

## 1.0 Stormwater Management

The objective of Stormwater Management is to provide:

- Water quality control
- Flooding control (minimize health hazard, loss of life and property damage)
- Enhance groundwater recharge conditions
- Minimize alteration of the local groundwater system and maintain base flows in receiving water courses
- Reproduce pre-development hydrological conditions
- Solutions that are economically efficient to construct and maintain

A stormwater management report shall accompany each design of urban Stormwater Management Practices (SWMP) are undertaken in an integrated process to ensure that an environmentally responsible planning process is implemented. The recommended strategy for Stormwater Management (SWM) is to provide an approach to water management that is premised on controlling pollution at the source. Hierarchies of preferred SWM practices are:

- Stormwater lot level controls
- Stormwater conveyance controls
- End of pipe Stormwater Management facilities

In recognition of diverse development conditions, consideration by the City of Quinte West will be given to all innovative approaches and/or techniques that can be demonstrated to meet its stormwater management objectives.

Stormwater management options will be discussed with the City and appropriate Conservation Authority prior to undertaking detailed design and analysis.

## 2.0 General

This document will be subject to revisions from time to time. The City of Quinte West reserves the right to make revisions having due regard for applications already in the review process. Individuals or groups affected accordingly will be notified by the City of Quinte West, and revisions will become effective on the date of notification.

**(Contents of this document are subject to change without further notice)**

## 3.0 References

In addition to the standards specified in this manual, stormwater designs shall follow current standards and in conformance with the following standards, specifications or publications:

### Publications

- Ontario Provincial Standard Specifications
- Ministry of the Environment Stormwater Management and Design Manual 2003
- Bay of Quinte Remedial Action Plan Guidelines
- Municipal Engineers Association Design Manual
- City of Quinte West Official Plan

Master Drainage Plan or Stormwater Management Plan for the site, as applicable.

Standards

City of Quinte West Standard Drawings

- Series 800 – Stormwater Management

Permits/Approvals

- Lower Trent Conservation Authority
- Quinte Conservation Authority
- City of Quinte West Planning Department Site Plan Approval
- City of Quinte West Bylaw 08-30 "Site Alteration Bylaw"

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## 5.0 Design Criteria

A stormwater management report shall accompany each design submission and the owner's engineer shall include calculations to support the design of related quality and quantity facility and conveyance requirements. Stormwater management plans are to be in accordance with the Bay of Quinte Remedial Action Plan Stormwater Guidelines and the Ministry of Environment's Storm Water Management Planning and Design Manual, 2003 or its successor.

While it is not the responsibility of development to improve the drainage conditions of neighboring properties, consideration must be given to neighboring properties as to not negatively impact existing drainage and outlet patterns. As part of a submission package, ground elevations of neighboring properties may be requested to confirm design suitability.

### 5.1 Design Storm Frequency

Peak flows released from the development property are not to exceed the "pre-development" peak flows released from the site for all return periods from 2 years to 100 years. The Regional Storm in the Quinte Conservation Authority jurisdictions is the 100-year storm. Developments in the Lower Trent Conservation jurisdiction must also safely pass the Timmins Regional Storm.

### 5.2 Minor / Major Storm Flows

Minor storms shall be conveyed through a piped distribution system while major storm events shall be conveyed overland using the street system and other public lands, as the major flow route.

The depth of flow in the major flow path, both on public and private lands, shall not exceed 300mm.

### 5.3 Rainfall Intensity Formulas

Rainfall intensities can change and should be verified prior to design work.

Design Storm	Yarnell Rainfall Intensity Formula (Metric)
1:2 Year	$I = 1486 / (T_c + 12)$
1:5 Year	$I = 2143 / (T_c + 14.7)$
1:10 Year	$I = 2470 / (T_c + 13.5)$
1:25 Year	$I = 2923 / (T_c + 14.4)$
1:50 Year	$I = 3278 / (T_c + 14.6)$
1:100 Year	$I = 3620 / (T_c + 14.7)$

### 5.4 Coefficient Values

Runoff coefficients shall be based on the following (unless otherwise noted)

- Asphalt, concrete, roof areas 0.90
- Grassed area, parkland 0.25
- Commercial 0.80

• Industrial	0.70
• Residential	
o Single family housing, $\geq$ lot size of 400 m <sup>2</sup>	0.40
o Single family housing, $\leq$ lot size of 400 m <sup>2</sup>	0.50
o Semi-detached housing	0.50
o Townhouses	0.60
o Apartments	0.60
o Institutional	0.55

## 6.0 Design Principles for Conveyance Systems

See *City of Quinte West Engineering Design Guideline - Storm Flow Management*.

