

FACILITIES STANDARDS MANUAL

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CHAPTER 1.000

AUTHORITY

1.100 GENERAL

This document, entitled the Loudoun County Facilities Standards Manual, has been developed and designed to assist the public and the development community in determining the policies, which apply to land development in the County. It contains information primarily concerned with the design and construction standards and guidelines for improvements related to subdivisions and site plans.

The majority of the information contained herein is a compilation of existing requirements already in place. This document will serve as a central reference for these items.

Each land development application shall be subject to the version of the Facilities Standards Manual in effect at the time of initial acceptance. Land Development Applications for Record Plats, Dedication Plats, or Easement Plats shall be subject to the version of the Facilities Standards Manual in effect at the time of the initial submission and acceptance of the Construction Plans and Profiles or Site Plans upon such plat is based.

In the event any land development application is made for a development which is served by or subject to a previously approved roadway or stormwater management facility, such previously approved roadway or stormwater management facility would not have to be upgraded to meet current standards.

Any land development application proposing:

1. a site redevelopment involving major reconstruction or major demolition, or
2. a revision or construction modification to alter stormwater management facilities which (a) is in conjunction with a change to the land use on-site that would result in an increase in runoff over that for which the facility was originally designed or (b) benefits additional land areas not previously utilizing the improvements included that results in an increase in runoff over which the facility was originally designed, except when such changes are minimal in nature with negligible impact.

shall be subject to the current version of this manual.

1.200 INTERPRETATION AND REVISION

A. Interpretation

These standards and guidelines are designed to supplement the provisions of existing Federal and State regulations and County codes and ordinances. Nothing herein shall be deemed to waive or modify other requirements of existing codes. Except as expressly provided otherwise in this document, the Director of Building and Development is the designated official charged with the administration of the standards and requirements contained in this manual and, in administering them, shall treat them as guidelines. The Director may allow for variations of given standards where the effect of such variation is in keeping with established engineering practices and procedures and shall make the final decision on all questions regarding interpretation of this manual, after reviewing recommendations from the designated departments, authorities, boards, and committees.

B. Revision

As new basic information on design criteria becomes available and is accepted, and as Federal, State, and County laws, regulations, and standards are changed, they will be reflected in this publication after at least an annual review. Any record plats, final site plans or construction plans and profiles submitted prior to the approval of any revisions will comply with the standards in effect at the time of the officially accepted submission for such record plats, final site plans, and/or construction plans and profiles.

C. Facilities Standards Manual Review Committee

This committee shall consist of at least seven representatives appointed by the Board of Supervisors of Loudoun County. The candidates for appointment may be any persons whom the Board of Supervisors deem qualified. In addition to public notification and request for citizen participation on the Review Committee, nominations shall be requested from, but not limited to the following organizations:

- National Association of Industrial & Office Parks
- Loudoun Chamber of Commerce
- Virginia Society of Professional Engineers
- Virginia Association of Surveyors
- Heavy Construction Contractors Association
- Associated Building Contractors
- Northern Virginia Building Industry Association
- Piedmont Environmental Council
- Washington Area Council of Engineering Laboratories
- Consulting Engineers Council
- Association of Soil & Foundation Engineers
- Association of Engineering Geologists
- Virginia Association of Professional Soil Scientists
- Virginia Association of Geologists

Loudoun County Board of Realtors
Engineers & Surveyors Institute

The majority of members shall be actively involved in the Loudoun County Community and shall represent professionals registered to practice engineering, surveying, geology, landscape, architecture, or soil science in Virginia.

Committee members shall elect a chairman. The Director of Building and Development or his designee shall serve as secretary to the committee. County staff members may serve as advisory staff to the committee but shall not be appointed to sit on committee.

Members shall be appointed for a term of not less than one year and no more than four years and shall serve until replaced. If a member resigns, the Board of Supervisors will appoint a replacement.

The committee shall meet at least once a year to review the Facilities Standards Manual and shall advise the Director of Building and Development of their findings and recommendations. Whenever a change in the Facilities Standards Manual is proposed, the Director of Building and Development shall request the advice of the committee prior to requesting a public hearing for consideration of changes to the FSM.

D. Appeals

Any applicant who is aggrieved by an interpretation or decision made by the Director in the administration of the standards and requirements contained in this manual may, within five (5) working days of receiving written notice of such decision or interpretation, deliver a written notice to the Director requesting the Chairman of the Facilities Standards Manual Review Committee (the Committee), to appoint a subcommittee to review the matter. Such subcommittee shall consist of at least three members of the Committee. Such subcommittee shall hear the matter at the Department of Building and Development at a time convenient to the applicant and the Director, but in no event more than thirty (30) days after the notice and request is delivered to the Director, and shall make a written recommendation to the Director, stating the basis for such recommendation.

Upon receiving such recommendation from the subcommittee, the Director shall render a final decision within five (5) working days thereafter. If the applicant is aggrieved by such final decision, the applicant may take such action as is otherwise provided by law with respect to the subject land use application at the appropriate time.

Any applicant who files an appeal under this subsection of the Facilities Standards Manual shall waive, during the period of pendency of the appeal, any right to require the County to take any action to approve or disapprove the application pursuant to any statutory or other legally imposed timeline requirement. Any applicant giving notice of such appeal shall execute and deliver to the said Director such written waiver along with such notification in substantially the following language:

"I/we hereby waive any right I/we may have to require the County to take any action to approve or disapprove the subject application during the pendency of the appeal, such that the time which elapses from the date of delivery of this notification to the Director until the date of the final decision on this appeal by the Director shall not be counted in determining the date as of which County action on the application is legally required."

The thirty (30) day period for action on this appeal shall not commence until such written waiver has been delivered to the Director.

E. Disclaimer of Liability

The purpose of this manual is to establish reasonable land development standards and guidelines for the protection and promotion of the general health, safety, and welfare of the County's residents. Approval of plans and plats by the County or its agencies pursuant to the ordinance and this manual, is not intended and shall not be deemed as a guarantee or warranty for any individual, landowner, or developer that any improvements will be designed, planned, constructed, or operated in any particular manner or be free from defects. Such approval shall create no duty or result in any liability on the part of the County, its officials, or employees for any claim, demand, suit, or damages alleged to have resulted from the development, construction, existence, or operation of improvements constructed pursuant to such approved plans or plats. Further, no such approval shall operate as or be deemed as a waiver of any provision or requirement of the ordinance, or this manual, unless such waiver has been specifically granted in writing by the Director as a variation allowed under Section 1.200.A hereof. In the event that any aspect of any such approved plan or plat fails to comply with any provision or requirement of this ordinance, or this manual, in effect at the time of such approval, such provision or requirement of the ordinance, or this manual, shall take precedence over the approved plans, and development shall be in accordance with the ordinance and this manual.

1.300 NECESSARY REFERENCE MATERIAL

In order to properly utilize this manual, the designer or user in general should have certain publications readily available, as they are referenced throughout this document.

A listing of the most commonly utilized publications is as follows:

"The Sewage Handling and Disposal Regulations," Board of Health, Commonwealth of Virginia.

"Virginia Water Works Regulations," State Health Department, Division of Water Engineering.

"Virginia Erosion and Sediment Control Handbook."

The Loudoun County Sanitation Authority's Design and Construction Standards for Sanitary Sewers and Water Supply System .

The Building Official's Code Administrators, "The BOCA Basic Building Code," latest edition.

"Interpretive Guide to the Use of Soils Maps, Loudoun County, Virginia," latest edition.

Controlling Urban Runoff: A Practical Manual for Planning and Designing Urban BMPs.

Federal Manual for Identifying and Delineating Jurisdictional Wetlands.

Additional reference materials specific to each subject area is listed at the end of each chapter.

CHAPTER 2.000

WATER SUPPLY AND DISTRIBUTION SYSTEMS

2.100 GENERAL

There are several alternatives for providing domestic water supply and distribution to properties within Loudoun County. Adopted policies and long-term practice, however, generally favor extensions of existing systems in urban areas and the construction of private, individual systems in rural areas. Applicants are referred to the County Revised General Plan, for statements as to current policy and to the Zoning Ordinance for statutory limitations on options in certain zoning districts.

Applicants are reminded that, in all cases, the applicable requirements of the State and County Health Departments, the Virginia Department of Health "Water Works Regulations", State and County codes and/or Town design and construction standards, where applicable, must be met. The applicant is referred to the Codified Ordinances of Loudoun County for local permitting requirements.

The most common domestic water systems in Loudoun County are:

Central Water Systems: The Loudoun County Sanitation Authority (LCSA) is chartered to provide water and sewer service throughout Loudoun County. LCSA's rights to provide service, however, are not exclusive and connection is not mandatory, except as mandated under the provisions of the Zoning Ordinance. While LCSA is under no obligation to provide service, new services will be accepted in accordance with LCSA policy. The Authority's Policy is to require that new facilities be designed and constructed by the applicant, and dedicated to LCSA for operation and maintenance. LCSA has detailed design and construction standards for urban water distribution systems in development areas designated for public water supply systems.

Municipal Water Systems: The incorporated towns of western Loudoun County own and operate municipal water systems. Adopted County policies (Revised General Plan) permit the extension of these utilities to serve adjoining areas, particularly those designated as Joint Land Management Areas by the Revised General Plan. The Towns, however, are not obligated to permit or provide such extensions, and in most cases the extension must be approved at the option of elected officials in both the subject town and the County. The Town of Leesburg has established policies and standards for such extensions in accordance with the annexation agreement.

Communal Water Supply Systems: The Revised General Plan designates LCSA as the agency to own and operate communal water systems. LCSA has adopted standards for rural water supply systems to govern villages, hamlets, and other low-density developments. Therefore, applications for rural services will be guided by LCSA and Virginia Department of Health standards, the Codified Ordinances of Loudoun County and Chapter 6 of the Facilities Standards Manual.

Private Water Systems: These are separate stand-alone systems permitted by the Health Department to serve individual users. The predominant source of supply is ground water from deep, drilled

wells. These systems are generally utilized to serve residential development in rural areas and isolated businesses. Water systems routinely serving more than 25 employees or the public-at-large (restaurants, etc.) may be subject to more stringent state and federal regulations for non-community water supplies.

2.200 DESIGN AND CONSTRUCTION STANDARDS (Public Water Supply and Distribution Systems)

- A. The design and construction of all central and communal water supply and distribution systems shall be in strict compliance with LCSA's Water Distribution System - Standards & Extensions, latest edition. Municipal water supply and distribution systems to be operated and maintained by incorporated towns shall be designed and constructed in conformance with the standards and requirements of the town having responsibility for the system. Where such final jurisdiction does not have its own design standards, the applicant will meet the requirements as directed by the Director of Health.
- B. New water wells for potable water shall be designed in accordance with the Loudoun County Codified Ordinances.
- C. Water distribution systems associated with central and municipal water systems shall include provision for fire protection and be designed in accordance with the Codified Ordinances of Loudoun County.

2.201 LOCATION OF WATERMAINS IN REGARD TO PUBLIC RIGHT OF WAY

A. General

Watermains and distribution systems shall be allowed within the right-of-way of any roadway, except within limited access right-of-way, unless as determined by VDOT, there are design or safety issues, which would demand consideration of an alternate location. The preferred location for water mains and distribution systems is within the right of way or under the pavement of roadways. In all cases, water mains and distribution systems should be located so as to protect existing trees and vegetation and the Green Infrastructure.

B. Divided Roads

It is the general intent that water mains and distribution systems will not be allowed under the pavement of divided roads having four or more lanes. However, watermains within the right-of-way of such roads may be permitted subject to approval and consensus by VDOT. In accordance with VDOT's policy, the conditions listed in Items 1 through 4 below shall be present to allow placement of the watermain under the pavement of such roads. When watermains are permitted within the pavement of divided roadways, they are to be located five (5) feet from the outside edge of the pavement or seven (7) feet from the face of curb. It should be noted that for the conditions and situations cited below, VDOT, LCSA or the

County may determine that there are compelling design or safety issues which shall demand consideration of an alternate location. In any case, the applicant shall be notified of the appropriate watermain location prior to the approval of the preliminary subdivision application. In instances that require special consideration, applicants are encouraged to seek VDOT, LCSA and County concurrence of the waterline design concept prior to or during the preliminary plan process.

1. When the divided roadway is designed for aesthetic purposes rather than to meet projected traffic volumes.
2. In areas where an existing and sufficient interparcel access is available to provide an alternative route for traffic, as required for watermain maintenance.
3. Existing water lines are located under existing pavement.
4. The extension of water lines under undivided roadways through intersections widened, only through the intersection, to a divided section.

C. Undivided Roads

Watermains will be allowed under the pavement for all undivided roadways unless compelling design or safety issues are identified by VDOT, LCSA or the County, as identified prior to preliminary plat approval. These water mains shall generally be placed within the pavement, no less than five feet from the outside edge of the gutter pan or seven feet from the face of curb.

2.300 WATER SUPPLY WHERE WATER SYSTEMS ARE NOT AVAILABLE FOR FIRE PROTECTION

2.310 GENERAL

This section identifies minimum water supply requirements for fire protection in areas where an extension of central and/or municipal water supply systems do not exist, as required by the Zoning Ordinance. The requirements contained within this section are minimum requirements and shall not apply if the subdivision provides the mandated provision of building sprinkler systems within primary residential structures. In case of conflict between this section and standards of another applicable regulation, ordinance, code or law, the more stringent standards shall prevail. All references to the National Fire Protection Association's (NFPA) Standards shall be construed to include the latest amendments to those Standards.

The requirements of this section shall be applicable to land development applications which require approval by the County in accordance with the regulations set forth within the Land Subdivision and Development Ordinance (LSDO).

The maintenance and operational integrity of the water supply and fire protection systems

established pursuant to this section shall be the responsibility of the Chief of Fire and Rescue Services.

2.320 DEFINITIONS (For purposes of Chapter 2 only)

Structure: Building erected for the purpose of providing shelter for persons.

Natural Water Source: Any natural water sources of cumulative volume capable of supplying the minimum needs for the fire problem. Examples of natural water sources are, but not limited to: streams, ponds, rivers, lakes, and creeks or other like sources.

Man Made Sources of Water: The man made sources of water supplies which may include, but not limited to: cisterns, swimming pools, quarries, stationary tanks, dry hydrants, etc.

Volume: To be measured in cubic feet.

2.330 WATER SUPPLY FOR FIRE PROTECTION

Calculations and other design information determining both the water supply required and the water supply available for fire protection shall be provided on applicable land development applications. The required water supply shall be based on the structure requiring the greatest volume as determined by the Chief, Fire and Rescue Services, based on the size, construction, occupancy hazard, and type of fire suppression system available, if any.

While applicants may submit more detailed data and calculations to support their estimate of available water supply, the County will generally honor the following assumptions:

- A. Free-flowing streams to be used as an available water supply for fire protection shall be capable of providing 500 gallons of stream flow per minute.
- B. Ponds, quarries and other open and unlined impoundments, with a contributory watershed will require a normal depth of five (5) feet at the draft pipe and a minimum of 10,000 gallons of volume for use based on an assumed 90 day drought.

2.340 DESIGN REQUIREMENTS

Water supply facilities, either man-made or natural, in areas where water facilities are not available for fire protection shall be designed and constructed in accordance with the following specifications approved by the Chief of Fire and Rescue Services or his designee as follows:

1. Adequate man-made or natural water supplies shall be required to serve hamlets, clusters, and rural villages, excluding conservancy lots), and shall meet the following design parameters:

- a. The tank size or number of tanks provided, if applicable, shall provide a minimum of 15,000 gallons of storage capacity.
 - b. The water source shall be spaced every 2,600 linear feet of roadway.
 - c. The water source shall be located within a common area protected under the covenants of an easement. Such an easement shall be granted to the County.
 - d. Natural water sources shall meet the criteria as established in Section 2.330 of this Chapter.
 - e. Permanent provision shall be made for private maintenance of water supply facilities.
2. Access: Dry hydrants may be treated as standard fire hydrants and located within VDOT or private road rights-of-way or easements. Otherwise, dry hydrants shall be located adjoining fire lanes that are at least 18 feet wide. Access travelways, whether private drives, public roads or road shoulders, shall be capable of supporting a 34-ton vehicle (H-20 loading) in all weather conditions. Travelways built to Facilities Standards Manual and/or VDOT subdivision street standards shall be assumed to meet these criteria. Road shoulders used for such access shall be designated and clearly marked as fire lanes. Access drives and private roads may be co-used for access to businesses or residences. Emergency vehicle use shall not be counted in considering appropriate design criteria respective to width of pavement or right-of-way.
 3. Signage: All drafting facilities shall be marked by reflective signs. Letters and/or numbers shall be at least 3 inches high. The signage may be directly affixed to the drafting pipe. The sign shall contain information as noted in the Rural Water Supply Facilities Construction specification document available in the office of Loudoun County Fire and Rescue Services.
 4. Easements: Easements shall be provided for access to the drafting pipe and within 10 feet of any storage tank and appurtenances. Where ponds are used as a source of water supply, the entire pond shall be placed in an easement granting to the County rights to assure access for fire protection.
 5. Construction: Minimum specifications for construction of water storage facilities shown in Figure 1 and Figure 2 at the end of this chapter and should be adhered to in all cases, unless otherwise authorized by the Chief of Fire and Rescue.

2.400 WATER SUPPLY AND DISTRIBUTION SYSTEM REFERENCES

"BOCA", Basic Building Code and Mechanical Code.

"Waterworks Regulation", Commonwealth of Virginia/State Department of Health.

"Guide for Determination of Required Fire/Flow", Insurance Services Office, 160 Water Street, New York, NY 10038.

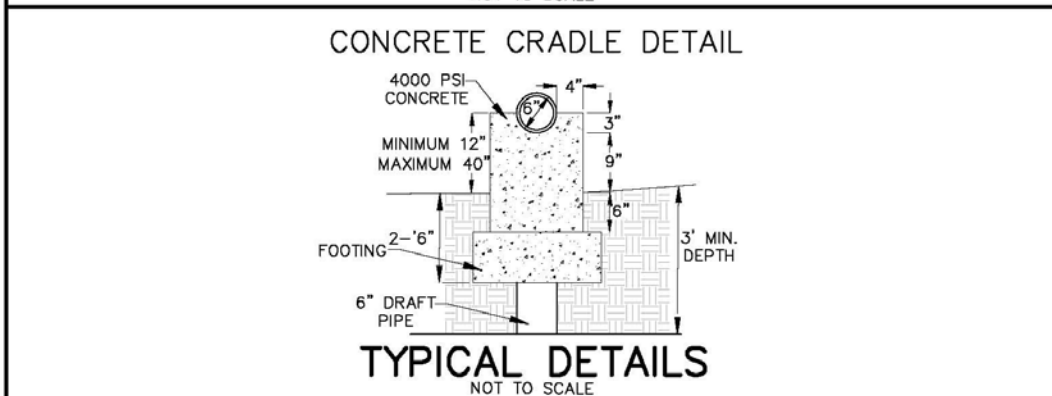
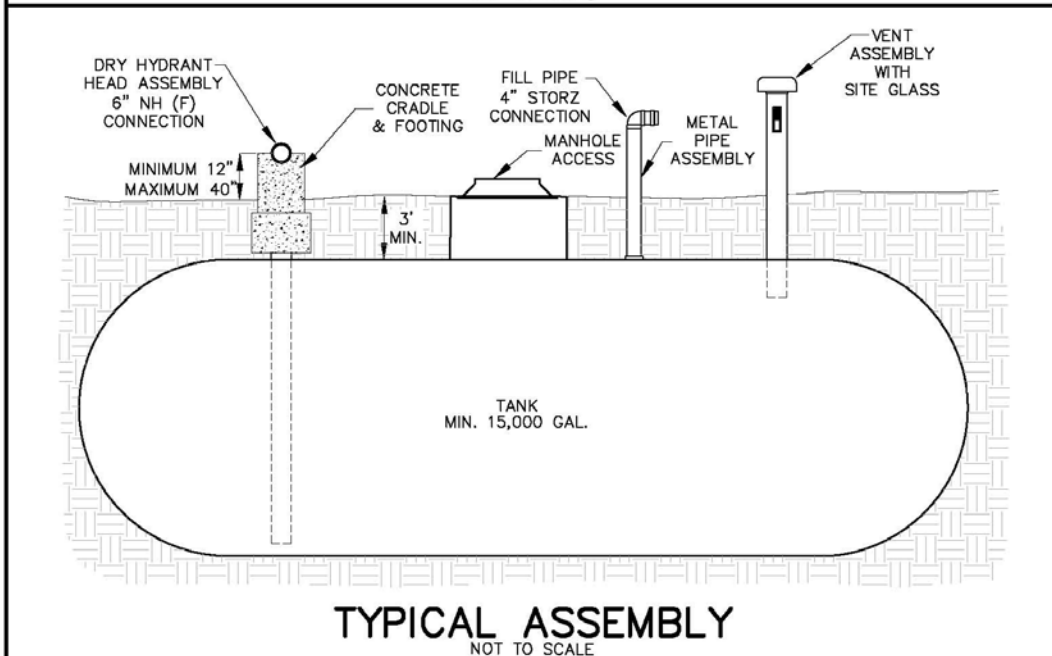
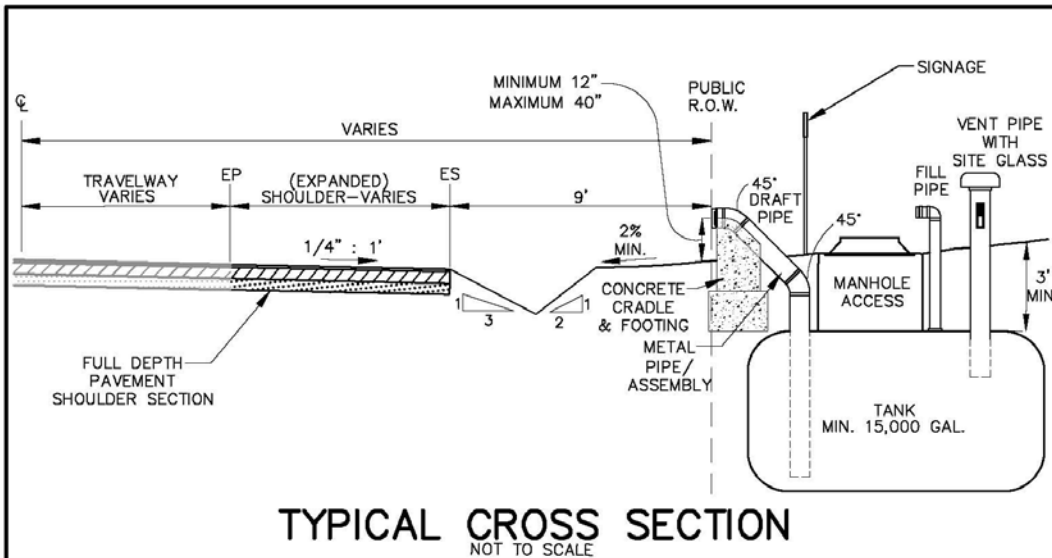
"Grading Schedule for Municipal Fire Protection", Insurance Services Office, 160 Water Street, New York, NY 10038.

"Water Distribution System - Standards and Extensions", Loudoun County Sanitation Authority.

"Codified Ordinances of Loudoun County, Chapters 1040 Water Wells, 1042 Water Systems and 1044 Water Supply Emergency".

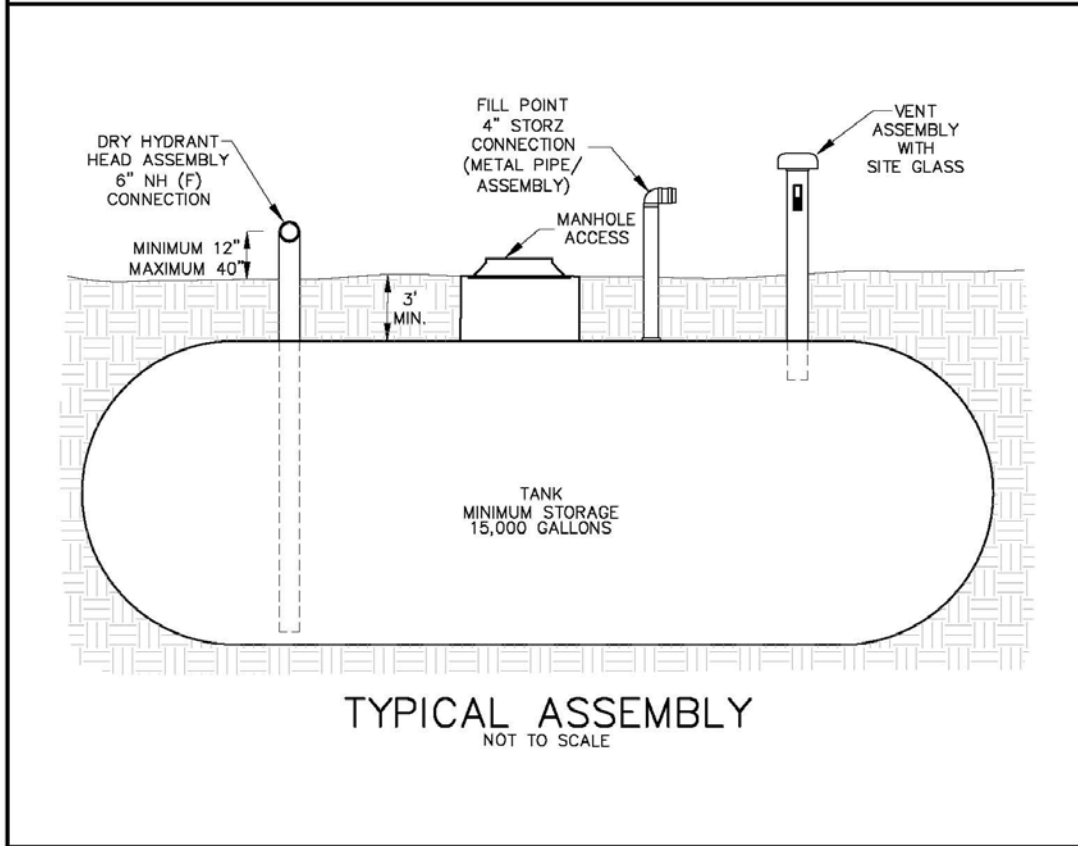
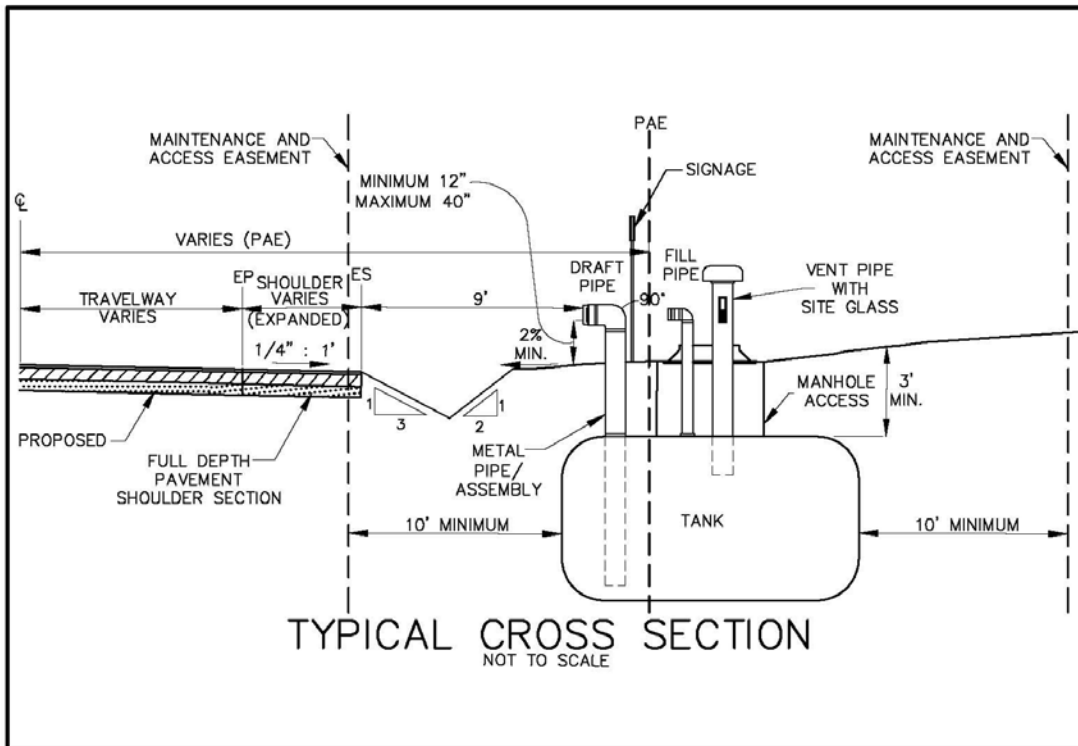
"AWWA Standards", American Water Works Association.

"NFPA Standards", National Fire Protection Association.



DRY DRAFTING HYDRANT
FIRE TANK DETAIL
(PUBLIC ROW)
NOT TO SCALE

Figure 1



**DRY DRAFTING HYDRANT
FIRE TANK DETAIL
(PRIVATE ACCESS ESMT)**
NOT TO SCALE

Figure 2

CHAPTER 3.000

WASTE COLLECTION AND DISPOSAL SYSTEMS

3.100 GENERAL

There are several alternatives for providing domestic sewage disposal to properties within Loudoun County. Adopted policies and long-term practice, however, generally favor extensions of existing systems in urban areas and the construction of private, individual systems in rural areas. Applicants are referred to the County General Plan, Choices and Changes, for statements as to current policy and to the Zoning Ordinance for statutory limitations on options in certain zoning districts.

Applicants are reminded that, in all cases, the applicable requirements of the State and County codes and Health Department regulations, and where applicable, Town design and construction standards must be met. The applicant is referred to the Codified Ordinances of Loudoun County for local permitting requirements.

A. The most common domestic sewer systems in Loudoun County are:

Central Sewer Systems: The Loudoun County Sanitation Authority (LCSA) is chartered to provide water and sewer service throughout the county. LCSA's rights to provide service, however, are not exclusive and connection is not mandatory except as mandated under the provisions of the Zoning Ordinance. While LCSA is under no obligation to provide service, new services will be accepted in accordance with LCSA policy. The Authority's Policy is to require that new facilities be designed and constructed by the applicant, and dedicated to LCSA for operation and maintenance. LCSA currently provides sanitary sewer service in most of the Eastern Loudoun and Dulles North areas and has detailed design and construction standards for urban sewer systems in these areas.

Municipal Sewer Systems: Most incorporated towns of western Loudoun County own and operate municipal sanitary sewer systems. Adopted County policies (General Plan) encourage the extension of these facilities to serve adjoining areas, particularly those designed as Urban Growth Areas by the General Plan. The Towns, however, are not obligated to permit or provide such extensions, and in most cases the extension must be approved at the option of elected officials in both the subject town and the County. The Town of Leesburg has established policies and for such extensions in accordance with the annexation agreement.

Communal Sewer Systems: The General Plan designates LCSA as the agency to own and operate communal sanitary sewer systems. LCSA has not adopted standards for rural sanitary sewage disposal systems to govern villages, hamlets, and other low-density developments. Therefore, applications for rural services will be guided by Virginia Department of Health standards, and the Codified Ordinances of Loudoun County and shall be handled on a case-by-case basis.

Private Sewer Systems: These are separate stand-alone systems permitted by the Health Department to service individual users. These systems are generally utilized to serve residential development in rural areas and isolated areas. Sewer systems routinely serving more than 25 employees or the public-at-large (restaurants, etc.) may be subject to more stringent state and federal regulations for non-community sanitary sewage systems.

3.200 DESIGN AND CONSTRUCTION STANDARDS (SANITARY SEWER SYSTEMS)

The design and construction of all central and communal sanitary sewer systems shall be in strict compliance with the Loudoun County Sanitation Authority's General Design Standards and the latest edition of the Authority's Sewer System-Standards and Extensions. Municipal sanitary sewage systems to be operated and maintained by incorporated towns shall be designed and constructed in conformance with the standards and requirements of the town having responsibility for the system. Where such final jurisdiction does not have its own design standards, the applicant will meet the requirements as directed by the Director of Health.

3.210 ON SITE SEWAGE HANDLING AND DISPOSAL

New onsite sewage disposal systems shall be constructed in accordance with the Loudoun County Codified Ordinances.

3.300 SOLID WASTE DISPOSAL FACILITIES

The design and operation of all solid waste facilities shall be in conformance with the requirements of the Loudoun County Codified Ordinances, Chapter 6, of this manual and applicable State and Federal regulations.

CHAPTER 4.000
TRANSPORTATION

4.100 GENERAL

The purpose and intent of this chapter is to establish minimum standards for the planning, design, and construction of both public and private roadways, certain associated facilities and pedestrian and bicycle accommodations within the County. The chapter is divided into five sections establishing guidelines and criteria for Transportation Planning, Design and Construction Standards, Pedestrian and Bicycle Accommodations, Street Name and Addressing Standards and Signs. It is the intent of the County of Loudoun that all roads be dedicated for public use and maintained by the Virginia Department of Transportation (VDOT), except as may be permitted under the provisions of the Zoning Ordinance or the Land Subdivision and Development Ordinance (LSDO).

4.200 TRANSPORTATION PLANNING

A. General Requirements

1. Roadway Classifications

Public roads constructed in conjunction with subdivision and site plans shall be designed to comply with the standards of the Virginia Department of Transportation (VDOT) and this chapter of the Loudoun County Facilities Standards Manual (FSM).

For purposes of this chapter, private roadways shall include: private roads, pipestem driveways, townhouse and multi-family accessways, private lanes, private access easement roads, Class III roadways, private rural village through roads and neighborhood roads as referenced within the Zoning Ordinance and LSDO. Private roadways shall be designed to comply with the standards outlined in this chapter for the appropriate roadway category as described below.

- a. Category A: Includes Private Roads for residential and non-residential applications, Private Rural Village Through Roads; Private Rural Village Neighborhood Road; Class III Roads serving more than 25 lots.
- b. Category B: Includes Townhouse, and Multi-Family Accessways (which includes condominiums).
- c. Category C: Includes Class III Roads serving 25 lots or less; Pipestem

Driveways; Residential Private Access Easement Roads; Private Lanes; Alleys.

2. Facility Planning Guidelines

- a. The streets within and contiguous to any development shall be designed and constructed so as to ensure coordination with other existing or planned streets within the general area as to width, grade, location, and drainage. Existing and planned streets shall be deemed to include, without limitation, streets depicted in the Comprehensive Plan and existing or planned streets in existing or future adjacent or contiguous to adjacent subdivisions. For purposes of this paragraph 2.a, "Streets" includes "Roadways" as described in this Chapter 4.
- b. When a subdivision or other development site abuts one side of any public road in the State highway system, the subdivider shall be required to dedicate one-half of the total right-of-way or easements necessary to make such road conform to VDOT and County standards, including accommodations for pedestrians and bicycles. The subdivider may be required to dedicate more or less right-of-way or easement to make appropriate horizontal and vertical adjustments to such road.
- c. Vehicular access from off road parking and service areas shall be so combined, limited, located, designed, and controlled so as to channel traffic from and to such areas conveniently, safely, and in a manner that minimizes traffic friction and promotes free traffic flow on roads without excessive interruption.
- d. Whenever a proposed development contains or is adjacent to an arterial or major collector road, direct access shall be evaluated and the Director may require that provisions be made for the future elimination or reduction of direct access through methods such as the creation of a parallel road system, combined lot access, and other methodologies as determined appropriate.
- e. Shoulder and ditch section roadways are encouraged and may be provided as a low-impact design measure, as defined in Chapter 5 of this manual. Curb and gutter roadway sections shall be provided for developments within the Route 28 Taxing District and within the following zoning districts: PD (excluding PD-RV and PD-CV), R and CLI. The low-impact drainage design within residential developments shall also meet the swale and open channel specifications, as set forth in Chapter 5. Shared-use trails shall be provided in conjunction with shoulder and ditch roadway sections in developments in the Suburban

Policy Area, the Transition Policy Area, the Joint Land Management Area, and in Rural Villages. In developments where lot sizes of one acre or less are proposed, sidewalks may be provided in lieu of shared-use trails.

- f. Reserve strips (spite strips) controlling access to public roads shall be prohibited as defined in the VDOT Subdivision Street Ordinance.
- g. Per the Zoning Ordinance, in Planned Development Housing Districts only, no more than eighty (80) dwelling units shall be permitted to be served by a single point of access directly to publicly maintained roadways or indirectly to a publicly maintained roadway via an appropriate access easement.
- h. The transportation system proposed for subdivision or other development shall safely accommodate non-motorized users. Design shall address both internal circulation as well as connections to existing and planned contiguous roads and bike and pedestrian facilities. In the absence of existing and planned contiguous bike and pedestrian facilities, reservations are encouraged to the most logical access points for adjacent parcels.
- i. Where required by the Zoning Ordinance, interparcel connections for both vehicular and non-motorized users shall be provided.

3. Traffic Calming

The County promotes the use of traffic calming measures to improve safety for non-motorized street users and pedestrians in accordance with VDOT's adopted policies and standards. During street layout and design, the issue of traffic calming should be considered. Early consideration can minimize future speeding problems and improve the livability of the neighborhood. If the street layout cannot be designed to encourage target speeds, traffic calming treatments may be appropriate. The type of treatment chosen for incorporation in the design depends on the function and traffic volume of the roadway segment. When traffic-calming measures are proposed, such measures may be shown on the preliminary subdivision plat, and shall be shown on construction plans and profiles and site plan submissions. If desired, a comprehensive traffic calming design, designating proposed measures such as but not limited to signage, striping, narrower roadways, chokers, raised crosswalks and roundabouts, can be submitted for review and approval for the entire development with the first preliminary subdivision application. In such cases, subsequent applications shall make reference to the approved comprehensive traffic calming design and the traffic calming measures should be appropriately provided on the current

application.

B. Traffic Studies

1. General

- a. Traffic studies required for zoning map amendments and special exception land development applications or otherwise required by VDOT shall be used to determine the site specific and regional impact to the existing or planned roads within the County.
- b. The performance standards of traffic studies as contained within this chapter are intended to be a general guideline. However, the specific details, methodologies, and study requirements shall be confirmed and agreed upon by the County and the applicant in writing prior to the formal submission of the study. Additional requirements may be imposed by VDOT.

2. Pre-Submission Requirements, Policies, and Procedures

- a. Prior to submitting a traffic study, the applicant shall submit a written request to the Office of Transportation Services for a traffic study "scoping" meeting and/or a request to modify the requirements of a traffic study. The intent of this meeting is to identify elements of the study and resolve issues associated with the study to promote a complete and effective submittal by the applicant and a timely review by the County. This request shall include the following information and details:
 - i. A vicinity map and parcel identification number of the subject site, and if available, a conceptual development plan should also be provided.
 - ii. Identification of the points of ingress/egress for the subject site.
 - iii. The existing and proposed land use(s) and square footage or number of residential units, if applicable, for the subject site.
 - iv. A list of traffic issues and considerations associated with the subject site and application.
 - v. Where appropriate, justification of reduced study standards or a waiver of further study requirements.
- b. The County shall hold a traffic study scoping meeting or respond in writing that further traffic study information is not required, within ten (10) working days of receipt of a written request. The County shall

invite VDOT to the meeting. Upon notification of the date and time for the scoping meeting, the County will advise the applicant of additional materials that would facilitate an effective and resourceful meeting. The applicant is encouraged to provide such additional materials prior to the meeting if possible.

- c. The County checklist, reflecting the technical performance standards as outlined in this Section 4.200.B, shall be used to identify and clarify the specific traffic study requirements. This checklist shall also document the agreements made during the course of the scoping meeting. At the conclusion of the meeting, the participants shall sign the checklist document in confirmation of the meeting discussion and results. Copies of this document shall be provided to the applicant and the County for future reference. Unless a scoping meeting is not required, a copy of this signed document must be submitted with the traffic study to aid in the acceptance of an application during the review of the traffic study.
- d. If during the traffic study scoping process, it is determined that certain performance standards and requirements as provided in this chapter are not applicable to the requested land use, this decision shall be so documented on the checklist document. This document shall constitute a modification of the traffic study performance standards and requirements set forth in this section of the chapter.

3. Post-Submission Requirements, Policies, and Procedures

- a. Upon receipt of the traffic study, the County shall use the traffic study scoping meeting checklist document to verify that the agreed upon components of the study have been provided. This verification shall be limited to confirmation that the provided traffic study includes the materials noted on the checklist. If the study is found to be incomplete due to non-compliance with the scoping meeting checklist document, it shall be rejected and returned to the applicant.
- b. Upon acceptance of the traffic study, the County shall provide the applicant with written comments per the timelines consistent with the type of application, e.g., within thirty (30) calendar days for SPEX, sixty (60) calendar days for ZMAP and ZCPA. If necessary, a post-submission meeting(s) shall be scheduled by the County to discuss and clarify outstanding issues.
- c. When applicable, the applicant should respond to outstanding comments and issues generated by the County per the timelines consistent with the type of application for its processing, but usually within thirty (30)

calendar days.

- d. Once major outstanding issues with respect to the review of the traffic study have been resolved and the applicant has submitted a set of draft proffers consistent with the resolutions reached on the traffic study issues, the County shall review and evaluate the traffic study and draft proffers in unison to confirm that the infrastructure improvements and associated access requirements are consistent with the Comprehensive Plan and the submitted technical analyses.

4. Content of Traffic Studies

- a. **Study Area:** Roadways internal or adjacent to the development site shall be included in the traffic study. The study area should be defined at the scoping meeting and as a guideline should include other external roads to the extent that the project's generated traffic is anticipated to exceed 10 percent of the road's current/existing traffic volumes (at the time of application).
- b. **Traffic Counts:** Traffic counts are required on the adjacent roads and in the adjacent intersections beyond the project's frontage on adjacent roads in the study area. The AM/PM peak period traffic counts shall not be more than twelve (12) months old at the time of the application submission. Twenty-four hour weekday traffic counts or estimates are also required for roadway segments.
- c. **Trip Generation:** As a general guide to vehicle trip generation, the latest edition of the Institute of Transportation Engineer's (I.T.E.) Trip Generation Report shall be used. These rates may be supplemented by additional information provided by the County. If the applicant chooses to use different rates, they shall be documented and agreed to at the scoping meeting prior to their use in the traffic analyses. Primary trip reductions associated with passby trips and methodologies for trip reductions associated with passby trips shall be discussed and agreed upon at the scoping meeting.
- d. **Traffic Volume Projections:** The traffic study shall include an agreed upon build out year and provide existing and projected traffic volumes, with and without the subject project, for Average Daily Traffic , as well as AM and PM peak hours. The peak hour of the project/individual land use(s) (as given in the ITE Trip Generation Report) should be added to the corresponding AM/PM existing peak hour of the adjacent roadway traffic volumes (to show the worst case scenario), if the peak hour of the project/individual land use(s) for the generator is greater than the peak

hour of the adjacent roadway (per ITE Trip Generation Report). The existing peak hour of traffic on the roads adjacent to the subject project site shall be identified. These traffic volumes shall be provided at roadway intersections and commercial or private accessways/entrances.

- e. LOS Analyses: Level of Service (LOS) calculations for existing and projected conditions, with and without the subject project, for highway segments, intersection legs, and entrances shall be provided. Calculations shall be in accordance with the Highway Capacity Manual (HCM) and/or the Highway Capacity Software (HCS), or as may be agreed at the scoping meeting. Traffic volumes and level of service information shall be provided for each phase of development, to include conditions at date of project completion. Projections shall also be made for date of completion plus ten (10) years or to an agreed upon forecast year.
- f. Minimum Roadway/Intersection LOS Standards: Recommendations for phased improvements to the road network links in order to maintain an acceptable level of service (minimum LOS "D") shall be provided. For each phase up to and including buildout, a minimum approach and overall LOS "D" at intersections shall apply.
- g. Background Traffic Assumptions: Assumptions which determine projected background traffic, including through traffic growth rate to be applied on roadway links, shall be confirmed at the scoping meeting. The sources for determining future traffic projections will include one or more of the following:
 - The Loudoun County Growth Summary or similar documents from Loudoun County.
 - The Loudoun County transportation model which incorporates COG's Cooperative Forecasts for Loudoun County.
 - Approved developments in the vicinity of the proposed development.Specific other approved development names and respective development square footage or residential units used in the study shall be provided.
- h. Traffic/Trip Distribution: Directional trip distribution information shall be provided for project entrances and collector and arterial intersections within the study area for the phases and categories (e.g., residential, office, retail, industrial and institutional) of development.
- i. LOS Calculation Assumptions: Traffic counts and level of service (LOS) worksheets and projected traffic volume level of service (LOS) analyses, using agreed upon analysis techniques, including existing AM/PM peak hour signal timing, shall be included as a part of the traffic study.

- j. Mode Choice: Modal split information shall be provided for the phases of the analysis, with sources of information identified (e.g., COG model).
 - k. Safety Locations: Road safety hazards, as identified by the ISTEA set-aside funding criteria and/or as identified by the County at the scoping meeting, within the study area shall be analyzed for all roadway links and intersections in the traffic study.
 - l. Traffic Mitigation Measures: If trip reduction factors are used in the study, measures necessary to implement the reduction must be specified, with supporting documentation.
 - m. When bicycle and pedestrian accommodations are used to reduce anticipated traffic volume, a description of the physical and functional characteristics of the proposed bicycle and pedestrian accommodations shall be provided. If such separate bicycle accommodations (e.g., striped lanes or multi-purpose trails) are anticipated, they shall also be identified. A description of the functional characteristics shall be provided to identify the transportation options that these accommodations provide (e.g., pedestrian access to retail center, safe bicycle route to elementary school, inter-parcel connections to adjacent neighborhoods, access to W&OD trail, etc.)
 - n. VDOT connectivity requirements and location of stub out streets.
- C. When required by the Zoning Ordinance, Average Daily Trips in VPD shall be calculated using the latest version of the ITE Trip Generation Report unless otherwise specified by the County.

4.300 DESIGN AND CONSTRUCTION STANDARDS

The following standards are intended to protect the public health, safety and welfare in addition to enhancing transportation efficiency.

4.310 GENERAL DESIGN REQUIREMENTS

- A. Roads shall be configured to avoid floodplain unless no other alternative alignment is feasible, and to limit stream crossings.
- B. Roads shall be laid out in such a manner as to intersect as nearly as possible at right angles. No roadway shall intersect a public roadway or Category A private roadway at

less than 80 degrees except as may be permitted by the Director, where existing topographic conditions and/or design constraints prohibit meeting this requirement.

- C. Road jogs with center lines offsets of less than 225 feet shall not be allowed in Category A private roadways, except as may be permitted by the Director. A road jog is defined as a through traffic movement in an urban or high volume road situation which may make two changes of directions at successive intersections. See Figure 1 at the end of this chapter. Public street intersection spacing shall be accordance with VDOT standards.
- D. Public roadways and Category A private roadway intersections shall be designed to align with existing or planned roadway intersections.
- E. A road which permanently ends with a cul-de-sac or turn-around (not including dead end roads which end at a temporary turn-around) shall not exceed the lengths set forth below. Measurement of the length shall be taken along the centerline from the road's intersection with an existing or proposed through road to the center of the cul-de-sac or turn around.

Development Type	Allowable Maximum Length
Commercial, retail, industrial, office	1500 feet
Rural Non-residential	3500 feet
Multi-family residential	1000 feet
Single family residential	
Townhouse	1500 feet
Detached	
Zoned 1 unit per acre or greater density	2500 feet
Zoned less than 1 unit or lot per acre	3500 feet

Additional criteria for cul-de-sacs or turn-arounds include:

1. Grades for cul-de-sac turnarounds shall not exceed 6 percent measured along face of curb or edge of pavement.
2. The geometry for a cul-de-sac or turn around shall have a radius of no less than 40 feet at the property line and no less than 30 feet at the face of curb or edge of pavement line. Other types of turn arounds may be considered for private roadways.

3. Developments with a single point of ingress/egress shall provide a secondary point of access for emergency vehicle use if the length of road, measured along the centerline from the point of beginning of the ingress/egress to the front of the most remote lot, exceeds the maximum allowable length as may be permitted by the Director. Such emergency vehicle access easement shall be an 18 foot wide easement, which shall contain a 14 foot wide graded and compacted travelway, centered in the easement. The grade or slope of the emergency vehicle access travelway shall not exceed 10 percent at any point along the centerline in the travelway. A typical section of the proposed emergency vehicle access easement and travelway shall be included in the land development submission.

