

## ARTICLE 9

## PERFORMANCE GUIDELINES

## 9.1 GENERAL

## 9.1.1 Purpose

The Sections enumerated in this Article are guidelines, and are intended to be benchmark indicators of what standards could be acceptable. They are further intended to allow alternate designs that could produce results similar to these performance standards and similar protection to the public. The objective of these performance standards is not to suggest a single methodological standard of acceptance exclusive of all others. Rather they establish what would otherwise be allowed in the absence of an acceptable alternative.

## 9.1.2 Constraints

The alternative design solutions are constrained by the Design Requirements of Article 5, the Access Requirements and Street and Right-of-Way Requirements and the Street Construction Standards of Article 6, and the Grading, Detention, Drainage Requirements of Article 8, as well as the Purpose and Intent of these Regulations.

## 9.1.3 Documentation Required

In the event that an alternative is suggested by the applicant, studies and reports conducted by professionals currently certified in the State of Georgia will be required to be submitted to and approved by the Department. These studies and reports must clearly relate to the desired results and purposes expressed or implied in the applicable performance standard. Once an alternative has been approved by the Department, it shall become a required standard applicable to the specific approved Permit only.

## 9.2 LOTS

9.2.1 Lots should be designed generally such that they are no more than four times as deep as they are wide at the building setback line, unless accepted by the Director.

a. The Department may require notation that a House Location Plan (HLP) is required to be approved prior to issuance of a building permit on certain lots when particular care in locating the house or other improvements will be necessary. Such lots include, but are not limited to:

- (1) a lot which presents particular or unusual difficulties for a builder to meet minimum required building setbacks;
- (2) a lot upon which is located an easement of unusual configuration;
- (3) a lot containing floodplain but upon which no fill or other encroachment into the floodplain is anticipated at the time the Final Plat is filed;

- (4) a lot upon which is located all or a part of a stormwater detention facility;
    - (5) a lot upon which is located a buffer which was required by the Zoning Ordinance as a condition of zoning approval;
    - (6) all duplex lots;
  - b. The Department may require notation that a Residential Drainage Plan (RDP) is required to be approved prior to issuance of a building permit on certain lots where additional (site specific) engineering will be necessary to properly grade the lot or locate the building or other improvements. Such lots include, but are not limited to:
    - (1) a lot containing floodplain where fill or other encroachment into the floodplain is planned or reasonably expected;
    - (2) a lot containing severe topographic features interdicting the building site;
    - (3) a lot containing a drainage easement with a pipe discharge or other facilities, or flow characteristics which may adversely affect the location of a building or other site improvements.
  - c. The Department may require notation that a Residential Drainage Study (RDS) is required to be approved prior to issuance of a building permit on certain lots where particular attention to site grading will be necessary, but formal engineering is not needed. Such a RDS is conducted in the field where the effect of the site grading must be accomplished with adequate care so as not to create a drainage problem on neighboring property.
- 9.2.2 Side lot lines generally should be at right angles, ninety degrees (90°) to straight street lines or radial to curved street lines as much as practical. Side lot lines should be radial to the radius points of all cul-de-sacs. Variations of more than ten degrees (10°) shall require approval of the Department, but shall be approved when appropriate to the reasonable loading pattern of the subdivision, efficient use of the land relative to topographic conditions, or provisions of improved building sites over those which would result without variation of the side lot lines.
- 9.2.3 Corner lots shall be sufficiently larger so that they have the same width between minimum side setback lines as an interior lot, but in no case shall more than seventy-five feet (75') between side setback lines on a corner lot be required.
- 9.2.4 Wet Detention Facilities/Extended Detention Facilities. The creation of an unbuildable lot for the exclusive purpose of providing and maintaining a wet detention facility or extended facility is authorized as specified in 8.2.4 (h).

### 9.3 BLOCKS

- 9.3.1 The lengths, widths, and shapes of blocks shall be determined with regard to:
  - a. Provision of adequate building sites suitable to the special needs of the type of use contemplated,

- b. Applicable zoning requirements as to lot size and dimensions,
- c. Needs for convenient access, circulation, control, and safety of street traffic,
- d. Limitations and opportunities of topography.

