**Department of Public Works/Stormwater Division**
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# CITY OF WINSTON-SALEM'S POST CONSTRUCTION STORMWATER MANAGEMENT PERMIT

**PART 1:** APPLICATION
**PART 2:** SUBMITTAL CHECKLISTS

# PART 1

# APPLICATION

(PLEASE READ AND COMPLETE ALL SECTIONS IN FULL)

**UNCOMPLETED APPLICATION ITEMS WILL DEEM A SUBMITTAL INSUFFICIENT**

## 1. Project/Site Information

Project/Site Name: _____
Project Location (Address): _____
PIN(s) (Parcel Identification Numbers): _____
Block/Lot(s): _____
Total Site Area (ac): _____
Total Proposed Disturbed Area (ac): _____
Existing Built-Upon Area (BUA): _____ (ac) _____ (sq.ft.)
Proposed BUA: _____ (ac) _____ (sq.ft.)
Proposed BUA (%): _____ (as a percentage of disturbed area)
Proposed BUA (%): _____ (as a percentage of parcel/site area – for master plans or when using the entire parcel to calculate the percentage)
Net Increase in BUA (if applicable): _____ (ac) _____ (sq.ft.)
For Subdivisions: Number of lots _____ Lot density (units/acre) _____
Low Density (for Water Quality) Development (<24% BUA or < 2 units/acre): YES ____ NO ____
High Density (for Water Quality) Development (>24% BUA or > 2 units/acre): YES ____ NO____

**Note - Exemptions to having to comply with certain provisions of the ordinance and/or having to obtain a permit:**

**A.** If less than 1 acre is disturbed during construction and the development is NOT part of a larger common plan of development then the development is exempt from the Stormwater Quality Provisions of the City of Winston-Salem's Post Construction Stormwater Management Ordinance. (Herein after referred to as "the ordinance" (see Section 75-105 (d)(1) and 75-105 (d)(2) of said ordinance for exemption details).
**Does this apply: Yes_____ No _____**
**(If "No" a stormwater permit that addresses the Quality Provisions must be applied for unless Item C answer is "Yes" below)**

**B.** If the development creates less than 20,000 sq.ft. of a net increase in BUA (comparing proposed to existing) then the development is exempt from the Stormwater Quantity Provisions of the ordinance. (see Section 75-105 (d)(3) of the ordinance for exemption details).
**Does this apply: Yes_____ No _____**
**(If "No" a Stormwater permit that addresses the Quantity Provisions must be applied for)**

**C.** Any development/redevelopment activity for which the proposed BUA is equal to, or less than, the existing BUA on the site is exempt from all provisions (Quality and Quantity) of the ordinance. (see Section 75-105 (d)(4) of the ordinance for details).
**Does this apply: Yes_____ No _____**

**Note:** Sealed copies of the existing and proposed site plans and grading plans that include relevant information shown on them to verify if a development or redevelopment meets exemptions A and B, or C, of the above must be submitted to the Stormwater Division. If either of A or B does not apply then complete an application and the relevant checklist(s) that addresses completion of either a no adverse impact downstream study, hydrologic and hydraulic report/study for management for quality and/or management for quantity or whichever combination thereof applies and the checklist for the Stormwater management plan set(s).

## 2. Engineer/Designer Information

Engineer Name: _____ NC PE License #: _____
Engineers Company/Firm: _____

Engineers Company/Firm Address: _____
_____
Office Phone: _____ Cell Phone: _____ Fax: _____
Design Engineers E-mail: _____
Engineers Signature: _____ Date: _____

## 3. Project Owner Information

Owner/Developer Name (if an individual): _____
Owner/Developer/Firm (if a company): _____
Name of person signing and authorized to sign on behalf of a firm/company_____
Owner/Developer Address: _____
_____
Office Phone: _____ Cell Phone: _____ Fax: _____
Owner/Developer Contact E-mail: _____
Owner/Developer Signature: _____Date: _____

## 4. Contractor Information (if available at the time of the application)

Contractor Name: _____
Contractor Address: _____
_____
Office Phone: _____ Cell Phone: _____ Fax: _____
Contractor E-mail: _____

## 5. Application Review Fee (check box to indicate inclusion in submittal)

☐ Review Fee of $220 is included with the application. The review fee should be in a check made payable to "The City of Winston-Salem". An application is not considered complete without submittal of the review fee at the time of the application.

## 6. Stormwater Management System Financial Surety

A non-refundable financial surety must be posted with the City of Winston-Salem prior to issuance of a Post Construction Stormwater Management permit for any development which has SCM's (Stormwater Control Measures) also known as BMP's (Best Management Practices) designed as part of the Stormwater Management Plan. **A permit will not be issued until such a surety is in place**
**There are two types of surety accepted by the City and which one is submitted and established depends on the developer and their intent as regards the entity responsible for long term Operation and Maintenance of the Stormwater Management System. These are outlined as Options A and B that follow.**

**Select which option applies to your submittal:**

☐ **OPTION A - For all Stormwater Management Systems that are to be owned and maintained by a single owner (typically commercial or single owner developments):** The developer must comply with the surety requirements outlined in Section 75-404 of the ordinance namely:

- Submit a sealed engineer's estimate, or, certified contractors bid tab for the construction cost of the Stormwater Management System to the Stormwater Division upon approval of the design phase of the permit (plans and report/study receiving approval from reviewer). This estimate or bid tab should include all items related to the cost of constructing the system including, but not limited to, grading, conversion costs from the erosion control phase and associated components of that phase of the project to the post construction phase, SCM component breakdown costs, stormwater conveyance system costs throughout the site that convey runoff to and from any SCM including any by-pass conveyances, landscaping costs etc.
- Upon approval of the estimate or contractors bid tab by the Stormwater Division, the owner/developer must submit a check or other acceptable form of payment to The City of Winston Salem that is equal to 4% of this approved estimated construction cost.

