



ECS Mid-Atlantic, LLC

Groundwater Resources Evaluation

Piedmont Aquifer of Stafford County

Stafford County, Virginia

ECS Project No. 47:4330

February 2, 2018





February 2, 2018

Mr. Keith Dayton
Stafford County
1300 Courthouse Road
P.O. Box 339
Stafford, Virginia 22555-0339

ECS Project No. 47-4330

Reference: Groundwater Resources Evaluation
Piedmont Aquifer of Stafford County
Stafford County, Virginia

Dear Mr. Dayton:

ECS Mid-Atlantic, LLC (ECS) is pleased to provide Stafford County with the results of our Groundwater Resources Evaluation of the Piedmont Aquifer in Stafford County. If there are any questions regarding this report, or a need for further information, please contact the undersigned at (540) 785-6608.

Respectfully Submitted,

ECS MID-ATLANTIC, LLC

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Groundwater Resources Evaluation
Piedmont Aquifer of Stafford County
Stafford County, Virginia

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PROJECT

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DATE

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Stafford County, Virginia**

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1.0 EXECUTIVE SUMMARY

ECS is pleased to provide this report documenting our findings from a Groundwater Resources Evaluation of the Piedmont Aquifer in Stafford County. The purpose of this study was to provide a comprehensive evaluation of Stafford County's Piedmont Aquifer with a focus on better understanding the aquifer's capacity as a water resource and current usage of the resource. The study's findings are intended to be used as a tool for aiding future land use and planning decisions. The Groundwater Resources Evaluation consisted of the following tasks: (1) conducting a literature review, (2) calculating the study area's hydrologic budget, (3) quantifying the Piedmont Aquifer's maximum capacity and current groundwater withdrawals, (4) evaluating well record information to identify potential correlations between well yield and several analyzed parameters, (5) examining groundwater monitoring options and domestic well best practices, and (6) reviewing existing groundwater withdrawal regulations in other counties located within the Piedmont Province or nearby Blue Ridge Province.

The study area consists of the Piedmont Province portion of Stafford County. Virginia's Piedmont Province extends from the Blue Ridge Mountains on the west to the Coastal Plain Province on the east. Bedrock within the Piedmont Province generally consists of hard, resistant igneous rock and metamorphosed igneous and sedimentary rock, although sedimentary basin deposit formations are also present in distinct areas of the Piedmont. Consolidated bedrock within the Piedmont Province is overlain by unconsolidated regolith and/or saprolite of variable thickness.

Two separate Stafford County supply well databases were instrumental in completing this Groundwater Resources Evaluation. These databases have been referred to within this report as the Attribute Data Well Database and the Non-Attribute Piedmont Well Database. Stafford County's Attribute Data Well Database contains information from a total of 1,801 georeferenced well records within the study area and was compiled as part of two separate digitization efforts. The first well log digitization effort was completed as part of the 2004 Stafford County Groundwater Management Plan project and the second well log digitization effort was completed as part of this Groundwater Resources Evaluation. Information from numerous data fields within the well logs, including well yield, well depth, casing depth, casing intervals, parcel identification, address, etc., is contained within the Attribute Data Well Database. Conversely, Stafford County's georeferenced Non-Attribute Piedmont Well Database contains 4,940 well records that lack well construction and performance information, but do contain information pertaining to the physical locations of the wells. By combining the aforementioned well databases it was possible to calculate a total of 6,741 known or suspected supply wells within the study area.

ECS utilized the aforementioned supply well databases to estimate current groundwater withdrawals within the study area. Evaluation of well database information, in addition to several other data resources, revealed that the vast majority of groundwater withdrawals in the study area are for domestic water supply. Of the estimated 1.62 mgal/day of groundwater withdrawn from the study area, approximately 96.3% of this water is used for domestic supply. The remaining 3.7% is used for industrial, irrigation, and livestock watering purposes.

A mass-balance hydrologic budget of the study area was developed under both normal and drought conditions by ECS using the aforementioned groundwater withdrawal estimates, climate data, stream baseflow data, and data contained within pertinent geologic publications. ECS found that groundwater withdrawals under normal conditions comprise approximately 0.72% of total outflow from the study area. The vast majority of hydrologic outflow from the study area is from evapotranspiration (64.4%), groundwater seepage to streams (22.7%), and stormwater runoff to streams (10.7%) under normal conditions.

The hydrologic budget, groundwater withdrawal estimation information, and 7Q10 stream baseflow data were used to assess whether additional groundwater could be pumped from the Piedmont Aquifer without detrimentally impacting the hydrologic system. A modified version of groundwater appropriations criteria utilized by the MDE for fractured crystalline rock aquifer systems was utilized to assess the Piedmont Aquifer's maximum safe yield. The MDE version was modified to add two significant conservation factors. As such, the safe yield value calculated as part of this study is greater than ten times more conservative than the non-modified MDE calculation method. Overall, the maximum safe yield calculations revealed that an additional 6,500 households within the study area could withdraw groundwater at typical residential usage rates without causing significant negative impacts to the study area's hydrologic system.

ECS utilized Stafford County's Attribute Data Well Database to evaluate spatial variations in well yield and the relationship between well yield and a variety of natural and well construction factors. The purpose of this analysis was to characterize drilled well yields throughout the study area and assess potential correlations between well yield and several natural and well construction-related factors. Drilled well yields throughout the study area were evaluated in relation to bedrock lithology, well depth, casing depth as a proxy for unconsolidated overburden thickness, proximity to streams, well density, elevation, and topographic slope.

Findings from the well yield analysis revealed that well yield and the occurrence of low-yielding wells appear to be strongly influenced by the geologic composition of the aquifer into which the wells are drilled. ECS classified each geologic unit as having either a high, moderate, low, or unclassified well yield potential, based on the median well yields and the percentages of low-yielding wells (i.e., wells with yields less than 3 gpm) in each geologic unit. Relatively high-yielding geologic units with low occurrences of low-yielding wells include the Oc, O(C)p, and O(C)u geologic units. Moderately-yielding geologic units with moderate occurrences of low-yielding wells include the Opg and OZgm units. Low-yielding geologic units with high occurrences of low-yielding wells include the Oq, Oam, Sf, and Ol units. Overall, 23.37% of the study area is comprised of geologic units with high potential well yields, 40.13% of the study area is comprised of geologic units with moderate potential well yields, 25.48% of the study area is comprised of geologic units with low potential well yields, and the remaining 11.03% of the study area is unclassified. However, 55.77% of the land within the unclassified units is located within the municipal water service area, where extensive future groundwater development is unexpected. As such, only 4.88% of the study area is located in an unclassified zone outside of the municipal water service area. It is important to note that potential well yield ratings are approximations based on available well record data and are not a

guarantee that such conditions exist throughout the geologic unit. Zones of low-yielding wells are documented to exist within high potential yield zones, and conversely, zones of high-yielding wells exist within low potential yield zones. Site-specific evaluation would be required to more accurately assess well yield potential at a given site.

