CHAPTER 9

MISCELLANEOUS

9.9 Storm Water Detention Guidelines

9.9.1 General

9.9.1.1 Storm water detention facilities shall be designed so that their peak release rates, when combined with those of all detention bypass areas in the same basin, produce peak flow rates and flow velocities at the site's boundary line no greater than those which occurred at the same location for pre-developed conditions.

9.9.1.2 The positive effects of storm water management via on-site detention facilities diminish rapidly as the distance downstream from the point of distance increases, and the smaller the facility's contribution is, as a percentage of the total runoff contributing to downstream flow, the shorter the distance downstream that the benefits are realized. Because of these limitations, on-site detention is effective at controlling flooding only when flow from the facility is a significant percentage of the total flow at the point of interest, and only if the point of interest is "immediately" downstream. The concepts of "immediately" downstream'' and "significant percentage of total flow are inseparable." The portion of a receiving watercourse (one which receives and conveys runoff from a Site) which lies downstream from the site to the point where the project area is 10 percent of the total drainage area, shall generally be considered to constitute that portion of the watercourse which is "immediately" downstream. However, the total flow in the receiving watercourse may become very large, relative to the flow contributed by the project site, within a much shorter distance. For this reason, the "substantial percentage" test must also always be applied. For purposes of these Regulations, the flow from a site represents a "significant percentage" of the total flow in a watercourse only when the ratio of the peak flow rate from the site to the peak flow rate in the watercourse (including the contribution form the project site) is greater than 5 percent.

9.9.1.3 Peak flow rate control shall normally be provided only for the 2-year, 5-year, 10-year, and 25-year frequency storm events. However, under certain conditions, the 100-year event must also be detained to the pre-developed rate. Such control of the 100-year event shall be provided when failure to do so would result in flooding of other habitable dwellings, property damage, or public access and/or utility interruption.

9.9.1.4 For any storm water analysis, the composite "C" (Rational Method) or CN (SCS Method) used for analysis of pre-development conditions shall not exceed 0.25 or 60, respectively, unless prior approval has been obtained from the Department. A pre-design conference between the design engineer and appropriate Department personnel, which may in certain straightforward cases be conducted via the telephone, is required.

9.9.1.5 Rational Method runoff coefficients used for analysis of pre- and post-development conditions shall be consistent with those shown in the Storm Water Design Manual.

9.9.2 Dam Design and Construction Criteria

9.9.2.1 Detention facilities which take the form of normally-dry basins, ponds, or lakes usually are created by damming a drainage way or watercourse. Such dams can take a variety of different forms, the most common being earthen embankments and reinforced concrete walls. Each type of dam has different characteristics, and the selection of the most appropriate type for a particular site should be made by a Professional Engineer and based on the physical features of the dam site, the purpose of the dam, the type of impoundment, safety, and maintenance requirements.

9.9.2.2 For purposes of these Regulations, dams will be addressed separately for each of the three most frequently encountered types of detention facilities: normally-dry basins, ponds, and lakes. A normally-dry basin is one designed to impound storm water runoff for only a brief period of time following a storm event. The vast majority of the time the basin will be completely dry except for any normal stream flows which pass through unimpeded. Lakes and ponds, on the other hand, are designed to impound a body of water at least several feet in depth on a more-or-less permanent basis. Lakes and ponds vary from one another only in terms of magnitude. The magnitude of a lake is determined primarily from the height of its dam, the size of its contributing drainage area, and the volume of water it is capable of impounding. For purposes of these Regulations, a pond is any lake having a dam height of less than 9 feet and which is incapable of impounding more than 20 acre-feet of water.

9.9.2.3 All dam design shall be certified by a Professional Engineer currently registered in the State of Georgia.

9.9.2.4 Dams for normally-dry detention basins shall conform to the following:

9.9.2.4.1 Dams for normally-dry detention basins may be constructed of earth, reinforced concrete, mortared rubble, or other suitable materials.

9.9.2.4.2 The design of any concrete or rubble wall over 5 feet in height shall be certified by a Structural Engineer currently registered as a Professional Engineer in the State of Georgia, and the structural design shall be based on soil tests certified by a Geotechnical Engineer currently registered as a Professional Engineer in the State of Georgia.

9.9.2.4.3 Any non-earthen structure shall be designed to prevent piping failure through its subgrade and abutments.

9.9.2.4.4 The construction of walls over 5 feet in height shall be monitored and approved by a qualified materials testing company.