9.3.2 In blocks over one-thousand feet (1,000') long, the Director may, when existing or proposed pedestrian circulation patterns or public gathering places so justify, require pedestrian ways or pedestrian access easements, as appropriate, through the block.

#### 9.4 ACCESS

A maximum number of two-hundred (200) residential dwelling units shall be allowed to be constructed with only one street outlet to an existing public street. If a second access to an existing public road is not available or, in the opinion of the Director of Planning and Development or his/her designee, could induce non-residential traffic through the development, a single entrance may be allowed if designed with a traffic signal and/or sufficient right-of-way and improvements to provide a protected left-turn lane, subject to the approval of the Director of Planning and Development or his/her designee.

#### 9.5 ROADWAY DESIGN

##### 9.5.1 Street Grades and Design Speeds

- a. Minimum grade for all local and minor collector streets shall be one- and one-half percent (1.5%). Minimum grades for all major collector and arterial streets shall conform to Georgia D.O.T. practice.
- b. Minimum grade of less than one- and one-half percent (1.5%) on a local street may be approved by the Department, based on adequate engineering designs, where at least one- and one-half percent (1.5%) cannot reasonably be achieved due to topographical limitations imposed by the land. In such cases, a Record Drawing and such computations as necessary shall be provided after construction to establish that the street will drain in accordance with these Regulations. Street sections where unacceptable pooling, excessive spread at catch basins, or other hazardous conditions occur shall be reconstructed or otherwise improved to eliminate such conditions.
- c. Minimum vehicle design speeds and maximum grades allowable in the City of Snellville by street classification shall be as shown in Table 9-A (following page).

TABLE 9-A MINIMUM DESIGN SPEEDS AND MAXIMUM GRADES		
<u>STREET CATEGORY</u>	<u>MAXIMUM GRADE</u>	<u>DESIGN SPEED</u>
Principal Arterial	6%	60 mph
Major Arterial	8%	50 mph
Minor Arterial	10%	40 mph
Major Collector	10%	40 mph
Minor Collector	10%	30 mph
Local	15% *	20 mph

\* Grades between 12% and 14% shall not exceed a length of one-hundred-fifty feet (150') and shall require an "as graded" survey prior to the installation of the curb or utilities. The distance shall be measured as the tangent length between points of curvature.

- d. Maximum grade on any cul-de-sac turnaround shall be six percent (6%).

9.5.2 Vertical Street Alignment

- a. All changes in street profile grades having algebraic difference greater than one percent (1%) shall be connected by a parabolic curve having a minimum length (L) equal to the product of the algebraic difference between the grades in percent (A) and the design constant (K) assigned to the street according to its category (i.e.,  $L=KA$ ).
- b. Constant (K) values are shown in the Table 9-B (below) for both desirable and minimum acceptable ("hardship") conditions. In all cases, the "desirable" value shall be used, unless it cannot be achieved due to topographic conditions beyond the developer's control. In such hardship situations, the Department may approve a lesser value to the extent required by the hardship situation, but in no event less than the value shown in the Table as "minimum."

TABLE 9-B CONSTANT (K) VALUES FOR VERTICAL CURVES				
<u>STREET CATEGORY</u>	<u>CREST CURVES</u>		<u>SAG CURVES</u>	
	<u>MINIMUM</u>	<u>DESIRABLE</u>	<u>MINIMUM</u>	<u>DESIRABLE</u>
Principal Arterial	200	320	125	155
Major Arterial	100	170	80	110
Minor Arterial	55	80	55	70
Major Collector	55	80	55	70
Minor Collector	30	30	35	35
Local	10	10	20	20

9.5.3 Horizontal Street Alignment

- a. All new streets shall adhere to the following standards governing horizontal curvature and superelevation:

