of soil to be imported or exported from or to where, any Town or private tree impacts, and the method of surface restoration.

A Site Alteration Permit will be issued once the Town is satisfied that all precautions have been taken to protect a watercourse and/or storm system from contamination. This permit will also ensure the protection of trees (a Tree Permit may also be required under this process), detail site restoration and securities for any damage to municipal infrastructure, and general cleanup.

A Site alteration permit is required to support pre-servicing of subdivision plans but is not required for servicing once a subdivision agreement has been registered.

More information on this by-law can be found on the Town's website:

Site Alteration By-law:

<https://www.oakville.ca/getmedia/dac1ec7b-9e06-4919-89b4-091c09d22d49/bylaw-2003-021-site-alterations-consolidated.pdf?ext=.pdf>

Site Alteration Permit Process Guide for Subdivisions

<https://www.oakville.ca/getmedia/a9f2df71-a674-4385-ace2-9a91f4a078ae/building-site-alteration-permit-process-guide-subdivisions.pdf>

2.2.2 Use of Municipal Storm Sewers By-law No. 2009-031

To meet the Town's Use of Municipal Storm Sewers By-law requirements at all times, the storm sewer discharge activity must not:

- damage, impair, obstruct, adversely impact, or restrict flow within the storm sewer
- cause harm to any person, animal, property, or vegetation
- impair the quality in any well, watercourse, or water body
- contravene or result in the contravention of any federal or provincial legislation and/or permits/approvals with respect to the storm sewer and/or its discharge from the storm sewer into a watercourse
- contain any physical or chemical pollutants or contaminants.

Any knowledge or concern about meeting the Storm Sewer By-law must be reported to the Town for further consultation. Any planned discharges to Town infrastructure (ditches, storm sewers, stormwater management pond) or to the lake during construction dewatering, or for groundwater discharges, please see section 3.7.12 and section 5.4. More information on this by-law can be found on the Town's website:

Use of Municipal Storm Sewers By-law:

<https://assets.oakville.ca/blis/BylawIndexLibrary/2009-031.pdf>

2.3 Town of Oakville Stormwater Master Plan

The Town's first Stormwater Master Plan (SWMP) was approved in fall 2019. The SWMP focuses on the Town's more established community areas where stormwater infrastructure systems tend to be older and were designed to a standard reflective of the era in which they were built. Understanding the condition and limitations of these systems allows the Town to identify improvements to ensure these systems remain stable and functional, while minimizing exposure to the risk of urban flooding.

The SWMP identifies immediate and long-term actions to enhance the Town's approach to SWM and climate change issues. It also provides advice to property owners on what they can do themselves to reduce flood risk and flood damage on their property.

The SWMP is responsive and considerate of the increase in extreme rain events in Southwestern Ontario associated with climate change. The SWMP assessed the condition of the existing stormwater system, collected background data, assessed the performance of the stormwater system, identified vulnerabilities and opportunities to decrease flood risk, and advised on best management practices for managing impacts due to land use changes (e.g., infill development, land redevelopment) and climate change (e.g., increased rainfall frequency and intensity).

The SWMP utilized PCSWMM dual drainage modelling to characterize the capacity of both the minor and major systems within the study area, including storm sewers, ditches, overland flow routes, and roads. The information derived from this characterization is a useful tool in assessing outlets for development and redevelopment.

Public consultation was a key component in developing the SWMP. The SWMP followed the Municipal Class Environmental Assessment Process (MCEA) process and concluded with a Notice of Study Completion that allowed the public to review the final study document for a period of 30 days, ensuring the study complied with the MCEA process. That review period came to a successful conclusion in December 2019.

The SWMP should be referenced to consider existing condition capacity results when contemplating the outlet for stormwater, so that there are no impacts to adjacent properties, including the Town's ROW and/or infrastructure.

The SWMP can be found on the Town's website:

Stormwater Master Plan:

<https://www.oakville.ca/home-environment/environment/water-stormwater/stormwater-management/stormwater-master-plan/>

2.4 External Development Agencies Jurisdiction

It is the owner's/consultant's responsibility to follow the current regulations under all jurisdictions. The following subsections provide a list of applicable agencies' jurisdictions, based on information available at the time of writing. The list is not exhaustive and may not reflect the most recent available information,

and proponents should pre-consult with the various agencies and the Town to confirm the requirements and applicable guidance documents for specific projects.

2.4.1 Ontario Ministry of Transportation

The Development Engineering Section provides guidance and information regarding Ontario Ministry of Transportation (MTO) requirements.

- Access Permit:
 - ✦ A permit is required for modification of an access from a highway, use of an existing entrance for a different purpose, or change of ownership. It is the owner's/consultant's responsibility to obtain this permit.
- Encroachment Permit:
 - ✦ An encroachment permit is required for work upon, under, or within the limits of a provincial highway ROW. It is the owner's/consultant's responsibility to obtain this permit.
- Sign Permit:
 - ✦ Erection of a sign within 400 m of any provincial highway may require a permit. It is the owner's/consultant's responsibility to obtain this permit.
- Building and Fill Permits/Storm Drainage Criteria:
 - ✦ Placement of fill or constructing a building or any structure requires a permit. Check with MTO per their SWM criteria for sites draining toward their corridors.

All MTO requirements should be confirmed directly with MTO.

2.4.2 Credit Valley Conservation and Conservation Halton

Approval may be required from Conservation Halton (CH) and/or Credit Valley Conservation (CVC) for, but not limited to, the following:

- watershed and subwatershed, environmental implementation studies/functional servicing reports
- SWM studies, hydrogeologic impact, and water taking permits
- erosion and sedimentation control (ESC) plans and reports
- top-of-bank protection/lot grading adjacent to regulated creeks
- SWM facilities/outfall structures/alteration to a watercourses/watercourse crossings
- site alteration within regulatory floodplains or other regulated areas associated with other hazards including creeks, shorelines, and wetlands.

It is the owner's/consultant's responsibility to refer to the latest provincial policies and obtain the required approvals (or permits) from the appropriate conservation authorities.

2.4.3 Regional Municipality of Halton

Information and approvals are required for, but not limited to:

- wastewater/sanitary sewers:
 - ✦ the location of connections and an impact study of trunk and semi-trunk mains, approval of proposed subdivision wastewater services
 - ✦ the effect on and possible relocation of existing installations
- watermains:
 - ✦ the location of existing watermains and an impact study of proposed development on existing installations, approval of proposed subdivision works
 - ✦ changes to existing installations
 - ✦ the effect on pressure levels and impact on existing fire protection
- ground water and well water:
 - ✦ required impact assessments and hydrogeological studies
- storm sewers:
 - ✦ approval of storm systems on regional roads (RRs) only
- RR works:
 - ✦ For all proposed work within the ROW of a RR, Halton Region and the Development Coordinator shall approve limits of a RR. Note that the Town maintains the sidewalks on these roads.
 - ✦ Halton RRs include the following, in whole or part (check with Halton Region): Bronte Road (RR 25), Dundas Street (RR 5), Upper Middle Road (RR 38), Trafalgar Road (RR 3), Ford Drive (RR 13), Burloak Drive (RR 21), Dorval Drive (RR 17), Burnhamthorpe Road (RR 27), Neyagawa Boulevard (RR 4), and Ninth Line (RR 13).
- permits to take water

It is the owner's/consultant's responsibility to obtain Halton Region approvals.

2.4.4 Regional Municipality of Peel

Information and approvals are required for works within the Regional Municipality of Peel (Region of Peel).

Region of Peel RRs include Winston Churchill Boulevard (RR 19).

2.4.5 Ministry of the Environment, Conservation and Parks

Ministry of the Environment, Conservation and Parks (MECP) approvals are required for, but not limited to:

- Records of Site Condition, per Ontario Regulation (O. Reg.) 153/04: *Records of Site Condition – Part XV.1 of the Act*
- stormwater quality/quantity studies/Permits to Take Water
- municipal and private water & sewage works
- noise impact assessment studies
- species at risk impacts
- on-site and excess soil management
- brownfields redevelopment
- Consolidated Linear Infrastructure Environmental Compliance Approval (CLI-ECA).

It is the owner's/consultant's responsibility to obtain MECP approvals. The Town now maintains the CLI-ECA and for any infrastructure that will be Town-owned, the Town has the delegated authority to approve ECAs in most cases (not industrial applications and new outfalls). Please work with Development Services for the approval process.

2.4.6 Ministry of Natural Resources and Forestry

Ministry of Natural Resources and Forestry (MNRF) approvals are required for, but not limited to:

- Alteration to a Water Course/Lakes and Rivers Permit
- SWM studies (watershed and subwatershed level).

It is the owner's/consultant's responsibility to obtain MNRF approvals.

2.4.7 Other Agencies

Approvals may be required from:

- Ontario Ministry of Agriculture, Food and Rural Affairs
- Utility providers (Bell Canada, Rogers, Cogeco)

- Canada Post
- Canadian Pacific Railway/Canadian National Railway
- Ontario Ministry of Culture, Tourism and Sport
- GO Transit, Metrolinx
- pipeline authorities: National Energy Board, IPL Energy, TransCanada PipeLines Limited, Union Gas, Enbridge
- Ontario Ministry of Municipal Affairs and Housing/Ontario Realty Corporation - Parkway Belt
- Niagara Escarpment Commission
- Halton Community Housing Corporation
- Oakville Hydro
- Ontario Hydroelectric Power Commission
- Halton Regional Police Service
- Halton Public Health
- Halton District School Board
- Halton Catholic District School Board
- Royal Commission of the Future of the Toronto Waterfront
- Fisheries and Oceans Canada (DFO)

It is the owner's/consultant's responsibility to obtain approvals from these agencies, when necessary.

2.5 Requirement for Engineering Studies

The following studies may be required through a subdivision or site plan agreement:

- MECP-related studies
- MNRF-related studies
- watershed/subwatershed management impact studies/environmental implementation studies
- functional servicing studies (including SWM studies, Environmental Site Assessments (Phases One and Two), supporting studies for land conveyance, soil management and ESC studies)
- traffic impact studies

- transportation studies
- noise impact assessment studies
- tree inventory and arborist reports.

2.6 Accessibility for Ontarians with Disabilities Act

All engineering designs and studies must be compliant with the *Accessibility for Ontarians with Disabilities Act (AODA)*.

3 SUBDIVISION DESIGN CRITERIA

Section 3 outlines the engineering design criteria and servicing requirements for guidance to the land development industry with projects in the Town.

The criteria are to be used as a guide and are general in nature. They are not meant to relieve the developer of the responsibility of submitting a finished product of competent engineering design and construction. For any form of consideration made to diverge from the minimum Town standards of requirements, the applicant, prior to the respective submission for Town approval, shall specifically refer to a proposal.

The applicable planning documents should be requested from the Development Services Section. Completed studies are available on the Town website.

Planning Studies:

<https://www.oakville.ca/business-development/planning-development/planning-studies/>

Stormwater Master Plan:

<https://www.oakville.ca/home-environment/environment/water-stormwater/stormwater-management/stormwater-master-plan/>.

3.1 Water and Wastewater Servicing

Information regarding the design criteria and standards for water and wastewater servicing must be obtained from the Halton Region Public Works Department.

3.2 Stormwater Management Policy/Watershed-based Planning

The Town adheres to the recommendations of the province regarding the implementation of watershed management planning and the promotion of a comprehensive ecosystem approach. All new development proposals shall conform to the recommendations of the applicable watershed/subwatershed and/or environmental implementation study.

The preservation and enhancement of watercourses, valleys and natural heritage features shall be consistent with watershed and subwatershed impact management studies. New development shall be designed to mitigate impacts to watercourses, wetlands, valley features, and fish habitat, including erosion, flooding, water quality, water balance, and other potentially detrimental impacts.

Many creeks within the boundaries of the Town and south of Dundas Street have been assessed via subwatershed studies. These study reports are deposited with the Town and CH and shall be referred to when analyzing drainage impacts within the delineated subwatershed boundary. The Town and CH shall be consulted when determining which study applies and whether further assessment and updates are required.

The North Oakville Secondary Plans have a separate comprehensive watershed plan known as the *North Oakville Creeks Subwatershed Study* (NOCSS). The NOCSS applies to the lands north of Dundas Street up to the MTO Highway 407 corridor and between Tremaine Road and Ninth Line.

The NOCSS provides the terms of reference for the environmental implementation report (EIR), which shall be prepared for the watershed sub-area impacted by a development plan (subdivision). All draft plans of subdivision/condominium require an approved EIR and functional servicing study (FSS).

An EIR/FSS is prepared to ensure that the requirements of the NOCSS and North Oakville Secondary Plans are met and to address site characteristics in sufficient detail to allow for the development of draft plan of subdivision/condominium conditions. The NOCSS outlines the terms of reference for the EIR. The EIR provides a more detailed review of the following issues (not a finite list):

- preservation of the natural heritage system
- protection and rehabilitation of stream corridors and linkages
- SWM, hydrogeology/water balance, water quality, erosion
- refinement of floodline mapping and hydrologic features
- defining outlet elevations through detailed topographic survey and conceptual servicing that will guide the detailed design.

3.3 Best Management Practices and Low Impact Development Guidance

SWM practices across the province have evolved from more conventional end-of-pipe techniques (stormwater management facilities [SWMFs]) to the suite of practices commonly referred to as low impact development (LID) best management practices (BMPs) to reduce and treat the volume of storm runoff prior to discharge to receiving systems. The Town encourages the use of LID facilities to meet both quantity and quality control criteria for sites. LID facilities also provide additional benefits for water balance and erosion control. LID BMPs can be used as part of a treatment train approach to achieve stormwater management objectives. LID facilities will be credited for quality and water balance control, if they are sized and designed properly, but will not be credited for quantity flood control when sizing downstream infrastructure.

LID facilities are to be sized to retain runoff occurring from a 25 mm event per the recommendation of the Town SWMP and following the guidelines outlined in this section. A LID facility sizing design sheet is available upon request to assist designers.

LID facilities should not be oversized to overcontrol for entire sites; infiltration facilities should be sized up to a maximum of 90% of the average annual runoff volume for the contributing area.

Potential LID BMPs supported by the Town include, but are not necessarily limited to:

- bioretention areas and bioswales
- vegetated filter strips
- enhanced grassed swales
- permeable pavements (asphalt, concrete, paving and stones)

- soak-away pits, dry wells, and infiltration chambers
- exfiltration pipes
- prefabricated modules (including soil retention cells) and tree pits
- green or living roofs
- rainwater harvesting and reuse.

Design of these BMPs should be completed with reference to the following resources:

- Sustainable Technologies Evaluation Program (STEP) *Low Impact Development Stormwater Management Planning and Design Guide* Wiki:
https://wiki.sustainabletechnologies.ca/index.php?title=Main_Page
- CVC LID guidance: <https://cvc.ca/low-impact-development/>
- Toronto and Region Conservation Authority (TRCA) LID guidance:
<https://trca.ca/conservation/restoration/low-impact-development/>
- Town SWMP: <https://www.oakville.ca/home-environment/environment/water-stormwater/stormwater-management/stormwater-master-plan/>
- relevant subwatershed plans: <https://www.oakville.ca/home-environment/environment/environmental-projects-studies/>.

Location(s) of LID facilities are to be established in consultation with Town staff based on site characteristics and justified to the satisfaction of the Town. Where infiltration LID measures are proposed, it is recommended to place additional pre-treatment measures upstream, to prevent clogging and improve long-term functionality of the infiltration facility. Adequate separation from the seasonal high groundwater elevation should be demonstrated.

The selection of LID measures for a site must consider site characteristics, including:

- separation from the local groundwater table elevation and seasonal high groundwater elevation
- subsurface soil type and associated permeability/infiltration rate
- depth to bedrock
- availability of space
- existing and proposed subsurface utility conflicts
- existing zoning and land use, including legacy site contamination

- existing groundwater use, including downgradient groundwater receptors (e.g., private wells, wetlands, source water protection, etc.)
- long-term operations and maintenance requirements, including acceptable maintenance plans accepted by the Town.

3.4 Regulated Lands Pursuant to the Conservation Authorities Act

CH/CVC shall be consulted when determining the regulated limits associated with shoreline, wetlands, and creeks. Floodline mapping can be obtained from CH/CVC.

Storm sewer outfalls, creek crossings, erosion protection, and all other regulated land alterations require a permit from CH/CVC and may have restricted work periods based on the fishery designation of the creek/lake.

The proposed disturbance of natural features may also require an “environmental impact assessment” to identify the preferred infrastructure location with the least negative impacts.

3.5 Stormwater Management Report Requirements

A SWM report shall be prepared and include:

- a map of existing contours and pre-development catchments, including external contributing areas; identify flood plain limits of all watercourses
- a plan with post-development catchments, including area and runoff coefficients
- a plan of sewer system, SWMFs, and overland flow routes
- a description of methodology and existing watershed criteria (with reference to the applicable EIR/FSS, watershed/subwatershed study)
- a summary of the applicable criteria to be met
- detailed input parameters and schematics to hydrologic modelling
- complete computer output/input printouts (computer files)
- summary of computer output results in a simplified tabular format
- water quality control sizing calculations (pond, oil and grit separators [OGSs], LIDs)
- compare sewer sized by Rational Method to model output; identify revised pipes and proposed catch basin inlet controls

- verify that major overland flow routes do not impact properties, and that road gutter flows are within Town parameters
- calculate 1:100-year hydraulic and energy grade lines for all pipes and basement elevations evaluated for surcharge potential
- provide a summary of how all Town and watershed SWM criteria has been satisfied
- outline the maintenance and monitoring program for the SWM features.

3.6 Hydrologic Modelling Software

Where hydrologic modelling is warranted, industry standard software should be used. The list of Town-approved software is detailed in this section; consultants seeking to apply different hydrologic modelling software must request approval from the Town prior to use.

- PCSWMM/XPSWMM
- VISUAL OTTHYMO
- SWMHYMO
- HEC-HMS
- MIDUSS
- GAWSER.

3.7 Storm Drainage Criteria

3.7.1 Stormwater Quantity Control

Stormwater quantity control (i.e., control of peak flow rates of runoff) is required where increased storm runoff, due to development and associated catchment modifications, will cause detrimental impacts via flooding and erosion. Controls are to be implemented based on all applicable watershed/subwatershed and/or environmental impact studies and will require a site-specific stormwater impact management assessment to identify the detailed SWM methods required to comply with the watershed target levels and Town policies.

Subdivisions typically incorporate extended detention wet ponds to provide the required quality and quantity attenuation. These ponds are located within or adjacent to open space areas where they can provide natural habitat enhancement and a public amenity feature. Ponds provide a centralized efficient facility that is fully owned and operated by the Town. Town operation of these facilities ensures that the pond function will continue to comply with all of the required SWM attenuation targets.

The Town's requirements for the design of SWM ponds can be found in Section 3.8 (Stormwater Management Pond Design Guidelines).

Site-specific controls are required where peak runoff exceeds the receiving storm sewer and/or watercourse capacity or existing flooding or erosion problems have been identified. In the absence of a subwatershed study, the minimum control is to maintain post-development peak runoff rates to pre-development levels for all events up to the 100-year level. This applies where the capacity or impacts to the receiving system is unknown or too difficult to accurately determine. In some cases, additional control beyond the 1:100-year storm will be required if referenced in an applicable subwatershed study.

Typical site storage methods include SWM ponds, flat rooftops, bioswales, remote parking surfaces where permitted, and oversizing of pipes or buried tanks.

3.7.2 Stormwater Quality Control

Water quality controls are to be implemented on all developments in accordance with the applicable approved subwatershed plan/EIR or the established criteria for the receiving body. CH and CVC have established the sensitivity of most creek systems based on MNRF and DFO studies and surveys.

The province published the *Stormwater Management Planning and Design Manual* (MOE 2003), which shall be referenced for the appropriate method of quality control to achieve the targeted levels per the given receiving system.

A treatment train approach is strongly encouraged. At-source controls are encouraged, where soil conditions allow, for infiltration and biological treatment. Properly sized LID facilities (i.e., to retain the runoff from a 25 mm event) will be credited as providing adequate water quality control.

Subdivision level development will generally incorporate a centralized SWM pond that will provide quality and quantity control functions. These ponds are incorporated adjacent to the existing natural features and park facilities. The Town will establish the safety, aesthetic, and maintenance criteria based on each specific development.

The Town's requirements for the design of SWM ponds can be found in Section 3.8 (Stormwater Management Pond Design Guidelines).

Developers are required to maintain and monitor the operation of quality/detention ponds and shall ensure the facility meets with the current MECP criteria prior to the Town assuming the facility.

Small sites for general commercial and industrial development are suitable for the application of at-source controls such as LIDs and OGSs. Specific manufacturers shall provide certification of the performance of these devices (see requirements in Section 3.7.2.1 [Manufactured Treatment Devices]). The private site owner shall be responsible for the long-term operation and maintenance of this type of device.

The quality of discharged stormwater shall also comply with the Town's Use of Municipal Storm Sewers By-law No. 2009-031.

3.7.2.1 Manufactured Treatment Devices

The Town supports the use of manufactured treatment devices, including OGSs, filter-based treatment units, and catch basin inserts. Treatment device predicted performance must be verified under the Environmental Technology Verification Canada (ETV Canada) program and must be sized to meet a

minimum long-term average total suspended solids (TSS) removal efficiency in accordance with the applicable water quality target (e.g., 80% TSS removal). The device must also be sized to ensure 90% of the average annual runoff volume is treated without bypass.

The cost of maintenance for filter-based treatment units throughout the lifespan of this equipment can be significant. As such, the Town prefers the implementation of a treatment train approach and the use of various at-source and pre-treatment methods for limiting upstream sediment contribution to the proposed filters.

3.7.3 Stormwater Conveyance Design Criteria

3.7.3.1 Major and Minor Systems

In general, the Town supports the concept of urban drainage with two separate and distinct components: the minor drainage system and the major drainage system.

The minor drainage system may incorporate swales, street gutters, catch basins, and storm sewers. Components of the minor system accommodate the runoff from the more frequent storms up to the design frequency of the system (e.g., 1:2-year up to 1:10-year). When properly designed and maintained, it reduces the incidence of inconvenience to both pedestrians and motorists.

The major drainage system comprises natural streams and valleys and man-made channels and ponds and shall accommodate the runoff from even the least frequent storms such as 1:100-year and the Regional storm. In practice, the street also acts as components of the major system during severe floods since they transport runoff in excess of the storm sewer capacity. When properly designed and constructed, the major system shall minimize the risk of loss of life and property damage due to flooding.

3.7.3.2 Hydraulic Design Levels

The system of street gutters, catch basins, and storm sewers shall be designed for the **1:5-year storm**, with the following exceptions:

- Consideration will be given to using a 1:10-year storm for high value commercial development and for downtown business areas. In such cases, the Town may require some internal control in the form of storage on flat roofs, temporary ponding on parking areas furthest away from the building, or underground storage. In either case, the Town may require the developer to provide a maintenance hole located at the street line to control discharges into the storm sewer system.

It is absolutely vital that the interception capacity of the system of catch basins is completely compatible with the design capacity of the storm sewers. While the storm sewers will be designed for free-flow conditions for the 1:5-year, or 1:10-year storm noted previously, the actual flows captured by the catch basins during the 1:100-year design storm shall be determined using hydrologic/hydraulic modelling software or approved equivalent. The hydraulic grade lines shall be plotted on the detailed design drawings.

The spacing of catch basins may be varied, and approved orifice devices (ICDs) may be fitted into the catch basin lead to control the amount of water entering the storm sewers during less frequent storms.

Refer to Section 3.7.13 (Overland Flow Routes) for additional relevant criteria.

Refer to Section 3.7.9 (Foundation Drain Criteria) for foundation drain criteria and hydraulic grade line requirements.

3.7.3.3 Rational Method

The Rational Method, while simple and popular, has limitations in its crude representation of physical runoff parameters and its inability to simulate the actual runoff distribution in time. However, it can be used for the sizing of the minor sewer in the final design stage.

Storm sewers shall be designed to drain all lands as calculated by the Rational Method. The Rational Method calculations must be checked using the hydrologic/hydraulic model where the drainage area is greater than 5 ha. The larger of the flows is to be used in the design of the sewer system.

$$Q = 0.0028 C I A R$$

where,

Q = flow in cubic metres per second

C = runoff coefficient (see Section 3.7.3.4)

I = intensity in millimetres per hour (see Section 3.7.3.5)

A = area in hectares (see Section 3.7.3.8)

R = return period factor (see Section 3.7.3.9)

These parameters are further defined in the following subsections.

3.7.3.4 Runoff Coefficient

Pre-development values shall be based on the soil characteristics and the slope of the land.

Post-development values shall be as shown in Table 3.1.

Table 3.1 Runoff Coefficients

Land Use	Runoff Coefficient
Single residential (detached)	0.70 ⁽¹⁾
Medium density (townhouses)	0.75
High density (condo/high rise)	0.85
Industrial and commercial	0.90
Institutional	0.75
Parks	0.35

Note:

(1) With supporting calculations on imperviousness (see below), single residential value may be lowered to an allowable limit of 0.65.

To calculate the corresponding runoff coefficient for existing development, or where coefficients may be lower than standard values (to the allowable limit), the following formula may be used:

$$C = 0.25 (1 - i) + 0.9 i$$

where,

C = runoff coefficient

i = imperviousness ratio

Supporting calculations demonstrating the calculated imperviousness ratio (i) must be provided. Lower runoff coefficient (C) values must be accepted by the Town.

3.7.3.5 Rainfall Intensity and Design Storms

All hydrologic models derive their predicted flows from input of storms based on a given statistical return period frequency. The frequency of the predicted flow rate is, in general, not identical to the frequency of the storm. The Rational Method uses rainfall intensity-duration-frequency (IDF) curves. All other models use synthetically derived design storms or, in special cases, real storm distributions.

The intensity of rainfall for Rational Method analysis is to be determined from the most recent Town standard IDF rainfall curves. The meteorological data for Oakville was studied as part of the SWMP, which concluded that the IDF data presented in this Development Engineering Manual provides a conservative basis for the Town. The IDF data are based on the historical Atmospheric Environment Services (AES) Toronto (Bloor Street) gauge, which is now the Toronto City (ID 6158355) Environment and Climate Change Canada (ECCC) climate station and has long-term records of continuous rainfall data. These data may also be used to generate other synthetic storm hyetographs (i.e., distributions).

The intensity of rainfall shall be determined using the following equation:

$$I \text{ (mm/hour)} = A \div (T + B)^C$$

where,

T = time of concentration in minutes.

The values of A , B , and C for the various storm return periods are listed in Table 3.2.

Table 3.2 Intensity-Duration-Frequency Regression Equation Constants

	IDF Regression Constants					
	2-year	5-year	10-year	25-year	50-year	100-year
A	725	1,170	1,400	1,680	1,960	2,150
B	4.8	5.8	5.8	5.6	5.8	5.7
C	0.808	0.843	0.848	0.851	0.861	0.861

Notes:

The values of A , B , and C for the various storms, where intensity is calculated as:

$I \text{ (mm/hour)} = A \div (T + B)^C$, where T is time of concentration in minutes.

Table 3.3 shows the rainfall IDF values that shall be used for all frequencies from the 1:2-year to 1:100-year return period based on the regression equations.

The 1:5-year return period shall be used for the minor system design. The 1:100-year return period shall be used for the major system design.

The 24-hour Chicago design storm distribution type should be used to develop hydrographs for urban and rural basins and for determining the required detention storage.

A time step of 5 minutes, with a ratio of time of maximum intensity to storm duration of 0.33, should be used to discretize the design storm, and an initial time of concentration of 10 min.

Table 3.3 Intensity-Duration-Frequency Values

Duration (minutes)	Rainfall Intensity (mm/hour)					
	2-year	5-year	10-year	25-year	50-year	100-year
5	115	157	186	225	253	279
10	82	114	135	162	182	201
15	65	91	107	128	144	158
30	41	57	67	80	90	99
60	25	34	40	48	53	59
120	15	20	23	27	31	33
360	6.2	8.1	9.4	11	12	13
720	3.5	4.5	5.2	6.2	6.7	7.4
1,440	2.0	2.5	2.9	3.4	3.7	4.1

3.7.3.6 Future Climate Scenarios

As part of the SWMP, recommendations for reasonable estimates of future rainfall were provided based on the IDF relationships for the 1:5-year and 1:100-year return period 24-hour duration events for the 2050s (i.e., 2035-2065) and 2080s (i.e., 2065-2100). The relationships are based on an ensemble of Global Climate Model (GCM) projections using socioeconomic scenarios to represent carbon emissions called Representative Concentration Pathways (RCPs). As climate science is continuously evolving and improving, the latest available models and predictions published by the Intergovernmental Panel on Climate Change (IPCC) should be used, as well as the latest IDF tools. The Town will continue to monitor developments with regard to emissions scenarios and may periodically re-evaluate the modelling approach and recommendations presented in this manual. It is the consultant's/owner's responsibility to consult with the Town when evaluating these recommendations.

Within the context of the Town's current objectives, the following approach to incorporating climate change into servicing and drainage analysis is recommended at the EIR stage:

- Base-case assessments should be completed using climate-change-influenced rainfall based on scenario RCP 4.5 (representing a moderate scenario with global efforts to reduce emissions).
- Stress testing using climate-change-influenced rainfall based on scenario RCP 8.5 (representing the business-as-usual, high-emissions scenario) should be completed. A stress testing approach may be required when the Town is considering critical infrastructure decisions regarding long-lived infrastructure.

- The selection of time period used within design or impact studies (e.g., 2050s, 2080s) should be dependent on elements such as the expected lifespan of the infrastructure, cost-benefit analysis, and/or triple bottom line analysis, resilience return on investment, life-cycle costs, the criticality of the infrastructure, etc.
- Given the direction adopted by ECCO and the differences between the Gumbel distribution and generalized extreme value (GEV) distribution for extreme value analysis, the Town currently maintains reliance on the Gumbel-based estimates for assessment and design. However, the GEV-based rainfall estimates should be considered for stress testing infrastructure designs, as the GEV distribution used to fit IDF data is deemed to be more statistically accurate (as well as providing generally higher values).