9.9.2.4.5 Earthen dams for normally-dry detention basins shall have a top width of no less than 8 feet, and riprap protected slopes on the upstream face no steeper than 2 (horizontal) to 1 (vertical). Vegetated embankments shall have side slopes no steeper that 3:1.

9.9.2.4.6 For earthen dams for normally-dry detention basins, there shall be at least 1.5 feet of vertical separation between the 100-year ponding elevation in the basin and the low point on the top of the dam. One (1) foot of this distance is to provide a margin of safety against overtopping of the dam and the other 6 inches is to allow for settlement. Separation is not required for a non-earthen dam if it has been designed to overtop safely.

9.9.2.4.7 More stringent design and construction criteria shall be used for dams for normally-dry detention basins whenever the probable consequences of dam failure are severe.

9.9.2.5 Dams for ponds shall conform to the following:

Any engineer responsible for the design of a dam for a pond is expected to be knowledgeable of the criteria contained within the Georgia Safe Dams Act, Georgia Department of Natural Resources "Rules for Dam Safety" publication, and the U.S.D.A. Soil Conservation Service's Technical Release No. 60 "Earth Dams and

Reservoirs." The provisions of each are to be applied wherever applicable. Applicability shall be determined based upon site-specific constraints and downstream conditions. Consultation with appropriate Department personnel both prior to and throughout the design process is encouraged.

9.9.3 Detention Facility Outlet Devices

9.9.3.1 Because of the variables that may be associated with the choice of an outlet device for any given condition, the design consultant is responsible for the selection of the device, subject to the review and approval of the Department.

9.9.3.2 The Department will include in its consideration the ease of maintenance, longevity of the system, freedom form congestion, practicality, and aesthetics in its review of the outlet device. The consultant should be guided by the Departmental preference of vertical weir deigns since they have proven to generally meet most of the considerations expressed herein.

9.9.3.3 Orifices shall not be smaller than 3 inches in diameter. An orifice smaller than 15 inches in diameter shall be protected by a trash rack. A trash rack protecting an orifice shall have surface area of at least 10 square feet. Design shall be in accordance with the Storm Water Design Manual. No opening in the trash rack shall have an area more than one-half the size of the area of the orifice being protected. Two-stage trash racks, or screens having progressively smaller openings placed in series, are suggested. To facilitate outlet operation, curved or inclined trash racks designed to allow debris to rise with the water level are preferred. In all cases, trash racks shall be either hinged or removable to facilitate maintenance operations.

9.9.3.4 If the primary detention facility outlet is a conduit through a dam, and there is not an orifice, weir-box, or other flow-control device affixed to the upstream end, then the conduit shall be analyzed for both inlet and outlet control conditions. If an orifice or weir-box is affixed, then the conduit shall be analyzed to determine if any flows will occur for which outlet control conditions in the conduit, rather than the hydraulic characteristics of the flow-control structure, will determine the total flows occurring. In any case where the conduit through the dam is less than 15 inches in diameter, the trash rack provisions of "9.9.3.3" above shall be followed.

9.9.3.5 Unless the 100-year maximum flow velocity in a conduit through a dam forming a pond or a lake is less than 10 feet per second, and the hydraulic grade line for the 100-year condition is at or below the

crown of the conduit for at least 90 percent of its length, the conduit must be equal or superior to Class V reinforced concrete pipe in its structural characteristics.

9.9.4 Emergency Overflow Requirements

9.9.4.1 For every type of detention facility, a planned safe flowpath must be provided for conveyance of flows of water in excess of those for which the detention facility was designed. In many instances, this function can be provided through installation of an emergency spillway. Emergency spillways are usually excavated open channels, either vegetated or paved with reinforced concrete.

9.9.4.2 Every earthen dam shall be provided with an open-channel emergency spillway, unless all of the following apply:

9.9.4.2.1 The principal spillway is a closed conduit having a cross-sectional area that can pass 125 percent of the 100-year storm routed peak discharge.

9.9.4.2.2 The principal spillway is a closed conduit having a cross-sectional are of at least one square foot per each three acres of drainage area, or a maximum of twenty square feet of surface area, whichever is less.

9.9.4.2.3 The inlet is a reinforced concrete box structure having an interior width equal to the width of the conduit.

9.9.4.2.4 The principal spillway capacity is at least equal to the capacity required for an open-channel emergency spillway.