Evaluation of well yield in relation to well depth revealed that yields appear to progressively decline with increased well depth. This is most likely a result of low-yielding wells being advanced to greater depths to provide additional water storage and to attempt to encounter additional water. Surface casing depth can provide an estimate of unconsolidated overburden thickness, as surface casing is typically installed a few feet into stable bedrock through unconsolidated sediment and/or saprolite. Well yields appear to be negatively impacted when less than 50 feet of overburden/saprolite is present, as well yields are lower and the occurrence of low-yielding wells is higher than when casing is deeper. Well yields and the occurrence of low-yielding wells are comparable when surface casing is installed to depths exceeding 50 feet. Evaluating well yields in relation to proximity to streams, supply well density, elevation, and topographic slope showed that only minor correlations or an absence of correlations exist. A minor relationship does appear to exist between the yields of wells installed prior to the year 2000 and wells installed since 2000. The evaluation of well yield as a function of drilled well installation year revealed that wells installed since 2000 generally have yields that are slightly higher than or equal to that of wells installed prior to 2000. As such, there does not appear to be evidence that increased well development within the Piedmont Province of Stafford County has adversely impacted the well yields of more recently installed wells within this area.

Using monitoring wells to measure long-term groundwater levels can be an effective way to differentiate short-term, weather-induced groundwater level fluctuations from long-term trends that could be indicative of over-pumping or climate-induced shifts. Currently, there are no known public groundwater monitoring wells within the Piedmont portion of Stafford County. ECS evaluated 217 county-owned properties within the study area to assess the viability of prospective monitoring well locations. The evaluated properties consisted of vacant land, schools, radio tower sites, undeveloped floodplains, surface water, libraries, parks, county-owned apartments, municipal buildings, etc. Potential groundwater monitoring locations were evaluated based on proximity to surface water features, parcel size, proximity to the Coastal Plain Province, existing site developments, geologic unit, whether the site is located within or outside of the municipal water service area, and the regional supply well density of the surrounding area. ECS identified four preferred monitoring well target properties from the list of 217 county-owned properties. These sites include the Willowmere Park property, a radio tower site, T. Benton Middle School, and a vacant land parcel located near the intersection of Ramoth Church Road and Dog Patch Lane. ECS also recommends that Stafford County consider obtaining access to install a monitoring well within the Lunga Reservoir Formation (OI) to aid in assessing whether the area's relatively high degree of well development may be adversely impacting groundwater levels within the formation. Although preferred monitoring well sites have been identified as part of this study, further evaluation would be recommended prior to installing monitoring wells at the selected location(s). Estimated costs for monitoring well installation and ongoing groundwater level data collection have been provided within an appendix to this report.

Land use measures involving hydrogeologic assessment standards have been adopted for use by several counties within Virginia's Piedmont and Blue Ridge Province regions. ECS identified and reviewed ordinances from Albemarle, Fairfax, Fauquier, Orange, Loudoun, and Rappahannock Counties to provide a summary of general assessment details. Hydrogeologic testing standards and/or groundwater regulations were either adopted within a Subdivision Ordinance or within a specific groundwater-related ordinance in all six of the counties reviewed during this study. The Subdivision and/or Groundwater Ordinances cited either Code of Virginia Law as authorization or text that appeared to be based on Code of Virginia Law. Stated authorization was not identified within all reviewed ordinances. The process for a county considering the development and adoption of hydrogeologic testing standards should be guided by an attorney familiar with Virginia law.

2.0 INTRODUCTION

ECS Mid-Atlantic, LLC (ECS) is pleased to provide this report documenting our findings from a Groundwater Resources Evaluation of the Piedmont Aquifer in Stafford County (i.e. study area or subject area). The purpose of this study was to provide a comprehensive evaluation of Stafford County's Piedmont Aquifer with a focus on better understanding the aquifer's capacity as a water resource and current usage of the resource. The study's findings are intended to be used as a tool for aiding future land use and planning decisions.

The western half of Stafford County is underlain by a series of crystalline and metamorphic rock formations referred to collectively as the Piedmont Aquifer. The Piedmont Aquifer is regionally extensive and is an important water supply source in the Mid-Atlantic region. Stafford County's Piedmont Aquifer is relied upon for water supply by approximately 6,741 residences. The aquifer is also an important source of water for irrigation and for livestock watering. Current usage of the Piedmont Aquifer, as well as reports of insufficient water quantity in certain areas and Stafford County's high projected growth rate, has led to concerns about the future viability of this resource.

The Groundwater Resources Evaluation consisted of the following tasks: (1) conducting a literature review, (2) calculating the study area's hydrologic budget, (3) quantifying the Piedmont Aquifer's maximum capacity and current groundwater withdrawals, (4) evaluating well record information to identify potential correlations between well yield and several analyzed parameters, (5) examining groundwater monitoring options and domestic well best practices, and (6) reviewing existing groundwater withdrawal regulations in other counties located within the Piedmont Province or nearby Blue Ridge Province.

3.0 STUDY AREA NATURAL SETTING

3.1 Study Area Description

The study area consists of the portion of Stafford County located to the west of the Fall Line, which separates the Piedmont Province from the Coastal Plain Province. Although discussed in parts of this report, the portion of Stafford County occupied by Quantico

Marine Base is not considered to be part of the study area due to the lack of well data available within this area.

The total land area of Stafford County is approximately 280.2 square miles. Of this total area, the Piedmont Province consists of approximately 153.3 square miles and the Coastal Plain Province consists of approximately 126.9 square miles. Quantico Marine Base comprises approximately 43.3 square miles of the Piedmont Province's total area. As such, the study area portion of the Piedmont Province comprises approximately 110.0 square miles. Aerial photography showing the location of Stafford County is included as Figure 1 and a map of the county showing the Piedmont Province, Coastal Plain Province, fall line, and Quantico Marine Base is included as Figure 2.

3.2 Topography and Hydrology

Natural ground surface elevations within the subject area range from approximately 15 feet above mean sea level (amsl) along the County's southern border to 440 feet amsl along the County's northwestern border. The lowest elevation within the study area (-5 feet amsl) is located at the base of the Vulcan Quarry near Garrisonville. Regional topography generally slopes from the northwest to the southeast and is classified as being moderately rolling, based on the region's average topographic slope of 21 percent. A prominent topographic ridge extends from the highest elevation portion of the subject area toward the southeast. The southwestern side of this ridge drains primarily to tributaries of the Rappahannock River and the northeastern side of this ridge drains to tributaries of Abel Lake. A second, more subdued ridge extends from the highest elevation portion of the subject site toward the east. The southern side of this ridge primarily drains to tributaries of Abel Lake and the northern side of the ridge drains primarily to tributaries of Aquia Creek. Topography within the study area, based on data from a 30-meter resolution digital elevation model, is depicted within Figure 3.

Topographic slope within the subject area ranges from 0 degrees to 68 degrees, with stream banks generally comprising the steepest slopes. Regional topography is generally classified as being moderately rolling, based on the region's average topographic slope of 12 degrees. A map of the study area depicting topographic slope, based on data from a 30-meter resolution digital elevation model, is included as Figure 4.