TABLE 9-C HORIZONTAL CURVES		
STREET CATEGORY	MINIMUM RADIUS (FT)	MAXIMUM SUPERELEVATION
Principal Arterial	1,333	0.06
Major Arterial	833	0.06
Minor Arterial	560	0.04
Major Collector	560	0.04
Minor Collector	300	0.04 *
Local	120	0.00

\* No superelevation will be allowed on Minor Collectors internal to residential subdivisions

- b. Superelevation for horizontal curves shall be calculated utilizing the following formula:

R = minimum radius curve

v = vehicle design speed,  
(MPH)

e = rate of superelevation  
(decimal of a foot rise  
per foot of roadway

f = side friction factor,  
as follows:

$$R = \frac{v^2}{15(e + f)}$$

Vehicle Design Speed (v)	30	40	50	60
Side Friction Factor (f)	.16	.15	.14	.12

- c. Widening section along existing streets shall be designed reflecting existing curvature and superelevation, if any, unless the existing street has been included in a specific design by the County or Georgia D.O.T. which calls for different standards, in which case the project will be coordinated with the overall design.

- d. Superelevation Runoff

Roadway edge curves shall be provided for tangent runout (bringing edge from a normal crown to centerline elevation) and superelevation runoff (from the end of tangent runout to the point of design superelevation) in accordance with design standards of the Georgia Department of Transportation or other professional engineering standards.

e. Tangents and Compound Curves

Between reverse horizontal curves there shall be not less than the minimum centerline tangents shown in Table 9-D (below) unless otherwise specified by the Georgia Department of Transportation. Compound radii curves are prohibited. At least the "desirable" length shall be provided unless hardship conditions of topography or property configuration will not allow lengths greater than those shown as "minimum." For compound circular curves, the ratio of the flatter radius to the sharper radius shall not exceed 1.5 to 1.

TABLE 9-D TANGENTS		
STREET CATEGORY	MINIMUM	DESIRABLE
	TANGENT LENGTH (FT)	TANGENT LENGTH (FT)
Principal Arterial	150	180
Major Arterial	125	150
Minor Arterial	100	120
Major Collector	100	120
Minor Collector	75	90
Local	50	60

NOTE: Minimum tangents are based on the distance traveled in 1.7 seconds at the design speed for each category of street. Desirable length is based on distance traveled in 2.0 seconds.

9.5.4 Horizontal and Vertical Clearances

a. Horizontal Clearances

- (1) A shoulder of no less than eleven-feet (11') from the back of curb or edge of pavement, appropriately graded and having gentle slopes of not more than one-half-inch (1/2") per foot and rounded cross-sectional design shall be maintained along all streets. Beyond the shoulder but within the right-of-way, slopes shall not exceed one foot (1') of rise for each two feet (2') of horizontal distance on a cut slope, and one foot (1') of fall for each three feet (3') of horizontal distance on a fill slope.
- (2) Along all public streets, a clear zone shall be provided for a minimum distance of six-feet (6') from back of curb or edge of pavement wherein nothing may be located above ground level except traffic/street signs, public utility structures, and mail boxes.
- (3) At selected locations, such as the outside of a sharp curve a wider clear zone with greater horizontal clearances provided to any roadside obstruction may be required.
- (4) The Department, in accordance with Georgia Law 32-6-51, is authorized to remove or direct the removal of any sign, signal, device, or other structure erected, placed, or maintained on the right-of-way of a public road that because of its nature, construction, or operation, constitutes a danger to, or interferes with the vision of, drivers of motor vehicles.

b. Vertical Clearances

Vertical clearance at underpasses shall be at least fourteen- and one-half feet (14.5') over the entire roadway width.

9.6 STREET INTERSECTIONS

9.6.1 Angle of Intersection

Intersections shall generally be at right angles and shall not be at an angle of less than eighty-five degrees (85°) unless approved by the Department, nor less than eighty degrees (80°) unless the intersection is signalized in which case the angle of the intersection may be reduced subject to the review and approval of the Traffic Engineer.

