The Municipal Corporation of the Town of Fort Erie

BY-LAW NO. 110-05

BEING A BY-LAW TO ADOPT A STORMWATER MANAGEMENT FACILITY POLICY AND STANDARDS
(210102-14)

WHEREAS Section 11(2).1 of the *Municipal Act, 2001* provides interalia for spheres of jurisdiction for lower and upper-tier municipalities may pass by-laws respecting matters within the sphere of jurisdiction for drainage and flood control, except storm sewers, and

WHEREAS Item 6 of the Table under Section 11 of the said Act provides the sphere of jurisdiction for drainage and flood control, except storm sewers is a non-exclusive assignment enabling both the upper-tier municipality and the lower-tier municipality to pass by-laws, and

WHEREAS Section 96 of the said Act provides that despite Section 19, a municipality may for the purpose of preventing damage to property in the municipality as a result of flooding, exercise its powers under the "drainage and flood control" sphere of jurisdiction in relation to flood control in the municipality, in another municipality or in unorganized territory, and

WHEREAS Section 97 of the said Act provides that a municipality may enter on land, at reasonable times, to inspect the discharge of any matter into a land drainage system of any person and may conduct tests and remove samples for this purpose, and

WHEREAS Section 435(1) of the said Act provides that a by-law of a municipality under any Act may (a) adopt by reference in whole or in part with such changes as the Council considers appropriate any code, standard, procedure or regulation; and (b) require compliance with any code, standard, procedure or regulation so adopted.", and

WHEREAS Section 435(2) of the said Act provides that a copy of a code, standard, procedure or regulation adopted under this section shall be available for public inspection, and

WHEREAS By-law No. 115-04 was passed by the Municipal Council of the Town of Fort Erie on the 21st day of June 2004 to establish the Subdivision Control Guidelines which in part established the technical design requirements for Storm Water Management facilities for the Town of Fort Erie, and

WHEREAS Report No. IS-22-05 was approved at the Council-in-Committee meeting of June 13, 2005 approving the proposed Stormwater Management Facility Design, Operation, and Maintenance Policy and Standards, and

WHEREAS it is deemed desirable to adopt a Stormwater Management Facility Design, Operation, and Maintenance Policy and Standards for the Town of Fort Erie in the form of Schedule "A" annexed hereto to this by-law;

NOW THEREFORE the Municipal Council of The Corporation of the Town of Fort Erie hereby enacts as follows:

1. **THAT** the Stormwater Management Facility Design, Operation, and Maintenance Policy and Standards in the form of Schedule "A" annexed hereto to this by-law be and it is hereby authorized, approved and adopted.

2. **THAT** pursuant to the provisions of Section 227 of the *Municipal Act, 2001*, the Clerk of the Town of Fort Erie is hereby authorized to effect any minor modifications or corrections of an administrative, numerical, grammatical, semantical or descriptive nature or kind to the by-law and schedule as may be deemed necessary after the passage of this by-law.

READ A FIRST, SECOND AND THIRD TIME AND FINALLY PASSED THIS 20th DAY OF JUNE, 2005.

MAYOR

CLERK

I, the Clerk, Carolyn J. Kett, of The Corporation of the Town of Fort Erie hereby certify the foregoing to be a true certified copy of By-law No. 110-05 of the said Town. Given under my hand and the seal of the said Corporation this day of , 200 .

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Schedule 'A' to By-law No. 110-05

THE CORPORATION OF THE TOWN OF FORT ERIE
STORMWATER MANAGEMENT FACILITY
DESIGN, OPERATION, AND MAINTENANCE POLICY AND STANDARDS

Section 1. POLICY STATEMENT

The Town of Fort Erie encourages well designed and attractive residential, commercial, institutional and industrial developments. This document together with the Town's Official Plan, Comprehensive Zoning By-law 129-90 and various By-laws, provides guidelines and outlines the requirements and design standards for developments in the Town of Fort Erie. This policy is to be used in conjunction with the Subdivision Design Guidelines, as adopted under By-law 115-04.

The purpose of stormwater management facilities is to mitigate flooding and erosion from increased storm runoff and the degradation of water quality that can occur with development. This policy sets out the general design, operation and maintenance requirements, standards and guidelines for such stormwater management facilities.

The recommended design guidelines and standards are based on considerable technical background design approaches and experience in the operation and maintenance of municipal infrastructures. Generally, any variance to the Town's minimum standards would require Council approval. It is recommended that early consultation with Town staff be arranged prior to considering any variance to a non-standard approach.

