

# **PART 5**

## **STORM WATER TECHNICAL MANUAL**

### **A. INTRODUCTION**

The Storm Water Technical Manual contains requirements for land development and construction activities, as well as design criteria and guidelines for those performing such activities. It includes best management practices applicable to development and construction activities. It also includes the plan submittal requirements. The City Engineer has authority to modify the requirements of the Storm Water Technical Manual as needed to accomplish reasonable and effective storm water pollution prevention objectives.

### **B. REQUIREMENTS FOR PROPOSED DEVELOPMENTS**

Requirement for proposed developments are found in Section 13.23.200 of the Lindon City Code. It describes the following requirements:

1. Incorporate best management practices (BMPs) into development design to limit quantity of runoff and preserve quality of runoff
2. Prepare Construction Site Storm Water Management Plan
3. Provide financial guarantee that improvements contained in the Construction Site Storm Water Management Plan will be installed and maintained
4. Prepare Post Construction Storm Water Management Plan
5. Obtain UPDES Permit

### **C. REQUIREMENTS FOR CONSTRUCTION ACTIVITIES (OTHER THAN THOSE ASSOCIATED WITH INDIVIDUAL RESIDENTIAL STRUCTURES)**

Requirement for construction activities (excluding construction of a single family residence) are found in Section 13.23.210 of the Lindon City Code. It describes the following requirements:

1. Provide instruction to construction site operators regarding the Construction Site Storm Water Management Plan
2. Following Construction Site Storm Water Management Plan
3. Monitor effectiveness of the elements included in the Construction Site Storm Water Management Plan, and make improvements as necessary to achieve the plan objectives.
4. Provide verification that improvements were constructed as approved

## **D. REQUIREMENTS FOR CONSTRUCTION ACTIVITIES ASSOCIATED WITH INDIVIDUAL RESIDENTIAL STRUCTURES**

Requirement for construction activities associated with individual residential structures are found in Section 13.23.220 of the Lindon City Code. It describes the following requirements:

1. Construction Site Storm Water Management Plan
2. Sediment Control on Small Construction Sites
3. Owner or operator shall make adjustments to practices as needed to prevent storm water pollution

## **E. REQUIREMENTS FOR EXISTING DEVELOPMENTS**

Requirement for construction activities associated with individual residential structures are found in Section 13.23.220 of the Lindon City Code. It describes the following requirements:

1. Following approved Post Construction Storm Water Management Plan
2. Operator or owner makes adjustments to practices or improvements when necessary to achieve Post Construction Storm Water Management Plan objectives

## F. 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)**

<b>Duration</b>	<b>2 Year</b>	<b>5 Year</b>	<b>10 Year</b>	<b>25 Year</b>	<b>50 Year</b>	<b>100 Year</b>
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:

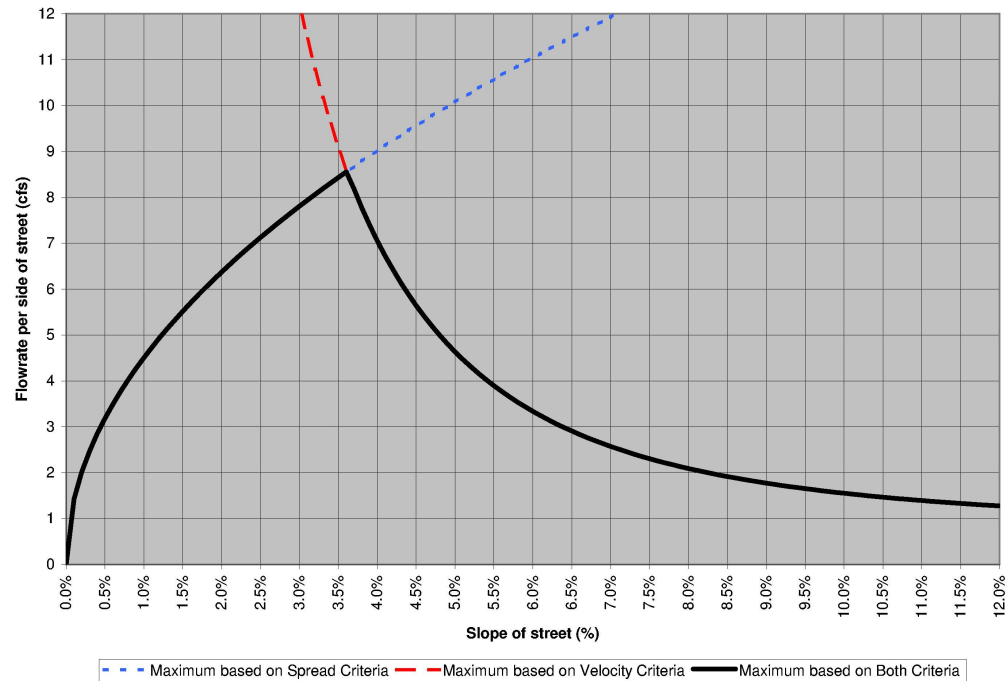
i. Spread of water in the street

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

Storm water must be detained such that the peak flow rate released from the site does not exceed 0.2 cubic feet per second per acre of development (cfs/acre). The following limitations apply to detention basins:

- i. No part of the bottom of a landscaped detention basin may have a slope flatter than 3%.
- ii. 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.
- iii. Excluding areas within 10 feet of the outlet, the maximum allowable depth of water in the basin is 3 feet.
- iv. 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.
- v. Basins are to be designed such 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 adjacent to the basin.
- vi. 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.

## 2. Storm water quality criteria

### A. Storm Water Treatment

Prior to discharging storm water, it must be treated 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 BMP fact sheets included in PART 6, CONSTRUCTION AND POST CONSTRUCTION BEST MANAGEMENT PRACTICES. **The following BMPs are required to be a part of all Construction Site Storm Water Management Plans:**

* BMP Inspection & Maintenance	BMPIM
* Contaminated or Erodible Surface Areas	CESA
* Concrete Waste Management	CWM
* Dust Controls	DC
* Portable Toilets	PT
* Spill Clean-Up	SCU
* Vehicle and Equipment Fueling	VEF
* Waste Disposal	WD

There is no list of BMPs that is required on all Post Construction Storm Water Management Plans.

In addition to the required BMPs listed above, other BMPs from PART 6 that apply to a given development should be used. Lindon City also encourages the use of practices in addition to those contained in the Lindon Storm Water Management Program 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

## **G. CONSTRUCTION SITE STORM WATER MANAGEMENT PLAN CONTENTS**

### **1. Purpose of the Construction Site Storm Water Management Plan**

The purpose of the Construction Storm Water Management Plan is to control storm water runoff and reduce pollutants in storm water runoff during construction by accomplishing the following:

- A. Controlling soil erosion
- B. Controlling discharge of sediment into storm drainage facilities or off-site
- C. Prevent illicit discharges into on-site soils, into storm drainage facilities or off-site
- D. Prevent uncontrolled discharge of storm water to adjacent property
- E. Controlling construction waste
- F. Controlling dust

### **2. Contents of the Construction Site Storm Water Management Plan**

The Construction Storm Water Management Plan is to be submitted with the site plans or improvement plans, and is to contain at least the following elements:

- A. Existing and proposed contours as shown on the grading plan
- B. Existing and proposed storm drainage improvements
- C. Best management practices to accomplish the purpose of the plan--show the following for each BMP specified, as applicable:
  - i. Location and extent of specified BMP
  - ii. Timing of implementation
  - iii. Duration of implementation
  - iv. Any information in addition to or different from that shown on the BMP fact sheet as necessary to employ the BMP on the site
- D. BMP Fact sheets or other descriptive material for all specified BMPs
- E. Proposed re-vegetation—show the following:
  - i. Location and type of re-vegetation proposed
  - ii. Timing of re-vegetation, possibly in terms of planting season or number of days following commencement of grading
- F. Sequencing of construction activities and BMPs
- G. Name, address & telephone number of individual who has responsibility for implementation and maintenance of the plan.
- H. If there are lots within the area that are subject to the Hillside Protection Zone (as defined in Section 17.57.220 of the Lindon City Code), the plan also must meet the requirements of Sections 17.57.100 and 17.57.120 of the Lindon City Code.