9.6.2 Maximum Grade

Street intersections should be designed with a flat grade wherever possible, but in no case should the grade exceed two percent (2%) in normal situations (or four percent (4%) in topographical hardship situations on local streets).

9.6.3 Intersection Approaches: Horizontal Alignment

- a. New local streets which approach an intersection with a street in a category higher than itself on a horizontal curve having a centerline radius less than two-hundred-forty feet (240') shall provide a tangent section of roadway at least thirty feet (30') long. Minor collectors approaching an intersection with a major thoroughfare on a horizontal curve having a centerline radius of less than five-hundred-fifty feet (550') shall also provide the thirty foot (30') tangent section. The tangent length shall be measured along the centerline of the street, from the right-of-way line of the intersecting street, extended, to the point of tangency with the centerline of the curve section.
- b. New major thoroughfares shall provide tangent sections at intersections with streets in equal or higher categories as needed to provide adequate stopping distances at their design speeds.

9.6.4 Intersection Approaches: Vertical Alignment

- a. For intersections with local or minor collector streets, a leveling of the street at a grade not exceeding two percent (2%) shall be provided but no level approach distance is required for streets approaching at less than seven percent (7%), and a minimum twenty-five foot (25') level approach distance shall be provided for streets approaching at a grade of seven percent (7%) or more. (See Standard Drawings).
- b. As a street approaches an intersection with a major thoroughfare, there shall be a suitable leveling of the street at a grade not exceeding two percent (2%) and for a distance not less than the following minimums:

TABLE 9-E APPROACH DISTANCES AT MAJOR INTERSECTIONS	
<u>APPROACHING STREET CATEGORY</u>	<u>MINIMUM APPROACH DISTANCE (FT)</u>
Principal Arterial	100
Major Arterial	100
Minor Arterial	100
Major Collector	75
Minor Collector	75
Local	50

\* Distance of the approach is measured from edge of pavement of the intersecting street to the point of curvature in the approaching street.

9.6.5 Intersection Radii

Intersection radii for roadways measured at back of curb and for the right-of-way lines shall be as follows. For intersecting streets of different classification, the larger radii shall be provided. In all cases, adequate right-of-way shall be provided to maintain minimum of eleven feet (11') from back-of-curb. Larger radii may be required for streets intersecting at angles less than ninety degrees (90°).

TABLE 9-F INTERSECTION RADII		
<u>STREET CATEGORY</u>	<u>ROADWAY RADII</u>	<u>R-O-W RADII*</u>
Arterial	40 Feet	20 Feet
Major Collector	40 Feet	20 Feet
Minor Collector (Residential)	25 Feet	9 Feet
Minor Collector (Non-Residential)	40 Feet	20 Feet
Local (Residential)	20 Feet	9 Feet
Local (Commercial/Office)	25 Feet	11 Feet
Local (Industrial)	40 Feet	25 Feet

\* Intersecting right-of-way lines may be joined by an arc having the minimum radius shown, or by a miter which cuts across the right-of-way lines connecting the points where the required radius would have otherwise been tangent.

9.6.6 Islands

Islands in street intersections shall conform to the design requirements of the standard drawings. In no case shall anything in an island extend more than three feet (3') above

the street grade within the right-of-way, except traffic regulatory devices and other infrastructure erected or approved by The City of Snellville. No island shall be approved which contains less than 100 square feet.

#### 9.6.7 Intersection Corner Sight Distance

- a. Intersections shall be designed with adequate corner sight distance for each street which approaches a street in an equal or higher street category (except an intersection of two local streets). Where necessary, backslopes shall be flattened and horizontal or vertical curves lengthened to provide the minimum required sight distance.
- b. The minimum corner sight distance from the approaching street shall be equal to or exceed ten times (10x) the regulated speed of the intersecting street, as measured from the center of the approaching street in both directions along the right-of-way line of the intersecting street. As an alternative, the minimum corner sight distance requirement may be calculated using AASHTO "Policy on Geometric Design of Highways and Streets," Chapter 9 (at-grade intersections), latest edition. The sight distance shall provide clear visibility of an object four feet (4') above the intersecting street viewed from the centerline of the approaching street at the right-of-way line of the intersecting street, at a height of three- and one-half feet (3.5') above the ground.

