DURHAM

1869

CITY OF MEDICINE

City of Durham "Reference Guide for Development" Provided by the: Public Works Engineering Division, Public Works Stormwater Services Division and Department of Transportation

City of Durham Public Works Department

Mailing Address: ***101 City Hall Plaza***

Durham, North Carolina 27701

Location: ***3rd Floor of City Hall***

Telephone: ***(919) 560-4326***

Facsimile: ***(919) 560-4316***

City of Durham Homepage: ***www.durhamnc.gov***

Original Printing-February 11, 1998
Revised Printing-May, 2008
Revised-September, 2008
Revised -March 2009
Revised –March and June 2010
Revised – July 2011
Revised – July, October, and December 2012
Revised – May and June 2013
Revised – July 2013
Revised – September 2013
Revised – May 2014
Revised – December 2014
Revised – September 2015
Revised – March and April 2016
Revised – January and February 2017
Revised- May and June 2017
Revised – November 2017
Revised – December 2017
Revised – January 2018

TABLE OF CONTENTS

Directory		3
Introduction		5
Site Plan, Final Plat and Construction Drawing Submittal Process		
Section 1.0	Public Works Department Engineering and Stormwater Services Divisions and Department of Transportation and the Rezoning, Site Plan and Plat Process	7
Section 1.1	Engineering Site Plan/Final Plat Submittal Checklist Requirements	9
Section 1.2	Stormwater Services Rezoning, Site Plan and Final Plat Submittal Checklist Requirements	14
Section 1.3	Transportation Site Plan/Final Plat Submittal Checklist Requirements	25
Section 2.0	Construction Drawing Review and Construction Process	29
Section 2.1	Construction Drawing Approval Process	34
Section 2.2	Construction Drawing Checklist	45
Section 2.3	Construction Drawing Profile Checklist	49
Section 2.4	Construction Permitting	53
Section 2.5	Construction Phase	58
Section 3.0	Permitting	61
Section 4.0	As-Built Drawings	67
Design and Construction Guidelines		
Section 5.0	Water Supply/Distribution	76
Section 6.0	Cross Connection Control	83
Section 7.0	Sanitary Sewer System	86
Section 8.0	Stormwater Design Criteria	92
Section 8.1	Peak Runoff Rate Increases	103
Section 8.2	Neuse River Basin Performance Standards	107
Section 8.3	Stormwater Control Measures (SCMs)	112
Section 8.4	Stormwater BMP Design Summaries	114
Section 8.5	<Blank>	132
Section 8.6	BMP Certifying Engineer Program for SCMs in the City of Durham	133
Section 9.0	Streets	168
Section 10.0	Transportation	172
Section 11.0	Sidewalks	186
Section 12.0	Standard Notes	187
Section 13.0	Forms	198
Section 14.0	Fees	199

DIRECTORY

These are the most commonly referred to numbers that are involved in development plans.

City of Durham

Main contact information for the City of Durham:

Address: 101 City Hall Plaza, Durham, NC 27701
Web address: http://durhamnc.gov
Phone number: 919-560-1200

Department, Division or Group	Telephone (919)	Fax (919)
Public Works Department (**http://durhamnc.gov/506/Public-Works**)		
Engineering Development Review Group ***Engineering plan review, construction drawing approval, extension agreements***	560-4326	560-4316
Inspection Section ***waterlines, sanitary sewer, storm sewer, right-of-ways***	560-4326	560-4316
Engineering Services ***water and sanitary sewer availability, petitions, water meters, frontage and tapping fees, water and sewer permits***	560-4326	560-4316
Stormwater Services ***Stormwater design review, BMP inspections***	560-4326	560-4316
Street Maintenance Division	560-4312	560-4340
Department of Transportation	560-4366	560-4561
Department of Water Management		
Water and Sanitary Sewer Maintenance	560-4344	560-4340
Cross Connections	560-4194	
Solid Waste Management Department	560-4186	560-1228
General Services: Urban Forestry	560-4197	560-4196
Parks and Recreation Department	560-4355	560-4021
Budget and Management Services	560-4111	560-4687

Joint City/County Offices

Department	Telephone (919)	Fax (919)
City-County Inspections Department	560-4144	560-4484
City-County Planning Department	560-4137	560-4641

Durham County

Department	Telephone (919)	Fax (919)
Durham County **http://dconc.gov/**		
County Engineering and Environmental Services		
Utility Division	560-9033	544-8590
Sedimentation and Erosion Control	560-0739	560-0740
Fire Marshal	560-0660	560-0670

Public Health Department: Environmental Health	560-7800	560-7830

State of North Carolina

State Agency	Telephone (919)	Fax (919)
NC Department of Transportation Division 5 (http://www.ncdot.gov/doh/divisions/?id=5)		
District 2 Engineer – Durham County	220-4750	560-3357
Resident Engineer's Office – Durham	220-4680	560-3399
NC Department of Environmental and Natural Resources (http://deq.nc.gov/)		
Raleigh Regional Office	791-4200	571-4718
Division of Water Quality: NPDES and Collection Systems (http://deq.nc.gov/about/divisions/water-resources)	807-6300	807-6489
NC Ecosystem Enhancement Program (http://deq.nc.gov/about/divisions/mitigation-services)	707-8976	707-8976

Federal Government

Federal Agency	Telephone (919)	Fax (919)
U.S. Army Corps of Engineers Wilmington District (http://www.saw.usace.army.mil/)		
Raleigh Field Office	554-4884	562-0421

Utility Companies

Utility Company	Telephone
Duke Energy Progress (http://www.duke-energy.com/north-carolina.asp)	919-508-5400
Piedmont Electric (http://www.pemc.coop)	1-800-222-3107
Time Warner Cable (http://www.timewarnercable.com/)	1-855-820-9903
PSNC Energy (http://www.psncenergy.com/en/)	1-877-776-2427
NC One Call (http://nc811.org)	811
Verizon (http://www22.verizon.com/)	1-800-VERIZON

INTRODUCTION

We are pleased to distribute to design professionals this Reference Guide for Development. The City of Durham Public Works Department, Engineering, Stormwater Services and Transportation Divisions, prepared this guide to provide a reference manual to some of the City of Durham Public Works Department's design standards and design requirements and to reference other key Departments involved in the Development Review Process. This guide does not cover all aspects of plan review or design requirements and references only the most frequently asked questions and procedures. The policies, requirements, specifications and charges listed herein are subject to change as amended.

It should be noted that projects may be required to meet additional criteria as set by the Durham City Council or the City of Durham Public Works Department. The City of Durham reserves the right to require any additional measures in accordance with City Codes, ordinances, policies and to address public safety concerns during any stage of the project.

There are detailed construction specifications for water, sanitary sewer, street and stormwater construction that are available from the Engineering Division of the Public Works Department.

If you have questions regarding the City of Durham Engineering Division's or Stormwater Services Division's procedures or policies not addressed in this guide, please contact the Divisions (919-560-4326). If you have questions regarding the City of Durham Department of Transportation's procedures or policies not addressed in this guide, please contact the Division (919-560-4366).

PREFACE TO THE UPDATE OF THE REFERENCE GUIDE FOR DEVELOPMENT

As an ongoing effort to provide better customer service to all parties involved with land development in Durham, the Public Works Department has undertaken the task of updating and revising this manual. Much of the initial printing remains the same but numerous issues, including those highlighted below, have been revisited and revised.

Summarized below are the major changes and additions to this guide. This summary is provided to give a "thumbnail sketch" of the revisions. We have elected not to highlight changes throughout the manual. This new version of the Reference Guide for Development supersedes all previous versions.

Section	Revision Description
1.2	Checklists have been revised and final plat checklists are now required to be submitted.
2.1	Clarifications as to when construction drawings can be submitted for review.
2.2	Clarification to Construction Submittal Checklist for site plan requirements to submit construction drawings.
2.3	Addition of requirement for Project Construction Information sheet to be submitted at time of Pre-Construction Conference.
4.0	Clarification of As-built requirements - Addition of a electronic file component for As-builts *(this program will begin January 2007 – see statement on the Public Works website)
4.1	Revised as-built requirements for the BCE Program.
4.2	Revised as-built requirements for the BCE Program.
4.3	Revised as-built requirements for the BCE Program.
4.4	Revised as-built requirements for the BCE Program.
4.5	Constructed Wetland As-built Requirements
4.6	Underground Detention As-built Requirements
5.0	Requirements in order to obtain a water meter revised.
7.0	Clarification of Easement location requirements. Requirements in order to obtain a sewer service connection revised.
8.0	Multiple updates
8.1	Multiple updates
8.2	Multiple updates
8.3	Multiple updates
8.4	Multiple updates
12.0	Addition of new note requirement for all site plans.
	June 2010 Revision:
1.1	Revised Engineering Final Plat Checklist
14.0	Updated Engineering Fees

SECTION 1.0

PUBLIC WORKS DEPARTMENT ENGINEERING AND STORMWATER SERVICES DIVISIONS AND DEPARTMENT OF TRANSPORTATION AND THE REZONING, SITE PLAN, PRELIMINARY PLAT AND FINAL PLAT PROCESS

The following information is to provide a basic overview of the roles of the above divisions as they relate to the site plan and plat review process. However it should clearly understood that all correspondence, plan submittals and status inquires associated with these processes **must always** be directed to the Durham City/County Planning Department. All documents that are not received through the Durham City/County Planning Department will not be considered as a valid submittal and will not be reviewed accordingly by any Division.

ENGINEERING DIVISION:

The City of Durham Engineering Division is located on the 3rd floor of City Hall. The Development Review Group is the main contact in the Engineering Division for all Engineering comments that are returned on rezoning, site plans and final plats. The Development Review Group can be contacted by mail at the following address: Public Works Department, City of Durham, 101 City Hall Plaza, 3rd Floor, Development Review Group, Durham, North Carolina, 27701. The contact phone number for questions is (919) 560-4326 and fax number is (919) 560-4316.

The City of Durham Engineering Division is tasked with reviewing rezoning, site plans and preliminary plats as these items relate to the City of Durham public and private road standards, sidewalk, water system, fire protection systems, sanitary sewer system and stormwater drainage and conveyance systems. The City of Durham Engineering Division is also tasked with reviewing final plats as they relate to roadway rights-of-way, water systems, storm drainage conveyance systems, sanitary sewer systems and related easements.

The typical time line for review of rezoning, site plan and plats is determined by the Planning Department. The typical time line for review of all resubmittals is determined by the Planning Department.

STORMWATER SERVICES DIVISION:

The City of Durham Stormwater Services Division is located on the 3rd floor of City Hall. The Stormwater Services Division is the contact in the Public Works Department for all stormwater impact analysis comments that are returned on rezoning, site plans and final plats. The Stormwater Services Division can be contacted by mail at the following address: Public Works Department, City of Durham, 101 City Hall Plaza, 3rd Floor, Stormwater Services Division, Durham, North Carolina, 27701. The contact phone number for questions is (919) 560-4326 and fax number is (919) 560-4316.

The City of Durham Stormwater Services Division is tasked with reviewing rezoning, site plans and preliminary plats as these items relate to stormwater impact studies, stream buffers (along with City/County Planning Department), floodplain analysis, stormwater quality facilities and stormwater quantity facilities, as well as major stream crossing systems. The City of Durham Stormwater Services Division is also tasked with reviewing plats as they relate to floodplain issues, stream buffers (along with City/County Planning Department) and stormwater easements for water quality and quantity facilities.

The typical time line for review of rezoning, site plan and plats is determined by the Planning Department. The typical time line for review of all resubmittals is determined by the Planning Department.

DEPARTMENT OF TRANSPORTATION:

The City of Durham Transportation Division is located on the 4th floor of City Hall. The Transportation Division is the contact in the Public Works Department for Transportation comments that are returned on rezoning, site plans, and final plats. The Transportation Division can be contacted by mail at the following address: Public Works Department, City of Durham, 101 City Hall Plaza, 4th Floor, Transportation Division, Durham, North Carolina, 27701. The contact phone number for questions is (919) 560-4366 and fax number is (919) 560-4561.

The City of Durham Transportation Division is tasked with reviewing rezoning, site plans and preliminary plats as these items relate to proposed public rights-of-way, cross-sections on proposed/existing roads, preserving the most current Durham Area Thoroughfare Plan (possible right-of way dedication and/or upgrade of the existing infrastructure), preserving the Bicycle Area Plan, placement of sidewalk, sight distance triangles, vehicular and pedestrian accesses, site traffic analyses (if necessary), interconnectivity of developments, and points of access. The City of Durham Transportation Division is tasked with reviewing final plats as they relate to proper public rights-of-way or private accesses (easements) and conforming to street naming convention for signage.

The typical time line for review of rezoning, site plan and plats is determined by the Planning Department. The typical time line for review of all resubmittals is determined by the Planning Department.

SECTION 1.1

ENGINEERING DIVISION, SITE PLAN, PRELIMINARY PLAT AND FINAL PLAT SUBMITTAL REQUIREMENTS

The following section provides a list, which should be used by the applicant before any site plan, preliminary plat or final plat submittals so that the applicants are aware of the minimum requirements in order to receive a complete review. The checklists in this section are intended as a guide and are not a submittal requirement with plans.

CITY OF DURHAM – ENGINEERING SITE PLAN AND PRELIMINARY PLAT CHECKLIST
Department of Public Works
101 City Hall Plaza | Durham, NC 27701
919.560.4326 | F 919.560.4316

www.durhamnc.gov

The following is a list of site plan and preliminary plat requirements from the Engineering Division. This list is intended to give general guidelines only and is not to be considered all-inclusive. Depending upon the development additional items may be required. Provide two copies of the Utility Impact Analysis Questionnaire for Projects within City Limits with the first submittal.

1. Cover Sheet

a) Provide sheet index
b) Add standard notes in the Public Works Conditions of Approval box (see Planning Checklist or Section 12 of Reference Guide)

2. Existing Conditions and Demolition Plan Sheet

a) Show all property boundaries with linear bearings and distances, curve boundary information (table format – curve number, radii, length, delta angle, chord bearing and chord distance) and the building setbacks. State the source of the provided boundary information.
b) Label existing property lines which are to be removed as "Hereby removed".
c) Show all buildings and structures and label current use/facility name and finished floor elevation.
d) Show all pavement, parking and driveway access points on the property.
e) Show all walkways/sidewalks/curb ramps both adjacent to the development and opposite any existing roadways or intersections.
f) Show all adjoining and opposing streets and alleys with names, rights-of-way and pavement widths, state route numbers. Label all roads as "Public" or "Private" and note any unopened rights-of-way. Show and label all existing features and improvements such as driveways, sidewalk, hydrants, light poles, etc.
g) Show and label (size, material, and inverts) all existing utilities within the right-of-way and the project site:
    i. Water lines, valves, hydrants (within 500 feet of the site), fire department connections, water services, water meters and vaults, and backflow preventers
    ii. Sanitary sewer lines, manholes, sanitary sewer services, cleanouts, force mains, and pump stations
    iii. Storm sewer pipes, catch basins, headwalls, junction boxes, other structures, ditches and swales
h) Provide abandonment notes for water and sanitary sewer services which are being abandoned.
i) Show and label all easements, both public and private with location and width. Define all easements by centerline bearings, distances and ties to property corners or page book and deed reference.
j) Show all topography with a maximum of two-foot contour intervals for the development. Provide notes that indicate references to any permanent benchmarks, accepted datum, and source data. Durham topography maps may be used but it is recommended to obtain field topography.

3. Site Plan Sheet

a) Show all areas to be dedicated or reserved for public or private use and define with property lines or easements.
b) Show proposed roadways and label pavement and right-of-way widths. Also label as 'Public' or 'Private'.
c) Provide typical roadway cross-sections for all proposed public and/or private streets/alleys. Include the size of curbing, shoulders, sidewalks, pavement widths and rights-of-way widths.
d) Provide new street centerline radius.
e) Show and label new parking areas and proposed driveways with radii and width.
f) In a townhome development, label the streets with parking on both sides as "Private Access/Common Area" and provide Townhome Note.
g) Show and label proposed sidewalks and curb ramps.

4. Grading Plan Sheet

a) Provide storm drainage system layout.
b) Provide preliminary storm drainage easement sizes, setbacks, and locations.
c) Label all retaining walls with preliminary top of wall and bottom of wall elevations.
d) Provide overland relief for all stormwater pipe systems, inlets, and culverts such that no building or habitable structure will be flooded or have water impounded against it during the 100-year storm event.

5. Utility Plan Sheet

a) Show and label all proposed water and sanitary sewer lines. Do not provide proposed sizes as these will be reviewed during construction drawing review.
b) Show and label all proposed utility easements and utility easement setbacks per the Reference Guide for Development.
c) Show and label all proposed valves, manholes, services, sanitary sewer cleanouts, hydrants, meters with sizes, fire department connection, backflow preventers, dumpster drains and grease traps.
d) Extend sewer to property lines for future service of adjacent parcels.
e) Provide second waterline feed for projects of 100 units or more.

6. Landscape Plan Sheet

a) Show and label all easements and ensure that landscaping is kept outside of the easements and the public rights-of-way.
b) Show existing and proposed water, sanitary sewer and storm drainage systems to ensure that there are no conflicts with the proposed landscaping.

The following is a list of final plat requirements from the Engineering Division. This list is intended to give general guidelines only and is not to be considered all-inclusive. Depending upon the development additional items may be required.

7. Standard Requirements

c) The plat must accurately reflect the data as shown on a currently approved Site Plan or set of Construction Drawings (if applicable) and adhere to all applicable City of Durham Development Standards.

8. Certificates Required

a) Provide the surveyor's certificate of accuracy and mapping stating that the plat has been prepared in accordance with GS 47-30, as amended.
b) Provide the Survey Type Certificate.
c) Provide a Review Officer's stamp.
d) Provide an Owner's Certificate with a Notary's Certificate for each owner involved.
e) Provide an Attorney's Certificate with a Notary's Certificate for each owner involved. This is only required for dedication of right-of-way, public easements, and open space.

9. Standard Notes Required

h) Provide the Standard Townhome Note per the Reference Guide for Development stating, "the driving and parking areas shown on this drawing noted as "Private Access and Common Areas" do not meet City of Durham Street Standards. The features within this area are private and will never be eligible for public maintenance".
i) Provide the Standard Sanitary Sewer Easement and/or Waterline Easement Notes (for Public Easements only) as applicable.
j) Provide the Standard Stormwater Easement Note for Public and/or Private Easements as applicable.
k) Provide Certification of Express Dedication for Public Use for Public Access Easements for sidewalks.

10. Graphical Data and Reference Requirements

e) Graphically show all new property lines, clearly distinguishable from existing, all lot numbers (lot numbers shall run consecutively), all required setbacks (including Easement Setbacks, typical lot layouts, buffer limit lines, open spaces (defined with numbers or letters), and other common areas. Provide total land area, proposed use, and boundary descriptions for all parcels of land to be designated/dedicated/reserved for public or private use. Provide an "Area Table" showing the areas for each type of parcel (i.e. Lots, R/W, Open Space, etc.) as well as a total area computation.
f) When subdividing or recombining property, graphically show all property lines to be removed, clearly distinguishable from property lines to remain. Provide data for all property lines or portions of property lines to be removed and label them as "Hereby Removed".
g) Provide bearing, distance, and curve data for all lot and boundary lines. Linear dimensions shall be expressed in feet and decimals of a foot and all angular measurements shall be expressed by bearings.
h) All curves shall be defined by radius, central angle (delta), tangent, arc, chord distances, and chord bearings. All curve data shall be shown in Curve Tables.
i) All line segments and curves listed in Line Segment and Curve Tables shall be shown in the appropriate locations on the plat, designated by L-# or C-#, and they shall be numbered consecutively throughout all Sheets of the plat. (i.e. do not begin renumbering on each Sheet).

j) Graphically show and appropriately label all “Proposed” alley lines, building setbacks, cemeteries, utility, storm drainage, greenway, and other easements. Define all “Proposed” easements with either boundary data or centerline data, and ties to property corners. (This applies to both Public and Private Easements).
k) Graphically show and appropriately label all “Existing” alley lines, building lines, cemeteries, utility, storm drainage, greenway, and other easements. Define all “Existing” easements with PB/PG and/or DB/PG references and centerline or boundary ties to property corners. If no existing references are available or if the easements have been resurveyed, define them with centerline or boundary data and ties to property corners. (This applies to both Public and Private Easements).
l) Graphically show the angle of departure of all adjoining property and right-of-way lines.
m) Provide the names of all adjoining property owners with deed and/or plat book references and Pin and Parcel ID numbers. If applicable, provide existing adjoining Lot numbers with the existing subdivision name and references.
n) Graphically show all street rights-of-way within or adjoining the property and label them with the street name (and SR Number if applicable), right-of-way width, “Public” or “Private”, and “Existing” or “Hereby Dedicated”. If available, provide the DB and/or PB references for all “Existing” rights-of-way.
o) Where available within 2000’, provide a precise tie (with bearing, distance, co-ordinate sets, and appropriate N.C. Grid Datum labels), between one or more prominent points on the exterior boundary of the property and a N.C. Grid Monument. If no monument is available within 2000’, add a note to the plat stating such, and provide bearing and distance ties, along with appropriate PB/PG references to the existing recorded plat used as the source to establish the plat bearings. NC grid coordinates can also be derived from GPS observations that are processed by OPUS. This does not apply to exempt plats (see Planning Checklist for requirements of Exempt Plats).
p) Label two or more permanent “Control Corners” on the plat. This does not apply to exempt plats (see Planning Checklist for requirements of Exempt Plats).
q) Acquire the addresses from the City of Durham for all lots or parcels and show them on the plat.

11. Additional Requirements for Plats with Multiple Sheets

f) Provide an overall Index Map with a North Arrow, Lot Numbers, Street Names, Matchlines, and Sheet Numbers, defining the total area of coverage and indexing the area of coverage for each Sheet of the plat.
g) Graphically show and label “Matchlines” on each Sheet of the plat. Also, provide labels along the Matchlines (i.e. “See Sheet___”) defining all adjoining Sheet Numbers.

SECTION 1.2

STORMWATER SERVICES DIVISION REZONING, SITE PLAN, PRELIMINARY PLAT AND FINAL PLAT SUBMITTAL REQUIREMENTS

The following section provides submittal checklists, which shall be used by the applicant before any rezoning, site plan, preliminary plat or final plat submittals so that the applicants are aware of the minimum requirements in order to receive a complete review. All checklists shall be sealed, dated and signed by a design professional.

The design checklists for rezoning, site plan, preliminary plat and final plat are to be submitted with all submittals, including resubmittals. Failure to submit these checklists and item requirements with each submittal will result in no review of the documents.

CITY OF DURHAM – STORMWATER SERVICES REZONING PLAN SUBMITTAL CHECKLIST
Department of Public Works
101 City Hall Plaza | Durham, NC 27701
919.560.4326 | F 919.560.4316

www.durhamnc.gov

Date: _____

PROJECT INFORMATION

Project Name: _____

Phase: _____ Planning Case Number: _____

Previous Project Name(s): _____

PIN(s): _____

Contact Person: _____ Phone: _____

Company: _____ Fax: _____

Email Address: _____

INSTRUCTIONS

For each review submittal, including re-submittals, the submittal checklist and supporting documentation shall be submitted. **Partial submittals will result in notification of an incomplete submittal with no review performed**. Note: The rezoning process is conceptual in nature; the approval of proposed stormwater control measure(s) (SCM[s]) will not occur with the Rezoning Plan.

The following checklist outlines submittal requirements. Initial in the space provided to indicate the following submittal requirements have been met and supporting documentation is attached.

REZONING PLAN CHECKLIST

Initial

_____ (Check One) __ INSIDE __ OUTSIDE Watershed Protection Overlay (WPO).
Indicate the WPO(s) where the project is located:

(Check all that apply) __ F/J-A __ F/J-B __ E-A __ E-B __ M/LR-A __ M/LR-B

_____ (Check all that apply) __ Jordan Basin __ Falls Basin __ Lower Neuse Basin

_____ A legible copy of the United States Geological Survey 7.5 Minute Quadrangle map is provided, including map reference, with site boundary clearly shown and labeled. The map clearly shows all streams.

_____ A legible copy of the published Durham County Soil Survey is provided, including map reference, with the site boundary clearly shown and labeled. The map clearly shows all streams, soil types, and soil type boundaries.

_____ Tops of banks for the streams are shown on the plan. [Contact the North Carolina Department of Environment and Natural Resources for stream identifications in the Neuse River Basin (Falls and Lower Neuse Basins). Stream determinations in the Jordan Basin shall be submitted per the Letter to Industry found on Stormwater Development Review's web site at New Stream Buffer Requirements [First Revision to LTI 07-03-08] (25August2011)].

_____ All Watershed Protection Overlay, Neuse River Basin, and Jordan Basin riparian buffers, measured from the tops of the stream banks, are shown on the plan.

_____ The 10-foot no build setback, measured from all riparian buffers, is shown on the plan.

_____ Diffuse flow is achieved into riparian stream buffers.

_____ (Check One) __ Yes __ No Regulated floodplain located on site.

_____ A legible copy of the effective Federal Emergency Management Agency (FEMA) National Flood Insurance Program Flood Insurance Rate Map is provided. Map number, map date, and site boundary are clearly shown and labeled. [This map is required regardless of whether floodplain is located on the site]. The effective and/or future FEMA 100-year floodplain, with base flood elevations (if applicable), if applicable, is shown on the plan.

CITY OF DURHAM – STORMWATER SERVICES SITE PLAN SUBMITTAL CHECKLIST
Department of Public Works
101 City Hall Plaza | Durham, NC 27701
919.560.4326 | F 919.560.4316

www.durhamnc.gov

Date: _____

PROJECT INFORMATION

Project Name: _____

Phase: _____ Planning Case Number: _____

Previous Project Name(s): _____

PIN(s): _____

Contact Person: _____ Phone: _____

Company: _____ Fax: _____

Email Address: _____

INSTRUCTIONS

For each review submittal, including re-submittals, the entire Stormwater Impact Analysis (SIA) and submittal checklist shall be submitted. **Partial SIA and checklist will result in notification of an incomplete submittal with no review performed.**

Contact Stormwater Services regarding redevelopment or expansion projects for modified requirements.

The following checklist outlines submittal requirements. Initial in the space provided to indicate the following submittal requirements have been met and supporting documentation is attached.

A. GENERAL REQUIREMENTS

Initials

_____ (Check One) __ INSIDE __ OUTSIDE Watershed Protection Overlay (WPO).
Indicate the WPO(s) where the project is located:
(Check all that apply) __ F/J-A __ F/J-B __ E-A __ E-B __ M/LR-A __ M/LR-B
If inside WPO, notation of WPO Standards is required on plans.

_____ (Check all that apply) __ Jordan Basin __ Falls Basin __ Lower Neuse Basin

_____ A legible copy of the United States Geological Survey 7.5 Minute Quadrangle map is provided, including map reference, with site boundary clearly shown and labeled. The map clearly shows all streams.

_____ A legible copy of the published Durham County Soil Survey is provided, including map reference, with the site boundary clearly shown and labeled. The map clearly shows all streams, soil types and soil type boundaries.

_____ Tops of banks for the streams are shown on the plan. [Contact the North Carolina Department of Environment and Natural Resources for stream identifications in the Neuse River Basin (Falls and Lower Neuse Basins). Stream determinations in the Jordan Basin shall be submitted per the Letter to Industry found on Stormwater Development Reviews' web site at New Stream Buffer Requirements [First Revision to LTI 07-03-08] (25August2011)].

_____ All Watershed Protection Overlay, Neuse River Basin, Jordan Basin, and City riparian buffers, measured from the tops of the stream banks, are shown on the plan.

_____ The 10-foot no build setback, measured from all riparian buffers, is shown on the plan.

_____ Diffuse flow is achieved into riparian buffers.

_____ (Check One) __ Yes __ No Regulated floodplain located on site.

_____ A legible copy of the effective Federal Emergency Management Agency National Flood Insurance Program Flood Insurance Rate Map is provided. Map number, map date, and site boundary are clearly shown and labeled. [This map is required regardless of whether floodplain is located on the site.] The effective and/or future FEMA 100-year floodplain, with base flood elevations (if applicable), are shown on the plan.

_____ All applicable notes, per the Standard Notes section of the *Reference Guide for Development*, have been added to the plan.

_____ Stormwater Impact Analysis (SIA) sealed and signed by a registered North Carolina Professional Engineer (NCPE) is provided, including narrative report and drainage calculations. Note: If a site is exempt from stormwater requirements then a narrative advising of the exemption can be submitted by any designer.

B. PEAK DISCHARGE RATE EVALUATION

Initials

_____ An introductory narrative describing pre- and post-development site conditions and site improvement changes, is provided. Note: The baseline conditions for the 1-year event varies based upon the regulatory basin in which the project is located.

_____ Drainage area maps (<u>one map for pre-development and one map for post-development</u>) are provided with the following items:

_____Scale and north arrow (Note: Except in the instance of site-to-drainage area maps, the scale of each drainage area map shall not exceed 1" = 30').

_____Sub-basin area(s) delineated with area(s) in acres indicated.

_____Analysis points clearly identified and labeled.

_____Segmented TR-55 time of concentration flow paths showing and labeling each segment.

_____ Methodologies and procedures are fully described.

_____ A site plan with contour lines or grading plan identifying pre- and post-development drainage patterns is provided.

_____ Pre- and post-development times of concentration, calculated by TR-55 segmented approach, are provided.

_____ Calculations for the pre- and post-development peak discharge rates are provided for the 1-, 2-, 10-, and 100-year, 24-hour storm using TR-55, TR-20, HEC-HMS, HEC-1 or Rational Method as applicable. Note: The Rational Method is not accepted for the 1-year analysis, areas that drain more than 50 acres, or watersheds that are not homogeneous.

_____ A Summary of Results is provided in the following format:

<u>Site Analysis Point #</u> _____

Site Condition	Storm Event (cfs)				
	1-year (cfs)	2-year (cfs)	10-year (cfs)	100-year (cfs)	____-year (cfs)
Pre-Development					
Post-Development without Detention					
Post-Development with Detention					

_____ Conclusions providing detailed findings are provided.

_____ Stormwater control measure(s) (SCM[s]) are provided (indicate number of each type of SCM):

____Level Spreader w/ Vegetative Filter Strip ____Stormwater Wetland

____Wet Detention Basin ____Sand Filter ____Bioretention ____Grassed Swale

____Restored Riparian Buffer ____Dry Extended Detention Basin

____Permeable Pavement ____Green Roof ____Disconnected Impervious Surface

____Rainwater Harvesting System

____Proprietary Systems or Other_____

____Not required (provide explanation): _____

_____ The SCM(s) indicated above are required to control the following peak discharge rates:

____1-year ____2-year ____10-year ____100-year ____Other_____

_____ A downstream analysis in accordance with the *Reference Guide for Development* is provided with findings, or is

_____Not required (provide explanation):

C. POLLUTANT CONTROL REQUIREMENTS

Initials

_____ The project is exempt based upon cumulative land disturbance as of the applicable baseline date.

_____ The proposed project is _____ ≥ 16% impervious (Falls and Jordan Basins) / _____ ≥ 24% impervious (Lower Neuse Basin), 85% Total Suspended Solids (TSS) removal is provided for this project, and all the impervious area as reasonably practical is treated by an SCM.

OR

The proposed project is _____ <16% impervious (Falls and Jordan Basins) / _____ <24% impervious (Lower Neuse Basin), 85% Total Suspended Solids (TSS) removal for all runoff from non-vegetated conveyances is provided for this project, and all the impervious area as reasonably practical is treated by an SCM.

_____ The project is low density without non-vegetated conveyances, thus TSS removal is not required.

_____ SCMs for TSS removal are provided (indicate number of each type of SCM): Note: Not all of the SCMs listed below provide 85% TSS removal as a stand-alone SCM and must be used in series with other SCMs to achieve the minimum TSS removal of 85%.

____Level Spreader w/ Vegetative Filter Strip ____Stormwater Wetland

____Wet Detention Basin ____Sand Filter ____Bioretention ____Grassed Swale

____Restored Riparian Buffer ____Dry Extended Detention Basin

____Permeable Pavement ____Green Roof ____Disconnected Impervious Surface

____Rainwater Harvesting System

____Proprietary Systems or Other_____

____Not required (provide explanation):

_____ Both hard copies, and Excel-format electronic copies on a DVD or compact disc, of the following:

- Pre- and post-development nutrient calculations using the Jordan/Falls Lake Stormwater Nutrient Load Accounting Tool found at : http://portal.ncdenr.org/web/jordanlake/implementation-guidance-archive or http://portal.ncdenr.org/web/fallslake/rules-implementation-information.

  Note: Nutrient calculations are always required regardless if the project is exempt from treatment requirements.

- The Nutrient Reporting Form (including the Compliance Worksheet tab) per the 3/7/2013 Letter to Industry http://durhamnc.gov/documentcenter/view/3185.

_____ Pre- and post-development land use area maps that correspond to the categories used in the Jordan/Falls Lake Stormwater Nutrient Load Accounting Tool for the nutrient calculations, to scale no smaller than 1 inch = 100 feet. The maps shall show the map scale, north arrow, and are to have the different land uses either hatched or shaded with areas indicated in a legend on the maps. Note: The land use area maps are always required regardless if the project is exempt from treatment requirements.

_____ SCMs for nutrient control are provided (indicate number of each type of SCM):

____Level Spreader w/ Vegetative Filter Strip ____Stormwater Wetland

____Wet Detention Basin ____Sand Filter ____Bioretention ____Grassed Swale

____Restored Riparian Buffer ____Dry Extended Detention Basin

____Permeable Pavement ____Green Roof ____Disconnected Impervious Surface

____Rainwater Harvesting System

____Proprietary Systems or Other_____

____Not required (provide explanation):

____ After meeting the minimum on-site treatment requirements, additional treatment and/or offsite credit purchases, if needed, is provided by:

____Additional SCMs

____Nutrient Offset Payment to the North Carolina Ecosystem Enhancement Program

____Nutrient Offset Payment to an Approved Nutrient Bank

____Land Bank Credit Transfer (Commitments shall be made prior to October 1, 2015)

_____ The project site is located in an area subject to a state-approved Total Maximum Daily Load (TMDL) for bacteria. (As of April 2014, only Northeast Creek has a TMDL for bacteria).

_____ SCMs rated as medium or high for bacterial removal are provided (indicate number of each type of SCM):

____Bioretention Area ____ Stormwater Wetlands

____Wet Detention Basin ____ Sand Filter

____Level Spreader w/ Vegetative Filter Strip ____Restored Riparian Buffer

____Dry Extended Detention Basin ____ Permeable Pavement

____Other (specify)_____

____Not required (provide explanation):

D. WATERSHED PROTECTION OVERLAY REQUIREMENTS

Initials

_____ 85% Total Suspended Solids (TSS) removal is required for this project, and 100% of the impervious area will be treated by an SCM. Note: Not all of the SCMs listed below provide 85% TSS removal as a stand-alone SCM and must be used in series with other SCMs to achieve the minimum TSS removal of 85%.

_____ SCM for TSS removal are provided (indicate number of each type of SCM):

____Level Spreader w/ Vegetative Filter Strip ____Stormwater Wetland

____Wet Detention Basin ____Sand Filter ____Bioretention ____Grassed Swale

____Restored Riparian Buffer ____Dry Extended Detention Basin

____Permeable Pavement ____Rooftop Runoff Management

____Disconnected Impervious Surface ____Rainwater Harvesting System

____Proprietary Systems or Other_____

____Not required (provide explanation):

E. ELECTRONIC FILE SUBMITTAL

Initials

_____ A compact disc (CD), DVD rom disk, or USB drive, separate from that submitted to fulfill the Planning Department's electronic file submittal requirements, and **marked "For Stormwater Services"** has been included with the submittal. An electronic file transfer protocol or other internet cloud-based file sharing website can be used in place of the electronic media. The disc or USB drive contains electronic copies of the following:

____**Sealed SIA**: entire document including narrative, data, calculations, pre- and post-development drainage area maps, pre- and post-development land use area maps that correspond to the categories used in the JFLSAT, and all appendices (pdf format)

____Jordan/Falls Lake Stormwater Accounting Tool (Excel format)

____Nutrient Reporting Form (Excel format)

CITY OF DURHAM – STORMWATER SERVICES FINAL PLAT SUBMITTAL CHECKLIST
Department of Public Works
101 City Hall Plaza | Durham, NC 27701
919.560.4326 | F 919.560.4316

www.durhamnc.gov

Date: _____

PROJECT INFORMATION

Project Name: _____

Phase: _____ Planning Case Number: _____

Previous Project Name(s): _____

PIN(s): _____

Contact Person: _____ Phone: _____

Company: _____ Fax: _____

Email Address: _____

INSTRUCTIONS

For each review submittal, including re-submittals, the submittal checklist shall be submitted with the final plat. **Partial submittals will result in notification of an incomplete submittal with no review performed.** The following is a list of standard final plat requirements that are reviewed by Stormwater Services. This list is intended to give general guidelines only and is not to be considered all-inclusive. Depending upon the development, additional items may be required.

Initial in the space provided to indicate the following submittal requirements have been met and supporting documentation is attached.

FINAL PLAT CHECKLIST

Initials

_____ All stormwater control measure(s) (SCM[s]) are delineated and labeled as shown on the approved construction drawings or as constructed. A note may be added to reference the source of the SCM delineation when not constructed and taken from approved construction drawings.

_____ All SCM access and maintenance easements are shown on the final plat exactly as prescribed on the approved construction drawings.

_____ The easement note per the Standard Notes section of the *Reference Guide for Development* has been added to the final plat for the SCM access and maintenance easement(s).

_____ The restrictive covenants note per the Standard Notes section of the *Reference Guide for Development* has been added to the final plat for developments with SCMs to ensure responsibilities of HOA members are clearly acknowledged.

_____ The effective and/or future Federal Emergency Management Agency (FEMA) 100-year floodplain, with base flood elevations (if applicable), is shown on the final plat. The effective FEMA National Flood Insurance Program Flood Insurance Rate map number, map date, and flood zones are indicated on the final plat. [Note that the map number, map date, and flood zones shall be indicated on the final plat even if floodplain is not present on the property.]

_____ The maximum impervious surface area per lot when located in a Watershed Protection Overlay, as was approved on the site plan and in the stormwater impact analysis.

_____ Tops of banks for the streams are shown on the final plat. [Contact the North Carolina Department of Environment and Natural Resources for stream identifications in the Neuse River Basin (Falls and Lower Neuse Basin). Stream determinations in the Jordan Basin shall be submitted per the Letter to Industry found on Stormwater Development Review's web site at New Stream Buffer Requirements [First Revision to LTI 07-03-08] (25August2011)].

_____ All Watershed Protection Overlay, Neuse River Basin, Jordan Basin, and City riparian buffers, measured from the tops of the stream banks, are shown on the final plat.

_____ The 10-foot no build setback, measured from all riparian buffers, is shown on the final plat.

_____ The riparian buffer standard note per the Durham City-County Planning Department has been added to the final plat.

Note: In accordance with the Planning Unified Development Ordinance, Stormwater Services reviews final plats for a specific site after the construction drawings for that site have been approved by the City. As such, Stormwater Services does not review final plats that are only for right-of-way dedication and will have no comments on these types of final plats.

SECTION 1.3

DEPARTMENT OF TRANSPORTATION SITE PLAN, PRELIMINARY PLAT AND FINAL PLAT SUBMITTAL REQUIREMENTS

The following section provides a list, which should be used by the applicant before any site plan, preliminary plat or final plat submittals so that the applicants are aware of the minimum requirements in order to receive a complete review. The checklists in this section are intended as a guide and are not a submittal requirement with plans.

CITY OF DURHAM – TRANSPORTATION SITE PLAN AND PRELIMINARY PLAT CHECKLIST
Department of Transportation
101 City Hall Plaza | Durham, NC 27701
919.560.4366 | F 919.560.4561

www.durhamnc.gov

The following is a list of site plan and preliminary plat requirements from the Department of Transportation. This list is intended to give general guidelines only and is not to be considered all-inclusive. Depending upon the development additional items may be required.

1. Access Points

a) 90 or less units – one public street access
b) More than 90 units – 2 public street accesses
c) Add a note on the plan regarding the limit of units before another access street is built
d) Access points needed for connectivity

Usability of Access Points

a) Sight distances (horizontal and vertical alignments and obstructions)
b) Landscaping in right-of-way or interfering with sight distance (sight triangle)
c) Sight distance triangles for adjacent drives
d) Relationship to other streets and drives
e) Entrance type
f) Turning radii (particularly fire access)
g) Turning lanes (left and right turns in and out)

Adjoining Property

a) Dedicated streets (are connections made or needed?)
b) Land locking (is access to adjoining property needed?)

Conformance with adopted plans

a) Impact of any proposed transportation improvements adjacent to or through the property (right-of-way and construction)
b) Additional right-of-way needed on streets adjoining project

Street Design

a) Meets Table of Minimum Design Requirements for Public and Private Residential Streets
b) Sight Distance (vertical and horizontal curves, landscaping, signs etc.)
c) Street Lighting
d) Driveway spacing, width, location and distance from intersection
e) Correct street and right-of-way width – according to street type
f) Provisions for on-street parking
g) Minimum centerline radius – as per design speed
h) Maximum cul-de-sac length = 800’
i) Minimum cul-de-sac bulb radius
j) Corner right-of-way radius or triangle needed
k) Accommodations for bicyclists (Durham Comprehensive Bicycle Transportation Plan)
l) Adequate right-of-way width to accommodate sidewalk and other proposed improvements. Is there a dedication of right-of-way?

Parking

a) Parking location and control (maneuvering away from entrances and intersections)
b) Parking stalls and aisle widths

c) Handicapped parking requirement and van accessibility
d) Bicycle parking (number, location, rack type)
e) Is a complex source permit required?

Miscellaneous

a) Dumpster location and access
b) Pedestrian access (internal and external sidewalks)
c) Stacking requirements
d) Internal site circulation
e) Transit accommodations (where applicable)
f) Off-site improvements needed (signals, street widening, turn lanes at intersections, etc.)
g) Traffic Impact Analysis required (peak hour generation > 150 trips)
h) Name and dimension cross-sections and right-of-way
i) General notes

CITY OF DURHAM – TRANSPORTATION FINAL PLAT CHECKLIST

Department of Transportation
101 City Hall Plaza | Durham, NC 27701
919.560.4366 | F 919.560.4561

www.durhamnc.gov

The following is a list of final plat requirements from the Department of Transportation. This list is intended to give general guidelines only and is not to be considered all-inclusive. Depending upon the development additional items may be required.

1. Show required right-of-way and right-of-way dedication (from site plan)
2. Make sure that the plat does not create any land locked parcels
3. Make sure that the street names on the plat agree with the street naming convention of the City and County of Durham
4. Illustrate required sight triangles

SECTION 2.0

CONSTRUCTION DRAWING REVIEW AND CONSTRUCTION PROCESS

The following information is to provide a basic overview of the roles of the above divisions as they relate to the construction drawing review process. All materials shall be submitted to the Development Services Center (ground floor of City Hall). Status inquires and correspondences associated with these processes can be directed to the individual reviewer of each Division.

ENGINEERING DIVISION:

The City of Durham Engineering Development Review Group is located on the 3rd floor of City Hall. The Development Review Group is the main contact in the Engineering Division for all Engineering comments that are returned on construction drawings. The Development Review Group can be contacted by mail at the following address: Public Works Department, City of Durham, 101 City Hall Plaza, 3rd Floor, Development Review Group, Durham, North Carolina, 27701. The contact phone number for questions is (919) 560-4326 and fax number is (919) 560-4316.

The City of Durham Engineering Development Review is tasked with reviewing construction documents as these items relate to the City of Durham public and private road standards, driveways, sidewalks, water systems, fire protection systems, sanitary sewer systems, stormwater drainage and conveyance systems and easements for these systems.

The typical time line for review of construction drawings is approximately 10 business days from the day of receipt of the documents by the City of Durham Engineering Division. The typical time line for review of all resubmittals is approximately 10 business days from the day of receipt of the documents by the City of Durham Engineering Division.

STORMWATER SERVICES DIVISION:

The City of Durham Stormwater Services Development Review Group is located on the 3rd floor of City Hall. The Stormwater Services Development Review Group is the contact in the Public Works Department for all stormwater analysis comments that are returned on construction drawings. The Stormwater Services Division can be contacted by mail at the following address: Public Works Department, City of Durham, 101 City Hall Plaza, 3rd Floor, Stormwater Services Development Review Group, Durham, North Carolina, 27701. The contact phone number for questions is (919) 560-4326 and fax number is (919) 560-4316.

The City of Durham Stormwater Services Development Review Group is tasked with reviewing construction drawing documents as these items relate to stormwater impact studies, stream buffers, floodplain analysis, stormwater quality systems and stormwater quantity facilities, as well as major stream crossing systems.

The typical time line for review of construction drawings is approximately 10 business days from the day of receipt of the documents from the City of Durham Engineering Development Review Group. The typical time line for review of all resubmittals is approximately 10 business days from the day of receipt of the documents from the City of Durham Engineering Division.

DEPARTMENT OF TRANSPORTATION:

The City of Durham Department of Transportation Development Review Group is tasked with reviewing construction documents as they pertain to traffic control devices, signs, pavement markings, lane widths, design and traffic control of roundabouts and placement and design of traffic calming measures. The Transportation Division can be contacted by mail at the following address: Public Works Department, City of Durham, 101 City Hall Plaza, 4th Floor, Transportation Division, Durham, North Carolina, 27701. The contact phone number for questions is (919) 560-4366 and fax number is (919) 560-4561.

The typical time line for review of construction drawings is approximately 10 business days from the day of receipt of the documents from the City of Durham Development Services Center. The typical time line for review of all resubmittals is approximately 10 business days from the day of receipt of the documents from the City of Durham Development Services Center.

What Types of Plans Need to be Submitted for Construction Plan Approval

This section is intended to notify the Engineer and the Developer of those plans that need to be submitted to the City Development Services Center for Construction Plan review and approval before construction can begin. Note: Construction plan approval process typically begins after Zoning and Site Plan approval (may run concurrently with site plan review).

General

Confirm that the site plan has valid approval, if not a concurrent review. This generally will be a plan indicating the improvements, which will have the Planning Department's Site Plan Approval Stamp. Be aware that some plans may have expiration dates. If there is any question about the validity of the plan contact the City/County Planning Department.

Type of Development	**Construction Plan Required**	**Refer to Section**
Commercial/Institutional/Educational		
Only if any items are listed as 'Yes' in Specific Improvements below	Yes	2.0-2.5
Multifamily	Yes	2.0-2.5
Subdivision	Yes	2.0-2.5

Specific Improvements	**Construction Plan Required**	**Refer to Section**
Water Supply		
Service (lateral)	No	Building Inspections
Water main extension	Yes	5.0
Fire Line	Yes	6.0
Backflow Prevention (BFP outside of buildings)	Yes	6.0
Hydrant Installation	Yes	5.0
Sanitary Sewer System		
Service (lateral)		
4-inch line (1 building)	No	Building Inspections

Type of Development	**Construction Plan Required**	**Refer to Section**
4-inch line (2 or more buildings)	Yes	7.0
6-inch line that services only 1 building w/out 4 hour fire walls	No	Building Inspections
All others	Yes	7.0
Extensions		
Mains (Any pipe 6-inches or greater)	Yes	7.0
Outfalls	Yes	7.0
Pump Stations/force mains	Yes	7.0
Industrial	Yes	Water Management
See Service or Extension (above)		As required

Specific Improvements	**Construction Plan Required**	**Refer to Section**
Storm Drainage System		
Pipe in right-of-way	Yes	8.0
Any pipe or conveyance of 15-inch equivalent diameter or larger	Yes	8.0
Water Quality/Quantity Basins	Yes**	8.0-8.4
Crossing public easements	Yes	8.0
On-site drainage	Yes	8.0
Streets (public or private)	Yes	9.0
Driveway		
Commercial		
With approved site plan	No*	
Site plan not required	Yes*	9.0
Residential-multifamily		

With approved site plan	No*	
Type of Development	**Construction Plan Required**	**Refer to Section**
Site Plan not required	Yes*	9.0
Single Family		
Existing street	No*	
Site Plan not required	Yes*	9.0
Sidewalk		
With approved site plan	No*	
Without site plan	Yes*	11.0

* Permit required from the City of Durham Engineering Division and/or from NCDOT.

** Permit fee, surety and executed Stormwater Facility Agreement and Covenant required by direction of the Stormwater Service Division.

SECTION 2.1

CONSTRUCTION DRAWING APPROVAL PROCESS

This section is intended to aid in the process of construction plan submittal.