Multi-phased developments, with an approved concept development plan or preliminary plat showing more than one ultimate point of access, shall not be required to meet this requirement for individual phases, sections or plats, on ultimately planned through roads.

4. Length criteria as contained within this section shall not be applicable for divided roadways with medians and the above criteria shall apply beyond the point where the divided section ends.
 5. The County encourages the use of landscaped islands within cul-de-sacs.
- F. Landings shall be provided for public roadways and Category A private roadways at intersections to ensure adequate grade and sight distance at intersections. The maximum grade along the landing for Category A private roadways shall not exceed 3% or the cross slope of the intersecting road, whichever is greater. Breakover shall not exceed 6%. The minimum length of landing shall be 50 feet. Landings for public streets shall meet VDOT standards.

Landings shall be provided for Category B private roadways at intersections. The maximum grade along the landing shall not exceed 6% for 25 feet.

Landing shall be defined as that section of a roadway which is adjacent to an intersection and utilized for vehicle stacking.

Breakover is the difference between the centerline grade of an intersection roadway and the cross slope of the intersecting roadway.

- G. Excepting driveway access to single residential lots, roadways intersecting with a public or Category A private roadway shall have a minimum length of 50 feet between curb returns and/or curb cuts. See Figure 2 at the end of this chapter.
- H. On curb and gutter sections, except for Category B and C private roadways, the

roadway right-of-way, or easement where applicable, shall extend a minimum of six feet beyond the face of curb so that drainage structures can be accommodated.

- I. Signage and fire lane marking shall be in accordance with Section 4.800 of this Chapter.
- J. Pavement designs will be done in accordance with Section 4.340.
- K. Residential driveway entrances in curb and gutter road sections shall be constructed in accordance with the figures located at the end of this chapter.
- L. On segments of proposed roadways with ultimate projected traffic counts of more than 2000 Vehicles Per Day (VPD), there shall be no direct access from any driveway or pipestem that serves three (3) or fewer dwelling units unless traffic calming measures approved by the Director are employed. On segments of proposed roadways with ultimate projected traffic counts of more than 4000 Vehicles Per Day (VPD), there shall be no direct access from any driveway or pipestem that serves three (3) or fewer dwelling units.

4.320 PUBLIC ROADWAY STANDARDS

- A. Public roadways shall be designed to conform to the requirements of the applicable Virginia Department of Transportation (VDOT) standards and this manual, except as specifically modified in writing by the Director and VDOT.
- B. Where this Ordinance and the standards of VDOT may differ, the more restrictive requirements shall apply.
- C. Public roadway construction plans and profiles require review and recommendation by VDOT.

4.330 PRIVATE ROADWAY STANDARDS

A. General

The following shall apply to the categories of private roadways, except as noted herein:

1. Traffic control signage and lane markings provided on private roadways shall be in accordance with the Manual on Uniform Traffic Control Devices (MUTCD). When a signal is warranted, signalization shall meet VDOT standards.
2. Private roadways may be designed with a curb and gutter section or a shoulder section. Shoulder sections shall have stabilized shoulders which may be a

paved, gravel, or sodded grass surface. Shoulders shall meet VDOT slope requirements.

3. Private roadways shall be designed to accommodate an SU-30 design vehicle (AASHTO) and to accommodate emergency vehicles in accordance with the design criteria contained within Tables I, II and III of this chapter. The travel way inside radius at an intersection shall be a minimum of 25 feet, except for alleys.
4. Where parking is provided on the roadway, pavement width shall be increased appropriately. Parking geometry designs shall meet the requirements of this chapter.
5. An entrance permit shall be secured from the Virginia Department of Transportation in order to tie into an existing VDOT maintained road.
6. Sidewalks shall be placed within the public access easements. Handicap accessible ramps and provisions, in accordance with State and Federal requirements, shall be provided at roadway intersections with curb gutter.
7. Roadway design details which are not standard designs used by VDOT, such as CG-6R or YI-1 components, shall be submitted as detailed drawings to the Director for approval.
8. All private roadways and access easements identified in this chapter that serve 3 or more lots, require construction plans and profiles and an approved Performance Bond prior to record plat approval for the subdivision the roadways or access easements are to serve.

B. Category A Roadways

1. Category A private roads may be utilized in locations as permitted in the Zoning Ordinance, LSDO, and in locations where private roads have been permitted through a Zoning ordinance Modification for residential and/or non-residential applications.
2. The width of the access easement within which a private roadway is located shall extend to the property lines and along the entire length of the property lines along the frontage of the individual lots to which it provides access. However, this requirement does not always require the construction of the frontage improvements along the entire property line. The following minimum criteria shall apply:

Roadway Cross Section Easement Limit

Curb and Gutter - Six feet behind the face of curb.
 Shoulder Section - The edge of shoulder and as necessary to accommodate roadside drainage.

3. Category A private roadways shall have a paved surface. For minimum standards regarding pavement section, widths, etc., refer to Table I.
4. Utility easements shall be provided, as necessary.
5. Category A roadways shall require construction plans and profiles for review and approval.

Table I

Type	Average Daily Traffic (in VPD)	Lane Width *	One-Way Width	Shoulder Width	Curve Radius (Min.)	Stopping Sight Distance	Maximum Grade	Vertical Curve Design	Minimum Intersection Sight Distance
A1	1-250	9 ft	16 ft	2 ft **	110 ft	150 ft	12%	20 mph	200 ft
A2	251-999	10 ft	N/A	4 ft	165 ft	150 ft	12%	25 mph	250 ft
A3	1000-3000	11 ft	N/A	6 ft	165 ft	150 ft	10%	25 mph	250 ft
A4	3001-5500	12 ft	N/A	6 ft	338 ft	200 ft	10%	30 mph	300 ft
A5	5500+	12 ft	N/A	6 ft	478 ft	275 ft	8%	35 mph	350 ft

* Does not include gutter pan.

** Shoulders shall be treated/compacted to support emergency vehicles.

Notes:

1. Minimum travelway width from face of curb to face of curb shall be 20 feet
2. Turn lanes shall be required at entrance locations with Average Daily Traffic in excess of 5500 VPD, if warranted based on the peak hour traffic volumes, per Appendix C of the VDOT Road Design Manual. Such turn lanes may be required on both the public and private legs of an intersection, if applicable.
3. Roadways in excess of 3,000 VPD shall be superelevated in accordance with the VDOT Road Design Manual.
4. Required thickness of subbase, base course, and top or surface course for private roads shall be determined based on projected Average Daily Traffic volumes for the roadway or segment, using the VDOT Subdivision Street

Requirements, if Average Daily Traffic exceeds 250 VPD.

5. The minimum pavement section for private roadways with a projected Average Daily Traffic of less than or equal to 250 VPD shall consist of 6 inch aggregate base course and a 2 inch bituminous surface course on a properly compacted subgrade.

C. Category B Roadways

Locations permitting Category B facilities shall include townhouse and multi-family uses. Category B facilities are defined as private vehicular facilities in residential townhouse and multi-family areas (including condominiums) which serve the following functions: 1) provide individual lot frontage or access, 2) provide for parking, and 3) carry predominantly on-site traffic. Category B roadways shall be used only where a volume of less than 1,000 VPD is anticipated. Where 1,000 VPD or greater are anticipated, use design standards specified for Category A roadways. Design of Category B roadways shall meet the minimum standards as defined for Type B1, B2 and B3 below and shall require construction plans and profiles or site plan submissions, whichever is applicable.

Table II

Type	Average Daily Traffic (in VPD)	Travelway Width (2-way)	Travelway Width (1-way)	Centerline Curve Radius	Stopping Sight Distance	Maximum Grade
B1	1-250	25 ft.	20 ft.	36 ft.	90 ft.	8%
B2	251-750	25 ft.	20 ft.	60 ft.	120 ft.	8%
B3*	751-1000	25 ft.	20 ft.	60 ft.	120 ft.	8%

*Angle parking is not allowed on Type B3 roadways. Parallel parking is allowed on Category B private roadways with additional pavement in accordance with the standards established in this chapter.

Notes:

1. Roadways and parking areas shall have a curb section and shall be contained within an access easement. The width of the access easement in which a Category B private roadway is located shall extend to the property lines and along the entire length of said property line of the individual lots to which it provides legal access. However, this requirement does not always require the construction of the frontage improvements along the entire property line. On sections of the roadway where this requirement is not applicable, the easement shall be established one foot behind the face of curb or six inches behind the

sidewalk.

2. For Type B2 and B3 roadways, intersections shall be spaced at least 50 feet apart, measured from the flow line of the gutter pan. See Figure 3 at the end of this chapter.
3. An intersection is defined as the juncture of at least three segments of roadways at a common point.
4. Category B private roadway intersections onto a public or Category "A" private roadway shall not be placed closer than 100' at centerline. See Figure 4 at the end of this chapter.
5. No parking shall occur for a minimum distance of 30 feet from an intersection, measured from the flow line of the gutter pan. For 3-segment intersections, parking is allowed along the through roadway opposite the intersecting roadway. See Figure 5 at the end of this chapter.
6. Category B private roadways shall not have a posted speed in excess of 15 mph.
7. Travelway widths excluding parking shall be measured from face of curb to face of curb.
8. The minimum pavement section for Category B private roadways and parking areas shall be based on the projected Average Daily Traffic volumes using the VDOT Subdivision Street Requirements if the Average Daily Traffic exceeds 250 VPD.
9. The minimum pavement section for Category B private roadways and parking areas with a projected Average Daily Traffic of less than 250 VPD shall consist of 6 inch aggregate base course and a 2 inch bituminous surface course.
10. A permanent turn-around shall be required when a dead-end roadway exceeds a distance of 500 feet, measured along the centerline from the last intersection with a public or private roadway to the center of the turn-around.

D. Category C Roadways

1. Category C private roadways shall be provided for the following:
 - a. Private access easement roads as permitted by the Land Subdivision Development Ordinance (LSDO) and the Zoning Ordinance (ZO).
 - b. Class III roads serving 25 or less lots, as permitted by the LSDO and

ZO.

- c. Pipestem drives as permitted by modification of the ZO. For the purposes of this manual, pipestem drives are defined as a means of access to a lot or several lots which do not have direct access to an abutting roadway other than by the pipestem driveway.
 - d. Alleys as permitted in the ZO.
2. Category C private roadways shall be designed to meet the minimum standards as defined for each Roadway Type C1, C2, C3 and C4 below including the referenced supplemental design criteria.

Table III

Subdivision Size	Easement Width *1	Travel-Way Width	Shoulder Width *7	Materials		Maximum Grade *4 *5	Centerline Curve Radius
				Paved	Gravel		
C1 (up to 2 lots)	24'	12'	N/A	2" over 4" base (opt.) *3	6"	10%	30'
C2 (3-7 lots)	30'	14'	2' grass	2" over 4" base *3	6"	10%	75'
C3 (8 or more lots)	40'	18' *2	2' gravel	2" over 6" base	6"	10%	110'
C4 (alley) *8	20'	14'	2' grass	2" over 6" base	N/A	12%	N/A
C4 (C&G Alley) *8	20'	14' (1 way) *6 18' (2 Way) *6	N/A	2" Over 6" base	N/A	12%	N/A

Footnotes:

- *1 Additional easement width may be required at specific locations to accommodate slope maintenance, drainage, sight distance, etc.
- *2 Travelway widths are permitted to step-down to a Type C1 facility, where the number of lots served is 2 or less.
- *3 All pipestem drives shall be paved and shall be limited to serving 7 lots. Refer to Figure 7 for Pipestem Driveway Entrance Standards.

- *4 12 percent for pipestems or Category C roads that require paving.
- *5 Steeper grades may be considered where there are topographic or environmental constraints which prohibit the maintenance of the 10% grade criteria.
- *6 Measured from face of curb to face of curb.
- *7 Shoulders shall be compacted/treated to support emergency vehicles.
- *8 Refer to Figure 15 for alley entrance to public street.

3. Supplemental Criteria

- a. Permanent dead-end Type C3 and C4 roadways which exceed four hundred (400) feet in length, measured along the centerline from the centerline of the last intersection with a public or private roadway to the center of the dead-end, shall include appropriate design provision to permit vehicular turnarounds.
- b. Type C3 and C4 roadways located within Class III and Class IV soils, as identified by the Interpretive Guide to Soils Maps, Loudoun County, Virginia; shall provide a field determination of CBR values based on actual sub-grade conditions. Quantities of borings required shall be in accordance with Chapter 6 of this manual.
- c. Type C3 roadways constructed of gravel must include a fifty (50) foot paved apron only when accessing an existing paved road.
- d. Type C3 and C4 roadways shall include signage for roadway names, private road identification, and traffic control, as may be appropriate.
- e. The following criteria shall be applicable to the design of Type C1 and C2 roadways constructed as pipestem drives:
 - i. Lots which share a pipestem driveway shall provide a minimum of three parking spaces per residential dwelling outside of the travelway. In addition, these driveways shall be clearly labeled or noted "no parking along driveway" on all plats and plans submitted.
 - ii. The design for pipestems which are to serve more than one lot shall be shown in typical section and on the grading plan of the construction plans, together with turnaround and required utilities, and shall be included in the performance bond for the

project.

- iii. Each pipestem shall be clearly identified as a private drive. A single sign, not to exceed two square feet in area, shall be posted at the entrance of each such driveway, displaying only the words "Private Drive" and the addresses of any residences utilizing the common driveway.
 - iv. No pipestem shall extend a distance of more than 400 feet from the public road to the property which the pipestem serves, or exceed a total length of 800 feet if a loop configuration, measured along the center line between the two intersections with a public or private road.
- f. Alleys are a means of secondary access, and properties served by an alley shall have separate frontage on a public or private roadway.

4.340 PAVEMENT THICKNESS DESIGN STANDARDS

- A. The methods and materials used in the construction of all roads shall conform to the current VDOT Road and Bridge Specification, unless herein modified.
- B. Required thicknesses of subbase, base course, and top or surface course for public roads shall be in accordance with current VDOT standards.
- C. Preliminary subbase depth and pavement design shall be based on an assumed design CBR value of 6, if soil tests have not been performed. For private roadways with an Average Daily Traffic in excess of 750 VPD, soil tests of the as-constructed subgrade shall be performed for the actual determination of CBR value. The required subbase thickness and pavement design may be modified prior to the placement of the subbase.
- D. Pavement thickness referenced for Category A, B, and C private roadways are minimum requirements and shall be increased to account for site specific conditions.
- E. Pavement design assumes that the number of Heavy Commercial Vehicles (HCV), consisting of Trucks, Buses, etc., with 4 tires or greater, will not exceed 5 percent of the total projected traffic. If the total projected traffic includes more than 5 percent of such vehicles, an equivalent projected traffic shall be equal to (Average Daily Traffic (in VPD)) + (20 X Number of HCV over 5 percent).
- F. The minimum pavement section for privately owned and maintained parking areas (including driveways aisles within parking areas) serving individual commercial parking lots with a projected Average Daily Traffic of less than 400 VPD shall consist of a 6 inch aggregate subbase course and a 3 inch bituminous base course, and a 1.5 inch

bituminous surface course.

- G. Pavement in commercial areas shall be of a heavy duty design in the major cartways and loading areas, and at dumpster pads to accommodate the anticipated vehicle loads. This design shall be subject to approval of the Director. A minimum 6 inch depth 3000 psi concrete section with steel reinforcement over 4 inches of aggregate shall be used for loading areas and dumpster pad areas.
- H. Alternate equivalent pavement designs may be approved by the Director. When using an alternative equivalent pavement design, the following thickness layers shall apply for roadways in excess of 100 vehicles per day (VPD):
 - 1. Minimum thickness of the aggregate layer used as a subbase is four inches.
 - 2. Minimum thickness of the soil stabilized layer (cement, lime etc.) is six inches.
- I. Alternative pavement design sections shall be encouraged. A request for approval of such designs shall be submitted with the site plan or construction plans and profiles and shall include the basis of design, calculations in accordance with current accepted engineering procedures and a justification for the exception to these standards. Technical information regarding the characteristics of the alternative materials of construction (e.g., brick or concrete pavers, pavement admixtures, pervious pavement, etc.) shall be provided as part of the request. The request may be submitted either as an integral part of the construction plans and profiles or site plans or separately for consideration.

4.400 PARKING GEOMETRIC STANDARDS

A. General Criteria

- 1. There shall be three types of passenger vehicle parking spaces which can be used in parking facilities for automobiles.
 - a. Standard car head-in parking.
 - b. Handicap accessible head-in parking.
 - c. Parallel parking.
- 2. Where four or more spaces are required by the Zoning Ordinance, parking areas shall be graded, well drained and provided with a surface of bituminous concrete or equivalent paving materials. All parking spaces shall be delineated and striped in accordance with this chapter.

3. Gravel, grasscrete, reinforced grass or gravel systems, or other suitable materials may be used for access and parking areas for agricultural and rural economy uses. Elsewhere, such materials may be used for temporary and overflow parking areas, low volume access ways and, when site conditions warrant, standard parking areas. The parking areas shall be well drained with defined travel aisles and designated parking bays. If, due to the rural nature of the facility, it is not feasible or practical to provide defined travel aisles and designated parking bays, the land development application shall provide a note explaining how this requirement shall be met (i.e., parking attendants, signs, etc.).
4. The County permits and encourages the use of pervious materials.
5. Rain gardens and other low-impact design options, in accordance with Chapter 5 of this manual, may be used to satisfy the landscaping requirements for parking areas, such as landscaped islands and peripheral parking lot landscaping, as set forth in this section and the Zoning Ordinance.

B. Geometrics

1. The following table shall represent the minimum size requirements for automobile parking spaces, except as specifically modified herein. (See the Zoning Ordinance for the required number of parking spaces per use.)

	<u>Width</u>	<u>Length</u>
Standard Head-In Parking	9'	18'
Parallel Parking	8'	22'

Geometrics for angle parking shall be measured as shown in Figure 14.

2. Travelway aisle widths for standard car parking lots shall be provided in accordance with the following: 90 degrees - 22 feet; 60 degrees - 20 feet; and 45 degrees - 18 feet. A minimum travel aisle width of 25 feet shall be maintained adjacent to buildings. The minimum travel aisle width is 18 feet. Travelway aisle width shall be measured from the face of curb where there is no parking and from the back of the parking space where there is parking.
3. The stall width for standard parking spaces when measured between stall striping may be reduced to 8 feet when spaces are separated by double line stripes set one foot apart. (i.e., the pavement area of each space shall remain 9 feet.)
4. Where wheel stops or curbing are provided for parking spaces, a 1 foot

reduction in the stall length will be allowed, providing the resulting overhang does not encroach on the required open space areas and/or pedestrian access system.

5. Parking spaces for handicapped persons and related access aisles, accessibility routes and signage for physically handicapped persons shall be provided in accordance with State and Federal requirements.
6. Parking lots shall provide for safe and functional traffic circulation.
 - a. Entrances to parking bays shall be located along the site accessway to avoid blockage of the public right of way by vehicles entering the site. No parking shall be allowed within 30 feet of the entrance, measured from the flow line of the gutter pan. See Figure 5 at the end of this chapter.
 - b. The major site accessways shall be clearly defined, with a minimum aisle width of 25 feet measured from face of curb to face of curb at curb returns, and no direct angle parking shall be allowed where anticipated Average Daily Traffic exceeds 1500 VPD. Major site accessways shall accommodate SU-30 and WB-40 design vehicle movements without requiring change of direction. A hierarchy of onsite travelways shall be maintained.
 - c. Retaining walls, screen, landscaping and building walls shall be protected from vehicle contact.
 - d. "Overhang" areas which are a part of the required parking space must be graded no higher than 2 inches above the top of the curb, and must not be encroached upon by landscape plantings, signs or other obstructions.
 - e. Loading spaces and dumpster pads shall be accessible by the design vehicle with all parking spaces occupied.
 - f. Where drive-through facilities are proposed, the travelway width shall be a minimum of 10 feet and shall be designed to address safe vehicle stacking.
7. Parking areas shall provide for safe pedestrian travel.
8. A permanent turn-around shall be required when the dead-end aisle exceeds 500 feet, measured along the centerline of the dead-end aisle, from the last aisle or public roadway.

C. Loading Spaces

Commercial building sites shall provide for loading space in accordance with the Zoning Ordinance. An AASHTO-WB-50 design vehicle shall be accommodated on all commercial sites where the proposed use warrants the same except as may be permitted by the Director where the applicant can show just cause for modification.

1. Single Unit Loading Space

- a. A single unit loading space shall be a minimum of 15 feet in width and 30 feet in length and provide a minimum horizontal clearance of 15 feet; provided, however, that when loading spaces are located alongside each other, additional loading spaces need only be a minimum of 12 feet in width.
- b. Uses which are required to provide a single unit loading space shall provide an entrance and circulation system which can accommodate an American Association of State Highway and Transportation Officials (AASHTO) SU-30 Design Vehicle.

2. Semi-Trailer Standard Loading Space

- a. Semi-trailer loading spaces shall be a minimum of 15 feet in width and 55 feet in length and provide a minimum horizontal clearance of 15 feet.
- b. Uses which are required to provide a standard or semi-trailer loading space shall utilize an AASHTO WB-50 design vehicle for planning the entrance and on-site circulation system.

3. Loading spaces shall be accessible to the design vehicle with no more than two backing movements. The circulation pattern for the design vehicle should provide for forward movement only and shall discourage backing movements.

4. Per the Zoning Ordinance, no off-roadway loading area shall be located within any required front yard. Furthermore, no off-roadway loading area shall be used to satisfy the requirements for parking or stacking spaces. Loading areas shall be designed and located in a manner which does not interfere with the free circulation of vehicles within parking or stacking areas.

5. In accordance with the Zoning Ordinance, loading spaces may be provided cooperatively for two or more uses, subject to the approval of the Director, where it is demonstrated that adjacent land uses can be adequately served by a shared loading facility and legal instruments ensuring the permanent availability of off-roadway loading for all such uses are recorded in the land records of

Loudoun County.

4.500 DRIVEWAYS

A. General Requirements

1. Driveways serving individual residential units shall conform to the design requirements contained in this Chapter and as demonstrated by the Figures at the end of this Chapter to achieve acceptable driveway geometry.

B. Design Criteria

1. Driveway slopes shall be 12 percent or less. The slope shall be measured along the driveway centerline from the edge of the right-of-way or private access easement to the garage slab.
2. Driveways located within the Mountainside Development Overlay District or in areas of Steep Slopes may, subject to the approval of the Director, have up to a 16 percent grade.
3. The driveway should maintain the full width of the garage doors to the property line or for a distance of 18 feet outside of the garage, whichever is less.
4. Skewed driveways cannot exceed a 10:1 angle with the driveway apron or the garage. Skews greater than 10:1 must be handled with a curved driveway.
5. Curved driveways must be designed with a 10 foot minimum inside radius and a 24 foot outside radius.
6. Tapered driveways cannot exceed a 10:1 angle of taper. When tapering greater than 10:1, minimum curves specified in Item 5 above shall be utilized.
7. The length of the driveway is measured from the back of the apron to the center of the garage door.
8. The use of roll top curb shall not be allowed as driveway entrances.

4.600 PEDESTRIAN AND BICYCLE ACCOMMODATIONS

A. Facility Planning

1. A Non-Motorized User Circulation System (NUCS) composed of sidewalks, shared use trails and/or on-street bicycle facilities shall be provided in non-residential zoning districts in accordance with the Zoning Ordinance and Land

Subdivision Development Ordinance and in residential zoning districts as set forth in this section 4.600.

2. Facilities for non-motorized users may include the following:
 - a. sidewalks
 - b. shared used trails
 - c. on-street bicycle facilities: signed, shared roadway and striped bike lanes
 - d. nature or recreational trails

3. The following specific provisions for NUCS shall be made in residential, office, commercial and industrial areas and activity centers:
 - a. The NUCS shall provide access to destinations such as recreation, school, retail and commercial locations within the subdivision.
 - b. The NUCS shall be required to extend to the property boundaries of the project, shall tie into existing and previously approved planned systems, and shall provide for future additions to ensure continuity of the bicycle and pedestrian system. When a sidewalk or trail is located outside of the VDOT right of way, it shall be contained within a public access easement that extends at least one (1) foot beyond the outside of the sidewalk or trail on both sides.
 - c. Single Family Detached: Sidewalk on both sides of curb and gutter roadways, and where required by the Zoning Ordinance.
 - d. Townhouse, Multi-Family: Sidewalk in front of the units and to parking areas.
 - e. Activity Centers (Playgrounds, pools, tot lots, recreation centers): Sidewalk or trail leading to the facility and/or crosswalks for safe pedestrian movement.
 - f. Office and Commercial Areas: Sidewalk leading to facility and/or crosswalks for safe pedestrian movement.
 - g. Along road frontages to provide safe and reasonable pedestrian inter-parcel access between developments and uses, where such access is set forth in the Zoning Ordinance as a performance standard.
 - h. Sidewalks shall be provided on both sides of the roadway where such accommodation conforms with VDOT standards and allowances.
 - i. Shared-use trails shall be provided in conjunction with shoulder and ditch roadway sections in developments in the Suburban Policy Area, the Transition Policy Area, the Joint Land Management Area, and in Rural Villages. In developments where lot sizes of one acre or less are proposed, sidewalks may be provided in lieu of shared-use trails.

B. General Design

Where sidewalks or trails are required, the following design requirements shall apply:

1. Sidewalks

- a. Sidewalks shall be constructed on a subgrade compacted to 95 percent density at optimum moisture content.
- b. Sidewalks shall be constructed to one of the following minimum cross-sections:
 - j. VDOT Type A-3 concrete to a minimum depth of four inches.
 - ii. Crushed stone, 4 inches thick, topped with 1.5 inches of asphalt.
 - iii. On well-drained soils only as defined in the Interpretative Guide to Soils in Loudoun County, 4 inches of asphalt.
 - iv. Alternate sections may be approved by the Director and, if applicable, VDOT.
- c. The maximum cross slope allowed for sidewalks shall be 1/4 inch per foot.
- d. Sidewalks within VDOT right-of-way shall be constructed to the standards of VDOT and as provided in this section.
- e. The sidewalk longitudinal slope shall be consistent with the adjacent roadway.
- f. VDOT standards for CG-12 handicap accessible ramps shall be provided at pedestrian roadway crossings on curb and gutter roadway sections.
- g. Sidewalks outside of the VDOT right-of-way shall have a minimum unobstructed width of (a) 5 feet for non-residential development, for development adjacent to roads depicted in the Countywide Transportation Plan, and for residential development sections where the average density exceeds ten (10) units per acre and (b) a 4-foot minimum unobstructed width for other applications.
- h. Pervious-surface sidewalks are a desired option for non-VDOT maintained sidewalks.

2. Shared-Use Trails

- a. Shared-use trails are generally asphalt and are intended to accommodate both bicyclists and pedestrians comfortably.
- b. Shared use trails shall comply with the General Design requirements set forth in subparagraphs 1.a, b, f and h above.
- c. Shared-use trails within VDOT right-of-way shall comply with VDOT standards.
- d. Shared-use trails outside of VDOT right-of-way shall be designed and constructed to conform to AASHTO standards, provided, however, that the minimum width shall be six (6) feet.

3. On-Street Bicycle Facilities

- a. On-Street Bicycle Facilities are bicycle lanes constructed as an integral portion of the roadway and may or may not be delineated by means of striping.
- b. If bicycle accommodations are provided on street, separate sidewalks or trails for pedestrians must be provided outside of the roadway.
- c. The design and construction of On-Street bicycle accommodations shall conform to AASHTO standards.
- d. On-Street bicycle accommodations shall be identified on all plats for applications proposing such accommodations as an element of the internal circulation for bicycles.
- e. Streets containing On-Street Bicycle Facilities shall have signage that adequately advises motorized vehicle operators that such streets contain such Facilities.

4. Nature or Recreational Trails

- a. To provide pathways for recreational or fitness use, for access to open space or for pedestrian connections to the NUCS, subdivisions may incorporate nature or recreational trails designed and constructed in accordance with the following subparagraphs. Such trails shall not substitute for sidewalks or trails that are part of the NUCS.
- b. Such trails that are designed exclusively as nature or recreational trails and are not part of the NUCS are not required to comply with minimum standards for sidewalks and trails set forth in sections 1 through 3 above. Trails should be constructed using pervious surface materials.
- c. Such trails should follow the natural topography as nearly as possible.
- d. Trails developed within a park site to be dedicated to the County shall comply with the guidelines set forth in the Loudoun County Department of Parks, Recreation and Community Services Construction and Design Guidelines in effect at the time construction commences.

4.700 NAMING OF STREETS

Reference is made to the Loudoun County Codified Ordinances for information on the naming of street, street-type designations, and the process for street name reservations.

4.710 ADDRESS PLAT AND ADDRESSING PREMISES

Reference is made to the Loudoun County Codified Ordinances and the Loudoun County Land Subdivision and Development Ordinance for information on the determination of addresses, developing and obtaining addresses, display and posting of addresses, and address plat documentation requirements.

4.800 SIGNS

4.810 FIRE APPARATUS ACCESS ROAD REQUIREMENTS

Pursuant to the Virginia Statewide Fire Prevention Code (the “SFPC”), as adopted in Chapter 1602 of the Codified Ordinances of Loudoun County, Loudoun County is authorized to adopt a written policy to establish where Fire Apparatus Access Roads are required, and the Loudoun County Fire Marshal, or his/her designee, is authorized to designate public and private Fire Apparatus Access Roads, as deemed necessary for the efficient and effective operation of fire and/or rescue apparatus.

A. Definitions

For purposes of this Section a “Fire Apparatus Access Road” shall mean a travelway that provides primary fire apparatus access from a fire station to a facility, building, or portion thereof, where “travelway” shall be construed generally and shall mean all private roadways as defined by Chapter 4 of this Manual and parking lot major site accessways, and shall include shoulders if treated/compacted to support emergency vehicles.

B. Provisions of this Section 4.810 may be waived in consultation with the Fire Marshal, only if in compliance with the SFPC.

C. Prior to the issuance of a certificate of occupancy for any residential, mixed-use or non-residential facility, building, or portion of a building hereafter constructed, the Fire Apparatus Access Road serving said facility, building, or portion of a building shall meet the following Fire Lane Identification requirements:

1. Where Fire Lane Identification is Required:

- a. Travelways with a total width less than twenty-six (26) feet shall be identified as a Fire Lane on both sides of the travelway, in accordance with this Section.
- b. Travelways with a total width of twenty-six (26) feet or greater, and less than or equal to thirty-two (32) feet shall be identified as a Fire Lane on one side of the travelway, in accordance with this Section.
- c. Commercial/Non-residential buildings shall require Fire Lane Identification, as specified by the Fire Marshal, along the frontage of the building and at other building access points, as designated by the Fire Marshal.
- d. Public pools shall provide Fire Lane Identification, as specified by the

Fire Marshal, at any entrance for emergency vehicles.

2. Fire Lane Identification Specifications for Residential Developments:

- a. Fire Lane signs shall be installed at the beginning of a designated Fire Lane and at the end of a designated fire lane with directional arrows pointing in. In addition, curbing shall be painted yellow with "Fire Lane" stenciled in black on the curbing every 50 feet of the fire lane in 4 inch letters.
- b. In lieu of curb markings in paragraph (a) above, Fire Lanes seventy-five (75) feet or greater in length, may have intermediate "Fire Lane" signs installed, with double directional arrows that point away from the center of the sign and towards the opposing ends of the Fire Lane, such that the spacing of signs is no greater than eighty (80) feet between signs in residential areas.
- c. Fire Lane signs shall comply with the design requirements and installation specifications for Fire Lane signage set forth in Chapter 486 of the Codified Ordinances of Loudoun County, except as modified by Figure 16.

3. Exceptions:

- a. Fire Lane Identification shall not be required if a travelway has a total width greater than thirty-two (32) feet.
- b. Fire Lane Identification shall not be required within the AR-1, AR-2, and A-3 Zoning Districts if parking along private streets and/or private access easements has been prohibited through owner's association documents or deed restrictions and the applicable Home Owners Association or Property Owners Association maintains "No Parking" signage at appropriate intervals.
- c. Fire Lane Identification shall not be required if the travelway is part of a development where all proposed lots are three (3) acres in size or greater.
- d. Fire Lane Identification shall not be required within attached and multi-family developments if parking along private streets and/or private access easements has been prohibited through owner's association documents or deed restrictions and the applicable Home Owners Association or Property Owners Association maintains "No Parking" signage at appropriate intervals.

4.820 STREET NAME SIGNS

Permanent street name signs shall be installed and maintained in accordance with the specifications contained within the Loudoun County Codified Ordinances.

Temporary street names signs are required and shall be installed within 24 hours of completion of clearing and in close proximity to each intersection location. Temporary street name signs shall meet the specifications contained within the Loudoun County Codified Ordinances (Chapter 1021) with the exception that a temporary post may be used in lieu of the 2" x 2" square galvanized steel post required by the Ordinance. Temporary signs shall be maintained until permanent signs are installed.

If the construction entrance for a work site is not at the location of a future street, it shall be marked with a street name sign for the nearest future street no later than the day of the preconstruction conference.

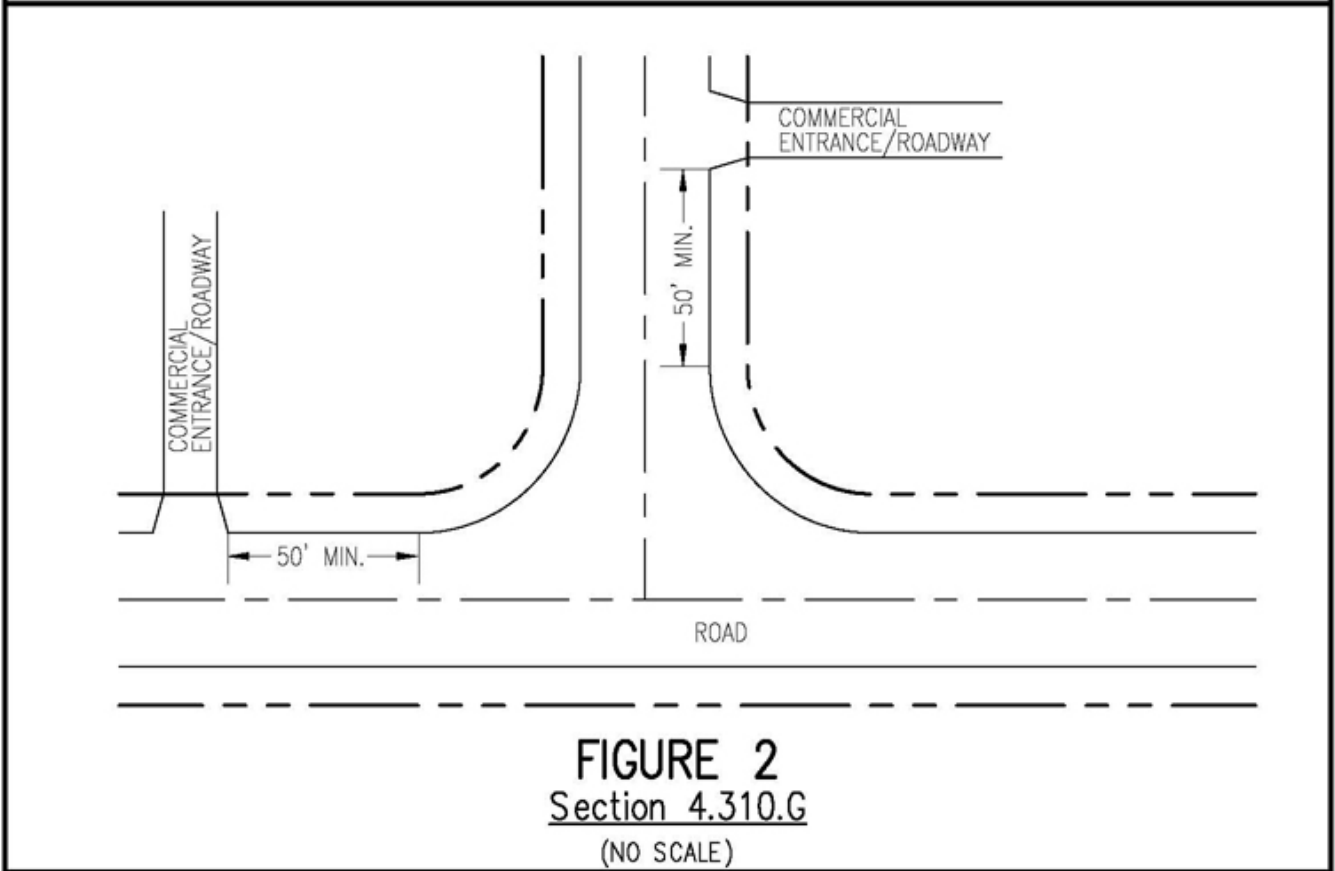
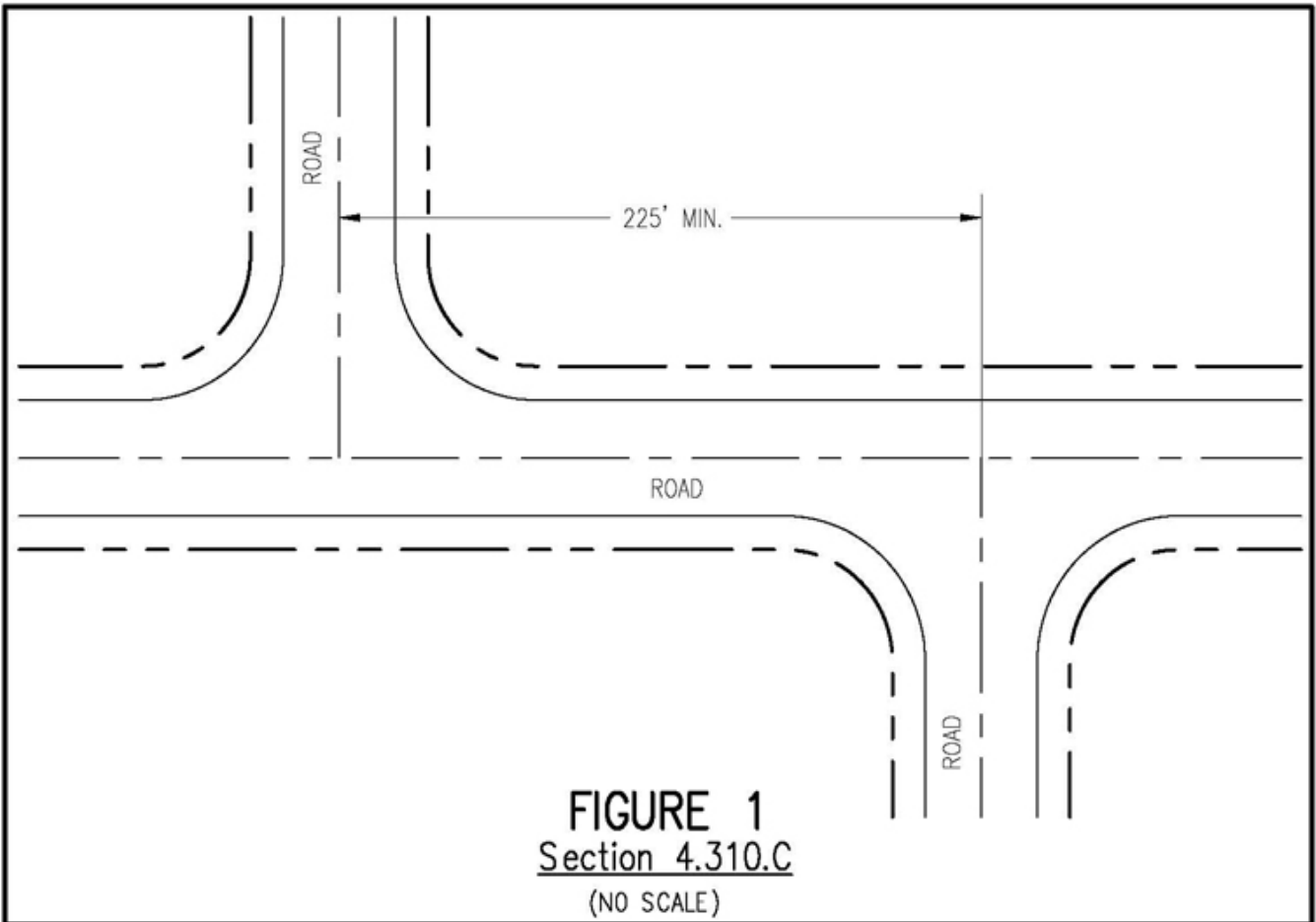
All new or modified mast arm traffic signal structures shall incorporate mast arm-mounted street name signage and all required regulatory signage. The street name signage shall be capable of properly identifying all intersection legs.

4.830 HANDICAP SIGNS

Handicap signs shall be provided on the plans in accordance with the specifications set forth in the American With Disabilities Act of 1990, as amended.

4.900 PUBLIC TRANSIT BUS SHELTER STANDARDS

When a public transit bus shelter is proffered or otherwise provided, the shelter shall be designed and constructed to meet the County adopted Standard for Public Transit Bus Shelters as available at the Office of Transportation Services.



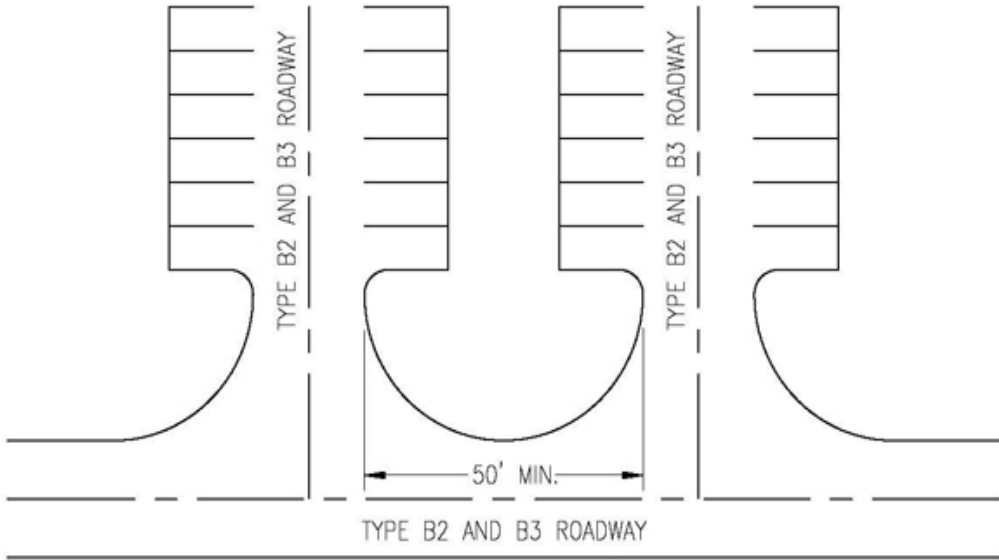


FIGURE 3
Section 4.330.C.2
 (NO SCALE)

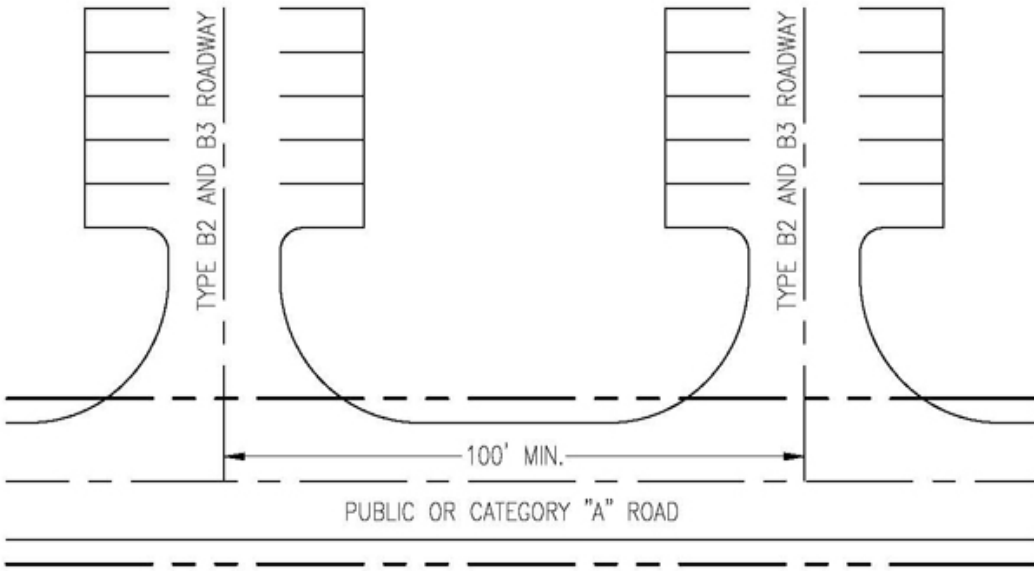


FIGURE 4
Section 4.330.C.4
 (NO SCALE)

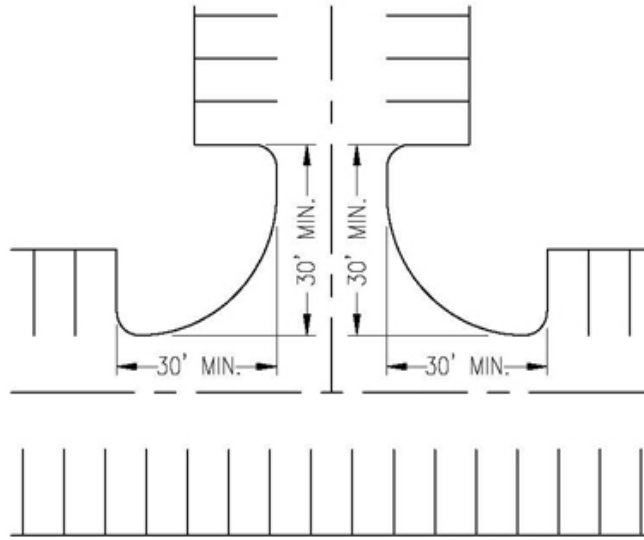
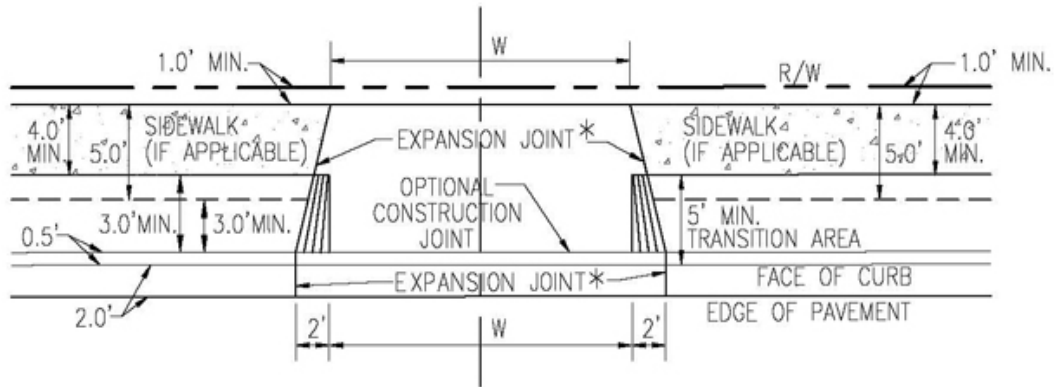
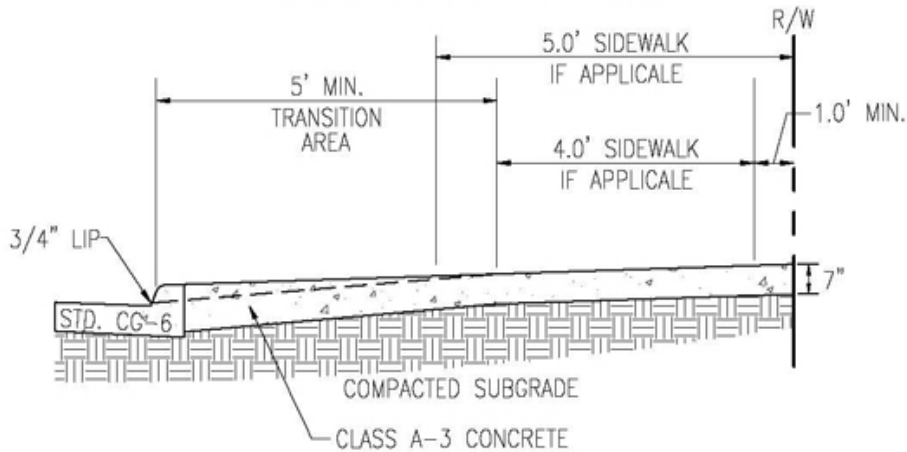


FIGURE 5
Section 4.330.C.5
(NO SCALE)



* NOTE: CONTROL JOINTS MAY BE USED IN PLACE OF EXPANSION JOINTS ON PRIVATE STREETS.