#### 9.6.8 Obstructing Visibility at Intersections

On any corner lot, within an area formed by the lot lines on the street sides of such lot and a line (miter) joining points on such lot lines located at a distance of twenty feet (20') from the point of their intersection, the following shall apply:

- a. There shall be no fence or wall or hedge higher than three feet (3').
- b. There shall be no obstruction to vision, other than a post or column or tree (except standards erected by the City of Snellville) not exceeding one foot (1') in greatest cross-sectional dimension, between a height of three feet (3') and a height of fifteen feet (15') above the established grade of either of the intersecting streets.

#### 9.6.9 Turning Lanes at Intersections

Left turning lanes shall be provided on all new internal project streets, classified as a minor collector or major thoroughfare, intersecting a major thoroughfare, and may be required in other locations to meet traffic demand and safe operations. Right turning lanes may be required to meet traffic demands or safety concerns. When provided, turning lanes shall meet the following criteria:

- a. Storage length - A minimum of one-hundred-fifty feet (150') of storage length for turning lanes on any arterial roadway shall be used. A minimum of one-hundred feet (100') of storage length for turning lanes on all collectors shall be used.

- b. Taper Length - The minimum taper length shall be fifty feet (50').
- c. Left turning lanes from arterial roads shall be subject to longer storage lengths and tapers as determined on a case by case basis.

## 9.7 DRIVEWAY INTERSECTIONS

### 9.7.1 Angle and Improvements

Driveways shall generally intersect streets at right angles. All private driveways shall be paved. The portion of a driveway located within a public right-of-way shall be paved. Driveways providing access to parking lots which contain six or more spaces shall be paved in accordance with the parking lot requirements of the Zoning Ordinance.

### 9.7.2 Driveway Design Standards

- a. Driveways serving single-family detached or duplex residences may be no less than ten feet wide at the right-of-way line and shall provide a radius to the back of curb or edge of pavement of the roadway of no less than five feet (5'). All other driveway curb cuts on public streets shall conform to the standards shown on the driveway details contained in the Standard Drawings, by land use type as follows:
  - (1) Driveway Detail 1 (32' Width, 25' Radius) for:
    - (a) Service Stations;
    - (b) Commercial Sites (over 80,000 Square Feet);
    - (c) Office/Institutional Complexes (Over 100,000 Square Feet);
    - (d) Apartment/Condo Complexes (Over 200 Units); and;
  - (2) Driveway Detail 2 (28' Width, 25' Radius) for:
    - (a) Commercial Sites (80,000 Square Feet or Less);
    - (b) Office/Institutional Complexes (100,000 Square Feet or Less);
    - (c) Apartment/Condo Complexes (200 Units or Fewer); and,
  - (3) Driveway Detail 3 (32' Width, 40' Radius) for:
    - (a) Industrial Sites
  - (4) Driveway Detail 4 (Optional Design with Island) for:
    - (a) Private Commercial/Office Street Entrances;
    - (b) Private Entrances to Apartment/Condo Complexes (Over 200 Units); and,
- b. All driveways and driveway curb cuts on State highways shall conform to Georgia DOT standards unless City requirements are more restrictive.

### 9.7.3 Auxiliary Lanes

Along any major thoroughfare, a deceleration lane, acceleration lane, larger turning radius, traffic islands, or other devices or designs may be required to avoid specific traffic hazards which would otherwise be created by the proposed driveway location.

#### 9.7.4 Corner Sight Distance

All driveways approaching a minor collector or major thoroughfare shall provide adequate corner sight distance. The minimum corner sight distance from the driveway shall be equal to or exceed ten times (10x) the regulated speed of the intersecting street, as measured from the center of the driveway in both directions along the right-of-way line of the intersecting street. As an alternative, the minimum corner sight distance requirement may be calculated using AASHTO "Policy on Geometric Design of Highways and Streets," Chapter 9 (at-grade intersections), latest edition. The sight distance shall provide clear visibility of an object four feet (4') above the intersecting street viewed from the centerline of the driveway at the right-of-way line of the intersecting street, at a height of three- and one-half feet (3.5') above the ground.

