

covered by leaves, needles, and organic matter and should only be used for passive recreation, such as hiking.

### Applicability

A natural infiltration area that meets the State BMP Manual's design criteria may be used as stormwater quality control in the Watershed Critical Area (WCA) where the built-upon area is 6% or less in the Lower Randleman WCA or is 12% or less in any other WCA.

## **SECTION 2: NORTH CAROLINA'S STORMWATER REQUIREMENTS**

### **Chapter 2.1 Overview of the City of Greensboro's Requirements**

To address the adverse effects of urbanization on water quality, Federal, State and local regulations have been adopted to protect the quality of surface waters.

#### **2.1.1 Stormwater Management Ordinance**

Chapter 27 of the City Code of Ordinances is the Stormwater Management Ordinance. The main objective of this ordinance is to provide enforcement authority to meet the City's municipal NPDES Permit and associated Stormwater Management Plan. This plan is supplemented by additional portions of the Ordinance, particularly Chapter 30. Another key objective of this ordinance is to protect properties from potential stormwater quantity and quality problems. Potential problems include increased flooding and drainage problems due to inadequate or lack of conveyance systems and excessive stream bank erosion/channel widening due to increased runoff from developed areas. To control the adverse effects of increased stormwater runoff associated with newly developed or redeveloped sites, the City ordinance Chapter 27 requires all new development within the city limits to submit a *Stormwater Management (SWM) Plan*.

The SWM Plan must show stream buffers along (1) perennial streams, (2) intermittent streams and (3) channels. The SWM Plan must also include adequately sized detention or an *offsite stormwater conveyance system analysis* that shows the effects the development will have on the downstream properties including a determination if the development will cause or increase quantity or quality problems. If the analysis shows that negative impacts will result, stormwater management improvements including structural and/or non-structural BMPs are to be implemented to minimize the impact.

#### **2.2.1 NPDES Discharge Permits**

With the Clean Water Act, the EPA mandated that it is illegal to discharge any pollutant to "waters of the United States" without a National Pollutant Discharge Elimination System (NPDES) Permit. Refer to the NC State BMP Manual Section 2.2 for a description and explanation of this permit.

## 2.5 Water Supply Watershed Protection Requirements

The City of Greensboro depends on a series of lakes in the Reedy Fork Watershed in the northern region of the city for its drinking water supply. There are other protected drinking water supply watersheds besides the Reedy Fork watershed where a portion of the watershed is within the jurisdictional boundaries of the City. A portion of High Point, Randleman Lake, Polecat Creek, and Burlington watersheds are regulated by the City of Greensboro. To enforce Watersupply Watershed regulations, the City requires that before any new development or re-development activities begin on a site located within a protected water supply watershed, a *Watershed Development Plan* must be submitted to the City for approval. The Watershed Development Plan, when required, should be incorporated into the *Stormwater Management Plan* as described in the following section.

The Watershed Development Plan must show that built-upon surfaces do not exceed the maximum percentage of built-upon area allowed in that designated watershed. Built-upon area includes all impervious surfaces but also includes some areas that are partially impervious. The amount of built-upon area that is allowed on new development sites in a particular watershed is based on State Law and depends on the classification of the watershed. Refer to the tables below for built-upon density percentages for the designated watersheds.

For “high density” development sites, the Watershed Development Plan must show how structural BMPs will be implemented to improve the quality of runoff from the site. The structural BMPs must be proven facilities and at a minimum meet the design criterion of 85% removal of total suspended solids (TSS) from runoff resulting from the first one inch of rainfall. In addition, high density projects must discharge the storage volume at a peak rate equal to or less than the predevelopment peak discharge rate for the one year 24 hr storm.

For “low density” development sites in the General Watershed Area, the Watershed Development Plan must indicate that the site design will minimize impacts to the environment. A minimum score of 120 on the “General Watershed Area Performance Scoresheet” (see TABLE INSET: Ref. 30-7-2-2 chart below entitled “GENERAL WATERSHED AREA PERFORMANCE SCORESHEET”) is required before a “low density” development can be approved for watershed protection. Low density development in the watershed critical area has different requirements.

Refer to the following density tables for designated watersheds.

**DENSITY LIMITS IN UPPER AND LOWER RANDLEMAN LAKE WATERSHEDS  
IN DWELLING UNITS PER ACRE & % BUILT-UPON AREA<sup>1</sup>**

**TABLE INSET: Ref. Table 30-7-1-3**

Watershed	Overlay Zone & Tier	Low Density Option		High Density Option
		DU/AC	%BUA	%BUA*
Lower Randleman Lake (WS-IV Critical Water Supply)	GWA	1***	12	50
Upper Randleman Lake (WS-IV Critical Water Supply)	GWA	2**	24	70

<sup>1</sup> If, compared to the sidewalk installation requirements effective through December 31, 2002, the sidewalk installation requirements contained in Ordinance Number 02-239, effective January 1, 2003, increase the amount of sidewalk built-upon area, thereby exceeding the maximum built-upon area allowable under the High Density Option or necessitating additional stormwater control, treatment, or mitigation measures, the Technical Review Committee may approve reductions to required street pavement widths, sidewalk widths, driveway widths, or off-street parking area, so as to result in the same built-upon area as under the previous sidewalk installation requirements.

\*In a subdivision, the BUA maximum applies to the subdivision as a whole, including streets, lots, etc. The maximum BUA allowed by this column (assuming engineered stormwater controls are large enough) shall be allocated among streets, lots, etc. In single-family detached development, the allocation to each house lot shall be uniform. In other development, the allocation may vary among lots. In all cases, the final plat shall clearly state each lot's allocation and restrictive covenants shall call attention to these allocations. On new or extended thoroughfare streets, allocate enough BUA to cover 5 foot sidewalks on both sides; and on all other new or extended streets allocate enough to cover a 5 foot sidewalk on one side.

\*\*Alternatively, if total area minus area in street right-of-way, divided by number of house lots, equals 20,000 square feet or more, that is Low Density.

\*\*\*Alternatively, if total area minus area in street right-of-way, divided by number of house lots, equals 40,000 square feet or more, that is Low Density.