## 7.0 Design Principles for Stormwater Facilities

### 7.1 Dry Ponds

Shall be designed to limit the maximum depth of water to 1.8 meters above the lowest point of the stormwater basin.

An additional 0.3m freeboard is required above the maximum peak flow flood level. The maximum depth of the extended detention zone shall not exceed 1.0m above the lowest point of the pond.

### 7.2 Wet Ponds

Stormwater management wet ponds shall be designed to limit the maximum depth of water to 3.3m above the lowest point of the stormwater basin.

An additional 0.3m freeboard is required above the maximum peak flow flood level.

The maximum depth of the extended detention zone shall not exceed 1.0m above the permanent pool elevation.

Maximum peak flow attenuation zone shall not exceed 1.8m above the permanent pool elevation.

The permanent pool depth shall range between a minimum depth of 1.0m to a maximum depth of 1.5m

A maximum 5:1 slope shall extend from the bottom of the pond (below permanent pool) to the limit of maximum extended detention (above the permanent pool), with a minimum horizontal length of 3.0 meters.

The minimum allowable gradient on the bottom of the basin shall be 1.0% and the maximum gradient shall be 5.0%.

### 7.3 Forebays

Forebays are required for all of the above described stormwater management facilities.

Minimize the number of inlets / Forebays to one (1) where possible.

The permanent pool depth shall range between a minimum depth of 1.0 meters to a maximum depth of 1.5 meters in which a maximum depth of 0.5 meters shall be used for sedimentation accumulation.

Forebays shall not exceed 33% of the total Wet Pond surface area and 20% of the Wetland permanent pool surface area. All other aspects regarding the design of Forebays shall conform to the above Wet Pond standards. Excluding maintenance access routes, all access to Forebays shall be discouraged through shrub plantings.

#### 7.4 Micropools

Micropools shall not exceed an additional maximum depth of 0.3 meters below the permanent pool level. Micropools shall not exceed 5% of the total wetland permanent pool surface area.

#### 7.5 Wetlands

Stormwater management wetlands shall be designed to limit the maximum depth of water to 2.1 meters above the lowest point of the stormwater basin excluding micropools. An additional 0.3 meter freeboard is required above the maximum peak flow flood level.

#### 7.6 Landscaping Requirements

Native and non-invasive trees, shrubs, ground covers and aquatic plants are required in a low maintenance landscape design, which has regard to the ecology of the site and the eco-region.

##### Wet Ponds and Wetlands

All slopes 5:1 and steeper ranging from a minimum horizontal distance of 3.0 meters from the permanent pool level to the property line (not including walkways and trails) shall also be planted. Incorporating a wide range of slopes and ponding depths into facility design that conform to the design principles is strongly encouraged and desirable in order to facilitate a wide range of flora and fauna habitat conditions.

From the point of maximum extended detention to the lower limits of the "Safety Separation" area or property line where it abuts private property, slopes shall vary between 2:1 to 6:1 and have a maximum average slope of 4:1, not including the maximum 10:1 maintenance access slope.

##### Tree Plantings

Subject to a review on a case by case basis, where trees are to be planted, they must be planted at a minimum rate of 1 tree (40mm cal.) per 50 square meters. The density of shrub

plantings, for safety purposes, shall vary depending on the degree of slope. Shrub plantings shall prevent public access on all 2:1 slopes and discourage access on all 3:1 slopes.

100% density equals 1 shrub per square meter, 25% density equals 1 shrub per 4 square meters.

#### 7.7 Access

Designed pedestrian access areas shall not exceed a maximum slope of 6:1.

Fencing of stormwater management facilities may be required as determined by the City.

In the case of headwall designs, the depth of water related to the adjoining side slopes may vary and fencing is required for safety purposes.