I. Before Submitting Construction Plans

1. If a site plan is required, obtain site plan approval prior to the construction drawing review or submit construction drawings concurrently with the site plan review (preferably after one review of the site plan has been completed). Construction drawings can't be approved until the site plan is approved. Be aware that some site plans may have expiration dates. If there are any questions contact the City/County Planning Department at (919) 560-4137.
2. Some projects require additional approvals that are beyond local authority (for example: erosion control permits, wetland permits, etc.). The Durham City Engineering Division requires that all appropriate agencies be contacted and approvals for the plans shall be obtained. Even if the City Engineering Division does not ask for proof of approvals, it does not relieve the applicant from obtaining them.
3. If water and/or sanitary sewer lines (mains and/or services) are extended outside the City Limits, an Extension Agreement Application and Annexation Petition Package shall be submitted to the City/County Planning Department (this is typically done at rezoning or prior to site plan review). A fully executed (completed with signatures and approval by City Council) Extension Agreement is required prior to Construction Drawing Approval. If the site is located within the City Limits the Engineering Division may require an Extension Agreement Application to be submitted. The request for the Extension Agreement Application is typically done during rezoning or site plan review, but if these are not required for the project, the Extension Agreement Application may be requested during construction drawing review.
4. Developers shall engage the services of a Professional Engineer registered in the State of North Carolina (NCPE) to prepare, sign and seal plans and specifications for the construction of all streets, water, sanitary sewer and applicable storm drainage systems and structures (Developers may also engage the services of a registered Professional Land Surveyor or Landscape Architect registered in the State of North Carolina to prepare, sign, seal plans and specifications for the construction of streets and applicable storm drainage systems and structures). For more detailed requirements of these construction plans see also the Sections 2.3, Construction Phase, through Section 12.0, Standard Notes.
5. Sanitary sewer pump stations for projects will require coordination with the Department of Water Management prior to submittal of site plan or construction plans. This is to determine if the station is feasible and to determine the design parameters that apply.

II. Construction Drawing Submittal Requirements

The consultant shall prepare constructions drawings in accordance with the approved site plan and the City of Durham Reference Guide for Development. The consultant shall then provide construction drawing submittal packages to the Development Services Center located at the ground floor of 101 City Hall Plaza, Durham, NC 27701. A construction drawing submittal package shall contain the following items:

- A completed original of the City of Durham *Public Works Construction Drawing Submittal Checklist* and shall include all items indicated in the checklist as required for the Engineering Division. All items for the Engineering Division shall be bound together.
- A completed copy of the City of Durham *Public Works Division Construction Drawing Submittal Checklist* and shall include all items indicated in the checklist as required for the

Stormwater Services Division. All items for the Stormwater Services Division shall be bound together.

- A completed copy of the City of Durham *Public Works Division Construction Drawing Submittal Checklist* and shall include all items indicated in the checklist as required for the Transportation Division. All items for the Transportation Division shall be bound together.

All submittals will be reviewed for completeness (triage process) by the end of the second business day after receipt. ***Incomplete submittals for any Division will cause the entire submittal to be rejected from the review process.*** Rejected submittals can be resubmitted for a completeness review the next business day, provided the missing information has been added to the submittal. Email triage@durhamnc.gov if you have questions about the triage process.

CITY OF DURHAM – CONSTRUCTION DRAWING SUBMITTAL CHECKLIST

City-County Planning Department – Development Services Center

101 City Hall Plaza | Durham, NC 27701

919-560-4137 or 919-560-4144 | DSC@DurhamNC.gov

www.durhamnc.gov

Date: _____

Submit plans to the Development Services Center at the ground floor of City Hall.

PROJECT INFORMATION

Project Name: _____

Project name above shall match exactly the project name shown on the cover sheet of the construction drawings.

Phase: _____ Planning Case Number: _____

Previous Project Name/s: _____

PIN numbers: _____

Project Address: _____

APPLICANT INFORMATION

Contact Person: _____ Company: _____

Email Address: _____ Phone: _____

SUBMITTAL INFORMATION

☐ 1st Construction Drawing Submittal

Fee: ☐ $500 ☐ $1,200 (for plans with plan and profile sheets)

The included sets of site plans are: ☐ approved and stamped ☐ approved and not stamped

☐ under review #_____ ☐ a site plan is not required

☐ Construction Drawing Re-submittal

☐ Final/Reproducible Construction Drawing Submittal for signatures

☐ Revision to Previously Approved Construction Drawings: Amendment # _____

Is the project under construction? ☐ Yes, PW Inspector: _____

☐ No

Fee: ☐ $500 ☐ $1,200 (for plans with plan and profile sheets)

Comments:

CITY OF DURHAM – CONSTRUCTION DRAWING SUBMITTAL CHECKLIST

City-County Planning Department – Development Services Center

101 City Hall Plaza | Durham, NC 27701

919-560-4137 or 919-560-4144 | DSC@DurhamNC.gov

www.durhamnc.gov

Date: _____

INSTRUCTIONS

Initial in the space provided to indicate the following submittal requirements have been met. For items that do not apply, the applicant should note "N/A" for those items. Depending upon the project, additional items may be required. Construction drawing submittals without the following minimum criteria will be returned to the applicant **without a review being performed**. All report covers must contain the project name as listed in the cover sheet of the construction drawings and PIN#s. Separate materials into submittal packages for each review group as shown on the checklist.

ENGINEERING DIVISION SUBMITTAL REQUIREMENTS

Initial Submittal

_____ Construction Drawing Submittal Checklist ***(include both paper and digital copies)***

_____ Digital Set of Site Plan

_____ Set of Construction Drawings (24"x36" sheet size – to scale)

_____ 10-year and 25-year HGL calculations for all proposed storm drainage pipes (as required by the Reference Guide for Development)

_____ Swale and flume design calculations (as required by the Reference Guide for Development)

_____ Culvert design calculations (as required by the Reference Guide for Development)

_____ Gutter spread calculations (as required by the Reference Guide for Development)

_____ Fire flow analysis for each individual phase and full project build-out if applicable (as required by the Reference Guide for Development)

_____ Private/public pump station plans included in set of construction drawings

_____ Electronic Submittal of all materials listed above on CD/DVD or USB Flash Drive

Re-submittals (Re-reviews)

_____ New Construction Drawing Submittal Checklist ***(include both paper and digital copies)***

_____ Set of Revised Construction Drawings

_____ Redlined Construction Drawings from previous submittal

_____ Revised calculations/reports

_____ Redlined calculations/reports from previous submittal

_____ Electronic Submittal of all materials listed above on CD/DVD or USB Flash Drive

Final Submittal for Signature/Approval

_____ New Construction Drawing Submittal Checklist ***(include both paper and digital copies)***

_____ Original signed/sealed reproducible Construction Drawings for signature

_____ Additional set of Revised Construction Drawings if there are comments from the previous review.

_____ Redlined Construction Drawings from previous submittal

_____ Redlined calculations/reports from previous submittal

_____ Electronic Submittal of all materials listed above on CD/DVD or USB Flash Drive

CITY OF DURHAM – CONSTRUCTION DRAWING SUBMITTAL CHECKLIST

City-County Planning Department – Development Services Center

101 City Hall Plaza | Durham, NC 27701

919-560-4137 or 919-560-4144 | DSC@DurhamNC.gov

www.durhamnc.gov

Date: _____

PROJECT INFORMATION

Project Name: _____

Phase: _____ Planning Case Number: _____

Previous Project Name/s: _____

PIN numbers: _____

Project Address: _____

APPLICANT INFORMATION

Contact Person: _____ Company: _____

Email Address: _____ Phone: _____

STORMWATER SERVICES DIVISION SUBMITTAL REQUIREMENTS

Initial Submittal

_____ Construction Drawing Submittal Checklist ***(include both paper and digital copies)***

_____ Hard Copy Set of Site Plan

_____ Approved stormwater impact analysis. If any changes have been made to the site plan that affect the analysis, a revised analysis must be submitted and a revised site plan may be required.

_____ Set of Construction Drawings (24”x36” sheet size – to scale)

_____ Final design calculations for any stormwater BMPs. All BMP designs, where routing is a key component of the design, will require the use of storage indication routing methodology such as TR-20 or HEC-1 models. Provide stage-storage relationship and inflow and outflow hydrographs for all routing calculations. Provide all tabulated data, including calculations showing the outlet under orifice control, barrel control, and weir control (as appropriate), and provide the equations used to develop the rating tables/curves.

_____ Stormwater BMP Design Summary filled out with design calculations (one for each BMP)

_____ Electronic submittal of hard copies on CD/DVD or USB Flash Drive in Portable Document Format (PDF) with the JFSLAT in Excel format.

Re-submittals (Re-reviews)

_____ New Construction Drawing Submittal Checklist ***(include both paper and digital copies)***

_____ Set of Revised Construction Drawings

_____ Redlined Construction Drawings from previous submittal

_____ Revised calculations/reports

_____ Redlined calculations/reports

_____ Electronic Submittal of hard copies on CD/DVD or USB Flash Drive in Portable Document Format (PDF) with the JFSLAT in Excel format.

City-County Planning Department – Development Services Center

101 City Hall Plaza | Durham, NC 27701

919-560-4137 or 919-560-4144 | DSC@DurhamNC.gov

www.durhamnc.gov

Date: _____

Final Submittal for Signature/Approval

_____ New Construction Drawing Submittal Checklist ***(include both paper and digital copies)***

_____ Original signed/sealed reproducible Construction Drawings for signature

_____ Digital Set of Original Signed/Sealed Calculations/Reports

_____ Additional set of Revised Construction Drawings if there are Comments from the Previous Review.

_____ Redlined Construction Drawings from Previous Submittal

_____ Redlined Calculations/Reports from Previous submittal

CITY OF DURHAM – CONSTRUCTION DRAWING SUBMITTAL CHECKLIST

City-County Planning Department – Development Services Center

101 City Hall Plaza | Durham, NC 27701

919-560-4137 or 919-560-4144 | DSC@DurhamNC.gov

www.durhamnc.gov

Date: _____

PROJECT INFORMATION

Project Name: _____

Phase: _____ Planning Case Number: _____

Previous Project Name/s: _____

PIN numbers: _____

Project Address: _____

APPLICANT INFORMATION

Contact Person: _____ Company: _____

Email Address: _____ Phone: _____

DEPARTMENT OF TRANSPORTATION SUBMITTAL REQUIREMENTS

Initial Submittal

_____ Construction Drawing Submittal Checklist ***(include both paper and digital copies)***

_____ Digital Set of Site Plan

_____ Set of Construction Drawings (24”x36” sheet size – to scale)

_____ Cover sheet with special conditions of approval requirements

_____ All road widening drawings (public, private or NCDOT)

_____ Signing and marking drawings included

_____ Signing and marking notes included on plans

_____ Standard signing and marking details included on plans (sign details, pavement marking details, street marker details, etc.)

_____ Signal Plans

_____ Traffic Control Plan (if closing streets for any length of time or closing sidewalks for more than 7 days)

_____ Electronic Submittal of all materials listed above on CD/DVD or USB Flash Drive

Re-submittals (Re-reviews)

_____ New Construction Drawing Submittal Checklist ***(include both paper and digital copies)***

_____ Set of Revised Construction Drawings

_____ Redlined Construction Drawings from previous submittal

_____ Electronic Submittal of all materials listed above on CD/DVD or USB Flash Drive

Final Submittal for Signature/Approval

_____ New Construction Drawing Submittal Checklist ***(include both paper and digital copies)***

_____ Original signed/sealed reproducible Construction Drawings for signature

_____ Additional set of Construction Drawings if there are comments from the previous review.

_____ Redlined Construction Drawings from previous submittal

_____ Electronic Submittal of all materials listed above on CD/DVD or USB Flash Drive

CITY OF DURHAM – CONSTRUCTION DRAWING SUBMITTAL CHECKLIST

City-County Planning Department – Development Services Center

101 City Hall Plaza | Durham, NC 27701

919-560-4137 or 919-560-4144 | DSC@DurhamNC.gov

www.durhamnc.gov

Date: _____

PROJECT INFORMATION

Project Name: _____

Phase: _____ Planning Case Number: _____

Previous Project Name/s: _____

PIN numbers: _____

Project Address: _____

APPLICANT INFORMATION

Contact Person: _____ Company: _____

Email Address: _____ Phone: _____

DEPARTMENT OF WATER MANAGMENT SUBMITTAL REQUIREMENTS

Initial Submittal

_____ Construction Drawing Submittal Checklist ***(include both paper and digital copies)***

_____ Digital Set of Construction Drawings (24"x36" sheet size – to scale)

_____ Digital Set of Electrical Plans Pump Station Designs (24"x36" sheet size – to scale)

_____ Digital Set of Private/Public Pump Station Design Calculations

_____ Digital Information for Sewer Basin Location of Project Provided

_____ Digital Copy of Utility Impact Analysis (UIA)from the Site Plan Review

_____ Digital Copy of No-Impact to City Infrastructure determined

_____ Digital Copy CIP Notification and Coordination

_____ Digital Copy of Design Worksheets (from Lift station design Standards Appendix A)

_____ Digital Copy of Manufacturer's Specifications for Pump (including controls), Generator, and Transfer Switch.

Re-submittals (Re-reviews)

_____ New Construction Drawing Submittal Checklist ***(include both paper and digital copies)***

_____ Digital Set of Revised Construction Drawings

_____ Digital Set of Revised of all Previously Submitted Drawings

_____ Digital Set of Redlined Documentation and Construction Drawings from previous submittal

Final Submittal for Signature/Approval

_____ New Construction Drawing Submittal Checklist ***(include both paper and digital copies)***

_____ Original Signed/Sealed Reproducible Documentation, Permits, & Construction Drawings for Signature ***(Hard Copy)***

_____ Digital Set of Revised Drawings

_____ Digital Set of Redlined Documentation and Construction Drawings from previous submittal

CITY OF DURHAM – CONSTRUCTION DRAWING SUBMITTAL CHECKLIST

City-County Planning Department – Development Services Center

101 City Hall Plaza | Durham, NC 27701

919-560-4137 or 919-560-4144 | DSC@DurhamNC.gov

www.durhamnc.gov

Date: _____

PROJECT INFORMATION

Project Name: _____

Phase: _____ Planning Case Number: _____

Previous Project Name/s: _____

PIN numbers: _____

Project Address: _____

APPLICANT INFORMATION

Contact Person: _____ Company: _____

Email Address: _____ Phone: _____

CITY-COUNTY PLANNING-DEVELOPMENT SERVICES SUBMITTAL REQUIREMENTS (Floodplain or Stream & Wetland)

Initial Floodplain Submittal

_____ Previous PW Numbers if known: _____

_____ Construction Drawing Submittal Checklist ***(include both paper and digital copies)***

_____ Digital Set of Site Plan (24”x36” sheet size – to scale)

_____ Digital Set of Construction Drawings (24”x36” sheet size – to scale)

_____ Digital Copy of the Floodplain Determination Form

_____ Digital Copy of the Completed Floodplain Checklist

_____ Digital Copy of the Floodplain Impact Plan (24”x36” sheet size – to scale)

_____ Digital Copy of the Floodplain Review Items per the Floodplain Determination Form

_____ Digital Copy of the Design Professional’s Narrative of Floodplain (Existing Conditions, Proposed Work, Impact of Activities, and Required Protections -Regulatory Specific)

Initial Stream and Wetland Submittal

_____ Previous PW Numbers if known: _____

_____ Construction Drawing Submittal Checklist ***(include both paper and digital copies)***

_____ Digital Set of Site Plan (24”x36” Sheet Size – to Scale)

_____ Digital Set of Construction Drawings (24”x36” Sheet Size – to Scale)

_____ Digital Copy of the Buffer/Setback Determination Form for Streams & Wetlands

_____ Digital Copy of the Stream & Wetland Impact Plan Checklist

_____ Digital Copy of the Stream & Wetland Impact Plan

_____ Digital Copy of the NPAA Form (Ordinance Use Noted)

_____ Digital Copy of the Stream Determination Report and Letter (Regulatory Specific)

_____ Digital Copy of the Design Professional’s Narrative of Stream & Wetland (Existing Conditions, Proposed Work, Impact of Activities, and Required Protections -Regulatory Specific)

CITY-COUNTY PLANNING-DEVELOPMENT SERVICES SUBMITTAL -DEVELOPMENT SERVICES SUBMITTAL REQUIREMENTS (Floodplain or Stream & Wetland) (CONTINUED)

Re-submittals (Floodplain or Stream & Wetland Re-reviews)

_____ New Construction Drawing Submittal Checklist ***(include both paper and digital copies)***

_____ Digital Set of Revised of All Previously Submitted Drawings

_____ Digital Set of Redlined Documentation and Drawings from Previous Submittal

Final Submittal for Floodplain or Stream & Wetland Submittal(s) Signature/Approval

_____ New Construction Drawing Submittal Checklist ***(include both paper and digital copies)***

_____ Original Signed/Sealed Reproducible Documentation, Permits, & Construction Drawings for Signature **(Hard Copy)**

_____ Digital Set of Revised of all Previously Submitted Drawings

_____ Digital Set of Redlined Documentation and Construction Drawings from Previous Submittal

III. Construction Plan Approval Process

1. The construction drawings shall be submitted to the Public Works Desk at theDevelopment Services Center. The City of Durham will review the submittals for completeness (triage process) by the end of the second business day after receipt of submittal. If all of the required items for each Division are not included in the submittal, the entire submittal set will be rejected. The contact person listed on the submittal form will be notified and told to pick up the rejected submittal with a redlined list of the missing items. All accepted submittals will be distributed to each Review Group for review. Email triage@durhamnc.gov if you have questions about the triage process. When the reviews are completed the contact person listed in the submittal checklist will be notified that redlined plans are available for pickup at the Development Services Center located on the 3rd floor of City Hall.

2. Responses to construction drawing comments directly on the redlined plans or in letter format are encouraged when resubmitting construction drawings.

3. When plans have completed the entire review cycle, the consultant will be instructed to provide all stormwater fees, surety and maintenance agreements (if applicable – see note below) and to submit original drawings (reproducibles) for final review, sealing and signoff by the Engineering, Stormwater Services and Transportation Divisions (*see sample of stamp at the end of this section*).

Note: Permit fee, surety and executed maintenance agreements for stormwater quality and/or quantity best management practices are required per the Stormwater Services Division. No plans will be allowed to proceed with construction until all of these items are completed.

The approval stamp below shall be provided on all of the construction drawing sheets by the design professional.

CITY OF DURHAM
PUBLIC WORKS DEPARTMENT
APPROVED

ENGINEERING _____ DATE _____
STORM WATER _____ DATE _____
TRANSPORTATION _____ DATE _____
_____ DATE _____
_____ DATE _____

SECTION 2.2

CONSTRUCTION DRAWING CHECKLIST

A registered Professional Engineer with the State of North Carolina shall prepare the plans (signed and sealed) for improvements to the water mains, sanitary sewer lines, street improvements and storm drainage systems and structures (see also Sections 2.5, Construction Drawing Profile Checklist, 5.0, Water Supply/Distribution, 7.0, Sanitary Sewer System, 8.0, Stormwater Design Criteria, 8.1, Peak Runoff Rate Increases, 8.2, Neuse River Basin Performance Standards, 8.3, Stormwater Control Facilities (BMPs), and 8.4, Stormwater BMP Design Summaries, and 9.0, Streets. A registered Professional Land Surveyor or Landscape Architect with the State of North Carolina may also be used to prepare street improvements and storm drainage systems and structures. *The following is intended as a guide in the preparation and submitting of plans for public and private improvements for water lines, sanitary sewer lines, street construction and storm drainage systems and structure improvements*.

The City Engineering Division's position is one of review and not of detailed checking. Plans found deficient will result in the rejection of the plans and could delay the entire approval process. Note that plan and profile shall be shown on the same sheet and shall be shown in the same direction.

I. General for All Improvements

___ Sheet size to be only 24-inch by 36-inch.

___ Plan and profile sheets are required (see also Section 2.5, Construction Drawing Profile Checklist).

___ North arrow.

___ Parcel Identification Number (PIN) written in the upper right corner.

___ A clear vicinity map (shown on the cover sheet or in the upper right corner) clearly showing location of site with respect to existing streets.

___ Site map (showing overall limits of improvements on the coversheet or in the upper right corner).

___ Bench mark shown and described on each plan and profile page. All elevations to be true and not assumed.

___ Cover sheet with all consultants and developers, telephone number, address and email address, project name (any former names), Planning Department's case number and entire special conditions of approval.

___ All consultant seals and signatures.

___ Does tree protection fence exactly match the site plan tree protection fence? (If not, contact the Planning Department as a revised site plan may be necessary).

___ Title block with street or project title, numeric and graphic scale, original date, revision date(s), drawing number, checked by, drawn by all in the lower right hand corner (see typical plan and profile drawing at the end of this section).

___ Approval stamp provided on the construction drawings by the design professional (see Section 13.0, Forms, for the Public Works Department stamp) on right side of sheet.

___ Note indicating that:

City of Durham standards and specifications are to be used.

___ Clearing limits shown.

Note: If the clearing limits are different than what was approved on the site plan, the revised plan shall be signed off by the Planning Department. This could require that the plan go through the entire Development Review Board (DRB)/Planning Department review cycle.

___ Adjacent owner(s) showing:

___ Names (optional).
___ Property lines.
___ Addresses (optional).
___ Tax map numbers.
___ Parcel Identification numbers.

___ Right-of-Way widths.
___ Existing and proposed with dimensions.
___ Easements, existing and proposed with dimensions.
___ Reference of plat book and page for dedication of additional right-of-way (if available).
___ Existing iron pins from location survey (optional).
___ If on a NCDOT road:
___ Reference state road number and street name.
___ Reference centerline intersection distance to nearest state road cross street.
___ Beginning and ending stations, including matchline stations for multiple sheets.
___ Easement Notes (see also section on Section 12.0, Standard Notes).
___ Legend for drawing symbols.
___ Drawing symbols to be proportionate.
___ Existing paved roads are to be bored for water and sanitary sewer crossings. Show /label and dimension encasement pipe, carrier pipe, and bore pit (at least 30 feet long).
___ Show all guardrails (include detail). Use standard NCDOT guardrail.
___ Provide standard utility crossing note on the overall utility plan (See Section 12.0, Standard Notes).
___ Phasing of the project shall match phasing shown in approved site plan. Provide water valve, manhole, and temporary turn-around at all phase lines.

II. Water Mains

___ Existing/proposed water lines shown (sizes, material, and if public or private) and labeled.
___ Dimension and show proposed water main from centerline or right-of-way.
___ Proposed water services installed at right angle to street.
___ Label size of all proposed tees, bends, and blow-off assemblies.

III. Sanitary Sewer Mains

___ Existing/proposed sanitary sewer lines shown (sizes, material, and if public, County, or private) and labeled.
___ Show angle alignment on outfalls.
___ Dimension proposed manhole from centerline.
___ Station manholes from left to right.
___ For outfalls orient the layout so that the lowest elevation manhole is on the left.
___ Manholes: station and label.
___ Existing manholes with proposed sanitary sewer connections show the following note: Core drill and install flexible rubber boot.
___ Label the manholes as a drop connection or doghouse as appropriate.
___ Show manhole rims 2-feet above 100-year floodplain elevation (existing or created).
___ All manholes not in street right-of-way to be 3-feet above finished grade.

___ Show stub-out or knock out for future sewer. Stub outs require a minimum sanitary sewer line length of 5-feet (and cap) from the manhole for future sanitary sewer or as directed by the City Engineering Division.

___ Lateral cleanouts shall be located at the easement or right-of-way line.

___ 4-inch lines should tie into the sanitary sewer main with a tap (avoid the manhole) except at cul-de-sacs or as approved by the City Engineering Division.

___ 6-inch lines and larger must tie into a manhole.

___ Show sanitary sewer services installed at right angles to the street/sanitary sewer easement for all lots and buildings.

___ Dumpster pads for food service establishments and all establishments utilizing a compactor shall have a drain connected to the sanitary sewer with a grease trap. Only the runoff from the dumpster pad shall be directed to the dumpster drain.

___ No storm structures or conveyance systems are shown in sanitary sewer easements except as crossing at 90 degrees.

___ Minimum sanitary sewer easement width for sanitary sewer mains is 30-feet and 5-feet building setback. No combined easements are allowed. Overlapping easements are allowed, so long as any structures or conveyance systems are located outside of the sanitary sewer easement and all easements are labeled separately.

IV. Storm Drainage

___ An overall grading and drainage plan provided showing existing and proposed grading.

___ Storm drainage calculations with hydraulic grade lines, gutter spread, culvert, flume, overland-relief, and scour velocity and supporting documentation (does not need to be on drawings). See also Section 8.0, Stormwater Design Criteria.

___ Signed and sealed by a registered Professional Engineer if system intercepts stormwater from public streets or offsite drainage.

___ Show all on-site and adjacent storm drainage facilities.

___ Existing drainage shown and labeled including pipes, culverts, manholes, catch basins, ditches, headwalls, endwalls, etc. and appropriate sizes and inverts.

___ Proposed drainage system shown and labeled (numbered) on overall grading and drainage plan.

___ Proposed storm drainage table showing sizes, inverts, grades, lengths, rims, materials, etc.

___ Outlet and inlet protection (type, size/dimensions, material, etc.).

___ Channel detail with size, typical section, lining, etc. (on the construction drawing).

___ Show and label all storm drainage easements.

___ Floodplain data (fringe line, elevation, floodway, and FEMA panel number).

___ Delineated wetlands.

___ Existing bodies of water (lakes, streams, creeks, etc.) with stream buffers and note (see Section 12.0, Standard Notes).

___ Show erosion control sediment basin locations. Basins not to be located on or cause stormwater to be retained on sanitary sewer easement or public right-of-way.

___ For public streets with 24-inch pipe or larger include a 4-feet high PVC coated dark green chain link fence at the right-of-way. Length shall be extended to end of fill section as it intersects existing grade.

___ Flared end sections or headwalls are required at beginning and end of all stormwater pipes.

___ Headwalls and endwalls or flared end sections are required on all pipes, however Stormwater Services reserves the right to require headwalls and endwalls instead of flared end sections or vice versa.

___ Minimum stormwater easement width shall be determined per guidelines (Section 8.0, Stormwater Design

Criteria). Show 2-feet setback from stormwater easement. No combined easements are allowed. Overlapping easements are allowed, as long as any structures for other utilities are located outside of the stormwater easement and all easements are labeled separately.

___ Overland relief shall be provided for all stormwater pipe systems, inlets, and culverts such that no building or habitable structure will be flooded or have water impounded against it during the 100-year storm event.

V. Street (refer to Section 9.0, Streets, for acceptable street types)

___ Provide all street centerline bearings and distances. Provide all centerline radii and length of curves.

___ Provide a typical cross section with pavement thickness.

___ Street names and State road numbers if applicable.

Existing pavement width (show shaded) dimensioned to back of curb (BOC).

___ Curve data with super elevation, runoff data and design speed.

___ Residential streets are designed without superelevation. If superelevation is desired or needed, submit a sketch to City Engineering indicating why this is needed.

___ Existing and proposed centerlines (if different or new streets are proposed), curb and gutter, edge of pavement, driveways (with widths and material type), sidewalks, handicap ramps, etc. (All center line information shall contain bearing and distance as well as all horizontal curve information).

___ Roll curb shall transition to standard curb at all radii, catch basins, fire hydrants, and as directed by the Engineering inspector during construction.

___ Stations along centerline and at special features (point of tangent, point of curve, catch basins, centerline point of intersection, low/high point, etc.).

___ Taper and lane storage lengths shown. Calculations of lengths to be placed directly on drawings.

___ Obstructions labeled.

___ Posted speed limits for widening of existing streets.

___ Design speed of new streets.

___ Utilities identified and labeled.

___ Trees and shrubs shown and labeled to remain and those to be removed.

___ Street intersection turnouts with radii.

___ Proposed elevations and grades around cul-de-sac and street intersection radii.

___ Street width (back of curb), right-of-way width and all street intersection radii.

___ Signing and Pavement Markings Sheet (when necessary, see Section 10.0, Transportation).

___ At all road stubs to adjacent properties where required by the Public Works Department, the consultant shall provide all requested future street profiles for review and approval.

SECTION 2.3

CONSTRUCTION DRAWING PROFILES CHECKLIST

Note that plan and profile must be shown on the same sheet and must be shown in the same direction.

Profile drawings are required when:

___ The improvements are to be public.

___ Sanitary sewer lines that are to be permitted.

___ Private water lines where they cross the sanitary sewer lines (a cross-section is acceptable or dimension if crossing is on the plan view).

___ Private streets are proposed.

___ When the City Engineering Division determines that it is required to adequately design the improvements.

A registered Professional Engineer with the State of North Carolina shall prepare the plans (signed and sealed) for improvements to the water mains, sewer mains, street improvements and storm drainage systems and structures. A registered Professional Land Surveyor or Landscape Architect with the State of North Carolina may also be used to prepare street improvements and storm drainage systems and structures (see also Sections 2.4, Construction Drawing Plan Checklist, 5.0, Water Supply/Distribution, 7.0, Sanitary Sewer System, 8.0, Stormwater Design Criteria, 8.1, Peak Runoff Rate Increases, 8.2, Neuse River Basin Performance Standards, 8.3, Stormwater Control Facilities (BMPs), 8.4, Stormwater BMP Design Summaries, and 9.0, Streets). *The following is intended as a guide in the preparation and submitting of plans for improvements for water lines, sewer lines, street construction and storm drainage system and structures.* The City Engineering Division's position is one of review and not of detailed checking. Plans found deficient will result in the rejection of the plans and could delay the entire approval process.

I. General

___ Plan view, required for all profile drawings (see Section 2.4, Construction Drawing Plan Checklist).

___ The plan view is to be at the top and the profile view is to be at the bottom of the sheet (see plan profile sheet at the end of this section for general layout and configuration).

___ For all improvements:

___ Sheet size to be 24-inch by 36-inch.

___ The scale shall be: 1-inch = 40-feet horizontally and 1-inch = 4-feet vertically. Show the scale both numerically and graphically.

___ Bench mark shown and described on each plan and profile page. All elevations to be true and not assumed.

___ Elevations shall be labeled in 10-foot intervals on the heavy lines (Ex. 360, 370).

___ Existing centerline profile shall be extended adequately to design future extensions (300-feet preferred).

___ Existing paved roads are to be bored for water and sanitary sewer crossings. Show/label and dimension encasement pipe and carrier pipe and vertical clearance to other pipes crossed.

___ All labels shall be legible and horizontal or vertical. The bottom of all labels shall face toward the bottom of the sheet or the right side of the sheet, whichever is applicable.

II. Water Mains

___ Existing water lines shown with size and type.

___ Proposed water lines shown with size and type.

___ Show minimum cover for proposed underground utilities (3-feet minimum or as required by the Engineering Division).

___ Waterlines above sewer lines.

___ Show minimum clearance between utilities:

___ 18-inches vertical above sanitary sewer lines or 10-feet horizontal from sanitary sewer line.

___ 24-inches from storm drainage lines.

___ Waterlines below sanitary sewer lines (sanitary lines shall be ductile iron for 10-feet on either side of crossing).

III. Sanitary Sewer Mains

___ Existing sanitary sewer lines shown with size and type.

___ Proposed sanitary sewer lines shown with size and type.

___ Show sanitary sewer grades, inverts at manholes, lengths, rims, etc.

___ Show intersecting inverts and label invert elevations.

___ Show centerline of intersecting streets with stations.

___ Check grades and inverts for accuracy.

___ Indicate 100-year flood elevation (reference FEMA panel #, date).

___ Show manhole rims 2-feet above 100-year floodplain elevation (existing or created).

___ All manholes not in street right-of-way to be 3-feet above finished grade.

___ Add shading to all ductile iron pipe sanitary sewer lines in profiles to distinguish DIP material from PVC material.

___ DIP used as force mains to be lined with "Protecto 401" or equivalent.

IV. Storm Drainage

___ Submit drainage calculations (see Section 8.0, Stormwater Design Criteria, for required drainage calculations).

___ Show existing drainage to remain with inverts, size, etc.

___ Show proposed drainage with inverts, grades, size, length, etc.

___ Maintain a minimum of 1% grade on storm drainage pipes. Further calculations will be required for grades less than 1%, but only with Stormwater Services Approval.

___ Easements required when pipe or channel collects stormwater from a public right-of-way. Easement width to be determined Section 8.0, Stormwater Design Criteria). See Section 12.0, Standard Notes, for storm easement note.

V. Street Design

___ Typical section of proposed street if not already shown on plan (refer to Section 9.0, Streets, for acceptable street types).

___ Existing and proposed centerline profile.

___ Existing top of curb profile.

___ Proposed centerline vertical curve information (VPI, VPC, VPT, Elevation, L, DS based on AASHTO and K value). Show TOC elevations at locations not covered by centerline vertical curve information.

___ Proposed grade lines with percent grade shown.

___ Maintain a minimum of 0.7% grade.

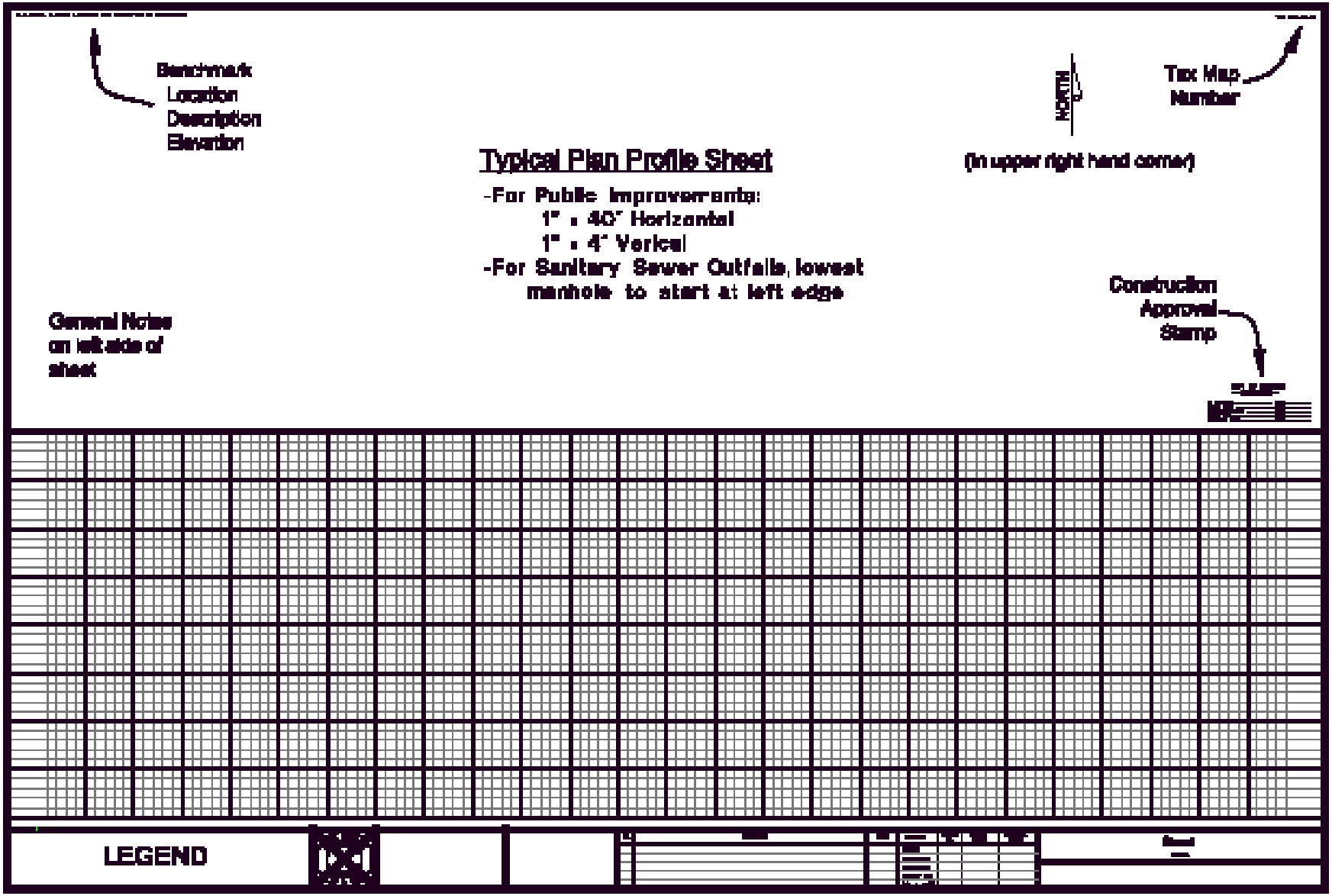
___ Existing elevations shown along centerline, right right-of-way and left right-of-way.

___ Profile shall be projected straight down from plan view whenever possible.

___ Show street intersection turnouts in the profile with elevations given at PC, 1/4, 1/2, 3/4, PT.

___ At all road stubs to adjacent properties where required by the Public Works Department, the consultant shall provide all requested future street profiles for review and approval.

Typical plan profile sheet:


Benchmark
Location
Description
Elevation
NORTH
Tax Map
Number
Typical Plan Profile Sheet
(In upper right hand corner)
-For Public Improvements:
1" = 40' Horizontal
1" = 4' Vertical
-For Sanitary Sewer Outfalls, lowest
manhole to start at left edge
Construction
Approval
Stamp
General Notes
on left side of
sheet
LEGEND

SECTION 2.4

CONSTRUCTION PERMITTING

After construction plans are approved and signed by all applicable Review Groups, the applicant will receive signed originals/reproducibles and a City of Durham Letter of Transmittal (to be picked up at the Development Services Center). The Letter of Transmittal (see below) will indicate required permits, the number of copies of the approved construction drawings to be submitted to Engineering Services and permit fees.

All construction projects with approved construction drawings are required to submit the following to Engineering Services at the 3rd floor of City Hall before the start of construction:

1. Project Information sheet with 4 copies (entire sets) of approved construction drawings
2. DVD or CD labeled with the project name and planning case number with the following files:
   - Combined (one single PDF) file of scans (200 dpi, grayscale) of all sheets of the Approved Construction Drawings,
   - Searchable PDF files (hard copy-only documents, such as the sealed cover sheet and older reports/drawings, may be scanned and included in the PDF, but ensure the rest of the file is searchable):
     - All pages of all approved calculations (fire flow report, HGL analysis, SIA, etc)
     - Supplemental reports used in designing the SCM
   - Jordan/Falls Lake Stormwater Accounting Tool Excel files, if revised from site plan
   - BMP Design Summaries in electronic format (not as a scan or non-fillable pdf)
   - BMP drainage area polygon on a CD-ROM and in one of the following file formats: AutoCAD DWG/DXF, Microstation DGN, or ESRI ShapeFile.
   - Text document listing committed elements from the development plan and/or site plan.
3. Additional items as checked in the Letter of Transmittal

The applicant is required to submit the required number of permit forms, fees and approved, signed construction documents copies to the City of Durham Engineering Division and/or the State of North Carolina as directed by the Letter of Transmittal. The City will review the permit applications for accuracy and compliance with all requirements. The review takes approximately 10 business days. Applicable Engineering inspection and frontage fees will be invoiced. All City of Durham approved permit applications are issued after all fees are paid. **CITY OF DURHAM PERMITS ARE NOT IMMEDIATELY ISSUED AFTER SUBMITTAL OF PERMIT APPLICATIONS**. Permit applications, which require State of North Carolina approval or North Carolina Department of Transportation approval, require substantial additional review by those agencies and the City of Durham does not issue these permits and is not responsible for delays in acquiring these permits.

Typical permits which are submitted and/or issued by the City of Durham include public/private water mains (permitted by City of Durham), public/private sanitary sewer mains (permitted by City of Durham and/or the State of North Carolina) and public sanitary sewer pump stations (submitted by City of Durham to the State of North Carolina and issued by the State of North Carolina). NCDOT utility and sidewalk encroachment agreements (submitted by City of Durham to NCDOT) are issued by NCDOT.

Please note that a variety of permitting situations apply for sanitary sewer inside Durham County and the City of Durham and that the applicant shall pay special attention to these situations and to the Letter of Transmittal. Certain situations will require that the applicant submit plans for review and/or permitting to

the State of North Carolina through *Durham County Engineering* or directly to the State of North Carolina. These situations often involve longer review periods before permits are issued by those review agencies.

See also Section 3.0, <u>Permitting</u>

CITY OF DURHAM – LETTER OF TRANSMITTAL
Department of Public Works
101 City Hall Plaza | Durham, NC 27701
919.560.4326 | F 919.560.4316
www.durhamnc.gov

Date: _____

From: _____

Contact Person: _____ Company Name: _____

Project Name: _____

INSTRUCTIONS

We are returning to you the original reproducible plans for the above mentioned project. These plans have been approved and signed by the City of Durham Public Works Department. Complete the items marked below. Allow a minimum of two weeks after submittal for the processing of any items listed below.

☑ Complete the Project Information sheet and submit with **4 sets** of plans to Engineering Services at the 3rd floor of City Hall. Applicable Engineering inspection and frontage fees will be invoiced and are to be paid before starting construction.

☑ Include a compact disc labeled with the project name and planning case number. Include on the disc the following:

- Combined (one single PDF) file of scans (200 dpi, grayscale) of all sheets of the Approved Construction Drawings,
- Searchable PDF files (hard copy-only documents, such as the sealed cover sheet and older reports/drawings, may be scanned and included in the PDF, but ensure the rest of the file is searchable):
  - All pages of all approved calculations, as applicable, including:
    - Fire flow report
    - Storm drainage conveyance and HGL report
    - Sealed Stormwater Impact Analysis
  - Supplemental reports, as applicable, used in the designing of BMPs, such as:
    - Soil sampling report (e.g., for seasonal high water table assessment, soil permeability assessment)
    - Geotechnical reports (e.g., for investigations for BMP design)
    - Engineer's Cost Estimate for each BMP
- Jordan/Falls Lake Stormwater Accounting Tool Excel files, if revised from site plan,
- BMP Design Summaries in electronic format (not as a scan or non-fillable pdf)
- The following specifications should be adhered to in the submittal for polygons associated with the BMP drainage areas:
  - Submit the BMP drainage area polygon on a CD-ROM and in one of the following file formats: AutoCAD DWG/DXF, Microstation DGN, or ESRI ShapeFile.
  - Files should be georeferenced to the North Carolina State Plane (NAD83) coordinate system in the units of US Survey Feet.
  - Isolate the BMP drainage area polygon to a single CAD layer named: BMP_AREAPOLY. (All ancillary layers can be included in this layer of the file, but are not required.)
- Text document listing committed elements from the development plan and/or site plan.

CITY OF DURHAM – LETTER OF TRANSMITTAL
Department of Public Works
101 City Hall Plaza | Durham, NC 27701
919.560.4326 | F 919.560.4316
www.durhamnc.gov

Date: _____

☑ After payment of Engineering inspection and frontage fees, contact City of Durham Engineering Inspections to schedule a preconstruction meeting (click request form at http://durhamnc.gov/667/Engineering-Inspections or email pwenginspections@durhamnc.gov). Send the request form or email 48 hours prior to the desired time. The contractor must have the latest edition of permitted drawings at this meeting.

☑ At completion of project, prior to issuance of any certificates of occupancy or compliance, submit **3 sets** of as-built drawings, showing inverts of all manholes and inlets, line sizes and slopes and the location of all meters, fire hydrants, valves, clean-outs, storm drainage, BMPs, etc. Engineering or Stormwater Services inspections may have other items required for as-builts. See Section 4.0, As-built Drawings and Section 8.6, BMP Certifying Engineer Program for SCMs in the City of Durham of Reference Guide for Development.

☐ Complete a City of Durham Gravity Sanitary Sewer Extension Permit Application and submit **2 sets** of plans and a **$450 check made payable to City of Durham** to Engineering Services at the 3rd floor of City Hall. If applicable, submit separate co-applications for public sanitary sewer and private sanitary sewer. Approved sanitary sewer permits are required before starting sanitary sewer construction.

☐ Complete the NCDENR application, listing the City of Durham as applicant and submit with **1 set** of plans and a **$480 check made payable to NCDENR** to Engineering Services at the 3rd floor of City Hall. Approved sanitary sewer permits are required before starting sanitary sewer construction (County drainage basin, inside city limits, Public).

☐ Complete the NCDENR application, listing the Developer as applicant and submit with **1 set** of plans and a **$480 check made payable to NCDENR** to Engineering Services at the 3rd floor of City Hall. Approved sanitary sewer permits are required before starting sanitary sewer construction (County drainage basin, inside city limits, Private).

☐ The project is within the County jurisdiction. Obtain a sanitary sewer permit from NCDENR and coordinate with Durham County (919) 560-0735 to obtain acceptance letter. Approved sanitary sewer permits are required before starting sanitary sewer construction.

☐ This project contains a pump station and force main. Complete the NCDENR application, listing City of Durham/Developer (Public/Private) as applicant, and submit with **2 sets** of plans and a **$480 check made payable to NCDENR** to Engineering Services at the 3rd floor of City Hall. Approved pump station permits are required before starting construction.

☐ Complete a City of Durham Water Extension Permit Application and submit **2 sets** of plans and **$450 check made payable to City of Durham** to Engineering Services at the 3rd floor of City Hall. If applicable, submit separate co-applications for public waterlines and private waterlines. Approved water permits are required before starting water main construction.

☐ Submit 1 copy of plans showing signage and pavement markings.

☐ Submit to Engineering Services at the 3rd floor of City Hall 6 **folded** sets of the sheet(s) that have the sanitary sewer and/or water main improvements shown, within NCDOT right-of-way, for an encroachment agreement. Submit 1 **original** of NCDOT's 16.6 (3-party) form, with the owner's signature as the 2nd party. NCDOT encroachment agreements are required before working within NCDOT right-of-way.

CITY OF DURHAM – LETTER OF TRANSMITTAL
Department of Public Works
101 City Hall Plaza | Durham, NC 27701
919.560.4326 | F 919.560.4316
www.durhamnc.gov

Date: _____

☐ Stormwater control facility(ies) (BMP(s)) are required for this project. Provide the required permit fee(s), surety(ies) and executed Stormwater Facility Agreement and Covenant document(s). The required items above are to be completed prior to issuance of any water or sanitary sewer permits or prior to construction of any improvements.

☐ Stormwater control facility(ies) (BMP(s)) are required for this project. Schedule a preconstruction meeting with the Stormwater Development Review section prior to commencing work on any Stormwater Control Measure (SCM). If the SCM will be constructed initially as a Sedimentation and Erosion Control (S&EC) device, to be converted to a permanent SCM at a later time, the preconstruction meeting should be scheduled prior to construction of the S&EC device. Call 919-560-4326 Ext. 30238 to schedule the required meeting a minimum of three business days prior to the desired meeting date.

☐ Backflow Preventer/s are required on this project. Owner/developer must obtain a Backflow Preventer Permit before applying for the water meter. Contact the Cross-Connection Control office at 919-560-4194 (http://durhamnc.gov/952/Cross-Connection-Control) to obtain additional information and installation requirements. The City of Durham's backflow permit fee is $100 per backflow.

☐ Other items are as follows:

_____

_____

_____

Other permits may be required for this project (erosion control, NCDOT driveway, etc.). These permits and the items listed above must be obtained/complied with before starting construction or the project may be stopped during construction until these items have been addressed. Downloadable forms can be found for most of the above referenced items on the City of Durham Public Works Department's website (http://durhamnc.gov/985/Forms-Applications).

SECTION 2.5

CONSTRUCTION PHASE

I. Starting Construction

Construction shall not begin until:

1. Construction drawings have been approved, sealed (see *stamp at end of this section) and signed.
2. Submittal of Project Information Sheet
3. Proper permits and/or encroachments have been obtained.
    a. Acquire and dedicate right-of-way
    b. Acquire and dedicate easements
4. Permit fee, sureties and maintenance agreements for any stormwater control facility (BMP) have been provided to the Stormwater Services Development Review.
5. Verify that all fees have been paid.
    a. These fees are mailed if there is/are water mains (permit), sanitary sewer mains (permit) or streets to be constructed with the project.
    b. Other projects that require Construction Drawing Approval will require an inspection fee to be applied for and paid for at City Engineering.
6. Contact Durham Engineering Inspections for a pre-construction conference no less than 48 hours before starting construction (online request form here or email pwenginspections@durhamnc.gov).
7.

II. During Construction

During construction of a project, the following shall be kept on site at all times:

1. A set of approved construction drawings and all revisions.
2. A copy of all permits, including water, sanitary sewer, driveway and sediment and erosion control.
3. A set of drawings showing as-built locations of valves, manholes, catch basins, meters, clean-outs, storm drain pipes, culverts, etc.

