



FCPS – FLOOD STUDY PLAN SUBMITTAL CHECKLIST

Project Name _____ **Watershed** _____ **Zoning** _____

Project Acreage _____ **Proposed Impervious** _____ **Disturbed Acreage** _____

Applicant:

Name _____
 Address: _____
 Phone: _____
 Email: _____

Engineer:

Name: _____
 Address: _____
 Phone: _____
 Email: _____

Flood Study Submittal Package Requirements

[14-12] The Flood Study submittal package must include all applicable items below to demonstrate compliance with applicable regulations. Unless otherwise noted, all references shown in brackets are for the [Wake County Unified Development Ordinance \(UDO\)](#), adopted 04/17/06. Select all applicable items below and provide with the submittal.

<input type="checkbox"/>	1.	Erosion Control and Stormwater Joint Application (Required to initiate processing)	
		Review Fees (Required to initiate processing)	
<input type="checkbox"/>	2.	Minor (less than 100 acres of drainage) = \$500 per crossing Major (greater than or equal to 100 acres of drainage) = \$1,000 per crossing	
<input type="checkbox"/>	3.	Methodology:	
	<input type="checkbox"/>	Minor study submittals may use Culvert Headwater Charts for inlet and outlet computations provide for review [14-15-3, 14-15-4]	
	<input type="checkbox"/>	Major study submittals must provide Standard Step Method or equivalent computations and field surveyed cross sections locations on construction plans; Submittals shall include the HEC-RAS checklist and may require FEMA approval [14-15-5]	
<input type="checkbox"/>	4.	Other documents:	
	<input type="checkbox"/>	a.	WC ONLY PRELIMINARY ZONING AND SUBDIVISION APPROVAL: Copy of approval notification (property description, subdivision or COSD approval, or Board of Adjustment approval, etc.).
	<input type="checkbox"/>	d.	401/404 Documentation (Buffer determination letters, PCN application, comments, and approval)
	<input type="checkbox"/>	e.	NCDOT Approval (Temporary Construction Entrances, Encroachment Agreements, etc.)
	<input type="checkbox"/>	f.	Encroachment agreement(s) completed, signed and notarized for all off-site construction
<input type="checkbox"/>	5.	Cover letter stating the purpose of the submission RESUBMITTALS: A letter detailing any changes, comments, proposed solutions to review comments, etc.	
<input type="checkbox"/>	6.	Copy of the USGS Quad Map with delineated project limits	
<input type="checkbox"/>	7.	Copy of the Wake County Soil Survey map with delineated project limits	



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<input type="checkbox"/>	9.	1 set of Flood Study Calculations:
<input type="checkbox"/>	a.	Provide flood study narrative describing study objectives including a summary of findings
<input type="checkbox"/>	b.	Existing and proposed watershed, sub-watershed and land use boundaries with supporting Zoning overlaid. Wake County requires Flood Study reports to be designed for upstream built out conditions
<input type="checkbox"/>		Inlet and Outlet Control Head Water computations and elevations for all culverts [NCDOT standard]
<input type="checkbox"/>		Delineate HW/D backwater area plus 1 (one) foot rise and label as Q100 backwater easement and label FFE on all affected lots with Special Flood Hazard Areas.[14-15-3, 14-15-4, 14-15-5]
<input type="checkbox"/>	c.	Include all assumptions for supporting methodology used for determining Cubic Feet per Second (Q100)
<input type="checkbox"/>	d.	Drainage area worksheets delineating upstream drainage area for each crossing / impact area in Acres
<input type="checkbox"/>	e.	Existing and proposed Tc/Tt flow paths used to calculate pre/post development flows.
<input type="checkbox"/>	f.	Show/label all flood encroachment information, including field surveyed cross-sections referenced to station locations, proposed culvert inverts, profile view, plan view, back slopes, all elevations, channel slope and sum of disturbed areas are required.
<input type="checkbox"/>	g.	Indicate the location and establishment of a temporary or permanent benchmark, note must be NAVD 88 for all SFHA's.
<input type="checkbox"/>	h.	Documentation supporting applicant's choice of Manning "n" values for channel and/or over bank.
<input type="checkbox"/>	i.	A velocity dissipater design specifying length, width, mean stone diameter, outlet velocity and detail is required for each culvert. [10-21-2]
<input type="checkbox"/>	j.	Note the Minimum Finished Floor Elevation on lots that are affected by the SFHA 100-yr. floodplain. Example MFFE = 268.4'
<input type="checkbox"/>	k.	Should flood study design incorporate overtopping of PRIVATE road or driveway, specify stabilization scope and type of downstream embankment. Overtopping shall not exceed 0.5 feet. [FEMA guidance] PUBLIC roads may not be overtopped. [8-32-4]
<input type="checkbox"/>	l.	Place an *(asterisk) on all lots affected with flood hazards and add note to plans " * - Before Acquiring a Building Permit for Lots Marked with an " * " the Builder May Need to Obtain a Flood Hazard Permit from County Zoning Administration. The Builders Engineer, Architect of Surveyor Must Certify on Any Permit That All Flood Hazard Requirements Are Met. There Shall be No Filling or the Erection of Permanent Structures in the Areas of Wake County Flood Hazard Soils or Federal Emergency Management Agency Flood Zones. [14-14-1]
<input type="checkbox"/>	m.	For submerged culverts to meet 404/401 certification, adjust the effective flow area in HEC-RAS report to reflect this condition.
<input type="checkbox"/>	n.	Summarize the pre-construction and the post-construction BFE at the upstream and downstream property lines before and after the proposed encroachment.