**DENSITY LIMITS IN WATER SUPPLY WATERSHEDS AND OTHER WATERSHED  
DISTRICTS  
IN DWELLING UNITS PER ACRE & % BUILT-UPON AREA<sup>1</sup>**

**TABLE INSET: Ref. Table from 30-7-1-4**

Watershed	Overlay Zone & Tier	Low Density Option		High Density Option	
		DU/AC	%BUA	%BUA*	
Greensboro & Polecat Creek (WS-III)	GWA	2**	24	50(70#)	
	WCA,1	See BUA	0.5	no HD option	
	WCA,2	0.2	2.4	no HD option	
	WCA,3,sewer	1***	12	30	
	no sewer	0.33	4	no HD option	
	WCA,4,sewer	2**	24	40	
	no sewer	1***	12	no HD option	
	Lake Mackintosh (WS-IV)	GWA	2**	24	70
	WCA,1	See BUA	0.5	no HD option	
	WCA,2	0.2	2.4	no HD option	
	WCA,3,sewer	2**	24	34	
	no sewer	0.33	4	no HD option	
	WCA,4,sewer	2**	24	40	
	no sewer	1***	12	no HD option	
	Other Watershed Districts <sup>2</sup>		2**	24	>24

<sup>1</sup> If, compared to the sidewalk installation requirements effective through December 31, 2002, the sidewalk installation requirements contained in Ordinance Number 02-239, effective January 1, 2003, increase the amount of sidewalk built-upon area, thereby exceeding the maximum built-upon area allowable under the High Density Option or necessitating additional stormwater control, treatment, or mitigation measures, the Technical Review Committee may approve reductions to required street pavement widths, sidewalk widths, driveway widths, or off-street parking area, so as to result in the same built-upon area as under the previous sidewalk installation requirements.

<sup>2</sup> According to Chapter 30-4-1.3(G) The Other Overlay District establishes regulation for protecting a watershed other than a water supply. These regulations are specified in Section 30-7-1 (Water Supply Watershed Districts and Other Watershed Districts) and Section 30-7-2 (General Watershed Areas and Other Watershed Districts)

#Watershed plans approved on and after October 31, 1997, collectively covering up to 10% of the WS-III GWA, may receive allocations permitting up to 70% BUA. An approved watershed plan constitutes a completed application for such an allocation. An allocation is granted to a lot when a building permit is issued thereon and to a part of a subdivision when the engineered stormwater control structure for it has been substantially completed. An allocation is lost if the building permit or plat approval expires or is revoked.

\*In a subdivision, the BUA maximum applies to the subdivision as a whole, including streets, lots, etc. The maximum BUA allowed by this column (assuming engineered stormwater controls are large enough) shall be allocated among streets, lots, etc. In single-family detached development, the allocation to each house lot shall be uniform. In other development, the allocation may vary among lots. In all cases, the final plat shall clearly state each lot's allocation and restrictive covenants shall call attention to these allocations. On new or extended thoroughfare streets, allocate enough BUA to cover 5 foot sidewalks on both sides; and on all other new or extended streets allocate enough to cover a 5 foot sidewalk on one side.

\*\*Alternatively, if total area minus area in street right-of-way, divided by number of house lots, equals 20,000 square feet or more, that is Low Density.

\*\*\*Alternatively, if total area minus area in street right-of-way, divided by number of house lots, equals 40,000 square feet or more, that is Low Density.

In making determinations whether modification requests are minor or major, remember that all Greensboro's WCA Tier 4 and the portion of its Tier 3 lying more than 1/2 mile from normal pool elevation are beyond the minimum WCA required by EMC Rules.

(Ord. No. 99-206, § 8, 12-21-99; Ord. No. 02-239, § 16, 12-3-02)

### GENERAL WATERSHED AREA PERFORMANCE STANDARDS

TABLE INSET: Ref. 30-7-2-1

Development Type		Schedule
1)	Low Density Option (see Tables 30-7-1-3 & 30-7-1-4 for density limits)	General Watershed Area and Other Watershed District Scoresheet (Table 30-7-2-2). A passing score is 120 or more points; or Engineer's Certification.
2)	High Density Option	Engineer's Certification.

### GENERAL WATERSHED AREA AND OTHER WATERSHED DISTRICT PERFORMANCE SCORESHEET

TABLE INSET: Ref. 30-7-2-2

MAXIMUM POINTS	FACTOR	POINT VALUE	POINTS EARNED
25	<b>1. Clustering</b>		
	Minimal	10	
	Moderate	15	
	Major	20	

	Exceptional	25	
25	<b>2. Built-Upon Area</b>		
	0-3%	25	
	3.01-7%	20	
	7.01-10%	15	
	10.01-15%	10	
	15.01-20%	5	
25	<b>3. Proximity to Floodway as Defined by FEMA</b>		
	More than 2000 Feet	25	
	1000-2000 Feet	20	
	500-1000 Feet	15	
	100-500 feet	10	
	50-100 Feet	5	
10	<b>4. Soil limitations as Defined on Pg. 29 and Tbl. 7, Pg. 57 Guil. Co. Soil Survey</b>		
	Slight	10	
	Moderate	5	
25	<b>5. Drainage-Protect and Use Natural Drainageways</b>		
	Piped or Improved Drainage With Riprap	5	
	Dispersed Drainage or Protected Drainageways	10	
	Dispersed Drainage and Protected Drainageways (or Dispersed and No Drainageway)	20	
	Enhanced and Protected Natural Drainageways	25	
25	<b>6. Average Pre-development Slope of Land Subject to Grading or Filling</b>		
	0-6%	25	
	6.01-10%	20	
	10.01-15%	5	
25	<b>7. Stream Buffer Along Drainageways</b>		
	No Drainageway Present on Property or Within 50 Feet	25	
	50 Feet, All Wooded Except for Sewers and Required Streets	25	
	50 Feet, At Least Half Wooded	20	

	50 feet, No Grading or Fill Except For Sewers and Required Streets	15	
	40 Feet, Same Restrictions	10	
25	<b>8. Stormwater Runoff Control Strategies</b>		
	Divide the % of Stormwater (Runoff) Controlled by 4		
10	<b>9. Sewage Disposal</b>		
	Public Sewer Service	10	
10	<b>10. Street &amp; Driveway Design</b>		
	With Vegetated Ditches	10	
	With Piped Drainage and/or Curb and Gutter and Energy Dissipators	5	
33	<b>11. Wooded Area</b>		
	Divide the % of Tract to Remain Wooded by 3 and To Be Thickly Planted in Tree Stands by 6		
	<b>12. Grading Reduction and Other bonuses</b>		
	NR:<1 Driveway per 300 Feet of Frontage	5	
	All: Creation of Wetlands	Up to 20	
	All: Other Measures	Up to 10	
	<b>Total</b>		

Notes: (1) All plans must have a minimum score of 120 points and meet all other requirements to be approved

(2) Use this table for low density option and only outside critical water supply watershed areas.

