STORM WATER PERFORMANCE CRITERIA AND DESIGN GUIDELINES

The following storm drainage criteria and design guidelines apply to all storm drainage plans in Lindon and shall be used in storm drainage calculations. The City Engineer has authority to modify the criteria and guidelines as needed to meet changing or unusual needs or conditions.

1. Storm water quantity criteria & design guidelines

A. Design Storm

i. Frequency
   a. Design piping system and detention for a 10 year storm
   b. Control the point of discharge and the flooding hazard of a 100 year storm

ii. Intensity—per the following table:

Rainfall Intensities (inches/hour)

Duration	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year
5 min	1.80	2.52	3.12	3.84	4.20	4.68
10 min	1.38	1.98	2.40	2.94	3.30	3.66
15 min	1.20	1.68	2.04	2.48	2.80	3.12
30 min	0.82	1.16	1.40	1.72	1.92	2.14
60 min	0.52	0.74	0.89	1.09	1.22	1.36
2 hours	0.31	0.43	0.52	0.62	0.70	0.77
3 hours	0.23	0.32	0.40	0.45	0.50	0.56
6 hours	0.14	0.19	0.23	0.26	0.30	0.33
12 hours	0.09	0.12	0.14	0.16	0.18	0.20
24 hours	0.05	0.07	0.08	0.10	0.11	0.12

B. Runoff Coefficients

Two approaches are available in establishing composite runoff coefficients:

i. Lindon City encourages the design engineer to calculate a composite runoff coefficient based on surface type and associated runoff coefficient, weighted by the area of each surface type.

ii. In traditional single family residential subdivisions, the engineer may use the following runoff coefficients:
   a. R1-12 Zone: 0.42
   b. R1-20 Zone: 0.32

C. Inlet Spacing

Two criteria must be met:

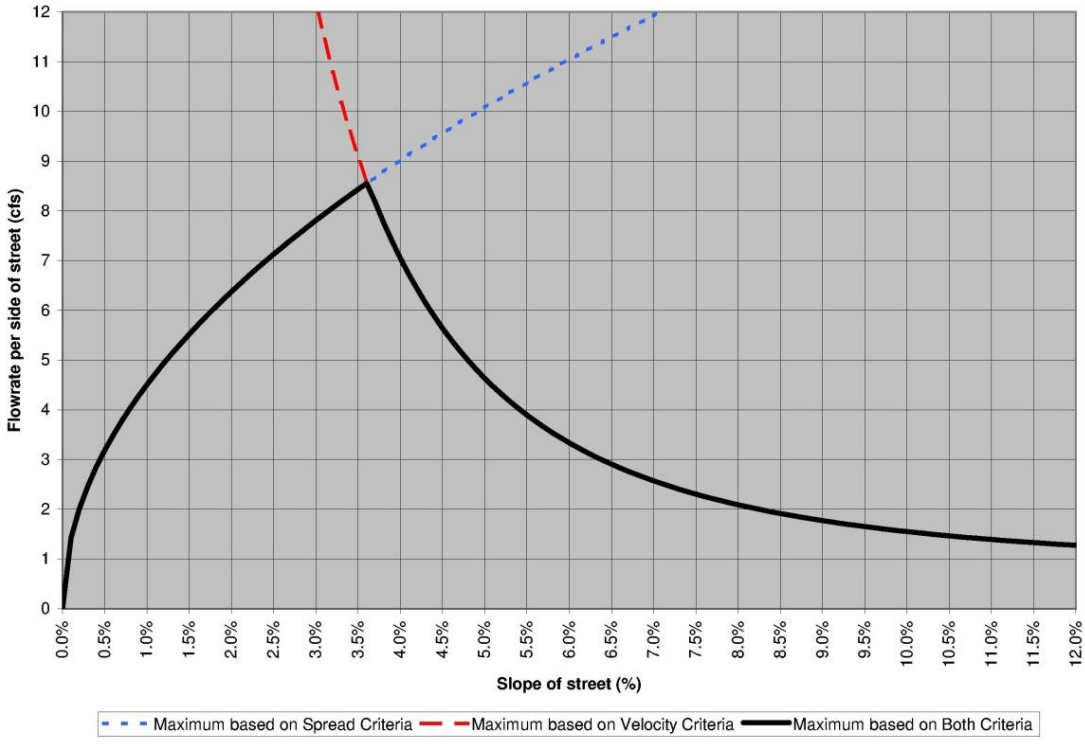
i. Spread of water in the street

Storm water must be delivered from the street into an underground piped system when the spread of water in the street covers the outside 10 feet of asphalt. This will leave two 7-foot traffic lanes in local streets (that have 34 feet of asphalt) and three 10-foot lanes in collector streets (that have 50 feet of asphalt) that are not submerged.