#### 7.8 Quality Control

Areas subject to the collection of contaminants or spills (i.e. fuel transfer stations) shall be fitted with adequate oil/grit separators or suitable alternatives.

### 8.0 **Criteria for Development**

#### 8.1 Subdivision Development

Stormwater management areas for subdivisions will be on lands conveyed at no cost to the city in addition to any lands required to be dedicated for park purposes under the Planning Act. Construction costs will be borne by the owner while long term maintenance of the stormwater management facility will be borne by the City.

#### 8.2 Site Plan Control

Stormwater management areas, subject to site plan approval, will be on lands retained by the owner. All costs associated with the construction and continuing maintenance of stormwater management facilities shall be borne by the owner.

### 9.0 **Development Conditions for Subdivisions – SUBDIVISIONS ONLY**

In addition to the above Stormwater design criteria, the following principals shall apply to subdivisions only:

#### 9.1 Landscape Plan

That a Landscape Plan of the stormwater management facilities be approved by the City, prior to the registration of the Plan of Subdivision. All landscaping of areas above the 5 year storm level shall be installed at the subdivider's cost, in accordance with the approved plan, during the first planting season after occupancy of the first unit. The remainder of the planting shall commence at such time as required by the City. The subdivider shall maintain the planting for a period of one year from the completion of final planting. Landscape plans are to be prepared by a Professional acceptable to the Municipality.

## 9.2 Community Trail

In the event that a community trail has been identified and/or required by the City in the vicinity or adjacent to a stormwater management pond, they shall be implemented above the maximum extended detention level or 5 year storm level, whichever is greater, in order to prevent frequent flooding.

Trails shall have a minimum width of 3.0 meters.

To enhance user comfort and safety, a 3.0 meter zone on each side of the community trail shall be designed in such a way that sight lines are preserved. If barriers are required, they must not interfere with visibility or create entrapment areas. In situations where a community trail is designed within the maximum peak flow depth zone, the 3.0 meter separation above the trail shall have a maximum slope of 3:1. Below the trail, the 3.0 meter separation shall have a maximum slope of 6:1. This zone shall be planted with low ground covers.

Deciduous trees should be planted at a minimum distance of 1.5 meters from the edge of the trail. Maintenance is required to ensure that tree canopies are raised to a minimum of 2.2 meters and shrubs must be regularly prevented from naturalizing this zone. The planting of coniferous trees within this zone is not permitted.

## 9.3 Maintenance Access Requirements

Maintenance access requirements are to be determined on a site-by-site basis, however, the following general criteria are recommended:

Controlled maintenance access routes shall be provided to both inlet and outlet structures and Forebays. A minimum 3.0 meter wide surface to accommodate maintenance vehicles with a minimum 10.0 meter turning radius (inside radius) and a flat 10.0 meter loading area is required. Maintenance access routes shall not exceed a maximum slope of 10:1. The design of maintenance routes and loading areas shall be to the approval of the City of Quinte West Public Works & Environmental Services Department.

## 9.4 Signage

Prior to the Municipality accepting the stormwater management pond, the developer shall erect one or more information signs at a public access point(s) detailing the purpose of the pond, phone number for further information and any other relevant information, all at the cost of the developer.

## 9.5 Design

In order to prevent surcharging of storm sewers upstream, pond inlet inverts shall not be lower than the maximum extended detention level.

## 9.6 Location

Stormwater management ponds, both for quality and quantity management shall be located on publicly owned lands. Where ponds are located on lands designated for park

purposes the area shall not be included in the owner's parkland contribution as stipulated under the *Planning Act*. Where the stormwater management pond can be integrated in or adjacent to active or passive recreation areas, it shall be suitably designed and landscaped to compliment the overall park concept. The site shall be designed for ease of maintenance and due regard for the safety of the public.

Where a stormwater management facility is located within or adjacent to a public park, the limit of the stormwater facility shall be constructed as being the highest elevation of free board.

## **10.0 Construction Requirements**

All construction shall be in accordance with Ontario Provincial Standard Specifications and Drawings, unless specifically amended by the City of Quinte West.

All maintenance holes located within the roadway shall be set at grade. Frame set adjustments shall only be made at the time of surface course application.

Adequate measures are to be designed and detailed on the plans to minimize the amount of siltation and erosion including that due to construction.