(3) See 30-7-2-2 for scoresheet timing of submittal, definitions, explanations and standards.

## 2.9 City of Greensboro's Requirements

### 2.9.1 City of Greensboro Stormwater Master Plans

It is the intent of the City of Greensboro to produce stormwater management master plans that will guide public and private development projects on various quantity and quality aspects of stormwater management for all of the major sub-watersheds in the city. Where such master plans are available, site development projects are to conform to the stormwater management guidance and standards available in said master plans.

### 2.9.2 Stormwater Management Plan

A Stormwater Management (SWM) Plan is required:

- ⇒ for all new development and redevelopment projects in the corporate limits and extraterritorial jurisdiction of the City, unless otherwise exempt.
- ⇒ to be approved by the City Technical Review Committee (TRC) prior to site plan or preliminary subdivision plat approval. It is preferred that the SWM Plan be submitted with the site plan or preliminary subdivision plat. For projects located in water-supply watershed areas or in other watershed district, a Watershed Development Plan should be incorporated into the Stormwater Management Plan.
- ⇒ to be approved prior to obtaining a grading or building permit except for grading plans submitted without corresponding TRC plans as allowed under City Ordinance.
- ⇒ to contain all items in section 2.9.2.1 below.

Site designers are encouraged to develop *comprehensive SWM plans* for the proposed development, including stormwater quantity and quality controls, non-structural and/or structural improvements, and pollution prevention programs for the site. Any proposed measures within commercial development that go beyond the requirements of Ordinance Section 27-22 may qualify for credits under the City's Stormwater Utility Fee Crediting Program.

#### 2.9.2.1 Stormwater Management/Watershed Development Plan Components

#### **Site Plans, Group Development Plans and Construction Drawings**

The following information is required on all Stormwater Management (SWM) Plans:

1. On the coversheet label the Watershed Location of Proposed Site Development: Note the watershed (i.e., North Buffalo Creek, South Buffalo Creek, Horsepen Creek) for the proposed site development. Note water-supply watershed name (i.e., Greensboro Watershed) and water-supply watershed designation (i.e., WS-III, WS-IV, WCA), as applicable.
2. Approved Watershed Master Plan Available? – “Yes” or “No”.



3. If the site was previously approved or part of a subdivision that was previously approved by the City or County for stormwater management or watershed development, provide the name of the plan and the date that the plan was approved.
4. Show existing built-upon area, if any, and note the amount (include % based on total site acreage)
5. Show the proposed built-upon area and note the amount (include % based on total site acreage)
6. Note the maximum amount of built-upon area (per watershed development restrictions, stormwater control design, etc.) (Include % based on total site acreage).
  - For development which includes a BMP, provide allocation table (onsite drainage area, offsite drainage area, total drainage area, onsite BUA, offsite BUA, total BUA, max BUA per stormwater control design and per watershed density)
7. Show the proposed disturbed (site development) area and note the amount. If site is located in the watershed critical area please include % of disturbance based on total site acreage.
8. Show the layout of existing and proposed stormwater conveyance system (pipes, channels, swales, catch basins, etc.) Label pipe size, material, elevations, slopes, lining material, and structure types (grate inlet, manhole, flumes, swales, energy dissipator devices, and roof drains). Show existing and proposed contours and label.
9. Label the amount of off-site drainage area and runoff quantities that discharge onto site.
10. Engineer's Certification of Stormwater Quantity Control (See Chapter 3 of Stormwater Management Manual)
11. Engineer's Certification of Stormwater Quality Control if applicable (See table 30-7-1-5)

#### Stormwater Management Study – Analysis of Off-site System

12. Map showing the limits of the off-site study; within the limits the map should show:
  - topography
  - stormwater conveyance system
  - properties and structures adjacent to the conveyance system
  - the total drainage area at the downstream limit of the study (at least 10 times greater than the site development area)
  - label site outlet and 10% point
13. Attributes of the off-site stormwater conveyance system including: structure types, materials, slopes, significant elevations, etc.
14. Provide supporting hydrologic and hydraulic calculations.

### Stream Buffer and Related Information

15. Show the location of all perennial and intermittent streams and drainage ways.
16. Show the intermittent and perennial stream buffers and where measured from (top of bank and show and label top of bank). Label Drainage Maintenance and Utility Easement (DMUE). Ensure sheet flow is achieved prior to the undisturbed buffer.
17. Label the dimensions and restrictions within the buffer (that is, To Remain Undisturbed, 50% impervious, vegetated, etc)
18. Show the location of jurisdictional waters and wetlands.\*

\*The U.S. Army Corps of Engineers and the N.C. Division of Water Quality regulate wetlands and waters of the United States through the 404 Corps Permit and 401 State Water Quality Certification process. The City encourages the protection and enhancement of wetlands and surface waters to promote improved water quality and water quantity management, as well as fish and wildlife biota and habitat preservation, and other benefits to local comprehensive watershed management. *Site designers/developers are responsible for obtaining all applicable Local, State, and Federal permits/certifications/approvals as necessary for proposed site development activities and submitting a copy of the applicable permits to the Stormwater Management Division as requested.*

Please add the following note on the plan:” All the necessary approvals have been (will be) obtained from State and Corps for any wetland disturbance and/or stream crossing disturbance”

19. Indicate location of proposed stream crossing(s) showing the proposed grading and overall stream impact (includes culvert and outlet protection dimensions). (Alternative analysis may be required by the City to reduce and /or mitigate impacts).

