City of Raleigh

Guidelines for Land Disturbing Activities

September 2013

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CHAPTER 1

INTRODUCTION

1. INTRODUCTION

The purpose of this manual is to provide guidance to assist design professionals, developers, owners, contractors, and project managers with land disturbing and stormwater management activities.

This manual does not cover every aspect of design necessary for project construction, nor does it cover every situation that may occur. The design professional is responsible for the design of a properly functioning project that meets all of the applicable land disturbance and stormwater requirements while considering all the unique conditions of an individual site. Where the designer determines that conformance with this manual would create an unreasonable hardship or where an alternative design may be more appropriate, the alternative designs, materials, and methodologies may be considered on a case-by-case basis for approval by the City of Raleigh (City).

To the best of their ability, the authors have insured that material presented in this manual is accurate and reliable. The design of a successful project, however, requires considerable judgment on the part of designer. It is the responsibility of the design professional to insure that techniques utilized are appropriate for the given situation. Therefore, neither the City, nor any author, or other individual, group, business, etc., associated with production of this manual, accepts any responsibility for any loss, damage, or injury as a result of the use of this manual.

Please refer to Appendix I for a list of acronyms that are commonly used throughout this document.

CHAPTER 2

SITE DESIGN

2. SITE DESIGN

The City has specific requirements for development activities within the City limits and the extraterritorial jurisdiction (ETJ). These requirements may include federal, state and local requirements and are designed to ensure that projects comply with the City Code. Determining which requirements apply and planning accordingly to meet those requirements will help guarantee a smooth project approval and construction process.

The City regulates stormwater related to development through permits for erosion and sediment control, permanent stormwater Best Management Practices (BMPs), watercourse buffers, water supply watersheds, and flood areas. These various permits are briefly described below.

2.1. Land Disturbing Permits

All Land Disturbing (LD) permits begin with the letters "LD". There are several categories of LD permits including Grading, Watercourse buffer, Watershed, and Stormwater Tracking (SWT) permits. Because these permits address various requirements, it is possible for one project to have multiple LD permits.

2.1.1. Grading Permits

Grading permits are required for all projects that disturb 12,000 square feet (0.275 acres) or more of land area. Grading permits fall under one of two categories, Mass Grading and Site Grading.

2.1.1.1. Mass Grading Permits

When an applicant wishes to clear land and perform grading activities on a site and when no structural improvements to the site are proposed, a Mass Grading permit may be obtained. A Mass Grading permit is for grading only. The permit does not authorize installation of any storm or sanitary sewer, curb and gutter, pavement, buildings or any other impervious surfaces. Subsequent improvements to the site will require a Site Grading permit.

2.1.1.2. Site Grading Permits

Site Grading permits are issued to authorize land disturbing activity with improvements, including installation of storm and sanitary sewer, curb and gutter, pavement, buildings or any other impervious surfaces.

2.1.2. Watercourse Buffer Permits

Watercourse Buffer permits are issued for projects that have a state regulated watercourse buffer on site. Buffers are determined by the NC Department of Environment and Natural Resources (DENR) Division of Water Quality (DWQ), but are typically 50-ft. from the top of bank on each side of all blue-line streams shown on USGS maps and drainage features illustrated on the Wake County Soil Survey. The buffer must be marked on the ground prior to permit approval. A certification statement from a Professional Land Surveyor which states that the buffer has been flagged or staked must be submitted with permit submittal, prior to the permit approval. See appendix for an example.

Occasionally DWQ will issue a variance/authorization to allow the construction of a structure or an activity to occur within a protected buffer area. This variance/authorization is documented by a letter from DWQ and a copy of this letter must be submitted to the City prior to permit approval. No grading or building activity is allowed within the buffer area unless specifically documented in such a letter.

2.1.3. Watershed Permits

Watershed permits are issued for projects within a regulated water supply watershed. In Raleigh there are two water supply watersheds; the Reservoir Watershed (Falls Lake and Swift Creek) and the Urban Supply Watershed (Upper Neuse/Richland Creek). All projects within a protected watershed may be subject to limitations on the amount of impervious surface area (driveways, sidewalks, rooftops, etc.). The recorded subdivision plat should indicate if any impervious limitations exist and what they are.

The specific impervious limitations for a permitted project will be denoted on the Watershed permit in the Conditions/Comments section.

2.1.4. Stormwater Tracking Permits (SWT)

A SWT permit is issued to track compliance with stormwater regulations located in Part 10, Chapter 9 of the Raleigh City Code governing any change in the amount of impervious surfaces such as rooftops, parking lots, or sidewalks on a site.

SWT permits also allow the City to document nutrient offset payments, identify permanent stormwater BMPs, and to hold the Certificate of Occupancy (CO) on a building in order to achieve compliance. Typically there are two types of SWT permits:

2.1.4.1 Nutrient Offset Payments and BMPs

Under the state's Neuse River Basin Nutrient Management Program, nutrient offset payments and permanent stormwater BMPs, may be used independently or in conjunction, depending upon site design, to mitigate nutrient loading

rates. When BMPs are utilized, an as-built plan and engineer's certification must be submitted and accepted for each BMP prior to final inspection approval and potentially the issuance of a CO.

2.1.4.2. Stand Alone

SWT permits designated as "Stand Alone" are issued for construction of multiple unit buildings such as townhomes, apartments, etc. and can be issued for individual commercial buildings. As each building/unit is completed, the area around the building must be stabilized/landscaped before the CO is approved for that building. The final inspection and approval of the "Stand Alone" to release the CO for the last unit or building cannot occur until the entire site is in compliance and temporary measures have been removed. This includes establishing ground cover and City written acceptance of any required flood certifications and/or permanent stormwater BMP as-built's and engineer's certifications.

2.2. Flood Permits

The City and Federal Emergency Management Agency (FEMA) have identified over 23 square miles of floodplain within Raleigh's jurisdictional area. Flooding primarily occurs in three major watersheds: the Neuse River, Crabtree Creek and Walnut Creek. The implementation and enforcement of the City's floodplain management program has far reaching affects, including the amount that our citizens must pay for flood insurance under the National Flood Insurance Program (NFIP).

Flood permits are required for all development activities conducted on property that is located within a flood prone area or floodplain - one that is likely to be inundated with storm water during the "1% annual chance" storm event (also known as the "100-year" storm event).

Anytime work is performed in the floodplain, a Flood permit is required. Because of this, multiple Flood permits could be issued for a single project. Flood permits begin with the letters "FL" and the type of floodplain determines what is required under the permit. This information is found in the comments and permit details sections of the permit document.

The City currently recognizes three types of floodplain: FEMA designated floodplain, drainage basin study maps, and flood hazard or alluvial soils.

2.2.1. FEMA Designated Floodplain

FEMA illustrates floodplains utilizing the Digital Flood Insurance Rate Maps (DFIRM) database, which shows areas that have potential to be inundated with flood waters during the 100-year storm event. The FEMA floodplain includes the floodway and the floodway fringe. FEMA floodplain mapping includes only areas with a contributing drainage area of at least one square mile (640 acres).

2.2.2. Floodplain Based on Drainage Basin Study Maps

The City develops maps to supplement the DFIRMs. The City Drainage Basin Study maps utilize the same criteria as the DFIRMs to illustrate floodplain areas with a contributing drainage area of less than one square mile (640 acres) and at least l00 acres.

2.2.3. Floodplain Based on Flood Hazard Soils or Alluvial Soils

Flood Hazard or Alluvial Soils are soil types illustrated on the Wake County Soil Survey. The City considers the following soil types to be flood prone or a flood hazard:

Table 1: Flood Hazard Soils Identified in the City Code

Soil Name	Map Symbol
Altavista fine sand loam, 0-4% slopes	AfA
Augusta fine sand loam	Au
Buncombe soils	Bu
Chewacla soils	Cm
Congaree fine sand loam	Co
Congaree silt loam	Cp
Mantachie soils	Me
Roanoke fine sand loam	Ro
Wahee fine sandy loam	Wh
Wehadkee silt loam	Wn
Wehadkee and Bibb soils	Wo

2.3. Special Site Considerations

There are many regulatory programs and requirements that apply to projects permitted in the City. Some of these programs are implemented by state and federal agencies. If a project is subject to state or federal permitting, the permit application submitted to the City will need to include copies of all approvals or other required information. Some common state and federal program requirements include DENR Land Quality Section self-inspections, National Pollutant Discharge Elimination System (NPDES) stormwater permits, and Clean Water Act 404/401 permits, and are described in more detail below. The City also has special site considerations for single family residential construction, which is also discussed below.

2.3.1. NCDENR Land Quality Section Self-Inspections

Effective October 1, 2010, all sites over 1 acre conducting land disturbing activity must self-inspect their project after each phase is completed. Phases to be inspected include:

- Installation of perimeter erosion and sediment control measures;
- Clearing and grubbing of existing ground cover;
- Completion of any phase of grading of slopes or fills;
- Installation of storm drainage facilities;
- Completion of construction or development; and/or
- Establishment of permanent ground cover sufficient to restrain erosion.

The inspections are to be documented using the DENR Land Quality Section Self-Inspection Report. This is a state requirement that is administered and enforced by the state DENR Land Quality Section. The City Inspector may ask to see these reports while on site, but they are not submitted to or enforced by the City.

2.3.2. NPDES Stormwater Permits

All development projects in North Carolina that disturb an acre or more of land require a local or state approved Erosion and Sedimentation Control (E&SC) plan and a NPDES permit. If the City approved plan includes the additional conditions of the DWQ permit, the project will be deemed covered by the DWQ NPDES Stormwater General Permit NCG010000 for construction-related activities. Plan submittals require a separate sheet to address NPDES requirements. The NPDES general permit will be provided to the customer at the pre-construction meeting and can also be downloaded from the DWQ web site. Per City Code, all reports generated under the NPDES stormwater permit must be submitted to the City. These reports are not required to be submitted to DWQ, but must be maintained on site and provided to DWQ upon request.

2.3.3. Clean Water Act 401/404 Permits

Water bodies impacted by development activity will require additional permitting from other agencies. Copies of these permits must be included in the City permit submittal package. The U.S. Army Corps of Engineers (USACE) issues 404 Permits for the discharge of fill material into streams, wetlands and open waters. "404" refers to Section 404 of the Clean Water Act.

The DWQ issues 401 Water Quality Certifications (WQC). "401" refers to Section 401 of the Clean Water Act. When the state issues a 401 WQC (which is required for any federally permitted or licensed activity that may result in a discharge to waters of the U.S.), this certifies that a given project will not degrade Waters of the State or violate State water quality standards.

A 401 WQC is required for any federally permitted or licensed activity that may result in a discharge to waters of the U.S. Typically, if the USACE determines that a 404 Permit is required because the proposed project involves impacts to streams, wetlands, or surface waters, then a 401 WQC is also required. Examples of activities that may require 401/404 permits include:

- Any disturbance to the bed (bottom) or banks (sides) of a stream.
- Any disturbance to a wetland.
- Damming a stream channel to create a pond or lake.
- Placement of any material within a stream, wetland or open water, including material that is necessary for construction, culvert installation, causeways, road fills, dams, dikes or artificial islands, property protection, reclamation devices and fill for pipes or utility lines.
- Temporary impacts including dewatering of dredged material prior to final disposal and temporary fill for access roads, cofferdams, storage and work areas.

2.3.4. Single Family Residential Construction

Typically, a subdivision is developed under a LD permit that regulates the construction of the overall subdivision. Once utilities and streets are in place, the lots are usually sold to individual builders/owners who finish the development process by constructing homes on the lots. The City requires a LD permit be issued to builders/lot owners under certain circumstances which are summarized in Table 2 below. Specific permitting information for single family construction can be found in Appendix D.

Table 2: Criteria for Permitting Land Disturbing Activity on Single Family Residential Lot (SFR LD Permits)

Size of SFR	**< 12,000 sq. ft.**	**≥ 12,000 sq. ft.**
Plan required to be prepared and filed with the City:	No*	**Yes****

*** The City has the right to require preparation and approval of soil and erosion and sedimentation control plans where off-site sedimentation occurs; soil erosion and sedimentation control plans are required for any land disturbing activity in any Reservoir Watershed Protection Area Overlay District, in any watercourse natural buffer yard, in open space areas, and relocation of any natural watercourse.**

****Single family lots that total ≥12,000 sq. ft. can be comprised of a single lot, adjoining lots or multiple lots/not adjoining within the same subdivision and the same owner.**

Note: Silt fence and a stabilized construction entrance are required for all single family construction projects, even if the disturbed area is less than the 12,000 sq. ft. threshold for obtaining a grading permit (see Section 4.3.2 for erosion control requirements).

CHAPTER 3

CITY DESIGN REQUIREMENTS

3. CITY DESIGN REQUIREMENTS

The City has erosion control plan design requirements above and beyond those required by the State of North Carolina. For minimum design requirements, please refer to North Carolina Erosion and Sediment Control Planning and Design Manual. More stringent City requirements are provided below, with the associated Raleigh City Code Section noted.

3.1. Seeding & Stabilization (Section 10-5006)

"Any portion of a site upon which further land-disturbing activity is not being undertaken shall be provided with permanent ground cover sufficient to restrain erosion within fourteen (14) calendar days of temporarily or permanently suspending the land disturbing activity…"

3.2. Design Storm (Section 10-5006)

Adequate erosion control measures must be..."planned, designed, installed and maintained…during construction for the maximum calculated peak rates of runoff from the 10 and 25-year storms."

3.3. Peak Attenuation (Section 10-9023)

Peak Attenuation is necessary to reduce downstream flooding impacts resulting from new development. Requirements include:

3.3.1. "For any land disturbing activity on sites…between 5 and 15 acres…peak stormwater runoff leaving the site at each discharge point for the 2 and 10-year storm shall be no greater during construction than for pre-development conditions…"

3.3.2. "For any land disturbing activity on sites…greater than 15 acres…peak stormwater runoff leaving the site at each discharge point for the 2, 10 and 25-year storm shall be no greater during construction than for pre-development conditions…"

3.3.3. Regulation shall not be applicable when disturbed acreage is less than 5 acres and the 2-year peak discharge for the disturbed condition is less than 10% of the peak discharge from the contributing watershed as measured at the nearest receiving watercourse…"

3.4. Structures in Flood Prone Areas

There are specific design and construction requirements that should be considered for residential, accessory, and commercial structures built within flood prone areas. Additional certifications and documentation may be required prior to the issuance of a CO and these requirements are indicated within the comments and permit details sections of the permit document. The major design and construction requirements for structures in flood prone areas are Elevation of the Lowest Floor, Flood Vents, and Floodproofing, which are explained below

3.4.1. Lowest Floor Elevation

For new construction or substantial improvement of structures located in flood prone areas, the lowest floor (including basement) and attendant mechanical, electrical, heating, ventilation, air conditioning equipment, and any other service facility must be elevated at least to the Regulatory Flood Protection Elevation (RFPE). RFPE is defined as the Base Flood Elevation (BFE), or 1% annual chance flood elevation, plus two (2) additional vertical feet.

Prior to issuance of a CO, a Professional Land Surveyor shall certify to the nearest tenth of one foot, in NAVD 88 datum, the elevation of the lowest floor. For structures located within FEMA identified floodplain areas, a FEMA Elevation Certificate must be completed and submitted prior to the final inspection. For structures located within non-FEMA delineated floodplains, a City of Raleigh Lowest Floor Certification Form must be completed by a Professional Land Surveyor and submitted prior to the final inspection.

3.4.2. Flood Vents

Flood vents are required for all new construction and substantial improvements that fully enclose areas below the RFPE which are usable solely for parking of vehicles, building access, or storage in an area other than a basement, and which are subject to flooding. All flood vents shall be designed to automatically equalize hydrostatic flood forces on exterior walls by allowing for the entry and exit of flood waters. Openings in foundation walls, also known as “flood vents” must meet or exceed the following minimum design criteria:

- There must be a minimum of two (2) openings on different sides of each enclosed area. If a building has more than one enclosed area, each area must have openings on exterior walls to allow floodwater to directly enter and exit.

- The total net area must be at least one square inch for every square foot of enclosed area below the RFPE.

- The bottom of all openings shall be no higher than one foot above grade as measured from the outside of the foundation.

- Openings may be equipped with screens, louvers, valves, or other coverings or devices provided that they permit the automatic entry and exit of floodwaters.

Prior to issuance of a CO, a Professional Land Surveyor shall certify the number and sizing for the installed openings. For structures located within FEMA identified floodplain areas, this information should be provided on the FEMA Elevation Certificate. For structures located within non-FEMA delineated floodplains, the flood vent information should be provided on a City of Raleigh Lowest Floor Certification Form.

3.4.3. Floodproofing

New construction or substantial improvement of nonresidential or residential accessory structures located in flood prone areas may incorporate floodproofing measures as outlined within 10-6037(b) of the Raleigh City Code. The two generally accepted flood proofing methods are known as "Dry Floodproofing" and "Wet Floodproofing".

An Emergency Plan may be required to be submitted during plan review and prior to the approval of the Flood permit. If utilizing flood-proofing measures, a FEMA Floodproofing Certificate must be completed and submitted prior to the final inspection.

3.5. Phases of Construction

All erosion control plans require a minimum of two phases of construction shown on separate plan sheets. In some instances, more phases may be necessary due to the complexity and/or construction sequencing of the site development. Dialogue is encouraged between the designer and the contractor, when possible, prior to the design of the erosion control plan; the contractor will be required to follow the plan as permitted.

3.5.1. Phase 1: Rough Grading

Phase 1 should include the perimeter measures utilized during the clearing, grubbing, and rough grading of the site. Examples of such perimeter measures include, but are not limited to, silt fence, silt fence outlet, construction entrance, diversion ditches, basins, etc.

3.5.2. Phase 2: Fine Grading

Phase 2 should address the measures needed upon installation of storm systems, pavement, buildings, ditches, etc. Examples of measures used in Phase 2 include, but are not limited to, inlet protection, slope drains, basins, silt fence, silt fence outlets, etc.

3.6. Construction Sequence

Each phase of construction should have a specific construction sequence which identifies the order in which the site is developed, brought to finished grade and stabilized. The removal of particular devices can be identified in the construction sequence if the process is thought out prior to design and approval of the erosion control plan. Otherwise, a stormwater inspector will have to approve removal of devices prior to the work being done.

The following items, at a minimum, need to be included in all construction sequences:

1. Submit documentation required under the site NPDES stormwater permit for construction activity (NCG010000) to Stormwater Inspections throughout the project.
2. Prior to beginning construction, call the Stormwater Inspections Regional Coordinator at (919) XXX-XXXX to schedule an on-site pre-construction meeting. (see appendix for map of coordinators and phone numbers)
3. Install all temporary erosion and sediment control measures. Limit clearing and land disturbing activity to only the area necessary to install the permitted measures.
4. Call the rapid response number (919) 857-4412 to schedule a Stormwater Site Inspection.
5. Upon approval of the Stormwater Site Inspection, commence permitted land disturbing activity – clearing and grubbing.
6. All erosion control measures shall be inspected and maintained, if needed, at least once per week and after every rainfall event.
7. Stabilization is required within 14 calendar days of completion of any phase of grading or inactivity on project site.
8. Site stabilization is required prior to final approval of grading permit and issuance of Certificate of Occupancy. Grass utilized as permanent ground cover must be at a mowable height that generally provides at least 80% coverage throughout the site, with no large bare patches or evidence of erosion.
9. If applicable, at a minimum of seven (7) calendar days prior to scheduling the Stormwater Final Inspection, submit a City of Raleigh Form 511 and approvable BMP As-Built Plan and Engineer's Certification to City of Raleigh staff for review and written acceptance. The certifications must be accepted prior to a Certificate of Occupancy being issued.
10. If applicable, elevation Certificate submittal, review and acceptance is required prior to approval of final Flood permit inspection.
11. If applicable, impervious survey submittal, review and acceptance is required prior to approval of final Watershed permit inspection.
12. Call the rapid response number (919) 857-4412 to schedule a Stormwater Final Inspection.

3.7. Stormwater Best Management Practices (BMPs)

Permanent stormwater devices are required on some projects to remove pollutants from stormwater runoff, reduce downstream erosion, provide flood control, and promote groundwater recharge. These structural BMPs refer to constructed structures that typically require engineering design.

3.7.1. Design Criteria

Stormwater BMPs are designed to meet a variety of requirements including peak attenuation and nutrient reduction. All major design elements, as identified in the North Carolina Division of Water Quality Stormwater Best Management Practices Manual, should be met to qualify as a BMP for nitrogen and/or phosphorus reduction. In many instances, this will require site investigation prior to the design of the BMP to determine the suitability of the site for a specific type of BMP. The following items must be provided for each stormwater BMP:

- Drainage area map showing all on-site and adjacent off-site drainage;
- Map identifying proposed private drainage easement(s) and access for maintenance from a public right of way;
- Elevation of seasonal high water table in the location of each BMP as determined by a geotechnical engineer or North Carolina Licensed Soil Scientist;
- A numbered list corresponding to the major design elements for the appropriate BMP identifying how each element is being achieved. This can be a copy from the manual with notes in the margins.

3.7.2. Certifications & As-Built

Certification by an appropriate design professional of each stormwater BMP, as-built plans, and City staff acceptance of BMP(s) are required prior to final approval of a SWT permit, which is tied to the CO on a building. The as-built plans and certification (Form 511) must be signed and sealed by an appropriate design professional and all applicable checklist items must be included. The as-built plans must show field location, size, depth and planted vegetation of all stormwater structures and devices as installed. The plans must identify, in tabular form, the acreage of impervious area, pervious or managed open space, and permanently protected open space.

3.7.3. Annual Inspections

The property owner is responsible for having an annual inspection report submitted to the City (Form 501). The annual inspection anniversary date will be set when the City accepts the original as-built plan and certification.

3.8. NPDES Stormwater

For projects with one acre or more of disturbed area, a separate plan sheet titled "NPDES Stabilization Plan" must be submitted to address the DWQ NPDES general stormwater permit for construction activities (NCG010000) requirements. If the NPDES Stabilization Plan is submitted and basin surface withdrawal requirements are met per the NCG010000 general stormwater permit, the NPDES general stormwater permit will be automatically issued when the grading permit is issued by the City. If this separate NPDES Stabilization Plan sheet is not provided and the basin surface withdrawal requirements of the NCG010000 are not met, the project is required to be covered under an individual NPDES stormwater permit, which can be obtained from DWQ.

The general permit requirements can be downloaded on the DWQ web site. NPDES requires specific ground cover standards that, in some instances, differ from City requirements. The submitted NPDES Stabilization Plan sheet should address all ground cover and any other NPDES requirements for the site. The critical areas which require more stringent stabilization requirements should be hatched and an associated legend should be included on the plan sheet. A statement block with the following standard language must be included on the NPDES Stabilization Plan sheet:

- This page is submitted to comply with NPDES General Stormwater Permit NCG010000;
- This page can be approved by the City pursuant to NPDES General Stormwater Permit NCG010000 only;
- This page of the approved plans is enforceable exclusively pursuant to NPDES General Stormwater Permit NCG010000;
- The City is not authorized to enforce this page of the plans and it is not a part of the approved plans for purposes of enforcement action under the City Code.

3.9. Common Mistakes & Omissions

City staff identified the following items as those that are most commonly overlooked or omitted from plan submittals. These omissions can result in extended review times and a lengthy permitting process. Please ensure that all submitted plans include the following design standards and supporting documentation.

3.9.1. Design Standards

Standardized design requirements apply to all projects permitted by the City. The following Appendices contain common design standards:

Subject	Appendix
Ground Cover	8.1
Cut & Fill Areas	8.2
Erosion and Sediment Control Detail Drawings*	8.3

** These standard detail drawings can be downloaded from the City web site. A list of the available standard detail drawings is located in Appendix 8.3.*

3.9.2. Supporting Documentation

The items listed below are frequently overlooked and should be included with supporting documentation for any erosion control plan. Please refer to the appropriate chapters of the North Carolina Erosion and Sediment Control Planning and Design Manual as identified beside each subject:

Subject	Chapter*
Ditch analysis	6.20
Required stabilization	8.05
Silt fence slope requirements	6.62
Slope drains	6.32

** North Carolina Erosion and Sediment Control Planning and Design Manual*

Additional items listed below are required, but are frequently overlooked or submitted in an incomplete or insufficient state:

- Financial Responsibility/Ownership Form
- Stormwater quantity, quality and erosion control calculations
- Existing and proposed grades
- Project, property, disturbed area and floodplain boundaries
- Offsite conditions
- Standard details
- Size and length-to-width ratio for sediment basins
- Construction sequence on erosion control plans

CHAPTER 4

PERMITTING

4. PERMITTING

The City requires a grading permit for any project that disturbs more than 12,000 square feet (0.275 acres). Additional permits may also be required for construction or development within watercourse buffers, water supply watersheds, or floodplains (see Chapter 2: Site Design). The permit application submittal includes the application form, permit fees, Financially Responsibility/Ownership Form (FRO), and development plans that include erosion and sediment control plans, permanent stormwater control measures, and all supporting documentation.

The FRO form includes legal information about the people who are responsible for the project. It also lists designated agents of the responsible party. This form is a contract between the City and the parties responsible for the project. The listed parties are responsible for submitting a new FRO whenever project ownership and/or contact information on file changes. All documentation on a project, such as City inspection reports and letters, will be sent to the party listed as the person or firm financially responsible for the land disturbing activity and will also be copied to any agents listed on the form and courtesy contacts that have been provided.

Once received, a stormwater development plan review engineer will review the plans, work with the design engineer to resolve any issues and approve the plans and issue the permit. Stormwater engineers often work with the appropriate stormwater inspectors to perform a joint initial plan review. It is not uncommon for plans to go through several stormwater engineering reviews before being approved. For large or complex sites, the stormwater inspector may perform a site review in the field prior to participating in the plan review.

4.1. Permit Applications

The permit application will be given a precursory review for completeness when it is submitted. If accepted, the application will be logged in to the City permit tracking system and routed to the appropriate plan reviewers. Section 2.3.4 provides single family residential permit submittal requirements. All other submittals must include the following items, ***as appropriate***:

- Permit Application Form
- Stormwater Permit Checklist
- Financial Responsibility/Ownership Form
- Four (4) sets of 24”X36” plans sealed by PE, RLA, or PLS
    - When applicable, the following note should be included on the plans: “The developer will be responsible to ensure that all individual lot builders and/or site contractors maintain the erosion and sediment control devices during construction and that any failure by the builders or contractors to maintain the erosion and sediment control devices may result in enforcement against the developer under this grading permit.”
- One (1) set of erosion control design calculations
- Operation and Maintenance Manual
- Stormwater Calculations

    - One (1) set of stormwater BMP design calculations
    - One (1) set of Water Quality calculations (Nitrogen and/or Phosphorus loading)
    - One (1) set of Water Quantity calculations (Runoff and Detention)
- NPDES Stabilization Plan sheet
- Surveyor letter indicating buffers have been flagged
- DWQ approval(s)
- USACE approval(s)
- FEMA approval for floodway encroachment
- City Flood study number with approval date
- DENR Land Disturbance approvals for City or State project which disturb one (1) acre or more
- Fee payment (current fee schedule is on the City's web site)

Complete permit application packages should be submitted to:

Customer Service Center
One Exchange Plaza, Suite 400
Raleigh, NC 27601

4.2. Plan Review

The submitted package is routed to the appropriate plan reviewers for initial plan review. This review cycle is ten (10) days. Once comments have been prepared by City staff, the Customer Service Center will contact the applicant to pick up the plans for revision, if necessary. Once revisions are completed and the complete package is resubmitted, the subsequent review period is five (5) days.