Section 2. DESIGN FLOWS AND CONVEYANCE SYSTEM DESIGN

2.1 STORM SEWER – DESIGN FLOW

2.1.1 Storm Drainage System

The proposed storm drainage system within or external to the development will be designed with two components, the minor system and the major system.

The minor system is generally referred to as the storm sewer system with all appurtenances thereto including minor ditches and swales. The design of the minor system shall be the runoff from the 5 year storm event (unless otherwise approved in writing by the Director of Infrastructure Services) with minimal inconvenience to activities of property owners and damage to properties.

The major system is the route followed by runoff in excess of the minor system and is designed to prevent flooding or excessive ponding, undue hazards to property owners and property damage. This system may be piped or designed overland using the roadways, swales, ditches or channels, etc. as conveyance system. The major system is designed to convey the 100 year flow (with consideration to the impact of the regional storm in the proposed system).

2.1.2 Peak Runoff – Rational Method

Minor stormwater flows shall be estimated using the following Rational Formula:

$Q = 2.778\ CiA$

Where: Q = peak runoff from drainage area, liters/second (l/sec)
C = Runoff coefficient
A = Drainage area, hectares (ha)
i = Average Rainfall Intensity, see Town of Fort Erie Design Rainfall IDF Curves, Appendix "A" or using the IDF Formula, $i = \frac{A}{(B + T_c)^C}$ (see Table 2)
Tc = Time of concentration, minutes (min)

TABLE 2 – RAINFALL INTENSITY DATA

Return Frequency	A	B	C
2 Year	628.05	6.652	0.796
5 Year	747.93	6.800	0.768
100 Year	1083.55	6.618	0.735

TABLE 3 – RUNOFF COEFFICIENTS

Land Use	Coefficient, C
Flat Woodland	0.10
Rolling Woodland	0.20
Parkland	0.25
Flat Cultivated	0.30
Land Use	**Coefficient, C**
Single Family	0.40
Semi-Detached	0.50
Town & Row Housing	0.60
Apartments	0.70
Industrial & Institutional	0.75
Suburban Commercial	0.80
Downtown Commercial	0.95

The 100 year return frequency shall be used for the design of major drainage channels and culverts. The above noted guidelines for urban runoff coefficients in Table 3 may be used for storms having a return frequency of up to 100 years. Calculation of composite runoff coefficient is recommended, refer to Chart E4-2, MTO Drainage Manual, Volume 2 for guidelines.

The Time of Concentration (T_c) in minutes is required to determine the rainfall intensity which is the sum of the inlet time (time taken for stormwater to reach the inlet) and the time of flow in the sewer. Inlet times should be calculated and for larger tributary areas, the Airport Method is commonly used. However, calculations may not be necessary by using a maximum inlet time of 10 minutes for residential subdivisions.

Flow estimates shall be based on post-development condition for the entire drainage area, ensuring that all tributary lands can be drained. Consideration must also be given to the existing outlet capacity to accept the design flow. This applies particularly to the design storm frequency of the receiving storm sewer system or drainage outlet. Should the design flow exceeds the design capacity of the receiving system, stormwater management (zero increase in runoff) will be required.

For the design of the minor sewer system, the Rational Method shall be used to determine the storm runoff. Calculations shall be made on Town of Fort Erie Storm Sewer Design Sheet, attached as Appendix "I", or a comparable form and shall be accompanied by a plan showing the area to be serviced including all associated tributary areas (Storm Sewer Drainage Area Plan). If any other method of calculation is used, the criteria used and all calculations must be provided in the design file or report or supplied electronically as may be required.

Any major drainage watercourse proposed for enclosure (culvert) shall be designed to ensure that an acceptable method of overland flow for the 100 year storm is provided.

2.2 STORM SEWER – PIPE SIZE DESIGN

Storm sewer pipe selection shall be sized using the Manning Formula for open channel flow formula:

$$Q = A\,V$$

$$V = \frac{R^{2/3}\,S^{1/2}}{n}$$

Where: Q = Flow, m^3/sec (cms)
V = Pipe velocity, m/sec
A = Cross-sectional area of flow, m^2
R = Hydraulic radius = $\frac{A \text{ (Cross-sectional area, } m^2)}{P \text{ (Wetted perimeter, m)}}$
S = Pipe slope, m/m
n = Roughness coefficient

- Smooth-walled PVC or concrete pipes 0.013
- Corrugated steel pipe 0.024

2.2.1 Minimum and Maximum Velocities

The following velocities are required for storm sewers:

- Minimum velocity 0.80 meters/sec (m/sec)
- Maximum velocity 6.00 meters/sec (m/sec)

2.2.2 Minimum Pipe Sizes, Material Types and Sewer Bedding

The minimum pipe size for storm sewers shall be 300mm diameter with a minimum of 1.50m cover below final grade. Minimum pipe size for a single catch basin lead shall be 200mm diameter and 250mm diameter for double catch basin lead.