☐ **OPTION B - For all Stormwater Management Systems that are to be owned and maintained by a homeowners association, property owners association, or similar entity (typically associated with residential subdivisions or other types of multi owner developments):** The developer must comply with the surety requirements outlined in Section 75-402(b) of the ordinance namely:

- **Estimate A:** Submit a sealed engineer's estimate, or, certified contractors bid tab for the construction cost of the Stormwater Management System to the Stormwater Division upon approval of the design phase of the permit (plans and report/study receiving approval from reviewer). This estimate or bid tab should include all items related to the cost of constructing the system including, but not limited to, grading, conversion costs from the erosion control phase and associated components of that phase of the project to the post construction phase, SCM component breakdown costs, stormwater conveyance system costs throughout the site that convey runoff to and from any SCM including any by-pass conveyances, landscaping costs etc. This estimate, once approved will be used in determining the developer's escrow account contribution.
- **Estimate B:** Submit a sealed engineer's estimate of the annualized cost of operation and maintenance of the Stormwater Management System to the Stormwater Division upon approval of the design phase of the permit. This estimate, once approved, will form the basis for future HOA or POA contributions to the escrow account
- The developer must establish a Home Owners Association (HOA), or similar type of entity, that will agree to operate, maintain, repair, inspect and if necessary reconstruct the Stormwater Management System as part of the permit application process. The City of Winston-Salem's Attorneys must review all Association Articles of any such entity prior to establishment to ensure adequacy and proof of establishment is to be provided to the Stormwater Division after the fact.
- Establish an escrow account which shall be used to maintain, operate, repair, inspect or if necessary reconstruct the Stormwater management system
- The developer must pay into the escrow account, by depositing with the escrow agent, an amount equal to 15% of the approved **"Estimate A"** and provide proof of deposit of payment with the escrow agent to the Division
- Two-thirds of **"Estimate B"** required to fund the escrow account shall be deposited by the HOA, or, POA into the escrow account within the first five years and the full amount deposited within 10 years following the initial construction of the Stormwater Management System (from date of City of Winston-Salem's As-Built plans approval)

**The surety is not provided until the plans/design phase of the permit review has been approved as review comments may require changes to the design and hence cost. The above information is provided in order to enable the developer and his engineer to plan to take this phase of the permit process into account from the outset and to inform the Stormwater Division what option surety they will be submitting**

## 7. Stormwater Management System Operation and Maintenance Agreement and if applicable Escrow Agreements Information

A fully reviewed and recorded Operation and Maintenance Agreement, per Section 74-402 of the ordinance, must be in place and recorded for any development that has a Stormwater Management System designed and approved. **A permit will not be issued until such an agreement is recorded**

**Note:** In addition to the above, for residential developments an escrow agreement must also be submitted, reviewed, approved and recorded. This will also be required for any other type of development that will involve a HOA/POA. See further below for details. *

The following describes the process of the Operation and Maintenance Agreement submittal and requirements for its review:

Upon approval of the design phase of the permit the developer must submit to the Stormwater Division an appropriately signed and notarized Operation and Maintenance Agreement with all relevant exhibits attached. This agreement must be signed by the person, or, entity who is taking responsibility for all future operation and maintenance requirements for the Stormwater Management System. The Agreement shall consist of the following:

- The main body of the agreement including all signature pages signed and notarized appropriately by the owner/developer and if applicable the HOA/POA. The standard template and approved language of the Agreement is available upon request to the Stormwater Engineer. Please note that there is one template for single owner type developments and one for multi owner (HOA/POA) type developments and the appropriate template will be sent to the engineer upon request.
- **Exhibit A** is a legal description of the land on which the development is taking place. This exhibit (as with Exhibit B and C) should be included in the agreement following the main signature pages
- **Exhibit B** is either a recorded plat of the required Stormwater private access, drainage and maintenance easements for the Stormwater Management System, or, in lieu of a recorded plat/dedicated easements, a legal description of the blanket easement that encompasses the entire property on which the development is taking place. Please note that if a plat of dedicated easements is to be provided these easements must match what is shown on the approved design plans and the plat must be submitted through the City of Winston-Salem's/Forsyth County Planning Department plat review process before ultimately recording the plat at the Forsyth County Register of Deeds. Only a copy of the recorded plat that shows the deed book and page number will be accepted as Exhibit B. An unrecorded plat is not acceptable.
- **Exhibit C** is the signed and notarized Operation and Maintenance Manual(s) for the specific SCM(s) designed. Some of the more frequently designed SCM manual templates that we accept may be found at the following location: http://www.cityofws.org/Departments/Stormwater-Erosion-Control/Post-Construction Other manuals that a developer or his engineer may choose to submit will be accepted by the City if they review them and find them appropriate to address all inspection and maintenance needs for a particular SCM
- * For residential and other types of multi owner type developments an **Escrow Agreement** must also, in addition to an O&M Agreement items above, be submitted to the Stormwater Division. The standard template and approved language of this agreement is available upon request to the Stormwater Engineer.