Climate change assessments can use the latest version of The Western University IDF-CC Tool (available for free at <https://www.idf-cc-uwo.ca/>), using the Toronto City (ID 6158355) climate station information. Other climate change assessment tools are available; however, the Town should be consulted prior to use.

3.7.3.7 Time of Concentration

Time of concentration represents the time required for water to travel from the hydraulically most remote point of the basin to the point of interest. The minimum initial time of concentration (t_c) is to be 10 minutes.

- Pre-development: To calculate the initial time of concentration for upstream, undeveloped lands, the following formulae may be used: Bransby Williams, HYMO/OTTHYMO, SCS Upland Method, etc. The most appropriate method will be determined at the Town's discretion.
- Post-development: To calculate the initial external time of concentration for external lands that are scheduled for future development, a straight line is to be drawn from the furthest point within the watershed to the proposed inlet. The top 50 m shall have an initial time of concentration of 10 minutes, and the remainder shall have a time of concentration as if the velocity in the sewer is 2 m/second.

The summation of the two times of concentration will give the future external time of concentration. If the upstream area has adequate storm sewers, channels, or culverts, the velocity of the flow through these sewers, channels, or culverts shall supersede the 2 m/second calculations.

3.7.3.8 Contributing Drainage Area

Drainage systems shall be designed to accommodate all upstream drainage areas for interim and ultimate conditions, as determined by contour mapping and drainage plans.

3.7.3.9 Return Period Factor

When using the Rational Method (Section 3.7.3.3), to account for soil saturation conditions, the return period factors (R) shown in Table 3.4 shall be used for design purposes.

Table 3.4 Return Period Factor

Return Period	Return Period Factor (R)
Up to 1:10	1.00
1:25	1.10
1:50	1.20
1:100	1.25

3.7.4 Storm Sewer Pipe Design Parameters

3.7.4.1 Depth of Storm Sewers and Minimum Clearance

Storm sewers shall be placed at a depth to be a minimum of 1 m below basement floor elevations and to allow for the installation of foundation and weeping tile connections. Note that the 100-year hydraulic and energy grade line must be calculated and shown on the drawings. This is to confirm that there is no potential surcharging of sewers and foundation drains. Refer to Section 3.7.9 (Foundation Drain Criteria) for criteria on foundation drains.

All storm sewers require a minimum cover of 1.2 m to protect from freezing.

At the functional design level, the minimum cover of storm sewers from the centre line of the road to the overtop of the pipe shall be 2.5 m to allow for the connection of foundation drains.

Unless the engineer is sure of the types of buildings to be incorporated along a street, it is suggested that storm sewers be placed with 3.0 m of cover below the centre line of the road.

NOTES:

- Where weeping tiles cannot drain into storm sewers by gravity, sump pumps may be installed to pump foundation drain water into storm sewers. Three pipe systems may be used, as approved by the director of planning services, where gravity drainage is to be provided separate from the surface drainage system. Refer to Sections 3.7.9 to 3.7.12 for criteria related to foundation drains and sump pumps.
- A minimum clearance of 500 mm between the barrel of the sanitary sewer and the barrel of the storm sewer must be provided if the sanitary sewer connections are required to go under the storm sewer.

3.7.4.2 Location of Storm Sewer

Storm sewer mains shall be offset by 1.5 m from the centre line of the road. The sanitary sewer main shall be placed at the same 1.5 m centre line offset on the opposite side of the storm sewer location.

Pipes may be located closer to the road centerline if a common trench is to be used. Note that the pipes shall have a minimum offset of 1.0 m from their barrels. The size of maintenance holes shall dictate the pipe offset.

Alternate configurations may be provided with justification subject to approval by the Town.

3.7.4.3 Pipe Material

- Concrete pipe with rubber gasket joints shall be used:
 - ✦ Non-reinforced per CSA Group standard CSA A257.1:19 – *Non-reinforced circular concrete culvert, storm drain, sewer pipe, and fittings*.
 - ✦ Reinforced per CSA Group standard CSA A257.2:19 – *Reinforced circular concrete culvert, storm drain, sewer pipe, and fittings*.
 - ✦ Pipe strength is to be determined via Ontario Provincial Standards Drawing (OPSD) tables, using depth, trench width, and bedding type as parameters.
 - ✦ Polyvinyl chloride (PVC) pipe (SDR 35) Manning's n that will be used for the sizing of PVC pipes shall be 0.013.
 - ✦ Maximum allowable deflection of main line sewer is 5%. Deformation gauge (pipeline inspection gauge [PIG]) test may be required prior to acceptance.
 - ✦ Pipe shall meet the CSA Group requirement as noted within Ontario Provincial Standard Specification (OPSS) OPSS 1841: *Material Specification for Non-Pressure Polyvinyl Chloride Pipe Products*. The basic material used in manufacturing this pipe shall have a cell classification of 12454-B or 12454-C or American Society of Testing and Materials (ASTM) International Standard ASTM D3034-16: *Standard Specification for Type PSM Poly(Vinyl Chloride) (PVC) Sewer Pipe And Fittings* and OPSS 1841. The pipe manufacturer must be approved by the Planning Services Department.
 - ✦ Maximum PVC pipe size that will be allowed to be installed for the Town shall be 600 mm diameter.
 - ✦ The compaction of all bedding and cover material shall be 95% Standard Proctor Density or better. Maximum cover shall be in accordance with OPSD 806.040: *Height of Fill Table, Polyvinyl Chloride Gravity Sewer Pipe 210, 320, and 625 kPa* and OPSD 806.06: *Height of Fill Table Polyvinyl Chloride Pressure Pipe for Different Dimension Ratios*. Special care must be given to contouring the bedding material to conform with the pipe bottom and projecting bells, along with proper compaction of the haunches in order to provide even support throughout the pipe. Backfill of manufacturer's specifications and all flexible pipes shall be in accordance with the Town standards and OPSS 401: *Construction Specification for Trenching, Backfilling, and Compacting*.

3.7.4.4 Changes in Pipe Sizes

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

3.7.4.5 Standard Easement and Servicing Block Requirements

Easements or servicing blocks must be provided for infrastructure that will be maintained by the Town. If a servicing block is not provided, a sufficient easement must be provided in favour of the Town for the purposes of accessing and maintaining the infrastructure.

Table 3.5 provides the minimum easement and servicing block widths based on the pipe size and maximum depth of invert for a single pipe, assuming use of a trench box for supported excavations.

If a supported excavation with a trench box is not intended to be used for maintenance purposes, then for each specific site, reference must be made to the following OPSD standards to determine the required easement or servicing block width based on site conditions for unsupported excavations:

- for flexible pipe:
 - ✦ OPSD 802.010: *Flexible Pipe Embedment and Backfill, Earth Excavation*
- for rigid pipe:
 - ✦ OPSD 802.030: *Rigid Pipe Bedding, Cover, and Backfill, Type 1 or 2 Soil, Earth Excavation*
 - ✦ OPSD 802.031: *Rigid Pipe Bedding, Cover, and Backfill, Type 3 Soil, Earth Excavation*
 - ✦ OPSD 802.032: *Rigid Pipe Bedding, Cover, and Backfill, Type 4 Soil, Earth Excavation*

Table 3.5 Minimum Easement Widths

Size of Pipe	Depth of Invert	Minimum Width of Easement
250 to 375 mm	3.0 m maximum	3.0 m
450 to 675 mm	3.0 m maximum	4.5 m
750 to 1050 mm	3.0 m maximum	6.0 m
1200 mm and larger	4.0 m maximum	Greater of 10 m or 4 + 3 × OD

Note:

OD - outer diameter

All servicing block designs and requirements will be reviewed and judged on an individual basis by the Transportation and Engineering Department. Deviations from Table 3.5 require justification to the Town for the proposed easement or servicing block width, with calculations that consider pipe size and depth, soil type, and relevant OPSD.

3.7.4.6 Pipe Classification and Bedding

The type and classification of storm sewer pipe and the sewer bedding shall be clearly indicated on all profile drawings for each sewer length.

All storm sewer pipes shall conform to the requirements of the CSA Group.

The class of pipe and the type of bedding shall be selected to suit loading and proposed construction conditions. In general, Type "B" bedding (crushed stone base with granular over the sewer) shall be used for storm sewers in new developments, and the class of pipe will be selected to suit this bedding detail. See Section 5.5.7 (Materials) for construction materials.

The width of trench at the top of the pipe must be carefully controlled to ensure that the maximum trench width is not exceeded unless additional bedding or higher strength pipe is used.

3.7.4.7 Radius Pipes

Radius pipe shall be allowed for storm sewers 1,050 mm in diameter and larger, provided that a maintenance hole is located at the beginning or at the end of the radial section. The minimum centre line radius allowable shall be in accordance with the minimum radii table as provided by the manufacturer(s).

3.7.4.8 Limits of Construction

Sewers shall be terminated with a maintenance hole at the subdivision limits when external drainage areas are considered in the design. The design of the terminal maintenance holes must allow for the future extension of the sewer.

When external areas are not included on the sewer design, the sewer shall extend at least halfway across the frontage/flankage of any lot or block in the subdivision.

3.7.4.9 Sewer Alignment

Storm sewers shall be laid in straight line between maintenance holes unless radius pipe has been designed. Joint burial (common trenching) with sanitary sewers will be considered when supported by the recommendations of a soils report prepared by a qualified geotechnical engineering company.

3.7.4.10 Pipe Capacities

Manning's formula shall be used to determine the capacity of all storm sewers. The capacity of the sewer shall be determined on the basis of the pipe flowing full.

The value of the roughness coefficient n used in Manning's formula shall be as follows:

Concrete pipe	0.013
Concrete box culverts	0.013
Corrugated metal 68 × 13 mm corrugations	0.024
Corrugated metal 25% paved invert	0.021
PVC pipe	0.013

Design flow calculations must be completed on Town design sheets.

3.7.4.11 Minimum Slope

The minimum storm sewer slope for all pipe sizes shall be not less than 0.5%. If minimum slope cannot be achieved, approval by the Director of Transportation and Engineering is required.

3.7.4.12 Flow Velocities

For circular concrete pipes, the minimum acceptable full flowing velocity is 0.75 m/second, and the maximum acceptable full flowing velocity is 4.0 m/second.

3.7.4.13 Minimum Sizes

The minimum size for:

- street storm sewer shall be 300 mm
- foundation drain collector shall be 200 mm

3.7.5 Catch Basin Criteria

Catch basins shall be selected, located, and spaced in accordance with the conditions of design. The design of the catch basin location and type shall take into consideration the lot areas, the lot grades, pavement widths, road grades, hydraulic efficiency, intersection locations, and bicycle and pedestrian travel safety (as per Town and AODA requirements).

The maximum area to be served by any catch basin shall be 2,000 m² of paved area or 4,000 m² of sodded area.

Catch basins shall be generally located upstream of sidewalk crossings at intersections and upstream of all pedestrian crossings. Catch basins shall not be located in driveway curb depressions, if possible, to avoid.

Double catch basins are to be installed at the low point of any road. For hydraulic reasons, or where double catch basins are not practical, curb inlet overflow for catch basins (OPSD 400.090: *Cast Iron, Curb Inlet Overflow for Catch Basins*) can be considered on a case-by-case basis.

- maximum catch basin spacing:

✦ pavement width	maximum catch basin spacing
8.5 m or less:	100 m
9 to 12 m:	80 m
12.5 m or greater:	60 m
- road catch basins: sump unit, "square opening" grate per OPSD 400.11: *Cast Iron, Square Frame With Square Overflow Type Flat Grate for Catch Basins, Perforated Openings*
- rear-yard catch basins: sumpless unit, beehive grate
- catch basin (including rear lot catch basins) connections:
 - ✦ single catch basin = 250 mm pipe at 1%
 - ✦ double catch basin = 300 mm pipe at 1%
- catch basin inlet controls shall be the plug type (not plates)

- For the purposes of calculating required surface inlet capacity, all surface inlets located at depressions and sag points shall be assessed assuming 50% blocked conditions.
- The 1:100-year HGL is to be below the top of grate for rear lot catch basins to prevent flooding of backyards.
- Rear lot catch basin leads to be concrete

3.7.6 Maintenance Hole Criteria

Maintenance holes are to be provided at pipe junctions, change in pipe alignment (vertical and horizontal), change in pipe size or material, and where maximum pipe run is attained.

Maintenance holes are to conform to relevant OPSDs; use of integrated frame and cover systems can be used, in consultation with the Town.

3.7.6.1 Maximum Maintenance Hole Spacing

- 90 m for pipes 600 mm or smaller
- 150 m for pipes larger than 600mm

Maintenance hole size is to be based on pipe size and number of pipes at junction, per OPSD.

Maintenance holes larger than 3.0 m in diameter are to be designed and detailed.

3.7.6.2 Pipe Angle at Maintenance Hole

Acute interior angle of flows not allowed (less than 90°).

Pipes 1,050 mm and larger shall not exceed a maximum change in direction of 45°.

3.7.6.3 General Requirements

Maintenance holes may be either precast or poured in place. Integrated frame and cover systems can be used, in consultation with the Town.

Safety gratings shall be provided in all maintenance holes when the depth of the maintenance hole exceeds 5 m.

The obverts on the upstream side of maintenance holes shall not be lower than the obvert of the outlet pipe. Where the difference in elevation between the obvert of the inlet and outlet pipes exceeds 1.2 m, a drop pipe shall be placed on the inlet pipe.

Provide benching to the obvert of the outlet pipe per OPSD 701.021: *Maintenance Hole Benching and Pipe Opening Alternatives*.

Three pipe systems, where a separate foundation drainpipe is in a common trench with the sanitary sewer, shall be designed with individual maintenance holes.

3.7.6.4 Head Losses and Drops

Suitable drops shall be provided across maintenance holes to compensate for the loss in energy due to the change in flow velocity and for the difference in the depth of flow in the sewer. Restrict the change on velocity between the inlet and outlet pipes to 0.6 m/second.

The minimum drops across maintenance holes shall be as shown in Table 3.6.

Table 3.6 Minimum Drops Across Maintenance Holes

Change of Direction	Minimum Drop (mm)
0°	20
1° to 45°	50
46° to 90°	80

3.7.7 Service Connections To Main Sewer

The location of service laterals at lot frontages is detailed within the *Department of Public Works Standard Drawings* manual. Note the storm/sanitary alignment and the angle into the lot.

3.7.7.1 Service Lateral Sizing

- single-family and semi-detached and multiple residential areas (foundation drain only): minimum size 200 mm diameter PVC SRD 28
- commercial and industrial areas (sized for surface drainage): minimum size 300 mm diameter concrete or PVC up to 600 mm

Note: Double connections are acceptable in residential areas where all other utilities can be accommodated and where the difference in the two connecting basement elevations does not exceed 500 mm. See the Halton Region double sanitary service requirements.

3.7.7.2 Main Line Connections

Manufacture of service tees at the main sewer shall be as follows:

- For storm main sewer pipe sizes 600 mm or smaller, prefabricated tees from the plant shall be utilized.
- For storm main sewer pipe sizes 675 mm to 900 mm, tees shall be manufactured in the field on top of the trench with the proper saddles and shall be inspected by the consulting engineer prior to installation.
- For storm pipe sizes 975 mm and larger, tees shall be manufactured in the trench with proper saddles.

In both above cases, the storm sewer shall be drilled or scribed at the plant rather than breaking through the pipe wall on site.

3.7.7.3 Identification of Buried Service Stub

Wooden markers, 100 mm × 50 mm, placed from the invert of the storm service to 1.0 m above ground

level shall be placed at the ends of each residential connection (street line). The top 0.5 m of the markers are to be painted white.

3.7.8 Roof Leader Criteria

In general, roof drainage shall discharge to landscaped areas to encourage infiltration. Commercial, industrial, and high-density residential building sites may not have the ability to discharge to landscaped areas; therefore, the stormwater roof drainage may be discharged directly into a storm sewer system given that flow control shall be applied where deemed necessary.

Within new subdivisions, storm sewers are sized based on sodded lots; therefore, roof leaders are not to be connected directly to the storm sewer system, thereby encouraging infiltration.

The following conditions apply to residential lot roof discharge:

- The following clauses shall be in the servicing agreement:
 - ✦ The consultant is to certify, as part of the preliminary lot-grading certificate, that the roof leader(s) are not connected directly to the storm sewer and are located in accordance with Town standards.
 - ✦ The consultant is to certify, as part of the final lot-grading certificate, that the roof leader(s) have been installed in accordance with the preliminary lot-grading certificate.
- A warning clause is to be placed in the development agreement for the affected lots indicating that the roof leader cannot be connected to the storm sewer system.
- Roof leader down spout locations are to be indicated on site grading plans.
- Downspouts shall discharge to grade via concrete splash pads, directed away from the building to prevent erosion and percolation to the weeping tile. Downspouts shall not typically discharge in between houses, only to the front and rear yards. Rainwater harvesting is encouraged, provided any overflow pipes or overflows meet the requirements of this section.
- Downspouts shall not have pipes ending at a mutual property line and allowed to discharge onto another property.
- Downspouts shall not be directed towards an adjacent property where there is no property line intercept swale or the volume/velocity may impact that property or interfere with access or pose a safety issue.
- For higher density developments or where required by the Town, downspouts may be connected to a municipal storm sewer with permission from the Town in its sole discretion.
- Roof leader downspout locations are to be indicated on all plot plans, site grading, and site plans.

3.7.9 Foundation Drain Criteria

For new or infill subdivision development, the proponent must determine the seasonal high groundwater elevation, as determined by a qualified professional or as determined in an existing geotechnical or

hydrogeological study (EIR or FSS). This must be determined prior to draft plan of subdivision/condominium approval.

The Town's preferred approach is to connect foundation drains to storm sewer via gravity, provided ALL of the following conditions are met:

- The underside of footing is at least 0.5 m above the local high groundwater elevation, AND
- There is at least 0.5 m between the underside of footing and the 1:100-year hydraulic grade line of the receiving system, AND
- There is an available gravity drainage connection to a storm sewer, AND
- Provision of an approved backflow preventer valve is provided on each service lateral connection.

Foundation intersection with high groundwater table is strongly discouraged. Continuous long-term groundwater discharge to existing infrastructure (pipes/ponds/ditches) may lead to cumulative impacts and is not supported by the Town (refer to Section 3.7.12 for further guidance). Options to mitigate include raising the foundation elevation above the groundwater table, eliminating basements, or engaging with the Town to determine an appropriate mitigation strategy.

Where the above provisions for gravity connection of foundation drains cannot be met due to hydraulic grade line (HGL) issues or lack of storm sewer connection, a foundation drain collector (third pipe) may be required and discharged to an acceptable outlet. Alternatively, a sump pump system may be installed with an acceptable discharge location to the satisfaction of the Town. Refer to Section 3.7.11 (Sump Pump Criteria) for more details. Foundation drainage may be subject to consultation with the Town.

3.7.9.1 Multi-unit Blocks

Freehold developments shall be provided with individual unit service connections to the foundation drainage system. Condominium shared ownership developments shall be provided with a minimum of two connections per block.

3.7.10 Foundation Drain Collector "Third Pipe"

Three pipe systems, where the foundation drainage system is a separate sewer, are acceptable in the Town, but must be justified to the satisfaction of the Director of Transportation and Engineering. A schematic of a typical foundation drain collector (FDC) system is shown in Figure 3.1. An acceptable outlet must be determined to the satisfaction of the Town. Note this could be several kilometers away.

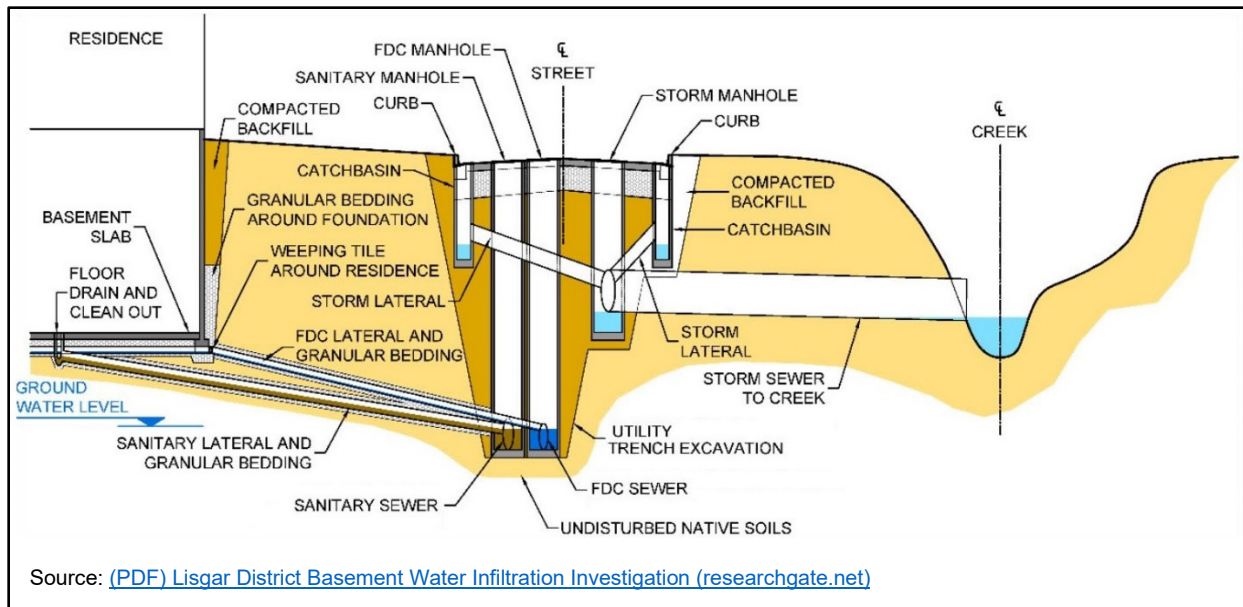


Figure 3.1 Schematic of a Foundation Drain Collector System

3.7.11 Sump Pump Criteria

Sump pumps shall discharge via pipe directly to a storm sewer where available and provided there are no sewer capacity issues. A backflow preventor at the property line and air gap are to be provided. Sump pump details must be included on the grading plan.

Where a storm sewer does not exist, sump pumps shall discharge to grade according to the following discharge outlet criteria:

- The discharge pipe must outlet to the front of the building; outletting to the side or rear yard is not permitted.
- Outlet must maintain a minimum 1 m setback from buildings and direct discharge away from buildings.
- Outlet to concrete splash pads and then to pervious grassed or landscaped areas for infiltration.
- Outlet must be a minimum of 1.8 m from roof leader/downspout discharges.
- Discharge must be contained on site with no negative effect to neighbouring properties.

Where an existing basement excavation (underside of footings) is lower than the seasonally high groundwater level, sump pumps may run continuously and, therefore, are not acceptable (see Section 3.7.12 [Long-term Groundwater Discharge and Foundation Drainage]).

3.7.12 Long-term Groundwater Discharge and Foundation Drainage

Continuous long-term groundwater discharge to existing infrastructure (pipes/ponds/ditches) may lead to cumulative impacts. The Town's stormwater infrastructure has not been sized to accommodate long-term continuous discharges of groundwater. Cumulative impacts include capacity concerns, diversion of flows

between watersheds, loss of cooling water and drawdown of groundwater. The following criteria have been developed:

- Foundation intersection with high groundwater table is strongly discouraged.
- Proponent must complete a detailed technical analysis, including items such as:
 - ✦ undertake a geotechnical/hydrogeological study
 - ✦ determine the overall hydrogeologic setting
 - ✦ confirm range of pumping rates and volumes
 - ✦ potential impacts (e.g., groundwater drawdown, municipal infrastructure, neighbouring properties)
 - ✦ determine an acceptable outlet (e.g., local watercourse) and/or alternative mitigation strategy (e.g., waterproofing)

Foundation drainage must be accounted for in the storm sewer and downstream infrastructure design (e.g., SWM pond). This assessment of groundwater discharge impacts includes consideration of capacity for all storm events up to and including the Regional event.

Applications will be subject to consultation with the Town.

Refer to Section 5.4 (Dewatering During Construction) for short-term discharges for groundwater dewatering during construction.

3.7.13 Overland Flow Routes

Major flows in excess of the minor system capacity shall be safely routed to the receiving watercourse. An overland flow route must be established through all areas and shall be contained within either the road ROW or by other lands in the Town's ownership.

The depths of overland flows permitted on streets and at intersections during the 1:100-year storm are as follows:

- No building shall be inundated at the ground line, unless the building has been flood proofed (no buildings within regulated flood plain).
- For all classes of roads, the product of depth of water (m) at the gutter times the velocity of flow (m/second) shall not exceed $0.65 \text{ m}^2/\text{second}$.
- For arterial roads, the depth of water at the crown shall not exceed 0.15 m.
- Flow across road intersections shall not be permitted for minor storms (generally 1:10-year). To meet criteria for major storm run-off, low points in roads must have adequate provision for the safe overland flow.

- Where possible, low maintenance concrete walkways shall serve as the overland discharge route through residential blocks.

3.7.14 Remnant Channels

Remnant channels provide overland flow routes for runoff and are not regulated by the conservation authority. Figure 3.2 shows commonly recognized remnant channels that were demonstrated to be relied upon as overland flow routes within the Town's SWMP. These may not be the exclusive locations of remnant channels. Figures are included in Appendix A that identify properties that require further assessment to demonstrate the Town's requirements are met. The proponent will need to demonstrate the 1:100-year flow limits within their property.

In areas of remnant channels, the following requirements apply:

- A SWM report must be prepared by a qualified professional to demonstrate the extent of the floodline for the 1:100-year event.
- The remnant channels are not to be enclosed. This leads to blockages and flooding.
- The function of the channel is to be replicated (conveyance, infiltration, filtration).
- The dwelling and any accessory buildings (e.g., pool house, shed) are to be demonstrated to be outside of the limits of the 1:100-year event, and no impacts to adjacent properties will be permitted.
- Any grading works within the 100-year flow limits will require cut/fill balance to demonstrate no impacts.
- Refer to Appendix A for properties that require further assessment

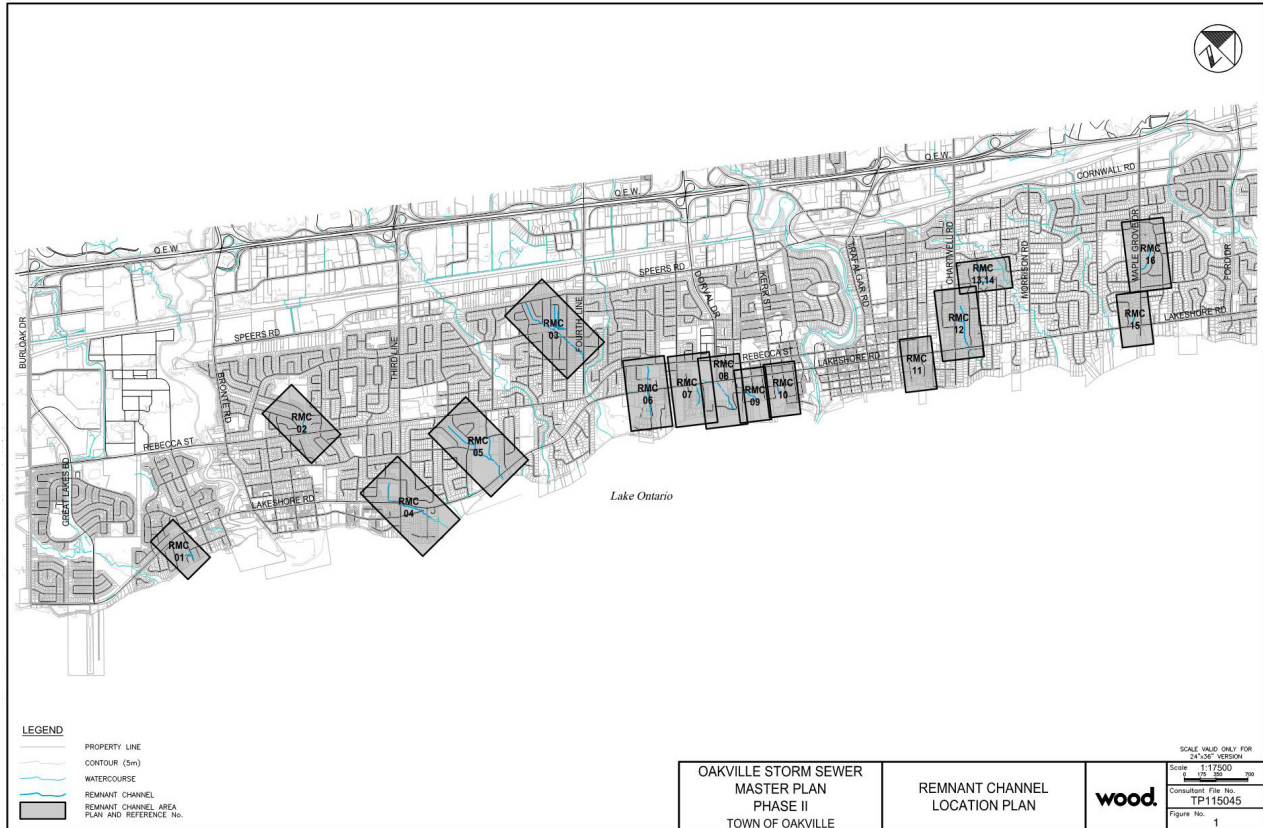


Figure 3.2 Remnant Channels Location Plan

3.7.15 Inlet/Outlet Structures

Inlet/outlet structures shall be fully detailed on the engineering drawings. The details provided shall include the existing topography/vegetation, proposed grading and works necessary to protect against erosion of the channel/slopes and structure foundations.

Armour stone, riprap, concrete, or other erosion protection shall be provided at all inlets to prevent erosion of the watercourse and to the area adjacent to the headwall. The extent of the erosion protection shall be indicated on the engineering drawings and shall be dependent upon the velocity of the flow at the storm outlet/inlet, the soil conditions, the flow in the existing watercourse, and slope conditions.

The openings to inlets and outlets must be protected to prevent unauthorized access and blockage of the system. Safety grates are required where pipes exceed 300 mm diameter. Large culverts may not require grates where the system is open at both ends and the length is determined to be acceptable. Safety fencing is required on structures where a vertical face exists greater than 1.0 m in height.