ENTRANCE TYPE	MINIMUM APRON WIDTH (W)
TOWNHOUSE DRIVEWAY ENTRANCE	10'
SINGLE CAR GARAGE DRIVEWAY ENTRANCE	12'
MULTICAR GARAGE DRIVEWAY ENTRANCE (1) GREATER THAN 35' IN LENGTH	12'
MULTICAR GARAGE DRIVEWAY ENTRANCE (1) LESS THAN 35' IN LENGTH	18' (2)

- NOTE: (1) DRIVEWAY LENGTH IS MEASURED FROM THE CENTER OF THE BACK OF THE CONCRETE APRON TO THE CENTER OF THE GARAGE FACE WHERE THE DOOR(S) ARE LOCATED.
 (2) MINIMUM WIDTH SHALL BE THE GREATER OF 18' OR THE WIDTH ACHIEVED BY NECKING THE DRIVEWAY AT A 10:1 ANGLE STARTING 18' OUTSIDE THE GARAGE DOOR.

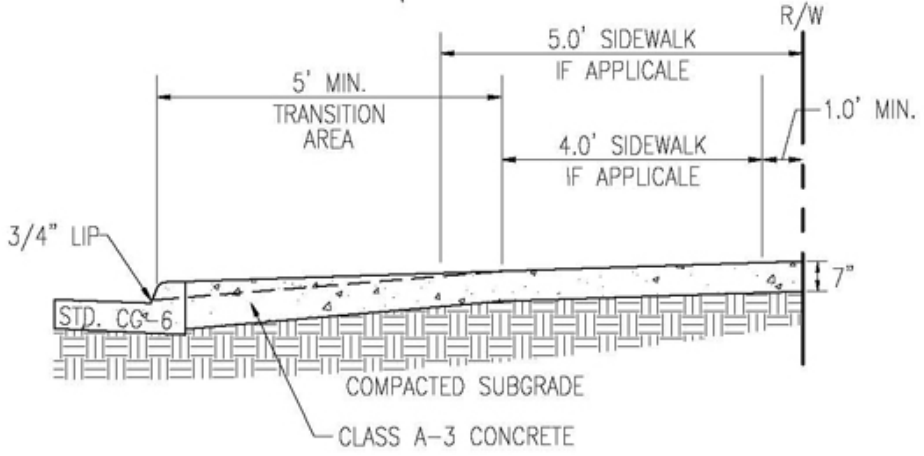
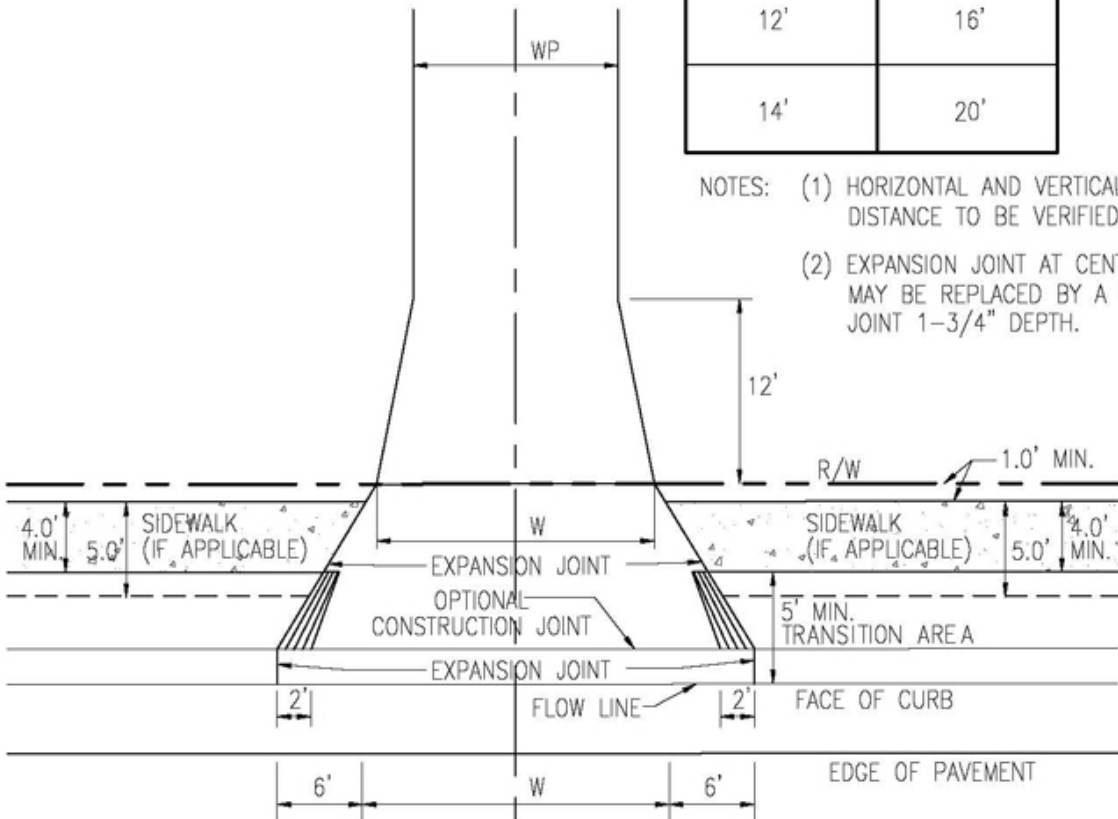
STANDARD CURB AND GUTTER INDIVIDUAL DRIVEWAY ENTRANCE

(NO SCALE)

FIGURE 6

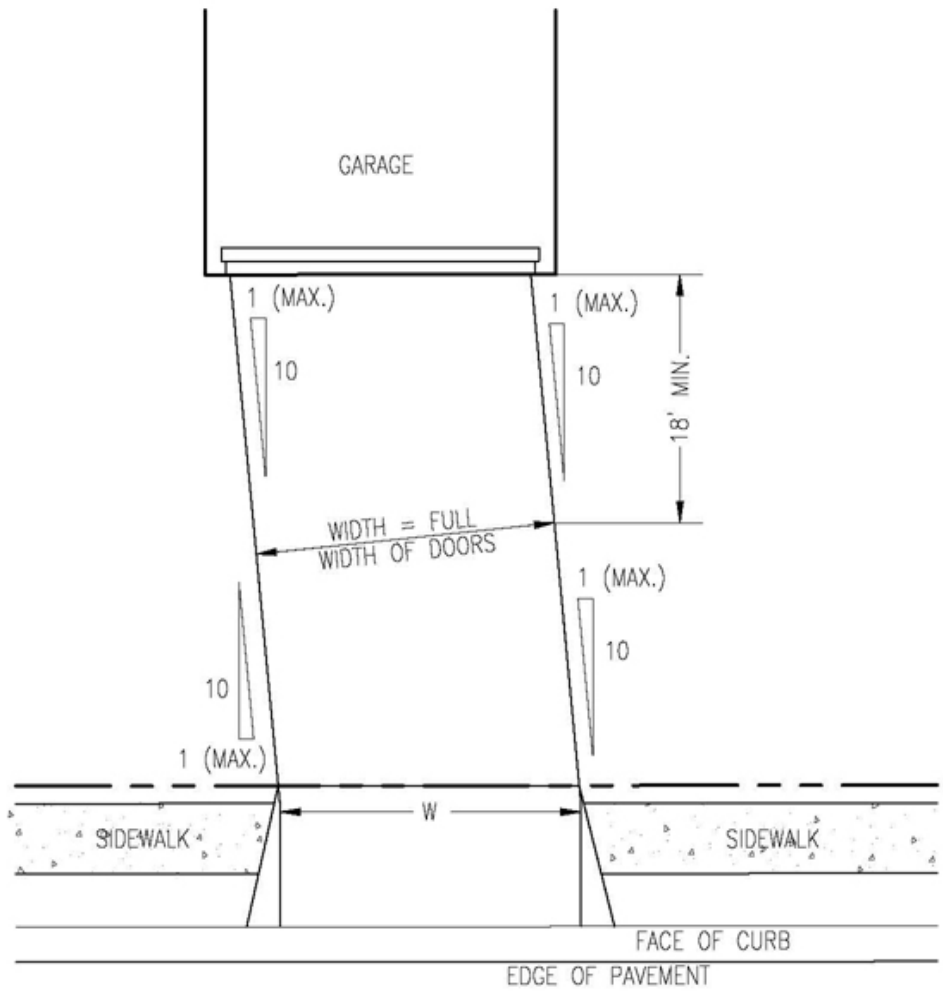
PIPESTEM DRIVE WIDTH (WP)	MIN. APRON WIDTH (W)
12'	16'
14'	20'

- NOTES: (1) HORIZONTAL AND VERTICAL SIGHT DISTANCE TO BE VERIFIED.
 (2) EXPANSION JOINT AT CENTERLINE MAY BE REPLACED BY A CONTROL JOINT 1-3/4" DEPTH.



STANDARD PIPESTEM DRIVEWAY ENTRANCE
 (NO SCALE)

FIGURE 7

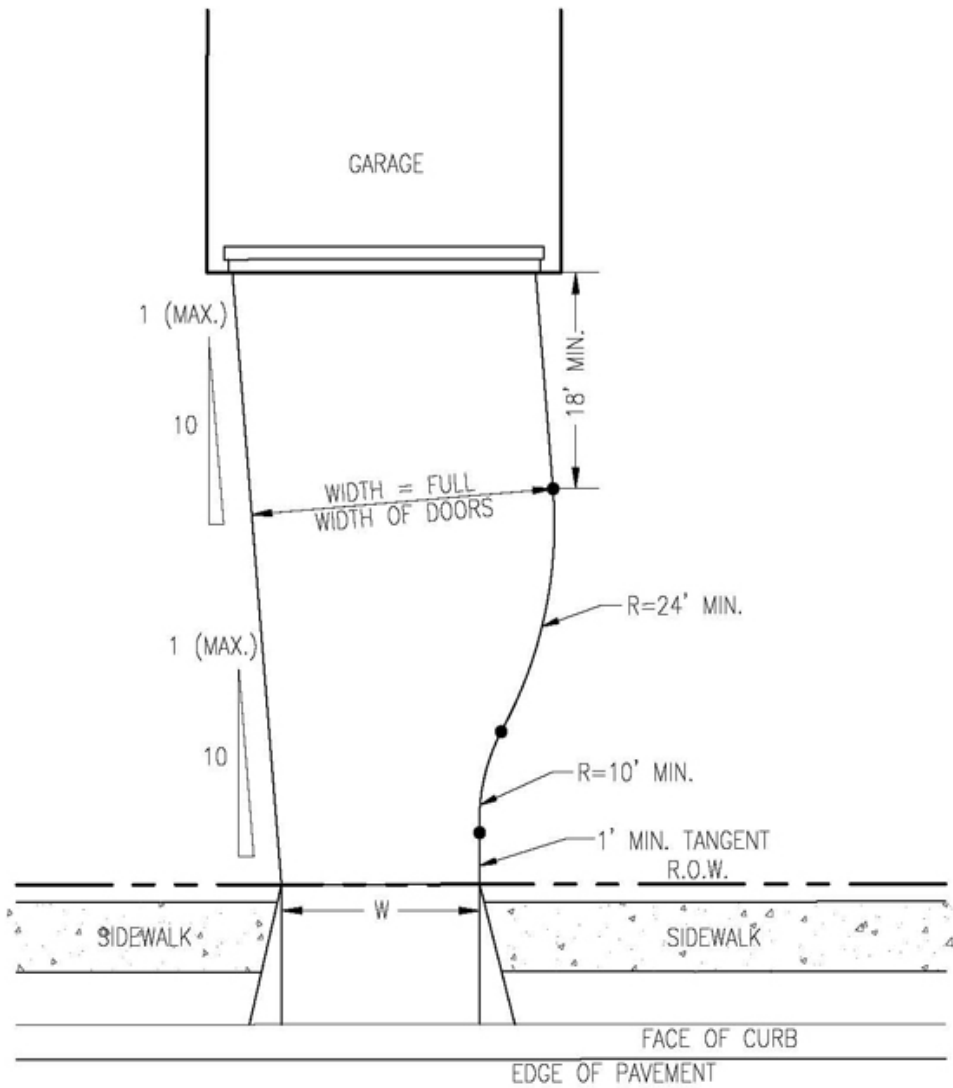


- NOTES: (1) SKEW ANGLE CANNOT EXCEED A 10:1 ANGLE WITH THE GARAGE FACE OR STREET.
- (2) DRIVEWAY TO MAINTAIN FULL WIDTH OF DOORS FOR A DISTANCE OF 18' FROM GARAGE.
- (3) SEE FIGURE 6 FOR APRON WIDTH.

STANDARD DRIVEWAY DETAIL
(DRIVEWAY LENGTH SHORTER THAN 35')

(NO SCALE)

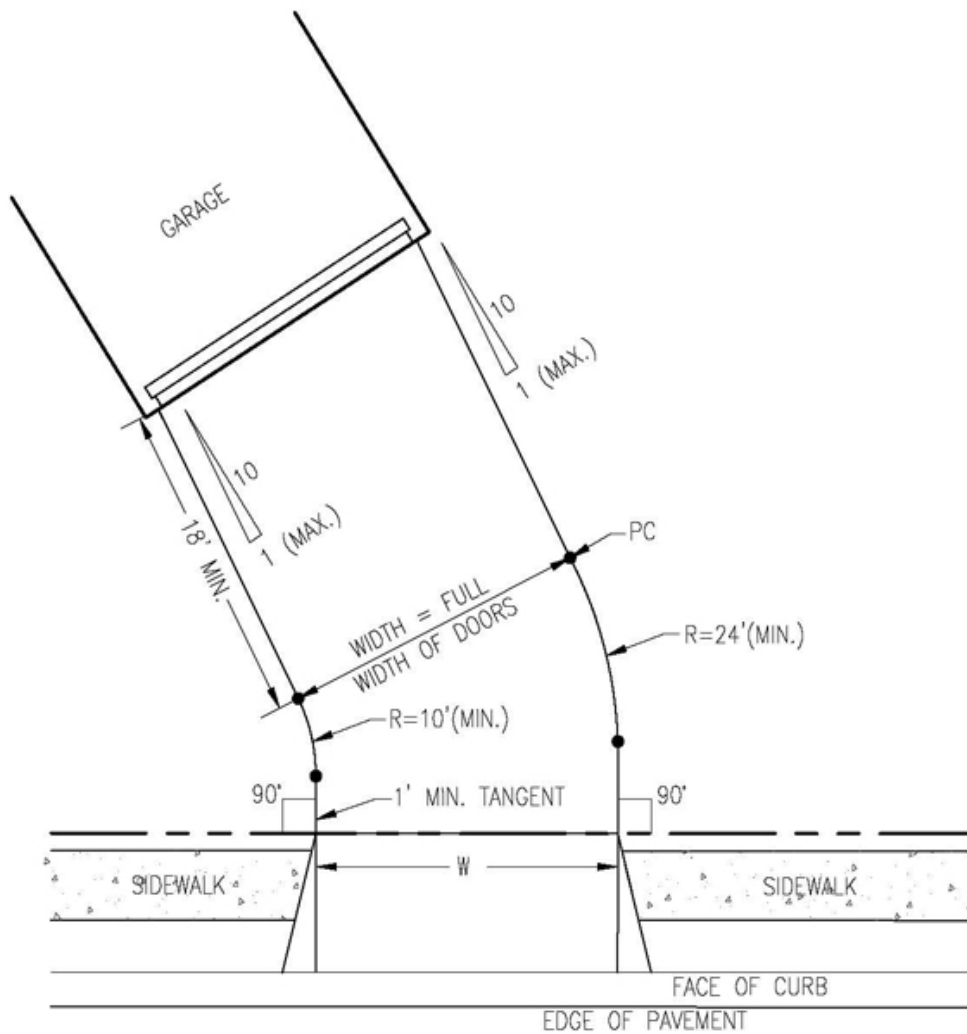
FIGURE 8



- NOTES: (1) SKEW ANGLE CANNOT EXCEED A 10:1 ANGLE WITH THE GARAGE FACE OR STREET.
- (2) DRIVEWAY TO MAINTAIN FULL WIDTH OF DOORS FOR A DISTANCE OF 18' FROM GARAGE.
- (3) MINIMUM INSIDE CURVE RADIUS IS 10' AND MINIMUM OUTSIDE CURVE RADIUS IS 24'.
- (4) SEE FIGURE 6 FOR APRON WIDTH.

STANDARD DRIVEWAY DETAIL
(DRIVEWAY LONGER THAN 35')
 (NO SCALE)

FIGURE 9

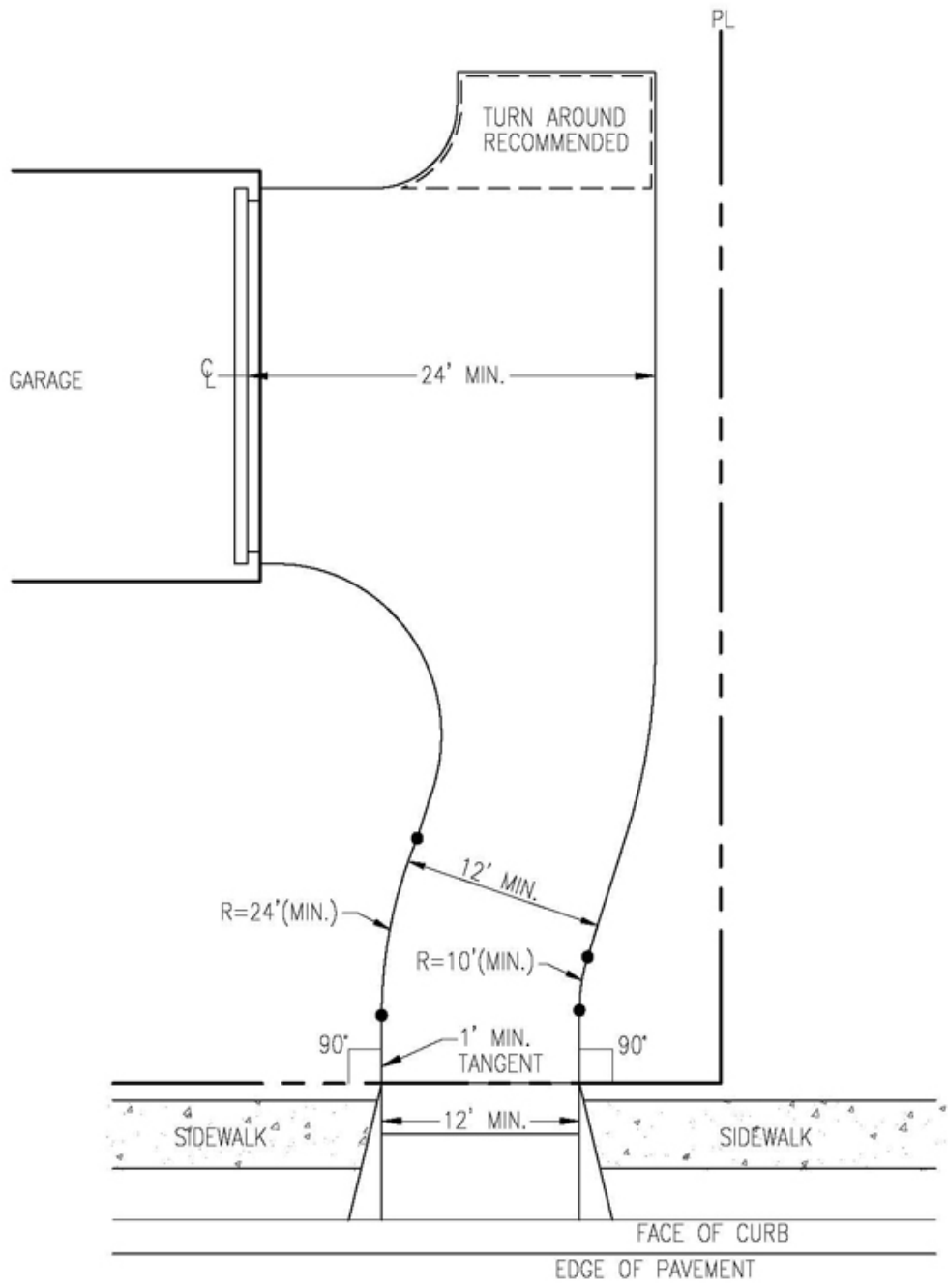


- NOTES: (1) SKEW ANGLE CANNOT EXCEED A 10:1 ANGLE WITH THE GARAGE FACE.
- (2) DRIVEWAY TO MAINTAIN FULL WIDTH OF DOORS FOR A DISTANCE OF 18' FROM GARAGE.
- (3) DRIVEWAY MUST BE PERPENDICULAR TO THE APRON FOR A MINIMUM DISTANCE OF 1'.
- (4) MINIMUM INSIDE CURVE RADIUS IS 10', AND MINIMUM OUTSIDE CURVE RADIUS IS 24'.
- (5) SEE FIGURE 6 FOR APRON WIDTH.

STANDARD CURVED DRIVEWAY DETAIL

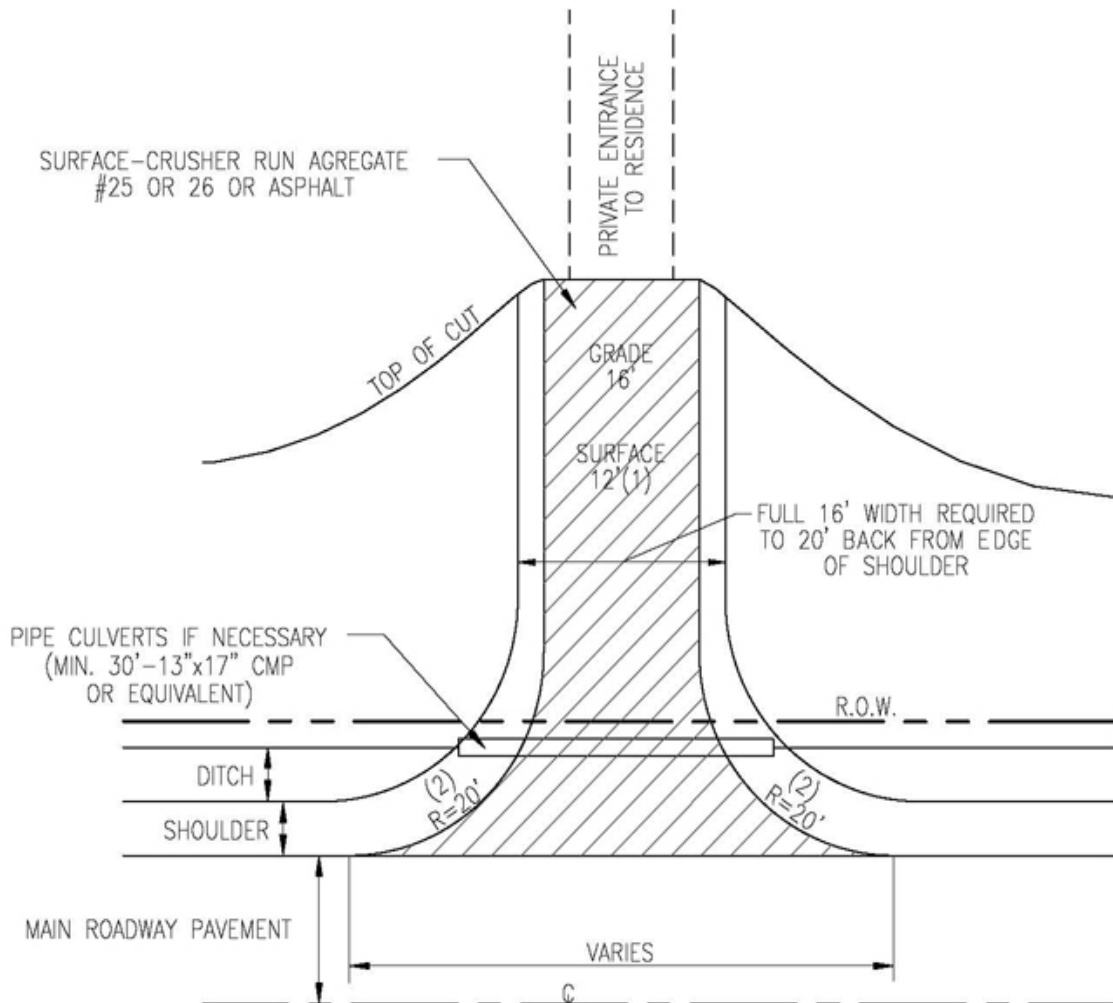
(NO SCALE)

FIGURE 10



STANDARD SIDE LOAD DRIVEWAY DETAIL
 (DRIVEWAY LONGER THAN 35')
 (NO SCALE)

FIGURE 11



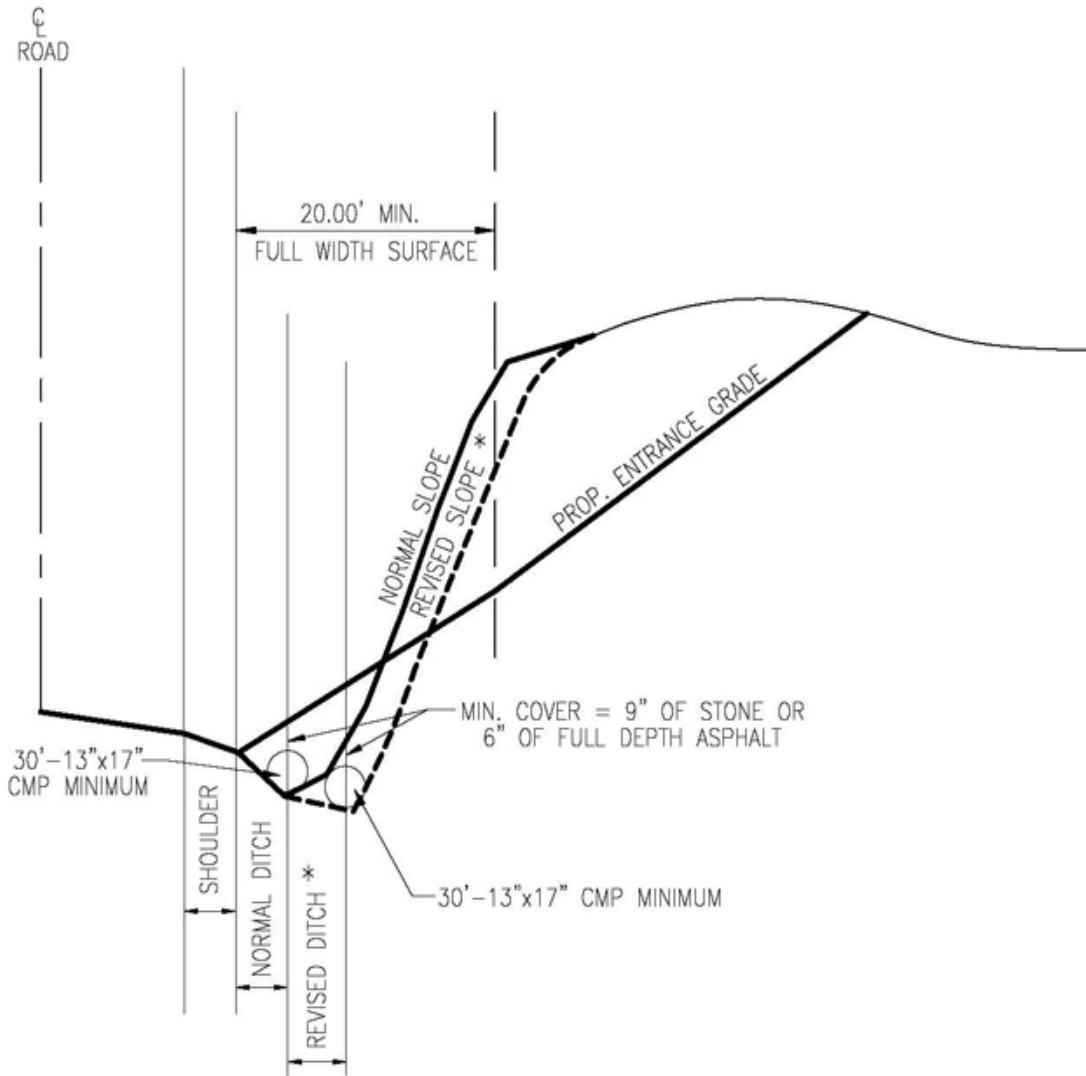
ENTRANCES IN FILL TO BE THE SAME AS ABOVE EXCEPT LOCATION OF CULVERT (WHEN NECESSARY)

NOTE: ALL ENTRANCE GRADES SHALL START BACK OF THE SHOULDER LINE. IF DRAINAGE IS NECESSARY, THE DITCH LINE MAY BE MOVED BACK TO PROVIDE AT LEAST 9" OF GRAVEL OR 6" FULL DEPTH ASPHALT OVER PIPE.

- (1) 12' OR EXISTING WIDTH WHICHEVER IS GREATER
- (2) RADIUS MAY BE REDUCED TO 15' IF APPROVED BY V.D.O.T. .

**STANDARD PRIVATE DRIVEWAY ENTRANCE
FOR SHOULDER SECTIONS VDOT ROADS**
(NO SCALE)

FIGURE 12



NOTE: LENGTHS OF CULVERT SHOWN ON ROAD PLANS FOR ENTRANCES ARE APPROXIMATE AND SHALL BE ADJUSTED TO OBTAIN ABOVE ROADWAY WIDTHS.

* IF REVISED DITCH EXTENDS BEYOND ROAD RIGHT OF WAY, AN EASEMENT IS REQUIRED.

**CROSS SECTION FOR
STANDARD PRIVATE DRIVEWAY ENTRANCE
FOR SHOULDER SECTIONS VDOT ROADS**

(NO SCALE)

FIGURE 13

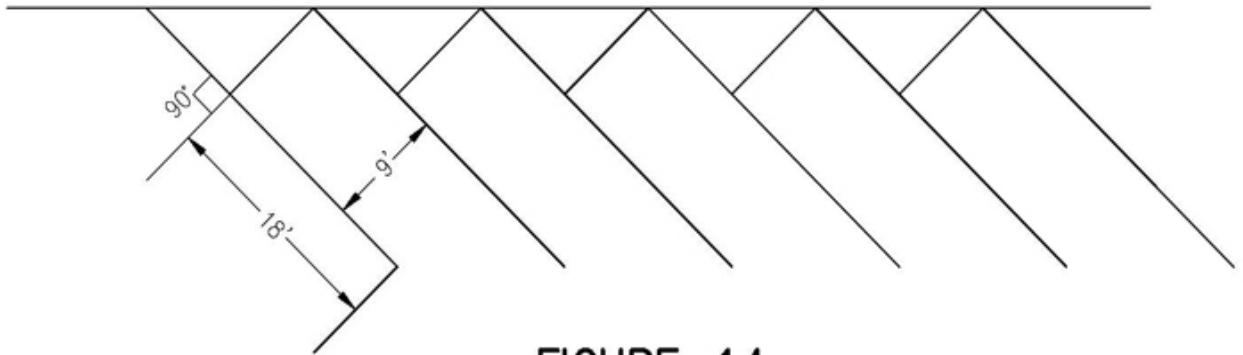
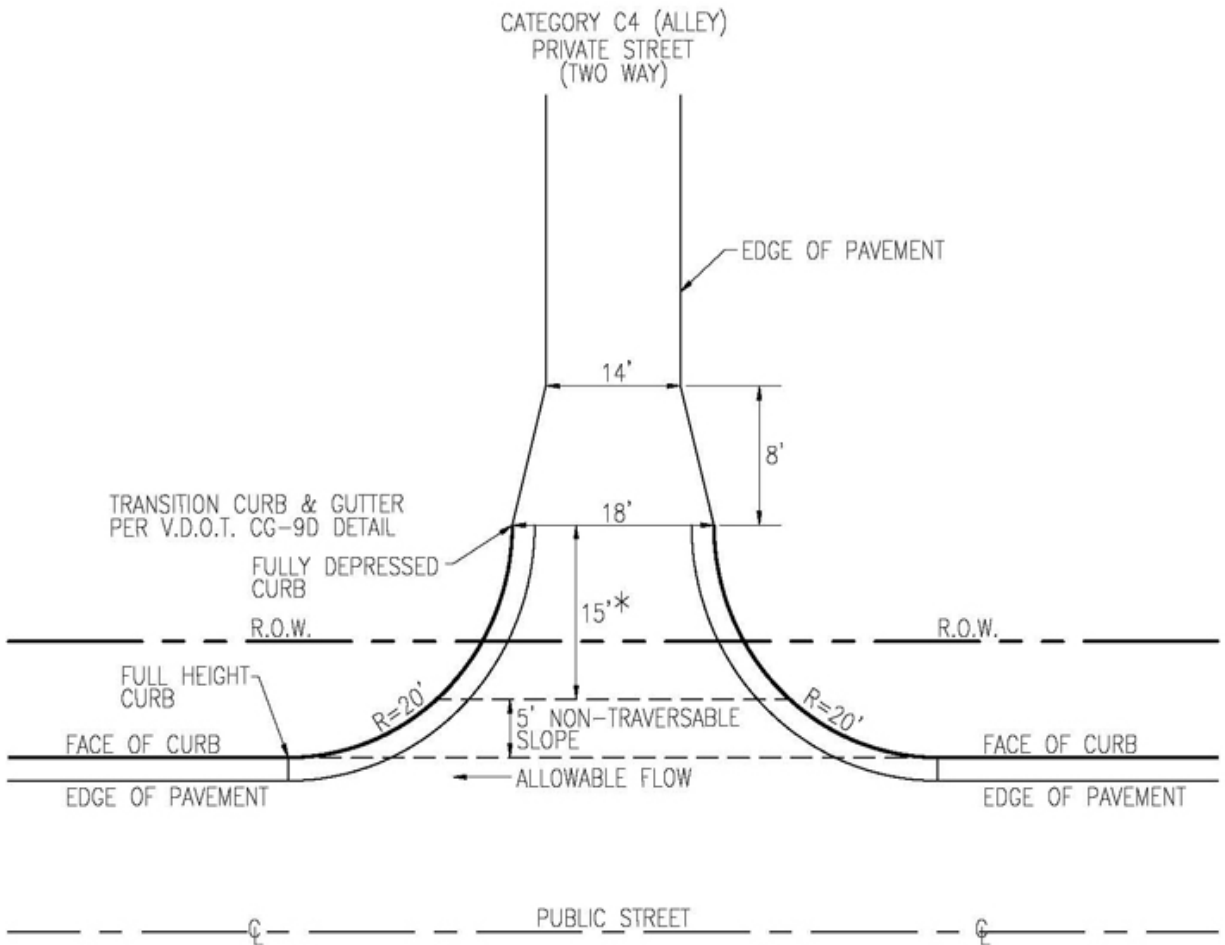


FIGURE 14
Section 4.400.B.1
(NO SCALE)



* IF ACCESSIBLE ROUTES ARE BEING PROVIDED,
A MINIMUM 4' TRAVERSABLE WIDTH IS
REQUIRED WITH A MAX. 2% CROSS SLOPE.
ACCESSIBLE ROUTE TO BE PROVIDED IN
THIS AREA. NO CG-12 IS REQUIRED.

**ALLEY ENTRANCE
TO
PUBLIC STREET**
(NO SCALE)

FIGURE 15

CHAPTER 6.000

SOILS, GEOTECHNICAL, AND HYDROGEOLOGICAL REVIEWS

Soils and/or geotechnical reviews are required for all applicable development activities as specified in this manual and hydrogeological reviews are required for specified development activities that will rely upon or may potentially impact groundwater resources. The extent of these reviews is directly related to engineering and/or environmental impacts of the proposed development. In an effort to standardize these reviews and to document that all factors have been considered, Loudoun County has formulated a systematic approach to soils, geotechnical, and hydrogeological requirements. Chapter 6.000 and the criteria for these reviews are divided into Soils and Geotechnical / Geophysical Reviews, which are defined in section 6.100, and Hydrogeological Testing, which are defined in section 6.200.

6.100 SOILS AND GEOTECHNICAL REVIEWS

Soils and geotechnical reviews as defined in this document are evaluations of local soil conditions, the potential effects those soil characteristics may have on the proposed development or land use, and the potential effect the proposed development activity and land use changes may have on the soils and associated landforms.

6.110 TYPES OF SOILS AND GEOTECHNICAL REVIEWS

The County recognizes that there are many types of soils and geotechnical investigations and reports. Many reports will not conform to these standards and will not have to be submitted to the County. However, where County ordinances or this manual establish a requirement for such reports to be submitted to the County, it is in the applicant's, as well as the County's, best interest to insure all reports are complete and speak to the needs of the project. This report should insure that costly delays and misunderstandings will be avoided and that the quality desired by all will result.

6.120 SOILS MAP CERTIFICATION

The purpose of the soils map certification is to serve as a screening mechanism to identify those tracts of land or building sites, or parts thereof, where Class III and/or Class IV soil classifications exist. To provide a soils map certification, the following criteria shall be followed:

- A. The applicant shall review the latest adopted County soils map for the subject tract to determine the existing soil conditions.
- B. Land development applications for preliminary plans of subdivision, site plans, and construction plan and profiles shall contain:

1. A maximum 1:2400 scale (1 inch = 200 feet) copy of the proposed development layout, overlaid on the County soils map, including the soils, drains, spot points, and a soils table with mapping unit name and number, hydrologic class, general development class, and identifying hydric soils. Once a Preliminary Soils Review (PSR) has been completed for the property, the above information shall be updated, and;
2. A note stating whether or not Class III and/or Class IV soils exist on the development site per the following:

"The subject development site does (or does not) contain Class III and/or Class IV soils, per the latest County soils map as identified by the Interpretive Guide to Soils Maps, Loudoun County, Virginia, or per the approved Preliminary Soils Review Investigation and Report."

Such statement, once approved by the Director or his designee, constitutes the soils map certification.

6.130 PRELIMINARY SOILS REVIEW INVESTIGATION AND REPORT

The Preliminary Soils Review is to be prepared by or under the direction of a Virginia Certified Professional Soil Scientist (C.P.S.S.), Licensed Professional Engineer (P.E.) or Certified Professional Geologist (C.P.G.).

The County can generally provide a Preliminary Soils Review to the applicant within 30 days of such request, provided:

1. The applicant bears the cost of soils and topographic maps required to complete the review;
2. Field stake-out is provided, when requested by the County, to adequately identify specific soil characteristics within proposed disturbed land area.
3. The applicant provides a backhoe and operator to the County for soil observation, if required based on seasonal or climatic conditions or stoniness.

If desired, the applicant may have such a report prepared by qualified consultants, in accordance with the guidelines of this chapter. Reports prepared by a consultant shall be submitted for review and approval of County staff.

- A. The scope of a Preliminary Soils Review is to provide detailed soil mapping for the subject study / review area. It is intended to verify and augment the detail of the most recent Loudoun County Soil Survey and determine the general constraints related to the

suitability of an area for some use or combination of uses. The Preliminary Soils Review must address the areas proposed for development and/or land disturbance. A separate Preliminary Soils Review shall be required prior to development and/or land disturbance of any areas of a given parcel or lot of record that were not included within a prior Preliminary Soils Review. Descriptions of soils and landscapes are appropriate for this review, which will rely heavily on a soils map and literature review, with site specific fieldwork to confirm published mapping or actual mapping of a tract of land. Field verification of the County soils map, or identification of required changes, must be conducted in accordance with the National Cooperative Soil Survey standards as set forth in the "National Soil Survey Handbook". The review report shall identify the mapping units as set forth in the Interpretative Guide to Soils Maps, discuss characteristics of the mapping unit, potential problems with proposed uses, and potential remedial actions, if available. The source of descriptions and their use potential ratings shall be documented, whether from a published report or actual field borings.

B. The Preliminary Soils Review report shall include the following:

1. Background
 - a. A description of the site location and terrain.
 - b. A brief description of bedrock geology and associated surface materials.
 - c. A description of field methods and procedures.
 - d. A description of laboratory methods and procedures, if used.
2. Scope of Project and Objectives
3. Narrative of Standard Terminology, if required
4. Report of Field Investigation (verification of, or recommended changes to, the County soil map and variations to the soil mapping units identified on the official Loudoun County legend).

C. The report of investigations shall contain the following:

1. A soils map, drawn to 1:2400 scale (1 inch = 200 feet) or larger, as desired, on sheet(s) 24 inches by 36 inches. Where small tracts are the subject of review (typically less than 12 acres), an 8 1/2-inch by 11-inch sheet may be used, provided it is at the 1:2400 scale and complies with all the requirements herein. Soil map(s) shall show the following:
 - a. The following information as per the Loudoun County planimetric base maps:

1. Topography, with at least 5-foot contour intervals.
 2. Planimetric detail, including swamps, marshes, ponds, wooded areas, buildings, roads, fence lines, utility structures, etc.
 3. Approximate Coordinate Grid System, at 1,000-foot intervals, with complete annotation.
 4. Location map, at 1 inch = 2,000 feet, north arrow and approximate grid coordinate information.
- b. The general location and extent of soil mapping units for the tract and other soil/landscape features, including stone symbols, gullies, rock outcrop, springs, and sinkholes or other karst features.
 - c. General location of all borings and backhoe pits. Test holes/pits are to be numbered.
 - d. The proposed development plan as related to the mapped soil units.
2. Minimum Soil Boring Densities

The number of observations must be adequate to evaluate each landscape position, geologic formation and map unit according to the National Soil Survey Handbook. Tracts of 100 acres or less require 1 boring/5 acres. Tracts greater than 100 acres require 1 boring/5 acres for first 100 acres, and 1 additional boring per 10 acres or fraction thereafter. The minimum number of borings required is 4. Boring density must be sufficient to evaluate each landscape position and geologic break within the area to be mapped.

3. Descriptions of mapping units, including range in characteristics, slope, texture, color, structure, permeability, drainage, landscape position, parent material, presence of perched or ground water table, depth to rock and other site characteristics such as karst features, identified as Karst Sensitive Environmental Features within Zoning Ordinance Section 4-1900.
4. Narratives on mapping unit potential for proposed uses. Notes: Boring logs, field notes, field/laboratory data should be available for review if requested. (Refer to the Interpretative Guide to the Use of Soils Maps, Loudoun County, VA.)
5. The following should be placed on the map and report, signed by the registered professional, and stating that: "The field work verifying this soils map has been completed by a Virginia Certified Professional Soil Scientist, Engineer or Geologist as required in Chapter 6 of the Facilities Standards Manual for Loudoun

County."

"This report has been written by a Virginia Certified Professional Soil Scientist Engineer or Geologist as required in Chapter 6 of the Facilities Standards Manual for Loudoun County. This report was developed for submission to the Department of Building and Development which shall be notified, in writing, of any changes (amendments) to this report."

Signed _____ Date _____

Certified Professional Soil Scientist/Geologist/Engineer
Certification # _____

D. Recommendations/Conclusions (As appropriate for proposed use)

1. Preliminary summary of soil/rock problems and their extent for proposed uses.
2. General recommendations on needs for drainage (foundation under drainage and/or curtain drains for sewage disposal systems).
3. General recommendations for undercutting high shrink-swell materials.
4. General recommendations on frost heave potential.
5. General recommendations on use suitability of soil materials for road fill and fill under slabs.
6. General recommendations for application of topsoil and vegetative stabilization (lawns and shrubs).
7. General recommendations on soil corrosivity.
8. Recommendations for a geotechnical and/or geophysical study (Section 6.150 of this chapter), if needed.
9. General recommendations for onsite sewage disposal.

6.140 DETAILED SOILS/SITE INVESTIGATIONS

Detailed soils/site investigation reports for all proposed onsite sewage disposal systems and facilities including those which are not exclusively regulated by the State are to be submitted to the Loudoun County Department of Health in accordance with County Code and current State regulations, where applicable. Prior to conducting the detailed soils/site study, which requires any land disturbance or tree removal in the Mountainside Development Overlay District,

Limestone Overlay District and within areas of steep slopes, a conceptual site layout must be provided and approved by the Department of Building and Development. Necessary excavation of potential drainfield sites shall be performed by hand and not by using equipment that may require clearing and grading for access to the sites.

In addition, a detailed soils/site investigation may be required to determine the suitability or limitations of a particular tract of land for any land filling operation, solid waste operation, composting facility or other similar use. The investigation may require physical or chemical analyses, either in situ or on selected samples in a laboratory. The intensity of investigation should be sufficient to provide information for immediate use or planning decisions. The technical standards for a detailed soils/site investigation for a land filling operation, solid waste operation, composting or other similar use are set forth in the Codified Ordinances of Loudoun County and current State regulations, where applicable.

6.150 GEOTECHNICAL STUDIES

Geotechnical Studies are to be prepared under the direction of, and sealed by, a registered Professional Engineer licensed in the State of Virginia with experience in geotechnical engineering specific to the underlying geology. Geotechnical Studies shall not be required in areas where development and/or land disturbing activities are not proposed.

Requirements for Geotechnical Studies

A Geotechnical Study shall be required for all public and other infrastructure improvements located where known soil conditions may generate problems relative to the planned land use as identified by the latest adopted County soils map, including private streets, building foundations, and other infrastructure facilities (such as storm drainage and stormwater management), which require performance bonding with the County.

A Geotechnical Study shall be required for all soil classifications for proposed impoundment dams for retention in accordance with Chapter 5 of this manual or where any road or driveway serving two or more residences crosses a proposed or existing dam. Development of all other public and private facilities shall not require a Geotechnical Study unless the specific need is identified and requested by the County at the time of preliminary subdivision and/or site plan, whichever is applicable.

- A. Laboratory data and field measurements, such as subsurface stratification and ground water levels, shall be provided to document findings and design parameters. Maps shall be provided to illustrate major conclusions. The report shall address areas impacted by the proposed construction. It shall contain preliminary appropriate designs and earthwork specifications, and recommendations for remedial action in problem areas.
- B. Boring densities must be in accordance with section 6.153 of this manual, and as required by the Building Official.

- C. If the Geotechnical Study is within the Limestone Overlay District, the report must identify and address the required Geophysical Study in accordance with 6.151 of this manual.

6.151 GEOPHYSICAL STUDIES

Geophysical Studies are to be prepared under the direction of, and sealed by, a registered Professional Engineer licensed in the State of Virginia or by a Virginia Certified Professional Geologist in consultation with an engineer. The person preparing the study must have experience in geophysical analysis, geotechnical engineering and should have an understanding of the underlying karst geology. Geophysical Studies shall not be required in areas where development and/or land disturbing activities are not proposed. Geophysical Studies may be performed to augment and/or verify a geotechnical report. Within the Limestone Overlay District (“LOD”), geophysical studies will be required to identify and address karst features in areas of proposed land disturbance. Geophysical Studies may also be required for proposed landfills, quarries or other special uses or as directed in a Preliminary Soils Review.

A. Requirements for a Geophysical Study:

1. Geophysical Study (determined by ground penetrating radar, electromagnetic properties, electric resistivity, microgravity, seismic or other investigative techniques) must identify and address any anomalies or areas of voids, rocks, saturated soil, mud-filled voids, and all Karst Sensitive Environmental Features revealed by the Preliminary Soils Review, or the Geophysical Study.
2. Field measurements, such as subsurface stratification and ground water levels, shall be provided to document findings and design parameters. Maps shall be provided to illustrate investigations of karst features and major conclusions. The report shall address areas impacted by the proposed construction. It shall contain either appropriate recommendations for remedial action in problem areas or recommendations for borings to verify significant geophysical anomalies and findings within 45 feet of the surface or as directed by the Director.
3. For LOD areas geotechnical studies and borings must be performed after the geophysical study to verify and address any potential karst features indicated by the geophysical study.
4. Boring densities must be in accordance with section 6.153 of this manual.
5. When borings are required provide geotechnical testing and evaluation by continuous Standard Penetrometer Test soil borings to a depth of 45 feet. Should the borings with a Split Spoon Sampler encounter refusal prior to a depth of 35 feet, the boring shall be moved adjacent to the initial location until the depth is

achieved, or extended by other means into the obstruction an additional depth of 5 feet. All borings attempted in the LOD shall be abandoned with either bentonite or neat cement, recorded and certified by the driller and certified by the supervising Licensed Professional Engineer/Certified Professional Geologist on the boring log for each attempted boring.