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<input type="checkbox"/>	<input type="checkbox"/>	o.	Should flood study report prove offsite backwater, applicant must secure and record any necessary backwater encroachment easements. For on-site backwater, label backwater area with flood elevation plus 1'. [14-15-3, 14-15-4, 14-15-5]
<input type="checkbox"/>	<input type="checkbox"/>	p.	Overlay and Label Future Conditions / 500 year FEMA Floodplain.
<input type="checkbox"/>	<input type="checkbox"/>	q.	Submit draft flood study as built compliance document.
<input type="checkbox"/>	<input type="checkbox"/>	r.	Signature, Date And Professional Seal: for all Material to be reviewed.
<input type="checkbox"/>	10.		One (1) electronic copy of a complete set of construction drawings
<input type="checkbox"/>	11.		Proposed Site Plan:
<input type="checkbox"/>	<input type="checkbox"/>	a.	Combined Erosion Control, Stormwater and Floodplain Approval Block (Cover Sheet)
<input type="checkbox"/>	<input type="checkbox"/>	b.	Location/Vicinity Map
<input type="checkbox"/>	<input type="checkbox"/>	c.	North arrow, graphic scale, drafting version date, legend and professional seal
<input type="checkbox"/>	<input type="checkbox"/>	d.	Existing and proposed contours: plan and profiles for roadways
<input type="checkbox"/>	<input type="checkbox"/>	e.	Boundaries of tract: including project limits
<input type="checkbox"/>	<input type="checkbox"/>	f.	Proposed improvements: roads, buildings, parking areas, grassed landscaped, and natural areas.
<input type="checkbox"/>	<input type="checkbox"/>	g.	Lot lines, lot numbers and road names
<input type="checkbox"/>	<input type="checkbox"/>	h.	Utilities: community water and sewer, plan/profiles, easements and sediment controls, and offsite septic.
<input type="checkbox"/>	<input type="checkbox"/>	i.	Stormwater Network: inlets, culverts, swales, ditches, channels and drainage easements.
<input type="checkbox"/>	<input type="checkbox"/>	j.	Delineate crossings and/or impacted flood hazard area(s) and label on site plan
<input type="checkbox"/>	<input type="checkbox"/>	k.	Show all Riparian Buffers [Article 9-21]; (Neuse: [15A NCAC 02B.0233 & 0242])
<input type="checkbox"/>	<input type="checkbox"/>	l.	Delineation of current FEMA boundaries (floodway, non-encroachment areas, flood fringe and future/0.2%)
<input type="checkbox"/>	<input type="checkbox"/>	m.	Delineation of flood prone soil areas; provide soils re-delineation approval as needed
<input type="checkbox"/>	<input type="checkbox"/>	n.	RESIDENTIAL ONLY Asterisk lots requiring flood permits
<input type="checkbox"/>	<input type="checkbox"/>	o.	Finished floor elevations as required
<input type="checkbox"/>	<input type="checkbox"/>	p.	Q-100 backwater elevations must be shown above all culverts/SCMs draining 4 or more acres
<input type="checkbox"/>	<input type="checkbox"/>	q.	Location and type of all proposed stormwater management structures (<i>grass swale, wet/dry detention basin, filtering/infiltration basin, bioretention, etc.</i>)