Storm sewers and catch basin leads up to 375mm diameter shall be Concrete pipe, Class 3 to CSA A257.1, Polyvinyl Chloride (PVC) pipes, DR 35 to ASTM Specification D 3034 and CSA Standards B 182.1-M and 182.2-M or PVC Concentric Ribs pipe to CSA B182.4. The strength of pipe shall be sufficient to withstand earth pressure and other loads. Bedding shall be as per OPSD 802.010 for flexible pipes and OPSD 802.030 for rigid pipes.

2.3 OPEN CHANNEL DESIGN

The design of open channels (including ditches and swales) shall be based on the Manning Formula as shown in Section 3.10, Storm and Sanitary Sewer – Pipe Size Design. Table 4 below showing the guideline for roughness coefficient, n, shall be used in calculating channel velocities and flows:

TABLE 4 – ROUGHNESS COEFFICIENT, n

Channel Lining Material	Coefficient
Asphalt or Monolithic Concrete	0.013
Corrugated Material, Metal or Plastic	0.024
Random Rubble or Rip-rap	0.030
Grass	0.040

- Maximum allowable velocity for grass-lined channel 1.80 m/sec
- Freeboard to be provided - 20% of design depth 0.30m minimum.

2.4 FOUNDATION DRAINS AND ROOF LEADERS

Foundation drains (weeping tiles) shall be connected directly to a sump and drained via a sump pump to a Foundation Drain Collector (FDC) or the storm sewer within the urban area. In the absence of a storm sewer or FDC, sump pump shall discharge on ground via splash pads to a defined drainage system.

Direct connections of roof drains to the Municipal storm sewer are prohibited. Residential roof leaders or downspouts shall discharge on ground via splash pads at least 1.2m away from the building foundation walls. Flows shall be directed away from the building towards side or rear yard swale without any erosion or inconvenience to adjacent property.

Within Industrial, Commercial or Institutional development sites, roof drains may be connected to a properly designed private storm drainage system and directed to a stormwater management facility. Roof drainage is subject to stormwater management.

Section 3. STORMWATER MANAGEMENT

A Stormwater Management (SWM) Report will be required identifying the conveyance of stormwater runoff from the site by major and minor systems, detailing any impacts of the proposed development upstream and downstream of the site. The report shall identify the extent of the development's stormwater impacts (flooding, erosion, water quality etc.) and how such impacts or constraints will be mitigated.

On-site stormwater management may be applied to address stormwater impacts within and external to the development. SWM includes the control of post-development flows to pre-development levels with emphasis to any erosion impacts downstream from controlled rate of flow. SWM facility may also be required to address stormwater quality in accordance with the criteria set out by the Director of Infrastructure Services or the MOE Stormwater Management Planning and Design Manual, March 2003 or the latest revision thereof.

Typically, as a minimum, post-development storm runoff flow rates must be controlled to pre-development flow rates and the difference stored on site for the minor storm event (5 year return) and up to and including the major storm event (100 year return). Erosion control and/or water quality requirements may require extended storage.

Section 4. STORMWATER MANAGEMENT FACILITY DESIGN

4.1 SWM PLAN

A stormwater management (SWM) plan within or external to the development shall be prepared as per the approved SWM report filed with the Town and other approving agencies. The selection of SWM practices shall be in accordance with the latest revision of the MOE's Stormwater Management Planning and Design Manual.

The plan shall indicate, but not be limited to, the following:

- Stormwater lot level controls
- Stormwater conveyance controls
- End of pipe SWM facilities
- Pond cross sections
- Detail grading
- Storage capacity and rate of discharge (quantity facility)
- Flow control details
- Landscaping including planting details, etc.