B. Alternative Methodologies for Geophysical Studies

To best address site specific characteristics, an alternative methodology (i.e. a list of alternative requirements) to those listed in subparagraph A, above, may be submitted to the Director for review, and revision if needed. If approved by the Director, such alternative methodology shall be followed in lieu of subparagraph A., above.

6.152 ADDITIONAL REPORTING REQUIREMENTS FOR GEOTECHNICAL AND GEOPHYSICAL STUDIES

The geotechnical or geophysical report shall specifically address structural improvements proposed on soils with problematic conditions or properties such as low to very high expansive soils, high water tables, known low-bearing capabilities, and areas which have potential geomorphic instability per the Interpretive Guide to Soils Maps, Loudoun County, Virginia. The Geotechnical or Geophysical study shall be in compliance with the guidelines specified herein and as applicable in section 4-1900 of the Revised 1993 Zoning Ordinance as amended. The study shall reflect the particular structures and facilities in the development proposal.

The report shall address areas of the site impacted by proposed construction. It shall contain approximate designs, earthwork specifications, and recommendations for remedial action in problem areas. The Geotechnical and/or Geophysical report shall contain the following:

A. Background

1. A brief description of the underlying geology, based on United States Geologic Survey (USGS) maps.
2. A brief description of exploration, equipment and sampling methods.
3. A brief description of laboratory test procedures and results.

B. Scope of Project and Objectives

C. Narrative of Standard Terminology, if Required

D. Report of Field Investigation

The report of field investigation shall contain the following:

1. Maps and Drawings

A map, drawn to 1:2400 scale (1 inch = 200 feet and larger, as desired), and other maps as needed, on sheet(s) 24 inches by 36 inches. Where the proposal covers more than one sheet, a compiled photo reduction, at 1:12,000 scale (1 inch = 1,000 feet) of all maps shall be submitted in addition to the 1:2400 scale maps. Where the proposed site consists of less than 5 acres, maps at 1 inch = 50 feet scale or larger may be submitted. Maps shall show the following:

- a. The following details, per the Loudoun County planimetric base map:
 - i. Existing topography, with at least 5-foot contour intervals.
 - ii. Within the LOD, proposed topography, with at least 2-foot contour intervals.
 - iii. Existing planimetric detail from base map and field observations, including swamps, marshes, ponds, wooded areas, rock outcrops, karst features, buildings, roads, fence lines, utility structures, etc.
 - iv. Within the LOD, sinkholes, based on field observations.
 - v. Property and Site boundary lines.
 - vi. Approximate grid coordinate system in 1,000 foot intervals with complete annotation.
 - vii. Location map, at 1 inch = 2000 feet, with north arrow and approximate Coordinate Grid information.
- b. Location of all test holes, borings, backhoe pits, geophysical data lines (such as, resistivity lines, etc.) and/or seismic tests on a soils map approved by the Director. Test holes/pits shown on the soils map are to be numbered and located dimensionally. Boring log records shall include surface elevations based upon County topographic maps. Boring densities shall follow the criteria of Section 6.153.
- c. The general spatial distribution of the various soils and geologic materials. Particular attention shall be paid to identifying and delineating areas where soil factors are expected to mandate modifications or special designs for proposed construction.

2. Cross-sections based upon County topographic maps of soil/geologic materials, showing stratigraphic relationships, including structure, and subsurface distribution.
3. Narratives describing geology, geomorphology, and hydrology.

- a. General

For development proposals not described in subparagraph (b) below, a general geologic report will be sufficient and must include the following:

- i. Narrative of location, type, and hardness of bedrock encountered; evaluation of expected rippability.
- ii. Ground water conditions, including depth and type of aquifer, based on current published information.

- b. Detailed Geology/Hydrology

A detailed section on geology and hydrology, evidenced by appropriate drill hole data and/or test pit data, shall be required when one or more of the following uses are proposed:

- i. Extraction of Natural Resources.
- ii. Dams/impoundments over 15 feet in height or 25 acre feet in impoundment capacity, as required per Chapter 5.
- iii. Land development proposed in mountain colluvium (mapping unit numbers 27C, 52E, 59C, 88C, 88D, 89D, and 89E) with slopes greater than 12 percent.
- iv. Landfills.

The section shall include, as appropriate:

- (a). Type(s) of rock materials present, including structural, stratigraphic, physical, chemical, and mineralogical properties, description of mapping units (geologic formations if more than one are shown on the map).
- (b). Macro- and micro-structure of rock or geologic material, including joints and fracture patterns; faults, if present; cleavage; foliation and bedding, if applicable.

- (c). Geologic map and cross-sections of the tract. At least two of these cross sections shall show elevation of the water table (i.e. hydrogeologic cross-section).
- (d). Directions of groundwater movement in both soil and geologic materials; method of recharge; dewatering effect of proposal; map showing groundwater contours; transmissibility of rock; effect of regional fractures (linear fractures) on water movement; discussion of existing ground water supply; discussion of existing levels of water; historic water availability.
- (e). Environmental geology. Susceptibility of area to pollution from site-industry products, leachate, or surface contamination (such as landfills and sewage disposal facilities), and extraction of natural resources. This section of the report shall specifically address the potential of area to undergo catastrophic collapse, presence of slip plains, sinkholes, and shock transfer or the presence of asbestos content in rocks.
- (f). Geophysical data (i.e. the result of ground penetrating radar, electromagnetic properties, electric resistivity, microgravity, seismic or other instruments) is required. All applications shall comply with State solid waste laws/or other environmental regulations.
- (g). Economic geology. (Required only for the extraction of urces.) Information needed for estimated length of extraction time for removal of natural resources and evidence of proven reserves.

4. Narratives describing soils and surface materials.

For all other areas impacted by construction proposals, a detailed description of soils and surface materials illustrated on the map (Section 6.150.A) will be required and should include the following:

- a. Description of physical properties for soils in each affected mapping unit or area of similar soil conditions or "strata," including silt content, clay amount, and type (expansiveness, plasticity, bearing capacity of materials, chemical properties), particularly as these apply to revegetation, apparent stability of sidewalls in cuts.

- b. Description of surface drainage, permeability, presence of seasonal perched water tables, and karst features, identified as Karst Sensitive Environmental Features within Zoning Ordinance Section 4-1900.
 - c. The Geotechnical Study shall note any significant differences from the County Soils Map.
- E. Recommendations/conclusions section, which shall address all of the above information and contain recommendations/conclusions as required by Section 6.154.

6.153 BORING DENSITIES

Boring density may include borings, test holes, backhoe pits, and geophysical investigative techniques, and seismic tests. The number of observations must be adequate to evaluate each landscape position, and/or geologic formation. Geophysical investigative techniques may be used to reduce the minimum boring densities in the LOD.

- A. Roads and Streets: Boring densities for proposed road and street construction shall, at a minimum, reflect the specifications contained within subparagraphs 1, 2, and 3 below unless adequate justification for varying such densities is provided as part of the geotechnical report, and is signed and sealed by the registered professional:
 - 1. As recommended by the Director at the time of preliminary subdivision or site plan, whichever is applicable, in Class I and Class II soils, as identified by the Interpretive Guide to Soils Maps, Loudoun County, Virginia.
 - 2. One boring per 250 feet, or fraction thereof, in Class III and Class IV soils, as identified by the Interpretive Guide to Soils Maps, Loudoun County, Virginia.
 - 3. Borings in areas of transition from Class I and II soils to Class III or IV soils shall be spaced sufficiently to accurately estimate the location of soil change.
- B. Impoundment dams and associated public improvements.
 - 1. Borings shall be located to be representative of the variety of land forms and geologic formations contained within the specific development site.
- C. Structures and Retaining Walls.
 - 1. Boring densities associated with the building permit process will be determined on an individual basis by the County Building Official, as defined in the Virginia Uniform Statewide Building Code.

6.154 RECOMMENDATIONS/CONCLUSIONS

The following are areas which shall be included in the recommendations and conclusions section, as appropriate:

A. Structures, Roads, Dams and Retaining Walls

1. Recommendations for foundation design including specification of whether standard foundation design is, or special measures are, appropriate. Where special measures are appropriate, design standards for those special measures shall be included if applicable. Special measures shall be provided, at minimum, when structures are located:
 - a. Within drainage swales identified on the latest adopted County soils map, or by the Geotechnical Study;
 - b. On “wet” or “marsh” spot points identified on the latest adopted County soils map, or by the Geotechnical Study; or
 - c. Within areas where the presence of soil mapping units 4A, 6A, 66A, 69A, 79A or 99A are confirmed by the Geotechnical Study.
2. Recommendations for typical California Bearing Ratio (CBR) values and identification of potential subgrade stabilization problems or special pavement design requirements.
3. Recommendations on feasibility of slab on grade versus supported ground floor construction.
4. Allowable soil bearing values at all bearing locations and elevations.
5. If soil conditions indicate, recommended pile type, loading, tip elevation, etc.
6. Recommended bearing values of rock based on unconfined compression tests, pressure meter tests, triaxial tests.
7. Conclusion that rock strata are sound and not underlain with solution channels that would affect the allowable bearing loads or provide recommendations for correction of these conditions.
8. Ground water elevations and recommendations for temporary dewatering procedures during construction and for permanent dewatering facilities after construction, including effects of seasonal variations.
9. Other factors, such as alkali content, corrosivity, underground springs, fill areas,

maximum depth of frost penetration, etc.

10. Thickness, consistency, character, compressibility, shear value, safe bearing value, etc., of the various strata encountered.
11. Recommendations for removal of perched/seasonal water tables, including foundation drainage, under drainage for roads, and feasibility of subgrade walls with finished living space.
12. Specifications for fill materials, including gradation ASTM, AASHTO, or VTM test method and percent of maximum theoretical density and optimum moisture, site preparation and material placement, qualifications of testing personnel and testing laboratory.
13. Recommendations to address low to very high expansive soils (shall include a description of the depth and thickness, encountered).
14. Recommendations to control differential settling.
15. Shoring for utility or other deep excavations.
16. Recommendations for design lateral pressure for below grade foundation walls.
17. A statement indicating whether the problematic conditions or properties of the soil(s) where the structure is located will be minimized, alleviated, or avoided if the recommendations of the report are implemented.

B. Landfills

1. Refer to Chapter 1080 of the Codified Ordinances of Loudoun County.

C. Extraction of Natural Resources

1. Analysis of controlled blasting vibrations and their potential effects on structures near the proposed facility.
2. Recommendations for monitoring programs for blasting vibrations and ground water supplies, including location and number of observation points and frequency of sampling.

D. Additional Recommendations/Conclusions within LOD

1. Within the LOD, the report must include conclusions as to the risks of ground surface collapse and groundwater contamination for the proposed location and use.

2. Within the LOD, the report must include recommendations of measures to mitigate the potential for ground surface collapse pursuant to Zoning Ordinance Section 4-1908.
3. Within the LOD, the report must include recommendations of measures to mitigate potential adverse impacts of pollution on surface water, or groundwater, or springs pursuant to Zoning Ordinance Section 4-1908.
4. When blasting is required, the report must include a recommendation as to the need for post-blasting field inspection and/or additional geophysical investigation.

6.155 SOILS BORING LOGS

The following shall be provided with these studies and reports, if applicable:

- A. Boring/test pit number.
- B. Approximate surface elevation.
- C. Approximate elevation, thickness, description (ASTM D2487, ASTM D2488), and classification of each soil stratum.
- D. Location of all samples taken and field tests or laboratory analyses conducted.
- E. Location and identification of rock; indicate soundness.
- F. Location of water table and 24-hour water levels.
- G. "N Values" (standard penetration test results) and natural moisture content ("W") from split-spoon and/or Shelby tube samples.
- H. Other samples/tests to be performed.
- I. Name of company performing the field operation and the name of the contact person at that company who is familiar with the field operation.
- J. Ground water monitoring data.
- K. Seismic or other geophysical data for site.
- L. Rock core descriptions.

6.156 LABORATORY DATA

All laboratory data should be supplied as required to support recommendations and description narratives.

6.157 BLASTING IN LIMESTONE OVERLAY DISTRICT

All blasting conducted in the Limestone Overlay District the County shall require the following:

- A. A blasting plan shall be submitted to the Director for approval that contains blasting procedures, blast layout, explosives descriptions and quantities, drill logs, water sampling data, structural pre-blast surveys, etc. The plan should identify any water wells, springs, or streams within a 1000' radius of the blast location; and any structure within 500' radius of the blast location.
- B. A pre-blasting site inspection and Geophysical study to determine base-line conditions, and the potential for solution channels or cavities below the blasting site.
- C. The applicant shall contact and notify, in writing, the owners of wells within a 1000' radius of the proposed blasting location and offer to sample and test the water in a pre-blast condition.
- D. The applicant shall contact and notify, in writing, the owners of structures within a 500' radius of the proposed blasting location, and complete a pre-blast survey to document the condition of the structure.
- E. Monitoring of all blasts by appropriate seismic and noise measurements at sensitive locations identified in the blasting plan;
- F. Post-blasting inspections and/or post-blasting Geophysical Study when required by Geophysical Report.
- G. Mitigation, as needed, based on the post-blasting Geophysical Study, and well water and structural damage complaints.
- H. Restrictions on blasting and explosives, or limits on blasting to specific times and atmospheric conditions to minimize impact.

6.158 NUTRIENT MANAGEMENT PLANS IN LIMESTONE OVERLAY DISTRICT

A nutrient management plan in accordance with DCR Standards and Criteria and §10.1-104.2 of the Code of Virginia and 4 VAC 5-15 as required per the Loudoun County Zoning Ordinance, Limestone Overlay District.

6.159 STRUCTURE/BUILDING PAD CONSTRUCTION WITHIN THE LOD

Any structure built in the LOD shall be verified and certified in writing to the Director that the building pad proposed in the site development plans and built in the site construction process, is sufficient in size, compaction, and subgrade materials to support the proposed structure applied for in the building permit application. In furtherance of this requirement the following shall also be required:

- A. The entity performing construction monitoring and testing shall acknowledge, and submit in writing, prior to commencing work, that they have obtained and reviewed the requirements of the detailed geotechnical report.
- B. The entity performing foundation monitoring and testing shall acknowledge, and submit in writing, prior to commencing work, that they have obtained from the county or from the entity responsible for the construction monitoring and testing, all construction and monitoring/compaction testing reports and have reviewed the reports. Such acknowledgement shall also include a disclosure of any possible deficiencies, anticipated impacts to foundation construction for any proposed structure, and proposed corrective measures to rectify any deficiencies.
- C. The entity responsible for approving foundation subgrade shall verify, in writing, that all prior work done for the building pad construction meets a reasonable standard of care prior to performing any subsequent work.

6.160 IMPLEMENTATION OF RECOMMENDATIONS

The design engineer/architect will provide the Chief Building Inspector and the Director of Building & Development with a written statement, stating that he has reviewed the plans and, as submitted, the plans were prepared in accordance with the recommendations of the Geotechnical / Geophysical report.

6.161 STANDARD REFERENCES, METHODS, AND PROCEDURES FOR SOILS AND GEOTECHNICAL STUDIES

The following will be considered standard reference manuals and publications:

Black, C.A. (ed.), 1965. Methods of Soil Analysis: Parts I and II, Agronomy Series, American Society of Agronomy, Madison, Wisconsin.

American Society of Testing and Materials, 1992. Annual Book of ASTM Standards, Volume

4.08: Soil and Rock; Dimension Stone; Geosynthetics.

Soil Survey Staff, 1972. Soil Survey Laboratory Methods.

Soil Survey Staff, Soil Conservation Service, National Soil Survey Handbook, title 430-VI (Washington D.C., U.S. Government Printing Office, November, 1993).

Virginia Department of Highways and Transportation, 1978. Virginia Test Manual.

NWWA/EPA Series RCRA Groundwater Monitoring Technical Enforcement Guidance Document, Sept. 1986.

Conrad, E. T., et al., 1981. Solid Waste Landfill Design and Operation Practices, Environmental Protection Agency, Washington, D. C.

The International Code Council, Building and Residential Codes.

Virginia State Sewage Disposal and Handling Regulations.

Loudoun County Codified Ordinance, Chapter 1040 (Water Wells) and Chapter 1066 (Private Sewage Disposal Systems).

Interpretive Guide to the Use of Soils Maps, Loudoun County, Virginia, 2000, County Extension Office, Loudoun County, Department of Building and Development.

Sowers, G.F. Introductory Soils Mechanics and Foundations: Geotechnical Engineering, Fourth Edition, Macmillan Publishing Co., Inc., N.Y.

Terzaghi, K., Peck, R.B and Mesri, G. (1966), Soil Mechanics in Engineering Practice, 3rd, ed. Wiley-Interscience

Braja, M. Das, Jonathan Wickert. (2005) Introductory Principles of Geotechnical Engineering, Sixth Edition, Thomas Learning College

Budhu, Muni (2006). Soil Mechanics and Foundations, Second Edition, John Wiley & Sons, Inc.

Bowles, J. (1996) , Foundation Analysis and Design, Fifth Edition, McGraw-Hill Publishing Company

Kramer, Steven L. (1996), Geotechnical Earthquake Engineering, Prentice-Hall, Inc.

Rajapakse, Ruwan, (2008), Pile Design and Construction, Butterworth-Heinemann

Loudoun County Karst Feature Database – The County maintains an informational database of the following features within the LOD, which shall be updated based on information in

Geophysical Studies provided by applicants for land disturbing activities and land development applications within the LOD, information identified in Preliminary Soils Reviews as required by the Facilities Standards Manual, Revised United States Geologic Survey (USGS) Geological Mapping updates, and information provided through field inspections:

- (a) The known extent of the Limestone Bedrock Formations (Sensitive Limestone Areas);
- (b) Sinkholes, Swallets and Closed Depressions;
- (c) Rock Outcrops;
- (d) Springs;
- (e) Cave Openings; and
- (f) Perennial Sinking Streams.

6.200 HYDROGEOLOGIC TESTING

Hydrogeologic testing as set forth in this document is an evaluation of groundwater quantity and quality and the potential effects that a proposed land development may have on water resources. The evaluation is based on both on-site hydrogeologic testing and existing and readily available information. Hydrogeologic testing and reports are required and specifically defined for four general types of land development applications: (1) residential subdivisions not served by central water and sewer (further divided into those with wells on individual lots and those with communal systems); (2) solid waste facilities (for example landfills), (3) resource extraction areas (for example quarries and mines), and (4) other types such as certain industrial, irrigation, commercial, and recreational developments.

Described below are the requirements for hydrogeologic testing and reports as related to the general types of land development applications. Each hydrogeologic test shall be performed by or under the direct supervision of a professional geologist certified by the Commonwealth of Virginia. A report of the evaluation, the Hydrogeologic Report, shall be prepared and signed by the professional geologist and submitted to the County for review. Where not specifically defined in Chapter 6.200, the methodology used for testing and evaluation shall follow generally accepted professional hydrologic and hydrogeologic practices and standards. Examples of documents and sources considered representative of professional standards and methods are included in section 6.250.

6.210 HYDROGEOLOGIC TESTING REQUIREMENTS FOR SUBDIVISIONS NOT SERVED BY CENTRAL WATER AND SEWER

A hydrogeologic report for subdivisions will examine the local hydrogeologic conditions and the

relationship between the proposed land use and those conditions. The testing will focus on the groundwater quantity and quality as they relate to the requirements of the proposed subdivision and the potential impacts the subdivision may have on the water resources. A hydrogeologic report is required prior to a preliminary subdivision submission in accordance with Section 8.102.B of this manual.

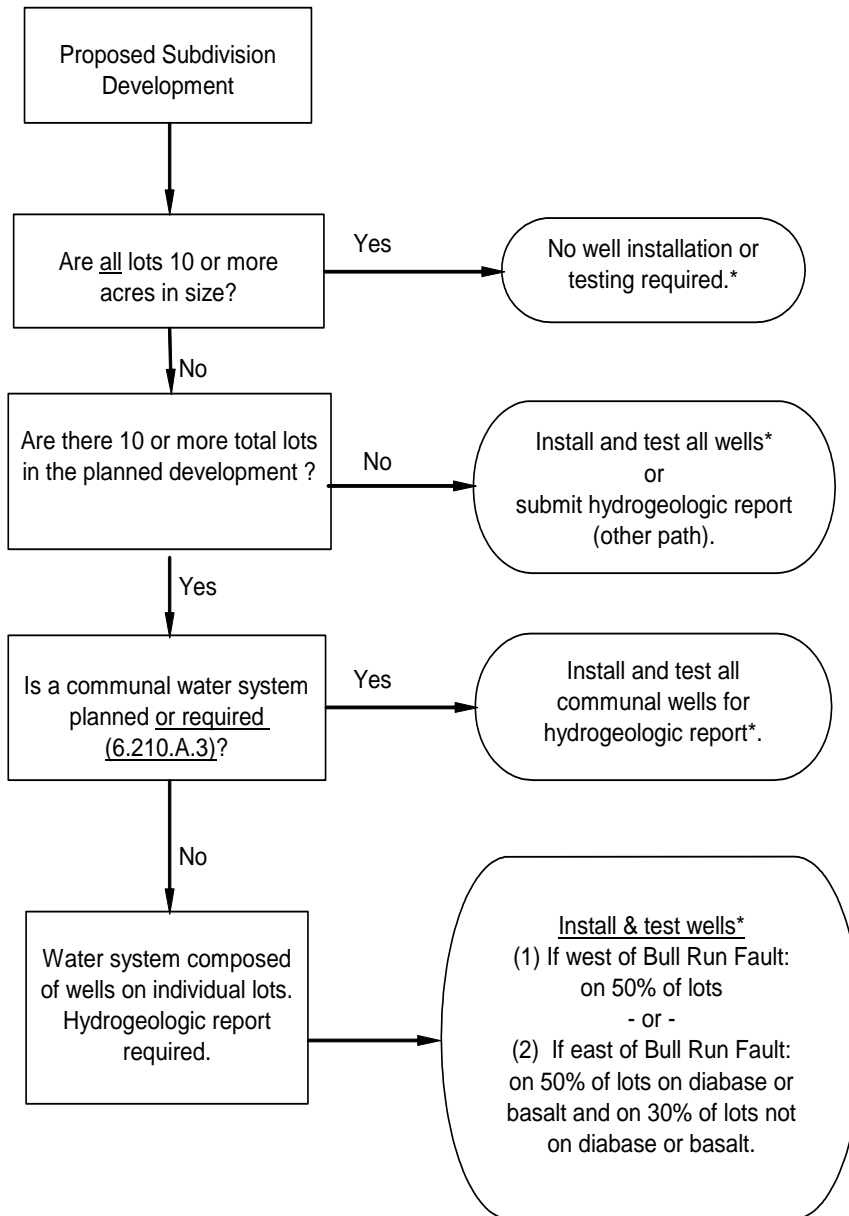
Subdivisions not served by central water and sewer can be divided into two groups based on the type of water supply system; those having a private well on each individual lot and those having communal (community) water systems serving multiple lots. Many of the requirements for hydrogeologic evaluation are the same for both types of water supply systems and will be listed in this section (6.210). However, there are a number of requirements that are specific to either communal systems or wells on individual lots and will be listed separately in sections 6.211 and 6.212, respectively.

A. Applicability of Hydrogeologic Testing for Subdivision Water Supply Approvals

1. The hydrogeologic testing requirements and procedures must be conducted on any new subdivision having any lots of less than ten (10) acres, except as provided in subparagraph 2 below.
2. If the number of proposed lots is nine (9) or less, the applicant has the option of either conducting Hydrogeologic Testing or drilling and successfully testing a well for water quantity and quality on each lot in accordance with the requirements of the Codified Ordinances of Loudoun County, Chapter 1040 (Water).
3. Hydrogeologic testing shall be required for all communal water supply systems.

Prior to obtaining permits or initiating any site preparation, hydrogeologic testing, or well installation within the MDOD or steep slopes, the applicant shall provide a conceptual site layout and obtain a Locational Clearance through the County in accordance with Sections 4-1600 or 5-1508 of the Zoning Ordinance.

Figure 6.210-1: Flowchart for Identifying Type of Water System and Well Drilling and Testing Requirements for Subdivision Developments in Loudoun County.



*Any development in Mountainside Development Overlay District (MDOD), *Limestone Overlay District (LOD)*, or steep slopes, as defined in Loudoun County Zoning Ordinance, must obtain a Locational Clearance from the County prior to any permits or land disturbing activity.

B. Background Information

Conduct a background evaluation of the hydrogeology using readily available existing resources such as publications and/or data from the U.S. Geological Survey, State of Virginia Water Control Board, U.S. Environmental Protection Agency, Loudoun County Department of Health, Department of Building and Development and the Office of Mapping and Geographic Information. At a minimum, extend the evaluation to include the area within approximately one (1) mile beyond the property boundary. Such evaluation shall include the following:

1. USGS and Loudoun County topographic information, whichever is more detailed.
2. Property plats and aerial photographs.
3. Geologic maps and data reports (well logs, water quality analysis, geologic information).
4. Existing well data or descriptive statistical summary of the same (e.g., minimum, maximum and mean of well depths and yields).
5. Reference existing research reports, hydrogeologic reports, geophysics reports, etc.
6. Existing pollution sources (e.g., underground storage tanks, septic fields, graveyards, etc) of record or those observed on site and within a minimum of 2,000 feet of the site boundary. An attempt shall be made to verify sources of record by field reconnaissance. The report shall contain a copy of a study from a company (or companies) that specializes in federal and state database searches for historical pollution source reporting. The report shall contain statements as to the type of background investigation conducted for pollution sources, the results of the investigation, and a verification statement that certifies that this historical pollution search has been conducted.

6.211 SUBDIVISIONS WITH COMMUNAL WATER SYSTEMS

The testing and analyses specified in this section shall be conducted for subdivisions planning to use communal (formerly termed community) water systems. These shall include all communal systems, including those with fourteen (14) or fewer connections.

A. Analysis of Background Information

1. Using the background information compiled previously, conduct an evaluation of the site hydrogeology and the occurrence, quality, and quantity of groundwater, including:

- a. Preliminary field verification of existing geologic information including rock outcrops, karst features, etc.
 - b. Analysis of fracture fabric: At sites with bedrock outcrops, fracture orientations (strike and dip measurements) shall be measured and documented in the report. The number and orientations of linear features or photo lineaments shall be analyzed and correlated with documented bedrock fractures.
 - c. Groundwater budget analysis: The effects of the proposed development on groundwater shall be evaluated using water budget concepts. The evaluation shall include available recharge under normal (10 inches/year) and drought (6 inches/year) conditions and net consumption of groundwater by the development at a rate specific and appropriate to the conditions and intended use. The evaluation should also include groundwater baseflow to streams using, when possible, available data from the subwatershed in which the proposed development is located.
2. Prioritization of groundwater zones: Based upon the data derived from the preliminary field verification, analysis of fracture fabric and groundwater budget analysis, each groundwater zone shall be delineated and prioritized according to the probability of developing the groundwater resources. Each of these zones shall be placed on a map (acceptable scales 1:2400 to 1:12000) identifying all probable or favorable zones and ranking the zones by their estimated relative potential to develop water for the proposed development.
 3. A geophysical investigation shall be conducted on each zone being considered for drilling of a communal well. The geophysical method used and the area of investigation shall be appropriate for the hydrogeologic conditions and purpose of the study. A summary of the investigation shall be included in the report with a copy of all logs, field data, and data interpretations provided to the County if requested.

B. Water Supply Testing

Wells shall be installed and tested to provide evidence that the hydrogeologic system is capable of furnishing and sustaining the potable water needs of the eventual inhabitants of the proposed development. Well construction and testing shall be performed in accordance with the latest revisions of the Waterworks Regulations of the Virginia Department of Health, the Loudoun County Codified Ordinances, and Loudoun County Sanitation Authority water system standards, whichever is more stringent.

1. Wells: For each proposed water supply (planned production) well installed, a minimum of two (2) observation wells will be constructed unless suitable existing observation wells are available. However, in LOD, the minimum number

of observation wells shall be the number necessary to identify a wellhead's zone of influence (i.e. The area surrounding a pumping well within which the water table or potentiometric surface has been changed due to the well's pumping) The locations of the observation wells shall be proposed by the applicant to the Loudoun County Department of Health and the Department of Building and Development for approval.

2. Formation Sampling: During all drilling, representative samples shall be collected for each change in geologic formation encountered and at intervals of twenty (20) feet when in the same geologic formation. The applicant shall retain these samples for a period of one (1) year after the study has been approved and be provided to the County if requested. A Virginia Certified Professional Geologist shall complete a geologic drilling log for each well constructed for the investigation.
3. Aquifer Pumping Test: An aquifer pumping test shall be conducted on each proposed communal water supply well that is constructed.
 - a. Method and Rate: Each test shall employ the down-hole method of pumping and be at a continuous and constant rate. A pumping rate shall be used that reasonably stresses the aquifer but does not result in excessive drawdown in the well. The minimum acceptable pumping rate for the test shall be one (1) gallon per minute (gpm) for each proposed equivalent hookup. The selected pumping rate shall not vary by more than 10 percent during the test. Discharge water shall be conveyed downgradient a sufficient distance (minimum 200 feet) from the pumping and observation wells, or to an impermeable conveyance feature (e.g., storm drain) or stream, to prevent recharge to the aquifer that could affect the test results.
 - b. Duration: Pumping shall be continuous for not less than seventy-two (72) hours and shall continue until the water level in the well reaches equilibrium or near equilibrium conditions. Immediately upon completion of pumping, the recovery phase of the test shall begin and continue for a period equal to the duration of pumping or until the water level in the pumping well recovers to within 90 percent of the pre-pumping water level, whichever occurs first.
 - c. Monitoring: The rate of discharge from the pumping well shall be measured and recorded at standard intervals during the test. (See Section 6.250 for references of standards and guidelines.) Water levels in the pumping and observation wells shall be monitored during the pumping phase and recovery phase of the test. All water level drawdown and recovery measurements shall be made at standard intervals. Monitoring shall include pre-test measurements of water levels in the pumping well and observation wells to identify possible water level trends. Pre-test

monitoring shall be for a period of at least 48 hours immediately prior to the start of pumping.

C. Laboratory Testing for Water Quality.

1. For all proposed communal wells, tests shall be conducted to provide evidence that the system is capable of providing potable water. Such tests shall be conducted in accordance with the latest revision of the Waterworks Regulations of the Virginia Department of Health. Water quality testing results to satisfy this requirement shall be applicable for not more than three (3) years after sample collection unless the subdivision plat or plats for the entire subdivision have been recorded.
2. The County may require additional water quality sampling if a well has one or more of the water quality test results listed below in subparagraphs a through c. The Applicant shall notify the County Department of Health and County Department of Building and Development prior to conducting any additional sampling.
 - a. The presence of any regulated contaminant at a concentration above the maximum contaminant level as defined in the latest version of the Waterworks Regulations of the Virginia Department of Health.
 - b. The presence of any unregulated contaminant as defined in the latest version of the Waterworks Regulations of the Virginia Department of Health at a concentration equal to or greater than the laboratory's detection or reporting limit.
 - c. The presence of any hazardous compound associated with either regulated or unregulated contaminants [e.g., methyl tertiary butyl ether (MTBE)] at a concentration equal to or greater than the laboratory's detection or reporting limit.

D. Well Protection

Upon completion of all testing, the applicant shall assure that each well is secured and permanently protected until being put in use by:

1. Installing a lockable well cap with lock or welding a piece of flat steel that completely seals the well casing; and
2. Placing a seven (7)-foot post of a bright, visible color next to the well casing to ensure visible identification of the well.

6.212 SUBDIVISIONS WITH INDIVIDUAL WELLS

The testing and analyses specified in this section shall be conducted for proposed subdivisions planning to use a private well on each individual lot. A summary of the well drilling and testing requirements for various proposed subdivision development scenarios is presented in Figure 6.210-1.

A. Analysis of Background Information

Using the background information compiled previously, conduct an evaluation of the site hydrogeology and the occurrence, quality, and quantity of groundwater, including:

1. Preliminary field verification of existing geologic information including rock outcrops, karst features, etc.; and
2. Groundwater budget analysis: The effects of the proposed development on groundwater shall be evaluated using water budget concepts. The evaluation shall include available recharge under normal (10 inches/year) and drought (6 inches/year) conditions, net consumption of groundwater by the development at a rate specific and appropriate to the conditions and intended use, and groundwater baseflow to streams using, when possible, available data from the subwatershed in which the proposed development is located.
3. Analysis of fracture fabric: At sites with bedrock outcrops, fracture orientations (strike and dip measurements) shall be measured and documented in the report. The number and orientations of linear features or photolineaments shall be analyzed and correlated with documented bedrock fractures.

B. Water Supply Testing

A portion of the proposed total number of wells shall be installed and tested to provide evidence that the hydrogeologic system is capable of furnishing and sustaining the potable water needs of the proposed development. Well construction and testing shall be performed in accordance with the latest revisions of the Waterworks Regulations of the Virginia Department of Health and the Loudoun County Codified Ordinances, whichever is more stringent.

1. Wells: All wells shall be designed to meet standards defined in Chapter 1040 of the Loudoun County Codified Ordinance. The proposed locations of the wells shall be submitted by the applicant as part of a subdivision layout showing proposed well sites for each building lot to the Loudoun County Department of Health and the Department of Building and Development for approval. The number and general placement of test wells shall be based on the following criteria:

- a. A minimum of three (3) test wells shall be required for each study.
 - b. Selected test well sites shall include at least one well on each unique combination of landform and geologic formation on which wells are proposed.
 - c. Lots located west of the Bull Run Fault: Test wells shall be installed and tested on fifty percent (50%) of the proposed lots.
 - d. Lots located east of the Bull Run Fault: Test wells shall be installed and tested on fifty percent (50%) of the proposed lots with any portion of the lot overlying diabase or basalt rock and on thirty percent (30%) of the lots having no portion of the lot overlying diabase or basalt rock.
 - e. Where individual wells are proposed for each lot, physical or chemical alteration of geologic materials or structures (e.g., hydraulic fracturing, use of explosives, or addition of chemicals) to increase yield of test wells will not be permitted prior to the pumping test.
2. Formation Sampling: During all drilling, representative samples shall be collected for each change in geologic formation encountered and at intervals of twenty (20) feet when in the same geologic formation. The applicant shall retain these samples for a period of one (1) year after the study has been approved and be provided to the County if requested. A Virginia Certified Professional Geologist shall complete a geologic drilling log for each well constructed for the investigation.
 3. Aquifer Pumping Test: An aquifer pumping test shall be conducted on each well constructed for water supply testing. For each pumping well test, the two closest available test wells shall be monitored as observation wells unless otherwise approved by the County.
 - a. Method and Rate: Each test shall employ the down-hole method of pumping and be at a continuous and constant rate. A pumping rate shall be used that reasonably stresses the aquifer but does not result in excessive drawdown in the well. The minimum acceptable pumping rate for the test shall be one (1) gpm. Generally, the maximum required pumping rate shall be 20 gpm unless otherwise directed by the County. The selected pumping rate shall not vary by more than 10 percent during the test. Discharge water shall be conveyed downgradient a sufficient distance (minimum 200 feet) from the pumping and observation wells, or to an impermeable conveyance feature (e.g., storm drain) or stream, to prevent recharge to the aquifer that could affect the test results.
 - b. Duration: Pumping shall be continuous for not less than eight (8) hours

and, if possible, continue until the water level in the well reaches equilibrium or near-equilibrium conditions. Immediately upon completion of pumping, the recovery phase of the test shall begin and continue for a period equal to the duration of pumping or until the water level in the pumping well recovers to within 90 percent of the pre-pumping water level, whichever occurs first.

- c. **Monitoring:** The rate of discharge from the pumping well shall be measured and recorded at standard intervals during the test. (See Section 6.250 for references of standards and guidelines.) Water levels in the pumping and observation wells shall be monitored during the pumping phase of the test and the pumping well shall be monitored during the recovery phase of the test. All water level drawdown and recovery measurements shall be made at standard intervals. Monitoring shall include pre-test measurements of water levels in the pumping well and observation wells to identify possible water level trends and shall be for a period of at least 8 hours immediately prior to the start of pumping.

C. Laboratory Testing for Water Quality

1. Water quality sampling and analyses shall be conducted on each test well to provide evidence that the local groundwater system is capable of providing potable water. Such tests shall be conducted in accordance with the latest revision of the Chapter 1040 of the Codified Ordinances of Loudoun County. Water quality testing results to satisfy this requirement shall be applicable for not more than three (3) years after sample collection unless the subdivision plat or plats for the entire subdivision have been recorded.
2. The County may require additional water quality sampling if a well has one or more of the water quality test results listed below in subparagraphs a through c. The Applicant shall notify the County Department of Health and County Department of Building and Development prior to conducting any additional sampling.
 - a. The presence of any regulated contaminant at a concentration above the maximum contaminant level as defined in the latest version of the Waterworks Regulations of the Virginia Department of Health.
 - b. The presence of any unregulated contaminant as defined in the latest version of the Waterworks Regulations of the Virginia Department of Health at a concentration equal to or greater than the laboratory's detection or reporting limit.
 - c. The presence of any hazardous compound associated with either regulated or unregulated contaminants (e.g., methyl tertiary butyl ether [MTBE]) at

a concentration equal to or greater than the laboratory's detection or reporting limit.

D. Well Protection

Upon completion of all testing, the applicant shall assure that each well is secured and permanently protected until being put in use by:

1. Installing a lockable well cap with lock or welding a piece of flat steel that completely seals the well casing; and
2. Placing a seven (7)-foot post of a bright, visible color next to the well casing to ensure visible identification of the well.

6.213 REPORTING REQUIREMENTS

The detailed hydrogeologic report shall include, at a minimum, the items described in paragraphs A through N below. All report material shall be organized by either "type" (well completion reports, pumping test analyses, water quality reports, etc.) or by well, in tabbed appendices clearly marked showing the content of the tabbed section. Identification of test sites, field data, laboratory reports, and test analyses must all match exactly. Raw field data (and corrected data if used) from the pumping tests and a tabulated summary of well drilling and testing results (including items listed below in sections F, G, and, unless pre-approved by the County, section H) shall be included with the report in a digital format acceptable to the County.

A. General Discussion

A discussion of the geologic setting, local watershed, hydrogeologic units, land surface elevation and relief, occurrence and movement of surface water and groundwater, and interpretation of groundwater data from surrounding areas, including groundwater quality.

B. Maps

A map or set of maps (scales from 1:2400 [1 inch = 200 feet] to 1:12000 [1 inch = 1,000] feet and with north arrows and explanations as needed) covering the development proposal. The map(s) shall contain all existing planimetric features, topography with contour intervals of 5 feet or less in North American Vertical Datum of 1988 (NAVD 88), North American Datum of 1983 Virginia North State (NAD 83 HARN) coordinate grid system, all proposed roads, proposed lot lines, proposed lot sites, proposed house sites, proposed septic fields, surface water features, and springs. Groundwater contours with data control points and direction of groundwater flow shall be illustrated. (Projects that were started prior to November 9, 2009 may use the previously required NAD 27 datum.)

C. Cross-Sections

The report shall contain one or more cross-sections, at true horizontal scale and vertical scale (exaggerated as appropriate). The location of each cross-section shall be shown on the plan view map and the cross-section shall contain the following information:

1. Geologic data including regolith, bedrock, and structural features if present.
2. Well site locations showing well casings, total depths, and specific capacities.
3. Elevations of ground surface, rock formations, and static water surfaces.
4. Final water level in each pumped well at the end of the pumping tests and the corresponding pumping rate of the well.

D. Geologic Logs

For each well drilled for the investigation, a geologic log shall be completed and sealed by a Virginia certified professional geologist. A Virginia Water Well Completion Report (form GW-2) shall be completed for each well and signed by the driller who shall be licensed to do business in Loudoun County. The geologic log shall include the NAD 83 HARN grid coordinates and land surface elevation in NAVD 88 of the well. (Projects that were started prior to November 9, 2009 may use the previously required NAD 27 datum.)

E. Well Construction Diagrams

For each well constructed for the investigation, provide a well construction diagram with vertical scale showing (when applicable) the well number, well permit number, date of construction, well location coordinates, land surface elevation, total depth, well casing depth, grout depth, bentonite seal thickness, top and bottom of well screen, height of casing above land surface, static water level and date, depth of distinct water bearing zones and estimated contribution per zone, and corresponding graphic (symbol) geologic log with generalized descriptive text.

F. Well Construction Summary

For all wells constructed for the investigation, provide a summary table which includes, at a minimum, the well I.D. number, well construction permit number, completion date, land surface elevation, total well depth, well casing depth, depth to bedrock, static water level (all on the same date), total well yield and yield test method, and depths and estimated yields of water producing zones.

G. Well Testing Summary

In either the well construction summary table (previous item) or a separate table, summarize the well testing results, including at a minimum, the well number (and pumping well number if different), date tested, duration of pumping, pumping rate, pre-pumping (static) water level, maximum observed water level drawdown, distance to pumped well, percent of available drawdown used (assume maximum available drawdown is 40 feet above well bottom or use more stringent criteria if appropriate), specific capacity, transmissivity, storativity (if available), and time to achieve 90 percent recovery (or the percent recovery after a specified time) in the pumped well.

H. Groundwater Quality

For all wells tested for the investigation, provide a table summarizing the groundwater quality and include, at a minimum, the concentrations of any compounds exceeding the maximum contaminant levels as defined in the latest version of the Waterworks Regulations of the Virginia Department of Health and any detected organic compound or pesticide. Copies of the laboratory reports shall be included in the appendices.

I. Water Balance

The report shall develop groundwater mass balance and recharge estimates for the area. Applicable calculations and references shall be included as well as assumptions and limitations of the methods used. The report shall include a discussion of the following information, including appropriate supporting calculations and diagrams, which shall include, at a minimum:

1. Identification of the source or sources of recharge, using recharge from rainfall for normal conditions of 10 inches per year and for drought conditions of 6 inches per year.
2. The calculated effect of all proposed subdivision wells pumping at a daily net consumption rate specific and appropriate to the conditions and intended use. For subdivisions with communal water systems, provide calculations for both of the following conditions:
 - a. At a rate that does not include lawn and landscape irrigation.
 - b. At a rate that does include irrigation of private lawns and any irrigated common area lawns and landscaping. Irrigation rates used in calculations shall follow normal recommendations for the area (e.g., 1 inch of water per week for turf lawns during dry periods).

- J. For communal systems in LOD, prepare:
2. A wellhead protection plan to include:
 - a. Delineation of wellhead's zone of influence. The methodology used to delineate the zone of influence shall be technically based on site-specific data, and be appropriate to Hydrogeologic conditions and the withdrawal rate of the intended use. The methodology chosen shall be referenced and justified in terms of its appropriateness.
 - b. Estimation of sustainable yield (i.e. the average rate of pumping that can be maintained without endangering either the quantity or quality of groundwater.)
 - c. Pumping schedule.
 - d. Number and location of independent backup wells.
 3. An analysis and evaluation of the impact of groundwater withdrawals on the groundwater and surface water resources including the impact on surrounding water supply wells
 4. A plan for investigating potential impacts on existing off-site water supply wells within a minimum of 1,000 feet of the proposed development's production wells if the off-site wells experience water level or water quality problems during periods of production well use. Initial mitigation measures would include demand management strategies.
- K. Nitrate Loading Computations shall be performed in accordance with the Loudoun County Department of Health memorandum dated February 27, 1989.
- L. Evaluate the possibility of wells on the remaining (non-tested) individual lots having inadequate yield and propose how these may be addressed.
- M. Aquifer Test Analyses

The transmissivity and storativity of the various materials evaluated by aquifer tests interpreted using professionally accepted methods. Indicate the analytical method used, the appropriateness of the selected method relative to the hydrogeologic conditions, and show a summary of calculations. If there are significant background trend effects that are identified in the pre-test monitoring data or by other means, then the pumping test data shall be corrected for these effects prior to analysis and the corrected data shown on a graph.

N. Safe Yield Evaluation

Testing results and topics pertinent to the concept of “safe yield” shall be presented and discussed under a separate heading of the report. The methods used in the evaluation along with the method's assumptions and limitations shall be explained. For the purposes of this report, the safe yield evaluation shall encompass the assessment of the effects from the combined groundwater withdrawal of the proposed subdivision. These effects shall include but not be limited to:

1. Estimated extent of the one (1)-foot drawdown contour using representative values of transmissivity and storativity (based on the on-site testing) and a net withdrawal rate of 150 gpd per household or the rate used in paragraph 6.213.I.2 above, whichever is greater.
2. Alteration of groundwater flow direction including a map showing estimated groundwater contours and flow directions resulting from the effects of the net withdrawal rate used in the calculations for paragraph 6.213.I.2 above or based on more accurate data if available. This map shall be on the same base and scale as the pre-development groundwater contour and flow map required in paragraph 6.213.B.
3. The potential adverse or undesired affects to the water resources caused by the estimated combined groundwater withdrawal from all of the proposed development wells (items 1 and 2 above). Examples of adverse affects are the possibilities of lowering or depleting on-site surface water or groundwater sources and drawing in or altering the flow direction of groundwater from potential pollution sources such as leaking USTs, ASTs, waste water, or other zones of contaminated surface or groundwater. Such discussion should also address the potential for lowering or depleting offsite surface water or groundwater sources.

6.220 HYDROGEOLOGIC REPORT REQUIREMENTS FOR SOLID WASTE FACILITIES

Refer to the most recent versions of Chapter 1080 of the Codified Ordinances of Loudoun County and the Virginia Solid Waste Management Regulations for the hydrogeologic report requirements for solid waste facilities.

6.230 HYDROGEOLOGIC REPORT REQUIREMENTS FOR RESOURCE EXTRACTION

The following information, testing, analyses, and reporting are required at a minimum:

A. Background Information

Conduct a background evaluation of the hydrogeology using readily available existing

resources such as publications and/or data from the U.S. Geological Survey, State of Virginia Water Control Board, U.S. Environmental Protection Agency, Loudoun County Department of Health, and Office of Mapping and Geographic Information. At a minimum, extend the evaluation to include the area within approximately one (1) mile beyond the property boundary.

1. USGS and Loudoun County topographic information, whichever is more detailed.
2. Property plats and aerial photographs.
3. Geologic maps and data reports (well logs, water quality analysis, geologic information).
4. Existing well data or descriptive statistical summary of the same. (For example, minimum, maximum and mean of well depths, water levels, etc.).
5. Reference existing research reports, hydrogeologic reports, geophysics reports, etc.
6. Existing pollution sources (e.g. underground storage tanks, septic fields, graveyards, etc) of record or observed on site and within a minimum of 2,000 feet of the site boundary. An attempt shall be made to verify sources of record by field reconnaissance. The report shall contain a copy of a study from a company or companies that specialize in federal and state database searches for historical pollution source reporting. The report shall contain statements as to the type of background investigation conducted for pollution sources, the results of the investigation, and a verification statement that certifies that this historical pollution search has been conducted.

B. Analysis of Background Information

Using the background information compiled previously, conduct an evaluation of the site hydrogeology including:

1. Preliminary field verification of existing geologic information including rock outcrops, karst features, etc.
2. Analysis of fracture fabric: At sites with bedrock outcrops, fracture orientations (strike and dip measurements) shall be measured and documented in the report. The number and orientations of linear features or photo lineaments shall be analyzed and correlated with documented bedrock fractures.
3. Locations and identifications of all wells within 2,000 feet of the proposed area of resource extraction or production wells.

4. Water budget analysis: The effects of the proposed development on groundwater and surface water discharges shall be evaluated using water budget concepts. The evaluation shall include available recharge under normal and drought conditions, net consumption of groundwater by the development, and groundwater baseflow to streams using, when possible, available data from the subwatershed in which the proposed development is located.