The obvert outlet pipes shall be above the 1:25-year flood elevation of the receiving body. Complete slope restoration shall be provided where slopes are disturbed. Natural stabilization methods are encouraged, including plant replacement/enhancement and bioengineering techniques.

All outlets to a regulated watercourse require a permit from CH/CVC.

3.7.16 Culverts and Bridges

Road crossings of watercourses shall be designed per flood frequencies. Table 3.7 shows the minimum capacities that shall be provided with allowance for overtopping of roads.

Table 3.7 Minimum Hydraulic Capacities for Road Crossings of Watercourses

Road Classification	Design Flood Frequency
Arterial	1:100-year to Regional
Collector	1:100-year
Year Urban Local	1:50-year
Rural Local	1:25-year
Temporary Detour	1:10-year
Driveway	1:10-year

Bridges and other major drainage structures shall require special designs as determined by the Development Services Section. Hydraulic calculations will be required to identify the capacities required. Road crossings shall not result in an increase in upstream Regulatory storm flood levels; therefore, sizing may exceed these minimum requirements.

All crossings of a regulated watercourse require a permit from CH/CVC and possibly MNRF and DFO.

3.8 Stormwater Management Pond Design Guidelines

SWM ponds are generally designed as multifunctional stormwater quantity and quality control facilities. Ponds can detain volumes and limit outflow velocities to control the impacts of increased volumes and runoff rates associated with impervious surfaces within developments. The main goals are to prevent negative impacts to downstream watercourses and floodplains by preventing increases in erosion and flood levels.

In most cases these ponds will also provide a level of quality treatment by retaining particulates that are transported by stormwater as surface flows wash chemicals and debris from roads and building sites. This type of pond will incorporate a permanent pool of water which acts as a settling basin and given a certain detention time will allow the target particle sizes to settle to the pond bottom. This type of pond is currently the standard and is referred to as an “extended detention wet pond.” To enhance the quality treatment, appropriate aquatic plants are to be incorporated into the landscape design, as well as upstream LID BMPs as part of a treatment train approach, where appropriate.

All ponds must incorporate the requirements of the Town, the EIR or subwatershed study and the MECP *Stormwater Management Planning and Design Manual* (MOE 2003) to ensure proper hydraulic function, water quality treatment, safe public access, enhancement to the existing natural features, and minimize the long-term maintenance costs. Generally, the Town prefers centralized facilities which serve a minimum drainage area of 25 ha. The goal is to minimize the number of facilities and structures, thereby reducing the long-term maintenance costs. The engineering design of the SWM pond block must receive preliminary approval from the Parks and Open Space Department and the Development Services Section prior to draft approval. The intent of the preliminary design approval is to demonstrate the SWM pond block will be large enough to accommodate the required functions.

CH and CVC have jurisdiction on the level of control, the determination of the flood lines, erosion prevention, the location of outfalls, and the approval of construction within defined floodplain and some natural areas.

SWM ponds form a part of the overall open space/natural area associated with regulated watercourses and creeks; therefore, they are used by the public as passive recreational features with pathways connecting the ponds with the adjacent park and open spaces. If the design can include sufficient design of side slopes, the ponds are not to be fenced and public water access restricted using strategically planted vegetation and warning signs.

3.8.1 Design Considerations and Retaining Walls in High-density Areas

The design guidelines for SWM ponds in high-density areas contain several additional considerations to those for conventional ponds, including the potential for retaining wall design, safety railings and maintenance considerations. The following considerations must be addressed, in addition to the design requirements highlighted in Table 3.8:

- The proponent must demonstrate that ponds controlling runoff from areas defined within the NOCSS will meet the stipulated targets for water quality, erosion, flood storage, and peak flow control.
- The proponent is required to meet the Town SWM pond policy and MECP guidelines for safe side slopes, vegetation, and fencing.
- The proponent must provide justification for any retaining wall feature of a SWM pond to ensure that the above noted additional considerations are recognized and that expected community benefits are obtained.

Some SWM ponds in high-density urban settings may include vertical retaining walls along a portion of the perimeter rather than traditional earthen slopes. These ponds can still provide benefit to the public through aesthetic enhancement and reduction of the overall pond footprint, while also resulting in a greater developable area.

For applications in the Town, SWM ponds with retaining walls are **only permitted** with the following conditions:

- the location of the pond is within an urban core area
- the adjacent land use to the retaining wall component must be designated as high density
- retaining walls must not be located adjacent to natural heritage system features such as stream corridors, core preserve areas, and linkages

If a pond design includes a proposed retaining wall, the Development Engineering, Engineering & Construction, and Parks and Open Space departments at the Town must be consulted for initial acceptance prior to Draft Plan approval. The Development Engineering Section shall work in consultation with Parks and Open Spaces and Engineering & Construction departments to coordinate staff comments on the applications and streamline the review process.

3.8.2 General Guidelines for Extended Detention Wet Ponds

Table 3.8 outlines a list of guidelines to be incorporated into a SWM pond design, including special considerations for retaining walls in high density areas.

Table 3.8 Guidelines for Extended Detention Wet Ponds

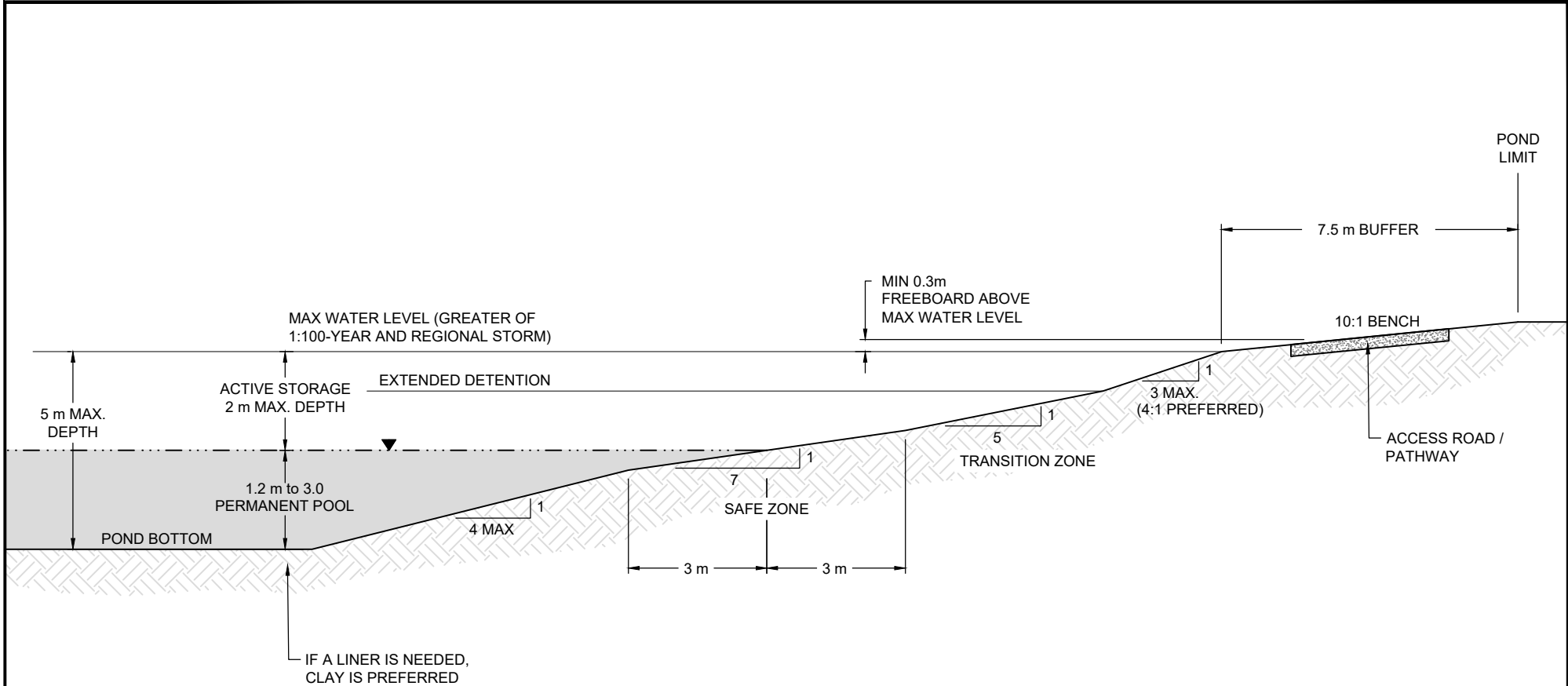
Criteria	General Guidelines
Shape/Size	<ul style="list-style-type: none"> • Incorporate two cells, forebay and main cell, with submerged berm. • Berm design requirements for elevated ponds (i.e., not dug ponds) should be built with consideration for the full range of storm events, dynamic forces (i.e., wave action), loading, etc. on the berm. • Length is based on particle size and settling rate, reference should be made to MECP calculations. • Shape of shoreline should vary per landscape design. • Minimum 3:1 length to width ratio; preferred ratio is 5:1 or greater. • When applicable, the proponent must demonstrate that the pond will meet the NOCSS targets for water quality, erosion, and flood storage. • Where applicable, shape of pond and placement of retaining walls shall allow for safe egress rescue efforts in case of emergencies as well as maintenance access.
Pond Depth	<ul style="list-style-type: none"> • Total pond depth not to exceed 5.0 m, measured from top of pond to the bottom of pond (i.e., including the permanent pool). • Permanent pool: <ul style="list-style-type: none"> ✦ forebay minimum depth of 1.5 m ✦ main cell minimum depth of 1.2 m. • Active volume: maximum depth of 2.0 m for the 100-year return event. • Minimum 0.3 m of freeboard above the high-water level. • Refer to Figure 3.3, Minimum Stormwater Management Pond Side Slopes.
Pond Lining	<ul style="list-style-type: none"> • Pond lining standards may be subject to change depending on individual site locations, soil composition, water table elevation, and sensitivity of receiving watercourse. • If the excavation is not watertight, use a clay lining. • For retaining wall sections, an additional form of lining may be required to minimize water entering area behind wall structure. • Retaining wall structures should allow for backfill drainage to relieve hydrostatic pressure behind the wall.
Side Slopes	<ul style="list-style-type: none"> • Minimum 7H:1V slopes within 3 m horizontal zone above and below the permanent pool/normal water line as “safe zone.” • Minimum 5H:V1 slopes to upper limit of extended detention zone as “transition zone.” • Minimum 4H:1V slopes below the “safe zone” to the pond bottom. • Maximum 3H:1V in all other zones above extended detention level; preferred 4:1. • Refer to Figure 3.3, Minimum Stormwater Management Pond Side Slopes

Criteria	General Guidelines
Pond Block Size	<ul style="list-style-type: none"> • The required pond block size shall be determined at the draft plan of subdivision/condominium stage of the planning approval process (may be refined prior to registration). • Pond size shall be determined by total flood volume, required side slopes and required shape, including retaining walls. • Pond size shall include a perimeter buffer of 7.5 m beyond the high-water level (either the 100-year or Regional storm, whichever is the highest design elevation) to allow for pathway, maintenance, upland planting, and a buffer zone from private property. This buffer should not exceed 10% slope.
Retaining Walls	<ul style="list-style-type: none"> • Retaining walls shall be permitted on a maximum of 50% of the pond perimeter, as measured along the permanent pool. • The pond forebay must have at least one side not adjacent to a retaining wall structure to facilitate maintenance access. • Retaining walls to be set no closer to the permanent pool than the edge of the 7:1 slope zone above the wetted perimeter of the permanent pool. This area shall function as a safety bench to allow safe egress from the pond. • Retaining wall designs shall be stamped by a professional structural and/or geotechnical engineer licensed in the Province of Ontario and shall be inspected by a licensed geotechnical engineer during installation. • Site-specific constraints, including soil conditions, must be identified and considered in the feasibility and design of the retaining wall. • Retaining walls shall be constructed of armour stone. • Retaining walls shall be designed for a 75-year life cycle. • Retaining walls shall be designed to withstand live loads from vehicular traffic and heavy maintenance equipment as required, as well as horizontal loadings from safety railings and/or traffic barriers. • Double (i.e., tiered) retaining walls are not appropriate due to additional maintenance access and costs. • The impact of ice and winter weather conditions on retaining walls should be considered in the design. • Retaining walls should be north facing where possible to reduce impacts on water temperature and water quality for the pond itself and receiving drainage. • Retaining wall designs for urban ponds will be subject to additional review by Town structural staff, and may be subject to additional review fees. • Retaining walls should not be placed adjacent to natural heritage system features such as stream corridors, core preserve areas, and linkages.
Safety Railing	<ul style="list-style-type: none"> • Railings shall be installed at the top of retaining walls for public safety. • Railings shall be designed in accordance with Town and Ontario Building Code standards for “guard” design.
Traffic Barriers	<ul style="list-style-type: none"> • Traffic barriers may be required at the top of retaining walls for ponds in close proximity to roadways. Traffic barriers shall be designed in accordance with the Ontario Highway Bridge Design Code, CSA 56
Inlet Structures	<ul style="list-style-type: none"> • Pipe invert to be at, or a maximum of 0.3 m above, the permanent pool elevation. • An armour stone splash pad should extend 5 m into the forebay. • End wall to be poured in place concrete with armour stone wingwalls and 1.2 m chain-link safety fence.

Criteria	General Guidelines
Outlet Structures	<ul style="list-style-type: none"> • To mitigate thermal impacts, the primary outlet control pipes shall be bottom draw with perforated end complete with protective stone jacket. • Minimum cover of 0.5 m below normal water level. • Provide anti-seepage collars or impervious bedding/cover to pipe. • Secondary control via cut outs in structure plus grates. • Overflow (emergency and/or uncontrolled) via pond berm spillway; spillway elevation to be controlled using a concrete feature or buried curb, below frost line (1.2 m), bordering the asphalt access road to prevent potential for vertical movement. • Avoid submerged grates, but if grates are required, stone steps to be provided for safe egress out of pond. • Refer to Figure 3.4 Example Outlet Structure Detail. • Refer to Figure 3.5 Example Emergency Spillway Detail.
Flow Control Devices	<ul style="list-style-type: none"> • Control of low (frequent) flows by orifice plate cap on storm pipe, pipe to be concreted in place within precast rectangular concrete maintenance hole. • Orifice openings must have a diameter of no less than 75 mm. • Provide guides and plate to plug flow when desired. • Valve may be an option, with approval from the Town. • Control of high (infrequent) flows by secondary orifice or weir opening in maintenance hole structure designed for staged storage of all event targets. • Avoid submerged grates, but if they are required, stone steps to be provided for safe egress out of pond. • Refer to Figure 3.6 Example Orifice Detail.
Maintenance Drain	<ul style="list-style-type: none"> • Provide secondary outlet pipe with knife gate valve, minimum 300 mm diameter. • Valve to be housed in maintenance hole with easy access from surface using valve key without requiring confined entry into maintenance hole. • Allow for the pond to drain to the bottom where an appropriate outlet elevation can be provided.
Maintenance Access	<ul style="list-style-type: none"> • Layout of pond must allocate a minimum of 7.5 m of open space behind the retaining wall for access of maintenance vehicles. • Access to functional design elements of the SWM facility such as all structures and the pond bottom must be available. • Above the water level, roads to be 3.0 m wide with 300 mm granular base and turn around at dead ends. • Below water level and on down slopes, road to be 4.0 m wide, a hard surface, and have a maximum slope of 10%. Access roads must be turfstone for slopes greater than 6%. • A designated area for removed sediment materials should be included in the site layout. • Maintenance access points should consider ease of travel for maintenance vehicles (i.e., dump trucks). • The location of maintenance access roads must consider the location and context of pedestrian access points as well as trails/sidewalks. Access roads can be combined with pathways where practical. Access road leading into the pond shall include a physical barrier using posts/guidewire with reflective sleeve or p-gates.

Criteria	General Guidelines
Utilities	<ul style="list-style-type: none"> • If retaining walls are placed alongside roadways, public utilities may be affected. • Utilities are recommended to be placed above saturation level of permanent pool to facilitate future maintenance and replacement. • Electricity, telephone or cable utilities lines shall not be permitted near pond retaining wall due to potential moisture impacts. • Anchors for retaining walls may affect the location of utilities.
Public Pathways	<ul style="list-style-type: none"> • Pathways within the pond block shall be approved by the Parks and Open Space Department and shall be incorporated within the approved pond landscape plan. Pedestrian pathways are typically 2.4 m wide and may be combined with maintenance access roads where practical. • All public pathways shall be located above the high-water level. • Path materials should be chosen in accordance with pond aesthetic planning and enhance the overall design of ponds and surrounding area. • The location of public pathways should consider the movement of pedestrians to enhance the overall urban character of the pond, including lookouts and seating areas.
Pond Landscaping	<ul style="list-style-type: none"> • A landscape plan shall be prepared to the satisfaction of the Town and CH. The type, density, and location of the plant material shall satisfy the aesthetic, habitat, and pond quality treatment functions of the pond. • Ground cover shall be established per CH approved seed mix and shall include an average consolidated topsoil depth of 0.3 m on all areas above the normal water line, and the extent of the 7:1 submergent zone below the normal water line. No topsoil to be placed on pond bottom. • Trees shall be located in such a manner that the roots do not adversely impact the integrity of pond retaining walls. • Trees or dense woody vegetation shall not be located where it can impede the flow of water, for example overland flow, spillways. • Trees or dense woody vegetation shall be strategically placed to not limit access for inspections and maintain around inlets and outlets. A 1 m buffer should around inlets and outlets should be maintained. • Where possible, aquatic benches are encouraged around the permanent pool perimeter to support aquatic vegetation and to provide for egress. • Landscaping features where retaining walls terminate should be designed to deter access to permanent pool edges. • Refer to Section 3.8.3 (Stormwater Management Pond Landscape Design Guidelines).
Pond Aesthetics	<ul style="list-style-type: none"> • Consideration for aesthetic enhancement should be incorporated into the approved landscape plan to assist with urban pond integration. This plan may include planning of walkways, attractive railings, specific materials, or installation methods to be used for retaining wall structures, etc. • Consideration for the prevention/discouragement of graffiti and vandalism of retaining walls and other pond structures should be included in the pond design, landscaping and operations and maintenance plans


Criteria	General Guidelines
Perimeter Fencing	<ul style="list-style-type: none"> • Considerations for upgraded fencing alternatives will be made in areas of public use. • The fence is property of the Town and private gates are prohibited. Fencing must suit traffic types in the area (i.e., vehicular traffic, pedestrians).
Public Information Signage	<ul style="list-style-type: none"> • All ponds shall include public signage to identify the general operation of the pond, information about the facility, nuisance algae, routine maintenance, and frequency of sediment dredging and list the public restrictions for recreational use and fish stocking. These signs have been prepared by the Town. The developer shall acquire the signs from Town staff who will dictate the number of signs required and their specific locations for placement. • Signs must be anchored to ground with concrete and posts.
Safety Signage	<ul style="list-style-type: none"> • Town-approved signs should be located at all public points of access to the urban pond facility. • Signage should be in accordance with the Town's SWM policy and installed in consultation with the Town staff. • Signs must be anchored to ground with concrete and posts.
Monitoring	<ul style="list-style-type: none"> • Monitoring shall be required per Monitoring Mediation Agreement (July 26, 2007) for water quality, quantity, and erosion controls. • Access to sediment forebay and inlet and outlet structures shall be maintained for monitoring purposes. The location of these monitoring sites in areas with retaining walls should be avoided. • Performance monitoring of ponds shall include provision for the inspection of retaining walls for material and workmanship deficiencies, where applicable. • Refer to the <i>Town of Oakville Stormwater Management Facilities: Monitoring, Inspection and Maintenance</i> for additional requirements: https://www.oakville.ca/getmedia/3747be39-e88c-4148-a0a1-89214b16c92c/building-development-engineering-stormwater-management-facilities-monitoring.pdf
Sediment Management Plan	<ul style="list-style-type: none"> • A sediment management plan should be developed for the SWM pond, in line with the requirements established under O. Reg. 406/19: On-Site and Excess Soil Management. The sediment management plan should focus on innovative sediment reuse on site, rather than sediment export, possibly incorporating sediment reuse with landscape design features. If exporting, there needs to be an adequately sized sediment drying area.

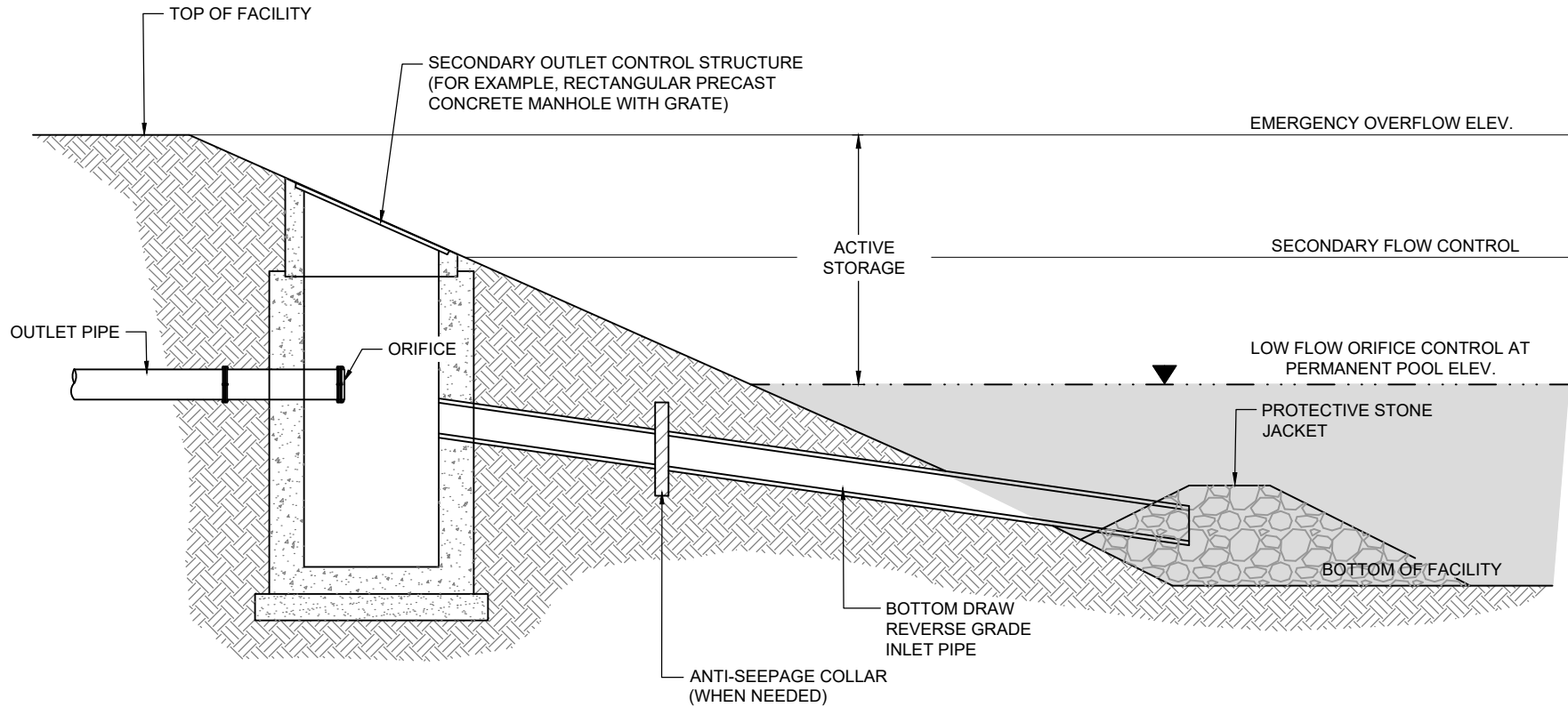


MINIMUM SWM POND SIDE SLOPES

NOT TO SCALE

THIS IS AN EXAMPLE FOR ILLUSTRATION PURPOSES ONLY


 OAKVILLE			
TOWN OF OAKVILLE DEVELOPMENT ENGINEERING PROCEDURES AND GUIDELINES MANUAL			
MINIMUM SWM POND SIDE SLOPES			
Date:	Project:	Submitter:	Reviewer:
APRIL 2023	35481-Details	S. BLUE	S. BLUE
Disclaimer: The schematic shown is provided as a visual aid based on the information contained in the Town of Oakville Development Engineering Procedures and Guidelines Manual, dated April 2023. Actual design details must be determined by proponents based on actual site conditions. Matrix Solutions Inc. and the Town of Oakville assume no liability for the use of these details by third parties.			Figure 3.3

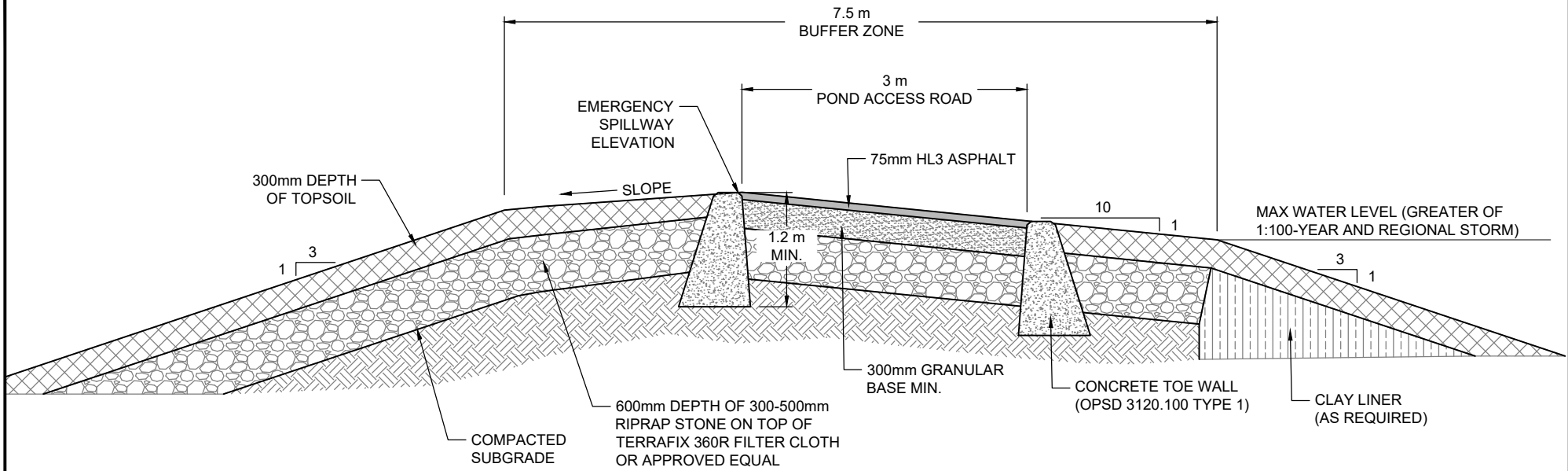


OUTLET STRUCTURE DETAIL

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 OAKVILLE			
TOWN OF OAKVILLE DEVELOPMENT ENGINEERING PROCEDURES AND GUIDELINES MANUAL			
EXAMPLE OUTLET STRUCTURE DETAIL			
Date:	Project:	Submitter:	Reviewer:
APRIL 2023	35481-Details	S. BLUE	S. BLUE
Disclaimer: The schematic shown is provided as a visual aid based on the information contained in the Town of Oakville Development Engineering Procedures and Guidelines Manual, dated April 2023. Actual design details must be determined by proponents based on actual site conditions. Matrix Solutions Inc. and the Town of Oakville assume no liability for the use of these details by third parties.			Figure 3.4



EMERGENCY SPILLWAY DETAIL

NOT TO SCALE

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ILLUSTRATION PURPOSES ONLY**



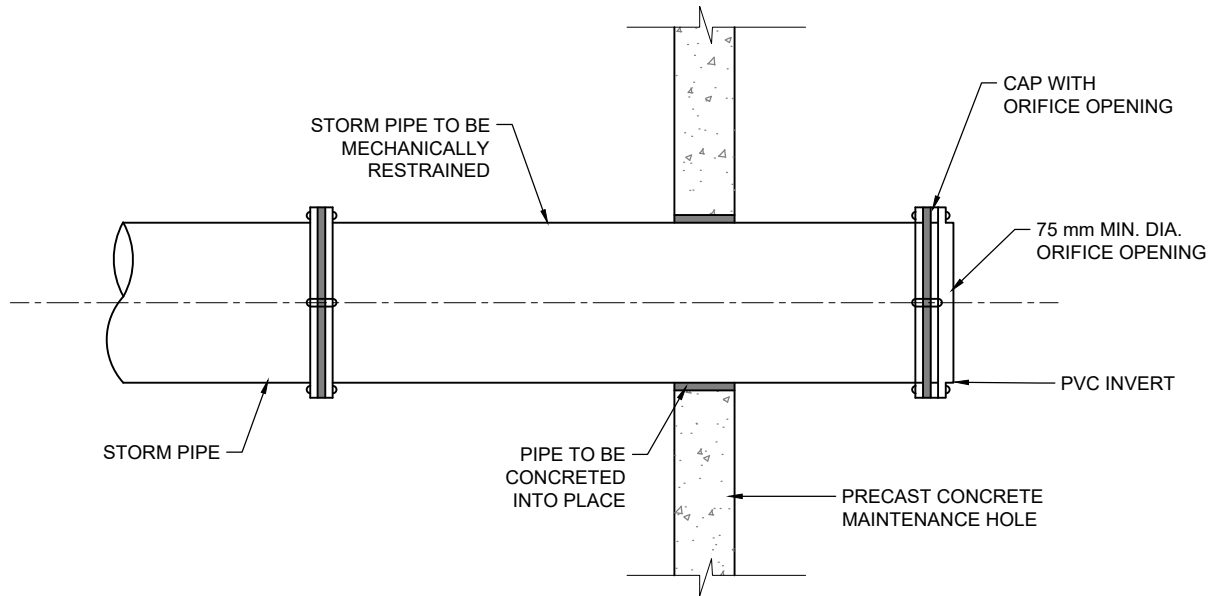
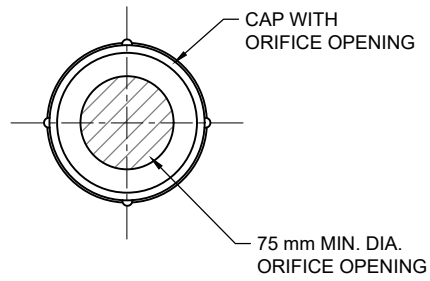
TOWN OF OAKVILLE
DEVELOPMENT ENGINEERING PROCEDURES AND GUIDELINES MANUAL

EXAMPLE EMERGENCY SPILLWAY DETAIL

Date:	APRIL 2023	Project:	35481-Details	Submitter:	S. BLUE	Reviewer:	S. BLUE
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Figure **3.5**



ORIFICE DETAIL

NOT TO SCALE



TOWN OF OAKVILLE
 DEVELOPMENT ENGINEERING PROCEDURES AND GUIDELINES MANUAL

EXAMPLE ORIFICE DETAIL

Date:	APRIL 2023	Project:	35481-Details	Submitter:	S. BLUE	Reviewer:	S. BLUE
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Figure **3.6**

THIS IS AN EXAMPLE FOR ILLUSTRATION PURPOSES ONLY

3.8.3 Stormwater Management Pond Landscape Design Guidelines

The following is a list of landscape design guidelines to be incorporated into a SWM pond design:

- Landscape plans are to be prepared by a landscape architect in good standing with the Ontario Association of Landscape Architects.
- Landscape plans are to be reviewed and approved by the consulting engineer to ensure conformance with approved subdivision grading plans.
- Landscape plans are to be submitted to the Development Services Section for review and comment.
- Landscape plans are to be submitted to CH for review and comment.
- Landscape plans are to be submitted to the Parks and Open Space Department for review and approval.
- Grading design shall be in accordance with development engineering standards. See previous section for Town safe side slope requirements.
- Topsoil requirements shall conform to Town standards: 300 mm minimum throughout and 750 mm minimum for designated shrub or tree planting beds.
- Maintenance access routes to sediment forebays and outlet structures shall be in accordance with development engineering standards. A standard gate shall be installed along the access route outside of the permanent pool that is integrated with the fringe vegetation surrounding the SWM pond.
- Recreational trails and related amenities shall be in accordance with Parks and Open Space Department standards.
- Where required, pedestrian bridges/crossings shall be subject to the approval of the Parks and Open Space Department, the Development Engineering Section, and CH (as necessary). Pedestrian bridge structures shall be in accordance with Parks and Open Space Department standards.
- A 1,200 mm high black vinyl chain-link fence separating public from private property will be required. This fence will be in accordance with Parks and Open Space Department standards.
- See previous section regarding retaining wall requirements.
- Secondary fencing or other such barriers may be utilized to deter the public from accessing the waters edge, steep slopes, and other areas which may be hazardous.
- Planting design shall generally conform to CH “Landscape and Tree Preservation Guidelines”
- The CH guidelines shall be modified as follows:
 - ✦ Tree planting stock shall be 60% caliper, ball and burlap, or wire basket material and 40% whip and or saplings.