Numerous streams and reservoirs are located within the study area. Some of the larger streams within the study area include Aquia Creek, Beaverdam Run, Cannon Creek, Chopawamsic Creek, Falls Run, Horsepen Run, Long Branch, Potomac Creek, Potomac Run, Richland Run, Rocky Pen Run, and the Rappahannock River at the county's southern boundary. Surface water reservoirs within the study area include Abel Lake, Big Lake Arrowhead, Breckenridge Reservoir, Hidden Lake, Little Lake Arrowhead, Lunga Reservoir (located within Quantico Marine Base), and Smith Lake. Mapped streams and reservoirs located within the study area are shown in Figure 5.

The study area is contained within four watersheds. The majority of the study area, which comprises the central and northwestern portion of the subject area, is located within the Potomac Creek – Potomac River Watershed. Streams within this watershed generally drain in a southeastern direction toward the Potomac River. The northern tip of Stafford County's Piedmont Aquifer is within the Quantico Creek – Potomac River

Watershed. Streams in this portion of the county generally drain to Chopawamsic Creek, which is located along portions of the county's northeastern boundary. The southwestern corner of the study area is located within the Marsh Run – Rappahannock River Watershed, where streams generally drain to the Rappahannock River. The southern portion of the study area is located within the Massaponax Creek – Rappahannock River Watershed, where streams generally drain to the Rappahannock River within the Piedmont Aquifer portion of the county. Watershed boundaries within the study area are shown in Figure 5.

3.3 Geology

Both the Piedmont Province and Coastal Plain Province are present within Stafford County. The Piedmont Province occupies the western 55% of the county and the Coastal Plain Province occupies the eastern 45% of the county. The roughly north-south oriented line along which these provinces join is referred to as the fall line, which generally marks the line along which crystalline and metamorphic rocks of the Piedmont Province transition to layered unconsolidated sediment that comprise the Coastal Plain Province. Figure 2 depicts the Piedmont Province and Coastal Plain Province within Stafford County, as well as the fall line that separates the provinces. The location of the fall line has been approximated based on large-scale geologic mapping by Rader and Evans (1993), since further investigation would be required to delineate its exact location. In general, the eastern portion of Stafford County that is underlain by sand or gravel has been assigned within the Coastal Plain Province and the remaining portion of Stafford County has been assigned within the Piedmont Province.

Virginia's Piedmont Province extends from the Blue Ridge Mountains on the west to the Coastal Plain Province on the east. Bedrock within the Piedmont Province generally consists of hard, resistant igneous rock and metamorphosed igneous and sedimentary rock, although minor sedimentary basin deposit formations are also present. Rocks within the Piedmont Province are typically steeply dipping and have a pronounced northeast-trending structural grain (Mixon et al., 2005). Crystalline bedrock within the Piedmont Province is overlain by unconsolidated regolith. A significant portion of the regolith is typically comprised of saprolite, which is a soft, typically clayey, decomposed rock created by chemical weathering of the uppermost bedrock surface. Saprolite within the Piedmont Province is variably thick and can exceed 60 feet in thickness.

The subject area generally consists of metamorphosed rocks that have been intruded by igneous plutons. Mapping by Rader and Evans (1993) and Mixon et al. (2005) indicates that 19 geologic units are mapped within the study area. The majority of these units are comprised of Proterozoic- to Paleozoic-age plutonic, meta-plutonic, meta-sedimentary, and meta-volcanic rocks. Additionally, more recent Tertiary-age unconsolidated sedimentary deposits and thin, pinched-out sedimentary layers of the Cretaceous Potomac Formation overlying Piedmont Province geologic units are present within the study area. A summary of geologic units present within the study area, as well as the percentage of the study area occupied by the units, is included as Table 1. Figure 6 mapping depicts the locations of these units within the study area. Ordovician Metatonalite of the Richland Run Pluton comprises the highest percentage of the study area (19.72%). The Garrisonville Mafic Complex (17.53%), Chopawamsic Formation (12.77%), and Miocene Sand and Gravel (11.62%) also comprise relatively large

Table 1: Summary of Geologic Units Located within the Study Area.

Geologic Name	Geologic Symbol	Primary Rock Type	Age	Percent of Study Area	Description
Metatonalite of the Richard Run Pluton	Opg	Metatonalite	Ordovician	19.72%	Plagioclase- and quartz-rich metamorphosed intrusive rock with minor epidote, muscovite, biotite, and chlorite.
Garrisonville Mafic Complex	OZgm	Amphibolite	Proterozoic - Ordovician	17.53%	Fine- to coarse-grained, massive to foliated amphibolite and hornblendite with minor other metamorphosed mafic and ultramafic rocks. Interpreted to be part of a volcanic arc or a remnant of oceanic crust.
Chopawamsic Formation - Interlayered Mafic to Intermediate Metavolcanic Rocks	Oc	Metavolcanic Rock	Ordovician	12.77%	Includes laterally discontinuous lenses and tongues of metamorphosed mafic and intermediate volcanic flows and volcanoclastic rocks with minor felsic interlayers. Primarily comprised of amphibolite, schist, and gneiss. Includes amygdular and vesicular volcanic flows. Interpreted to be part of a volcanic arc terrane.
Miocene Sand and Gravel	Tms	Gravel	Tertiary	11.62%	Fine- to coarse-grained sand, sandy gravel, silt, and clay, gray to light-yellowish-gray, commonly oxidized to yellowish-orange and yellowish-brown; constitutes thin Coastal Plain outliers in easternmost Piedmont where deposits directly overlie weathered crystalline rocks. Thickness is 0 to 35 feet.
Lunga Reservoir Formation	OI	Metadiamictite	Ordovician	5.19%	Consists of non-stratified, pebbly, micaceous, quartzofeldspathic metagraywacke matrix that supports granule- to boulder-sized clasts of metasedimentary and meta-igneous rock with abundant polycrystalline, granoblastic quartz clasts. Interpreted to be part of a mélange terrane.
Pliocene Sand and Gravel	Tps	Gravel	Tertiary	4.18%	Interbedded yellowish-orange to reddish-brown gravelly sand, sandy gravel, and fine to coarse sand, very poorly to moderately well-sorted, cross-bedded, includes thin to medium clay and silt beds. Extends into the Piedmont Province as high-level terrace deposits that overlie crystalline rocks. Thickness is 0 to 35 feet.