4.2.1. Surety for Grading Permit

Prior to the issuance of a grading permit (>12,000 sq. ft. of land disturbance), a surety is required for the total disturbed acreage as identified in the submitted plans. The surety will ensure that stabilization is achieved throughout the disturbed areas in the event the Financially Responsible Party/Owner is unable to complete such task. The surety will be assessed using the following criteria:

- $1,000/acre of land disturbance rounded to the nearest 1/10 acre.
- For example: Land disturbance = 1.12 acres: Surety = $1,100

The surety shall be released once the site is stabilized with a sufficient amount of ground cover to prevent erosion or permanent mowable vegetation with 100% coverage and 80% growth with no large bare patches.

4.3. Permit Issuance

Once the plan reviewers have approved the submitted plans, the package is sent to final review and preparation for permit issuance. The Customer Service Center will contact the applicant to pick up the permit and approved plans. The permit is not

officially issued until the approved plans and permit have been picked up and all fees have been paid.

4.3.1. No Fee Flood Permits

Certain Flood permits may be eligible for a No Fee Flood Permit. The City plan reviewer will determine if a no fee permit is appropriate, but in general a no-fee permit may be issued for projects such as:

- Installation of underground utilities without fill (irrigation meters, light poles, water/sewer connections, etc.),
- Installation of temporary power poles,
- Minor alteration of building interiors such as moving walls, adding sprinklers, etc.,
- Replacement of mechanical, electrical or plumbing equipment, or
- Construction of outdoor, non-enclosed structures such as decks, patios, swimming pools, landscaping walls, play equipment, fences, etc.

4.3.2. Single Family Residential Construction

Silt fence and a stabilized construction entrance are required for all single family construction projects, even if the disturbed area is less than the 12,000 sq. ft. threshold for obtaining a grading permit. The required construction entrance should be at least ten (10) feet wide or the width of the proposed driveway and twenty-five (25) feet long. Silt fence is always required on the low side(s) of the lot. In addition, silt fence should be installed along all watercourse buffers to prevent off-site sedimentation. At a minimum, the installation of erosion and sediment control measures must be equal to or exceeding standards shown on the City standard details, which are available on the City web site.

If a catch basin/yard inlet is located within the limits of disturbance of the lot, then inlet protection is required. Additional measures should be installed as needed to prevent off-site sedimentation.

The City has the right to take enforcement action and/or require any project to obtain a grading permit where off-site sedimentation occurs.

Single family construction is subject to permitting as described in Section 2.3.4 and Appendix D. The following items must be included in each single family residential permit submittal:

- ☑ Permit fee
- ☑ Financial Responsibility/Ownership Form 112
- ☑ Financial Responsibility/Ownership Addendum Form 112-A (*multiple lots only*)
- ☑ Erosion Control Plan sheets which include, at a minimum:

- Subdivision plan sheet indicating lots owned/covered under the permit.
- City standard construction details for silt fence, construction entrances, and any other proposed erosion and sediment control measures.
- Construction sequence indicating the following:
  - A new Financial Responsibility/Ownership Addendum Form 112-A shall be submitted whenever lots are sold or purchased and intended to be covered under this permit.
  - Erosion and sediment control measures shall include silt fence installed on the low sides of the lot and stabilized construction entrances for ingress/egress.
  - Erosion and sediment control measures shall be installed prior to any land disturbing activity.
  - Additional measures will be installed as needed to prevent sediment from leaving the site.
  - Call the automated voice response system 24-hours a day at (919) 857-4412 to schedule a Site Inspection once the erosion and sediment control measures have been installed on the first lot and before land disturbing activity occurs.
  - All erosion and sediment control measures will be maintained in good working order throughout the project.
  - The lot shall be stabilized and approval from the inspector attained prior to removing erosion and sediment control measures.
  - Permanent ground cover shall be installed within fourteen (14) calendar days following suspension or completion of construction.
  - The site shall be permanently stabilized and all erosion and sediment control measures shall be removed prior to obtaining a Certificate of Occupancy.
  - Once all construction on all lots is complete, call the automated voice response system 24-hours a day at (919) 857-4412 to schedule a Final Inspection. Final Inspection approval shall signify the owner's request to close the land disturbing permit.

CHAPTER 5

CONSTRUCTION

5. CONSTRUCTION

This section is particularly relevant to contractors, project managers and others responsible for getting the project successfully completed. The City has specific requirements for projects which can result in delayed completion and prevent issuance of a CO if not properly addressed in a timely manner. These requirements are highlighted below.

5.1. Approved Plans

The site is inspected for compliance with the approved plans, so it is important the approved plans reflect the measures in use. If the contractor has not been consulted prior to permitting, the first opportunity to revise the approved plans will occur at the pre-construction meeting.

Stormwater Inspectors can approve minor revisions that do not require an engineer's design and /or calculations. These minor plan revisions may be informally completed on site by the City stormwater inspector or a formal field revision submittal may be required. City staff reserves the right to determine when a field revision is appropriate and to require a field revision submittal if necessary. Minor revisions include changing or adding a City Standard Detail measure that does not require an engineering design. Any changes made in the field must be shown on the inspector's copy and the contractor's copy of the approved plans in order to avoid confusion over compliance issues. These changes to the plan must be initiated by the permit holder and/or responsible party, as the inspector cannot direct work on the site or take responsibility for designing and implementing appropriate measures. It is strongly recommended that an engineer be consulted before making any changes to the approved plan. All other changes to the approved plans will require a formal plan or field revision submittal and plan review.

5.2. Plan Revisions

A plan revision will be needed when implementation of the approved erosion and sediment control plan does not adequately control the site and/or changes to the approved plan are necessary. A plan revision and associated review fees are required in order to change the approved limits of disturbance. Refer to Section 4.1 for plan revision submittal requirements

5.3. Field Revisions

If the stormwater inspector requires a field revision or a proposed measure requires an engineer or other registered professional to perform calculations and/or design, a field revision must be submitted for plan review and approval. A Field Revision Form is required for all field revision submittals. There is a Commercial Revision Form (Form 119) and a Residential Revision Form (Form 118). The appropriate form must be submitted depending on the site work being conducted. This form must be signed by a stormwater inspector and will not be accepted without a signature. The required

review fee is paid when the approved revision is picked up from the City offices. The field revision submittal must include:

- The appropriate revision form
- One (1) copy of the original approved plan, and
- Four (4) copies of the revised plan sheets

A field revision is not appropriate for increasing limits of disturbance on a project. A new plan submittal and associated review fees are required in order to change the approved limits of disturbance.

5.4. Financial Responsibility Revisions

Under City of Raleigh Code Section 10-5011, a fully executed FRO is required as a part of the approved Sediment and Erosion Control plan and grading permit. When this information changes for any reason, a new form must be immediately submitted to the City.

5.5. Construction Sequence

The construction sequence is part of the approved plans and must be followed. Changes to the construction sequence should be discussed with the stormwater inspector and noted on the plans. Major changes to the sequence will require a field revision.

5.6. Inspections

During construction, the project will have required and unscheduled inspections. The required inspections are typically a Site Inspection and a Final Inspection. Work should not begin until the initial erosion and sediment control measures have been installed and approved by a stormwater inspector via a scheduled Site Inspection. Once the Site Inspection is approved, clearing and grubbing may commence. Routine, or unscheduled inspections, will occur throughout the construction process. The Final Inspection is required to obtain a CO and close out the permit. The Final Inspection cannot be scheduled until all permitted work is complete. Special conditions apply for certain permits. See Section 6.5 for specific information on what is required prior to scheduling a Final Inspection. More complete information on inspections can be found in Section 6 of this manual.

5.7. Scheduling Inspections

The standard information needed to schedule a Site Inspection is the permit number, group number and project address. All of this information is provided on the permit. There are two (2) ways to schedule an inspection. You can either;

- Use the on-line development center (user account and password required), or
- Call the automated Rapid Response System at (919) 857-4412

5.8. NPDES Report Submittals

Effective August 1, 2010 the City of Raleigh Code Part 10, Section 10-5006(a)(4)(d) requires that all NPDES permitted construction sites submit NPDES inspections to the City. Any site disturbing 1 acre or more is subject to NPDES permitting. NPDES permits require self-inspections of the site at least once every seven days, and/or after every rainfall greater than 0.5 inches in a 24-hour period. The NPDES form can be found at the DWQ website at: *http://portal.ncdenr.org/web/wq/ws/su/npdessw#tab-3* and will also be provided in the pre-construction meeting packet. The inspection reports are not required to be submitted to DWQ, but must be maintained on site and provided to DWQ upon request. The City provides a quarterly list to DWQ which summarizes which sites are submitting and which sites have been issued advanced enforcement actions.

5.9. Ground Cover

Ground cover is the best erosion control measure available and ground cover requirements are taken very seriously. It is important to understand the ground cover requirements that apply to your site. These should be clearly presented in the construction sequence on the approved plans.

Where grass is utilized as permanent ground cover, it must be at a mowable height that generally provides at least 80% coverage throughout the site, with no large bare patches or evidence of erosion. If the project is scheduled for completion during a poor growing season or on a short time frame, it is best to plan on utilizing sod.

5.10. Certifications & As-Built

Permanent stormwater treatment devices, or BMPs, must be certified by a Professional Engineer, Professional Land Surveyor (PLS), or Registered Landscape Architect (RLA) before the final inspection can be approved. The certification includes as-built drawings, a Stormwater BMP As-Built Certification (Form 511), GPS coordinates and photographs of the structure(s). Certification submittals must be made to the City at least seven (7) days prior to scheduling the Final Inspection. The certification must be accepted in writing by a Stormwater Plan Review Engineer before the Final Inspection can be approved.

5.11. Certificate of Occupancy

In order to obtain a CO, Final Inspection approval is required.

CHAPTER 6

STORMWATER INSPECTIONS

6. STORMWATER INSPECTIONS

The Stormwater Inspections Group (SIG) performs stormwater inspections for erosion/sediment control, stormwater BMPs, flood, watershed and buffer requirements throughout the City. The SIG inspects projects to ensure that they are in compliance with the approved plans, issued permits and the City Code. The SIG is customer service oriented and each project has a team of stormwater inspectors with specific project knowledge. This ensures there will always be an informed City representative available to help with issues on the site. The SIG also issues enforcement actions against projects that cannot be brought into compliance through other means. A list of stormwater inspector contacts can be found in Appendix F.

6.1. Pre-Construction Meeting

A Pre-Construction Meeting is to be held before any land disturbing activity begins. Once the final erosion control plan is approved and the permits are obtained, a call to one of the stormwater inspectors servicing the region should be made. The stormwater inspector's contact information is typically listed in the Construction Sequence section of the approved erosion and sediment control plan.

The pre-construction meeting will consist of a review of the erosion control plan, the construction sequence and any questions the property owner, appointed agent or contractors may have. The stormwater inspectors will review the inspection and enforcement process and provide guidance on how to remain in compliance. Any courtesy contacts to receive City inspection reports can be added at this time.

6.2. Site Inspection

The Site Inspection is an inspection of the site to make sure that appropriate measures are in place before work begins. If the permit is tied to a building, then footings cannot be poured until the Site Inspection is approved. The standard information needed to schedule a Site Inspection is the permit number, group number and project address. All of this information is provided on the permit. See Section 5.7 for information on how to schedule an inspection.

6.2.1. Grading Permit

The grading permit Site Inspection should be scheduled once all temporary measures have been installed. Follow the construction sequence listed in the approved erosion and sediment control plan for specific measures and installation sequence. Once the Inspector has approved the Site Inspection, grading work may begin within the limits of disturbance designated on the approved Erosion Control Plan.

6.2.2. Watercourse Buffer Permit

The Site Inspection should be called in at the beginning of the project. The stakes or flags demarcating the watercourse buffer should be easily visible to the stormwater inspector. No encroachment is permitted in the watercourse buffer and the stakes or flags must remain in place throughout the project.

6.2.3. Watershed Permit

Watershed permits typically only have a Final Inspection. However, if a Site Inspection is listed on the permit, it should be called in at the beginning of the project.

6.2.4. Stormwater Tracking Permit (SWT)

The SWT permits issued for Nutrient Offset Payments and Stormwater BMPs require a Site Inspection approval for the device(s) and should be called in along with the grading permit unless otherwise directed by the stormwater inspector. For certain devices such as underground detention and sand filters, the stormwater inspector may request that the Site Inspection be called in during the installation process. This is to ensure the device is in the location designated in the approved plan and is the correct dimensions.

The Site Inspection for Stand Alone SWT permits should be called in when the erosion control measures are installed. For a typical Stand Alone building, erosion control measures should be installed to keep sediment on the site. The Site Inspection will automatically be scheduled with the Footings Inspection if not called in beforehand. If erosion control measures are not installed, the Site Inspection will be rejected. Stand Alone SWT permits that are covered under an overall grading permit typically only have a Final Inspection. However, if a Site Inspection is listed on the permit, it should be called in at the beginning of the project.

6.2.5. Flood Permit

The RFPE utilizing the NAVD-88 datum as noted in the "conditions/comments" area of the permit determines what is required for Site Inspection approval.

If the RFPE is listed on the permit as a number less than 1, there is no benchmark requirement, but the floodplain must be flagged or otherwise demarcated on the ground prior to the Site Inspection. The floodplain boundary flagging must remain in place during construction and through Final Inspection. In some cases, the proximity of construction to the floodway will necessitate flagging the floodway instead of the floodplain. If this is required, it will be noted in the comments section of the permit.

Most permits have an actual RFPE listed on the permit – a number greater than 1. For these Flood permits, a Professional Land Surveyor must certify that a benchmark has been installed on site prior to the Flood permit Site Inspection. The stormwater inspector will field verify that the benchmark is installed in a location appropriate/convenient to the construction location before approving the Site Inspection. The benchmark must remain undisturbed on the site through the Final Inspection.

6.3. Routine Inspections

In between the Site and Final Inspections, the SIG performs periodic routine inspections to ensure that the project stays in compliance as it progresses. These inspections are documented through an official compliance inspection report. Routine inspections are unscheduled inspections that are conducted on a regular basis for all projects with grading permits.

Sites are prioritized for routine inspection frequency. Factors considered include the potential to impact protected resources, the compliance history, etc. For high priority sites that are actively working, a routine inspection will be conducted a minimum of every fourteen (14) days. For lower priority sites, those that are inactive or lower activity, a routine inspection will be conducted a minimum of every thirty (30) days. Contractors may request a courtesy call when the Inspector is en route to the site, but inspectors cannot pre-arrange routine inspections. A checklist of the items reviewed during a routine inspection can be found in Appendix G.

6.4. Inspection Reports

Once a grading permit is issued, the SIG receives a copy of the permit and the approved plans. If a Site Inspection has not been called in yet, the SIG will perform the first routine inspection within two weeks of the issuance of the permit.

All inspection reports are sent to the persons that are listed on the FRO. The reports are sent via email or fax. Up to three additional courtesy contacts can be added upon request. These usually include the builder and/or contractor. The inspection reports are sent out to all the contacts within one business day of the inspection. Each inspection report has a header with the project information, date and time of the inspection and includes the inspector's information so they can be contacted if needed. The inspection reports also denote a deadline for correcting any non-compliant items, or Immediate Corrective Actions, listed. Inspector's comments may also be provided on items that are in compliance, but may warrant special attention.

6.5. Final Inspection

A Final Inspection is performed to ensure that the project is in compliance with all permitted requirements and is not contributing toward any other stormwater violations. A CO cannot be issued until a Final Inspection has been approved. The final inspection can be scheduled once permitted work is complete, the site is completely stabilized, all temporary measures have been removed, and written acceptance by the City for all required certifications and as-built surveys.

The standard information needed to schedule an inspection is the permit number, group number and project address. All of this information is provided on the permit. See Section 5.7 for information on how to schedule an inspection.

6.5.1. Grading Permit

Prior to scheduling the Final Inspection, all temporary measures must be removed, the site must be completely stabilized (see Section 5.9 for ground cover requirements), and all required certifications and as-built surveys must have been accepted by the City. Once the Final Inspection is approved, the permit is closed and a CO is issued.

6.5.2. Watercourse Buffer Permit

Any required buffer flags or staking must still be in place at the Final Inspection so that the inspector can verify that no unauthorized work occurred in the buffer. Once the Final Inspection is approved, the permit is closed and a Certificate of Completion is issued.

6.5.3. Watershed Permit

Watershed permits usually only have a Final Inspection. These projects are inspected to ensure that there are no hard surfaces exceeding the square footage impervious limit. An as-built plan signed and sealed by a Professional Land Surveyor (PLS) is required in order to verify the impervious limit before a Final Inspection can be approved.

6.5.4. Stormwater Tracking Permits

For nutrient offset payment and BMP SWT permits, a certification is required to be submitted (see Section 3.7.2 for certification and as-built submittal requirements) and written acceptance provided by the City for each stormwater BMP prior to scheduling the Final Inspection. The certification(s) must be submitted to the stormwater inspector or stormwater plan reviewer a minimum of seven (7) calendar days prior to scheduling the inspection and must be accepted before the inspection will be performed.

For Stand Alone SWT permits, the area around each building must be stabilized/landscaped before the Final Inspection can be approved and the CO released. The Final Inspection and approval of the Stand Alone permit to release the CO for the last unit or building cannot occur until the entire site is in compliance and temporary measures have been removed. This includes establishing ground cover (see Section 5.9 for ground cover requirements) and City written acceptance of any required flood certifications and/or permanent stormwater BMP as-built and engineer's certifications.

6.5.5. Flood Permit

The purpose of the Final Inspection is to verify that construction meets elevation, and floodproofing requirements. For new construction or substantial improvement of structures located in flood prone areas, the lowest floor (including basement) and attendant mechanical, electrical, heating, ventilation, air conditioning equipment, and any other service facility must be elevated at least to the RFPE.

If the RFPE is listed as a number less than 1 on the permit, all work related to a structure or livable space must be at or above the lowest existing floor elevation. Livable space is loosely defined as a porch, a deck with electric service, the building interior, a finished basement below grade or an unfinished walk-out basement.

A RFPE of less than 1 is also noted on Flood permits issued for land disturbance only or the construction of an accessory structure within the floodplain. Elevation certifications are not required for final inspection of these permits.

The following certifications, if required, must be received, reviewed, and approved prior to the Final Inspection. All required documentation shall be submitted to the City at least seven (7) days prior to a scheduled Final Inspection.

- **City of Raleigh Lowest Floor Certificate (if required)**
  For structures located within non-FEMA delineated floodplains, a City of Raleigh Lowest Floor Certification Form providing elevation and flood vent information should be completed and submitted prior to the Final Inspection.

- **FEMA Elevation Certificate (if required)**
  For structures located within FEMA identified floodplain areas, a FEMA Elevation Certificate providing elevation and flood vent information should be completed and submitted prior to the Final Inspection.

- **Floodproofing Certificate (if required)**
  New construction or substantial improvement of nonresidential or residential accessory structures located in flood prone areas may incorporate floodproofing measures. If a Floodproofing Certificate is required, it will be noted in the comments section on the Flood permit and it must be completed and submitted prior to the Final Inspection.

CHAPTER 7

ENFORCEMENT ACTIONS

7. ENFORCEMENT ACTIONS

The City understands the dynamic nature of construction activities and strives to balance the regulatory program with the needs of our customers. It is understood that all projects are likely to receive reports on non-compliant items over the course of the project. Communicating with your inspector is the best course of action to prevent enforcement action resulting from initial reported non-compliance.

While the City strives to be customer friendly, we do sometimes encounter sites that do not comply with City requirements. For those sites that do not remedy issues in a timely manner, there is a standardized enforcement process prescribed in Raleigh City Code Part 10, Chapter 5. This process is applied to all projects subject to City permitting for soil erosion and sedimentation control. The process provides escalating enforcement actions and assessment of penalties for sites that do not comply with their permit or the City Code.

7.1. Not in Compliance (NIC) Reports

When a site is inspected and found to have items that must be corrected to be in compliance, a courtesy inspection report is issued. This Not in Compliance (NIC) report specifies a deadline and items that must be corrected. If the deadline is not met or an extension on the deadline is not obtained prior to the re-inspection date, then enforcement action begins. For normal compliance issues, re-inspection will typically occur in seven (7) calendar days. For more urgent compliance issues, the re-inspection time may be as short as 24 hours.

7.2. Notice of Violation (NOV)

A Notice of Violation (NOV) is issued when the corrective actions from the NIC report have not been remedied within the time allotted. NOVs may also be issued immediately without a courtesy NIC report if a violation is particularly severe. The NOV is a legal document that lists the violation(s), provides a deadline for compliance and informs the owner of penalties that may be assessed if the Immediate Corrective Actions are not remedied prior to the deadline. NOVs are typically issued with a ten (10) day re-inspection time frame. If there is high potential for serious resource impacts, a 24-hour or three (3) day re-inspection time frame may be issued.

7.3. Notice of Continuing Violation (NOCV)

A Notice of Continuing Violation (NOCV) will be sent if the corrective actions from the NOV are not completed within the 10 days allotted. When a NOCV is sent, fines are automatically assessed, retroactively, from the date of the initial penalty (NOV receipt date) and accrue on a daily basis until the project is in compliance.

7.4. Penalties

The amount of the initial penalty depends on the violation and is set by the Raleigh City Code. The inspector does not have any leeway in the amount of the penalties. The fines start at $1,000 and go up to $5,000 for the initial penalty. An additional $5,000 per day accrues from the initial date of violation until the item(s) are corrected. An assessment for the initial penalty is sent when the NOCV is issued. A final assessment with the total penalties is issued once the site is brought back into compliance. A list of common violations and associated penalties can be found in Part 10, Section 10-5014 of the Raleigh City Code and also in Appendix 8.8.

7.5. Appeals

Article 3 of Chapter 150B of the General Statutes provides a process for penalties to be appealed within 30 days of issuance. A petition must be filed with the North Carolina Office of Administrative Hearings (OAH). See *www.NCOAH.com* for further details.

7.6. Stop Work Orders (SWO)

If compliance cannot be achieved or continued work on site presents a significant threat to public or private property, a Stop Work Order (SWO) may be issued. This enforcement action prevents the project from receiving any inspections from the City and the only land disturbing activity allowed is that required to remedy violations.

7.7. Service of Enforcement Actions

Enforcement actions are sent to the property owner, financially responsible party and the registered agent via certified mail. If the certified mailing is returned as undeliverable or refused, the enforcement action will be served in person via the Sheriff's Department. If service cannot be achieved through standard methods, a SWO will be issued until the financially responsible party contacts the Stormwater Inspections Group and a course of action to gain compliance is agreed upon.

APPENDICES

Appendix A

Standards and Specifications for Ground Cover

Chapter 1

STANDARD AND SPECIFICATION FOR PERMANENT SEEDINGS ON GRADED DEVELOPMENT AREAS

Definition

Seeding perennial grasses and legumes on critical areas for permanent cover.

Purpose

To stabilize the soil; reduce damage from sediment and runoff to downstream areas, and improve an area for safety and beauty.

Where Applicable

On any sediment-producing, eroding or severely eroding areas (where vegetation is difficult to establish with normal planting methods) such as, construction sites, cut and fill slopes, borrow areas and other areas denuded of vegetation where perennial vegetation is needed for long term protection.

Specifications Guide

A. Site Preparation

1. Install needed surface water control measures.
2. Grade and slope as feasible to use planned equipment for seeding, mulching and maintenance. Slopes steeper than 3:1 are difficult to establish vegetation on and *maintain* with conventional equipment.
3. Chisel compacted areas and spread available topsoil 3" deep over adverse soil conditions as a final operation in grading. Where conventional seeding equipment is to be used, rip the entire area.
4. A minimum of grading and shaping is required when hydraulic seeding equipment is to be used.
5. Remove all loose rock, roots and other obstructions from the surface that will interfere with establishment and maintenance of vegetation. Leave surface reasonably smooth and uniform for final seedbed preparation.
6. Perform all cultural operations of land preparation and seeding on the general contour.

B. Lime, Fertilizer and Seedbed Preparation

1. When soil material is reasonably uniform, apply lime and fertilizer according to soil test report. In the absence of a soil test apply lime as follows:

	Tons / Ac.	Lbs. / 1000 Sq. Ft.
Clay and Clay loams	3	135
Sandy loams, loams, silt loams	2	90
Loamy sands, sands	1	50

Agricultural lime used shall be within the specifications of the North Carolina Department of Agriculture.

2. Rates and analysis of fertilizer if soil test not available:

   a. Grasses alone – 800 to 1,000 pounds per acre (18-23 pounds / 1,000 sq. ft.) of a 1-1-1 ratio such as 10-10-10.

   b. Legumes alone or grass and legume mixture – 800 to 1,000 pounds per acre (18-23 pounds / 1,000 sq. ft.) of a 1-2-2 ratio such as 5-10-10.

3. Phosphorous is essential for developing vigorous ~~seeding~~ root systems. If soil test is not available,

apply 500 to 800 pounds (12-18 pounds / 1,000 sq. ft.) per acre of 20% superphosphate or equivalent in addition to fertilizer listed above or use an analysis to supply the additional phosphorous.

4. When hydraulic seeding equipment is used, no seedbed preparation is required. Cut slopes and compacted areas may require scarification.
   a. The fertilizer, seed and wood cellulose fiber mulch will be mixed with water and applied in a slurry. Spread the mixture uniformly over the area.
   b. The lime will be mixed with water and applied on top of the mulch or the lime may be combined with the top dressing when grass is 2 to 4 inches tall.
5. When conventional equipment is used, the lime and fertilizer will be applied uniformly and mixed with the soil during seedbed preparation.
   a. On field conditions or slopes that are 3:1 or flatter, prepare a seedbed 4 inches deep, excluding rock.
   b. Continue tillage until a well pulverized, firm, reasonably uniform seedbed is prepared.

C. Seeding

Select species from attached table, considering plant adaptation to desired use, site to be vegetated, seeding dates and maintenance requirements or utilize the attached seeding schedule as approved for this area by the Wake County Soil Conservation District. Seed used shall be labeled to show they are within the requirements of the North Carolina Department of Agriculture as to purity, germination, and presence of restricted or prohibited weeds. Erosion control plans or seeding contracts should list species or mixtures to be used, planting dates, seed germination and purity that are acceptable.

1. Conventional seed – Seed on a freshly prepared, firm seedbed. Use equipment that will apply seed uniformly such as cultipacker seeder, drill, or cyclone seeder. Cover seed lightly with seeding equipment or cultipack after seeding.
2. Hydraulic seeding – Mix the fertilizer, *Seed* and wood cellulose fiber mulch with water and apply the slurry uniformly over the area being treated. The slurry must be applied within one hour after mixing the seed with fertilizer.
3. Use inoculant prepared specifically for any legume being seeded. Twice the recommended rate will be used when seeded dry with conventional equipment and four times the recommended rate when seeded with hydraulic equipment.
4. Mulching – Mulch all permanent seedings on critical areas immediately after seeding unless sufficient mulch is present from previous temporary vegetation grown. Mulch is essential to protect seedlings and area from erosion until plant cover is established. Refer to MULCHING specifications for kinds, amounts and anchoring methods.
5. Irrigation – Supplementary irrigation will speed up the establishment of plant cover during most seasons and may prevent failure of seedings not made at optimum planting date or seedings on adverse site conditions. Where irrigation is used, water must be applied at a rate that will not cause soil movement.

