

Local Stormwater Design Manual

City of Fairburn

May 2008

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1. FORWARD

This manual is meant to serve as a comprehensive guide to designing and implementing stormwater management controls and systems in the City of Fairburn. *Additionally, the manual is designed to supplement the Georgia Stormwater Management Manual (GSMM) Latest Edition, which shall serve as the technical manual for design and specification of individual components within the system.*

2. GENERAL LEVEL OF SERVICE STANDARDS

2.1. Detention Requirements

2.1.1. Discharge Rates from New Development Projects

Development plans including site grading and drainage plans should be developed to minimize disruption of natural drainage patterns on properties. Additionally, ***no increases in stormwater runoff rates shall be allowed at any discharge point on the site.*** The baseline (pre-developed) conditions shall be a wooded undisturbed site regardless of whether any clearing has occurred in the past and shall model any depression storage and/or detention storage. The development shall be analyzed for the following storm events:

- *2-year 24-hour Design Storm*
- *5-year 24-hour Design Storm*
- *10-year 24-hour Design Storm*
- *25-year 24-hour Design Storm*
- *50-year 24-hour Design Storm*
- *100-year 24-hour Design Storm*

If the total area of the site (i.e. total property area) and the drainage area to each stormwater management facility is less than one acre, then a rainfall intensity based analysis (i.e. rational method) may be performed. If detention facilities are to be designed and constructed in series, the ***24-hour storm criteria*** will apply regardless of the drainage area.

2.1.2. Discharge Rates from Redevelopment Projects

Development plans including site grading and drainage plans should be developed to minimize disruption of natural drainage patterns on properties. Additionally, ***no increases in stormwater runoff rates shall be allowed at any discharge point on the site.*** The baseline conditions shall be based on an analysis of the stormwater discharge rates from the site in its existing condition and shall model any depression storage and/or detention storage. The development shall be analyzed for the following storm events:

- *2-year 24-hour Design Storm*
- *5-year 24-hour Design Storm*
- *10-year 24-hour Design Storm*
- *25-year 24-hour Design Storm*
- *50-year 24-hour Design Storm*
- *100-year 24-hour Design Storm*

If the total area of the site (i.e. total property area) and the drainage area to each stormwater management facility is less than one acre, then a rainfall intensity based analysis (i.e. rational method) may be performed. If detention facilities are to be designed and constructed in series, the ***24-hour storm criteria*** will apply regardless of the drainage area.

2.2. Conveyance Systems

2.2.1. Bridges

Bridges shall be required for streams with a drainage area greater than 20 square miles. For smaller drainage areas and greater than 0.2 square miles, bridges or bottomless culverts are recommended. Alternatives to systems other than bridges or bottomless culverts for the intermediate drainage areas shall include a detailed environmental impact analysis, justifying the system. All bridges shall be designed to accommodate the ***100-year 24-hour design storm with no over topping.***

2.2.2. Culverts & Pipe Systems

Roadway Classification / Use	Design Storm
Arterial / Emergency Evacuation Roadway	<i>100-Year</i>
Collector Roads	<i>50-Year</i>
Local Streets	<i>25-Year</i>
Roads with No Other Outlet	<i>100-Year</i>
Parking Lots / Material Storage Areas / Landscape Areas	<i>10-Year</i>

Culverts with contributing drainage areas greater than ***10 acres shall be designed to the 24-hour storm.*** For example, if a cross drain is to be designed to convey stormwater runoff from a 20-acre drainage basin under a neighborhood road, then the design storm shall be a 25-year 24-hour storm.

If a culvert is designed to connect to an existing system of a differing design level of service, then the system with the greater design requirement will be used to size the proposed system.