Once all of the above applicable items are complete they should be submitted to the Stormwater Division for review. The Stormwater Director will sign the agreement(s) if they are deemed to be sufficient and then forward the agreement(s) to the City Attorney's office for their own standard review and signature process. Once the Agreement(s) have been signed by all relevant City officials the City Attorney's Office will contact the owner/developer to collect the agreement(s) for recording purposes. The owner/developer must record the agreement(s) at the Forsyth County Register of Deeds office and provide a copy of this recorded agreement(s) (showing the deed book and page number stamp) back to the Stormwater Division for their files. **Note: A permit will not be issued until the Stormwater Division is in receipt of a copy of the recorded applicable agreement(s).**

## 8. As-Built records submittal - acknowledgement by owner/developer and design engineer of requirement to submit these records upon completion of construction

We, the undersigned owner/developer and design engineer for this development, acknowledge that immediately after completion of the construction of the Stormwater management system and as it becomes operational, the system shall be inspected by the design engineer and a detailed set of as-built plans based on survey information of the Stormwater Management System and its design components and as-built calculations of the Stormwater Management System that verify the system has been built and is operating in accordance with the approved design, be submitted to the City of Winston-Salem's Stormwater Division for their review and approval per the ordinance requirements. **Failure to submit this information as required will result in the development been placed under a Notice of Violation (NOV) at that time if necessary per provisions of the ordinance in Section 75 – Division 5 – Enforcement and Violation**

Owner/Developer Signature: _____ Date: _____

Design Engineer Signature: _____ Date: _____

# PART 2

## SUBMITTAL CHECKLISTS

(PLEASE CHECK APPROPRIATELY ALL BOXES IN THE VARIOUS CHECKLISTS OUTLINED BELOW TO INDICATE THE OPTION(S), OR COMBINATIONS THEREOF, THAT YOU INTEND PURSUING IN YOUR SUBMITTAL. WRITE N/A (NOT APPLICABLE) NEXT TO ANY BOX IF THAT IS THE SITUATION)

☐ 1. Concept Plan Meeting items if applicable

**Report/Study Related Checklists**

☐ 2. No Adverse Impact Downstream Study in lieu of management for quantity. Also complete appropriate checklist 3 and 4 items if the project is high density as it relates to water quality.

☐ 3. Hydrologic/Hydraulic Analysis Report/Study for developments that will incorporate a Stormwater management device(s). Checklist No.2 may also need to be filled out if a study is submitted in lieu of management for quantity.

**Plan Set Related Checklists**

☐ 4. Stormwater Management Plan items

☐ 5. Low Density Development Plan items if applicable to water quality (Complete checklist 4 if a SCM(s) is included for water quantity.

☐ 6. Master Plan items (typically submitted for campus style developments looking to stay within low density thresholds for water quality, in combination with all, or parts, of other checklists above to address low density water quality provisions and water quantity provisions.

**UNCOMPLETED CHECKLISTS WILL DEEM A SUBMITTAL INSUFFICIENT**

## 1. **Checklist for a Concept Plan Meeting** (items per Section 75-203(a) of the ordinance)

**NOTE:** This checklist only applies if a concept meeting may have been deemed appropriate at the request of the Stormwater Division staff or at the owners/design engineers request before a full submittal is made and is deemed complete. If a concept meeting is requested by any such party the following items should be prepared for the meeting by the owner/design engineer:

- ☐ Existing site plans showing at a minimum existing site layout, property boundaries, existing topography, perennial and intermittent streams, wetlands, existing drainage conveyances, floodplain/floodway limits, existing stormwater management systems, if applicable
- ☐ Proposed site plan showing at a minimum the proposed site layout, property boundaries, proposed topography, perennial and intermittent streams, wetlands, proposed drainage conveyances, floodplain/floodway limits, proposed stormwater management systems, if applicable
- ☐ Existing and proposed BUA percentages and areas and units/acre totals if available
- ☐ Pre and Post development drainage area delineation maps showing the location of proposed development and pertinent drainage areas, including off-site areas draining to the proposed development
- ☐ A conceptual plan for any proposed stormwater management system(s) that would enable the site to meet stormwater quantity and quality regulations as applicable. The plan should indicate the type of SCM(s) the engineer proposes using.
- ☐ If available and sufficiently advanced enough at the time of the meeting, preliminary calculations for the system regarding the quality and quantity design criteria of the ordinance should be provided for discussion and analysis. These should include hydrologic inputs such as soils data/groupings, curve number analysis and time of concentration methodology/analysis.

## 2. Checklist for a "No Adverse Impact Downstream Study" (items per Section 75-203(b)(2) of the ordinance)

**NOTE:** This checklist only applies if a no adverse impact downstream study is been submitted in lieu of management for the quantity design provisions of the ordinance and the site is either exempt from quality, or, is qualifying as a low density development in terms of the quality provisions. If the site has to comply with the high density provisions of the ordinance as it relates to water quality then those appropriate General Items, Hydrologic Section, Hydraulic Section and Water Quality Section items in Checklist No. 3 that should also be completed

**Submit two copies of the report for review. Report to be spirally bound preferably. 3 ring binders WILL NOT BE ACCEPTED**

**General Items:**

☐ Cover page with project title; project name and address; owner's name, address, email and phone number; designers/preparer's name, address, email and phone number; and designers seal, signature and date

☐ Table of contents (with sequential numbering of pages) indicating report sections, appendices, exhibits, tables and figures

☐ Project narrative – to include a description of project, a description of how the project will meet the ordinance requirements with regard to quality (if applicable) and quantity provisions of the ordinance, pre and post development site conditions, channel protection etc.

☐ A description of the downstream study point(s) and how it/they were chosen

☐ A description of the methodologies, assumptions and procedures used in preparing the analysis

☐ Summary of any previous hydrologic/hydraulic studies, if applicable – e.g. for a site that already has an existing Stormwater Management Plan in operation for development prior to this proposal or other information which may pertain to the development of the property

☐ A conclusion paragraph summarizing the findings of the study. Include tables of results comparing pre and post development peak discharges and increases, pre and post development conveyance capacity comparisons and velocity comparisons (for erosive impact analysis) and any other pertinent data you may have analyzed to ensure a no adverse impact situation. Also include your professional opinion of a "no adverse impact" statement with regard to all downstream properties and conveyances from the development of the property.

☐ Copies of all state and federal permits as applicable are included in the report if applicable. (Note: this would include for example any required US Army Corps of Engineer and North Carolina Division of Environmental Quality permits for work in regulated waters/wetlands such as 401/404 permit, State Dam Safety permits etc.)