4.2 SWM FACILITY LANDSCAPE AND PLANTING

A proposed SWM pond is to be designed with regard to being functional (Quality and Quantity Control) and as a neighbourhood feature. A Landscape Drawing of the proposed SWM facility shall be submitted detailing all trees and plantings (including maintenance schedule) for review and approval of the Town's Manager of Parks and Open Space Development.

4.3 SWM FACILITY SLOPES

To facilitate the SWM pond as a neighbourhood feature, the pond shall be designed with a minimum sideslope of 7:1 with a 10:1 sideslope where it abuts a neighbourhood park or a public roadway. This facility will be integrated as a park area in conjunction with the proposed parkland dedication or an existing parkland. A 3.0m wide maintenance and pedestrian walkway will be required around the top of slope along the perimeter of the facility.

As a functional facility, the minimum acceptable sideslope shall be 5:1. This functional facility shall be fenced with a 1.50m high black vinyl coated chain link fence, including a maintenance access and gate for vehicles, when abutting existing or proposed lots.

4.4 SWM FACILITY LOCATION

Stormwater management facilities shall be constructed off line from existing water courses. Stormwater management facilities shall not be located within the floodplain of the 100 year storm event or below the 100 year storm flood elevation.

4.5 SWM FACILITY ACCESS FOR MAINTENANCE VEHICLES

SWM facilities should have a dedicated access route, capable of supporting heavy equipment that will be conducting periodic maintenance activities (mowing, tree trimming, sediment removal). The minimum acceptable standard for an access lane is 4.0m wide, with 375mm granular base.

4.6 SWM FACILITY FENCING

All municipal Stormwater Management facilities and access lanes abutting residential lots shall be fenced with a 1.5m high black vinyl-coated chain link fence, located on Town-owned block or easement, to the satisfaction of the Town. Lots with reverse perimeter frontages shall be fenced with a 1.5m high pressure treated board on board fence complete with a 0.30m high lattice top. Should a fence is required for noise attenuation purposes; the fence may be altered to meet the noise mitigation requirements of the subdivision.

Pedestrian gates may be permitted for lots abutting a municipally owned open space or parkland at the discretion of the Town's Director of Infrastructure Services, at the request and sole expense of the Developer.

4.7 SWM FACILITY SIGNAGE

Warning signs, as per Appendix 'B', shall be posted at all SWM facilities. For SWM facilities that will be assumed by the Town, the signs shall be located, supplied and installed by Town forces at the Developer's expense.

During construction of SWM facilities, the Owner shall install and maintain warning signs, as per Appendix 'B'.

4.8 STREETSCAPE AND LANDSCAPE REQUIREMENTS

The Developer shall file with the Town a Tree Preservation Plan prepared by a qualified forester for approval by the Town and the Ministry of Natural Resources. No tree cutting, clearing and grubbing shall be allowed until a Tree Preservation Plan is filed with and approved by the Town and/or the Ministry of Natural Resources. The Developer agrees to implement the approved Tree Preservation Plan to the complete satisfaction of the Director of Infrastructure Services and the Director of Community and Development Services.

Submission of a landscape and planting plan for the SWM facility is required and should be prepared in consultation with the Manager of Parks and Open Space Development.

4.9 SWM FACILITY PLANTINGS

SWM facility plantings shall be appropriate to the proposed SWM facility and will be generally in accordance with the plant list provided in Appendix 'E' of the MOE SWM Planning & Design Manual and will be subject to review and approval of the Director of Infrastructure Services or designate.

4.10 ADJACENT LAND USE

When locating a new SWM facility in a development, the designer will have regard for adjacent land use and provide adequate buffers. Reverse lot frontages, berming and landscaping, fencing or deeper lots may be used to deal with the incompatibility. It is preferred that new SWM facilities not be sited directly adjacent to existing residential lots.

Section 5. APPROVALS

It is the Developer's responsibility to obtain and pay for all approvals required from the Town of Fort Erie (Service Connection Permit to existing sewers, etc.), the Ministry of the Environment (MOE) and other regulatory agencies (submission of drawings and calculations included). Town endorsement of the MOE Certificate of Approval does not constitute approval of drawings or design.