### FEMA Regulated Floodway/Floodplain Information

20. Show designated FEMA-regulated floodway and Special Flood Hazard Area (SFHA) boundaries on property as taken from the effective Flood Insurance Rate Map (FIRM). Note the 1% annual chance Base Flood Elevation (BFE) as provided in the Flood Insurance Study (FIS). Show and label cross sections and for limited detail studied streams, the non-encroachment area boundary.
21. If the site is located within a FEMA Special Flood Hazard Area (SFHA) the following additional requirements will apply:
  - Note the reference level (top of the lowest floor) elevations of all structures, also show flood proofing (non-residential facilities only) elevations of all structures. Note submittal of the required Elevation Certificates (EC) for structures located in the SFHA. The first EC must be submitted after the reference level is established and the final (as-built) EC must be submitted before the Certificate of Occupancy is issued. If

floodproofing is proposed, a floodproofing certificate must be submitted prior to the start of construction.

- Note that no encroachment / development into FEMA-regulated floodway or non-encroachment area boundary shall be made\*.
- A Floodplain Development Permit Application must be submitted and a Floodplain Development Permit issued prior to or concurrent with Site Plan approval.
- If a FEMA-designated floodway or floodplain does not exist on the property/parcel, note the nearest distance to a FEMA-designated floodway, if within 2000 feet.

\* In general, encroachment into a FEMA-regulated floodway is not permitted unless section 30-7-5.4(A) of the City of Greensboro Development Ordinance is met. Questions regarding development procedures within SFHA's may be directed to the Floodplain Administrator in the City's Stormwater Management Division.

Any proposed structures to be located adjacent to intermittent and perennial streams without an established Special Flood Hazard Areas (SFHA) require a BFE to be determined in accordance with Section 30-7-5.6(F) of the City of Greensboro Development Ordinance. Elevation or floodproofing certification is not required if the adjacent grade is five (5) feet or more above the Base Flood Elevation (BFE).

#### Low density development information

22. Provide completed watershed scoresheet. Refer to Chapter 2 of this manual or Section 30-7-2-2 of the Greensboro Development Ordinance.
23. For each factor where points are claimed, the requirements of that factor must be clearly depicted on the plans (for example, if 20 points for factor 7, "stream buffer along drainageways" are claimed, the plans need to show a 50' buffer on each side of the creek, the areas to remain wooded, and note the total buffer area amount and the wooded area amount).

#### Watershed Development in WCA (Watershed Critical Area)

24. Show location of natural slopes greater than 15% which are adjacent to streams and drainageways. Show drainageways carrying 17 cfs in the 100 yr storm. These areas and jurisdictional wetlands must remain undisturbed and either dedicated as drainageway and open space or platted as Undisturbed Easement (UDE) and common elements.
25. On the plan and plat please show limits of disturbance and label undisturbed areas as Undisturbed Easement.
26. Note that drainage will be provided by means of open vegetated channels.
27. Note the intended land use and SIC Industry Code. Show location of proposed storage tank(s) and indicate material to be stored. A secondary containment system must be constructed for the tank(s) and approved by the City.

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## Stormwater Control BMP Information

28. Indicate the type(s) of non-structural and/or structural stormwater control best management practices (BMPs) that are proposed. If proposing to use *existing* on-site or off-site controls, provide information to demonstrate that the controls have been approved by the City and can continue to meet quantity/quality control requirements.
29. If proposing to use off-site stormwater controls, indicate the location and owner(s) of the controls and provide information to demonstrate that the property owner will assist in maintaining the controls.
30. If proposing to use a public owned regional stormwater management facility, provide information to demonstrate that the municipality accepts participation from the property owner.
31. Show the location of the proposed stormwater controls and the location of the inlets and outlets of the control.
32. Show and label the 20' access easement to the stormwater control from the public R-O-W to the DMUE around the facility. Show the DMUE and label as "DMUE over and 15' around \_\_\_\_\_" DMUE must include all the components of the BMP (inlets, outlets, energy dissipators, etc). If access easement is not located in common elements a gravel access road is required.
33. Show the approximate size, configuration, and hydraulic structures for the stormwater control/improvement (with calculations). If proposing to use *existing* on-site or off-site controls, provide information to demonstrate that the controls have been approved by the City and can continue to meet quantity/quality control requirements.
34. Provide applicable maintenance agreements for proposed stormwater controls.
35. Note: The engineer's certification of completion will be required prior to the final plat or certificate of occupancy. The stormwater control is to be inspected to ensure it is functioning as designed and has full design volume prior to issuance of the final certificate of occupancy.
36. Note: The property owner (or homeowner's association) is responsible for maintaining the stormwater control(s) according to the approved maintenance plan and direction of the City of Greensboro.
37. Note: The City of Greensboro and their assigns have right to access the stormwater control(s) for inspections or maintenance, as necessary.
38. Note (for Underground Detention Systems only): The property owner or (or owner's Representative) is responsible for the inspection of the Underground Detention System

according to the approved maintenance plan and the City of Greensboro's Underground Detention System Policy.

### Stormwater Control/Improvement Construction Plans

39. Show and label the layout of stormwater control, grading, and significant components (for example, primary outlet structure(s), dam, filter bed depth, bottom drain, etc.).
40. Include the cross section of proposed BMP improvements showing the elevations of significant components and storage allocations (e.g. sediment storage, peak reduction storage, etc.) Label 1, 2, 10, 100 yr 24 hour storm elevations.
41. Details and material specifications of all significant components of the stormwater control. For dry ponds, wet ponds, stormwater wetlands please provide embankment seepage control details.
42. Provide Engineer's Statement of Pond and Dam Safety (if dam construction is proposed). "In accordance with the requirements in articles GS 143-215.25A and 143-215.26 of the NC Dam Safety Law and NC Administrative Code 15A NCAC 2K .0200, the Regional Engineer in the Winston-Salem Regional Office of the NC State's Land Quality Section has been / will be contacted for the determination of whether the proposed dam is governed by or exempt from the Dam Safety Law."
43. Provide hydrologic and hydraulic analysis/calculations, water quality and other pertinent calculations for design of the stormwater control.
44. Provide an inspection/maintenance plan for reference by the owner for long-term maintenance needs.
45. Provide the construction sequence for completing the stormwater control.

### TRC Lite Plans

The following information is required on TRC Lite Stormwater Management (SWM) Plans:

1. On the coversheet, label the Watershed Location of Proposed Site Development: Note the watershed (i.e., North Buffalo Creek, South Buffalo Creek, Horsepen Creek) for the proposed site development. Note water-supply watershed name (i.e., Greensboro Watershed) and water-supply watershed designation (i.e., WS-III, WS-IV, WCA), as applicable.
2. Approved Watershed Master Plan Available? – “Yes” or “No”.