2.2.3. Inlets (Catch Basins, Yard Inlets, Drop Inlets, Hooded Grate Inlets and Flumes)

Inlets collecting stormwater runoff from street surfaces and area inlets shall be sized to capture the storm event specified for the pipe system to which it drains and a maximum flooding depth as determined by the following table:

Roadway Classification / Use	Flooding Depth
Arterial / Emergency Evacuation Roadway	<i>One Lane Width Open</i>
Collector Roads	<i>One Lane Width Open</i>
Local Streets	<i>8.0 ft Lane Width Open</i>
Roads with No Other Outlet	<i>One Lane Width Open</i>
Parking Lots	<i>Maximum 0.5 ft Depth</i>
Detention Areas utilized for other purposes (i.e. parking lot detention, etc.) with flood warning sign	<i>Maximum 1.5 ft Depth</i>

Roadway Classification / Use	Flooding Depth
Material Storage Areas / Landscape Areas	Maximum 2.0 ft Depth

Inlets and grading adjacent to habitable structures shall be designed to prevent stormwater runoff from entering the structure during the 100-year design storm.

2.2.4. Inlets (Headwalls, Flared End Sections, etc.)

Inlets that utilize the opening of the pipe as the inlet (i.e. headwalls, flared end sections, etc.) shall be sized to capture the storm event specified for the pipe system to which it drains and a maximum flooding depth that will not result in bypass of the inlet or cause structural / nuisance flooding.

2.2.5. Roadside Ditches

Roads constructed without curb and gutter shall incorporate ditches that are designed to the specific design storms as shown in the following table:

Roadway Classification / Use	Design Storm
Arterial / Emergency Evacuation Roadway	100-Year
Collector Roads	50-Year
Local Streets	25-Year
Roads with No Other Outlet	100-Year

2.2.6. Drainage Channels

For drainage channels designed to convey stormwater runoff either from or to a culvert, the channel should be sized to accommodate the same storm event specified for the pipe system. Channels designed to convey stormwater runoff to detention ponds shall be sized to accommodate the **100-year design storm**.

2.2.7. Flood Elevation Impacts

It is the general policy of the City that raising the elevation of flooding on an adjacent property(ies) is prohibited. However, due to extreme hardships or where land limitations warrant (for the overall minimization of stormwater impacts), the level of service may be reduced to allow impact to the adjacent property. This exception is at the City Engineer’s discretion to rescind if the adjacent property owner does not provide a permanent drainage easement between the affected property owners. The easement shall provide that the owner of the impacted property acknowledges that an increase in flood elevations will occur on their property as a result of the proposed development. Additionally, the easement shall include at a minimum a map showing the extent of the pre-development and post-development 100-year flood areas. Finally, the easement must be recorded with the City (and with the County) as an attachment to the affected property’s land deed and shall be binding on all future property owners.

2.3. Water Quality Treatment

2.3.1. Water Quality in New Development

All stormwater runoff generated from a site shall be adequately treated before discharge. ***Stormwater management systems must be designed to remove 80% of the average annual post-development total suspended solids (TSS) load and be able to meet any other additional watershed or site-specific water quality requirements.*** It is presumed that a stormwater management system complies with this performance standard if:

- It is sized to capture and treat the prescribed water quality treatment volume, which is defined as the runoff volume resulting from the first ***1.2 inches of rainfall*** from a site.
- Appropriate structural controls are selected, designed, constructed, and maintained according to the specific criteria in this manual and the GSMM.

The City encourages the designer to implement specific stormwater credits for reducing the water quality treatment requirements on site. These credits can be found in Section 1.4.4 of the GSMM. However, the City recognizes that water quality treatment of stormwater runoff from certain areas of a site is impractical. As such, the following areas are exempt from water quality treatment:

- Portions of the site that lie within City mandated undisturbed buffers
- Portions of the site that lie within 50 feet of the property line and drain away from the site assuming that no impervious surfaces (including compacted gravel / rock) lie within the 50 foot zone except retaining walls
- Impervious surfaces associated with the driveway for the first 50 feet as measured from the edge of pavement of the public street to which it connects
- Portions of the site which will remain undisturbed and which do not drain to a water quality or detention facility / BMP. These undisturbed areas must contain at least 10,000 square feet of contiguous area. Additionally, these areas must not be used for any purposes during construction and must be protected from such activities by construction fencing or other means to prevent construction personnel ingress.

Additional water quality requirements may be specified for hotspot land uses and activities.