Geologic Name	Geologic Symbol	Primary Rock Type	Age	Percent of Study Area	Description
Falls Run Granite Gneiss	Sf	Granite	Silurian	4.11%	Pink to white, coarse-grained, strongly-foliated hornblende-biotite granite to monzonite gneiss. Primary mineralogy includes microcline, plagioclase, quartz, biotite, muscovite, and hornblende.
Quantico Formation	Oq	Metasedimentary Rocks	Ordovician	3.98%	Comprised primarily of slate, phyllite, and schist with minor interbeds of volcanoclastic rock. Contains beds of fine-grained metagraywacke of variable thickness.
Metasedimentary Rocks Undivided	O(C)u	Metasedimentary Rocks	Cambrian - Ordovician	3.93%	Gray to green phyllite, gray to white meta-siltstone and fine-grained quartzite, fine-grained mica schist, green slate and phyllite, and sparse granule quartzite and graywacke.
Phyllite	O(C)p	Phyllite	Cambrian - Ordovician	3.72%	Mostly gray-to-green phyllite with lesser metasilstone.
Potomac Formation	Kp	Sand, silty- and sandy-clay, and sandy-silt	Cretaceous	2.90%	Variable composition dependent on depositional history. Consists of (1) Fine- to coarse-grained sand and sandstone point-bar deposits; (2) silty- and sandy-clay cutoff channel-fill deposits; and (3) sandy-silt, clay, silty-sand, and sandstone floodplain deposits.
Gneiss of the Potomac Creek Pluton	Ygn	Gneiss	Lower Paleozoic or Neoproterozoic	2.87%	Fine- to medium-grained biotite-quartz-plagioclase gneiss of tonalitic, dioritic, or granodioritic composition. Includes accessory epidote, garnet, and muscovite mineralization.
Amphibolite	Oam	Amphibolite	Ordovician	2.79%	Dark gray, fine-grained, composed mainly of hornblende and plagioclase. Interpreted to be metamorphosed mafic volcanoclastic rock.
Trondhjemite	O(C)tj	Trondhjemite	Cambrian - Ordovician	1.79%	Light-gray, light-colored, fine-grained; composed of intergrown albite and quartz exhibiting granophyric texture. Blue-green amphibole and garnet are present locally.
Goldvein Pluton	O(C)gg	Granite Gneiss	Cambrian - Ordovician	1.05%	Mesocratic, coarse- to medium-grained, weakly- to strongly-foliated meta-monzogranite. Altered feldspars commonly impart pink and green colors to the rock.

Geologic Name	Geologic Symbol	Primary Rock Type	Age	Percent of Study Area	Description
Falmouth Intrusive Suite	PMf	Granite	Mississippian - Pennsylvanian	0.65%	Fine-grained to pegmatitic granite, quartz monzonite, granodiorite, and tonalite; consists of dikes, sills and small plutons. Primary mineralogy includes plagioclase, quartz, microcline, biotite, muscovite, and hornblende.
Surface Water	Water	---	---	0.34%	Surface water reservoirs.
Alluvium	Qal	Alluvium	Quaternary	0.33%	Fine to coarse gravelly sand and sandy gravel, silt, and clay, light- to medium-gray and yellowish-gray. Deposited mainly in channel, point-bar, and flood-plain environments; thickness can be up to 80 feet along major streams.
Quantico Formation - Micaceous Quartzite	Oqq	Quartzite	Ordovician	0.31%	Light-gray, fine- to medium grained quartzite and quartzose muscovite schist. Primary mineralogy includes quartz, muscovite, plagioclase, and microcline.
Amphibole Metagabbro	Ogb	Amphibolite	Ordovician	0.20%	Dark-greenish-gray, coarse grained, massive, hornblende meta-gabbro. Primary mineralogy includes plagioclase, hornblende, biotite, clinopyroxene, and quartz.

portions of the study area. All other geologic units comprise less than 6% of the study area.

Two major fault zones, the Chopawamsic Thrust Fault and the Long Branch Fault Zone, are located within the study area (Figure 6). Within the study area, the Chopawamsic Thrust Fault emplaced the southern island arc terrane of the Garrisonville Mafic Complex onto the northern terrane of the Lunga Reservoir Formation. The nature of the Chopawamsic Thrust Fault in the vicinity of the study area is poorly understood due to limited fault exposures (Mixon et al., 2005). The Long Branch Fault Zone is a thrust fault that separates the Chopawamsic Formation to the northwest from the Quantico Formation to the southeast in the southern half of the study area. The Long Branch thrust fault is not believed to be present at the contact between the Chopawamsic Formation and the Quantico Formation in the northern half of the subject area (Mixon et al., 2005). Late strike-slip movement may have occurred along this fault (Pavlidis, 2000) and mylonite within the basal quartzite unit of the Quantico Formation is present along portions of the fault.

3.4 Hydrogeology

3.4.1 Piedmont Province Aquifers and Groundwater Flow

Groundwater flow within plutonic and metamorphosed geologic units of the Piedmont Province is primarily via interconnected joints and fractures within the rock, as primary porosity within these units is typically negligible. Regional fracture density and the degree to which fractures are interconnected can be highly variable and is dependent on several factors, including geologic structure, rock type, and depth. Saprolite overlying crystalline bedrock typically functions as a source of groundwater storage for bedrock aquifers, as illustrated in Figure 7. As such, wells completed in areas with a thin saprolite layer are typically more likely to be adversely impacted by drought conditions than wells completed in areas with thicker saprolite layers. The level at which water is transmitted from the saprolite layer to bedrock is largely a function of the degree of fracturing in the uppermost section of bedrock. In general, a relatively minor percentage of infiltrated precipitation is transmitted from the saprolite layer to the underlying bedrock aquifer. The majority of infiltrated precipitation moves vertically through the saprolite until saturated conditions are encountered, at which time groundwater flows laterally through the saprolite and discharges to streams (Trapp, Jr. and Horn, 1997).

The porosity of saprolite typically ranges from approximately 20–30 percent, depending on the parent rock source. This is higher than the porosity found in crystalline bedrock aquifers, which typically ranges from approximately 0.01 to 2 percent (Trapp Jr. and Horn, 1997). The size, number, and interconnection of fractures within crystalline bedrock aquifers typically decreases with depth. The greatest number of fractures within crystalline bedrock is typically found from the ground surface to 200 feet below ground surface (bgs) (Powell and Abe, 1985). Fault zones within the Piedmont Province typically have low permeability because they can be filled with clay, re-cemented breccia, or recrystallized rock (Trapp, Jr. and Horn, 1997). However, this is not always the case, as exemplified by a study conducted in the Maryland Piedmont Province by Nutter (1977), which found higher well yields in crystalline bedrock wells located near fault zones.

Groundwater levels within the saprolite and bedrock aquifers of the Piedmont Province fluctuate seasonally. A lagged response to periods of precipitation is typically observed in Piedmont Province wells due to the time required for precipitation to infiltrate to the saturated portion of the aquifer (Powell and Abe, 1985). Groundwater levels are generally lowest during summer months as a result of significant losses due to evapotranspiration during the growing season.

3.4.2 Piedmont Province Well Yields

Supply well yields within the Piedmont Province are highly variable. In general, wells that penetrate highly fractured rock have higher yields than wells that intersect less fractured rock. Well yields are affected by bedrock composition, saprolite thickness, and topographic setting (Trapp, Jr. and Horn, 1997). Trapp, Jr. and Horn (1997) also state that coarse-textured crystalline bedrock, such as gneiss, schist, and granite, typically yields more water than fine-textured, metavolcanic rocks. Additionally, Piedmont wells located within valleys or other topographic depressions have average well yields that are typically three times greater than the yields of equivalent wells completed on hills or ridges (Trapp, Jr. and Horn, 1997; Powell and Abe, 1985). Valley wells also typically have greater specific capacities than hilltop or ridge wells.