D. Treatment after seeding and maintenance is the most important controllable factor in retaining an effective vegetative cover. The kind of grass or grass-legume, soil, weather and the level of management one desires to give a seeding determine the fertilization needed after the first year.

1. Repairs – Inspect all seeded areas and make necessary repairs or reseedings within the planting season, if possible. If stand should be over 60% damaged, reestablish following original lime, fertilizer and seeding recommendations.
2. Control weed growth during establishment mechanically and/or with herbicides. When chemicals are used, follow current North Carolina Agricultural Experiment Station's weed control recommendations and adhere strictly to instructions on the label.

3. LIME

Apply lime according to soil test recommendations for plants being grown. In the absence of a soil test, apply lime from October to March every 4-5 years at rate of 2 tons per acre (100 lbs. / 1,000 sq. ft.)

4. FERTILIZER

Permanent seedings will be fertilized the next growing season after planting. For the warm season plants, this would be early spring (bermuda, sericea, etc.); for the cool season plants, early fall or early spring (tall fescue, bluegrass, etc.)

Follow a regular fertilizer program based on soil test reports and use being made of the vegetative cover. The following fertilization guide is the minimum level that can be expected to maintain land cover. For a quality turf that is mowed regularly, or is subject to heavy use and/or irrigated, much higher fertilization rates will be required.

a. *Stand is primarily Tall Fescue, Bluegrass, and mixtures of Tall Fescue-Red Fescue, and similar cool season plants.* Apply 500 pounds per acre (12 pounds per 1,000 square feet) of 10-10-10, or its equivalent in early fall annually. Additional fertilization with nitrogen or a complete fertilizer is needed in early spring.

   To reduce incidence of leaf diseases, do not apply N on Fescue or Bluegrass from May to mid August in hot humid area.

b. *Stands of Bermuda, Bahia, Lovegrass and similar warm season grasses.* Apply 500 pounds per acre (12 pounds per 1,000 square feet) of 10-10-10 fertilizer or equivalent when the plants start to green up in the spring. Topdress with 60-90 pounds of nitrogen per acre (1-2 pounds per 1,000 square feet) during the growing season. When the higher rate is used, apply in split applications.

c. *Stands of Sericea Lespedeza, Crownvetch and similar legumes.* Fertilize in early spring with 500 pounds of 0-10-20, (12 pounds 1,000 sq. ft.) of 5-10-10 or equivalent per acre every 2-4 years.

d. *Mixtures of Sericea Lespedeza, Fescue, Lovegrass, or Bermudagrass.* Fertilize in early spring with 500 pounds per acre (12 pounds 1,000 sq. ft.) of 5-10-10 or equivalent every 2-3 years. In Fescue-Sericea Lespedeza mixture, apply in the fall if the Sericea Lespedeza is developing better than the Fescue.

e. *Fescue–White Clover, Bluegrass-White Clover and similar mixtures.* Apply 500 pounds per acre (12 pounds per 1,000 sq. ft.) of 0-20-20 or equivalent in early fall. An additional application of nitrogen or complete fertilizer will be needed in the spring to keep plants lush and in balance. Where grass is crowding out the clover, reduce or eliminate spring application of nitrogen.

5. MOWING

Mow Sericea Lespedeza, or Sericea grass mixtures only after frost or sericea seed are mature. Bluegrass should be mowed not closer than 2 inches and Tall Fescue not closer than 3 inches. Mow Crownvetch only when necessary to control bushes. If mowing is done, it should not be lower than 12 inches. Bahia and the bermudas may be mowed at any height desired.

Care should be taken not to damage the vegetation mechanically through use of improper mowing equipment or by attempting to mow with heavy equipment on steep slopes when the vegetation is lush and slippery or when the ground is soft enough to be rutted by mower or tractor wheels.

Where mowing fails to control weeds satisfactorily, apply chemicals in accordance with current North Carolina Agricultural Experiment Station's weed control recommendations and adhere strictly to instructions on label.

Permanent Seedings

Plants and Mixtures 1/	Planting Rates Per Acre 2/	Planting Dates 1. Coastal Plain 2. Piedmont 3. Mountains 3/	Notes
1. Wilmington Bahiagrass	40 – 50 lbs.	1. Mar. 15 – June 15 2. April – May	Adapted south of line – from Shelby, Greensboro Elizabeth City, N.C.
2. Common Bermudagrass (hulled)	8 – 12 lbs.	1. April – July 2. Apr. 15 – June 30 3. May – June 15	Bermuda Stands traffic, does not tolerate shade. In mountains keep under 2,000' elevation on well-drained sunny sites. Refer to specifications for SODDING AND SPRIGGING.
3. Common Bermudagrass (unhulled)	15 – 20 lbs.	1. Jan. – March 2. Jan. – March 3. Dec. – April	
4. Crownvetch	15 – 20 lbs.	2. Aug. 20 – Sept. 20 Feb. 20 – Apr. 15 3. Mar. 15 – April	Best in mountains, and upper Piedmont. Requires a pH of 6+ and maintenance of lime, P & K every 3-4 years. Slow to establish with seed. Good plant on slopes that will not be mowed. Refer to specifications for VINES, SHRUBS, AND TREES.
5. Crownvetch and Tall Fescue	10 – 20 lbs. 20 – 30 lbs.	2. Aug. 20 – Sept. Feb. 15 – Apr. 3. Mar. 15 – April	Avoid wet sites – Mow *only* to control brush. Fescue used to increase land cover during establishment of Crownvetch.
6. Sericea Lespedeza (scarified) and Weeping Lovegrass	40 – 50 lbs. 4 – 5 lbs.	1. March – June 2. March 15 – June 3. April – May	Lovegrass provides quick protective cover.
7. Sericea Lespedeza (scarified) and Common Bermudagrass	40 – 50 lbs. 6 – 8 lbs.	1. March – June 2. March 15 – June 3. April – May	Bermuda provides quick cover, spreads, and heals in open areas. Bermudagrass usually disappears where Sericea establishes a canopy.

Plants and Mixtures	Planting Rates Per Acre	Planting Dates 1. Coastal Plain 2. Piedmont 3. Mountains	Notes
8. Sericea Lespedeza (scarified) and Tall Fescue	40 – 50 lbs. 25 – 30 lbs.	1. March – April 2. March – April 3. April – May	Scarified Sericea may be spring seeded on Fescue that was seeded the previous fall.
9. Sericea Lespedeza (unscarified) and Tall Fescue	50 – 60 lbs. 25 – 30 lbs.	1. Dec. – Feb. 2. Nov. – Feb. 3. Nov. – March	If Sericea seed unavailable at planting time, it may be overseeded on Fescue later in the winter.
10. Sericea Lespedeza (unhulled-unscarified) Tall Fescue Millet or Sudan	60 – 70 lbs. 20 – 30 lbs. 15 – 20 lbs.	1. Sept. – Jan. 2. Aug. – Jan. 3. July – Feb.	Include summer annuals in early seedings only. If Sudan growth exceeds 10 inches mow.
11. Sericea Lespedeza (unhulled-unscarified) Common Bermuda (unhulled) Rye	60 – 70 lbs. 10 lbs. 25 lbs.	1. Sept. – Dec. 2. Aug. – Jan. 3. July – Feb.	
12. Tall Fescue	40 – 60 lbs.	1. Sept. – Nov. Feb. – March 2. Aug. 15 – Oct. 15 Feb. 15 – May 3. July 15 – Sept. March – May	Not well suited to infertile droughty, sandy soils. Requires good maintenance. Seeding date in mountains varies with elevation and aspect. Good shade tolerance. Double seeding rate for lawn quality turf.
13. Tall Fescue and White Clover	30 – 50 lbs. 3 – 4 lbs.	1. Sept. – Nov. Feb. – March 2. Aug. 15 – Oct. Feb. 15 – Apr. 15 3. July 15 – Sept. March & April	Can be used where regular mowing is desired and high level of maintenance will be provided. Double seeding rate for lawn quality turf.
14. Tall Fescue and Red Fescue	30 – 40 lbs. 20 – 30 lbs.	2. Aug. 20 – Oct. 10 Feb. 15 – Apr. 15 3. July 15 – Sept. 1 March & April	Red Fescue in this mixture has a tendency to fill in voids. It is shade tolerant.
15. Tall Fescue and Bluegrass	30 – 40 lbs. 20 – 30 lbs.	2. Aug. 15 – Oct. Feb. 15 – Apr. 15 3. July 15 – Sept. March – April	Limited to fertile, well-drained soils in Northern Piedmont and Mountains. Shade tolerant.

Plants and Mixtures	Planting Rates Per Acre	Planting Dates 1. Coastal Plain 2. Piedmont 3. Mountains	Notes
16. Tall Fescue and Browntop Millet or Sorghum-Sudan Hybrids	60 lbs. 35 lbs. 30 lbs.	1. Aug. – Sept. 2. July 15 – August 3. July – Aug. 15	Keep annuals cut back to 10-12 inches.
17. Tall Fescue and Rye	70 lbs. 25 lbs.	1. Dec. – Jan. 2. Nov. – Jan. 3. Oct. – Feb.	Use only when necessary to complete a job. Mulching will be necessary to provide erosion control. Keep annuals cut back to 10-12".
18. Reed Canarygrass	15 – 20 lbs.	2. Aug. 20 – Sept. Feb. 15 – April 3. March – July	Excellent on berms, stream banks and poorly drained sites. Do not use on small streams with low velocity.
19. Weeping Lovegrass	4 – 5 lbs.	1. March – June 2. April – June 3. May – June	Gives quick summer cover – well adapted to droughty sites – best in mixtures with Sericea Lespedeza. Tends to become clumpy with age.

1/ There will be conditions and interest that will warrant the use of other plants or mixtures not listed in the above table. Their use should be evaluated for each site.

2/ Some rules of thumb for conversions:

Lbs. / Ac. x .023 = Lbs / 1,000 sq. ft.

Sq. Ft. of area x .000023 = Acres (valid up to 10 acres)

3/ Seeding dates within the geographic area will vary by season, temperature and rainfall

Local Seeding Schedule

(per Wake Soil and Water District)

Perminant Seeding: Shoulders, Side Ditches, and Slopes (max 3:1)

Date	Type	Planting Rate
Aug. 15 - Nov. 1	Tall Fescue	200 lbs/acre
Nov. 1 - Mar. 1	Tall Fescue	200 lbs/acre
	and Abruzzi Rye *(nurse crop)	25lbs/acre
Mar. 1 - April 15	Tall Fescue	200 lbs/acre
April 15 - June 30	Hulled Common Bermudagrass	15 lbs/acre

Perminant Seeding: Slopes 3:1 up to 2:1

Aug. 15 - Nov. 1	Tall Fescue	200 lbs/acre
	and Sericea Lespedeza (unhulled, unscarified)	60 to 70 lbs/acre
Nov. 1 - Mar. 1	Tall Fescue	200 lbs/acre
	and Sericea Lespedeza (unhulled, unscarified)	60 to 70 lbs/acre
	and Abruzzi Rye	25 lbs/acre
Mar. 1 - June 1	Tall Fescue	200 lbs/acre
	and Sericea Lespedeza (scarified)	40 to 50 lbs/acre
Mar. 15 - June 30	Weeping Lovegrass	10 lbs/acre
	and Sericea Lespedeza (scarified)	40 to 50 lbs/acre
March 15 - June 30	Hulled Common Bermudagrass	15 lbs/acre
	and Sericea Lespedeza (scarified)	40 to 50 lbs/acre

Temporary Seeding

June 1 - Sept. 1	Tall Fescue	200 lbs/acre
	and Browntop Millet* (nurse crop)	35 lbs/acre
	or Sorghum-Sudan Hybrids* (nurse crop)	30 lbs/acre

Consult Conservation Engineer or Soil Conservation Service for additional information concerning other alternatives for vegetation of denuded areas. The above vegetation rates are those which do well under local conditions; other seeding rate combinations are possible.

*Nurse Crop / Temporary Seedings - Reseed according to optimum season for desired permanent vegetation. Do not allow temporary cover to grow over 12 inches in height before mowing, otherwise Fescue may be shaded out.

Chapter 2

STANDARD AND SPECIFICATION FOR TEMPORARY COVER FOR CONSTRUCTION SITES

Definition

Stabilizing construction sites and severely eroded areas by planting annual grasses or small grains.

Purpose

To provide short-term cover for the control of surface runoff and erosion to reduce damages from sediment to downstream areas until permanent vegetation or other stabilization measures can be established.

Where Applicable

On any sediment-producing, bare or denuded area which may be subject to erosion and where temporary vegetation can be used to retard erosion for periods from two (2) to twelve (12) months.

The temporary measures should be coordinated with the permanent measures planned to assure economical and effective control.

Specifications Guide

A. Site Preparation

1. Install needed erosion control practices, either temporary or permanent, such as dikes, ditches, diversions, drains, contour ripping and desilting basins.
2. Grade as needed to permit the use of planned seeding equipment. Shaping may not be required if hand seeding or hydraulic seeding equipment is to be used.

B. Seedbed Preparation

1. Chisel or loosen compacted areas. Spread available topsoil over unfavorable soil conditions for successful establishment of plants.
2. When hydraulic seeder is to be used, seedbed preparation is not required.
3. When conventional seeding is to be done, no preparation is required if the soil material is loose and has not been sealed by rainfall. On smooth undisturbed cut slopes, the surface will require pitting, trenching or scarifying to provide a place for seed to lodge and germinate.

C. Lime and Fertilizer

1. Lime is not required for temporary cover on most sites.
2. The majority of sites will require fertilization to establish effective cover quickly. In the absence of a soil test, apply 10-10-10 fertilizer or equivalent at the rate of 400 to 700 pounds per acre (10-16 pounds per 1,000 sq. ft.).
3. On reasonably fertile topsoil such as formerly cultivated fields, fertilizer may not be required at time of planting but topdressed after plants are growing.
4. Work in lime and fertilizer to a depth of 3-4 inches using any suitable equipment for conventional seeding.
5. Topdress with 30-50 pounds of N 30-60 days after planting if needed to increase plant growth and cover.

D. Planting

1. Select species suitable to the area and season of the year from Table 1.

Plants and Mixtures	Planting Rates Per Acre	Planting Dates 1. Coastal Plain 2. Piedmont 3. Mountains	Notes
16. Tall Fescue and Browntop Millet or Sorghum-Sudan Hybrids	60 lbs. 35 lbs. 30 lbs.	1. Aug. – Sept. 2. July 15 – August 3. July – Aug. 15	Keep annuals cut back to 10-12 inches.
17. Tall Fescue and Rye	70 lbs. 25 lbs.	1. Dec. – Jan. 2. Nov. – Jan. 3. Oct. – Feb.	Use only when necessary to complete a job. Mulching will be necessary to provide erosion control. Keep annuals cut back to 10-12".
18. Reed Canarygrass	15 – 20 lbs.	2. Aug. 20 – Sept. Feb. 15 – April 3. March – July	Excellent on berms, stream banks and poorly drained sites. Do not use on small streams with low velocity.
19. Weeping Lovegrass	4 – 5 lbs.	1. March – June 2. April – June 3. May – June	Gives quick summer cover – well adapted to droughty sites – best in mixtures with Sericea Lespedeza. Tends to become clumpy with age.

1/ There will be conditions and interest that will warrant the use of other plants or mixtures not listed in the above table. Their use should be evaluated for each site.

2/ Some rules of thumb for conversions:
Lbs. / Ac. x .023 = Lbs / 1,000 sq. ft.
Sq. Ft. of area x .000023 = Acres (valid up to 10 acres)

3/ Seeding dates within the geographic area will vary by season, temperature and rainfall

E. Mulching

1. Temporary vegetation is normally established without using vegetative mulch except on very severe conditions such as steep slopes. On unscarified areas or cut slopes, a minimum of 500 pounds of wood cellulose fiber mulch should be mixed in the slurry when seeding with hydraulic equipment.
2. Mulching without temporary seeding may provide and should be considered for short-term protection.

F. Irrigation

1. Irrigation will speed up germination of seed and establishment of cover. Water must be applied at a rate that will not cause runoff and erosion. Normally .25 inches per hour is the maximum rate on construction sites. Thoroughly wet the soil to a depth that will ensure germination of the seed. A second application should be made when needed.

Chapter 3

STANDARD AND SPECIFICATION FOR ESTABLISHING PERMANENT VEGETATION OR PROVIDING TEMPORARY PROTECTION WITHOUT SEEDING

Definition

Applying plant residues or other materials to erosive or sediment-producing sites.

Purpose

To protect cleared, graded or other soil surfaces from erosion and to reduce runoff and sediment damage downstream; prevent surface compaction or crusting; conserve moisture; modify soil temperature; and help establish plant cover.

Where Applicable

On any areas subject to erosion. (a) The practice may be used alone where the season or other conditions are not suitable for growing an erosion-resistant cover. (b) Where stabilization is needed for a short period until more suitable protection can be applied. (c) As an integral part of establishing vegetation.

A. Mulching for temporary erosion control without seeding.

1. Provide surface water control and for removal of subsurface water as needed.
2. Select mulch material and anchoring method.
3. Subsequent earth moving or seeding plans will determine if seedbed preparation, liming and fertilizing are feasible at this stage. Grade, slope or smooth the site to permit the use of planned mulch on equipment to be used for applying and anchoring. Compacted soil should be loosened to a depth of 3 inches if mulch anchoring tool or disk is to be used to anchor mulch.

B. Refer to Item B and C that follow for mulch materials and anchoring methods.

B. MULCH MATERIALS

Organic Materials	Quality	APPLICATION RATES Per 1000 sq. ft.	Per Acre	NOTES
a. Small grain straw or tame hay.	Undamaged, air dry threshed straw free of undesirable weed seed.	75-100 lbs.	1½ - 2 tons	Spread uniformly — approximately ¼ ground should be visible to avoid smothering seedling. Anchor either during application or immediately after placement to avoid loss by wind or water. Straw anchored in place is excellent on permanent seedings.
b. Corn stalks chopped or shredded.	air dried, shredded into 8" to 12" lengths.	140-230 lbs.	3-5 tons	Effective erosion control if uniformly spread. Relatively slow to decompose. Resistant to wind blowing.
c. Wood excelsior	Burred wood fibers approximately 4" long.	70-90 lbs.	1½ - 2 tons	A commercial product packaged in 80-90 lbs. bales. Apply with power equipment. Tie down usually not required. Decomposes slowly.
d. Wood Cellulose Fiber	Air dry, nontoxic with no growth inhibiting factors.	12 lbs. 25-35	500 lbs. 1000 - 1500 lbs.	When followed with straw mulch applied at rate of 1½ to 2 tons per acre. On steep slopes or all sites if only this mulch used. Must be applied with hydraulic seeder
e. Compost or manure	Shredded, free of clumps or excessive coarse material.	300-450 lbs.	6-10 tons	Excellent around shrubs. Strawy manure more effective for erosion control. May create problems with weeds.
f. Wood chips and bark	Air dried, free from objectionable coarse material.	400-700 lbs.	8-15 tons	Apply 2-7" deep. Most effective as mulch around ornamentals, etc. Resistant to wind blowing. May require anchoring with netting to prevent washing or floating off. May require N topdressing to alleviate deficiency while decaying.

MULCH MATERIALS (CONT.)

Organic Materials	Quality	APPLICATION RATES Per 1000 sq. ft.	Per Acre	NOTES
g. Sawdust	Free from objectionable coarse material.	80-500 cu. ft.		Apply 1-7" deep. More commonly used as a mulch around ornamentals and nursery stock. Use deeper application for weed control. Requires anchoring on slopes. Tends to crust and shed water. Requires 25-35 lbs. of N, topdressing per ton to prevent N deficiency while decaying. Weight of sawdust 18-25 lbs. per cu. ft.
h. Pine Straw	Air dry. Free of coarse objectionable material.	50-90 lbs.	1-2 tons	Excellent around plantings. Resistant to wind blowing. Decomposes slowly.

OTHER MULCH MATERIALS

Other Mulch Materials	Quality	APPLICATION RATES Per 1000 sq. ft.	Per Acre	NOTES
a. Asphalt Emulsion	Slow setting SS-1	14-28 gal.	800-1200 gal.	Use as a film on soil surface for temporary protection without seeding. Requires special equipment to apply.
b. Gravel or Crushed Stone		9 cu. yards		Apply 3" deep as a mulch around woody plants. May be used on seeded areas subject to foot traffic. (Approximate wt. — 1 ton per cu. yd.)
c. Wood Excelsior Mats	Blanket of Excelsior fibers with a net backing on one side.	Sq. yds. needed		Use without additional mulch. Tie down as specified by manufacturer
d. Jute, Mesh or net	Woven jute yarn with 3/4" openings	Sq. yds.		Use without additional mulch. Will withstand flowing water in waterways and ditches when properly installed. Tie down as specified by mfgr.

OTHER MULCH MATERIALS (CONT.)

Organic Materials	Quality	APPLICATION RATES Per 1000 sq. ft. Per Acre	NOTES
e. Plastic	2-4 mils		Polyethylene film may be used to provide temporary cover for banks, fills or stock piled material. Use black for weed control and conserve moisture around plantings; use white for seeding establishment. Remove plastic after seeding is up.

C. MULCH ANCHORING GUIDE

Anchoring Method Or Tie Down Material	Mulch Material To Be Anchored	Notes On Application
1. Mechanical a. Asphalt Tie-Down	Small grain straw, hay, shredded corn stalks, compost	Apply with asphalt applicator on power mulch blower or other suitable equipment. Use liquid asphalt (thinned with kerosene) during freezing weather, rapid curing or medium curing. Application rate / ton of straw 200 gal. Use Emulsified asphalt (thinned with water) when temperature is above freezing, rapid curing, medium curing or slow setting. Approximately 150 gal / ton of straw.
b. Mulch anchoring tool or disk	Straw or hay, pine straw	Pull over mulch. When disk is used, set straight. Do not cut up straw. Mulch material should be pressed into soil about 3 inches. Operate equipment across the slope.
c. Pick chain (chain harrow)	Straw or hay	Use on slopes steeper than 3:1. Pull across slope.
d. Other materials		Other commercial products are being tested and are coming on the market. Apply with hydraulic seeder or power mulcher.
2. Manual a. Mulch netting	Straw hay, wood chips and bark, pine straw, compost	Staple light weight plastic, paper, textile or jute nettings to soil surface according to manufacturer's specifications.
b. Peg and twine	Straw or hay	After mulching, drive wooden pegs (approx. 8–10" long) within 3 inches of the soil surface every 3 to 4 feet in all directions. Stretch twine in a crisscross and square pattern. Secure twine at each peg with two or more turns. Pegs may now be driven closer to soil surface if desired.

Chapter 4

STANDARD AND SPECIFICATION FOR ESTABLISHING PERMANENT COVER BY SODDING OR SPRIGGING ON CONSTRUCTION SITES AND URBAN AREAS

Definition

Stabilizing silt producing areas by covering the soil with a perennial sod or planting bermuda grass stolons.

Purpose

To stabilize the soil, to protect property improvements from erosion, to reduce damages to downstream areas from sediment and runoff, and to add to the appearance and beauty of the landscape.

Where Applicable

Graded areas and urban sites subject to erosion and where (a) there is a concentration of water (b) a high quality turf is desired (c) grass cover is needed sooner than can be established by seeding (d) when desired species cannot be propagated by seed.

Specifications Guide

A. Site Preparation

1. Grade as needed and feasible to permit the use of conventional equipment for liming, fertilizing, soil preparation, planting, and maintenance. Where slopes must be steeper than 3:1 consider constructing retaining walls, planting vines or shrubs, and placing riprap.
2. Install needed surface water control measures. Where internal water movement may cause seeps or soil slippage at the toe of slopes install drainage before sodding.
3. Cut areas must be loosened if needed to permit grass root penetration. Cover areas where excavation was made into dense clay material with 3-4 inches of topsoil or incorporate organic material.
4. Fill areas must be compacted enough to resist uneven settling. Apply agricultural limestone according to soil test report or at the rate of 2-3 tons per acre (100-135 lbs / 1,000 sq. ft.). Lime used shall be within the specifications of the North Carolina Department of Agriculture.
5. Apply fertilizer according to soil test report or 800 pounds per acre of 10-10-10 or equivalent. (20 lbs / 1,000 sq. ft.)
6. After applying lime and fertilizer evenly over the area, work into the soil to a depth of 2 inches for sodding and 3-4 inches for sprigging using hand tools if necessary. Work soil until a reasonably uniform, firm seedbed has been prepared.
7. Smooth any irregularities in the surface and clear the area of any trash, stones or debris that would interfere with sodding or sprigging.

B. Sod Specifications

1. Nursery grown sod one to three years old is preferred over pasture sod.
2. Use sod that is free of weeds and weedy grasses.
3. Sod should be of uniform thickness with a ½ to 1½ inches layer of soil (excluding top growth) depending on species and season of year it is lifted.
4. Sod should have a compact root mat to assure mechanical strength and to assure early and firm anchoring to soil surface.

5. Only moist, fresh sod shall be used. Sod should be lifted, delivered and installed within a period of 24 to 36 hours depending upon season and temperatures. Sod should not be lifted when excessively dry or wet conditions may adversely affect its survival.
6. Species commonly used are:

Species	Planting Date	Notes
1. Bluegrass	March - April Sept. - October	Upper Piedmont & Mountains
2. Bermudagrass	April - August	Piedmont - C. Plain
3. Bahia Grass	April - August	Piedmont - C. Plain Seed heads may be objectionable in lawns
4. Tall Fescue	Anytime - except when semidormant. July in Piedmont & C. Plain	Grown statewide
5. Zoysia	April - August	Piedmont - C. Plain
6. Mixtures of 1 & 4 or 2 & 3		

C. Sod Placement

1. Solid Sodding
   a. Sod strips should be laid across slope, never up and down the slope, starting at the bottom of the slope and working up. During periods of high temperature, lightly irrigate the soil immediately prior to laying the sod.
   b. Place sod strips with snug even joints. Stagger joints. All joints will be butted tight in order to prevent voids which cause air drying of the roots or invites erosion.
   c. Roll or tamp sod immediately following placement to insure solid contact of root mat and soil surface.
   d. On steep slopes secure sod to surface soil with wood pegs, wire staples, or split shingles (8 to 10 inches long by 3/4 inch wide).
   e. Where surface water is flowing over the face of the slope, install a capping strip of heavy jute wire or plastic netting, properly secured, along the crown of the slope for protection against lifting and undercutting of sod. Use the same technique to hold sod in channels. Use wire staples only to anchor jute or plastic netting in channel work.
   f. Immediately following rolling and anchoring sod, apply water until moisture penetrates the soil layer beneath sod. Maintain optimum moisture until sod is growing.
2. Spot Sodding

Each sod spot should be a minimum of 2-4 inches in diameter or square and spaced 12 x 18 inches. Sod spots within a row should be placed alternately and not directly opposite sod spots in adjacent rows. Sod pieces shall be even with the surface of the adjoining ground. Sod chunks are sometimes used and are normally 4 x 4 x 4 inches.

D. Establishment of Bermudagrass

1. Common bermudagrass may be seeded but is best established on critical areas by planting spriggs (a small section of plant 4-6 inches long with at least one node or joint with leaves). All hybrid bermudagrasses must be established vegetatively.