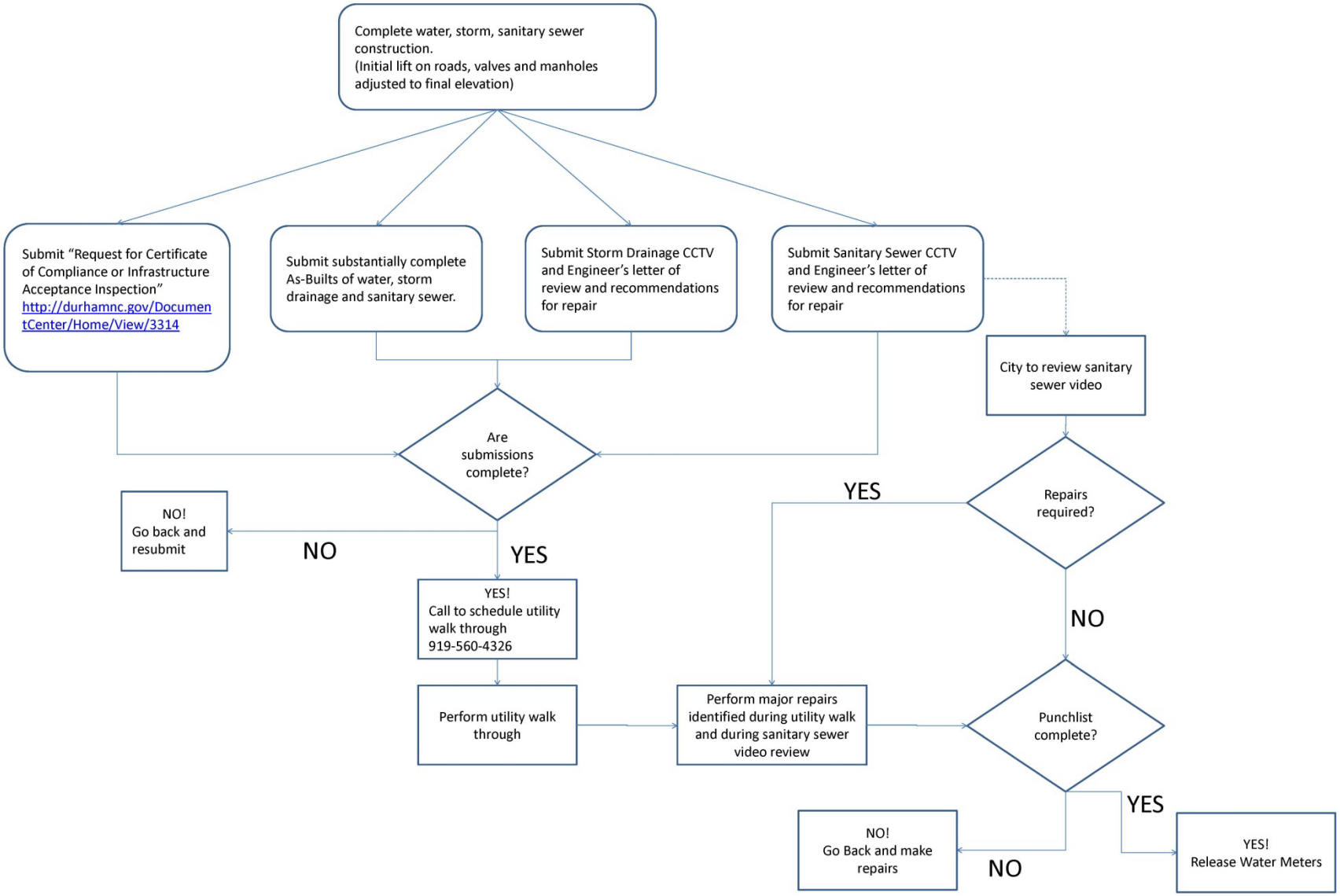
III. Completing Construction (Closing Construction Plan Process)

After all construction is complete the project is not closed until the following items are completed:

1. The project is complete and is acceptable to the City Engineering Inspection Section.
2. If the following items apply to the approved construction drawings or site plan, they shall be completed prior to the provision of a certificate of compliance or occupancy:
    - The Developer shall furnish the Engineering Division approved as-built drawings as described in Section 4.0, As-built Drawings. If a right-of-way map is required for public water, sanitary sewer and stormwater easements, the developer shall provide a mylar copy of the right-of-way map. NOTE THAT NO METERS OR SANITARY SEWER SERVICE CONNECTIONS SHALL BE MADE PRIOR TO ACCEPTANCE OF ASBUILTS
    - The Developer shall furnish the Stormwater Services Division approved as-built drawings as described for any stormwater best management practice described in Section 8.6, BMP Certifying Engineer Program for SCMs in the City of Durham.

- The Engineer shall submit certification pursuant to State water and sanitary sewer permits and stormwater best management practice(s)
- Submit Request for Certificate of Compliance or Infrastructure Acceptance Inspection form.
- Complete sidewalk and have it inspected
- Final right-of-way and driveway inspection approved
- Complete turn lanes if applicable
- Complete stormwater collection system and complete stormwater BMP(s) and receive approval of construction
- Complete water and sanitary sewer, streets and accepted
- Complete roadway construction
- Utility mainline construction permits for each utility installed
- The responsible party for each pavement cut identified
- Provide a construction surety in lieu of completing the required infrastructure (see options available)

3. For public improvements, the Developer shall provide a 1-year warranty on the improvements from date of acceptance (a letter of acceptance will be issued by the City of Durham Public Works Department).


Complete water, storm, sanitary sewer construction.
(Initial lift on roads, valves and manholes adjusted to final elevation)
Submit "Request for Certificate of Compliance or Infrastructure Acceptance Inspection" http://durhamnc.gov/DocumentCenter/Home/View/3314
Submit substantially complete As-Builts of water, storm drainage and sanitary sewer.
Submit Storm Drainage CCTV and Engineer's letter of review and recommendations for repair
Submit Sanitary Sewer CCTV and Engineer's letter of review and recommendations for repair
City to review sanitary sewer video
Are submissions complete?
NO
NO! Go back and resubmit
YES
YES! Call to schedule utility walk through 919-560-4326
Perform utility walk through
Perform major repairs identified during utility walk and during sanitary sewer video review
Repairs required?
YES
NO
Punchlist complete?
NO
NO! Go Back and make repairs
YES
YES! Release Water Meters

SECTION 3.0

PERMITTING PROCESS

This section is intended to describe the permitting process and which items need to be permitted through the Engineering Division and which may need input from other agencies. The permitting process can start only after the plans have completed the Section 2.1, Construction Plan Approval Process. For the fee structure, refer to Section 14.0, Fees.

I. Building Permit

A. Single Family

Contact City/County Building Inspections for a building permit or a building moving permit application and submittal procedure. If the project is a new or revised site plan in Durham City or Durham County the City/County Planning Department should be the first point of contact. The Planning Department will determine if the site requires other type of plan submittals.

B. Multi-family/Commercial Sites

Contact City/County Building Inspections for a building permit application.

The Engineering Division will not review the building permit application until:

1. Site has a valid site plan approval.
2. Construction drawings (if required) have been submitted to the Engineering Division.

II. Moving and Demolition Permits and Information

A. When moving a structure, contact City/County Building Inspections for a Moving Permit Application. This completed form shall be submitted to the Engineering Division, along with a completed Engineering Moving Information Form (see Section 13.0, Forms) and other appropriate paperwork. The Moving Permit must be sent to numerous other departments and utilities listed on the application.

B. When demolishing a structure, complete the Engineering Demolition Information Form and submit it with a drawing showing existing conditions. Highlight locations of all utilities. Refer to Section 5.0, Water Supply/Distribution, and Section 7.0, Sanitary Sewer System, for information regarding abandonment of water service and sewer service, respectively. All services shall be terminated per Section 5.0, Water Supply/Distribution, and 7.0, Sanitary Sewer System.

III. Driveway Permits

A. City (Single Family House)

Only for new driveway construction onto a city street. Submit to the City Engineering Division by telephone or by facsimile the street address a minimum of 24 hours before starting construction. The permit can be picked up when the permit fee is paid. The permit is valid if work is to begin within 30 days of being issued.

B. City (Multi-family/Commercial):

1. For previously approved site plans, the permit can be applied for immediately. Bring a copy of the stamped, approved site plan indicating Planning Department's sign off. The permit will be issued within 24 hours.
2. For new driveway cuts onto city streets that do not require complete construction drawings (as indicated in the Section 2.1 follow the following approval process:
   a. Submit to Engineering Development Review a copy of a site plan for the proposed driveway for

review and approval (allow a maximum of two weeks).

b. After approval of a site plan, a permit can be applied for at the Public Works Department's front desk; typical turnaround time is 24 hours.

c. Contact Engineering Inspections Department 48 hours before starting work to schedule an inspection.

C. State

1. Part of the NCDOT driveway application is securing an approval with signature by the Engineering Division. All NCDOT driveway applications ***shall*** be submitted with one copy of a signed, stamped and approved valid site plan by the Durham City/ County Planning Department. ***All permits shall be completely filled out in order to be signed***. Normal turn-around time for a driveway permit is 24 hours.
2. If the road is state maintained contact the NCDOT office (telephone number listed under Directory) for a permit application.

IV. License Agreements (also known as Encroachment Agreements for State Roads)

A. City

Only for encroachments of private utilities (such as irrigation systems or private communication lines) within the right-of-way of a city street. Refer to the License Agreement Application (a copy of the agreement application is located in Section 13.0, Forms).

B. State

Referred to as Encroachment Agreements and are required for all work located inside the right-of-way of a state maintained road. Contact NCDOT office for a listing of their requirements.

V. Right-of-Way Inspections:

Prior to issuing an occupancy permit by the City/County Building Inspections Department, a right-of-way inspection is required by Engineering Inspection Section. Contact the City Engineering Inspection office.

VI. Sanitary Sewer Permits (NPDES Sewer Extension Permit)

A. General

This section is to include sanitary sewer main extensions (private and public). All sanitary sewer mains plans must have City or County Engineering approval before proceeding with permit application. Refer to Section 2.1, Construction Plan Approval Process, and Section 7.0, Sanitary Sewer System, for more detail.

No person shall do any of the following things or carry out any of the following activities until or unless they have applied for and have received from the City a permit and complied with such conditions, if any, as are prescribed by such permit:

1. Construct any sanitary sewer system within the City's utility service area if the system is to be connected to the City sanitary sewer system;
2. Alter, extend or change the construction or method of operation of any sanitary sewer system within the City's utility service area if the system is, or is to be connected to the City sanitary sewer system;
3. Enter into a contract for the construction and installation or the alteration or extension, of any sanitary sewer system that both is within the City's utility service area and is to be connected with the City sanitary sewer system.

B. City (gravity)

The City of Durham Engineering Division has been delegated by the State of North Carolina to permit sanitary sewer lines for the state within the City's collection system. All sanitary sewer lines extending from the City of Durham sanitary sewer collection system that fit the definition of a collection system require a sanitary sewer permit before starting sanitary sewer installation. Collection systems shall be as defined by Title 15A of the North Carolina Administrative Code, Subchapter 2H.

If a sanitary sewer permit is required complete the following procedure:

1. Section 2.1, Construction Plan Approval Process.
2. Submit to the Engineering Division:
   a) A complete sanitary sewer permit application (a copy of a permit application is located in Section 13.0, Forms). A separate permit needs to be completed for a private system and a public system.
      i) Owner shall sign application
      ii) NCPE shall sign and seal application
   b) A check in the amount of $450 made payable to the City of Durham for each permit application. For example, if a project had a public and a private sanitary sewer distribution system, check in the amount of $900 is required (2 permits at $450 each).
   c) Appropriate number of City of Durham Engineering Division approved construction documents.
3. Permit applications are generally reviewed within 10 business days of receipt.

C. City (Pump Stations)

For projects using sanitary sewer pump stations, the applicant shall contact the City Engineering Division prior to submittal of site plan or construction plans. This is to determine if the station is to be public or private and what special requirements might be needed. Be advised that this process takes a longer time to complete since the State will need to review and issue the permit.

1. Complete Section 2.1, Construction Plan Approval Process.
2. Submit a complete state pump station permit application, listing the City of Durham as the owner.
3. Submit a check in the amount of $450 made payable to NCDENR.
4. Submit 2 complete sets of approved plans and specifications.

D. County (gravity)

The County of Durham operates a sanitary sewer collection system in the southeast section of Durham County. For collection systems in this area plans should be submitted simultaneously to the City Engineering Division and the County Engineering Division. Contact City Engineering to confirm jurisdiction. After the plans have been approved, the applicant shall forward the plans to the state. Coordinate approvals with the County Engineering Division.

E. County (Pump Stations)

The County of Durham operates a sanitary sewer collection system in the southeast section of Durham County. For collection systems in this area plans should be submitted simultaneously to the City Engineering Division and the County Engineering Division. Contact Durham Engineering Division to confirm jurisdiction. After the plans have been approved the applicant shall forward the plans to the state. Coordinate approvals with the County Engineering Division at (919) 560-7993.

F. County (septic)

Contact the Durham County Health Department for a listing of their requirements.

G. Industrial Wastewater Discharge Permit

All industrial users and any other users who discharge wastewater that exceeds the domestic waste

concentration as specified in Sec 23-103 of the City's Sanitary Sewer Use Ordinance shall request an industrial user discharge determination from the Industrial Waste Control Section of the Water Management Department.

An Industrial Wastewater Survey and Permit Application package can be obtained by calling the Water Management Department at (919) 560-4381. Based on the information submitted, a determination will be made and a permit will be issued within 180 days from date of completed application. No wastewater discharge is allowed until the Industrial Wastewater Discharge Permit is issued or a determination is made that a permit is not required.

Conditions governing Industrial Wastewater Discharge, permit application process and applicable fees are contained in the City's Sanitary Sewer Use Ordinance and can be obtained from the Water Management Department.

VII. Soil and Erosion Control (Grading) Permit

Contact Durham County Sedimentation and Erosion Control office before doing any land disturbing activity anywhere in Durham County (including inside City) to verify if a permit or a plan is needed. Any disturbance over 12,000 square feet requires a permit and any disturbance over 1 acre requires a plan and a permit.

Pipes and/or structures shown in the Erosion Control Plan of the Site Plan that are proposed to be permanent will be reviewed and approved as part of the Grading Plan during Construction Drawing review. These pipes and/or structures may not be installed prior to Construction Drawing approval and payment of inspection fees.

VIII. Stormwater

A. Drainage Permits for any drainage work that does not require a site plan from the City/County Planning Department pertaining to work on individual properties (channels, pipes, culverts-15" or larger, inlets, etc.) not including Water Quality/Water Quantity Basins.

These plans only have storm drainage improvements.

1. Submit three sets of plans and two sets of calculations to Stormwater Services for approval.
2. The permit can be picked up within 24 hours at the front desk of the Public Works Department upon completion of #1 above.
3. Contact the Engineering Inspections Department 48 hours before starting work to schedule a pre-construction conference.

B. Stormwater Control Facilities (BMPs)

See Section 8.0, Stormwater Design Criteria, through Section 8.4, Stormwater BMP Design Summaries, for a complete listing of requirements needed for facilities. It is highly recommended this process be started as early as possible. There is a permit fee (listed in Section 14.0, Fees), surety and operation and maintenance agreement required before any construction drawings will be approved.

IX. Water Permits

A. General

Plans must have City Engineering approval before proceeding with permit application. Refer to Section 2.1, Construction Plan Approval Process, and Section 5.0, Water Supply/Distribution, for more detail.

No person shall do any of the following activities until or they have applied for and have received

from the City of Durham a permit and shall have complied with such conditions, if any, as are prescribed by such permit:

1. Construct any water system within the City's utility service area if the system is to be connected to the City water system;
2. Alter, extend or change the construction or method of operation of any water system within the City's utility service area if the system is, or is to be connected to the City water system; or
3. Enter into a contract for the construction and installation or the alteration or extension, of any water system that both is within the City's utility service area and is to be connected to the City water system.

B. City

The City of Durham Engineering Division has been delegated by the State of North Carolina to permit waterlines for the state within the City's distribution system. *The following waterlines will need a permit:*

1. Public or private waterline distribution systems as defined by NCDENR.
2. All fire lines;
   a. That have taps on them outside of the building, or
   b. That have fire hydrants
3. Lines that the City Engineering Division determines require a permit.

If a permit is required:

1. Complete Section 2.1, Construction Plan Approval Process;
2. Submit to the Engineering Division;
   a) Complete water permit application (a copy of a permit application is located in the section entitled Section 13.0, Forms). A separate permit shall be completed for a private system and a public system.
      i) Owner shall sign application
      ii) NCPE shall sign and seal application
   b) A check in the amount of $200 made payable to the City of Durham for each permit application. For example, if a project had a public and a private water distribution system, 1 check in the amount of $400 is required (2 permits at $200 each).
   c) Three (3) sets of approved plans by the City of Durham Engineering Division.
3. Permit applications are generally reviewed within 10 business days of receipt.

C. State

Required for all private waterline distribution systems with wells. Contact North Carolina Department of Environmental Health and Natural Resources for a listing of their requirements and/or the Durham County Health Department.

D. Cross Connection

Refer also to the Section 6.0, Cross Connection Control or visit http://durhamnc.gov/952/Cross-Connection-Control. Contact the Department of Water Management Cross Connection Control work group for permit application, plan review and annual testing requirements when:

1. A dead end waterline is greater than 50'
2. Fire lines
3. Irrigation lines
4. Waterlines as required by Cross-Connection

X. Wetlands

Contact the U.S. Army Corps of Engineers if there is any possibility of wetlands on the site before starting any land planning. All wetlands shall be mapped and plans approved by the Corps of Engineers. An area is generally considered as potential wetlands if the site has floodplain, creeks (dry or wet weather), ponds or meets certain other criteria of the Corps of Engineers. Wetland mitigation plans may also be required. Note that it is the responsibility of the applicant to contact the U.S. Army Corps of Engineers and this should be done early in the planning process.

XI. Utility Mainline Construction Permits

This permit type shall be applied for by all utility companies that possess a franchise agreement to operate within the City of Durham limits and wish to install their utilities within the existing or proposed public right-of-way of a development. Permits shall be required when:

A. The proposed development is located within the current City limits and the proposed utility is to be placed within the public right-of-way and/or easement.

B. The proposed development is located outside the current City limits, but an annexation petition is being pursued.

Utility companies shall submit letters of application and plan drawings to the City Engineering Division. Permits shall be issued prior to the start of work.

XII. As-Built Approval

Before a sanitary sewer connection or water meter are installed and prior to issuance of certificate of occupancy, As-Built drawings must be approved. See Section 4.0 for as-built submittal requirements.

Section 4: City of Durham As-built Drawings Review Process

When are As-built Drawings Required?

As-built drawings are required for:

- Water and/or sanitary sewer service connections
- Doghouse manhole for service connections
- Irrigation system connections
- Water main extensions
- Fire lines (sprinkler lines)
- Fire hydrants (including relocations of existing hydrants)
- Sewer main extensions
- Sewer outfalls
- Pump stations and force mains
- Industrial use sewers
- Storm drainage conveyance systems within the right-of-way or private property
- Stormwater Control Measures (see Section 8.6)
- New streets (including horizontal & vertical design data)
- Extensions of existing streets
- Turn-lanes
- Sidewalks
- Other improvements that require permits

Approved as-built drawings are required prior to the installation of water meters and sewer connections and prior to issuance of the certificate of occupancy.

As-built Review Process

The consultant shall provide as-built drawings submittal package to the Public Works Engineering Division located at the 3rd floor of City Hall (101 City Hall Plaza, Durham, NC 27701). Plans are turned-around within 10 business days. Comments are provided as redlines on the plans.

The first submittal package shall consist of:

- As-built Drawing Submittal Checklist
- 2 paper sets of as-built drawings
- 1 CD, DVD, or USB drive with PDF of as-built drawings and PDF(s) of recorded plats of right-of-ways and easements
- 1 CD or DVD with TV inspection of utilities and certified report of TV inspection (separate disk from above)
- Engineering Certification for Water Extension Form
- Engineering Certification for Sewer Extension Form
- Request for Certificate of Compliance or Infrastructure Acceptance Inspection Form
- Request for Infrastructure Acceptance Pursuant to Durham City Code 62-126 Form

Include the As-built Drawing Submittal Checklist with all submittals. Include previously redlined plans on resubmittals.

The Developer shall submit as-builts to the Stormwater Services Division for the Stormwater Control Measures with the SCM As-built Drawings Submittal Checklist in accordance with the BMP Certifying Engineer (BCE) Program (see Section 8.6).

As-built Drawings Checklist

Show and label all constructed improvements as noted below:

1. Make plans 24”x36” size per approved construction drawings.
2. Provide a cover sheet with a vicinity or site plan map.
3. Correct the construction drawings to the as-built condition. The corrections shall be legible.
4. Remove "Proposed" from all locations unless applicable.
5. Scale horizontal distances within 5-feet and vertical distances within 6-inches. Redraw items to correct locations, if actual location differs by more than this.
6. Differentiate new construction from existing infrastructure.
7. Show as-built of on and off-site sidewalk and curb cuts.
8. Show and label all abandoned water, sewer, storm, etc.
9. Label all installed pipe sizes, pipe materials and pipe locations (inverts or top elevations).
10. Show on plan view:
    a. water connections as dashed lines
    b. sanitary sewer connections as solid lines
11. For subdivisions, reference water meter and sanitary sewer service cleanout locations to the nearest property lines to the nearest 0.1-feet. For non-subdivision or commercial, tie down to two physical features.
12. If water-only project: locate connections by station from nearest mainline valve or hydrant valve (example: WM 2+00). Label 0+00 at the valve where stationing begins with an arrow indicating the direction that stations run. Stations should generally run in the same direction for each street.
13. If sanitary sewer-only or water and sanitary sewer project: locate services with distance from property corner or from station from nearest downstream manhole (example: W S 1+80).
14. Show on plan view distances between all water line valves, tees, bends, etc. (example: 500-feet valve to tee).
15. Provide for water mains a separate enlarged detailed sketch on the plan view above all intersecting water mains and fire hydrants showing as-built distances between valves, hydrants, crosses, tees, etc.
16. Tie down all FDC, PIV and BFPs.
17. Show and label if gate valve is in a manhole.
18. Show rim elevations to air release valves.
19. Show and tie down grease outlets and interceptor to dumpsters.
20. Show on plan view and profile view as-built stations for all sanitary sewer and storm drainage manholes (example: MH Sta. 3+01.59).
21. Show on plan and profile view as-built manhole-to-manhole distances for sanitary sewer and storm drainage manholes (example: 301.59 MH to MH). Measure distances in the field from center of manhole cover to center of manhole cover.
22. Show on profile view as-built manhole rim elevations. (example: RIM 810.10).
23. Show as-built ground elevations to all outfalls.
24. Show all water mains conflicts with as-built dimensions.
25. If a reverse tap was approved for the project, provide a 3-D dimensioned enlarged sketch.
26. Show on profile view as-built elevation of all inverts (ins and outs) for all sanitary sewer and storm drainage manholes (example: C/L MH INV 800.10). Show elevations for the invert at the top of the drop pipe for an outside drop manhole and for the vent pipe on a Type B manhole.
27. Use as-built MH-to-MH distances and invert elevations to compute as-built grades to two decimal places (example: 5.06%).
28. Indicate major horizontal alignment changes on plan view. Label bearings, distances and easements of all sanitary sewer outfall sections.
29. Show as-built grades, inverts, rim elevations and locations of all storm drainage structures (storm lines, catch basins, yard inlets, culverts, etc.).
30. Show horizontal or vertical changes in the street alignment or profile if:
    a. The design speed is affected or the K values for vertical curves per AASHTO.
    b. The horizontal or vertical change is greater than 0.5-foot.
    c. Stormwater direction of flow is different from original approved plans
31. Label in plan view street names, lot numbers (as referenced on plat), right-of-way, street widths, intersection radii, cul-de-sac radii, etc.
32. Remove all notes pertaining to copy right infringements and preventing photo copies of drawings.
33. Provide both certification statements signed and sealed from registered NC Professional Engineer and/or Land Surveyor

Note: These certification statements must be executed by a registered NC Professional Engineer and/or Land Surveyor with experience in the design, construction, and survey of water systems, sanitary sewer systems, storm drainage conveyance systems and streets of a nature similar in scope to that certified to in this certification. Periodic observations of construction by the certifying registered NC Professional Engineer (or Designee) and a final inspection for design compliance by the certifying registered NC Professional Engineer will be required to complete this certification.

FIELD SURVEY CERTIFICATION STATEMENT

I, _____**,** as a duly registered Professional Land Surveyor / Engineer (circle one) in the State of North Carolina, hereby certify that the data shown on this drawing, obtained under my supervision, is an accurate and complete representation of what was constructed in the field, that the physical dimensions or elevations shown thus are as-built conditions and the facility was constructed according to the approved plans, except otherwise noted hereon.

Name: _____ Date: _____

NC Registered Seal:

ENGINEER CERTIFICATION STATEMENT

I, _____, as a duly registered Professional Engineer in the State of North Carolina, having been authorized to observe (___ periodically, ___ weekly, ___ full time) the construction of the project, _____, hereby state that, to the best of my abilities, due care and diligence was used in the observation of the construction such that by my inspection of the constructed improvements and my review of the as-built survey data, I hereby certify that the (1) public improvements, (2) private improvements, and (3) public safety of the above referenced project as constructed are in compliance with the requirements of the improvements as prescribed in the approved Construction Drawings, approved design documents, and/or any approved modifications, except as noted in red on the 'As-Built' drawings. Furthermore, I certify that the red-noted exceptions do not adversely affect the required performance or public safety aspects of the improvements.

Name: _____ Date: _____

NCPE Seal:

Electronic Submittal Requirements

Submit electronic drawings and data files as described further on CD or DVD computer media, subject to the following requirements:

1. Summary information file
2. CAD file(s) that include all as-built structures within the project
3. PDF files of signed and sealed as-built drawing
4. Data files for water, sanitary sewer, and stormwater infrastructure

The CD or DVD shall have a permanent typewritten label (hand written labels will not be accepted due the issues regarding legibility) that contains the project name, name of the firm that prepared the data, and date when the CD or DVD was prepared.

Summary Information File

The summary information file is to be an ASCII file that contains the following items:

1. The project name
2. Name of the firm that prepared the data

3. Date the CD (or DVD) was prepared
4. Specification of two or more survey control monuments established and/or used for the project.

   The preferred horizontal coordinate system for the digitally submitted data as described below shall be North Carolina State Plane (NAD83), U.S. Survey Feet. The preferred vertical coordinate system for the digitally submitted data as described below shall be North American Vertical Datum, 1988 (NAVD 1988), U.S. Survey Feet. This specification should include the following information for each survey control point:

   a. Easting – East coordinate value (+/- 0.01')
   b. Northing – North coordinate value (+/- 0.01')
   c. Elevation – Elevation (+/- 0.01')
   d. Description – A brief description of the control monument (including what type of monument it is, such as USGS, NCGS, LEC, WKD, or monument located for the project).
   e. A statement that indicates the horizontal and vertical datum of the control monuments.

CAD File(s)

Submit one or more AutoCad/MicroStation (DGN, DWG, or DXF format) drawing files that contain the entire utility infrastructure (water, sewer, and stormwater) that was constructed during the project, as well as all other pertinent reference lines, project information, and survey control data. The infrastructure shall be drawn in the file at the **as-built locations** as surveyed and certified by the Professional Land Surveyor. The AutoCAD or MicroStation file(s) shall be placed into a folder named "CAD" on the submitted media. **Please note: the delivered CAD files should not be of the Plan/Profile sheets, but should be the overall working drawing in "model space" that is registered to North Carolina State Plane, NAD 1983**.

PDF Files of each As-built Drawing Submitted

Submit one PDF file for each for each hard copy as-built drawing submitted according to specifications in items 1 and 2 above. The PDF file(s) shall be placed into a folder named "PDF" on the submitted media. The PDF must include the signature and seal of the engineer.

Data files for Water, Sanitary Sewer, and Stormwater Infrastructure

Submit as-built data for direct import into the City's Geographic Information System (GIS). This data shall consist of files in an ASCII Comma Separated Value (CSV or TXT) file format. The preferred horizontal coordinate system for the digitally submitted data as described below shall be North Carolina State Plane (NAD83), U.S. Survey Feet. The preferred vertical coordinate system for the digitally submitted data as described below shall be North American Vertical Datum, 1988 (NAVD 1988), U.S. Survey Feet. All of these file(s) shall be placed into a folder named "DATA" on the submitted media.

Several of the data files require the recording of materials for various pipes and structures. Please use the following standard codes where required:

Table 4.1: Material Codes

Code	Description
BRICK	Brick
CA	Corrugated Aluminum
CM	Corrugated Metal
CON	Concrete (Precast)
CONB	Concrete Block
CU	Copper
DI	Ductile Iron
HDPE	High Density Polyethylene
PVC	Polyvinyl Chloride
RC	Reinforced Concrete
VC	Vitrified Clay

1. Water Features

The file shall be named "WaterFeatures" and contains various elements that connect and control the distribution of water within and among various water lines. These features include both buried fittings (bends, crosses, end caps, reducers, and tees) and features that are accessible and/or visible at the surface (meters, valves, and hydrants). Buried features should be located similar to the method our utility locators use: a paint dot is placed on the pavement at the approximate location of the feature and then surveyed location is taken at the paint mark.

Water line locations ("WATERLINE" type in the table below) are required only if the water line curves. These locations will be surveyed at 25 foot stations along the length of the water line.

Each line of the file shall contain the following information:

a. **ID, Type, Easting, Northing, Elevation, Description** (all on first line of the file)
b. Where:
    1. **ID** - A unique ID number assigned to each feature noted on the as-built plan and profile sheets (e.g. GV-1, HYD-1, etc.)
    2. **Type** - The type of feature. Provide the following codes as indicated in the table below:

Table 4.2: Water Features Descriptions

Feature Description	Type
Air Release Valve	ARV
Backflow Preventer	BFP, RPZ, RPA, etc
Bend	BEND
Blow Off	BLOWOFF
Cross	CROSS
End Cap	CAP
Fire Department Connection	FDC
Fire Hydrant	HYDRANT
Post Indicator Valve	PIV
Reducer/Increaser	REDUCER
Tee/Tapping Sleeve	TEE
Water Valve	VALVE
Water Line	WATERLINE
Water Meter	METER

    3. **Easting** – East coordinate value (+/- 2.0' if buried, +/- 0.1' otherwise)
    4. **Northing** – North coordinate value (+/- 2.0' if buried, +/- 0.1' otherwise)
    5. **Elevation** – Elevation, collected as follows: (+/- 2.0' if buried, +/- 0.1' otherwise)

Table 4.3: Water Feature Elevation Locations

Feature Type	Elevation Location
BEND/BLOWOFF/CROSS/END CAP/REDUCER/TEE	Surface, at the mark that indicates the approximate location of the buried feature.
HYDRANT	Top of the fire hydrant.
METER/VALVE	Center of the access structure.
WATERLINE	Surface, at the mark that indicates the approximate location of the buried line, at 25 foot stations. *Only required if a water line is curved.*

    6. **Description** - The description of the item for the feature; encoded as follows:

Table 4.4: Water Feature Descriptions

Feature Type	Description
BEND	Degree of bend (e.g. 11.25/22.5/45/90).
BLOWOFF	Size (in inches) of the blow off.
CROSS	Size (in inches) of each water line that connects to the cross (e.g. “12x12x8x8”).
ENDCAP	Size (in inches) of the water line.
HYDRANT	Manufacturer and year of manufacture. This information will be on the hydrant (e.g. “CLOW-2004”).
METER	The size (in inches).
REDUCER	The size (in inches) of the lines on either side of the reducer (e.g. “8x4”).
TEE	The sizes (in inches) of each water line that connects to the tee (e.g. “12x12x8”).
VALVE	The size (in inches) and type of the valve (e.g. 6 GV, 12 BFV)
WATERLINE	No description required.

2. Water Lines

The file shall be named “WaterLines” and shall contain the following data. There is one line of data for each water line that connects two water features.

a. **ID, Size, Material, FeatureID1, FeatureID2** (all on first line of the file)
b. Where:
    1. **ID** – A unique number assigned to each section of water line noted on the as-built plan and profile sheets (e.g. “WL-1”)
    2. **Material** – Water line material (see Table 4.1: Material Codes above)
    3. **Size** – The size (in inches) of the water line
    4. **FeatureID1** - The ID of the feature on the near end of the water line as shown on the as-built plans (e.g. “GV-1”)
    5. **FeatureID2** - The ID of the feature on the far end of the water line as shown on the as-built plans (e.g. “HYD-1”)

3. Sewer Features

The file shall be named “SewerFeatures” and shall contain information about manholes, cleanouts, and other features listed in the table below. There is one line of data for each sewer feature.

Buried features such as force main bends and tees should be located similar to the method our utility locators use: a paint dot is placed on the pavement at the approximate location of the feature and then surveyed location is taken at the paint mark.

Force main locations (see the “FORCEMAIN” type in the table below) are required only if the force main curves. These locations will be surveyed at 25 foot stations along the length of the water line.

a. **ID, Type, Easting, Northing, Elevation, Invert, Material** (all on first line of file)
b. Where:
    1. **ID** – If the feature is a manhole then the number as shown on the as-built drawings (e.g. “MH-1”). If feature is a clean out then a lot number or street address (e.g. “LOT10” or “123 Street Name”).
    2. **Type** – The feature type, coded according to the following table:

Table 4.5: Sanitary Sewer Features Descriptions

Feature Description	Type
Clean Out	CLEANOUT

Drain	DRAIN
Force Main Valve	FMVALVE
Force Main Tee	FMTEE
Force Main Bend	FMBEND
Force Main	FORCEMAIN
Grease Trap	GREASETRAP
Manhole	MANHOLE
Oil-Water Separator	OWS

3. **Easting** – East coordinate value (+/- 0.1').
4. **Northing** – North coordinate value (+/- 0.1').
5. **Elevation** – Rim elevation at the center of cover (+/- 0.1').

Table 4.6: Sanitary Sewer Features Elevation Locations

Feature Type	Elevation Location
CLEANOUT	Surface adjacent to the cleanout.
DRAIN	Center of the drain grate.
FMVALVE	Center of the access structure.
FMTEE/FMBEND	Surface, at the mark that indicates the approximate location of the buried feature.
FORCEMAIN	Surface, at the mark that indicates the approximate location of the buried main, at 25 foot stations. *Only required if a force main curves.*
GREASETRAP/OWS	Center of the structure
MANHOLE	Rim of the manhole.

6. **Invert** – Invert elevation (+/- 0.1', required only for manholes)
7. **Material** – Construction material (see Table 4.1: Material Codes above)

4. Sewer Pipes

The file shall be named "SewerPipes" and shall contain the following data. There is one line of data for each sewer pipe.

If the pipe is a force main, values for **Size**, **Material**, **USId**, and **DSId** only need to be provided.

a. **ID, Size, Material, USId, DSId, USInv, DSInv, Slope, Length** (all on first line of the file)
b. Where:
    1. **ID** – A sequential pipe number as noted on the as-built drawings (e.g. "SSP-1").
    2. **Size** – Inside pipe diameter (inches).
    3. **Material** – Pipe material (see Table 4.1: Material Codes above).
    4. **USId** – Upstream manhole number as shown on the as-built drawings (e.g. "MH-1").
    5. **DSId** - Downstream manhole number as shown on the as-built drawings (e.g. "MH-2").
    6. **USInv** – Invert elevation at the upstream end.
    7. **DSInv** – Invert elevation at the downstream end. If downstream end is a drop connection provide both elevations separated by a slash (e.g. 344.10/340.03).
    8. **Slope** – The as-built grade of the pipe, expressed as a percentage and carried out to two decimal places.
    9. **Length** – The length (in linear feet) of the pipe as indicated on the as-built mylar carried out two decimal places.

5. Stormwater Features

The file shall be named "StormwaterFeatures." A storm water feature is either a combination inlet, curb inlet, drop/yard/grate inlet (cast iron grate cover with slotted openings), manhole, riser pipe, or slab inlet (solid concrete cover, supported on the corners with side flow entry). There is one line of data for each storm water structure.

a. **ID, Type, Easting, Northing, Elevation, Invert, Material** (all on first line of the file)
b. Where:
    1. **ID** – Structure number as shown on the as-built drawings (e.g. "SWMH-1", "CB-2", "YI-4","DI-3").
    2. **Type** – Type of storm water feature, to be encoded according to the following table:

Table 4.7: Stormwater Features Description

Feature Description	Type
Frame and Grate Inlet	COMBINATION INLET
Curb Inlet (frame, no grate)	CURB INLET
Drop/Grate/Yard Inlet (grate flush with ground)	DROP INLET
End Section	END SECTION
Headwall	HEADWALL
Junction Box	JUNCTION BOX
Manhole	MANHOLE
Pond Outlet Riser	RISER PIPE
Slab Inlet/Open Throat Catch Basin	SLAB INLET
Weir Box	WEIR BOX

    3. **Easting** – East coordinate value (+/- 0.1').
    4. **Northing** – North coordinate value (+/- 0.1').
    5. **Elevation** – Elevation, collected as follows: (+/- 0.1').

Table 4.8: Stormwater Features Elevation Locations

Feature Type	Elevation Location
COMBINATION INLET	Back of curb, center of box
CURB INLET	Back of curb, center of box
DROP INLET	Center of grate
END SECTION	Top of end section
HEADWALL	Center of the headwall
JUNCTION BOX	Center of cover
MANHOLE	Center of cover
RISER PIPE	Top of the riser
SLAB INLET	Top of slab, center of box
WEIR BOX	Top center of box

    6. **Invert** – The invert elevation.
    7. **Material** – Construction material (see Table 4.1: Material Codes above).

6. Stormwater Pipes

Stormwater Pipes – The file shall be named "StormwaterPipes" and shall contain the following data. There is one line of data for each stormwater pipe. .

a. **ID,Size, Material, USId, DSId, USInv, DSInv**, **Slope, Length** (all on first line of the file)
b. Where:
    1. **ID** – A sequential pipe number as noted on the as-built drawings (e.g. "SWP-1").
    2. **Size** – Pipe diameter (inches). Non-circular pipe sizes can be indicated with two dimension values separated by an "X" (e.g. "4x6").
    3. **Material** – Pipe material (see Table 4.1: Material Codes above).

4. **USId** – Upstream feature ID number as shown on the as-built drawings (e.g. “SWMH-1”).
5. **DSId** - Downstream feature ID number as shown on the as-built drawings (e.g. “CB-2”).
6. **USInv** – Invert elevation at the upstream end.
7. **DSInv** – Invert elevation at the downstream end.
8. **Slope** – The as-built grade of the pipe, expressed as a percentage carried out to two decimal places.
9. **Length** – The length (in linear feet) of the pipe as indicated on the as-built mylar and carried out to two decimal places.

7. Stormwater Channels (Constructed Channels)

The file shall be named “StormwaterChannels” and shall contain the following data. Each line of the file shall correspond to a location collected at 25 foot stations along the centerline of the open channel. Each line of the file shall contain the following information:

a. **ID, Easting, Northing, Elevation** (all on first line of the file)
b. Where:
    1. **ID** – is a unique number assigned to each section of open channel. The ID for an open channel changes at any intersection with another open channel and/or stormwater structure.
    2. **Easting** – East coordinate value (+/- 0.1’).
    3. **Northing** – North coordinate value (+/- 0.1’).
    4. **Elevation** – Elevation at the bottom of the channel (+/- 0.1’).

Example Project File

A “Frequently Asked Questions” section and an “Example Project File” of As-built digital submittals are available at the City’s website: http://durhamnc.gov/FAQ.aspx?TID=34.

Approved As-built Drawings Submittal

A. Approved As-built Drawings Submittal

After the as-built drawings have been reviewed and approved provide:

1. One set of reproducible double matte Mylar with corrections and the As-built Certification Statements both signed and sealed by a registered North Carolina Professional Engineer and/or a Professional Land Surveyor
2. Marked-up set (redlines)
3. Electronic submittal (see Section 4.4 above)

As-built Drawings Construction Security

A construction security, in the form of a bank check with an escrow agreement, can be provided in lieu of the final as-built Mylar plans and digital information after paper as-built drawings have been approved. The amount of the construction security will depend on the size of the project. For a single phase of a subdivision the construction security is a minimum of $5,000. The amount may be more depending on the amount of infrastructure constructed.

SECTION 5.0

WATER SUPPLY/DISTRIBUTION

I. General

This section provides guidelines for the design of water main extensions for the City of Durham water distribution system. As a minimum, the Developer/Engineer shall satisfy the requirements contained herein and the City of Durham Construction Water and Sewer Details and Specification. See also Section 2 and Section 3.

II. Sizing Of Water Mains

A. Source

If the proposed development has 100 or more dwellings the site shall have no less than two public water main feeds serving the site. Existing mains greater than 16-inches in diameter are considered transmission mains and no connection of any kind to these mains is allowed. Developers must use mains 16-inches in diameter and less as the source location.

B. Size

1. The size of the water lines are determined by:
   a) Fire flow plus domestic demand for the site (see also C. Pressure).
   b) Future growth beyond the site.
   c) Engineering Division.
2. The standard pipe diameter for public and private lines are 4-inch, 6-inch, 8-inch, 12-inch, 16-inch (refer to the City of Durham Water and Sewer Specifications). In addition, 10-inch diameters may be used for private lines.

C. Pressure

Water mains shall be sized to provide a minimum system pressure of 20-pounds per square inch (psi) during peak system demands plus fire demand. In certain areas of Durham, or for multi-story buildings, there is a potential for having lower water pressure and a private booster pump may be needed to assure adequate service to the site. If it is determined that the proposed development has a potential of being in one of these lower pressure areas, complete and submit the "Potential Low Water Pressure Acknowledgement" in Section 13.0, Forms, as directed by the City of Durham Engineering Division. If higher pressures are required or desired, it is the responsibility of the water customer to provide the necessary booster pumping equipment and facilities. If booster pumps are used contact the Engineering Division and Cross-Connection Control for requirements (back-flow, etc.). The booster pumps should be clearly noted on the construction plans if they are proposed. The peak system demands are to include:

1. The peak domestic demand plus
2. The Fire Protection System (sprinkler) demand plus
3. The fire flow demand shall be the demand for any hydrant on the project. A minimum residual pressure of 20-psi shall be available at all points in the distribution system during peak system demands. The project types and demands based on the highest use allowed by the zoning or the land use map shall be as follows in gallons per minute (gpm):

a) Single family residential	1,500-gpm
b) Office; hotels with sprinklers; institutional; townhomes; multifamily; or	2,000-gpm

apartment buildings (24 units or less)	
c) Commercial with sprinklers; hotels without sprinklers; large scale multifamily apartment buildings (greater than 24 units in building)	2,500-gpm
d) Commercial without sprinklers	3,000-gpm
e) Industrial; research (RTP) with sprinklers	3,000-gpm
f) Industrial; research (RTP) without sprinklers	3,500-gpm

Hydrant demand may also be calculated using Appendix B from the International Fire Code. A reduction of required hydrant demand is allowed **only** when an approved sprinkler system is installed. The resulting hydrant demand (after reduction) shall not be less than 1,500 gpm.

For projects designed with more than one phase, pressure shall be checked so that these guidelines are satisfied during each phase of construction as well as after final completion of all phases.

For projects that are designed with multiple uses, the fire flow selected shall be based on the highest use allowed by zoning (i.e. – a use is set up as an office building but the zoning would allow a commercial or retail occupant to occupy the building then the requirement would be to satisfy the ultimate use of a commercial or retail occupant).

D. Fire Flow Report Requirements

If a hydrant is proposed on a project a fire flow analysis report is required to be approved by the City of Durham Engineering Division. The Engineer shall be responsible for contacting the City of Durham Engineering Division to determine the water system characteristics in the vicinity of the project. See Fire Flow Test Application in Section 13.0, Forms. The City will provide fire flow information in the vicinity of the proposed development. The Developer/Engineer shall submit information on the required fire flow and calculations in accordance with the submittals section to confirm the required fire flow is available. The fire flow analysis shall include the following:

a) Cover sheet with project name, property identification number and PE seal and signature

b) Summary Report should include the following:
   1) Location of pressure hydrant in relation to the site.
   2) Statement of required fire flow for the project. Briefly describe the project and indicate current zoning of the parcel.
   3) Statement of the following: "The (name of project) project with (required fire flow) gpm fire flow, (required peak domestic demand) gpm peak domestic flow and (sprinkler flow demand from sprinkler designer) gpm sprinkler flow provides (lowest residual pressure in system) psi residual flow at the critical node (lowest residual pressure system node). This (meets)/ (does not meet) the City of Durham fire flow requirements.

c) Schematic drawing with pipe system layout referencing nodes and pipes. Map (to scale) of location of test hydrant (pressure) and the location of the site clearly indicated.

d) List original water system characteristics as provided by the City noting date, location, flow hydrant, pressure hydrant and Q20 flow available.

e) Pipe and node report indicating pipe sizes, lengths, frictions factor, minor losses

and appropriate elevations and demands. Provide all references for minor loss factors and if a range is given state the value you are using. (Use C=120 for new pipes and C=110 for existing pipes)

f) Static condition indicating only new domestic demand. (Provide all references and calculations for domestic peak demands)

g) Separate fire flow models from each hydrant to indicate each hydrant is capable of providing the fire flow demand while concurrently providing peak domestic and fire protection system demand.

If the fire flow analysis does not meet the minimum City of Durham requirements then the consultant shall contact the City of Durham Engineering Division for further instruction, which may include additional offsite/onsite improvements.

NOTE: At the successful completion of the waterline testing phase the City of Durham Engineering Division may elect to flow test some of the hydrants to obtain data to compare against the fire flow analysis. If the flow data is inconsistent with the analysis, the design consultant and developer will be contacted to remedy the situation.

E. Water Main Material

All waterlines shall be ductile iron and services to be copper to the water meter or to the property line (meeting AWWA standards).

III. Water Main Location

A. Depth

1. Water mains shall be designed with a minimum of three feet of cover or as directed by the Engineering Division from the top of the ground to the crown of the pipe.
2. For proposed waterlines along existing roads, road centerline or edge of pavement will be required on profile in addition to the top of ground above the waterline (Cross-sections of the road from centerline of roadway to right-of-way will be required at 100-foot intervals in addition to waterline profiles). Additional cross-sections may be required depending on the project. Over long distances (greater than 1000-feet) the number of cross-sections may be reduced with the City of Durham Engineering Division approval.

B. Location

Water mains are normally located:

1. Under pavement unless approved by the City of Durham Engineering Division.
2. On the north and east sides of streets.
3. Additional waterline stubs can be required at the discretion of the City of Durham Engineering Division. At a minimum, additional stubs will be required at all intersecting roadways or rights-of - way (locations to be determined by the Engineering Division).
4. 10-feet from centerline of street (not to be under the curb and gutter section).
5. Shall be 18-inches above or 10-feet horizontal from sanitary sewer lines. If unable to maintain either of these separations both lines shall be made of ductile iron for a minimum of 10-feet beyond the crossing with the joint being centered at the point of intersection.
6. Shall be 12-inch separation from storm sewer lines and other utilities.

C. Easements, Encasements and Rights-of-Way

1. All public water mains shall be located within a street right-of-way to allow City personnel access to the main for maintenance and repair. Public water mains in easements are the

exception and require special approval for use.

2. Public water main easements shall be no less than 25-feet and may be greater depending upon depth and location.
3. Private water main easements shall be no less than 25-feet and may be greater depending upon depth and location.
4. Private water lateral easements shall be no less than 15-feet and may be greater.
5. No landscaping or earthwork is allowed in existing waterline easements. No landscaping is allowed in proposed waterline easements and all earthwork must be completed before waterline is installed.
6. Encasements are required for bored crossings and railroad right-of-way. Refer to the City of Durham Water and Sewer Construction Specifications for pipe encasement details. See the table below for encasement sizes. The pipe is required to have restrained joints under the road area. The jack & bore pit size shall be shown and labeled on the construction plans. NCDOT and the railroads may have more stringent requirements.