C. Geophysical Survey

A geophysical survey shall be conducted to investigate zones adjacent to the proposed resource extraction area that may be sensitive to soil/rock removal or dewatering activities in the form of reduced stability or increased groundwater flow. Information from the background data analyses shall be used to assist in targeting potential transects for the surveys. The geophysical method or methods used shall be appropriate for the hydrogeologic conditions and purpose of the study. A summary of the survey shall be presented in the report including a description of the methods used, diagrams of the survey transect locations, an interpretation of the data, and an analysis of the findings with respect to the proposed land use. A copy of all logs, field data, and data interpretations shall be provided to the County if requested. Results of the survey shall be used to help select sites for additional investigation, well construction, and aquifer testing.

D. Geology

For each well drilled for the investigation, lithologic samples shall be collected at intervals of 10 feet or change in lithology, whichever is less. Geologic logs shall be completed and sealed by a Virginia Certified Professional Geologist. The Applicant shall retain these samples for a period of one (1) year after the study has been approved and provide them to the County if requested.

E. Pumping Test

The minimum number of pumping tests required is contingent on acreage, layout, and volume of the proposed area of resource extraction. The tests shall include:

1. Wells: For each well to be tested, a minimum of two (2) observation wells will be required. Additional existing wells shall be monitored as observation wells if they are available and within a distance that is reasonable to expect measurable impacts from the pumping test. The locations of the wells intended for monitoring shall be proposed by the applicant and approved by the Loudoun County Department of Health and the Department of Building and Development. If dewatering will be part of the proposed resource extraction process, a series of test wells near the edge of the proposed extraction area shall be installed and completed to a depth below the planned level of dewatering for use in simulating dewatered conditions.

2. Method and Rate: Each test shall employ the down-hole method of pumping and be at a continuous and constant rate. A pumping rate shall be used that reasonably stresses the aquifer but does not result in excessive drawdown in the well. The selected pumping rate shall not vary by more than ten (10) percent during the test. If test wells are pumped to simulate dewatered conditions, the pumping test shall be a constant drawdown test and the water level in the well shall be quickly pumped down to and held at or below the planned level of dewatering. In all cases, discharge water shall be conveyed downgradient a sufficient distance (minimum 200 feet) from the pumping and observation wells, or to an impermeable conveyance feature (e.g., storm drain) or stream, to prevent recharge to the aquifer that could affect the test results.
 3. Duration: Pumping shall be continuous for not less than forty-eight (48) hours and continue until the water level reaches equilibrium or near-equilibrium conditions. Immediately upon completion of pumping, the recovery phase of the test shall begin and continue for a period equal to the duration of pumping or until the water level in each well (and at each surface water site) recovers to within 90 percent of the pre-pumping water level, whichever occurs first.
 4. Monitoring: The rate of discharge from each pumping well shall be measured and recorded at standard intervals during the test. (See Section 6.250 for references of standards and guidelines.) Water levels in the pumping and observation wells shall be monitored during the pumping phase and recovery phase of the test. All water level drawdown and recovery measurements shall be made at standard intervals. Monitoring shall include pre-test measurements of water levels in the pumping well and observation wells to identify possible water level trends. Pre-test monitoring shall be conducted for a period of at least 48 hours immediately prior to the start of pumping. If there are significant background trend effects that are identified in the pre-test monitoring data or by other means, then the pumping test data shall be corrected for these effects prior to analysis and the corrected data shown on a graph. The water level of ponds, streams, and springs within the immediate vicinity of the pumping well(s) shall be measured on an hourly basis for the duration of pumping. Where appropriate and technically feasible, flow measurements shall be recorded in streams and springs at a minimum of every six (6) hours. Pre-test monitoring of surface waters shall be conducted for a period of at least 48 hours immediately prior to the start of pumping.
- F. The transmissivity and storativity of the aquifer(s) based on aquifer tests evaluated using professionally accepted methods. Indicate the analytical method used, the appropriateness of the selected method relative to the hydrogeologic conditions, and show a summary of the calculations including data plots and curve matching.

- G. Groundwater monitoring program proposal to include:
1. Monitoring well locations and construction specifications.
 2. Monitoring and reporting frequency.
 3. Water quality sampling and analysis plan (methodologies according to Virginia Groundwater Quality or ASTM Standards, whichever is more stringent).
 4. Well maintenance and security.
- H. Hydrogeologic cross-sections showing the geology, proposed area of extraction (include diagrams showing before extraction and after extraction conditions), well casings and total depths, and static groundwater levels.
- I. Include an evaluation on the impact of the proposed extraction operations (including but not limited to dewatering) on surrounding geologic stability, groundwater and surface water
- J. For existing and future off-site water supply wells within a minimum of 1,000 feet of the proposed resource extraction area, quantity and quality baseline testing prior to extraction shall be conducted and submitted and a plan for investigating and mitigating the potential impacts on existing off-site water supply wells within a minimum of 1,000 feet of the proposed resource extraction area if the off-site wells experience water level or water quality problems while the extraction process or dewatering is active.
- K. Include all water level monitoring and pumping data used in the report in a digital format acceptable to the County.

6.240 HYDROGEOLOGIC REPORT REQUIREMENTS FOR OTHER DEVELOPMENTS

Other types of developments that withdraw groundwater, including but not limited to recreational developments (golf courses, water theme parks, etc.), large non-agricultural irrigation systems, and industrial or commercial developments with water demands potentially exceeding an average of ten thousand (10,000) gallons per day during any single thirty (30)-day period. Also included are proposed agricultural developments potentially withdrawing more than one million (1,000,000) gallons during any 30-day period. The minimum information, testing, analyses, and reporting requirements for other developments are listed in the section below. Given the wide range of these developments, the resulting potential impacts to groundwater and surface water resources may vary significantly. For some proposed developments, more rigorous testing and evaluation may be appropriate because of their planned groundwater needs or their location. It is recommended that the applicant, prior to conducting their investigation, arrange a meeting with the County to discuss their proposed development and find out if more rigorous testing and evaluation requirements are appropriate.

A. Background Information

Conduct a background evaluation of the hydrogeology using readily available existing resources such as publications and/or data from the U.S. Geological Survey, State of Virginia Water Control Board, U.S. Environmental Protection Agency, Loudoun County Department of Health, and Office of Mapping and Geographic Information. At a minimum, extend the evaluation to include the area within approximately one (1) mile beyond the property boundary.

1. USGS and Loudoun County topographic information, whichever is more detailed.
2. Property plats and aerial photographs.
3. Geologic maps and data reports (well logs, water quality analysis, geologic information).
4. Existing well data or descriptive statistical summary of the same. (For example, minimum, maximum and mean of well depths, water levels, etc.)
5. Reference existing research reports, hydrogeologic reports, geophysics reports, etc.
6. Existing pollution sources (e.g. underground storage tanks, septic fields, graveyards, etc) of record or observed on site and within a minimum of 2,000 feet of the site boundary. An attempt shall be made to verify sources of record by field reconnaissance. The report shall contain a copy of a study from a company or companies that specialize in federal and state database searches for historical pollution source reporting. The report shall contain statements as to the type of background investigation conducted for pollution sources, the results of the investigation, and a verification statement that certifies that this historical pollution search has been conducted.

B. Analysis of Background Information

Using the background information compiled previously, conduct an evaluation of the site hydrogeology including:

1. Preliminary field verification of existing geologic information including rock outcrops, karst features, etc.
2. Analysis of fracture fabric: At sites with bedrock outcrops, fracture orientations (strike and dip measurements) shall be measured and documented in the report. The number and orientations of linear features or photo lineaments shall be analyzed and correlated with documented bedrock fractures.

3. Locations and identifications of all wells within 2,000 feet of the proposed development's production wells.
4. Water budget analysis: The effects of the proposed development on groundwater and surface water discharges shall be evaluated using water budget concepts. The evaluation shall include available recharge under normal and drought conditions, net consumption of groundwater by the development, and groundwater baseflow to streams using, when possible, available data from the subwatershed in which the proposed development is located.

C. Geophysical Survey

Depending on the type of development and its water demands, the County may require that a geophysical survey be conducted to investigate subsurface conditions that can not be readily determined through other methods. The Applicant shall present the preliminary findings of the initial investigation (sections 6.240 A and B above) to the Loudoun County Department of Health and Department of Building and Development for a determination of the need for a geophysical study. If a geophysical survey is conducted, information from the background data analyses shall be used to assist in targeting potential transects for the surveys. The geophysical method or methods used shall be appropriate for the hydrogeologic conditions and purpose of the study. A summary of the survey shall be presented in the report including a description of the methods used, diagrams of the survey transect locations, an interpretation of the data, and an analysis of the findings with respect to the proposed land use. A copy of all logs, field data, and data interpretations shall be provided to the County if requested. Results of the survey shall be used to help select sites for additional investigation, well construction, and aquifer testing.

D. Geology

For each well drilled for the investigation, lithologic samples shall be collected at intervals of 10 feet or change in lithology, whichever is less. Geologic logs shall be completed and sealed by a Virginia Certified Professional Geologist. The Applicant shall retain these samples for a period of one (1) year after the study has been approved and provide them to the County if requested.

E. Pumping Test

The minimum number of pumping tests required are contingent on acreage and layout of the proposed development and the volume and proposed use of groundwater.

1. Wells: For each well to be tested, a minimum of two (2) observation wells will be required unless otherwise approved by the County. Other test wells may be temporarily used as the required two observation wells provided they are within a

distance that is reasonable to expect measurable impact from the test pumping well. (In addition to the two required observation wells, additional existing wells, if they are available, shall also be monitored as observation wells if they are relatively close to the pumping test well.) The locations of the wells intended for monitoring shall be proposed by the applicant and approved by the Loudoun County Department of Health and the Department of Building and Development.

2. **Method and Rate:** Each test shall employ the down-hole method of pumping and be at a continuous and constant rate. A pumping rate shall be used that reasonably stresses the aquifer but does not result in excessive drawdown in the well. The pumping rate shall not be less than the maximum anticipated daily withdrawal rate used in the proposed groundwater withdrawal plan (see Section 6.240.I). The selected pumping rate shall not vary by more than ten (10) percent during the test. Discharge water shall be conveyed downgradient a sufficient distance (minimum 200 feet) from the pumping and observation wells, or to an impermeable conveyance feature (e.g., storm drain) or stream, to prevent recharge to the aquifer that could affect the test results.
3. **Duration:** Pumping shall be continuous for not less than forty-eight (48) hours and continue until the water level in the well reaches equilibrium or near-equilibrium conditions. A minimum test duration greater than forty-eight (48) hours may be appropriate and required depending on the location and groundwater needs of the proposed development or to satisfy requirements of other agencies. Immediately upon completion of pumping, the recovery phase of the test shall begin and continue for a period equal to the duration of pumping or until the water level in each well (and each surface water site) recovers to within 90 percent of the pre-pumping water level, whichever occurs first.
4. **Monitoring:** The rate of discharge from each pumping well shall be measured and recorded at standard intervals during the test. (See Section 6.250 for references of standards and guidelines.) Water levels in the pumping and observation wells shall be monitored during the pumping phase and recovery phase of the test. All water level drawdown and recovery measurements shall be made at standard intervals. Monitoring shall include pre-test measurements of water levels in the pumping well and observation wells to identify possible water level trends. Pre-test monitoring shall be conducted for a period of at least 48 hours immediately prior to the start of pumping. If there are significant background trend effects that are identified in the pre-test monitoring data or by other means, then the pumping test data shall be corrected for these effects prior to analysis and the corrected data shown on a graph. The water level of ponds, streams, and springs within the immediate vicinity of the pumping well(s) shall be measured on an hourly basis for the duration of pumping unless otherwise approved by the County. Where appropriate and technically feasible, measurements shall be recorded in streams and springs at a minimum of every six (6) hours. Pre-test monitoring of surface waters shall be conducted for a period of at least 48 hours immediately prior to the

start of pumping.

- F. Determination of aquifer transmissivity and storativity.
- G. Groundwater monitoring program proposal to include:
 - 1. Monitoring well locations and construction specifications.
 - 2. Monitoring and reporting frequency.
 - 3. Water quality sampling and analysis plan (methodologies according to Virginia Groundwater Quality or ASTM Standards, whichever is more stringent).
 - 4. Well maintenance and security.
- H. Hydrogeologic cross-sections showing the geology, proposed production wells, test and observation well casings, total depths, and static groundwater levels.
- I. Proposed groundwater withdrawal plan including estimated average and maximum withdrawals, by well, by month, for a one year period and the estimated maximum withdrawal for a one (1)-day period. Include a percentage breakdown of the major uses of the groundwater.
- J. An analysis and evaluation of the impact of groundwater withdrawals on the groundwater and surface water resources including the impact on surrounding water supply wells.
- K. A plan for investigating and mitigating potential impacts on existing off-site water supply wells within a minimum of 1,000 feet of the proposed development's production wells if the off-site wells experience water level or water quality problems during periods of production well use.
- L. Water Quality Sampling: Any well used or potentially used for potable water supply shall be sampled in accordance with the latest version of the Waterworks Regulations of the Virginia Department of Health. Contact the Loudoun County Department of Health for specific testing requirements.
- M. Include all water level monitoring and pumping data used in the report in a digital format acceptable to the County.

6.250 REFERENCES OF STANDARD PRACTICES AND GUIDELINES

American Society for Testing and Materials (ASTM) Standards: D 653, Terminology Related to Soil, Rock, and Contained Fluids; D 2488, Practice for Description and Identification of Soils (Visual Manual Procedure); D 4043, Guide for Selection of Aquifer-Test Field and Analytical Procedures in Determination of Aquifer Properties by Well Techniques; D 4050, Standard Test Method (Field Procedure) for Withdrawal and Injection Well Tests for Determining Hydraulic Properties of Aquifer Systems; D 4105, Test Method (Analytical Procedure) for Determining Transmissivity and Storativity of Nonleaky Confined Aquifer by the Modified Theis Nonequilibrium Method; D 4106, Test Method (Analytical Procedure) for Determining Transmissivity and Storativity of Nonleaky Confined Aquifers by the Theis Nonequilibrium Method; D 4448, Standard Guide for Sampling Ground Water Monitoring Wells; D 4750, test Method for Determining Subsurface Liquid Levels in a Borehole or Monitoring Well (Observation Well); and D 5092, Standard Practice for Design and Installation of Ground Water Monitoring Wells in Aquifers. E 1527, Practice for Environmental Site Assessments: Phase I Environmental Site Assessment Process.

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CHAPTER 7.000

ENVIRONMENTAL DESIGN STANDARDS

7.100 STREET AND SITE LIGHTING STANDARDS

The standards established within this section are applicable to lighting required in conjunction with subdivision and/or site plan development. In addition, the light and glare performance standards established within the Zoning Ordinance shall be met, where applicable.

It is the intent of this section to assure lighting practices and systems that will improve the quality and effectiveness of night-time lighting, protect the night sky, provide glare reduction, minimize light trespass, and conserve energy and resources, while maintaining night-time safety, utility, security and productivity.

7.110 GENERAL REQUIREMENTS

Construction plans and profiles and site plan submissions shall show the layout of the proposed lighting fixtures. The plans shall also include a narrative specifically outlining the proposed lighting standards and specifications, the parties responsible for the associated operation and maintenance costs and, if applicable, the permit requirements, as established in this section. Fixtures shall be located so as not to interfere with other utilities, and to minimize potential conflicts with building sites. Lighting shall be provided in accordance with the following:

- A. Unless prohibited by VDOT standards, full cutoff and fully shielded light fixtures shall be utilized to meet the requirements of this chapter.
 - 1. Street lighting shall be provided at Public and Category A subdivision street intersections within single family detached subdivisions in accordance with the standards outlined in this chapter. This applies to street intersections in all Urban Districts and all Planned Districts as defined in the Zoning Ordinance with the exception of PD-RV and PD-CV Districts.
 - 2. Street lighting shall be provided along private streets/accessways within townhouse developments in accordance with the standards outlined in this chapter.
 - 3. Site lighting shall be provided within multi-family developments in accordance with the standards outlined in this chapter.
- B. Residential Subdivisions/Site Plans
 - 1. Street lighting shall be provided at Public and Category A subdivision street intersections within single family detached subdivisions in accordance with the

standards outlined in this chapter. This applies to street intersections in all Urban Districts and all Planned Districts as defined in the Zoning Ordinance with the exception of PD-RV and PD-CV Districts.

2. Street lighting shall be provided along private streets/accessways within townhouse developments in accordance with the standards outlined in this chapter.
3. Site lighting shall be provided within multi-family developments in accordance with the standards outlined in this chapter.

C. Retail, Commercial, Office, And Industrial Subdivisions/Site Plans

1. Street lighting shall be provided at Public and Category A subdivision street intersections in accordance with the standards outlined in this chapter.
2. Site lighting shall be provided within developments which provide customer services to the general public after 5:00 p.m.

7.120 LIGHTING STANDARDS

A. Street Lighting

1. Lighting located at subdivision street intersections shall be at a minimum of a 5,000 lumen colonial fixture with a Type III reflector or approved equal mounted at a 14' height. Four way intersections will require a maximum of 2 lights located on opposite corners. Intersections with four lane divided roadways will require lights at all corners.

B. Site Lighting

1. Lighting located within single family attached or multi-family developments shall be in general accordance with the Table below. Deviations from this table may be allowed if adequate information is provided to ensure that the requirements are met in an equivalent manner.

Table I - Standard Street Lighting Spacing

Lamp: Reflector:		Colonial Fixture Type III	
Lumen Rating	Mounting Height	Maximum Spacing	
5,000	10'	100'	
5,000	14'	120'	
8,000	10'	150'	
8,000	14'	190'	

2. Lighting located within developments which provide customer service to the public after 5:00 p.m. shall have a minimum of .6 foot-candle at grade and the average horizontal illumination shall not exceed 40 foot-candles at grade level, subject to a uniformity ratio (ratio of average to minimum illuminance) no greater than 4:1.

7.130 OPERATIONAL, MAINTENANCE, AND INSTALLATION COSTS

- A. Operation and maintenance costs of the lighting system will not be the responsibility of Loudoun County.
- B. The recordation documents of the subdivision will indicate that the operational and maintenance costs are not the public responsibility, and will further designate the party with whom these responsibilities will ultimately lie.
- C. Where the proposed system lies within or adjacent to dedicated public street right-of-way, the Virginia Department of Transportation requires that such operation, maintenance, and installation can only be contracted through public utilities or Loudoun County. The developer or responsible party shall sign an agreement with the public utility which guarantees full payment to the public utility of all associated charges, as well as all administrative costs experienced by the public utility. Said agreement shall be executed prior to Performance Bond release.
- D. When VDOT requests the installation of street lights within publicly maintained street right-of-way concurrent with the land development application process of Loudoun County, VDOT shall be obligated for the future operation and maintenance costs arising after the acceptance into the State system.

7.300 TREE CONSERVATION AREAS

- A. The County recommends that the following be considered priorities for tree conservation:
1. Trees, shrubs, and plants located within the Floodplain Overlay District;
 2. Intermittent and perennial stream buffers, nontidal wetlands, and steep slope areas;
 3. Contiguous forest that connects the largest undeveloped or most vegetated tracts of land within and adjacent to the site;
 4. Trees, shrubs, or plants determined to be rare, threatened, or endangered under the federal Endangered Species Act and those species identified by the Virginia Department of Game and Inland Fisheries;
 5. Trees that are identified as part of a registered historic site;
 6. Hedgerows/Fencerows; and
 7. Invigorated, healthy, structurally sound trees having a diameter measured at 4.5 feet above the ground of 30 inches or more.

7.303 TREE PROTECTION DURING CONSTRUCTION

A. Critical Root Zone

Tree preservation areas shall be identified on the site plan or construction plans and profiles. A “critical root zone” (CRZ) shall be delineated on the plans and clearly marked and protected in the field prior to any land disturbance. The CRZ shall be determined as follows:

1. For individual trees, the CRZ shall be represented by a concentric circle centered on the tree trunk with a radius equal in feet to one (1) times the number of inches of the trunk diameter (i.e., The CRZ for a twenty (20) inch diameter tree is twenty (20) feet).
2. When two or more trees are grouped together within a designated tree preservation area, the limit of the CRZ shall be the aggregate of the individual CRZs or a line 15 feet beyond the aggregate dripline of the trees.

B. General Requirements

1. Prior to any land disturbance suitable protective barriers, such as safety fencing, shall be erected outside of the CRZ of any tree or stand of trees to be preserved.

Protective barriers shall remain so erected throughout all phases of construction. No grade changes or storage of equipment, materials, debris, or fill shall be allowed within the area protected by the barrier. No construction traffic, parking of vehicles, or disposal of liquids is permitted within the CRZ.

2. Tree roots which must be severed shall be cut by a trencher or similar equipment aligned radially to the tree. This method reduces the lateral movement of the roots during excavation, which if done by other methods could damage the intertwined roots of adjacent trees. This effort shall take place and be complete prior to any land disturbance activities.
 3. Within four hours of any severance of roots, all tree roots that have been exposed and/or damaged shall be trimmed cleanly and covered temporarily with moist peat moss, moist burlap, or other moist biodegradable material to keep them from drying out until permanent cover can be installed.
 4. Trees likely to die as a result of site disturbance activities within 25 feet of the safety fence, as identified in the tree conservation plan, shall be removed.
 5. Grade changes and excavations shall not encroach upon the tree CRZ, unless supported by plan prepared by a design professional in this field and approved by the County.
 6. No toxic materials, including petroleum products, should be stored within 100 feet of the CRZ.
 7. Sediment, retention, and detention basins shall not be located within the CRZ. The basins shall not discharge directly into the CRZ unless the discharge is transitioned back to sheet flow prior to entering the CRZ or is discharged into an adequate natural channel, in accordance with Chapter 5 of this manual.
- C. When there is a change of grade within the tree conservation boundary of 30 inches or less, the cut slope will be graded no greater than 2:1. Where the change of grade is over 30 inches, a retaining wall shall be required.
- D. Pruning Methods

All final cuts shall be made sufficiently close to the trunk or parent limb but without cutting into the branch collar or leaving a protruding stub, according to the American National Standards Institute. All necessary pruning cuts must be made to prevent bark from being torn from the tree and to facilitate rapid healing. Flush cuts are unacceptable.

7.304 ESTABLISHMENT OF RIPARIAN STREAM BUFFERS

The County promotes the use of riparian stream buffers for the purpose of providing the required water quality BMP for a development site and such buffers may be used for BMP credits, in

accordance with Chapter 5 of this manual. The performance standards set forth in this section shall be used for the purpose of establishing a new buffer or to enhance an existing buffer. In either, case the minimum width of the buffer shall be 100 feet, measured from the stream's edge.

A. Plant Materials

Tree and shrub species should be native and have multiple values such as biomass, nuts, fruit, browse, nesting, and aesthetics. Native riparian tree species are preferable because they co-evolved with the stream's inhabitants. Bottomland species, such as silver maple, black willow, eastern cottonwood, green ash, and sycamore, are best suited for this zone. In the drier portions of the streamside zone, hardwoods such as black walnut, red and white oak, and white ash can be planted. If the water table is at least 3 feet below ground for most of the growing season, plant hardwood species that require good drainage. If the site has poor drainage, select hardwood species that are more tolerant of wet conditions. Some examples are river birch, black ash, bitternut, hickory, and hackberry. Species diversity should be provided in order to avoid loss of function due to species-specific pests; plantings should consist of a mixture of two or more species to achieve diversity. Tables within this chapter contain recommended riparian stream buffer tree species and plants.

1. One-to two-year-old seedlings of most tree and shrub species, or rooted or unrooted cuttings of black willow can be obtained from various forest nurseries. Seeds should be ordered as PLS (Pure Live Seed).
2. Plant trees and shrubs as soon as possible after receiving them. If planting must be delayed, keep plants cool and moist or heel-in. Always use high quality stock with good root systems. Quality hardwood seedlings should have a minimum of four to five large lateral roots.
3. Trees and shrubs should be planted in early spring (March–April). A tree planter, auger, planting bar, or shovel can be used to plant seedlings and cuttings. Before planting, soak rooted cuttings in water for 2 to 4 hours and unrooted cuttings for 24 hours. Root collars of seedlings should be slightly below the soil surface. Make sure planting holes are closed, that plant material is not J-rooted, and the soil around the root or cutting is firm. For unrooted cuttings, plant deep enough to leave only 1 or 2 buds above ground.
4. Site preparation, tree protection and maintenance are required in a riparian stream buffer. Technical expertise is available from the Virginia Department of Forestry or through the Urban Forester, Department of Building and Development.
5. Grass and forb seeds may be broadcast planted using a spinner-type seeder or a drop-seeder.

B. Planting Densities for Shrubs and Trees

Initial plant-to-plant densities for trees and shrubs will depend on their potential height at 20 years of age. Estimated heights are included in Table 6. It is recommended that plant spacing be clustered in a natural pattern.

Table 2 - Recommended Planting Densities

Plant Types/Height	Plants per Acre	Plant Spacing (ft)
Shrubs less than 10 ft in height	4,500 to 1,750	3 to 5
Shrubs and trees from 10 to 25 ft in height	1,750 to 450	5 to 10
Trees greater than 25 ft in height	450 to 100	10 to 30

Source: USDA-NRCS

- C. A minimum of 2 rows of trees and shrubs should be established alongside the water resource (i.e. Streamside Zone). The remaining area of the designated riparian zone should also be planted or left to meet natural regeneration requirements. Plantings can be intermixed with open areas treated for natural regeneration. An opening should not exceed 4,356 square feet (1/10 acre) in area. Total open area should not exceed 25% of the riparian stream buffer.
- D. Natural regeneration and direct seeding may be used with approval of the Director, where rapid establishment is not a high priority, and invasive plant species are absent. Where a native seed source exists within close proximity, allowing natural regeneration to occur may be the most cost-effective approach. Seeds may be sown to improve the success rate of desired species. A naturally regenerated riparian stream buffer is considered initially established when plant densities have reached the planted buffer recommended densities for trees and shrubs. Three growing seasons is a reasonable amount of time in which to determine if natural regeneration would take place and be initially established. Trees and shrubs are considered established when they have begun to dominate herbaceous plants and undesired shrubs that are competing with them for nutrients, water, and sunlight.
- E. Trees in the riparian stream buffer help provide streambed and streambank stability. Deadwood and leaf litter falling into the stream helps regenerate the streambed, and is very important to the health of the stream and to aquatic life. The tree species nearest the water's edge also provide shade and are selected for their ability to quickly develop deep roots that can increase bank stability.

Table 3

Recommended Tree Species for Streamside Zone		
American beech	Green Ash	Silver maple
Bald cypress	Hackberry	Sweetgum
Basswood	Loblolly pine	Swamp white oak
Bitternut hickory	Persimmon	Sycamore
Blackgum	Pitch pine	Tulip poplar
Black walnut	Red maple	White ash

Table 4

Recommended Shrub Species for Streamside Zone		
Arrowwood	Inkberry	Spicebush
Bayberry	Maple-leaf viburnum	Swamp azalea
Buttonbush	Pinxterbloom azalea	Swamp leucothoe
Common ninebark	Pussy willow	Sweet pepperbush
Elderberry	Red chokeberry	Virginia sweetspire
Grey dogwood	Rosebay rhododendron	Winterberry

Table 5

Recommended Understory Woody Plants for Streamside Zone		
American holly	Flowering dogwood	Redbud
Blackhaw	Hornbeam	Shad-bush
Boxelder	Paw paw	Sweet bay

Notes:

1. The large hardwood tree species mentioned above provide a canopy as they mature. Understory trees and shrubs should be interplanted among these canopy species to provide stability for the streambank and shading next to the water.
2. Table 4 lists shrub species tolerant of flooding and wet soils.
3. Table 5 lists understory species recommended for the Chesapeake Bay watershed.
4. On sunny banks, shade-intolerant species will thrive until overshadowed by the canopy. On wide streams, south-and west-facing banks receive more sun. North-facing streambanks receive less solar exposure. Fewer

species thrive in these shadier conditions, so plant selection is more limited. Swamp leucothoe (fetterbush), pinxterbloom azalea, spicebush, rosebay rhododendron, and mapleleaf viburnum are good choices for shady conditions.

5. Native forbs also may be part of the mix, especially if they are seeded in clumps with other native grasses.

F. Preparation of Planting Sites

Planting sites shall be properly prepared based on the soil type and existing and planned vegetation.

1. Often, a riparian stream buffer will have a mixture of pasture, overgrown fields, and a line of branchy, poor quality trees along the stream. This requires a combination of site preparation techniques. In all situations a combination of mechanical and herbicidal methods will be most effective and efficient. Site preparation should begin the fall prior to planting. In some situations site preparation can require up to a year of vegetation control prior to planting. Any necessary streambank stabilization needs to be included in the planting plan so work can proceed in a logical order.
2. If the area has been used for row crops, disk the ground in the spring and seed the area where the woody material will be planted with a cover crop, such as annual rye grass or cereal rye. Since a good cover is essential, cool season grasses such as field brome grass and tall fescue are often appropriate. These grasses are not invasive, do not require mowing, and will be shaded out (eventually eliminated) by the woody plants.
3. In pasture-type situations, eliminate competing perennial vegetation with herbicides in 3-to 4-foot-wide circles or strips where trees or shrubs will be planted. Many pasture type areas may be machine planted. The machinery removes strips of grass and competing vegetation along the lines being planted. It also allows for much easier follow-up maintenance. Problem species, such as multiflora rose and honeysuckle, will still need to be controlled by cutting, pulling, and/or herbicides.
4. Abandoned fields of varying ages already have tree saplings, shrubs, and vines. In this situation, site preparation focuses on releasing the desired saplings and other plants from competition by undesired species. Release methods vary according to the target species and extent of infestation by invasives. Techniques include spraying basal bark herbicides during the dormant season, cutting large shrubs and vines and then treating the stumps to prevent resprouting, and mowing everything around the "keepers" after they have leafed out in late spring. Larger cut stumps may also require an application of an herbicide to control resprouting.

5. Herbicides that are rendered inactive upon contact with the soil are recommended for riparian stream buffers. If pesticides are used for site preparation, apply only when needed and where needed to control competition from undesirable plants or insect damage. Handle and dispose of pesticides properly and in accordance with federal, state and local regulations. Follow label directions and heed all safety precautions listed on the container.

G. Site Stabilization

Mulch may be used for erosion control, weed control, and moisture conservation for new plantings on all sites, particularly those with pronounced growing season moisture deficits or invasive, weedy species. When stabilizing the disturbed areas between tree plantings, do not use grasses or legumes which will “out compete” the new seedlings. Where possible, a circle of heavy mulch around seedlings will help them compete with herbaceous plants.

H. Planting Protection

Human activities, livestock activities, and wildlife might hinder successful establishment of a riparian buffer. Planting protection should be considered where there is potential for damages. Cattle, horses or stock must be fenced from any riparian planting. This also protects water quality and prevents streambank degradation.

I. Wildlife Damage

Browsing deer or beaver activity might hinder establishment of a riparian stream buffer. To prevent or reduce damage to the riparian stream buffer from deer or beaver consider using one or more of the following measures:

1. Use plants that are considered less palatable to beaver or deer. Using plants that may not be attractive to these animals might help reduce browsing damage. However, starving beaver and deer will feed on anything they can reach.
2. Some plants considered less palatable to beaver are: Spruce, White Cedar, Hemlock, Tamarack (Larch), Beech, Red Maple, and White Birch. Avoid plants that are preferred by beaver such as Poplars (tulip tree), Yellow Birch, and Ash.
3. Some plants considered less palatable to deer are: Alder, Spruce, Hemlock, Tamarack (Larch), Beech, Hornbeam (Iron wood), Hawthorne, and Sycamore. Avoid using plants preferred by deer such as Ash, Apple, White and Yellow birch, Maples, White Cedar, Dogwoods, and Willows.
4. Some plants that are preferred deer or beaver foods, but will endure heavy browsing are: Dogwoods, Willows, Ash, and Yellow Birch.
5. Protect young seedlings. Planting tubes are commercially available to protect

young seedlings from browsing. Tubes are not recommended where frequent flooding occurs.

6. Deer Repellents: Taste and odor repellents are commercially available. Repellent performance will vary depending on the density of the deer population and the availability of other sources of food.

J. Maintenance

Weed control is essential for the survival and rapid growth of trees and shrubs in a buffer. Options include 4 to 6 inches of organic mulch, weed control fabrics, shallow cultivation, nonchemical weed control techniques, and mowing. Continue weed control until woody plants occupy the area, normally 2 to 3 years.

K. Long-term Management

Buffers should be monitored and managed to maintain their maximum water quality and wildlife habitat benefits. They should be inspected at least once a year, and always within a few days of severe storms for evidence of sediment deposit, erosion, or concentrated flow channels. Repairs should be made as soon as possible.

Table 6 - Recommended Trees for Riparian Buffer Areas
(Match Species with drainage)

Common Name	Scientific Name	Mature Ht. (ft)	Tolerance to Wet Soils	Tolerance to Shade	Tolerance to Dry Soils	Tolerance to Flooding	Aesthetics	Wildlife Habitat
			L=Low, M=Medium, H=High					
Hardwood Trees								
Red Maple	<i>Acer rubrum</i>	50 to 70	H	M	H	H	H	M
Silver Maple	<i>Acer saccharinum</i>	60 to 80	H	L	L	M	M	M
Speckled Alder	<i>Ainus rugosa</i>	30 to 40	H	H	M	H	M	M
River Birch	<i>Betula nigra</i>	50 to 80	H	M	M	H	H	L
Gray Birch	<i>Betula populifolia</i>	33	M	L	M	L	L	L
White Ash	<i>Fraxinus americana</i>	75 to 100	H	L	M	H	H	H
Green Ash	<i>Fraxinus pennsylvanica</i>	30 to 50	H	L	H	H	L	H
American Sycamore	<i>Platanus occidentalis</i>	110 to 120	H	L	H	H	M	L
Cottonwood	<i>Populus deltoides</i>	80 to 100	H	L	M	H	H	M
Swamp White Oak	<i>Quercus bicolor</i>	60 to 70	H	M	L	H	L	H
Pin Oak	<i>Quercus palustris</i>	40 to 80	M	M	H	H	M	H
Black Willow	<i>Salix nigra</i>	30 to 60	H	L	L	M	H	L
Basswood	<i>Tilia americana</i>	65 to 80	M	H	L	M	M	M
Evergreen Trees								
Eastern redcedar	<i>Juniperus virginiana</i>	20 to 50	H	H	H	H	M	H
Tamarack	<i>Larix laricina</i>	50 to 80	M	L	L	M	H	L
White Spruce	<i>Picea glauca</i>	60 to 70	M	M	H	M	M	H
White Pine	<i>Pinus strobus</i>	60 to 100	M	H	M	L	H	M
Northern White Cedar	<i>Thuja occidentalis</i>	50 to 65	M	M	M	M	H	M
Eastern Hemlock	<i>Tsuga canadensis</i>	65 to 80	L	H	H	L	H	H
Shrubs								
Shadbush	<i>Amelanchier canadensis</i>	20 to 30	H	M	H	H	H	H
Silky Dogwood	<i>Cornus amomum</i>	7 to 10	H	L	M	H	M	H
Hawthorn	<i>Crataegus L.</i>	5 to 25	H	L	H	H	M	H
Winterberry	<i>Ilex verticillata</i>	10	H	M	M	H	H	H
Bankers Dwarf Willow	<i>Salix cotteti</i>	6	H	M	M	H	L	L
Pussy Willow	<i>Salix bicolor</i>	26	H	M	M	H	H	L
Streamco Purpleosier Willow	<i>Salix pupurea</i>	10 to 18	H	H	L	H	L	M
Elderberry	<i>Sambucus canadensis</i>	12	H	L	M	M	M	H
Highbush Blueberry	<i>Vaccinium corymbosum</i>	6 to 12	H	M	M	H	H	H
Nannyberry	<i>Viburnum lentago</i>	33	M	M	M	M	H	H

Source: USDA, Natural Resources Conservation Service

TABLE 6A - NATIVE RIPARIAN VEGETATION

RECOMMENDED USES: W WILDLIFE
 H HORTICULTURE AND LANDSCAPING
 C CONSERVATION AND RESTORATION
 D DOMESTIC LIVESTOCK FORAGE

NATIVE REGIONS: M MOUNTAINS
 P PIEDMONT
 C COASTAL PLAIN

MINIMUM LIGHT REQUIREMENTS: S FULL SHADE
 P PARTIAL SUN
 F FULL SUN

VEGETATION ZONES_ 1 EMERGENT
 2 RIVERSIDE THICKET
 3 SATURATED THICKET
 4 WELL-DRAINED

Native Riparian Plants																	
Scientific Name	Common Name	Uses				Region			Light			Zone					
		W	H	C	D	M	P	C	S	P	F	1	2	3	4		
Herbaceous plants																	
<i>Acorus americanus</i> (A. calamus)	sweet flag	X	X			X	X	X			X	X		X			
<i>Amsonia tabernaemontana</i>	blue star	X					X	X		X	X					X	X
<i>Arisaema triphyllum</i>	Jack-in-the-pulpit	X				X	X	X		X						X	X
<i>Asarum canadense</i> +	wild ginger	X	X			X	X	X		X							X
<i>Asclepias incarnata</i>	swamp milkweed	X	X	X		X	X	X			X	X		X	X		
<i>Aster novae-angliae</i>	New England aster	X	X			X					X	X				X	
<i>Aster novi-belgii</i>	New York aster	X	X	X				X			X	X		X	X		
<i>Aster umbellatus</i>	flat-top white aster	X	X			X	X				X	X				X	
<i>Bidens cernua</i> +	nodding beggar-ticks	X	X	X		X	X	X			X	X		X	X		
<i>Boltonia asteroides</i> *	aster-like boltonia	X						X				X		X	X	X	
<i>Caltha palustris</i>	marsh marigold	X	X			X		X			X	X				X	
<i>Chamaecrista fasciculata</i> +	partridge pea			X		X	X	X				X					X
<i>Chelone glabra</i>	white turtlehead	X	X			X	X	X		X	X				X	X	

Native Riparian Plants

Scientific Name	Common Name	Uses				Region			Light			Zone						
		W	H	C	D	M	P	C	S	P	F	1	2	3	4			
<i>Chrysogonum virginianum</i>	green and gold		X	X			X	X	X		X						X	
<i>Coreopsis tripteris</i>	tall coreopsis		X	X			X	X	X			X	X			X	X	X
<i>Delphinium tricorne</i>	dwarf larkspur		X				X	X			X	X						X
<i>Dicentra cucullaria</i>	Dutchman's breeches		X				X	X			X							X
<i>Equisetum hyemale</i>	horsetail, scouring rush			X			X	X	X		X	X	X			X	X	X
<i>Eupatorium coelestinum</i>	Mistflower	X	X	X			X	X	X		X	X	X				X	X
<i>Eupatorium fistulosum</i>	Joe Pye weed	X	X	X			X	X	X			X	X			X	X	X
<i>Eupatorium perfoliatum</i>	common boneset			X			X	X	X			X	X		X	X	X	
<i>Helenium autumnale</i>	Sneezeweed	X	X	X			X	X	X			X	X		X	X	X	
<i>Helianthus decapetalus</i>	ten-petaled sunflower	X	X	X			X	X	X			X	X				X	X
<i>Heliopsis helianthoides</i>	oxeye sunflower	X	X	X			X	X	X			X	X				X	X
<i>Hibiscus moscheutos</i>	Eastern rosemallow	X	X	X			X	X	X				X		X	X		
<i>Iris virginica</i>	Virginia blue flag		X	X				X	X			X	X		X	X		
<i>Kosteletskya virginica</i>	seashore mallow	X		X					X				X		X	X		
<i>Lilium superbum</i>	Turk's cap lily		X				X	X	X			X	X				X	X
<i>Lobelia cardinalis</i>	cardinal flower	X	X	X			X	X	X			X	X		X	X	X	
<i>Lobelia siphilitica</i>	great blue lobelia	X	X	X			X	X	X		X	X					X	X
<i>Maianthemum racemosum</i>	false Solomon's seal		X	X			X	X	X		X	X					X	X
<i>Mertensia virginica</i>	Virginia bluebells		X	X			X	X			X	X					X	X
<i>Mimulus ringens</i>	Monkeyflower		X	X			X	X	X				X		X	X	X	
<i>Monarda didyma</i>	bee balm	X	X	X			X				X	X					X	X
<i>Nymphaea odorata</i>	American water lily	X	X	X			X	X	X				X		X			
<i>Oenothera fruticosa</i>	Sundrops	X	X	X			X	X	X				X		X	X	X	X
<i>Peltandra virginica</i>	arrow arum	X	X	X				X	X			X	X		X	X		
<i>Phlox divaricata</i>	woodland phlox		X	X			X	X				X					X	X
<i>Phlox paniculata</i>	summer phlox		X	X			X	X	X			X	X				X	X
<i>Podophyllum peltatum+</i>	Mayapple	X	X	X			X	X	X			X	X					X
<i>Polemonium reptans</i>	Jacob's ladder		X				X	X	X		X	X						X
<i>Pontederia cordata</i>	pickerel weed	X	X	X				X	X				X		X			
<i>Rhexia virginica</i>	Virginia meadow-beauty	X		X			X	X	X				X				X	

Native Riparian Plants																	
Scientific Name	Common Name	Uses				Region			Light			Zone					
		W	H	C	D	M	P	C	S	P	F	1	2	3	4		
<i>Rudbeckia laciniata</i>	cut-leaved coneflower	X	X	X		X	X	X		X	X			X	X	X	
<i>Sagittaria latifolia</i>	broadleaf arrowhead	X	X	X		X	X	X			X		X	X			
<i>Saururus cernuus</i>	lizard's tail		X	X		X	X	X		X	X		X	X			
<i>Senecio aureus</i> +	golden ragwort	X		X		X	X	X		X	X			X	X	X	
<i>Solidago rugosa</i> +	rough-stemmed goldenrod	X		X		X	X	X		X	X			X	X	X	
<i>Verbena hastata</i>	blue vervain	X		X		X	X			X	X			X	X		
<i>Vernonia noveboracensis</i>	New York ironweed	X	X	X		X	X	X		X	X			X	X	X	
<i>Viola cucullata</i>	marsh blue violet	X	X	X		X	X	X		X	X				X		
<i>Viola pubescens</i>	yellow violet	X	X	X		X	X			X	X					X	
<i>Zephranthes atamasco</i>	Atamasco lily		X	X				X		X	X			X	X	X	
Ferns and fern allies																	
<i>Athyrium asplenoides</i>	Southern ladyfern		X	X		X	X	X		X					X	X	
<i>Botrychium virginianum</i>	Rattlesnake fern		X			X	X	X		X	X					X	
<i>Onoclea sensibilis</i> +	sensitive fern		X	X		X	X	X		X	X				X	X	
<i>Osmunda cinnamomea</i>	cinnamon fern		X	X		X	X	X		X	X			X	X		
<i>Osmunda regalis</i>	royal fern		X	X		X	X	X		X					X	X	
<i>Polystichium acrostichoides</i>	Christmas fern		X	X		X	X	X		X						X	
<i>Thelypteris palustris</i>	marsh fern		X			X	X	X		X	X		X	X	X		
<i>Woodwardia virginica</i> +	Virginia chain fern		X	X				X		X	X	X	X	X			
Grasses, sedges, reeds																	
<i>Agrostis perennans</i>	autumn bentgrass			X		X	X	X		X	X	X		X	X	X	X
<i>Andropogon gerardii</i>	big bluestem	X	X	X	X	X	X			X	X			X	X		
<i>Andropogon glomeratus</i>	bushy bluestem		X	X		X	X	X		X	X				X		
<i>Arundinaria gigantea</i>	wild cane, river cane	X		X		X				X	X	X		X	X	X	
<i>Carex crinita</i> var. <i>crinita</i>	long hair sedge	X	X	X		X	X	X		X	X		X	X	X		
<i>Carex lurida</i>	sallow sedge	X		X		X	X	X		X	X		X	X	X		
<i>Carex stricta</i>	tussock sedge	X		X		X	X	X		X	X		X	X	X		
<i>Chasmanthium latifolium</i>	river oats, spanglegrass		X	X		X	X	X		X	X	X		X	X	X	

Native Riparian Plants																	
Scientific Name	Common Name	Uses				Region			Light			Zone					
		W	H	C	D	M	P	C	S	P	F	1	2	3	4		
<i>Dichanthelium clandestinum</i>	deer-tongue	X		X	X		X	X	X		X	X		X	X	X	X
<i>Dichanthelium commutatum</i>	variable panicgrass	X	X	X	X		X	X	X		X	X					X
<i>Dulichium arundinaceum</i>	dwarf bamboo	X		X	X		X	X	X		X	X		X	X	X	
<i>Elymus hystrix (Hystrix patula)</i>	Bottlebrush grass	X	X				X	X	X		X	X	X				X
<i>Elymus virginicus</i>	Virginia wild rye	X		X			X	X	X		X	X			X	X	X
<i>Juncus canadensis</i>	Canada rush	X		X				X	X		X	X		X	X	X	
<i>Juncus effusus</i>	soft rush	X		X			X	X	X		X	X		X	X	X	
<i>Leersia oryzoides</i>	rice cutgrass	X		X			X	X	X		X	X		X	X	X	
<i>Panicum virgatum</i>	switch grass	X	X	X			X	X	X		X	X		X	X	X	
<i>Saccharum giganteum</i>	giant plumegrass	X	X	X				X	X		X	X		X	X	X	
<i>Scirpus cyperinus</i>	woolgrass bulrush	X	X	X			X	X	X		X	X		X	X	X	
<i>Sparganium americanum</i>	American bur-reed	X		X			X	X	X		X	X		X			
<i>Tripsacum dactyloides</i>	gama grass	X	X	X	X		X	X	X		X	X		X	X	X	X
<i>Typha latifolia</i>	broad-leaved cattail	X		X			X	X	X			X		X			
<i>Zizania aquatica</i>	wild rice	X	X	X					X			X		X			
Vines																	
<i>Bignonia capreolata</i>	Crossvine	X	X				X	X	X		X	X			X	X	X
<i>Celastrus scandens</i>	climbing bitter-sweet	X	X				X	X	X		X	X	X				X
<i>Clematis virginiana</i>	virgin's bower		X				X	X	X		X	X		X	X	X	X
<i>Parthenocissus quinquefolia</i>	Virginia creeper	X	X	X			X	X	X		X	X			X	X	X
Shrubs																	
<i>Alnus serrulata</i>	common alder	X	X	X			X	X	X		X	X	X		X	X	X
<i>Aronia arbutifolia</i>	red chokeberry		X	X			X	X	X		X	X			X	X	X
<i>Aronia melanocarpa</i>	black chokeberry		X	X			X	X	X		X	X			X	X	X
<i>Callicarpa americana</i>	American beautyberry	X	X						X		X	X				X	X
<i>Cephalanthus occidentalis</i>	Buttonbush		X	X			X	X	X		X	X		X	X		
<i>Clethra alnifolia</i>	sweet pepper-bush	X	X	X					X		X	X				X	
<i>Cornus amomum</i>	silky dogwood	X		X			X	X	X		X	X			X	X	

Native Riparian Plants																
Scientific Name	Common Name	Uses				Region			Light			Zone				
		W	H	C	D	M	P	C	S	P	F	1	2	3	4	
<i>Hydrangea arborescens</i>	wild hydrangea		X			X	X	X		X	X				X	
<i>Ilex decidua</i>	Possumhaw	X	X	X			X	X		X	X			X	X	X
<i>Ilex verticillata</i>	Winterberry	X	X	X		X	X	X			X	X		X	X	X
<i>Itea virginica</i>	Virginia willow	X	X	X				X		X	X			X	X	
<i>Leucothoe racemosa</i>	fetterbush, sweetbells		X	X		X	X	X			X	X		X	X	
<i>Lindera benzoin</i>	Spicebush	X	X	X		X	X	X		X					X	X
<i>Myrica cerifera</i>	Southern wax myrtle	X	X	X				X		X	X		X	X	X	X
<i>Rhododendron viscosum</i>	swamp azalea		X	X		X	X	X			X	X			X	X
<i>Rubus allegheniensis</i>	Alleghany blackberry	X	X	X		X	X				X			X	X	X
<i>Salix sericea</i>	silky willow		X	X		X	X	X			X	X		X	X	
<i>Sambucus canadensis</i>	common elderberry	X	X	X		X	X	X			X			X	X	X
<i>Spiraea alba</i>	narrow-lvd. Meadowsweet	X	X	X		X					X			X	X	
<i>Spiraea latifolia</i>	broad-lvd. Meadowsweet	X	X	X		X					X			X	X	X
<i>Vaccinium corymbosum</i>	highbush blueberry	X	X	X		X	X	X		X	X	X		X	X	X
<i>Viburnum dentatum</i>	So. arrow-wood viburnum	X	X	X		X	X	X			X	X				
<i>Viburnum prunifolium</i>	black-haw viburnum	X	X	X		X	X	X			X	X				
Small trees																
<i>Amelanchier arborea</i>	downy serviceberry	X	X	X		X	X	X			X	X				X
<i>Amelanchier canadensis</i>	Canada serviceberry	X	X	X		X	X	X			X			X	X	X
<i>Amelanchier laevis</i>	smooth serviceberry	X	X	X		X				X	X					X
<i>Asimina triloba</i>	paw paw	X	X	X		X	X	X		X	X				X	X
<i>Cornus alternifolia</i>	alternate-leaf dogwood	X	X	X		X	X			X	X					X
<i>Crateagus flava</i>	October haw	X	X			X	X	X			X	X			X	
<i>Morus rubra</i>	red mulberry	X	X	X		X	X	X		X	X				X	X
<i>Ostrya virginiana</i>	Eastern hop-hornbeam		X			X	X	X		X	X					X
<i>Persea borbonia</i>	redbay, sweet bay		X	X				X		X	X				X	
<i>Rhus glabra</i>	smooth sumac	X	X	X		X	X	X			X				X	X
<i>Salix nigra</i>	black willow			X		X	X	X			X	X	X	X	X	X

Native Riparian Plants																	
Scientific Name	Common Name	Uses				Region			Light			Zone					
		W	H	C	D	M	P	C	S	P	F	1	2	3	4		
Medium to Large Trees																	
<i>Acer rubrum</i>	red maple		X	X			X	X	X			X		X	X	X	X
<i>Betula lenta</i>	sweet birch, black birch	X	X	X			X	X			X	X				X	X
<i>Betula nigra</i>	river birch	X	X	X			X	X	X			X			X	X	
<i>Diospyros virginiana</i>	Persimmon	X	X	X			X	X	X		X	X	X		X	X	X
<i>Fraxinus americana</i>	white ash	X	X				X	X	X		X	X			X	X	X
<i>Fraxinus pensylvanica</i>	green ash	X	X	X			X	X	X		X	X			X	X	
<i>Juglans nigra</i>	black walnut	X		X			X	X	X		X	X			X	X	X
<i>Liquidambar styraciflua</i>	Sweetgum		X	X			X	X	X		X	X	X		X	X	X
<i>Liriodendron tulipifera</i>	tulip-tree, tulip poplar	X	X	X			X	X	X			X			X	X	
<i>Nyssa aquatica</i>	water tupelo	X	X	X					X		X	X		X			
<i>Nyssa sylvatica</i>	black gum	X	X	X			X	X	X		X	X			X	X	X
<i>Oxydendrum arboreum</i>	Sourwood		X				X	X	X		X					X	X
<i>Pinus taeda</i>	loblolly pine	X	X	X				X	X			X			X	X	X
<i>Platanus occidentalis</i>	Sycamore			X			X	X	X		X	X			X	X	X
<i>Quercus bicolor</i>	swamp white oak	X		X			X	X	X		X	X			X	X	
<i>Quercus laurifolia</i>	swamp laurel oak	X		X					X		X	X			X	X	
<i>Quercus michauxii</i>	swamp chestnut oak	X	X					X	X		X	X			X	X	X
<i>Quercus nigra</i>	water oak	X		X					X		X	X			X	X	X
<i>Quercus palustris</i>	pin oak	X	X	X			X	X	X		X	X			X	X	
<i>Quercus phellos</i>	willow oak	X	X	X				X	X		X	X			X	X	X
<i>Taxodium distichum</i>	Bald cypress		X	X					X			X		X			
+May be aggressive in garden setting.																	
*Due to the rarity and sensitivity of habitat in Virginia, these species are recommended for horticultural use only.																	
Planting these species in natural areas could be detrimental to the survival of native populations.																	

