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# PART 1  GENERAL

## 1.1        Purpose

.1    The purpose of this design standard is to set rainwater management practices and design guidelines implemented by Fairwinds for the Lakes District and Schooner Cove to full build out.

.2    This standard defines the implementation of Best Management Practices that were outlined in the 2012 'Fairwinds Lakes District and Schooner Cove ISMP'.

## 1.2        General Requirements

Briefly the ISMP discovered that volumetric and peak reduction was not a strong driver in watershed health for this catchment.  The presence of very thin soils underlaid by rock throughout the site coupled with almost 30% exposed rock along with very short watercourses which run to large waterbodies mean that pre and post runoff are very similar.  The peak controls proposed are contained at the outlets of Enos Lake, Dolphin Lake and the wetland north of Enos Lake.  The two Lake controls are modifications of existing controls.  The wetland control is to be combined with a safety berm to protect against another failure of the existing beaver dam.

The BMP's outlined in this document are focussed on water quality.  Technical specifications for pipework, catchbasins etc are also included such that a complete design specification is presented.

## 1.3        Acknowledgments

.1    Sources for the standards adopted herein are as follows:

a.    Urban Stormwater Guidelines and Best Management Practices for Protection of Fish and Habitat. – Fisheries and Oceans Canada

b.    A Guidebook for British Columbia Stormwater Planning – BC Ministry of Water, Land and Air Protection

c.    MMCDA Design Guideline Manual (2005)

d.    Fairwinds Lakes District and Schooner Cove ISMP (KWL 2012)

# PART 2  RAINWATER MANAGEMENT BMPS

## 2.1        Water Quality BMP (WQ)

**Purpose:** Mitigate water quality impacts to fish habitat by collecting and treating "first flush" events of smaller storms and more frequent runoff events from impervious areas.

**Guidelines:** Collect and treat the volume of the 24-hour precipitation 6 month event which equals 90% of the total rainfall from impervious areas with suitable BMPs. Rate-of-discharge will not be greater than required to provide suitable hydraulic retention time as to maximize the effectiveness of the specific BMP.

**Suitable BMPs:**

 .1     Bio-filtration swales or burrows

 .2     Raingardens

 .3     Constructed wetlands

 .4     Exfiltrating dry detention pond systems.

# PART 3  DESIGN STANDARDS

## 3.1        Bio-Filtration Swale

 .1     Calculate swale dimensions using equations 7.28 to 7.311 in Dr Gary Mintons' Stormwater Treatment 'Third Edition'.

 .2     Flow to the swale should be distributed sheet flow, travelling through a grassy filter area at the swale verges.  Provide pre-treatment and erosion control to avoid sedimentation in the swale.

 .3     Provide a 25mm drop at the edge of paving to the swale soil surface, to allow for positive drainage and buildup of road sanding/organic materials at this edge. Edge to be concrete with a bury of 200 mm to avoid erosion.

 .4     Swale planting is typically sodded lawn.  Low volume swales can be finished with a combination of grasses, shrub, groundcover and tree planting.

 .5     Swale bottom – flat cross section, minimum 600mm wide to a maximum 2400 mm wide, longitudinal slope 1-2%.

 .6     Swale side slopes should be 4:1 V:H and no greater than 3:1 slope.

 .7     Weirs to have level top to spread flows and avoid channelization, keyed in 100mm minimum.

 .8     Maximum ponding level of 150mm.  24 hour drawdown time for the maximum surface ponded volume.

.9     Treatment soil depth should be 450mm average and no less than 300mm.

.10    Design stormwater conveyance using Manning's formula or weir calculations which ever governs with attention to channel stability during maximum flows.

## 3.2     Raingarden

.1     Rain garden areas should be approximately 2.5% of the upstream impervious area from roads, sidewalks, and driveways.

.2     The ISMP identifies locations for regional raingardens that could be used in lieu of roadside gardens.  Where a regional facility is constructed two parallel storm mains will be required in the catchment.  One will carry roof and footing drain water directly to the discharge point and bypass the raingarden.  The second will be dedicated for roads and sidewalks and driveways that drain to the street and will be directed to the raingarden.

.3     Locate rain gardens a minimum 30 meters from wells, 3 meters downslope of building foundations, and only in areas where foundations have footing drains.

.4     Provide pre-treatment and erosion control with a grass filter strip to avoid introducing sediment into the garden.

.5     At point-source inlets, install non-erodible material, sediment cleanout basins, and weir flow spreaders.

.6     Bottom width shall be 600mm minimum to 3000mm optimum.

.7     Side slopes shall be a maximum 2:1 with 3:1 preferred for maintenance in non roadside areas.  Maximum ponded level shall be 300 mm.

.8     Raingardens to have a 150 mm diameter SDR 35 perforated drain placed within 150 mm of drain rock.  The drain shall have a minimum 1% slope.

.9     The interface between the growing medium and the drain rock shall be separated by a medium weight needle punched geofabric.

.10    An impermeable liner shall be placed between the drain rock and the native soil to avoid water leaving the raingarden.  The liner shall be omitted when there is no danger of groundwater causing problems on adjacent property.  The Engineer of Record shall make this determination.

.11    Treatment soil depth shall be 450mm.  Soils shall have an infiltration rate of 70mm/hr +/- 15%..

.12    Surface planting should be primarily trees, shrubs, and groundcovers, with planting designs respecting the various soil moisture conditions in the garden.  Planting may include rushes, sedges and grasses as well as lawn areas for erosion control and multiple use.

.13    Apply a 50-75mm layer of organic mulch for both erosion control and to maintain infiltration capacity.

.14    Install an overflow system that allows flow up to the 100 year event to enter the piped storm drain system.

.15 Avoid utility or other crossings of the rain garden. Where utility trenches must be constructed below the garden, install trench dams to avoid infiltration water following the utility trench.

### 3.3 Site and Lot Grading

Grading is to comply with the B.C. Building Code and the following:

.1 Avoid drainage across adjacent lots. If cross-lot drainage is unavoidable, provide swale to divert runoff away from lower lots.

.2 Grade areas around buildings away from foundations.

.3 Where lots are lower than the adjacent roadway, direct road runoff away from buildings and driveways and into a rainwater management system.

.4 Set the minimum building elevation a minimum of 0.3 meters above the 200-year return period instantaneous flood elevation or high water level of the rainwater management system and a minimum of 0.6 meters above the sewer service connection invert.

### 3.4 Remaining Stormwater Systems

.1 The remainder of the stormwater system shall be designed to the Section 4.0 of the 2005 MMCDA Design Guideline Manual.