Sizing Table for Carrier Pipes and Casing Pipes				
Nominal Carrier Pipe Size (Inches)	Steel Casing Pipe Size (Inches)			
	Railroad Crossing		Road Crossing	
	Outside Diameter	Wall Thickness	Outside Diameter	Wall Thickness
3 and Under	12.75	0.188	6.625	0.250
4	12.75	0.188	8.625	0.250
6	12.75	0.188	12.75	0.250
8	16	0.219	16	0.250
10	20	0.281	20	0.250
12	24	0.312	24	0.250
14	28	0.375	28	0.312
16	30	0.406	30	0.312
18	36	0.469	36	0.375
20	42	0.562	42	0.500
24	42	0.562	42	0.500

IV. Fire Hydrants

1. The spacing and location of fire hydrants shall meet the current provisions of the North Carolina Fire Prevention Code in addition to those provisions set forth in Items 2 through 16 below. Adequate spacing of fire hydrants shall be determined by the Fire Official. Spacing of fire hydrants around buildings and facilities shall take into account natural and man-made barriers, including steep terrain, walls, fences, waterways, culverts and vehicle parking areas. Distance measurements shall be made along the centerline of fire equipment access roadways where roadways occur.
2. Fire hydrants shall be located so that they shall be installed on a 6-inch branch line and shall be equipped with a gate valve for isolation purposes. The hydrant isolation valve shall be located directly adjacent to the water main and shall be inside the pavement when possible.
3. Hydrants shall be oriented so that large diameter connection faces fire apparatus access.
4. Hydrants shall be no closer than 10-feet from the PC or PT of any intersection, including driveways.
5. Hydrants are to be placed 18-inches to back of curb.
6. Hydrants are 1-foot within the right-of-way on strip paved streets.
7. In residential and multi-family areas:
   a) Fire hydrants shall be located near each street intersection.
   b) Maximum spacing of hydrants in single-family housing areas shall not exceed 500-feet. The

hydrant spacing distance shall be the horizontal distance as measured along the centerline of the street.

c) Hydrants shall be located near the entrance of each cul-de-sac bulb where the street leading to the bulb is greater than 500-feet in length from the street centerline to the cul-de-sac radius point.

d) Hydrants should be on same side as all Fire Department Connections.

8. In all commercial, business, institutional, office, shopping center, mobile home, and industrial areas:
   a) Fire hydrants shall be located at each street intersection.
   b) Maximum spacing between hydrants shall not exceed 500-feet. The hydrant spacing distance shall be the horizontal distance as measured along the centerline of the street.
9. For projects designed with more than one phase, hydrants shall be located so that these guidelines are satisfied during each phase of construction as well as after final completion of all phases.
10. Hydrants shall be situated at locations which enable fire apparatus to pass other fire apparatus which have stopped to connect to the hydrant (driveway width 20-foot minimum).
11. A hydrant shall be installed no less than 6-feet nor more than 50-feet (lineal) from any and all Fire Department Connections (FDC). This requirement does not apply to FDC's serving the apartment buildings of group apartment housing as defined in Durham City Code Section 70-22(a)(1).
12. Landscape plantings (when fully grown) or other vertical projections greater than 6-inches in height shall not encroach upon any fire hydrant within a 3-foot radius and not obscure view of hydrant upon approach.
13. Hydrants should be located a minimum of 40-feet from any building walls.
14. Hydrants shall be situated to enable fire equipment to first pass a fire hydrant before reaching any structure or hazard associated with a site.
15. Fire hydrants located on private property adjacent to a site may be considered when an off-street access roadway of sufficient width and height between the two sites is established by an easement and approved by the Fire Official.
16. Fire Hydrants located –
    a) Across streets or roadways with median dividers, or
    b) Across streets or roadways with 4 or more lanes, or
    c) Across streets or roadways with an average daily traffic count of more than 30,000 vehicles.

    From a site shall not be considered accessible and useable for purposes of this section.

V. Fire Department Connections (FDC)

A. These fittings, typically associated with a sprinkler/standpipe system within a building, shall be located no closer than 6-feet or greater than 50-lineal feet of a fire hydrant. In all instances, these fittings shall be located on the same side of the travel lane. Both hydrant and connection shall be accessible along the roadway fronting the building or along the roadway approaching the building. The location is subject to approval by the Fire Official. This requirement does not apply to FDC's serving the apartment buildings of group apartment housing as defined in Durham City Code Section 70-22(a)(1).

B. Contact Fire Department for requirements for buildings with standpipe systems.

VI. Valves

Only City personal are permitted to operate public water main valves unless other arrangements have been pre-approved by the City Engineering Division.

A. Type

1. Valves 12-inch and below require a valve box.

2. Valves 16-inch are required to be in 4-foot diameter manholes.
3. Gate valves are to be used up to and including 12-inch diameter water lines.
4. Valves controlling fire protection system water supplies, where located on private property shall be in accordance with the North Carolina Fire Prevention Code. Post indicator valves (PIV), located 40-feet from building walls when possible, shall be installed unless other valve arrangements are approved by the Fire Official.

B. Locations

1. Each intersection of water mains shall have one less main line valve than the number of intersecting pipes.
2. For all private water systems, the valves shall be located at the right-of-way line to denote public and private maintenance responsibilities.

C. Straight Runs

Main line valves located in straight runs of pipe shall be spaced as follows:

Main Size	Maximum Spacing
4-inch	400-feet
6-inch	600-feet
8-inch	900-feet
12-inch	1000-feet
16-inch	1000-feet

D. Tapping Sleeves

1. A City of Durham Engineering Division Inspector is to be present at all taps to water mains prior to the tap being made unless other arrangements have been made with the City Inspector.
2. Wet tap with a tapping sleeve and valve is permitted (refer to the City of Durham Water and Sewer Standards and Specifications).
3. Same size taps are only allowed on an 8-inch line and smaller. Any larger same size connection requires installing a tee and valve(s).
4. If a tapping valve is 12-inch or larger, the valve and the tapping sleeve are to be located within one manhole. Cut in tees with sleeves are required for 12-inch by 12-inch same size taps or larger.

E. Terminating Lines

1. For 12-inch by 16-inch taps the valve and tapping sleeve are to be located in a 5-foot diameter manhole.
2. Piping 12-inch and greater shall extend 3 pipe joints beyond end line valve.

VII. Blow-offs

A 2-inch blow-off assembly shall be installed on all dead end mains and, as directed by the Engineering Division, at elevated points along the water main. Fire hydrants are not considered as blow-offs for public lines.

VIII. Pressure-Reducing Valves

Pressure-reducing valves for water services shall be installed in accordance with current City of Durham Plumbing Code.

IX. Services and Meters

1. Two meters shall not share one service line unless one meter is for irrigation purposes. Each domestic meter shall have its own service line from the main.

2. Water meters shall be accessible to city personal at all times.
3. Water line services shall be copper or ductile iron from the main to the water meter and property line.
4. Water services shall be at right angles from the centerline of the street.
5. Meters locations shall be:
   a) Behind the right-of-way line.
   b) Just inside the right-of-way line. If sidewalk is located at the right-of-way line then the meter shall be installed at the back of sidewalk or can be installed in the sidewalk providing the water meter box top is flush, smooth and is not a tripping hazard. Extreme care shall be taken to avoid hindering the accessibility of the meter with sidewalk construction. Avoid getting concrete in or on any part of the meter box.
   c) Easy to access with a vehicle (so a truck could back up to the meter).
   d) Located in non-heavily landscaped areas.
6. Meter boxes are to be DFW Plastics Inc. model DFW37C-12 for 5/8" meters, DFW1324C-12 for 1" meters, or approved equal. Meter lids are to be DFW Plastics Inc. model DFW37C-12-1EA for 5/8" meters, DFW1324C-12-1EA for 1" meters, or approved equal.
7. Meters equal to or greater than 1 ½-inch shall be located in a vault with a 4-inch PVC gravity drain to daylight or drainage structure. Meters less than 1 ½-inch shall be located in a meter box.
8. If a meter 2" or larger is proposed, contact Water Management at 560-4381 ext. 35268 prior to the construction of the meter vault to verify the type and dimensions of the meter.
9. Sites with city sewer that are served by wells need a city water meter installed at an accessible place for the meter reader.
10. Maximum tap sizes, allowed without a saddle, for various classes of ductile iron pipe:

Pipe Diameter (inches)	Maximum Tap Size for Class 250/350 Pipe (inches)
4	3/4
6	3/4
8	1
10	1 ¼
12	1 ½

16-inch and larger see City Engineering for prior approval before tapping. Taps larger than those listed must utilize a saddle or approved tapping sleeve.

11. Meters shall not be installed until as-built drawings have been approved. See Section 4.0 for as-built drawing submittal requirements.

X. Water System Abandonment

A. Water Services

1. Abandonment of water services shall include excavating down to corporation stop, turning it off and cutting service line free from corporation stop. The meter, if present, shall be returned to City of Durham. Prior to any credit or refund being processed the meter must be returned to Water Management Department and the meter number verified and coded properly as returned. Utility Service Abandonments will take place prior to beginning utility construction work for a project. Any excavation as part of abandoning utilities will require backfilling per City of Durham standards.

Section 6: Cross Connection Control

This section is intended to provide design criteria for when a backflow preventer is required. The Department of Water Management Cross Connection Control work group is responsible for reviewing the type of backflow prevention assembly specified during plan review and issuing backflow preventer permits. Contact Cross Connection Control (CCC) at (919) 560-4194 or via email at cccprogram@durhamnc.gov if you have any questions. Submit plans to City Engineering according to Section 2.1, Construction Plan Approval Process.

6.1 Guidelines

These guidelines are supplemental to the North Carolina Building Code, City of Durham Code of Ordinance, and the City of Durham Cross Connection Manual. These guidelines are intended as a minimum requirement. Public water suppliers may adopt more stringent requirements. Each supplier of water shall conform to the minimum requirements established in these guidelines.

- All installed backflow preventers shall be installed above ground, between 12" – 60" off the ground and not subject to flooding or freezing.
- No water line shall create greater than 50-feet of dead water without a backflow preventer assembly being installed.
- All non-residential properties shall have domestic containment against backflow.
- All lawn irrigation systems are required to be protected with an approved ASSE #1013 – RP type backflow.
- Per G.S. §143-355.4 for any new in-ground irrigation system that is connected to local government water system shall have a separate irrigation meter.
- A backflow preventer permit shall be obtained prior to any removal, new installations, and replacement of existing backflow preventers.

A. Degree of Hazard

- Severe/High: Actual or potential threat of contamination that presents an imminent danger to the public health with consequence of serious illness or death.
- Moderate/Low: One that presents foreseeable and significant potential for pollution, nuisance, aesthetically objectionable or other undesirable alterations of the drinking water supply.

B. Backflow Prevention Assembly Requirements:

Table 6.1: Backflow Prevention Assembly Requirements

Degree of Hazard	RP/RPDA	DCVA/DCDA	Air Gap
High	Yes	No	Yes
Low	Yes	Yes	Yes

RP: Reduced Pressure Backflow Assembly
RPDA: Reduce Pressure Detector Assembly
DCVA: Double Check Valve Assembly
DCDA: Double Check Detector Assembly

C. Guidelines for Backflow Assembly Installation in Water Distribution Systems

- RP/RPDA shall be installed above ground and shall have 12-inches minimum clearance in hotbox from the floor to the lowest point of the backflow and 6-inches minimum from walls. Support stands shall be located where they do not obstruct maintenance of the assembly.

- DCVA/DCDA shall be installed above ground.
- All backflow preventers shall be installed per ASSE specifications listed in the seal authorization booklet provided at http://www.asse-plumbing.org/listings.html.
- RPDA/ DCDA servicing fire protection, by-pass meters must read in cubic feet.

6.2 Facilities that Require Installation of a Backflow Preventer

This is not intended to be an exhaustive list. Please contact CCC if your service is not provided below to confirm adequate protection:

A. Low hazard - DCVA or DCDA

- Fire sprinkler systems without booster pump facilities, fire department connection, or chemical additives on facilities less than 5 stories
- Connection to tanks, lines and vessels that handle non-toxic substances
- Most commercial establishments
- Automotive service stations, bakeries and beauty shops with no health hazard and bottling plants with no backpressure

B. High hazard - RPZ, RPDA or air gap

- Lawn sprinkler systems
- Wastewater treatment plants
- Connection to an unapproved water system or unapproved auxiliary water supply
- Connection to tanks, pumps, lines, steam boilers and vessels that handle sewage, lethal substances, toxic or radioactive substances
- Fire sprinkler systems with booster pump facilities, fire department connection, or chemical additives or installation for buildings with five or more stories above ground level
- Domestic water services for buildings with five or more stories above ground level
- Hospitals and other medical facilities
- Morgues, mortuaries and autopsy facilities
- Metal plating facilities
- Bottling plants (subject to back pressure)
- Canneries
- Battery manufacturers
- Exterminators and lawn care companies
- Chemical processing plants
- Dairies
- Film laboratories
- Car wash facilities
- Dye works
- Laundries
- Swimming pools
- Water front facilities
- Restaurants

6.3 Approved Backflow Prevention Assemblies

Meets ASSE standard (http://www.asse-plumbing.org/listings.html) and/or carries ASSE seal or is on the University of Southern California approval list.

6.4 Backflow Prevention Assembly Installation

Backflow prevention assemblies must be located in a place where it is readily accessible for regular testing, maintenance and inspection. Bypass lines parallel to a backflow prevention assembly shall have an approved backflow prevention assembly installed that is equal to that on the main line.

All backflow preventers shall be installed a minimum of 12-inches minimum clearance from the ground to the lowest point on the backflow assembly and no higher than 60" to the top of the assembly and 6-inches minimum from walls.

6.5 Fire Hydrants

Fire Hydrants (FH) shall be installed within 50' of the main. If the 50' rule cannot be met, to protect against stagnant water, then backflow protection is required. If FH cannot be re-located indicate type, size, and location on drawings of fire hydrant backflow, which shall have a Reduced Pressure Detector Assembly (RPDA) ASSE #1047, with bypass meter reading in Cubic Feet. In ASSE #1060 heated insulated enclosure, within 50' of the domestic tee.

6.6 Lawn Irrigation

All lawn irrigation systems are required to be protected with an approved ASSE#13-RP type backflow. Per G.S. § 143-355.4, any new, in ground irrigation system that is connected to a local government water system shall have a separate irrigation meter.

6.7 MEP Drawings

Effective 11/01/2017, CCC will implement a $150.00 fee to perform plan review and re-review(s) associated with received building permit applications to the City/County Inspections Department. Application fees are due once the building permit has been submitted to the City/County Inspections Department for review. In order to request CCC to perform a plan review, a CCC Plan Review Request Form must be completed. For additional information, please visit http://durhamnc.gov/952/Cross-Connection-Control.

6.8 Fee Schedule

The fee schedule can be found in our website http://durhamnc.gov/952/Cross-Connection-Control.

SECTION 7.0

SANITARY SEWER SYSTEM

I. General

This section provides minimum guidelines for the design of sanitary sewer main extensions for the City of Durham sanitary sewer collection system. The Developer/Engineer shall satisfy the requirements contained herein. See also Section 2 and 3, and the City of Durham Water and Sanitary Sewer Construction Details and Specifications.

II. Sizing Of Sanitary Sewer Mains

A. Pipe diameter

1. The size of the sanitary sewer lines are determined by:
   a) NCDENR sizing requirements for sanitary sewer collection systems.
   b) Future growth beyond the site.
   c) Water Management and Engineering Division.
2. Standard pipe diameter for public lines are 8-inch, 10-inch, 12-inch, 15-inch, 18-inch, 21-inch, 24-inch, 30-inch and 36-inch (refer to the Water and Sanitary Sewer Specifications).
3. A private sanitary sewer main shall be no less than 6-inches in diameter. The Engineer designing the sanitary sewer main shall sizing provide calculations (sealed and signed).
4. A sanitary sewer main is a collection system of 2 or more laterals, or as defined by the definition in Section 3.0, Permitting. A sanitary sewer permit is required for all sanitary sewer mains, and as defined by Title 15A of the North Carolina Administrative Code, Subchapter 2H.

B. Slope Requirements

Minimum slope requirements for all pipe sizes are achieved by maintaining a minimum velocity of 2.5 ft/s through the pipe when flowing half full. The minimum slope of any particular sanitary sewer main will also govern the capacity of this pipe. Maximum slopes on sanitary sewer mains are 10% unless specific approval from the Engineering Division is obtained. The Engineering reserves the right to require specific slopes as needed to insure future service and maintenance needs. Minimum slope requirements are:

6-inch diameter pipe - 1.00% minimum slope (private line size)
8-inch diameter pipe - 0.50% minimum slope
10-inch diameter pipe – 0.28% minimum slope
12-inch diameter pipe – 0.22% minimum slope
15-inch diameter pipe – 0.15% minimum slope
18-inch diameter pipe – 0.12% minimum slope
21-inch diameter pipe – 0.10% minimum slope
24-inch diameter pipe – 0.08% minimum slope

C. Sanitary Sewer Line Material

1. Standard sanitary sewer line material is to be PVC (schedule 35 for sanitary sewer mains and outfalls and schedule 40 for 4-inch and 6-inch sanitary sewer laterals) or ductile iron class 350 pressure (refer to the Water and Sanitary Sewer Specifications). All ductile iron pipe installed within a right-of-way (ROW) or utility easement that is currently or may reasonably become public shall be lined with *Protecto 401* or approved

equal. Liners shall be applied per manufacturer's requirements and must meet all ASTM requirements. The ceramic epoxy liner cannot be field applied.

2. All sanitary sewer mains located in casing pipes shall be DIP.

3. Transition of materials shall be done at manholes or with a rigid ductile iron coupling. The coupling shall have deep socket push joint gasketed bells and a tapered flow way for a smooth transition between different pipe materials. The coupling must also be air test rated and be able to pass a mandrel for pipe inspection. Gasket grooves shall be machined and the gaskets shall be SBR rubber. The body of the coupling must meet ASTM A536 for ductile iron. The SBR rubber gaskets must meet ASTM F477.

III. Sanitary Sewer Line Location

A. Depth

1. Sanitary sewer mains shall be designed meeting minimum depth requirements for both sanitary sewer outfalls and street mains. Sanitary sewer outfalls shall maintain a minimum depth of 4-feet from the ground elevation to the pipe crown. Sanitary sewer mains in the street require a minimum depth of 5-feet from the ground profile to the pipe crown. If a minimum depth of 3-feet cannot be met, ductile iron pipe instead of PVC sanitary sewer pipe will be required.
2. Sanitary Sewer lines greater than 20-feet deep shall be ductile iron, have a minimum of 5-foot diameter manholes and the City may require parallel and/or oversized sewer lines with wider easements.
3. Pipe tops are to be kept 2-feet below streambed flow line elevations to avoid aerial stream crossings. The pipe shall be placed to center the crossing at the midpoint between joints of the pipe (keeping the joints as far from the creek as possible).

B. Location

1. Sanitary sewer lines are normally located (unless it is an outfall):
   a. Under pavement within the right-of-way.
   b. On the south and west sides of streets.
   c. In the center of the driving lane of the street.
   d. Terminate all sanitary sewer mains with manholes.
   e. 18-inch below or 10-feet horizontal from water lines. If unable to maintain either of these separations or sanitary sewer crosses over water both lines shall be made of ductile iron for a minimum of 10-feet to either side of crossing with midpoint of pipe being centered at the point of intersection.
   f. With 24-inch separation from storm drainage lines.

C. Easements and Encasements

1. Where required a storm drainage pipe shall be installed across the sanitary sewer easement. The size of the pipe shall be determined using the 2-year storm event when it does not create a flooding problem. The City of Durham reserves the option to require an additional analysis based on a larger storm event and subsequent increase in storm pipe size.
2. Public sanitary sewer easements shall be no less than 30-feet and may be greater depending upon depth and location.
3. All public sanitary sewer easements shall be located in open space.

4. Private sanitary sewer main easements shall be no less than 30-feet and may be greater depending upon the depth and location.
5. Private sanitary sewer service easements shall be no less than 15-feet.
6. All sanitary sewer easements shall be drivable: Max longitudinal slope = 5:1 (H:V); Max cross slope = 10:1 (H:V).
7. Building setbacks shall be a minimum of 5-feet from all sanitary sewer easements where the depth to invert is less than 15-feet. If depth to invert is greater than 15-feet the building setback shall be a minimum of 10-feet.
8. All sanitary sewer mains shall be located within a street right-of-way or permanent sanitary sewer main easement to allow city personnel access to the main for maintenance and repair. Approval of the sanitary sewer main extension shall be contingent upon the procurement of all necessary easements.
9. No landscaping is allowed in existing or proposed sanitary sewer easements. Earthwork may be allowed with City of Durham approval. Typical submittal shall be a plan and profile provided at the site plan stage. All earthwork must be completed before sanitary sewer is installed.
10. Encasements for mains are required for crossing NCDOT roads/streets and may be required for crossing City of Durham roads/streets. Refer to the City of Durham Water and Sewer Construction Specifications for pipe encasement details. See the table in Section 5.0, Water Supply/Distribution, for encasement sizes. NCDOT and the railroads may have more stringent requirements. The pipe is required to have restrained joints under the road area. The jack & bore pit size shall be shown and labeled on the construction plans.
11. No sediment traps, including temporary, shall be located in sanitary sewer easement or around manhole.

IV. Manholes

A. Locations

1. Manholes shall be used when sanitary sewer lines change slope or direction.
2. Manholes shall be used when sanitary sewer lines 6-inch and greater intersect.
3. Manholes shall be spaced no greater than 400-feet apart.

B. Invert and Rim Elevations

1. The maximum separation of invert in to invert out within a manhole is 0.50-feet.
2. Rim elevations along outfalls are to be a minimum of 3-feet above existing ground elevation. Depending upon the height, the City of Durham Engineering Division may require flat manholes, exterior steps and safety bars on top of manhole.
3. In flood plain areas, the 100-year flood elevation shall be noted on the drawings and the rim elevations are to be set at 2-feet above the 100-year flood elevation.
4. Along outfalls, sealed top manholes with vents may be utilized but only with the approval of the Engineering Division.

C. Drop Connections

1. Drops connections shall be outside drops (City of Durham Standards) unless approved by the City of Durham Engineering Division. The entire drop and upstream pipe shall be ductile iron.
2. Drop connections are required when the difference between invert in and invert out is greater than 0.5-feet (refer to Engineering Water and Sanitary Sewer specifications).
3. The minimum difference between the upper and lower inverts of the drop is 2-feet for 8-inch diameter sanitary sewers. Lines larger than 8-inch may require more height. The drop connections should be labeled on profile view.

D. Manhole Diameter

1. Sanitary sewer mains from 8-inches up to but not including 18-inches in diameter require manholes to be 4-feet in diameter. Sanitary sewer mains that are 18-inches in diameter and greater will require a manhole diameter determined by the Engineering Division.
2. When the depth of the manhole exceeds 20-feet (measured from the rim to invert of the manhole) the manhole shall be a minimum 5-foot diameter.
3. Larger diameter manholes, when necessary, may be required by the Engineering Division.
4. Depending on the number of lines entering the manhole and the angle of the lines entering the manhole, a larger diameter may be required by Engineering Division.

V. Sewer Taps

1. 4-inch lines should tap sewer mains instead of manholes where possible (exception would be cul-de-sacs, which must be tapped at the invert of the manhole).
2. 6-inch taps and larger will require a manhole at the sanitary sewer main.
3. Terminal manholes in cul-de-sacs are limited to a total number of 5, 4-inch diameter lateral services.
4. New taps into manholes shall be core drilled and installed with a flexible rubber boot.

VI. Anchors

1. For sanitary sewer mains less than 20% slope, there are no anchoring requirements.
2. For sanitary sewer mains greater than 20% and less than 35% slope, anchors will be required a maximum of 36-feet apart.
3. For sanitary sewer main slopes of 35% to 50%, anchors will be necessary at a maximum of 24-feet apart.
4. For sanitary sewer mains with slopes greater than 50%, anchors will be required at a maximum of 16-feet apart.

VII. Creek Crossings (Aerial)

Ductile iron lock-joint pipe will be required for all creek/river/aerial

crossings. Concrete supports and/or piers may also be required depending on the depth and span of the creek/river. All aerial crossings require the pipe or casing pipe to be at least 1-foot above the 10-year flow depth and at least above the 25-year flow depth.

VIII. Services

Sanitary sewer services shall be installed according to the City of Durham standards and specifications. Standard requirements are:

1. Cleanouts every 75-feet maximum.
2. 'Y' Cleanouts shall be installed at the right-of-way line or at the sewer easement line. Use of combinations are not permitted.
3. Whenever possible, laterals shall be perpendicular from the sanitary sewer main to the clean out at the right-of-way or the sanitary sewer easement.
4. When cleanouts are necessary in traffic areas, they shall be built according to the City of Durham details.
5. Cleanouts that are not traffic bearing are to be flush with the ground with an 18-inch by 18-inch by 4-inch concrete (3000-pounds per square inch (psi) min.) protective collar.
6. Cleanouts are to be installed according to the City of Durham details.
7. Laterals to be installed at the following minimum grade:

Lateral Size	Minimum Grade
a) 4-inch diameter	2%
b) 6-inch diameter	1%

8. Pool drain shall be tied into sanitary sewer. Discharge into pool drain must be by pumping, not gravity.
9. Carwash drain shall be tied into sanitary sewer. The drain shall be placed such that it will not collect rainwater and should be located under a roof, with the area beyond the roof sloping away from the drain. The drain line shall contain a grit separator and oil/water separator.
10. Dumpster pads for food service establishments and all establishments utilizing a compactor shall have a drain connected to the sanitary sewer. The areas beyond the dumpster/trash compactor pad shall be sloped to drain away from inlet.
11. All force mains that are covered under the plumbing code shall discharge by gravity into public lines starting at the right-of-way line.
12. Sanitary sewer connections to stubbed out services shall not be made until As-built drawings are approved.

IX. Force Mains

A. General

1. All public sanitary sewer force mains shall be ductile iron and be sized the largest diameter capable of maintaining 2.5ft/s of velocity at lift station startup. Manifolding proposed force mains on to existing force mains is not permitted. Bends are not allowed in force mains. Plan and profile drawings are required. See the Section 2.1, Construction Plan Approval Process.
2. For private force mains, the Engineer shall submit designs to City of

Durham Engineering Division (see Section 2.1, Construction Plan Approval Process) and shall also conform to requirements of the State of North Carolina. The private force main shall connect to a standard gravity service cleanout at the right-of-way or easement line.

3. All ductile iron pipe used for force mains shall be lined with *Protecto 401*, or equivalent (approval by Engineering Division required), to reduce corrosive action. This is only required where the water column separates from the pipe and creates an air pocket (at high points with air release valves).

X. Pump Stations

A. General

1. For projects involving a sanitary sewer pump station, the applicant shall contact the City Engineering Division prior to submittal of site plan or construction plans. This is to determine if the station is required or if there is a gravity option, whether or not the station will be public or private and to determine the designs that apply. The Water Management Department shall decide on types of equipment, station layout and pump operation characteristics.
2. Contact the Water Management Department to obtain the *Lift Station Design Standards* handout. The Water Management Department will review and approve the pump station design construction documents.
3. Driveways into the pump station access drives shall have a minimum radius of 25 feet.
4. City Engineering Division will hold the approval of the construction drawings of a project until the Water Management Department has approved the pump station design.

XI. Sanitary Sewer Abandonment

A. Sanitary Sewer Main and Manholes

1. Abandonment of manholes shall consist of removal of manhole structures to 3-feet below finished grade, filling the manhole with concrete to an elevation of 1-foot above the crown of the pipe and filling the remaining portion with stone. The area of this removal shall be backfilled with clay and compacted well.
   When sanitary sewer mains are abandoned, 5-lineal feet of sanitary sewer nearest the sanitary sewer to remain live shall be filled with concrete.

B. Services

1. Abandonment of sanitary sewer service lines shall consist of excavating down to the service connection to the main, cutting this connection and installing a watertight plug in the main. The service line and all clean-out risers on the service line shall be removed. Utility Service Abandonments will take place prior to beginning utility construction work for a project. Any excavation as part of abandoning utilities will require backfilling per City of Durham standards.

SECTION 8.0

STORMWATER DESIGN CRITERIA

This section is intended to provide design criteria for stormwater design of stormwater best management practice(s) (BMP(s)), open channels, culverts and pipes. All designs should be submitted as per Section 2.1, Construction Plan Approval Process and per the design summaries found in Section 8.4, Stormwater BMP Design Summaries.

I. General

Grading permits covering sedimentation and erosion control measures shall be obtained from the Durham County Soil and Erosion Control Office before construction can commence. Contact the Durham County Soil and Erosion Control Office at (919) 560-0736.

II. Runoff Calculations

Runoff calculations shall be provided for all proposed storm drainage structures including, but not limited to culverts, storm drain systems, inlets, ditches, open channels, BMPs, outlet protection, etc. and shall be sealed and signed by a registered Professional Engineer. Runoff calculations shall be provided in an 8.5-inch by 11-inch format (refer to checklists found in Section 1.2, Stormwater Services Rezoning, Site Plan and Final Plat Submittal Checklist, and Section 2.2, Construction Plan Submittal Requirements) with the exception of the drainage area maps and shall include:

A. Drainage area maps to scale. Scale shall be no smaller than 1-inch = 100-feet.

B. Mapping provided shall delineate the site area and the watershed area for proposed improvement. Copies of topographic mapping are available from the City of Durham GIS Division (919-560-4122). A USGS map may be used only if that is the best available information. The map scale, north arrow, analysis point(s), times of concentration flow paths and the drainage area for each sub-basin shall be shown. The various segments (sheet/overland, shallow concentrated and ditch/open channel/pipe flow) are to be labeled on the drainage area maps. Separate pre- and post-development maps are required for a Stormwater Impact Analysis (SIA).

C. Copy of Durham County Soil Survey, including map reference, with the site highlighted shall be provided. List all of the soils on the site and their corresponding Hydrologic Soil Group (HSG, see Table 1).

D. Runoff Coefficient Calculations (C/CN). It shall be shown in the calculations how the composite runoff coefficient was determined. Simply providing a composite runoff coefficient with no supporting documentation is not acceptable. The pre-development hydrologic condition for an undeveloped site is to be assumed in “good” hydrologic condition unless additional material is submitted supporting a different hydrologic condition.

Table 1
Hydrologic Soil Group for Soils in Durham County

Soil Abbreviation	Soil Type	Hydrologic Soil Group
AiA	Altavista	C
AiB	Altavista	C
ApB	Appling	B
ApC	Appling	B
Cc	Cartecay	C
CfB	Cecil	B
CfC	Cecil	B
CfE	Cecil	B
Ch	Chewacla	C
Cp	Congaree	B
CrB	Creedmoor	C
CrC	Creedmoor	C
DaB	Davidson	B
DaC	Davidson	B
GeB	Georgeville	B
GeC	Georgeville	B
GeD	Georgeville	B
GiE	Goldston	C
GiF	Goldston	C
GrB	Granville	B
GrC	Granville	B
Gu	Gullied Land	D
HeB	Helena	C
HeC	Helena	C
HrB	Herndon	B
HrC	Herndon	B
HsC	Herndon	B
IrB	Iredell	D
IrC	Iredell	D
IuB	Iredell	D
IuC	Iredell	D
LgB	Lignum	C
MfB	Mayodan	B
MfC	Mayodan	B
MfD	Mayodan	B
MfE	Mayodan	B
MrC	Mayodan	B
MrD	Mayodan	B
MuB	Mecklenburg	C
MuC	Mecklenburg	C
NaD	Nason	C
NaE	Nason	C
NoD	Nason	C
PfC	Pinkston	B
PfE	Pinkston	B
Ro	Roanoke	D
TaE	Tatum	C
Ur	Urban Land	D
Wh	Wahee	D
WmD	Wedowee	B
WmE	Wedowee	B
Wn	Wehadkee	D
WsB	White Store	D
WsC	White Store	D
WsE	White Store	D
WwC	White Store	D
WwE	White Store	D
WvC2	White Store	D
WvE2	White Store	D
WxE	Wilkes	C

1. Rational Formula

a. Refer to the following acceptable Rational Formula C values in Table 2 (Highway Drainage Manual, Maryland State Highway Administration, 1981 and Stormwater Design Manual, City of Raleigh, NC, 2002) that are based upon the HSG. There are no HSG A soils within Durham County. Refer to Table 1 for the appropriate HSG for the soil types within Durham County.

b. The C values in Table 2 are only acceptable for storm events less than or equal to the 10-year storm event. To correct for storm events greater than the 10-year storm event, a correction factor (multiplier) is provided in Table 3 (Municipal Storm Water Management, Debo and Reese, 1995). C value will never be greater than 1.0.

c. The Residential, Commercial and Industrial C-values can only be used for estimating the flow rates for offsite areas. For the specific project site C value, a composite C value must be developed.

Table 2
Rational Formula C Values for Storm Events Less Than or Equal to the 10-year Storm Event

Land Use	Hydrologic Condition	HSG B*	HSG C*	HSG D*
Pasture/Range	Poor	0.33	0.38	0.41
	Fair	0.25	0.33	0.37
	Good	0.20	0.29	0.34
Meadow		0.14	0.17	0.20
Wooded	Poor	0.17	0.22	0.26
	Fair	0.15	0.19	0.23
	Good	0.13	0.17	0.20
Open Space and Lawns		0.25	0.30	0.35
Paved areas, gravel and other impervious areas		0.95	0.95	0.95
	Zoning			
Residential Single Family**	RU-5(2) (3,000 ft^2 lots)	0.63	0.65	0.67
	RU-5 (5,000 ft^2 lots)	0.51	0.54	0.57
	RS-8 (8,000 ft^2 lots)	0.47	0.51	0.54
	RS-10 (10,000 ft^2 lots)	0.46	0.50	0.53
	RS-15 (15,000 ft^2 lots)	0.41	0.45	0.48
	RS-20 (20,000 ft^2 lots)	0.34	0.39	0.43
	RR (30,000 ft^2 lots)	0.30	0.33	0.35
	Zoning			
Residential Multi Family**	RS-M (8 units/acre max)	0.60	0.65	0.70
	RS-M (12 units/acre max)	0.65	0.70	0.75
	RS-M (16 units/acre max)	0.70	0.75	0.80
	RU-M (20 units/acre max)	0.75	0.80	0.85
	RC	0.75	0.80	0.85
Commercial, Retail, Office, Mixed Use and Institutional**		0.80	0.85	0.90
Industrial**		0.80	0.85	0.90

* HSG refers to the Hydrologic Soil Group
** These C-values can be used only to develop flow rates for un-developed off-site areas to predict flows for culvert or bypass storm conveyance sizing.

Table 3
Frequency Correction Factors for Rational Formula C-Values

Recurrence Interval (years)	C_f
25	1.1
50	1.2
100	1.25

d. The Rational Formula cannot be used for areas more than 50 acres. In such instances, or when the limitations of the Rational Formula have been exceeded, please refer to the United States Department of Agriculture (USDA) Natural Resources Conservation Service (NRCS) method below.

e. To determine the intensity for the Rational Formula, the following equation can be used, refer to Table 4 for the values of g and h for different return periods:

$$I = g/(h+T_C)$$

I = Intensity in inches per hour
T_C = Time of Concentration in minutes (Refer to **2. b.** below to determine T_C)

Table 4
Variables for Intensity Equation

Return Period	G	H
2	132	18
5	169	21
10	195	22
25	232	23
50	261	24
100	290	25

2. USDA NRCS Hydrologic Urban Hydrology for Small Watersheds (Formerly the SCS Method)

a. For determining the curve number values, refer to the NRCS TR-55 manual recommendations, which can be found at http://www.nrcs.usda.gov/wps/portal/nrcs/detailfull/national/water/?cid=stelprdb1042901.

b. Pre- and post-developed time of concentration flow paths shall be delineated on drainage maps and shall be representative of the project site. The TR-55 segmented approach shall be used for computing times of concentration for both the pre-development and post-development condition. Assuming a time of concentration greater than 5 minutes is not acceptable without utilizing TR-55. Maps and calculations are to be submitted with all plans with a NCPE seal and signature. Drainage area maps shall be updated to reflect relevant existing conditions and development. The post-development sheet flow length shall be no more than 50-feet unless it can be shown that the sheet flow depth is 0.10-feet or less. Refer to Table 5 below for the appropriate Manning's n values as defined in the NRCS TR-55 manual for sheet flow. The remainder of the flow path shall be shallow concentrated or channel flow as appropriate. For discussions concerning the time of concentration flow path, the TR-55 manual can be downloaded at http://www.nrcs.usda.gov/wps/portal/nrcs/detailfull/national/water/?cid=stelprdb1042901.

c. The following rainfall amounts, provided by NOAA, shall be used in Durham:

- 1-year, 24-hour rainfall amount: 3.0-inches
- 2-year, 24-hour rainfall amount: 3.5-inches
- 5-year, 24-hour rainfall amount: 4.4-inches
- 10-year, 24-hour rainfall amount: 5.1-inches
- 25-year, 24-hour rainfall amount: 6.0-inches
- 50-year, 24-hour rainfall amount: 6.7-inches
- 100-year, 24-hour rainfall amount: 7.4-inches

Table 5
Manning's n Values for Sheet Flow (Flow Depths of < 0.10-Feet)

Surface Description	Manning's n Values
Smooth Surfaces (concrete, asphalt, gravel or bare soil)	0.011
Short Grass	0.15
Dense Grass	0.24
Woods, light underbrush	0.40
Woods, dense underbrush	0.80

III. Stormwater Layout

A. Design

1. Stormwater conveyance systems (storm drain systems, culverts and open channels) shall be sized based upon either the 10-year storm event or 25-year storm event depending upon drainage area, see Table 6 for the requirements.

The hydraulic grade line (HGL) shall not exceed the top of structures or gutter elevations as appropriate for the 25-year storm event for any storm drain system. Include the 25-year HGL calculations with storm drain sizing calculations.

HGL calculations shall take into account all head losses, friction factors and bypass flows. The downstream hydraulic gradient at the outlet end of the storm drain system shall begin at a "known" water surface elevation (as computed from backwater calculations starting at a downstream channel cross-section where the channel constricts) or shall begin at the downstream crown of the outlet of the storm drain system, whichever is greater.

In instances where the City decides to allow the 10-year HGL to exceed the crown of the pipe, all out of compliant pipe segments from one structure to another structure shall be constructed with water tight joints rated to 10-psi. In addition, the pipe shall be manufactured without lift-holes if applicable.

Inlet control calculations for culvert designs must be provided showing HW/D less than or equal to one for culverts for the design event as indicated in Table 6 or off-site improvements may be required.

Outlet control calculations for culvert designs must also be provided for culverts. The downstream hydraulic gradient at the outlet end of the culvert shall begin at a "known" water surface elevation (as computed from backwater calculations starting at a downstream channel cross-section where the channel constricts) or shall begin at the downstream crown of the culvert, whichever is greater. These calculations must show that the HW/D is less than or equal to one for the design event.

For all non-local streets, all culverts and through drainage storm systems shall be designed to pass the 50-year storm without encroaching upon the roadway pavement. For all local streets, all culverts shall be designed to pass the 25-year storm without encroaching upon the roadway pavement. No building or habitable structure, either proposed or existing, shall be designed to be flooded or have water impounded against it during the 100-year event.

Open channel conveyance systems shall be sized with a minimum of the 10-year storm event or 25-year event as shown in Table 6 with the design storm contained within the channel banks with non-erosive velocities or suitable channel lining.

Overland relief shall be provided for all stormwater pipe systems, inlets, and culverts such that no building or habitable structure will be flooded or have water impounded against it during the 100-year storm event. 100-year storm ponding elevations, areas and overland relief zones shall be shown and labeled on the Construction Drawings. For all sump inlets, use a 100% clogging factor to determine 100 year overland relief or 100 year ponding elevation. A separate grading and drainage plan sheet shall be dedicated to delineating these zones.

New development shall not create new (e.g., expanded) 100-year floodplains on previously developed or improved property or on property proposed to be improved. This requirement applies to floodplains not currently regulated by FEMA. Improvements do not include BMP facilities, drainage structures, roads, tree save areas, or open space areas. For questions concerning how this requirement is to be applied on a particular project, please contact the Stormwater Services Division at 919/560-4326.

Table 6
Design Criteria for Installation of New Stormwater Conveyance Systems

Culverts	**Design Storm**	**Design Criteria**
Drainage Basins less than 100 acres	10-year	HW/D must be less than or equal to 1 for both inlet and outlet control conditions.
Drainage Basins greater than or equal to 100 acres	25-year	HW/D must be less than or equal to 1 for both inlet and outlet control conditions.

Storm Drain Systems	**Design Storm**	**Design Criteria**
Drainage Basins less than 100 acres	10-year	HGL for the entire system is to be below crown of all pipes
Drainage Basins greater than or equal to 100 acres	25-year	HGL for the entire system is to be below crown of all pipes

Open Channels	**Design Storm**	**Design Criteria**
Drainage Basins less than 100 acres	10-year	10-year storm event must be contained within

		channel banks with non-erosive velocities or suitable channel lining.
Drainage Basins greater than or equal to 100 acres	25-year	25-year storm event must be contained within channel banks with non-erosive velocities or suitable channel lining.

2. The minimum pipe diameter shall be 15-inches. Pipe systems and culverts shall be at a one percent (1%) minimum slope. Slopes less than one percent (1%) may be accepted with the Stormwater Services Division's approval.

3. Acceptable Pipe Materials – Inside and Outside of Right-of-Way (ROW)

a. Reinforced Concrete Pipe, conforming to ASTM C76 (minimum Class III)

b. High Density Polyethylene (HDPE) pipe, conforming to AASHTO M294, Type S pipe with silt tight joints or better. Minimum diameter of 15-inches to a maximum diameter of 60-inches. HDPE pipe may be used in temporary sediment basins, but shall not be used for risers or spillway structures in BMPs.

c. Structural Plate Pipe (including bottomless culverts) with full bituminous coating inside and out and a paved invert, conforming to AASHTO Section 12.

d. Structural Plate Aluminum Pipe (including bottomless culverts), conforming to AASHTO Section 12.

e. Corrugated Metal Pipe (including bottomless culverts) with full bituminous coating inside and out and a paved invert, conforming to AASHTO Section 12.

f. Corrugated Aluminum Pipe (including bottomless culverts), conforming to AASHTO Section 12. Aluminized pipe is not acceptable.

g. Corrugated Steel, Aluminum Coated, Type 2 Pipe conforming to AASHTO M274 with silt tight joints or better. Allowable soil and water pH range 6.0 - 8.0 shall apply. The maximum allowable flow velocity shall be 5-fps. Resistivity shall be greater than 1500-ohm-cm. Soil shall be tested for pH value and Resistivity every 200-feet. A minimum of 2 test locations per pipe run will be required.

h. Ductile Iron Pipe – cement lined.

For new construction: All pipes shall be installed per Section 300, "Pipe Installation", of the North Carolina Department of Transportation (NCDOT) Standard Specifications for Roads and Structures, January 2002 edition unless stated otherwise in the City's Standards. Backfill material used to install pipe within the street right-of-way shall be Select Material, Class I-VI, as defined by Section 1016-3 of the NCDOT Standard Specifications for Roads and Structures, January 2002 edition. Upon submittal of written certification of material suitability by a licensed geotechnical engineer, NCDOT Class I material may be used. All backfill material shall be approved by the City inspector prior to placement of material within the street right-of-way.

For repairs and utility cuts please follow the Public Works Street Cut Repair Standards located here: http://durhamnc.gov/ich/op/pwd/eng/Documents/DurhamStreetCutRepair.pdf.

4. An overall drainage and grading plan shall be provided showing existing and proposed contours. All proposed and existing contours shall be labeled.

5. Adequate drainage controls shall be provided at all street intersections, usually upstream of

the intersection. Gutter spread calculations shall be provided on all public improvements, private streets and as required by the City of Durham. Gutter spread is not to exceed ½ a travel lane for the 2-year storm event. Bypass shall be limited to less than 0.10-cubic feet per second (cfs) into an intersection for the 2-year storm event. Gutter spread Calculations shall include the following information:

1) All flow rates shall be provided in cfs to the nearest hundredth of a cfs.
2) All bypasses shall be noted. This note shall include the inlet that it will be directed to.
3) All bypass flows shall be accounted for in gutter spread calculations.
4) Half of a travel lane is calculated as half of the pavement section plus the width of the gutter (see Table 7 below). Gutter spread calculations for parallel parking are identical to the standard street section before parking was added.
5) Cul-de-sacs shall have a maximum spread of ½ the travel lane of the road stem of the cul-de-sac.
6) All gutter spread calculations shall be referenced by methodology and/or equations.
7) Curb inlets are not allowed within the radii of driveways or street intersections.
8) For sump conditions, use a 50% clogging factor to determine the inlet capacity.
9) Provide a table of checks for spread calculations and bypass as shown below in Table 8.

Table 7
Allowable Gutter Spread for Typical Back-Back Widths

B-B Width (feet) (24-inch Curb and Gutter)	Allowable Gutter Spread (feet)	B-B Width (feet) (30-inch Curb and Gutter)	Allowable Gutter Spread (feet)
22	6.0	23	6.5
24	6.5	25	7.0
26	7.0	27	7.5
32	8.5	33	9.0

Table 8
Example Table of Checks for Spread Calculations and Bypass

Inlet #	Bypass Inlet	Spread (feet)	Allowable Gutter Spread (feet)	Check	Bypass (cfs)
CB1	CB2	5.5	6.0	Pass	
CB2	CB3	6.1	6.0	Fail	

6. Storm drain outfalls shall be piped a minimum of 20-feet beyond the rear of any existing or proposed buildings and released to the natural drainage ditch or stream. It may be necessary to cross intervening property and obtain private drainage easements to ensure discharge into natural watercourse. All costs shall be borne by the developer. Receiving water courses shall be evaluated for adequacy (refer to Section 8.1 10% Stormwater Rule).

7. Concrete end-sections or concrete headwalls and endwalls shall be required at the beginning and end of all storm drain pipes. Storm drain pipes with a 36-inch diameter or greater will require headwalls and endwalls. If HW/D is $\geq$ 0.90 for any pipe with less than a 36-inch diameter, a headwall and endwall are required. An endwall is required if there is a tailwater condition at the pipe outlet such that the crown is submerged. A headwall shall be provided at the upstream end of a pond spillway pipe unless a riser is proposed and an endwall shall be provided at the outlet of a pond spillway pipe unless a closed system

outfall is proposed. Pond inlet pipes with diameters greater than or equal to 36-inch shall have concrete endwalls. Pond inlet pipes with diameters less than 36-inch shall have concrete endwalls or concrete flared end-sections. Whenever a flared end-section is proposed, a concrete curtain wall shall be provided to mitigate undermining influences. The curtain wall shall extend for the entire width of the flared end-section opening and shall extend to a depth below the bottom of adjacent riprap. Riprap or an approved alternative (permanent synthetic liners, stilling basins, level spreaders, etc) dissipation methods will be required as necessary.

HDPE flared-end-sections are not allowed.

8. Storm drain pipes are to extend to the right-of-way or beyond improvements as indicated in **6.** above.

9. Storm drainage pipe and structure information table shall be listed on each sheet of construction plans and profile drawings. This information shall include pipe diameter, material, grade, inlet and outlet inverts, structure type, drainage area and flow into the pipe structure. This information should be written in a table format with corresponding pipe or structure numbers shown in plan view.

10. When drainage ditches cross sanitary sewer easements, storm drain pipes are to be installed. The pipes are to be sized to accommodate the 2-year storm event flow of the ditch. See the requirements under **1.** above. The pipe shall extend the entire width of the easement.

11. Provide riprap or approved alternative outlet protection calculations for all storm drain outlets.

12. Provide open channel design calculations for all channelized storm drain flow; see requirements under **1.** above.

13. All through drainage conveyance facilities shall be placed in a storm drainage easement. Through drainage shall be defined as the artificial collection and conveyance of drainage from one property (including the public right-of-way) through another property.

A yard swale will be considered a through drainage channel if and when it drains two or more upstream properties or conveys a 10-year storm event peak flow rate of 2-cfs or greater. When the above occurs, a storm drainage easement shall be provided.

14. Stormwater easements for pipes are to be calculated as follows: Width of storm drain easement equals 14-feet plus the outer diameter plus 2-feet for every 1-foot of vertical depth greater than 5-feet. The depth shall be measured from the top of the ground to the invert of the pipe. Structural encroachments into easements shall not be allowed. All storm drain lines and easements are to be located in open space as much as possible. Storm drain easements are not to be combined with other utility easements but can overlap with other utility easements. When overlapping easements are proposed, the physical utility in one easement shall not be permitted to encroach the easement of another utility.

15. Minimum building setback on all storm sewer easements shall be 2-feet.

Excessively deep storm sewers shall have an additional building setback from the easement. Storm sewers that are between 10-feet and 15-feet measured from the ground surface to the pipe invert shall have an additional building setback from the easement of 5-feet.

Storm sewers deeper than 15-feet shall have a 10-foot building setback.

In no instance shall the load plane of a building or structure come within 5-feet of the outside edge of a

storm pipe.

16. Stormwater easements for channels are to be calculated as follows: Easement width equals the channel width measured from the top of bank, plus 7-feet from the top of bank on each side of the channel. Structural encroachments into easements shall not be allowed.