Table 7 - Recommended Grass Seeding Mixtures for Riparian Buffers

<i>Recommended Use</i>	<i>Common Name</i>	<i>Variety</i>	<i>Seeding Rate (lb. pure live seed/acre)</i>
Wildlife Habitat	Switchgrass	Shelter	2.0
	Big Bluestem	Niagara	3.2
	Eastern gamagrass	Pete	1.0
	Indiangrass	Rumsey or NE-54	1.0
	Little Bluestem	Aldous or Camper	2.1
	Sideoats grama	El Reno or Trailway	1.0
			Total
Wildlife Habitat	Switchgrass	Shelter	8.0
	Deertongue	Tioga	2.0
	White clover	common	1.0
			Total
Erosion Control	Birdsfoot trefoil or	Empire	3.0
	White clover	Common	
	Orchardgrass	Pennlate	6.0
	Timothy	Climax	5.0
	Perennial ryegrass	Turf type	1.0
			Total

Source: USDA, Natural Resources Conservation Service

7.350 FOREST MANAGEMENT PLAN

A Forest Management Plan as required by the Zoning Ordinance shall be required and submitted to the County for approval for tracts of land three (3) acres or larger in size. The County acknowledges the fact that the management and subsequent harvesting of commercially value timber resources is a bona fide form of land use which is an important component of the County's economy. However, in order to help assure the protection of the County's mountain and steep slopes and other environmentally sensitive areas, a Forest Management Plan (FMP) is required to be on file in the State Forester's office and a copy kept on site during the entire length of logging.

The purpose of the FMP is to establish the tract location, describe the Best Management Practices (BMP's) required for structural stabilization and re-vegetation of all exposed mineral soil sites. The following information is required and must be filed with the Virginia Department

of Forestry prior to the initiation of any timber harvest in the Mountainside Development Overlay District.

- A. County base map at 1" = 200', showing tract boundaries, timber type lines, water bodies, topography and acreage to be harvested. These maps are available through the Loudoun County Office of Mapping and Geographic Information.
- B. Identify all streams, their headwaters and the 35-foot riparian stream buffers, and identify a Streamside Management Zone (SMZ) at least 50 feet on either side of the stream.
- C. Approximate location of all decks, haul road, and primary skid trails.
- D. If grading is necessary in the road construction process, a detailed map showing location, topography and information addressing its stabilization are required. Should land disturbance exceed 10,000 square feet, a grading permit will be required.
- E. Identify species composition, stocking, regeneration, soils, stand history, unique natural features, percent slope, quality and growth rate.
- F. Harvest type (i.e., selective, shelterwood, diameter limit cut, clear-cut, etc.)
- G. Means of regeneration (natural or artificial).
- H. Means of stabilization (crawler tractor, skidder, loader, etc.)
- I. Recommendations regarding the viability of a fuel wood harvest.
- J. Statement that all BMP's shall be done in accordance with those outlined by the Virginia Department of Forestry and immediately upon logging completion.
- K. Plan shall be signed by the drafting professional forester.
- L. Notification call to the County Urban Forester's office at least 24 hours prior to commencement of the logging operation.
- M. Notification call to the Urban Forester's office immediately upon installation of all BMP's.

7.400 TREE CONSERVATION AND LANDSCAPE PLANS

Where required by the Zoning Ordinance or this Manual, or where required as a part of a rezoning or a condition of approval of a special exception or variance, an applicant shall submit a Tree Conservation and Landscape Plan as specified within the Zoning Ordinance, and Chapter 8 of this manual. The County recommends that tree and shrub species be native and have multiple values such as biomass, nuts, fruits, browse, nesting and aesthetics.

- A. The Tree Conservation and Landscape Plan shall be overlain upon the site plan or construction plans and profiles submission, whichever is applicable, to illustrate the following:
1. Accurate location and species of each planting.
 2. Planting shall not be allowed within sight distance easements or other easements where the plantings may be detrimental to the purpose of the easement.
 3. Required landscape buffers.
 4. Areas of tree canopy and vegetation that an Applicant has agreed to preserve or conserve as part of a proffer or condition of approval.
 5. Areas of existing tree canopy and vegetation used as Best Management Practices (BMP) as provided in Section 7.402 of this chapter.
- B. Landscape and tree canopy calculations shall be provided and may be presented in tabular form per the following examples:

TREE CANOPY CALCULATIONS			
TREE TYPE	QUANTITY	ALLOWANCE	TOTAL
Acer Rubrum	15	250	3,750
Fraxinus Pennsylvanica 'Marshall's Seedless'	16	250	4,000
Liquidambar Styraciflua	18	250	4,500
Platanus Acerifolia	14	250	3,500
Pinus Nigra	68	250	17,000
Pinus Rigida	27	250	6,750
Pinus Strobus	38	250	9,500
Pinus Sylvestris	37	250	9,250
Zelkova Serrata	24	250	6,000
TOTAL PROPOSED TREE CANOPY ALLOWANCE			64,250 sf

CANOPY COVER CALCULATIONS		
	Acreage	sf
Gross Site Area	200	8,712,000
Less Exclusion Areas per Zoning Ordinance	5	217,800
Net Site Area	195	8,494,200
Canopy Coverage Required (10%)	20	871,200
Canopy Coverage Provided	21	914,760
Canopy Conservation	10	435,600
Proposed Canopy on Lots	2	87,120
Proposed Canopy – Open Space	5	217,800
Proposed Canopy – Street Trees	2	87,120
Proposed Canopy – Buffers	1	43,560
Reforestation	1	43,560
Total Canopy Coverage Provided	21	914,760
Requirement is met . . . <u>914,760 sf</u> is greater than <u>871,200 sf</u>		

C. Plant schedule to include: (Refer to sample planting schedule below.)

1. Key or symbol of plant material.
2. Plant name (botanical and common).
3. Quantity of each species.
4. Size (caliper, height, or spread).
5. Type of root stock to be planted--balled and burlapped (B&B), bareroot, container.
6. Reference the guidelines for planting and maintenance of the materials outlined in the current Virginia Erosion and Sediment Control Handbook.

Sample Landscape Plan Planting Schedule

Key	Botanical Name	Common Name	Quantity	Size	Remarks
C	Cornus florida	Flowering Dogwood	5	6'- 8'	B&B
Q	Quercus alba	White Oak	10	2 1/2" caliper	B&B
A	Acer rubrum	Red Maple	35	6'- 8'	B&B

7.401 CONSERVATION OF EXISTING TREES TO MEET CANOPY AND BUFFER REQUIREMENTS

- A. Existing tree canopy and vegetation, including those areas of tree canopy and vegetation that an Applicant has agreed to preserve or conserve as part of a proffer or condition of approval, may be used to meet canopy and buffering and screening requirements of the Zoning Ordinance, provided that existing tree canopy meets standards of desirability and life-year expectancy established by the Zoning Administrator, and as defined herein per the following requirements:
1. The location of such existing tree canopy and vegetation shall be identified on the Tree Conservation and Landscape Plan.
 2. Such existing tree canopy and vegetation shall be included in the overall canopy or buffer calculations. However:
 - a. Concentrated stands of Virginia Pine shall not be used to meet canopy requirements unless there is a substantial, successional hardwood canopy potential, as determined by a Certified Arborist, Urban Forester, or Landscape Architect.
 - b. Existing tree canopy and vegetation located within fifteen feet (15') of the limits of clearing and grading shall not be used to meet canopy requirements.
 - c. Existing tree canopy and vegetation located on residential lots with a total size of 20,000 square feet or less shall not be used to meet canopy or buffering and screening requirements.
 3. A field inspection shall be conducted, and a narrative prepared, by a Certified Arborist, Urban Forester, or Landscape Architect. The date of the inspection and the name of the individual who conducted the inspection shall be identified in the narrative.

4. The narrative may be accompanied by photographs and shall describe the overall size, species and general condition of the conserved area where the existing trees and vegetation are located to demonstrate compliance to the canopy or buffering and screening requirements as set forth in the Zoning Ordinance. General conditions include factors such as dominant species, growth rate, stocking/basal area, structure, form and quality characteristics, regeneration, age range, soils, aspect, stand history, invasive species, and hazard trees.
- B. Existing tree canopy and vegetation used to meet canopy or buffering and screening requirements of the Zoning Ordinance, and those areas of tree canopy that an Applicant has agreed to preserve or conserve as part of a proffer or condition of approval, shall be protected to avoid degradation and harm through tree protection measures as provided in Section 7.303 of this chapter and shall be depicted on the Construction Plans and Profiles, Site Plan, and Grading Plan for the subject land use application.

7.402 CONSERVATION OF EXISTING TREE CANOPY AND VEGETATION FOR USE AS BEST MANAGEMENT PRACTICES (BMP)

- A. Existing tree canopy and vegetation used as BMPs in accordance with Chapter 5 of this Manual shall be depicted and labeled on the Tree Conservation and Landscape Plan, as provided in Section 7.400 of this chapter.
- B. A field inspection shall be conducted, and a narrative prepared, by a Certified Arborist, Urban Forester, or Landscape Architect. The date of the inspection and the name of the individual who conducted the inspection shall be identified in the narrative.
- C. The narrative shall be provided on the Tree Conservation and Landscape Plan. The narrative may be accompanied by photographs and shall describe the overall size, species and general condition of the conserved area where the existing trees and vegetation are located to demonstrate compliance with the BMP requirements of Chapter 5 of this Manual. General conditions include factors such as dominant species, growth rate, stocking/basal area, structure, form and quality characteristics, regeneration, age range, soils, aspect, stand history, invasive species, and hazard trees.
- D. Existing tree canopy and vegetation used as BMPs in accordance with Chapter 5 of this Manual shall be located within an easement dedicated to the County of Loudoun.

Table 8 - Tree Canopy for Deciduous Trees

Botanical Name	Common Name	Native	Minimum Planting Area (ft ²)	1.0" Caliper	2.0" Caliper	3.0" Caliper
<i>Acer Rubrum</i> 'Columnare'	red maple	Yes	55	45	55	75
<i>Carpinus betulus</i> 'Fastigiata'	fastigate European hornbeam		55	45	55	75
<i>Fagus sylvatica</i> 'Fastigiata'	fastigate European beech		55	45	55	75
<i>Ginkgo biloba</i> 'Sentry'	sentry ginkgo		55	45	55	75
<i>Quercus robur</i> 'Fastigiata'	fastigate European oak		55	45	55	75
<i>Acer campestre</i>	hedge maple		55	75	100	125
<i>Acer ginnala</i>	amur maple		55	75	100	125
<i>Acer palmatum</i>	Japanese maple		55	75	100	125
<i>Amelanchier arborea</i>	downey serviceberry		55	75	100	125
<i>Amelanchier laevis</i>	Allegheny serviceberry		55	75	100	125
<i>Carpinus caroliniana</i>	American Hornbeam		55	75	100	125
<i>Cercis canadensis</i>	Redbud		55	75	100	125
<i>Chionanthus virginicus</i>	Fringetree		55	75	100	125
<i>Cornus florida</i>	flowering dogwood		55	75	100	125
<i>Cornus kousa</i>	kousa dogwood		55	75	100	125
<i>Halesia carolina</i>	Carolina silverbell		55	75	100	125
<i>Magnolia stellata</i>	star magnolia		55	75	100	125
<i>Magnolia virginiana</i>	sweetbay magnolia		55	75	100	125
<i>Malus</i> spp.	Crabapples		55	75	100	125
<i>Oxydendrum arboreum</i>	Sourwood		55	75	100	125
<i>Prunus cerasifera</i>	flowering plum		55	75	100	125
<i>Prunus x incam</i> 'Okame'	Okame cherry		55	75	100	125
<i>Stewartia koreana</i>	Korean stewartia		55	75	100	125
<i>Stewartia ovata</i>	mountain stewartia		55	75	100	125
<i>Stewartia pseudocamellia</i>	Japanese stewartia		55	75	100	125
<i>Styrax japonicus</i>	Japanese snowbell		55	75	100	125
<i>Aesculus hippocastanum</i>	Horsechestnut		90	130	150	175
<i>Betula nigra</i>	river birch		90	130	150	175
<i>Castanea mollissima</i>	Chinese chestnut		90	130	150	175
<i>Celtis occidentalis</i>	Hackberry		90	130	150	175
<i>Cercidiphyllum japonicum</i>	Katsuratree		90	130	150	175
<i>Diospyros virginiana</i>	Persimmon		90	130	150	175
<i>Eucommia ulmoides</i>	hardy rubber tree		90	130	150	175
<i>Fagus sylvatica</i>	European beech		90	130	150	175
<i>Fraxinus pennsylvanica</i>	green ash		90	130	150	175
Marshall's seedless'			90	130	150	175

Botanical Name	Common Name	Native	Minimum Planting Area (ft ²)	1.0" Caliper	2.0" Caliper	3.0" Caliper
Patmore'			90	130	150	175
Summit'			90	130	150	175
Gleditsia triacanthos inermis	thornless honeylocust		90	130	150	175
'Imperial'			90	130	150	175
'Skyline'			90	130	150	175
'Shademaster'			90	130	150	175
Gymnocladus dioicus	Kentucky coffeetree		90	130	150	175
Juglans nigra	black walnut		90	130	150	175
Koelreuteris paniculata	goldenrain tree		90	130	150	175
Larix decidual	European larch		90	130	150	175
Maclura pomiferal	osage orange (male only)		90	130	150	175
Magnolia acuminata	cucumber tree		90	130	150	175
Magnolia macrophylla	Bigleaf magnolia		90	130	150	175
Metasequoia glyptostroboides	dawn redwood		90	130	150	175
Nyssa sylvatica	black gum, tupelo		90	130	150	175
Phellodendron amurense	amur corktree (male only)		90	130	150	175
Prunus serrulata 'Kwanzan'	Kwanzan cherry		90	130	150	175
Prunus sargentii	sargent cherry		90	130	150	175
Prunus subhirtella 'Pendula'	weeping Japanese cherry		90	130	150	175
Prunus yedoensis	yoshino cherry		90	130	150	175
Pyrus calleryana	callery pear		90	130	150	175
'Aritocrat'			90	130	150	175
'Autumn blaze'			90	130	150	175
'Chanticleer'			90	130	150	175
'Redspire'			90	130	150	175
'Whitehouse'			90	130	150	175
Salix bablonica	weeping willow		90	130	150	175
Taxodium distichum	bald cypress		90	130	150	175
Tilia cordata	littleleaf linden		90	130	150	175
'Glenleven'			90	130	150	175
'Greenspire'			90	130	150	175
Acer rubrum	red maple		130	150	200	250
Acer saccharum	sugar maple		130	150	200	250
Carya illinoensis	Pecan		130	150	200	250
Carya ovata	shagbark hickory		130	150	200	250
Fagus grandifolia	American beech		130	150	200	250
Fraxinus americana	white ash		130	150	200	250
Ginkgo biloba	ginkgo (male only)		130	150	200	250
Liquidambar styraciflua	Sweetgum		130	150	200	250

Botanical Name	Common Name	Native	Minimum Planting Area (ft ²)	1.0" Caliper	2.0" Caliper	3.0" Caliper
<i>Liriodendron tulipifera</i>	tulip poplar		130	150	200	250
<i>Platanus x acerifolia</i>	London planetree		130	150	200	250
<i>Platanus occidentalis</i>	Sycamore		130	150	200	250
<i>Quercus acutissima</i>	sawtooth oak		130	150	200	250
<i>Quercus alba</i>	white oak		130	150	200	250
<i>Quercus bicolor</i>	swamp white oak		130	150	200	250
<i>Quercus coccinea</i>	scarlet oak		130	150	200	250
<i>Quercus imbricaria</i>	shingle oak		130	150	200	250
<i>Quercus palustris</i>	pin oak		130	150	200	250
<i>Quercus phellos</i>	willow oak		130	150	200	250
<i>Quercus rubra</i> (borealis)	northern red oak		130	150	200	250
<i>Sophora japonica</i>	Japanes pagoda tree		130	150	200	250
<i>Tilia americana</i>	American linden, basswood		130	150	200	250
'Redmond'			130	150	200	250
'Legend'			130	150	200	250
<i>Ulmus hollandica</i> 'Groenveldt'	Groenveldt elm		130	150	200	250
<i>Ulmus parvifolia</i>	Chinese elm		130	150	200	250
<i>Zelkova serrata</i>	Japanese zelkova		130	150	200	250

Table 9 - Tree Canopy for Evergreen Trees (10 Year Canopy)

Botanical Name	Common Name	Native	Minimum Planting Area (ft ²)	6.0 ft. Height	8.0 ft. Height	10.0 ft. Height
<i>Ilex x attenuate</i> 'Fosteri'	Foster's holly		35	45	55	75
<i>Ilex x</i> 'Nellie R. Stevens'	Nellie Stevens holly		35	45	55	75
<i>Juniperus chinensis</i>	Chinese juniper		35	45	55	75
'Denserecta'			35	45	55	75
'Hetzi columnaris'			35	45	55	75
'Keteleeri'			35	45	55	75
'Robusta green'			35	45	55	75
'Columnaris'			35	45	55	75
'Torulosa'			35	45	55	75
'Gray Gleam'			35	45	55	75
'Erecta Glauca'			35	45	55	75
<i>Juniperus virginiana</i> 'Princeton Sentry'	Eastern redcedar		35	45	55	75
<i>Taxus baccata</i> 'Fastigata'	upright Irish yew		35	45	55	75

Botanical Name	Common Name	Native	Minimum Planting Area (ft ²)	6.0 ft. Height	8.0 ft. Height	10.0 ft. Height
<i>Thuja occidentalis</i> 'Nigra'	dark green American arborvitae		35	45	55	75
<i>Thuja orientalis</i> (<i>Platycladus orientalis</i>)	columnar oriental arborvitae		35	45	55	75
<i>Abies concolor</i>	white fir		55	75	100	125
<i>Calocedrus decurrens</i>	incense cedar		55	75	100	125
<i>Chamaecyparis lawsoniana</i>	Lawson false cypress		55	75	100	125
<i>Chamaecyparis obtusa</i>	Hinoki false cypress		55	75	100	125
<i>Chamaecyparis pisifera</i>	plume sawara false cypress		55	75	100	125
<i>Cunninghamia lanceolata</i>	China fir		55	75	100	125
<i>Ilex aquifolium</i>	English holly		55	75	100	125
<i>Ilex opaca</i>	American holly		55	75	100	125
<i>Cryptomeria japonica</i>	Japanese cryptomeria		55	75	100	125
X <i>Cupressocyparis leylandii</i>	leyland cypress		55	75	100	125
<i>Juniperus virginiana</i>	Eastern redcedar		55	75	100	125
'Canaert'			55	75	100	125
'Manhattan Blue'			55	75	100	125
<i>Picea glauca</i>	white spruce		55	75	100	125
<i>Picea omorika</i>	Serbian spruce		55	75	100	125
<i>Picea orientalis</i>	oriental spruce		55	75	100	125
<i>Picea pungens</i>	Colorado blue spruce		55	75	100	125
<i>Pinus bungeana</i>	lace-bark pine		55	75	100	125
<i>Pinus parviflora</i>	Japanese white pine		55	75	100	125
<i>Pinus thunbergii</i>	Japanes black pine		55	75	100	125
<i>Pseudotsuga menziesii</i>	Douglas fir		55	75	100	125
<i>Taxus cuspidata</i> 'Capitata'	pyramidal Japanese yew		55	75	100	125
<i>Tsuga canadensis</i>	Canadian hemlock		55	75	100	125
<i>Tsuga caroliniana</i>	Carolina hemlock		55	75	100	125
<i>Cedrus atlantica</i>	atlas cedar		90	125	150	175
<i>Picea abies</i>	Norway spruce		90	125	150	175
<i>Pinus echinata</i>	shortleaf pine		90	125	150	175
<i>Pinus nigra</i>	Austrian pine		90	125	150	175
<i>Magnolia grandiflora</i>	Southern magnolia		110	125	150	175
<i>Pinus rigida</i>	pitch pine		110	125	150	175
<i>Pinus stroba</i>	white pine		110	125	150	175
<i>Pinus virginiana</i>	Virginia pine		90	125	150	175
<i>Pinus taeda</i>	loblolly pine		110	125	150	175

Table 10: NATIVE SHRUBS

W = Wildlife	M = Mountains	S = Full Shade	L = Low Moisture
H = Horticulture and Landscaping	P = Piedmont	P = Partial Sun	M = Moderate Moisture
C = Conservation and Restoration	C = Coastal Plain	F = Full Sun	H = High Moisture

Native Shrubs																	
Scientific Name	Common Name	Uses					Region				Light				Moisture		
		W	H	C	D		M	P	C		S	P	F		L	M	H
Shrubs																	
<i>Alnus serrulata</i>	Common alder	x	x	x			x	x	x		x	x	x			x	
<i>Aronia arbutifolia</i>	Red chokeberry		x	x			x	x	x		x	x			x	x	
<i>Aronia melanocarpa</i>	Black chokeberry		x	x			x	x	x			x	x		x	x	
<i>Baccharis halimifolia</i>	High tide bush		x	x					x				x		x	x	
<i>Callicarpa americana</i>	American beautyberry	x	x						x		x	x			x		
<i>Castanea pumila</i>	Allegheny chinkapin	x	x	x			x	x	x		x	x	x		x		
<i>Ceanothus americanus</i>	New Jersey tea	x	x	x			x	x	x			x	x		x		
<i>Cephalanthus occidentalis</i>	Buttonbush		x	x			x	x	x			x	x			x	
<i>Clethra alnifolia</i>	Sweet pepper-bush	x	x	x					x		x	x				x	
<i>Cornus amomum</i>	Silky dogwood	x		x			x	x	x		x	x			x	x	
<i>Crataegus crus-galli</i>	Cockspur hawthorn	x	x	x			x	x	x			x	x		x	x	
<i>Gaultheria procumbens</i>	Wintergreen	x	x				x	x	x		x	x			x	x	
<i>Gaylussacia baccata</i>	Black huckleberry	x	x	x			x	x	x		x	x			x	x	
<i>Gaylussacia frondosa</i>	Dangleberry	x	x	x			x		x		x	x	x		x		
<i>Hamamelis virginiana</i>	Witch hazel		x	x			x	x	x		x	x			x	x	
<i>Hydrangea arborescens</i>	Wild hydrangea		x				x	x	x		x	x			x		

Native Shrubs																
Scientific Name	Common Name	Uses				Region			Light			Moisture				
		W	H	C	D	M	P	C	S	P	F	L	M	H		
<i>Ilex decidua</i>	Deciduous holly, possumhaw	x	x	x			x	x		x	x			x		
<i>Ilex glabra</i>	Inkberry	x	x	x				x		x	x			x	x	
<i>Ilex verticillata</i>	Winterberry	x	x	x		x	x	x			x	x		x	x	
<i>Ilex vomitoria</i>	Yaupon holly	x	x	x				x		x	x	x		x		
<i>Itea virginica</i>	Virginia willow	x	x	x				x		x	x				x	
<i>Iva frutescens</i>	Marsh elder		x	x				x				x		x	x	
<i>Kalmia latifolia</i>	Mountain laurel	x	x	x		x	x	x		x	x			x		
<i>Leucothoe axillaris</i>	Coastal dog-hobble		x					x		x					x	
<i>Leucothoe racemosa</i>	Fetterbush, sweetbells		x	x		x	x	x			x	x			x	
<i>Lindera benzoin</i>	Spicebush	x	x	x		x	x	x		x				x		
<i>Lyonia lucida</i>	Shining fetterbush		x	x				x		x	x				x	
<i>Myrica cerifera</i>	Southern wax myrtle	x	x	x				x		x	x			x	x	
<i>Myrica heterophylla</i>	Southern bayberry	x	x	x				x		x	x			x	x	
<i>Myrica pensylvanica</i>	Northern bayberry	x	x	x				x				x		x	x	
<i>Pieris floribunda</i>	Evergreen mountain fetterbush		x	x		x				x					x	
<i>Rhododendron atlanticum</i>	Dwarf azalea	x	x					x			x				x	
<i>Rhododendron calendulaceum</i>	Flame azalea		x			x					x				x	
<i>Rhododendron catawbiense</i>	Catawba rhododendron		x	x		x	x				x	x			x	
<i>Rhododendron cumberlandense</i>	Cumberland flame azalea		x			x					x				x	
<i>Rhododendron maximum</i>	Great rhododendron rose bay	x	x	x		x	x			x	x				x	
<i>Rhododendron periclymenoides</i>	Pinxter flower		x	x		x	x	x		x	x				x	
<i>Rhododendron prinophyllum</i>	Rose azalea	x	x			x				x	x	x		x	x	

Native Shrubs																		
Scientific Name	Common Name	Uses				Region				Light				Moisture				
		W	H	C	D	M	P	C	S	P	F	L	M	H				
<i>Rhododendron viscosum</i> (<i>R. serrulata</i>)	Swamp azalea		x	x			x	x	x			x	x			x	x	
<i>Rhus aromatica</i>	Fragrant sumac		x				x	x				x	x			x		
<i>Rhus copallinum</i>	Winged sumac, flameleaf sumac	x	x	x			x	x	x		x	x				x		
<i>Rosa carolina</i>	pasture rose	x		x			x	x	x			x	x			x	x	
<i>Rubus allegheniensis</i>	Alleghany blackberry	x	x	x			x	x					x			x		
<i>Rubus odoratus</i>	purple flowering raspberry			x			x					x					x	
<i>Salix humilis</i>	prairie willow		x	x			x	x	x				x			x		
<i>Salix sericea</i>	silky willow		x	x			x	x	x			x	x				x	
<i>Sambucus canadensis</i>	common elderberry	x	x	x			x	x	x				x				x	x
<i>Spiraea alba</i>	narrow-leaved meadowsweet	x	x	x			x						x				x	
<i>Spiraea latifolia</i>	broad-leaved meadowsweet	x	x	x			x						x				x	
<i>Stewartia malacodendron</i> *	silky camelia		x						x		x	x						x
<i>Vaccinium angustifolium</i>	Northern lowbush blueberry	x	x	x			x						x				x	
<i>Vaccinium corymbosum</i> (<i>V. virgata, formosa</i>)	highbush blueberry	x	x	x			x	x	x		x	x	x			x	x	x
<i>Viburnum dentatum</i>	Southern arrow-wood viburnum	x	x	x			x	x	x			x	x			x	x	
<i>Viburnum nudum</i>	possum-haw viburnum		x	x			x	x	x		x	x						x
<i>Viburnum prunifolium</i>	black-haw viburnum	x	x	x			x	x	x			x	x				x	

+ May be aggressive in garden setting.

* Due to the rarity and sensitivity of habitat in Virginia, these species are recommended for horticultural use only. Planting these species in natural areas could be detrimental to the survival of native populations

TABLE 11 NATIVE TREES

Recommended Uses	Native Regions	Minimum Light Requirements	Minimum Moisture Requirements
W = Wildlife	M = Mountains	S = Full Shade	L = Low Moisture
H = Horticulture and Landscaping	P = Piedmont	P = Partial Sun	M = Moderate Moisture
C = Conservation and Restoration	C = Coastal Plain	F = Full Sun	H = High Moisture
D = Domestic Livestock Forage			

Native Trees																
Scientific Name	Common Name	Uses				Region			Light			Moisture				
		W	H	C	D	M	P	C	S	P	F	L	M	H		
Small trees																
<i>Amelanchier arborea</i>	Downy serviceberry	x	x	x		x	x	x			x	x			x	
<i>Amelanchier canadensis</i>	Canada serviceberry	x	x	x		x	x	x				x			x	x
<i>Amelanchier laevis</i>	Smooth serviceberry	x	x	x		x					x	x		x	x	
<i>Asimina triloba</i>	Paw paw	x	x	x		x	x	x		x	x				x	
<i>Cercis canadensis</i>	redbud (Eastern)		x	x		x	x	x		x	x				x	
<i>Chionanthus virginicus</i>	fringetree		x			x	x	x			x	x			x	
<i>Cornus alternifolia</i>	alternate-leaf dogwood	x	x	x		x	x			x	x			x	x	
<i>Cornus amomum</i>	silky dogwood	x		x		x	x	x		x	x				x	x
<i>Cornus florida</i>	flowering dogwood	x	x	x		x	x	x		x	x			x	x	
<i>Crateagus crus-galli</i>	cockspur hawthorne	x	x	x		x	x	x			x	x		x	x	
<i>Crateagus flava</i>	October haw	x	x			x	x	x			x	x			x	
<i>Euonymus atropurpureus</i>	wahoo		x	x		x	x	x		x	x				x	
<i>Halesia tetraptera (H. carolina)</i>	common silverbell		x			x					x	x			x	
<i>Ilex opaca</i>	American holly	x	x	x		x	x	x		x					x	
<i>Magnolia</i>	sweetbay magnolia		x	x			x	x		x	x				x	x

Native Trees																
Scientific Name	Common Name	Uses				Region			Light			Moisture				
		W	H	C	D	M	P	C	S	P	F	L	M	H		
<i>virginiana</i>																
<i>Morus rubra</i>	red mulberry	x	x	x		x	x	x		x	x				x	
<i>Ostrya virginiana</i>	Eastern hop-hornbeam		x			x	x	x		x	x				x	
<i>Persea borbonia</i>	redbay, sweet bay		x	x				x		x	x				x	x
<i>Prunus americana</i>	American wild plum		x	x		x	x	x			x				x	
<i>Prunus virginiana</i>	choke cherry	x	x	x		x					x				x	
<i>Rhus glabra</i>	smooth sumac	x	x	x		x	x	x				x			x	x
<i>Rhus hirta</i> (<i>R. typhina</i>)	staghorn sumac	x	x	x		x	x	x				x			x	
<i>Salix nigra</i>	black willow			x		x	x	x			x	x			x	x
Medium to Large Trees																
<i>Acer rubrum</i>	red maple		x	x		x	x	x				x			x	x
<i>Acer saccharum</i>	sugar maple		x	x		x	x				x	x			x	
<i>Aesculus flava</i> (<i>A. octandra</i>)	yellow buckeye		x			x	x				x				x	
<i>Betula alleghaniensis</i>	yellow birch	x	x	x		x					x	x			x	
<i>Betula lenta</i>	sweet birch, black birch	x	x	x		x	x				x	x			x	
<i>Betula nigra</i>	river birch	x	x	x		x	x	x				x			x	x
<i>Carya alba</i> (<i>C. tomentosa</i>)	mockernut hickory			x		x	x	x		x	x				x	x
<i>Carya glabra</i>	pignut hickory	x	x	x		x	x	x		x	x				x	
<i>Carya ovata</i>	shagbark hickory			x		x	x	x			x	x			x	
<i>Chamaecyparis thyoides</i> *	Atlantic white cedar	x	x					x		x	x				x	x
<i>Diospyros virginiana</i>	Persimmon	x	x	x		x	x	x		x	x	x			x	x
<i>Fagus grandifolia</i>	American beech	x	x			x	x	x		x	x	x			x	
<i>Fraxinus americana</i>	white ash	x	x			x	x	x			x	x			x	
<i>Fraxinus pensylvanica</i>	green ash	x	x	x		x	x	x			x	x			x	
<i>Juglans nigra</i>	black walnut	x		x		x	x	x			x	x			x	

Native Trees																
Scientific Name	Common Name	Uses				Region			Light			Moisture				
		W	H	C	D	M	P	C	S	P	F	L	M	H		
<i>Juniperus virginiana</i>	red cedar (Eastern)	x	x			x	x	x			x	x		x	x	
<i>Liquidambar styraciflua</i>	sweetgum		x	x		x	x	x		x	x	x			x	x
<i>Liriodendron tulipifera</i>	tulip-tree, tulip poplar	x	x	x		x	x	x				x			x	
<i>Magnolia acuminata</i>	cucumber magnolia		x			x						x			x	
<i>Nyssa aquatica</i>	water tupelo	x	x	x				x			x	x				x
<i>Nyssa sylvatica</i>	black gum	x	x	x		x	x	x			x	x			x	
<i>Oxydendrum arboreum</i>	sourwood		x			x	x	x			x				x	
<i>Pinus echinata</i>	shortleaf pine		x			x	x	x			x	x		x		
<i>Pinus serotina</i>	pond pine	x	x	x				x				x			x	x
<i>Pinus strobus</i>	white pine		x	x		x	x	x				x		x	x	
<i>Pinus taeda</i>	loblolly pine	x	x	x				x				x		x		x
<i>Pinus virginiana</i>	Virginia pine			x		x	x	x				x		x		
<i>Platanus occidentalis</i>	sycamore			x		x	x	x			x	x			x	x
<i>Prunus pennsylvanica</i>	pin cherry, fire cherry	x		x		x					x	x		x		
<i>Prunus serotina</i>	wild black cherry	x		x		x	x	x			x	x		x		
<i>Quercus alba</i>	white oak	x	x	x		x	x	x			x	x		x		
<i>Quercus bicolor</i>	swamp white oak	x		x		x	x	x		x	x					x
<i>Quercus coccinea</i>	scarlet oak	x	x			x	x	x			x	x		x		
<i>Quercus falcata</i>	Southern red oak	x	x	x		x	x	x		x	x			x	x	
<i>Quercus ilicifolia</i>	bear oak	x		x		x	x					x		x		
<i>Quercus laurifolia</i>	swamp laurel oak	x		x				x			x	x			x	x
<i>Quercus michauxii</i>	swamp chestnut oak	x	x					x	x			x	x			x
<i>Quercus montana (Q. prinus)</i>	chestnut oak	x		x		x	x	x		x	x			x		
<i>Quercus nigra</i>	water oak	x		x				x		x	x			x	x	
<i>Quercus palustris</i>	pin oak	x	x	x		x	x	x		x	x				x	x
<i>Quercus phellos</i>	willow oak	x	x	x				x	x		x	x			x	x
<i>Quercus rubra</i>	Northern red oak	x	x	x		x	x	x			x	x		x	x	
<i>Quercus stellata</i>	post oak	x	x	x		x	x	x				x		x		

Native Trees															
Scientific Name	Common Name	Uses				Region			Light			Moisture			
		W	H	C	D	M	P	C	S	P	F	L	M	H	
<i>Quercus velutina</i>	black oak	x		x		x	x	x		x	x		x		
<i>Robinia pseudoacacia</i>	black locust			x		x	x	x			x	x			x
<i>Sassafras albidum</i>	sassafras			x		x	x	x			x	x		x	x
<i>Taxodium distichum</i>	bald cypress		x	x				x				x			x
<i>Thuja occidentalis</i>	white cedar	x	x	x		x					x			x	x
<i>Tilia americana</i>	American basswood			x		x	x	x			x				x
<i>Tsuga canadensis</i>	Eastern hemlock	x	x	x		x	x				x	x			x
<i>Tsuga caroliniana</i>	Carolina hemlock	x	x	x		x					x	x		x	x
+ May be aggressive in garden setting.															
* Due to the rarity and sensitivity of habitat in Virginia, these species are recommended for horticultural use only. Planting these species in natural areas could be detrimental to the survival of native populations.															

7.600 EROSION AND SEDIMENT CONTROL

- A. The Virginia Erosion and Sediment Control Handbook and the Loudoun County Codified Ordinances shall be the accepted references in the preparation of grading plans and erosion and sediment control proposals.

The following measures currently specified as acceptable by the Handbook are, in fact, prohibited within Loudoun County without the specific authorization from the Director of Building and Development:

1. Straw bale barriers
 2. Brush barriers
- B. The use of diversion berms to break up drainage divides to support the use of sediment traps shall only be allowed where it can be demonstrated that maintenance of the berm can be accomplished during site grading activities.
- C. The erosion and sediment control plan shall provide for two-phase erosion and sediment measures.
1. The First Phase shall reflect the perimeter controls and any interior controls necessary to protect undisturbed land areas and shall reflect existing conditions

including drainage divides. Existing drainage divides shall be the basis to determine the use of sediment traps versus sediment basins.

2. The Second Phase shall reflect specific controls once the infrastructure and storm sewer pipes are installed. Future drainage divides shall be considered when designing this phase.
- D. See FSM Section 8.111 for Grading Permit application requirements.
- E. The erosion and sediment control plan shall provide a detailed narrative to include the following:
1. Project Description
 2. Existing Site Conditions
 3. Adjacent Property Information (Including adequate outfall analysis, if applicable.
 4. Off-Site Areas (i.e. Stockpile Areas, Site Access)
 5. Soil Information
 6. Critical Erosion Areas
 7. Explanation of the designed erosion and sediment control measures.
 8. Sequence of construction plan/schedule and, if applicable, the phasing of proposed clearing and construction activities.
- F. Super silt fence is a temporary barrier of Geotextile Class F over 2-inch wire fabric mesh (chain link) used to control sediment-laden runoff from small drainage areas where the use of typical silt fence is questionable due to slope, proximity to a stream or other site conditions. Super silt fence should be used where the installation of a dike would destroy sensitive areas such as woods and wetlands.
1. Super silt fence should be placed as close to the contour as possible. No section of silt fence should exceed a grade of 5 percent for more than 50 feet.
 2. Super silt fence is not intended to replace primary controls such as sediment traps or sediment basins.
 3. Length of the flow contributing to the super silt fence installation site shall conform to the following limitations:

SLOPE	SLOPE STEEPNESS	SLOPE LENGTH (MAX.)	SILT FENCE LENGTH (MAX.)
0-10%	0-10:1	Unlimited	Unlimited
10-20%	10:1-5:1	200 feet	1,500 feet
20-33%	5:1-3:1	100 feet	1,000 feet
33-50%	3:1-2:1	100 feet	500 feet
50% Plus	2:1 Plus	50 feet	250 feet

4. Construction Specifications

- a. Fencing shall be 42 inches in height and constructed in accordance with the latest Virginia Department of Transportation Road and Bridge Standards for chain link fencing.
- b. Chain link fence shall be securely fastened to the fence posts with wire ties or other suitable means. The lower tension wire, brace and truss rods, drive anchors and post caps are not required except on the ends of the fence.
- c. The silt fence fabric shall be securely fastened to the chain link fence with ties spaced every 24 inches at the top and mid-section.
- d. The silt fence fabric shall be embedded a minimum of 8 inches into the ground.
- e. When two sections of silt fence fabric adjoin each other, they shall be overlapped by 6 inches and folded.
- f. Maintenance shall be performed as needed and silt build-up removed when the silt reaches one-half the height of the fence.
- g. The silt fence fabric shall meet the following requirements for Geotextile, Class F:

Tensile Strength	50 lb/in (Min)	ASTM Test Method D-4595
Tensile Modulus	20 lb/in (Min)	ASTM Test Method D-4595
Flow Rate	0.3 gal/cu.ft/min. (Max)	ASTM Test Method D-5141
Filtering Efficiency	75 Percent (Min)	ASTM Test Method D-5141

G. Development of Parks, Recreation and Community Services Facilities

Grading and construction of any facilities for the Loudoun County Department of Parks,

Recreation and Community Services (PRCS), such as ballfields, trails and open space areas, shall comply with the PRCS Construction & Design Guidelines in effect at the time construction commences.

7.700 UTILITY PLACEMENT

Underground installation of utilities, such as electric, telephone and cable television, shall be installed for new subdivision and site plan developments and to the extent possible in re-development projects. Such utilities shall be placed under the sidewalks or within the right-of-way when feasible.

7.800 ENVIRONMENTAL AND CULTURAL RESOURCE EXISTING CONDITIONS PLAT

An Environmental and Cultural Resource Existing Conditions Plat (“Existing Conditions Plat”) is required for the optional pre-submission meetings as set forth in Chapter 8 of this manual. A preliminary sketch plan and narrative to provide an overview of the proposed development layout and plan shall accompany this Existing Conditions Plat. Both the preliminary sketch plan and Existing Conditions Plat shall be drawn at the same scale, preferably 1” equals 200’.

The purpose of this Existing Conditions Plat is to determine the limits of environmentally sensitive and cultural resource areas within any property(ies) prior to development of the property to promote conservation of the resources and the incorporation of the features into the development design. The Existing Conditions Plat shall be prepared using literature, data or County generated maps to illustrate the existing environmental and cultural resources identified herein. This requirement does not release the applicant from obtaining permits from the Army Corps of Engineers and the Virginia Department of Environmental Quality for disturbances in wetland areas.

The Existing Conditions Plat shall identify and illustrate the location of environmental and cultural resources on the property and off-site 100 feet beyond the subject property boundary and shall be accompanied by a brief narrative description of the identified resources and the source of the information for each identified resource. The following are examples of such resources:

- A. A letter from the Virginia Department of Conservation and Recreation, Division of Natural Heritage identifying occurrences of natural heritage resources on the property such as the habitat of rare, threatened, or endangered plant and animal species, unique or exemplary natural communities, and significant geologic formations.
- B. Areas of forest or other vegetated cover as depicted in the Loudoun County Geographical Information System (LOGIS).
- C. Floodplains, as depicted in LOGIS or an approved floodplain study.

- D. Archaeological sites, historic structures, cemeteries, historic districts, and historic landmarks as identified and specifically numbered in a letter from the Virginia Department of Historic Resources or as part of a Phase I archaeological survey.
- E. Very Steep and Moderately Steep Slopes, as identified in LOGIS.
- F. Known pollution sources (including without limitation dump sites, drainfields, buried fuel tanks, hazardous material storage facilities, solid and liquid disposal sites, etc.), wells and springs as identified in LOGIS.
- G. Topography using 5 foot or lower contours, structures, foundations, and features such as sink holes, karst features, drainage channels, and water bodies as identified in LOGIS.
- H. Soils and geologic information as identified in LOGIS.
- I. Open space and conservation easements.
- J. Overlay Districts, as established in the Zoning Ordinance.
- K. The boundaries of the Scenic Creek Valley Buffer and any other required environmental buffers.
- L. Potential jurisdictional waters and wetlands as identified by (i) the Loudoun County Predictive Wetlands Model, or (ii) a consultant delineation performed in accordance with Army Corps of Engineers (Corps) standards, or (iii) a Corps-approved wetland delineation.

7.810 PHASE I ARCHAEOLOGICAL SURVEY

The purpose of the Phase I archaeological survey is to identify the locations of existing archaeological resources on a property subject to the application

- A. The Phase I archaeological survey shall be conducted by a qualified professional meeting the Qualification Standards as set forth in “the Secretary of the Interior’s Standards and Guidelines for Archaeology and Historic Preservation” as defined in 36 CFR 61, Appendix A.
- B. The Phase I archaeological survey and reporting shall meet the standards set forth in the Virginia Department of Historic Resources (VDHR) “Guidelines for Conducting Historic Resources Survey in Virginia.”
- C. The Director may approve a Phase I Archaeological Management Summary Report, in lieu of the reporting required by VDHR’s “Guidelines for Conducting Historic Resources Survey in Virginia,” if the Phase I archaeological survey does not result in the identification of archaeological sites, or results in the identification of archaeological

resources that are determined by the consultant to warrant no further archaeological investigation. The Phase I Archaeological Management Summary Report must include the following:

1. A brief description of the property with a vicinity map.
 2. The testing methodology and map of project area showing areas tested.
 3. The results of fieldwork including artifact inventory and brief description of any identified sites.
 4. The rationale for site recommendations if applicable.
- D. The Director may waive or modify the requirement for Phase I archaeological survey and reporting after determining that a site has little or no potential for cultural resources based on a finding such as (a) the site has been subject to prior significant grading or ground disturbance beyond normal agricultural use, or (b) the site contains environmental characteristics (such as slopes, wetlands, hydric soils) that would have rendered previous human occupation reasonably unlikely.

7.900 REFERENCES FOR CHAPTER 7

Codified Ordinances of Loudoun County of Virginia.

"Guide Policy for Roadway Lighting Facilities and Security Lighting Facilities" (VDOT).

Virginia Erosion and Sediment Control Handbook, Division of Soil and Water Conservation.

AASHTO Handbook.

CHAPTER 8.000

ADMINISTRATIVE PROCEDURES

This chapter establishes certain criteria which must be met to allow a systematic approach to a comprehensive review process. In addition to the information below, it is the developer's responsibility to provide all necessary information to allow reviewing agencies to adequately determine if all requirements of pertinent ordinances and provisions of this manual have been met.