2.3.2. Water Quality in Redevelopment

All stormwater runoff generated from the disturbed area of the site shall be adequately treated before discharge. Stormwater management systems must be designed to remove 80% of the average annual post-development total suspended solids (TSS) load and be able to meet any other additional watershed or site-specific water quality requirements. It is presumed that a stormwater management system complies with this performance standard if:

- It is sized to capture and treat the prescribed water quality treatment volume, which is defined as the runoff volume resulting from the first 1.2 inches of rainfall from a site.
- Appropriate structural controls are selected, designed, constructed, and maintained according to the specific criteria in this manual and the GSMM.

The City encourages the designer to implement specific stormwater credits for reducing the water quality treatment requirements on site. These credits can be found in Section 1.4.4 of the GSMM. However, the City recognizes that water quality treatment of stormwater runoff from certain areas of a site is impractical. As such, the following areas are exempt from water quality treatment:

- Portions of the site that lie within 50 feet of the property line and drain away from the site assuming that no impervious surfaces (including compacted gravel / rock) lie within the 50 foot zone except retaining walls
- Impervious surfaces associated any new driveway for the first 50 feet as measured from the edge of pavement of the public street to which it connects

Additional water quality requirements may be specified for hotspot land uses and activities.

2.4. Channel Protection

2.4.1. Channel Protection for New Development Projects

Channel protection shall be provided for each discharge point from the site unless meeting the exemption criteria outlined below. ***Channel protection shall be provided by providing extended detention of the 1-year storm event released over a period of 24-hours to reduce bankfull channel conditions.***

Channel protection shall not be required if one of the following criteria is applicable to an outfall point on the site:

- Point discharges that do not exceed 2 cubic feet per second for the 1-year 24-hour storm in a post developed condition
- Sheet flow discharges that do not have more than 100 feet of contributing drainage area assuming that no impervious surfaces are within the contributing drainage area
- Point or sheet flow discharges from drainage areas consisting entirely of undisturbed lands on the site
- Point discharges which drain directly to a piped drainage system and which the City Engineer has determined that the outfall of the system will not experience significant channel erosion as a result of not providing channel protection via extended detention of the 1-year 24-hour storm
- Point discharges which drain directly to streams, rivers, wetlands, lakes or other scenarios where reduction of the 1-year 24-hour storm will, in the opinion of the City Engineer, result in no impact to downstream channel integrity

2.4.2. Channel Protection for Redevelopment Projects

Channel protection shall be provided for each discharge point from the disturbed portion site unless meeting the exemption criteria outlined below. ***Channel protection shall be provided by providing extended detention of the 1-year storm event released over a period of 24-hours to reduce bankfull channel conditions.***

Channel protection shall not be required if one of the following criteria is applicable to an outfall point on the site:

- Point discharges that do not exceed 2 cubic feet per second for the 1-year 24-hour storm
- Sheet flow discharges that do not have more than 100 feet of contributing drainage area assuming that no impervious surfaces are within the contributing drainage area
- Point discharges which drain directly to a piped drainage system and which the City Engineer has determined that the outfall of the system will not experience significant channel erosion as a result of not providing channel protection via extended detention of the 1-year 24-hour storm
- Point discharges which drain directly to streams, rivers, wetlands, lakes or other scenarios where reduction of the 1-year 24-hour storm will, in the opinion of the City Engineer, result in no impact to downstream channel integrity

2.5. **Energy Dissipation**

Energy dissipation shall be employed whenever the velocity of flows leaving a new stormwater facility exceeds the erosion velocity of the downstream channel or ***five feet per second (fps) whichever is less.***

3. **APPROVED CONSTRUCTION MATERIALS & BMPs**

3.1. **Conveyance Structures**

3.1.1. **Pipes Under Roads and Pavement**

All pipes under roadways, parking lots and other surfaces designed for vehicular traffic; or designed to convey offsite stormwater through a project shall be constructed of reinforced concrete pipe (RCP) meeting Georgia Department of Transportation Standards. Any pipe that originates or terminates within or immediately adjacent (twice the depth of the pipe section adjacent to the roadway) to a pavement surface as defined above shall be continued to the next structure (i.e. manhole, inlet, headwall, etc.). Longitudinal pipes with diameters of 30-inches or smaller may be High Density Polyethylene (HDPE) Pipe if the depth of the pipe is four feet or less and if approved by special permission of the City Engineer. Bedding standards for HDPE pipe shall be such that stone bedding (i.e. No. 57 stone) shall be placed to half of the pipe diameter for all depths greater than four feet and/or in accordance with manufacturers specifications whichever are greater. HDPE pipes must have a minimum of 24-inches of cover from the crown of the pipe unless prior approval of the City of Fairburn has been obtained.