3.4.3 Stafford County Piedmont Aquifer Characteristics

Aside from reports and data generated for Stafford County, as discussed in Section 3, there is a general lack of published reports and data specific to hydrogeologic conditions within the study area. Although hydrogeologic data is not prevalent, it can be inferred that regional groundwater flow direction is likely to generally follow topography. As such, regional-scale groundwater is likely to flow from higher elevation areas at the northwestern portion of the study area and from topographic ridges to down-gradient areas within the study area. Typically, groundwater flow within the Piedmont Province's crystalline aquifers is along short flow paths from recharge areas to the nearest stream (Trapp, Jr. and Horn, 1997). The predominant regional groundwater flow direction within the study area is likely toward the southeast.

The primary sources of inflow to the study area's hydrogeologic system include infiltration of precipitation and, to a lesser degree, subsurface groundwater flow from adjoining counties and surface water infiltration. Groundwater recharge is highly variable within the Piedmont Province as a result of variable precipitation rates, topographic relief, and ground infiltration capacity (Trapp, Jr. and Horn, 1997). The primary sources of outflow from the study area's hydrogeologic system include evapotranspiration, seepage to surface water, pumping withdrawal, and subsurface groundwater flow to adjoining land outside of the study area.

3.4.4 Piedmont Province Groundwater Quality

ECS reviewed pertinent literature and conducted interviews with persons familiar with water quality in the Piedmont Aquifer of Stafford County. Although groundwater quality across the Piedmont Province is relatively comparable, variations in quality is believed to be largely the result of groundwater residence time and subsurface mineralogical variations. Overall, areas with high iron concentrations and low pH are reported to be somewhat common within the Piedmont portion of Stafford County.

3.4.4.1 Literature Review

Groundwater quality across the Piedmont Province is generally similar (Trapp, Jr. and Horn, 1997) and is largely affected by the regolith and bedrock aquifers in which the groundwater is transported (Powell and Abe, 1985). However, water quality variations do exist within Piedmont aquifers, as groundwater within mafic igneous rock aquifers or mafic meta-igneous aquifers is typically harder, more alkaline, and higher in dissolved-phase iron and manganese than felsic or intermediate igneous rock aquifers or meta-igneous rock aquifers (Powell and Abe, 1985). In general, mineral content increases as groundwater residence time increases and groundwater quality can be seasonally variable, based on the amount of effective recharge being supplied to an aquifer.

Groundwater within Piedmont Province regolith and bedrock aquifers is typically suitable for human consumption but may contain elevated concentrations of iron, manganese, and sulfate. The median iron concentration is 0.1 milligrams per liter (mg/L), although concentrations of up to 25 mg/L have been reported (Trapp, Jr. and Horn, 1997). The U.S. Environmental Protection Agency's (USEPA's) Secondary Maximum Contaminant Level for iron, which is a non-enforceable guidance standard, is 0.3 mg/L. Iron concentrations in excess of this standard may cause rusty colored water, sedimentation, reddish-orange staining, and/or a metallic taste. As such, elevated iron concentrations in drinking water may require treatment. Groundwater within the Piedmont Province is generally soft and has a median pH of 6.7.

Bored wells completed in unconsolidated overburden aquifers are more prone to contamination than drilled wells completed in bedrock aquifers (Bourne, 2001; Whitsell and Hutchinson, 1973). However, all types of wells are susceptible to contamination from improper well siting and/or well construction techniques, such as siting a well near a contaminant source, using insufficient lengths of surface casing, or installing a poor surface grout seal. Common sources of groundwater contamination within the Piedmont Province include septic drainfields, landfills, excessive fertilizer or pesticide applications, leaking fuel or solvent storage tanks or pipelines, and animal waste from feed lots (Powell and Abe, 1985).

3.4.4.2 Local Interviews and Water Quality Data

ECS contacted local water treatment firms to discuss common types of water quality issues and typical treatment requirements in the Piedmont portion of Stafford County. A representative with Pristine Water Treatment indicated that their clients often encounter the following water quality concerns: hardness, iron, calcium, sulfur, manganese, and some biological issues. A representative with Quality Water, Inc. indicated that low pH, iron, and hardness issues impact their clients. When asked about typical treatment requirements, both firms indicated that generally whole house treatment systems were used, which may include neutralizers, iron filters, and softeners.

A publication from the Virginia Cooperative Extension Service, which was generated based on findings from a public drinking water clinic, provided insight regarding water quality within Stafford County and nearby Spotsylvania County (Benham et al., 2013). Residents from Stafford County (27), Spotsylvania County (65), Louisa County (1), Caroline County (1) and King George County (1) participated in a drinking water clinic sponsored by local Virginia Cooperative Extension offices and the Virginia Household Water Quality Program. A total of 95 residents participated and each was provided with a confidential water sample analysis. Each water sample was tested for the following

parameters: iron, manganese, nitrate, fluoride, sulfate, pH, total dissolved solids, hardness, sodium, lead, arsenic, and copper. The participants were asked certain questions regarding their water system prior to water sample analysis. Use of at least one water treatment device was indicated by 59% of the participants. Staining problems were reported by 53.7% of participants, objectionable water odor was reported by 23.2% of participants, and an unpleasant taste was reported by 21.1% of participants.

The publication indicated that the most common groundwater quality issues were associated with sodium, manganese, low pH, and the presence of total coliform bacteria. A summary of water test results was provided within the publication but the results were not categorized by region or aquifer type. As such, water quality data from both the Piedmont and Coastal Plain Aquifers were combined within the findings.

ECS contacted the Virginia Department of Health Office of Water Programs to discuss groundwater quality data associated with public water systems within the Piedmont region of Stafford County. ECS was provided water data from 10 existing public systems. ECS understands that of these 10 systems, four of them utilize treatment technology.

The Virginia Department of Health data generated from the untreated systems were reviewed to provide insight into general water quality and to identify changes in water quality over time. The data review focused on the following parameters, some of which are understood to commonly be associated with water quality concerns within the study area: pH, iron, sodium, total hardness, sulfate, and nitrite/nitrate. Bacteria were listed as being “not present” in all of the reviewed sampling data. As previously discussed, these data were collected from systems that did not require treatment, and it is expected that more elevated concentrations of these quality parameters exist within the study area. Table 2 includes a summary of reported minimum and maximum water quality concentrations, as reported by the Virginia Department of Health for untreated public water systems.

Table 2: Summary of Public Drinking Water System Water Quality Data.

Analyte	Minimum Concentration (mg/L ^a)	Maximum Concentration (mg/L)
pH	6.3	6.85
Total hardness	38	89
Sulfate	<5	18.2
Sodium	11.1	14.5
Nitrite/Nitrate	<0.05	1.19
Iron	<0.05	0.467

^amg/L = milligrams per liter

4.0 PREVIOUS STAFFORD COUNTY HYDROGEOLOGIC EVALUATIONS

4.1 Stafford County Groundwater Management Plan (2004)

ECS reviewed the 2004 Stafford County Groundwater Management Plan (Draper Aden, 2004). The Management Plan was completed in response to an extended drought that occurred from 2001–2003 and the general purpose of the plan was to evaluate groundwater resources throughout Stafford County, in both the Piedmont and Coastal Plain Aquifers. The 2004 study involved reviewing geologic publications, estimating current and projected groundwater usage and availability, assessing groundwater susceptibility to contamination, providing groundwater protection strategies, digitizing well records from the Virginia Department of Health (VDH), and creating a georeferenced geographic information system (GIS) database of the well records. Based on the objectives of the current groundwater assessment study, this review focuses on findings pertaining to groundwater availability, groundwater usage, the well record geodatabase, and well record spatial characteristics.