9.9.4.2.5 The low point of the dam crest is not in a fill section.

9.9.4.2.6 A trash rack or other debris protection is provided on the outlet control.

9.9.4.3 Any portion of any emergency spillway excavated into a dam embankment or other fill section must be paved. Pavement material shall be either reinforced concrete or asphalt, as dictated by the design life of the dam and the potential consequences of its failure. Any portion of any emergency spillway excavated into natural ground shall be vegetated in accordance with the practices described in the "Manual for Erosion and Sediment Control in Georgia."

9.9.4.4 In determining the necessary dimensions of an open-channel spillway for a normally-dry basin, a pond, or a lake, either the methodology

contained in the "Earth Emergency Spillway Design Data" section of the "Manual for Erosion and Sediment Control in Georgia".

9.9.4.5 Emergency spillway capacity for dams shall be as follows:

9.9.4.5.1 For normally-dry detention basins, ponds, and lakes, having a dam height of less than 9 feet and which are incapable of impounding more and which are incapable of impounding more then 20 acre-feet of water, and for which the probable sequences of dam failure are not severe, the emergency spillway shall be placed at the 25-year ponding elevation or higher. Its capacity shall be at least equal to the difference between the 100-year peak flow into the detention facility and the 25-year peak release rate from the facility.

9.9.4.5.2 For normally-dry detention basins, ponds, and lakes, which do not meet all of the magnitude limitations in "1" above, the emergency spillway shall be placed no lower than the 100-year ponding elevation, and its capacity shall be at least equal to the lesser of either the full 100-year peak flowrate into the facility, or the routed one-fourth PMF hydrography. In those cases where State or Federal regulations may require greater spillway capacity, those more stringent regulations shall govern.

9.9.4.6 Emergency overflow for non-earthen dams may take the form of planned structure overtopping. In such cases, however, care must be taken to prevent flows from eroding supporting soils along the toe of or immediately downstream from the dam so as the cause it to be undermined. The profile of the top of the dam shall be so designed as to prevent flows along the ends of the structure which might result in abutment erosion.

9.9.5 Parking Lot Detention Facilities

9.9.5.1 Parking lot detention facilities shall generally be of one of the two following types:

- Depressed areas of pavement at drop inlet locations; and,
- Ponding areas along sections of raised curbing. The curbing in these areas is usually higher than a standard curbed section.

9.9.5.2 The detention methodology utilized for all parking lot detention facility design shall conform to the Storm Water Design Manual.

9.9.5.3 Parking lot detention areas shall be located so as to restrict ponding to areas other than parking spaces near buildings, and to not encroach upon entrance drives.

9.9.5.4 The maximum depth of detention ponding in a parking lot, except at a flow control structure, shall be 6 inches for a 10-year storm, and 9 inches for a 100-year storm. The maximum depth of ponding at a flow control structure shall be 12 inches for a 100-year storm.

9.9.5.5 In truck parking areas, the maximum depth of ponding shall be 12 inches for the 10-year storm.

9.9.5.6 Detention ponding areas are to be drained within 30 minutes after the peak inflow occurs

9.9.5.7 Parking lot detention areas shall have a minimum surface slope of 1 percent, and a maximum slope of 5 percent.

9.9.6 Underground and Rooftop Detention Facilities

The design of underground or rooftop detention facilities shall be in accordance with current engineering standard practice, and shall conform to the general spirit and intent of this Article. In the case of rooftop detention, permissible structural loads and weatherproofing shall be governed by the Georgia State Building Code as may be amended by the City.

9.9.7 Sediment Basins

9.9.7.1 Stormwater management and sediment trapping functions should be separated whenever possible. Every erosion control design should seek to: first, prevent erosion from occurring; second, trap sediments as close to their sources as possible, and: third, provide a second-tier or backup line of defense will usually consist of check dams/and or sediment basins.

9.9.7.2 Whenever a sediment basin and a detention facility are both required on the same watercourse, the sediment basin should be located immediately upstream of the detention facility.

9.9.7.3 In unusual cases where a normally-dry detention basin is planned to be used to trap sediment as well as provide stormwater control, the basin may be undercut to accommodate the sediment so that the required detention characteristics, particularly volume, will be maintained.

9.9.7.4 The design of sediment basins shall be in accordance with Appendix C of the "Manual for Erosion and Sediment Control in Georgia."

9.9.8 Ponds and Lakes Not Used for Detention

In such cases where a pond or lake is provided as part of a development, but is not planned to function as a stormwater detention facility, the same general and specific criteria contained in these Regulations shall apply, but may be modified in instance where a specific requirement is clearly detention oriented rather than safety-based.

END OF SECTION 9.9