- ✦ Shrub stock shall be potted.
- ✦ No bare root planting without written permission from the Town Parks and Open Space Department.
- ✦ No seedlings and/ or plug planting without written permission from the Town Parks and Open Space Department.
- ✦ Target tree planting density is seven to ten trees per 100 m².
- ✦ When determining tree planting density three, 50 mm caliper trees shall be deemed equal to ten, 10 mm caliper whips.
- ✦ Regardless of planting density targets, some filtered views from residential properties through to the SWM pond surface shall be maintained. The intent being to provide some visual access for safety and security reasons.
- ✦ As per MECP guidelines, plant selection and massing will be utilized to provide a continuous barrier to deter the public from accessing the waters edge, steep slopes, and other areas which may be hazardous.
- ✦ All slopes steeper than 5:1 require dense shrub planting.
- ✦ All seeding shall be “Terraseeding®.” Hydro seeding is not acceptable.

3.8.4 Stormwater Management Pond Monitoring, Maintenance, and Assumption

The applicant should refer to the *Town of Oakville Stormwater Management Facilities: Monitoring, Inspection and Maintenance* for further guidance: <https://www.oakville.ca/getmedia/3747be39-e88c-4148-a0a1-89214b16c92c/building-development-engineering-stormwater-management-facilities-monitoring.pdf>

3.8.4.1 Performance Monitoring

SWM ponds shall be monitored to establish the functional and performance compliance with the approved design. Monitoring shall be initiated at completion of base servicing of the subdivision plan and continue through to the Town’s assumption of the facility.

It is the intent of the monitoring program is to answer the following questions prior to the Town’s assumption of SWMF operations:

- **Is it built as approved?** A qualified engineer shall certify that the SWM facility is constructed in accordance with the approved engineering drawings and approved EIR/FSS or equivalent study. Staff will also evaluate whether the plantings are installed as per the approved drawings.
- **Does it operate as intended?** Functional and inspection monitoring is needed to ensure that all structural components of the SWM facility are in good working condition and the SWMF maintains its required storage volume.

- **Does it meet the design targets?** Performance monitoring is needed to determine the SWMF pollutant removal efficiency, hydraulic response to rainfall events, infiltration target achieved, and overall conformance with the NOCSS, EIR/FSS, or other comprehensive study.

Monitoring shall be in conformance with the *Town of Oakville Stormwater Management Facilities: Monitoring, Inspection and Maintenance* and transition to the consolidated linear infrastructure Environmental Compliance Approval (ECA) requirements (refer to MECP website for details). Note that the guidelines provide the minimal level of monitoring and that the approved EIR may outline more specific monitoring procedures. A monitoring terms of reference must be prepared and approved by the Town prior to its implementation.

The expectation is that the SWMF will meet performance targets as demonstrated through the monitoring program. If the SWMF performance meets the objectives of the monitoring program and high-level study targets, the SWMF may be considered for assumption by the Town, subject to the other conditions of assumption. Note that the pond shall be cleaned/dredged of all construction sediment prior to the assumption of the final plan contributing to the pond. However, if the performance of the SWMF does not meet targets, the following actions will be considered by the Town in consultation with the developer.

- review of conformance reports to see if the SWMF was sized and designed appropriately
- review of maintenance practices to ascertain if maintenance is required, especially focusing on sediment build-up and removal
- consideration of other factors that could explain high TSS levels in the outlet, such as berm erosion, or short circuiting of flows
- consideration that efficiency of removal is low due to lower-than-expected TSS concentrations and loadings to the SWMF
- modifications to the inlet or outlet works if these are considered contributing to the high TSS
- adaptive management or corrective actions for facilities that exceed quantity and infiltration targets (in the case of LID)
- additional years of monitoring by the owner before assumption by the Town
- other, as may be needed

3.8.4.2 Operations and Maintenance Manual

A SWMF operations and maintenance manual shall be provided prior to acceptance of the SWMF. This manual will serve as an instruction manual to the Town and should provide details related to:

- design targets (based on subwatershed plan, EIR/FSS or equivalent study, and/or MECP requirements)
- details of the SWMF design

- instruction guide for long-term operation and maintenance, including details related to specific features of the SWMP or LID BMPs
- performance highlights of the facility based on past monitoring data
- budget forecasting based on maintenance activities carried out prior to assumption, including estimates of sediment removal frequency
- copy of MECP ECA and engineer's certifications
- as-built drawings
- bathymetric survey following clean out and subsequent sediment depth and volume survey results
- storm drainage plans
- stormwater plan schematics

The developer may be required to provide the money required for the operation and maintenance of the facility for the next 10 years of operation by the Town. A cost estimate should include all items as recommended in the MECP *Stormwater Management Planning and Design Manual* (MOE 2003) and shall include the removal of sedimentation at the 1:10-year interval. The Town shall review and approve the cost estimate and request the funds at present day value.

3.8.4.3 Storm Water Management Pond Assumption Procedure

SWM ponds will be owned and operated by the Town to ensure the long-term control and operation of the facilities. The Town will assume a facility no sooner than 2 years after complete buildout of the final plan within the drainage area.

SWM ponds are generally designed as sedimentation basins as well as flood storage/flow control facilities. Most ponds act as construction sediment basins during the house building period of the plans within the contributing drainage area. This period of several years is only the first phase of the pond with the second phase being the long-term SWM treatment of the developed drainage area.

The Town will not assume maintenance responsibility for these ponds until they are fully functional and have been certified to provide the treatment level as per the approved SWM design. To be fully functional, the SWM ponds shall be cleaned by removing all of the accumulated sediment from the construction phase of the development and restored/repared so as to be stable and 100% operational including all of the required landscaping and access roads.

When the Town is satisfied that the pond has been cleaned and is safe and operational, the final 2-year monitoring period shall commence.

3.8.4.4 Cleanout and Certification of Stormwater Management Ponds (Procedure Check List)

1. The engineer shall request that the SWM pond is at the stage of cleanout and shall justify this stage of the development by documenting the build out of the drainage area and the end of the construction period. This request shall be made no later than May 1. A site meeting shall be arranged with Town staff, the developer's engineer, and the contractor. The SWM pond shall be inspected per the current condition and cleanout issues shall be reviewed. Items to discuss include, but not limited to, type of machinery to be used, points of access, storage areas/drying of pond material, proposed haul routes to disposal site, ESCs, and extent of disturbed zones versus established water plant growth. An approved work plan shall be established prior to June 30. Written notice to local residents must be sent to identify maintenance works and duration. The work period shall be limited from July thru to September. This is the dry season and will allow for ground cover to establish in the disturbed areas prior to the end of fall. This timing is also preferable from an environmental perspective in order to protect hibernating herpetofauna in the winter and breeding wildlife in the spring/early summer. The Town has the authority to stop work if progress is unsatisfactory and shall order the restoration of the site including establishment of temporary ground cover. The developer will be required to apply for the completion of the remaining work the following spring.
2. The engineer shall provide an estimate of the amount of sediment to be removed and the proposed disposal site and provide a copy of sediment chemistry analysis. The removal of sediment is to be per O. Reg. 406/19: On-Site and Excess Soil Management. A Site Alteration Permit is required where soil/earth is to be placed within the Town limits.
3. Additional permits may be required, including Licensed to Collect Fish for Scientific Purpose, issued under O. Reg. 664/98: Fish Licensing for the collection, handling, and deposition of fish and Wildlife Scientific Collector's Authorization, issued under the *Fish and Wildlife Conservation Act* for any collection, handling, and deposition of protected wildlife species that may be necessary during a SWMF cleanout.
4. The engineer shall request that the pond be drained via the opening of the maintenance valve or by pumping. The Town will authorize the draining when satisfied that all cleanout issues have been resolved. The water shall be released no faster than over a 48-hour period.
5. A second site meeting shall be arranged once the pond is drained, and the Town shall decide when the cleanout operation can commence.
6. During the cleanout process, the engineer shall provide weekly status reports identifying the amount of material removed, the status of silt controls, and the condition of the adjacent roads. The completion date shall be updated as work progresses.
7. On completion of sediment removal, the engineer shall perform a bathymetric survey and determine the actual pond volume and certify the pond as per the design volumes. All structures shall be inspected and cleaned. Remove and replace outlet pipe stone jackets with clean stone. Inspect perforated outlet pipes for structural condition and ensure anchoring to bottom.
8. Prior to allowing the pond to fill, another site meeting shall be arranged to inspect the pond condition: side slopes, control structures, access roads, and extent of areas to be restored. When cleanout is

acceptable, the restoration of all areas shall be performed including the final topsoil placement on the pond slopes, placement of ground cover, and the final planting of water edge plants. The pond can now be allowed to fill with water again.

9. A final inspection shall be performed once all restored areas have established and an as-constructed pond survey is submitted with the engineer's certification of the pond operation. When all documentation is submitted and the pond block has been restored to the satisfaction of the Town, the final 2 -year monitoring period of the pond can commence.

3.9 Lot Grading and Drainage Criteria

The following provides for detailed procedural policy for any form of lot grading within the Town, based on a lot-specific basis.

Note that a detailed lot grading plan must accompany all building permit applications. Building permits will not be issued until the Development Services Section is satisfied with the lot grading plan.

3.9.1 Information Required on Lot Grading Plans

Plot plans shall be submitted as one lot per sheet at a scale of 1:200. Sheet size of 24 × 36 inches Arch D is preferred; 8.5 × 14 inches or 11 × 17 inches is acceptable if all required information fits on the page at the 1:200 scale.

A key plan with north arrow is required in the upper righthand corner of the sheet. Provide a title block with the name of builder/developer/subdivision, registered plan number, architect/designer company, scale of drawing, and date of preparation.

Provide the as-built location and elevation of storm, sanitary, and water services:

- elevation of culverts, drainage ditches, sidewalks
- location of approved erosion and sedimentation controls
- location of sump pump, discharge point, downspouts, and any dry wells
- all hard surfaces, patios, walkways
- location of air conditioning unit

Provide the existing elevations as per topographic survey indicating existing buildings, drainage patterns, and finished first floor elevations for all buildings on adjacent lands.

Indicate the surface runoff for all adjacent and proposed lots using arrows to show the direction of flow and swale locations, length and slope percentage.

Indicate the house type and elevations of the finished first floor, top of foundation wall, basement floor, underside of the footings, and service lateral invert at property line.

Indicate the elevations at the lot corners, landings, garage slab and all entrances (indicating the number of risers), the existing roads, and catch basins. Refer all elevations to a geodetic Town benchmark.

Indicate the location, length, and percent slope of proposed driveways.

Provide complete details of proposed retaining walls and noise/privacy fencing.

NOTE: lots submitted within unassumed subdivisions must be approved by the developer's engineer as for conformance to the overall subdivision design, prior to review by the Town.

3.9.2 Drainage Criteria

The following criteria applies to overall residential subdivision drainage control and lot/site-specific drainage design. Note that lot specific elevations shall conform with the approved subdivision control plan.

Grading and drainage shall provide positive surface drainage directed away from any buildings toward lot line swales, graded to drain to an acceptable outlet.

Drainage shall be directed to an outlet location that is deemed acceptable by the Town. Where split or front-to-back grading design is utilized to outlet surface drainage and runoff will or is likely to drain onto another property, a private or municipal rear lot catch basin is required to be constructed to collect the water and outlet it to the storm sewer or municipal ditch or other suitable outlet. Easements may be required. Should this not be feasible, other approved methods may be proposed. On older infill residential lots, pass-through grading (a portion of a higher lot drains through a lower lot) is not permitted unless specific permission from the Town is obtained.

All swales shall have a minimum depth of 150 mm, 3H:1V (horizontal to vertical) slopes on both sides, and a minimum slope of 2.0% (or 1% slope with subdrain exiting within the property) for a maximum length of 60 m before outfall to sewer, creek, or municipal road/block.

Window wells, where required, shall be indirectly connected to the weeping tile system using 100 mm drainpipe filled with 19 mm clear stone.

All downspouts shall discharge onto approved sodded areas using splash pads for erosion control. Direct connection of the downspouts to the storm system must have prior approval from the Town (high density). The location of the discharge is not to interfere with access or pose a safety hazard. Refer to Section 3.7.8 (Roof Leader Criteria). Where required by site plan or site alteration, a SWM report/brief is required.

3.9.2.1 Dry Wells

- **Why use a dry well?**
 - ✦ A dry-well is used when conventional storm drainage methods do not work or could be challenged. One of these challenges is the increase of hard surfaces on a property. Typically, drainage from a lot is required to be self-contained and directed to an approved outlet point (i.e., overland swale to the municipal ROW or municipal ditch, a rear lot storm sewer catch basin, etc.).

- **How does a dry well work?**
 - ✦ A dry well takes the immediate stormwater surface (rainwater) runoff and stores it for a short period of time as it allows infiltration or percolation into the adjacent soils. The time taken for discharge depends upon the dry well shape and size and the surrounding soil's infiltration characteristics. Dry wells can be constructed in different forms and from a range of materials.

- **When can a dry well be used?**
 - ✦ To utilize a dry well, there are certain things that must be addressed, these being:
 - Are there conventional methods of drainage available to you?
 - The soils at the location for use are tested and have satisfactory infiltration rates (Percolation Test required). **Please note: Dry wells do not work in all soil types.**
 - The water table is sufficiently low to allow stormwater percolation.
 - The site is not on filled ground.
 - The site does not slope towards the building.
 - All dry wells must be no closer to any buildings than 5 m as per the Ontario Building Code. If you are close to your property boundaries you should discuss this with your neighbour.
 - ✦ If you cannot meet the above criteria, a dry well will not be considered for approval.

- **Dry well design criteria**
 - ✦ A report, stamped, signed and dated by a qualified professional engineer is required. The report shall provide data from a percolation test indicating that the soils are suitable, drawdown time of 48 hours, the sizing is correct for a 25 mm rainfall event, and a suitable runoff coefficient and a factor of safety has been determined.
 - ✦ Detailed grading drawings, stamped, signed, and dated by a qualified professional engineer with the pertinent details of the drainage system shall be included to facilitate the intended construction, including, but not limited to, drainage area is to be clearly illustrated on the plan, detailed grading information including the "high point" split on all property lines, all downspout locations draining to grade, etc.
 - ✦ The dry well shall be lined with filter fabric and filled with 19 mm clear stone or bigger.
 - ✦ Every dry well must have one area drain. Dry wells in excess of 8 m² must have additional drains on the surface to provide for greater surface drainage, a pump out point, and to serve as a reminder for current and future owners that the facility exists.
 - ✦ An overflow route from a dry well may be required, where deemed necessary, by the Town.

3.9.3 Lot Grading Criteria

3.9.3.1 Yard and Driveway Slopes

All yard surfaces front and rear shall have a minimum slope of 2.0%.

Rear yards are to have a maximum grade of 5.0% for a minimum apron length of 5 m distance from the rear face of the dwelling.

The maximum slope allowed on any yard surface side, front and rear shall be 3H:1V.

Driveway slopes shall be a minimum of 1.0% and a maximum of 7.0%.

There shall be a 0.6 m wide path at a 2.0% slope away from the foundation around one side of the building, except where side yard setbacks from lot lines do not permit. This flat area allows for a walkway to access the rear of the house.

3.9.3.2 Lot Sodding and Topsoil Requirements

All residential lots and Town ROW boulevards shall be sodded per the following soil criteria so as to minimize weeds and reduce the need for pesticides:

- **Topsoil Specification:**

- ✦ A minimum of **200 mm** of unconsolidated native topsoil is to be placed over the entire lot where sod is to be placed and a lawn is to be established.
- ✦ A minimum of **750 mm** of topsoil is to be placed on road boulevards where Town trees are planted.
- ✦ Native topsoil is to be screened through a **25 mm** sieve to remove all large subsoil fragments, stones, roots, and remnant construction material.
- ✦ Soil is to be fertile, with no less than **5%** organic matter for clay loams and no less than 2% organic matter for sandy loams.
- ✦ Soil acidity range shall be within **6.0 to 7.5 pH** and free of agricultural residue (measure NPK/magnesium levels)
- ✦ The following ratio of soil elements shall be provided (micrograms/gram):
 - nitrogen at 20 to 40, phosphorous at 10 to 20, Potassium at 70 to 120.
- ✦ Where imported topsoil is required, the same parameters shall be used to approve the source of the topsoil.

- **Topsoil Testing Procedure:**

- ✦ The developer's engineer shall test topsoil from local stockpile by randomly acquiring 0.5 kg grab samples and forwarding to a testing laboratory as approved by the Town; all samples shall be identified as to location and current land use.
- ✦ The samples shall be shipped in accordance with provincial testing regulations.
- ✦ Soil shall meet MECP standards for soil, groundwater and sediment for the appropriate land use as per Ontario Regulation 406-19. Testing shall identify all hazardous elements and qualify the level as per provincial acceptance limits; typical known harmful elements include, but are not limited to, atrazene, sodium/salts, herbicides, growth inhibitors or sterilants, heavy metals, and hydrocarbons.
- ✦ Should the testing reveal levels of any element which exceeds residential soil quality guidelines, further testing shall be performed to isolate the source and limit of the contaminated soil, and a program of removal or enhancement shall be recommended (nutrient enrichment may be required in some cases).
- ✦ The Town reserves the right to reject any topsoil supply that does not meet the Town's topsoil guidelines.

- **Final Responsibility for Topsoil Quality:**

- ✦ The subdivision developer, as identified in the subdivision agreement, shall be wholly responsible for the placement of topsoil and sod and shall ensure that all lots are sodded and comply with the Town's topsoil policy and lot grading criteria until such time as the Town assumes the plan of subdivision/condominium.

3.9.3.3 Importing of Excess Soil (other than Topsoil)

Excess soil imported shall meet the minimum of generic standards of the O. Reg. 406/19: On-Site and Excess Soil Management for the proposed used. If excess soil is imported from other project areas for beneficial reuse, the applicant will need to indemnify the Town for the quality of the soil imported.

3.9.4 Retaining Walls

All retaining walls are to be constructed of a minimum material being pressure treated wood conforming to Standards Council of Canada CAN/CSA-080.1-M89: *Preservative Treatment of All Timber Products by Pressure Processes*. Retaining walls may also be constructed of poured in place concrete, pre-cast concrete or stone. A Site Alteration Permit is required.

Retaining walls exceeding 1.0 m in height are required to have plans submitted to the Development Services Section stamped by a professional engineer and showing the proposed retaining wall construction. Fences or rails will be required on all retaining walls that exceed 0.6 m in height. The fence must be a minimum height of 1.2 m and conform to the Swimming Pool Enclosure By-Law 2006-071.

All retaining walls are to have the face of the wall placed on the property line in such a manner that any

tiebacks etc. are located entirely within the upper lot.

Retaining walls along the natural heritage system are not permitted as long-term access is an issue.

Retaining walls are to be a minimum 0.3 m offset from property lines.

3.9.5 Driveway Settlements and Lot Grading Repairs

Settlements in asphalt driveways are to be repaired by saw cutting around the settled area, removing the material and replacing with compacted granular material to provide a constant approach to the garage. Notwithstanding any agreement signed by the homeowner, the procedure outlined previously will be the minimum that is accepted by the Town.

Prior to the commencement of repair work to driveways or settled areas, the homeowner will be circulated a waiver form outlining the type and method of repair that is to be done. This form will enable the homeowner to agree to or waive commencement of the work.

NOTE: Under the conditions of a subdivision agreement, it is the developer's responsibility to pave driveway aprons within the road ROW.

3.9.6 Exterior Stairs and Landings

Exterior stairs and landings are to conform to Section 9.8 of the Ontario Building Code. Decks and landings that are less than 1.0 m in height shall have the area directly under them covered with a 100 mm layer of 19.0 mm clear stone.

3.9.7 Reverse Grade Driveways

The Town does not support the use of reverse slope driveways.

Where a reverse slope driveway **already exists**, the Town requires removal upon redevelopment unless this is proven to be infeasible. If it can be demonstrated that it's not possible to abandon the continued requirement for a reverse slope driveway, then the following standards must be met:

- All aspects of the trench drain protecting the garage must be designed to ensure that runoff resulting from a 1:100-year storm will be accommodated by the drain.
- The slope of the reverse grade driveway should not exceed 10%.
- If the slope is greater than 8%, a heating system is required to mitigate ice concerns.
- The heating system is not permitted on Town property and that portion of the driveway must have positive drainage.
- Reverse grade driveway drainage facilities may not be connected by gravity to the storm system unless it can be proven that the HGL in the receiving sewer during a 1:100-year storm would not cause water to surcharge into a dwelling. An additional amount for resilience purposes of 300 mm above HGL is also recommended. The hydraulic grade line at the street shall be verified to prohibit overland flow from

the municipal road from spilling down the driveway and flooding the structure. Typically, an analysis of the major system is done to ensure a minimum of 100 mm of freeboard is also available at the lowest point of potential spill at the driveway before street runoff would be able to spill backwards into a dwelling via the driveway.

- The drainage strictly from the driveway and contributing lot area would typically otherwise be managed by a separate sump system consisting of two sumps on generator backup. Discharge would be to grade with a proper outlet to ensure positive drainage. The sump will not be connected to the storm sewer on the street. Details on the sump location will be needed.

3.9.8 Lot Grading Certificates

Lot grading certificates signed by a qualified professional engineer must be submitted to the Town upon completion of the grading and prior to assumption. The certificate must be submitted as outlined on the Town's website: <https://www.oakville.ca/home-environment/building-renovations/property-drainage-grading/lot-grading-certifications/>.

Development Engineering Section staff will perform a final inspection of lots once the engineer submits the grading certificate. Any grading deficiencies, which develop prior to the assumption of the plan, will require rectification. The developer in accordance with the Town's current lot grading criteria shall address property owner concerns.

Upon completion of the development works for infill lots, the owner shall supply the Town a Lot Grading Certificate, in the Town approved format, stamped by a civil engineer (professional engineer, P.Eng.), landscape architect (Ontario Association of Landscape Architects), or an Ontario Land Surveyor (Association of Ontario Land Surveyors) certifying that they have been on site within the past 30 days and that the grading conforms to the approved grading plan/s and that final grading will result in no adverse impacts to neighbouring properties.

3.9.9 Approved Plot Plans

The Development Engineering Section will sign and stamp approved plot plans with one copy kept on file and one for the builder's record.

Approved plans may have red-lined revisions attached to the approval; therefore, it is imperative that builders obtain their approved copy of the plot plan prior to construction.

The builder's copy of approved plot plans can be obtained from the Development Services Section, Permits and Construction Section.

3.10 Municipal Roads Criteria

3.10.1 Road Right-of-Way and Pavement Widths

All roads within the Town shall be constructed to urban standards: concrete sidewalk, asphalt pavement, concrete curb and gutter, storm sewers, and street lighting.

NOTE: See the Town Standard Drawings for complete details of all road sections, including the 2009 North

Oakville road standards.

3.10.2 Geometric Design

This geometric design will be in accordance with the Town Standard Drawing STD 8-4. (radii, daylights, pavement widths, slopes). The Town does not support hammerhead road designs.

All geometric design criteria with respect to horizontal and vertical control elements must also conform generally with the standards as set out in the latest edition of *Geometric Design Standards for Canadian Roads and Streets*, issued by the Transportation Association of Canada/MTO.

3.10.3 Pavement Design

Refer to Town Standard Drawing STD 7-2 for material type and thickness. The Town standard is only a minimum guideline.

The developer shall engage a soils consultant to design a flexible pavement based on results of local soils evaluation and in accordance with the *Equivalent Thickness Method of Flexible Pavement Design* from the Asphalt Institute.

All field tests must be conducted by a recognized soils laboratory and certified by a professional engineer. Copies of such tests must be submitted to the Development Services Section.

3.10.4 Construction Accesses

All proposals for construction accesses onto public road allowances must be submitted to the Town for prior approval. Permits and security deposits will be based on each application. MTO and Halton Region require separate application.

3.10.5 Driveway Entrances

Driveway entrances and curb cuts on existing roads shall be in accordance with Town Standard Drawings. Special designs will be required for commercial and industrial driveways, depending on intended use. See Use of Roads for Construction Purposes By-law 2009-072 and the driveway permits procedure.

Driveway Permits Procedure:

<https://www.oakville.ca/town-hall/policies-procedures/use-of-municipal-right-of-ways-and-municipal-parking-lots-policy/driveway-permits-procedure/>

All proposals for entrances must be completed on the application form obtained from the Transportation and Engineering Department and submitted to the Town for prior approval. Permits and security deposits will be based on each application and submitted to the Transportation and Engineering Department for approval. Driveways within a new subdivision plan do not require a permit.

Public lane entrances are to be treated similar to the commercial accesses with a depressed curb and continuous sidewalk.

3.10.6 Curbs

All new Town streets are to be constructed with either curbs or curbs and gutters. A driveway entrance is required for each lot. Curb depressions are required at each intersection on pedestrian road crossings.

Two-stage curb construction shall be used except where site-specific conditions warrant otherwise. See Town Standard Drawing STD 6-1. For subdrains see Town Standard Drawing STD 6-2.

3.10.7 Sidewalks

The Town has revised the sidewalk policy for 1996 based on input from the development industry and with support from the province's Alternative Development Guidelines. Sidewalks must comply with AODA requirements.

Table 3.9 Sidewalk Location Criteria

Road Type	Sidewalk Location
Cul-de-sac	Both sides of street
Local (<100 units)	Both sides of street
Local (>100 units)	Both sides of street
Collector/Arterial	Both sides of street
Industrial Local	Both sides of street
Industrial/Collector	Both sides of street
Industrial Arterial	Both sides of street

Note:

Requests for policy exemption shall be submitted to the Development Services Section.

3.10.8 Traffic Signs, Street Names, and Pavement Markings

A separate Transportation Management Implementation Plan (TMIP) shall be submitted showing the proposed location of all traffic signs and pavement markings to be installed within the subdivision (refer to Section 4.1.9 Transportation Management Implementation Plan).

The Town shall be satisfied with an approved TMIP prior to the release of building permits. The developer's engineer shall contact the Traffic Operations Section a minimum of 90 days prior to the registration of the plan to allow for review and ordering of materials.

Temporary or permanent signage shall be installed as per TMIP prior to the first house occupancy of the plan. The Town's subdivision inspector shall monitor this installation and if delinquent the Town may contract the work to be completed and charge all costs to the subdivision security.

Permanent traffic control signage as per TMIP shall be installed prior to the placement of top course asphalt and the start of the final 1-year road maintenance period leading up to the assumption of the TMIP. Final sign placement may be modified based on as-built field conditions; therefore, a red-line TMIP may be required to be provided to the Town based on the inspection of the as-built condition.

Traffic and street name sign fabrication, mounting materials, and placement shall be as specified in Town standards. All pavement markings and traffic signs are to be paid for by the developer. Traffic signs can be installed by the Town at the developer's expense.

3.10.9 Street lighting

The developer is responsible for arranging for the installation of street lighting on all streets in accordance with the standards of the Town and Oakville Hydro. The work must be paid for by the developer and securities approved by the Town and deposited under the Town's Agreement. Refer to the Town *Street Lighting Standard*.