2. On sites where crabgrass or weeds are a problem use 600 to 800 pounds per acre of 0-14-14 or 0-10-20 fertilizer (18 lbs/1,000 sq. ft.) instead of 10-10-10 at planting.
3. Select variety from attached table. Secure stolons that are healthy that have had old growth removed by close mowing before digging and received proper care from field to planting site. Spriggs must be kept moist, not allowed to heat or freeze, until they are planted.
4. Planting Methods
   a. *In rows* open furrow 4-6 inches deep, 2 feet apart. Fertilizer may be placed in first furrow and second furrow opened for spriggs. Drop clumps of stolons in furrow and cover 2 inches deep; smooth and firm the soil.

      Planting may be made with a tractor drawn bermuda transplanter or hand transplanter.
   b. *Broadcast* broadcast plantings save labor but require more plant material. Broadcast stolons and press or disk into top 2-3 inches of soil. Set angle of rear disk almost straight to avoid bringing stolons to the surface.
   c. *In hills* dig holes on desired spacing 6-8 inches deep and 6 inches in diameter. Mix fertilizer with soil material and replace in hole. Set plants 2 inches above fertilizer and finish filling hole with soil without fertilizer.
   d. Tip of stolon must be at or just above ground level. Regardless of method of planting soil must be firmed around roots (spriggs) by any method that does not injure the spriggs.

E. Maintenance

1. *Irrigation* for maximum growth and spread, provide supplemental water as needed during the establishment year.
2. *Fertilization* lime and fertilizer should be applied under a regular program based on soil test, use and appearance of the grass. In the absence of a soil test, apply 2 tons of lime (100 lbs / 1,000 sq. ft.) per acre every 4-5 years. A complete fertilizer such as 10-10-10 (500 lbs / ac or 12 lbs / 1,000 sq. ft.) should be applied each fall to the cool season grasses and each spring to the warm season grasses. Depending upon the soil exposure and use up to 200 pounds per acre of additional N may be applied in split applications. On the bermuda in the warm months and to the cool season grasses from September to April. To reduce incidence of leaf diseases do not add nitrogen to tall fescue or bluegrass from May to mid-August in Piedmont and Coastal Plain areas of the state.
3. *Mowing* normally low growing grasses on critical areas do not require mowing. The bermudas, bahias and bluegrasses may be mowed as desired. Normal mowing height for tall fescue is 3 inches. The closer the mowing height, the more nitrogen is required.

TABLE – Bermudagrass Varieties and Planting Dates

Varieties	Planting Rates / Acre [1]	Planting Dates 1. Coastal Plain 2. Piedmont 3. Mountains[2]	Notes
1. Common or Tufcote	Sprigs 18" x 24" 30 cu. ft. 18 x 18" 40 cu. ft. or Broadcast 40-70 cu. ft.	1. March - April 2. March - May	Common bermudagrass may be established with seed, however, sprigs from local sources are more dependable and are preferred. In the mountains keep under 2,000' elevation on south facing slopes that are well-drained. Tufcote is lower growing and finer turf than common. Tiflawn produces a finer, higher quality turf than Tufcote but is not as winter hardy.
2. Tiflawn	Sprigs 18" x 24" 30 cu. ft. 18" x 18" 40 cu. ft. or Broadcast 30-50 cu. ft.	1. March - April 2. March - May 3. May - June	
3. Coastal	Sprigs 2' x 2' 30 cu. ft. or Broadcast 40-70 cu. ft.	1. March - April 2. March - May 3. no	Suited to well-drained sites, where higher bermuda is not objectionable. Requires high level of management. Use is limited to lower Piedmont and Coastal Plain. Good in beach areas on spoil, fills, construction sites or dredged sand.
4. Midland	Sprigs 2' x 2' 30 cu. ft. or Broadcast 40-70 cu. ft.	2. May - June 3. May - June	Tall growing Bermuda more cold hardy than Coastal.

[1]The closer spacing should be used where the erosion hazard is greater. Given a normal growing season, both spacings will provide a complete cover by the end of the first growing season. Soil moisture is critical the first two weeks following planting.

[2]Planting dates may be extended into July if irrigation systems are used.

Chapter 5

STANDARD AND SPECIFICATION FOR ESTABLISHING GROUND COVERS – VINES, SHRUBS, AND TREES ON CONSTRUCTION STIES AND URBAN DEVELOPMENTS

Definition

Stabilizing silt producing areas by establishing long-lived vegetative cover.

Purpose

To stabilize the area; to reduce damages from runoff and sediment to downstream areas; to enhance the beauty of the area.

Where Applicable

Graded or cleared areas subject to erosion. Where a long-lived vegetative cover other than turf is desired; to enhance environmental quality by providing landscape variety, wildlife food or cover, screening, and pedestrian or sound barriers.

Specifications Guide

A. Site Preparation and Plant Selection

1. Grade and smooth the area as needed and feasible for planting the selected plant materials. These plants cannot be expected to prevent soil slippage on a soil that is not stable due to its structure, water movement or excessive slope.
2. Install needed surface water control measures.
3. The plant materials listed (see attached list) were selected because of their known conservation use, ability to grow on problem soil and site conditions and possess aesthetic value. Some of the plants establish easily on difficult sites while some will require careful site improvement before they will grow satisfactorily. The list IS NOT complete but a listing of some of the more common plants.

B. Planting Time

1. Early spring is preferred for most plant materials. This allows for the maximum root and top development to check erosion and allows the plant to become established before winter. Planting season can be extended by using container grown or balled and burlaped plants.

C. Soil Preparation

1. Soils at most critical area planting sites should be amended by the addition of topsoil, compost, peat, sawdust, manure or other organic material. Fertilizer will be used for each planting. Lime will also be required unless the soil is known to have a pH of 6 or above unless the plant requires an acid site.
2. *For close spaced mass plantings* apply a commercial granular fertilizer, such as 5-10-10 and organic supplement (such as composted cow manure, peat or well rotted sawdust), and work into the soil prior to planting. Fertilizer rate – 3 to 5 lbs. per 100 sq. ft. The amount of organic material needed will depend upon the soil and plant being used. Ground covers such as Pachysandra require a high rate of organic material, about a 2 inch layer worked into the root zone. Depending on the soil type and steepness of slope, the depth of soil working will vary from 4 to 6 inches.
3. *For plantings on steep slopes and large area plantings* working up the entire planting area would not be practical and would induce erosion. Instead, work up the soil in contour rows or dig single holes for each plant. Blend the needed lime, fertilizer and organic material with the soil

removed from each hole or furrow. Great care must be taken to avoid fertilizer burn. Use it sparingly. Mix it thoroughly with the soil before planting. If the soil in the site is not suitable for plant growth, it is best to batch blend a planting medium, such as a mixture of 1:1 or 2:1 sandy loam soil and peat, composted cow manure or well rotted sawdust and 10 lbs. of 5-10-10 and 20 lbs. of lime per cubic yard of soil mix. (If manure is used, delete the 5-10-10.)

4. *For spaced plantings* of individual vines, shrubs or trees, single holes are dug for each plant. Holes must be at least a third larger than needed to accommodate the root system.

D. Mulching

1. The entire disturbed or bare area should be mulched with an acceptable mulch material to control erosion, conserve moisture and suppress weeds. Sloping areas will be mulched with small grain straw, pine straw, wood chips or bark, excelsior or other weed-free material properly anchored.
2. Where erosion hazard is very high use heavy jute matting, excelsior blankets or fiberglass mats stapled to the soil. (See MULCHING specifications).

E. Maintenance

1. Some watering, weeding, remulching and feeding may be required for new ground covers or spaced plantings during the period of establishment. Cultivation as such is not recommended as this may encourage erosion and might also cause some root injury. Competing weeds should be pulled.
2. If a controlled release fertilizer was not used at time of planting, fertilize the plantings the spring of the second growing season and thereafter as needed using 2 to 3 lbs. of a granulated commercial fertilizer such as 5-10-10 per 100 sq. ft.

Plant Species	Cons. Use*	Adapted For Sites**	Adapted Area CP, P, Mts.	Growth Rapid Medium Slow	Height
A. Low Mat Forming Evergreens					
Bugleflower (Ajuga reptans)	1	a, f	All	R	4-8"
Lilyturf (Liriope spicata)	1	a, f	All	S	8-12"
Aaronsbeard (Hypericum calycinum)	1	a, b, f	CP, P	R	10-12"
Japanese spurge (Pachysandra terminalis)	1, 6	f	All	S-M	6-12"
Moss pink (Phlox subulata)	1	a, b	All	S	6"
Lavender Cotton (Santolina chamaecyparissus)	1, 9	a, b	All	M	1-2'
Green santolina (Santolina virens)	1, 9	a, b	All	M	10-16"
Wineleaf cinquefoil (Potentilla tridentata)	1	a, b, c	All	S	4-12"
B. Herbaceous Plants					
Daylily (Hemeracallis sp.)	1, 2, 9	a, b	All	M	16-24"
Crownvetch (Coronilla varia)	1, 2	a, b	P, Mts.	M	24"
Iris (bearded) (Iris sp.)	1	a, b	All	S	1-2'
Everlasting pea (Lathyrus latifolius)	1	a, b	All	S	1-1½'
Beargrass (Yucca filamentosa)	1, 6, 9	a, b	CP	S	1-2'
Spanish bayonet (Yucca alnifolia)	1, 6, 9	a, b	CP, P	S	4-10'
Bamboo (Various species)	1, 3	a	CP, P	S	1-20'

*Conservation Uses:

1. Critical area erosion control and beautification
2. Shorelines, stream and ditch banks
3. Screens and windbreaks
4. Clipped hedges
5. Foot traffic barriers
6. City conditions (smog, etc.)
7. Songbird food or cover
8. Upland game bird food or cover
9. Seashore

**Soil and Site Conditions:

a. Infertile soils
b. Dry sties
c. Acid soils
d. Wet sites
e. Steep cuts
f. Shady locations

Plant Species	Cons. Use*	Adapted For Sites**	Adapted Area CP, P, Mts.	Growth Rapid Medium Slow	Height
C. Evergreen Vines					
English Ivy (Hedera helix)	1	a, f	All	M	1'
Wintercreeper (Euonymus fortunei)	1, 6	c, f	All	S	10"
Honeysuckle (Lonicera japonica)	1, 2, 7, 8	a, b, c, e, f	All	M	2'
Periwinkle (Vinca minor)	1, 6	a, b, c, e	All	M	8"
Carolina jessamine (Gelsemium sempervirens)	1	a, b, c, e	CP, P	S	16"
D. Deciduous Vines					
Virginia creeper (Parthenocissus quinquifolia)	1, 6, 7, 9	a, b, c, e	All	M	
Peppervine (Ampelopsis arborea)	1, 9	a, b, c, e	CP	R	
Porcelain vine (Ampelopsis brevipedunculata)	1, 7	a, f	CP, P	M	
Muscadine grape (Vitis rotundifolia)	1, 7, 8, 9	a, b, c, e, f	All	S	
Kudzu (Pueraria thunbergiana)	1, 2	a, b, c	All	R	
Trumpet creeper (Campsis redicans)	1	a, b, c, e	CP, P, Mts.	R	
E. Evergreen Shrubs with Needles					
Creeping juniper (Juniperus horizontalis)	1, 6	a, b	All	S	12-16"
Sargent juniper (Juniperus chinensis sargenti)	1, 6, 9	a, b	All	S	2-3'
Pfitzer's juniper (Juniperus chinensis) Pfitzeriana)	1, 6, 9	a, b	All	S	3-6'
Shore juniper (Juniperus conferta)	1, 6, 9	a, b	All	M	1-2'

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Plant Species	Cons. Use*	Adapted For. Sites**	Adapted Area CP, P, Mts.	Growth Rapid Medium Slow	Height
F. Evergreen Shrubs - Broadleaf					
Thorny elaeagnus (Elaeagnus pungens)	1, 3, 4, 5, 6, 7, 9	a, b, f	CP, P	M	6-10'
Bigleaf winter creeper (Euonymus fortunei vegetus)	1, 2, 6	a, e, f	All	M	3-4'
Evergreen euonymus (Euonymus japonicus)	3, 4, 6, 9	a, b	CP, P	R	7-10'
Wax myrtle (Myrica cerifera)	1, 3, 7, 8, 9	a, c, d	CP, P	M	10-30'
Bayberry (Myrica pennsylvanica)	1, 7, 8, 9	a, b, c	All	M	4-7'
Yaupon holly (Ilex vomitoria)	3, 7, 9	a, b, c, d	CP, P	S	10-24'
Inkberry (Ilex glabra)	1	a, d	CP	S	6-9'
California privet (Ligustrum ovalifolium	1, 3, 4, 9	a, b	All	R	10-15'
Japanese privet (Ligustrum Japonicum)	1, 3, 4, 6, 9	a, b, f	All	R	8-16'
Glossy privet (Ligustrum lucidum)	1, 3, 6	a, b	All	R	15-30'
Regel privet (Ligustrum obsifolium regelianum	1, 6, 7, 9	a, b	All	R	4-5'
Oleander (Nerium oleander)	9	a, b	CP	M	7-15'
Pittosporum (Pittosporum tobira)	3, 6, 9	b	CP	M	6-10'
Wintergreen barberry (Berberis julianae)	1, 4, 5	a, b, f	All	S	4-6'
Firethorn (Pyracantha coccinea)	3, 5, 7, 8	f	CP, P, Mts.	M	6-10'

*Conservation Uses:

1. Critical area erosion control and beautification
2. Shorelines, stream and ditch banks
3. Screens and windbreaks
4. Clipped hedges
5. Foot traffic barriers
6. City conditions (smog, etc.)
7. Songbird food or cover
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Plant Species	Cons. Use*	Adapted For Sites**	Adapted Area CP, P, Mts.	Growth Rapid Medium Slow	Height
G. Deciduous Shrubs					
Tatarian honeysuckle (Lonicera tartarica)	1, 7	a, b	All	R	10-15'
Arnold dwarf forsythia (forsythia arnoldi)	1, 6	a, b	All	R	2-3'
Showy forsythia (Forsythia intermedia spectabilis)	1, 6	a, b	All	R	7-9'
Goldflower (Hypericum moserianum)	1	a, b	CP, P	R	2-3'
Winter jasmine (Jasminum nudiflorum)	1	a, b	All	M	2-4'
Beautyberry (Callicarpa americana)	1, 7, 8, 9	a, b	CP	M	3-5'
Rugosa rose (Rosa rugosa)	1, 5, 6, 7, 9	a, b	All	R	4-6'
Memorial rose (Rosa wichuraiana)	1, 6	a, b, c, e	All	M	1-2'
Scotch broom (Cytisus scoparius)	1, 9	a, b	All	R	5-7'
Autumn olive (Elaeagnus umbellata)	1, 3, 7, 8, 9	a, b, c	All	R	7-11'
Tag alder (Alnus rugosa)	2	d	All	M	6-15'
Rose acacia (Robinia hispida)	1	a, b, c	All	R	5-8'
Elderberry (Sambucus canadensis)	2, 7	d	All	R	9-12'
New Jersey tea (Ceanothus americanus)	1	a, b, c	All	M	2-4'
Shining sumac (Rhus copallina)	1, 8, 9	a, b, c	All	R	11-15'
Smooth sumac (Rhus glabra)	1, 8, 9	a, b, c	P, Mts.	R	12-20'
Fragrant sumac (Rhus aromatica)	1	a, b, c	P	R	3-6'
Coralberry (Symphoricarpos orbiculatus)	1, 8	a, b	P, Mts.	M	1-2'

*Conservation Uses:

1. Critical area erosion control and beautification
2. Shorelines, stream and ditch banks
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4. Clipped hedges
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7. Songbird food or cover
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Plant Species	Cons. Use*	Adapted For Sites**	Adapted Area CP, P, Mts.	Growth Rapid Medium Slow	Height
G. Deciduous Shrubs (Cont.)					
Halberd willow (Salix hastata)	2	a, d	CP, P	R	4-5'
Sandbar willow (Salix interior)	2	a, d	CP, P	R	6-12'
Bicolor lespedeza (Lespedeza bicolor)	1, 8	a, b	CP, P	R	6-10'
Japonica lespedeza VA-70 (Lespedeza japonica VA-70)	1, 8	a, b	CP, P, Mts.	R	4-6'
H. Trees					
Carolina laurel cherry (Prunus caroliniana)	2, 3, 4, 7, 8, 9	a, b, c, f	CP, P, Mts.	R	15-30'
Chinese chestnut (Castanea Mollissima)	1, 2, 5, 7, 8	a, b, c	CP, P, Mts.	R	50-60'
Eastern redcedar (Juniperus virginiana)	1, 3, 5, 7, 8	a, b, c, f	CP, P, Mts.	M	10-50'
Japanese black pine (Pinus thunbergii)	1, 3, 7, 8, 9	a, b, c, d, e	CP, P, Mts.	M-R	90-100'
Loblolly pine (Pinus taeda)	1, 2, 3, 6, 7, 8	a, b, c, d, e	CP, P	R	90-100'
Virginia pine (Pinus virginiana)	1, 3, 5, 7, 8	a, b, c, e	CP, P, Mts.	M-R	40-50'
Eastern redbud (Cercis canadensis)	1, 2, 7, 8	a, b, c, f	CP, P, Mts.	M-R	15-45'
River Birch (Betula nigra)	1, 2, 7, 8	a, b, c, f	CP, P, Mts.	M-R	50-60'
White Poplar (Populus alba)	1, 2, 6, 9	a, b, c, e	CP, P, Mts.	R	25-35'

*Conservation Uses:

1. Critical area erosion control and beautification
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7. Songbird food or cover
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Plant Descriptions

Bugleflower – Ajuga reptans

Description: Low fleshy stemmed, leafy florming mats of purple or dark green leaves. Spreads by rhizomes. Bright blue to white spring flowers on spikes.

Soil & Site: Prefers moderately moist soils. Will tolerate low fertility and wet to dry sites. Sun or shade.

Use: Medians, roadbanks and other situations in urban areas where planting can be maintained. Low landscaping plants around buildings. Not for traffic areas. Plant 8 to 12" apart. Mulch between plants.

Lilyturf – Liriope spicata

Description: Forms dense cover of dark green, grass-like leaves. White spike of flowers in July. May be mowed but takes only limited foot traffic. Spreads by rhizomes. Extremely heavy mat of roots. Slow grower. (Also, *L. graminifolia* with narrower and shorter leaves and *Ophiopogon japonicus,* dwarf lilyturf, similar in habit to above but not cold hardy in mountains.)

Soil & Site: All but droughty sites. Prefers shade, tolerates sun.

Use: Especially shady areas, for low borders, circle of cover around tree trunks, medians, etc. Plant 8-10" apart. Mulch between plants helps.

Aaronsbeard – Hypericum calycinum

Description: Leafy stems from ground with solitary, bright yellow flowers, 3" in diameter at branch tips. Leaves to 4" long. Spreads fast from rhizomes.

Soil & Site: Shady to sunny, snady, moist to dry.

Use: Roadbanks (northern exposures best), low borders, low masses, city medians. Propagated by divisions, cuttings or seed. Plant 1' apart.

Japanese spurge – Pachysandra terminalis

Description: Flowers and berries not showy, upright stems thick, fleshy, leaves lustrous, light green 2-4" long. Mass of uniform height.

Soil & Site: Moist soils with high organic matter. Shade to partial shade only. Will grow under trees but will not take traffic.

Use: Plant rooted cuttings 1' apart under trees or other shade areas.

Moss pink – Phlox subulata

Description: Very low, dense slowly creeping cover resembling a coarse moss. Flowers in spring are blankets of red, white or lavender. Fertilize sparingly.

Soil & Site: Poor, dry, sandy, rocky sites in full sun.

Use: Roadbanks, rock gardens and similar situations. Plant 1' apart.

Lavender cotton – Santolina chamaecyparissus

Description: Leaves silvery gray, wooly, ½ to 1½" long, aromatic. Has appearance of a "dry land" plant. Plant spreads 3 to 5'. Clip after flowering to control excess growth.

Soil & Site: Poor sandy or gravelly soil, dry sites, full sun.

Use: In group with yuccas, etc., for desert-like motif. City road medians, etc. Plant spacing 18 to 24".

Green santolina – Santolina virens

Description: Same as above except smaller and leaves emerald green all year.

Wineleaf cinquefoil – Potentilla tridentata

Description: Flowers 5-petaled white ¼". Leaves dark green, strawberry like, lustrous and very attractive. Grows to a very dense mass. Spreads by rhizomes, but is quite slow. Also, *P. tripetalum* with 3-petal flowers and smaller leaves.

Soil & Site: Dry sites on acid soils in full sun.

Use: Low garden borders or masses in front of taller permanent plants, median plantings along walkways, etc. Use transplants 6-12" apart.

Daylily – Hemeracallis sp.

Description: Various varieties with orange-yellow to red, large lily-like flowers in July. The old fashioned orange types are best for erosion control work. Leaves bright green long, 2' or more, arching, 1 to 1½" wide dying to ground in fall. Spreads by tubers.

Soil & Site: Good or poor soil in sun or shade. Prefers moist situations but will do well on dry banks. Will not bloom in shaded locations.

Use: Roadbanks and other slopes and fills, along streambanks. Will do well at the beach if some topsoil is added to sand. Space plants 12 to 24" apart.

Crownvetch – Coronilla varia

Description: Abundant fine leafy and viny growth in summer. Leaves compound, blue-green. Pink and white flower clusters (crowns) during long early summer period. Dies to ground in winter leaving only a green rosette. Spreads widely by rhizomes. Takes 2 to 3 years to establish. It is a high lime requiring plant. Best in mountains and upper Piedmont.

Soil & Site: Infertile, rocky, dry soils. Especially well adapted on "sweet" soils and rocky limestone areas. Full sun to partial shade.

Use: Ideal for roadbanks, fills and other slopes and along streambanks. New sprouts from rhizomes may be transplanted using a 2 to 3' spacing. Also, seeded at 10 to 15 lbs. per acre. Seed must be inoculated. A light over-seeding of tall fescue (10 to 20 lbs. per acre) will help to prevent erosion during establishment of the vetch. This is a high lime requiring plant. On acid soils re-lime every 4 to 5 years.

Iris – Iris sp.

Description: Upright blade-like leaves 1 to 2½" wide and 8 to 24" long, light blue-green, long pointed. Flowers large, showy and of various colors. The bearded irises (large rhizome types) are best for erosion control on poor, dry sites. Does not furnish complete soil protection – especially in winter.

Soil & Site: Dry, fertile to infertile, often rocky sunny sites.

Use: Beautification and erosion protection on banks, fills and roadside gardens in urban areas where some maintenance is possible. Plant rhizomes 1' apart or in contour rows with 1½ to 2' middles. Plant near the surface with about 1" or less of soil cover. Clip off half leaf surface when transplanting.

Everlasting pea – Lathyrus latifolius

Description: A scrambling, viny-type plant with bluish leaves and stems with pink, lavender or white sweetpea-like blossoms. Plant often called wild sweetpea. Vines 6 to 8' long climbing up on other vegetation and dying back in winter.

Soil & Site: Fertile to infertile, dry to moist sites in full sun to one-half shade.

Use: Beautification of banks and fills. Seems to be especially vigorous in the upper Piedmont and mountains. Propagation by seed sown in late winter and planted 1½ to 3" deep – usually in contour rows.

Beargrass – Yucca filimentosa

Description: Bold, stiff leaves from the ground in tufts 1 to 2' tall with curly threads attached and hanging from edges of leaves. White, bell-shaped flowers borne in June on a tall central stalk to 6'. Fruit – brown fleshy pods. Seed stalk dies each fall. Also, *Y. filimentosa concava* with broad, stiff, spoon-like leaves.

Soil & Site: Full sun to partial shade. Poor, dry infertile soils including beach dunes.

Use: Road medians, banks, etc., for accent. Often used with Santolina species for desert-type motif. Usually single specimens rather than close groups. Good with tall growing yuccas.

Spanish bayonet – Yucca alnifolia

Description: Slender, tapered, dagger-like, sharp pointed leaves from a central crown at the ground. Flowers in June – early July. Fruit black-purple on a central flower stalk. Short, stocky trunk. Also, *Y. gloriosa* with leaves 2" wide, stiff, smooth and nearly flat. Flowers, sometimes red tinged, appear in October. Forms a short trunk as plant ages. If dead leaves are trimmed from trunk, the plant resembles a miniature palm.

Soil & Site: (See Beargrass above.)

Use: (See Beargrass above.)

Bamboo – Various species

Description: Tall perennial evergreen grasses with hard, hallow, jointed, woody stems. Height varies from the dense growing ground cover types (1 to 2'), to tall 40 to 50' specimens, such as the timber bamboo. There are also two general groups: one which spreads vigorously from rhizomes and a second group which increases slowly to form compact clumps. Each stem of bamboo is the product of one growing season. It never adds additional height after the first year. Not until the third or fourth year do the new culms grow to maximum height. Consult local nurseryman for adapted species and additional use information.

Soil & Site: Bamboos prefer a moist but well drained site. It is especially adapted along river and stream banks. However, it has been used successfully on moderately dry infertile sites and in gullies. Sun to partial shade.

Use: Low dense types of edgings, foreground plantings. Seldom for mass ground cover. Tall species used for background, screens, unclipped hedges and windbreaks. Plant rhizomes about 3" deep and end to end in a furrow if a continuous row is desired. For clumps, plant 2 or 3 rhizomes.

English Ivy – Hedera helix

Description: Mottled gray on green leafy vine, wide spreading on the ground but climbing on buildings or trees to 50' high. Slow in establishing but fast after root system develops. Agressive in shaded areas on good soil. Will take out shade grasses, Aaronsbeard, lilyturf and wintercreeper. Very dense ground cover to about 1' deep.

English ivy – Hedera helix (continued)

Soil & Site: Prefers moderately fertile sites with medium drainage and high organic content. But will grow on poorer, dryer sites. Prefers shade or north slopes if not under tree cover.

Use: For ground cover in shady areas, on banks, or low clipped borders along walks, circles under trees. Plant rooted cuttings 16 to 24" apart. Mulch between plants.

Wintercreeper – Euonymus fortunei

Description: Clinging evergreen vine which will form a dense ground cover and will also climb by means of aerial roots on solid surfaces. Stems tack down. Leaves 1 to 2" and dull dark green. Slower and not as vigorous as English ivy but with a smoother, finer textured appearance. Also, *E. fortunei colorata* with leaves turning to purplish red in the winter and *E. fortunei radicans* with leaves 1" long. All of these species are sometimes bothered by Euonymus scale.

Soil & Site: Moist soils of moderate fertility with high organic content. Will grow on well drained sites and will tolerate acid soils.

Use: For week free, low dense mats in shaded locations. Edging, foreground in front of junipers, etc. Does well on north slopes. Plant rooted cuttings 1' apart.

Honeysuckle – Lonicera japonica

Description: The common evergreen vine of southern woods, fence rows and roadsides. Fragrant whitish-yellow blooms in spring, black berries in the fall. Tangled mass of leafy stems which will form a 2' deep ground cover or will climb other vegetation by twining. Stems tack down.

Soil & Site: Wide range of soils – Moist to dry, fertile to moderately infertile and acid. Sun or shade.

Use: Principally for roadbanks and especially slopes too steep to seed. After the first year, use nitrogen generously. Mulch between plants which should be spaced 2 to 3'. For a minimum planting, two rows of plants in the moist and loose talus slope will eventually do the job, but at least one more row at the top of the bank will greatly increase the speed of covering. Plants may be seedlings or rooted cuttings from a nursery or rooted stems dug in the wild. Well rooted nursery stock is preferred if available. Honeysuckle makes good wildlife food and cover. A number of songbirds eat the seed. Quail, turkey and deer graze the leaves as well.