☐ Include any Variance Petition Form(s), if applicable, to request a variance granting permission to use land in a manner otherwise prohibited by The City of Winston-Salem's Post Construction Stormwater Management Ordinance, if applicable. See Section 75-306 of the ordinance for qualification requirements for a variance. Variance request forms may be found at the following

web address: http://www.cityofws.org/Departments/Stormwater-Erosion-Control/Post-Construction/Variance-Request

**Hydrologic information to be included (including maps and plans), data and quantities for pre and post development project conditions, should be as follows:**

☐ Site and watershed topography – existing and proposed

☐ Delineated drainage areas and outfall points including offsite if applicable, mapped and quantified, for pre and post development conditions

☐ The location of the downstream study point(s) indicated on mapping.

☐ Land uses for pre and post development (mapped and quantified)

☐ Soils types (mapped and quantified, include hydrologic group classifications)

☐ Pre and post development drainage paths and lengths for each delineated drainage basin - mapped and quantified including start and finish points of sheet flow, shallow concentrated flow and concentrated flow along with lengths, conveyance sizes and all other relevant data used in the TR-55 time of concentration calculations. Explain choices of Manning's coefficients.

☐ Precipitation data (most recent data from NOAA website)

☐ Time of concentration (TC) calculations for pre and post development conditions. Use TR-55 analysis. Include a description of any assumptions made if applicable. Note: Sheet flow lengths should not exceed 100 feet. Kirpich method may be accepted for smaller watersheds (2 acres or less). Use a 5 minute minimum time if calculated value is less than this.

☐ Composite Curve Number (CN) analysis and determinations for pre and post development conditions. Describe why each CN was chosen including references to type of ground cover

☐ Hydrographs for both pre and post development conditions used to analyze a no adverse impact conclusion. Must include peak flows and volumes for the 2, 10 and 25 year storm events of minimum 6 hour duration and the 1 year 24 hour event.

**Perform a 2, 10, 25 and 100 year storm events of minimum 6 hour duration and 1 year 24 hour hydraulic performance analyses for off-site impacts for the following items:**

☐ Analyze to a suitable downstream point – typically the 10% point which is defined as the point downstream where the proposed site development or redevelopment represents less than 10% of the total watershed area draining to that point. Other study analysis points may be used if approved by the Stormwater Division Staff in advance of submittal or requested after submittal if deemed appropriate, but are less common. Refer to section 75-203(b)(2) of the ordinance for more details.

☐ Evaluate all road crossings between the site and the study point(s) for changes in service level due to the proposed development. Include capacity calculations and hydraulic grade line analysis with profiles of HGL's.

☐ Evaluate impacts to existing and/or off-site impounding structures, if applicable

☐ Evaluate potential increases in downstream structural flooding impacts.

☐ Evaluate capacity of receiving conveyances such as pipes, culverts, swales etc. Provide design information such as conveyance dimensions and existing type of lining specifications (for swales) and show increases in water surface elevations for receiving channels at suitable cross section intervals. These cross sections particularly of swales must be shown on the plans submitted with the report as well.

☐ Describe how you determined or assumed the dimensions of the conveyances. Ideally they need to be field verified/measured/surveyed prior to the study.

☐ Evaluate all overland flow areas on downstream properties and open channel conveyances for erosive velocities in the post development condition

☐ Per Section 75-303(f) of the ordinance, evaluate the receiving natural channel or waterbody (on site and/or offsite to the downstream study point) been evaluated to ensure that the downstream conveyances are not eroded and/or degraded by altered stormwater flows from the development or re-development? Mitigation measures shall be implemented where the volume of runoff from a post development 2 year, 1 hour rainfall event is 10% greater than the volume of the runoff from a predevelopment 2 year, 1 hour rainfall event. Calculations must be provided to validate no impacts. Acceptable mitigation alternatives include on-site detention to reduce post construction runoff rates and volumes and natural channel stabilization measures to control channel degradation. Where allowed by other State and Federal agencies (e.g. US Army Corp of Engineers), armoring of receiving channels is permissible impact. Copies of permits from such agencies must be provided with the submittal as mentioned in the General Items section of this checklist. If the calculation shows detention systems are required to mitigate the impact then the no adverse impact study no longer applies and the designer should complete Checklist No. 3

**Water Quality - Low Density Provision Items:**

Note: These items apply to projects submitting a no adverse impact study for quantity but that must still obtain a permit for complying with the low density development provisions of the ordinance as it applies to quality. High density projects should follow Checklist 3 requirements

☐ Built upon areas are meeting the landward buffer requirements for all perennial and intermittent surface waters, as stipulated in section 75-302(2) for low density projects and section 75-302(5) for high density projects, in the ordinance. Note: the buffer widths are based on disturbed area. Therefore if the plans show less than 10 acres disturbed during the construction of the development or redevelopment then the required landward buffer width, as measured from the top of stream bank, shall be 30 feet and the undisturbed buffer width (within the landward buffer and measured from the top of creek back) shall be 15 feet. For a disturbed area of 10 to 50 acres the buffer width shall be 50 feet and for a disturbed area of greater than 50 acres the buffer width shall be 100 feet. Perennial and intermittent surface waters shall be determined to exist if they are indicated on USGS and/or Soil Survey mapping. Designers may submit sealed documentation from NCDEQ or from NCDEQ certified professionals that prove otherwise, based on field determinations, if they choose to do so.