Section 6. DRAWINGS

6.1 STORM DRAINAGE AREA PLAN

Storm Drainage Area Plan shall be drawn to a scale of 1:1000 or larger (a scale not to exceed 1:5000 will be accepted for large external drainage areas) to fit in a single drawing. The plan shall indicate the total area to be drained by the proposed storm sewers. The plan shall be compatible with the Grading Plan and the Town's latest contour mapping (1:2000 OBM). The Storm Drainage Area Plan shall indicate, but not be limited to, the following:

- Existing contours
- Drainage patterns of adjacent lands
- Runoff coefficients and tributary areas (ha) outside the development area and for each section of the proposed storm sewers
- Direction of runoff
- Street names
- Manhole numbers
- Existing and Proposed sewer sizes, material type and slope
- Direction of flow in the sewers
- Any street catch basins, rear yard catch basins, ditch inlets or swales
- Temporary or permanent quantity and quality SWM facilities
- Overland flow route
- Receiving system for the proposed storm sewers & SWM outlet

Open channels, culverts and other drainage appurtenances

6.2 PLAN AND PROFILE DRAWINGS

Plan and Profile drawings for storm shall conform to the following:

- Where intersecting streets are shown on Profile, only the diameter and material of the pipe and direction of flow of the intersecting sewers are to be shown. This also applies to easements or blocks wherein a separate Plan and Profile is required
- On Plan, only the length, sewer type and diameter are to be shown
- On Profile, the length, sewer type, material and class of pipe, pipe diameter, pipe slope, pipe inverts, bedding type and manhole type are to be shown
- Where possibility of conflict with other services exists, connections are to be plotted on Profile

- Show existing and proposed sewer services on plan
- Manhole data shall indicate the following on Profile:
  - Manhole number or description
  - Manhole type or size
  - Chainage
  - Rim or top of manhole elevation
- Pipe inlet and outlet inverts

6.3 GENERAL GRADING PLAN (Subdivision Grade Control Plan, Site Grade Control Plan)

A General Grading Plan for lots and blocks within the subdivision shall be prepared to a scale of 1:500 or larger showing existing contours established from field elevations.

The Plan shall indicate, but not limited to, the following:

- Existing contours
- Proposed building envelope
- Proposed building garage and main floor elevations
- Proposed elevations at the following locations:
  - Along centreline of existing or proposed roads (maximum interval of 30m)
  - At the corners of each building envelope
  - High points at each lot and building envelope and at the corners of each lot and block
  - Any break in grades along property lines and road centreline
  - Rear yard CB tops (grates) and bottom of swales
  - Top and bottom of retaining walls
- Existing contours and elevations within the subdivision and at least 50 meters externally. External contours shall be extended far enough to determine existing drainage pattern.
- Grading Plan for parklands shall indicate existing contours at 0.5m intervals along with existing trees to be retained, structures, watercourses, etc.
- Rear yard and Side Yard swale grades and flow direction
- Overland flow route
- 100 year floodline and elevation (if applicable)
- Easements including dimensions and descriptions
- Fencing
- Retaining walls
- Drainage type in accordance with typical details
- Storm sewers and appurtenances
- Temporary/interim drainage facilities and outlets

6.4 EROSION AND SEDIMENT CONTROL PLAN

The erosion and sediment control plan shall be prepared in accordance with the Ontario Guidelines on Erosion and Sediment Control for Urban Construction Sites, May 1987 or the latest revision thereof. All drainage ditches, swales or depressions within the development including all inlet structures to the storm drainage system, shall be maintained with Town approved silt traps.

The above noted requirements/information can be shown on the General Grading Plan with approval from the Director of Infrastructure Services.

Section 7. SWM FACILITY MAINTENANCE

SWM facility sedimentation rates and maintenance requirements can be influenced by the type of SWM facility, land use, upstream development and wildlife.

7.1 Seasonal Maintenance

Seasonal Maintenance generally includes grass cutting, weed control, care/replacement of plantings and trash removal. These activities should be conducted in accordance with schedules provided in the MOE SWM Planning & Design Manual.

Where a SWM facility is a neighbourhood feature or part of an active park, grass cutting should be done at the same frequency as an active park (every 10 to 14 days, subject to vegetation growth rate and weather conditions).

Where a SWM Facility is considered a passive park, grass cutting may be less frequent (every 4 to 6 weeks, subject to vegetation growth rate and weather conditions).

7.2 Sediment Removal

Most SWM facilities are designed to prevent sediment from entering the downstream water course or drainage system. Over time, sediment will accumulate and must be removed in order to maintain the SWM facility operating performance.

All SWM reports, submitted in support of development applications must contain a maintenance schedule for sediment removal. Sediment accumulation is a function of SWM facility design and upstream environment. SWM facilities should be designed with minimum sediment removal cycle of 10 years, however, 15 to 20 year removal cycle is preferred.