3. If the site was previously approved or part of a subdivision that was previously approved by the City or County for stormwater management or watershed development, provide the name of the plan and the date that the plan was approved.
4. Show existing built-upon area, if any, and note the amount (include % based on total site acreage)
5. Show the proposed built-upon area and note the amount (include % based on total site acreage)
6. Note the maximum amount of built-upon area (per watershed development restrictions, stormwater control design, etc.) (Include % based on total site acreage).
  - For development which includes a BMP provide allocation table (onsite drainage area, offsite drainage area, total drainage area, onsite BUA, offsite BUA, total BUA, max BUA per stormwater control design and per watershed density)
7. Show the proposed disturbed (site development) area and note the amount. If site is located in the watershed critical area please include % of disturbance based on total site acreage.
8. Show the layout of existing and approximate location of the proposed stormwater conveyance system (pipes, channels, swales, catch basins, etc.) Label approximate pipe size and material. Show existing and proposed contours and label.
9. Label the amount of off-site drainage area and runoff quantities that discharge onto site.
10. Engineer's Certification of Stormwater Quantity Control (See Chapter 3 of Stormwater Management Manual)
11. Engineer's Certification of Stormwater Quality Control if applicable (See table 30-7-1-5)

#### Stormwater Management Study – Analysis of Off-site System

12. Map showing the limits of the off-site study; within the limits the map should show:
  - Topography
  - Stormwater conveyance system
  - Properties and structures adjacent to the conveyance system
  - The total drainage area at the downstream limit of the study (at least 10 times greater than the site development area)
  - Label site outlet and 10% point
13. Attributes of the off-site stormwater conveyance system including: structure types, materials, slopes, significant elevations, etc.
14. Provide supporting hydrologic and hydraulic calculations.

### Stream Buffer and Related Information

15. Show the location of all perennial and intermittent streams and drainage ways.
16. Show the intermittent and perennial stream buffers and where measured from (top of bank and show and label top of bank). Label Drainage Maintenance and Utility Easement (DMUE). Ensure sheet flow is achieved prior to the undisturbed buffer.
17. Label the dimensions and restrictions within the buffer (that is, To Remain Undisturbed, 50% impervious, vegetated, etc)
18. Show the location of jurisdictional waters and wetlands.\*

\*The U.S. Army Corps of Engineers and the N.C. Division of Water Quality regulate wetlands and waters of the United States through the 404 Corps Permit and 401 State Water Quality Certification process. The City encourages the protection and enhancement of wetlands and surface waters to promote improved water quality and water quantity management, as well as fish and wildlife biota and habitat preservation, and other benefits to local comprehensive watershed management. *Site designers/developers are responsible for obtaining all applicable Local, State, and Federal permits/certifications/approvals as necessary for proposed site development activities and submitting a copy of the applicable permits to Stormwater Management Division as requested.*

Please add the following note on the plan: "All the necessary approvals have been (will be) obtained from State and Corps for any wetland disturbance and/or stream crossing disturbance"

19. Indicate location of proposed stream crossing(s) showing the proposed grading and overall stream impact (includes culvert and outlet protection dimensions). (Alternative analysis may be required by the City to reduce and /or mitigate impacts).

### FEMA Regulated Floodway/Floodplain Information

20. Show designated FEMA-regulated floodway and Special Flood Hazard Area (SFHA) boundaries on property as taken from the effective Flood Insurance Rate Map (FIRM). Note the 1% annual chance Base Flood Elevation (BFE) as provided in the Flood Insurance Study (FIS). Show and label cross sections and for limited detail studied streams, the non-encroachment area boundary.
21. If the site is located within a FEMA Special Flood Hazard Area (SFHA) the following additional requirements will apply:
  - Note the reference level (top of the lowest floor) elevations of all structures, also show flood proofing (non-residential facilities only) elevations of all structures. Note submittal of the required Elevation Certificates (EC) for structures located in the SFHA. The first EC must be submitted after the reference level is established and the final (as-

- built) EC must be submitted before the Certificate of Occupancy is issued. If floodproofing is proposed, a floodproofing certificate must be submitted prior to the start of construction.
- Note that no encroachment / development into FEMA-regulated floodway or non-encroachment area boundary shall be made\*.
  - A Floodplain Development Permit Application must be submitted and a Floodplain Development Permit issued prior to or concurrent with Site Plan approval.
  - If a FEMA-designated floodway or floodplain does not exist on the property/parcel, note the nearest distance to a FEMA-designated floodway, if within 2000 feet.

\* In general, encroachment into a FEMA-regulated floodway is not permitted unless section 30-7-5.4(A) of the City of Greensboro Development Ordinance is met. Questions regarding development procedures within SFHA's may be directed to the Floodplain Administrator in the City's Stormwater Management Division.

Any proposed structures to be located adjacent to intermittent and perennial streams without an established Special Flood Hazard Areas (SFHA) require a BFE to be determined in accordance with Section 30-7-5.6(F) of the City of Greensboro Development Ordinance. Elevation or floodproofing certification is not required if the adjacent grade is five (5) feet or more above the Base Flood Elevation (BFE).

#### Low density development information

22. Provide completed watershed scoresheet. Refer to Chapter 2 of this manual or Section 30-7-2-2 of the Greensboro Development Ordinance.
23. For each factor where points are claimed, the requirements of that factor must be clearly depicted on the plans (for example, if 20 points for factor 7, "stream buffer along drainageways" are claimed, the plans need to show a 50' buffer on each side of the creek, the areas to remain wooded, and note the total buffer area amount and the wooded area amount).

#### Watershed Development in WCA (Watershed Critical Area)

24. Show location of natural slopes greater than 15% which are adjacent to streams and drainageways. Show drainageways carrying 17 cfs in the 100 yr storm. These areas and jurisdictional wetlands must remain undisturbed and either dedicated as drainageway and open space or platted as Undisturbed Easement (UDE) and common elements.
25. On the plan and plat show limits of disturbance and label undisturbed areas as Undisturbed Easement.
26. Note that drainage will be provided by means of open vegetated channels.
27. Note the intended land use and SIC Industry Code. Show location of proposed storage tank(s) and indicate material to be stored. A secondary containment system must be constructed for the tank(s) and approved by the City.