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<input type="checkbox"/>	r.	Proposed stormwater easements, access lanes and backwater easements. Provide and label minimum 20 ft. Access easement and 10 ft. Maintenance easement from toe of stormwater pond embankment. Provide and label 20 ft. Drainage easement between every 4 residential lots or 4 acres of drainage area.
<input type="checkbox"/>	s.	Provide stream crossing detail compliant with NC DEQ and COE including pump around and erosion control measures and construction sequence
Standards and Requirements By marking items with an "X", applicant acknowledges potential standards to be applied to the proposed development.		
Wake County UDO Article 14 – Flood Hazard Areas		
<input type="checkbox"/>	12.	14-12 Flood Study A study of the potential changes in the base flood elevation caused by the obstruction, encroachment, alteration or relocation of: (1) a FEMA mapped floodway; (2) a non-encroachment area; (3) a FEMA mapped area of special flood hazard that has not previously been studied in detail; (4) flood hazard soils areas with a total drainage area of more than 5 acres but no more than 25 acres; (5) flood hazard soils areas with a total drainage area of more than 25 acres, but less than 100 acres; and (6) flood hazard soils area with a total drainage area of 100 acres or more.
<input type="checkbox"/>		14-15-3 Drainage Areas greater than 5 acres but less than 25 acres Encroachments into a flood hazard soils area must be designed and certified by an appropriate design professional. The design must be based upon the establishment of a temporary or permanent benchmark and an analysis of the effects of the proposed encroachment to establish a base flood elevation or depth of flow, using Manning's Equation, field surveyed cross-sections including channel slope, Wake County Topographic Maps, and, where appropriate, use of Culvert Headwater Charts. No benchmarks are required when establishing a depth of flow. A minimum of one vertical foot must be added to the calculated base flood elevation or depth of flow to provide a factor of safety due to the potential backwater effects of the encroachment. The analysis must conclude that no existing or proposed structures or offsite properties will be inundated by the base flood. As-built certification of compliance with the construction drawings must be provided prior to receiving a footing inspection from the Wake County Building Inspections Division on any structures on any lots involved in the analysis. The as-built certification with the construction drawings is in addition to any elevation certifications which may be required for the structures.



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<input type="checkbox"/>		<p>14-15-4 Drainage Areas greater than 25 acres but less than 100 acres</p> <p>Encroachments into a flood hazard soils area must be designed and certified by an appropriate design professional. The design must be based upon the establishment of a temporary or permanent benchmark and an analysis of the effects of the proposed encroachment to establish a base flood elevation or depth of flow; using Manning's Equation, field surveyed cross sections including channel slope, Wake County Topographic Maps, and where appropriate use of Culvert Headwater Charts. No benchmarks are required when establishing a depth of flow. A minimum of one vertical foot must be added to the calculated base flood elevation or depth of flow to provide a factor of safety due to the potential backwater effects of the encroachment. The analysis must conclude that no existing or proposed structures, or offsite properties will be inundated by the base flood. As-built certification of compliance with the construction drawings must be provided prior to receiving a footing inspection from the Wake County Building Inspections Division on any structures on any lots involved in the analysis. The as-built certification with the construction drawings is in addition to any elevation certifications which may be required for the structures</p>
<input type="checkbox"/>		<p>14-15-5 Drainage Areas greater than 100 acres</p> <p>Encroachments into a flood hazard soils area must be designed and certified by an appropriate design professional. The design must be based upon the establishment of a temporary or permanent benchmark based on National Geodetic Vertical Datum and an analysis of the effects of the proposed encroachment to establish a base flood elevation; using Manning's Equation, the Standard Step Method to analyze backwater effect, fieldsurveyed cross sections including channel slope, and where appropriate, use of Culvert Headwater Charts. The analysis must conclude that no existing or proposed structures, or offsite properties will be inundated by the base flood. As-built certification of compliance with the construction drawings must be provided prior to receiving a footing inspection from the Wake County Building Inspections Division on any structures on any lots involved in the analysis. The as-built certification with the construction drawings is in addition to any elevation certifications which may be required for the structures.</p>
<input type="checkbox"/>	13.	<p>14-23 Impoundments and Dams</p> <p>If an impoundment is proposed to be constructed or retained within any proposed subdivision, the following standards shall apply. These County standards are separate from and do not supersede any State Agency requirements.</p> <ul style="list-style-type: none"> • The impoundment and its dam shall be constructed or structurally upgraded to accommodate the runoff from a 24-hour, 100-year frequency storm. • Runoff computations must use SCS methods or other acceptable engineering standards.
<input type="checkbox"/>	14.	<p>10-20-3 Operation in Lakes or Natural Watercourses -Land disturbing activity in connection with construction in, on, over, or under a lake of natural watercourse must minimize the extent and duration of disruption of the stream channel. Where relocation of a stream forms an essential part of the proposed activity, the relocation must minimize unnecessary changes in the stream flow characteristics.</p>

Applicant Signature: _____

Date: _____