Periwinkle – Vinca minor

Description: A delicate much branched vine with dark green, lustrous leaves, opposite 1 to 1½" long and pointed at both ends. Stems not wide ranging and will not climb. Spring flowers lilac-blue, single, 5 petaled, about 1" in diameter. Forms a dense low mat. One of the best ground covers. Spread is rather slow.

Soil & Site: Sun or shade, will endure moderately infertile and acid soils, moist to fairly dry.

Use: One of the most widely used ground covers because of its wide adaptation to soil and site and its beauty. Use especially in shady locations, low 8" borders, around trunks of trees where grass will not grow on shady banks and those with north exposures. Space plants 12 to 18". An 18" spacing will close by the end of the second season.

Carolina jessamine – Gelsemium sempervirens

Description: A twining somewhat straggly vine with narrow, pointed, opposite evergreen leaves. Showy yellow flowers which appear in the spring are very fragrant. The vine is a high climber, and it blooms most abundantly when it is hanging from other vegetation or supported on trellis. Trailing stems make a good but not dense ground cover. Vines root at nodes. This plant is the state flower of South Carolina.

Carolina jessamine – Gelsemium sempervirens (continued)

Soil & Site: Will grow on poor dry sandy sites and is found mostly on the sandy Coastal Plain soils. Sun or Shade.

Use: Specimen plants supported by shrubs, small trees or trellises. Mainly for roadbanks in Sandhills area where honeysuckle is not well adapted. Plant spacing 3'.

Virginia Creeper – Parthenocissus quinquifolia

Description: Perennial deciduous vine. Leaves consist of 5 leaflets each 2 to 4" long. Sometimes confused with poison ivy which is 3 leaved. Vines will climb by tendrils and adhesive "hold fasts." Growth habit is loose. Does not usually form dense ground cover. Small greenish flowers in spring with open clusters of blue-black berries in fall. Autumn foliage brilliant red.

Soil & Site: Prefers medium fertility on well drained sites. Tolerates dry, rocky, poor or very sandy sites.

Use: Rough steep roadbanks to lend fall color and supplement other denser growing vines. To hide unsightly fences. Dune erosion control and beautification. Good songbird food (8 species). Plant spacing 3 to 4'.

Peppervine – Ampelopsis arborea

Description: A vine with finely cut foliage divided twice to form a compound leaf resembling trumpet creeper or cow itch vine. New leaf growth at terminal ends of branches bronze-red. Small green flowers in spring. Black berries in fall. Tendrils enable it to over-top shrubs and climb trees. Seed resemble grape seed. Spreads by underground rhizomes. Trailing stems will also tack down. Considered a weed plant in one deep South state, but not as rambunctious as Kudzu.

Soil & Site: Moderately moist to dry sites. Mostly in sandy soils of Coastal Plain and prominent in coastal beach areas. Good growth were found on clay soils.

Use: Erosion control on steep critical sites (roadbanks, gullies, etc.). Use similar to Kudzu. On dune beach areas for cover after grass has stilled sand. Plant 3 to 4' apart. On banks plant at least one row at the top and one in the talus slope.

Porcelain vine – Ampelopsis brevipendunculata

Description: A high climbing vine with tendrils and dark green grapevine-like leaves. Has divided and thickened tap root system. Berries lilac or whitish finally turning to a bright blue. Will not spread from underground roots or rhizomes.

Soil & Site: Not too particular but prefers rich moist sites. Plantings at beach indicate moderate adaptation to dune plantings. Sun or shade.

Use: As kudzu for roadbanks, gullies and similar steep areas difficult to seed. Plant in talus. Also one row on top of bank but improve this site by adding topsoil or peat. On trellises, or fences for screening. Seed are eaten by a number of songbirds.

Kudzu – Pueraria thunbergiana

Description: A high climbing, exceedingly vigorous vine with twining stems (no tendrils or aerial "Holdfasts"). The plant is a perennial legume. Trailing stems tack down at the nodes and produce crowns at these points. Flowers violet in loose hanging clusters. Hairy brown bean-like seed pods borne in fall, but sparingly and mostly on supported vines. The plant is generally as a pest especially because of its tree climbing habit. But there are a number of difficult erosion control problems where its vigor and dense cover is a necessity. In these circumstances, kudzu is often the most practical solution. Cattle will graze it out. Annual corp cultivation will keep it out of crop fields. Will climb edge trees when bordered by woods.

Soil & Site: Full sun to partial shade. Will not grow into dense (especially broadleaf) forest shade. Well drained soils of medium to low fertility.

Kudzu – Pueraria thunbergiana (continued)

Use: Gullies, very large steep banks too difficult to seed. River and large stream and channel banks and spoils. Large mine spoil areas. Planting in the moist talus of roadbanks or gullies is usually very successful. Especially useful on road and channel banks since it greatly reduces maintenance on such sites. Plant spacing 4 to 5'

Muscadine grape – Vitis rotundifolia

Description: A high climbing deciduous vine with tendrils. As a trailing plant on the ground, it makes a dense cover. Greenish-yellow flowers in spring. Fruit a dark purple, marble-sized grape with a tough skin. It is found throughout the state but is most abundant in the sandy Coastal Plain soils. (This species also includes the Scuppernong grape with a green-yellow skin.)

Soil & Site: Dry, sandy, infertile. Often on dune sands, eroded areas. Sun to partial shade.

Use: Permanent cover on poor eroded sites, roadbanks, etc., mine spoils, beach dunes. For human food and wildlife use. Fourteen songbirds use it for food. Also, wild turkey.

Trumpet creeper – Campsis radicans

Description: A rather stringy, sparcely leaved vine at first but gradually increasing to a moderately dense ground cover. Leaves divided into 9 to 11 leaflets. Orange trumper-shaped flowers in summer 3 to 4" long. Climbs by aerial rootlets. Long pointed capsule bearing double winged seed in fall. Familiar sight on utility poles, fence posts, etc.

Soil & Site: Full sun to half shade. Will tolerate infertile, eroded, dry acid sites.

Use: For erosion protection on banks too steep to plant (road cuts, spillway banks, etc.). Possibly the best plant to vegetate bank abutments under bridges. Also, Mine and dug channel spoils, coastal sand dunes. A favorite food flower of hummingbirds. Plant spacing 2 to 4'.

Creeping juniper – Juniperus horizontalis

Description: Evergreen perennial shrub with dark green to blue-gray needles. Branches lax and creeping to about 16" tall. Also, *J. horizóntalis plumosa* (Andorra juniper) to 1½' tall and turning dull pink-purple in the fall. All shrub juniper types are acceptable for this work and all are hardy throughout North Carolina.

Soil & Site: Dry, hot, moderately infertile sites. Full sun to 1/3 shade.

Use: Road and other dry infertile banks where maintenance can be provided. Low mass plantings – sometimes in lieu of small lawn areas. Road medians; foreground plantings. Space plants 3 to 4'.

Sargent juniper – Juniperus chinensis – sargenti

Description: This is one of the Chinese junipers. It is a low dense plant about 2 to 3' tall. The needles are steel-blue in color. Single plants have grown to rounded mats 8-10' in diameter. Will tolerate moderate exposure to salt spray.

Soil & Site: (See *J. horizontalis* above.)

Use: (See *J. horizontalis* above.)

Pfitzer's juniper – Juniperus chinensis pfetzeriana

Description: Similar to above but 3 to 6' tall, flat topped with long, drooping, graceful, horizontal branches. Needles dark green to steel-blue. One of the most used landscaping plants. Requires annual pruning to keep it dense and within bounds of desired height.

Soil & Site: Will tolerate dry, infertile sites and city conditions.

Use: Low screens, borders, background, road medians, specimen plants. Has also been used successfully for wildlife cover. Space plants 4'.

Shore juniper – Juniperus conferta

Description: A perennial evergreen shrub with bluish, light green needles. Drooping stems. Mat forming ground cover. A vigorous grower and the fastest spreading of all shrub junipers.

Soil & Site: Sand soils (including coastal dunes) to infertile Piedmont soils. Prefers full sun but will take part shade.

Use: Beach landscaping but requires organic additives to the sand. Mass plantings well adapted to dry banks. Has become a popular substitute for grass for small areas formerly put in lawns. Drapes well in planter boxes, over walls, etc.

Thorny elaeagnus – Elaeagnus pungens

Description: Evergreen broadleaved shrub. Leaves shiny, dark green above, silvery underneath. Newer stems also silvery with cinnamon colored speckles. Stems long and pendulous. Twigs spurred. Flowers in December. Red silver-scaled berries ripen in April. Though not a legume, this plant has nitrogen fixing bacteria on its roots. The accumulation of nitrogen in the nodules is one important reason why this plant is able to prosper on poor sites. (A number of varieties, all good: Fruitlandi, Simoni, Reflexa.)

Soil & Site: Well drained soils of medium to low fertility including dune sands. Sun to 2/3 shade.

Use: Hedges, shrub borders, specimens, low screens and as shrub understory in pine windbreaks. On eroded or other sites for wildlife food. Its berries are taken by turkey, quail and several songbird. Frequent nesting site of mockingbird, brown thrasher, towhee and cardinal. The berries ripen when other foods are still scarce. Requires frequent pruning as a shaped trimmed hedge. In rows, space 3 to 4' in groups 4 to 5'.

Bigleaf wintercreeper – Euonymus fortunei vegatus

Description: Trailing evergreen vine to semishrub. Rounded leaves 1 to 1½" long, leathery, dark shining green on top, dull light green beneath. Will form a weed free mat 2' or more deep. The thick green stems have aerial "holdfasts" and the plant will climb walls, buildings, posts, etc. It grows faster than other *E. fortunei* varieties. The stems tack at the nodes. Cuttings easily rooted in jar of water. Insignificant cream colored flowers produce white to pinkish capsules which split open to expose flesshy orange fruit inside.

Soil & Site: Well drained, poor to moderately fertile. Will tolerate moist or acid sites. Sun or shade.

Use: For ground cover 2' or more thick. Good on banks, mass plantings, wall or fence cover where it can be properly maintained.

Evergreen Euonymus – Euonymus japonicus

Description: Evergreen shrub with waxy green, leathery leaves 1 to 3" long. Stems green, upright. Small yellow flower clusters give way to capsules which split open in the fall exposing orange colored fruits. Sometimes over 12' tall. Cuttings easily produced by putting stems in a jar of water. Sometimes bothered by Euonymus scale which can appear on most Euonymus species. A very popular and serviceable landscape plant in the South.

Soil & Site: Will tolerate infertile, moist sites. Better on well drained soils. Sun or shade.

Use: For clipped hedges, shrub borders, specimens. Leafy stems are excellent in flower arrangements. Excellent for beach landscaping where it has phenomenal resistance to salty sea winds.

Wax Myrtle – Myrica cerifera

Description: Evergreen aromatic shrub which in some cases may be described as a small tree. Foliage narrow 1 to 3" long and yellow green in color – especially underneath. In the fall the outer stems and twigs covered with small grey berries slightly less than 1/8" in diamter. Has fine texture and irregular form. The sexes are separate. Only female plants produce fruit.

Soil & Site: Best in moist Coastal Plain soils but O.K. in Piedmont. Will tolerate dryer sites and even sand dune areas. Full sun to 1/2 shade.

Use: For tall shrub borders, or as understory for pine windbreaks. Specimens, road medians, etc., around buildings, city malls (where trimmed to a small tree form). Also, moderately good salt wind resistance for beach work.

Bayberry – Myrica pennsylvanica

Description: A semi-evergreen shrub mostly of the northern coastline in North Carolina. Leaves narrow, about 3" long and aromatic when crushed. Inconspicuous flowers produce clusters of waxy berries about ¼" in diameter. These appear along the stems on old wood. The plant grows to 5 to 7' and spreads to form open growing colonies by means of root suckers. It is very resistant to salt spray.

Soil & Site: Found naturally on pure dune sands. Dry infertile sites in full sun.

Use: Excellent for landscaping and erosion control in beach areas. Also, being tested for wildlife and critical site protection in Piedmont and mountains. Use in groups or rows for shrub backgrounds. The berries are still used to some extent to make bayberry candles. They are also a staple food of turkey, quail and 35 species of songbirds. Plant spacing 3' in rows, 4 to 5' in groups.

Yaupon holly – Ilex vomitoria

Description: Evergreen native shrub to small tree with dark waxy-green foliage. Leaves long oval about 1" long. Bright red berries in the fall are very showy. The berries remain on the plant through the winter and following spring. Spreads very slowly by occasional sprouts from root suckers. Will withstand shearing. Considered as being the most drought resistant holly. Has irregular form and fine texture. The sexes are on separate plants. Use only stock from cuttings to get all fruiting plants. Growth is slow.

Soil & Site: Poor dry sandy or clay soils. Will also endure moist acid sites. Full sun to partial shade.

Use: Shrub borders, clipped hedges, specimen shrub or trained to small tree in malls, medians, etc. Christmas decoration. In rows, space plants 2 to 3', in groups 4 to 5'. The berries are an emergency food of five songbirds.

Inkberry – Ilex glabra

Description: A native, upright, semi-globe shaped, evergreen shrub. Leaves 1 to 2" long, lustrous and dark. Flowers are inconspicuous. Single black berried fruits (¼") in fall. Male and female plants required for berry production. Female plants turn purplish in the winter. Withstands severe pruning. Foliage not dense and the texture is medium. Growth is slow. Sometimes bothered with a scale.

Soil & Site: Acid soils to damp (bays, flat wood areas). But will grow on infertile sites with good drainage if organic material is added.

Use: Good background plant, shrub borders, or often in groups. Not for banks. Groups in medians, malls.

California privet – Ligustrum ovalifolium

Description: A tall semi-evergreen to evergreen shrub to 10-15'. Leaves glossy, 1 to 2" long, turn purplish in fall. Flowers creamy white. Black berries in small 2 to 3" clusters in fall. Easily propagated by hardwood cuttings. Rather stiff upright habit of growth. Densely branched. Can be heavily trimmed. The leaves are partially resistant to salty sea winds.

Soil & Site: Will tolerate dry infertile sites if started off with some topsoil or organic material. Does moderately well in beach sand – again with organic soil amendment.

Use: Beach landscaping, clipped hedges, tall borders, understory for pine windbreaks. Not usually in singles or groups.

Japanese privet – Ligustrum japonicum

Description: Shrub to about 15' but usually 6 to 8'. Evergreen leaves, leathery up to 4" long and quite glossy. Flowers have strong odor, are creamy white in panicles about 6" long. Berries blue-black on terminal branches in fall. A vigorous grower and much used in landscaping. May be clipped. Fairly dense growth in full sun.

Soil & Site: Not particular – infertile sites, dry to medium moist (not wet). Sun or shade.

Use: Clipped hedges or even better in unclipped screens or borders. Specimen plants. In medians for headlight shading or as understory in pine windbreaks. Berries are favorite food of cedar waxwing. Also, taken readily by five other species. One of the most used species in beach landscaping. Spacing in rows 2' (close hedges), 3 to 4' (borders, etc.).

Glossy privet – Ligustrum lucidum

Description: This is the tallest of the privets to 30' but commonly about 15'. Its leaves are larger (up to 6") and more pointed and less glossy than those of *L. japonicum.* Growth upright and soon a small tree if so pruned. Large panicles (8 to 16" or more) of white flowers in spring. Blue-black, drooping panicles of berries in the fall. Cannot take heavy pruning. Use corrective trimming only. Growth rate fast.

Soil & Site: Tolerant of average sites. Requires medium fertility, drainage and depth. Use topsoil or organic additives on droughty poor soils.

Use: For tall shrub windbreaks or a pine windbreak understory. Screens and borders. A number of songbirds use the berries for winter food. Small specimen trees for small spaces. Plant 4 to 5' apart in rows.

Regel privet – Ligustrum obtusifolium regelianum

Description: This is a low, graceful, horizontally branched variety of border privet. Stems are quite thin and curved downward. Leaves opposite (as all privets) and very regularly spaced. Leaves "bronze off" in fall with purple tinge. Flowers are white: berries a dull blue-black. It can withstand pruning to keep in bounds and is a fast grower. Somewhat open growing.

Soil & Site: Seems to have better adaptation than previous species to poor dry sites. Sun to 2/3 shade.

Use: As low, graceful shrub borders or small groups. Good on moderate slopes to hide rock or just for cover, but may not give complete erosion protection. Will not obstruct visibility in road medians. Berries ate taken by several songbirds. In rows, plant 3' apart, in groups 4'.

Oleander – Nerium oleander

Description: An upright evergreen shrub with most branching directly from ground. Leaves long (3 to 5") slim and pointed. Many varieties with flowers of many colors (red, white, yellow, purple), – single and double. Best adapted to the lower Coastal Plain. May be heavily pruned. Both leaves and flowers are poisonous. Stems will root if placed in a jar of water. Good salt wind resistance.

Soil & Site: Withstands dry, hot situations. Best in full sun. Seems to prefer sandy Coastal Plain soils.

Use: Mainly for beach landscaping. Its poisonous quality has probably restricted its use in urban plantings. It will do well in borders or groups. Is striking for single plant accent along medians. Border or group spacing 3-4'.

Pittosporum – Pittosporum tobira

Description: Evergreen shrub to about 10'. Growth is stiff and bushy. Foliage, blunt, leathery, rolled inward and 3 to 4" long – somewhat resembling rhododendron. Clusters of orange-like blossoms in spring with brown capsules in fall. These split open showing orange colored seed covered with glue-like substance. Leaves extremely resistant to salt wind burn. This shrub is the No. 1 landscaping plant on Carolina beaches. An outstanding evergreen shrub. Cold hardy about to Raleigh south and east.

Soil & Site: Tolerates dry sandy or finer testured soil conditions. Avoid soils with shallow hardpans. Prefers loose deep soils. Good drainage required, moderate fertility appreciated. Sun to ¼ shade.

Use: Beach landscaping. borders, low screens. Not too good as a clipped hedge. Single specimens or groups for general landscaping – medians, malls, school grounds, etc. Spacing in rows 3 to 4', in groups 4 to 5'.

Wintergreen barberry – Berberis julianae

Description: Upright and dense, evergreen shrub. Leaves glossy, narrow, spiny, evergreen and to 3" long. Thorns on twigs are three-parted and very sharp and stiff. Small yellow flowers (1/3") appear in April; blue-black berries in the fall. The shrub usually is narrower at the bottom and somewhat top heavy. The plant is very hardy and disease free. It tolerates pruning well and is free of insects.

Soil & Site: Will grow on relatively infertile, dry sites in sun or part shade.

Use: For trimmed or untrimmed hedges which are impenetrable. To protect areas from foot traffic. Also, promise as one component of wildlife cover plantings (principally for rabbits).

Firethorn – Pyracantha coccinea

Description: Firethorn grows to about 8 to 10' with a spread usually greater than its height. Leaves are evergreen, oval and about 1½" long. Growth is open, formless and the twig ends more or less spurred. Dense clusters of white flowers appear in early May – well after frost date in most areas. Thus, the berry production each fall is very dependable. Orange to red (or on variety "Aurea" – yellow) berries ripen in the fall in dense brilliant clusters. Orange berried "Kasan" and "Lalandee" with scarlet fruit are supposed to be the most cold hardy and are preferable in the mountains. Bare rooted plants do not take well to transplanting. It is best to use plants grown in gallon cans. It is subject to several diseases and insects, yet is a much used landscape plant because of its winter beauty.

Site & Soil: Not a poor soil plant but can be grown on dry infertile sites with organic soil amendments. Sun or part shade.

Firethorn – Pyracantha coccinea (continued)

Use: Screens, borders, groups and specimens in many situations. Effective as an espalier – a plant trained against a well, fence, etc. A fine wild turkey food. Also, taken by cedar waxwing, robins, cardinal and mockingbird. Plantings in the wild must be protected from deer grazing and cultivated for at least two years.

Tartarian honeysuckle – Lonicera tartarica

Description: Deciduous, upright shrub to 10' with leaves 1 to 2½" long, light green, short and fuzzy. Flowers pink, crimson or white. Fruit – a red juicy berry about ¼" ripening in June. It is free of disease and insects.

Soil & Site: Will grow on poor dry sites. Best in full sun.

Use: Will perform moderately well on critical areas, in contour rows or clumps. Also, summer songbird food.

Arnold dwarf forsythia – Forsythia arnoldi

Description: This plant originated at the Arnold Arboretum in 1941. It was selected for its low dwarf habit (to 3') and widely spreading to prostrate branches (to 7' or more). Branches root where they touch the ground. Flowers are a poor faded yellow – not as showy as on the following type. It finally makes a thick mat of interlocking branches at or near the ground surface – its chief claim to fame. Growth is rapid. Propagated readily from cuttings.

Soil & Site: Any well drained soil in full sun.

Use: For ground cover on rough or relatively steep places between rocks, roadbanks, other cuts. Not recommended for its beauty. Plant spacing 2 to 3'.

Showy forsythia – Forsythia intermedia spectabilis

Description: This shrub is noted for its brilliant, deep yellow bell-like flowers (2" in diameter). It will grow erect and 5 to 9' tall but less on poor sites. Flowers prolific in early spring before leaves appear. Dry to valved seed capsules in fall. Transplants well, roots quickly and is a fast grower. Takes pruning well. Renew occasionally by taking out three-year-old wood. Other good varieties: "Spring Glory," "Lynwood Gold" and "Beatrix Farrand." Also, *F. suspensa sieboldi* is an excellent choice with pendulous, spreading, rooting branches.

Soil & Site: Any well drained soil in full sun.

Use: On rough banks, medians, etc. One of the best for spring beauty. Use in groups, in rows for borders or as single specimens for any landscaping job on poor soil conditions.

Goldflower – Hypericum moserianum

Description: This low shrub (2 to 3') has arching stems and is broader than tall. Yellow blossoms about the size of a wild rose are odorless, striking and continue to bloom most of the summer. Fruit capsules persist through the winter. Bark peels. Root system is fibrous, creeping. It requires thinning occasionally to renew growth. No pest problems.

Soil & Site: Will tolerate infertile dry sites. Likes sand. Sun to ½ shade.

Use: In poor soil areas for small mass cover or borders on banks, rockeries, medians and similar sites. Select this one for beautification when long continuous bloom is needed. Plant spacing 2'.

Winter jasmine – Jasminum nudiflorum

Description: A densely, green branched, drooping shrub to about 4' (usually less). Leaves small, trifoliate. Widely spaced, small yellow flowers appear in January and February before the leaves. Twig

Winter jasmine – Jasminum nudiflorum (continued)

tips root when in contact with loose dirt. Forms dense cover up off the ground. Prune occasionally to rejuvenate. Does not look bare in the winter.

Soil & Site: Well known plant for difficult infertile dry soil conditions. Sun or shade.

Use: Banks, above walls, low dense borders, accent specimens with low ground covers and for other various poor soil sites. In rows or groups, space plants 2 to 3' apart.

Beautyberry – Callicarpa americana

Description: A native shrub with arching upright stems mainly from the ground with regularly spaced, opposite leaves 3 to 6" long. Thick rounded clusters of lilac colored berries in the fall at regular intervals clinging closely to stems. Berries remain attractive on shrubs long after leaf fall. Need dark green background to show off fruit to best advantage. Not good against red brick background. Does not furnish good erosion control alone.

Soil & Site: Seems to prefer sandy soils of Coastal Plain. Prefers moist sites but will tolerate Sand Hills on dry infertile soils. Sun to almost complete shade.

Use: Select this one for color of autumn fruit and as an addition to wildlife and songbird food plantings. Also for beach plantings in flats between dunes. In groups or rows with plants 3' apart.

Rugosa rose – Rosa rugosa

Description: A very sturdy upright shrub with a fairly dense mass of stems. Leaflets thick, dark green turning orange in the fall. Flowers 2-3" in diameter with overlapping purplish petals. Fruit a bright brick red hip. This is one of the least exacting of the roses. It is a rapid grower. It spreads slowly from root suckers. Many good varieties: one of the best is "Max Graf" a trailing pink rose.

Soil & Site: Will endure poor moderately dry sites, in beach sand and elsewhere. Full sun. Withstands salt spray.

Use: Borders, shrubberies, specimens in medians, etc. Use especially for color of its flowers, fruit and foliage. Plant spacing 3' in rows, 4-5' in groups.

Memorial rose – Rosa wichuraiana

Description: A very long-branched, trailing shrub with canes to 25' or more. Flowers single, white and 2" in diameter. Fruit-reddish hips not showy. Leaves lustrous and semi-evergreen. Stems make good, low ground cover but require a number of years to become dense. Stems will root where covered by soil.

Soil & Site: All but poorly drained soils. Will grow on stony rough slopes, etc. Best in full sun.

Use: As ground cover on banks and other slopes. Will scramble over rough rocky sites. On steep banks plant row at top with plants 2-3' apart. Seed balance of bank with an adapted grass or legume. Rose will gradually take over. If practical plant additional rows 6' apart.

Scotchbroom – Cytisus scoparius

Description: Upright, stringy, green branched shrub. Yellow pea-like flowers in April. Flat brown seed pods in fall. This plant is not easy to transplant. The plant is inclined to be top-heavy with little growth near the ground. It is not a good ground cover, but it is still useful in landscaping on poor sites. Growth is moderately fast and it has no pest problems. Also *Cytisus procumbens* a lower growing shrub to 30" tall. Not as vigorous as above but better ground cover.

Soil & Site: Will grow on typical critical area sites which are infertile and droughty.

Use: Use for its winter green color of twigs and stems and for yellow flowers. For accent, informal background on banks, etc. Plants should be carefully dug, tops should be sheared back and the plants firmed and watered.

Autumn olive — Elaeagnus umbellata

Description: Large spreading deciduous shrub to 12'. Often spiny at ends of silvery brown branchlets. Leaves oval often crisped at margins, green on top, silver with brown speckles beneath. Flowers insignificant in leaf axials. One seeded berries which ripen in late September-October are red with silvery scales. Branches often pendulous with heavy fruit crops. Easy to transplant. Very vigorous and hardy. Will produce berries 2nd or 3rd year after transplanting.

Soil & Site: Will grow on dry, infertile, acid sites. Not for wet soils. Needs full sun to 1/3 shade.

Use: For large areas, screens, borders, backgrounds. Understory for pine windbreaks. Contour rows and clumps for songbirds (17 species) and also quail, turkey, grouse. Successful on mine spoils. Moderately good at the beach with organic soil amendment.

Tag alder — Alnus rugosa

Description: A tall shrub of stream banks, shores and marshes. Long, somewhat crooked and bare main stems supporting an umbrella-like top canopy when mature. Twigs rusty and fuzzy. Leaves dark green with jagged edges and usually with brownish fine hair beneath. Male and female flowers separate but on the same plant (as in Pine). Small wingless seed produced in female cones in early fall.

Also *A. glutinosa,* European black alder which is actually a small tree with spreading branches and a symmetrical ovoid top.

Soil & Site: Moist to wet sites along streams, ponds, etc. Will endure dryer and moderately infertile soils.

Use: Mainly to control erosion (wave action, etc.) along shorelines of lakes and also for protection of streambanks. *A. glutinosa* especially, has promise of shading out waterweeds along ditch and canal banks.

Rose acacia — Robinia hispida

Description: Mostly single stemmed plants from the ground but then branching. Spread vigorously from root suckers to form thickets. Smaller stems, twigs and leaf axials covered with small stiff amber hair. The plant is a native legume. Leaves divided into 7-13 leaflets. Flowers lavender to pink, pea like in loose hanging clusters. Flat pea pods in fall. Nitrogen fixing bacteria in roots promotes its growth on infertile soils. (Also called *R. fertilis*) A good selection developed by the S.C.S. is called Arnot bristly locust.