Street Lighting Standard:

<https://www.oakville.ca/getmedia/cc3b46c8-a556-4378-8f9c-8bd5670e59e9/transportation-roads-street-lighting-standard.pdf>

3.10.10 Hydro

The developer is responsible for arranging the installation of all hydro work within the plan of subdivision/condominium. This is a separate agreement between the developer and Oakville Hydro. The developer shall engage a qualified consultant to design the electrical system to the satisfaction of Oakville Hydro or they may provide the design.

The developer shall pay for the electrical facilities, including streetlights, and shall provide a security deposit of 100% of the value of the approved electrical system.

Building permits will not be available until Oakville Hydro is satisfied that the work is completed and fully energized.

3.10.11 Bicycle Pathways

On-road and off-road bicycle paths require approvals from Transportation and Engineering Department.

3.10.12 Canada Post Facilities

Mail delivery is a federal jurisdiction; therefore, Canada Post must approve the number of units and their location. An agreement between Canada Post and the Town details the location requirements.

The approved final locations of mail facilities shall be clearly shown on the approved engineering drawings and on the site-posted land use signs prior to the Town issuing building permits. Note that warning clauses are required in the builder's purchase sale agreement for lots adjacent to the facilities.

The developer shall provide the concrete pads and ramps at the locations approved for the installation of mailboxes.

3.10.13 Pipeline Authorities

All crossings of pipelines require the authorities' approval and the execution of an agreement between the Town and the authority.

3.10.13.1 Municipal Street Names

The Transportation and Engineering Department, Heritage Planning Department, and Parks and Open Spaces Department staff approve all new street names. Contact the Transportation and Engineering

Department to review potential names.

3.10.14 Noise Fences

To comply with the MECP noise attenuation requirements, the need for noise fences may be imposed on new developments. A qualified professional acoustical engineer shall prepare a report and provide the noise attenuation recommendations per the current MECP requirements. This report shall be submitted in support of draft plan approval of a plan of subdivision/condominium.

When a noise fence is required, it shall be installed entirely on Town owned property where practical. The Town shall assume responsibility for the maintenance of these fences. Warning clauses shall be placed on title of these lands to clarify any encumbrances or liabilities.

The type of fence material shall be site specific although the preferred material is cedar wood per the approved Town Detail Drawing (see [website](#)). Maximum allowed fence height is 2.4 m. (Greater heights can be achieved with a combination of retaining wall/berm or special structural approval by the Town.)

The acoustical engineer shall certify the final as-built condition based on the final lot grading, prior to the assumption of a plan of subdivision/condominium.

Noise studies which are assessing the traffic noise impact from Halton Region roads shall be submitted to and approved by Halton Region.

3.10.15 Transit Facilities Plan

Transit facilities shall be provided per the Town's Transit First policy.

A transit facilities plan specifies the required transit corridors, facilities and amenities and their specific design and location.

The transit facilities plan shall also specify the required streets to be built in the initial subdivision phase for the formation of the transit link. A schedule of house construction shall be determined so as to compliment the completion of this transit link.

Oakville Transit approval of the transit facilities plan is required prior to final engineering approval.

4 SUBDIVISION SUBMISSION REQUIREMENTS

4.1 Drawing and Drafting Requirements

4.1.1 Specification for Engineering Drawing Sheets

- **Size:** All drawings shall measure 594 mm × 841 mm (A1 metric).
- **Format:** Town standard sheet format.
- **Sheet material:** plotting velum for construction drawings, mylar for as-built drawings.
- **Digital copies:** PDFs of all authenticated drawings.

4.1.2 General Drawing Requirements

- Computer-aided design (CAD) shall be used to generate all engineering drawings. Vector format DXF files shall be supplied to the Town's IT Department for incorporation into the geographic information system (GIS). This data shall be supplied when the engineering drawings are approved and again when the as-built drawings are submitted for assumption.
- All drawings shall be signed, sealed, and dated by a qualified professional engineer.
- All elevations shall relate to a Town geodetic datum and the benchmark shall be described on the drawings. A description of Town benchmarks is available from the Survey Section of the Roads and Works Department.
- Mylar drawings of the registered plan of subdivision/condominium, a point plot plan, and a coordinate point listing in hard copies and DXF files, or other form suitable to the Town, shall be submitted to the Town's Public Works Department for all boundary monuments shown on the registered plan of subdivision/condominium.
- Plans shall show a relation to the province's horizontal control network *Control Survey Information Exchange* (COSINE) and provide coordinates of the control monuments used.
- Prior to registration of the plan of subdivision/condominium, the owner's surveyor shall submit horizontal coordinates of all boundary monuments to the Town.
- All coordinates shall be based on 6° Universal Transverse Mercator (UTM) projection, North American Datum (NAD) NAD83. Exemptions and alternatives to this can only be granted by the Town Transportation and Engineering Department
- The boundaries of the overall site shall be obtained from the Town's IT Department. All mapping supplied to the Town must snap to the adjacent property boundaries.
- All drawings shall include a "key plan" to identify the subject area.

- A complete engineering set of drawings shall include:
 - ✦ cover sheet.
 - ✦ general notes
 - ✦ general plan/legal plan
 - ✦ composite aboveground/utility plan
 - ✦ phasing plan
 - ✦ external storm plan
 - ✦ storm drainage plan
 - ✦ traffic management implementation plan
 - ✦ ESC plan
 - ✦ grading plans
 - ✦ plan and profile drawings
 - ✦ details sheets
 - ✦ construction management plan
 - ✦ standard drawings (Town/OPSD).

4.1.3 General/Legal Plan

General plan(s) shall be drawn to a scale of 1:1000, or larger, and shall show land uses, road layout, street names, lot numbers, and legal descriptions of adjoining lands.

4.1.4 Composite Aboveground/Utility Plan

Aboveground plan(s) showing all aboveground services shall be drawn to a scale of 1:1000, or larger, and shall indicate all street furniture and surface features. Canada Post, Halton Region, and all utility agencies shall approve this plan prior to the issue of building permits. Coordination with utility agencies is the engineer's responsibility.

This plan shall also indicate the required traffic controls/signs/pavement markings.

A draft composite utility plan shall be provided prior to pre-servicing.

4.1.5 Storm Drainage Plans

Storm drainage plans shall be drawn to a scale of 1:1000 or larger (a scale of 1:5000 will be accepted for

large external drainage areas) and shall indicate the total area to be drained by the proposed storm sewers. This plan shall be compatible with the grading plan and the Town's latest contour mapping and shall indicate the following:

- existing contours (0.5 m intervals)
- drainage patterns of adjacent lands
- runoff coefficients and number of hectares of tributary areas outside the development for each section of the storm sewers within the development
- direction of runoff (overland flow)
- street names
- maintenance hole numbers
- sewer sizes
- directions of flow in the sewers
- any catch basins or swales on the lots or blocks required to pickup the runoff
- complete major and minor storm systems.

NOTE: Ontario Base Maps at a scale of 1:2000 in digitized format are available from the Drafting Section of the Public Works Department.

4.1.6 Grading Plans

Grading plans for all lots and blocks shall be drawn to a scale of 1:200, 1:300, or 1:500, showing existing contours (0.5 m intervals) established from elevations taken in the field and/or from the Town's base mapping:

- Existing elevations shall be taken at:
 - ✦ the corners of each lot and block
 - ✦ external elevations extending to a minimum 30 m perimeter external to the plan of subdivision/condominium.
- Proposed elevations shall be taken at:
 - ✦ intervals along the centre line of all proposed roads (maximum 30 m spacing); note slope of each road section
 - ✦ all high points (split drainage, rear and side yards)

- ✦ the corners of each lot and block
- ✦ intervals along cut-off swales and ditches
- ✦ the exterior grade at the front and rear of each structure
- ✦ any other points necessary to give a proper picture of the proposed drainage scheme, including tops of catch basins and bottoms of swales and associated easements
- ✦ critical transition points adjacent to walkways or existing lots (provide section details where useful).
- Other required information shall include:
 - ✦ street furniture, including road structures (catch basins and maintenance holes)
 - ✦ direction of gutter flow at catch basins
 - ✦ direction of overland flow routes, including points of outlet and ponding limits for the 100-year event
 - ✦ all lots labelled with a drainage type and referring to a detail on the detail drawings
 - ✦ existing trees and proposed tree-saving limits; provide elevations at base of trees where proposed grading may conflict
 - ✦ retaining walls where required (refer to Section 3.9.4 [Retaining Walls])
 - ✦ all fencing, easements, and noise attenuation structures
 - ✦ the regulatory flood limits of watercourses
 - ✦ percent grade where swales are at minimum slope or are otherwise critical
 - ✦ run vs. rise ratio where slopes are created with a slope greater than 10% (maximum slope is 3H:1V).

4.1.7 Plan and Profile Drawings

4.1.7.1 General Requirements

- All plan and profile drawings shall be drawn to a horizontal scale of 1:500 and a vertical scale of 1:50.
- Two short streets may be shown on one plan and profile drawing if space permits.
- Where two or more sheets are required for one street, match lines shall be used and there shall be no overlaps or duplication of information.
- Where intersecting streets are shown on a plan and profile drawing, only the diameter of the pipe and direction of flow of the intersecting sewers shall be shown. This also applies to easements for which a separate plan and profile drawing has been drawn.

- Pavement designs for the particular roadway shall be indicated on the first plan and profile drawing.
- The detailed information from all the borehole logs shall be plotted on the profile and located on the plan. If this interferes with some other detail, such as a maintenance hole, the exact location may be altered sufficiently for clarity. Borehole information should contain a borehole plot plus a brief description of soils and water level.

4.1.7.2 Plan View

- The following information and details shall be included: key plan; legend; street names; block/lot number and frontage dimension; block/lot type (single, semi, multiple); servicing locations for storm, sanitary, and water; all sewers and watermains; maintenance holes; catch basins; valve chambers; hydrants; sidewalks; centerline chainage (every 20 m); north (true and construction); road allowance and pavement dimensions; curb radii; easements; reserves; road sections where clarification is required; and detail gutter grades on large radius bends and cul-de-sacs (minimum 0.5%).
- Only the type and diameter of the sewers shall be indicated on the plan view.

4.1.7.3 Profile View

- The type of sewer (sanitary or storm) and the diameter, length, grade, and class of pipe shall be shown on the profile portion of the drawings only.
- Where the possibility of a conflict with other services exists, connections shall be plotted on the profile (i.e., watermain).
- The road profile, existing and proposed, shall be indicated and any fill areas shall be hatched in.
- Centerline chainage and elevations and the elevation at grade changes and the slope and length of each section shall be provided.
- All vertical curve data on the top of the profile view shall be provided.
- Maintenance hole details, including size, Town or OPSD standard, pipe inverts at entry and exit, and drop structure details shall be provided and safety platforms and elevations shall be indicated where required.
- The 100-year HGL shall be plotted or verify that no sewer surcharging will occur.

4.1.8 General Notes Sheet

The general notes sheet shall list the following:

- general Town design criteria, which apply to all sheets
 - ✦ The pertinent notes for the project can be extracted from Section 3 (Subdivision Design Criteria; i.e., lot service, pipe sizes, curb type, catch basin grate type, etc.).

- special warnings from utility companies and government agencies (i.e., existing structures and buried services)
- general Town policies and by-laws that apply to the construction activity (i.e., hours of work, mud tracking, fire permits, construction access, etc.)

4.1.9 Transportation Management Implementation Plan

The TMIP shall be drawn to a scale of 1:1000, or larger, and shall show the road layout, street names, lot numbers, all proposed traffic control signage, pavement markings, on-street parking, private driveway access, utility/light poles, hydrants, and any other applicable street furniture.

4.1.10 Erosion and Sedimentation Control Plan

A phasing and construction schedule shall be provided that shows the works required to mitigate sediment contamination of the affected creek, adjacent lands, and storm sewer systems and how they are to be staged.

Controls for catch basins shall be detailed and sediment basins shall be shown with design calculations and instructions for maintenance.

The ESC plan shall show the existing contours and proposed grades at various stages/phases of construction.

The ESC plan shall be drawn to a scale of 1:1000 or larger. The drawing shall conform to the design details and requirements outlined in Section 3.

NOTE: no person shall alter the grade of land in the Town until they have complied with Site Alteration By-Law 2003-021 (see Section 2.2.1 [Site Alteration By-law 2003-021]).

4.1.11 As-built Drawings

As-built drawings comprise the original engineering drawings, which have been revised to include as-built conditions. The as-built drawings shall be submitted to the Development Engineering Section for the Town's permanent record, upon completion of construction and prior to the request for the Town to initiate the assumption process.

The as-built revisions shall be based upon an as-built survey of all the subdivision services and shall include, as a minimum, a field check of the following items:

- as-built field survey:
 - ✦ location of maintenance holes and utilities
 - ✦ location of catch basins
 - ✦ location of curbs
 - ✦ location of sidewalks

- ✦ location of hydrants
- ✦ location and ties to valve chambers and valve boxes
- ✦ road centre line profile
- ✦ maintenance hole/storm pipe inverts
- ✦ pipe sizes
- ✦ distance between maintenance holes
- ✦ special maintenance hole details
- ✦ benchmark to be checked

The as-built drawings for all public services shall incorporate all revisions found in completing the as-built field survey and include a check of the following items and incorporation of the necessary revisions:

- as-built drawings:
 - ✦ length and percent grade of sewers
 - ✦ road centerline and percent grade of roads
 - ✦ house connections location and invert at the property line
 - ✦ pipe classes and bedding
 - ✦ "as-built" drawing (shown in revision column with date)
 - ✦ drawing number (Town file reference)
 - ✦ all construction notes shall be removed
 - ✦ registered plan number shall be shown on the plan view of each drawing and the general plan
 - ✦ lot and block numbers shall be in conformity with the registered plan of subdivision/condominium
 - ✦ street names shall conform with the Registered plan of subdivision/condominium
 - ✦ all easements shall be verified and provide reference plan numbers
- tolerances:
 - ✦ A maximum 50 mm tolerance shall be accepted for all engineering information shown in the profile of each drawing.

- ✦ A maximum 300 mm tolerance shall be accepted for all engineering information shown on the plan view of each drawing, and the sewer lengths shall be dimensional within the nearest 100 mm.
- ✦ All road and sewer grades shall be recalculated according to as-built information.
- ✦ The amendments should be incorporated into all plans.
- digital data/GIS compatibility:
 - ✦ As-built drawings shall also be submitted in a DXF digital format and shall be compatible with the Town's GIS.
- acceptance of as-built drawings:
 - ✦ "As-built" drawings shall be submitted to the Transportation and Engineering Department, Planning Services Section when the field survey is completed, no later than 3 months after base servicing is complete (prints are acceptable at this stage).

The Town's Development Services Section will spot check each submitted drawing, including field checks. Drawings shall be revised if discrepancies are found or insufficient details are provided.

Prior to assumption of the plan, a complete set of mylars shall be submitted along with the digital files (see Section 4.1 [Drawing and Drafting Requirements] for digital format). When satisfied with the information provided, the Development Services Section will forward the drawings to the Permits, Inspections and Road Corridor Section for record keeping.

4.1.12 Construction Management Plan

A construction management plan is to be undertaken which outlines the overall proposed building works and how the constructor intends to manage the project to minimize the impact during construction and meet the requirements of the Town. The construction management plan should be prepared by a qualified professional.

Prior to commencement of any site works, the Owner shall prepare, and receive approval of, a construction management plan in accordance with the Town's terms of reference available on the Town's website (see link below). The Owner agrees to hold a pre-construction meeting with Town staff, prior to commencement of any site works, to review implementation of the approved construction management plan and to coordinate permitting activities. The Owner further agrees to implement the approved construction management plan.

Please refer to the Town's website for further information on the requirements of the Construction Management Plan at the following link: <https://www.oakville.ca/business-development/planning-development/planning-applications-forms/planning-applications/development-application-guidelines/>

4.2 Engineering Submission Requirements

The following requirements are those of the Development Engineering Section. The specific requirements of other agencies and departments are the responsibility of the developer and their agents.

4.2.1 First Submission

- The following shall be submitted as one package:
 - ✦ hard copies of two complete full-sized sets of drawings: one reduced (11 × 17) hard copy set and one digital copy, as outlined in Section 4.1 (Drawing and Drafting Requirements)
 - ✦ storm sewer design sheets (two copies)
 - ✦ geotechnical report/Phase 1 environmental audit report (one copy)
 - ✦ acoustical report (two copies)
 - ✦ traffic impact/transit facilities report (two copies)
 - ✦ stormwater management report (first draft; two copies)
 - ✦ ESC report and plans
 - ✦ Photometric plans
 - ✦ completed permit application and appropriate fee
 - ✦ a Letter of Retention to the Town from the consulting engineer stating that they have been engaged for the design and complete general construction supervision of all municipal services
 - ✦ a Letter of Retention from the geotechnical consultant stating that they have been retained to supervise, in total, the installation of bedding and the backfilling of all trenches within road allowances and easements and to certify to the owner and the Town that they supervised the backfilling operations, carried out sufficient tests to obtain a representative report as to the compaction of the backfill, and that they find the backfill installation and all engineering fill to be in compliance with the Town's specifications
 - ✦ one copy of the landscape design prepared for the Parks and Open Space Department, including the engineer's statement of conformity with the proposed lot grading and municipal services

NOTE: This submission will not be reviewed until a complete package is received. A redlined, marked set of drawings shall be returned to the consultant with the Town's comments. A letter summarizing the Town's comments will be provided and a meeting can be arranged if clarification is required.

Town Council will not review submissions prior to draft plan of subdivision/condominium approval.

4.2.2 Second Submission

- The following shall be submitted:
 - ✦ two complete sets of all drawings and a digital copy, or as requested by the Town
 - ✦ the redlined/marked up first submission drawing package, including a checklist of:

- comments addressed/revised
- items still outstanding
- items revised contrary to Town's comments, with reasons
- new details added or revised (not based on Town comments)
- ✦ revised SWM report
 - This report shall include the final storm modelling with the input used and output generated. The storm sewer design sheets shall be revised based on the findings of the modelling and the drawings shall be revised accordingly to show catch basin flow controls, where required, and a plot of the 100-year HGL of the sewer system.
- ✦ two copies of the draft Plan of Subdivision and all applicable reference plans
- ✦ two sets of the MECP application forms for approval of water and sewage works
 - These shall be completed, filled out, and signed by the developer and consulting engineer. The Town will fill in the storm sewer approval section and pass the forms to Halton Region. Halton Region shall also be supplied with the storm sewer design sheets and all applicable drawings.
 - **NOTE:** This application will not be forwarded to Halton Region until the Town and CH are satisfied with the storm sewer design. Applications shall be submitted directly by the applicant.
- ✦ two copies of the draft cost estimate or contract prices
- ✦ copies of applications for approval to all ministries, authorities, and agencies, as they pertain to the particular development
- ✦ certification of compliance with Environmental Assessment Schedule "C" for private projects
- ✦ submission of street names to be approved by the Transportation and Engineering Department.

4.2.3 Interim and Subsequent Submissions

Interim submissions shall include digital and two hard copies of all drawings and documents revised, as well as the previous submissions redlined drawings with an explanation of changes or additions or as requested by the Town.

Each interim submission shall require a minimum 2- to 3-week response time from the Town; therefore, all revisions should be complete and correct to avoid delays in the approval process.

The Town suggests that the owner's engineer arrange meetings with Town staff to clarify all comments and requirements prior to submitting revisions. It is the responsibility of the owner's engineer to ensure that all Town departments and agencies are contacted with respect to revisions pertaining to their jurisdictions.

4.2.4 Final Submission

Submit the following as one package:

- digital and two complete hard copy sets of final drawings
- original velum/mylar sheets for signature
- two final cost estimates, including breakdown for agreement:
 - ✦ roads, earth and site works
 - ✦ storm sewers
 - ✦ SWM facilities, creek rehabilitation, ESCs (a priced contract shall be provided once awarded.)
- one set of landscape drawings as approved by Parks and Open Space Department
- final composite utility plan (Canada Post boxes), traffic management plan, and transit facilities plan
- all required approvals from MTO, MNRF, MECP, conservation authority, school boards, pipelines (IPL, TCPL)
- plan of approved phasing/staging of subdivision servicing
- final versions of all engineering reports (noise, SWM, traffic/transit)
- preliminary copies of all schedules required for the subdivision agreement, reference plans, costs, *Development Charges Act* breakdown.

4.2.5 Engineering Drawing Approval

Drawings will be signed per the Development Services Section approval once all revisions have been made and clearances from all agencies have been received.

Distribution of signed sets of prints:

- two sets for the Development Services Section
- three sets for the supervisor of inspections
- compact disc of digital drawing files to the Permits, Inspections and Road Corridor Section for record keeping.

Prior to the release of Building Permits, the digital drawing files shall be submitted to the Town's GIS coordinator in the format as described in the subdivision agreement.

4.2.6 Revisions to Approved Engineering

All proposed field revisions shall be authorized by the Development Services Section. Drawings shall be updated with the revision details, and the revisions block shall note the type of revision and the date of Town authorization.

All replotted computer-generated drawing sheets shall have the Town signing block documented per the original Town approval date.

For any revisions to the drawings, a complete set of prints shall be printed and submitted to the Development Services Section.

4.3 Construction Administration/Timeline

4.3.1 Development Services Section Jurisdiction

The Development Services Section has the responsibility of approving subdivision engineering designs, implementation and monitoring of ESCs, grading and drainage, construction of municipal infrastructure (roads and storm sewers), preparation and administration of the subdivision agreement, the approval of security reductions, and the final release for assumption. Development Services inspectors will inspect works pertaining to private lands, ESCs, and general SWM control features.

As for the monitoring of construction, the Development Services construction inspectors perform all inspections of municipal infrastructure within the limits of public road allowances and other Town lands such as valleys and creek blocks. The construction inspectors enforce the approved design in conformance with Town policies and standards. See Section 4 (Subdivision Submission Requirements) for specific subdivision construction procedures and specifications.

The developer's engineer has full responsibility for the actions of all contractors and the quality of their work. Therefore, the engineer shall provide full-time inspection services. The Town staff shall only perform a part-time monitoring of construction activities to ensure general conformance to the agreement and Town policies and standards.

All revisions to the approved design during construction shall be reviewed and approved by the Development Services Section for design consistency. It is the consultant's responsibility to obtain this approval by submitting all field revisions to the Development Services Section.

The Parks and Open Space Department shall approve and inspect all landscaping associated with the development of Town open space and parks.

4.3.2 Requirements Prior to Construction

Ideally construction starts when the engineering drawings are signed, the subdivision agreement is executed, all securities are deposited, and the subdivision plan is registered.

The following are the minimum requirements prior to any construction activity on development sites.

4.3.2.1 Topsoil Stripping/Earthworks

The following is required prior to any earth moving activity:

- ESC plan approved by Town and the conservation authority
- approval from the Town arborist with respect to tree removal/preservation
- Site Alteration Permit issued by the Permits, Inspections and Road Corridor Section
 - ✦ prior to permit application submission:
 - draft plan of approval must be secured (at the discretion of the Director of Transportation and Engineering)
 - request and obtain clearance of draft plan of conditions related to site alteration if any
 - Refer to **Site Alteration Permit Process Guide for Subdivisions:**
<https://www.oakville.ca/getmedia/a9f2df71-a674-4385-ace2-9a91f4a078ae/building-site-alteration-permit-process-guide-subdivisions.pdf>
- No environmental issues identified for the site as supported by Environmental Site Assessment(s) (Phase 1 and/or Phase 2).
- Soil imported to the site shall meet MECP standards for soil, groundwater and sediment for the appropriate land use as per Ontario Regulation 406-19.
- archeological investigation completed and clearance from the Ontario Ministry of Tourism, Culture and Sport
- ESCs and tree hoarding must be in place and inspected by the conservation authority/Town, prior to any work on site:
 - ✦ cost estimate for ESC measures is reviewed by the Town's development engineering technologist
 - ✦ upon completion of cost estimate review, the development engineering technologist will advise the applicant of the security amount
 - ✦ payment of the security in the form of a certified cheque must be submitted to the Town prior to issuance of the Site Alteration Permit
- a pre-construction meeting arranged (schedule of work and limits):
 - ✦ prior to the Town scheduling a pre-construction meeting for earthworks:
 - the Site Alteration Permit must be secured with the Town prior to installing perimeter ESC measures
 - perimeter ESC measures must be installed and inspected by a Town inspector:

- notify the supervisor of inspections minimum 5 days prior to the pre-construction meeting
 - submit a pre-construction meeting agenda, inclusive of Town's standard and site-specific agenda items, to the supervisor of inspections
 - refer to list of agencies to be included in Section 4.3.3 (List of Agencies for Pre-construction Meeting)
- ✦ construction shall begin within 30 days after the pre-construction meeting or a follow-up pre-construction meeting shall be scheduled.

4.3.2.2 Pre-servicing (Prior to Registration of the Plan)

Any work started before 1) the drawings are signed; 2) the subdivision agreement is executed; and 3) the plan is registered is done at the owner's risk.

Prior to pre-servicing, the Town requires the following:

- An application shall be submitted by the owner in the form of a "Pre-servicing Letter of Agreement" stating his recognition of risk and the submission of financial security in the amount equal to 100% of the value of the municipal works.
- The Town shall sign the engineering drawings and all reference plans, M-Plans, and agreement schedules to be submitted in draft form.
- All planning issues pertaining to the draft plan of subdivision/condominium shall be resolved; no pending revisions by Town Council or appeals to the Ontario Land Tribunal.
- All permits and approvals shall be in place per CH, MECP, Halton Region, MTO, and all pertinent Town departments.
- Insurance certificates shall be in place with the Town and its agents specifically mentioned as co-insured by the policy and a minimum coverage of \$ 5,000,000.00.
- The Halton Region servicing agreement shall be executed.
- The conservation authority shall approve SWM concept and issue permits.
- No external servicing or connections to existing services will be permitted prior to the preparation of the subdivision agreement.
- Approval from the MECP under their ECA. Note: for stormwater management ponds with Regional storm controls, a peer review of the design is required prior to ECA approval
- Completion of a Phase 1 environmental audit to the Town's satisfaction. This audit is required prior to any lands being conveyed to the Town.

- No authorization for tree removal shall be granted until the subdivision agreement is executed and the Town forester approves the tree preservation/removal plan.
- All utility companies do not object to servicing commencing.
- All pipeline crossing agreements are in place (TCPL/IPL/Enbridge).
- A pre-construction meeting has taken place prior to work commencing (refer to Section 4.3.3 [List of Agencies for Pre-construction Meeting] for list of agencies to include).

4.3.3 List of Agencies for Pre-construction Meeting

The owner's engineer shall arrange a pre-construction meeting prior to commencement of construction. Representatives from the following departments and agencies shall be included:

- Town of Oakville:
 - ✦ Development Services Section
 - ✦ Parks and Open Space Department
 - ✦ Fire Prevention Section
- Halton Region
- CH (or CVC)
- utility companies (pipeline companies)
- owner (developer)
- contractor (general and main subcontractors)
- developer's engineers (including soils consultant)

4.3.4 Clearance of Agreement Conditions for Building Permits

The Development Services Section will provide the Building Services Department with building permit clearance when all items pertaining to this department's jurisdiction have been satisfied. Each plan will have specific conditions, as summarized in a schedule of the development agreement.

The following is a list of standard conditions:

- completion of base servicing and works certified by the developer's engineer
- 100% completion of primary utilities
- engineer's certification of SWMFs (stabilized ground cover)

- 100% of financial securities and fees deposited with the Town
- registration of the subdivision plan and the subdivision agreement
- site posting of land use signs (identifies land uses and facilities)
- meeting with all builders, utilities, Town departments, and agencies
- submission of each builder's purchase/sale agreement warning clauses
- confirmation that all silt/erosion controls are functioning
- all Parks and Open Space Department fencing and walkways installed
- noise attenuation features constructed per approved report
- final composite aboveground utility plan approved
- site to be clean of garbage and roads safe for access
- Canada Post to approve of temporary box site and order required units
- traffic control plan/transit facilities plan shall be approved by the Traffic Operations Section and Oakville Transit
- digital engineering drawings shall be submitted to the Town's GIS Department per the GIS layer requirements

NOTE: partial plan clearances may be granted based on the number of builders involved and the need for specific site plan approvals.

4.3.5 Grading Plan Review for Building Permits

Each building permit application requires the submission of a plot plan detailing the lot grading and drainage for each drawing. The review of this plan is a Development Services Section function and is coordinated via the Building Services Department.

The owner's/developer's engineer must certify that each of the builder's plans are in conformance to the overall subdivision grading plans and schedules, and that ESCs are in place prior to submission for Development Services Section approval. This certification must be stamped, dated, and signed. See Section 3.1 (Sanitary Sewers and Water Supply) for detailed criteria.

4.3.6 Security Reductions

Security reductions may be requested at any time after registration and throughout the construction of the subdivision. Completed works may be reduced by 85%, but the total value of securities shall never be less than 25% of all works after application of top asphalt. Each reduction request must be made in writing to the development coordinator and include the following documentation:

- owner's statutory declaration of payment of accounts and the engineer's statement of work completed
- a security reduction chart as per the Town's format
 - ✦ **Subdivision Agreement and Security Reduction Request Guide:**
<https://www.oakville.ca/getmedia/7a780c2a-e01e-48fe-a454-bea9cb73eefa/building-development-engineering-subdivision-agreement-security-reductions.pdf>
- a copy of the payment certificate certified by the consultant
- summary of work completed versus work outstanding (tender form)
- a copy of the current insurance policy.

4.3.7 Maintenance Period

Once all of the subdivision works are completed as per the agreement, the construction staff will confirm the acceptance of the work and a 1-year maintenance period will commence. This period can begin when top asphalt has been completed and house construction is substantially complete.

NOTE: The developer is responsible for all works within the road allowance and shall not pass on the cost or obligation of performing these works to individual property owners or builders.

At the completion of the final maintenance phase, the Town shall review all lots for compliance to the individual and overall drainage concept. All settlements shall be rectified prior to the Town assuming the plan.

See Section 6.2 (Assumption) for complete details pertaining to the assumption process.