3.1.2. Pipes Not Under Roads and Pavement

Pipes not under roadways, parking lots and other surfaces meant for vehicular traffic shall be constructed of RCP or HDPE meeting Georgia Department of Transportation Standards and approved by the local jurisdictional authority. Bedding standards for HDPE pipe shall be such that stone bedding (i.e. No. 57 stone) shall be placed to half of the pipe diameter for all depths greater than four feet and/or in accordance with manufacturers specifications whichever are greater. HDPE pipes must have a minimum of 24-inches of cover from the crown of the pipe unless prior approval of the City of Fairburn has been obtained.

3.1.3. Channels

All channels must be protected from erosion through the use of rip-rap, concrete, erosion control matting or similar method acceptable to the City. All channel side slopes shall have a 3-foot horizontal to 1-foot vertical (3:1) slope or less.

3.1.4. Inlets

All inlets shall be constructed of materials and methods approved by the Georgia Department of Transportation and designs pre-approved by the City of Fairburn. Inlet covers (where appropriate) shall be designed and manufactured in accordance with local construction standards related to storm drain stenciling and pollution prevention education. The Owner and/or designer shall consult with the City regarding specific requirements for storm drain covers and inlets.

3.2. Detention Ponds

3.2.1. Dry Earthen Detention Ponds

Dry detention ponds shall be designed to provide for positive drainage on the pond floor to the outlet of the pond. Side slopes shall be designed to have a maximum of 3-feet horizontal to 1-foot vertical (3:1) slopes. ***If the 100-year maximum water surface depth is equal to or greater than four feet, then a black, vinyl-coated, four-foot chain link fence with top and bottom rails shall be constructed around the detention pond with a 20-foot gate provided to allow access.***

3.2.2. Dry Underground Detention Ponds

No underground detention pond shall be constructed on residential development projects. Underground detention ponds may be considered on non-residential development projects after the Engineer has shown that construction of an aboveground detention pond is infeasible.

3.2.3. Wet Detention Ponds

Wet detention ponds may be constructed if the facilities are designed to the criteria outlined in Section 3.2.1.5 of the GSMM (Volume 2). ***If the 100-year maximum water surface depth is***

equal to or greater than four feet, then a black, vinyl-coated, four-foot chain link fence with top and bottom rails shall be constructed around the detention pond with a 20-foot gate provided to allow access.

3.2.4. Above-Ground Retaining Wall Ponds

No above-ground retaining wall type detention ponds consisting of more than one side shall be permitted. Retaining wall structures shall be adequately screened with suitable vegetation that shall cover at least 50% of the wall area from public view upon installation. If 50% cannot be achieved, an architectural treatment to the structure may be used along one face of the wall.

3.2.5. Earthen Dam & Water Impoundment / Diversion Structures

Acceptable backfill and fill materials shall consist of suitable soils for dam construction as determined by the City; free of rock or gravel larger than 1-inch in any dimension, debris, waste, frozen materials, vegetation, and other deleterious matter. Backfill and fill materials should be placed in layers not more than eight inches in loose depth for material compacted by heavy compaction equipment, and not more than four inches in loose depth for material compacted by hand-operated tampers. Each layer should be uniformly moistened or aerated before compaction to within 3% of optimum moisture content. Layers should not be placed on surfaces that are muddy, frozen, or contain frost or ice. All backfill and fill materials should be placed evenly to required elevations, and uniformly along the full length of the embankment. Additionally, soils should be compacted to at least 95% maximum dry unit weight according to ASTM D 698.