Soil & Site: Any well-drained soil-tolerates droughty soils and rough slopes. Also Sand Hill area. Prefers full sun.

Use: Due to its vigorous spread give plenty of room. Good for the typical critical sites, spoil from excavations, mines spoil dumps etc.

Elderberry — Sambucus canadensis

Description: A native shrub — large wide spreading, deciduous with coarse compound leaves. A vigorous grower. White flowers in large flat clusters. Heavy flat clusters of dark purple berries are conspicuous in autumn. Leaves, buds, young shoots, roots and bark are poisonous. Boys, now men, who have made whistles of the hollow stems take note!

Soil & Site: Moist to wet sites. Full sun for heavy berry production, but will grow in 2/3 shade. Usually on rich sites.

Use: Along stream banks, shorelines or other damp areas and especially where songbird food is desired. It is taken by 14 bird species. The fruit is sometimes used in various preserves and for wine. Used in this way the berries are not harmful.

New Jersey Tea – Ceanothus americanus

Description: Small, upright native shrub with dark green leaves which were used for tea during the Revolutionary War. A dense "crown" of small white flowers bloom on branch ends in the spring. These are noticeably attractive. A three seeded "drupe" black in color, ripens in late August and September. This plant has nitrogen fixing bacteria on its roots. This thoughtful arrangement accounts for its successful occurence along dry sterile roadbanks. New Jersey tea spreads very slowly from root suckers. Branches buried in soil sediment will root. This allows the plant to grow thru and spread out as sediment is deposited around it.

Soil & Site: Endures dry eroded acid soils. Rough banks, gulley bottoms. Full sun to ½ shade. Prominent in the mountains.

Use: On roadbanks and other rough sites usually as part of a landscape plan – for accent and spring flower beauty. Not good alone for erosion control except in gulley bottoms where depositing sediment spurs growth and spread.

Shining sumac – Rhus copallina

Description: Native shrub to 15' on good sites but on poor soils where it is useful the usual height is 4 to 6'. Single stems from ground later branching to make a canopy. Leaves rich green, compound with 9-23 leaflets – mostly 9-11. The leaf stems are winged with a flange-like margin of tissue. A panicle of greenish flowers bloom after the leaves appear. A loose, bright red "cone" of seed is born at the terminal ends of main branches. This sumac spreads rather vigorously from root suckers to form colonies fairly open underneath but with a complete canopy above. The leaves turn scarlet in the fall. On roadbanks etc., this canopy helps to suppress encroachment of undesirable native vegetation. Easy to transplant. May be cut to the ground each winter without harm.

Soil & Site: Will grow on most of our poorest, driest, most acid sites. Successful on beach sands.

Use: A very useful conservation plant because of its beauty and agressiveness on trying site conditions. Plant in groups on banks, spoils and other dry sites to be landscaped. Interesting in confined landscape plots. Also for beach work – cottage plantings and dune erosion control. Space 3' apart.

Smooth sumac – Rhus glabra

Description: Similar to shining sumac above but usually a heavier plant and somewhat taller. Dense rich red cone of fruit in fall. Leaves compound and without flanges or wings turning brilliant red in the fall. Spreads from root suckers to form thickets – open underneath but with almost complete canopy which is quite effective in suppressing other native plant encroachment. May be severely pruned off or allowed to grow to small tree form.

Soil & Site: Will grow on most of our poorest, driest most acid sites. Successful on beach sands.

Use: A very useful conservation plant because of its beauty and agressiveness on trying site conditions. Plant in groups on banks, spoils and other dry sites to be landscaped. Interesting in confined landscape plots. Also for beach work – cottage plantings and dune erosion control. Space 3' apart.

Fragrant sumea – Rhus aromatica

Description: A straggly shrub 3 to 6' tall but on poor sites 2 to 3' and quite dense. Leaves in threes, thick pubescent on both sides especially when young. Berry-like clusters at ends of branches turn red in fall along with the leaves. Somewhat resembles poison ivy. It blooms before the leaves appear in the spring. Spreads by root suckers to form colonies. Growth is rapid.

Fragrant sumac – Rhus aromatica (continued)

Soil & Site: Poor dry acid sites. Best in full sun.

Use: Excellent shrub in front of taller plants or on banks. Do not use along unpaved roads since pubescent leaves catch and hold dust. Plant spacing 2 to 3'.

Coralberry – Symphoricarpos orbiculatus

Description: A low, native shrub with slender upright spreading branches. Forms clumps as it spreads from rhizomes. White flowers in the spring are insignificant, but the small clusters of coral colored fruit in the fall are attractive. Twigs and underside of leaves are densely pubescent. Appears in old over-grazed pastures, woods, borders, etc.

Soil & Site: Fertile or infertile moist sites. Sun to one-half shade.

Use: Banks, dry rocky rough slopes. Will not cover rocks. Plant 2' apart.

Halbred willow – Salix hastata

Description: A dwarf willow to about 5'. Lower limbs hug the ground and take root. Leaves remain green long after frost. Plant easily established by planting rooted or unrooted cuttings in moist soil in the spring before leaves appear. Lower limbs catch sediment. At present, available only from Soil Conservation Service Plant Materials Centers in the Southeast.

Soil & Site: Fertile or infertile moist sites. Sun to one-half shade.

Use: Along streambanks, lake shores (to prevent wave action damage), and in moist sediment accumulations in gully bottoms. Plant spacing 2 to 3'.

Sandbar willow – Salix interior

Description: This is a native of central North America growing to a height of 6 to 10'. It spreads rapidly from rhizomes and/or root suckers to form dense colonies. Stems are erect with sparse, side branching. This shrub is easily established by spring planting unrooted whips or rooted cuttings in moist soil. In the fall, the leafy stems produce a good protective mulch on the ground.

Soil & Site: (Same as *Salix hastata.)*

Use: (Same as *Salix hastata.)*

Bicolor lespedeza – Lespedeza bicolor

Description: Leguminous shrub to about 10' or more – usually 6 to 8' on poorer sites. Heavy flowering of lavender to pink pea-like blooms in September. Seeds ripen in mid to late October. Frost sometimes kills the seed before they mature. Flowers depend on insect pollination. Shrubs may be cut to the ground occasionally. This reduces following year height and induces an increase of stems from the ground. Has a very tough wiry root system.

Soil & Site: Wide soil adaptation – poor to rich, dry to moderately moist but not wet. Is a little better adapted to poor eroded areas, s land subclasses, spoils, etc., than *Lespedeza japonica.* Sun to one-half shade.

Use: On banks, especially very large ones or those where the soil may be inclined to slide. Large mountain fill areas. Permanent contour borders across fields. Spoils. Also proven winter quail food, but is giving away to Japonica VA-70 which is a more dependable seeder and does not require cutting back. Along roadbanks, do not block driver's visibility. Established from seed or plants. Seed: 10 to 12 lbs. per acre broadcast for erosion control. For wildlife 8 lbs. per acre. Plants: 3 x 3' for wildlife and contour borders (use minimum of 3 rows), 3 x 2' for erosion control.

Japonica lespedeza VA-70 – Lespedeza japonica

Description: A selection made at the Gretna, Virginia, Soil Conservation Service Nursery in 1952. A leguminous shrub to 5' where woody stems are killed back to the ground each winter. This does away with the need to cut back the stems (as with "bicolor"). Pink to lavender pea-like blooms appear in late August – early September. Seed ripen in early October. Stems from the ground increase each year from the crown. This produces a clump 1 to 2' across with up to 40 closely growing stems. On the poorest sites, it will not perform as well as *L. bicolor.*

Soil & Site: Moderately well drained to dry soils of medium to low fertility. Requires full sun for best growth and seed production. Will endure one-half shade.

Use: Contour rows across fields. On banks where soil is relatively deep. Fills. Cloverleaf areas (mowed down once a year after frost). For quail food, it is preferred to bicolor since the seed crops are more dependable and it does not have to be cut back. Established from plants or seed. Plants: 3 x 2'. Seed 10 lbs. per acre broadcast or 30 seed per linear foot if in rows.

Carolina laurel cherry – Prunus caroliniana (Other common names: Cherry laurel)

Description: Small to fairly large tree; usually 15-30' high; up to 10" in diameter; occasionally 60' high when cultivated. Trunk is straight or inclined with slender horizontal branches forming a narrow, oblong or sometimes broad head. Leaves are evergreen, elliptic to elliptic-lanceolate, sharply pointed, thick leathery-textured, dark shiny green above and paler beneath; margins usually smooth, or sometimesfinely toothed, slightly rolled to the lower side; 2-4½" long, 3/4-1½" wide. Flowers are small, creamy white, borne in numerous, short racemes; appear February to April. Fruit is dull, black, thinly fleshed, one-seeded drupe, about ½" long. Ripens in autumn, but persistent to following flowering season. This tree is native to the Coastal Plain, but will grow in the approximate area east and south of Greensboro. It is believed to be rare as a native tree; more abundant as an escapt from cultivation. Growth is fairly rapid on good sites.

Soil & Site: Laurel cherry grows most rapidly on deep, fertile, well drained, but moist, alluvial soils; however, it is not very exacting and will grow on dry sands. Best growth is made in full sunlight, but it will tolerate some shade.

Use: Ornamental, shade, windbreaks, screens, hedges, beach landscaping, and wildlife food and cover. Primary uses are for screens and windbreaks. Can be clipped and formed into a hedge. *Spacing:* (a) Windbreaks – 5-6' either in a single row, alone, or in outside rows with pines in center; (b) screens – 5-6' apart in 1 or 2 rows; (c) hedges – 2-3' apart. Does not survive well unless most of the leaves are clipped from the stem before transplanting. Leaves contain hydrocyanic acid (also called prussic acid and are poisonous to livestock if eaten when wilted.

Chinese chestnut – Castanea mollissima

Description: Small to medium-sized shrubby tree; but occasionally 50-60' high. Leaves are deciduous, simple, alternate, elliptic-oblong to oblong lanocolate, pointed; 3½-6" long; margin coarsely toothed; surface smooth and green above, whitish-green and wooly beneath, turning yellow brown in fall. Fruit is a brown nut, about 1" wide; usually 2-3 enclosed in a spiny burr. Bark is furrowed. This species is a native of northern and western China. It is hardy throughout North Carolina and is more resistant to Chestnut blight, *Endothia parasitica,* than the American and European species.

Soil & Site: Grows best on deep, fertile, well-drained to moderately well-drained soils in full sunlight, but will tolerate rather dry and stony soil.

Use: Ornamental as specimens, groups, or tall borders; edible nuts; wildlife and cover. *Spacing:* Ornamental – 15-20'.

Eastern redbud – Cercis candensis (Other common names: Judas-tree)

Description: Large shrub to small tree; usually 15-35' high; occasionally 45-50'; with a straight trunk, usually separating above the ground into stout branches that form an upright, rounded, or, frequently, a wide, flattened head. Leaves deciduous, simple, alternate; nearly circular, often abruptly contracted at the apex into a sharp broad point; more or less heart-shaped at the base; 3-5" long and broad; margins smooth; bright clear yellow in autumn. Flowers conspicuous, pale pink to deep rose or purplish, appearing from late February to April, usually before the leaves. Fruit, a legume appearing from late February to April, usually before the leaves. Fruit, a legume (pod) 2½" - 3½" long. Seeds ¼" long, available in August. Pods frequently remain closed throughout winter unless opened by birds. Although found chiefly in Piedmont woodlands, redbud is fairly hardy and will grow throughout North Carolina except at highest elevations. Growth is fairly rapid on good sites.

Soil & Site: Redbud grows most rapidly on deep, fertile, well-drained, but moist, slightly acid alluvial soils; however, it will grow on drier sites in the uplands on slightly acid loams, sandy loams and sands, and even on slightly calcareous soils. Although it tolerates shade, best growth is made in full sunlight.

Use: Chiefly used as an ornamental for its showy flowers in early spring; also, wildlife food and cover. *Spacing:* Ornamental – 15-20'. Special care may be necessary in some localities to establish and maintain this species.

Eastern Redcedar – Juniperus virginiana (Other common names: Red juniper, savin)

Description: Small to medium-sized, evergreen tree with dense, fragrant foliage; usually 40-50' high; 12-24" in diameter. It varies in form from broadly pyramidal to narrowly columnar. The trunk is usually grooved. Leaves are of two types: (a) minute and scale-like, clasping the stem in 4 ranks, or (b) awl-shaped, sharply pointed and spreading on young shoots. Both types are found on older trees. Foliage color ranges from dark yellow-green to bluish green. Fruit is a berry-like, spherical, highly aromatic cone,, 1/4 - 1/3" in diameter, enclosing 1 or 2 seeds in a resinous pulp. Color is dark blue at maturity. Bark is very thin, reddish brown and shreddy. Eastern redcedar is the most widely disbributed tree-sized conifer in the Eastern United States, being found in every state east of the 100th meridian.

Soil & Site: Red cedar is very adaptable, growing on a wide variety of soils, often under very adverse conditions – from swamp land to dry, rocky ridges, or rock outcrops. Soil depth and drainage are the most important site factors affecting growth. Growth is best on deep, well drained alluvial soils and poorest on upland soils less than 12" deep. It will grow on soils with pH values varying from 4.7 to 7.8. Redcedar is intolerant of shade, requiring direct sunlight for best growth; however, on dry, sterile it can withstand competition from hardwoods.

Use: Ornamental, windbreaks, screens and sound barriers, roadbank protection, Christmas trees, wildlife food and cover; also, cedar chests, interior woodwork, furniture, flooring, rustic woodwork, poles, posts, pencils, wood oil for perfumes, and leaf oil for medicines. *Spacing:* (a) Windbreaks – 5-6' in row, preferably as exterior rows with pines in center rows, 6' apart; (b) screens – 5-6', staggered in two rows 5' apart; (c) roadbank protection 3 x 3' to 4 x 4'; Christmas trees – 5-10'. Seedlings planted on dry, sterile sites should be mulched and fertilized.

River Birch – Betula nigra (Other common names: Red birch)

Description: Medium-sized to large tree, up to 100' high; 30-36" in diameter; usually 50' high, 15-20" in diameter, with a trunk that separates 15 to 20 above the found into several arching branches. Leaves are deciduous, simple, alternate; ovate to elliptic; 1½-3" long with conspicuous, sharply doubled-toothed, margins; upper surface is shiny, dark green; lower is whitish and usually wooly; turning yellow in autumn. Flowers are catkins (spike-like inflorescence); male and female occuring on the same tree. Fruit is a small, one-seeded samara, the body (nut) with 2 thin, lateral wings,

River birch – Betula nigra (continued)

compounded to form an erect brown cone, 1-1½" long; available for wildlife July-September. Bark is salmon-pink to reddish brown; peeling into tough, papery layers; later becoming coarsely scaly on older trunks. River birch is a rapid-growing tree when young. It is the only birch occurring naturally at low elevations in the South.

Soil & Site: River birch commonly grows along streambanks and on floodplains on poorly drained to well-drained alluvial soils, but is not very exacting and will make good growth on dry, eroded upland sites. Tolerates flooding for a period of several weeks. Often seeds in naturally on road banks. Although shade-tolerant, best growth is made in full sunlight.

Use: Ornamental as specimens or groups, shade, streambank protection, erosion control, wildlife food and cover; also furniture, woodenware, turnery, fuel wood. *Spacing:* (a) Ornamental – 20-30'; (b) streambank protection and erosion control – 4 x 4' to 5 x 5'.

Loblolly pine – Pinus taeda (Other common names: Arkansas pine, foxtail pine, frankincense pine, North Carolina pine, old field pine, shortleaf pine, and southern pine)

Description: Large, rapid-growing, needleleaved, evergreen tree; usually 90-100' high; 24-30" in diameter. Under forest conditions, it develops a long, cylindrical bole. Although its crown is open, it is denser than other southern yellow pines. It matures in about 150 years. The needles are borne 3 in a cluster (occasionally 2); 6-9" long, dark yellow green, somewhat stiff, sharply pointed, slender and sometimes twisted; usually persistent until the third season. Fruit is a sessile, ovoid-conical to narrowly conical woody cone, 3-5" long. Bark is variable; on young trees, scaly and nearly black, later becoming deeply furrowed with irregular, brownish blocks, 3/4-2" thick.

Soil & Site: Loblolly pine will grow on a wide variety of soils from flat, poorly drained Coastal Plain soils to the residual soils of the upper Piedmont. Best growth is made on soils with a deep surface layer, a firm subsoil and poor surface drainage. In the Coastal Plain, growth is considerably slower on soils with hardpans in the root zone and on deep, excessively drained sands where the water table is below the reach of the tree roots. In the Piedmont, growth is best on floodplains and uneroded upland soils, and slowest on severely eroded soils with very plastic subsoils. Loblolly pine grows naturally in the Coastal Plain and well in the central Piedmont. Although, in North Carolina, it is not native to the upper Piedmont and mountains, it has been successfully planted in the upper Piedmont and in the southwestern mountain counties of Cherokee, Clay and Macon at elevations up to 2,000 ft. Loblolly pine is relatively intolerant of shade and requires direct sunlight for best growth.

Use: Erosion control, windbreaks, screens, ornamental, roadbank and streambank protection; also, lumber, veneer, pulpwood, poles and piling. Because of its abundance, wide range, occurrence in pine stands and versatility, loblolly is the chief commercial pine species in the Southeast. Although it is an excellent litter producer, when used for erosion control, grasses and/or legumes should be planted to establish a quick cover until the trees are 5-7 years old. Spacing: (a) Erosion control – 4 x 4'; (b) windbreaks – at least 2 rows 6' apart, with 6-7' between trees in row; (c) wood production – 7-10'.

Virginia pine – Pinus virginiana (Other common names: Bur pine, Jersey pine, North Carolina pine, poverty pine, scrub pine, and spruce pine)

Description: Evergreen, needleleaved tree; usually small, 40-50' high, 12-18" in diameter with long, horizontal branches. Lateral branches are usually persistent for many years, even after dying. This gives the tree a scrubby appearance, accounting for one of its common names. The needles are borne two in a cluster; 1½-3" long, yellow-green, stout and twisted. Fruit is a shiny, reddish-brown woody cone about 2" long. As cones may remain on branches 3-5 years, a treetop with many open cones is a characteristic of the species.

Virginia pine – Pinus virginiana (continued)

Soil & Site: Virginia pine will grow on a wide variety of soils, but is mainly characterized by its ability to grow on very dry, rocky, sterile, severely eroded or gullied soils where others cannot compete. It is less tolerant of wet sites and impeded drainage than loblolly and pitch pines. It will tolerate soil acidities ranging from a pH of 4.6 to 7.9. Virginia pine requires direct sunlight, dying if planted on densely shaded sites. Growth rate is fairly rapid on good sites, but slow on dry, sterile sites.

Use: Erosion control, screens, windbreaks, roadbank protection and Christmas trees; also, pulpwood, lumber, paneling and fuel. Although Virginia pine is a good litter producer, when used for erosion control grasses and/or legumes should be planted to establish quick cover until trees are 6-8 years old. If properly sheared, Virginia pines will make handsome Christmas trees. *Spacing:* (a) Erosion control – 4 x 4'; (b) Christmas trees – 5x5'; (c) windbreaks – at least 2 rows 6' apart with trees 6-7' in row; (d) wood production – 5 x 10'.

White Poplar – Populus alba (Other common names: Silver poplar, abele)

Description: Usually a small tree about 30-35' high (10-15' on poor sites), with many, wide-spreading branches. Leaves are deciduous, simple, alternate; long-stalked, ovate or 3-5 lobed, sharp-pointed; coarsely and irregularly toothed, 2½-4" long; dark green above and characterized by a white or gray wooly coat beneath, giving them a silvery appearance when wind-blown. Flowers are catkins (spike-like inflorescence); male and female appearing on different trees in early spring. Fruit is a capsule containing cottony seeds. Bark is smooth, whitish or light gray, becoming dark-colored and furrowed on base of trunk. This species was introduced from Eurasia and has become naturalized in eastern United States. Growth rate is rapid and it spreads aggressively by root sprouts which form colonies. Often considered to be a "weed" tree.

Soil & Site: Grows best on deep, fertile, well-drained soils, but is not very exacting and will grow on poor, sterile sties. Requires full sunlight for best growth.

Use: Erosion control on sandy beach areas, gullies, mine spoils and other disturbed areas when its tall growth and spreading habit would not be detrimental. It is tolerant of city smoke and can be used as shade tree where smog is a problem. *Spacing:* Erosion control – 4 x 4' to 5 x 5'.

Japanese Black Pine – Pinus thunbergii (Other common names: Thunberg Pine)

Description: Large, evergreen, needleleaved tree, 90-100' high; with spreading, somewhat pendulous branches. Branches form a broad, pyramidal, often irregular, head. Bark is irregularly divided into blackish gray plates. Needles are borne 2 in a cluster; 2½-4½" long, bright green, stiff and sharply pointed. Fruit is a short-stalked, conic-ovate, grayish brown, woody cone, 2-3" long. Under favorable conditions it is a rather fast-growing tree, usually assuming a handsome, often picturesque, form at maturity. This species is native to Japan.

Soil & Site: It is a very adaptable and hardy species, and will grow on a wide variety of soils, under adverse conditions. It withstands salty wind well and will live and grow in almost pure sand. Thus, it is especially suitable for planting near the seashore.

Uses: Ornamental, screens, windbreaks, beach landscaping, and erosion control. Important timber tree in eastern Asia. Spacing: (a) Windbreaks - at least 2 rows, 6' apart, with 7' between trees in rows; (b) erosion control - 4 x 4'. Seedlings planted on dry, sterile sites should be mulched and fertilized.

Chapter 6

STANDARD AND SPECIFICATION FOR TOPSOILING

Definition

Spreading natural surface soil over excavated areas.

Purpose

To provide a suitable soil medium for vegetative growth on areas where soil materials will not produce or maintain a stand of desirable plants.

Where Applicable

Topsoiling is expensive. Stockpiling existing topsoil from the area being urbanized is much more desirable and less expensive than outright purchase. A study of local soil profile characteristics should be made to determine the need for saving existing topsoil or bringing it in from an outside source. Many subsoils have desirable physical characteristics though they are usually acid and low in fertility. Satisfactory stands of grasses and legumes are usually obtained on such subsoils by applying sufficient amounts of fertilizer, lime and mulch.

The use of topsoil may be justified where soil materials are:

1. Extremely permeable – sands and loamy sands.
2. Very fine textured – clays and silty clays.
3. Low in organic matter.
4. Very shallow and underlain by impervious layers.
5. Where exposed layers are strongly acid, or salty.

Specifications Guide

A. Topsoil Material

Topsoil should consist of natural surface soil, friable and loamy in character, and capable of producing good stands of grasses, legumes or other kinds of vegetation. It should be free of brush, stumps, litter, objectionable weeds, stones, rocks and contain no toxic substance that may be harmful to plant growth. A pH range of 5.0 to 7.5 is most desirable. Soluble salts should not exceed 500 ppm.

B. Applying Topsoil

Topsoil should be uniformly applied to a depth of 3 to 6 inches after settling. This is considered adequate for establishing grasses and legumes. A 6-inch depth of loose soil will settle an inch or two. An important part of topsoiling is to obtain a good bond between the applied soil and the material underneath. Scarifying the site prior to spreading the topsoil is a good way to accomplish this. Proper bonding is especially important on sloping lands.

Volume of Topsoil Required
For Application to Various Depths

Depth (Inches)	Cubic Yards Per 1000 Square Feet	Cubic Yards Per Acre
2	6.2	268.9
4	12.4	537.8
6	18.6	806.7

Appendix B

Standard and Specifications for Cut and Fill Areas

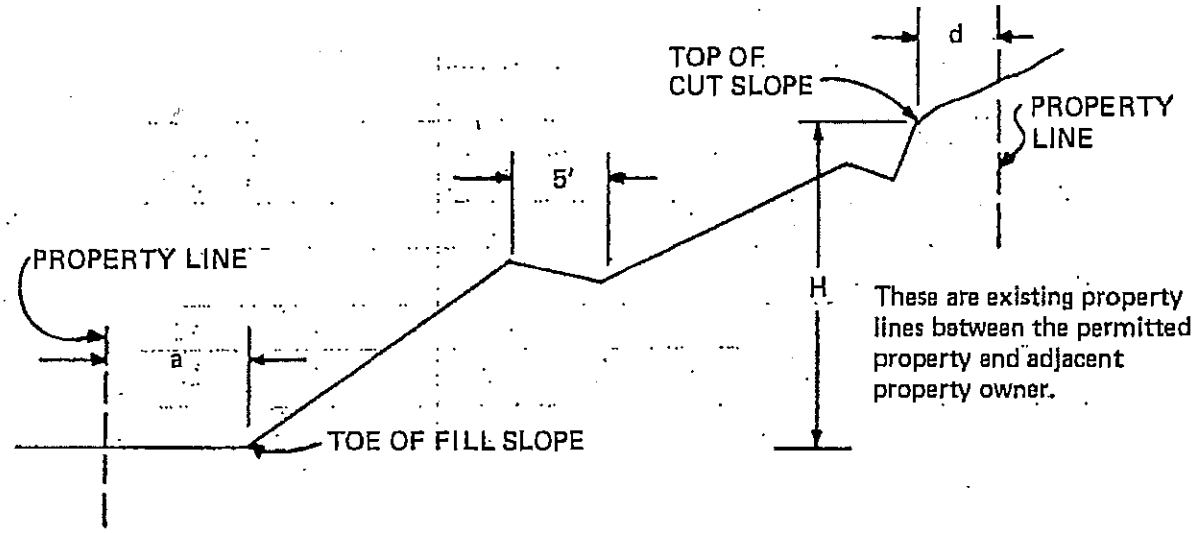
Chapter 21

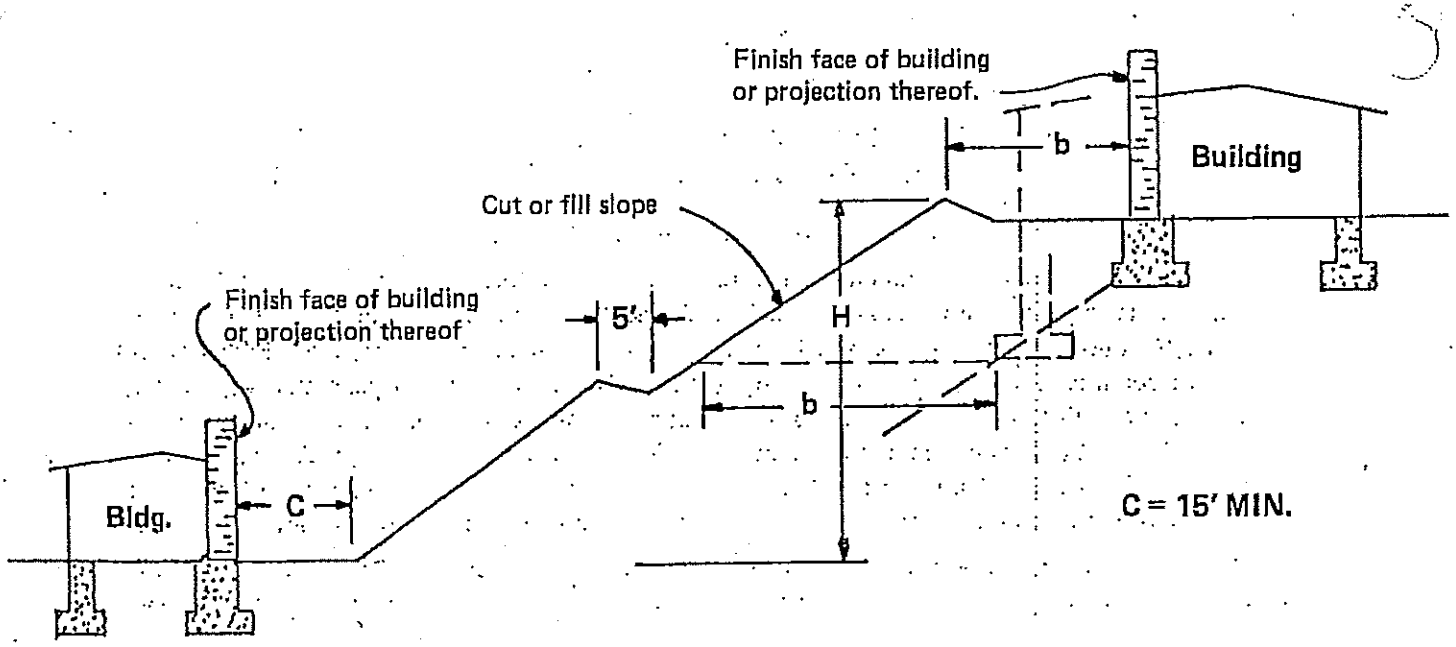
STANDARD AND SPECIFICATION FOR CUT AND FILL AREAS

A. Cut and Fill Slopes – Bench Terraces

1. Cut and fill slopes in more than thirty feet (30') but less than forty feet (40') in vertical height shall be terraced at approximately mid-height. Terraces in slopes with a vertical height greater than forty feet (40') shall be made at equal vertical intervals not more than twenty feet (20') apart; but if soil conditions adversely affect the stability, vegetative establishment or maintenance of safety, the Conservation Division may require terraces at closer intervals. Bench terraces shall be not less than five feet (5') wide with minimum invert gradient of one percent (1%) if sodded, or one-half percent (½%) if paved. Such terraces shall have a ten to one (10:1) lateral slope towards the toe of the upper bank, and shall convey water with not less than (0.3') free-board to an acceptable outlet.
2. Cuts and fills shall be set back from property lines and buildings shall be set back from cut or fill slopes in accordance with the following diagrams in subsections (A) and (B) hereof, respectively.