☐ Vegetative conveyances are been used to the maximum extent practicable per the low and high density provisions of the ordinance

## 3. Checklist for the Hydrologic and Hydraulic Analysis Report/Study for developments that will incorporate stormwater management device(s)

**NOTE:** This checklist only applies to the following design situations:

- **A development that must manage for both quality and quantity provisions of the ordinance**
- **A development that is exempt from quality but must manage for quantity** (Ignore the water quality items in this checklist)
- **A development that is exempt from quantity but must manage for quality** (Ignore the water quantity items in this checklist)
- **A development that must manage for quality but in lieu of managing for quantity chooses to submit a no adverse impact downstream study.** (In this case ensure all items regarding water quality in this checklist and all items in Checklist No.2 for the no adverse impact study are addressed and that the general items from both checklists are addressed as appropriate)

**Submit two copies of the report for review. Report to be spirally bound preferably. 3 ring binders WILL NOT BE ACCEPTED**

**General Items:**

☐ Cover sheet with project title; project name and address; owner's name, address, email and phone number; designer/preparer's name, address, email, and phone number; and designers seal, signature and date

☐ Table of contents (with sequential numbering of pages) showing report sections, appendices, exhibits, tables and figures

☐ Project narrative to include a description of project, a description of how the project will meet the ordinance requirements with regard to quality and quantity provisions (as applicable) of the ordinance, pre and post development site conditions, channel protection etc.

☐ A description of the methodologies, assumptions and procedures used in preparing the analysis

☐ Summary of any previous hydrologic/hydraulic studies, if applicable – e.g. for a site that already has an existing Stormwater Management Plan in operation for development prior to this proposal or other information which may pertain to the development of the property

☐ A conclusion paragraph summarizing the findings of the study/report. Include tables of results comparing pre and post development peak discharges and increases as well as routed discharges and drawdown times for applicable storm events

☐ Copies of all state and federal permits as applicable are included in the report. (Note: this would include for example any required US Army Corps of Engineer and North Carolina Division of Environmental Quality permits for work in regulated waters/wetlands such as 401/404 permits, State Dam Safety permits etc.)

☐ A sealed geotechnical engineering analysis report including details of subsurface exploration which shows the investigation of the location of the seasonally high groundwater elevation if this elevation is required to be ascertained per the North Carolina Division of Environmental Quality (NCDEQ) Stormwater Design Manual. Borings or other approved means of subsurface exploration, shall be taken at, or as close as practicable to the immediate vicinity of each

proposed stormwater management device. Boring(s) should include the existing ground elevations at the boring location(s) as well as depths of boring(s)

☐ Include any Variance Petition Form(s) to request a variance granting permission to use land in a manner otherwise prohibited by The City of Winston-Salem's Post Construction Stormwater Management Ordinance, if applicable. See Section 75-306 of the ordinance for qualification requirements for a variance. Variance request forms may be found at the following web address: http://www.cityofws.org/Departments/Stormwater-Erosion-Control/Post-Construction/Variance-Request

**Hydrologic Section:**

☐ Location map showing the project in relation to adjacent properties, streets and nearby water features

☐ Site and watershed topography – existing and proposed

☐ Delineated drainage areas and outfall points including offsite if applicable, mapped and quantified, for pre and post development conditions

☐ Land uses pre and post development (mapped and quantified)

☐ Soils types (mapped and quantified, include hydrologic group classifications)

☐ Pre and post development drainage paths and lengths for each delineated drainage basin - mapped and quantified including start and finish points of sheet flow, shallow concentrated flow and concentrated flow along with lengths, conveyance sizes and all other relevant data used in the TR-55 time of concentration calculations. Include reasons for choice of a Manning's coefficient(s) or assumptions of why you chose a certain coefficient

☐ Precipitation data (most recent data from NOAA website)

☐ Time of concentration (TC) calculations for pre and post development conditions. Use TR-55 analysis. Include a description of any assumptions made if applicable. Note: Sheet flow lengths should not exceed 100 feet. Kirpich method may be accepted for smaller watersheds (2 acres or less). Use a 5 minute minimum time if calculated value is less than this.

☐ Composite Curve Number (CN) analysis and determinations for pre and post development conditions. Describe why each CN was chosen including references to type of ground cover

**Hydraulics Section**

☐ Open channel conveyance capacity design for all designed swales including bypass conveyances. If the development has a SCM(s) designed for quantity controls for the 2, 10 and 25 year, 6 hour rainfall event, then the conveyance capacity designs must be based on the 25 year, 6 hour rainfall event.

☐ Provide adequate cross sections of the open channel conveyances with dimensions noted.

☐ Design information/calculations on the types of liner (vegetated, rip-rap etc.) to be used to ensure conveyances will not suffer erosion.

☐ Design computations for all culverts, storm drainage pipes and inlets (both for conveyances that carry runoff to a SCM(s) and for any bypass systems). Design shall include a labeled schematic

of the storm drain network and pipe and inlet labels should match those on the design plans, design discharges, pipe capacities, pipe sizes, slopes and lengths, profiles, outlet velocities, upstream and downstream invert elevations and hydraulic grade line information/profiles (for the 25 year event). Note: if the development has a stormwater device designed for quantity controls for the 2, 10 and 25 year, 6 hour rainfall event, then the conveyance capacity designs must be based on the 25 year, 6 hour rainfall event. The systems may be designed for the 10 year storm event capacity as long as it can be shown that the HGL for the 25 year storm does not surcharge the system.

