

Drainage Criteria Update (June 2022)

(Replaces Section III Paragraph E of the City of Newton Standard Engineering Design Criteria)

1.0 Stormwater Detention Facilities:

Detention facilities shall be provided in connection with the development of land where problem areas have been identified and where homes, buildings or other structures within the drainage basin and downstream from the proposed development are currently flooded in a 100-year, or more frequent, storm event. Detention facilities shall be required where 1) an engineering study indicates the proposed development would cause flooding of downstream structures; or 2) where determined by the City Engineer or other authorized staff to be beneficial to the system.

1.1 Determining a Need for Detention

- a. An engineering drainage study will be required for all projects to determine the impact of the proposed development on the existing drainage system and the need for detention. The report shall be submitted to the City with the preliminary plat or prior to any development in previously platted but yet undeveloped areas.
- b. Detention will not be required where the engineering study indicates that construction of a detention facility will increase the downstream system's peak discharge by delaying the peak from the proposed development so that it coincides with the peak discharge from the upstream area.
- c. When required, detention facilities shall be designed in accordance with Section III Paragraph E, 2.0 through 5.0.

1.2 These requirements apply to all development except the following:

- a. Where downstream flooding is entirely confined within the limits of the 100-year floodplain as defined by the Federal Flood Insurance Study (FIS) current at the time the development is proposed.
- b. Additions to, improvement and repair of existing single-family and duplex dwellings.
- c. Remodeling, repair, replacement, and improvement to any existing structure or facility and appurtenances that does not cause an increased area of impervious surface on the site in excess of 10% of that which existed previously.
- d. Improvements on any site having a gross land area of one acre or less, regardless of land use.
- e. Construction of any one new single-family or duplex dwelling unit, irrespective of the total area of the site on which the structure is situated.

2.0 General

Detention facilities may be either wet or dry. Joint uses, such as recreation, not interfering with detention functions are permitted for dry facilities. Parking will not be allowed in detention facilities. Wet ponds shall be designed to maintain a minimum water depth of 7.0 feet. Where upstream or downstream drainage studies have been performed the most current data shall be incorporated into the drainage plan.

3.0 Other Regulatory Requirements

All state or federal requirements shall also apply to detention facilities that meet regulatory size or function characteristics.

4.0 Detention Requirements

4.1 Hydrologic analysis should be performed using the NRCS Unit Hydrograph with a Soil Conservation Service (SCS) Type 2 storm and 24-hour storm duration or the Rational Method for sites less than or equal to 5 acres.

4.2 Detention facilities shall be designed to detain for the 2-, 5-, 10-, 25-, and 100-yr design storm where the post development runoff rate shall be equal to or less than the existing runoff rate in all directions of flow. In poorly drained areas it may be necessary to detain to the predeveloped (green site) condition if impervious areas are already present on the project site.

4.3 The modified Puls method is to be used for calculating detention storage models and detention pond sizing.

$$\frac{S_2 - S_1}{\Delta t} = \frac{I_1 + I_2}{2} - \frac{O_1 + O_2}{2} \quad \Rightarrow \quad 2S_2 + O_2 = I_1 + I_2 + \frac{2S_1}{\Delta t} - O_1$$

where;

S_1, S_2 = storage volume at beginning and end of time step
 O_1, O_2 = outflow at beginning and end of time step
 I_1, I_2 = inflow at beginning and end of time step
 t = duration of time step (the routing interval)

4.4 Modeling software that uses the modified Puls method are acceptable, such as HEC-HMS or HEC-1. Other modeling methods are acceptable only with the approval of the City Engineer or authorized staff. Cases where other methods may be considered include historical or regional studies where calibration is required.

4.5 Runoff from the 100-year design storm shall be routed through the detention facility. Detention facilities shall have a minimum of 1' of freeboard to the top of the berm in the 100-year design storm.

4.6 Emergency overflow routes must be designated for each detention facility to provide an acceptable path for drainage for flood events which exceed the capacity of the detention facility. The elevation and size of the emergency overflow route shall be determined by routing the 100-year design storm through the detention facility assuming the emergency overflow route is the only outlet for flow, and maintaining the required minimum 1' of freeboard. The emergency overflow route shall be placed such that the flow is released directly into the downstream channel or routed to the downstream channel without endangering any structures, public improvements or public right of way.

4.7 Stage-Storage-Discharge tables are required in the drainage report as well as pre and post development runoff for the 2-, 5-, 10-, 25-, and 100-yr design storms. Other parameters used in the drainage analysis including but not limited to, curve number or C factor, time of concentration and rainfall intensities shall also be included in the report.

4.8 Pond side slopes shall be designed and constructed to be no greater than 3:1 above the normal pool and no greater than 2:1 below the normal pool. Provisions should be made to allow removal of silt from the bottom of wet detention ponds.

5.0 Downstream Capacity

The capacity of the system downstream of the project site is to be analyzed and improved if necessary to a point downstream where tributary area released from the project site is a minimum of 10% of the total tributary area. For example;

A site is a total of 5.0 acres, it is located at the top of the tributary area and no other areas drain into it. The flow path of the runoff from the site must be analyzed until the tributary area of all the flows in the flow path is at least 50 acres.

The length of downstream analysis can be modified according to site and drainage way circumstances and at the discretion of engineering staff.

6.0 Operation and Maintenance

6.1 Private detention facilities shall be constructed by the property owner after plan approval and are to be placed in a Reserve or an easement dedicated specifically to the purpose of drainage or detention.

6.2 Maintenance of private detention facilities are to be the responsibility of the property owner and successors. Maintenance activities are to include but not be limited to;

1. Debris removal and cleaning.
2. Cutting of vegetation.
3. Repair of erosion.
4. Removal of silt.
5. Maintenance of structural facilities, including outlet works.