3.3. **Water Quality Best Management Practices**

3.3.1. General Application Structural Stormwater Controls

The following general application structural stormwater controls shall be acceptable to meet the water quality requirements for the contributing drainage areas. For design, construction and maintenance specifications for each control, the reader is directed to Section 3.2 of the GSMM (Volume 2).

- Stormwater Ponds
- Stormwater Wetlands
- Bioretention Areas
- Sand Filters (Hotspot/Commercial Developments Only)
- Enhanced Swales

3.3.2. Limited Application Structural Controls

The following limited application structural stormwater controls shall be acceptable to meet the water quality requirements for the contributing drainage areas. For design, construction and maintenance specifications for each control, the reader is directed to Section 3.3 of the GSMM (Volume 2).

- Filter Strip
- Grass Channel
- Organic Filter (Hotspot/Commercial Developments Only)
- Underground Sand Filter (Hotspot/Commercial Developments Only)
- Submerged Gravel Wetlands (Hotspot/Commercial Developments Only)

3.3.3. Proprietary Structural Controls

The City Engineer may at their discretion allow proprietary structural controls. Prior to specification of such a device, the designer shall consult the City Engineer to determine if the control will be acceptable.

3.4. **Channel Protection Design**

Outlets to provide for meeting channel protection criteria shall be designed to meet the standards outlined in Section 2.3.3 and Section 2.3.5 of the GSMM (Volume 2).

4. **APPROVED HYDROLOGIC & HYDRAULIC METHODS**

4.1. **Hydrologic Methods**

4.1.1. Rational Method

The rational method may be used with the approval of the City Engineer to develop peak runoff flows for culverts and/or detention ponds with contributing drainage areas less than **10 acres** in size. All computations shall be in accordance with Section 2.1.4 of the GSMM (Volume 2). Rainfall intensities shall be derived from Table A-2 (Atlanta) of Appendix A of the GSMM (Volume 2).

As specified above, the rational method may be used to size detention facilities. If the rational method is utilized, the DeKalb Method or the Baumgardner / Morris Method (Terramodel) must be utilized to develop runoff hydrographs. Triangular rational method runoff hydrographs may not be utilized in the design of detention facilities.

4.1.2. SCS Method

In most cases, the Soil Conservation Service (SCS) method must be utilized to size detention ponds and culverts with contributing drainage areas greater than **10 acres**. All computations shall be in accordance with Section 2.1.5 of the GSMM (Volume 2). Rainfall depths shall be derived from Table A-10 of Appendix A of the GSMM (Volume 2). The following table provides the rainfall depths for use in Fairburn, GA:

Design Storm	Rainfall Depth
1-Year 24-Hour	3.36"
2-Year 24-Hour	4.08"
5-Year 24-Hour	5.04"
10-Year 24-Hour	5.76"
25-Year 24-Hour	6.72"
50-Year 24-Hour	7.20"
100-Year 24-Hour	7.92"

4.2. **Hydraulic Methods**

All hydraulic calculations shall be made in accordance with Chapter 4 of the GSMM (Volume 2).

5. **SPECIAL DISTRICTS**

The City may establish special design criteria for select areas based on the findings of watershed assessments, hydrologic and hydraulic reports, and known flooding issues. The designer shall consult with the City Engineer to determine if any special watershed districts exist within City of Fairburn.

6. **HYDROLOGIC & HYDRAULIC REPORT REQUIREMENTS**

All development projects must submit a hydrologic and hydraulic report or Site Specific Stormwater Management Plan outlining the impacts of the site on the stormwater system and drainage basin. At a minimum, this report must include the following sections:

- Certification by Registered Professional
- Project Description & Stormwater Compliance Summary
- Existing Conditions Hydrologic Analysis
- Post-Development Hydrologic Analysis
- Stormwater Management System Design
- Downstream Analysis

- Erosion & Sedimentation Control Plan
- Planting Plan
- Reference to any existing City developed drainage master plans*
- Operations & Maintenance Plan

** The designer should consult with the City Engineer regarding the existence and /or applicability of any existing City developed drainage master plans prior to initiating work on the Site Specific Stormwater Management Plan.*

The following subsections outline the requirements for each of the elements outlined above.