☐ Provide design calculations and design specifications for all rip-rap aprons or other forms of approved energy dissipaters

**Stormwater Management System Design Section:**

**Water Quality Items**

☐ Vegetative conveyances are been used to the maximum extent practicable per the low and high density provisions of the ordinance

☐ The SCM(s) designed must be approved device(s) for 85% TSS (Total Suspended Solids) removal and referenced in the NCDEQ Stormwater Design Manual. The manual can be found at the following link: http://deq.nc.gov/about/divisions/energy-mineral-land-resources/energy-mineral-land-permit-guidance/stormwater-bmp-manual

☐ The design of the SCM(s) meets all of the MDC (Minimum Design Criteria) in the relevant chapter of the NCDEQ Stormwater Design Manual

☐ The SCM(s) are designed so that the first inch runoff volume is discharged at a rate equal to or less than the predevelopment discharge rate for the 1 year, 24 hour rainfall event per Section 75-302(b)(2) of the ordinance

☐ All SCM calculations are provided as necessary per the NCDEQ Stormwater Design Manual chapter requirements to verify the design, including drainage areas, built upon areas and percentages, surface area and volume calculations etc. as needed and that these match plan call outs

☐ All existing built upon areas onsite (that will remain) and offsite must also be accounted for and treated in the SCM(s) unless those area can be successfully bypassed.

☐ Built upon areas are meeting the landward buffer requirements for all perennial and intermittent surface waters, as stipulated in section 75-302(2) for low density projects and section 75-302(5) for high density projects, in the ordinance. Note: the buffer widths are based on disturbed area. Therefore if the plans show less than 10 acres disturbed during the construction of the development or redevelopment then the required landward buffer width, as measured from the top of stream bank, shall be 30 feet and the undisturbed buffer width (within the landward buffer and measured from the top of creek back) shall be 15 feet. For a disturbed area of 10 to 50 acres the buffer width shall be 50 feet and for a disturbed area of greater than 50 acres the buffer width shall be 100 feet. Perennial and intermittent surface waters shall be determined to exist if they are indicated on USGS and/or Soil Survey mapping. Designers may submit sealed documentation from NCDEQ or from NCDEQ certified professionals that prove otherwise, based on field determinations, if they choose to do so.

☐ If retaining walls are utilized as part of an SCM design, free body diagrams showing all forces, moments and computations are provided for determining factors of safety against sliding and overturning.

## Water Quantity

- ☐ If the development or redevelopment disturbs less than 3 acres and is not part of a larger common plan of development, redevelopment or sale and is less than 24% built upon area then the standards for stormwater quantity shall be limited to controlling only the pre versus post development peaks for the 2 and 10 year design storms per Section 75-105(d)(6) of the ordinance. If this applies check the box and if not indicate "N/A".
- ☐ The SCM(s) are designed and calculations/supporting design documentation such as model information as applicable including plotted hydrographs for pre and post development drainage basins, pond reports, reservoir routing stage storage information etc. provided, to show that the development is managing the 2, 10 and 25 year storm events of minimum 6 hour duration so that the post development routed peak discharge rates for those events are less than or equal to the pre development peak discharge rates for the site
- ☐ The SCM(s) are designed and calculations/supporting design documentation such as model information including plotted hydrographs etc. provided, to show that the development detains the stormwater runoff volume at least equal to the difference between the pre and post development volume for the 25 year storm of 6 hour duration and that this volume difference is detained and released over a period of no less than 48 hours but no longer than 120 hours
- ☐ All existing built upon areas onsite (that will remain) and offsite must also be accounted for and attenuated in the SCM(s) unless those area can be successfully bypassed
- ☐ Calculations are provided to show that the development of the site does not increase flooding impacts to structures on properties upstream and downstream of the site during a 100-year flood event
- ☐ Discharge from any on-site stormwater management system into any natural or surface drainage channel or feature has been evaluated to ensure that the discharge does not cause damage to the receiving system.
- ☐ Are any water impounding structures (dams) designed in accordance with NC Dam Safety standards and if required reviewed and approved by the NC Dam Safety Engineer. Proof of compliance with this requirement shall be provided by the applicant during the submittal.
- ☐ If retaining walls are utilized as part of an SCM design, free body diagrams showing all forces, moments and computations are provided for determining factors of safety against sliding and overturning.

## 4. Checklist for Stormwater Management Plan Items

**NOTE:** This checklist applies to plans incorporating an SCM(s) to meet the high density water quality and/or water quantity management provisions of the ordinance)

**Submit two copies of the plans for review (Plan sheets should be 36" x 24")**

☐ Plan set should include the following at a minimum: Cover sheet with a list of plans sheets including; existing site plan; proposed site plan; stormwater management and grading and drainage plan; utility plan; erosion control plans, drainage area delineation sheets, details sheets as appropriate for stormwater management items etc. Other sheets may be required by the City of Winston-Salem if deemed necessary

☐ All plans sheets are sealed and certified/signed by a registered North Carolina professional engineer or landscape architect, to the extent that the General Statutes, Chapter 89A, allow

☐ Date(s) of preparation and all revisions

☐ Vicinity map (upper right corner of top sheet)

☐ North arrow as applicable on each plan sheet

☐ Appropriate scale(s)

☐ Appropriate legend identifying features and layers for all plan sheets.

☐ Established benchmark of known elevation indicated on the on existing site plan to which every other elevation is referenced

☐ Property boundary lines for the proposed development/redevelopment site, along with adjacent property lot lines and street right of way lines. Indicate names of the streets and if they are private or public on the plans.

☐ Existing and proposed zoning and land use

☐ Show ownership information for site and adjacent properties

☐ Note allowable limits on BUA % (if applicable).

☐ Existing and proposed impervious areas for the development in terms of area (acres and/or sq.ft.) and percentage of the site. Include references to any existing impervious area that may be existing and will remain or will be removed etc.

☐ State the number of units/acre, if applicable.

☐ Location(s) of existing easements (temporary and permanent, public and private) if applicable

☐ Proposed private drainage and access easements shown and labeled for future maintenance of any stormwater management system(s). 20-ft minimum width required to surround all permanent SCM(s) and all conveyances to and from the SCM(s) and bypass conveyance systems and the maintenance and access easements must connect to a public right-of-way. If a blanket easement covering the entire property is proposed in lieu of platting dedicated easements then a note indicating the provision of such a blanket easement is to be provided on the stormwater management plan sheet

☐ Delineation of all existing and proposed impervious surfaces including locations of buildings, roads, parking areas and other permanent impervious structures or ground coverings.