17. All stormwater easements shall be drivable: Max longitudinal slope = 5:1 (H:V); Max cross slope = 10:1 (H:V).

B. Stormwater Quality/Quantity Best Management Practices (BMPs)

1. Specific locations determined by the Public Works Department within a site deemed to be pollution hot spot sources will require discharge to the sanitary sewer system or adequate treatment. These locations include, but are not limited to, restaurants, fast food restaurants, any other food industry that generates food waste, automobile repair or service businesses, commercial laundry facilities such as dry cleaners and laundromats, commercial car wash businesses, etc.

2. At a minimum, Stormwater BMPs shall be designed in accordance with the Stormwater Best Management Practices Manual, N.C. Department of Environment and Natural Resources, April 1999 or latest revision and the design criteria provided in Section 8.3, Stormwater Control Facilities (BMPs), and design summaries provided in Section 8.4, Stormwater BMP Design Summaries. Provide a design summary form with design calculations for the BMPs (wet detention ponds, constructed wetlands, sand filters, underground detention structures, bio-retention areas, and dry detention ponds) with all construction drawing submittals. If a design summary does not exist for the BMP then a summary of design standards and references must be submitted. Coordination with the Stormwater Services Division is required for BMPs not covered by the design summaries or other BMP manuals.

3. Stormwater BMPs must be located on common open space in a single/multi-family project.

C. Construction

1. If RCP is used at a stream, then an 8-foot section must be used at the lower end (nearest the stream) because of possible undermining.

2. Storm drain pipes or drainage ways shall have a minimum 12-inches of cover. Inside the right-of-way, storm drain pipe shall have a minimum of 18-inches of cover from the top of the pipe to the finished grade; storm drain pipe of 60-inches in diameter or larger shall have a minimum of 24-inches of cover. When pipe is exposed to construction loads or other loads in excess of AASHTO H-20, an additional 12-inches of cover shall be provided. Pipe diameters 30-inch and larger shall be deep enough to accommodate drainage structures.

3. Storm drain pipes or drainage ways shall have at least a one-foot vertical distance from all water and sanitary lines.

4. Street catch basins shall be City standard catch basin type II or NCDOT 840.01 where applicable. Pre-cast structures may be allowed, requiring inverts to be factory cut.

5. Yard inlet catch basins shall be Type A, B, III, IV and V as shown in the City of Durham Street Construction Specifications.

6. For public streets crossed with an open-ended 24-inch diameter pipe or larger, a 4-foot high PVC coated dark green chain link fence will be required at the right-of-way for a length measured from the culvert to the end of the fill section.

7. Transition between different pipe materials shall be by a structure only, and not by a coupling.

8. 24-hour notice is required prior to beginning pipe installation.

9. Prior to burying pipe at a depth greater than 20-feet, City approval must be obtained.

10. All storm drain pipes are to be visually inspected by the City of Durham Engineering Inspectors, with an option to require the system to be videoed or mandrel tested.

D. Floodplain and FEMA Flood Zones

1. All floodplains with cross-sections and FEMA Flood Zones shall be shown on every site plan, preliminary plat, construction drawing plan and final plats. Base flood elevations and floodways shall be shown if applicable. If the floodplain is proposed to be changed, both the existing and proposed floodplain shall be shown. If a CLOMR is required, it must be obtained from FEMA before Construction Drawing approval; a LOMR must be obtained prior to the issuance of any certificate of occupancy or certificate of compliance on the project.

2. Refer to the City of Durham Unified Development Ordinance (UDO) for further information.

3. Proposed development or fill in areas currently within the base flood are required to show the lowest finished floor elevation (including duct work) and proposed grading.

SECTION 8.1

APPLICATION OF THE STORMWATER ORDINANCE

Amendment to:

Section 12.8 of the Unified Development Ordinance (UDO)
Section 8.1 of the Durham Zoning Ordinance
Section 19-5(n) of the Durham Subdivision Ordinance
Section 23-145 of the Durham City Code

Adopted by the Durham City Council on April 23, 1997
Adopted by the Durham Board of County Commissioners on February 9, 1998

Requirement (as written in the ordinance amendment)

Properties and waterways downstream from land development sites may be adversely impacted from increases in volume, velocity and peak flow rates. Any land-disturbing activity which results in an increase of impervious area may be required to provide stormwater management facilities or make other improvements to the existing drainage system to address water quantity concerns, water quality concerns, or both if the proposed development will increase potential flood damages to existing properties or significantly increase pollutant levels in downstream receiving waters.

Prior to the approval of any subdivision or site plan or the issuance of a building permit for any structure other than a single-family residence, the owner of the property proposed for development shall submit a stormwater impact analysis that complies with the requirements of the Stormwater Services Division Manager and which determines the impact of the increased stormwater runoff on downstream stormwater facilities and properties whenever the peak runoff rate from either the 2-year storm or the 10-year storm increases by more than 10% as a result of the proposed development. The Stormwater Services Division Manager shall determine the need for stormwater management facilities to address offsite impacts. Stormwater management facilities shall be designed and maintained in accordance with Section 5.5.7.2 of the Durham Zoning Ordinance and 8.7.2.D of the UDO.

Purpose

The purpose of this requirement is to assess potential flooding and water pollution impacts on existing downstream areas as a result of new development before the development occurs. It is applicable to those projects requiring zoning approval, subdivision approval or a building permit.

It should be noted that a 10% increase in runoff rates does not automatically mean that a project will be required to provide detention or make drainage improvements. It should also be noted that an increase in runoff rates less than 10% does not automatically mean that a project will not be required to provide detention or make drainage improvements.

Note: The Stormwater Services Division Manager shall have the authority to decide when and where it is in the best interests of the City to require or not require a stormwater BMP in a proposed development. In addition to, or in-lieu of, on-site management, the Stormwater Services Division Manager may, in some instances, require that an existing BMP facility be retrofitted or that downstream improvements be provided to address water quantity and/or water quality concerns.

Process

This must be performed by a North Carolina Registered Professional Engineer. The Stormwater Services Division's site plan checklist located in Section 1.2, Stormwater Services Rezoning, Site Plan and Final Plat Submittal Checklist Requirements, provides a summary of all required items.

The applicant's engineer must proceed through the following steps:

1. Use TR-55/TR-20, HEC-HMS, HEC-1 or the Rational Formula (refer to Section 8.0, Stormwater Design Criteria) to calculate the pre- and post-development discharges for each point of discharge from the site. A reduction in "overall" site imperviousness does not eliminate the requirement for an impact analysis at "every point of discharge." It would also include those projects for which a building permit had been issued and was still valid. However, individual single-family residential lots may be exempted. If runoff leaves the site at several points, the engineer must conduct a separate analysis for each point. In addition, downstream confluence points should also be checked.

2. If the post-development calculations do not show an increase greater than 10% in the pre-development 2- and 10-year peak discharges, then no further analysis is needed unless further analysis is deemed necessary by the Stormwater Services Division Manager. If the calculations show an increase greater than 10% in the pre-development discharges, then an additional downstream analysis is required.

3. A site to drainage area analysis can be used to show that the site is a small percentage of the total watershed area. Further analysis between the site and the point of analysis of the total watershed area to determine the impact of the increase in discharge is required. See the table below for percentage thresholds for using the site to drainage area analysis.

Existing Land Use	Proposed Land Use	Threshold
Unimproved	~85% impervious - (ex) commercial, business c=0.75	If the total site area as a percentage of the total watershed area at the analysis point is 2.5% or less, your analysis is complete.
Unimproved	~70% impervious - (ex) townhouses c=0.6	If the total site area as a percentage of the total watershed area at the analysis point is 3% or less, your analysis is complete.
Unimproved	~35% impervious - (ex) 1/4 acre single family homes c=0.3	If the total site area as a percentage of the total watershed area at the analysis point is 10% or less, your analysis is complete.

4. Identify the downstream point at which the increase becomes less than 10%. Further analysis is required to determine the impacts of the increase between the site and the downstream point at which the increase becomes less than 10%. Identify what is located along the drainage corridor (swales, ditches, open channels, culverts, pipe systems, etc.). If there are no negative impacts, the analysis must specifically state and demonstrate that no structures (businesses, homes, culverts, streets) will be adversely impacted by the increase in site runoff. If no structures exist between the site and analysis points, state this in the study. All negative impacts on existing improvements (e.g. streets, culverts, etc.) and development (e.g. businesses, homes, lawns, etc) must be identified. All critical sites must be analyzed. Analyses should include, but not necessarily be limited to, inlet

and outlet calculations for culverts and channel capacity calculations for drainage ways and storm drain systems.

5. Photographs must be provided for the representative downstream channel cross-sections and all culvert inlets and outlets.

6. If the downstream system is inadequate, contact the Stormwater Services Division to discuss possible improvements and/or detention requirements. If detention is required, the peak flow must be managed back to the pre-development condition.

7. Phased Developments, Expansion Projects and Re-Development Projects

a. Phased Developments

There are two options for phased projects. The first option is to have post-development calculations, on the first submittal, reflect the complete build-out conditions, thus any conveyance, detention or treatment devices would be sized for the ultimate project build-out. The second option is to have later improvements and impact studies reflect the site before any development has taken place. The earlier (previous phase) submittal will not be considered as "existing" improvements for subsequent submittals.

b. Expansion Projects and Re-Development Projects

If the existing development was built after enactment of the City of Durham 10% Stormwater Rule (4/23/97) without 2- and 10-year stormwater controls, then the existing impervious surface cannot be used as the pre-development condition. The existing and proposed impervious surface must all be accounted for in the post-development weighted runoff coefficient.

Stormwater Impact Statement Submission Requirements

The following minimum information must be submitted as part of the Stormwater Impact Analysis:

1. Stormwater Services Site Plan and Preliminary Plat Submittal Checklist found in Section 1.2, Stormwater Services Rezoning, Site Plan and Final Plat Submittal Checklist Requirements, and a Stormwater Impact Analysis signed and sealed by a registered North Carolina professional engineer.

2. A narrative report shall be provided as part of the Stormwater Impact Analysis that includes at a minimum the following:

a. an introduction that identifies the project location, including Cape Fear or Neuse River Basin, whether or not it is in a Water Supply Watershed (F/J-A, F/J-B, E-A, E-B, M/LR-A, M/LR-B) and if so which zone, site address, a description of the pre- and post-development land cover and a general description of the proposed improvements (# of lots, parking spaces, buildings and removal of existing impervious surfaces)
b. description of the methodologies and procedures
c. calculations with supporting documentation
d. summary of results including pre- and post- discharges for each drainage area
e. conclusion detailing the findings of the drainage investigation

3. A drainage map delineating the site area and the watershed area(s) for pre- and post-development. The study area is to incorporate all downstream tributaries until it is demonstrated that the increased runoff from the developed site is no longer increasing the existing flow by more than 10%. Sub-basins must be delineated for each point of discharge for the site. Copies of topographic mapping (200/400 scale) are available from the

Department Public Works, Engineering Division. A USGS map may be used only if that is the best available information. The map scale, north arrow, analysis point(s) and time of concentration flow paths must be shown.

4. Times of concentration calculations are to be computed using the TR-55 segmented approach and shall be representative of the site. The various segments (sheet/overland, shallow concentrated and ditch/channel/pipe flow) are to be labeled on the drainage area maps. An "assumed" minimum sheet/overland flow length of 75-feet in the pre-developed condition will be accepted by the Stormwater Services Division provided that the area has not been altered such that overland sheet flow lengths would exceed 75-feet. This shall apply to flat slopes (2% or flatter) with predominantly B soil types. A maximum of 50-feet is to be used for the post-development sheet/overland flow segment unless it can be shown that the depth of sheet flow is 0.10-feet or less. Show the location of channels, ditches, swales, culverts and pipe systems analyzed on the drainage map. Digital maps are available from Technology Solutions at (560-4122).

5. A site plan or grading plan identifying the pre-development and post-development drainage patterns and imperious area coverage.

6. Calculations for the pre- and post-development discharges for the 2- and 10-year 24-hour storm using TR-55/20 HEC-1, HEC-HMS or Rational Method. Complete calculations and all supporting documentation (including but not limited to calculation of composite runoff coefficients, time of concentration (pre- and post-), ditch/open channel analysis, storm drain analysis, culvert analysis, etc.). This includes all assumptions used in the calculations and necessary channel cross-sections or pipe information used for the downstream analysis. Land use information is available from the City/County Planning Department for use in determining runoff coefficients and times of concentration. A table summarizing the pre-development and post-development peak rates with no backup information is not acceptable.

Storm Water Impact Analysis submittals that do not meet the above minimum submittal requirements will be returned without review.

See Stormwater Services Site Plan and Preliminary Plat Submittal Checklist in Section 1.2, Stormwater Services Rezoning, Site Plan and Final Plat Submittal Checklist Requirements, for submittal requirements concerning buffers (City and Neuse), floodplain, Neuse Basin (1-year storm controls and nitrogen reduction) and Water Supply Watershed requirements.

SECTION 8.2

NEUSE RIVER BASIN PERFORMANCE STANDARDS

The following information is applicable to new development in the City of Durham portion of the Neuse River Basin. For information concerning Durham County, please contact the Durham County Engineering Department at (919) 560-0735.

Under the Neuse River Basin Nutrient Sensitive Water Management Strategy, the City of Durham is one of 15 local governments required to develop and implement a stormwater management program to control nitrogen from new development. The effective date for program implementation is March 9, 2001.

For purposes of the Neuse stormwater program, new development is defined as follows:

"New development" means development within the Neuse River Basin for a project requiring site plan or subdivision approval or similar approvals by the Durham Planning Department, which, in the case of single family detached, duplex, or recreational development will result in land disturbance of greater than one acre, or in the case of other residential (including multi-family and townhomes), office, institutional, commercial, or industrial development will result in land disturbance of greater than one half acre. New development shall include re-development but shall NOT include agriculture, mining or forestry activities.

"Land disturbance" means grubbing, stump removal, removal of topsoil and coarse or fine grading, including disturbance to the subgrade.

The stormwater management program must address three elements that affect new development:

1. Limit the nitrogen export from new development to 3.6-pounds per acre per year (lbs/ac/yr)
2. Control post-development peak flow rate for the 1-year, 24-hour storm
3. Protect and maintain existing riparian buffer areas

Site Plan and Subdivision Plan Submission Requirements

Applications for new development located in the Neuse River Basin shall include the following with all site plans and subdivision plans submitted to the Durham City/County Planning Department:

1. A plan drawing showing 50-foot wide buffers immediately adjacent to all streams, lakes and water bodies that appear on EITHER the USGS 7.5 minute quad maps or the USDA SCS Soil Survey of Durham County.

2. Documentation from the NC Division of Water Quality approving any activities that impact the Neuse buffers.

3. Peak runoff calculations for the 1-year, 24-hour storm, pre-development and post-development conditions, at each drainage outlet.

4. Nitrogen loading calculations for the pre-development and post-development conditions.

5. Plans and supporting calculations showing how the nitrogen export limits and the peak runoff limits will be met. For any structural BMPs, the calculations shall include sizing and treatment design calculations.

These calculations and BMP design plans shall be submitted to the Durham City/County Planning Department with all site plan and subdivision plan applications.

6. If offset payments will be used to meet the nitrogen loading requirements, the applicant shall furnish proof that offset fees have been paid to the North Carolina Ecosystem Enhancement Program before a site plan or subdivision plan can be approved.

Development Plan Submission Requirements

Applications for development plan approval must show Neuse riparian buffers on development plan drawings and provide a conceptual plan indicating how the development can meet the nitrogen export and the peak flow requirements. If one or more structural controls will be required for either the nitrogen export or peak flow requirements, the location(s) of facility(s) shall be shown at each appropriate drainage outlet. Conceptual plans must provide enough detail to show that the plan is likely to work within the constraints of topography and space.

Controlling Post-Development Peak Runoff Rate

New development may not increase the post-development peak runoff rate from the 1-year, 24-hour storm at each point of discharge over the pre-development peak runoff rate by more than 10%.

Peak runoff calculations shall be made using the Peak Discharge Method as described in USDA Soil Conservation Service's Technical Release Number 55 (TR-55), "Urban Hydrology for Small Watersheds." For the 1-year, 24-hour storm, the rain depth to be used with this methodology is 3.0-inches.

The Rational Method cannot be used because no rainfall intensity-duration curves are available for the one-year storm in this part of the state.

New residential development is exempt from the peak runoff control requirement *IF* the impervious area does not exceed 15% impervious area and swales *and* other natural stormwater conveyances are used to the maximum extent practicable.

This requirement applies in the Neuse River Basin in addition to the City's existing requirements under the Stormwater Controls for Off-site Impacts Ordinance.

Application Guidelines

Peak flow will normally be evaluated at each point of discharge. Typically, the point of analysis for each discharge will be the point at which the flow enters the channel of a stream requiring a Neuse River Stream Buffer. The analysis of flow at this location may, at the discretion of the Stormwater Services Division Manager, include the flow in the Neuse River stream itself. If the stream does not border the site, the point of analysis may be taken either at the point the flow leaves the site or the point it enters the Neuse River stream.

Management of peak flow may not be required if the increase is less than 10% for that outlet. If management is provided, however, the peak flow must be managed back to the pre-development condition.

Neuse Riparian Buffers

The Neuse River Stream Buffer Rule is separate from the stormwater rule. However, the 15 local governments subject to the Neuse River Basin stormwater rule are required to ensure compliance with the Neuse River Stream Buffer regulations.

The buffer rule requires local governments to ensure that 50-foot riparian buffers on both sides of intermittent and perennial streams and around lakes, ponds and estuaries are maintained and protected from new development regardless of the amount of disturbed area for the project.

In addition to the stream buffer, a 10-foot no build setback measured from the buffer line is also required.

The applicant shall show, on subdivision and site plans of all types, 50-foot wide riparian buffers immediately adjacent to all streams, lakes and ponds appearing on either the Durham County Soil Survey maps or the USGS 7.5 minute quadrangle maps.

For intermittent and perennial streams, the buffer shall begin at the most landward limit of the top of bank and extend landward on all sides of the surface water, measured horizontally on a line perpendicular to the surface water.

For ponds, lakes, and estuaries, the buffer shall begin at the most landward limit of the normal water level and extend landward, measured horizontally on a line perpendicular to the surface water.

The applicant shall demonstrate that the new development does not impact the Neuse River Basin Stream Buffer or that the North Carolina Division of Water Quality has approved the activity that impacts the Neuse River Basin Stream Buffer.

Applicants for new development approval should note that the Neuse River Basin Stream Buffer requirements are separate from the stormwater program requirements and have different rules of applicability. Please refer to the buffer rule itself for information about the requirements to protect and preserve the Neuse River Basin riparian buffers.

A Fact Sheet on the buffer rules is appended to this guidance document. The Neuse River Basin Stream Buffer rules can be viewed at the North Carolina Division of Water Quality's website: http://h2o.enr.state.nc.us:80/nps/neuse.htm.

Nitrogen Export

New development is required to limit the amount of nitrogen loading to 70% of the 1995 average non-urban nitrogen load. This is equivalent to 3.6-lbs/ac/yr of nitrogen.

The nitrogen export limit of 3.6-lbs/ac/yr can be met by using one or more of the following strategies: limit the amount of impervious area; treat stormwater runoff to reduce nitrogen; or make payment of offset fees to the North Carolina Ecosystem Enhancement Program.

Treatment

Stormwater runoff can be treated to reduce nitrogen using a variety of stormwater Best Management Practices (BMPs), including wet detention ponds, sand filters, water quality swales, buffers and constructed wetlands. Treatment methods may be used in series if greater removal rates are needed. For BMPs in series, total removal efficiency must be determined by serial calculation.

Offset Fees

Under the offset fee option, the applicant makes a one-time payment, as determined by the most recent adopted payment calculation published by the North Carolina Department of Enviroment and Natural Resources (NCDENR), to the North Carolina Ecosystem Enhancement Program. Offset fees are allowed for certain residential developments when the nitrogen export is between 3.6- and 6.0-lbs/ac/yr. For other developments, offset fees are permitted when the nitrogen export is between 3.6-and 10.0-lbs/ac/yr. The "certain residential developments" referenced above include the following:

a. Single Family Detached House Construction
b. Semi-Attached House Construction
c. Patio House Construction
d. Zero Lot Line House Construction
e. Traditional House Construction
f. Class A and Class B Manufactured House Construction (when the house resides in a Manufactured Home Subdivision (e.g. containing residential lots for sale by individual deed))

If a proposed development would generate more nitrogen, then the stormwater would have to be treated to reduce the nitrogen loading to either 6.0-lbs/ac/yr for certain residential developments or 10.0-lbs/ac/yr for other development before it would be eligible for the offset payment option.

Applicants must furnish documentation that offset fees have been paid to the North Carolina Ecosystem Enhancement Program **before** site plans and subdivisions will be approved. During the development review process the plan drawing and accompanying design and sizing calculations will be reviewed by Stormwater Services. Once the applicant has addressed all plan review comments, the applicant will be notified that the project is conditionally approved subject to receipt of proof that ofset payment has been made. The conditional approval will indicate the amount of the offset payment that must be made.

Checks should be made out to the "North Carolina Ecosystem Enhancement Program." The NC Ecosystem Enhancement Program will verify that the amount paid matches the amount specified in the conditional approval, and will send a receipt to both the applicant and the City of Durham normally within five working days, at which time the site plan drawings can be signed and released.

Check may be sent to NC Ecosystem Enhancement Program, ATTN: Christopher Mankoff, 1652 Mail Service Center, Raleigh, NC 27699-1652. The street adress and phone number are as follows: NCEEP, Parker-Lincoln Building, 2728 Capital Boulevard, Suite 1H1 103, Raleigh, NC 27604; 919/715-0476.

CALCULATING NITROGEN EXPORT

Note: Most jurisdictions are using the calculation methods provided in the state's Model Stormwater Program. The City of Durham prepared its own calculation procedure based on monitoring data that has been collected under its NPDES stormwater permit. The North Carolina Environmental Management Commission approved this methodology at its Water Quality Committee meeting on February 7, 2001.

The method requires that either the building footprints are shown or that the lot's maximum impervious area is indicated on the final plat drawings. This method may be used with any type of development. In rare cases a development will take place on agricultural land, which has higher nitrogen loadings than normal managed or unmanaged open space land. In these situations the applicant will need to determine the acreages devoted to pasture land and to cropland. For pasture a loading of 4.4-lbs/ac/yr should be used. For cropland a loading of 13.6-lbs/ac/yr should be used. Contact Stormwater Services for guidance on calculating nitrogen loading for the pre-development condition where the land is currently being used for agricultural purposes.

Method for Quantifying TN Export From
Residential/Industrial/Commercial Developments

The calculations below shall be performed for both the pre-development and post-development site conditions.

Spreadsheets can be found at:

http://www.durhamnc.gov/departments/works/divisions/stormwater/design_plan_review.asp#useful

Step 1: Determine area for each type of land use and enter in Column (2).

Step 2: Total the areas for each type of land use and enter at the bottom of Column (2) at "Total Area =."

Step 3: Calculate the fraction of the total area that is impervious area and enter in space provided Column (1).

Step 4: Using the impervious surface fraction in step 3 as "I," calculate (0.43 + 7.7 I) and enter the result in each cell of Column (4).

Step 5: For each row, multiply columns (2), (3) and (4) and enter in Column (5).

Step 6: Sum the rows of column (5) and enter at the bottom as the TN Loading.

Step 7: Divide the TN Loading calculated in Step 6 by the total area calculated in Step 2 to determine the Unit Nitrogen Loading in lbs/ac/yr.

(1) **Type of Land Cover**	**(2)** **Area (acres)**	**(3)** **Land Cover Concentration Coefficient**	**(4)** **(0.43 + 7.7 I)**	**(5)** **Product of Columns (2), (3) and (4)**
Impervious surface Fraction of total area: _____ = I		2.60		
Managed open space		1.36		
Undisturbed open space		0.95		
Total Area =		**TN Loading (lb/yr) =**		
			Unit Nitrogen Loading (lbs/ac/yr) =	

Managed open space includes lawns and landscaped areas.
Undisturbed open space includes only tree save areas; tree replacement areas are considered managed open space.

Section 8.3: Stormwater Control Measures

General

The City of Durham recognizes the importance of controlling stormwater, both quality and quantity to preserve the City's natural resources, public safety and the overall well-being of the citizens of Durham. The techniques developed to improve stormwater quality and quantity are referred to most commonly as "Best Management Practices" (BMPs). This section covers structural BMPs or Stormwater Control Measures (SCMs), as the City of Durham generally refers to them as. SCMs are complex structures that must be designed and constructed with the specific site conditions, the availability of construction materials, the particular functions of the facility, and the associated hazards in mind. The City recognizes that the most effective control of stormwater pollutants is to reduce their generation at the source. The guidelines and standards provided herein, when applied correctly, will reduce the concerns with stormwater runoff, thus protecting the safety, health and general welfare of the public. The design of an SCM requires considerable engineering judgment and experience and no single written document, including but not limited to this document, can cover all the design and construction issues that may be confronted by the design engineer. It should be noted that the SCM design requirements referenced in this document are minimum design requirements based on typical conditions and, as such, are not meant to be considered all-inclusive for the design of any particular SCM. It shall also be noted that in order to most effectively treat stormwater for a given site, it is necessary for the designer to determine which type of SCM(s) are most appropriate for the physical characteristics of the site as well as the intended usages of the site. Physical site constraints may include soil suitability, depth to the seasonally high water table, depth to bedrock, slope, and watershed size. Site usage and other constraints may include proximity to potable water sources, foundations, land availability and cost, recreational use potential, aquatic and terrestrial wildlife habitat values, and maintenance requirements.

The acceptability of the design and the adequacy of the plans and specifications for the SCMs will be determined by these guidelines/standards. Ultimately, the responsibility for the proper design of the stormwater facility and its appurtenant structures shall rest with the design engineer of record and *not* with the City of Durham (City). When approving construction drawings, the City takes into consideration the fact that the plans and specifications were prepared, sealed, signed, and dated by a Professional Engineer licensed to practice engineering in the State of North Carolina and that the design engineer of record is wholly and soley responsible for the content of the plans and specifications.

In instances where any State or Federal statute, requirement, or standard is more or less stringent than that required by the City, the more stringent statute, requirement, or standard shall apply. When determined that a dam is subject to the Dam Safety Law of 1967 (15A NCAC 02K .0201), approval of the dam design by the North Carolina Dam Safety Office will be required prior to City approval of the plans. Additionally, where other state and/or federal approvals or permits are required, said approvals and permits shall be obtained and the City may utilize its discretion whether to review or approve plans prior to obtaining. It is the owner's/applicant's responsibility to ensure all state and federal regulations are complied with. It should be recognized that stormwater quality technology, design criteria, and requirements, as well as federal, state, laws and regulations, are dynamic and periodically change. As such the City expects the designer to stay current with these latest requirements, since this manual is only periodically updated.

The future operation and maintenance of SCMs is a primary concern to the City. Engineers, in the preparation of Construction Drawings, must include facility maintenance and operation as a primary design consideration.

Design elements not covered in this section are not necessarily allowed or disallowed. The merits and efficacy of such elements will be subject to the review and approval of City staff.

A. Design Documents

1. The design of each SCM device shall be displayed on a plan sheet dedicated solely to providing detailed design views of the device. For review and future archiving purposes, the plan view of the facility shall be at a scale of 1 inch = 30 feet or larger, and the scaled profile view of the dam (if present), emergency spillway, and outlet works shall be at a horizontal scale of 1 inch = 10 feet or larger and at a vertical scale of 1 inch = 5 feet or larger.

2. For underground and filtration systems, the scaled profile shall include the impoundment/storage structures and the inlet/s to the device.

3. Seasonal high water table (SHWT) levels or perched water tables due to confining soil layers shall be depicted on the profile view of all proposed SCM structures (including Filterra® units, underground sand filters, and below grade rainwater harvesting systems). The location of each test should be within the footprint of the proposed SCM in question; however, adjacent borings in close proximity to the facility and with like topographical conditions can be accepted by the City.

4. Hydraulic inputs and performance tables for each device shall be included with each construction drawing submittal package. In addition, all routing inputs and outputs for the operation of the facility, and all documentation showing how these inputs and outputs were determined shall be provided with the submittal package.

B. Design Methodologies

To regulate stormwater control measure design and construction, the City of Durham utilizes the following:

- The latest addition of the North Carolina Division of Water Quality *Stormwater Best Management Practices Manual* and its associated BMP Manual Errata Sheet. These documents can be viewed or downloaded from the Division of Water Quality's website at the following address: http://portal.ncdenr.org/web/wq/ws/su/bmp-manual.

- The City of Durham Addendum to the state manual, which can be found under the City's Stormwater Development Review webpage at: http://durhamnc.gov/DocumentCenter/View/3082.

Please note that additional chapters have been added to the *Stormwater Best Management Practices Manual* through the City of Durham Addendum. These chapters are inserted after the appendix.

*Revised October 1, 2013

SECTION 8.4

STORMWATER BMP DESIGN SUMMARIES

City of Durham

Public Works Department

Stormwater Services Divisions

101 City Hall Plaza, Durham, North Carolina, 27701
Telephone (919) 560-4326 FAX (919) 560-4316

Dry Detention Basin Design Summary

Stormwater Management Construction Plan Review:
A complete stormwater management construction plan submittal includes a design summary for each stormwater BMP, design calculations, plans and specifications showing BMP, inlet and outlet structure details.

I. PROJECT INFORMATION

Project Name: _____ Phase _____
PIN: _____ Case #: _____
Design Contact Person: _____ Phone #: (____) ____-_____
Legal Name of Owner:_____
Owner Contact: _____ Phone #: (____) ____-_____
Owner Address:_____
Deed Book _____Page #_____ or Plat Book _____ Page#_____ for BMP Property
For projects with multiple basins, specify which pond this worksheet applies to: _____
Detention provided for: ___ 1-year ___ 2-year ___ 10-year ___ other _____
Dam Height: _____ (feet) Dam Classification: _____

Elevations

Basin bottom elevation	_____ ft.	*(floor of the pond)*
1-year storm orifice/weir elevation	_____ ft.	*(invert elevation)*
1-year storm water surface elevation	_____ ft.	
2-year storm orifice/weir elevation	_____ ft.	*(invert elevation)*
2-year storm water surface elevation	_____ ft.	
10-year storm orifice/weir elevation	_____ ft.	*(invert elevation)*
10-year storm water surface elevation	_____ ft.	
Emergency spillway elevation	_____ ft.	*(invert of emergency spillway)*
Top of embankment/dam	_____ ft.	*(elevation)*
Maximum water surface elevation	_____ ft.	(max. storm pond can safely pass)

Areas

Design storm surface area	_____ ft^2	*(Specify frequency event:_____year)*
Drainage area	_____ ac.	*(total drainage to the pond)*

Volumes

Total storage volume provided at design storm	_____ ft^3
Total storage volume provided at top of dam	_____ ft^3

Hydraulic Depth (volume of design storm divided by surface area of design storm)
Hydraulic Depth _____ ft.

Discharges (Specify only applicable frequency events)

At BMP

	1-year	2-year	10-year	_____-year
Inflow	_____ cfs	_____ cfs	_____ cfs	_____ cfs
Routed outflow	_____ cfs	_____ cfs	_____ cfs	_____ cfs

At Analysis Point(s) that BMP Contributes to

	1-year	2-year	10-year	_____-year
Pre-development	_____ cfs	_____ cfs	_____ cfs	_____ cfs
Post-development w/o detention	_____ cfs	_____ cfs	_____ cfs	_____ cfs
With detention	_____ cfs	_____ cfs	_____ cfs	_____ cfs

Riser/Principal and Emergency Spillway Information

1-year storm orifice/weir	diameter_____ in.	length _____ft.	
2-year storm orifice/weir	diameter_____ in.	length _____ft.	
10-year storm orifice/weir	diameter_____ in.	length _____ft.	
___- year storm orifice/weir	diameter_____ in.	length _____ft.	
Principal spillway	diameter_____ in.		
Emergency spillway	width_____ ft.	side slopes ___:1	slope_____%

II. REQUIRED ITEMS CHECKLIST

The following checklist outlines design requirements. In the space provided to indicate the following design requirements have been met and supporting documentation is attached.

Applicant's initials

_____ a. Riprap outlet protection, if provided, reduces flow to non-erosive velocities (provide calculations).

_____ b. The basin side slopes are no steeper than 3:1.

_____ c. Vegetative cover for the basin is specified. No woody vegetation is permitted on the embankment.

_____ d. A trash rack or similar device is provided for both the overflow and orifice. Flat top trash racks are not acceptable. Access hatch has been provided.

_____ e. A recorded drainage easement is provided for each basin including access to the nearest right-of-way and is graded per Section 8.3, Stormwater Control Facilities (BMPs).

_____ f. If the basin is used for sediment and erosion control during construction, a note requiring clean out and vegetative cover being established prior to use as a dry detention basin shall be provided on the construction plan.

_____ g. Anti-floatation calculations are provided for riser structure.

_____ h. A plan view of the pond with grading shown is provided.

_____ i. A profile through the forebay, main pond and spillway is provided. Water surface elevations are shown on the profile.

_____ j. Riser structure details are provided.

_____ k. Compaction specifications for the embankment are provided on the plan.

_____ l. Dam designed to account for a 5.00% settlement factor.

_____ m. The minimum top of dam width has been provided for the pond embankment top width per Section 8.3, Stormwater Control Facilities (BMPs).

Note: Executed Stormwater Facility Operation and Maintenance Permit Agreement, payment of permit fee per facility and payment of surety are required prior to construction drawing approval.

City of Durham

Public Works Department

Stormwater Services Divisions

101 City Hall Plaza, Durham, North Carolina, 27701
Telephone (919) 560-4326 FAX (919) 560-4316

Wet Detention Pond Design Summary

Stormwater Management Construction Plan Review:
A complete stormwater management construction plan submittal includes a design summary for each stormwater BMP, design calculations, plans and specifications showing BMP, inlet and outlet structure details.

I. PROJECT INFORMATION

Project Name: _____ Phase _____
PIN: _____ Case #: _____
Design Contact Person: _____ Phone #: (____) ____-_____
Legal Name of Owner:_____
Owner Contact: _____ Phone #: (____) ____-_____
Owner Address:_____
Deed Book _____Page #_____ or Plat Book _____ Page#_____ for BMP Property
For projects with multiple basins, specify which pond this worksheet applies to: _____
Does the proposed pond also incorporate stormwater detention? Yes No
Detention provided for: ___ 1-year ___ 2-year ___ 10-year ___ other _____
Dam Height: _____ (feet) Dam Classification: _____

Elevations

Pond bottom elevation	_____	ft.	*(floor of the pond)*
Permanent pool elevation	_____	ft.	*(invert elevation of the orifice)*
Temporary pool elevation	_____	ft.	*(elevation of the structure overflow)*
1-year storm orifice/weir elevation	_____	ft.	*(invert elevation)*
1-year storm water surface elevation	_____	ft.	
2-year storm orifice/weir elevation	_____	ft.	*(invert elevation)*
2-year storm water surface elevation	_____	ft.	
10-year storm orifice/weir elevation	_____	ft.	*(invert elevation)*
10-year storm water surface elev.	_____	ft.	
Emergency spillway elevation	_____	ft.	*(invert of emergency spillway)*
Top of embankment/dam	_____	ft.	*(elevation)*
Maximum water surface elevation	_____	ft.	(max. storm pond can safely pass)

Areas

Permanent pool area provided	_____	ft^2	*(water surface area at orifice invert elevation)*
Minimum required permanent pool area	_____	ft^2	*(calculated surface area required)*
Design storm surface area	_____	ft^2	*(Specify frequency event:_____ year)*
Drainage area (10-acres min)	_____	ac.	*(total drainage to the pond*

Discharges (Specify only applicable frequency events)

At BMP

	1-year	2-year	10-year	_____-year
Inflow	_____ cfs	_____ cfs	_____ cfs	_____ cfs
Routed outflow	_____ cfs	_____ cfs	_____ cfs	_____ cfs

At Analysis Point(s) that BMP Contributes to

	1-year	2-year	10-year	_____-year
Pre-development	_____ cfs	_____ cfs	_____ cfs	_____ cfs
Post-development w/o detention	_____ cfs	_____ cfs	_____ cfs	_____ cfs
With detention	_____ cfs	_____ cfs	_____ cfs	_____ cfs

Volumes

Permanent pool volume	_____ ft^3	*(volume of main pond and forebay)*
Water quality pool storage volume	_____ ft^3	*(volume above permanent pool)*
Design storm storage volume	_____ ft^3	*(volume above permanent pool)*
Total Storage volume provided at design storm	_____ ft^3	
Total Storage volume provided at top of dam	_____ ft^3	
Forebay volume	_____ ft^3	*(~ 20% of permanent pool volume)*

Hydraulic Depths

Volume of normal pool divided by surface area of normal pool	_____ ft.
Volumes at temporary pool plus normal pool divided by surface area of temporary pool	_____ ft.

Other Parameters

SA/DA[1]	_____		*(from DWQ table)*
Diameter of orifice	_____	in.	*(must provide draw down over 2 to 5 day period)*
Draw-down time	_____	hrs	

[1] When using the SA/DA tables from the Stormwater Best Management Practices Manual, linear interpolation may be used for values between table entries.

Riser/Principal and Emergency Spillway Information

1-year storm orifice/weir	diameter_____	in.	length _____ft.	
2-year storm orifice/weir	diameter_____	in.	length _____ft.	
10-year storm orifice/weir	diameter_____	in.	length _____ft.	
___- year storm orifice/weir	diameter_____	in.	length _____ft.	
Principal spillway	diameter_____	in.		
Emergency spillway	width_____ ft.		side slopes ___:1	slope_____%

II. REQUIRED ITEMS CHECKLIST

The following checklist outlines design requirements. Initial in the space provided to indicate the following design requirements have been met and supporting documentation is attached.

Applicant's initials

_____ a. The permanent pool depth is between 3- and 6-feet (required minimum hydraulic depth of 3-feet).
_____ b. The forebay volume is approximately equal to 20% of the pond volume.
_____ c. The temporary pool controls runoff for water quality design storm.
_____ d. The temporary pool draws down in 2- to 5-days.
_____ e. The drainage area to the facility is at least 10-acres.
_____ f. Riprap outlet protection, if provided, reduces flow to non-erosive velocities (provide calculations).
_____ g. The pond length to width ratio is greater than or equal to 3:1.
_____ h. The pond side slopes above the permanent pool area are no steeper than 3:1.
_____ i. A submerged and vegetated shelf with a slope no greater than 6:1 is provided around the perimeter of the pond (show on plan and profile and provide a vegetation plan).
_____ j. Vegetative cover above the permanent pool elevation is specified. No woody vegetation is permitted on the embankment.
_____ k. A surface baffle, trash rack or similar device is provided for both the overflow and orifice. Flat top trash racks are not acceptable. Access hatch has been provided.
_____ l. A recorded drainage easement is provided for each pond including access to the nearest right-of-way and is graded per Section 8.3, Stormwater Control Facilities (BMPs).
_____ m. If the basin is used for sediment and erosion control during construction, a note requiring clean out and vegetative cover being established prior to use as a wet detention basin shall be provided on the construction plan.
_____ n. A mechanism is specified which will drain the pond for maintenance and emergencies. Valves used shall be plug valves.
_____ o. Anti-floatation calculations are provided for riser structure.
_____ p. A plan view of the pond with grading shown is provided.
_____ q. A profile through the forebay, main pond and spillway is provided. Water surface elevations are shown on the profile.
_____ r. Riser structure details are provided.
_____ s. Dam designed to account for a 5.00% settlement factor.
_____ t. Compaction specifications for the embankment are shown on the plan.
_____ u. The minimum top of dam width has been provided for the pond embankment top width per Section 8.3, Stormwater Control Facilities (BMPs).

Note: Executed Stormwater Facility Operation and Maintenance Permit Agreement, payment of permit fee per facility and payment of surety are required prior to construction drawing approval.

City of Durham

Public Works Department

Stormwater Services Divisions

101 City Hall Plaza, Durham, North Carolina, 27701
Telephone (919) 560-4326 FAX (919) 560-4316

Sand Filter Design Summary

Stormwater Management Construction Plan Review:
A complete stormwater management construction plan submittal includes a design summary for each stormwater BMP, design calculations, plans and specifications showing BMP, inlet and outlet structure details.

I. PROJECT INFORMATION

Project Name: _____ Phase _____
PIN: _____ Case #: _____
Design Contact Person: _____ Phone #: (____) ____-_____
Legal Name of Owner:_____
Owner Contact: _____ Phone #: (____) ____-_____
Owner Address:_____
Deed Book _____Page #_____ or Plat Book _____ Page#_____ for BMP Property
For projects with multiple basins, specify which pond this worksheet applies to: _____

Drainage area	_____	ac.	*(total drainage area to the sand filter)*
Impervious area	_____	ac.	*(total impervious area to the sand filter)*
Design runoff	_____	in.	
Design treatment volume (540 ft^3/Ac)	_____	ft^3	

Sediment chamber design

Bottom elevation	_____	ft.	*(floor of the sediment chamber)*
Weir elevation	_____	ft.	*(invert elevation of overflow to sand bed)*
Volume	_____	ft^3	*(volume of sediment chamber to weir elevation)*
Surface area	_____	ft^2	*(surface area of sediment chamber at bottom)*
Design treatment volume provided	_____	ft^3	

Sand filter bed design

Bottom elevation	_____	ft.	*(elevation of bottom of sand bed)*
Top of sand	_____	ft.	*(elevation of top of sand)*
Sand volume	_____	ft^3	*(volume of sand in bed)*
Sand surface area	_____	ft^2	*(surface area of sand bed at bottom of bed)*
Design treatment volume provided	_____	ft^3	
Perforated pipe length	_____	ft.	*(length of perforated pipe provided under sand bed)*
Diameter of perforated pipe	_____	in.	*(pipe diameter of perforated pipe)*

II. REQUIRED ITEMS CHECKLIST

The following checklist outlines design requirements. Initial in the space provided to indicate the following design requirements have been met and supporting documentation is attached.

Applicant's initials

_____ a. Runoff from landscaped areas and other non-impervious areas has been directed away from the sand filter to the maximum extent practical.

_____ b. Drainage area for sand filter is less than 5-acres.

_____ c. Maximum water quality head over the sand filter is 12" or less.

_____ d. Plan specifies how all slopes draining to the sand filter will be stabilized.

_____ e. No side slopes draining to sand filter greater than 3:1.

_____ f. Design drawings provide note: "All slopes draining to sand filter shall be stabilized per the North Carolina State Erosion and Sediment Control Planning and Design Manual before sand is placed in sand bed."

_____ g. Riprap outlet protection, if provided, reduces flow to non-erosive velocities (provide calculations).

_____ h. A recorded drainage easement is provided for each sand filter including access to the nearest right-of-way and is graded per Section 8.3, Stormwater Control Facilities (BMPs).

_____ i. Anti-floatation calculations are provided for riser structure.

_____ j. A surface baffle, trash rack or similar device is provided for both the overflow and orifice. Flat top trash racks are not acceptable. Access hatch has been provided.

_____ k. A plan view of the sand filter with grading shown is provided.

_____ l. A profile through the settling chamber, sand bed and spillway is provided. Water surface elevations are shown on the profile.

_____ m. Riser structure details are provided.

_____ n. Compaction specifications for the embankment are provided on the plan.

_____ o. Runoff from storms larger than the 1-year storm are routed around the sand bed.

_____ p. Sand size, type and gradation specified. The sand shall be a clean ASTM C-33 medium aggregate sand with a size range of 0.02-inch to 0.04-inch.

Note: Executed Stormwater Facility Operation and Maintenance Permit Agreement, payment of permit fee per facility and payment of surety are required prior to construction drawing approval.

City of Durham

Public Works Department

Stormwater Services Divisions

101 City Hall Plaza, Durham, North Carolina, 27701
Telephone (919) 560-4326 FAX (919) 560-4316

Bio-Retention Area Design Summary

Stormwater Management Construction Plan Review:
A complete stormwater management construction plan submittal includes a design summary for each stormwater BMP, design calculations, plans and specifications showing BMP, inlet and outlet structure details.

I. PROJECT INFORMATION

Project Name: _____ Phase _____
PIN: _____ Case #: _____
Design Contact Person: _____ Phone #: (____) ____-_____
Legal name of Owner:_____
Owner Contact: _____ Phone #: (____) ____-_____
Owner Address:_____
Deed Book _____Page #_____ or Plat Book _____ Page#_____ for BMP Property
For projects with multiple basins, specify which pond this worksheet applies to: _____

Drainage area	_____	ac	*(on-site drainage to the area, 1-acre max[1])*
Impervious area	_____	ac	*(on-site impervious area draining to facility)*
Design runoff	_____	cfs	
Design treatment volume	_____	ft^3	

[1] Assumes 100% impervious, larger areas may be considered if maximum sheet flow velocity is not exceeded

Bioretention Design

Grass buffer strip width	_____	ft	*(Max slope of 4:1 and minimum width of 10 feet or a forebay)*
Size of cell area	_____	ft^2	*(Min 5% of drainage area with sand bed, 7% without bed)*
Depth of ponding area	_____	ft	*(6-inches max)*
Width of cell	_____	ft	*(Minimum width of 25-feet[2])*
Length of cell	_____	ft	*(Minimum length of 2 times the width)*
Inflow sheet flow velocity	_____	ft/s	*(Maximum of 1-foot/second)*
Mulch layer elevation	_____	ft	*(Elevation of top of layer)*
Planting soil top elevation	_____	ft	*(Elevation of top of soil)*
Depth of planting soil	_____	ft	*(Minimum depth of 4-feet[3])*
Top of sand if applicable	_____	ft	*(Elevation of top of sand)*
Bottom elevation	_____	ft	*(Elevation of bottom of cell)*
Perforated pipe length	_____	ft	*(Length of perforated pipe provided under cell layers)*
Space between pipe runs	_____	ft	*(Spacing between perforated pipe runs, max of 10-feet)*

[2] Smaller widths may be accepted in urbanized areas or in retrofit situations. These designs will be evaluated on a case-by-case basis.

[3] Smaller depths may be accepted in urbanized areas or in retrofit situations. These designs will be evaluated on a case-by-case basis.

Longitudinal slope _____ ft *(1% minimum longitudinal slope)*
Diameter of pipe _____ in *(Pipe diameter of perforated pipe, min of 6-inches)*

Emergency Spillway Information

Emergency outlet elev. _____ ft *(invert of emergency overflow weir)*
Emergency spillway width_____ ft. side slopes ___:1 slope_____%

II. REQUIRED ITEMS CHECKLIST

The following checklist outlines design requirements. Initial in the space provided to indicate the following design requirements have been met and supporting documentation is attached.

Applicant's initials

_____ a. Runoff from landscaped areas and other non-impervious areas has been directed away from the bioretention area to the maximum extent practical.
_____ b. Drainage area for bioretention area is less than 1-acre.
_____ c. Plan specifies how all slopes draining to the bioretention area will be stabilized, note that the slopes must be stabilized before installation of the under drain system.
_____ d. Construction sequencing shall be considered and a note added to the plan that states: "All sediment and erosion control practices shall be in place and the slopes draining to the bioretention area shall be stabilized before construction of the bioretention area begins."
_____ e. No side slopes draining to bioretention area greater than 3:1, promote sheet flow through the grass filter strip.
_____ f. Riprap outlet protection, if provided, reduces flow to non-erosive velocities (provide calculations).
_____ g. A recorded drainage easement is provided for each cell including access to the nearest right-of-way and is graded per Section 8.3, Stormwater Control Facilities (BMPs).
_____ h. A plan view of the bioretention area with grading shown is provided.
_____ i. A profile through the bioretention area and emergency spillway is provided.
_____ j. Geotextile fabric is placed at the bottom of the excavated cell to prevent soil from getting into the underdrain system.
_____ k. The underdrain system is wrapped in a gravel jacket and a geotextile fabric is placed between the bottom of the sand bed or planting soil and the top of the gravel jacket.
_____ l. The pipe for the underdrain system shall be perforated Schedule 40 PVC.
_____ m. The underdrain system shall connect to the outflow system at a point at least 1 foot inside the bioretention cell wall.
_____ n. A non-perforated piping system is connected to the underdrain piping and extends to the surface of the planting soil for cleanouts.
_____ o. Cleanouts are to be provided at the beginning of each pipe run and at all intersections.
_____ p. A planting soil mixture specification and a soil characteristics table are provided. Maximum clay content in the soil mixture is 8.00%.
_____ q. The hydraulic conductivity for the planting mixture is to be 1-inch to 2-inches per hour.
_____ r. Mulch layer specification is provided; mulch is to be a 4-inch layer of coarse hardwood mulch with re-application rate specified.
_____ s. Soil with a P index of less than or equal to 25 specified on plan.
_____ t. A bioretention area landscape plan is provided including the transport of plant material, preparation of the planting pit, fertilization, installation of the plant material, type and number of plantings (note that there shall be a minimum of three species of trees and three species of

shrubs selected to insure diversity, their planting locations, post-installation inspection and maintenance guidelines.