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## Stormwater Control BMP Information

28. Indicate the type(s) of non-structural and/or structural stormwater control best management practices (BMPs) that are proposed. If proposing to use *existing* on-site or off-site controls, provide information to demonstrate that the controls have been approved by the City and can continue to meet quantity/quality control requirements.
29. If proposing to use off-site stormwater controls, indicate the location and owner(s) of the controls and provide information to demonstrate that the property owner will assist in maintaining the controls.
30. If proposing to use a public owned regional stormwater management facility, provide information to demonstrate that the municipality accepts participation from the property owner.
31. Show the approximate location of the proposed stormwater controls and the location of the inlets and outlets of the control.
32. Show and label the 20' access easement to the stormwater control from the public R-O-W to the DMUE around the facility. Show the DMUE and label as "DMUE over and 15' around \_\_\_\_\_" DMUE must include all the components of the BMP (inlets, outlets, energy dissipators, etc). If access easement is not located in common elements a gravel access road is required.
33. Show the approximate size, configuration, and hydraulic structures for the stormwater control/improvement (with calculations). If proposing to use *existing* on-site or off-site controls, provide information to demonstrate that the controls have been approved by the City and can continue to meet quantity/quality control requirements.
34. Provide applicable maintenance agreements for proposed stormwater controls.
35. Note: The engineer's certification of completion will be required prior to the final plat or certificate of occupancy. The stormwater control is to be inspected to ensure it is functioning as designed and has full design volume prior to issuance of the final certificate of occupancy.
36. Note: The property owner (or homeowner's association) is responsible for maintaining the stormwater control(s) according to the approved maintenance plan and direction of the City of Greensboro.
37. Note: The City of Greensboro and their assigns have right to access the stormwater control(s) for inspections or maintenance, as necessary.
38. Note (for Underground Detention Systems only): The property owner or (or owner's Representative) is responsible for the inspection of the Underground Detention System

according to the approved maintenance plan and the City of Greensboro's Underground Detention System Policy.

Please provide preliminary design for the proposed stormwater control, drainage area, surface area calculations, etc.

### **Grading Plans**

The following information is required on all Stormwater Management (SWM) Plans:

1. On the coversheet label the Watershed Location of Proposed Site Development: Note the watershed (i.e., North Buffalo Creek, South Buffalo Creek, Horsepen Creek) for the proposed site development. Note water-supply watershed name (i.e., Greensboro Watershed) and water-supply watershed designation (i.e., WS-III, WS-IV, WCA), as applicable.
6. Note the maximum amount of built-upon area (per watershed development restrictions, stormwater control design, etc.) (Include % based on total site acreage).
  - For development which includes a BMP provide allocation table (onsite drainage area, offsite drainage area, total drainage area, onsite BUA, offsite BUA, total BUA, max BUA per stormwater control design and per watershed density)
7. Show the proposed disturbed (site development) area and note the amount. If site is located in the watershed critical area please include % of disturbance based on total site acreage.
9. Label the amount of off-site drainage area and runoff quantities that discharge onto site.

### **Stream Buffer and Related Information**

15. Show the location of all perennial and intermittent streams and drainage ways.
16. Show the intermittent and perennial stream buffers and where measured from (top of bank and show and label top of bank). Label Drainage Maintenance and Utility Easement (DMUE). Ensure sheet flow is achieved prior to the undisturbed buffer.
17. Label the dimensions and restrictions within the buffer (that is, To Remain Undisturbed, 50% impervious, vegetated, etc)
18. Show the location of jurisdictional waters and wetlands.\*

\*The U.S. Army Corps of Engineers and the N.C. Division of Water Quality regulate wetlands and waters of the United States through the 404 Corps Permit and 401 State Water Quality Certification process. The City encourages the protection and enhancement of wetlands and surface waters to promote improved water quality and

water quantity management, as well as fish and wildlife biota and habitat preservation, and other benefits to local comprehensive watershed management. *Site designers/developers are responsible for obtaining all applicable Local, State, and Federal permits/certifications/approvals as necessary for proposed site development activities and submitting a copy of the applicable permits to Stormwater Management Division as requested.*

Please add the following note on the plan: "All the necessary approvals have been (will be) obtained from State and Corps for any wetland disturbance and/or stream crossing disturbance"

19. Indicate location of proposed stream crossing(s) showing the proposed grading and overall stream impact (includes culvert and outlet protection dimensions). (Alternative analysis may be required by the City to reduce and /or mitigate impacts).

#### FEMA Regulated Floodway/Floodplain Information

20. Show designated FEMA-regulated floodway and Special Flood Hazard Area (SFHA) boundaries on property as taken from the effective Flood Insurance Rate Map (FIRM). Note the 1% annual chance Base Flood Elevation (BFE) as provided in the Flood Insurance Study (FIS). Show and label cross sections and for limited detail studied streams, the non-encroachment area boundary.
21. If the site is located within a FEMA Special Flood Hazard Area (SFHA) the following additional requirements will apply:
  - Note the reference level (top of the lowest floor) elevations of all structures, also show flood proofing (non-residential facilities only) elevations of all structures. Note submittal of the required Elevation Certificates (EC) for structures located in the SFHA. The first EC must be submitted after the reference level is established and the final (as-built) EC must be submitted before the Certificate of Occupancy is issued. If floodproofing is proposed, a floodproofing certificate must be submitted prior to the start of construction.
  - Note that no encroachment / development into FEMA-regulated floodway or non-encroachment area boundary shall be made\*.
  - A Floodplain Development Permit Application must be submitted and a Floodplain Development Permit issued prior to or concurrent with Site Plan approval.
  - If a FEMA-designated floodway or floodplain does not exist on the property/parcel, note the nearest distance to a FEMA-designated floodway, if within 2000 feet.

\* In general, encroachment into a FEMA-regulated floodway is not permitted unless section 30-7-5.4(A) of the City of Greensboro Development Ordinance is met. Questions regarding development procedures within SFHA's may be directed to the Floodplain Administrator in the City's Stormwater Management Division.

Any proposed structures to be located adjacent to intermittent and perennial streams without an established Special Flood Hazard Areas (SFHA) require a BFE to be determined in accordance

with Section 30-7-5.6(F) of the City of Greensboro Development Ordinance. Elevation or floodproofing certification is not required if the adjacent grade is five (5) feet or more above the Base Flood Elevation (BFE).