6.1. Professional Certification

Each report should begin with the following statement and be signed and sealed by the professional who prepared the report and analysis:

“I, (Name of Professional), a Registered (Professional Engineer / Land Surveyor) in the State of Georgia, hereby certify that the grading and drainage plans for the project known as (Project Name), lying in Land Lot (XXX), of the (XX) District, City of Fairburn, Georgia, have been prepared under my supervision, and, state that in my opinion, the construction of said project will not produce storm drainage conditions that will cause damage or adversely affect the surrounding properties. This (day) day of (Month), (Year).”

6.2. Project Description & Stormwater Compliance Summary

The report shall contain enough of a narrative to adequately describe the project and for each compliance item below, provide enough information and documentation to determine that the applicant is in compliance with each of the regulatory requirements.

- NPDES Construction Activity Permit Compliance (reference plans & notes)
 - Monitoring Plan – Methodology, Sample Locations
 - Draft NOI
- NPDES Industrial Stormwater Permit (if applicable to its end use)
- TMDL – Whitewater Creek Basin water supply watershed
- GEORGIA PLANNING ACT – River Corridor Protection (Chattahoochee River basin, Line Creek, Whitewater Creek) 100’ buffer, 25% impervious surface (if applicable)
- GROUNDWATER RECHARGE (if applicable)
- METROPOLITAN RIVER PROTECTION ACT
- SECTION 404 (Certify no impact or provide compliance documentation)
 - Wetland Protection
 - Stream Channel Protection
- FLOOD CONTROL/ protection
 - FEMA Floodplain

- Future (Buildout) Floodplain
- STREAM BUFFER protection
 - 25' State Undisturbed Buffer
 - 50' Fairburn Undisturbed Buffer
 - 75' Fairburn Non-Impervious Setback
- LITTER CONTROL (FLOATABLES)

6.3. Existing Conditions Hydrologic Analysis

The existing conditions hydrologic analysis should provide the reader with a comprehensive evaluation of the site conditions prior to development of the project. The designer should provide the following information with this element of the report:

6.3.1. Existing Conditions Map

- Topography (2-ft. or less contour interval) of existing site conditions
- Perennial / intermittent streams, wetlands, lakes and other surface water features
- Drainage basin delineations showing the location of each drainage sub-basin
- Drainage basin delineations for each contributing drainage basin upstream of the project site on an appropriate map (USGS Quadrangle, County LIDAR, etc.)
- Existing stormwater conveyances and structural control facilities
- Direction of flow and discharge points from the site including sheet flow areas
- Reference any existing County developed drainage master plans
- Any area of significant depression storage

6.3.2. Existing Conditions Tables

- A table listing the acreage, soil types and land cover characteristics for each sub-basin
- A table listing the peak runoff rates and total runoff volumes from each sub-basin
- A table listing the peak runoff rates and total runoff volumes for each drainage area upstream of the project site
- A table listing the peak runoff rates and maximum water surface elevations for all detention facilities studied as part of the existing conditions analysis

6.3.3. Narratives

- Written description of the existing conditions found on the site
- Analysis of runoff provided by off-site areas upstream of the project site
- Methodologies, assumptions, site parameters and supporting design calculations used in the analyzing the existing conditions site hydrology

6.4. Post-Development Hydrologic Analysis

The post-development hydrologic analysis should provide the reader with a comprehensive evaluation of the anticipated site conditions following development of the project. The designer should provide the following information with this element of the report:

6.4.1. Post Development Conditions Map

- Topography (2-ft or less contour interval) of proposed site conditions
- Perennial/intermittent streams, wetlands, lakes and other surface water features
- Drainage basin delineations showing the location of each drainage sub-basin
- Proposed stormwater conveyances and structural control facilities
- Direction of flow and discharge points from the site including sheet flow areas
- Reference any existing City developed drainage master plans
- Location and boundaries of proposed natural feature protection areas

6.4.2. Post Development Conditions Tables

- A table listing the acreage, soil types, impervious surface area and land cover characteristics for each sub-basin
- A table listing the peak runoff rates and total runoff volumes from each sub-basin
- A table listing the peak runoff rates and total runoff volumes for each drainage area upstream of the project site
- A table listing the peak discharge rates, total runoff volumes and peak elevations for all detention ponds studied