The 2004 Groundwater Management Plan found that groundwater withdrawal in Stafford County was primarily for residential use and to a lesser extent for agricultural and golf course use. Residential usage was estimated to be approximately 1.75 million gallons per day (gpd), agricultural usage was estimated to be approximately 800,000 gpd, and usage from two golf courses that were being considered for development at the time of the study was estimated to be approximately 800,000 gpd. In total, it was estimated that the worst-case total groundwater withdrawal in Stafford County in 2004 ranged between 3.2 million gpd and 5.3 million gpd. Additionally, projected groundwater withdrawal rates for 2007 and 2012 were estimated as 3.82–6.2 million gpd and 4.43–7.45 million gpd, respectively. These usage rates were compared to groundwater availability rates calculated as part of the study, which were estimated to be between 31 million gpd and 43 million gpd. The estimated groundwater availability rates appear to have been calculated by assuming that the entire volume of effective recharge supplying the county's aquifers was available for pumping withdrawal in the Piedmont Aquifer (6 million gpd) and the Coastal Plain's Aquia Aquifer (27 million gpd), and that 50% of the effective recharge was available for withdrawal in the Coastal Plain's Middle Potomac Aquifer (12.5 million gpd).

A total of 1,780 hard copy VDH well records were utilized to create a digitized well log database. Not all of these well records were from within the Piedmont Province, as a portion of the records were from within the Coastal Plain Province. Information from 48 data fields within the well logs, such as well yield, well depth, casing depth, casing intervals, address, etc., was entered into the well log database. The well records were then manually georeferenced based on parcel identification numbers, aerial photography, and a GIS layer showing structures within Stafford County. Of the 1,780 well records within the database, a total of 1,669 records were georeferenced. The well log database created as part of the 2004 Groundwater Management Plan study was utilized as part of this current groundwater assessment study.

The 2004 Stafford County Groundwater Management Plan concluded that current (i.e., 2004) and projected (i.e., 2007 and 2012) groundwater demands were significantly less than the County's available groundwater resources. The Plan also indicated that individual well yields may vary based primarily on geographic location and well depth.

5.0 STUDY AREA LAND USE AND HYDROLOGIC BUDGET

5.1 Study Area Land Use

Land use within the study area is largely based on the extent of Stafford County's municipal water service area. Commercial, industrial, and residential zoned parcels are primarily located within the municipal water service area and agricultural zoned parcels comprise the majority of the study area located outside of the water service area. In total, approximately 26% of the study area is located within Stafford County's municipal water service area and the remaining 74% is located outside of this area.

ECS utilized a well record database (hereinafter referred to as the Non-Attribute Piedmont Well Database) compiled by Stafford County to estimate groundwater usage rates within the study area. The Non-Attribute Piedmont Well Database contains a total of 4,940 unique well records. The database includes records of all properties known or suspected to utilize a supply well within the Piedmont portion of Stafford County. The Non-Attribute Piedmont Well Database is different than the well database compiled as part of the 2004 Stafford County Groundwater Management Plan study (see Section 4.1) and this current study (see Section 7.1) because it only contains property parcel identification, address, and coordinate information. Well attribute information, such as well depth, well yield, casing depth, etc., is not included within the Non-Attribute Piedmont Well Database.

ECS estimated the total number of wells within the Piedmont portion of Stafford County by supplementing the Non-Attribute Piedmont Well Database with non-duplicative well records compiled as part of the 2004 Stafford County Groundwater Management Plan study and this Groundwater Resources Evaluation. Well records for properties already contained within the Non-Attribute Piedmont Well Database were not added as supplemental records. A total of 1,801 well records were used to supplement the 4,940 non-attribute well records, resulting in a combined total of 6,741 known wells within the Piedmont portion of Stafford County. Of these 6,741 records, 6,595 records are from the portion of the study area located outside of the municipal service area and the remaining 146 records are from within the service area. The majority of the wells within the service area were likely installed prior to the expansion of the service area. Figure 8 depicts the locations of wells contained within both the Non-Attribute Piedmont Well Database and the Stafford County Attribute Data Well Database. The Stafford County Attribute Data Well Database contains well records compiled as part of the 2004 Stafford County Groundwater Management Plan study and this current study and includes attribute data included within the well records. This database is described in further detail in Section 7.1.

Based on the high number of well records located outside of the municipal service area in comparison to the number of wells located within the service area, the majority of groundwater withdrawn from the study area's Piedmont Aquifer appears to be pumped from the portion of the study area located outside of the municipal water service area. For the portion of the Piedmont located outside of the municipal service area, 95.5% is zoned agricultural (A1 or A2 zoning), 2.5% is zoned as a roadway, 1.6% is zoned industrial (M1 or M2 zoning), 0.20% is zoned residential (R1 or R2), and 0.07% is zoned commercial (B1 or B2 zoning). Figure 9 depicts Stafford County's municipal water service area and zoning classifications for parcels located outside of the service area.

The largest industrial groundwater user within the portion of the study area located outside of the municipal service area is likely to be the 562.5-acre Vulcan Materials Stafford Quarry, which is located along the northern boundary of the study area (Figure 9). In addition to the Vulcan quarry, other industrial parcels within the portion of the study area located outside of the municipal service area include an 87.6-acre property that is owned by Crucible Properties, which is utilized as a gun range and tactical training facility, and a 33.0-acre property owned by Stafford County that is utilized as a microwave tower site. Other industrial zoned parcels currently appear to be undeveloped. Neither the Crucible Properties site nor the Stafford County microwave tower site is likely to be considered a high-volume groundwater user.

Several commercial zoned parcels exist within the portion of the study area located outside of the municipal service area. Businesses operating at these commercial parcels include the following: tire and automotive repair shops, a storage warehouse, an electrician shop, a gas station and convenience store, a small engine repair shop, a restaurant, post office, and a fire department. Other commercial zoned parcels are either undeveloped or utilized residentially. It is unlikely that the aforementioned commercial operations are high-volume groundwater users.

ECS evaluated land use at the 146 properties located within the municipal service area that were identified within the Non-Attribute Piedmont Well Database as being suspected of utilizing a supply well. ECS found that the majority of these properties were residential and that the remaining properties were commercial. Commercial uses of these properties included an appliance repair shop, community facility, gas station, consulting firm office, balloon shop, management company office, church, sailing school office, real estate office, construction company office, cemetery, and towing company. None of the aforementioned commercial operations are likely to be high-volume groundwater users.

5.2 Study Area Hydrologic Budget

Understanding hydrologic inflows and outflows to a region is an important step toward effective hydrologic resource management. As such, ECS generated a water budget comprised of hydrologic inflows and outflows to/from the study area. Information generated as part of this Groundwater Resources Evaluation and existing published data, specifically from Sanford et al. (2012), were used to generate the water budget.