5 CONSTRUCTION METHODS AND MATERIALS (MUNICIPAL SEWER AND ROAD WORKS)

5.1 General New Development Construction Process

The Town has a corporate goal to provide quality infrastructure within the community. Maintaining functional infrastructure is heavily dependent on the Town's ability to inherit quality road and sewer infrastructure built by developers.

Section 5 outlines the construction phase of subdivision development. Note that the construction stage cannot commence until the Town has approved the engineering design drawings and the subdivision agreement with the Town has been executed. See Section 3 (Subdivision Design Criteria) and Section 4 (Subdivision Submission Requirements) for the engineering design and subdivision administration process.

The Development Services Section is responsible for the design, construction, and assumption of municipal infrastructure associate with the land development process.

In general, the Transportation and Engineering Department has adopted OPSDs and OPSSs for road and sewer construction. There is a Town engineering standards book, which overrides several of the OPSDs. Contact the Transportation and Engineering Department for the most recently revised engineering standards book. Developers, consultants, and contractors engaged in subdivision projects in the Town should carry both OPSDs and OPSSs and the overriding Town engineering standards book as reference for subdivision construction in addition to this manual.

The developer shall retain a qualified civil engineer (consulting firm) for the purposes of design, contract administration, and construction certification of the municipal infrastructure required by the land development.

It is the responsibility of the developer's consultant to ensure that the Town's specifications and standards are adhered to. Development Services Section staff will liaise with the developer's consultant and will provide periodic inspections to ensure the Town's standards and specifications are adhered to and to ensure that the developer's consultant is providing full-time supervision to the contractor during all stages of construction.

The developer shall ensure that their engineer provides full-time construction administration and inspection. The contract for services shall be clear on this requirement, including the final inspections and repairs required for final assumption of the plan and the preparation of as-constructed drawing records for deposit with the Town.

5.2 Role of the Development Services Section

The Development Services Section is involved in the planning process from the initial application to final Town Council approval.

Once approved by Town Council, the developer approaches the Development Services Section to proceed with the construction of the municipal infrastructure required to provide the services to allow for the construction of residential/commercial/industrial buildings.

The Development Services Section approves the engineering design, prepares and administers the subdivision agreement, inspects the road and sewer works, and approves all lot grading. The section is responsible for this process to ensure that the roads and sewers are constructed to the current Town and provincial standards, and that the quality of the infrastructure is acceptable for the Town to assume and maintain.

All development engineering related design and construction enquiries shall be directed to the manager of development engineering or the manager of permits and construction.

5.3 Working Hours

Normal working hours for inspection and quality control staff are 8:00 a.m. to 4:30 p.m., Monday to Friday.

Depending on workload, staff may be authorized to work prior to 8:00 a.m. and/or after 4:30 p.m. In addition, staff may be authorized to work on Saturdays.

The Noise Restrictions - Noise & Hours of Work By-law 2008-098 prohibits noise pollution between the hours of 7:00 p.m. and 7:00 a.m., Monday through Saturday.

Absolutely no work is allowed on Sundays!

The Town recognizes the following dates as holidays; therefore, any work is prohibited on these dates:

- New Year's Day
- Civic Holiday
- Good Friday
- Labour Day
- Easter Monday
- Thanksgiving Day
- Victoria Day
- Christmas Day
- Canada Day
- Boxing Day
- Family Day

5.4 Dewatering During Construction

The Town does not have a formal permit for short-term dewatering of groundwater during construction; however, consent from the Town, and in some cases Halton Region, is required prior to the discharges. If the dewatering will discharge to Halton Region's infrastructure, then further information may be required as part of their process. In many cases, these discharges have impacts to the Town's infrastructure, including downstream SWM ponds, and as such, both sets of requirements would apply. The following outlines the process and the requirements in general.

The short-term discharges must meet the Town's Storm Sewer By-law 2009-031 requirements at all times, and the discharge activity must have:

- no negative impact to the storm sewer system
- not interfere with the proper operation of a storm sewer
- not impair the water quality and the environment and/or cause a nuisance.

More information on this by-law can be found on the Town's website:

Storm Sewer By-law:

<https://assets.oakville.ca/blis/BylawIndexLibrary/2009-031.pdf>

A discharge plan must be completed by a qualified professional and provided in a letter/report to Development Services Section staff to review. The following subsections list the information required in, but not necessarily limited to, the discharge plan. Consideration for discharge requirements under Permit to Take Water and/or water taking activities under the Environmental Activity and Sector Registry (EASR) regulation should also be considered in developing the discharge plan. The discharge plan should include real-time sampling prior to discharge to confirm the requirements are met.

5.4.1 Required Discharge and Storm Sewer Capacity Information

The following discharge and storm sewer capacity information is required:

- maximum daily discharge volume
- expected maximum discharge rate
- expected total volume
- estimated discharge period
- frequency of discharge
- contingency plan for handling rain events for no discharge to the stormwater system scenario
- locations identify where the water will be generated (with the site)
- location/connection of the storm sewer system for the discharge; if first discharged at a private system, then where would it connect to the town system?
- identify the closest storm sewer outlet to a watercourse
- identify the pipe size of storm sewer as to the Town system (or to the connection from private to the Town system).

5.4.2 Required Water Quality and Treatment System Information

The discharge is required to meet the storm sewer by-law limits at all times. If the site or the discharge water is either contaminated or the water requires treatment, the following additional information is required:

- if the site has a Record of Site Conditions or if contamination has been identified
- list of parameters that do not meet the storm sewer by-law limits
- quality of the treated water before and after treatment, including pH and alkalinity

- other standards, as applicable, to demonstrate the treated water complies with MECP, the Town's storm sewer, and/or other standards
- residual odor:
 - ✦ Is there any residual odour after treatment?
- the type of treatment system that will operate to comply with the storm sewer by-law limits
 - ✦ Does the treatment system have an ECA for its operation? Who will be operating the system?
- location of the system related to the site
- protocol/procedure for treatment process upset or system failure, especially for a continuous flow system
- protocol/procedure for dealing with exceedance of the treated water
- protocol/procedure for ensuring the storm sewer by-law is met at all times before discharge, including contingency plan and preventative and/or corrective actions during the treatment system failure

5.4.3 Flow and Water Quality Monitoring Plan

A monitoring plan for flowrates (groundwater and surface water, if separated) and water quality for the whole duration of the short-term discharge period is required, including parameters and frequency that adapt to changes at different circumstances.

5.5 Construction Procedures/Requirements

5.5.1 Pre-construction Meeting

The developer's consultant shall coordinate a pre-construction meeting with the developer, contractor, consultant, utilities, Halton Region, and all applicable Town Development Services Section staff.

5.5.2 Construction Start-up

Prior to the start of construction, the following must be in place:

- subdivision agreement executed by all parties (developer, Halton Region, and Town) or pre-servicing agreement.
- approved construction drawings signed by the director of development services (the Town) and commissioner of engineering (Halton Region)
- All required securities submitted by developer.

A site trailer, with heat and hydro (air conditioning in the summer), is to be suitably located within the subdivision site and accessible by all parties. An adequate parking area (graded with granular material) is

to be provided adjacent to the trailer for all necessary staff/visitors for meetings, etc. Please note that parking on existing adjacent Town roadways for the purpose of accessing the trailer is not acceptable.

The trailer shall be equipped with a desk for both Town and Halton Region construction inspection staff. In addition, a table and chairs sufficient for all site meetings are to be provided. Also, clean drinking water and toilet facilities as per the *Occupational Health and Safety Act*, Part II, General Construction Hygiene, Sections 28 and 29, are to be supplied.

5.5.3 Site Meetings

At the discretion of the developer's consultant, site meetings shall be scheduled at frequent intervals, depending on construction progress. However, during normal construction periods, frequency of meetings of once per week or biweekly are appropriate. The Development Services Section shall be notified of each meeting.

5.5.4 Excavation

Excavations shall be to widths and depths necessary to provide adequate space for the wall or fitting formwork, and if required, over-excavation of unsuitable material. Generally, excavation shall be such that it leaves a firm and even surface of undisturbed soil, true to the required subgrade elevations. Where the subgrade is of poor quality, the consultant will direct the contractor to over-excavate and place a 19-mm layer base gravel to the required elevation.

Prior to placing concrete or loose gravel, the excavated subgrade shall be compacted to achieve an average density within the upper 500 mm of the subgrade, equivalent to 98%, by using vibratory compaction equipment.

NOTE: All excavations must comply with the *Occupational Health and Safety Act* and Regulations for Construction Projects.

5.5.5 Backfilling and Compaction

The contractor's attention is drawn to the backfilling requirements that must be carried out in strict accordance with the specifications. A geotechnical engineer shall provide an analysis of the existing soil conditions and provide a methodology for the excavation, storage, mixing, moisture control, and the placement procedure for use as backfill.

The Town requires that all trenches within the proposed road allowance be backfilled using Granular "B" unless the use of select native material is approved by the director of development services.

The following procedures are to be followed where native material (specifically shale) is to be used for backfilling sewer trenches:

- The excavation of the trench shall be done with a rock bucket equipped with "tiger teeth" on a hydraulic backhoe. The trench is to be ripped by the teeth of the bucket across the entire horizontal surface. This ripping breaks the shale layers into fragments less than 150 mm across, which then can be stockpiled for reuse as backfill. Any fragments larger than 150 mm are to be segregated and disposed of on abutting lots. Excavation of the center of the trench and knocking down the sides to widen it produces

fragments larger than 150 mm. This is not an accepted procedure and will result in the Town rejecting the material as suitable backfill under the roadway. In the event that this procedure is not effective, the contractor will be directed to use a “V” shaped rock bucket. As such, the contractor should have access to a “V” bucket, if it is deemed necessary.

- The shale fragments and clay overburden are to be mixed and pushed into the trench with a bulldozer. The mix must be to the satisfaction of the soils consultant and/or Development Services Section staff. This blends the material in a more thorough manner than dumping with a front-end loader. A small dozer is then to be used in the trench to distribute the backfill in 200 mm maximum lifts. Each lift is to be compacted to a minimum of 95%.
 - ✦ Standard Proctor Density using a self-propelled vibratory sheep’s foot roller shall be used. The owner is responsible to take soils tests, particularly adjacent to the trench walls and maintenance holes to determine if the density has been reached. If 95% cannot be achieved as established by the test strip method, the problem should be traced to the cause of failure.
- The length of trench section left open shall be kept to a minimum to reduce the drying (freezing in the winter) of the excavated material. The native material, as excavated, is usually drier than optimum, and with additional air drying, more compactive effort is required to obtain the desired results. Water will be imported during hot dry periods (to be added to the pile) and added to the native material to bring it to optimum moisture content to achieve the required compaction where necessary. The application of water shall be via the use of water cannon trucks. It is desirable to keep the moisture level of the backfill material in the lower reaches of the trench to slightly above optimum. In the higher reaches (i.e., nearer to subgrade level) it is desirable to keep the moisture level slightly below optimum. Therefore, the contractor is required to carefully apply water to the piles and, if necessary, into the trench to achieve the above.
- Under winter conditions, frozen material will not be permitted as backfill.
- If the trench width is inadequate to allow the equipment to operate as required, Granular “B” will be used and the surplus excavated material will be disposed of, as directed. Bull dozers are not permitted to widen trenches. A hydraulic backhoe is required for this operation.
- At the start of the project, a trial section 70 m to 150 m will be required to verify the techniques and familiarize the contractor with the procedure. This section will be observed by the Town, the developer’s engineer, and the soils consultant.
- Sewer laterals may be handled in two ways. If the sewer laterals are installed after the installation of the sewer main, Granular “B” is required from the sewer main to 1 m beyond the curb line. If the laterals are installed with the sewer main, native material may be used, provided the same procedure is used as on the mainline sewer and the corner formed by the lateral trench wall and main line trench wall is stepped back using a hydraulic backhoe to allow compaction equipment to operate. Catch basin laterals are to be treated in the same fashion as sewer laterals. Ramps into the trench for backfill purposes are to be done with hydraulic backhoe.
- The granular backfill around maintenance holes and catch basins must extend at least 0.6 m from the maintenance hole or catch basin or to where the native material can be compacted to the required

specification. The granular backfill must be installed in lifts before the native material is brought up. To achieve proper compaction, the drum of the compactive equipment must be able to travel from the native material to the granular material.

- Experience has indicated that careful attention to both excavation and backfill techniques are required to achieve the desired results. Any failure by the contractor to follow both procedures will result in the Town changing the backfill requirements back to Granular “B” at the contractor’s expense.

5.5.6 Quality Control

It is the developer’s responsibility to provide for quality control testing for all phases of construction. Apart from utilizing the services of a consulting engineer to design and administer the subdivision project, the developer should engage a reputable soils consultant for trench backfill compaction as well as granular, asphalt, and concrete testing.

The Town may contract its own soils consultant during trench backfilling and compaction operations when weather conditions or difficult soils are encountered, and a third-party verification is deemed appropriate to ensure quality results.

The backfilling and compaction of trenches is a critical operation in subdivision construction and consequently requires extensive testing in this area to ensure strict adherence to specifications.

All testing results by the soils consultant shall be copied to the manager of permits and construction, Development Services Section on a monthly basis. Daily results are to be forwarded to the subdivision inspector by the next day.

5.5.7 Materials

The following are the approved list of materials for use in road building and storm sewer servicing installation operations:

- sewer bedding:
 - ✦ rigid pipe: HL8 conforming to OPSD 802.030: *Rigid Pipe Bedding, Cover, and Backfill, Type 1 or 2 Soil, Earth Excavation*
 - ✦ flexible pipe HL8 conforming to 802.010: *Flexible Pipe Embedment and Backfill, Earth Excavation*
- storm sewers and appurtenances:
 - ✦ rigid pipe: concrete conforming to CSA A257.1: *Non-reinforced circular concrete culvert, storm drain, sewer pipe, and fittings*/CSA A257.2: *Reinforced circular concrete culvert, storm drain, sewer pipe, and fittings*
 - ✦ flexible pipe: PVC SDR 35, conforming to CSA B182.2 (max PVC pipe size allowed is 600 mm for mainline storm sewer)

- ✦ maintenance holes: precast or cast in place concrete conforming to Ontario Provincial Standards and Town Standards.
- ✦ catch basins and ditch inlets: conforming to Ontario Provincial Standards and Town Standards (rear yard catch basins shall be “sumpleless”)
- ✦ adjustment units and caps: conforming to Ontario Provincial Standards
- ✦ frames and covers: integrated frame and cover system or conforming to Ontario Provincial Standards and Town Standards
- ✦ inlet control devices: “scepter” plug type
- ✦ catch basin leads to rear yard drains (beyond street line) are to be concrete
 - If flexible pipe is used, a concrete slab shall be poured above the pipe cover from pipeline to structure. This is to prevent fence posts damaging the pipe.
- sewer cover:
 - ✦ Granular “B”/HL8 granular conforming to OPSD 802.03 and/or 802.01.
- trench backfill:
 - ✦ select native material or Granular “B” where trench is too narrow for equipment to operate
 - ✦ Granular “B” backfill material under all existing pavements
 - soil compaction criteria = 95 % Standard Proctor Density
 - upper 0.5 m layer of road subgrade to be compacted to 98%
- road base granular:
 - ✦ Granular “B”: May 1 to September 30
 - Granular “B” must be placed on subgrade by end dumping and pushing with a dozer at the full make-up thickness to eliminate alterations to subgrade profile.
 - ✦ Granular “A”: May 1 to September 30
 - ✦ 50 mm crushed limestone: October 1 to April 30 **wet weather specification**
 - ✦ 19 mm limestone: October 1 to April 30 **wet weather specification**
 - ✦ granular base compaction criteria = 100% Standard Proctor Density

- subdrains:
 - ✦ 100 mm perforated corrugated polyethylene pipe with geotextile fabric conforming to OPSS 405, OPSS 1860, and Town Standard Drawing STD 6-2.
- curb and gutter:
 - ✦ 30 Mpa concrete at 28 days (minimum 355 kg/m³ Type 10 Portland Cement) conforming to OPSS 1350 and Town Standard Drawing STD 6-1.
- sidewalks and walkways:
 - ✦ 30 Mpa concrete at 28 days (minimum 355 kg/m³ Type 10 Portland Cement) conforming to OPSS 1350 and Town Standard Drawings STD 6-3 and STD 6-4.
- Asphalt:
 - ✦ base asphalt: HL8 conforming to OPSS
 - ✦ top asphalt: HL3 conforming to OPSS

NOTE: See appropriate road standard for asphalt pavement depths.

- ✦ driveway apron asphalt: 75 mm HL3A conforming to OPSS (150 mm of 19 mm crushed limestone to be full width of driveway in the apron area)
- ✦ asphalt compaction criteria = 98%

NOTE: All utility road crossings must be installed prior to placement of base asphalt.

In the event that a utility must revise its plant design after base asphalt has been placed, the road crossing trench will be entirely backfilled with unshrinkable backfill. In addition, the cut in the base asphalt shall be stepped 40 mm deep by 300 mm wide around the entire circumference of the cut where base asphalt thickness is 80 mm or greater. The step will only be 25 mm deep where base asphalt thickness is less than 80mm.

NOTE: It is preferable to have all driveways constructed with 50 mm of HL8 (OPSS) and 25 mm of HL3A (OPSS) in two separate lifts to allow for settlement during the maintenance period of the roads.

5.5.8 Construction Season Cut-off Dates

Subdivision construction may proceed during all seasons, subject to the following conditions:

- top asphalt works: June 1 to October 31
- top stage concrete curb: March 21 to October 31
- concrete sidewalk and walkways: March 21 to October 31

- base asphalt works: March 21 to December 15
- base stage concrete curb: March 21 to December 15

Underground servicing may proceed year-round, provided that the backfill material is free from frozen components.

5.6 Base Servicing for Building Permits (First Stage)

Plan registration is required prior to issuance of building permits; refer to Section 6.1.5.

5.6.1 Level of Road Completion for Permits

- All roads within the phase shall be complete to a base asphalt and base curb.
- Lots shall be clear of debris and set at pre-grade condition.
- Storm sewers and outfall shall be completed and all SWMFs (ponds) shall be constructed and certified as operating per the design.
- Geodetic benchmarks shall be submitted to the Town surveyor.
- All required street signs (temporary format) shall be installed to satisfaction of the manager of traffic operations.
- All walkways and public paths shall be roughed in per the Parks and Open Space Department, including the required fencing (between lots leading to parks and top of valley path systems).
- Primary utilities shall be installed within boulevards and Oakville Hydro shall be satisfied with hydro installation, including streetlights.
- Halton Region shall be satisfied with water and sanitary sewer testing.
- ESCs shall be in place and functioning.
- Noise attenuation fences shall be constructed, or at minimum, posts shall be in place where conflicts with house construction exist.
- Road barricades shall be installed where construction traffic is prohibited and interim construction access roads shall be built where required by the Town.
- A builder's meeting shall be arranged to review the list of conditions.

Requests for Building Permit issuance are to be formally made to the manager of development services. In general, clearances will be provided for complete plans. Partial plan clearances may be considered based on warranted conditions. A letter from the developer's consultant is required certifying that all works have been completed to base asphalt level and in accordance with Town Standards.

The developer shall contact the development coordinator to review all other administrative conditions per the subdivision agreement (Section 6 [Subdivision Administration]).

5.6.2 Transit Facilities Plan (Transit First Policy)

Oakville Transit shall ensure that the building permit release schedule complies with the approved transit facilities plan and the Town's Transit First planning principles.

Contact the manager of transit planning to arrange a meeting to review the Building Permit schedule.

5.6.3 Utility Installation

A composite utility plan shall be approved by all the utilities, including Canada Post. All primary utilities shall be in the ground and the boulevard restored to grade.

Canada Post shall be satisfied with temporary centralized pad for the initial installation of post boxes. Canada Post shall be informed of the timing of first occupancy.

5.6.4 Stormwater Management Status

Stormwater ponds shall be certified as complete and fully functional.

Ponds shall have all exposed slopes stabilized with ground cover or erosion control devices when the time of year prohibits establishment of natural cover.

All outfalls to creek systems shall be complete and stabilized to the satisfaction of CH and DFO.

The engineer shall verify that all safety features have been installed (fences and grates) and that all side slopes have been graded to the required safe public access criteria.

Submit all SWM and sewer design reports in final form including a schedule for the monitoring of all SWM features and siltation/erosion control works.

5.7 Subdivision Services Control (House Building Stage)

Once the subdivision is complete to base asphalt and base curb level, it is the developer's responsibility to:

- maintain roadway pavement widths for safe vehicular traffic during the construction of homes, buildings, etc.
 - ✦ Use of the road allowance for the stockpiling of materials by trades is not permitted.
- maintain clean (mud and dust free) roadways within the subdivision and adjacent Town roadway
 - ✦ This will necessitate frequent sweeping and flushing at the developer's expense. Also, garbage/waste is to be contained within garbage bins.
- maintain free flowing sediment-controlled catch basins, ditch inlets, sewers, outfalls, and channels during the construction of homes, buildings., etc.

- maintain all traffic signs (stop sign, street names signs, etc.) as well as the subdivision information signboard
- monitor the interim road barriers (two-stage chain) and inform the Town when roads can be opened based on the state of construction versus the level of occupancy

The subdivision services inspector will inspect the subdivision for adherence to the above on a regular basis. The inspector will provide direction to either the developer or the consultant for rectification of any infractions. The Town may, at its own discretion, arrange to resolve infractions with its own forces or hire contract forces, the cost of which (including 100% administration) will be charged to the developer.

5.8 Completion of Top Curb, Sidewalks, Boulevards (Second Stage)

Completion of the finished road works will generally be performed at different stages during the house-building phase of the development and shall be timed to coincide with the occupancy of units.

Sidewalks and top-stage curb are required to set the grade control for lot grading of the individual lots to allow for the lot grading to be completed prior to the occupancy of the newly constructed homes.

The subdivision agreement requires that homeowners shall have their lots sodded within 30 days of occupancy (weather/season permitting). The timing and scheduling of the sidewalk and curb work is critical to ensure that lot sodding is not unduly delayed.

It is recommended that the developer's consultant arrange for a meeting (several times a year) with the Town's manager of development services to discuss/coordinate the necessary sidewalk, curb, and boulevard installations to be scheduled based on building activity.

Prior to the installation of top-stage curb, sidewalks, boulevards, aprons, and top asphalt, the developer's consultant is to contact the subdivision inspector in advance for the scheduling of inspections. Prior to any of this work proceeding, the consultant and Town staff shall review the existing base asphalt and base curb, etc. for any evident deficiencies, which are to be repaired prior to the progression of additional works.

The developer's engineer shall administer and monitor all works within the municipal ROW during this house-building stage and shall ensure that the appropriate quality control testing is being performed by the geotechnical/quality control consultant.

5.8.1 Top Asphalt (Final Surface Course)

Top asphalt may be placed once the subdivision has experienced at least two winter seasons after the completion of servicing to base asphalt and base curb level.

In addition, top asphalt placement may not proceed until the completion of all:

- lot grading and sodding
- sodding of boulevards

- driveway aprons installed (asphalt/concrete/interlock; minimum base course)
- base asphalt, curb, and sidewalk repairs completed to the satisfaction of the Town
- permanent traffic and street name signs installed

Special circumstances may allow for the placement of top asphalt where some lots are incomplete or minor road repairs are outstanding. Specific requests for these circumstances shall be submitted to the manager of development services for approval.

5.9 Final Inspection for the Assumption of Municipal Works

The developer's consultant may make a request for assumption once all of the municipal works have been completed in the subdivision and once the top asphalt has experienced at least one winter season.

The consultant shall formally request for an assumption inspection by June 1 by providing written notice to the manager of development services and development coordinator, as per the requirements of Section 6.2 (Assumption) of this manual. Final inspections are completed by the Town's Permits, Inspection and Road Corridor Section.

The final inspection will include an entire walkover of all curbs, sidewalks, boulevards, aprons, walkways, and roadways within the subdivision. The inspection will also include a review of all maintenance hole and catch-basin structures, storm sewers, as well as all box culverts, headwalls, railings, and all traffic signs, etc.

NOTE: Prior to the final inspection by the Town, the developer is to arrange for all storm sewers to be flushed.

Prior to the assumption of sewers, the following requirements must be completed:

- closed-circuit television (CCTV) inspection provided to the Town to confirm that no defects exist
- mandrel testing/pipe deflection
 - ✦ a mandrel shall be pulled for all flexible piping (PVC and HDPE) piping as per OPSS 410
 - ✦ deflections shall not exceed a maximum of 5% of the pipe diameter
- as-built drawings signed and stamped by a qualified professional engineer (P.Eng.)

It is the consultant's responsibility to record all deficiencies noted (with locations) during this inspection. The compiled list will be forwarded to the construction coordinator and the subdivision inspector as soon as possible prior to any repair work proceeding.

It will be the consultant's responsibility to contract a road sweeper and flusher, at the developer's expense, to sweep and flush the entire roadway network within 30 minutes prior to the inspection. The purpose for this is to review the drainage of the pavement areas within the subdivision.

The consultant is required to contact the Subdivision inspector prior to the commencement of deficiency repairs in order that the inspection may be scheduled.

Once all noted deficiency repairs have been completed (subject to annual cut-off dates), the developer's consultant is to contact the subdivision inspector to arrange for one final walkover of the subdivision to ensure that all the repairs are satisfactory.

It is at this time that final lot grading inspections shall also be performed with the Town's inspector.

5.10 Administrative Process for the Assumption By-law

Once all of the works have been completed as described above, the manager of development services shall be notified to initiate the preparation of the Assumption By-law report, as required to be submitted to Town Council for adoption.

The consultant shall submit the following to the manager of development services:

- subdivision assumption fee payment
- statutory declaration for all works completed
- certificate of completion for all subdivision works conforming to original design plans
- sewer CCTV inspection videos
- as-built drawing records (both mylar and digital file)
- lot grading certificates
- top-course asphalt installation certificate
- updated Public Sector Accounting Board (PSAB) documents for end of project summary
- survey certifications:
 - ✦ control standard iron bars (SIBs), easement iron bars (IBs), Town-dedicated land IBs re-established
 - ✦ re-monumentation plan
 - ✦ survey benchmark installation
- original acoustic report
- noise attenuation feature certificates (if applicable)
- payment of additional "security reduction" fees (applicable past the first reduction request submission)
- roads and works cash reimbursement for traffic signage and pavement markings
- letter of credit/cash-in-lieu settlements for future works, if authorized

6 SUBDIVISION ADMINISTRATION

6.1 Subdivision Agreements

The developer shall enter into a subdivision agreement with the Town of Oakville for the purposes of controlling the design and construction of municipal services and ensuring the completion of works to the satisfaction of all Town departments.

6.1.1 General Functions of the Agreement

- to satisfy draft plan approval conditions for the registration of the plan
 - ✦ Several draft conditions cannot be fulfilled at the time of registration and are, therefore, transferred into the subdivision agreement to satisfy the registration process.
- to refer to the approved engineering design which is to be adhered to and to detail the responsibilities of the owner's engineer
- to refer to appropriate Town policies and procedures
- to secure monies for the completion of works to the Town's satisfaction
- to amalgamate the requirements of all Town departments and related agencies
- to define and obtain all public lands and Town easements as required
- to provide time frames for the construction of municipal services
- to detail the services which are to be paid for by the Town via the Development Charges By-law
- to establish conditions/warning clauses which are to be placed on individual lots via the builder's purchase/sale agreement
- to provide a process for the acceptance and assumption of the subdivision and the subsequent release of obligations by the developer
- to obtain the Town's fees required for the processing of the engineering approval and the monitoring of construction
- to define all works required outside of the plan of subdivision/condominium on existing Town roads and land
- to establish the conditions to be fulfilled prior to the issuance of Building Permits

6.1.2 Agreement Preparation

The following items shall be submitted as one package to the Development Services Section development coordinator for the preparation of the agreement:

- a. four draft copies of all M-Plans
- b. four draft copies of all reference plans (storm and hydro easements)
- c. two sets of signed drawings (signed by the Town and the Region)
- d. four copies of the lot frontage and area schedules
- e. final cost estimate or tendered prices, (all items detailed)
- f. legal description of lands
- g. summary of security items Schedule "A"
 - ✦ roads and site work Schedule "B"
 - ✦ storm sewers Schedule "C"
 - ✦ environmental works (SWM/ESC) Schedule "G"
- h. electrical distribution and street lighting
 - ✦ cost estimate as approves by Oakville Hydro Schedule "F"
- i. landscaping cost estimate (Parks and Open Space Department) Schedule "H"
- j. detailed listing of all lots, parts, and blocks for easements, reserves, and dedications.....Schedule "I"
- k. financial summary.....Schedule "J"
 - ✦ listing of all securities, cash-in-lieu costs and the fee calculation for engineering approval and monitoring of construction by the Town
- l. works to be constructed on behalf of Town..... Schedule "K"
- m. Building Permit requirements summarySchedule "L"
- n. \$5,000,000 liability insurance with the Town to be named as the co-insured

6.1.3 Financial Requirements

- agreement preparation fee
 - ✦ A non-refundable fee is required to initiate the agreement.
- Town subdivision administration fee; calculated as a percentage of the value of 100% of all municipal works, excluding Hydro, Regional, and *Development Charges Act* items
- securities for works to be constructed
 - ✦ Estimate based on 100% of the construction costs of municipal roads, sidewalks, storm sewers, SWMFs (ponds), and landscaping (letter of credit to be provided per approved list of financial firms).
- additional securities (cash or letter of credit)
 - ✦ garbage
 - ✦ street cleaning
 - ✦ signage
 - ✦ park/valley rehabilitation
 - ✦ electrical distribution (Oakville Hydro)
 - ✦ street trees
 - ✦ cash in-lieu of parkland dedication
- securities for works to be constructed on behalf of the Town
 - ✦ 100% of the cost of works to be paid for by the Town as approved per the Development Charges By-law.

NOTE: See Subdivision and Condominium Agreements Processing Fees By-law 2011-137 for complete details of the subdivision agreement and administration financial fee schedule.