6.4.3. Narratives

- Written description of the existing conditions found on the site
- Stormwater calculations for water quality, channel protection and post construction detention for each sub-basin affected by the project
- Documentation and calculations for any applicable site design credits that are being utilized
- Methodologies, assumptions, site parameters and supporting design calculations used in the analyzing the post development conditions site hydrology

6.5. Stormwater Management System Design

The stormwater management system design should provide the reader with a comprehensive description of the proposed stormwater management system components on site. The designer should provide the following information with this element of the report:

6.5.1. Stormwater Management System Map

- Location of all non-structural stormwater controls
- Location of all existing stormwater controls to remain after development
- Location of all proposed stormwater controls
- Location of all proposed impoundment type controls (i.e. detention ponds, stormwater ponds, regional detention ponds, stormwater wetlands, etc.)
- Location of all conveyance structures
- All impoundment type controls should be labeled with the following information: maximum water surface elevation, depth and storage volumes for both the design storm and maximum water surface if the design storm event is exceeded (i.e. top of dam)
- All inlets to conveyance structures should be labeled with the following information: maximum design water surface and maximum potential water surface
- All pipes should be labeled with length, material and slope
- All pipes should be profiled and labeled with length, material, slope and hydraulic grade line

6.5.2. Narratives

- Narrative describing that appropriate and effective structural stormwater controls have been selected
- Design calculations and elevations for all existing and proposed stormwater conveyance elements including stormwater drains, pipes culverts catch basins, channels, swales and areas of overland flow
- Design calculations and elevations for all structural water quality Best Management Practices to be utilized for water quality improvement
- Design calculations showing that the design meets the requirements of the water quality improvements as outlined in the ordinance and local design manual

6.6. **Downstream Analysis**

The downstream analysis should provide the reader with a comprehensive picture of the downstream areas and their capacity to accommodate stormwater runoff from the proposed development.

6.6.1. Maps

- Drainage basin delineations showing the point at which the contributing area of the project represents 10% of the total drainage basin area as defined in Section 2.1.9.2 of the GSMM
- Identify culverts, channels and other structural stormwater controls that the stormwater runoff must pass through prior to the 10% point identified previously

6.6.2. Narratives

- Supporting calculations for a downstream peak flow analysis using the 10% rule necessary to show safe passage of the post-development design flows downstream

6.7. **Erosion & Sedimentation Control Plan**

The erosion and sedimentation control plan should be included in the report demonstrating the plan to effectively mitigate stormwater impacts during construction. The following elements should be included in this section of the report.

- All elements specified in the Georgia Erosion and Sediment Control Act and local ordinances and regulations
- Sequence/phasing of construction and temporary stabilization measures
- Temporary structures that will be converted into permanent stormwater controls

6.8. **Planting/Landscape Plan**

A planting plan should be included in the report for all water quality BMPs that utilize vegetation as a pollutant removal method. Examples of these types of controls include but are not limited to stormwater wetlands, enhanced swales, etc.

6.9. **Operations & Maintenance Plan**

Property owners are responsible for performing operation and maintenance activities for stormwater management facilities and practices located on their property. The applicant shall provide a project-specific operations and maintenance plan that includes detailed descriptions of required operations and maintenance procedures for the project's stormwater management facilities and practices to ensure their continued function as designed and constructed or preserved. The plan shall identify the parts or components of each stormwater management facility or practice that needs to be regularly or periodically inspected and maintained, and the equipment and skills or training necessary for this work. The plan shall include a detailed inspection and maintenance schedule, a list of all maintenance tasks, and identify the responsible parties for all maintenance, funding, access and safety issues. Provisions for the periodic review and evaluation of the effectiveness of the maintenance program and the need for revisions or additional maintenance procedures shall also be included in the plan. Checklists shall be provided, as appropriate. Any revisions to the operations and maintenance plan shall be submitted with the stamp and seal of a Professional Engineer (PE) licensed in the State of Georgia and receive written approval from the City Engineer.