#### Low density development information

22. Provide completed watershed scoresheet. Refer to Chapter 2 of this manual or Section 30-7-2-2 of the Greensboro Development Ordinance
23. For each factor where points are claimed, the requirements of that factor must be clearly depicted on the plans (for example, if 20 points for factor 7, “stream buffer along drainageways” are claimed, the plans need to show a 50’ buffer on each side of the creek, the areas to remain wooded, and note the total buffer area amount and the wooded area amount).

#### Watershed Development in WCA (Watershed Critical Area)

24. Show location of natural slopes greater than 15% which are adjacent to streams and drainageways. Show drainageways carrying 17 cfs in the 100 yr storm. These areas and jurisdictional wetlands must remain undisturbed and either dedicated as drainageway and open space or platted as Undisturbed Easement (UDE) and common elements.
25. On the plan and plat please show limits of disturbance and label undisturbed areas as Undisturbed Easements.
26. Note that drainage will be provided by means of open vegetated channels.
27. Note the intended land use and SIC Industry Code. Show location of proposed storage tank(s) and indicate material to be stored. A secondary containment system must be constructed for the tank(s) and approved by the City.

### **2.9.3 Stream Protection Requirements**

The Stormwater Management Plan must also show buffers along streams that are required to be protected. The type of streams that are required to be protected and the development activity that is allowed in the buffer can differ in each watershed.

City Ordinance Section 30-7 incorporates NPDES Phase II and other State requirements to protect and preserve stream channels and floodplains from excessive disturbance and encroachment. Watershed master plans adopted by the City, if any, may identify sensitive floodplain areas that require additional conditions for development and/or buffers within floodplain/ flood prone areas in order to provide protection for citizens from identified existing/future flood risks and/or to meet other objectives.

Stream buffers protect the overall quality of the stream, by achieving pollutant removal as runoff flows through the buffer, by providing shade for the stream and habitat for wildlife. Although

stormwater BMPs may be allowed within a certain portion of required stream buffers, other alternative locations should be examined to avoid locating BMPs within stream buffers. Whenever there is practical alternative, structural BMPs should not be placed in stream buffers, but if encroachment into the stream buffer is needed, the amount of stream buffer area that is impacted and the distance between the impact and the stream should be minimized. Also, consideration should be given to the design of the BMP discharge to prevent erosion in the buffer zones and of stream banks.

### *2.9.3.1 Stream Channelization / Piping Restrictions*

Generally, no perennial or intermittent stream is to be channelized or piped without first obtaining approval from the Technical Review Committee and receiving other applicable City, State and Federal permits and certifications. In general, **perennial and intermittent streams may not be channelized or piped** except where street, driveway and utility crossings and other activities are permitted by the ordinance and are shown to be necessary with minimized impacts. In a GWA, WCA, or Other Watershed Districts approval from the Technical Review committee, NC Division of Water Quality and U.S. Army Corps of Engineers shall be secured before any intermittent or perennial stream is channelized. Additionally if the stream is in a WCA it shall not be channelized without prior approval by the Planning Board. Evaluation of the channelization request shall be based on grounds for a modification in accordance with Section 30-9-11.7 of the Greensboro Development Ordinance.

### *2.9.3.2 Stream Buffers*

Riparian areas shall be protected and maintained in accordance with the City ordinance on all sides of surface waters (intermittent streams, perennial streams, lakes, ponds other surface waters and ditches or manmade conveyance that delivers runoff) as indicated on the most recent version of The United States Geological Survey 1:24,000 scale topographic maps, the hardcopy soil survey maps developed by USDA-Natural Resource Conservation Service and other Environmental Management Commission (EMC) approved stream maps.

The City of Greensboro currently has an official Stream Map approved by the North Carolina Environmental Management Commission and the North Carolina Division of Water Quality (effective July 10, 2003). This map shows the origin points for intermittent and perennials streams in the watersupply watershed areas. This map is considered by DWQ and the City of Greensboro to be definitive for intermittent and perennial Streams, ponds and lakes in the Watersupply Watershed Areas. Any areas that have not been mapped on the Stream Map will have to be evaluated by a qualified professional. A third party stream determination must be evaluated and approved by the office having local jurisdiction. Intermittent and perennial stream are defined below.

In all watersheds, intermittent streams, lakes and ponds along them, that are indicated as being intermittent 1) on the most recent version of the US Geological Survey 1:24000 scale (7.5 minute quadrangle) topographic maps, 2) on the most recent version of the Soil Survey map developed by the USDA--Natural Resource Conservation Service, or 3) by an examination of site-specific evidence by the City Stormwater Services Management Division using criteria approved by the

NC Division of Water Quality or U.S. Army Corps of Engineers. However, if the above-mentioned map indicates an area as an intermittent stream but the Stormwater Managements Division finds no intermittent water body actually exists on the ground, that area shall not be deemed an intermittent stream. Ponds and lakes created for animal watering, crop irrigation, or other agricultural uses that are not part of a natural drainageway are not streams. If the City of Greensboro develops a detailed stream network map covering one or more watersheds, and that map is approved by the NC Division of Water Quality, then within the watersheds covered by that map intermittent streams shall thenceforth be as shown by that map. In the event of a conflict in stream determination, a NC Division of Water Quality or U.S. Army Corps of Engineers determination shall supersede any local designation.

Perennial streams and ponds along them, that are indicated as being perennial 1) on the most recent version of the US Geological Survey 1:24000 scale (7.5 minute quadrangle) topographic maps, 2) on the most recent version of the Soil Survey map developed by the USDA--Natural Resource Conservation Service, or 3) by an examination of site-specific evidence by the City Stormwater Services Management Division using criteria approved by the NC Division of Water Quality or U.S. Army Corps of Engineers. However, if the above-mentioned map indicates an area as a perennial stream but the Stormwater Management Division finds no perennial water body actually exists on the ground, that area shall not be deemed a perennial stream. Ponds and lakes created for animal watering, crop irrigation, or other agricultural uses that are not part of a natural drainageway are not streams. If the City of Greensboro develops a detailed stream network map covering one or more watersheds, and that map is approved by the NC Division of Water Quality, then within the watersheds covered by that map perennial streams shall thenceforth be as shown by that map. In the event of a conflict in stream determination, a NC Division of Water Quality or U.S. Army Corps of Engineers determination shall supersede any local designation.

