
Stormwater Local Design Manual

Prepared for

City of Fayetteville

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APPENDIX

Model Stormwater Report Check List	Appendix A.
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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 Fayetteville as required by Chapter 42 of the City of Fayetteville Code of Ordinances. Additionally, the manual is designed to supplement the Georgia Stormwater Management Manual (GSMM) First 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 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

All bridges shall be designed to accommodate the 100-year 24-hour design storm with no over topping. The peak 100-year flood elevation shall be one foot below the lowest pavement elevation of the bridge or adjacent ramps.

2.2.2. Culverts & Pipe Systems

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

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 minor street, then the design storm shall be a 50-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	One Lane Width Open
Collector Roads	One Lane Width Open

Roadway Classification / Use	Flooding Depth
Minor Streets	<i>One Lane Width Open</i>
Roads with No Other Outlet	<i>One Lane Width Open</i>
Parking Lots / Material Storage Areas	<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>
Landscape Areas	<i>Maximum 2.0 ft Depth</i>

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	<i>100-Year</i>
Collector Roads	<i>100-Year</i>
Minor Streets	<i>50-Year</i>
Roads with No Other Outlet	<i>100-Year</i>

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.

2.3. **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.

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

2.3.2. Water Quality in Redevelopment

Redeveloped shall be as defined in the Post Development Stormwater Management Ordinance of the City of Fayetteville. 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.

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 site by providing extended detention of the 1-year storm event released over a period of 24-hours to reduce bankfull.

2.4.2. Channel Protection for Redevelopment Projects

Channel protection shall be provided for the disturbed portion of each site by providing extended detention of the 1-year storm event released over a period of 24-hours to reduce bankfull.

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 area channel area or five feet per second (fps) whichever is less.

3. APPROVED CONSTRUCTION MATERIALS & BMPs

3.1. Conveyance Structures

3.1.1. Pipes Under Publicly Owned Roads and Pavement

All pipes under publicly owned roadways, parking lots and other surfaces designed for vehicular traffic 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 utilize Bituminous Coated Corrugated Steel Pipe (BCCSP) or High Density Polyethylene (HDPE) Pipe if the depth of the pipe (measured at the pipe invert) is six feet or less. All BCCSP and HDPE shall meet the Georgia Department of Transportation Standards. Bedding standards for HDPE/BCCSP 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 Fayetteville has been obtained.

Those areas where a high ground water table exists or soil corrosivity is excessive as determined by the City of Fayetteville only RCP may be utilized. The City of Fayetteville may at its discretion require soil tests to be provided at the Owner's expense to determine corrosivity of the soils and the presence of groundwater.

3.1.2. Other Pipes

Pipes not under roadways, parking lots and other surfaces meant for vehicular traffic or under privately owned parking lots or other surfaces outside of public street rights of way shall be constructed of RCP, HDPE, or BCCSP meeting Georgia Department of Transportation Standards and approved by the local jurisdictional authority. Bedding standards for HDPE/BCCSP 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 Fayetteville has been obtained.

Pipes under privately owned roads used by the public shall meet the requirements of section 3.1.1 above.

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 Fayetteville.

3.2. **Detention Ponds**

3.2.1. Dry Earthen Detention Ponds

Dry detention ponds shall be designed to provide for positive drainage of 1.0% on the pond floor to the outlet of the pond unless it includes a stormwater quality feature that requires non-positive drainage. Side slopes shall be designed to have a maximum of 3-foot horizontal to 1-foot vertical (3:1) slopes. Stormwater detention ponds less than 3½ feet deep, as measured from the invert of the pond outlet structure to the 100-year flood elevation, are exempt from fencing requirements. All other above ground detention ponds shall be completely enclosed by fencing requirements of Sec. 7 of this design manual or constructed with a graded safety bench two feet below the 100-year flood elevation.

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).

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 Manager to determine if the control will be acceptable.

3.4. **Channel Protection Design**

Outlets constructed to meet 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 with contributing drainage areas less than 10 acres in size and for detention ponds with contributing drainage areas less than 1 acre 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-10 (Peachtree City) 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

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 Fayetteville, 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 should consult with the City Engineer to determine if any special watershed districts exist within City of Fayetteville.

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. Submittals shall be in electronic format meeting City of Fayetteville's Data Submission Standards if required by City Engineer or designee. At a minimum, this report must include the following sections:

- Certification by Registered Professional
- Existing Conditions Hydrologic Analysis
- Post-Development Hydrologic Analysis
- Stormwater Management System Design
- Downstream Analysis
- Erosion & Sedimentation Control Plan
- Planting Plan (if applicable)
- 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 Fayetteville, 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. 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:

6.2.1. 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

6.2.2. 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

6.2.3. 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

6.3. 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:

6.3.1. 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

6.3.2. 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

6.3.3. 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

6.4. **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:

6.4.1. 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

6.4.2. 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

6.5. **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.

6.5.1. 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

6.5.2. 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.

6.6. **Erosion & Sedimentation Control Plan**

The erosion and sedimentation control plan, meeting the requirements of Chapter 42 of the City of Fayetteville Code of Ordinances should be included in the report demonstrating the plan to effectively mitigate stormwater impacts during construction.

6.7. 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.

6.8. Operations & Maintenance Plan

A narrative of what maintenance tasks will be required for the stormwater controls specified for the site as well as the responsible parties. Additionally, the report will need to identify access and safety issues for the site. Maintenance issues for various BMPs and other stormwater controls can be found in the GSMM.

7. STORMWATER DETENTION POND FENCING

(a) Stormwater detention ponds less than 3 1/2 feet deep, as measured from the invert of the pond outlet structure to the 100-year flood elevation, are exempt from fencing requirements.

(b) All other above ground detention ponds shall be completely enclosed by fencing or constructed with a graded safety bench two feet below the 100-year flood elevation. Fencing shall meet the following criteria:

(1) The fencing material shall contain gaps no wider than four inches in the horizontal, diagonal, or vertical directions, and completely enclose the ponding area.

(2) Gate for access shall be provided, minimum eight feet wide.

(3) Bottom of fence shall be at the 100-year floodplain elevation or above.

(4) Fencing material:

a. Ornamental fencing shall be required for all above ground detention ponds where fencing is required with the following exceptions:

i) In a platted residential subdivision where the fence is more than 500 feet from a major or collector road, measured from the right of way line to the fence.

ii) In the rear of a commercial building where the fence is not visible to an average person from a public street or public parking lot or from developed portions of offsite property.

iii) Fencing shall be constructed of ornamental wrought iron, ornamental tubular steel, ornamental tubular aluminum, or other ornamental metal material (excluding all chain link fencing), with metal or brick posts. Examples of acceptable ornamental fence styles and acceptable ornamental fence materials shall be maintained in the city's office of planning and zoning for public inspection.

b. Black or green vinyl coated chain link fence or ornamental fencing may be used for locations described in sections (4)a i, ii, and iii above.

c. All above ground detention ponds shall be screened with landscaping approved by the Planning and Zoning Commission as part of the development plan review process.