☐ Existing and proposed utilities

☐ Existing and proposed stormwater discharge points (surface and subsurface flows). Show where and how the runoff from the developed site, including outflows from SCM(s) safely connects into a downstream receiving drainage system and or/open channel or streams

☐ Delineated drainage area maps for pre and post development conditions provided showing all discharge points for all basins/sub-basins for pre and post development conditions including relevant off site areas contributing to the site. Show and quantify the impervious area within each basin.

☐ Pre and post development drainage paths and lengths for each delineated drainage basin - mapped and quantified including start and finish points of sheet flow, shallow concentrated flow and concentrated flow along with lengths, conveyance sizes and all other relevant data used in the TR-55 time of concentration calculations, or the Kirpich method (if permitted)

☐ Show all perennial and intermittent streams, lakes, ponds, impoundments, drainage swales, conveyances, regulatory floodplains (including 100-year floodplain identifying the Base Flood Elevations where available, floodway fringe, 50% flood fringe line (also called the "floodplain no fill line", etc.)) wetlands, natural storage and other physical or environmentally sensitive features within or adjacent to the project area.

☐ Show the required landward buffer widths from all perennial and intermittent surface waters and also indicate the undisturbed buffer widths as measured from top of bank, if applicable. **Note: These buffers must be platted prior to permitting**

☐ Show and label all existing and proposed site topography. Utilize a contour interval that is appropriate for the site conditions, typically 2-ft unless specific site conditions dictate otherwise, and extend contours into adjacent properties as appropriate to be able to show discharge and off site drainage patterns.

☐ Identify and label all proposed and existing stormwater conveyance systems including but not limited to storm drainage inlets, catch basins, junction boxes etc. showing their location, details, profiles, cross-sections and other specifications as necessary to be able to construct all of the proposed major and minor stormwater management conveyance systems (Indicate type and size of conveyance, e.g. storm drainage pipe, grass swale, diversion berms etc.) Include all bypass systems as well. The conveyances must be designed to convey the 25 year event unless otherwise exempt.

☐ Hydraulic data summary for all proposed pipes and/or channels. (Designed for 25 year event unless otherwise exempt)

☐ Cross sections/details with specifications of dimensions and type of lining of any permanent swales and/or swale/berm combinations

☐ Roof drainage directions and roof leader locations/specifications

☐ Estimated seasonal high groundwater elevation (documented in geotechnical report) in the vicinity of the SCM(s) if this elevation is required to be ascertained per the NCDEQ Stormwater Design Manual. Label this elevation in the profile/sectional views of the proposed SCM(s)

☐ Construction notes, specifications and design details for any existing stormwater management system components if applicable. e.g. If an existing and already approved stormwater management plan is been modified to allow for a development expansion or addition.

☐ Recommendations from any soils engineering or engineering geology report incorporated in the plans and/or specifications as needed e.g. required permeability testing/specifications, recommendations on liners etc.

☐ Proposed limits of disturbance and the area of disturbance stated.

☐ Erosion Control plans and detail sheets clearly specifying and showing how a site is to be transitioned from the erosion control phase to the permanent post construction stormwater management phase. Detailed sequencing must be provided that describes the steps required to convert a temporary sediment and erosion control device to a permanent SCM(s) situation. This sequencing should incorporate a note stating that the contractor is to contact the City of Winston-Salem's Stormwater Engineer for a pre-construction site meeting and upon completion of construction of the Stormwater management system a set of as-built plans and calculations of the system prepared by the design engineer are to be provided to the City before the contractor leaves the site so that a "close out" meeting with the contractor and design engineer may be held with the City of Winston-Salem's Stormwater Engineer to ensure the system is built per the City's satisfaction and in accordance with the design/permit.

☐ Specifications of all permanent energy dissipation devices

☐ Details of all the components of the proposed stormwater management system that the engineer chooses to design. The SCM(s) used in a design to meet the water quality provisions of the ordinance must be approved and referenced for 85% TSS removal in the NCDEQ Stormwater Design Manual and meet all of the relevant MDC of that manual. **The following items are examples of what is expected to be seen on the plans for the SCM(s) depending on the type of SCM(s) designed:** Plan views of the SCM(s) location, detailed cross sections and profiles of the SCM(s) showing critical design specifications as applicable for such components as side slopes, soil/media, structural components such as risers /outlet control structures, design elevations, relevant peak design storm elevations and water quality elevations, orifice and weir information, bypass structures, underdrains and cleanout locations, forebay details, emergency spillway information, aquatic shelf information, details of inlet and outlet pipes/conveyances **Note: Other items may be required as necessary depending on the design chosen.**

☐ Provide landscaping plans and specifications in accordance with the NCDEQ Stormwater Design Manual if applicable for the SCM(s). Note: No trees or shrubs should be planted within 10 feet of inlet or outlet pipes, spillways or flow spreaders, or, on any dam areas

☐ Provide details and specifications of all liners that may be required for a SCM(s) as applicable. If the designer does not choose to include a liner he must include and provide information on his plans and in geotechnical reports verifying that excluding a liner is warranted

## 5. Checklist for Low Density Development Plan Items (if applicable to water quality)

**NOTE:** If a Stormwater Management Device(s) is to be designed for water quantity then Checklist 4 should be completed as this checklist will also cover the low density items for quality