ECS utilized a mass-balance approach to calculate hydrologic inflows and outflows to/from the study area. The following equation was used to perform the calculations: $\text{Total Inflow} = \text{Total Outflow} + \text{Change in Storage}$. The change in water storage within the study area was assumed to be negligible, based on limited groundwater level data collected in the vicinity of the study area, as discussed below. As such, the mass-balance equation was reduced to the following: $\text{Total Inflow} = \text{Total Outflow}$.

Potential changes in water storage within the study area would be manifested primarily as reductions or increases in groundwater storage, which itself would be manifested primarily as declining or rising groundwater levels. To evaluate potential groundwater storage changes within the study area, groundwater level data from a U.S. Geological Survey (USGS) monitoring well identified as site number 383423077245901 was

reviewed to assess historical groundwater levels in the Piedmont Aquifer. The USGS monitoring well is located in the Piedmont Province of Prince William County, approximately 0.7 mile north of Stafford County, and has a total depth of 490 feet. Groundwater level data have been collected at this monitoring well since 1973. Historical data show that groundwater levels have remained fairly constant since 1973, with the exception of seasonal fluctuations and anomalously high and low groundwater level years. Overall, there does not appear to be an increasing or decreasing trend in groundwater levels and recent groundwater level measurements are generally within three feet or less of historical data collected at the site during comparable seasons. Based on this information, ECS concluded that it could safely be assumed that changes in water storage within the study area are minor and could be ignored within the water budget calculations. Historical groundwater level data collected at USGS monitoring well 383423077245901 is included as Figure 10.

ECS performed two iterations of the mass-balance calculations, where normal hydrologic conditions were used for the first iteration and drought conditions were used for the second iteration. Drought conditions were represented by reducing precipitation inflows by 35%, since the Virginia Drought Response Technical Advisory Committee (2003) considers an indicator of extreme drought to be a 35% reduction in normal precipitation levels over a 12-month period. Hydrologic inflow and outflow parameters, as well as flow volumes for each parameter, are discussed in further detail in Sections 5.2.1 and 5.2.2, below.

5.2.1 Hydrologic Budget Inflows

The primary hydrologic inflow to the study area is from precipitation. ECS utilized the average annual precipitation value for Stafford County (43.0 inches/year), as presented in Sanford et al. (2012), to conduct the first iteration of mass-balance calculations (i.e., the normal conditions scenario). Multiplying this value by the area of the study area yielded an average daily precipitation inflow of 225.21 million gallons per day (mgal/day). To conduct the second iteration of calculations that represent drought conditions, ECS utilized a precipitation rate that was 35% less than the normal average precipitation rate, which yielded an average daily precipitation inflow of 146.39 mgal/day. Calculations of total inflow volumes to the study area under normal and drought conditions are included in Appendix A and are summarized in Table 3.

A secondary hydrologic inflow to the study area is from groundwater migration via regions located up-gradient from and outside of the study area. The actual rate of groundwater flow to the study area from up-gradient regions located outside of the study area is unknown and would require a detailed subsurface investigation to quantify. However, on a mass-balance basis, this inflow is accounted for through the utilization of a “net subsurface groundwater flow” parameter. Net subsurface groundwater flow refers to the net gain or loss of groundwater into or out of a region. By way of example, if 10 mgal/day of groundwater inflow entered a hypothetical zone and 20 mgal/day of groundwater outflow left that same zone, then the zone’s net subsurface groundwater flow would be -10 mgal/day (i.e., 10 mgal/day of net subsurface outflow). Calculation of this parameter, as described in Section 5.2.2, revealed that net subsurface outflow exceeded net subsurface inflow for both the first and second iterations of mass-balance calculations. As such, the net subsurface groundwater flow value is considered to be an outflow parameter within the mass-balance calculations and is discussed further in Section 5.2.2.

Table 3: Study Area Hydrologic Budget Summary.

Parameter Category	Parameter	Normal Conditions		Drought Conditions	
		Flow Rate (in/yr ^a)	Daily Flow (mgal/day ^b)	Flow Rate (in/yr)	Daily Flow (mgal/day)
Inflow	Precipitation	43.0	225.21	27.95	146.39
Outflow	Evapotranspiration	27.7	145.08	18.0	94.30
	Groundwater Seepage to Streams	9.75	51.06	6.34	33.21
	Stormwater Runoff to Streams	4.6	24.09	3.0	15.71
	Groundwater Pumping Withdrawals	0.31	1.62	0.31	1.62
	Net Subsurface Groundwater Flow	0.64	3.35	0.30	1.55

^ain/yr = inches per year

^bmgal/day = million gallons per day

5.2.2 Hydrologic Budget Outflows

Hydrologic outflow components from the study area include evapotranspiration, streamflow contributed from stormwater runoff, streamflow contributed from baseflow (i.e., groundwater seepage), pumping withdrawals, and net subsurface groundwater flow losses. Calculation of total outflow rates from the study area under both normal and drought conditions are included in Appendix A and are discussed in detail below. Table 3 summarizes hydrologic budget findings under both normal and drought conditions.

The average total evapotranspiration rate for Stafford County (27.7 inches/year), as presented in Sanford et al. (2012), was utilized to calculate the total daily volume of evaporative outflow. Based on the area of the study area, the daily evaporative outflow from the study area under normal conditions is approximately 145.08 mgal/day. As with precipitation, drought conditions were simulated by reducing this evaporative rate by 35%, yielding a daily evaporative outflow from the study area of 94.30 mgal/day.

The average stormwater runoff rate of Stafford County (4.6 inches/year), as presented in Sanford et al. (2012), was utilized to calculate the total daily volume of stormwater runoff outflow. Based on the area of the study area, the daily stormwater runoff outflow from the study area under normal conditions is approximately 24.09 mgal/day. As with precipitation, drought conditions were simulated by reducing this stormwater runoff rate by 35%, yielding a daily stormwater runoff outflow from the study area of 15.71 mgal/day.

Stream outflow contributed from baseflow was calculated using published data within Sanford et al. (2012) pertaining to Aquia Creek's watershed. Although Aquia Creek is present within both the Piedmont and Coastal Plain Provinces, Sanford et al. (2012) only studied the portion of the Aquia Creek watershed located upstream of U.S. Geological Survey (USGS) gauging station 01660400, which is located near the Onville Road Bridge near Garrisonville, Virginia. As such, the studied portion of the Aquia Creek

watershed is located entirely within the Piedmont Province. Aquia Creek forms the eastern half of the border between the study area and Quantico Marine Base. The creek is located entirely within the study area from the point at which it diverts to the south of the study area-Quantico border. Approximately one-third of the portion of Aquia Creek studied by Sanford et al. (2012) forms the border between the study area and Quantico Marine Base and the remaining two-third is located entirely within the study area.

Sanford et al. (2012) calculated the percentage of Aquia Creek's streamflow attributed to baseflow based on chemical hydrograph separation techniques. They found that an estimated 70.0% of the creek's total streamflow was attributed to baseflow. Based on the area of the Aquia Creek watershed (35 square miles) and the creek's average flow (35.9 cubic feet per second), it was possible to calculate the portion of the creek's total streamflow attributed to baseflow as 9.75 inches/year, when applied throughout the watershed area. Calculations performed to support this value are included in Appendix A.