Stream buffer requirements are summarized in the following tables. Stream buffers are most effective when the buffer remains in an undisturbed state. Therefore, it is encouraged that disturbance be minimized in the entire stream buffer, not just the portion that is required to remain undisturbed. Where the buffer is disturbed in accordance to the approved plan, it shall be promptly restored in accordance with Section 15 of the State BMP Manual.



TABLE 30-7-2  
HIGH DENSITY STREAM BUFFER WIDTH\* REQUIREMENTS  
IN WATERSHED DISTRICTS

HIGH DENSITY OPTION

TABLE INSET:

Watershed <u>District</u>	Perennial Streams, Lakes & Ponds			Intermittent Streams		
	<u>Zone 1</u>	<u>Zone 2</u>	<u>Zone 3</u>	<u>Zone 1</u>	<u>Zone 2</u>	<u>Zone 3</u>
Greensboro	<u>30</u>	<u>30--50</u>	<u>50--100</u>	<u>0--30</u>	<u>30--50</u>	N/A
Lake Mackintosh	<u>30</u>	<u>30--50</u>	<u>50--100</u>	<u>0--30</u>	<u>30--50</u>	N/A

Polecat Creek	<u>30</u>	<u>30--50</u>	<u>50--100</u>	<u>0--30</u>	<u>30--50</u>	N/A
<u>Randleman</u>	<u>30</u>	<u>30--50</u>	<u>50--100</u>	<u>0--30</u>	<u>30--50</u>	<u>N/A</u>
<u>Other Watershed Districts</u>	<u>30</u>	<u>30--50</u>	<u>N/A</u>	<u>0--30</u>	<u>30--50</u>	<u>N/A</u>

\*Distances on all sides of water bodies are in feet and are with reference to top of bank for streams and normal pool elevation for all other water bodies. Thus, "0" equals top of bank or normal pool elevation and "30" equals 30 feet landward from top of bank or normal pool elevation.

Intermittent and perennial streams without established Special Flood Hazard Area must meet stream encroachment requirements of Section 30-7-5.6(F)(1) of the Greensboro Development Ordinance

All the stream buffers must be measured from the top of stream bank; lake buffers are to be measured from the normal pool elevation.

Exemptions: Street crossings, utility crossings, water dependant structures.

Stream buffers in the critical area must remain undisturbed with some exemptions (see ordinance 30-7-3.2)

The City of Greensboro Development Ordinance does provide a mechanism for requesting a variance to stream buffer requirements. A stream buffer variance request is handled in the form of a modification to watersupply watershed standards which in themselves carry a significant documentation and justification requirement. Refer to Section 30-9-11.5 of the Greensboro Development Ordinance for additional information on minor and major watershed modifications. Randleman Lake watersupply watershed stream buffer variances are handled as a major watershed modification and as such are to be approved by The Environmental Management Commission via NCDENR Division of Water Quality.

Refer to APPENDIX 10 for the Buffer Bubble document developed by NCDENR Division of Water Quality. All stream buffers in the City of Greensboro must follow document guidelines and show the buffer bubble.

## **2.9.4 Modifications to Stormwater Requirements**

### *2.9.4.1 Water-Supply Watershed Protection*

City of Greensboro Ordinance Section 30-9-11, Modifications, describes the procedures for obtaining a modification to the water supply watershed standards of Chapter 30-7.

### *2.9.4.2 Stormwater Management Control*

#### Quantity Control Requirements

*A modification to the quantity control requirements of Section 27-22 (g) may be granted by the Enforcement Officer if it can be shown by detailed hydrologic and hydraulic engineering studies and analysis which are acceptable to the Enforcement Officer that one of the following applies:*

1. the installation of stormwater management facilities would have insignificant effects on downstream flood peaks; or
2. stormwater management facilities are not needed to protect downstream developments and the downstream drainage system has sufficient capacity to receive any increase in runoff; or
3. it is not necessary to install stormwater management facilities to control developed peak discharge rates at the exit to a proposed development or redevelopment and installing such facilities would increase flood peak discharge rates at some downstream locations; or
4. the Enforcement Officer determines that stormwater management facilities are not needed to control developed peak discharge rates and that installing such facilities would not be in the best public interest.

Quantity control requirements may not be waived if the Enforcement Officer determines that not controlling downstream flood peak discharge rates would increase known flooding or drainage problems, or exceed the capacity of the downstream drainage conveyance system at any point between the exit of a proposed site development or redevelopment and the 10 percent downstream point.



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## **2.10 Regulatory Requirements**

### **2.10.1 Jurisdictional Streams and Wetlands**

It is the intent in most cases to design stormwater management devices to remove pollutants before they have a chance to enter “waters of the United States.” Stormwater BMPs should be constructed outside of perennial streams and natural wetland areas unless no practical alternative exists. Also, natural or existing lakes, ponds, and wetlands should not be considered for stormwater BMP retrofits until Federal and State Permits for such purpose have been obtained. The US Army Corps of Engineers (ACE) requires that all impacts to jurisdictional waters and wetlands be reported to their office. Depending on the impact, the US ACE and NC Division of Water Quality (DWQ) may require the applicant to obtain permits, prepare environmental documents, mitigate for the impact, etc. For Greensboro, the contacts are the US ACE Raleigh Regulatory Field Office at 919-876-8441 and NC DWQ Winston-Salem Division Office at 336-771-4608.

### **2.10.2 FEMA Floodway/Floodplain**

Placement of structures including stormwater structural BMPs within a Special Flood Hazard Area (SFHA) as shown on the effective Flood Insurance Rate Map (FIRM), is strongly discouraged. In the event of a large flood, floodwaters could cause significant damage to the BMP. No structural BMP will be allowed in the designated “floodway” unless Section 30-7-5.4(A) of the Greensboro Development Ordinance is met and all applicable Federal and State permits have been obtained. Structures placed in the SFHA should be appropriately constructed to prevent damage from floodwaters. Structures (including structural BMP’s) placed alongside intermittent and perennial streams without an established SFHA must meet the flood damage prevention set back requirements as listed in Section 30-7-5.6(F). Refer to Section 30-7-5 Flood Damage Prevention, for more information regarding this subject.