**Submit two copies of the plans for review (Plan sheets should be 36" x 24")**

- ☐ Plan set should include the following at a minimum: Cover sheet with a list of plans sheets included; existing site plan; proposed site plan; grading and drainage plan; erosion control plans. Other sheets may be required by the City of Winston-Salem if deemed necessary
- ☐ All plans sheets are sealed and certified/signed by a registered North Carolina professional engineer or landscape architect, to the extent that the General Statutes, Chapter 89A, allow
- ☐ Date(s) of preparation and all revisions
- ☐ Vicinity map (upper right corner of top sheet)
- ☐ North arrow as applicable on each plan sheet
- ☐ Appropriate scale(s)
- ☐ Appropriate legend identifying features and layers for all plan sheets.
- ☐ Established benchmark of known elevation indicated on the on existing site plan to which every other elevation is referenced
- ☐ Property boundary lines for the proposed development/redevelopment site, along with adjacent property lot lines and street right of way lines. Indicate names of the streets and if they are private or public on the plans.
- ☐ Existing and proposed zoning and land use
- ☐ Show ownership information for site and adjacent properties
- ☐ Note allowable limits on BUA % (if applicable).
- ☐ Existing and proposed impervious areas for the development in terms of area (acres and/or sq.ft.) and percentage of the site. Include references to any existing impervious that may be existing and will remain or will be removed etc.
- ☐ State the number of units/acre, if applicable
- ☐ Delineation of all existing and proposed impervious surfaces including locations of buildings, roads, parking areas and other permanent impervious structures or ground coverings.
- ☐ Existing and proposed stormwater discharge points (surface and subsurface flows). Show where and how the runoff from the developed site, safely connects into a downstream receiving drainage system and or/open channel or streams
- ☐ Show all perennial and intermittent streams, lakes, ponds, impoundments, drainage swales, conveyances, regulatory floodplains (including 100-year floodplain identifying the Base Flood

Elevations where available, floodway fringe, 50% flood fringe line (also called the "floodplain no fill line", etc.)) wetlands, natural storage and other physical or environmentally sensitive features within or adjacent to the project area.

☐ Show the required landward buffer widths from all perennial and intermittent surface waters and also indicate the undisturbed buffer widths as measured from top of bank, if applicable. **Note: These buffers must be platted prior to permitting**

☐ Show and label all existing and proposed site topography. Utilize a contour interval that is appropriate for the site conditions, typically 2-ft unless specific site conditions dictate otherwise, and extend contours into adjacent properties as appropriate to be able to show discharge and off site drainage patterns.

☐ Identify and label all proposed and existing stormwater conveyance systems including but not limited to storm drainage inlets, catch basins, junction boxes etc. showing their location, details, profiles, cross-sections and other specifications as necessary to be able to construct all of the proposed major and minor stormwater management conveyance systems (Indicate type and size of conveyance, e.g. storm drainage pipe, grass swale, diversion berms etc.)

☐ Hydraulic data summary for all proposed pipes and/or channels.

☐ Cross sections/details with specifications of dimensions and type of lining of any permanent swales or swale/berm combinations

☐ Proposed limits of disturbance and the area of disturbance stated.

☐ Specifications of all permanent energy dissipation devices

☐ Plans and design should follow the Low Density Guidance chapter of the NCDEQ manual and meet those requirements contained therein.

## 6. Checklist for Master Plans

**NOTE**: Master plans are most commonly submitted in the following scenario and submittal of them is at the choice of the owner/developer and his engineer:

Where a developer has a large tract of land but is only developing a portion of it and is wanting to use the entire tract area rather than using the site area (the area within the disturbed limits) in determining the built upon percentage in order to qualify the development as a low density project as it relates to the water quality provisions of the ordinance. Therefore instead of having to potentially manage the new built upon area for water quality purposes as it relates to the disturbed (site) area, they utilize the full tract, to fall under and only have to comply with, the low density provisions. The development may still have to comply with the water quantity provisions of the ordinance if more than 20,000 sq.ft. of net new BUA is created and if that is the case then the developer must submit a no adverse impact study, per Checklist 2, or, if they choose to manage for quantity for the developed portion, complete the relevant items of Checklist 3 and Checklist 4. A no adverse impact study can also be submitted which accounts for a greater amount of BUA than for what is currently proposed in order to allow for future build out within the approved master plan limits if the City of Winston-Salem Stormwater Division sees adequate. Updates to the master plan in the future can then reference this study. The developer/owner must realize that the master plan becomes a "living document" and it is their responsibility to ensure the most current copy is provided to the Stormwater Division Office for their files. They also need to keep a file in their own records. No credit is given to existing built upon area within the tract of land at the time of master plan submittal. Therefore, if there is already 15% build out then the developer has 9% left to develop to keep the site as a low density development which is any site that is less than 24% BUA or less than 2 units/acre. Should this 24% or 2 units/acre threshold be exceeded in the future the developer must not only manage for the increase in BUA at that time but also for all of the BUA previously permitted under the low density option since the time of creation of the Stormwater Master Plan and apply for a new permit at that time to meet all relevant ordinance criteria and provisions. The following items at a minimum should be submitted for a master plan:

- ☐ Sealed engineered site plan sheets titles "Stormwater Master Plan(s)" showing the full property parcel boundaries intended to be covered by the master plan. The plans must show and call out the existing BUA on the property at the time of submittal and the proposed BUA. The existing (current) BUA or units/acre should be referenced as well as the proposed BUA or units/acre. This master plan and BUA or units/acre call outs must be updated for any future additions to the property.
- ☐ Complete Checklist No.5 to ensure the low density water quality items are addressed on the master plan
- ☐ Complete Checklist No. 2 **IF** a no adverse impact study is to be submitted to meet the quantity provisions of the ordinance
- ☐ Complete the appropriate items in Checklists No's 3 and 4 **IF** a SCM(s) is to be incorporated to meet the quantity provisions of the ordinance
- ☐ Provide a spreadsheet with the "running totals" of BUA and units/acre, as applicable, which becomes a "living document" and must be updated by the developer/owner for all future additions that may occur over time