#### 9.7.5 Separation and Spacing

All driveways except those serving residential units on individual lots shall be recommended to meet the following criteria:

- a. Minimum separation from a street intersection: One-hundred feet (100') from centerline of driveway to nearest right-of-way line of the intersecting street, extended. For any driveway on a major thoroughfare having a centerline between one-hundred feet (100') and two-hundred feet (200') from the intersecting street right-of-way line, access restriction may be imposed to avoid traffic hazards. Greater separation may be required for safe operation of a free-right lane, acceleration or deceleration lane, etc.
- b. Minimum separation between driveways along the same side of a major thoroughfare: One-hundred feet (100') between centerline as measured along the roadway edge or back of curb.
- c. Whenever possible, proposed driveways along one side of a street shall coincide with existing or proposed driveways on the opposite side of such street.
- d. Maximum number of driveways serving a single project: one (1) for each four-hundred feet (400') of property frontage, or fraction thereof per street, along a major thoroughfare. This is not meant to be a spacing standard but only an expression of the total number of driveways that are permitted serving a single project.

### 9.8 STORMWATER DETENTION GUIDELINES

#### 9.8.1 General

- a. Stormwater 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 flowrates and flow velocities at the site's boundary line no greater than those which occurred at the same location for pre-developed conditions.
- b. The positive effects of stormwater 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 ten percent (10%) 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 "significant 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 flowrate in the watercourse (including the contribution from the project site) is greater than five percent (5%).

- c. Peak flowrate control shall normally be provided 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.
- d. For any stormwater 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.
- e. Rational Method runoff coefficients used for analysis of pre- and post development conditions shall be consistent with those shown in the Gwinnett County Storm Water Design Manual.
- f. In circumstances where previously exempt sites (i.e. residential) are being converted to commercial developments or where existing commercial, industrial or institutional developed sites with inadequate or non-existent storm water detention facilities are being expanded, improved or renovated, the site shall be brought into conformity to these requirements assuming the site to be undeveloped with a runoff coefficient no greater than 0.25 or a CN no greater than 55. The Director of Planning and Development or his/her designee may take existing site conditions and other pertinent facts into consideration to grant partial relief from full compliance or to impose stricter undeveloped site conditions if in his opinion these circumstances so warrant.

### 9.8.2 Dam Design and Construction Criteria

- a. Detention facilities which take the form of normally-dry basins, ponds, or lakes usually are created by damming a drainageway 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.
- b. 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 stormwater 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 nine feet (9') and which is incapable of impounding more than twenty (20) acre-feet of water.
- c. All dam design is to be certified by a Professional Engineer currently registered in the State of Georgia.
- d. Dams for normally-dry detention basins shall conform to the following:
  - (1) Dams for normally-dry detention basins may be constructed of earth, reinforced concrete, mortared granite rubble, or other suitable materials.
  - (2) The design of any concrete or rubble wall over five feet (5') 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.
  - (3) Any non-earthen structure shall be designed to prevent piping failure through its subgrade and abutments.
  - (4) The construction of walls over five feet (5') in height shall be monitored and approved by a qualified materials testing company.
  - (5) Earthen dams for normally-dry detention basins shall have a top width of no less than eight feet (8').
  - (6) For earthen dams for normally-dry detention basins, there shall be at least one- and one-half feet (1-1/2') of vertical separation between the 100-year ponding elevation in the basin and the low point on the top of the dam. One foot (1') of this distance is to provide a margin of safety against overtopping of the dam and the other six inches (6") is to allow

- for settlement. No separation is required for a non-earth dam, if it has been designed to overtop safely.
- (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.
- e. Dams for ponds shall conform to the following:
- (1) 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.
- f. Dams for lakes shall conform to the following:
- (1) Any engineer responsible for the design of a dam for a lake shall be a Professional Engineer currently registered in the State of Georgia and is expected to be thoroughly familiar with 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." All design is to be in accordance with the applicable requirements contained in each of the above referenced publications.