ii. Gutter velocity

Water must be delivered from the street into an underground piped system when the velocity of water in the deepest part of the gutter reaches 10 feet per second (as a safety consideration).

Both of these requirements are a function of street slope and storm water flow rate. Storm water must be delivered from the street to storm drains when flows reach amounts shown in the following graph. This means that for a given longitudinal street slope, flows on the street surface must be delivered into the underground piped system when they reach the amount indicated on the graph by the solid line.



Note: The spread of water in the street is calculated using the Manning equation in the form developed by Izzard, with a roughness coefficient of 0.013 and the standard street cross section. The velocity criteria is based on the velocity at the deepest part of the gutter with the Manning Equation, with a roughness coefficient of 0.013, and using a depth at a point six inches from the face of the curb as the hydraulic radius.

D. Inlet Capacity

The designer is to assume 50% blockage of inlets when considering storm drain inlet capacity.

E. Detention

On-site storm water detention is required on all private sites other than single family lots. Storm water detention in residential areas is handled on a more regional basis.

Detain storm water so that the peak flow rate released from the site does not exceed 0.2 cubic feet per second per acre of development (cfs/acre).

Design detention basins with sufficient capacity to detain the necessary volume of water resulting from all 10 year return period storms identified in the rainfall intensity table above.

The following apply to detention basins:

i. In landscaped detention basins:
   a. No part of the bottom of the basin may have a slope flatter than 3%.
   b. Within 10 feet of the outlet, the slope of the basin bottom must not be flatter than 5% unless a concrete apron is constructed around the outlet.
   c. Excluding areas within 10 feet of the outlet, the maximum allowable depth of water in the basin is 3 feet.

ii. Design detention basins in parking lots so that water cannot rise high enough to damage the interior of parked cars or restrict the passage of cars in isles.

iii. Storm drain pipes are to be continuous through detention areas to allow low flows to proceed through the storm drainage system without having to come to the surface. These flows must still pass through the outlet restriction that limits runoff rates.

iv. Design detention basins receiving water from adjacent streets so that water does not run into them after storm water reaches a maximum depth (unless a free flowing overflow is provided)—this can usually be controlled by the elevation of an inlet box in the street.

v. Basins are to be designed such that when runoff exceeds design values or when restrictions plug, excess storm water will be directed to the street system or bypass the restriction by entering the piped system via a free flowing overflow.

vi. Basins shall have a surface that does not contribute to storm water pollution.

vii. Basins should incorporate structural controls that reduce the load of sediment and floatables in storm water.

2. Calculations Methods

A. Hydrologic

The Rational Method is generally appropriate and acceptable. Other proposed methods will be considered.

B. Hydraulic

Methods based on the Mannings Formula are generally appropriate and acceptable. Supplement calculations using the Energy Equation and the Orifice Equation as necessary. Other proposed methods will be considered.

C. Detention

The Modified Ration Method is generally acceptable to estimate detention volume requirements, particularly on small sites. Use the Orifice Equation for discharge calculations where appropriate. Other proposed methods will be considered.

3. Storm Water Quality Criteria

A. Storm Water Pretreatment

Prior to discharging storm water, it must be pretreated to reduce illicit discharges of sediment, oils, floatables and other pollutants. In public facilities the treatment system shown in the Standard Drawings should normally be used. On private sites other methods may be proposed.

B. Use of Best Management Practices

Lindon City encourages the use of the Lindon City BMP Fact Sheets. Lindon City also encourages the use of other practices that may be suitable for a given development. Engineering judgment must be used in selecting BMPs for a given development.

C. Prohibited Practices

The following practices are specifically prohibited:

- Piling soil or construction materials in streets
- Constructing soil bridges over curb and gutter