6.1.4 Agreement Administration

- The development coordinator ensures that all legal drawings, financial schedules, and special conditions are in order for the agreement document preparation. The complete information package is then passed to the Legal Services Department for the preparation of the draft subdivision agreement.
- The draft agreement document is then circulated by the development coordinator for comment to all appropriate Town departments, the conservation authority, Halton Region, Oakville Hydro, and all other pertinent agencies.

- Once all sections of the agreement are finalized, a report is prepared by the development coordinator to be presented to the Planning and Development Council for final approval.
- After Planning and Development Council approval, the agreement is executed by the Town and the developer. The agreement will be registered on the lands once the plan is registered.
- All securities and cash must be in place prior to the registration of the plan(s). The Development Engineering Section forwards the request for subdivision clearance to the appropriate Town departments for the final plan registration.
- During the life of the project, the Development Services Section monitors and enforces the conditions of the agreement, including all security reductions, various timing items, mud and dust controls, safety issues, etc.
- When the maintenance period is over, the Development Services Section will accept the request for assumption and will process it.

6.1.5 Plan Registration

The Town will authorize the registration of a plan when the development coordinator for the Town is satisfied that all conditions of the subdivision draft plan approval have been fulfilled.

The development coordinator for the Town is responsible for ensuring that all Town conditions and the conditions of all other agencies are satisfactorily addressed. All monies and securities shall be deposited with the Town prior to registration.

Once a plan is registered with the Land Registry Office, the Town requires ten copies of the printed plan for Town distribution. A reproducible copy shall be deposited at the Public Works Department, Drafting Section.

The Building Services Department will not issue building permits prior to the registration of a plan. The Zoning Section requires three copies of the lot area and frontage schedules as certified by the Ontario Land Surveyor.

It is the developer's responsibility to correspond with all agencies who have applied conditions to the approval of the plan of subdivision.

The developer shall inform the development coordinator of their intention to register a plan and arrange for a meeting to clarify the process.

The following is a list of the chronological steps to follow when registering a plan:

- subdivision registration process:
 - ✦ Town subdivision agreement is approved by Town Council
 - ✦ confirmation that all agency clearances and conditions of draft approval is satisfied; the Town's development coordinator to be contacted for instructions

- ✦ final version of M-Plan (endorsed by Registry Office) received by Town
- ✦ M-Plan circulated to Town Legal and Planning departments, Halton Region, and Oakville Hydro for review
- ✦ Halton Region's conveyance requirements sent to Town and incorporated in Town's document registration agreement (DRA).
- ✦ Town's DRA signed by Town solicitor and circulated to solicitor for developer, Halton Region, and Oakville Hydro for signature
- ✦ fully executed DRA returned to Town Legal Department
- ✦ developer's solicitor prepares Town, Halton Region, and Oakville Hydro conveyance documents as set out in DRA (except Notice of Inhibiting Order, Notice of Subdivision Agreement, and Application to Delete Inhibiting Order, which is prepared by the Towne Legal Department); documents electronically messaged to other parties for review
- ✦ Legal Department receives inhibiting order (executed by Regional Clerk) from Planning Department, attaches schedule of Town conveyance requirements, circulates inhibiting order to Oakville Hydro's solicitor for execution by Oakville Hydro and to Clerk's Department for execution by Town Clerk, and completes Inhibiting Order by inserting names of persons signing inhibiting order
- ✦ Legal Department notifies developer's solicitor and Planning Department that Legal Department requirements have been completed; Town's director of planning signs M-Plan
- ✦ developer or his surveyor receives plan from Planning Department and delivers plan to Land Registry Office
- ✦ developer's solicitor registers plan of subdivision/condominium, obtains M-Plan number, and registers Notice of Inhibiting Order
- ✦ developer's solicitor registers reference plans and Halton Region conveyance documents
- ✦ Oakville Hydro's solicitor registers hydro conveyance documents and notifies Legal Department that inhibiting order may be lifted.

6.1.6 Street Names

The naming of municipal streets shall be to the satisfaction of the Town surveyor. A draft legal plan shall be submitted to the Roads and Works Department as early as possible after draft plan approval. Suggested names can be provided, but the Town has final authority.

The developer can pay the Town to install the street signage, ahead of occupancy, for a fee.

6.2 Assumption

Following completion of all construction, the subdivider may request assumption of the subdivision. A letter from the subdivider's engineer, along with the executed "Certificate Recommending the Assumption of the Subdivision by the Town", is submitted to the development coordinator. A circulation for clearance is distributed to the following agencies and Town departments, as required:

- Parks and Open Space Department
- Roads and Works Department
- Traffic Operations
- Transportation and Engineering Department
- Survey
- Legal Services Department
- Finance Department
- Building Services Department
- Transit Department
- CH
- CVC
- Oakville Hydroelectric Commission
- Halton Region

The above noted agencies and Town departments provide subdivision deficiency forms to the Development Services Department. The onus is on the owner/subdivider to ensure that each agency or department has all of the required information, and that all deficiencies are addressed.

The Development Services Department assesses the deficiency items for assumption. Once all departments/agencies are satisfied, a Town Council report is prepared with an applicable assumption by-law number. When assumption is approved by Town Council, the development services coordinator then advises the owner's subdivider of the respective approval and any special conditions which may be attached.

Any remaining securities shall be released once Town Council approves the Assumption By-Law. Some securities may be withheld if all building lots have not yet been completed.

NOTE: The request to initiate the assumption process requires the submission of the associated financial fee.

See By-law 2009-148 for complete details of the subdivision agreement and administration financial fee schedule.

6.2.1 Key Requirements for Assumption

- Submit the Statutory Declaration Form, to be supplied by the owner, verifying the payment of all accounts pertaining to the construction of the subdivision.
- Owner's engineer shall certify that all subdivision works have been constructed in general conformity to the approved plans and specifications including as-built records of roads and sewers.
- Lot grading certificates to be provided by the developer's engineer and final grading inspection and approval by the Development Engineering Section. All housing construction shall be complete prior to the assumption of the plan. Lot grading at the time of assumption must be in accordance with the approved grading certificates. Special consideration may be given where vacant lots still remain. The director of planning services shall determine the conditions and securities required.
- Certification by a registered Ontario Land Surveyor that all control SIBs, all easement IBs, and all Town dedicated land IBs have been confirmed or re-established
- Certification by the acoustical engineer that all noise attenuation features have been constructed or installed as per the approved acoustical report.
- Certification by the engineer that the SWMF are operating per design. Submission of final as-built SWM models and facility operational and monitoring manuals.
- Confirmation from the Town solicitor that the developer's solicitor has submitted all records of the transference of easements, reserves, and municipal lands.
- Release from Development Services on the acceptance of all road works and storm sewers. Traffic Operations Section to confirm traffic signs and pavement markings (traffic signals),
- Clearance from the Parks and Open Space Department.
- Clearance from Transit per "Transit First" planning policy.
- Acceptance of all works under the jurisdiction of other agencies such as Oakville Hydro, Halton Region, MTO, and CH.
- Payment of all development charge fees (generally due at building permit stage).
- As-built drawings approved by the Development Services Section (digital files submitted per Town's GIS criteria).

NOTE: Assumption requests must be received prior to June 1 to ensure the completion of the process within that year.

7 SITE PLAN DEVELOPMENT

7.1 General Procedure

Site plan approval by the Development Services Section is one of the general prerequisites to the issuance of a Building Permit. All applications to the Planning Department are circulated to the Development Services Section for review.

For the general procedures in a site plan application, please refer to the requirements as specified by the Planning Services Department. It is the responsibility of the applicant to ensure that all application criteria for submission to the Development Services Section is complete and in accordance with the following requirements. Incomplete submissions will be refused.

7.2 Site Plan Procedure

At the pre-construction meeting, the applicant will be made aware of the following:

- If the project will or will not result in a formal site plan agreement.
- That no works to advance their development may proceed on the site until final site plan approval has been granted, unless written approval for advance works due to mitigating circumstances has been granted by the Director of Development Engineering or their delegate.
- Erosion and siltation controls are to be shown on the grading and drainage plan(s) and an ESC detail plan.
- Following site plan approval, the owner shall provide written notice to the Town's Permits and Inspection Section, via "Serviceoakville", 48 hours in advance of the intention to commence active works on the site.

The following procedure will be followed upon the receipt of the application:

- Planning will circulate the application to the Development Engineering Section as normal.
- The Development Engineering Section will review plans and reports, including the addition of erosion and siltation controls and cost estimate for the controls, inclusive of a 50% addition for maintenance. (The cost estimate shall be used to define the securities).
- Development engineering will ensure that the above notes are on the plan.
- The Development Engineering Section will review the arborist report for tree removals/protection on site, protection of trees on municipal property, and cost estimate for securities. The security shall be defined as the value of the municipal trees being protected around this site plus the value of the hoarding to be installed on the site.
- If there is to be no formal site plan agreement, securities shall be in the form of a letter of credit or certified cheque. Securities will be held by the Finance Department and noted within the property files .

- If there is a formal site plan agreement, then the appropriate schedules within the site plan agreement must reference the requirement for the posting of these securities.

7.3 Design Criteria

Section 3 (Subdivision Design Criteria) of this manual specifically outlines the design criteria for subdivision development. The criteria as specified is to be reflected in the site plan design. A grading guide is in progress and will be available on the Town's website once complete.

The Town's SWMP should be referenced:

Stormwater Master Plan:

<https://www.oakville.ca/home-environment/environment/water-stormwater/stormwater-management/stormwater-master-plan/>

Prior to an engineering submission, the applicant shall contact the following external authorities for specific design criteria should the subject properties abut or contain:

- a watercourse/valley/shoreline/wetland block regulated by the CH or CVC (site plan, grading, drainage/servicing, and landscape plans to be submitted)
- Ontario Hydro property (grading, drainage/servicing, and landscaping plans)
- Canadian National Railway or Canadian Pacific Railway (CP; grading and drainage/servicing plans)
- pipelines or pipeline easements (grading and drainage/servicing plans)
- if a driveway is proposed on a municipal road within 180 m of an intersection with a provincial highway (QEW, Highway 403, Highway 407)
- frontage or access to RRs (Halton Region of Region of Peel)
- land adjacent to Lake Ontario (MNRF and CH).

7.3.1 Storm Drainage Criteria

- Sites are to be designed such that the runoff from a 25 mm event shall be retained (infiltrated) on site for all site areas (rooftop, hardscape, and softscape yard areas), as per the recommendation of the Town SWMP. This can be completed through various LID methods such as cisterns, soak-away pits, dry wells, grey water systems, rooftop storage, green roofs, infiltration trenches, modular underground infiltration systems, and bioretention areas. Rain barrels and pools will NOT be considered for SWM storage requirements. See Section 3.3 (Best Management Practices and Low Impact Development Guidance) for additional LID guidance.
- Quality treatment of stormwater runoff is required. The level of treatment shall be determined per the receiving system (see CH or existing subwatershed study). LID measures, wet detention ponds, and manufactured treatment devices are acceptable treatment methods.

- ✦ Manufactured treatment devices, such as OGSs, predicted performance must be verified under the ETV Canada program and must be sized to meet a minimum long-term average TSS removal efficiency in accordance with the applicable water quality target (e.g., 80% TSS removal). The device must also be sized to ensure 90% of the average annual runoff volume is treated without bypass. (see Section 3.7.2.1 [Manufacture Treatment Devices]). The device must be certified by the installer/manufacture as per installation, operation, and final cleaning for acceptance.
- ✦ Discharge details including any pump/float requirements for the discharge system must be provided.
- ✦ Cisterns or underground storage tanks must be no closer than 3 m to any buildings and no closer than 1.2 m to a property line. If the infrastructure is proposed close to property boundaries, additional discussion may be required with the owners of potentially affected properties.
- ✦ Flat rooftop storage systems require locations of drains, drain types with material detail drawings, discharge flow rates, confirmation from the architect and design engineer that the system is to be installed with the construction of the dwelling, and that a structural engineer reviewed the plans and ensured that the design of the dwelling can meet the Ontario Building Code.
- ✦ Infiltration systems (e.g., soak-away pits) shall provide data from a percolation test indicating that the soils are suitable to provide a drawdown time of 48 hours and seasonal groundwater and bedrock elevations (if applicable) to confirm elevations are sufficiently low to allow stormwater percolation. A 1 m separation between the bottom of the infiltration system and the seasonal high groundwater elevation is required.
- ✦ Drywells are not permitted to be designed such that they spill into neighbouring properties. An overflow to an appropriate outlet should be provided, if feasible. If not possible, a factor of safety of 2.0 shall be provided to account for emergency conditions.
- ✦ The dry well shall be lined with filter fabric and filled with 19 mm clear stone or larger.
- ✦ Every dry well must have one area drain. Dry wells in excess of 8 m² must have additional drains on the surface to provide for greater surface drainage and a pump out point and to serve as a reminder for current and future owners that the facility exists.
- ✦ Where deemed necessary by the Town, an overflow route from a dry-well may be required.
- ✦ All dry wells must be no closer than 5 m to any buildings and no closer than 1.2 m to a property line. If the proposed infrastructure is close to property boundaries, additional discussion may be required with the owners of potentially affected properties.
- Peak runoff rates shall be controlled to local constraints of receiving systems (Town's SWMP), established subwatershed study, MTO guidelines, existing sewer capacity, or "post-to-pre" (i.e., control post-development peak runoff rates to pre-development levels for all events up to the 1:100-year level) where capacity is unknown or there is a history of flooding or erosion concerns. Where the receiving storm system capacity is constrained (upstream or downstream), peak runoff from the site should be limited to 1:5-year pre-development levels for storms up to the 1:100-year level.

- Quality and quantity control devices shall be located at the property line for municipal access. If this is not possible, easements may be required. (These private facilities shall be operated and maintained by the property owner.)
- Control devices shall be installed on the upstream side of control maintenance holes located on the property line.
- Orifice openings must have a diameter of no less than 75 mm in order to prevent clogging of the opening.
- Where practical, sites shall be designed with a sewer network capable of capturing the 1:5-year event. If sewers are not possible, surface drainage reaches shall be limited to 50 m.
- The modified Rational Method or equivalent may be used for the analysis of simple sites.
- Hydrologic modelling may be required where warranted or another model may be dictated by the watershed/subwatershed study (see Section 3.6 [Hydrologic Modelling Software] for accepted hydrologic modelling software).
- Drainage from sites shall be self contained unless part of a previous master drainage scheme. Existing external drainage shall be accommodated without impacts to upstream lands.
- An overland flow route shall be clearly marked on drawings. The grading of landscaped areas and parking lots shall provide a safe path for the overland flow route to the surrounding municipal ROW during storms exceeding the design storm event.
- Surface ponding limits and available storage shall be depicted on the site servicing/grading drawings.
- Maximum ponding depth in parking areas is not to exceed 250 mm, and no ponding shall be in a fire route.
- No ponding shall occur on paved surfaces for frequent events up to and including the 1:5-year event, as this nuisance ponding interferes with operation of site access. Loading docks/storage areas, landscaped areas, roof top or underground structures, etc. may be used for detention storage.
- Storm connections from the building roof and foundation drains must be made downstream of the maintenance hole and/or catch basin inlet controls.
- Roof drains shall be selected to provide the required flows per unit to obtain the designed detention storage.
- All storm sewer structures shall comply with OPSD specifications and adhere to the requirements of the Ontario Building Code. The Building Services Department will approve code issues.
- A SWM report shall be prepared and stamped, signed, and dated by a qualified professional engineer. The SWM report must include:

- ✦ existing conditions of the lot drainage, existing outlet for the site drainage, and existing capacity of the municipal drainage system (based on the Town's SWMP results)
 - ✦ a suitable runoff coefficient (see Section 3.7.3.4 [Runoff Coefficient]), based on increased hardened surface for both the proposed dwelling and hardscaping
 - ✦ correct sizing for all SWM systems quantity and quality controls, such that runoff from a 25 mm event shall be retained (infiltrated) on site
 - ✦ detailed grading drawings stamped, signed, and dated by a qualified professional engineer with the pertinent details of the drainage system shall be included to facilitate the intended construction, including, but not limited to, drainage area clearly illustrated on the plan; detailed grading information, including the "high point" split on all property lines; all downspout locations draining to grade, etc.
- A qualified professional engineer must approve and stamp the on-site SWM report and site servicing drawings. The design engineer shall provide an "as-built certification" of the SWM system prior to the final release from the Town.

7.3.2 Foundation Drainage for Site Plan

The same criteria shall apply as outlined in Section 3.7.9 (Foundation Drain Criteria) for foundation drainage. Possible mitigation strategies include waterproofing the building.

Refer to Section 3.7.12 (Long-term Groundwater Discharge and Foundation Drainage) for long-term groundwater discharge requirements.

7.3.3 Foundation Drainage for Infill Residential

For single residential infill developments south of Dundas Street, the proponent must determine if they are in an area of known high groundwater or in an area with continuous sump pump discharges. This may be documented in an existing geotechnical or hydrogeological study (e.g., EIR or FSS). If this is unknown, testing may be required to confirm existing conditions. Groundwater study requirements must be confirmed with the Town.

The Town's preferred approach is to discharge foundation drains to grade with a splash pad, approximately 1.5 m (5 feet) from the foundation, provided ALL of the following conditions are met:

- the underside of footing is at least 0.5 m above the local high groundwater elevation, AND
- there is positive drainage away from the foundation toward the front yard (outletting to the side or rear yard is not permitted), AND
- discharge must be contained on site with no negative effect to neighbouring properties.

A foundation intersection with a high groundwater table is strongly discouraged. Continuous long-term groundwater discharge to existing infrastructure (pipes/ponds/ditches) may lead to cumulative impacts and is not supported by the Town (refer to Section 3.7.12 [Long-term Groundwater Discharge and Foundation

Drainage] for further guidance). Options to mitigate include raising the foundation elevation above the groundwater table, eliminating basements, or engaging with the Town to determine an appropriate mitigation strategy.

Where the above provisions for at-grade foundation drainage cannot be met due to grading constraints, foundation drains may be directed to a soak-away pit (also called a dry well), provided site conditions are appropriate. Refer to Section 3.9.2.1 (Dry wells). The proponent may request the Town's soak-away pit/dry well design guidance sheet for design assistance.

If a soak-away pit/dry well is not a valid option, and there is an existing municipal storm sewer or ditch, the proponent should review the capacity information detailed in the Town's SWMP to determine the best outlet option. In all cases, foundation drainage must be managed to the satisfaction of the Town and may be subject to further consultation with the Town.

A grading guide is in progress and will be available on the Town's website once complete.

7.4 Submission Requirements

7.4.1 Engineering Drawing Requirements

All site servicing and grading plan drawings must include:

- ESCs (Site Alteration Permit required)
- Town benchmark description and elevation
- all abutting streets, ROWs, and easements
- all utilities on existing roads, including storm, sanitary, water, Bell, hydro, and gas
- all proposed services to the building (note that all services, including Bell and hydro must be provided underground from the existing source to the building)
- tree inventory and removal/preservation plan.
- existing grades of abutting roads and proposed grades through new entrances, elevations on a grid throughout the site including lot corners, and a minimum of 15 m external to the site so that drainage patterns may be evaluated
- all surface drainage routes, including swales, ditches, and watercourses and their invert elevations and flow direction (floodplain limits)
- the overall surface drainage pattern on the site is to be shown by flow arrows
- location of on-site storm sewers, maintenance holes, and catch basins, including size and class of pipe and grades

- ground floor elevations of the building and ground elevation at all building corners, entrances, catch basins, tops and bottoms at slopes, and other locations, as required to establish the surface drainage system
- location of roof downspouts and details of roof hoppers (flow controls)
- location and size of driveways and culverts
- all hard surfaces, patios, and walkways
- location of air conditioning unit
- a legend detailing all symbols used (i.e., catch basins, retaining walls, road, property line, building line, existing and proposed elevations).

The following notes shall be included on the drawings:

- All ESCs shall be installed according to approved plans prior to commencement of any earth moving work on the site and shall remain in place until all disturbed areas are stabilized with the intended final ground cover.
- ESCs shall be inspected by the builder/developer:
 - ✦ weekly
 - ✦ before and after any predicted rainfall event
 - ✦ following an unpredicted rainfall event
 - ✦ daily during extended duration rainfall events
 - ✦ after significant snow melt events.
- ESCs shall be maintained in proper working order at all times. Damaged or clogged devices shall be repaired within 48 hours.
- Where a site requires dewatering and where the expelled water can be freely released to a suitable receiver, the expelled water shall be treated to capture suspended particles greater than 40 μm in size. The captured sediment shall be properly disposed of per MECP guidelines. The clean expelled water shall be freely released to a suitable receiver in a manner that does not create downstream issues, including, but not limited to, erosion, flooding (nuisance or otherwise), interference issues, etc.
- Existing storm sewers and drainage ditches adjacent to the works shall be protected at all times from the entry of sediment/silt that may migrate from the site. For storm sewers, all inlets (rear lot catch basins, road catch basins, pipe inlets, etc.) must be secured/fitted with siltation control measures. For drainage ditches, the installation of rock check dams, siltation fencing, and sediment containment devices must be installed to trap and contain sediment. These siltation control devices shall be inspected and maintained per above.

7.4.2 Survey Plan Requirements

An up-to-date survey must be prepared and stamped, signed, and dated by an Ontario Land Surveyor or, as an alternative, an Ontario Land Surveyor stamp and signature on a site plan prepared by an architect or engineer indicating:

- the lot number and registered plan or concession/lot of Town grid and address
- the lot area in metric measure
- location of proposed building(s), i.e., to verify setbacks
- all existing structures and topographical features (i.e., swales, ditches, top of bank).

7.4.3 Subdivider's Approvals

Applicants are referred to the subdivider to determine if the subdivider's approval of a proposal is also required where a plan is not assumed. Any revisions to approved plans, such as those required by the subdivider's engineer and architect or otherwise, will require further review and approval by the Town.

7.4.4 Permits and Other Approvals

The following permits or approvals may be required:

- **Road Corridor Access Permit:** Any work within a Town ROW shall be reviewed by the Public Works Department and a permit may be required (i.e., new driveways, road cuts for service installations, road widenings).
- **Site Alteration Permit:** Any alteration to a property where excavation or alteration of the existing grade is proposed requires Town approval and issuance of a Site Alteration Permit per Site Alteration By-law 2003-021. This permit secures for damage to a Town ROW, tree protection, adjacent lands and to control sedimentation and erosion of the site.
- **Conservation Authority Permits:** See the conservation authority for permit requirements per the alteration of water courses and stormwater management.
- **Encroachment Agreements:** Any occupation of Town land in conjunction with the building activity for a site requires an agreement with the Town; this includes site hoarding, construction access, and equipment/material storage.
- **Plumbing Permits:** Site servicing/plumbing shall be reviewed and inspected by the Town's Building Services Department (inspection fees apply).

7.5 Site Development Agreements

The applicant may be required to enter into a form of development agreement with the Town, to allow for construction works external to the Plan of Subdivision. Such works may include roadway widening, sewer reconstruction, watercourse improvements, SWM works, etc. It is highly recommended that the applicant contact the Development Engineering Section prior to formal application to discuss these requirements.

7.6 Site Inspection and Approval

Once an applicant has completed all of the works that were conditions of site plan approval, an applicant may request a reduction of the posted securities. The applicant shall submit a written request to the Planning Services Department, giving the property address and the site plan number.

Upon receipt of the request and the required fees, Planning Services Department staff will circulate a request to the Transportation and Engineering Department for confirmation that all engineering and construction requirements have been satisfied.

It is highly recommended that the applicant ensure that the requirements for the respective development are fulfilled prior to application for inspection. If deficiencies are found, a deficiency form is submitted to the site planner. Depending on the extent of deficiencies, a specified security holdback will be requested of the applicant's security.

7.7 Multi-family and Condominium Servicing

This section pertains to the engineering development design criteria for private condominium and multi-family type developments.

Generally, the form of application is through the Town's site plan control process. The Town's development coordinator shall be contacted for the requirements of a condominium agreement and the registration process.

7.7.1 General Servicing Requirements

Engineering drawings shall be prepared to show location (horizontal and vertical) of all underground services including sanitary, storm, watermains, hydro, Bell communication, gas, etc., together with cross section drawings of all roadways, sidewalks, and boulevards, certified and each drawing is to be stamped, signed and dated by a registered professional engineer of the Province of Ontario. Three copies must be submitted to the Development Services Section within 60 days of completion of the project stamped "as-constructed." The "as-constructed" drawings shall show all of the underground services on one drawing. Drawings shall be submitted to a scale of 1:500 horizontal and 1:50 vertical.

Multi-family developments shall be signed so as to easily identify the location of all blocks. The director of planning services shall approve such signs.

Proper garbage collection areas must be provided at the municipal frontage to the development so that the municipal refuse collectors can collect refuse efficiently and safely (site access/egress in forward motion). Such arrangements shall be in accordance with standards as set down by the Roads and Works Operations Department of the Town.

7.7.2 Private Residential Roadways

Roadways shall not be considered to form any part of the required parking. Parking lots shall be structurally designed to the residential road standards. Designated fire access routes shall be provided throughout the development to the standards of the Fire Department and in accordance with good engineering practice.

Emergency access routes may be required. The consulting engineer must contact the Fire Department for actual requirements and approval (structural design to accommodate 18-ton vehicles).

Internal private roadways shall be designed in accordance with the current design criteria for a minor residential street (including curbs, curb and gutters and sidewalks) with the following modifications:

- Minimum width of roadway shall be 7.5 m between curb faces.
- Minimum centre line turning radius shall be 12.5 m (fire truck) for any development which has no buildings over three storeys. For high-rise developments (four storeys or greater), the minimum centre line turning radius shall be 14 m (aerial ladder trucks). In instances where future land use changes are possible, the turning radius shall be 14 m. The Town does not support hammerhead roads.
- Minimum overhead clearance shall be 4.5 m.
- The minimum road pavement design shall be as follows:
 - ✦ 300 mm Granular "B"
 - ✦ 150 mm Granular "A"
 - ✦ 50 mm H.L.8 asphalt
 - ✦ 40 mm H.L.3 asphalt
- An internal 1.5 m wide sidewalk on one side only of all internal roadways.

7.7.3 Utility Services

The developer/builder is responsible for ensuring that all utility services are designed and constructed in accordance with the relevant agencies.

A certified statement signed and stamped by a registered professional engineer of the Province of Ontario stating that all services have been designed and constructed in accordance with Town requirements is required prior to registration of the development.

Storm sewer design and construction must adhere to the requirements outlined in the storm drainage policies and criteria manual and the plumbing code.

Contact Halton Region for wastewater and municipal water service capacity and connections to mains and trunk sewers.

7.7.4 Lot Grading and Amenity Area

Multi-family lots shall generally adhere to the requirements of Sections 3.9.2 to 3.9.33 (Lot Grading and Drainage Criteria). These typically smaller lots require additional attention due to many constraints.

NOTE: While smaller than single lots, amenity areas are still required and their size shall be determined via the site plan process. Minimum 2% and maximum 5% slopes apply to the amenity areas.

Free hold amenity areas shall conform to general lot grading policy; no cross-lot drainage except at rear swales and all side yards to have directional swales to acceptable receiving systems.

7.8 Tree Protection and Preservation Policy/Permit

The Town has placed the protection and preservation of the “urban forest” as a priority and ensures that land developers, businesses, and individuals maintain and preserve native tree species’ through the development process.

A tree protection and preservation policy and procedures manual has been created to assist in outlining the Town’s objectives for preserving and enhancing the urban forest as per the direction of the Town’s Official Plan. This manual can be obtained from the urban forestry coordinator, Development Services Section.

The Town forester has full control of all Town trees that are owned and maintained by the Town as they reside on Town land. These trees are protected from land development activities via a tree protection agreement which regulates the construction activity adjacent to these trees by implementing the appropriate protection measures as approved by the Town. The tree protection agreement is issued in conjunction with the site alteration permit which regulates and controls all development/building/servicing projects.

For further details on the protection of municipal trees, refer to the Tree Protection By-law 2009-025 and the Site Alteration By-law 2003-021 (see Section 2.2.1 [Site Alteration By-Law No. 2003-021]).

The Town has enacted a Private Tree Protection By-law 2017-038 (amended by 2018-034, 2018-043, 2019-030, 2021-038, 2022-031), a by-law to regulate or prohibit the injury or destruction of trees on private property within the Town.

The implementation of the by-law when related to a development application is processed through the Development Services, Permits and Construction Section. All other non-development related tree issues are enforced by the Forestry Section of the Parks and Open Space Department.

It is recommended that applicants refer to the noted procedures manual for the methodology of inventorying and assessing the existing tree resources and the design elements required to develop an appropriate site development plan. The by-law can be referenced through the Town website under the Forestry Section.