## **H. POST CONSTRUCTION STORM WATER MANAGEMENT PLAN CONTENTS**

### **1. Purpose of the Post Construction Storm Water Management Plan**

The purpose of the Post Construction Storm Water Management Plan is to control storm water runoff and reduce pollutants in storm water runoff after construction is complete and the developed site is in operation. This is achieved by accomplishing the following:

- A. Controlling soil erosion
- B. Controlling discharge of sediment into storm drainage facilities or off-site
- C. Preventing illicit discharges into on-site soils, into storm drainage facilities or off-site

### **2. Contents of the Post Construction Storm Water Management Plan**

The Post Construction Storm Water Management Plan is to be submitted with the site plans or improvement plans. It shall be contained on a plan sheet of its own, rather than being a part of another plan sheet, and is to contain at least the following:

- A. The site plan, including vicinity map, proposed contours, permanent storm drainage improvements, and landscaping.
- B. Best management practices to accomplish the purpose of the plan. Examples of appropriate BMPs may include those addressing operation and maintenance of storm drainage quality control facilities, operation and maintenance of storm water discharge control facilities, maintenance of landscaping, good housekeeping practices, etc.
- C. Show the following for each BMP specified:
  - i. Location and extent of specified BMPs, as appropriate
  - ii. Detailed schedule of execution for each specified BMP, in terms of starting time, duration, frequency, etc., as appropriate
  - iii. Any information in addition to or different from that shown on the BMP fact sheets as necessary to employ the BMPs on the site
- D. BMP fact sheets or other descriptive material for all specified BMPs. BMP fact sheets associated with the Post Construction Storm Water Management Plan are to be on a separate sheet from those that are part of the Construction Site Storm Water Management Plan.



- E. The following statement shall prominently appear on all Post Construction Storm Water Management Plans:

The holders of the business license at this site (or owner of the lot if there is no business license) are responsible to perpetually follow this Post Construction Storm Water Management Plan. Failure to follow the plan may result in the City refusing to renew business licenses or take other action against the property owner.

The objectives of the Plan are to:

1. Control soil erosion
2. Control discharge of sediment into storm drainage facilities or off-site
3. Prevent illicit discharges into on-site soils, into storm drainage facilities or offsite

If the objectives of the Plan are not being met, the site operator or owner shall make adjustments to the Plan as needed to accomplish its purposes.

Lindon City encourages adjustments to the plan that enhance effective storm water management. However, significant reduction of practices contained in the plan is to be accomplished through formal modification of the plan and resubmission to the Development Review Committee for approval.

## **I. PROPOSED CONSTRUCTION AND POST CONSTRUCTION STORM WATER MANAGEMENT PLAN REVIEW PROCEDURES**

The Construction Storm Water Management Plan and Post Construction Storm Water Management Plan will be submitted to Lindon City with the development plans. They will be reviewed along with the development plans, with storm water quantity and quality benefits in mind. The review procedure will be the same as for subdivision improvement plans and site plans, as outlined in the Development Flow Charts found in the Lindon Land Development Policies, Standard Specifications and Drawings Manual.

## **J. CONCLUSION**

Inasmuch as the construction and post construction related best management practices will generally be carried out by those in the private construction industry, they will be implemented as specified in specific construction site and post construction storm water management plans as development occurs. The BMPs found in the Inspection and Enforcement Procedures of PART 4, OPERATION AND MAINTENANCE PRACTICES, cover Lindon City's efforts to assure that the plans are followed.

Lindon City's Storm Water Technical Manual satisfies, in part, two of the six minimum control measures established by the Storm Water Phase II Rule. PART 7, SUMMARY OF BEST MANAGEMENT PRACTICES AND MEASURABLE GOALS, shows how the best management practices correlate with the six minimum control measures.