The information in this chapter includes:

- 8.000 Optional Pre-Submission Requirements for Preliminary Subdivision, Site Plans and Certain Construction Plans and Profiles Applications
- 8.100 Details of Plat and Plan Requirements
 - 8.101 General
 - 8.102 Preliminary Plan of Subdivision
 - 8.103 Plats for Subdivision and Other Plats
 - 8.103.1 Record Plat
 - 8.103.2 Boundary Line Adjustment
 - 8.103.3 Preliminary/Record Subdivision
 - 8.103.4 Family Subdivision
 - 8.103.5 Subdivision Waiver
 - 8.103.6 Easement Plat
 - 8.103.7 Dedication Plat
 - 8.103.8 AR-1 and AR-2 Division Plats
 - 8.104 Floodplain Study
 - 8.105 Floodplain Alteration
 - 8.106 Construction Plans and Profiles
 - 8.107 Site Plan
 - 8.108 Record Drawings
 - 8.109 Plan Revisions
 - 8.110 Plan Amendments
- 8.200 Requirements for Start of Any Construction
- 8.300 Bonding Policy
- 8.400 Certificate of Occupancy or Use
- 8.500 Inspections

8.000 OPTIONAL PRE-SUBMISSION MEETINGS PRIOR TO PRELIMINARY SUBDIVISION, SITE PLAN, PLAT AND CONSTRUCTION PLAN AND PROFILE APPLICATIONS

In order to familiarize an applicant or landowner with the development review process; or to provide an applicant or landowner the opportunity to discuss development alternatives; or to provide an applicant or landowner the opportunity to discuss a particular property and any environmental and cultural resource issues; an applicant or landowner may request a pre-submission meeting prior to submission of Preliminary Subdivision, Site Plan, Plat, or Construction Plan and Profile applications. To facilitate discussion at the pre-submission meeting, an Environmental and Cultural Resource Existing Conditions Plat shall be prepared in accordance with Chapter 7 of this manual, accompanied by a sketch plan and narrative of the proposed land use proposal, and submitted to the County.

Upon receipt of the Existing Conditions Plat, the County will schedule an Existing Conditions Review meeting to be held within ten (10) working days. During the Existing Conditions Review meeting, the County and applicant shall collaborate and share design options to meet the proposed land use objectives while preserving and protecting the environmental and cultural resources identified on the subject site. Conclusions and agreements made at the pre-application meeting shall be documented for future reference by the applicant and the County during the land development application preparation, review and approval process.

8.100 DETAILS OF PLAT AND PLAN REQUIREMENTS

The information contained in the following subsections is required to be included on plats and plans reviewed by the Department of Building and Development.

8.101 GENERAL

The information in this section gives an explanation of standard plat and plan requirements. See the specific requirements of each plat or plan for the requirements of each document.

A. Standards:

1. Scale: The scale of the plat or plan shall be shown in feet or meters. If meters are provided, an equivalency to feet must be shown.
2. Proposed name of subdivision or development: No proposed names of subdivisions or developments shall duplicate or closely resemble the name of any existing or currently proposed subdivision or development in Loudoun County. Name should include Phase or Section Number, as applicable.
3. Revision Block: A revision block shall be shown on the first sheet of the plat or plan set in substantially the following form and shall contain a summary of all revisions made to any part of the plat or plan.

No.	Sheet Number and Revision Description	Date

4. Source of Title: The source of title should be shown by listing the deed book and page of the last instrument in the chain of title for all included property.
5. Zoning Requirements: F.A.R. or lot coverage calculations as required by the Zoning Ordinance (i.e. construction plans and site plans). In tabular form show the specific zoning requirements, in accordance with the Zoning Ordinance including proffered or special exception conditions, for the subject property and the existing zoning districts, to include but not limited to: applicable version of the Zoning Ordinance (i.e. 1972 or 1993), Zoning district; overlay zoning districts; minimum lot area; minimum lot width; maximum length/width ratio; minimum front, side and rear yards; maximum floor area ratio; maximum building coverage; maximum building heights, parking spaces required and provided (including standard and handicap accessible); open space requirements; proposed uses; proposed number of lots; and if applicable, density transfer rights.
6. Zoning, variance, special exception, subdivision, subdivision exception, floodplain study and alteration information: Reference to application numbers and corresponding approval dates for land development applications preceding the subject application submission and relevant to the subject property.
7. Vicinity Map: The plat or plan shall show the location of the proposed subdivision by an insert vicinity map, drawn to a scale 1 inch equals not more than 2000 feet or other appropriate scale as permitted by the Director. The boundaries of the insert map shall be in intervals evenly divisible by 1000 of the Coordinate Grid System and shall be so labeled and indicated thereon:
 - a. The existing boundary lines of the proposed subdivision and/or site plan and of any larger tract of which the subdivision and/or site plan forms a part.
 - b. Adjoining roads and private access easements with their names and route numbers.
 - c. Town boundary lines, and other landmarks, if any, within one mile of the proposed subdivision.
 - d. North arrow.

8. Coordinate Grid Lines: Approximate coordinate grid lines and values reflecting the North American Datum of 1983 Virginia North State Plane (NAD 83 HARN) coordinate grid system with at least four ticks or intersection points shall be shown on each plan sheet, for informational purposes, in intervals of no less than 250 foot increments and no more than 1,000 foot increments. For record plats, grid system coordinates of at least two adjacent corners shall be included, if any point in the subdivision is within 1/2 mile of an NGS or equivalent triangulation or traverse station established within the standards for a second order geodetic monument. (Projects that were started prior to November 9, 2009 may use the previously required NAD 27 datum.)
9. Adjoining property information: The names of adjoining property owners; or adjoining tax map references; or, if a subdivision, the name, section and lot number of adjacent properties. Also adjacent zoning district and departing property lines shall be shown. For preliminary plats, construction plans and profiles, and site plans the existing adjacent land use shall be indicated for the purpose of determining buffer requirements per the Zoning Ordinance.
10. Zoning district and jurisdictional boundaries: The zoning district boundaries and overlay district boundaries shall be shown when a property contains more than one zoning or overlay district. Jurisdictional boundaries shall be shown for property located in Loudoun County and a town, another County and which falls under the subdivision control of a town.
11. Yard and Setback Lines: Front, side and rear yard and setback lines required by the Zoning Ordinance and/or proffers shall be shown as dashed lines or in tabular form. The dimension from each lot line and the length of the front yard line shall be clearly illustrated and identified. A note may be added to the plat stating that the yards are for depiction of current ordinance requirements only and may be subject to change.
12. Stakeout and plan: Either of the following shall be provided:
 - a. A stakeout plan shall show all parcel outer tract corners and the approximate location of proposed entrances from State-maintained roads which are staked. The stakeout plan and field stakes will have a corresponding reference system. The plan will include the following statement: "Those points shown on this plan have been field staked". It is the developer's responsibility to do necessary clearing and provide stakes high enough to make them visible for a reasonable distance.

or

 - b. In lieu of providing a plan, the approximate location of proposed entrances from State-maintained roads will be staked, and the name, address and telephone number of the party who will respond to the Director's request

for field assistance, when required, to identify specific areas of proposed development as related to existing site conditions.

13. Approval block: An approval block shall be provided per the following with appropriate application number provided within:

APPROVAL BLOCK	
LAND DEVELOPMENT APPLICATION NUMBER _____	
_____ Director of Building & Development	_____ Date

14. Fee Check: A fee check, payable to the County of Loudoun, shall be attached to the plat or plan submission. Fee schedules are available from the Director.
15. Land Development Application Form: A complete and executed Land Development Application Form with original signatures, as provided by the Director.
16. Tax Map Reference: The MCPI number is required for all properties that are a part of the application. The tax map and parcel numbers are optional. Such references may be made in tabular form or shown on the plat or plan.
17. Topography: Topographic information, indicating when and by what means it was made, having contour intervals of 2 feet or less, showing all the area covered by the site, including a 50 foot overlap, and related to the North American Vertical Datum of 1988 (NAVD 88). Areas of forest or other vegetated cover shall also be shown. Champion trees as identified in adopted Federal and State documents must also be identified. (Projects that were started prior to November 9, 2009 may use the previously required NAD 27 datum.)
18. Seal and Signature: The seal, signature, and date of the professional engineer or surveyor who prepared this plat or plan shall be shown on each sheet.

8.102 PRELIMINARY PLAT OF SUBDIVISION

The purpose of the preliminary plat of subdivision is to conceptually show the probable lot layout and location of streets and other necessary infrastructure to demonstrate geometric locations of all lots and improvements of such proposed subdivision.

- A. The preliminary plat of subdivision shall contain the following data, legibly drawn, on sheets of 24 inches by 36 inches in size, with appropriate matchlines, (if necessary). The

failure to depict the following items on the preliminary plat of subdivision, shall not relieve the developer of any requirement to depict such items on subsequent application.

1. The title "Preliminary Plat of Subdivision".
2. Scale. (See 8.101)
 - a. Lots less than or equal to 3 acres: 1 inch equals no more than 100 feet.
 - b. Lots greater than 3 acres 1 inch equals no more than 200 feet.
3. North arrow.
4. Date. A date shall be shown on the cover sheet
5. The proposed name of the subdivision. (See 8.101)
6.
 - a. The name and address of the owner of record.
 - b. The name of the subdivider.
 - c. The professional engineer or surveyor who prepared the plat.
7. The number of sheets comprising the plat.
8. A revision block. (See 8.101)
9. Source of title. (See 8.101)
10. Zoning requirements. (See 8.101)

In addition to the applicable zoning requirements, as stated in Section 8.101.5, the following note shall be provided on preliminary plats of subdivision which are preceded by a rezoning or special exception application:

"All development within this subdivision shall be in substantial conformance with (A) the requirements of the applicable concept development plan, proffers and special exception conditions in accordance with (insert specific reference to County application numbers), pursuant to which such concept development plan, proffers and special exception conditions were approved, and (B) any conditions set forth as conditions of approval of this preliminary plat."

11. Zoning, variance, special exception, subdivision, or subdivision exception information. (See 8.101)
12. Election District and Loudoun County, Virginia in Title Block.

13. Vicinity map. (See 8.101)
14. Boundary lines and total acreage of the proposed subdivision and the acreage remaining in the original tract, if any.
15. Proposed lot lines, (showing approximate dimensions), proposed block and lot numbers, and the approximate area of each lot.
16. Coordinate Grid lines. (See 8.101)
17. Adjoining property information. (See 8.101)
18. The Zoning District and jurisdictional boundaries. (See 8.101)
19. Tax map reference. (See 8.101)
20. The approximate location of existing buildings within the subdivision.
21. The proposed location, width, centerline and projected Average Daily Traffic (ADT's) of each road or other public or private way within the subdivision. Pedestrian circulation paths shall be shown, including proposed trails and sidewalks, if such improvement is required.
22. The approximate location, width, ADT's and centerline of adjoining roads, and access easements with their names and/or route numbers.
23. Proposed roads shall include approved and/or reserved road names and road sign locations per the Codified Ordinances of Loudoun County.
24. Proposed yard and setback lines. (See 8.101)
25. The approximate location and approximate area of any land to be dedicated or reserved for public use, road right-of-way use, or common use of future property owners in the subdivision. The location of any existing and proposed conservation easements.
26. Approximate watercourse locations and names, if any, and floodplain delineation per the Floodplain Map of Loudoun County or per a floodplain study performed in accordance with Chapter 5 of this manual which has been approved by the County or which has been submitted and accepted by the County for review; or per a vertical field survey in accordance with Chapter 5 of this manual. A note stating the source of the floodplain delineation shall be included.
27. General location of existing drainage ways, ponds, springs, on site sewage disposal, on site water supply systems and existing and proposed public water and sewer lines.

28. The locations of archaeological sites, historic structures, cemeteries, historic districts, and historic landmarks on the site, as identified by the Phase I archaeological survey (Phase II and Phase III if applicable) performed on the property.
29. Current topographic information, indicating when and by what means it was made, having contour intervals of 5 feet or less, showing all the area covered by the subdivision not including residue parcel(s) and related to the National Geodetic vertical datum of 1929. Areas of forest or other vegetated cover shall also be shown. In cases where a Tree Cover Inventory has been performed for the property, identified cover type areas and specimen trees must be depicted. Champion trees as identified in adopted Federal and State documents must also be identified.
30. Stakeout and plan. (See 8.101)
31. Graphically shown on the plan, 65 and 60 LDN Limits and any areas within one mile of the 60 LDN line, as defined by the Zoning Ordinance of Loudoun County.
32. Approval block. (See 8.101)
33. Proffered preservation areas shall be clearly delineated (e.g., trees, structures, etc.).
34. For lots less than 3 acres in size a typical lot detail shall be provided at a scale of not less than 1 inch = 50 feet.
35. A tabulation of lot yield for those properties being developed pursuant to the Cluster Subdivision Option or Principal/Subordinate Option in the AR-1 or AR-2 Zoning Districts.
36. Wetlands data as follows:
 - a. Potential jurisdictional waters and wetlands as identified by the Loudoun County Predictive Wetlands Model or a consultant wetland delineation performed in accordance with Army Corps of Engineers (Corps) standards shall be depicted on the plat.
 - b. A note referencing the source of the wetland information depicted on the plat (including the Corps Jurisdictional Determination number and date, if it exists) and indicating that all applicable state and federal permits shall be obtained prior to disturbances within jurisdictional waters and wetlands shall be provided on the plat.
37. Very Steep and Moderately Steep Slopes, as defined in the Zoning Ordinance of

Loudoun County and as identified in LOGIS, or based on a topographic analysis where a contour interval of less than 5 feet is used.

38. The boundaries of Scenic Creek Valley Buffer and other required environmental buffers.
39. A soils map certification in accordance with Chapter 6 of this manual.
40. Overlay Districts as established in the Zoning Ordinance.

B. Items to Accompany Preliminary Plat of Subdivision

The following items shall accompany the submission of a preliminary plat of subdivision:

1. For any subdivision to be served in accordance with the requirements of the LSDO section relating to onsite sewage disposal systems, written approval of the proposed locations of sewage disposal systems shall be obtained from the Health Director or his designee and submitted with the preliminary plan. For any subdivision proposed to be served by on site wells, the developer shall submit with the preliminary plan written verification from the Health Director, or his designee, that the Hydrogeologic Report has been reviewed and approved in accordance with Chapter 6 of this manual.
2. Fee check.
3. Land Development Application Form.
4. A Phase I archaeological survey report prepared in accordance with the standards set forth in this Manual and in the Virginia Department of Historic Resources (VDHR) "Guidelines for Conducting Historic Resources Survey in Virginia."
 - a. The Director may waive or modify the requirement after determining that there is little or no potential for cultural resources on the site based on a finding such as (a) the site has been subject to prior significant grading or ground disturbance beyond normal agricultural use, or (b) the site contains environmental characteristics (such as slopes, wetlands, hydric soils) that would have rendered previous human occupation reasonably unlikely.
5. If within the Limestone Overlay District or Mountainside Development Overlay District, documentation of the submission of an application for, or the submission of a private, Preliminary Soils Review in accordance with Chapter 6 of this manual.
6. A letter from the Virginia Department of Conservation and Recreation, Division of Natural Heritage identifying occurrences of natural heritage resources on the property such as the habitat of rare, threatened, or endangered plant and animal

species, unique or exemplary natural communities, and significant geologic formations. If an endangered and threatened species survey has been completed for the property, a copy of the report shall also be submitted.

7. If applicable, plan and analysis of VDOT connectivity requirements and locations of stub out streets.

C. Preliminary Plat Review

Following the first review by the County, the Preliminary Plat may be conditionally approved. After the first review, the Director shall prepare and provide an Official Comment Letter setting forth the corrections and revisions that are required or recommended, including, by attachments, the referral comments from the referral agencies. When the Official Comment Letter is received by the applicant, applicant may submit a written response to the Director that it will comply with all County and referral comments as part of its Construction Plans and Profiles and record plat submissions. The Director will consider this response, and if the Director finds that the revision of the Preliminary Plat in accordance with the Official Comment Letter will not substantially alter the conceptual layout of the Preliminary Plat, such Preliminary Plat shall be conditionally approved.

8.103 PLATS FOR SUBDIVISION AND OTHER MISCELLANEOUS PLATS

- A. The plats shall be prepared by a professional surveyor or engineer. These plats shall contain the data listed below, legibly drawn, on sheets of 18 inches by 24 inches in size, with appropriate matchlines (if necessary). The following shall be included for each plat as appropriate.

1. Scale.
 - a. Lots less than 1/4 acre 1 inch equals no more than 50 feet.
 - b. Lots 1/4 to 3 acres 1 inch equals no more than 100 feet.
 - c. Lots greater than 3 acres 1 inch equals no more than 200 feet.
2. North arrow. Revision Date: 11/08/2010
3. Date.
4. The name of the subdivision.
5.
 - a. The name of the owner(s) of record.
 - b. The name and address of the engineer or surveyor who prepared the plat.

6. Number of sheets comprising the plat.
7. A revision block.
8. Tax map reference(s).
9. Seal and signature.
10. A certificate, endorsed by the engineer or surveyor, setting forth the source of title of the land subdivided and the place of record of the last instrument(s) in the chain of title, in accordance with Section 15.2-2262 of the Code of Virginia, as amended.
11. The boundary survey with an error of closure within the limits established by the Commonwealth of Virginia.
12. Coordinate grid lines.
13. The original tracings and paper copies submitted for signature and recordation shall be drawn legibly and accurately per Virginia State Library and Archives Standards for plats.
14. Zoning requirements.
15. Zoning district and jurisdictional boundaries.
16. Zoning, variance, special exception, subdivision, or subdivision exception information.
17. Election District and Loudoun County, Virginia in the Title Block.
18. Vicinity Map.
19. The plat shall show parcel and lot lines, showing dimensions, block and lot numbers, and the area of each parcel or lot including area outside of major floodplain. Dimensions shall be shown in feet and decimals of a foot to the closest one-hundredth of a foot, and bearings in degrees, minutes, and seconds. The data for curves shall be shown in detail at the curve or in a curve data table containing the following: radius, delta, arc, tangent, chord, and chord bearing. Acreage shall be shown to the ten thousandth decimal place and square footage to the nearest whole foot and all of the remaining area in the original tract/residue parcels to the nearest one hundredth of an acre.
20. Roadways shall include approved and/or reserved names per the Codified Ordinances of Loudoun County. Existing public roadways shall include route numbers and road names.

21. The location, dimensions of easements, dimensions and area of roadways, public sites (schools, fire and rescue facilities, etc.), parks and other public areas shall be included.
22. Adjoining property information.
23. Graphically shown on the plan, 65 and 60 LDN Limits and any area within one mile of the 60 LDN line, as defined by the Zoning Ordinance of Loudoun County.
24. Yard and setback lines.
25. If land is being dedicated or reserved for public use for roads, parking areas for public use, or for common use of the future property owners of the subdivision, the record plat shall so state and illustrate such.
26. As applicable, the location, width, and centerline of existing/proposed roads, easements, parking areas, and public or private rights-of-way within or immediately abutting the property. Deed book and page numbers shall be provided, as applicable.
27. If not otherwise contained within the deed accompanying the plat, the plat shall contain a statement to the effect that the subdivision is with the free consent and in accordance with the desire of the undersigned owners and trustees of the property and shall be duly acknowledged in accordance with Section 15.2-2264 of the Code of Virginia of 1950, as amended.
28. The plat shall indicate Health Director approved sewerage disposal systems and water supply systems, as specified in the Loudoun County Codified Ordinances.
29. The plat shall contain a statement setting forth the persons or entities responsible for maintenance of stormwater detention, drainage facilities, easements, sidewalks, trails, lighting and other facilities, as required.
30. In the AR-1, AR-2, A-10 and A-3 Zoning Districts, record plats shall contain the following statement:

"In all areas within the AR-1, AR-2 or A-10 Zoning Districts, agricultural and rural economy activities are the preferred land uses. Owners of land within AR-1, AR-2 or A-10 Zones are hereby notified that agricultural and rural economy activities shall be given preference by the County when conflicts arise concerning the compatibility of such farm or rural economy uses with adjacent or nearby non-farm or non-rural economy uses. The County shall not restrict or interfere with farming and rural economy activities in AR-1, AR-2 or A-10 Zones. The farming and rural economy activities, including such effects as noise, odors, and machinery traffic, shall not be recognized or accepted by the County as valid or

proper cause for complaints from adjacent or nearby residential neighbors."

31. Watercourses and names, if any, and a floodplain easement in accordance with Chapter 5 of this manual.
32. All restrictive covenants or reference thereto.
33. An Approval Block.
34. If private roads or access easements are proposed, the following notes shall be added as appropriate:
 - a. Construction of the access easement shown hereon shall conform to the standards set forth in the Loudoun County Land Subdivision and Development Ordinance.
 - b. Construction of the Class III road shown hereon shall conform to the standards set forth in Chapter Four of this manual.
 - c. The access road or access easement shown hereon is private and its maintenance, including snow removal is NOT a public responsibility. It shall not be eligible for acceptance into the State secondary system for maintenance until such time as it is constructed and otherwise complies with all requirements of the Virginia Department of Transportation for the addition of subdivision roads current at the time of such request. Any costs required to cause this road to become eligible for addition to the State system shall be provided from funds other than those administered by the Virginia Department of Transportation and Loudoun County.
35. The location of structures to be retained, including stone walls within areas to be dedicated for public use.
36. Designation of ADU lots in accordance with Zoning Ordinance.
37. If the property is being developed pursuant to the Principal/Subordinate Subdivision Option, the following as appropriate:
 - a. Tabulations showing the lot yield originally calculated for the Originating Tract, all prior subdivisions from the Originating Tract, and all resulting Principal Lots and number of Subordinate Lots created pursuant to each such subdivision.
 - b. Labels clearly identifying the Principal and Subordinate lot (s).
 - c. A note stating that "Subordinate lots are ineligible for further subdivision."

38. If the property is being developed pursuant to the Cluster Subdivision Option in the AR-1, AR-2, RR-1 or RR-2 Zoning District, the following as appropriate:
- a. Inclusion of a note on the record plat and documentation within the deed that agricultural operations enjoy the protection of the Right to Farm Act.
 - b. A tabulation of density for such cluster subdivision.
 - c. Inclusion of note on the record plat and documentation within the deed stating that all lots are ineligible for further subdivision.

B. Documents to Accompany Plats

The following items shall accompany the submission of the plat.

- 1. Verification of Water Supply and Sewage Disposal.
 - a. (i) A letter signed by the Health Director evidencing conformance with applicable requirements of the County Health Department. (ii) If public water or public sewerage is to be provided, a letter signed by an authorized official of the appropriate public authority shall be submitted indicating that service can and will be provided. (iii) In cases where a communal supply is proposed, approved plans for the water distribution and treatment facility shall also be included.
- 2. Fee check.
- 3. Land Development Application Form.
- 4. Application Form Certification.

"I hereby acknowledge that failure to record the approved plat within 6 months of the date of approval will make the plat null and void. Furthermore, monuments, as required by the Loudoun County Land Subdivision and Development Ordinance, shall be set prior to release of performance guarantee(s) or in the case where performance guarantee(s) are not established, prior to recordation of the plat."

Property Owner

Date

C. Final Documents

Prior to plat approval, the following items must be submitted for review and approval to the Director:

1. If improvements required under these regulations are not completed, a financial guarantee in the form of a cash bond, certified check, or surety performance bond and agreement as required by Section 8.300 of this chapter. Such guarantee must be accepted by the Board of Supervisors or designee prior to plat approval.
2. An unexecuted copy of the deed, accompanied by a Certificate of Authenticity signed by the developer and duly acknowledged before an officer authorized to take acknowledgments of deeds, to the effect that this is a true copy of the proposed deed which will be presented for recordation, unless revisions are required by the Director, in which case such deed will be recorded in the form as approved by the Director or designee. Such deed shall:
 - a. Contain a correct description of the land subdivided or adjusted and state that such subdivision or adjustment is with the free consent and in accordance with the desire of the undersigned owners and trustees of the property and shall be duly acknowledged in accordance with Section 15.2-2264 of the Code of Virginia, as amended.
 - b. Contain language such that, when the deed is recorded, it shall operate to transfer in fee simple to the Board of Supervisors such portion of the platted premises as is on such plat set apart for roads, easements, or other public use and to create a public right-of-passage over the same.
 - c. Contain protective or restrictive covenants, if applicable.
 - d. Contain, when applicable, provisions for maintenance and indemnification by the property owner with respect to any structure, including permanent fences and stone walls, within the proposed and future right-of-way.
3. In cases where land or facilities are to be dedicated to and held in perpetuity by a homeowner's association, copies of homeowner's association documents shall be submitted.
4. A letter from the obligor acknowledging that a maintenance and indemnification agreement satisfactory to the Board of Supervisors to provide for public facilities maintenance must be executed and delivered to the Director prior to final release of the financial guarantee.
5. Certificate by subdivider that structures subject to Zoning Ordinance minimum yard requirements, which are not shown on the plat, will be removed, unless satisfactory alternate arrangements have been approved by the Director.

6. The submitted mylar and paper copies shall be at the scale of the original plat, without enlargement or reduction to change the size of the plat. If the plat contains lots served by well or septic drainfields, a second reproducible mylar copy of the plat shall be submitted.
7. If not included in the deed, a Deed of Release if there are deed of trust trustees who did not enter into the application or a letter or other documentation from the owner which certifies that there is no deed of trust lien on the property
8. A letter from the owner which states that a performance bond or check adequate to insure the installation of required water or sewerage facilities in a manner which will satisfy the requirements of the County Health Department, the town, or the Authority, as applicable, has been furnished to such public authority.
9. When the developer is required to establish an owners' association prior to approval of the plat to satisfy proffer or other zoning or regulatory requirements, documentation evidencing the creation and legal existence of the association. For properties located within the Goose Creek Reservoir Protection area as defined in Chapter 5 of this manual, such association documents shall include covenants requiring the association to maintain the storm drainage inlet structure markings described in Chapter 5 and covenants restricting the use of pesticides, herbicides and fertilizers to those materials which are labeled safe for aquatic use.
10. A copy of the document establishing the funding mechanism providing maintenance of the common facilities in accordance with the Zoning Ordinance (AR and RR Districts only).
11. A copy of a minimum two year maintenance contract if communal and/or sewage disposal system is to be maintained by an entity other than LCSA (AR and RR Districts only).
12. For developments containing stormwater management retention facilities commonly referred to as wet ponds or lakes, an unexecuted copy of a Stormwater Maintenance Agreement as defined in Chapter 1096 of the Loudoun County Codified Ordinances to establish the mutual responsibilities of the County and the property owner for maintenance of such facility. Such Agreement shall be in a form acceptable to the County Attorney in consultation with the Department of General Services.

D. Standard Process

The following process is required for plat applications (“Plats”) that are based on construction plans and profiles or site plans (“Plans”). It does not apply to easement, boundary line adjustment, family subdivision, subdivision waiver or preliminary/record plat applications that do not involve construction plans. Any application that fails to

provide all the information required in this section will be returned without review and, upon resubmission, placed after all other applications that have been submitted prior to such resubmission.

1. The first submission of the Plat shall not be submitted prior to the second submission of the Plans. The first submission of the Plat shall address, as appropriate, all of the County's first review comments on the Plans. The first submission of the Plat shall be submitted without Legal Documents. The first submission of the Plat shall be accompanied by a signed "Certification of Plat Preparer" form (on colored paper) from the submitting firm. The certification submitted by the firm shall be in the general form which is posted on the Loudoun County Website.
2. The second submission of the Plat shall address all of the first submission Plat referral comments. The second submission of the Plat shall be accompanied by the first submission of the Legal Documents which shall have been prepared based upon the second submission revised plat and in conformance with any applicable proffers or conditions. For the purpose of this process, Legal Documents shall include, as applicable, Deed of Subdivision, Dedication and Easements, Deed of Open Space Easement, ADU Covenants, and Declaration of Covenants or Supplementary Declaration of Covenants. The first submission of the Legal Documents shall be accompanied by a signed "Certification of Document Preparer" (on colored paper) from the document preparer, stating that the documents have been prepared based on a review of the applicable proffers and based on the revised plat which plat shall be identified in the Certification by its most recent revision date, in the general form which is posted on the Loudoun County Website. Legal Documents shall be forwarded by the project planner to the Office of the County Attorney for review. Review comments regarding the Legal Documents shall be provided to the project planner by the Office of the County Attorney. The review comments associated with the second submission Plat and first submission Legal Documents will be forwarded to the applicant upon completion.
3. The third submission of the Plat and second submission of the Legal Documents shall address all of the second submission Plat and first submission Legal Documents referral comments. The third submission Plat and second submission Legal Documents shall be accompanied by updated Certifications. The second and all subsequent submissions of the Legal Documents shall each be highlighted by the document preparer to reflect all revisions to the immediately prior submission. It is also encouraged that, where appropriate, Plats be highlighted to reflect all revisions to the plat. The third submission Plat and second submission Legal Documents shall not be submitted until the Plans upon which the Plat is based have been approved and the bond amount approved. A copy of the County staff bond estimate approval letter shall be submitted with the third submission of the plat (second submission of Legal Documents).

4. Staff will complete review of the third submission Plat and second submission Legal Documents within 3 weeks and forward comments on both Plat and documents within 5 working days after receipt of comments from the Office of the County Attorney.
5. Required associated documents such as Bonds, Letter of Credit, Cash Contribution Agreements, and State and Privately Maintained Road Agreements, shall be submitted separately. These documents should be submitted at least four weeks prior to the anticipated Plat approval. The review of these documents will follow the current procedures and timelines. In any event, bonding documents, when required, must be posted and accepted prior to formal Plat Approval.
6. After review of the third submission Plat and second submission Legal Documents, both plat and documents should be able to be approved or near approval. However, if the applicant fail properly to address previous comments such that a subsequent submission of either the plat or the documents is necessary, subsequent submissions will be reviewed after all other applications that have been submitted prior to such subsequent submission.
7. The primary review agencies may include the Loudoun County Sanitation Authority (LCSA) and the Loudoun County Health Department (LCHD). The County does not exercise direct control over LCSA, which is a separate Authority, or LCHD, which is a State Agency, and cannot therefore commit LCSA or LCHD to any time line or comment period. Regardless of whether or not the County has received LCSA or LCHD comments, County comments will be forwarded as soon as they are completed. LCSA and LCHD referral comments will not be required prior to resubmission of an Application (but will ultimately need to be addressed in order to obtain final approval).

8.103.1 RECORD PLATS

- A. In addition to the plat requirements within Section 8.103, a record plat shall also include the following:
 1. The title "Record Plat".

8.103.2 BOUNDARY LINE ADJUSTMENT

- A. In addition to the plat requirements within Section 8.103, a boundary line adjustment plat shall also include the following:
 1. The title "Boundary Line Adjustment".
 2. Exterior boundary dimensions shall be shown and may be taken from existing surveys of record or new surveys. In all cases, new interior boundary lines shall

include the dimensions shown in feet and decimals of a foot to the closest one-hundredth of a foot, and all bearings in degrees, minutes, and seconds. The data for curves shall be shown in detail at the curve or in a curve data table containing the following: radius, delta, arc, tangent, chord, and chord bearing. Old property lines will be shown as dashed lines, and labeled "Old Property Line Hereby Deleted". New property lines shall be shown as bold lines and labeled "New Property Line Hereby Created".

3. Old acreages prior to the boundary line adjustment and new acreages clearly identified and differentiated.
4. The requirement of Section 8.103.A.35 is modified as follows: Building footprints within the area of adjustment or whose proximity to the area of adjustment is less than or equal to the applicable minimum yard requirement for the Zoning district of the subject property. If the yard requirement has been modified or varied, state the application number and approval date.
5. Where appropriate, proposed/existing septic, on-site sewage disposal and water supply systems, sanitary, storm sewer and water lines, or the appropriate plat note as required by Chapter 1243 of the LSDO.
6. The requirement of Section 8.103.A.33 is modified as follows: "Approved in accordance with Chapter 1243 of the Loudoun County Land Subdivision and Development Ordinance to which reference is hereby made for limitations of such review and approval."

Director

Date

B. Documents to Accompany Boundary Line Adjustments

1. Where boundary adjustments are being made to properties under separate ownership, an unexecuted deed shall be provided which contains a correct description of the land being adjusted, and a statement of the owners, proprietors and trustees (if any), in accordance with Section 15.2-2264 of the Code of Virginia.

2. Certification of Application Submission
"I hereby state that to the best of my knowledge and belief the information required by the Facilities Standards Manual is included in the attached boundary line adjustment application. Further, I have included on the plat a reference to known conditions required by proffers of an approved zoning, special exception or variance, special agreements or covenants."

Engineer/Surveyor Signature

Firm Name

Date

3. When necessary, the appropriate documentation as required by Chapter 1243 of the LSDO.

8.103.3 PRELIMINARY/RECORD SUBDIVISION

In accordance with LSDO, Chapter 1243, a preliminary/record plat shall contain all required detail as specified for both a preliminary plat of subdivision and a record plat.

- A. The preliminary/record plat, which is intended to be recorded in the land records of Loudoun County, shall include those plat requirements of Section 8.103, and shall include the following:
 1. The title "Preliminary/Record Plat".
- B. On separate sheets, for informational purposes only and not for recordation, the applicant shall submit the appropriate required information for a preliminary plat of subdivision as required by Section 8.102.

8.103.4 FAMILY SUBDIVISION

- A. In addition to the plat requirements in Section 8.103, a family subdivision plat shall also include the following:
 1. The title "Family Subdivision Plat".
 2. The requirement of Section 8.103.A.33 is modified as follows:

"Approved for recordation as a FAMILY SUBDIVISION under the Land Subdivision and Development Ordinance of Loudoun County, Virginia which

provides for such subdivision ONLY for the purpose of sale or gift to certain eligible family members specified in the Ordinance and not for the purpose of circumventing the Land Subdivision and Development Ordinance or any other ordinance of Loudoun County. This approval shall automatically terminate if this plat and the approved deed or deeds referenced in Note _____ on this plat have not been recorded within six (6) months of the date written below, and thereafter, this plat shall be NULL and VOID:

Director

Date

- 3. The following notes shall appear on the plat:
 - a. "This plat shall be NULL and VOID unless this plat and the deed or deeds conveying lot(s) _____ to _____ shall have been recorded within six (6) months after the date of approval of this plat by the County as indicated hereon."
 - b. "The lots shown hereon are being conveyed to members of the immediate family of the owner. If any grantee of any such lot conveys such lot within one (1) year after the date of approval of this plat, such conveyance may subject this subdivision to be vacated in whole or in part."

If in accordance with Section 1243.04(2) of the LSDO, the applicant elects not to extend public water to all lots or to provide an approved location on each lot for a well, then one of the following notes, whichever is applicable, shall be placed on the plat:

- c. "The lots on this plat have **NOT** been tested or approved for wells and there is no guarantee that an approvable well can be located on any lot. No zoning permit or building permit will be issued for any lot until a well has been approved for such lot by the Health Director."

OR

"The lots on this plat are required to be served by public water. However, such service has **NOT** been extended to such lots. No zoning permit or building permit will be issued for any lot until public water has been extended to such lot in accordance with regulations and specifications of the Facilities Standards Manual and the Loudoun County Sanitation Authority or other applicable federal, state, or local agency. The owner of each lot on this plat shall grant, without compensation, such reasonable easements as are necessary to permit such extension of public water to all lots."

If the public water note is required on the plat, then the deeds of conveyance, or a

separate deed of subdivision, must create and establish appropriate easements to permit the future extension of public water to all lots.

B. Documents to Accompany Family Subdivisions

1. A copy of the deed(s) of conveyance and an affidavit certifying the division is being made for the purpose of a family subdivision under the Land Subdivision and Development Ordinance.
2. An executed and notarized Affidavit of Family Subdivision shall accompany each deed.
3. A copy of the recorded Deed or other document of title which establishes that the current owner of record has held fee simple title to the property for more than one (1) year.
4. On a separate sheet for informational purposes only and not for recordation, topographic information at 5 foot intervals with the proposed development layout, including proposed driveway locations, site entrances, opposing entrances, and median breaks on adjacent roads. The plan shall also illustrate that adequate sight distance requirements can be achieved where on-site roads/easements will intersect existing roads.

8.103.5 SUBDIVISION WAIVER

A. In addition to the plat requirements within Section 8.103, a subdivision waiver plat shall also include the following:

1. The title "Subdivision Waiver Plat."
2. A note similar to the following:

"Both lots are ineligible for further waiver subdivision for a period of one year after approval in accordance with Section 1243.05.1 of the LSDO."

On a separate sheet for informational purposes only and not for recordation, topographic information at 5 foot intervals with the proposed development layout, including proposed driveway locations, site entrances, opposing entrances, and median breaks on adjacent roads. The plan shall also illustrate that adequate sight distance requirements can be achieved where on-site roads/easements will intersect existing roads.

8.103.6 EASEMENT AND VACATION PLATS

A. The plats shall be prepared by a professional engineer or surveyor. These plats shall

contain the data listed below, legibly drawn.

1. Titled with type of easement(s).
2. North arrow.
3. Date.
4. The name of the subdivision.
5. The name of the owner of record and land record reference for source of title.
6. The name of the engineer or surveyor who prepared the plat.
7. Number of sheets comprising the plat.
8. Tax map reference.
9. Sheet size and scale. The original tracings and paper copies submitted for signature and recordation shall be drawn legibly and accurate per Virginia State Library and Archives Standards for plats.
10. Election District and Loudoun County, Virginia within the Title Block.
11. The plat shall show parcel and lot lines, including dimensions. Dimensions shall be shown in feet and decimals of a foot to the closest one-hundredth of a foot, and bearings in degrees, minutes and seconds. The data for curves shall be shown in detail at the curve or in a curve data table containing the following: radius, delta, arc, tangent, chord, and chord bearing. If land is being dedicated or reserved for public use for roads, parking areas or for common use of the future property owners, the plat shall so state and dimension such.
12. The location and dimensions of new easements with dimensions to appropriate boundary, parcel or lot lines.
13. The plat shall contain a statement setting forth the persons or entities responsible for maintenance of stormwater detention and drainage facilities and easements.
14. A revision block.
15. A vicinity map.
16. As applicable, the location, width and/or centerline of existing/proposed roads, easements, parking areas, and public or private rights-of-way within or immediately abutting the property. Deed book and page numbers shall be provided, as applicable.

17. If private roads or access easements are proposed, the notes set forth in Section 8.103.A.34 shall be added as appropriate.

18. Seal and signature.

B. Documents to Accompany Easement Plats

1. An unexecuted copy of the Deed of Easement, with maintenance agreement language per Chapter 1245 of the Land Subdivision and Development Ordinance where applicable, shall be submitted for review and recommendation concurrent with the associated easement plat.

8.103.7 DEDICATION PLATS

A. Any plat other than one covered by Section 8/103:1-5 upon which property is dedicated to the County for public street purposes shall be considered as a dedication plat. In addition to the plat requirements within Section 8.103, a dedication plat shall also include the following:

1. The title "Dedication Plat".

8.103.8 AR-1 AND AR-2 DIVISION PLATS

A. The plats shall be prepared by a professional engineer or surveyor. These plats shall contain the data listed below, legibly drawn.

1. Title.

2. North arrow.

3. Date.

4. The name of the Division.

5. The name of the owner of record and land record reference for source of title.

6. The name of the engineer or surveyor who prepared the plat.

7. Number of sheets comprising the plat.

8. Tax map reference.

9. Sheet size and scale. The original tracings and paper copies submitted for signature and recordation shall be drawn legibly and accurate per Virginia State

Library and Archives Standards for plats.

10. Election District and Loudoun County, Virginia within the Title Block.
11. The plat shall show parcel and lot lines, including dimensions. Dimensions shall be shown in feet and decimals of a foot to the closest one-hundredth of a foot, and bearings in degrees, minutes and seconds. The data for curves shall be shown in detail at the curve or in a curve data table containing the following: radius, delta, arc, tangent, chord, and chord bearing. If land is being dedicated or reserved for public use for roads, parking areas or for common use of the future property owners, the plat shall so state and dimension such.
12. If not otherwise contained in the deed accompanying the plat, the plat shall contain a statement to the effect that the Division is with the free consent and in accordance with the desire of the undersigned owners of the property and shall be duly acknowledged in accordance with Section 15.2-2264 of the Code of Virginia of 1950 as amended.
13. Seal and signature.
14. If private access easements are proposed, the following notes shall be added as appropriate:
 - a. Construction of the access easement shown hereon shall conform to the standards set forth in the Loudoun County Land Subdivision and Development Ordinance.
 - b. Construction of the Class III road shown hereon shall conform to the standards set forth in Chapter Four of this manual.
 - c. The access road or access easement shown hereon is private and its maintenance, including snow removal is NOT a public responsibility. It shall not be eligible for acceptance into the State secondary system for maintenance until such time as it is constructed and otherwise complies with all requirements of the Virginia Department of Transportation for the addition of subdivision roads current at the time of such request. Any costs required to cause this road to become eligible for addition to the State system shall be provided from funds other than those administered by the Virginia Department of Transportation and/or Loudoun County.

7. Documents to accompany Division Plats

1. If applicable, an unexecuted copy of the Private Roads Maintenance Agreement with maintenance agreement language per Chapter 1245 of the Land Subdivision and Development Ordinance where applicable, shall be submitted for review and recommendation concurrent with the associated

Division plat.

2. A letter signed by the Health Director evidencing conformance with applicable requirements of the County Health Department.
3. If applicable, an unexecuted Deed of Easement establishing ingress/egress rights, maintenance and construction responsibilities including snow removal.

8.104 FLOODPLAIN STUDY

A. Floodplain studies shall be prepared by a professional engineer or surveyor. The plans shall contain the following data, legibly drawn, on sheets of 24 inches by 36 inches in size, with appropriate match lines (if necessary).

1. Title "Floodplain Study".
2. Scale.
3. North arrow.
4. Date.
5. Name of subdivision or development.
6.
 - a. Name and address of owner of record.
 - b. Name of the engineer or surveyor who prepared the plan.
7. Number of sheets comprising the plan.
8. A revision block.
9. Election District and Loudoun County, Virginia in the Title Block.
10. Tax map reference.
11. Vicinity map.
12. Coordinate grid lines.
13. Seal and signature.
14. A note describing the origin of the floodplain boundary, e.g. "This boundary is based on (select one) [a site-specific engineering floodplain study,] [latest adopted FEMA maps,] [actual site-specific survey of either SCS or FEMA adopted flood elevations (include date of report)], or [County base maps with floodplain

overlay], [or other information] (described)."

15. Approval block, as shown below:

APPROVED IN ACCORDANCE WITH THE ZONING ORDINANCE AND THE FACILITIES STANDARDS MANUAL OF LOUDOUN COUNTY.

Director, Building and Development (Date)

Zoning Administrator (Date)

16. A minimum 1:12,000 (1"=1,000') scale exhibit showing drainage divides, subwatershed(s), hydrologic soil group, and land use per the Loudoun County General Plan for the entire watershed draining to the site.
17. A minimum of 1:1200 (1"=100') scale exhibit of the plan view and other scale exhibits of the plan and profiles showing:
- a. The boundaries of parcels for which the study is submitted and an approximate floodplain acreage for each parcel.
 - b. Topography, including scale and source of information.
 - c. The location of streams, ponds, prominent existing land features pertinent to the study or survey (e.g. existing and new road crossings, manholes).
 - d. Location of cross-sections and/or vertical traverse points with annotations of the cross-section and/or point identifiers, and the base flood elevation.
 - e. The boundaries of the floodplain consistent with County approved floodplain information and calculated water surface elevations at and between each cross section.
 - f. In areas where major and minor floodplains overlap, the maximum elevation reflected in the Loudoun County Floodplain Map revision.

Other information may be supplied at the discretion of the developer.

18. A minimum of 1:120 (1"=10') vertical scale and a minimum 1:1200 (1"=100') horizontal scale exhibit of the profile view showing the following:
- a. Stream invert and computed water surface elevation.

- b. Cross-section stations annotated with 100-year water surface elevation.
 - c. Existing and new road crossing.
 - 19. Delineation of floodplain easements which contain the floodplain area.
 - 20. Hydrology documentation and calculations, as specified in Chapter 5 of this Manual.
- B. Documents to Accompany Floodplain Studies
- 1. FEMA submission materials are required coincident with a Flood Insurance Rate Map Amendment in accordance with Chapter 5 of this manual.
 - 2. Upon recommendation for approval, the developer shall submit two legible reproducible mylar copies of the plan view with cross section locations_annotated with the 100-year water surface elevations at a scale of 1" equals 200'. The reproducible shall contain the project name, land development application number, and three Virginia Coordinate Grid tics evenly divisible by 1000. If the review material was submitted on multiple plan view sheets, the mylar shall be a compilation of end matched study sheets. In addition, a DXF file diskette shall be submitted which contains the previously referenced information. The County may provide release of liability, if requested.

8.105 FLOODPLAIN ALTERATION

- A. In addition to the application requirements within the Floodplain Study section of this chapter, 8.104.A, a floodplain alteration application shall also include the following:
- 1. Title "Floodplain Alteration".
 - 2. Detailed description and drawings of the proposed alteration.
 - 3. Hydraulic model that shows how the 100-year flows will be conveyed and hydraulic effects on the existing conditions floodplain. Measures shall be provided to maintain pre-alteration discharge velocities.
 - 4. The hydraulic model will need to be supported with engineering computations in areas where the model cannot adequately address the hydraulic effects.
 - 5. Documentation to illustrate that the floodplain alteration will not result in an off site increase in the water surface elevation of the base flood. In watersheds of greater than 640 acres, alterations in the floodway result in no rise in the water surface elevation of the base flood.
 - 6. The pre-alteration and post-alteration flood elevations shall be illustrated on plan

view, profile view and cross section view.

7. Detailed construction plans of the proposed alteration.
8. Detailed stream rehabilitation program and erosion and sediment control plan for the stream alteration.
9. A narrative assessing the need for any State or Federal permits required for the proposed activity.
10. The developer shall provide a certification by a professional surveyor or engineer within the floodplain alteration application stating that to the best of his knowledge and belief all applicable federal, state and local laws relative to the protection of the environment, historical or archaeological features have been or will be met.

B. Documents to accompany a floodplain alteration application.

1. FEMA submission materials are required coincident with a Flood Insurance Rate Map Amendment in accordance with Chapter 5 of this manual.
2. Upon recommendation for approval, the developer shall submit two legible reproducible mylar copies of the plan view with cross section locations annotated with the 100-year water surface elevations at a scale of 1" equals 200'. The reproducible shall contain the project name, land development application number, and three Virginia Coordinate Grid tics evenly divisible by 1000. If the review material was submitted on multiple plan view sheets, the mylar shall be a compilation of end matched study sheets. In addition, a DXF file diskette shall be submitted which contains the previously referenced information.

8.106 CONSTRUCTION PLANS AND PROFILES

A. The construction plans and profiles shall be prepared by a professional engineer or surveyor. The plans shall contain the following data, legibly drawn, on sheets of 24 inches by 36 inches in size, with appropriate match lines (if necessary).

1. Title "Construction Plans and Profiles".
2. Scale.
3. North arrow.
4. Date
5. Proposed name of subdivision or development.

6.
 - a. Name and address of the owner of record.
 - b. Name of the engineer or surveyor who prepared the plan.
7. The number of sheets comprising the plan.
8. A revision block.
9. Source of title.
10. Zoning requirements.
11. Zoning, variance, special exception, subdivision or subdivision exceptions and flood plain study and alteration information.
12. Election District and Loudoun County, Virginia within the Title Block.
13. Tax map reference(s).
14. Vicinity map.
15. Topography.
16. Seal and signature.
17. A soils map certification in accordance with Chapter 6 of this manual.
18. Roadway and utility improvement plans are to consist of plan and profile, drawn to a minimum scale of 1 inch to not more than 50 feet horizontally and 1 inch to not more than 5 feet vertically. The plan portion of the roadways shall include the location of roads, lots, storm drainage, sanitary sewerage, and water distribution systems. The profiles shall show the existing and proposed roadway improvements and profiles of sanitary sewer, waterline and storm improvements. Details of standard road sections, curb and gutter type, and miscellaneous construction items shall appear on the sheets, as well as any construction notes pertaining to the proposed improvements. Plans shall conform to the following:
 - a. Average Daily Trip (ADT) projections for all existing and proposed roadways.
 - b. Stations indicated every 100 feet on centerline; at points of curvature, points of intersection and points of tangency; at centerline of entrances and intersections, at subdivision or section limits, and at turnaround radius points.
 - c. The profile of the building restriction lines. Where there are none, show

profile 25 feet from the right-of-way or easement line.