### 9.8.3. Detention Facility Outlet Devices

- a. 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.
- b. The Department will include in its consideration the ease of maintenance, longevity of the system, freedom from congestion, practicality, and aesthetics in its review of the outlet device. The consultant should be guided by the Departmental preference of vertical weir designs since they have proven to generally meet most of the considerations expressed herein.
- c. No orifice shall be smaller than three inches (3") in diameter. An orifice smaller than fifteen inches (15") in diameter shall be protected by a trash rack. A trash rack protecting an orifice shall have surface area of at least ten (10) square feet. Design shall be in accordance with the Gwinnett County 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.

- d. 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 fifteen inches (15") in diameter, the trash rack provisions of "c" above shall be followed.
- e. Unless the 100-year maximum flow velocity in a conduit through a dam forming a pond or a lake is less than ten feet (10') per second, and the hydraulic grade line for the 100-year condition is at or below the crown of the conduit for at least ninety percent (90%) of its length, the conduit must be equal or superior to Class V reinforced concrete pipe in its structural characteristics.

#### 9.8.4 Emergency Overflow Requirements

- a. 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.
- b. Every earthen dam shall be provided with an open-channel emergency spillway, unless all of the following apply:
  - (1) The principal spillway is a closed conduit having a cross-sectional area that can pass one-hundred-twenty-five percent (125%) of the 100-year storm routed peak discharge.
  - (2) The principal spillway is a closed conduit having a cross-sectional area of at least one square foot per each three acres of drainage area, or a maximum of twenty (20) square feet of surface area, whichever is less.
  - (3) The principal spillway capacity is at least equal to the capacity required for an open-channel emergency spillway.
  - (4) The low point of the dam crest is not in a fill section except for roadway embankments.
  - (5) A trash rack or other debris protection is provided on the outlet control.
- c. 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."

- d. In determining the necessary dimensions of an open-channel spillway for a normally-dry basin, a pond, or a lake, the methodology contained in the "Earth Emergency Spillway Design Data" section of the "Manual for Erosion and Sediment Control in Georgia" should be used.
- e. Emergency spillway capacity for earthen dams shall be as follows:
  - (1) For normally-dry detention basins, ponds, and lakes, having a dam height of less than nine feet (9'), and which are incapable of impounding more than twenty (20) acre-feet of water, and for which the probable sequences of dam failure are not severe, an emergency spillway shall be provided. Its capacity shall be at least equal to the difference between the routed 100-year peak flow out of the detention facility assuming the principal spillway is blocked.
  - (2) For normally-dry detention basins, ponds, and lakes, having a dam height of nine feet (9') or more and which are capable of impounding twenty (20) acre-feet or more of water, an emergency spillway shall be provided. Its capacity shall be at least equal to the greater of either the routed 100-year peak flowrate out of the facility assuming the principal spillway is blocked, or the routed one-fourth PMF hydrograph out of the facility. In cases when State or Federal regulations may require greater spillway capacity, those more stringent regulations shall govern.
- f. 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 to 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 that might result in abutment erosion.

#### 9.8.5 Parking Lot Detention Facilities

- a. Parking lot detention facilities shall generally be of one of the two following types:
  - (1) Depressed areas of pavement at drop inlet locations; and,
  - (2) Ponding areas along sections of raised curbing. The curbing in these areas is usually higher than a standard curbed section.
- b. The detention methodology utilized for all parking lot detention facility design shall conform to the Gwinnett County Storm Water Design Manual.
- c. 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.
- d. The maximum depth of detention ponding in a parking lot, except at a flow control structure, shall be six inches (6") for a 10-year storm, and nine inches (9") for a 100-year storm. The maximum depth of ponding at a flow control structure shall be twelve inches (12") for a 100-year storm.