Note: Executed Stormwater Facility Operation and Maintenance Permit Agreement, payment of permit fee per facility and payment of surety are required prior to construction drawing approval.

City of Durham

Public Works Department

Stormwater Services Divisions

101 City Hall Plaza, Durham, North Carolina, 27701
Telephone (919) 560-4326 FAX (919) 560-4316

Constructed Wetland and Pocket Wetland Design Summary

Stormwater Management Construction Plan Review:
A complete stormwater management construction plan submittal includes a design summary for each stormwater BMP, design calculations, plans and specifications showing BMP, inlet and outlet structure details.

I. PROJECT INFORMATION

Project Name: _____ Phase _____
PIN: _____ Case #: _____
Design Contact Person: _____ Phone #: (____) ____-_____
Legal Name of Owner:_____
Owner Contact: _____ Phone #: (____) ____-_____
Owner Address:_____
Deed Book _____Page #_____ or Plat Book _____ Page#_____ for BMP Property
For projects with multiple basins, specify which pond this worksheet applies to: _____
Does the proposed pond also incorporate stormwater detention? Yes No
Detention provided for: ___ 1-year ___ 2-year ___ 10-year ___ other _____
Dam Height: _____ (feet) Dam Classification: _____

Elevations

Wetland bottom elevation	_____	ft.	*(floor of the wetland)*
Permanent pool elevation	_____	ft.	*(invert elevation of the orifice)*
Temporary pool elevation	_____	ft.	*(elevation of the structure overflow)*
1-year storm orifice/weir elevation	_____	ft.	*(invert elevation)*
1-year storm water surface elevation	_____	ft.	
2-year storm orifice/weir elevation	_____	ft.	*(invert elevation)*
2-year storm water surface elevation	_____	ft.	
10-year storm orifice/weir elevation	_____	ft.	*(invert elevation)*
10-year storm water surface elev.	_____	ft.	
Emergency spillway elevation	_____	ft.	*(invert of emergency spillway)*
Top of embankment/dam	_____	ft.	*(elevation)*
Maximum water surface elevation	_____	ft.	(max. storm pond can safely pass)
Depth from design storm to Lowest orifice elevation	_____	ft.	

Areas

Permanent pool area provided	_____	ft^2	*(water surface area at orifice invert elevation)*
Minimum required perm. pool area	_____	ft^2	*(calculated surface area required)*
Design storm surface area	_____	ft^2	*(Specify frequency event:_____ year)*
Drainage area (10-acres min to Constructed Wetland)	_____	ac.	*(total drainage to the wetland)*

Discharges (Specify only applicable frequency events)

At BMP

	1-year	2-year	10-year	_____-year
Inflow	_____ cfs	_____ cfs	_____ cfs	_____ cfs
Routed outflow	_____ cfs	_____ cfs	_____ cfs	_____ cfs

At Analysis Point(s) that BMP Contributes to

	1-year	2-year	10-year	_____-year
Pre-development	_____ cfs	_____ cfs	_____ cfs	_____ cfs
Post-development w/o detention	_____ cfs	_____ cfs	_____ cfs	_____ cfs
With detention	_____ cfs	_____ cfs	_____ cfs	_____ cfs

Volumes

Permanent pool volume _____ ft^3 *(volume of main pond and forebay)*
Water quality pool storage volume _____ ft^3 *(volume above permanent pool)*
Design storm storage volume _____ ft^3 *(volume above permanent pool)*
Total Storage volume provided at design storm _____ ft^3
Total Storage volume provided at top of dam _____ ft^3
Forebay volume (Constructed Wetlands only) _____ ft^3

Environmental Zones

Zone	**Water Depth at Normal Pool[1]**	**Water Depth at Temporary Pool (Max Depth of 12-inches above Normal Pool)[1]**	**Portion of Temporary Pool Surface Area**
Deep Pool			
Low Marsh			
High Marsh			
Woody Upland			

[1] Depths are to be calculated using the hydraulic depth calculation for each zone. Hydraulic Depth is the volume of water at an elevation divided by the water surface area at the same elevation.

Other Parameters

SA/DA[2] _____ *(from DWQ table)*
Diameter of orifice _____ in. *(must provide draw down over 2 to 5 day period)*
Draw-down time _____ hrs
Design TSS removal _____ % *(minimum 85% removal required)*

[2] When using the SA/DA tables from the NCDENR BMP Manual, linear interpolation may be used for values between table entries.)

Riser/Principal and Emergency Spillway Information

1-year storm orifice/weir	diameter_____ in.	length _____ft.		
2-year storm orifice/weir	diameter_____ in.	length _____ft.		
10-year storm orifice/weir	diameter_____ in.	length _____ft.		
___- year storm orifice/weir	diameter_____ in.	length _____ft.		
Principal spillway	diameter_____ in.			
Emergency spillway	width_____ ft.	side slopes ___:1	slope_____%	

II. REQUIRED ITEMS CHECKLIST

The following checklist outlines design requirements. Initial in the space provided to indicate the following design requirements have been met and supporting documentation is attached.

Applicant's initials

_____ a. The forebay volume is approximately equal to 20% of the pond volume.
_____ b. The temporary pool controls runoff for water quality design storm.
_____ c. The temporary pool draws down in 2- to 5-days.
_____ d. The drainage area to a Constructed Wetland is at least 10-acres. Smaller drainage areas to Pocket Wetlands will be reviewed on a case-by-case basis.
_____ e. Riprap outlet protection, if provided, reduces flow to non-erosive velocities (provide calculations).
_____ f. The wetland length to width ratio is greater than or equal to 3:1.
_____ g. The wetland side slopes above the permanent pool area are no steeper than 3:1.
_____ h. A submerged and vegetated shelf with a slope no greater than 6:1 is provided around the perimeter of the pond (show on plan and profile and provide a vegetation plan).
_____ i. Vegetative cover above the permanent pool elevation is specified. No woody vegetation is permitted on the embankment.
_____ j. A surface baffle, trash rack or similar device is provided for both the overflow and orifice. Flat top trash racks are not acceptable. Access hatch has been provided.
_____ k. A recorded drainage easement is provided for each pond including access to the nearest right-of-way and is graded per Section 8.3, Stormwater Control Facilities (BMPs).
_____ l. If the basin is used for sediment and erosion control during construction, a note requiring clean out and vegetative cover being established prior to use as a wet detention basin shall be provided on the construction plan.
_____ m. A mechanism is specified which will drain the pond for maintenance and emergencies. Valves used shall be plug valves.
_____ n. Anti-floatation calculations are provided for riser structure.
_____ o. A plan view of the wetland with grading shown is provided.
_____ p. A profile through the forebay, wetland and spillway is provided. Water surface elevations are shown on the profile.
_____ q. Riser structure details are provided.
_____ r. Dam designed to account for a 5.00% settlement factor.
_____ s. Compaction specifications for the embankment are shown on the plan.
_____ t. The minimum top of dam width has been provided for the wetland embankment top width per Section 8.3, Stormwater Control Facilities (BMPs)

Note: Executed Stormwater Facility Operation and Maintenance Permit Agreement, payment of permit fee per facility and payment of surety are required prior to construction drawing approval

City of Durham

Public Works Department

Stormwater Services Divisions

101 City Hall Plaza, Durham, North Carolina, 27701
Telephone (919) 560-4326 FAX (919) 560-4316

Underground Detention Design Summary

Stormwater Management Construction Plan Review:
A complete stormwater management construction plan submittal includes a design summary for each stormwater BMP, design calculations, plans and specifications showing BMP, inlet and outlet structure details.

I. PROJECT INFORMATION

Project Name: _____ Phase _____
PIN: _____ Case #: _____
Design Contact Person: _____ Phone #: (____) ____-_____
Legal Name of Owner:_____
Owner Contact: _____ Phone #: (____) ____-_____
Owner Address:_____
Deed Book _____Page #_____ or Plat Book _____ Page#_____ for BMP Property
For projects with multiple basins, specify which pond this worksheet applies to: _____
Detention provided for: ___ 1-year ___ 2-year ___ 10-year ___ other _____

Elevations

Bottom elevation	_____	ft.	*(invert out elevation of system)*
1-year storm orifice/weir elevation	_____	ft.	*(invert elevation)*
1-year storm water surface elevation	_____	ft.	*(elevation at the outlet of system)*
2-year storm orifice/weir elevation	_____	ft.	*(invert elevation)*
2-year storm water surface elevation	_____	ft.	*(elevation at the outlet of system)*
10-year storm orifice/weir elevation	_____	ft.	*(invert elevation)*
10-year storm water surface elevation	_____	ft.	*(elevation at the outlet of system)*
Emergency spillway elevation	_____	ft.	*(invert of emergency spillway)*
Ground Surface Elevation	_____	ft.	*(elevation of ground above outlet)*
Maximum Water Surface Elevation (____-year storm)	_____	ft.	*(elevation at the outlet of system)*

Areas

Drainage area	_____	ac.	*(total drainage to the facility)*

Volumes

Total Storage Volume Provided	_____	ft^3	*(volume detained at design storm)*

Discharges (Specify only applicable frequency events)

At BMP

	1-year	2-year	10-year	_____-year
Inflow	_____ cfs	_____ cfs	_____ cfs	_____ cfs
Routed outflow	_____ cfs	_____ cfs	_____ cfs	_____ cfs

At Analysis Point(s) that BMP Contributes to

	1-year	2-year	10-year	_____-year
Pre-development	_____ cfs	_____ cfs	_____ cfs	_____ cfs
Post-development w/o detention	_____ cfs	_____ cfs	_____ cfs	_____ cfs
With detention	_____ cfs	_____ cfs	_____ cfs	_____ cfs

System Information

1-year storm orifice/weir	diameter_____ in.	length _____ft.	
2-year storm orifice/weir	diameter_____ in.	length _____ft.	
10-year storm orifice/weir	diameter_____ in.	length _____ft.	
___- year storm orifice/weir	diameter_____ in.	length _____ft.	
Principal spillway	diameter_____ in.		
Emergency spillway	width_____ ft.	side slopes ___:1	slope_____%

II. REQUIRED ITEMS CHECKLIST

The following checklist outlines design requirements. In the space provided to indicate the following design requirements have been met and supporting documentation is attached.

Applicant's initials

_____ a. Riprap outlet protection, if provided, reduces flow to non-erosive velocities (provide calculations).

_____ b. The system consists of two 60-inch minimum header pipes and two 60-inch minimum perimeter pipes. 36-inch interior pipes for additional storage are provided if needed.

_____ c. Manhole access has been provided at the 4 corners of the system.

_____ d. Traffic bearing cleanouts have been provided every 100-feet with a minimum of two per pipe run. Manholes may be counted as cleanouts.

_____ e. A traffic bearing door (bilco type or approved equal) has been placed at the inlet and outlet of the system.

_____ f. Spacing of pipe runs are per the manufacturer's specification.

_____ g. The backfill material has been certified by a Geotechnical Engineer.

_____ h. The system is water tight for the 10-year hydrostatic pressure calculated at the inlet to the system.

_____ i. A surface or sub-surface bypass has been sized to safely convey the maximum required design storm.

_____ j. An operation and maintenance plan for the system has been provided.

_____ k. A recorded drainage easement is provided for each basin including access to the nearest right-of-way and is graded per Section 8.3, Stormwater Control Facilities (BMPs).

_____ l. A plan view of the system with grading shown is provided

_____ m. A profile through the system and emergency bypass is provided. Water surface elevations are shown on the profile.

_____ n. Outlet structure details are provided.

_____ o. Compaction specifications for the installation of the system are provided on the plan.

Note: Executed Stormwater Facility Operation and Maintenance Permit Agreement, payment of permit fee per facility and payment of surety are required prior to construction drawing approval.

Section 8.5:

This section is intentionally left blank.

Section 8.6: BMP Certifying Engineer Program for SCMs in the City of Durham

8.6.1 Program Description Drainage

A. Background

A registered North Carolina Professional Engineer (NCPE), who designs a stormwater Best Management Practice (BMP) facility, is required to submit a BMP As-Built Certification ("Certification") of the constructed BMP after it has been completed. It is understood that sometimes the certifying engineer may not be the same engineer that designed the original BMP. The Certification consists of the provision of as-built drawings and information demonstrating that the BMP was constructed in a manner that accomplishes its designed functions. These Certifications must be submitted in accordance with the City of Durham's (City's) BMP Certifying Engineer (BCE) Program and must be reviewed and approved by the City's Stormwater Services Section (S3) of the Engineering and Stormwater Services Division.

While it is recognized that the term "Best Management Practice (BMP)" is an outdated term and that it is being replaced industry wide with the term "Stormwater Control Measure (SCM)," for the purposes of continuity, the BCE Program will continue to be referred to as the BCE Program. However, throughout this document, the acronym "BMP" will be replaced with the acronym "SCM."

B. Program Objectives

The overall objectives of the City's BCE Program are three-fold:

1. To improve the quality of SCM facilities being designed and constructed in the City.
2. To improve customer service by decreasing S3 review times for Certifications.
3. To reduce the work load of construction compliance assessments to be provided by the City.

C. BMP Certifying Engineer Qualifications

The City will certify as a "BMP Certifying Engineer", or "BCE", any registered NCPE, who demonstrates a thorough knowledge of the evaluation of SCM construction by providing two complete Certifications that are approved by S3 on the first submittal.

For engineers that wish to submit Certifications in the City, enrollment in this program is mandatory.

D. Effective Dates of Program

For dry ponds, wet ponds, constructed wetlands, and pocket wetlands, this program went into effect on July 1, 2006, and applies to all Certifications received after that date.

For all other stormwater SCMs, this program becomes effective on October 1, 2010. If a site plan or preliminary plat has not been accepted for review by the City/County Planning Department by October 1, 2010, all Certifications associated with the SCMs on that site shall be governed by the BCE Program.

E. Benefits to the Development Community

Once an NCPE has completed the process to become a BCE and has been assigned a BCE number, that BCE is granted approval to submit Certifications in the City. The City may, at its discretion, approve a particular Certification based on a review of the documentation received without a field assessment. However, random field assessments will be performed from time to time. For example, the City may field-assess three out of five Certifications from one BCE and one out of ten

Certifications from another BCE. All BCEs should submit Certifications under the assumption that the City will perform a field assessment of the certified facility and will provide a comprehensive review of the Certification.

8.6.2 Certification Process

C. Certification as a BCE

To become a BCE, a registered NCPE will be provided four opportunities to submit two complete Certifications that are approved by S3 on the first submittal. One of the two Certifications shall be an SCM that includes a dam. NCPEs endeavoring to obtain certification as a BCE are urged to note the following submittal parameters:

1. Each Certification shall be hand delivered, by scheduled appointment, to S3. A time block of at least four hours per Certification shall be allotted for the submittal meeting as each Certification will be reviewed and each SCM will be assessed in the field during that time. The submitting NCPE will review the Certification with S3 and will accompany S3 on a field assessment of each constructed SCM submitted for certification. As an aside, once an NCPE has been certified as a BCE, appointments with the City will not be required.
2. The Certification of a level spreader, vegetated water quality swale, or proprietary SCM device shall not count as one of the two out of four required Certifications to be approved by S3 at first submittal.
3. The submittal of an approved Certification of more than one SCM without a dam will not subtract from the four opportunities allotted for certification as a BCE; however, any Certifications, whether the SCM includes a dam or not, that are not approved by S3 on the first submittal will subtract from the four opportunities allotted for certification as a BCE.
4. If the NCPE, after four first-submittal Certifications, is unable to achieve certification as a BCE, that individual will not be permitted to submit a Certification for at least six months from the date of the City's last Certification disapproval.

B. Acceptable Certifications

An acceptable Certification shall be defined by the City as indicated below:

1. The Certification must be complete. A complete Certification shall include the following documents in hard copy and electronic compact disc ("electronic CD") formats (Note all documents on the electronic CD must be in PDF format unless indicated otherwise below):
   a. An executed "General Certification."
   b. One (1) copy of the approved construction drawings for the SCM.
   c. One (1) copy of the as-built drawings for the SCM with an executed General Certification on the drawings.
   d. One (1) copy of the survey plot, including all spot shots, of the SCM.
   e. One (1) copy of the drainage area map that delineates the drainage area to the SCM as presented in the construction drawings.
   f. One (1) copy of the revised drainage area map that delineates the drainage area to the SCM based on as-built conditions.
   g. One (1) copy of the summary sheet for the facility as presented in the construction drawings.
   h. One (1) copy of the revised summary sheet for the SCM based on as-built conditions.
   i. An original completed copy of the signed and sealed General Certification Assessment Checklist ("Checklist") required by the City. A complete Checklist shall contain no NC (e.g., Non-Compliant) items. Note: If, while completing the Checklist, an NC item is noted at an SCM by the certifying engineer, a Certification for that SCM should not be submitted until the NC item has been brought into compliance. If a BCE awards a score of anything less than 15 and submits a Certification to the City anyway, the City will reject the entire Certification.
   j. Color digital photographs of the completed SCM, including the dam, emergency spillway, riser, outfall structure, outfall area, impoundment area, access way, etc. (electronic CD format: .jpeg or .tiff).

k. One (1) copy of the landscape company's letter certifying the installation of the specific plants required at the SCM.

l. One (1) copy of an Operations and Maintenance Manual for the SCM (electronic CD: Word format).

m. One (1) copy of a cost accounting for the construction of the SCM (electronic CD: Excel format). Note: If the cost accounting results in an amount 10% or greater than the original construction estimate, an additional payment into the City's Stormwater Facility Replacement Fund will be required prior to Certification approval.

n. An original signed and sealed Geotechnical Certification with all supporting geotechnical and materials testing documentation.

o. An original signed and sealed Materials Certification, with all supporting documentation, for SCMs with filter media.

2. An additional Checklist completed by the City during the field assessment that scores at least 14. When completing a Checklist, the following parameters shall govern:

a. If any item within a section is deemed NC, no points shall be awarded for that section.

b. The minimum passing score shall be 14 out of 15. If the City scores the SCM as less than 14, the Certification will be deemed not acceptable.

C. Disciplinary Actions for BCEs

The following disciplinary actions will be taken against those BCEs that submit Certifications that do not comply with the requirements of the BCE Program:

1. If the City field assesses a BCE-certified SCM and, in completing the Checklist, scores the SCM with a 13 or less (out of 15 possible points), the Certification will be disapproved, and the certifying engineer's BCE number will be suspended until the following has occurred:

a. The appropriate waiting period (see below) has elapsed; and

b. The engineer has satisfactorily repeated the process for certification as a BCE.

c. Note: If the BCE is also a BMC, that individual's BMC certification will also be revoked, and the individual will be required to follow the BMC protocol for BMC certification to become recertified as a BMC after the waiting period (see below) has elapsed.

2. Waiting Period: If a certified BCE submits a Certification that is disapproved by the City, that BCE's certification will be suspended, and the BCE will not be able to submit Certifications for six months for the first offense and one year for any succeeding offenses. The waiting period will always begin the date the City disapproves the Certification.

8.6.3 Certification Forms and Documents

The following documents are required for each Certification:

- General As-Built and Construction Certification. This is required for all Certifications.
- Geotechnical Certification for Dams. This is required for all Certifications of SCMs that include a dam.
- Materials Certification for SCMs with filter media.
- General Certification Assessment Checklists for individual SCMs, as applicable:
  - General Certification Assessment Checklist for Dry Ponds, Wet Ponds, Constructed Wetlands and Pocket Wetlands
  - General Certification Assessment Checklist for Above Ground Sand Filters
  - General Certification Assessment Checklist for Underground Sand Filters
  - General Certification Assessment Checklist for Underground Detention Systems
  - General Certification Assessment Checklist for Bioretention Areas
  - General Certification Assessment Checklist for Level Spreader-Vegetated Filter Strip Systems

- General Certification Assessment Checklist for Vegetated Water Quality Swales
- General Certification Assessment Checklist for Green Roof Systems
- General Certification Assessment Checklist for Rainwater Harvesting Systems
- General Certification Assessment Checklist for Filterra® Units

The above documents are provided on the following pages. General Certification Assessment Checklists for SCMs not mentioned above will be developed on a case-by-case basis.

General As-Built and Construction Certification

SCM Facility Name	Click here to enter text.

Note: This certification statement must be executed by a registered North Carolina Professional Engineer with experience in the design and construction or operation of SCMs of a nature similar in scope to that certified to in this certification. Periodic observations of construction and a final assessment for design compliance by the certifying registered professional engineer will be required to complete this certification.

CERTIFICATION STATEMENT

Based upon (1) my assessment of the constructed facility, (2) my review of the as-built survey data, (3) my review of the drainage area treated or managed by the facility, and (4) my analysis of the hydraulic performance of the constructed facility, I hereby certify that the (A) hydrologic and hydraulic, (B) geometric, (C) public safety, (D) facility access, (E) drainage area1, and (F) vegetative elements of the constructed facility are in compliance with the requirements of the facility as proscribed in the approved Construction Drawings, approved design documents, and/or any approved modifications, except as noted in red on the 'As-Built' drawings. Furthermore, I certify that the red-noted exceptions do not adversely affect the required performance or public safety aspects of the facility.

Note 1: The drainage area treated by the facility must, at a minimum, be the area proposed for treatment in the approved construction drawings. In addition, a minimum of 85% of the drainage area to the facility must be adequately stabilized, and any remaining disturbed areas in the drainage area must have sufficient alternate controls in place to mitigate against the deposition of sediment in the facility. If these drainage area requirements are not met, the Certification will be disapproved.

The following supporting documents are included in hard copy and electronic CD formats (Note all documents on the electronic CD must be in PDF format unless indicated otherwise below):

1. An executed "General Certification."
2. One (1) copy of the approved construction drawings for the SCM.
3. One (1) copy of the as-built drawings for the SCM with an executed General Certification on the drawings.
4. One (1) copy of the survey plot, including all spot shots, of the SCM.
5. One (1) copy of the drainage area map that delineates the drainage area to the SCM as presented in the construction drawing design documents.
6. One (1) copy of the revised drainage area map that delineates the drainage area to the SCM based on as-built conditions.
7. One (1) copy of the summary sheet for the facility as presented in the construction drawing design documents.
8. One (1) copy of the revised summary sheet for the SCM based on as-built conditions.
9. An original completed copy of the signed and sealed General Certification Assessment Checklist ("Checklist") required by the City. A complete Checklist shall contain no NC (e.g., Non-Compliant) items. Note: If, while completing the Checklist, an NC item is noted at an SCM by the certifying engineer, a Certification for that SCM should not be submitted until the NC item has been brought into compliance. If a BCE awards a score of anything less than 15 and submits a Certification to the City anyway, the City will reject the entire Certification.
10. Color digital photographs of the completed SCM, including the dam, emergency spillway, riser, outfall structure, outfall area, impoundment area, access way, etc. (electronic CD format: .jpeg or .tiff).
11. One (1) copy of the landscape company's letter certifying the installation of the specific plants required at the SCM.
12. One (1) copy of an Operations and Maintenance Manual for the SCM (electronic CD: Word format).
13. One (1) copy of a cost accounting for the construction of the SCM (electronic CD: Excel format). Note: If the cost accounting results in an amount 10% or greater than the original construction estimate, an additional payment into the City's Stormwater Facility Replacement Fund will be required prior to Certification approval.

14. An original signed and sealed Geotechnical Certification with all supporting geotechnical and materials testing documentation.
15. An original signed and sealed Materials Certification, with all supporting documentation, for SCMs with filter media.
16. A copy of the certifier's BCE Certificate.

Name: _____ Date: _____

BCE #: _____ NCPE Seal:

Geotechnical Certification for Dams

SCM Facility Name	Click here to enter text.
Dam Class	Choose an item.

Note: This certification statement must be provided for all dams and must be executed by a registered North Carolina Professional Engineer (NCPE) with experience in the design and construction of small earth dams of a nature similar in scope to that certified to in this certification. For all dams, with the exception of Class C dams that serve a detention only function and that drain an area less than 25 acres and all Class D dams, this certification must be executed by a registered NCPE with geotechnical engineering expertise. Periodic observations of construction and a final assessment for design compliance by the certifying engineer will be required to complete this certification.

CERTIFICATION STATEMENT

Based upon my observation and monitoring of the construction of the dam for this facility, I hereby certify that the constructed facility is in compliance with the geotechnical requirements of the facility, as proscribed in the approved Construction Drawings, approved design documents, and any approved modifications.

The following supporting documents are included in hard copy and electronic CD formats (Note all documents on the CD must be in PDF format unless indicated otherwise below):

1. Copies of all dam embankment material composition and density testing paperwork, including a map that labels all points where the dam and dam foundation areas where tested. Note: Insufficient testing in the zones over and around the principal outlet works for the dam will render this certification invalid.
2. Copies of all concrete compressive strength testing paperwork for any cast-in-place concrete items associated with the construction of the dam.
3. One (1) copy of the purchase receipt for the principal spillway pipe. The purchase receipt should identify the ASTM specifications governing the manufacture of the pipe.
4. One (1) copy of the manufacturer's certification that any armoring, other than concrete, used to armor the emergency spillway was completed in accordance with the manufacturer's published specifications.
5. Colored digital photographs showing the dam foundation areas, the riser, the principal spillway pipe, the concrete cradle, the seepage diaphragm, relief drains, etc, as those items were being prepared and installed (electronic CD format: .jpeg or .tiff).
6. One (1) copy of the certifying engineer's resume that demonstrates required geotechnical engineering expertise.

Name: _____ Date: _____

NCPE Seal:

Materials Certification for SCMs with Filter Media (except Filterras®)

SCM Facility Name	Click here to enter text.

Note: This certification statement must be executed by a registered North Carolina Professional Engineer with experience in the design, use, identification, and materials testing of SCMs with filter media. Observation of the installation of the filter media used in this SCM will be required to complete this certification.

CERTIFICATION STATEMENT

Based upon my observation and monitoring of the installation of the filter media used in this facility, and based on my testing of the media or my review of the media test results, I hereby certify that the filter media used in this constructed facility is in compliance with the filter media requirements of the facility, as proscribed in the approved Construction Drawings, approved design documents, and any approved modifications.

The following supporting documents are included in hard copy and electronic CD formats (Note all documents on the electronic CD must be in PDF format unless indicated otherwise below):

1. A copy of the portion of the construction drawings that details, by section view, the filter media design proposed for this SCM.
2. A signed and sealed drawing of the installed filter media section view.
3. One (1) copy of the materials testing paperwork for the materials used in the filter media section.
4. One (1) copy of the purchase receipts for the materials used in the filter media section.
5. Color digital photographs that document the installation of the filter media, including the underdrain portion (and cleanouts) of the filter media section, used in this facility (electronic CD format: .jpeg or .tiff).

Name: _____ Date: _____

NCPE Seal:

General Certification Assessment Checklist

for

Dry Ponds, Wet Ponds, Constructed Wetlands, and Pocket Wetlands

Date of Certification Assessment: _____

Assessing and Certifying NCPE: _____ Seal:

BCE #: _____

SCM Facility Name: _____

Access Address: _____

PIN/s of Parcel/s Where the Facility is Sited: _____

SCM and Access Easement Information:

DB _____ PG _____ PB _____ PG _____

Height of Dam: _____

Class of Dam: _____

Impoundment Volume (at Top of Dam): _____

CHECKLIST

CDs: Approved Construction Drawings
NC: Non-compliant with the Approved CDs and/or City of Durham Requirements and Policies. Note: An "NC" should only be circled if the element in question is non-compliant.
Y: Yes
N: No
N/A: Not Applicable. If an element is not applicable, please write "N/A" next to the element.

A. Open Space -- 1 Point

- The SCM is located entirely on open space property (residential areas only). [Note: This restriction shall not apply to inlets and access ways.] _____. NC

B. Easements -- 1 Point

- The constructed SCM facility is located entirely in a recorded SCM easement _____. NC
- The constructed access way is located entirely in a 20-ft wide recorded access easement _____. NC

C. Accessibility -- 1 Point

- A drivable access way to the top of the dam has been provided from a road or parking lot _____. NC
- At its narrowest point, the access width is _____. NC
- At its steepest point, the centerline grade of the access is _____. NC

- At its steepest pitch, the pitch or cross-slope of the access is _____. NC
- Unless it has been surfaced with gravel, asphalt, concrete, etc., 85% of the access way has achieved a healthy stand of grass, and all remaining areas have been seeded and mulched _____. NC
- An access hatch (minimum 3' × 3') and steps down the inside of the riser have been provided _____. NC.
- At least one side of the riser is accessible by foot during permanent pool conditions and direct access from dam embankment is provided _____ . NC

D. Dam Embankment -- 3 Points

- The narrowest top of dam width is _____. NC
- The steepest slope on the upstream face of the dam is _____. NC
- The steepest slope on the downstream face of the dam is _____. NC
- Based on manual rod probings of the dam, particularly in the zones over and around the principal spillway pipe, the dam appears to have been well compacted _____. NC
- The dam and dam foundation, groin, toe, and abutment areas are completely free of trees, landscaping, and other woody growth _____. NC
- The dam has been fine graded and is free of ruts, erosion, etc. _____. NC
- 85% of the dam embankment and dam foundation, groin, toe, and abutment areas have achieved a healthy stand of grass, and all areas that have not achieved a healthy stand of grass have been seeded and mulched. The dam is not overgrown and there is no undesirable vegetation _____. NC
- No evidence of seepage was noted on the downstream face of the dam _____. NC

E. Emergency Spillway -- 2 Points

- The narrowest width of the control section is _____. NC
- The side slopes of the control section are [Left] _____ and [Right] _____. NC
- The size, shape, and alignment of the exit channel are in accordance with the CDs _____. NC
- Armoring has been installed in accordance with the CDs _____. NC
- The spillway has been fine graded and is free of ruts, erosion, etc. _____. NC
- Excluding the hard-surfaced armored area, 85% of the spillway has achieved a healthy stand of grass, and all remaining areas have been seeded and mulched. The spillway is not overgrown and there is no undesirable vegetation _____. NC

F. Riser/Control Structure -- 2 Points

- The riser/control structure is reinforced concrete _____. NC
- The diameter or opening dimensions of the riser is/are _____. NC
- A top, peak-roofed trash rack has been provided and bolted down to the riser _____. NC
- An 8" plug valve with an accessible operating mechanism has been provided _____. NC
- A low-flow debris cage has been provided in accordance with the CDs _____. NC
- The riser structure and all appurtenant devices (plug valve, etc.) appear to be sound _____. NC

- For precast structures, the barrel sections were installed with gasketted joints, and adjacent riser barrel sections have been bolted together with steel strapping _____. NC
- All orifices, siphons, ports, and weirs were installed in accordance with the CDs _____. NC
- The anti-floatation ballast has been provided in accordance with the CDs _____. NC
- A placed concrete invert to the invert out of the principal spillway pipe has been provided _____. NC
- The riser is free of debris or obstructions _____. NC

G. Principal Spillway Pipe -- 2 Points

- The principal spillway pipe (PSP) is reinforced concrete _____. NC
- The diameter of the PSP is _____. NC
- Based on a visual inspection, it appears that the joints of the PSP were "homed" reasonably well, and it appears that no joints are leaking _____. NC
- No piping (loss of soil) is evident around the PSP _____. NC

H. Outfall Structure -- 1 Point

- The outfall structure is a concrete endwall (with wing walls if required) _____. NC
- Appropriate fall protection has been provided across the top of the structure _____. NC

I. Outfall Area -- 1 Point

- A level spreader-vegetated filter strip system or a stilling basin (plunge pool) has been provided in accordance with the CDs _____. NC
- The outfall area appears stable, and all accumulated silt and debris has been removed _____. NC

J. Impoundment Area -- 1 Point

- Riprap energy dissipaters and sediment forebays have been installed at the inlets in accordance with the CDs _____. NC
- Forebay berm has been constructed with an armored spillway, and top of berm is no deeper than 3" below permanent pool _____. NC
- The top of the forebay berm has been planted with trees, shrubs, and vegetation conducive to a wetland or wet meadow environment. Seeding has been done only as a supplement to the plantings _____. NC
- The narrowest width of the safety bench is _____. NC
- The positioning of the safety bench is in accordance with the CDs _____. NC
- All accumulated sediment and other debris in the sediment basins, riprap energy dissipaters, forebay/s, and the pond floor has been removed _____. NC
- All inlet pipes have been installed with appropriate end treatments in accordance with the CDs _____. NC
- 85% of the wetland/wet meadow plantings proposed for the pond floor and aquatic shelf are thriving _____. NC
- The landscaping proposed for the riparian buffer surrounding the pond has been planted _____. NC
- The pond has a minimum length:width ratio of 1.5:1 (wet ponds, wetlands, and extended detention dry ponds) _____. NC

BCE's Score: _____

City of Durham's Score: _____

Scoring Notes:

(1) A passing score shall be 14 out of 15;

(2) If any item within a section is deemed NC, no points shall be awarded for that section;

(3) If a BCE awards a score of anything less than 15 and submits an as-built and construction certification to the City anyway, the City will reject the entire submittal.

General Certification Assessment Checklist

for

Open, Vegetated, Sand Filters

Date of Certification Assessment: _____

Assessing and Certifying NCPE: _____ Seal:

BCE #: _____

SCM Facility Name: _____

Access Address: _____

PIN/s of Parcel/s Where the Facility is Sited: _____

SCM and Access Easement Information:

DB _____ PG _____ PB _____ PG _____

CHECKLIST

CDs: Approved Construction Drawings
NC: Non-compliant with the Approved CDs and/or City of Durham Requirements and Policies. Note: An "NC" should only be circled if the element in question is non-compliant.
Y: Yes
N: No
N/A: Not Applicable. If an element is not applicable, please write "N/A" next to the element.

A. Drainage Area – 2 Points

- The drainage area to the facility is less than 5 acres and is, characteristically, 90% impervious or greater _____. NC
- The drainage area to the facility is completely stabilized, and no excess sediment is discharging into the sediment chamber or sand filter _____. NC

B. Easements and Accessibility -- 1 Point

- The constructed SCM facility is located entirely in a recorded SCM easement _____. NC
- The constructed access way is located entirely in a 20-ft wide recorded access easement _____. NC
- Unobstructed maintenance vehicle access from a nearby public or private right-of-way (i.e., road, parking lot, etc.) has been provided to the control structure and all inlets _____. NC
- At its narrowest point, the access width is _____. NC
- At its steepest point, the centerline grade of the access is _____. NC
- At its steepest pitch, the pitch or cross-slope of the access is _____. NC
- Unless it has been surfaced with gravel, asphalt, concrete, etc., 85% of the access way has achieved a healthy stand of grass, and all remaining areas have been seeded and mulched _____. NC

- An access hatch and steps down the inside of the riser/control structure have been provided in accordance with the CDs _____. NC

C. Dam Embankment -- 2 Points

- The narrowest top of dam width is _____. NC
- The steepest slope on the upstream face of the dam is _____. NC
- The steepest slope on the downstream face of the dam is _____. NC
- Based on manual rod probings of the dam, particularly in the zones over and around the principal spillway pipe, the dam appears to have been well compacted _____. NC
- The dam and dam foundation, groin, toe, and abutment areas are completely free of trees, landscaping, and other woody growth _____. NC
- The dam has been fine graded and is free of ruts, erosion, etc. _____. NC
- 85% of the dam embankment and dam foundation, groin, toe, and abutment areas have achieved a healthy stand of grass, and all areas that have not achieved a healthy stand of grass have been seeded and mulched. The dam is not overgrown and there is no undesirable vegetation _____. NC
- No evidence of seepage was noted on the downstream face of the dam _____. NC

D. Emergency Spillway -- 1 Points

- The narrowest width of the control section is _____. NC
- The side slopes of the control structure are [Left] _____ and [Right] _____. NC
- The size, shape, and alignment of the exit channel are in accordance with the CDs _____. NC
- Armoring has been installed in accordance with the CDs _____. NC
- The spillway has been fine graded and is free of ruts, erosion, etc. _____. NC
- Excluding the hard-surfaced armored area, 85% of the spillway has achieved a healthy stand of grass, and all remaining areas have been seeded and mulched. The spillway is not overgrown and there is no undesirable vegetation _____. NC

E. Riser/Control Structure and Principal Spillway Pipe -- 2 Points

- The riser/control structure is reinforced concrete _____. NC
- The diameter or opening dimensions of the riser is/are _____. NC
- A top, peak-roofed trash rack has been provided and bolted down to the riser _____. NC
- The riser structure and all appurtenant devices appear to be sound _____. NC
- The riser is free of debris or obstructions _____. NC
- For precast structures, the barrel sections were installed with gasketted joints, and adjacent riser barrel sections have been bolted together with steel strapping _____. NC
- All orifices, siphons, ports, and weirs were installed in accordance with the CDs _____. NC
- The anti-floatation ballast has been provided in accordance with the CDs _____. NC
- A placed concrete invert to the invert out of the principal spillway pipe (PSP) has been provided _____. NC
- The PSP is reinforced concrete _____. NC

- The diameter of the PSP is _____. NC
- Based on a visual inspection, it appears that the joints of the PSP were “homed” reasonably well, and it appears that no joints are leaking _____. NC

F. Sediment Chamber (Forebay) -- 2 Points

- The sediment chamber minimum size has been installed in accordance with the CDs _____. NC
- A minimum depth of 3 feet (in the deepest portion) has been provided in the sediment chamber _____. NC
- The top of the forebay berm has been installed level, and 100% of the berm has either achieved a healthy stand of turf grass or been armored in accordance with the CDs _____. NC
- All accumulated sediment and other debris in the sediment chamber have been removed _____. NC
- All inlet pipes have been installed with appropriate end treatments in accordance with the approved CDs _____. NC

G. Sand Chamber -- 4 Points

- The sand chamber minimum size has been installed in accordance with the approved CDs _____. NC
- The sand chamber has been constructed such that the maximum head above the sand layer is in accordance with the approved CDs _____. NC
- The required filter media mix, including the minimum mix depth, has been installed in accordance with the approved CDs, and there is no sediment in the sand filter media _____. NC
- The underdrain system has been installed in accordance with the approved CDs _____. NC
- All side slopes leading to the sand chamber are no steeper than 3:1 _____. NC
- Any flow splitters or bypass systems have been constructed in accordance with the approved CDs _____. NC
- Even flow distribution into the sand chamber has been provided in accordance with the CDs and is not creating scour in the sand chamber _____. NC
- The bottom of the lowest part of the underdrain system is located at least two feet above the seasonal high water table _____. NC
- 85% of the plantings specified in the approved CDs are thriving _____. NC
- The filter has been observed by the certifying engineer to drawdown the runoff from the first inch of rainfall in a manner consistent with that specified in the approved CDs _____. NC

H. Outfall Structure and Outfall Area -- 1 Points

- The control structure has been installed in accordance with the CDs _____. NC
- The outfall structure is a concrete endwall (with wingwalls if required) _____. NC
- Appropriate fall protection has been provided across the top of the structure _____. NC
- A stilling basin (plunge pool) has been provided in accordance with the CDs _____. NC
- The outfall area appears stable, and all accumulated silt and debris has been removed _____. NC

BCE’s Score: _____

City of Durham’s Score: _____

Scoring Notes:

(1) A passing score shall be 14 out of 15;

(2) If any item within a section is deemed NC, no points shall be awarded for that section;

(3) If a BCE awards a score of anything less than 15 and submits an as-built and construction certification to the City anyway, the City will reject the entire submittal.

General Certification Assessment Checklist

for

Closed Sand Filters

Date of Certification Assessment: _____

Assessing and Certifying NCPE: _____ Seal:

BCE #: _____

SCM Facility Name: _____

Access Address: _____

PIN/s of Parcel/s Where the Facility is Sited: _____

SCM and Access Easement Information:

DB _____ PG _____ PB _____ PG _____

CHECKLIST

CDs: Approved Construction Drawings
NC: Non-compliant with the Approved CDs and/or City of Durham Requirements and Policies. Note: An "NC" should only be circled if the element in question is non-compliant.
Y: Yes
N: No
N/A: Not Applicable. If an element is not applicable, please write "N/A" next to the element.

A. Drainage Area -- 2 Points

- The drainage area to the facility is less than 5 acres and is, characteristically, 90% impervious or greater _____. NC
- The drainage area to the facility is completely stabilized, and no excess sediment is discharging into the sediment chamber or sand filter _____. NC

B. Easements and Accessibility -- 2 Points

- The constructed SCM facility is located entirely in a recorded SCM easement _____. NC
- The constructed access way is located entirely in a 20-ft wide recorded access easement _____. NC
- Unobstructed maintenance vehicle access from a nearby public or private right-of-way (i.e., road, parking lot, etc.) has been provided to the control structure and all inlets _____. NC
- At its narrowest point, the access width is _____. NC
- At its steepest point, the centerline grade of the access is _____. NC
- At its steepest pitch, the pitch or cross-slope of the access is _____. NC
- Unless it has been surfaced with gravel, asphalt, concrete, etc., 85% of the access way has achieved a healthy stand of grass, and all remaining areas have been seeded and mulched _____. NC

- Access into the control structure and the sediment and sand chambers has been provided in accordance with the CDs _____. NC

C. Control Structure and Principal Spillway Pipe -- 2 Points

- The control structure is reinforced concrete _____. NC
- The dimensions of the structure are _____. NC
- The structure and all appurtenant devices appear to be sound _____. NC
- The structure is free of debris or obstructions _____. NC
- The foundational support for, and the backfill around, the structure have been placed in accordance with the CDs _____. NC
- All orifices, siphons, ports, and weirs were installed in accordance with the CDs _____. NC
- The PSP is reinforced concrete _____. NC
- The diameter of the PSP is _____. NC
- Based on a visual inspection, it appears that the joints of the PSP were “homed” reasonably well, and it appears that no joints are leaking _____. NC

D. Sediment Chamber -- 3 Points

- The sediment chamber minimum size has been installed in accordance with the CDs _____. NC
- A minimum depth of 3 feet has been provided in the sediment chamber _____. NC
- The ports and weirs that drain the sediment chamber into the sand chamber have been installed in accordance with the CDs _____. NC
- Any flow splitters or bypass systems have been constructed in accordance with the approved CDs _____. NC
- The foundational support for, and the backfill around, the structure have been placed in accordance with the CDs _____. NC
- All accumulated sediment and other debris in the sediment chamber have been removed _____. NC

E. Sand Chamber -- 5 Points

- The sand chamber minimum size has been installed in accordance with the approved CDs _____. NC
- The sand chamber has been constructed such that the maximum head above the sand layer is in accordance with the approved CDs _____. NC
- The foundational support for, and the backfill around, the structure have been placed in accordance with the CDs _____. NC
- The required filter media mix, including the minimum mix depth, has been installed in accordance with the approved CDs, and there is no sediment in the sand filter media _____. NC
- The underdrain system has been installed in accordance with the approved CDs _____. NC
- Any flow splitters or bypass systems have been constructed in accordance with the approved CDs _____. NC
- Even flow distribution into the sand chamber has been provided in accordance with the CDs and is not creating scour in the sand chamber _____. NC
- The bottom of the structure is located at least one foot above the seasonal high water table _____. NC

- The filter has been observed by the certifying engineer to drawdown the runoff from the first inch of rainfall in a manner consistent with that specified in the approved CDs _____. NC

F. Outfall Structure and Outfall Area -- 1 Points

- The outfall structure is a concrete endwall (with wingwalls if required) _____. NC
- Appropriate fall protection has been provided across the top of the structure _____. NC
- A stilling basin (plunge pool) has been provided in accordance with the CDs _____. NC
- The outfall area appears stable, and all accumulated silt and debris has been removed _____. NC

BCE's Score: _____

City of Durham's Score: _____

Scoring Notes:

(1) A passing score shall be 14 out of 15;

(2) If any item within a section is deemed NC, no points shall be awarded for that section;

(3) If a BCE awards a score of anything less than 15 and submits an as-built and construction certification to the City anyway, the City will reject the entire submittal.

General Certification Assessment Checklist

for

Underground Detention Systems

Date of Certification Assessment: _____

Assessing and Certifying NCPE: _____ Seal:

BCE #: _____

SCM Facility Name: _____

Access Address: _____

PIN/s of Parcel/s Where the Facility is Sited: _____

SCM and Access Easement Information:

DB _____ PG _____ PB _____ PG _____

CHECKLIST

CDs: Approved Construction Drawings
NC: Non-compliant with the Approved CDs and/or City of Durham Requirements and Policies. Note: An "NC" should only be circled if the element in question is non-compliant.
Y: Yes
N: No
N/A: Not Applicable. If an element is not applicable, please write "N/A" next to the element.

A. Easements -- 1 Point

- The constructed SCM facility is located entirely in a recorded SCM easement _____. NC
- The constructed access way is located entirely in a 20-ft wide recorded access easement _____. NC

B. Accessibility -- 2 Points

- Unobstructed maintenance vehicle access from a nearby public or private right-of-way (i.e., road, parking lot, etc.) has been provided to the control structure and all inlets _____. NC
- At its narrowest point, the access width is _____. NC
- At its steepest point, the centerline grade of the access is _____. NC
- At its steepest pitch, the pitch or cross-slope of the access is _____. NC
- Unless it has been surfaced with gravel, asphalt, concrete, etc., 85% of the access way has achieved a healthy stand of grass, and all remaining areas have been seeded and mulched _____. NC
- Manhole access has been provided at the four corners of the system. All access manholes are reinforced concrete manholes conforming to the CDs _____. NC
- Traffic bearing cleanouts have been provided at 100-foot intervals, with a minimum of two provided in each pipe run. Manhole access structures may be counted as cleanouts _____. NC

- A Bilco®-type door (or approved equivalent) has been placed at the inlets and at the control structure for the underground detention system. Access points that occur in areas subject to vehicular traffic are of the traffic bearing type _____. NC

C. Control Structure and Principal Spillway Pipe -- 5 Points

- The control structure is reinforced concrete _____. NC
- The dimensions of the structure are _____. NC
- The structure and all appurtenant devices appear to be sound _____. NC
- The structure is free of debris or obstructions _____. NC
- The foundational support for, and the backfill around, the structure have been placed in accordance with the CDs _____. NC
- All orifices, siphons, ports, and weirs were installed in accordance with the CDs _____. NC
- A surface or sub-surface bypass has been installed to safely convey the 100-year, 24-hour post-development storm event or the maximum storm in accordance with the CDs _____. NC
- The PSP is reinforced concrete _____. NC
- The diameter of the PSP is _____. NC
- Based on a visual inspection, it appears that the joints of the PSP were “homed” reasonably well, and it appears that no joints are leaking _____. NC

D. Underground Storage Chambers/Pipes -- 6 Points

- The correct size, linear footage, and materials for the system have been installed in accordance with the CDs _____. NC
- Spacing of the storage pipes was installed to manufacturer specifications and in accordance with the CDs _____. NC
- The foundational supports for, and the backfill around, the storage structures have been placed in accordance with the CDs (Note: The backfill material placed around HDPE, CMP, and aluminum storage pipes has been certified by a registered NCPE with geotechnical engineering expertise) _____. NC
- All inlet pipes have been installed in accordance with the CDs _____. NC
- The system remains water tight for the maximum hydrostatic pressure, calculated at the inlet to the underground detention system, generated during the 10-year storm _____. NC
- A surface or sub-surface bypass has been installed to safely convey the 100-year, 24-hour post-development storm event or the maximum storm in accordance with the CDs _____. NC
- All accumulated sediment and other debris in the system has been removed _____. NC

E. Outlet and Outfall -- 1 Point

- The outfall structure is a concrete endwall (with wingwalls if required) _____. NC
- Appropriate fall protection has been provided across the top of the structure _____. NC
- A level spreader-vegetated filter strip and/or a stilling basin (plunge pool) has been provided in accordance with the CDs _____. NC
- The outfall area appears stable, and all accumulated silt and debris has been removed _____. NC

BCE’s Score: _____

City of Durham's Score: _____

Scoring Notes:

(1) A passing score shall be 14 out of 15;

(2) If any item within a section is deemed NC, no points shall be awarded for that section;

(3) If a BCE awards a score of anything less than 15 and submits an as-built and construction certification to the City anyway, the City will reject the entire submittal.

General Certification Assessment Checklist

for

Bioretention Areas

Date of Certification Assessment: _____

Assessing and Certifying NCPE: _____ Seal:

BCE #: _____

SCM Facility Name: _____

Access Address: _____

PIN/s of Parcel/s Where the Facility is Sited: _____

SCM and Access Easement Information:

DB _____ PG _____ PB _____ PG _____

CHECKLIST

CDs: Approved Construction Drawings
NC: Non-compliant with the Approved CDs and/or City of Durham Requirements and Policies. Note: An "NC" should only be circled if the element in question is non-compliant.
Y: Yes
N: No
N/A: Not Applicable. If an element is not applicable, please write "N/A" next to the element.