8 REFERENCES

- Simonovic, S.P., A. Schardong, R. Srivastav, and D. Sandink. 2015. *IDF_CC Web-based Tool for Updating Intensity-Duration-Frequency Curves to Changing Climate – version 6.0*. Western University Facility for Intelligent Decision Support and Institute for Catastrophic Loss Reduction, open access: <https://www.idf-cc-uwo.ca>.
- Ontario Ministry of the Environment (MOE). 2003. *Stormwater Management Planning and Design Manual*. Queen's Printer. Ottawa, Ontario. March 2003. 2003. <http://www.ontario.ca/document/stormwater-management-planning-and-design-manual>



APPENDIX A

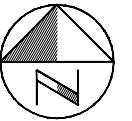
Remnant Channels





Appendix K

**Remnant Channel
Alternative Assessment**



Plotted: 2019-09-05
Last Saved: 2019-09-05
Plotted By: richard.bartolo
Last Saved By: richard.bartolo
Path: P:\Work\TP115045\Water\Draw\2019-09 (SWM)\FigRC-PropImpacts.dwg

- LEGEND**
- PROPERTY LINE
 - CONTOUR (0.5m)
 - REMNANT CHANNEL
 - UNDERGROUND CONVEYANCE
 - FURTHER ASSESSMENT REQUIRED

OAKVILLE STORM SEWER
MASTER PLAN
PHASE II
TOWN OF OAKVILLE

100 YEAR STORM EVENT
REMNANT CHANNEL
PROPERTIES FOR FURTHER ASSESSMENT
(EXISTING CONDITIONS)

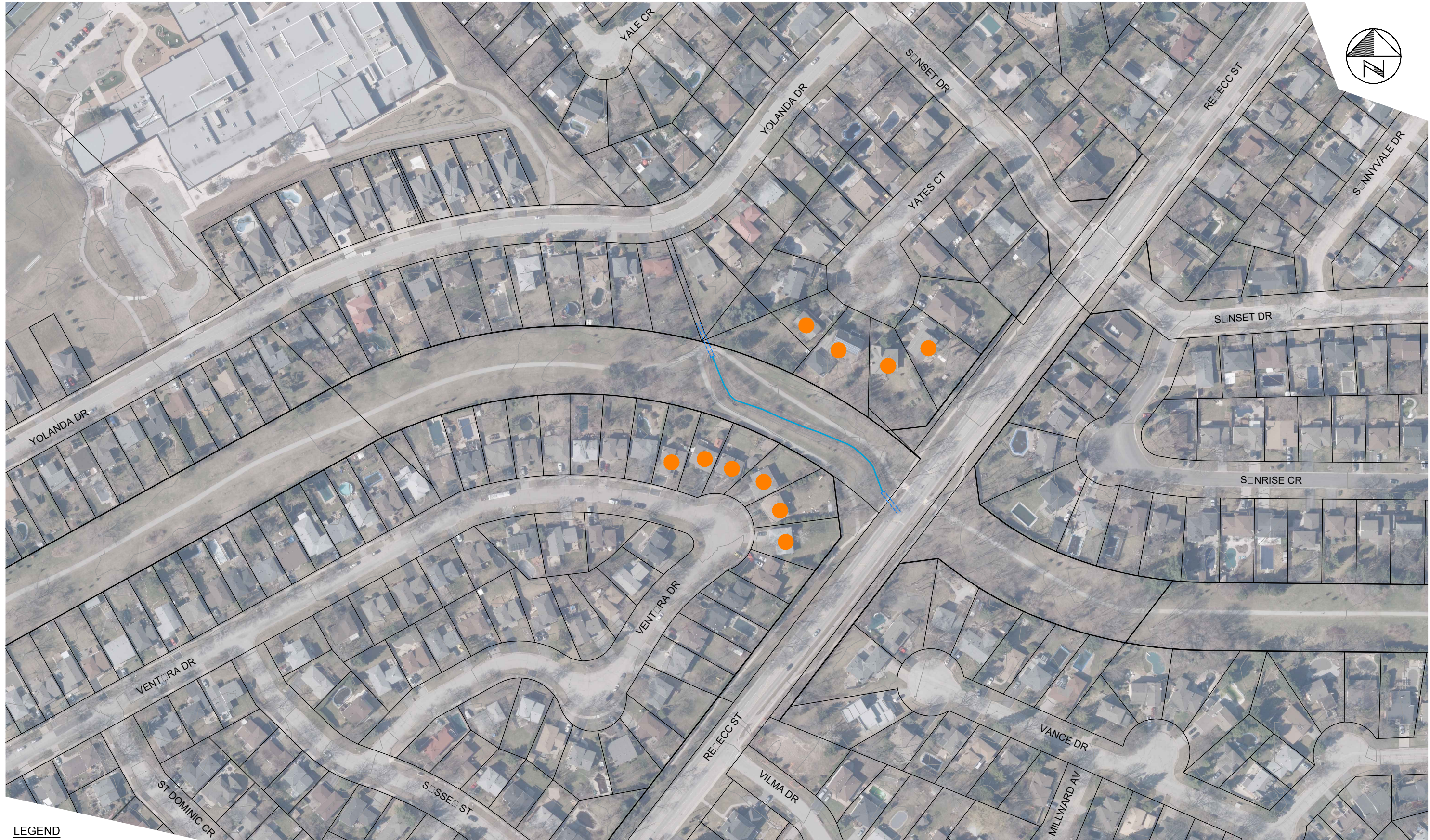
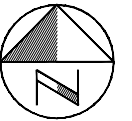


SCALE VALID ONLY FOR
24"x36" VERSION

Scale 1:750
0 7.5 15 30

Consultant File No.
TP115045

Figure No.
RC-1



Plotted: 2019-09-05
Last Saved: 2019-09-05
Plotted By: richard.bartolo
Last Saved By: richard.bartolo
Path: P:\Work\TP115045\Water\DWG\2019-09 (SWM)\FigRC-PropImpacts.dwg

- LEGEND**
- PROPERTY LINE
 - CONTOUR (0.5m)
 - REMNANT CHANNEL
 - UNDERGROUND CONVEYANCE
 - FURTHER ASSESSMENT REQUIRED

OAKVILLE STORM SEWER
MASTER PLAN
PHASE II
TOWN OF OAKVILLE

100 YEAR STORM EVENT
REMNANT CHANNEL
PROPERTIES FOR FURTHER ASSESSMENT
(EXISTING CONDITIONS)

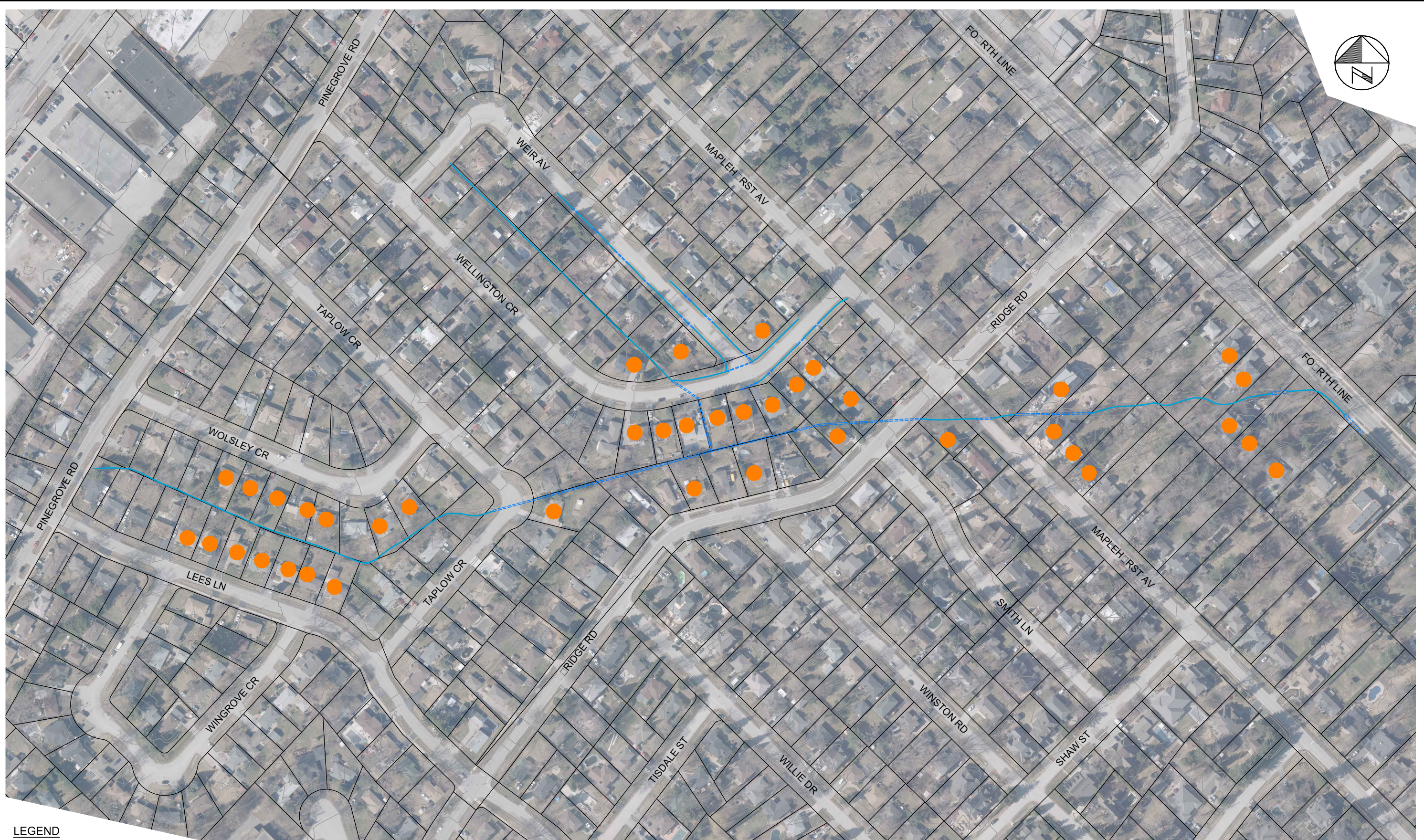
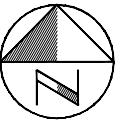


SCALE VALID ONLY FOR
24"x36" VERSION

Scale 1:1000
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Consultant File No.
TP115045

Figure No.
RC-2



Plotted By: richard.bartolo
Last Saved By: richard.bartolo
2019-09-05
2019-09-05
Path: P:\Work\TP115045\Water\Draw\2019-09 (SWM)\FigRC-PropImpacts.dwg

- LEGEND**
- PROPERTY LINE
 - CONTOUR (0.5m)
 - REMNANT CHANNEL
 - UNDERGROUND CONVEYANCE
 - FURTHER ASSESSMENT REQUIRED

OAKVILLE STORM SEWER
MASTER PLAN
PHASE II
TOWN OF OAKVILLE

100 YEAR STORM EVENT
REMNANT CHANNEL
PROPERTIES FOR FURTHER ASSESSMENT
(EXISTING CONDITIONS)

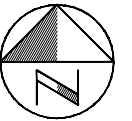


SCALE VALID ONLY FOR
24"x36" VERSION

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Consultant File No.
TP115045

Figure No.
RC-3



Plotted: 2019-09-05
Last Saved: 2019-09-05
Plotted By: richard.bartolo
Last Saved By: richard.bartolo
Path: P:\Work\TP115045\Water\Draw\2019-09 (SWM)\FigRC-PropImpacts.dwg

- LEGEND**
- PROPERTY LINE
 - CONTOUR (0.5m)
 - REMNANT CHANNEL
 - UNDERGROUND CONVEYANCE
 - FURTHER ASSESSMENT REQUIRED

OAKVILLE STORM SEWER
MASTER PLAN
PHASE II
TOWN OF OAKVILLE

100 YEAR STORM EVENT
REMNANT CHANNEL
PROPERTIES FOR FURTHER ASSESSMENT
(EXISTING CONDITIONS)

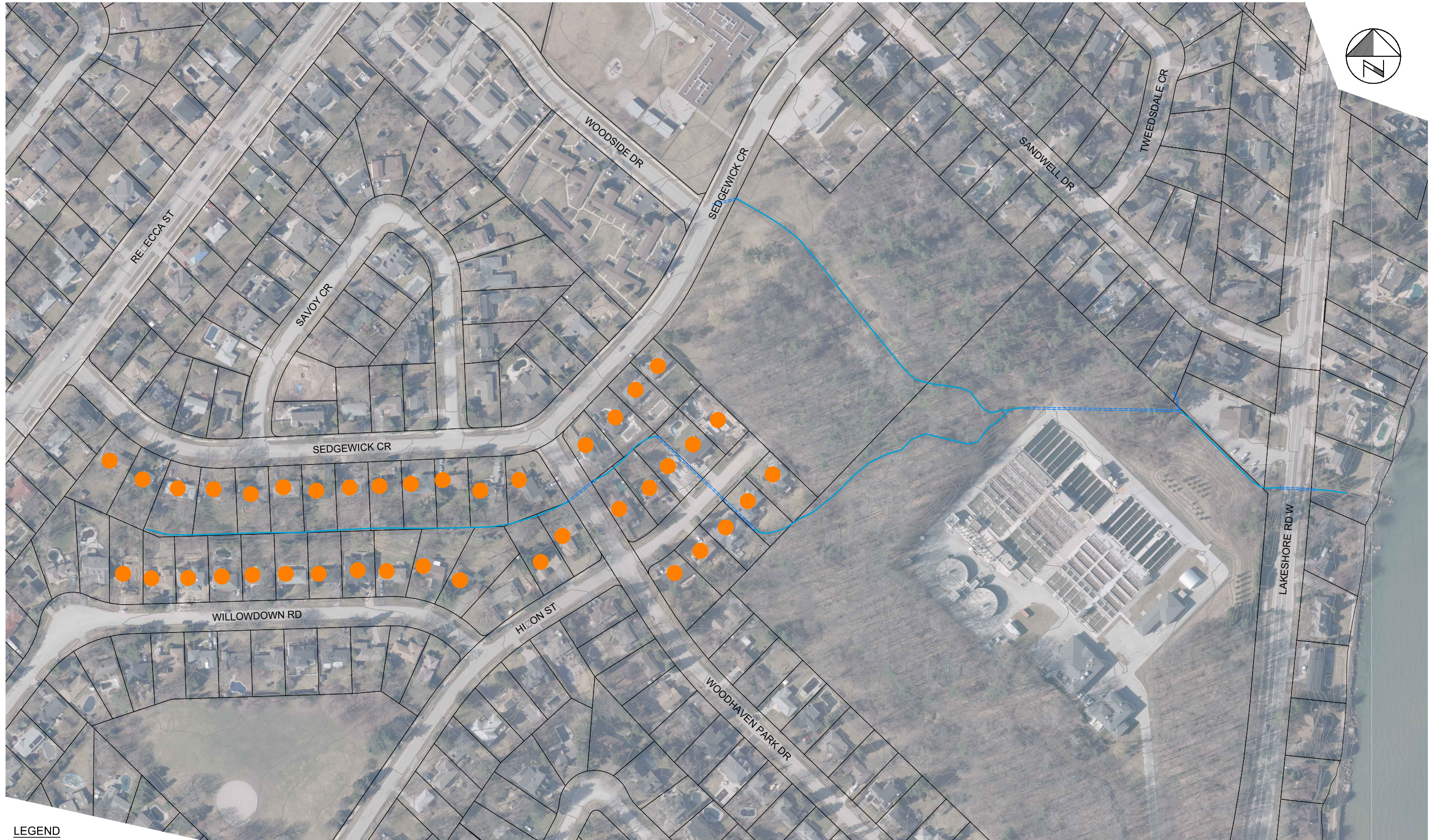
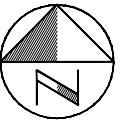


SCALE VALID ONLY FOR
24"x36" VERSION

Scale 1:1250
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Consultant File No.
TP115045

Figure No.
RC-4



Plotted: 2019-09-05
Last Saved: 2019-09-05
Plotted By: richard.bartolo
Last Saved By: richard.bartolo
Path: P:\Work\TP115045\Water\DWG\2019-09 (SWM)\FigRC-PropImpacts.dwg

- LEGEND**
- PROPERTY LINE
 - CONTOUR (0.5m)
 - REMNANT CHANNEL
 - UNDERGROUND CONVEYANCE
 - FURTHER ASSESSMENT REQUIRED

OAKVILLE STORM SEWER
MASTER PLAN
PHASE II
TOWN OF OAKVILLE

100 YEAR STORM EVENT
REMNANT CHANNEL
PROPERTIES FOR FURTHER ASSESSMENT
(EXISTING CONDITIONS)



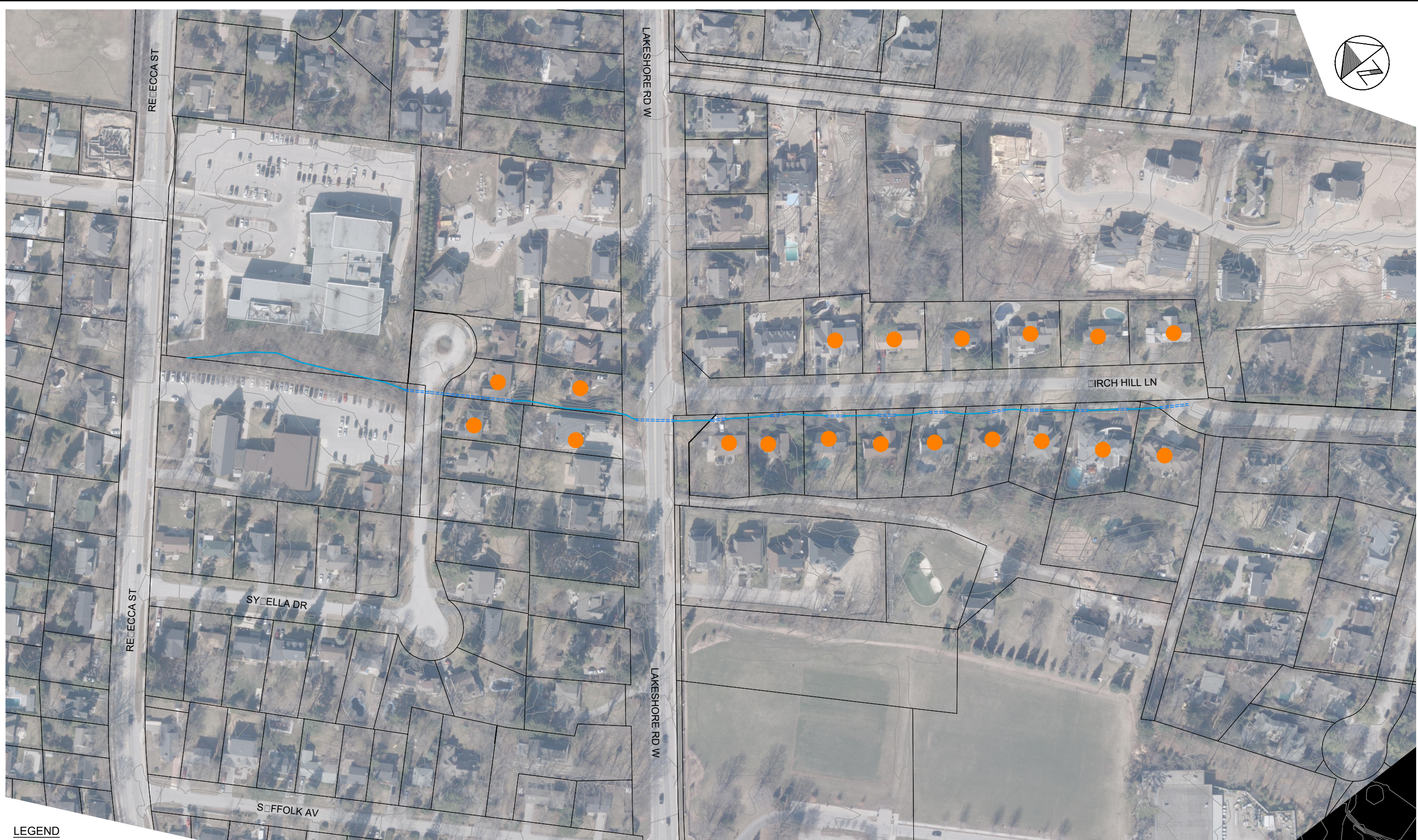
SCALE VALID ONLY FOR
24"x36" VERSION

Scale 1:1250
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Consultant File No.
TP115045

Figure No.
RC-5

Plotted: 2019-09-05
 Last Saved: 2019-09-05
 Plotted By: richard.bartolo
 Last Saved By: richard.bartolo
 Path: P:\Work\TP115045\Water\DWG\2019-09 (SWM)\FigRC-PropImpacts.dwg



- LEGEND**
- PROPERTY LINE
 - CONTOUR (0.5m)
 - REMNANT CHANNEL
 - UNDERGROUND CONVEYANCE
 - FURTHER ASSESSMENT REQUIRED

OAKVILLE STORM SEWER
 MASTER PLAN
 PHASE II
 TOWN OF OAKVILLE

100 YEAR STORM EVENT
 REMNANT CHANNEL
 PROPERTIES FOR FURTHER ASSESSMENT
 (EXISTING CONDITIONS)



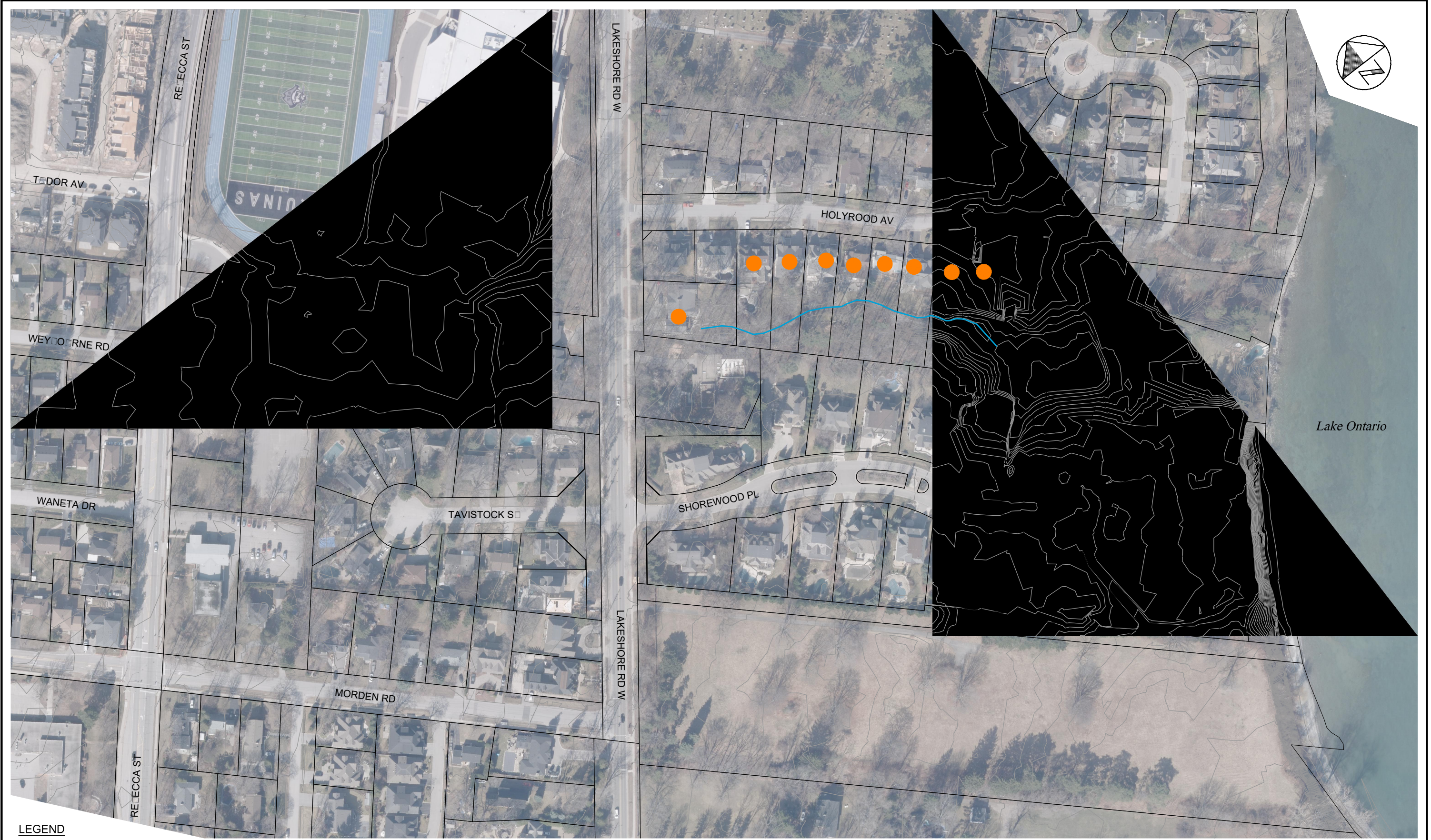
SCALE VALID ONLY FOR
24"x36" VERSION

Scale 1:1000






Consultant File No.
TP115045

Figure No.
RC-6

Plotted: 2019-09-05
 Last Saved: 2019-09-05
 Plotted By: richard.bartolo
 Last Saved By: richard.bartolo
 Path: P:\Work\TP115045\Water\DWG\2019-09 (SWM)\FigRC-PropImpacts.dwg

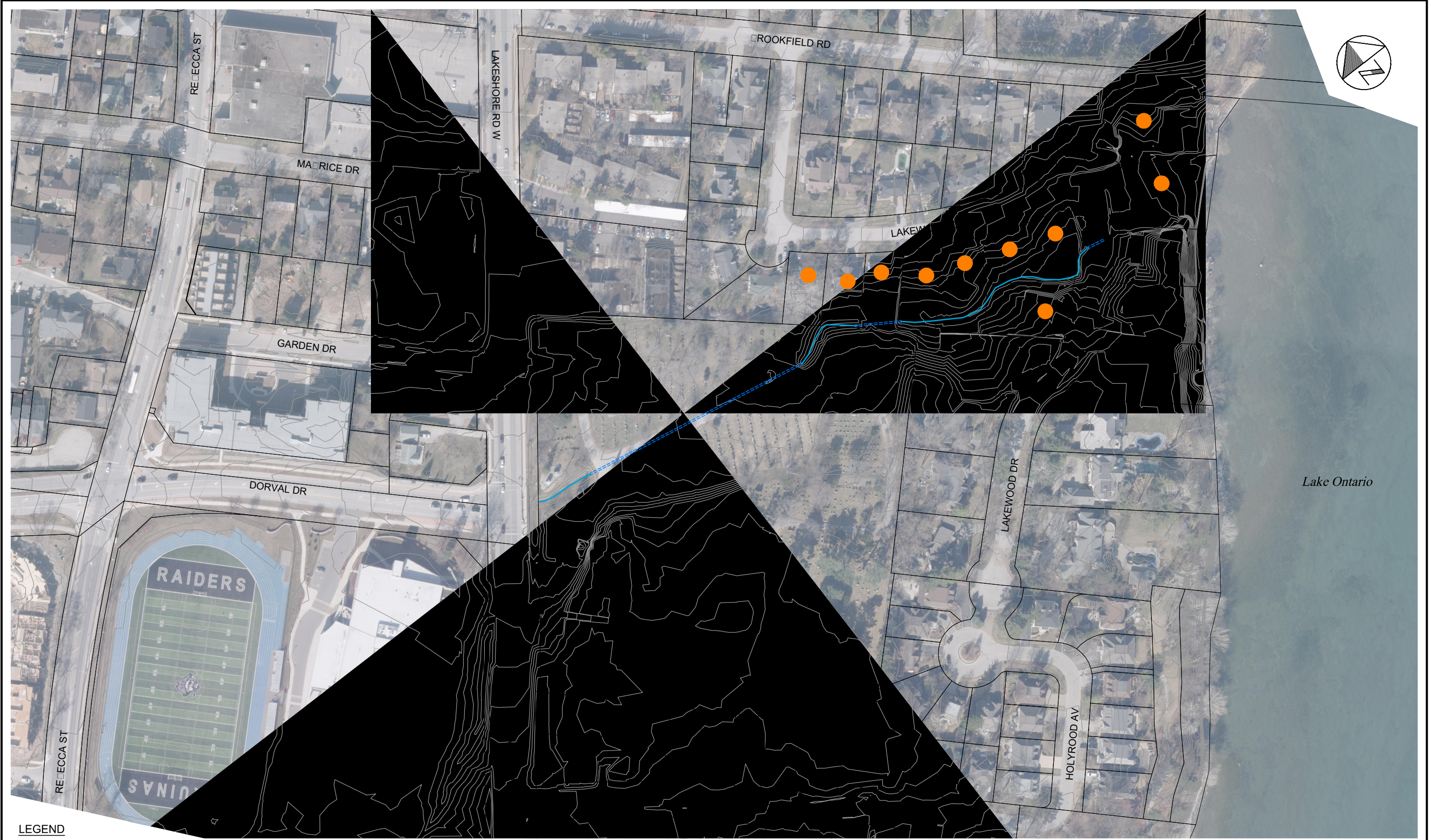


LEGEND

	PROPERTY LINE
	CONTOUR (0.5m)
	REMNANT CHANNEL
	UNDERGROUND CONVEYANCE
	FURTHER ASSESSMENT REQUIRED

OAKVILLE STORM SEWER MASTER PLAN PHASE II TOWN OF OAKVILLE	100 YEAR STORM EVENT REMNANT CHANNEL PROPERTIES FOR FURTHER ASSESSMENT (EXISTING CONDITIONS)		<small>SCALE VALID ONLY FOR 24"x36" VERSION</small>
			<small>Scale 1:1000</small> 
			<small>Consultant File No. TP115045 Figure No. RC-7</small>

Plotted By: richard.bartolo
 Last Saved By: richard.bartolo
 Path: P:\Work\TP115045\Water\Draw\2019-09 (SWM)\FigRC-PropImpacts.dwg
 2019-09-05
 Last Saved: 2019-09-05



LEGEND

	PROPERTY LINE
	CONTOUR (0.5m)
	REMNANT CHANNEL
	UNDERGROUND CONVEYANCE
	FURTHER ASSESSMENT REQUIRED

OAKVILLE STORM SEWER
 MASTER PLAN
 PHASE II
 TOWN OF OAKVILLE

100 YEAR STORM EVENT
 REMNANT CHANNEL
 PROPERTIES FOR FURTHER ASSESSMENT
 (EXISTING CONDITIONS)

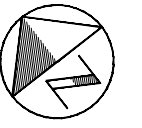


SCALE VALID ONLY FOR
 24"x36" VERSION

Scale 1:1000
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Consultant File No.
 TP115045

Figure No.
 RC-8








Plotted: 2019-09-05
Last Saved: 2019-09-05
Path: P:\Work\TP115045\Water\DWG\2019-09 (SWM)\FigRC-PropImpacts.dwg

Plotted By: richard.bartolo
Last Saved By: richard.bartolo



LEGEND

	PROPERTY LINE
	CONTOUR (0.5m)
	REMNANT CHANNEL
	UNDERGROUND CONVEYANCE
	FURTHER ASSESSMENT REQUIRED

OAKVILLE STORM SEWER
MASTER PLAN
PHASE II
TOWN OF OAKVILLE

100 YEAR STORM EVENT
REMNANT CHANNEL
PROPERTIES FOR FURTHER ASSESSMENT
(EXISTING CONDITIONS)



SCALE VALID ONLY FOR
24"x36" VERSION

Scale	1:750
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Consultant File No.	TP115045
Figure No.	RC-9