A. Slope Setback From Property Line





B. Minimum Building Setback Requirements

H In feet	Toe of fill from property line	Top of cut from property line	Building from top of slope
	a	d	b
0 - 10	2'	2'	10'
10 - 30	3'	3'	15'
over 30	5'	3'	20'

3. Minimum Requirements for slope stabilization.

Minimum Requirement	Slope
Stabilized with grass	3:1 and Flatter
Stabilized with shrubs or vines	3:1 to 2:1
Stabilized with riprap	2:1 to 1.5:1
Stabilized with retaining wall	Steeper than 1.5:1

Appendix C

List of Soil Erosion Standard Detail Drawings

The following City of Raleigh Standard Details for common erosion and sediment control measures are available on the City of Raleigh web site. To locate standard details on the web site, enter "Soil Erosion Standard Detail Drawings" in the box located below "What are you looking for?"

Number	Standard Detail Title
40.02	Standard Temporary Sediment/Silt Fence
40.03	Standard Temporary Sediment/Silt/Tree Protection Fence
40.04	Standard Tree Protection Detail
40.11	Temporary Sediment Trap Outlet Detail
40.12	Temporary Sediment Trap
40.13	Rock Pipe Inlet Protection
40.14	Excavated Drop Inlet Protection
40.15	Check Dam
40.21	Construction Entrance
40.22	Residential Construction Entrance
40.23	Diversion Ditch
40.24	Rip Rap Lined Channels
40.25	Temporary Stream Crossing
40.32	Block & Gravel Drop Inlet Protection
40.33	Standard Catch Basin Yard Inlet Protection
40.34	Temporary Silt Ditch
40.35	Skimmer Sediment Basin
40.36	Sediment Basin
40.37	Temporary Riser
40.38	Skimmer
40.39	Standard Silt Fence Outlet
40.40	Block and Gravel Curb Inlet Sediment Filter
40.41	Concrete Washout

Appendix D

Single Family Residential Land Disturbing Permits

Erosion Control Requirements for Single Family Construction

Due to an increased number of violations for sediment loss on single family sites, the City would like to remind all contractors that in order to ensure compliance with State and local regulations, all single family construction sites should at minimum maintain a construction entrance and install silt fence at the low side of the site.

**Details for the construction entrance and proper installation of silt fence can be found on the back of this sheet.*

Excerpts from the North Carolina General Statute

"Persons conducting land-disturbing activity shall take all reasonable measures to protect all public and private property from damage caused by such activities." [15A NCAC 04B .0105]

Excerpts from the City of Raleigh Erosion & Sedimentation Control Ordinance

[Section 10-9005]

Size of Site	Less than 12,000 sq. ft.	Between 12,000 sq. ft. and 1 acre (43,560 sq. ft.)	Greater than 1 acre (43,560 sq. ft.)
Plan required to be prepared and filed with the City:	No*	Yes	Yes

* The City has the right to require preparation and approval of soil erosion and sedimentation control plans where off-site sedimentation occurs; soil erosion and sedimentation control plans are required for any land-disturbing activity in any Reservoir Watershed Protection Area Overlay District, in any watercourse natural buffer yard established pursuant to Part 10, Chapter 9, Article B, Division 2, in open space areas, as defined in §10-9002,and any relocation of any natural watercourse.

Penalties for non-compliance can include, but are not limited to, the following [Section 10-5014]:

Grading without a permit. Five thousand dollars ($5,000.00) per day for failure to secure a valid required grading permit prior to conducting a land-disturbing activity.

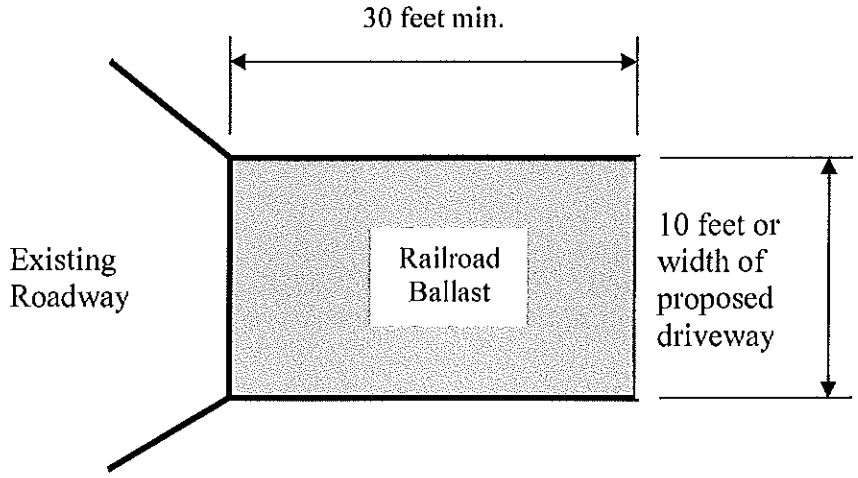
- Failure to protect. Five thousand dollars ($5,000.00) per day for failure to take all reasonable measures to protect public property or private property, from damage caused by the failure to retain sediment on-site for the design storm.
- Failure to maintain permanent and/or temporary measures. Two thousand five hundred dollars ($2,500.00) per day for failure to maintain adequate erosion control measures.
- Failure to keep dirt and mud off public streets. One thousand dollars ($1,000.00) per day for failure to prevent the accumulation of dirt, mud, or both on public streets in violation of this chapter plus one dollar ($1.00) per every (6) linear feet of street if cleaned by the City, its employees, or its contractors.

An additional civil penalty of one thousand dollars ($1,000.00) per day shall be charged to any person assessed a civil penalty for any violation of this chapter within the prior two (2) years. No initial civil penalty shall exceed seven thousand five hundred ($7,500.00); this limitation shall be inapplicable to continuous violations.

Any questions, please contact Ben Brown, Stormwater Development Supervisor at (919)516-2155 or email at ben.brown@ci.raleigh.nc.us

Required Construction Entrance Detail

Not to Scale

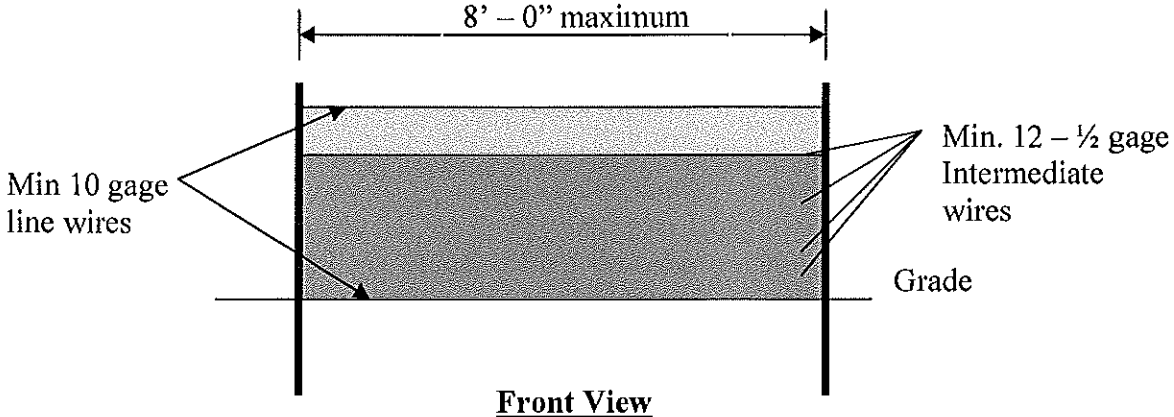


Notes:

1. If site must be permitted then the entrance will need to be extended to fifty feet minimum.
2. Install silt fence to ensure construction entrance is used.
3. Construction sites continuing to deposit mud and debris onto the public road will be subject to fine or other penalties.

Silt Fence Detail

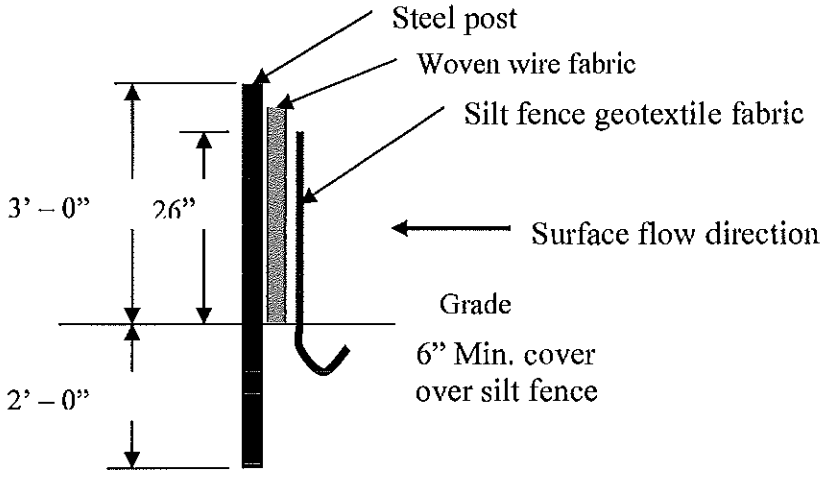
Not to Scale



Front View

Notes:

1. Erosion control devices shall be installed prior to clearing of the lot.
2. Bottom of silt fence needs to be buried 6"with soil or washed stone.
3. Silt fence is to remain in place and be maintained properly until the entire area has been permanently stabilized. Failure to do so could result in a fine.



Side View

Appendix E

Stormwater Development Plan Review Contacts

Stormwater Development Manager

Ben Brown	(919) 996-3515

Senior Plan Reviewers

Lisa Booze	(919) 996-3518
Susan Locklear	(919) 996-3516
Gary Morton	(919) 996-3517

Plan Reviewers

Nathan Burdick	(919) 996-3520
Kevin Kidd	(919) 996-3519
Tim Liles	(919) 996-3521

Appendix F

Stormwater Inspections Regional Contacts

Your stormwater inspection needs are handled by a team of regional inspectors. The City is divided into regions and each region has a team of inspectors who provide customer service throughout the region. Should you have a concern, you can contact any of the inspectors in your region. All members of the inspections team will perform scheduled and routine inspections on your project and will have access to all project information on file. In addition, you can always contact the Stormwater Inspectors Supervisor, Lauren Witherspoon at (919) 996-3505 or call the Stormwater Utility Division main office at (919) 996-3940.

West Region Team:

Rebecca Ferres	(919) 996-3509
Kevin Watson	(919) 996-3506
Justin Harcum	(919) 996-3507

East Region Team:

Chris Bridgers	(919) 996-3508
Eric Christopher	(919) 996-3512
Stephen Leischner	(919) 996-3510

* George Anagnostopoulos	(919) 996-3513

* serves both regions

Appendix G

Erosion and Sediment Control Inspection Checklist

- □ Are all the practices specified in the approved plan installed in the proper location and do they meet the minimum requirements?
- □ Are all practices working well and is the perimeter protected?
- □ Do any practices require repair or cleanout?
- □ Are there any bare areas that require temporary or permanent stabilization?
- □ Do seeded areas require maintenance, reseeding or mulching?
- □ Are cut and fill slopes stable and adequately protected from erosion?
- □ Are channels and outlets stable?
- □ Are storm inlets protected from sediment?
- □ Are stream banks and stream crossings stable?
- □ Are utility installations properly located?
- □ Are construction roads and right-of-way access routes stable?
- □ Is there evidence of sediment leaving the site or entering streams on the site through construction entrances/exits, channel outlets, storm drains, or by washing off slopes?
- □ Is dust control needed?
- □ Is there adequate buffer zone between the construction site and any water resource?
- □ Is there evidence of sediment entering a stream buffer?

* Excerpt from the NCDENR Erosion and Sediment Control Field Manual, July 2001.

Appendix H

Common Violations and Associated Penalties

Grading Without a Permit	$5,000.00 / day
Grading Beyond Limits of Plan	$1,000.00 / day / 0.1 acre
Failure to Protect	$5,000.00 / day
Failure to Follow Plan	$3,000.00 / day
Failure to Install Devices	$2,500.00 or $5000.00 / day
Failure to Maintain Measures	$2,500.00 / day
Failure to Maintain slopes	$2,500.00 / day
Failure to Protect slopes	$2,500.00 / day
Failure to Provide Adequate Cover	$1,200.00 or $2500.00 / day
Failure to Revise Plan	$2,500.00 / day
Failure to Correct Violation after Notice	$5,000.00 / day
Failure to Obey Stop Work Order	$5,000.00 / day
Failure to Keep Dirt/Mud off Public Streets	$1,000.00 / day
Failure to file inspection report	$2,500.00 / day
Failure to Submit As-built Plan	$2,500.00 / day
Failure to Certify Stormwater Devices	$2,500.00 / day
Falsified Certification	$3,000.00
Failure to Record	$2,500.00 / day
Any other violation, not listed	$2,500.00 / day

Appendix I

Common Acronyms

BFE	Base Flood Elevation
BMP	Best Management Practice
CO	Certificate of Occupancy
DENR	NC Department of Environment and Natural Resources
DWQ	Division of Water Quality
DFIRM	Digital Flood Insurance Rate Maps
E&SC	Erosion and Sediment Control
ETJ	Extraterritorial Jurisdiction
FEMA	Federal Emergency Management Agency
FL	Flood Permit
FRO	Financial Responsibility/Ownership Form
GPS	Global Positioning System
LD	Land Disturbing Permit
NAVD-88	North American Vertical Datum of 1988
NFIP	National Flood Insurance Program
NIC	Not in Compliance
NOCV	Notice of Continuing Violation
NOV	Notice of Violation
NPDES	National Pollutant Discharge Elimination System
OAH	Office of Administrative Hearings
PE	Professional Engineer
PLA	Professional Landscape Architect
PLS	Professional Land Surveyor
RFPE	Regulatory Flood Protection Elevation
SFD	Single Family Development
SFR	Single family Residential
SIG	Stormwater Inspections Group
SWO	Stop Work Order
SWT	Stormwater Tracking
USACE	United States Army Corps of Engineers
WQC	Water Quality Certification

Appendix J

Financial Responsibility/Ownership Form

Development SERVICES
FIRE • INSPECTIONS • PLANNING
PUBLIC UTILITIES • PUBLIC WORKS

Customer Service Center
One Exchange Plaza, Suite 400
Raleigh, North Carolina 27601
Phone 919-516-2495
Fax 919-516-2685

Financial Responsibility/Ownership Form

(Sedimentation Pollution Control Act)

This section to be completed by City of Raleigh staff			
Submittal Date		Effective Date	
Transaction Number		Permit Number LD-	

The remaining sections to be completed by the Applicant

SECTION 1: GENERAL INFORMATION & INSTRUCTIONS

This form is required to be completed, notarized and submitted with all Land Disturbing Permit applications. The information provided herein becomes an enforceable part of the approved Erosion and Sediment Control Plan and the Land Disturbing Permit listed above. Should any of the information on this form change, a revised, executed form shall be submitted within thirty (30) days.

The effective date of this form shall be the effective date as designated above by the City of Raleigh. All rights and liabilities associated with designation as Owner, Applicant/Permittee or Financially Responsible Party shall not incur until the effective date of transfer to any subsequent Party.

Raleigh City Code §14-1011 sets forth that it shall be unlawful and a violation of this code for any person to give false information or misrepresentations in any application or permit required by this code. Failure to provide full disclosure of the requested information may be grounds for denial or revocation of a Land Disturbing Permit.

Please complete all sections below. Type or print and, if information on the form is not applicable, place N/A in the blank. All pages of this form must be completed and submitted or the form will be rejected and returned. The property owner must initial each page of the form prior to submittal.

SECTION 2: PROJECT INFORMATION

PROJECT NAME _____

PERMITTED PHASE(S) _____

PROJECT ADDRESS _____

WAKE COUNTY PARCEL ID NUMBER(S) _____

ANTICIPATED DATE OF PROJECT INITIATION _____

EXPECTED DURATION OF PROJECT _____

ACREAGE OF LAND TO BE DISTURBED _____

PROPERTY OWNER'S INITIALS: _____

SECTION 3: PROPERTY OWNER INFORMATION

Identify the landowner(s) of record. Use additional sheets if necessary. If the owner does not reside within Wake County, North Carolina, then Section 4 of this form must be completed to designate an owner's agent within Wake County, North Carolina for service of compliance and enforcement action(s).

PROPERTY OWNER OF RECORD

MAILING ADDRESS (NO P.O. BOX) TELEPHONE NUMBER FAX NUMBER

CITY, STATE, ZIP E-MAIL ADDRESS

The undersigned acknowledges that he/she is the owner, or holds the owner's power of attorney, of the property which is the subject of this application, and further states that the permitted land-disturbing activities are authorized to be conducted on the subject property with the full knowledge, permission and consent of the owner(s).

He/she acknowledges that upon the transfer of ownership or power of attorney, a new Financial Responsibility/Ownership Form must be submitted for approval to the Stormwater Utility Division within thirty (30) days of said change. Said submission shall include a copy of any documents recorded with the Register of Deeds acknowledging said transfer. He/she further acknowledges that non-compliance may result in the assessment of civil penalties and could potentially affect all permits, inspections and/or Certificates of Occupancy for this project.

The owner of the subject property hereby authorizes the person(s) and/or firm(s) listed in Sections 5 and 6 of this form as the Applicant/Permittee and Financially Responsible Party subject to service of any notice, process, civil assessment or pleading in any action or legal proceeding arising out of any matter relating to the Land Disturbing Permit(s) issued under this permit application and Raleigh City Code, Chapter 5, Part 10. The owner further acknowledges the potential for compliance and enforcement action(s) against that party, which could affect all permits, inspections and/or Certificates of Occupancy for this project in the event of non-compliance.

The owner of the property upon which the land-disturbing activity is to be undertaken states and affirms that he/she has read and understands the statements and disclosures made in this form, that the information disclosed herein is true and correct to the best of his/her knowledge and belief, and that all information disclosed herein was provided by the undersigned while under oath.

This form must be signed by the owner of the property if an individual, or by the state Registered Agent or other person with authority to execute instruments for the owner, if not an individual.

This, the _____ day of _____, 20_____.

PROPERTY OWNER SIGNATURE TITLE

IN WITNESS WHEREOF, the undersigned Notary Public has hereunto set his/her hand and seal, this _____day of _____, 20_____.

(SEAL)

_____ _____

Notary Public (*print name*) Notary Public Signature

My Commission Expires: _____ Notary Public Title / Position

SECTION 4: OWNER'S APPOINTED AGENT INFORMATION

The owner of the property upon which land-disturbing activities will be undertaken is required to either reside in or appoint an agent for service with business and residence addresses within Wake County, North Carolina. **Section 4 must be completed if the Property Owner listed in Section 3 does not reside in Wake County, North Carolina and is optional for all others.**

The owner of the subject property hereby appoints the following person(s) as an agent(s) to receive service of any notice, process, or pleading in any action or legal proceeding arising out of any matter relating to Raleigh City Code, Chapter 5, Part 10. It is agreed that any notice, process, or pleading against the owner of the property upon which land-disturbing activities will be undertaken may be served by and through the undersigned and such service shall have the same force and effect as if service was accomplished upon the owner.

NAME	TITLE
COMPANY, IF APPLICABLE	TELEPHONE NUMBER
STREET ADDRESS (NO P.O. BOX)	FAX NUMBER
CITY, STATE, ZIP	E-MAIL ADDRESS

The undersigned acknowledges that he/she is the owner's appointed agent.

This, the _____ day of _____, 20_____.

APPOINTED AGENT SIGNATURE	TITLE

IN WITNESS WHEREOF, the undersigned Notary Public has hereunto set his/her hand and seal, this _____day of _____, 20_____.

(SEAL)

Notary Public (*print name*)	Notary Public Signature
My Commission Expires: _____	Notary Public Title / Position

SECTION 5: FINANCIALLY RESPONSIBLE PARTY INFORMATION

The owner of the subject property authorizes the following person(s) or firm(s) as the Financially Responsible Party subject to service of any notice, process, civil assessment or pleading in any action or legal proceeding arising out of any matter relating to the Land Disturbing Permit(s) issued under this permit application and Raleigh City Code, Chapter 5, Part 10. The Financially Responsible Party designated below is the person conducting land disturbing activity and the person responsible for violation(s) under Section 10-5003 of the Raleigh Municipal Code.

The Financially Responsible Party may be the landowner or another party who acknowledges that he/she is the Financially Responsible Party. Financial responsibility for a permit may not be transferred to a residential Home Owner's Association as the Applicant / Permittee or Financially Responsible Party until such time as the issued Land Disturbing Permit for this project is administratively closed by the Stormwater Utility Division.

FINANCIALLY RESPONSIBLE PARTY	TITLE
COMPANY, IF APPLICABLE	TELEPHONE NUMBER
STREET ADDRESS (NO P.O. BOX)	FAX NUMBER
CITY, STATE, ZIP	E-MAIL ADDRESS

The undersigned acknowledges that he/she is the Financially Responsible Party for permit implementation, compliance and enforcement resulting under the Land Disturbing Permit listed above and/or under Raleigh City Code, Chapter 5, Part 10 for the subject project. He/she acknowledges that upon the change of any information provided herein, a new form must be submitted for approval to the Stormwater Utility Division within thirty (30) days of said change. He/she further acknowledges that non-compliance may result in the assessment of civil penalties and could potentially affect all permits, inspections and/or Certificates of Occupancy for this project. He/she further states and affirms that he/she has read and understands the statements and disclosures made in this form, that the information disclosed herein is true and correct to the best of his/her knowledge and belief, and that all information disclosed herein was provided by the undersigned while under oath.

This form must be signed by the person(s) or firm(s) financially responsible for the land developing activity if an individual, or by the state Registered Agent or other person with authority to execute instruments for the owner, if not an individual.

This, the _____ day of _____, 20_____.

FINANCIALLY RESPONSIBLE PARTY SIGNATURE	TITLE

IN WITNESS WHEREOF, the undersigned Notary Public has hereunto set his/her hand and seal, this _____day of _____, 20_____.

(SEAL)

Notary Public (*print name*)	Notary Public Signature
My Commission Expires: _____	Notary Public Title / Position

SECTION 6: APPLICANT / PERMITTEE

The owner of the subject property authorizes the following person(s) or firm(s) as the Applicant/Permittee subject to service of any notice, process, civil assessment or pleading in any action or legal proceeding arising out of any matter relating to the Land Disturbing Permit(s) issued under this permit application and Raleigh City Code, Chapter 5, Part 10. The Applicant/Permittee designated below is the person responsible for implementation of permit conditions and violation(s) under Section 10-5003 of the Raleigh Municipal Code.

The Applicant/Permittee may be the landowner or another party who acknowledges that he/she is the Applicant/Permittee responsible for completion of the project as approved. A permit may not be transferred to a residential Home Owner's Association as the Applicant/Permittee or Financially Responsible Party, until such time as the issued Land Disturbing Permit for this project is administratively closed by the Stormwater Utility Division.

APPLICANT/PERMITTEE	TITLE
COMPANY, IF APPLICABLE	TELEPHONE NUMBER
STREET ADDRESS (NO P.O. BOX)	FAX NUMBER
CITY, STATE, ZIP	E-MAIL ADDRESS

The undersigned acknowledges that he/she is the Applicant/Permittee for permit implementation, compliance and enforcement resulting under the Land Disturbing Permit listed above and/or under Raleigh City Code, Chapter 5, Part 10 for the subject project. He/she acknowledges that upon the change of any information provided herein, a new form must be submitted for approval to the Stormwater Utility Division within thirty (30) days of said change. He/she further acknowledges that non-compliance may result in the assessment of civil penalties and could potentially affect permits, inspections, plan approvals and/or Certificates of Occupancy for this project, as well as for future projects per City Code 10-6035(i). He/she further states and affirms that he/she has read and understands the statements and disclosures made in this form, that the information disclosed herein is true and correct to the best of his/her knowledge and belief, and that all information disclosed herein was provided by the undersigned while under oath.

This form must be signed by the person(s) or firm(s) responsible for the permit if an individual, or by the state Registered Agent or other person with authority to execute instruments for the Applicant/Permittee, if not an individual.

This, the _____ day of _____, 20_____.

APPLICANT/PERMITTEE SIGNATURE	TITLE

IN WITNESS WHEREOF, the undersigned Notary Public has hereunto set his/her hand and seal, this _____day of _____, 20_____.

(SEAL)

Notary Public (*print name*)	Notary Public Signature
My Commission Expires: _____	Notary Public Title / Position

Appendix K

Site Review and Commercial Building Permit Application

Planning & Development

Development Services Customer Service Center
One Exchange Plaza, Suite 400
Raleigh, North Carolina 27601
Phone 919-516-2495
Fax 919-516-2685

Site Review and Commercial Building Permit Application

Please check appropriate review type when submitting plans.