A. Drainage Area -- 2 Points

- The drainage area to the facility is less than 5 acres and is, characteristically, 90% impervious or greater _____. NC
- The drainage area to the facility is completely stabilized, and no excess sediment is discharging into the forebay/sediment basin or bioretention area _____. NC

B. Easements and Accessibility -- 1 Point

- The constructed SCM facility is located entirely in a recorded SCM easement _____. NC
- The constructed access way is located entirely in a 20-ft wide recorded access easement _____. NC
- Unobstructed maintenance vehicle access from a nearby public or private right-of-way (i.e., road, parking lot, etc.) has been provided to the control structure and all inlets _____. NC
- At its narrowest point, the access width is _____. NC
- At its steepest point, the centerline grade of the access is _____. NC
- At its steepest pitch, the pitch or cross-slope of the access is _____. NC
- Unless it has been surfaced with gravel, asphalt, concrete, etc., 85% of the access way has achieved a healthy stand of grass, and all remaining areas have been seeded and mulched _____. NC

- An access hatch and steps down the inside of the riser/control structure have been provided in accordance with the CDs _____. NC

C. Dam Embankment -- 2 Points

- The narrowest top of dam width is _____. NC
- The steepest slope on the upstream face of the dam is _____. NC
- The steepest slope on the downstream face of the dam is _____. NC
- Based on manual rod probings of the dam, particularly in the zones over and around the principal spillway pipe, the dam appears to have been well compacted _____. NC
- The dam and dam foundation, groin, toe, and abutment areas are completely free of trees, landscaping, and other woody growth _____. NC
- The dam has been fine graded and is free of ruts, erosion, etc. _____. NC
- 85% of the dam embankment and dam foundation, groin, toe, and abutment areas have achieved a healthy stand of grass, and all areas that have not achieved a healthy stand of grass have been seeded and mulched. The dam is not overgrown and there is no undesirable vegetation _____. NC
- No evidence of seepage was noted on the downstream face of the dam _____. NC

D. Emergency Spillway -- 1 Points

- The narrowest width of the control section is _____. NC
- The side slopes of the control section are [Left] _____ and [Right] _____. NC
- The size, shape, and alignment of the exit channel are in accordance with the CDs _____. NC
- Armoring has been installed in accordance with the CDs _____. NC
- The spillway has been fine graded and is free of ruts, erosion, etc. _____. NC
- Excluding the hard-surfaced armored area, 85% of the spillway has achieved a healthy stand of grass, and all remaining areas have been seeded and mulched. The spillway is not overgrown and there is no undesirable vegetation _____. NC

E. Riser/Control Structure and Principal Spillway Pipe -- 2 Points

- The riser/control structure is reinforced concrete _____. NC
- The diameter or opening dimensions of the riser/control structure is/are _____. NC
- A top, peak-roofed trash rack has been provided and bolted down to the riser _____. NC
- The riser/control structure and all appurtenant devices appear to be sound _____. NC
- The riser/control structure is free of debris or obstructions _____. NC
- For precast structures, the barrel sections were installed with gasketted joints, and adjacent riser barrel sections have been bolted together with steel strapping _____. NC
- All orifices, siphons, ports, and weirs were installed in accordance with the CDs _____. NC
- The anti-floatation ballast has been provided in accordance with the CDs _____. NC
- A placed concrete invert to the invert out of the principal spillway pipe (PSP) has been provided _____. NC
- The PSP is reinforced concrete _____. NC

- The diameter of the PSP is _____. NC
- Based on a visual inspection, it appears that the joints of the PSP were “homed” reasonably well, and it appears that no joints are leaking _____. NC

F. Inlet/Flow Distribution Area -- 2 Points

- Pre-treatment (sediment basin + turf filter strip, or something equivalent) has been provided at each inlet in accordance with the CDs _____. NC
- All accumulated sediment and other debris in the pre-treatment areas has been removed _____. NC
- Any flow splitters or bypass systems have been constructed in accordance with the approved CDs _____. NC
- The maximum inflow velocity into the bioretention cell is no greater than one foot per second _____. NC
- The flow into the bioretention cell is evenly distributed across the cell in accordance with the CDs and there is no scour within the bioretention cell _____. NC
- All inlet pipes have been installed with appropriate end treatments in accordance with the approved CDs _____. NC

G. Bioretention Cell -- 4 Points

- The maximum allowable head, HM, above the mulch layer at VWQ (e.g., during the one-inch event) is less than or equal to 9 inches and is in accordance with the CDs _____. NC
- For bioretention areas with an internal water storage (IWS) zone shown on the CDs:
    - The depth of the IWS zone is between 12 and 18 inches above the gravel layer surrounding the underdrains _____. NC
    - A low-level release outlet has been provided in accordance with the CDs _____. NC
    - If a low-level release has not been provided for the facility, the bioretention area has been excavated to an additional depth to accommodate the IWS and maintain full storage availability within the top 30” of the bioretention soil mix _____. NC
- The surface area of the bioretention cell is in accordance with the approved CDs _____. NC
- The required bioretention soil mix and mulch layer, including the minimum mix depths, has been installed in accordance with the approved CDs, and there is no sediment in the bioretention cell _____. NC
- The underdrain system has been installed in accordance with the approved CDs _____. NC
- All side slopes leading to the bioretention cell are no steeper than 3:1 _____. NC
- Any flow splitters or bypass systems have been constructed in accordance with the approved CDs _____. NC
- Even flow distribution into the bioretention cell has been provided in accordance with the CDs and is not creating scour in the bioretention cell _____. NC
- The bottom of the lowest part of the underdrain system is located at least two feet above the seasonal high water table _____. NC
- 85% of the plantings specified in the approved CDs are thriving _____. NC
- The bioretention cell has been observed by the certifying engineer to drawdown the runoff from the first inch of rainfall in a manner consistent with that specified in the approved CDs _____. NC

H. Outfall Structure and Outfall Area -- 1 Point

- The control structure has been installed in accordance with the CDs _____. NC
- The outfall structure is a concrete endwall (with wingwalls if required) _____. NC

- Appropriate fall protection has been provided across the top of the structure _____. NC
- A stilling basin (plunge pool) has been provided in accordance with the CDs _____. NC
- The outfall area appears stable, and all accumulated silt and debris has been removed _____. NC

BCE's Score: _____

City of Durham's Score: _____

Scoring Notes:

(1) A passing score shall be 14 out of 15;

(2) If any item within a section is deemed NC, no points shall be awarded for that section;

(3) If a BCE awards a score of anything less than 15 and submits an as-built and construction certification to the City anyway, the City will reject the entire submittal.

General Certification Assessment Checklist

for

Level Spreader-Vegetated Filter Strip Systems

Date of Certification Assessment: _____

Assessing and Certifying NCPE: _____ Seal:

BCE #: _____

SCM Facility Name: _____

Access Address: _____

PIN/s of Parcel/s Where the Facility is Sited: _____

SCM and Access Easement Information:

DB _____ PG _____ PB _____ PG _____

CHECKLIST

CDs: Approved Construction Drawings
NC: Non-compliant with the Approved CDs and/or City of Durham Requirements and Policies. Note: An "NC" should only be circled if the element in question is non-compliant.
Y: Yes
N: No
N/A: Not Applicable. If an element is not applicable, please write "N/A" next to the element.

A. Drainage Area -- 1 Point

- The drainage area to the facility is as indicated in the CDs _____. NC
- The drainage area to the facility is 100% stabilized _____. NC

B. Easements and Accessibility -- 1 Point

- The constructed SCM, including the Vegetated Filter Strip, is located entirely in a recorded SCM easement _____. NC
- The constructed access way is located entirely in a 20-ft wide recorded access easement _____. NC
- At its narrowest point, the access width is _____. NC
- At its steepest point, the centerline grade of the access is _____. NC
- At its steepest pitch, the pitch or cross-slope of the access is _____. NC
- Unless it has been surfaced with gravel, asphalt, concrete, etc., 85% of the access way has achieved a healthy stand of grass, and all remaining areas have been seeded and mulched _____. NC

C. Flow Splitter -- 2 Points

- The flow splitter (FS) structure is reinforced concrete _____. NC

- The FS diameter or opening dimensions is/are _____. NC
- The FS appears to be sound _____. NC
- All orifices, ports, pipes, and weirs have been installed in accordance with the CDs _____. NC
- The FS is free of debris or obstructions _____. NC
- If a high-flow bypass has been provided, such flows are discharged into a stilling basin/plunge pool prior to entering the bypass channel _____. NC

D. Forebay -- 2 Points

- A forebay, with an armored spillway to the blind channel-linear wetland, has been installed in accordance with the CDs _____. NC
- All accumulated sediment and other debris in the forebay have been removed _____. NC

E. Blind Channel-Linear Wetland -- 2 Points

- The size, shape, and depth variations of the blind channel-linear wetland (BC-LW) are in accordance with the CDs _____. NC
- The width (e.g., the dimension perpendicular to the direction of flow from the BC-LW) is a minimum of 10 ft _____. NC
- 85% of the wetland/wet meadow plantings proposed in the BC-LW are thriving _____. NC
- All accumulated sediment and other debris in the BC-LW have been removed _____. NC

F. Level Spreader Lip -- 2 Points

- The level spreader lip (LSL) is reinforced concrete _____. NC
- The LSL is of the correct length _____. NC
- The LSL structure/leveler plate is level, and there are no locations where concentrated flows are discharging across the crest of the structure _____. NC
- The ends of the LSL have been contoured, with appropriate reinforcement, into the existing topography, and flows are not exiting the BC-LW around the ends of the LSL _____. NC
- A minimum 3-ft width of a 3-inch layer of washed #57 stone has been installed immediately downstream of the LSL, and the surface elevation of this stone layer is approximately 2 inches below the crest of the LSL _____. NC

G. Vegetated Filter Strip (VFS) -- 3 Points

- The length, width, grade, cross-slope, and vegetation for each component of the VFS are in accordance with the CDs _____. NC
- Flow across the VFS is even, and sheet flow is sustained throughout the length of the VFS _____. NC
- For an engineered filter strip (EFS), the entire EFS was covered with a 6-inch layer of topsoil prior to the installation of sod _____. NC
- For an EFS, the sod installed was grown in a non-clayey environment _____. NC
- For an EFS, 100% of the EFS and all slopes draining to the EFS have achieved a healthy stand of turf grass _____. NC
- Velocities across the VFS are not causing erosion either within or downstream of the VFS _____. NC

- For riparian buffers, the vegetation in the VFS was not disturbed during LS construction, unless such disturbance was approved specifically in the site plan and CDs _____. NC
- For riparian restoration projects, 100% of the 20-ft wide EFS has achieved a healthy stand of turf grass, and 85% of the vegetation planted in the 50-ft riparian restoration zone is thriving _____. NC

H. Bypass Channel -- 2 Points

- Bypass flows are being directed into a natural draw that can handle flows up to the 10-yr storm event without causing erosion. The "draw" has been observed by the certifying engineer to convey bypass flows without eroding and in a manner consistent with that proposed in the CDs _____. NC
- Bypass flows are being directed into a reinforced bypass conveyance (either a channel or a pipe) that conveys bypass flows up to the 10-yr storm event without causing erosion, the bypass conveyance connects to the stream obliquely, and all approvals for the conveyance and stream connection have been obtained from the North Carolina Division of Water Quality (NCDWQ) and the US Army Corps of Engineers, as appropriate (Note: Copies of these approvals are attached to this Checklist) _____. NC

BCE's Score: _____

City of Durham's Score: _____

Scoring Notes:

(1) A passing score shall be 14 out of 15;

(2) If any item within a section is deemed NC, no points shall be awarded for that section;

(3) If a BCE awards a score of anything less than 15 and submits an as-built and construction certification to the City anyway, the City will reject the entire submittal.

General Certification Assessment Checklist

for

Vegetated Water Quality Swales

Date of Certification Assessment: _____

Assessing and Certifying NCPE: _____ Seal:

BCE #: _____

SCM Facility Name: _____

Access Address: _____

PIN/s of Parcel/s Where the Facility is Sited: _____

SCM and Access Easement Information:

DB _____ PG _____ PB _____ PG _____

CHECKLIST

CDs: Approved Construction Drawings
NC: Non-compliant with the Approved CDs and/or City of Durham Requirements and Policies. Note: An "NC" should only be circled if the element in question is non-compliant.
Y: Yes
N: No
N/A: Not Applicable. If an element is not applicable, please write "N/A" next to the element.

A. Drainage Area – 1 Point

- The drainage area to the facility is as indicated in the CDs _____. NC
- 85% of the drainage area to the facility is completely stabilized, and no excess sediment is discharging into the facility _____. NC

B. Easements and Accessibility – 1 Point

- The constructed SCM facility is located entirely in a recorded SCM easement _____. NC
- 100% of the swale is accessible from the right of way or from a parking lot _____. NC

C. Inlets to Swale -- 1 Point

- All inlets have end treatments in accordance with the CDs _____. NC
- Riprap stilling basins have been installed at the inlets in accordance with the CDs _____. NC
- All accumulated sediment and other debris in the stilling basins have been removed _____. NC

D. Grass Swale – 12 Points

- The swale length, width, shape, and side slopes are in accordance with the CDs _____. NC

- The maximum longitudinal slope is in accordance with the CDs and is less than or equal to 5% _____. NC
- There are no visible signs of erosion, either in or downstream of the swale _____. NC
- All accumulated sediment and other debris in the swale have been removed _____. NC
- 85% of the swale vegetation is well established, is of the type specified in the CDs, and all un-vegetated areas have been seeded, mulched, and matted _____. NC
- The check dams (if any) have been constructed in accordance with the CDs _____. NC

BCE's Score: _____

City of Durham's Score: _____

Scoring Notes:

(1) A passing score shall be 14 out of 15;

(2) If any item within a section is deemed NC, no points shall be awarded for that section;

(3) If a BCE awards a score of anything less than 15 and submits an as-built and construction certification to the City anyway, the City will reject the entire submittal.

General Certification Assessment Checklist

for

Rainwater Harvesting Systems

Date of Certification Assessment: _____

Assessing and Certifying NCPE: _____ Seal:

BCE #: _____

SCM Facility Name: _____

Access Address: _____

PIN/s of Parcel/s Where the Facility is Sited: _____

SCM and Access Easement Information:

DB _____ PG _____ PB _____ PG _____

CHECKLIST

CDs: Approved Construction Drawings
NC: Non-compliant with the Approved CDs and/or City of Durham Requirements and Policies. Note: An "NC" should only be circled if the element in question is non-compliant.
Y: Yes
N: No
N/A: Not Applicable. If an element is not applicable, please write "N/A" next to the element.

A. Drainage Area – 1 Point

- The drainage area to the facility is stable and is as indicated in the CDs _____.

B. Easements – 2 Points

- The constructed Rainwater Harvesting System (RHS) tanks are located entirely in a recorded SCM easement _____. NC
- For dedicated uses that involve the irrigation of landscaped or natural areas or other SCMs, the distribution system to said uses are located entirely in a recorded SCM easement _____. NC

C. Access – 1 Point

- Suitable operation and maintenance access as well as structural replacement access has been provided for the RHS tanks and the distribution systems as indicated in the CDs _____. NC

D. RHS Tanks -- 3 Points

- The size, material, and location of the tanks are in accordance with the CDs _____. NC
- The initial inflow system (that which directly conveys rainfall runoff to the storage tanks) includes a heavy-gage debris screen, with a reinforced mosquito screen below it, to screen out trash, debris, and grit as well as to mitigate against the entry of mosquitoes into the storage tanks _____. NC

- The storage tanks include an overflow system that allows inflow volumes in excess of system capacity to discharge, non-erosively, into a grassed or natural area, a downstream SCM, or a downstream storm system that drains to an SCM, and the overflow mechanism is fitted with a reinforced mosquito screen _____. NC
- A winter shut-down low-flow relief drain has been provided in accordance with the CDs _____. NC
- Access to the inside of the tanks has been provided in accordance with the CDs _____. NC

E. Distribution Systems -- 3 Points

- The distribution systems, which include all pumps, pipes, and electrical components have been installed in accordance with the CDs _____. NC

F. Clear and Dedicated Uses -- 5 Points

- The RHS delivers harvested rainwater to the "clear and dedicated uses" as specified in the Site Plans and the CDs _____. NC

BCE's Score: _____

City of Durham's Score: _____

Scoring Notes:

(1) A passing score shall be 14 out of 15;

(2) If any item within a section is deemed NC, no points shall be awarded for that section;

(3) If a BCE awards a score of anything less than 15 and submits an as-built and construction certification to the City anyway, the City will reject the entire submittal.

General Certification Assessment Checklist

for

Filterra® Units

Date of Certification Assessment: _____

Assessing and Certifying NCPE: _____ Seal:

BCE #: _____

SCM Facility Name: _____

Access Address: _____

PIN/s of Parcel/s Where the Facility is Sited: _____

SCM and Access Easement Information:

DB _____ PG _____ PB _____ PG _____

CHECKLIST

CDs: Approved Construction Drawings
NC: Non-compliant with the Approved CDs and/or City of Durham Requirements and Policies. Note: An "NC" should only be circled if the element in question is non-compliant.
Y: Yes
N: No
N/A: Not Applicable. If an element is not applicable, please write "N/A" next to the element.

A. Drainage Area -- 5 Points

- The drainage area to the Filterra® unit is appropriate for the size of unit installed, and is, characteristically, 90% impervious or greater _____. NC
- The drainage area to the facility is completely stabilized, and no excess sediment is discharging into the Filterra® unit _____. NC

B. Easements and Accessibility -- 1 Point

- The Filterra® unit is located entirely in a recorded SCM easement _____. NC
- The constructed access way is located entirely in a 20-ft wide recorded access easement _____. NC
- Unobstructed maintenance vehicle access from a nearby public or private right-of-way (i.e., road, parking lot, etc.) has been provided to the unit _____. NC
- At its narrowest point, the access width is _____. NC
- At its steepest point, the centerline grade of the access is _____. NC
- At its steepest pitch, the pitch or cross-slope of the access is _____. NC
- Unless it has been surfaced with gravel, asphalt, concrete, etc., 85% of the access way has achieved a healthy stand of grass, and all remaining areas have been seeded and mulched _____. NC

C. Inlet -- 3 Points

- The Filterra® Top Curb (TC) and Flowline (FL) elevations are higher than the bypass TC and FL elevations in accordance with the CDs _____. NC
- All accumulated sediment and other debris in the pre-treatment areas has been removed _____. NC
- Any flow splitters or bypass systems have been constructed in accordance with the approved CDs _____. NC

D. Filterra® Unit -- 5 Points

- The size and location of the installed Filterra® unit is in accordance with the CDs _____. NC
- The required Filterra® media mix, including the mulch layer, has been installed in accordance with the CDs, and there is no sediment in the bioretention cell _____. NC
- The invert of the installed Filterra® unit is in accordance with the CDs_____. NC
- The underdrain system has been installed in accordance with the approved CDs _____. NC
- The Filterra® plant specified in the approved CDs has been installed and is thriving _____. NC
- The Filterra® unit has been activated by the manufacturer _____. NC
- The manufacturer has provided a Filterra® Media Quality Assurance Certificate _____. NC

E. Outlet -- 1 Point

- The outlet structure has been installed in accordance with the CDs _____. NC
- Positive drainage of the Filterra® unit is provided by the effluent treatment pipe _____. NC

BCE's Score: _____

City of Durham's Score: _____

Scoring Notes:

(4) A passing score shall be 14 out of 15;

(5) If any item within a section is deemed NC, no points shall be awarded for that section;

(6) If a BCE awards a score of anything less than 15 and submits an as-built and construction certification to the City anyway, the City will reject the entire submittal.

SECTION 9.0

STREETS

This section is intended to provide design criteria for construction plans. The Department of Transportation is responsible for reviewing and approving the general design layout of traffic flow patterns. Refer to Section 10.0, Transportation, for questions concerning traffic flow, turn lanes, proposed pavement width, etc.

The City and the County of Durham have adopted street standards for public and private streets. The Table of Minimum Design Requirements for Public and Private Residential Streets (PDF format - Acrobat Reader required) identifies the standard design criteria for street size and capacity and typical cross sections. In general all streets are designed according to their usage and proposed traffic volume and the City of Durham Street Construction Specifications.

When a project involves or is adjacent to an existing street, an investigation should be made as to the current maintenance of that street. Information on streets maintained by the City of Durham is listed in the Powell Bill, found at http://durhamnc.gov/documentcenter/view/2210.

I. General

1. All street construction, public and private, will conform to the requirements listed in Section 2.1, Construction Plan Approval Process.
2. The Engineer shall provide a pavement design that shall be based on projected traffic volumes and percentage of trucks. The minimum pavement design for a residential street is 8-inch ABC stone base course, 1.5-inch S9.5B initial course, and 1-inch SF9.5A final course. The minimum pavement design for a residential collector or thoroughfare is 10-inch ABC stone base course, 2-inch S9.5B initial course, and 1-inch SF9.5A final course. The minimum pavement design for a commercial or industrial street is 10-inch ABC stone base course, 3-inch S9.5B initial course, and 1-inch SF9.5A final course. Traffic characteristics or soil conditions may dictate increased stronger pavement section in any case.
3. Superelevated curves are not used on residential streets except by special approval.
4. Reverse Curves-horizontal
   a. For design speeds of 25-mile per hour (mph) or less, a minimum of 25-feet of tangent on residential streets is required.
   b. For design speeds greater than 25-mph, a minimum of 50-feet of tangent on residential streets is required.
5. No PCCs (point of compound curve) will be allowed.
6. On residential and non-residential streets, cul-de-sacs shall have a minimum 37-foot to back of curb roadway radii, 35-foot back of curb throat radii, 46-foot right-of-way radius, and 26-foot right of way throat radii (24-inch curb and gutter section). For a 30-inch curb and gutter section, cul-de-sacs shall have a minimum 37.5-foot to back of curb roadway radii, 34.5-foot back of curb throat radii, 46.5-foot right-of-way radius, and 25.5-foot right of way throat radii.
7. All storm drainage to conform to current City of Durham standards and policy.
8. Street signage along public streets and on private streets/drives will be the responsibility of the entity(ies) responsible for the development and placed according to the standards of the City of Durham and NCDOT, as applicable (see Section 10.0, Transportation). The street signage on public streets will be maintained by the entity(ies) of the development up to the time when the street is accepted by the City of

Durham or NCDOT, as applicable. The street signage for private streets will be maintained by the entity(ies) of the development. All signage shall conform to MUTCD (Manual on Uniform Traffic Control Devices) Standards.

9. Anticipated street classification, traffic volume, design speed, sight distances and other relevant standards shall govern horizontal and vertical curves and roadway alignment.
10. Intersections shall intersect at 90-degrees with minimum of 70-degrees (only on a case by case review).
11. Desirable maximum profile grade is 10%. Minimum desirable grade is 1%.
12. Grades should not exceed 3% for the first 300 feet from the centerline of any publicly maintained road for a residential collector/non-residential street. Grades should not exceed 5% for the first 100-feet from the centerline of any publicly maintained road for a residential street.
13. The use of a grade break, in lieu of a vertical curve, will be allowed only when the algebraic difference in the road grades is 0.80 or less.
14. Desirable curb radii for all intersecting streets are 30-feet with a minimum radius of 25-feet. Nonresidential and collectors require larger radii.
15. Plans for all widening shall show that the contractor will saw and remove the top 1 ½-inches of existing pavement a minimum of 12-inches from the edge, or as directed by the city, and place new pavement over the existing base. This may include additional surfacing up to full width of road as directed by the Department of Public Works.
16. Curb and gutter and roll curb shall be City of Durham standard (see Durham Street Specifications). NCDOT median curb is accepted for medians and islands. Roll curb shall transition to standard curb at all radii, catch basins, fire hydrants, and as directed by the Engineering inspector during construction.
17. ABC stone (Road Base) to extend under curb and gutter and terminate 6-inches beyond back of curb.
18. At all non-residential driveways, a 48-inch valley gutter is to be used unless an approved street type driveway intersection is approved. Minimum radii for all non-residential driveways will be 10-feet. Increased radii maybe required depending upon the project (Greater than 500 ADT will require a minimum 25-foot radius driveway).
19. Where streets terminate (example Phase lines) the following will be installed:
    a. Asphalt header.
    b. Riprap or concrete apron for storm water to dissipate.
    c. Utilities to extend a minimum of 5-feet beyond the edge of pavement.
    d. NCDOT type III barricade.
20. On projects involving irrigation systems within median areas, underdrain pipe shall be installed as follows:
    a. Starting at a roadway low point, install a minimum of 100-lineal feet in both directions from the low point, along both sides of the median.
    b. Along a section of road with "pickup" basins, a minimum of 100-lineal feet on the uphill side of the basins, on both sides of the median.
    c. At the downhill end of the median, if the end is not at a low point.

    If during construction, a situation arises where water is coming from somewhere and there is a chance that the water could cause problems with the road, utilities or sidewalks, etc., additional underdrain will be required to drain the area.

    The underdrain shall be directed to discharge into a drainage structure. No underdrain pipe shall cross roadway. Junction boxes and catch basins shall be added along median to intercept the underdrain as needed.
21. At a location where a wide street with curb and gutter tapers in to match a narrower street, without curb

and gutter, the curb and gutter shall not follow the taper. The distance between the ends of the curb and gutter shall be the width of the wider pavement area.

22. Temporary turnarounds are required when the street stub length is equal to or greater than 150-feet from the centerline of the intersection to the end of the stub or if there are 6 lots or more located adjacent to the street stub. A temporary cul-de-sac, built to permanent cul-de-sac standards, are required when the street stub length is equal to or greater than 300-feet from the centerline of the intersection to the end of the stub or if there are 10 lots or more located adjacent to the street stub.
23. At stream crossings, the road must be built to the full City of Durham cross-section.
24. For acceptable K values for vertical curves, refer to the latest edition of the AASHTO publication entitled "A Policy on Geometric Design of Highways and Streets (Green Book)."
25. For projects involving signalized intersection(s), an electronic copy of the approved construction drawings are to be submitted to the Traffic Operations Engineer, Transportation Division. Contact Transportation Division regarding submittal process. Submittals to take place only after Construction Drawings are approved.
26. At all road stubs to adjacent properties where required by the Public Works Department, the consultant shall provide all requested future street profiles for review and approval.

II. Construction

1. Refer to Section 2.1, Construction Plan Approval Process.
2. Immediately following placement and acceptance of the stone base, the 1 ½-inch of S9.5B asphalt shall be installed. Placement of the final 1-inch of SF9.5A shall occur within 1-year following the placement of the 1 ½-inch of S9.5B or near the full build-out of the dwelling units. Items within the pavement, such as valve boxes, manhole frames and covers, catch basin frames and grates, etc, shall be set to final road elevations prior to placement of the initial 1 ½-inch of S9.5B. To prevent damage to these items during the delay of the final SF9.5A placement, additional asphalt shall be "feathered" in around them.
3. All subgrade material shall be compacted to 100% standard proctor. The stone base shall be compacted to 100% standard proctor.
4. All driveway entrances must meet City of Durham standards or as subsequently amended or meet NCDOT if the driveways are located on the State Highway System. Permits are required before construction on both City and State roads (see Section 3.0, Permitting).
5. All work must carry a one-year warranty from the date of City's acceptance on materials and workmanship including damages from settlement.
6. Construction standards shall meet City of Durham Engineering Division's standards and specifications and N. C. Department of Transportation Standard Specifications for Roads and Structures, as revised 2002, (and as subsequently amended) and AASHTO's "A Policy on Geometric Design of Highways and Streets, 4th Edition" (2001), except where standards in these Guidelines are more stringent.

III. Standard Street Sections

The City's standard street sections can be found at http://durhamnc.gov/DocumentCenter/Home/View/2118.

TABLE OF MINIMUM DESIGN REQUIREMENTS FOR PUBLIC AND PRIVATE RESIDENTIAL STREETS

Commercial, Office, Industrial Development will be reviewed separately.

See also INGRESS/EGRESS requirements of the Durham Zoning Ordinance for use limits (Section 8.1.13)

Street Type	Maintenance Public	Maintenance Private	Speed Limit	Total Pavement Width: With Curb (See note #1)	Total Pavement Width: Without Curb (Edge to Edge)	Public ROW Width (See note #2 & #3 below)	Private Street Easement (Minimum Widths)	Pavement (See note #4 below)	Units Served	Vehicle Volume (Average Daily Traffic)	Design Speed Vertical (Min.)	Centerline Radius	Corner Radii
ALLEY *Limited use-secondary access to lot* *No mailboxes abutting alley.*	Public *Must tie into public street.*	Private	10 MPH	N/A	12'	20'	20'	3" ABC + 6" Concrete *Inverted crown*	Case by case.	Case by case.	Case by case.	35' *or ability to negociate turn.*	N/A
RESIDENTIAL LIMITED Same if adding parking bays.	Public		10 MPH	22'	22' *plus 6' shoulders*	WITH Curb = 40' WITHOUT Curb =60'		8" ABC+11/2",1" *or equal* *See note #6*	Up to 15. *26 with 2 or more outlets.*	< 150 ADT	25 MPH	50'	10'
RESIDENTIAL LIMITED Same if adding parking bays.		Private	10 MPH	22'	22' *plus 6' shoulders*		WITH Curb = 40' BAY = As needed to include bay WITHOUT Curb = 60'	8" ABC+11/2",1" *or equal* *See note #6*	Up to 15.	< 150 ADT	25 MPH	50'	10'
RESIDENTIAL STREET Same if adding parking bays.	Public		15 MPH	24'	22' *plus 6' shoulders*	WITH Curb = 40' WITHOUT Curb =60'		8" ABC+11/2",1" *or equal* *See note #6*	Up to 25	< 250 ADT	25 MPH	100'	20'
RESIDENTIAL STREET Same if adding parking bays.		Private	15 MPH	24'	22' *plus 6' shoulders*		WITH Curb = 40' BAY = As needed to include bay WITHOUT Curb = 60'	8" ABC+11/2",1" *or equal* *See note #6*	Up to 25	< 250 ADT	25 MPH	100'	20'
RESIDENTIAL LOCAL STREET (No Parking) See note #4 RESIDENTIAL LOCAL STREET (With Parking)	Public		25 MPH	26' 32'	22' *plus 6' shoulders*	WITH Curb=50' WITHOUT Curb =70'		8" ABC+11/2",1" *or equal* *See note #6*	Up to 100	< 1000 ADT	25 MPH	181'	20'
RESIDENTIAL LOCAL STREET (No Parking) See note #4 RESIDENTIAL LOCAL STREET (With Parking)		Private	25 MPH	26' 32'	22' *plus 6' shoulders*		WITH Curb = 50' WITHOUT Curb =70'	8" ABC+11/2",1" *or equal* *See note #6*	Up to 100	< 1000 ADT	25 MPH	181'	20'
RESIDENTIAL MAJOR LOCAL STREET (No Parking) See note #4 RESIDENTIAL MAJOR LOCAL STREET (With Parking)	Public		30 MPH	26' 32'	22' *plus 6' shoulders*	WITH Curb=50' WITHOUT Curb =70'		8" ABC+11/2",1" *or equal* *See note #6*	100-250	1000-2500 ADT	30 MPH	300'	25'
RESIDENTIAL MAJOR LOCAL STREET (No Parking) See note #4 RESIDENTIAL MAJOR LOCAL STREET (With Parking)		Private	30 MPH	26' 32'	22' *plus 6' shoulders*		WITH Curb = 50' WITHOUT Curb =70'	8" ABC+11/2",1" *or equal* *See note #6*	100-250	1000-2500 ADT	30 MPH	300'	25'
COLLECTOR (No Parking) *See note #4*	Public	Private	35 MPH	41'	N/A	WITH Curb = 60'	WITH Curb = 60'	To be designed	250-400	2500-4000 ADT	35 MPH	480'	30'

MINOR THOROUGHFARES	To be determined by the City.
MAJOR THOROUGHFARES	To be determined by the City.
FREEWAYS	To be determined by the City.

General Notes

1. a. Dimensions are based upon using a 24" upright curb and gutter section measuring from Back of Curb to Back of Curb (BC/BC). The COLLECTOR has a 30" upright curb and gutter.
   b. 30" roll curb can be used as a substitute for the 24" C&G on RESIDENTIAL LIMITED, RESIDENTIAL STREET and RESIDENTIAL LOCAL STREET but add 1' to the BC\BC dimension, and reduce treelawn by 0.5' each.
   c. Roll curb can not be used as a substitute for the RESIDENTIAL MAJOR LOCAL and COLLECTOR.
2. No above ground utility structures within the Street ROW or Public Street Easement unless approved by Engineering Department.
3. The pavement structure design may increase depending upon soil conditions and/or projected traffic volumes.
4. Street sections designed for 'No Parking' shall have signs installed at the developer's expense indicating no parking zones as required by the City.
5. Landscaping and improvements are allowed within the Street ROW or Public Street Easements only by approval of the City or NCDOT.
6. 1 1/2" I-2 to be installed immediately following ABC placement. 1" I-2 placement to be delayed until 6 months after the placement of the 1 1/2" of I-2.

Revision Date; Sept., 2000

Section 10.0

TRANSPORTATION

This section is intended to provide design criteria for street layout and vehicular movement. The Department of Transportation is responsible for reviewing and approving the general design layout of traffic flow patterns, for reviewing and approving the plans and installations of street name signs, traffic control signs and devices, traffic impact studies and street lighting.

For street types and sections available for public and private streets, construction plan and profile guidelines refer to Section 9.0, Streets.

Below is a list of items and corresponding Department or Division that can assist the designer if unable to locate the information in the Zoning and Subdivision Ordinance.

Item	**Department/Division**
1. Site Access	1. Planning; Zoning/Subdivision Ordinance, Fire Protection
2. Parking Spaces	2. Planning; for size, number of spaces
3. Parking	3. Public Works/Transportation; for layout, orientation
4. Entrance Location/width	4. Public Works/Transportation, Fire Protection
5. NCDOT streets (existing/future)	5. NCDOT
6. Cul-de-sacs length	6. Public Works/Transportation
7. Number of units served	7. Public Works/Transportation
8. Design Speed	8. Public Works/Transportation
9. ROW required	9. Public Works/Transportation
10. ROW; existing width	10. County Court House (plat/deed books
11. Sidewalk required	11. Public Works/Transportation
12. Sidewalk location, design	12. Public Works/Engineering
13. Pavement Designs	13. Public Works/Engineering
14. Curb and Gutter design	14. Public Works/Engineering
15. Construction details	15. Public Works/Engineering
16. Street Construction Plans	16. Public Works/Engineering
17. Current Street Maintenance	17. Public Works/Engineering Services ; NCDOT
18. Bus routes	18. Public Works/Transportation

Section I. Layout

The purpose of these street standards is to create safe, livable, attractive streets. Streets are not used for a single purpose, but for multiple purposes. Properly designed streets provide access and mobility, corridors for pedestrian, bicycle, transit and motor vehicle movement, fire and emergency vehicle access, attractive public spaces, a place for neighborhood interaction, the efficient provision of public utilities networks including water supply, sanitary sewer, electricity, telecommunications and gas services, refuge disposal and for delivery of postal and other services. Properly designed streets create attractive communities and contribute to clearly defined sense of place. Streets shall be designed with due attention to building spacing and setbacks, and green spaces. A street should be designed according to its function. The street pattern shall provide acceptable levels of accessibility, safety and convenience for all street users in residential areas, while meeting community urban design requirements. The pattern should discourage residential streets from operating as through traffic routes for externally generated traffic, while limiting the length of time local drivers need to spend in a low-speed environment. The neighborhood street pattern should be simple, and logical, with the following characteristics exhibiting connectivity:

a. minimize excessive vehicular traffic and discourage inappropriate through traffic
b. conforming with the thoroughfare plan and/or other adopted corridor plans
c. fit with and complement pedestrian, bicycle and transit networks.

The design of the streets is intended to promote appropriate vehicular speeds on local neighborhood streets and reasonable access requirements for emergency vehicles. Streets should be designed to reduce the potential for excessive speeds. Traffic calming elements may be necessary to accomplish this goal.

Section II. Signage and Pavement Marking Requirements

The developer is responsible for fabrication and installation of all required standard street name signs, traffic control signs, poles and pavement markings within the public right-of-way. The developer shall submit a signing and markings plan to the City at construction plan stage for review and approval. All signs and pavement markings, shown on the construction plans, must be in place prior to the issuance of any certificate of occupancy. The developer will maintain the signs, poles and markings until the street is accepted by the City of Durham, where from there, the City or NCDOT will maintain the signs, poles and markings at no additional cost to the developer.

If decorative (non-standard) street lighting, signs or poles are desired, the City may permit the developer to install the decorative (non-standard) items if they meet the minimum requirements set out in the Manual on Uniform Traffic Control Devices, the City of Durham Street Lighting Policy, and the IES (Illuminating Engineering Society) Applicable Standards. **Designs and locations of decorative items must be approved by separate agreement with the City of Durham Transportation Division.**

Criteria

1. All signage installed shall conform to standards set forth by the latest published edition of the Manual on Uniform Traffic Control Devices (MUTCD), the North Carolina Department of Transportation (NCDOT) Standard Construction Drawings, and City of Durham standards.
2. Signage material shall conform to MUTCD color and reflectivity standards and shall at a minimum be engineering grade reflective material, except stop signs. Stop signs shall be constructed of hi-intensity grade material on a 30-inch by 30-inch octagonal stop sign blank.
3. All signs, except street markers, shall be mounted in a manner that the bottom of the sign is a minimum of 7-feet above ground level. Street marker signs shall be mounted over the top of stop signs according to the street marker standards in **7.** below.

4. Ground mounted sign posts used to install street signage shall be 12-feet long and constructed of 14 gauge galvanized steel “U” channel posts or two inch (2-in) galvanized square steel tubing. When used in specific locations and directed by the City of Durham, colored ground mounted sign posts may be required to match existing streetscape in the project vicinity. Colored ground mounted supports shall be steel with a powder coated finish. All ground mounted sign posts shall have 3/8th-inch holes down the center of the post drilled at 1-inch spacing for the entire length of the post.
5. Ground mounted sign posts shall be driven to a minimum of 30-inches below ground level. All posts shall be plumbed and leveled as the post is installed.
6. If decorative (non-standard) items (poles, signs, etc.) are installed, it will be the responsibility of the developer to fabricate the items, install the items, and enter into an agreement with the City of Durham for the maintenance.
7. All street markers (street name signs) shall be designed and installed as follows:

a. Street markers shall be installed at all street intersections and will include the block number of each street
b. All signage provided and installed shall be constructed from a 0.080 gauge anodized aluminum sign blank and conform to standard MUTCD sign sizes.
c. Street markers shall be designed in a stacked configuration and located in a manner for visibility from all directions of travel.
d. Street names shall be displayed by using a minimum of 4-inch reflective white letters and 2-inch reflective white numbers for the block numbers and abbreviations (RD, DR, etc.) on a reflective green background. On private streets, a notation of "private street" in 2-inch black letters on a yellow background will be added on the edge of the sign closest to the road. Signs must not have borders.
e. The layout of the street markers shall conform to the City of Durham standard drawings. The street name shall appear centered vertically on the left of the street marker. The abbreviation shall appear to the top right of the street marker. The block number shall appear to the bottom right of the street marker. Each item should be spaced to balance the appearance of the street marker.
f. Street marker material shall conform to MUTCD color and reflectivity standards and shall at a minimum be engineering grade reflective material.
g. The letters shall be designed using the Standard Highway Alphabet of FHWA, series B.
h. 2 sign blanks are required for each street name marker assembly. Each blank shall have a street name on both sides. The sign blanks shall be installed in a stacked manner using commercially available aluminum mounting hardware. Each assembly shall contain 1 cross mount for flat blade street signs and 1 U-channel or square post bracket for flat blade street name signs. Street markers for different streets shall be placed at right angles (see City of Durham standard drawings for street marker sign and street marker assembly construction). The street marker assembly shall be mounted to the U-channel or square post over the top of the stop signs. If a stop sign is not present, or the stop sign is not at an appropriate location for street markers, street markers shall be mounted on a separate u-channel or square post at the appropriate location.
i. The length of the street marker is variable depending on the length of the street name, but should conform to Table 1 below. The height of the street marker shall be 6-inches.

Table 1

Street Marker Blank Length

Street Name – Number of Letters*	Street Marker Blank Length
3-7 letters	24-inches
8-10 letters	30-inches
11-13 letters	36-inches
Above 13 letters	36-inches plus 2-inches per additional letter

* Number of letters refers to the name of the street, but not the abbreviations needed to label road, drive, avenue, street, etc.

8. Pavement markings shall be placed on the streets adjacent to the site where roadway improvements are required or will be placed on new streets to be accepted by the City of Durham. Pavement markings must be made of a thermoplastic material and adhere to section 1200 of the NCDOT Roadway Standard Drawings, 2002 edition.

Checklist for the Signing and Pavement Marking Plans:

_____ Note that signs and markings must be installed prior to certificate of occupancy and/or street acceptance, as determined by the City
_____ Stop signs/street markers
_____ No outlet signs
_____ Speed limit signs **(25-mph signs will be installed on streets that are more than 800-feet in length in subdivisions where needed)**
_____ Speed hump signs/markings
_____ Stop bars (24-inch white thermoplastic)
_____ Details of signs, spacing from ground, etc
_____ All signs conform to the Manual On Uniform Traffic Control Devices (MUTCD) unless otherwise noted
_____ Standard notes
_____ Crosswalk Pavement Markings
_____ Dimensions of Storage Bays, Bay Tapers, Transitions, Lane Widths, Crosswalks, etc.
_____ All Permanent Pavement Markings Shall Be Thermoplastic
_____ Details or Reference to NCDOT Standard Drawings
_____ Any Site Specific Notes
_____ Labeling of All Markings (Existing and Proposed)
_____ Other things: To be determined

Standard notes

For site plan:

Add the following note to the Special Conditions of Approval Box: "The developer is responsible for fabrication and installation of all required signs and pavement markings within the public right-of-way. The developer shall submit a signing and markings plan to the City at construction plan stage for review and approval. All signs and pavement markings, shown on the construction plans, must be in place prior to the issuance of any certificate of occupancy and/or street acceptance, as determined by the City."

For construction drawings (signing and pavement marking plan):

1. All signs, street markers, and pavement markings (everything called out on the signing and marking sheet) must be installed on each street prior to the issuance of a certificate of occupancy and/or street acceptance, as determined by the City.
2. The street name sign shall be reflective to show the same shape and similar color both day and night. The letters and background shall be of contrasting colors.
3. Street name signs shall have white letters on a green background.
4. Lettering on the street names shall be 4-inch high in capital letters.
5. Suffix lettering to indicate the type of street (such as street, avenue, or road) or the section of the City (such as NW) shall be lettering 2-inch high.
6. Street name signs will be located on top of stop signs in a stacked position.
7. Stop bars shall be 2-feet wide white thermoplastic per NCDOT specifications.

8. All signs must conform with the Manual On Uniform Traffic Control Devices (MUTCD).
9. Street signs shall show block numbers. (Block numbers are shown on the recorded plat. If they are not shown on recorded plat, contact the City's Engineering Assessments Division at 560-4326)

Section III. Lighting Requirements

The City of Durham, at no additional cost to the developer or property owners, provides standard street lighting within the corporate City limits on City maintained streets. Street lighting is installed at all intersections and non-occupied cul-de-sacs. When requested by petition, extended street lighting may be installed in occupied cul-de-sacs and along the street blocks with an approximate spacing of 140-feet. The extended street lighting will be provided when budgeted funds are available.

The standard street light provided by the City of Durham is 9500 lumen, nema head, high pressure sodium unit mounted on a wooden pole at a minimum height of 20-feet.

A developer or legal home owner's association may elect to install decorative (non-standard) street lighting. This may be accomplished by ordering the non-standard lighting through the local utility company serving the area. At locations the City would have automatically installed the standard street lighting, the City may participate in the cost of the monthly electrical fees. Developers and associations considering this option are cautioned to consider possible problems with future maintenance.

Section IV. Guidelines for Traffic Impact Analysis (TIA)

Requirement:
A Traffic Impact Analysis (TIA) is required if the proposed development is expected to generate 150 or more peak hour vehicle trips as determined by the ITE Trip Generation Manual, most recent edition. The TIA must be of sufficient scope and detail to allow the City to evaluate the impact of the proposal and the need for roadway capacity, operation and safety improvements resulting from the proposed development. Supplemental analysis may be required if there is a change in the development plan, site plan or land use. A TIA is valid as long as the approved site plan or development plan associated with the TIA is deemed valid.

Preparer:
The report shall be prepared by a professional engineer who is registered in North Carolina and has expertise in traffic engineering.

Analysis Period:
The analysis must examine expected traffic conditions one year after the project is scheduled to be complete.

Pre-Submittal Conference:
Prior to submitting the TIA, the traffic engineer must consult with the City Transportation Division to discuss various assumptions for the study, including, but not limited to: trip generation assumptions, other approved developments within the study area, study area limits, trip distribution and pass-by traffic. This discussion may be accomplished via phone, e-mail or fax or in person. TIAs submitted without a pre-submittal conference may be rejected.

Memorandum of Understanding:
The traffic engineer shall submit a memorandum of understand to the City Transportation Division to document the agreements made during the pre-submittal conference. The memorandum of understanding may be received by the City via e-mail, fax, or mail. The traffic engineer shall not begin work on the TIA until the City Transportation Division has approved the memorandum of understanding.

Trip Generation:
Trip generation estimates must be obtained from the latest version of the ITE Trip Generation Manual. The standard trip generation estimates to be used are those for the AM and PM peak hours of adjacent street traffic on a weekday. Exceptions to this may include churches, recreation facilities or other special generators. ITE procedures for generating traffic shall be used as specified in the Trip Generation Manual. Alternate rates may be used with prior approval by City Transportation staff. Any assumption regarding site traffic distribution or demand reduction via pass-by trips, internal trips, transit usage or transportation demand management (TDM) strategies, must be approved in advance by the City Transportation staff and documented in the report. Include documentation calculations (i.e. rates or equations used for each land use) in the report.

Trip Distribution and Assignment:
Sketches of site traffic distribution percentages must be included. An accompanying trip assignment sketch should clearly indicate turning movements attributable to the project site at the analysis intersections.

Area of Analysis:
The analysis area should include all streets where site traffic will constitute 10% or more of any intersection approach during the peak hour. Current intersection turning movement counts must be obtained unless recent counts (within the last twelve months) are available from the City or NCDOT. All turning movement counts utilized must have been collected within the twelve months prior to the date of submittal and on weekdays (excluding Monday AM and Friday PM peak hours and holidays). Other peak periods such as noon or weekend periods, may be required if appropriate for the development. Efforts should be made to balance traffic volumes between closely spaced intersections where appropriate. City Transportation staff may require signal warrant analyses for high volume un-signalized intersections. The analysis must follow the warrant guidelines specified in the latest edition of the Federal Highway Manual of Uniform Traffic Control Devices (MUTCD).
The analysis may include recent crash data in the study area. The report should identify locations where traffic safety should be given extra consideration.

Approved Development Traffic:
As listed below, traffic from other nearby significant approved developments must be included in the analysis. Analysis of traffic from pending development projects with significant trip generation potential may also be required at the discretion of the City. Traffic volumes for any approved developments can be obtained from the City's Transportation Division.

Improvements:
Improvements which may be assumed in the analysis are those which have an expected completion date concurrent with that of the project and are either:

1. Funded in the City's Capital Improvement Program,
2. Funded through the State's Transportation Improvement Program, or
3. Indicated as required improvements of other approved development projects.

Those improvements related to other development projects must be clearly referenced in the report. Prior approval must be obtained from City Transportation staff to include other roadway improvements.

The study should clearly indicate those improvements offered by the developer to improve safety or operations. The goal is to achieve LOS D, ensure proper traffic operations, and mitigate potential safety concerns. Where existing conditions are below LOS D, improvements must be recommended that, at a minimum, attain LOS D unless otherwise approved by City staff.

Analysis Required:
The study shall be performed using the operational analysis of the latest Highway Capacity Manual and its associated software (Synchro HCM Reports may be substituted for HCS). Other software packages such as Synchro are preferred for coordinated signal systems and may be required for supplemental analysis. All signalized intersections within the analysis area, all project entrances, and all un-signalized intersections at which site traffic will constitute 10% or more of any one approach shall be modeled. Due to related impacts or current operational problems, the Transportation Division may require other adjacent intersections to be included in the study area. Safety, traffic simulation, gap, queue, traffic signal warrants or other analyses may also be required under certain circumstances.