- d. When a proposed roadway or entrance intersects with an existing roadway, the centerline profile of the existing roadway shall be shown for adequate sight distance, to the right and the left of the proposed connection, per VDOT standards. Sight distance shall be shown at entrances onto the road system and for intersections on both plan and profiles. Where the line of sight departs the established right-of-way or private roadway easement, a separate sight distance easement shall be provided. The profile along the line of sight shall be shown reflecting existing and proposed grades as well as any obstacles that may obstruct the driver's vision (e.g., plantings, utility structures, entrance features, fences, etc.)
- e. The centerline and building restriction line profiles shall extend 300 feet beyond the property line or boundary on roadways that may provide access to adjoining property.
- f. A grade line of road construction to include:
 - i. Percent of grade.
 - ii. Elevations at the beginning and the end of all vertical curves.
 - iii. The length of vertical curves with sight distances and stations of vertical points of intersection.
 - iv. Elevations computed every 50 feet on all tangent sections and every 25 feet on vertical curves.
 - v. Elevations at:
 - (a) centerline intersections of roads
 - (b) road centerline intersections with the boundaries of a subdivision
 - (c) curb returns
 - (d) culvert and storm sewer crossings
 - (e) curb inlets
 - (f) beginning and ending of superelevation transition sections.
 - vi. The point of finished grade on typical section (i.e., centerline, top

of curb, etc.).

- g. The locations of curb-cut ramps for the handicapped.
- h. The proposed location of multiple mailbox groupings and other uses requiring a vehicle staging area.
- i. Proposed roadside ditches indicated in the profile where the ditch varies from running parallel to the road centerline.
- j. The horizontal and vertical location of proposed and existing culverts, storm sewer crossings, sanitary sewer crossings and utility crossings shown on roadway profiles.
- k. Utility easements and proposed relocations.
- l. When a proposed roadway parallels or is located near an existing stream or open drainageway, profiles of the top of the bank of the stream, computed water elevations and invert (or flowline) of the stream or drainageway shall be provided. The relationship of the proposed roadway grade to existing profiles of the stream or drainage way shall be shown. Road construction shall not encroach on the approved floodplain limit of the stream, except as permitted by applicable floodplain requirements of Chapter 5 of this manual.
- m. Grade profiles of curb and gutter construction in cul-de-sacs are to be computed along the face of the curb starting at the beginning of the curb return, following the face of curb around the cul-de-sac and thence to the end of return or curve on the opposite side of the cul-de-sac:
 - i. Grade ties of the road, before entering the cul-de-sac grade, shall be shown on each end of the cul-de-sac grade profile.
 - ii. Other acceptable methods may be used subject to the approval of the Director and the Virginia Department of Transportation.
 - iii. Building Restriction Line profiles for cul-de-sacs shall be concentric with the profile at face of curb.
- n. If a difference exists in elevations on proposed curb grades, curb elevations showing top of curb right and top of curb left shall be shown on the plans.
- o. Landings shown on plans and profiles.
- p. Driveway locations (both individual and common).

- q. Traffic control signage and structures (e.g., road delineators, barricades, and stop signs), and road signs, shall be shown on the plans. Signage shall conform to VDOT requirements.
 - r. Off-site right-of-way required for construction shall be identified. Temporary construction and permanent maintenance easements for slope grading, drainage, erosion and sediment control shall be shown.
 - s. Typical roadway cross sections shall be provided on the plans.
 - t. Sidewalks, trails, and any other proffered improvements shall be shown and maintenance responsibilities shall be indicated.
 - u. For road sections consisting of more than two lanes, a pavement striping plan indicating the travelways, tapers, turn lanes and directional markings (e.g., turn and through arrows, solid and dashed line delineators, etc.) shall be provided. Pedestrian crosswalks shall be included on this plan.
 - v. The following standard notes shall appear on all construction plans:
 - i. "Subbase depth is based on a CBR value of _____, based on an actual determination per soil tests (or) an estimate which will be revised once the soil tests of subgrade are performed."
 - ii. "A smoothing grade shall be maintained from the centerline of the existing road to the curb and gutter, to preclude the forming of false gutters and/or the ponding of any water on the roadway."
 - iii. "Standard guardrail and handrail shall be installed at those locations as designated during final field inspections by Loudoun County or VDOT."
 - iv. "The approval of these plans shall in no way relieve the owner of complying with other applicable local, State and Federal requirements."
19. Grading and drainage plans, drawn to a scale of 1 inch to not more than 50 feet and showing the proposed road and lot layout, including dimensions. The existing topography shall be shown at no more than 2-foot contour intervals supplemented with spot elevations. Grading shall be shown by proposed contour lines, supplemented with spot elevations. In addition, elevations of the finished grade at the building and all lot corner elevations shall be shown. Storm drainage pipes and structures and their sizes and top and invert elevations shall be indicated.

20. Overlot grading plans in accordance with Chapter 5 of this manual.
21. An erosion and sediment control plan in accordance with the most recently adopted Virginia Erosion and Sediment Control Handbook and Chapter 7 of this manual.
22. A Tree Conservation and Landscape Plan, in accordance with the Zoning Ordinance and Chapter 7 of this manual.
23. Location, type, and dimensions of vehicular ingress and egress to the site, and clear zones as applicable.
24. Storm drainage calculations, with a statement as to the basis of design, and drainage area map showing individual and cumulative drainage area contributing to each point of concentration.
25. Lighting plans, regulatory signage and road name signs, in accordance with Chapter 7 of this manual.
26. Watercourses and names, if any, and floodplain easement(s) in accordance with Chapter 5 of this Manual. Wetlands data as follows:
 - a. Potential jurisdictional waters and wetlands as identified by a consultant wetland delineation performed in accordance with Army Corps of Engineers (Corps) standards shall be depicted on the plan.
 - b. A note referencing the source of the wetland information depicted on the plan (including the Corps Jurisdictional Determination number and date, if it exists) and indicating that all applicable state and federal permits shall be obtained prior to disturbances within jurisdictional waters and wetlands shall be provided on the plan.
27. Adjoining property information and use.
28. Coordinate grid lines.
29. Roads shall include approved and/or reserved road names and sign locations per the Codified Ordinances of Loudoun County.
30. Note(s) on plans where land or facilities are to be dedicated to and held in perpetuity by a lot-owner's association, condominium association, or similar organization.
31. Numbered archaeological sites and structures, cemeteries, and historic landmarks on the site to be preserved, as identified by archaeological surveys performed for the property.

32. Very Steep and Moderately Steep Slopes, as defined in the Zoning Ordinance of Loudoun County, shown on the plans that show limits of clearing, grading, and erosion and sediment control.
33. Pollution sources (including without limitation dump sites, drainfields, buried fuel tanks, hazardous material storage facilities, solid and liquid disposal sites, etc.), wells, and springs that are known or as identified in LOGIS.
34. Open space and conservation easements and instrument numbers.
35. Overlay Districts, as established in the Zoning Ordinance, shown on the plans that show limits of clearing, grading, and erosion and sediment control.
36. The boundaries of the Scenic Creek Valley Buffer and other required environmental buffers.
37. Approval block.
38. For single family attached and semi-detached developments, the following shall be shown:
 - a. Location, type, size, and height of fencing, screening, and retaining walls.
 - b. Off-road parking and parking bays, loading spaces, walkways, and bike paths, indicating type of surfacing, size, angle of stalls, width of aisles, and number of parking and loading spaces provided.
 - c. The number of floors, floor area, height, exterior dimensions, location, and proposed use of each building.
39. Design speed for all proposed roadways.

B. Items to Accompany Construction Plans and Profiles

1. Fee check.
2. Land Development Application Form.
3. A Performance Bond estimate, in accordance with Section 8.300 of this manual.
4. A geotechnical study in accordance with the requirements Chapter 6 of this manual.
5. If the construction plans and profiles are being submitted pursuant to Section 1243.10(1) of the Land Subdivision and Development Ordinance, subsequent to the first submission comments on the preliminary plat but prior to approval or

conditional approval of the preliminary plat, a copy of such first submission comments.

6. If not provided with a previous Preliminary Plat of Subdivision: a letter from the Virginia Department of Conservation and Recreation, Division of Natural Heritage identifying occurrences of natural heritage resources on the property such as the habitat of rare, threatened, or endangered plant and animal species, unique or exemplary natural communities, and significant geologic formations; and if an endangered and threatened species survey has been completed for the property, a copy of the report shall also be submitted.
7. If not provided with a previous preliminary plat of subdivision and if applicable, a plan and analysis of VDOT connectivity requirements and location of stub out streets.

8.107 SITE PLANS

- A. The site plan shall be prepared by a professional engineer or surveyor. The site plan shall contain the following applicable data, legibly drawn, on sheets of 24 inches by 36 inches in size, with appropriate matchlines, (as necessary).
 1. The Title "Site Plan".
 2. Construction drawings, notes, and specifications per the requirements of Section 8.106.A, Items 2 thru 38, if applicable, and for improvements substantially in accordance with the approved preliminary subdivision plan, if applicable.
 3. Zoning district and jurisdictional boundaries.
 4. Location, type, size, and height of fencing, screening, and retaining walls.
 5. Off-road parking and parking bays, loading spaces, walkways, and bike paths, indicating type of surfacing, size, angle of stalls, width of aisles, and number of parking and loading spaces provided.
 6. The number of floors, floor area, height, exterior dimensions, location, and proposed use of each building.
 7. Designation of ADU units in accordance with Zoning Ordinance.
 8. Proffers and conditions of approval associated with rezoning and special exception applications, if applicable. This information may either be included as part of the plans or as an attachment.

B. Documents to Accompany Site Plans

1. A letter signed by the Health Director evidencing conformance with all applicable requirements of the County Health Department. If public water or public sewerage is to be provided, a letter signed by an authorized official of the appropriate public authority shall be submitted indicating that service(s) can and will be provided. Such letter shall, in addition, state that a performance bond or check adequate to insure the installation of such water and/or sewage facilities in a manner which will satisfy the requirements of the County Health Department, the town, or Authority, as applicable, has been furnished to such public authority.
2. If public improvements required under this ordinance are not completed, a financial guarantee in the form of a cash bond, certified check, or surety performance bond and agreement, as required by Section 8.300 of this Chapter shall be submitted for review. Such guarantee shall be accepted by the Board of Supervisors or designee prior to site plan approval.
3. A geotechnical study in accordance with the requirements of Chapter 6 of this Manual.
4. Prior to site plan approval, if applicable, an unexecuted copy of the deed of dedication or deed of easement, accompanied by a certificate signed by the developer and duly acknowledged before an officer authorized to take acknowledgments of deeds, to the effect that this is a true copy of the proposed deed which will be presented for recordation, unless revisions are required by the Director, in which case such deed will be recorded in the form as approved by the Director or designee. Such deed shall:
 - a. Contain a correct description of the land developed and state that such development is with the free consent and in accordance with the desire of the undersigned owners, proprietors, and trustees, if any.
 - b. Contain language such that, when the deed is recorded, it shall transfer in fee simple to the Board of Supervisors such portion of the premises as is set apart on such site plan for roadways, easements, or other public use and to create a public right-of-passage over the same, with reference to the plat required under Subparagraph 5.
 - c. Contain protective or restrictive covenants, if applicable.
5. A plat of dedication or easement for those areas on the site plan as set apart for roads, easements, or other public use and to create public right-of-passage over the same.
6. A fee check.

7. Land Development Application.
8. If not included in the deed of dedication or deed of easement, a Deed of Release if there is any deed of trust trustee who did not enter into the application or a letter or other documentation from the owner which certifies that there is no deed of trust lien on the property.
9. If not provided with a previous Preliminary Plat of Subdivision or Construction Plan and Profile: a letter from the Virginia Department of Conservation and Recreation, Division of Natural Heritage identifying occurrences of natural heritage resources on the property such as the habitat of rare, threatened, or endangered plant and animal species, unique or exemplary natural communities, and significant geologic formations; and if an endangered and threatened species survey has been completed for the property, a copy of the report shall also be submitted.
10. Prior to site plan approval for developments containing stormwater management retention facilities commonly referred to as wet ponds or lakes, an unexecuted copy of a Stormwater Maintenance Agreement as defined in Chapter 1096 of the Loudoun County Codified Ordinances to establish the mutual responsibilities of the County and the property owner for maintenance of such facility. Such Agreement shall be in a form acceptable to the County Attorney in consultation with the Department of General Services.

8.108 RECORD DRAWINGS

A. Filing Requirements:

Upon satisfactory completion of the installation of the required improvements shown on the approved site plan or construction plans and profiles, whichever is applicable, the developer shall submit to the Director two (2) copies of the completed record drawings, prepared and signed by a professional engineer or surveyor, of such plans. Such record drawings shall be submitted at least two (2) weeks prior to the anticipated date of occupancy of any building for site plan applications. In the case of construction plans and profiles, the record drawings shall accompany the request for bond release in accordance with Section 8.300 of this manual or be submitted prior to record plat approval per Section 8.300.H of this manual, whichever is applicable. Such record drawings shall be reviewed for conformance with the approved plans and the ordinances and regulations of County and State agencies.

B. Record Drawings

The term "record drawings" shall be deemed to include what is sometimes referred to as "as built" drawings and shall be prepared in accordance with this Subparagraph. The following items shall be surveyed to determine actual field conditions, and the approved site plans or construction plans and profiles as annotated to reflect such actual field

conditions shall constitute the record drawings.

1. Storm Sewer Systems

- a. The general location of drainage structure(s) within their easements shall be observed and noted if the structure is outside the easement. Included in this location requirement are inlet or outlet end sections. Manholes wherever located shall have at least two measurements to permanent physical features provided.
- b. The structure top and pipe invert elevations, including end sections, shall be provided.
- c. Pipe size and the percent grade between inverts from structure to structure shall be noted.
- d. Spot elevations of the invert of manmade drainage ditches shall be provided on 100-foot centers.

2. Pavement

- a. The width of pavement shall be verified once for each width and at transitions.

3. Storm Water Management

- a. The elevations and lengths of dams and spillways shall be noted.
- b. The width of dams and spillways shall be noted.
- c. Stand pipe structure sizes and heights shall be noted.
- d. The volume of the detention impoundment area shall be calculated.

4. Buildings Shown on Site Plan

- a. Exterior dimensions of buildings shall be noted.
- b. Setback dimensions to buildings shall be noted.

C. Checklist

The developer submitting the record drawings shall also submit a letter with the record drawings certifying that the following items have been inspected and found to be in general conformance with the approved construction plans and profiles or site plans, as applicable.

1. Curb and Gutter. Confirm that the curbs are the proper type.
2. Sidewalk/Trail. Confirm that the sidewalk/trail is correctly situated with relation to the rights-of-ways or easement. Confirm that the sidewalk/trail maintenance responsibilities have been adequately provided for and specify the entity or entities that will bear such responsibilities. Verify that the construction material used is as approved.
3. Drainage. Confirm that the drainage patterns have been established in conformance with the grading plans. Confirm that slopes and swales are properly located and graded. Confirm that positive drainage exists.
4. Pavement. Provide a copy of the approved pavement design. Confirm that all pavement was placed in accordance with the approved pavement design. Confirm that all material was compacted to required standards. Provide a copy of the approved striping and signage plan.
5. Sight triangle and clear zones. Confirm that there are no encroachments.
6. Utility placement within roads. Provide a statement that all utilities located within roads are within recorded easements, or if in public right-of-way, located as approved and per the VDOT permit manual.
7. Landscaping and Buffering
 - a. Developer certifies that the tree conservation and landscaping are in general conformance as to location with the approved Tree Conservation and Landscape Plan. Confirm plantings conform to correct category (canopy, understory, shrub, or evergreen) in required quantities. If not, a redline Tree Conservation and Landscape Plan shall be submitted for review and approval.

8.109 PLAT AND PLAN REVISIONS

A. Revisions to Plats or Plans Under Review/Pending Approval

1. Minor revisions to the plats or plans which are not prompted by County and/or referral review comments may be made at the same time as the application is being revised to address outstanding comments transmitted by the Director. Such revisions shall be highlighted on the plats or plans and identified within the resubmission narrative.
2. Major revisions to plans pending approval by the Director which are not prompted by County and/or referral review comments shall require withdrawal of the plan under review and a new land development application submission. For the

purposes of this manual, a major revision shall be defined as changes to the original plan which alter the infrastructure configuration and design to the extent which will require a complete re-review of the project.

B. Revisions to Previously Approved Construction Plans and Profiles

1. Revisions to previously approved plans requires a formal submission process comprised of the initial plan submission components as stated within this chapter.
2. The cover sheet and revision block shall indicate that such plans are revisions to a previously approved land development application and shall indicate the case number of and date of approval of the said application.
3. The revisions shall be highlighted and identified within the resubmission narrative.

8.110 SITE PLAN AMENDMENTS

A. Site plan amendment applications are intended to provide a means of making minor revisions to previously approved site plan applications within an abbreviated land development application process. The site plan amendment application may be utilized for minor revisions as listed below. Revisions beyond the scope of the following shall require a new site plan application for review and approval by the Director and shall follow the parameters of 8.109.B above:

1. The improvements shall be minor in nature and not change the external traffic flow patterns; or
2. The gross floor areas shall not be increased by more than 5,000 square feet or 75 percent of the gross building area, whichever is less; or
3. The proposed additional disturbed area shall not exceed 10,000 square feet or 25 percent whichever is less; or
4. The proposed revision shall only require review by the Director and will not require review and concurrence by external review agencies (i.e. LCSA, VDOT, Health Department). However, associated review by the County Attorney's office may be provided within the site plan amendment process for minor easement revisions.

B. The plan submission requirements and accompanying documents for the site plan amendment application shall be consistent with the final site plan requirements as identified in this chapter.

1. Zoning tabulations shall be revised, as required.

2. Reference shall be provided on the plan denoting the original site plan number and approval date associated with the site plan amendment.
- C. Revisions shall be highlighted on the original site plan and explained in detail within a project narrative.

8.111 GRADING PERMIT APPLICATION

- A. The following items shall be required as part of the grading permit application:
1. Completed Grading Permit Application Form.
 2. Erosion and Sediment Control Plan.
 3. Overlot Grading Plan.
 4. Erosion and sediment control bond estimate reflecting the quantity of various control devices, unit cost per device and the extended cost of the same.
 5. Fee to be determined and paid prior to issuance of permit.
 6. Wetlands data as follows:
 - a. A Jurisdictional Determination approved by the Army Corps of Engineers (Corps). Any jurisdictional waters and wetlands verified by the Jurisdictional Determination shall be depicted on the Erosion and Sediment Control Plan and Grading Plan with a note referencing the Jurisdictional Determination number and date and all applicable federal and state wetland permits.
 - b. If not previously provided, the following shall be submitted with the Grading Permit Application as a digital file prepared according to the Department of Building and Development Digital Data Submission Checklist for Wetlands: i. the location of any jurisdictional waters and wetlands on the property verified by the Jurisdictional Determination approved by the Corps; ii. the location of all permitted impacts; and iii. copies of all applicable Jurisdictional Determinations and federal and state wetland permits.
 - c. If applicable, stream and wetland mitigation projects shall be reviewed as a Grading Permit Application.

8.200 REQUIREMENTS FOR START OF ANY CONSTRUCTION

The developer shall have accomplished or provided the following applicable items prior to the

start of any construction:

A. Approved Plans

The developer shall have obtained County approval of construction plans and profiles or site plan. At least one copy of the approved plans, with revisions, must be kept on-site at all times.

B. Inspection Agreement

For public improvements to be constructed for a proposed subdivision, the developer shall provide a statement that VDOT or a third-party inspector will perform testing and inspections for the construction and must have received the Director's written approval of the proposed inspection arrangement.

C. Grading Permit

The developer shall have received a permit to conduct land-disturbing activities in accordance with the Loudoun County Codified Ordinances, and shall have submitted a financial guarantee pursuant thereto and in compliance with the Bonding Policy as set forth in this chapter, except that upon the request of the developer, a conditional permit for clearing, grubbing and preliminary site preparation only may be obtained prior to construction plans and profiles or site plan approval once all technical issues associated with such plans have been resolved to the satisfaction of the Director.

D. Highway Permit

The developer shall have obtained permits from VDOT for work within the right-of-way of an existing state road.

E. Sewer and Water Requirements

The developer shall have coordinated separately with the appropriate public authority for approval of plans, issuance of required permits, and inspection of installation work with respect to sewer and water installations.

F. Off-site Construction Agreements

The developer shall have obtained a recorded easement, or a letter of permission for clearing and grading, whichever is applicable, from abutting property owners for off site construction. A letter of permission is satisfactory only for off-site clearing and grading which shall be completed and certified by the developer as completed prior to record plat or easement plat approval.

G. Health Department Certification

When applicable, the developer shall have obtained verification from the Health

Department that the abandonment of wells and/or drainfields has been accomplished in accordance with Health Department requirements.

H. Demolition Permit for Existing Structures

When applicable, the developer shall have obtained from the Director the necessary permit for demolition of existing structures.

8.300 BONDING POLICY

A. Purpose and Authorization

To provide for acceptable guarantees of performance to assure timely construction and completion of improvements in accordance with approved site plans or construction plans and profiles, as follows:

1. The County is authorized to require performance bonds in conjunction with the approval of subdivisions, in accordance with the Land Subdivision and Development Ordinance, and to accept performance bonds in conjunction with special exceptions, site plans, and proffer conditions, in accordance with the Zoning Ordinance, all pursuant to Virginia Code Sections 10.1-565, 15.2-2241, 15.2-2286, 15.2-2299 and 15.2-2309.
2. Performance bonds shall be required for public and other physical improvements as shown upon approved construction plans and profiles for record plats and as shown upon site plans, or the approved construction plans and profiles for site plans, for condominium residential developments. Such improvements shall include, without limitation, road, curb, gutter, sidewalk, trails, storm drainage, traffic signalization and control, and any other site-related improvements required by Loudoun County Ordinances for vehicular ingress and egress, for public access roadways, for structures necessary to insure stability of critical slopes and for stormwater management facilities. Notwithstanding the foregoing, the Director may waive the requirement for a performance bond for a site plan which does not contain any improvements eligible for public maintenance if the Director determines that the satisfactory completion of construction of improvements shown upon such site plan can be enforced pursuant to ordinances regulating building permits and occupancy permits.

B. Authority for Accepting/Monitoring Bonds

The Bond Committee shall review and recommend for approval or disapproval, and monitor, bonds for construction of improvements as identified within this Section 8.300.

1. Bond Committee Members (or their designees)
 - a. County Administrator
 - b. Director of Financial Services

- c. Director of Building and Development
2. Authority of the Bond Committee
 - a. Review new bonds, bond extensions, bond substitutions, bond reductions/releases, and action resulting from defaults; and send recommendations to the Director for final action or to the Board of Supervisors for further consideration.
 - b. Establish/update standard bond and agreement forms.
 3. Submission to the Bond Committee shall be made to the Director.

8.301 BOND SUBMISSION REQUIREMENTS

- A. A construction/performance agreement (Performance Agreement) between the Board of Supervisors and the owner/subdivider.
- B. A surety in an amount equal to the approved Bond Estimate, or in such lesser amount as is provided for in the Bond Estimate section of this manual, guaranteeing completion of the Performance Agreement.
- C. Letter from the Director approving the plans and Bond Estimate amount.
- D. Release of Lien from the contractor, if applicable.

8.302 TERM OF PERFORMANCE AGREEMENT

The maximum initial period for completion of the Performance Agreement for subdivision shall be three (3) years, and the minimum period shall be two (2) years. The period for completion of the Performance Agreement for a site plan shall be two (2) years. The period for completion of a Proffer Performance Agreement shall be as approved by the Zoning Administrator. If construction of the subject project is not commenced within the initial Performance Agreement timeframe, the bond amount may require adjustment and subsequent reconsideration and review by the Bond Committee.

8.303 ACCEPTABLE FORMS OF SURETY OR SECURITY

- A. Corporate Surety Bond: This surety shall be furnished by an insurance company licensed to transact fidelity and surety insurance in Virginia and will guarantee the full amount of the bond. The ability of the insurance company to provide satisfactory performance guarantee will be assessed by the Director in accordance with criteria reported in the most recent edition of the Best's Key Rating Guide (Best's) and the most recent annual revision of the U.S. Department of Treasury Fiscal Service Circular 570 (the Treasury Circular). Performance Bonds will be accepted only from sureties listed in Best's:

1. with a rating of Level A or better,
2. in a financial size category of Class VIII, or higher, unless otherwise agreed by the Board of Supervisors or designee, and such bonds shall be in amounts not exceeding:
3. those limitations identified in the Treasury Circular, nor
4. 1.5% of the minimum Adjusted Policyholders' Surplus for the financial size category as listed in Best's.

Such ratings and other qualifications must be maintained for the life of the Bond or the Bond must be replaced by adequate replacement surety at the request of the Director.

B. Cash Escrow: An amount equal to the approved bond estimate in the form of a cashier's check or certified check, accompanied by a W-9 or Substitute W-9 form, shall be submitted to the Director, to be deposited with the County Treasurer, in an interest bearing account with full financial accountability provided by the Director of Financial Services through a separate Performance Bond Fund. All cash escrows held shall be maintained by individual bond as to principal and accumulated interest but may be pooled for investment purposes with accrued interest allocated to each bond in accordance with County allocation policies. The Treasurer shall be entitled to retain a reasonable amount, not exceeding 5% of the interest accrued, to cover the cost of administering the account. Upon approval for release of the bond as provided herein, the Director of Financial Services shall be authorized to release the cash escrow (principal plus accrued interest less allowable cost of administration) and disburse the funds.

C. Letter of Credit. A letter of credit meeting the following minimum conditions will be accepted:

1. The lending institution must be insured by the Federal Deposit Insurance Corporation (FDIC) and shall have offices and license to practice banking in Virginia, Maryland or the District of Columbia, with a Sheshunoff national rating of at least 35 and with total letter of credit exposure of the County at the lending institution limited to no more than 50 percent of the institution's equity capital, unless otherwise agreed to by the Board of Supervisors or designee. The Board of Supervisors or designee may, upon the unanimous recommendation of all of the members of the Bond Committee, accept a letter of credit from an institution whose rating is lower than 35 provided that such rating shall be no less than 30 and shall be maintained at or above such lower level until such letter of credit has been completely released. Such ratings and other qualifications must be maintained for the life of the letter of credit, as amended, or the letter of credit must be replaced by adequate replacement surety at the request of the Director.
2. The expiration date in the Letter of Credit shall be at least 6 months after the date

by which the Performance Agreement must be performed. For example, a 12-month Performance Agreement requires an 18-month Letter of Credit. This 6-month requirement is in addition to the 6-month automatic extension that is required below.

3. The letter of credit shall contain the conditions of automatic renewal providing that the letter of credit will automatically be extended for additional periods of six months unless the Director, is notified in writing, by certified mail, with return receipt requested, at least ninety (90) days in advance of the present or future expiration date, that the issuing bank does not intend to extend such letter of credit.
4. All extensions of time of the Performance Agreement completion date will be granted only upon corresponding extension of the letter of credit expiration date to comply with Subparagraph 2 above.
5. Any new letter of credit or letter of credit amendment is subject to all the minimum requirements outlined in items 1 through 4.

D. Multiple Sureties

Where two or more sureties are provided in conjunction with one Performance Agreement, the agreement shall identify and incorporate each surety separately.

E. Additions to Previously Bonded Improvements

When a record plat is submitted for a subdivision containing public improvements that are extensions of public improvements dedicated upon a previously approved record plat for which a Performance Agreement and Surety have already been accepted, the construction of such proposed extension improvements may be guaranteed under the previously existing surety in accordance with the following conditions:

1. The surety instrument or agreement (Surety) must be capable of being modified, and any modifications must be accepted as satisfactory by the Board of Supervisors or designee upon recommendation of the Bond Committee before they shall become effective.
2. Modifications to the Surety must be in writing and must indicate that such Surety covers both the improvements shown upon the proposed record plat and the improvements dedicated upon the previously approved plat.
3. A separate Performance Agreement covering such proposed extension improvements and referencing the modified Surety must accompany the record plat.
4. The Bond Committee may recommend an extension of the completion date under

the Performance Agreement covering the previously approved plat in conjunction with the approval of the record plat, if requested by the developer, in order to establish a common date of completion under the Performance Agreements secured by the same Surety; provided that such extension of completion date shall not be for more than one (1) year and provided that the appropriate bond extension fee shall have been paid if such extension is for more than five (5) months.

5. Such separate Performance Agreement and modified Surety shall not be approved or accepted until the bonded and extension improvements have been inspected and found satisfactory and the Director has determined, in writing, that the amount of such Surety, as modified, is adequate to guarantee completion of both the previously approved record plat improvements and the proposed extension improvements.
- F. Due to the varying ease or difficulty of collection and reliability of the various types of financial guarantee (security), the County deems various types of security as being more or less preferred for the protection of the public. Cash is deemed to be the most preferred security because of the ease of collection and immediate availability. Letters of Credit are less preferred than cash, and Surety Bonds are less preferred than Letters of Credit. Once a Bond, Letter of Credit or cash security has been approved and accepted by the County, only a more preferred or equally preferred form of security may thereafter be substituted in place of the current form of security.

8.304 BOND ESTIMATE

- A. The Bond Estimate shall be based on the estimated cost of construction of all items shown upon the approved plans (labor and material), plus a 25 percent Contingency Factor to cover administrative and engineering costs in the event of default and potential damage to existing roads or utilities. The cost estimates shall reflect the current unit costs as published and distributed by the Director and shall be increased by an inflation factor equal to the annual percentage change in the Construction Index Code, as published weekly in the Engineering News Record. This inflation factor is to be applied over the life of the bond, using the equation $C = (P)(I)(E) + E$; where P = the period of the bond (years); I = annual inflation factor; and E = the estimated cost of construction (including the 25 percent Contingency Factor); C = total Bond Estimate.
- B. The Bond Estimate shall be prepared and sealed by a professional engineer or surveyor and submitted to the Director for approval.
- C. Where partial construction has already occurred, the amount of the surety may be less than the Bond Estimate to allow for work completed prior to establishing the original bond, subject to the Director's approval, in consultation with the Virginia Department of Transportation where applicable; provided, however, that after such original surety has been accepted by the Board or designee, any Bond Reduction requested shall be based upon the original Bond Estimate and not upon the original amount of such surety.

- D. For site plans only, the Director shall publish a policy permitting the original surety for a site plan bond to be in an amount equal to a specific percentage of the approved Bond Estimate, such percentage being set forth in the written policy, and the amount of any such surety submitted thereafter for any site plan may be equal to or greater than the amount of such percentage, rounded up to the nearest \$1000; provided, however, that the submission and acceptance of such surety shall be, and shall be treated as, a waiver of any and all right of the developer to obtain any partial release or reduction of the Bond Amount; and provided further that the acceptance of such surety shall not preclude the Director from thereafter requiring an increase in the amount of the surety pursuant to the approval of an Extension of the Performance Agreement.

8.305 BOND PROCEDURES AND REQUIREMENTS

A. Performance Agreement

A Performance Agreement which shall be supported by an acceptable form of surety or security, shall be required on projects which obligate the developer to construct required improvements pursuant to approved subdivisions, site plans, special exceptions or proffer conditions in a timely manner. Such Agreement shall specify the manner and date by which the required improvements shall be completed. An agreement format approved by the Bond Committee will be provided by the Director to all developers requesting same for use in preparation of the Performance Agreement. If the owner/subdivider acts, or fails to act, in a manner which would constitute a breach of the agreement, or all the noted improvements are not completed within the specified time period and no extension has been obtained or replacement agreement and bond submitted and approved with a new expiration date, the Agreement shall be in default.

B. Extensions and Rebonding of Agreements

It shall be the sole responsibility of the developer to keep the Performance Agreement current.

Approximately sixty (60) days prior to the expiration of an Agreement, the Director may review the project records to determine if the developer has initiated the process for final bond release and to determine if the bond may reasonably be eligible for release within sixty (60) days. If it is determined that the project bond is not reasonably expected to be released within such sixty (60) days, the developer and surety may be notified in writing, and may be required to provide for the extension of the Agreement and surety or security within such sixty (60) days. If the bond cannot be released or if no extension agreement and bond extension have been submitted in approved form by the agreement expiration date, the Agreement shall be in default.

1. Except as provided in this paragraph, no Performance Agreement shall be extended beyond five (5) years from the date of the original Agreement. Thus, if the initial period of completion was 2 years, no more than three (3) extensions

shall be granted. If the initial period was 3 years, no more than two (2) extensions shall be granted. For all performance agreements, the applicant shall submit a Preliminary Release Package to the County prior to or simultaneously with the initial bond extension request. An extension request shall not be approved if a Preliminary Release Package has not been submitted to the County. However, upon recommendation by the Bond Committee, the Director may, at the request of the developer submitted prior to the fifth extension, grant extensions beyond the 5 year limit, if the Bond Committee determines that such additional extensions are reasonably justified due to the magnitude of the bonded project, the reasonableness of the construction schedule and the diligence of the developer in carrying out the schedule, a reasonable estimate of the time necessary to satisfy Virginia Department of Transportation public need requirements, and such other factors as may be deemed relevant by the Bond Committee.

The developer can make a formal request to the Director for an extension of the completion date for a maximum period of 1 year. The developer must indicate the reasons and conditions which have prevented completion of the required improvements. The developer shall furnish to the Director an Extension Agreement, the surety's written consent to the extension and an extension of the surety or security. All signatures must be notarized.

2. Bond Extension Submission Requirements: The Bond Extension request shall not be processed unless the following items have been submitted as one complete package.
 - a. Fee check. The fee check entitles the owner/developer to one submission of the extension documents and, if needed, one correction. If two or more correction reviews are needed, a new fee equal to the original fee must be remitted.
 - b. Letter of request with justification from the developer.
 - c. Extension Agreement executed by the owner/subdivider, Consent to Extension executed by the owner/subdivider and surety, and extension of, or confirmation of continuation of, performance guarantee.
 - d. Extension Agreement and Consent to Extension must be prepared on forms approved by the Bond Committee.
 - e. If such extension request seeks to extend the completion date for a fifth year, such request shall not be considered nor approved unless accompanied by documentation that indicates the road acceptance/bond release process has been initiated. Such documentation shall include the punch list generated by the official inspection, submitted by the developer, and a practical work schedule reasonably designed to complete the punch list within a year. This requirement may be postponed to the next

subsequent extension request if the Bond Committee has recommended and the Director has approved an extension beyond the fifth year.

3. In situations where the developer has requested an extension or a new agreement and surety, the Bond Committee will review the Director's report on the project and the reasons supplied by the developer. The following are some of the factors to be considered by the Bond Committee:
 - a. Percentage of project already completed.
 - b. Number of homes or buildings completed, occupied, and served by public facilities.
 - c. Rate of construction activity.
 - d. Owner/sub divider/developer's history relating to completion of public improvements in the County and in neighboring jurisdictions.
 - e. Current projected completion cost: Dependent upon the amount of work yet to be completed and the currently estimated cost to complete construction of the project, the Bond Committee may require an increase in the amount of the existing bond to cover the completion of such outstanding improvements and obligations.
 - f. Current rating of the bank or corporate surety providing the security for the Performance Agreement. (See subsection IV above.)
4. In the event the developer does not respond to the letter sent by the Director cautioning of potential default or in the event the agreement is in default, the matter will be referred to the County Attorney's office for guidance and possible legal action.
5. No Extension Request for a bonded Stormwater Management Agreement shall be accepted for processing until the Bond Committee has determined that such Agreement is qualified for an extension. If such Agreement is not determined to qualify for extension, no extension shall be granted.

C. Effects of Bond Default

It shall be the sole responsibility of the developer to keep the Performance Agreement current.

While the Performance Agreement is in default, the owner/subdivider/developer shall not be entitled to any bond reduction, bond release, permits or inspections for the project covered by that Performance Agreement. If default can be cured by the approval of an extension of the agreement, then, upon fulfilling the Bond Extension Submission

Requirements set forth above, including payment of the appropriate fees for bond extension and, if applicable, bond reduction, the inspections necessary for such bond extension and, if applicable, bond reduction, will be performed. The denial of permits and inspections by the Director shall be in addition to any other remedy available to the Board of Supervisors under the Performance Agreement.

D. Bond Reductions

1. Bond Reduction Requirements: Partial releases of bonds, referred to herein as Bond Reductions, shall be granted based upon Completion of specific, identifiable portions of the project and shall be subject to the following limitations:
 - a. No bond shall be reduced until Completion of at least thirty (30) percent of the physical improvements secured by such bond.
 - b. The Board of Supervisors or designee shall not be required to consider more than three (3) Bond Reductions within any twelve (12) month period during the life of the bond.
 - c. No bond shall be reduced to an amount less than ten (10) percent of the original Bond Estimate.
 - d. For the purposes of this subsection D, Bond Reductions, "Completion" shall mean construction of any identifiable section of a specified improvement or facility in accordance with the approved site plans, construction plans, profiles and specifications, and the provisions of this manual. For example, for a specific section of public roadways to be eligible to be considered for Bond Reduction, the grading, subbase, base paving, curb and gutter, including all compaction and lab tests, and all other aspects of construction, with Exceptions as defined herein, shall be completed and all work in place must be in good condition. The "good condition" requirement shall not be deemed satisfied for any such section where there exists any failing pavement.
 - e. "Exceptions" to the Completion requirement may include final surface pavement and any other ancillary, uncompleted improvements such as sidewalks, driveway aprons and lot grading which the Director determines would probably suffer excessive damage during construction upon the property abutting the bonded improvement or facility.
 - f. The reduction of any bond shall not be considered acceptance of the improvements for which such reduction has been requested, and the owner/subdivider shall have a continuing responsibility for maintaining such improvements in good condition, including without limitation the repair of deterioration and damage, until they have been formally accepted by the County, VDOT, or other appropriate agency. Failure to perform

such maintenance within sixty (60) days of being so directed by the Director or his agent shall constitute default of the Performance Agreement.

- g. When any Exception to the Completion requirement is permitted, the amount of the bond as reduced shall include the cost of constructing or repairing such final surface pavement or other uncompleted improvements. In no event shall any bond be reduced to an amount less than the amount deemed necessary by the Board of Supervisors or designee to cover (i) the total estimated cost of achieving total completion of the project without exceptions, plus (ii) the entire twenty_(20) percent Contingency Factor included in the original approved Bond Estimate, plus (iii) the inflation factor referenced above in Section 8.304.A, applied to (i) and (ii).
 - h. When a developer has completed construction of a portion of a bonded project, and such portion has been accepted into the state system for maintenance by VDOT, such developer may revise the approved plans to exclude such accepted portion and submit such revised plans to the Director along with a revision of the original Bond Estimate to cover only the portion not yet accepted. The Board of Supervisors or designee, may, upon recommendation of the Bond Committee, approve such revised Bond Estimate and any consequent Bond Reduction in accordance with the foregoing Bond Reduction regulations as applied to such revised Bond Estimate.
 - i. No bond shall be reduced for a Performance Agreement that is in default.
2. Bond Reduction Procedures: A request for a reduction of the bond amount shall be deemed to have been made when the developer has provided notice to the Director in the following manner. The Bond Reduction Request shall not be deemed to have been made until the following items have been submitted as one complete package. Such notice must include:
- a. A written request for reduction of the bond amount, signed and acknowledged by the owner/subdivider who executed the Performance Agreement. When applicable, such written request shall include a certification by the owner or developer that the installation of all underground utilities located within the bounds of any public or private roadway covered by such bond has been inspected and approved by the utility provider.
 - b. An estimate prepared and certified as being accurate by a professional engineer that shows the quantities of all bonded improvements in place, complete, and in good condition.

- c. Written consent, signed and acknowledged by a duly authorized officer or agent of the corporate surety, banking institution, or other approved surety which provided the surety or security.
 - d. The applicable processing fee; and
 - e. Inspection reports in accordance with this chapter.
3. After a Bond Reduction is approved, an amendment to the Surety instrument shall be submitted to reflect the reduced amount.

E. Bond Release Procedures

1. A request for final and complete release of a bond and agreement shall be deemed to have been made when the developer has provided notice to the Director by certified mail. Such notice must include:
- a. A written request for final release from the bond and agreement, signed and acknowledged by the owner/subdivider who executed the Performance Agreement.
 - b. To the extent not previously submitted pursuant to bond reduction request, copies of inspection and test reports if work was inspected and tested by a third-party inspector.
 - c. Certification that all bonded improvements, other than improvements accepted by VDOT, have been completed in accordance with the approved plans, profiles, and specifications and the requirements of this manual. For improvements to be accepted for maintenance by VDOT, such certification shall state that the improvements have been installed and inspected in accordance with VDOT requirements.
 - d. The applicable processing fee(s).
 - e. A copy of the County approval of the record drawings as required for facilities within public rights-of-way or easements submitted pursuant to Section 8.108 of this manual.
 - f. For subdivisions, a letter from a professional engineer or surveyor certifying that property corners have been set.
 - g. Documentation of acceptance by VDOT of public roadways and rights-of-way, or a maintenance and indemnification agreement and bond approved by the Board of Supervisors or designee for public roadways which have been completed in accordance with VDOT standards but which, due to

F. Private Roadway Maintenance Bonds

Before a Performance Agreement and Surety (performance bond) for private roadway construction shall be released, a Latent Defects Indemnification Agreement and Bond shall be provided by the owner/subdivider and approved by the Board of Supervisors or designee. The guarantee provided by such Agreement and Bond must be for a period of two (2) years following the date of performance bond release, and must be in an amount equal to no less than five (5) percent of the original performance Bond Estimate. Such guarantee must provide that the owner/subdivider will be responsible for pavement, concrete or stormwater management system repairs arising from construction deficiencies as determined by the Director for a period of two (2) years after performance bond release, with such repairs to be made within sixty (60) days after notification by the Director, or his agent, that such repairs are needed. If repairs are not accomplished within that time, the owner/subdivider shall be deemed to be in default of the Agreement and Bond, and the Director may take any appropriate action provided for in such Agreement, including calling upon the Bond securing such Agreement in order to perform the repairs.

G. Vacation of Plat as Alternative to Subdivision Default

Failure by the owner/subdivider to perform its obligations under a Performance Agreement constitutes a default. This section provides an option that may allow the parties to avoid or correct a default situation where completion of the project is inappropriate or not feasible.

1. The option of total or partial vacation is available with the consent of the Board of Supervisors if accomplished by a written instrument in accordance with the provisions of Sections 15.2-2270, 15.2-2271 or 15.2-2272 of the Code of Virginia. Such written instrument, together with any plat of vacation necessary to clarify the nature of the vacation, shall be submitted to the Director along with a written explanation of the reason for seeking such vacation or partial vacation, and the Director shall submit such vacation request to the Board for approval.
2. Portions or sections of the subdivision in which construction has commenced or in which lots have been occupied or house construction has begun may not be vacated and must be completed and public improvements therein accepted by the appropriate public body or association. Under appropriate circumstances, as determined by the Board of Supervisors or designee, and in accordance with the policy stated herein relating to maintenance agreements and bonds, such completed improvements may be placed under security of a maintenance bond pending acceptance.

H. Construction of Road Improvements Prior to Approval of Plat or Plan

If the developer elects to construct the public road improvements prior to obtaining approval of a record plat or site plan, the following requirements shall apply:

1. Before beginning construction, the developer shall submit construction plans and profiles to the Director, as provided in the Land Subdivision and Development Ordinance and this manual. The Director shall submit such plans and profiles to VDOT for review and approval. After such plans and profiles have been approved by the Director, the developer shall obtain the required grading permits from the Director and all other required permits before commencing construction.
2. The developer shall then construct the road according to the approved plans and profiles and all applicable VDOT regulations existing at the time of construction. During construction the developer shall be responsible for obtaining all necessary inspections by VDOT or by third party inspectors in accordance with the requirements of this manual.
3. After the construction is completed, the developer shall submit to the Director:
 - a. A set of Record Drawings certified as to construction by a professional engineer in accordance with this chapter.
 - b. Third party inspection reports in accordance with this chapter.
 - c. A request, in writing, that a joint inspection be made by VDOT and the Director.
4. The Director shall schedule an inspection with VDOT, with all representatives present. Subsequent to such inspection, a punch list of those items requiring correction will be prepared. The Director shall notify the developer, in writing, of the items requiring correction or revision by providing a copy of such punch list within 30 days of the inspection date.
5. The developer shall complete all of the corrective work shown on the punch list within 30 days. This punch list shall not relieve the developer of any latent defects which might become apparent prior to roadway acceptance by VDOT. If punch list corrections are not completed within the allotted time, the entire project may be subject to reinspection.
6. The developer shall notify the Director, in writing, upon completion of the punch list items and shall request final inspection. The Director shall set a date for joint inspection with VDOT and the developer within 30 days of the request. Subsequent to final inspection, the Director shall await written notification from VDOT as to whether the road, as constructed, meets the applicable construction standards of VDOT as of the date of inspection. If not, the procedures of paragraph 5. and this paragraph 6. may be repeated, as applicable.
7. If all criteria for acceptance by VDOT have been met, the Board of Supervisors or designee shall cooperate with the developer to obtain acceptance into the State

system, as provided in this chapter.

8. If final inspection indicates that the developer has fully performed as to construction, but that the road(s), due to factors other than quality of construction, are not acceptable into the state system, the owner/subdivider shall enter a maintenance agreement with surety, in form approved by the County Attorney and executed by the Board of Supervisors or designee, guaranteeing that the owner/subdivider will maintain the roads in the same condition as existed at final inspection until such time as VDOT road acceptance occurs. Such surety shall be in an amount as recommended by the Bond Committee and approved by the Board of Supervisors or designee. Maintenance responsibility for the road(s) shall remain with the owner/subdivider until such time as the road(s) are accepted by VDOT.
9. When the road(s) have been accepted by VDOT or when the maintenance agreement required in paragraph 8 is approved by the Board of Supervisors or designee, the Bonding requirements, except for any ancillary improvements outside the right of way, for such road(s) shall be deemed satisfied for the purposes of record plat approval.

8.400 CERTIFICATE OF OCCUPANCY OR USE

No certificate of occupancy or use shall be issued for residential, commercial, institutional, or industrial uses until required improvements as specified by the Board of Supervisors or designee, Planning Commission, or Board of Zoning Appeals are installed, inspected, and approved by the Director and the Zoning Administrator. Concurrent with the final inspection, it shall be verified that the developer has fulfilled the conditions of approval/proffers which are applicable to an occupancy within the development.

Upon a request for issuance of a certificate, a final inspection shall be made within ten (10) working days of the request. Prior to the issuance of an occupancy permit, all required improvements not installed shall be bonded in accordance with Section 8.300 of this manual.

8.500 INSPECTIONS

Inspections are required for infrastructure improvements, as shown upon approved site plans or construction plans and profiles, for bond release, acceptance of such improvements into the State system, or issuance of Certificate of Occupancy or Use. Inspections shall be sufficient to insure that the improvements have been installed in accordance with the approved site plans or construction plans and profiles and applicable VDOT standards and specifications.

A. Types of Inspections

Inspection reports shall address the following items, as applicable:

1. Compaction of embankments, compaction of trench and structure backfill, compaction of sub-grade, sub-base and base for roads and the compaction of base for walks and curbs.
2. Roller patterns and control strips and theoretical and actual densities for base and final pavement.
3. Appropriate concrete tests for concrete structures and facilities.
4. Independent structural inspections for both precast and cast-in-place concrete structures.
5. Overpasses and bridges.
6. Such additional items as the nature of the construction and the Director shall reasonably require.

B. Third Party Inspections

1. Applicability

Third party inspections are acceptable for public roadways and are required for private roadways, alleys, and all stormwater management facilities, including structures and impoundment embankments, associated with such public or private roadways or alleys.

2. Personnel Qualifications and Supervision

Tests must be performed by a certified soil, asphalt or concrete technician as appropriate. Technicians holding certifications other than those issued by the Materials Division of VDOT must provide evidence that VDOT accepts the certification as an equivalent. These technicians must be operating under the direct supervision of a professional licensed in the state to perform such work.

3. Reporting and Submission Requirements

Tests required hereunder must be available upon request to County or VDOT personnel after construction commences and must be part of the final submission to the County at project completion in conjunction with the Record Drawings, as specified in Section 8.108 of this manual. The final submission must be accompanied by a cover letter signed and sealed by the supervising professional certifying that the project has been tested in accordance to VDOT specifications and the construction of the project meets the criteria set forth by the County and VDOT.