Plan Review Type			OFFICE USE ONLY
Building Permitting ☐ **New Building/Shell** ☐ **Addition** ☐ **Alteration** ☐ **Interior Completion** ☐ ***Change of Use per Building or Zoning Code** <12,000 sq. ft. disturbed area with improvement = Building and Site submitted together	**Site Permitting** ☐ **New Building/Shell** ☐ **Addition** ☐ ***Change of Use per Building or Zoning Code** ☐ **Site Review** ≥12,000 sq. ft. disturbed area with improvements = Site Only (Building must be submitted separately)	☐ **Mass Grading Only** ≥12,000 sq. ft. disturbed area with no improvements = Mass Grading Only <12,000 sq. ft. disturbed area with no improvements = no permit required	**Transaction Number** ☐ ***Site Plan** ☐ **Plot Plan** **Site Plans may require Planning Commission approval*
If your project has been through preliminary review, provide the Development Plan Number.			
Provide all previous transaction numbers for Coordinated Team Reviews, Due Diligence Sessions or Pre-Submittal Conferences.			

GENERAL INFORMATION		
North Carolina State Building Code ☐ 2012 ☐ 2009 North Carolina Rehab Code ☐ 2009		
Applicant		**Date**
Project Address		**Suite Number**
Subdivision/Tenant/Shopping Center		**Lot Number**
Property Owner	**Phone**	**Fax**
	Email	
Project Contact Person	**Phone**	**Fax**
	Email	
Proposed Work		
WILL IMPERVIOUS SURFACE CHANGE? ☐ Yes ☐ No If yes, has this impervious surface change been included on the prior permit application? ☐ Yes ☐ No **If not on a prior application, indicate amount of change: Increase (+ sq. ft.) or Decrease (- sq. ft.)**		
Owner/Agent Signature	**Email**	

BUILDING		
Other Permits Issued	Land Disturbing Permit #	Wake Co. Well/Septic Permit #
Contractor	NC License #/Class	City Business License #
Address	City/State/Zip	
Phone / Fax	Email	

Total Project Sq. Ft.		Total Project Cost	
Utilities	**Water** Public ☐ Private ☐ **Sewer** Public ☐ Private ☐		
ELECTRICAL			
Contractor	NC License #/Class	City Business License #	
Address	City/State/Zip		
Phone	Fax	Email	
Voltage	50 or less ☐ 600 or less ☐ over 600 ☐	Total Electrical Cost	
PLUMBING			
Contractor	NC License #/Class	City Business License #	
Address	City/State/Zip		
Phone	Fax	Email	
Contractor **(NFPA 13D Residential Fire Sprinkler Systems)**	NC License #/Class	City Business License #	
Address	City/State/Zip		
Phone	Fax	Email	
MECHANICAL			
Contractor **(HVAC)**	NC License #/Class	City Business License #	
Address	City/State/Zip		
Phone	Fax	Email	
Type of Heating	Electrical ☐ Gas ☐ Hot Water ☐ Oil ☐	Air Condition Size in Tons	
Work Includes	Appliances ☐ Appliance/Duct ☐ Ventilation ☐ Refrigeration ☐ Fuel Piping ☐		
Contractor **(Refrigeration)**	NC License #/Class	City Business License #	
Address	City/State/Zip		
Phone	Fax	Email	
Contractor **(Hood)**	NC License #/Class	City Business License #	
Address	City/State/Zip		
Phone	Fax	Email	
FIRE			
Contractor **(NFPA 13 & 13R Commercial Fire Sprinkler Systems)**	NC License #/Class	City Business License #	
Address	City/State/Zip		
Phone	Fax	Email	
Type of System:	Fire Pump ☐ Standpipe ☐ Sprinkler ☐		
Contractor **(Fire Alarm)**	NC Electrical License #/Class	City Business License #	
Address	City/State/Zip		
Phone	Fax	Email	
Contractor **(Fire Suppression)**	NC License #/Class	City Business License #	
Address	City/State/Zip		
Phone	Fax	Email	
Contractor **(Other)**	NC License #/Class	City Business License #	
Address	City/State/Zip		
Phone	Fax	Email	
Does business store or use Hazardous Materials? Yes ☐ No ☐ If yes, submit **Hazardous Materials Permit Application**			
Type of System	Compressed Gas ☐ Storage Battery ☐ Flammable Spraying and Dipping ☐ Flammable and Combustible Liquids ☐ Industrial Ovens ☐ Fuel Tank ☐ Hazardous Materials ☐ Private Fire Hydrant ☐ Other ☐		
SIGN			
Contractor	City Business License #		
Address	City/State/Zip		

Phone	Fax	Email	
Type of Sign	Temporary Construction ☐ Off Premise ☐ Wall ☐ Ground ☐ Awning ☐ Projecting ☐ Special Events ☐ Track Identification ☐ Canopy ☐ Under Canopy ☐ Other ☐		
Business Owner	Address	City/State/Zip	
Phone	Fax	Email	
ZONING			
Contractor	Address	City/State/Zip	
Phone	Fax	Email	
Type of Work	Accessory Structure ☐ Open Fence ☐ Dish Antenna ☐ Parking Lot ☐ Site Plan ☐ Tree Conservation ☐ Landscaping ☐ Swimming Pools ☐ Other ☐		
LAND DISTURBING			
Contractor		City Business License #	
Address		City/State/Zip	
Phone	Fax	Email	
Type of Grading	Mass Grading (no improvements) ☐ Fine Grading ☐	Construction Cost	Total Disturbed Area
FACILITY FEE			
Name of Payer			
Address		City/State/Zip	
Phone	Fax	Email	
FLOOD			
Contractor	NC License #/Class	City Business License #	
Address		City/State/Zip	
Phone	Fax	Email	

RIGHT-OF-WAY			
Contractor		City Business License #	
Address		City/State/Zip	
Phone	Fax	Email	
For Driveway ☐ Number to be installed		For Sidewalk ☐ Total Linear Feet	
For Maintenance Purpose ☐	For Construction Purpose ☐	Certificate of Eligibility #	
UTILITY			
Contact Person	Owner ☐ Renter ☐	Individual Meter ☐ Master Meter ☐	
Phone	Fax	Email	
Tap will be installed by	Water Size	Sewer Size	
City Business License #			
Property	Residential ☐ Non-Residential ☐		
Type of Service	Water ☐ Sewer ☐ Irrigation ☐		
Type of Meter	New Meter ☐ Split Meter ☐ Size of Meter		
SOLID WASTE SERVICES			
Contact Person		Email	
Phone		Fax	
Solid Waste/Recycling	Number of Units	Public ☐ Private ☐	

TO BE COMPLETED BY APPLICANT			COMPLETED BY CITY STAFF		
	YES	N/A	YES	NO	N/A
General Requirements – Permitting					
1. I have referenced the **Commercial Building Checklist** and by using this as a guide, it will ensure that I receive a complete and thorough first review by the City of Raleigh.	☐				
2. Approved **Infrastructure Construction Plans**, if required	☐	☐			
3. Completed **City of Raleigh Building Code Summary Sheet** must be printed on the plans	☐				
4. Four (4) sets of bound and rolled **proposed plans** (minimum size 18"x24" not to exceed 36"x42"), to architectural scale, including date of preparation, all revision dates (for re-submittals only), and sealed by design professional, if applicable. ONLY Cell towers and co-locates may be submitted on 11" x 17" sheet	☐	☐			
5. One (1) extra set of plans, if required by Wake County Health Department. Must include the **Wake County Food Service Application** and **Wake County Environmental Services Review Guide (Appendix S)**	☐	☐			
6. Payment to cover Commercial Plan Review, for all new commercial construction, changes in building occupancy type and additions greater than 4,000 square feet require a non-refundable plan review fee to be paid at the time of plan submittal	☐	☐			
7. Completed **Shell Variable Form** for each shell building	☐	☐			
8. Two (2) copies of proposed suite layout for all new Multi-tenant buildings or approved suite layout for existing multi-tenant building	☐	☐			
9. Permit from Wake County for Private Utilities	☐	☐			
10. Copy of letter/email from Pretreatment Coordinator printed on each set of plans approving pretreatment system and sizing calculations (food service establishments & vehicle maintenance facilities only)	☐	☐			
11. ADA Form must be reproduced on plans if project is an alteration/addition to an existing building	☐	☐			
Building Requirements - FOR NEW BUILDING, SHELL, ADDITION, CHANGE OF USE					
1. New and Existing work	☐	☐			
2. Building Plans: **a) Foundation Plan & Details** **b) Floor Plan** **c) Roof Plan** **d) Structural Plan**	☐	☐			
3. Truss Reactions	☐	☐			
4. Wall Sections	☐	☐			
5. Fire Rated Walls Legend (s)	☐	☐			
6. U.L. Designs for Penetrations	☐	☐			
7. Building Elevations	☐	☐			
8. Pre-Cast Drawings	☐	☐			
9. Pre-Cast Engineered Drawings	☐	☐			
10. Metal Building Certification	☐	☐			
11. Energy Code: **a) Building** **a) Electrical** **b) Mechanical**	☐	☐			
12. Accessibility Details	☐	☐			
Electrical Requirements					
1. Reflected Ceiling Plan	☐	☐			
2. Power Plan	☐	☐			
3. Riser Diagrams	☐	☐			
4. Fire Rated Walls Legend	☐	☐			
5. U.L. Designs for Penetrations	☐	☐			
6. Panel Location and Schedules	☐	☐			
7. Electrical Load Calculations	☐	☐			
8. Fire Rated Penetrations	☐	☐			
9. Receptacle Plan	☐	☐			
10. Fire Alarm/Smoke Detector	☐	☐			
Plumbing Requirements					
1. Fixture and Equipment Plan	☐	☐			
2. Hot and Cold Water Riser	☐	☐			

3. Waste and Vent Riser	☐	☐			
4. Plumbing Load Calculations	☐	☐			
5. Fire Rated Walls Legend	☐	☐			
6. U.L. Designs for Penetrations	☐	☐			
7. Fire Rated Penetrations	☐	☐			
8. Minimum Facility Calculations	☐	☐			
Mechanical Requirements					
1. Mechanical Equipment type	☐	☐			
2. Equipment location	☐	☐			
3. Dampers and Detail	☐	☐			
4. Fire Rated Penetrations	☐	☐			
5. Fire Rated Walls Legend	☐	☐			
6. U.L. Designs for Penetrations	☐	☐			
7. Gas Riser Diagram	☐	☐			
8. Refrigerator Calculations	☐	☐			
Fire Protection Requirements					
1. CD required for sprinkler calculations, cutsheets and fire alarm	☐	☐			
2. Sprinkler Plans, if sprinklered	☐	☐			
3. Fire Alarm Plans for all new sprinkler systems and all elevators and if required by code for all other occupancies	☐	☐			
4. Does business store or use Hazardous Materials? If yes, submit **Hazardous Materials Permit Application**	☐	☐			
5. Fuel Tanks? If yes, submit **Hazardous Materials Permit Application**	☐	☐			

TO BE COMPLETED BY APPLICANT			**COMPLETED BY CITY STAFF**		
	YES	**N/A**	**YES**	**NO**	**N/A**
General Requirements – Site Permitting					
1. I have referenced the **Site Review Checklist** and by using this as a guide, it will ensure that I receive a complete and thorough first review by the City of Raleigh	☐				
2. Land disturbing activity plans review fee (see **Fee Schedule** for rate)	☐	☐			
3. Four (4) sets of bound and rolled **proposed plans** (size 18"x24" or 24"x36"), to engineering scale (1"=20', 1"=100', etc.), including date of preparation, all revision dates (for re-submittals only), and sealed by design professional. ONLY Cell towers and co-locates may be submitted on 11" x 17" sheets	☐				
4. The following items must be printed on the **Plan Cover Sheet**: (Do not submit separately or staple.) a) Print and complete the **Site and Commercial Building Data Sheet** to the Plan Cover Sheet (Change of Use, Addition, New Bldg/Shell and Site review) b) **Sheet Index** c) **Vicinity Map** no smaller than 1"=500' and no larger than 1"=1000', showing the position of the site, it's relation to surrounding streets and properties, with true North arrow d) And, if zoned Conditional Use District, list all conditions and how the plan complies	☐				
5. The most recent **Recorded Map** or **Boundary Survey** (included in each set)	☐	☐			
6. **Existing Conditions Plan**	☐				
7. **Proposed Site Plan**	☐				
8. **Proposed Grading and Drainage Plan**	☐	☐			
9. **Proposed Sediment and Erosion Control Plan**	☐	☐			
10. **NPDES Stabilization Plan (required if disturbing 1.0 acre or more)**	☐	☐			
11. **Proposed Utility Plan**	☐	☐			
12. **Proposed Tree Conservation Plan**	☐	☐			
13. **Proposed Landscaping Plan**	☐	☐			
14. **Detail Sheets**	☐	☐			
15. **Building Elevations** that show maximum height from natural and finished grade	☐	☐			
16. Plan sheets should have a **legend** defining all symbols, and **north arrow** printed on the plans	☐				
17. One (1) separate set of **Stormwater Calculations Package**	☐	☐			
18. For secondary tree conservation areas include two (2) copies of the **Tree Cover Report** completed by a certified arborist, North Carolina licensed landscape architect, or North Carolina registered forester	☐	☐			

19. A **Financial Responsibility Form**, if grading more than 12,000 sq. feet	☐	☐			
20. Are there any retaining walls greater than 5' in height on the site? If yes, please print special inspections statement on the plans	☐	☐			

TO BE COMPLETED BY APPLICANT			COMPLETED BY CITY STAFF		
	YES	N/A	YES	NO	N/A
General Requirements – Mass Grading					
1. I have referenced the **Mass Grading Checklist** and by using this as a guide, it will ensure that I receive a complete and thorough first review by the City of Raleigh	☐				
2. Land disturbing activity plans review fee (see **Fee Schedule** for rate)	☐	☐			
3. Four (4) sets of bound and rolled **proposed plans** (size 18"x24" or 24"x36"), to engineering scale (1"=20', 1"=100', etc.), including date of preparation, all revision dates (for re-submittals only), and sealed by design professional.	☐				
4. **Vicinity Map** no smaller than 1"=500' and no larger than 1"=1000', showing the position of the site, it's relation to surrounding streets and properties, with true North arrow	☐				
5. **Existing Conditions Plan**	☐				
6. **Proposed Grading**	☐	☐			
7. **Proposed Sediment and Erosion Control Plan**	☐	☐			
8. **NPDES Stabilization Plan (required if disturbing 1.0 acre or more)**	☐	☐			
9. **Proposed Tree Conservation Plan**	☐	☐			
10. **Detail Sheets**	☐	☐			
11. **Sediment & Erosion Control Calculations**	☐	☐			
12. Plan sheets should have a **legend** defining all symbols, and **north arrow** printed on the plans	☐				
13. For secondary tree conservation areas include two (2) copies of the **Tree Cover Report** completed by a certified arborist, North Carolina licensed landscape architect, or North Carolina registered forester	☐	☐			
14. A **Financial Responsibility Form**, if grading more than 12,000 sq. feet	☐	☐			
15. Are there any retaining walls greater than 5' in height on the site? If yes, please print special inspections statement on the plans	☐	☐			

Appendix L

Site Review Checklist

Planning & Development

Development Services Customer Service Center
One Exchange Plaza, Suite 400
Raleigh, North Carolina 27601
Phone 919-516-2495
Fax 919-516-2685

Site Review Checklist

TO BE COMPLETED BY APPLICANT	YES	N/A
FIRE REQUIREMENTS		
1. Site plan detailing apparatus access to within 150' of all portions of ground floor of proposed buildings		
2. Apparatus access roads (dead end) greater than 150' require approved area to turn apparatus around (Hammer head, Wye, or 96' diameter cul-de-sac)		
3. FDC within 150' hose lay of fire hydrant and within 40' of apparatus access		
4. Minimum apparatus access width 20'; inside turn radius 28'		
5. Does business store or use Hazardous Materials? If yes, submit **Hazardous Materials Permit Application**		
PUBLIC UTILITIES REQUIREMENTS		
1. Show existing/proposed water mains with sizes along entire frontage of development		
2. Show existing/proposed sewer mains with sizes along frontages and/or easements		
3. Show reference for all existing sanitary sewer easements and possibly water easements		
4. Show fire hydrants		
5. If a private distribution system is proposed, the master backflow device must be shown with make and model number		
6. Show water/sewer services with sizes		
7. Show size and location of meters		
8. No structures/landscaping on City of Raleigh Sanitary Sewer Easements		
9. Show location and make and model number of backflow preventers		
10. Show location and size of grease traps		
11. All building parts must be within 300' of a hydrant		
STORMWATER REQUIREMENTS		
1. Existing conditions shown on plans should include existing contours of intervals of two (2) feet or less, referred to NAVD 88 datum; watershed, alluvial soils, FEMA flood hazard areas, Neuse River Buffers, wetlands, existing storm drainage system, hydrologic features and private drainage easements		
2. Hydrologic features include ditches, drainage swales, channels, and watercourses; plans should include flow direction arrows		
3. Grading and drainage features should include proposed contours of intervals of two (2) feet or less referred to NAVD 88 datum and spot elevations, velocity dissipaters and channel lining details along with supporting calculations		
4. Stormwater networks must be shown identifying inlets, culverts, swales, ditches, and channels. Top elevation, invert elevation, pipe size and slope reflected in a table		
5. Two and ten year stormwater runoff quantities entering and leaving the site at each discharge point for pre- and post-development conditions		
6. Show backwater elevations for new stream crossings		
7. Class and location of rip-rap and all creek location/relocation shown on plan view		
8. 100-year floodplain and floodway boundaries, flood hazard soil boundaries, flood storage area easements, and regulatory flood protection elevations should be shown on plans. Indicate FEMA map and/or flood study numbers. If filling in floodplain, identify limits of filled area		
9. Provide drainage divide maps (pre- and post- development) identifying discharge points, drainage areas, and BMP treatment areas		
10. Right-of-Way or Roadway improvements must be shown on the plans (plan and profile to be shown for roadway construction)		

TO BE COMPLETED BY APPLICANT	YES	N/A
11. Provide Hydraulic Grade Line and gutter spread calculations (2 year 24 hour storm – max. spread = ½ lane)		
12. Identify private drainage easements		
13. If the property is in a Watershed Protection Overlay District, provide detailed impervious surface area calculations and establish how you meet the watershed requirements		
14. If the property is in a Metro Park Protection Overlay District, include watercourse buffer areas, impervious surface calculations, park buffer yards and tree inventory, if impervious surface area exceeds 30%		
15. Stormwater BMP's (Best Management Practices) require a separate calculations package for any stormwater BMP's (designed according to current DWQ guidelines). Provide BMP details and cross sections showing inverts, orifices, slopes, elevations (including WQV, 2 yr, 10 yr and 100 yr). Specify if BMP is shared or private		
16. Provide nitrogen loading and reduction calculations and computation of any offset fees (buydown) to be paid		
17. Include Operations and Maintenance Manual (with estimate for annual maintenance and certifications requirements). Specify if BMP is shared or private. If shared, provide replacement fund information		
18. Permanently Preserved Undisturbed Open Space when included in nitrogen calculations is considered to be a BMP and must be identified on all plans and addressed in the maintenance manual		
19. Sedimentation and Erosion Control plan should be prepared with scale, legend and project orientation. All drawings must be sealed, signed and dated by the project designer. Plans must be 24x36 in size		
20. Erosion control plans should also include details and supporting calculations; site specific, detailed construction sequence (outlining permits, installation measures, inspections and approvals in the construction process); locations and dimensions of gravel entrances, diversion ditches, silt fence, sediment basins and other controls (devices shall be designed to the 10 year 24 hour storm event)		
21. If Neuse River Buffer exists, a letter from a surveyor stating the buffer has been flagged on the site must be submitted		
22. Provide copies of permits from appropriate agencies for any impacts to buffers, wetlands etc.		
TRANSPORTATION SERVICES REQUIREMENTS		
1. Show the ROW and pavement widths, street widths, sidewalk, curb and gutter, medians, median openings, curb radii		
2. Show the location of all opposing driveways surrounding the site		
3. Label street type or ramp type entrances		
4. Show driveways and vehicular surface area on plan		
5. Show the actual street names, if known. Show state road number, if applicable and type of road (collector, thoroughfare, etc.)		
6. Indicate on the plan whether the existing streets are asphalt, concrete, gravel or dirt		
7. All handicap ramps must be shown and labeled and must meet the placement requirements of Engineering Standard 20.11.		
8. Vertical alignment of streets only when deemed necessary by the Transportation Director to properly determine the safety of proposed streets or driveways		
9. Show typical cross sections for all public and private streets included with this plan. Use Engineering Standard 20.31 and 20.32 for pavement designs for all proposed street type entrances, residential, collector, and commercial streets		
10. Show existing and proposed curb and gutter, storm sewers, drainage structures, driveway pipes, water mains, sanitary sewer mains, etc. on the site plan		
11. Proposed private streets, dimensions and curb treatments		
12. Plans shall bear the note: "All construction shall be done in accordance with all City of Raleigh and NCDOT standards and specifications."		
13. Slope easements must be shown, labeled and dimensioned		
14. Existing and proposed ROW must be dimensioned and labeled		
15. Sight triangles must be shown and labeled including any structures within them		
16. Add note from the **Infrastructure Construction Plan Checklist** about the sight distance triangles. If you do not have this document, you can add the statement per City Code Section 10-2086 (a) regarding the sight triangles		
17. Show existing and proposed parking areas, bay dimensions and aisle dimensions		
18. Provide vehicular stacking areas, length of queue, storage space required per stacked vehicle including aisle width, stall depth, and stall width		
19. Provide internal traffic circulation details		
20. The corner clearance must be shown and verified and a note placed on plans stating: "Minimum corner clearance from curb line of intersection streets shall be at least twenty (20) feet from the point of tangency."		

TO BE COMPLETED BY APPLICANT	YES	N/A
21. Label the existing property irons “E.I.P.”		
22. Show the proper location of sidewalk (BOC to ROW < 12.5 feet), sidewalk located 1.0 foot inside		
23. ROW, BOC to ROW > 12.5 feet, sidewalk located 4.0 feet inside ROW		
24. Provide street lighting design and layout including the specifications		
25. Cul-de-sacs must be dimensioned (Back of Curb with ROW radius)		
26. A driveway permit from NCDOT must be acquired, if the access is on a state maintained road		
27. Provide construction details, where applicable		
28. Provide approved Infrastructure Construction Drawings, if required		
29. Provide supporting documentation such as TIA’s or traffic counts		
30. Any encroachment into the public ROW must be approved, if applicable		
TREE CONSERVATION REQUIREMENTS		
1. Tree conservation plan showing the proposed tree conservation areas (TCAs) that are labeled according to the “Standardized Names…” (Appendix 3 of the User’s manual for TC-7-04). Show the size of each area with metes and bounds descriptions		
2. Tree Conservation Areas need to be shown on the grading plan with the tree protection fence location		
3. A completed Tree Conservation Data Sheet (Appendix 4 of the User’s manual for TC-7-04) will need to be provided with the plan (four copies) or the information needs to be on the tree conservation plan		
For Secondary Tree Conservation Areas, include the following		
1. A tree cover report with description of each 50’ of TCA completed and certified by a certified arborist, North Carolina licensed landscape architect, or North Carolina registered forester (four copies)		
2. Photo panoramic panels of proposed secondary TCAs. Each photo to represent 50 linear feet of tree conservation area and must match the sections shown on the plan (four copies)		
3. Most recent aerial photo (four copies)		
PLANNING AND ZONING REQUIREMENTS		
1. Property lines, building footprint and location from property line (proposed and existing), parking areas, new and existing driveways, opposing driveways, right-of-way and street pavement width, curb, gutter and sidewalk, greenway, utility and drainage easements		
2. Survey of existing conditions with building uses and square footage		
3. Location of HVAC units and dumpsters with detail of screening to be used		
4. Floor plans and building elevations		
5. Parking layout and calculations; location of any off-site parking		
6. Adjacent uses and zoning		
7. Lighting plan, if applicable		
8. Cumulative expansion calculations of building square footage and vehicular surface area since 1/1/87		
9. If applicable, plat map with all subdivision/recombination, easements and dedications		
10. Calculations for open space requirements shown in tabular form and open space shown in plan view		
11. Landscape plans showing requirements of City Code Chapter 10, Section 10-2082		
12. Description of vegetation to be retained and removed in areas of both voluntary and mandatory preservation		
13. For subdivision or cluster development, provide the quotient calculations per City Code 10-3071 (5)		
14. Identify all protected areas, including but not limited to Conservation Management Districts, natural resource buffer yards, Resource Management Districts and street buffer yards located along Type B Residential Thoroughfares designated in the Comprehensive Plan		
15. Natural resource buffer yards and impervious surface coverage in Reservoir Watershed Protection and Metro-Park Overlay Districts. Identify all drainage structures or velocity control devices in all protected and buffer areas		
16. Plant list, with supporting calculations		

Appendix M

Stormwater BMP As-Built Certification (Form-511)

City of Raleigh Public Works
Stormwater BMP
As-Built Certification

For City Staff use:
Date received:
Date accepted:
By:
Annual Insp. Due:

Section A- Project Information

Project Name		Permit Number
Project Address		
City	State	Zip

Section B- Property Information

Property Owner's Name		
Property Owner's Address		
City	State	Zip

Section C- As-built Drawings

An as-built plan set (24" x 36") is necessary to complete this stormwater BMP certification The following items are to be included on the as-built drawings; initial by each item:

___ Accurate as-constructed conditions (contours, inverts, pipe location, pipe size, etc.)
___ Detailed drawings for each stormwater control device
___ Show all recorded drainage and access easements and recorded undisturbed open space areas; reference book of map and page number.
___ BMP Type (Wet Pond, Bioretention, Undisturbed Open Space, etc.)
___ Required BMP vegetation
___ Provide in tabular form the amount of impervious and pervious surfaces
___ Latitude and longitude location of each BMP
___ Photograph of each BMP

Original as-built drawings and certification should be submitted to the Stormwater Control Inspectors.

Section D- Surveyor, Engineer, or Landscape Architect Certification

I,_____ as a duly registered _____ in the State of North Carolina attest that on _____, 20___ a thorough inspection of all required stormwater control facilities, including open space areas, associated with this site are installed and performing in compliance with the approved stormwater control plan. All information provided is correct to the best of my knowledge. It is a violation of City Code Sect 10-9007 to falsify this certification. A civil penalty for falsifying this certification shall be assessed by the City of Raleigh in the amount of $3000.00.

Certifier's Name		License Number		Place Seal Here
Title	Company Name			
Address	City	State	Zip	
Signature	Date	Telephone		

Annual Inspection Reports: **Per City Code Section 10-9028 An original inspection report of all required stormwater BMPs, including open spaces, shall be filed with the City; due on the anniversary of the initial as-built certification date. Annual Inspection reports shall be accompanied by City provided 'Stormwater BMP Annual Inspection Report Summary' Form 501.**

PO Box 590
One Exchange Plaza
Raleigh, NC 27602
(919) 996-3940
www.raleighnc.gov

Appendix N

Neuse Riparian Buffer Delineation Certification

City Of Raleigh
North Carolina

NEUSE RIPARIAN BUFFER DELINEATION CERTIFICATION

I,_____, a registered, professional land surveyor in the state of North Carolina, certify that the Neuse Riparian Buffer located on the property at _____in Raleigh, NC has been delineated in accordance with the Neuse Riparian Buffer Regulations and flagged appropriately, as required by the City of Raleigh for *TRANSACTION* _____.

SEAL
OF
PLS

Signature License Number

Company Name Telephone Number

Appendix O

RFPE Certification

City Of Raleigh
North Carolina

RFPE
CERTIFICATION

I,_____, a registered, professional land surveyor in the state of North Carolina, certify that the Regulatory Flood Protection Elevation (RFPE) of _____has been set utilizing datum NAVD88 in accordance with permit #_____.

SEAL
OF
PLS

Signature License Number

Company Name Telephone Number