If a signal is part of a coordinated system, it must be analyzed as such under all scenarios. It is acceptable to optimize all signals for future alternative analyses, however present signal timings and phasing shall be used for the existing conditions analysis. The following assumptions shall be used unless City Transportation staff grants prior approval for variance. Supporting data may be required.

- A peak hour factor of 0.90 shall be applied for all cases except existing traffic.
- Zero right turns on red for signalized intersections as a worst-case scenario.
- Type III arrival rate.
- Minimum four (4) second yellow and two (2) second all-red clearance interval.
- Minimum seven (7) second green time per phase for left turns.
- Minimum ten (10) second green time for through movements.
- Preferred Signal Cycle Lengths:
    - Two or Three Phase = 60 second minimum, 120 second maximum
    - Four to Eight Phase = 110 second minimum, 180 second maximum

Intersections shall be analyzed under four scenarios:

1. Existing
2. No-Build (existing + 3% annual growth + approved developments)
3. Build (existing + 3% annual growth + approved + site traffic)
4. Build Improved (existing + 3% annual growth + approved + site + necessary improvements)

Scenario 4 may be eliminated if improvements are not necessary to satisfy any queuing problems or the LOS criteria listed herein. Overall LOS must be provided for all signalized intersections and worst movement LOS must be provided for all unsignalized intersections. Intersection analysis shall include queue analysis. The analysis year for all future scenarios is one year following the development's scheduled completion year (Build + 1).

Report Content:
Two copies of the final report should be submitted to the City Transportation Division, one copy shall be submitted to the City Planning Department, and if necessary, copies relating to projects impacting state roads should be submitted to the NCDOT District Office as well as the NCDOT Traffic Engineering Branch.

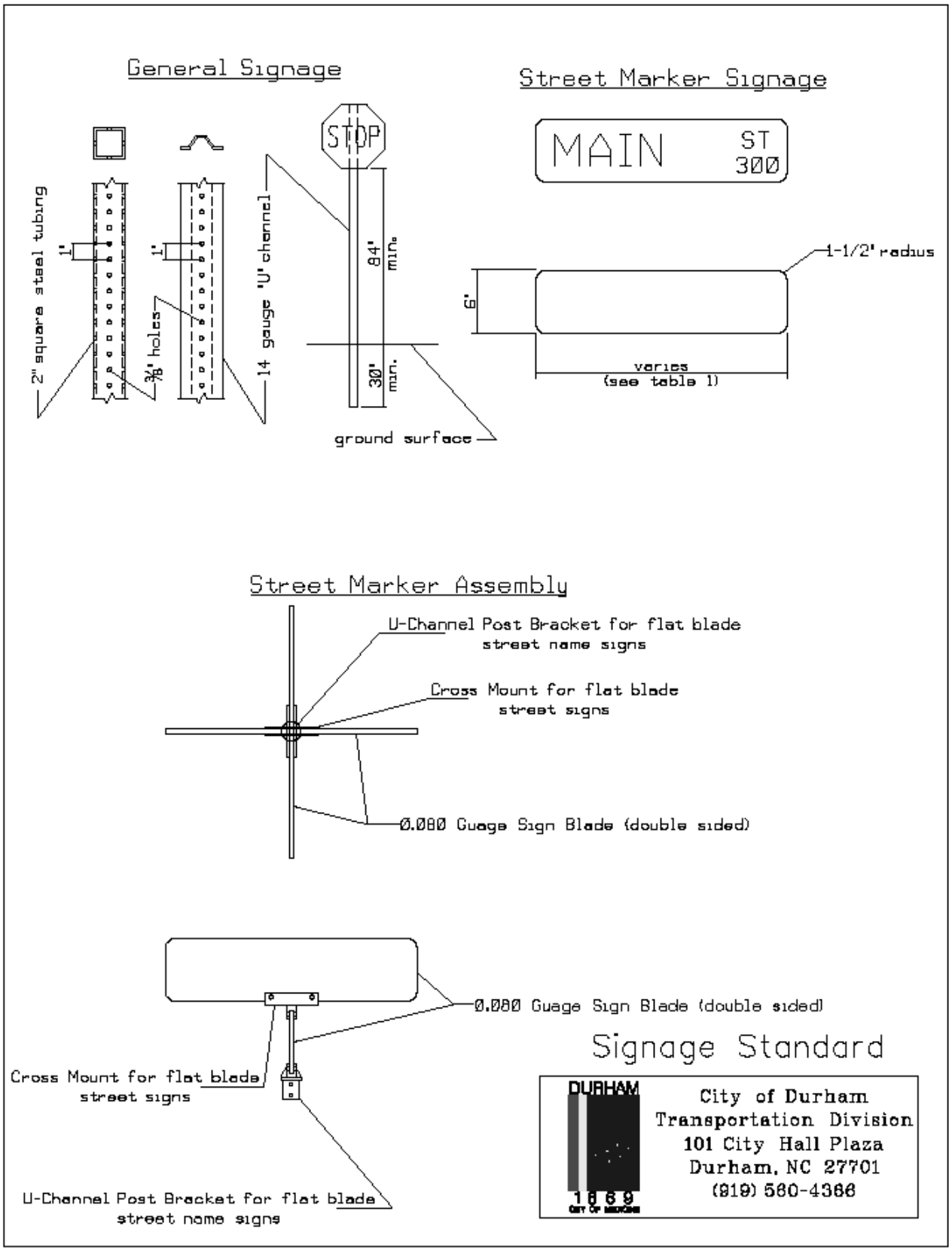
The report must include:

- A full size copy of the site/development plan, (If the site plan had a development plan preceding it, then the site plan must be consistent with the official development plan submitted to the City-County Planning Department.)
- A vicinity map,
- Speed limits of streets within the study area,
- Sketches of traffic distribution percentages and peak hour volumes,
- All capacity analyses (detailed report),
- Signal warrant studies, if appropriate,
- Intersection diagrams, which, as a minimum shall indicate:
    - The current approach and departure laneage at each intersection,
    - The distance between adjacent intersections,
    - The length of full width storage and departure for existing auxiliary lanes,
    - Recommended storage for proposed auxiliary lanes,
    - Any mid-block changes in cross section should also be noted, and
- Other documentation of data and assumptions used in the analysis.

Any submittal not containing all of the above elements will be considered incomplete and shall not be reviewed until a complete submittal is received.

The report must clearly indicate those improvements proposed by the developer. For multi-phase developments, the phasing of improvements should be addressed. Capacity analyses may be required to confirm that the phasing of improvements will provide an acceptable level of service with each phase.

Attached are pages that illustrate the preferred outline (table of contents) for all TIA reports submitted to the City along with the Review Checklist used by City of Durham officials. ***See attachments.***


General Signage
Street Marker Signage
STOP
MAIN ST
300
2" square steel tubing
1"
1"
3/8" holes
14 gauge 'U' channel
84" min.
30" min.
ground surface
6"
1-1/2" radius
varies
(see table 1)
Street Marker Assembly
U-Channel Post Bracket for flat blade
street name signs
Cross Mount for flat blade
street signs
0.080 Guage Sign Blade (double sided)
0.080 Guage Sign Blade (double sided)
Cross Mount for flat blade
street signs
U-Channel Post Bracket for flat blade
street name signs
Signage Standard
DURHAM
1869
City of Durham
Transportation Division
101 City Hall Plaza
Durham, NC 27701
(919) 560-4366

TIA Attachment #1 - Standard Table of Contents

FOR TIA REPORTS SUBMITTED TO THE CITY OF DURHAM

1. **Introduction**

2. **Executive Summary**

3. **Site Location and Access**
   - Figure: Vicinity Map
   - Figure: Site Plan Map
   - Figure: Existing Lane Geometry of Study Intersections *(include current approach and departure laneage at each intersection, distances between intersections, speed limits, and full width storage for exclusive turn lanes)*

4. **Existing Analysis**
   - Figure: Existing AM and PM Turning Movement Volumes
   - Table: Existing LOS Results *(Overall LOS indicated for signalized intersections and Worst Movement/Approach for unsignalized intersections)*

5. **Future No-Build Analysis**
   - Figure: No-Build AM and PM Turning Movement Volumes
   - Table: No-Build LOS Results *(Overall LOS indicated for signalized intersections and Worst Movement/Approach for unsignalized intersections)*

6. **Trip Generation**
   - Table: Trip Generation Rates *(Land use and quantity, ITE Code, and resulting ADT volumes, AM and PM Enter and Exit volumes included)*

7. **Trip Distribution and Assignment**
   - Figure: Directional Distribution Percentages
   - Figure: Site Generated Trip Assignment

8. **Future Build Analysis**
   - Figure: Build AM and PM Turning Movement Volumes
   - Table: Build LOS Results *(Overall LOS indicated for signalized intersections and Worst Movement/Approach for unsignalized intersections)*

9. **Future Build Improved Analysis *(Not required if no improvements are necessary)***
   - Figure: Build Improved AM and PM Turning Movement Volumes
   - Table: Build Improved LOS Results *(Overall LOS indicated for signalized intersections and Worst Movement/Approach for unsignalized intersections)*

10. **Supplemental Analysis (Safety, Signal Warrant, Queue, or other analysis as required)**

11. **Findings and Conclusions**
    - Table: LOS Comparison of All Scenarios *(Overall LOS indicated for signalized intersections and Worst Movement/Approach for unsignalized intersections)*
    - Figure: Roadway Lane Configurations *(Existing, Proposed, and Committed Improvements Indicated, with accompanying identification of parties responsible for improvments)*

Appendix – Count Data, Trip Generation, LOS Analysis and Output

TIA Attachment #2 -Traffic Impact Assessment
Review Checklist

Development Name : _____
Development Location : _____
Development Owner : _____
TIA Prepared by : _____ Company : _____
Site Plan Prepared by: _____ Company : _____
Review Date : _____ Reviewed By : _____

Submittal Package:
_____Full size copy of the site / development plan
_____Plans Sealed
_____TIA Sealed
_____Vicinity map
_____Speed limit(s) of streets within the study area
_____Sketch of traffic distribution percentages
_____Sketch of peak hour volumes
_____Capacity Analyses
_____Signal Warrant Study (if applicable)
_____Documentation of Data and Assumptions (traffic counts, trip generation, safety)
_____Intersection diagrams, including
- _____Approach laneage
- _____Departure laneage
- _____Distance between adjacent intersections
- _____Length of full-width storage in existing auxiliary lanes
- _____Recommended storage for proposed auxiliary lanes

_____Improvements proposed by developer clearly noted
_____Multi-phase development?
- _____Phased improvements addressed?
- _____Capacity analysis for phased improvement provided?

General Requirements:
_____Operational analysis performed using Highway Capacity Software / Synchro
_____All project entrances analyzed
_____All signalized intersections within study area analyzed
_____All un-signalized intersections where site traffic will constitute 10% or more of any one approach.
_____Other intersection analysis required??
Which intersection(s):_____
_____
_____

Assumptions:
_____Peak hour factor of 0.9
_____Type III arrival rate
_____Minimum 6-second yellow + all red clearance
_____7-second minimum green time per left turn movement
_____10-second minimum green time per left through movement (speed limit)

Scenarios Analyzed:

_____Existing traffic
_____No Build (Existing traffic + 3% annual growth + approved development traffic)
_____Build (Existing traffic + 3% annual growth + approved development traffic + site traffic)
_____Build Improved (Existing + 3% annual growth +approved development traffic+ site traffic+ necessary improvements)

Detailed Review Comments:

Existing Traffic Volumes: Are the existing counts based on recent peak hour turning movements? If older data were used, have they been updated using reasonable factors (agreed to by the City)? Are the seasonal and day of the week representative of the year or design year? Was construction or any other events that might have impacted the validity of the counts noted? _____

Comments:
_____
_____

Trip Generation: Are the project trip generation rates from the latest edition of ITE's Trip Generation? If yes, are the rates based on a sufficient number of studies to be accurate and used correctly? If local trip generation rates are used, such as from similar developments in the area, is there adequate documentation to support the rates? _____

Comments:
_____
_____

Reduction in Trip Generation: Are any trip reductions used for Pass-By Trips, Internal Capture Traffic, Transit, Ride-Sharing, etc. reasonable? Are reductions adequately documented? Is the source and rationale for reductions valid for this application? Is the full impact of turning movements addressed? _____

Comments:
_____
_____

Trip Distribution / Assignment: Are the expected trip patterns to / from the subject site reasonable based on a market analysis, existing patterns, population distribution, or a network traffic assignment model, etc.? _____

Comments:
_____
_____

Background Traffic: Is there a reasonable projection of non-project traffic on the nearby street system for the horizon year based on historic increases and consideration of approved projects in the vicinity? Are these volumes shown graphically?
_____

Comments:
_____
_____

Analysis: Are the correct time periods evaluated – i.e. AM peak hour, PM peak hour, daily / weekend peaks at shopping centers, recreational uses, etc.? Are levels of service shown for each movement at the study area intersections? Has the study addressed all issues from pre-study meetings / conferences / transmittals, etc.? _____

Comments:
_____
_____

Access: Are the number of driveways proposed the minimum needed to accommodate site traffic? Could conditions be improved with some sort of shared access system or relocation of access points? _____

Comments:
_____
_____
_____

Mitigation Alternatives: If the study acknowledges that improvements to the roadway system will be needed, are the proposed mitigation alternatives reasonable and implementable? _____

Comments:
_____
_____
_____
__

Mitigation Timing: Are the timing and responsibility for implementing mitigation measures addressed sufficiently? Are there any recommended roadway improvements which are not addressed? _____

Comments:
_____
_____

Review Meeting: Is there a need for a joint meeting between the City, community representatives, adjacent communities, others, and the developer to discuss traffic issues related to this project prior to any approval? _____

Comments:
_____
_____

SECTION 11.0

SIDEWALKS

This section is intended to provide design criteria for sidewalk layout and construction.

I. General

1. Sidewalk plans shall be to conditions as shown on site plan or field adjusted.
2. Add the following note for the proposed sidewalk located within the ROW;

   The location of the sidewalk shown on this plan is schematic. A City of Durham and /or NCDOT encroachment permit is required prior to any construction. After obtaining the required permits, please contact the City of Durham Engineering Construction Inspection office at 919-560-4326 for a pre-construction conference and field visit prior to any work on the proposed sidewalk.

3. Sidewalks are to be constructed inside and adjacent to the right-of way.
4. Sidewalks shall extend to all intersections (even crossing roadside ditches).
5. All sidewalks at intersections to have handicap ramps according to the City of Durham details and specifications. At NCDOT roads, two ramps at each corner.
6. Sidewalks shall be a minimum of 4-inches thick and 6-inches thick across driveways.
7. Sidewalks shall be a minimum of 5-feet wide.
8. If a meter is installed in the sidewalk, then the meter shall be installed at the back of sidewalk or can be installed in the sidewalk providing the water meter box top is flush, smooth and is not a tripping hazard.
9. Public sidewalks will have no wire reinforcing.
10. Sidewalks to extend across all driveways (6-inches thick).
11. All handicapped ramps shall be 6-inches thick.
12. The sidewalk and handicap ramp from PC to PT through a radius shall be 6-inches thick.
13. Sidewalks shall be 3,000-psi concrete.
14. Sidewalks at the back of curb shall be a minimum of 6 feet wide and 6 inches thick.
15. Payment in lieu for sidewalk construction may be an option for sites if it can be demonstrated to the approving body that such construction may cause undo construction hardship (culverts, bridges, etc.). The hardship must be demonstrated before a plan is submitted with the payment in lieu note on the plan. A request should be submitted in writing prior to the City/County Planning Department's Development Review Board's (DRB) consideration. DRB must grant approval of this option during review of the site plan.
16. On major and minor thoroughfares within the UGA, sidewalks must be placed on both sides of the road. All other roads within the UGA, sidewalk must be placed on at least one side of the road. The Transportation Division, at its own discretion, may require that sidewalks be constructed on both sides of roads in heavy commercial, heavy retail or heavy residential areas. On all site plans, sidewalk must be designated as so whether it is existing sidewalk or proposed sidewalk.
17. Sidewalks shall be placed as directed by the Engineering Division at an elevation that corresponds with future widening such that the sidewalk will not need to be replaced when future widening takes place.
18. PROWAG standards are to be used.

SECTION 12.0

STANDARD NOTES

This section contains the most commonly used notes and easement phrases. Some of the dimensions are left blank since it is a variable number. Refer to the Durham City/County Zoning Ordinance or the UDO, as applicable, for the requirements of these dimensions.

Engineering Division Notes

These are the Engineering Division's standard site plan notes. Add the following notes in the box labeled **Public Works Conditions of Approval**:

1. *The designing professional (a NCPE, NCPLS or NCRLA – as required) shall submit three (3) sets of construction drawings to the Public Works Department – Development Review for review and approval. Construction drawing approval is required prior to commencing construction (see Construction Plan Approval Process). The approval of construction drawings is separate from site plan approval. City officials shall review all sizes, materials, slopes, locations, extensions and depths for all proposed utilities (waterlines, sanitary sewer lines and storm drainage conveyance systems) for compliance with all applicable regulatory standards, specifications, and best management practices.*
2. *The designing professional (a NCPE, NCPLS or NCRLA – as required) shall submit one (1) set of as-built drawings to the Public Works Department – Development Review for review and approval. As-built drawing approval is required prior to water meter installation and/or sanitary sewer service connection and prior to issuance of a certificate of occupancy.*
3. *Fire flow analysis required for review and approval as part of the construction drawing approval process. To schedule flow test or to obtain current system data, complete the online application (http://durhamnc.gov/ich/op/pwd/Pages/fire_flow.aspx).*
4. *If a meter 2" or larger is proposed, contact Water Management at 560-4381 prior to the construction of the meter vault to verify the type and dimensions of the meter.*
5. *Water permit required after construction drawing approval and prior to commencing water main installation.*
6. *Sewer permit required after construction drawing approval and prior to commencing sanitary sewer main installation.*
7. *Sewer permit from Durham County required. Contact Durham County Utility Division at 560-9033.*
8. *Pipes and/or structures shown in the Erosion Control Plan of the Site Plan that are proposed to be permanent will be reviewed and approved as part of the Grading Plan during Construction Drawing review. These pipes and/or structures may not be installed prior to Construction Drawing approval and payment of inspection fees.*
9. *When project has 100 or more units: "A second waterline feed is required prior to the 100th certificate of compliance."*
10. *An NCDOT or City of Durham Driveway Permit is required.*

11. *When sidewalk and curb ramps are proposed:*

    i. *PROWAG standards are to be used. See City of Durham Curb Cuts Details http://durhamnc.gov/DocumentCenter/Home/View/2114.*

    ii. *For ramps in 'tight' existing developed areas with small ROW's (Downtown, etc) it is recommended specific ramp details are needed to prevent construction delays. The burden to make it work is on the designing engineer.*

12. *If Construction drawings are not required after site plan approval, provide the following notes instead of note 1 above:*

    i. *Provide two (2) sets of approved Site Plan documents to Engineering Inspections, 3rd Floor, 101 City Hall Plaza, Durham, NC 27701 at least 5 days prior to beginning construction and contact Engineering Inspections at 919-560-4326 at least 48 hours prior to beginning construction.*

    ii. *A Construction on City Right-Of-Way / Private Property Permit is required for the proposed [name infrastructure requiring permit]. Contact the Public Works at the Development Services Center at 560-4326.*

    iii. *An encroachment agreement may be required. Contact Engineering Services at 919-560-4326.*

Existing ponds to be drained note:

All road and fill sections that are to be constructed over existing pond features or wetlands will require all unsuitable soils to be excavated and structural road fill to be installed. Special compaction standards will also be required. A licensed geotechnical engineer will be required to provide the necessary analysis. The City of Durham will review and approve the analysis during Construction Drawing review.

Water easement note:

Centerline of _____ foot wide City of Durham Water Easement. Subject to terms stated in the Declaration in Real Estate Book 1510, page 958. No structures, fill, embankments, trees or obstructions permitted within the easement except according to those terms.

Sanitary sewer easement note:

Centerline of _____ foot wide City of Durham Sanitary Sewer Easement. Subject to terms stated in the Declaration in Real Estate Book 1510, page 958. No structures, fill, embankments, trees or obstructions permitted within the easement except according to those terms.

Centerline of _____ foot wide County of Durham Sanitary Sewer Easement. Subject to terms stated in the Declaration in Real Estate Book 1626, page 145. No structures, fill, embankments, trees or obstructions permitted within the easement except according to those terms.

Stormwater drainage easement note:

Centerline of _____ foot wide public storm water drainage easement. Ownership of and responsibility for improvement and maintenance of storm water facilities in this easement remains with the current owner. If the property is within or becomes a part of the City, the easement and access points to the easement are subject to the terms and restrictions stated in the "Revised Declaration of Rights and Privileges of the City of Durham in Storm Water Management Facility Easements" recorded in Real Estate Book 2298, Page 208, which document is incorporated herein. This easement and the Revised Declaration do not create the obligation to provide public

maintenance. No building, structures, fills, embankments or obstructions permitted within the easement except according to those terms.

Sidewalk note:

The location of the sidewalks shown on this plan is schematic. A City of Durham and/or NCDOT encroachment permit is required prior to any construction. After obtaining the required permits, please contact the City of Durham Engineering Construction Inspection office at 919-560-4326 for a pre-construction conference and field visit prior to any work on the proposed sidewalk.

Public Access Easement for Sidewalk Note:

Certification of Express Dedication for Public Use
[Description of the sidewalks to be dedicated inserted here] ("Sidewalks") are expressly dedicated to use by the general public. Upon construction of the Sidewalks in conformance with all applicable requirements, City Council may accept the Sidewalks for maintenance by the City of Durham ("City"). Acceptance of the Sidewalks by City Council conveys the right in, over, under, and through the Sidewalks, necessary for the City and its agents and contractors, to maintain and repair the sidewalks in the City's sole discretion. The right of ingress/egress to the Sidewalks from the public right of way is also granted to the City so the City can maintain and repair the sidewalks after acceptance. The City in its sole discretion has the right to determine the points of ingress and egress from the public right of way necessary to perform maintenance or repair after acceptance.

Driveway permit notes:

A City of Durham Driveway Permit is required prior to any driveway construction on public right-of-way. Submit plans for Driveway Permit approval to City Engineering Development Review. After obtaining the permit, please call City of Durham Engineering Inspection office at 919-560-4326 prior to start of construction.

NCDOT Driveway Permit required prior to construction. Contact NCDOT at 919-220-4750 for requirements.

Townhome Note:

Townhome developments may be designed and constructed with parking areas on both sides of the travel lanes. This configuration is not to be considered a street. If this option is used, the travel and parking areas shall be noted as "Private Access and Common Areas". As such, the Developer shall acknowledge and make prospective buyers aware that these areas will not be assigned a street name, nor will they ever be eligible for maintenance by the City of Durham. The Developer will ensure that all of the access and common area property is described in the covenants and that the Home Owners Association is responsible for the maintenance of this area. The following note shall be added to all site plans and plats associated with the development:

The driving and parking areas shown on this drawing noted as "Private Access and Common Areas" do not meet City of Durham street standards. The features within this area are private and will never be eligible for public maintenance.

Utility Notes:

A Utility Mainline Construction permit is required prior to the installation of each utility. All utilities shall submit plan drawings and applications to the City Engineering Division.

Water service abandonment:

Abandonment of water services shall include excavating down to corporation stop, turning it off and cutting service line free from corporation stop. The meter, if present, shall be returned to City of Durham. Prior to any credit or refund being processed the meter must be returned to Water Management Department and the meter number verified and coded properly as returned. Utility Service Abandonments will take place prior to beginning utility construction work for a project. Any excavation as part of abandoning utilities will require backfilling per City of Durham standards.

Sanitary sewer service abandonment:

Abandonment of sanitary sewer service lines shall consist of excavating down to the service connection to the main, cutting this connection and installing a watertight plug in the main. The service line and all clean-out risers on the service line shall be removed. Utility Service Abandonments will take place prior to beginning utility construction work for a project. Any excavation as part of abandoning utilities will require backfilling per City of Durham standards.

Provide Utility Crossing Construction note where there are new mainline (public or private) utilities proposed on plans as follows:

Water, sanitary sewer and storm sewer separation notes:

1. *Horizontal and Vertical Separation*

   A. *Sanitary Sewers shall be laid at least 10-feet horizontally from any existing or proposed water main. The distance shall be measured edge to edge. In cases where it is not practical to maintain a 10-foot separation, the City of Durham may allow deviation on a case-by-case basis, if supported by data from the design engineer. Such deviation on may allow the installation of the sanitary sewer closer to a water main, provided that the water main is in a separate trench or on an undisturbed earth shelf located on one side of the sanitary sewer and at an elevation so the bottom of the water main is at least 18-inches above the top of the sewer.*

   B. *If it is impossible to obtain proper horizontal and vertical separation as described above or anytime the sanitary sewer is over the water main, both the water main and sanitary sewer must be constructed of ferrous pipe complying with the public water supply design standards and be pressure tested to 150-psi to assure water tightness before backfilling.*

   C. *A 24-inch vertical separation shall be provided between storm sewer and sanitary sewer lines or ferrous pipe specified. A 12-inch vertical separation shall be provided between storm sewer and water mains.*

      1. *If a 12-inch vertical separation is not maintained at a crossing between storm sewer and water mains (or pressure sewers). The water main shall be constructed of ferrous pipe and a concrete collar shall be poured around water mains and storm sewer to immobilize the crossing.*

2. *Crossings*

   A. *Sanitary Sewer crossing water mains shall be laid to provide a minimum vertical distance of 18-inches between the outside of the water main and the outside of the sanitary sewer. The crossing shall be arranged so that the sanitary sewer joints will be equidistant and as far as possible from the water main joints.*

   B. *When it is impossible to obtain proper horizontal and vertical separation as stipulated above, one of the following methods must be specified.*

      1. *The sanitary sewer shall be designed and constructed of ferrous pipe and shall be pressure tested at 150-psi to assure water tightness prior to backfilling, or*

      2. *Either the water main or the sanitary sewer line may be encased in a watertight carrier pipe, which extends 10-feet on both sides of the crossing, measured perpendicular to the water main. The*

carrier pipe shall be of materials approved by the City of Durham for use in water main construction.

Stormwater Services Division Notes

The following notes are required on the cover sheet for site plans/preliminary plats, construction drawings, and on final plats as noted by the appropriate section below for each type submittal.

A. The following notes shall be included in the Public Works Conditions of Approval box on the cover sheet for Site Plan/Preliminary Plat submittals. These notes may or may not apply to the project depending on the requirements of the project (to be determined by designer and during review).

- At a minimum, the stormwater design details for this project shall be governed by the minimum standards of the most recent edition of the City of Durham (City) Reference Guide for Development (RGD) and any Letters to Industry (posted on the City's website) that are in effect the date Construction Drawings are first received for review by the City.

- Final design calculations for the stormwater control measure(s) (SCM[s]) require the use of storage indication routing methodology such as TR-20 or HEC-1 models. For each SCM, as applicable, stage-storage relationship and inflow and outflow hydrographs are required. All tabulated data including calculations showing the limiting discharge, whether orifice, weir, barrel, or outlet control, as appropriate is required. HydroCad, Hydraflow Hydrographs, and PondPack are commonly used and recognized software programs which incorporate routing methodology accepted by the City.

- *Use for residential developments with a Homeowners Association:*

  Stormwater control measure(s) (SCM[s]) permit fee(s), the executed Stormwater Facility Agreement and Covenants (prepared by the City of Durham Stormwater Development Review Section) and a payment into the Stormwater Replacement Fund are required for all SCM(s) associated with this development. Construction of the development is not allowed to commence until these items are provided in accordance with the terms and conditions outlined in the Stormwater Facility Agreement and Covenants or in accordance with written policy. The designer shall submit a sealed engineer's construction cost estimate for every SCM proposed in the development prior to approval of the construction drawings.

- *Use for Multi-family and other type developments:*

  Stormwater control measure(s) (SCM[s]) permit fee(s), the executed Stormwater Facility Agreement and Covenants (prepared by the City of Durham Stormwater Development Review Section) and either a payment into the Stormwater Replacement Fund or the provision of an alternate security are required for all SCM(s) associated with this development. Construction of the development is not allowed to commence until these items are provided in accordance with the terms and conditions outlined in the Stormwater Facility Agreement and Covenants or in accordance with written policy. The designer shall submit a sealed engineer's construction cost estimate for every SCM proposed in the development prior to approval of the construction drawings if a financial guarantee in the form of payment into the Stormwater Replacement Fund is utilized.

- An as-built certification for the stormwater control measure(s) (SCM[s]), provided by the BMP Certifying Engineer (BCE), is required. The as-built certification shall be submitted in accordance with the City of Durham BCE Program, refer to Section 8.6, BMP Certifying Engineer Program for Stormwater BMPs in the City of Durham, of the Reference Guide for Development. The SCM as-built certification(s) shall be approved by the Stormwater Development Review Section prior to issuance of any final certificates of occupancy/compliance for development, with the exception of when an appropriate construction security has been provided for single family or townhome development. With this provided construction security, certificates of occupancy/compliance can be issued for a percentage of single family lots in accordance with City requirements.

- Stormwater control measure(s) (SCM[s]) design calculations will not be reviewed or approved with the Site Plan/Preliminary Plat submittal. All SCM designs will be reviewed and approved during the construction drawing submittal process. If, at the time of construction drawing submittal, it is found that the proposed SCM(s) is undersized, not properly accessible, or otherwise insufficient or unsuitable for the site, it is the responsibility of the applicant to insure that the applicable stormwater ordinance requirements are met. A revised site plan or preliminary plat may be required if the originally proposed SCM(s) are found insufficient, not properly accessible, or unsuitable and alternative SCM(s) with associated easements are required.

- The Developer/Contractor shall schedule a preconstruction meeting with the Stormwater Development Review section prior to commencing work on any Stormwater Control Measure (SCM). If the SCM will be constructed initially as a Sedimentation and Erosion Control (S&EC) device, to be converted to a permanent SCM at a later time, the preconstruction meeting should be scheduled prior to construction of the S&EC device. Call 919-560-4326 Ext. 30238 to schedule the required meeting a minimum of three business days prior to the desired meeting date. This is in addition to other preconstruction meeting requirements for erosion control, engineering inspections, etc.

- *Use for Single Family Detached, Townhome and Duplex Residential Developments making use of a nutrient bank and/or the North Carolina Division of Mitigation Services (NC Ecosystem Enhancement Program) when insufficient credits are available from the nutrient banks:*

  To receive construction drawings approval for Single Family Detached, Townhome and Duplex Residential Developments that are making use of nutrient banks and/or the NCEEP, the approval of the construction drawings is contingent upon the purchase of nutrient credits. If a revised site plan/preliminary plat is submitted for this site, the revised site plan/preliminary plat will be subject to any ordinances in place at the time of the revised site plan/preliminary plat submission. Prior to the approval of any construction drawings or prior to the release of any building permits pertaining to this development, whichever comes first, a letter/receipt showing the purchase of the nutrient credits for this development and a copy of the nutrient bank ledger if applicable, showing the total nutrient credits available minus any and all deductions, is to be provided to the Stormwater Development Review Section. However, if insufficient credits are available from nutrient banks and NCEEP will not accept payment, then the applicant shall submit a revised site plan/preliminary plat back to the Durham City-County Planning Department and shall comply with the current Stormwater Performance Standards in place at the time of the revised site plan/preliminary plat submission.

- *Use for developments other than Single Family Detached, Townhome and Duplex Residential Developments making use of a nutrient bank and/or the North Carolina Division of Mitigation Services (NC Ecosystem Enhancement Program) when insufficient credits are available from the nutrient banks:*

  To receive site plan/preliminary plat approval for developments other than Single Family Detached, Townhome and Duplex Residential Developments that are making use of nutrient banks or NCEEP, the approval of the site plan/preliminary plat is contingent upon the purchase of nutrient credits. If a revised site plan/preliminary plat is submitted for this development, the revised site plan/preliminary plat will be subject to any ordinances in place at the time of the revised site plan/preliminary plat submission. Prior to the approval of the site plan/preliminary plat, a letter/receipt showing the purchase of the nutrient credits for this development and a copy of the nutrient bank ledger if applicable, showing the total nutrient credits available minus any and all deductions, is to be provided to the Stormwater Development Review Section.

B. The following notes shall be included on the cover sheet for Construction Drawings submittals. These notes may or may not apply to the project depending on the requirements of the project (to be determined by the designer and during review).

- At a minimum, the stormwater design details for this project shall be governed by the minimum standards of the most recent edition of the City of Durham (City) Reference Guide for Development (RGD) and any

Letters to Industry (posted on the City's website) that are in effect the date Construction Drawings are first received for review by the City.

- Final design calculations for the stormwater control measure(s) (SCM[s]) require the use of storage indication routing methodology such as TR-20 or HEC-1 models. For each SCM, as applicable, stage-storage relationship and inflow and outflow hydrographs are required. All tabulated data including calculations showing the limiting discharge, whether orifice, weir, barrel, or outlet control, as appropriate is required. HydroCad, Hydraflow Hydrographs, and PondPack are commonly used and recognized software programs which incorporate routing methodology accepted by the City.

- Stormwater control measure(s) (SCM[s]) permit fee(s), the executed Stormwater Facility Agreement and Covenants (prepared by the City of Durham Stormwater Development Review Section) and either payment into the Stormwater Replacement Fund or the provision of an alternate security is required for all SCMs associated with this development. Construction of the development is not allowed to commence until these items are provided in accordance with the terms and conditions outlined in the Stormwater Facility Agreement and Covenants or in accordance with written policy. The designer shall submit a sealed engineer's construction cost estimate for each SCM proposed in the development prior to approval of the construction drawings if a financial guarantee in the form of payment into the Stormwater Replacement Fund is utilized. Note that the Stormwater Replacement Fund is the only financial guarantee option for residential developments with a homeowners association.

- An as-built certification for the stormwater control measure(s) (SCM[s]), provided by the BMP Certifying Engineer (BCE), is required. The as-built certification shall be submitted in accordance with the City of Durham BCE Program, refer to Section 8.6, BMP Certifying Engineer Program for Stormwater BMPs in the City of Durham, of the Reference Guide for Development. The SCM as-built certification(s) shall be approved by the Stormwater Development Review Section prior to issuance of any final certificates of occupancy/compliance for development, with the exception of when an appropriate construction security has been provided for single family or townhome development. With this provided construction security, certificates of occupancy/compliance can be issued for a percentage of single family lots in accordance with City requirements.

- The Developer/Contractor shall schedule a preconstruction meeting with the Stormwater Development Review section prior to commencing work on any Stormwater Control Measure (SCM). If the SCM will be constructed initially as a Sedimentation and Erosion Control (S&EC) device, to be converted to a permanent SCM at a later time, the preconstruction meeting should be scheduled prior to construction of the S&EC device. Call 919-560-4326 Ext. 30238 to schedule the required meeting a minimum of three (3) business days prior to the desired meeting date. This is in addition to other preconstruction meeting requirements for erosion control, engineering inspections, etc.

C. The following notes shall be included on Final Plats. These notes may or may not apply to the project depending on the requirements of the project (to be determined by applicant and during review).

- *Restrictive covenants note(s) required per the final plat checklist for residential developments with a HOA:*

  THE "COMMON ELEMENTS" AND/OR "OPEN SPACES" EXPRESSLY ARE DEDICATED HEREBY FOR THE USE AND ENJOYMENT OF THE HOMEOWNERS IN (ENTER NAME OF DEVELOPMENT) AND ARE TO BE CONVEYED BY (ENTER OWNER NAME) TO (ENTER HOMEOWNER ASSOCIATION NAME), AS MORE FULLY PROVIDED IN THE DECLARATION OF COVENANTS, CONDITIONS, AND RESTRICTIONS APPLICABLE TO (ENTER NAME OF DEVELOPMENT) DATED _____ AND RECORDED IN BOOK _____, PAGES _____ , IN THE DURHAM COUNTY REGISTRY, AS AMENDED FOR THIS AND FUTURE SECTIONS AND MAPS, SAID DECLARATION BEING HEREBY INCORPORATED AND MADE A PART OF THIS PLAT.

STORMWATER FACILITY RESPONSIBILITY: THE (ENTER HOMEOWNER ASSOCIATION NAME) SHALL BE RESPONSIBLE FOR MAINTAINING THE COMPLETED PERMANENT STORMWATER FACILITY(IES) IN ACCORDANCE WITH THE OPERATION AND MAINTENANCE MANUAL(S) OR AS DIRECTED BY THE GOVERNEMENT OFFICE HAVING JURISDICTION FOR STORMWATER PERFORMANCE STANDARDS AND, IF THE OWNER'S ASSOCIATION SHOULD BE DISSOLVED OR CEASE TO EXIST, THEN IN THAT EVENT THE OWNERS OF RECORD AT THE TIME OF REQUIRED MAINTENANCE SHALL BE JOINTLY AND SEVERALLY LIABLE FOR ANY AND ALL COSTS ATTENDANT THERETO.

- Easement note per the final plat checklist for developments without an HOA:

  THE OPERATION, MAINTENANCE, AND RECONSTRUCTION RESPONSIBILITY OF THE STORMWATER CONTROL MEASURE(S) (SCM[s]) LOCATED WITHIN THE SCM ACCESS & MAINTENANCE EASEMENT RESTS WITH THE OWNER PER THE RECORDED STORMWATER FACILITY AGREEMENT AND COVENANTS OR OPERATION AND MAINTENANCE AGREEMENT. THE SCM ACCESS & MAINTENANCE EASEMENT GRANTS THE CITY OF DURHAM AND THEIR ASSIGNS RIGHT OF ACCESS TO THE PERMANENT STORMWATER CONTROL MEASURE(S) FOR INSPECTIONS AND ENFORCEMENT OF OPERATION & MAINTENANCE. NO OBSTRUCTION SHALL BE ALLOWED IN THE EASEMENT WHICH COULD IMPEDE NECESSARY MAINTENANCE BY THE OWNER AND ANY ENFORCEMENT BY THE CITY.

- Easement note per the final plat checklist for developments with an HOA:

  THE STORMWATER CONTROL MEASURE (SCM) ACCESS & MAINTENANCE EASEMENT GRANTS THE CITY OF DURHAM AND THEIR ASSIGNS RIGHT OF ACCESS TO THE PERMANENT STORMWATER CONTROL MEASURE(S) FOR INSPECTIONS AND ENFORCEMENT OF OPERATION & MAINTENANCE. NO OBSTRUCTION SHALL BE ALLOWED IN THE EASEMENT WHICH COULD IMPEDE NECESSARY MAINTENANCE BY THE OWNER OR ENFORCEMENT BY THE CITY.

- Optional blanket easement for multi-family and other development (cannot be used for limited residential):

  THE CITY OF DURHAM AND THEIR ASSIGNS HAVE RIGHT OF ACCESS TO THE PERMANENT STORMWATER CONTROL MEASURE(S) (ENTER TYPE(S)) FOR INSPECTIONS AND MAINTENANCE ENFORCEMENT. A BLANKET ACCESS EASEMENT TO, OVER AND AROUND THE STORMWATER CONTROL MEASURE IS HEREBY GRANTED FOR INSPECTIONS AS WELL AS ENFORCEMENT OF OPERATION & MAINTENANCE. ANY OBSTRUCTION PLACED IN THE BLANKET EASEMENT THAT IMPEDES NECESSARY MAINTENANCE ENFORCEMENT WILL BE REMOVED AND ALL THE ASSOCIATED COSTS WILL BE BORNE SOLEY BY THE OWNER.

- **Department of Transportation Notes**

Where Streets terminate, add the following note to the construction drawings:

Where streets terminate (example Phase lines) the following will be installed: 1) Asphalt header, 2) Riprap or concrete apron for storm water to dissipate, 3) Utilities to extend a minimum of 5-feet beyond the edge of pavement, 4) NCDOT type III barricade.

Off-site roadway improvements, add the following note to the special conditions of approval box:

By referencing roadway improvements on the plan, the applicant agrees to construct said improvements prior to issuance of certificate of occupancy in a manner that will allow them to function as noted on the plan and in accordance with NCDOT and City of Durham standards and policies. This includes (where appropriate) but is not limited to: adequate transition tapers, alignment of lanes through intersections, associated signal modifications, pavement markings, associated signage, curb and gutter, coordination with other proposed roadway improvements and bike lanes. The applicant also accepts the financial responsibility for acquisition of any additional right-of-way necessary to accommodate these improvements and any required sidewalk construction.

Signs and/or pavement markings to be installed by the developer (new subdivisions or off-site roadway improvements that need new markings for example), add the following note to the special conditions of approval box:

The developer is responsible for fabrication and installation of all required signs and pavement markings within the public right-of-way. The developer shall submit a signing and markings plan to the City at construction plan stage for review and approval. All signs and pavement markings, shown on the construction plans, must be in place prior to the issuance of any certificate of occupancy and/or street acceptance, as determined by the City.

Right-of-way dedication on a major/minor thoroughfare adjacent to the site, add the following note to the special conditions of approval box:

Dedicate an additional ___ feet of right-of-way along the frontage of the site on _____ Road prior to the issuance of any building permit. ***A copy of the recorded plat must be submitted with the first building permit application****.*

Bus stop/shelter is to be constructed near the site, add the following note to the special conditions of approval box:

Provide bus shelter with concrete pad on _____ Road. Design specifications and exact location to be reviewed and approved by DATA prior to construction.

Off-site roadway improvements on the site, add the following note to the special conditions of approval box:

All off-site roadway improvements must be complete prior to the issuance of any certificate of occupancy.

Variations to these standard notes may be applied with the express consent of the Transportation Division.

<u>Signage and Marking Plan Construction Drawing Notes:</u>

1. All signs, street markers, and pavement markings (everything called out on the signing and marking sheet) must be installed on each street prior to the issuance of a certificate of occupancy and/or street acceptance, as determined by the City.
2. The street name sign shall be reflective to show the same shape and similar color both day and night. The letters and background shall be of contrasting colors.

3. Street name signs shall have white letters on a green background.
4. Lettering on the street names shall be 4-inches high in capital letters.
5. Suffix lettering to indicate the type of street (such as street, avenue, or road) or the section of the City (such as NW) shall be lettering 2-inches high.
6. Street name signs will be located on top of stop signs in a stacked position.
7. Stop bars shall be 2-feet wide white thermoplastic per NCDOT specifications.
8. All signs must conform with the Manual On Uniform Traffic Control Devices (MUTCD).
9. Street signs shall show block numbers. (Block numbers are shown on the recorded plat. If they are not shown on recorded plat, contact the City's Engineering Assessments Division at 560-4326)

Section 13.0: Forms

The forms can be found at the Public Work's website http://durhamnc.gov/985/Forms-Applications and http://durhamnc.gov/2988/Forms-and-Templates (Stormwater Forms).

SECTION 14

ENGINEERING DEVELOPMENT FEES

This section is intended to aid in the process of determining Engineering fees that may be associated with the project. Contact other departments and agencies (i.e. Planning, Building Inspections, Durham County Erosion Control, Durham County Sewer etc.) to get a listing of these fees.

I. Water and Sanitary Sewer Charges:

A. Frontage Charges:
These fees are applicable when property is developed and a water and/or sanitary sewer line has not been installed by the developer or property owner across the street frontage or street right-of-way abutting the project. These fees are paid when the mains are extended for new projects. If no extension is made frontage charges are paid with the application for service. The rates below are effective since **May 1, 2010**.

The current frontage charges are:	Water	Sewer Sanitary
Inside City Limits	$27.00/LF	$50.00/LF
Outside City Limits	$29.50/LF	$56.00/LF

B. Capital Facilities Fees:
Are due prior to connection. Typically, these fees are paid with the application for the service connection. The fees below are required per Section 70-50(a) of the City Code and shall be in full force and effect of October 1, 2017.

The current capital facilities fees are:

Meter Size (Inches)	**Water**	**Sanitary Sewer**	**Total**
5/8	$ 1,870	$ 1,130	$ 3,000
1	$ 4,670	$ 2,830	$ 7,500
1 ½	$ 9,340	$ 5,660	$ 15000
2	$ 14,940	$ 9,060	$ 24,000
3	$ 28,193	$ 16,923	$ 45,116
4	$63,339	$45,726	$109,055
6	$126,414	$91,452	$217,866
8	$221,028	$160,041	$381,069
10	$347,178	$251,493	$598,671
Over l0 (per gpd)	$4.53/gpd	$3.05/gpd	$7.58/gpd

Note: Fees are subject to change without notification

C. Meter and Service Charges:**

1. Water Meter Actual Costs (existing service and meter box or vault)

Meter Size (Inches)	Pick-Up	Installed by City
5/8	N/A	$284.00
1	N/A	$420.00
1 ½	Actual Cost	$656.00
2 Compound	Actual Cost	$2100.00
3 Compound	Actual Cost	$2,625.00
4	Actual Cost	$3,675.00
6	Actual Cost	$10,500.00
8	Actual Cost	Actual Cost
10	Actual Cost	Actual Cost
12	Actual Cost	Actual Cost

These fees are applicable for existing services that need a meter set with new development with the developer installing the mains and services. Please contact Engineering Services (919-560-4326) for actual cost of meters.

For infill lots and single lot Developments call Engineering Services for information on City installed Water and Sanitary Sewer Services.

Note: Fees are subject to change without notification

II. Basin Fees

A. Fayetteville Road Pump Station
Properties located within the Fayetteville Pump Station sewer service basin and will connect and/or discharge to the Pump Station:

i) Detached single-family dwellings shall pay $1,700 per unit
ii) Other uses other than single family dwellings, such as multi-family and nonresidential development, shall pay up to $4.75 per gallon of permitted wastewater flow

B. Del Webb Pump Station
Properties located within the Del Webb Pump Station sewer service basin and will connect and/or discharge to the Del Webb Sewer Pump Station:

i) Detached single-family (includes condominium-style townhomes and townhomes) dwellings shall pay $2,500.00 per unit
ii) Other uses than single family dwellings, such as multi-family and nonresidential development, shall pay up to $11.57 per gallon of permitted wastewater flow

C. Southeast Regional Pump Station
Properties located within the Service Area for the Southeast Regional Lift Station shall pay the following Service Area Fees:

i) Single Family Residence $4,473.00/unit
ii) Multi-Family and Non-Residential $12.43/Gallon of Average Daily Flow

This Service Area Fee shall increase 5% annually effective July 1 of each year. Payment of Service Area Fees shall be made at the time the sewer collection lines are permitted for construction. Payment of the Service Area Fee does not guarantee that said infrastructure shall be available by any particular date.

D. Farrington Road Waterline

Properties located within the Service Area for the Farrington Road Waterline shall pay the following Service Area Fees:

i) Residential Unit $377.11
ii) Non- Residential Unit, rate per gallon of average daily flow $1.05

The fees stated in Part 15-103 (d) shall increase 5%, compounding annually effective July 1 of each year, with the first annual increase occurring on July 1, 2018. The rates shall be rounded up to the nearest cent with each increase.

III. Other Charges

A. Construction Drawing Review Fee (Paid at time of initial submittal)

i) For plans containing Plan and Profile sheets $1,200.00
ii) For all other plans $500.00
iii) For plans submitted during actual Construction related to field/modifications $500.00 or $1,200

B. Extension Agreements License Agreement (Paid at time of application submittal) $200.00

C. Fire Flow Test Request (Paid prior to actual test) $850.00

D. Water Extension Permit (Paid at time of permit application submittal) $450.00

E. Sewer Extension Permit (Paid at time of permit application submittal) $450.00

F. Construction Inspection Fees (Public and Private)

Street	$2.00/LF
Water Main	$1.00/LF
Sanitary Sewer Main	$1.00/LF
Sanitary Sewer Outfall	$1.00/LF

G. Drainage System Inspection Fees (Effective July 1, 2010)

Stormwater Pipes	$1.00/LF
Stormwater Open Channel	$0.50/LF

H. Driveway, Right-of-Way Excavation:

• driveways	$80
• street cuts	$80
• sidewalks	$80
• cow horn irrigation	$80
• any other single permit one time inspection that does not have an established fee	$80

I. Re-inspection Fees

Effective on July 1, 2010, a fee of $100 for each re-inspection is charged as follows:

- All inspection visits starting with the third inspection for single inspection driveways, street cuts, sidewalks, cow horn irrigation or other single permit one time inspections.
- All inspections visits starting with the third inspection for final right-of-way inspections performed by Public Works on building permits or any Land Office Development (LDO) related inspections.

J. Storm Water Items
Storm Water Facility Permit $3,500.00/facility
Surety bond amounts are determined by Stormwater Services.

K. Impact Fees:
Determined at the time of application for building permit by the Inspections Department

Note: Fees are subject to change