- e. In truck parking areas, the maximum depth of ponding shall be twelve inches (12") for the 10-year storm.
- f. Detention ponding areas are to be drained within thirty (30) minutes after the peak inflow occurs.
- g. Parking lot detention areas shall have a minimum surface slope of one percent (1%), and a maximum slope of five percent (5%).

#### 9.8.6 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 Standard Building Code.

#### 9.8.7 Sediment Basins

- a. 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 against sediments leaving the project site. This backup defense will usually consist of check dams/and or sediment basins.
- b. 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.
- c. 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.
- d. The design of sediment basins shall be in accordance with Appendix C of the "Manual for Erosion and Sediment Control in Georgia."

#### 9.8.8 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 instances where a specific requirement is clearly detention oriented rather than safety-based.

## 9.9 CULVERTS AND PIPE COLLECTION SYSTEM GUIDELINES

### 9.9.1 Culverts

- a. Single barrel or single cell culvert structures are less prone to clogging and require less maintenance than multi-barrel or multi-cell installations and should therefore be used whenever feasible.
- b. The maximum velocity in an aluminized steel coated pipe culvert for the 100-year flow shall be fifteen feet per second (15 fps). Velocities over ten feet per second (10 fps) in a pipe of any material shall be considered a special design with particular attention required to pipe or structure invert protection and to fill slope, stream bed, and stream bank stability.
- c. The minimum allowable slope shall be in accordance with the Gwinnett County Storm Water Design Manual.

### 9.9.2 Pipe Collection Systems

- a. The maximum velocity in an aluminized steel coated pipe system for the design flow shall be fifteen feet per second (15 fps). Velocities over ten feet per second (10 fps) in a pipe of any material shall be considered a special design with particular attention required to pipe invert protection and the ability of the receiving waterway or detention facility to accept the flow without damage.
- b. The minimum allowable slope shall be in accordance with the Gwinnett County Storm Water Design.
- c. The maximum allowable slope for a concrete storm drainage pipe shall be ten percent (10%), for a corrugated metal pipe shall be fourteen percent (14%) and for a HDPE pipe shall be fourteen percent (14%). Greater slopes may be approved if installation is in accordance with manufacturer's recommendations. In cases where the slope is in excess of ten percent (10%), anchor collars may be required.
- d. A minimum pipe cover of one foot (1') shall be required.

### 9.9.3 Outlet Location - Culverts and Pipe Systems

- a. Outlet structures (such as headwalls) shall not be located closer to the project site's property line with an adjoining property than the greater of the distance necessary to construct any velocity protection or a flow distance equal to 6 pipe diameters. For non-circular conduits, this distance shall be six times (6x) the rise dimension of the conduit.
- b. The invert elevation of a culvert or pipe outlet shall be no more than two feet (2') above the elevation of the bottom of the receiving watercourse at the outlet.

9.9.4 Energy Dissipation

The maximum developed condition flow velocity at the project site's downstream property line with an adjoining tract shall not exceed the maximum predeveloped condition velocity. Calculations may be required to support this velocity standard on a case-by-case basis.

9.9.5 Discharge of Concentrated Flows

- a. The discharge of concentrated flows of stormwater into public roadways shall be avoided. In no case shall such concentrated flows, including flows from swales, ditches, draws, driveways, or piped systems, exceed the allowable peak flowrates in Table 9-H, below.

TABLE 9-H MAXIMUM FLOWS INTO STREETS	
<u>STREET CLASSIFICATION</u>	<u>ALLOWABLE PEAK FLOWRATE FOR A 2-YEAR STORM</u>
Local	2.0 cfs
Minor Collector	1.0 cfs
Other	0.5 cfs

- b. In residential subdivisions, the drainage area contributing to the peak flow along any property line between lots within fifty feet (50') of the building setback line for either lot shall not exceed two (2) acres, unless contained within a piped drainage system or maintained in a natural watercourse. The storm water conveyance shall be in a drainage easement.