ECS applied the baseflow rate calculated for the Aquia Creek watershed to the entire study area to estimate total daily groundwater seepage to streams throughout the study area. The baseflow rate calculated for the Aquia Creek watershed (9.75 inches/year) was considered a reasonable proxy for conditions within the study area because both areas are located within the Piedmont Province and the majority of the Aquia Creek watershed is located within the study area. Based on the area of the study area and the aforementioned baseflow rate, the estimated rate of groundwater seepage to streams within the study area under normal conditions is 51.06 mgal/day. Drought conditions were simulated by reducing the rate of groundwater seepage to streams by 35%, yielding a daily rate of 33.21 mgal/day.

The average groundwater pumping withdrawal rate within the study area was estimated as part of this Groundwater Resources Evaluation, as discussed further in Section 6.1.2. Evaluation of total groundwater withdrawals revealed that approximately 0.31 inches/year is pumped from within the study area. This total includes pumping from all groundwater usage categories, including domestic, irrigation, and livestock watering. Based on the area of the study area, the groundwater pumping withdrawal outflow from the study area under both normal and drought conditions is approximately 1.62 mgal/day. This is considered a conservative estimate, as a significant portion of this water is likely returned to the hydrogeologic system via septic system inflows.

The final hydrologic outflow component considered as part of this evaluation is referred to as net subsurface groundwater flow losses. As with subsurface groundwater inflow, the actual rate of groundwater outflow from the study area to down-gradient regions located outside of the study area is unknown and would require a detailed subsurface investigation to quantify. However, on a mass-balance basis, the net difference between groundwater inflow and outflow (i.e., net subsurface groundwater flow) to/from the study area is the unknown variable of the hydrologic budget equation that can be solved. Solving the hydrologic budget equation for this parameter revealed that net subsurface outflow exceeded net subsurface inflow by 0.64 inches/year under normal conditions and 0.30 inches/year under drought conditions. Based on the area of the study area, these rates equate to daily outflows of 3.35 mgal/day under normal conditions and 1.55 mgal/day under drought conditions.

6.0 PIEDMONT AQUIFER WITHDRAWALS AND CAPACITY

6.1 Piedmont Aquifer Groundwater Withdrawals

6.1.1 Groundwater Withdrawal Evaluation: Entire Stafford County

Groundwater usage data obtained from the USGS and Stafford County were used to assess total groundwater withdrawals from the study area's Piedmont Aquifer. Specifically, ECS utilized county-level data from the USGS's "Estimated Use of Water in the United States" publication series (Hutson et al., 2004; Kenny et al., 2009; Maupin et al., 2014), which is produced every five years. The most recent USGS water usage report was published in November 2014 for the year 2010.

The USGS estimated that the total groundwater withdrawal from all of Stafford County was 2.69 mgal/day in 2010. The 2010 groundwater usage estimate was higher than the estimates calculated for 2000 and 2005, which were 1.02 mgal/day and 1.79 mgal/day, respectively. More than 96% of Stafford County's groundwater usage for 2000, 2005, and 2010 was attributed to domestic supply. Relatively minor withdrawals attributed to industrial, irrigation, and livestock operations comprised the remaining portion of groundwater usage. USGS-estimated groundwater usage data for Stafford County for the years 2000, 2005, and 2010 are presented in Table 4.

Table 4: USGS-Estimated Groundwater Usage Data for All of Stafford County.

Parameter ^a	Year		
	2000	2005	2010
County Population ^b	93,527	116,672	129,844
Number of Self-Supplied Domestic Users	13,380	23,044	35,048
Public/Municipal Supply (mgal/day)	0	0	0
Domestic Supply (mgal/day)	1.00	1.73	2.63
Industrial (mgal/day)	0.01	0.01	0
Irrigation: Crop (mgal/day)	NS ^c	0.04	0.02
Irrigation: Golf Course (mgal/day)	NS	0	0.03
Irrigation: Combined Crop & Golf Course (mgal/day)	0.01	0.04	0.05
Livestock (mgal/day)	0	0.01	0.01
Total Groundwater Usage (mgal/day)	1.02	1.79	2.69

^aAll parameter data except county population based on county-level data for Stafford County, as published by Hutson et al., 2004, Kenny et al., 2009, and Maupin et al., 2014.

^bCounty population data based on U.S. Census Bureau information.

^cNS = not specified.

6.1.2 Groundwater Withdrawal Evaluation: Study Area Only

Groundwater usage data and other information obtained from the USGS, Stafford County, and Stafford County business owners was used to estimate groundwater withdrawals within the study area. This evaluation of groundwater withdrawals within only the portion of the study area underlain by the Piedmont Aquifer utilized countywide USGS data (see Section 6.1.1) but was conducted in a more focused and detailed manner so that a better understanding of actual groundwater usage within the study area could be obtained. A review of county-level USGS groundwater usage data revealed that the primary usage categories in Stafford County include domestic supply withdrawals, irrigation withdrawals (crop and golf course irrigation), industrial withdrawals, and livestock watering withdrawals. No significant municipal groundwater withdrawals occur within the study area, according to Stafford County's Mr. Keith Dayton (K. Dayton, personal communication, August 29, 2017). Estimated withdrawals within the study area from the aforementioned usage categories are discussed below and are summarized in Table 5.

Table 5: Estimated Current Groundwater Use Within the Study Area.

Parameter	Current Estimated Groundwater Usage (mgal/day^a)
Public/Municipal Supply (mgal/day)	0
Domestic Supply (mgal/day)	1.48 – 1.56
Industrial (mgal/day)	0.01
Irrigation: Crop (mgal/day)	0.01
Irrigation: Golf Course (mgal/day)	0.01
Irrigation: Combined Crop & Golf Course (mgal/day)	0.02
Livestock (mgal/day)	0.01
Total Groundwater Usage (mgal/day)	1.54 – 1.62

^amgal/day = million gallons per day.

6.1.2.1 Domestic Groundwater Supply

Domestic supply groundwater withdrawals were estimated using two separate calculation methods. The first calculation method utilized known water usage rates for residences supplied by municipal water utilities within Stafford County's municipal water service area to estimate total groundwater usage within the study area and the second calculation method utilized USGS-estimated individual water usage rates to estimate total groundwater usage within the study area. Findings from the separate calculation methods were then compared to obtain an estimated domestic supply groundwater usage range for the study area.

Evaluation of Stafford County's Non-Attribute Piedmont Well Database and Attribute Data Well Database, as discussed in Section 5.1, revealed that an estimated 6,741 supply wells are utilized within the study area. Based on land use data (see Section 5.1), the vast majority of these wells appear to service residential properties and a much smaller number of wells service commercial properties. Groundwater usage from the relatively small number of commercial wells within the study area is included within the domestic well usage category, as a review of commercial operations at commercial well properties revealed an apparent absence of high-volume groundwater usage operations.

Domestic groundwater supply calculation method one consisted of utilizing the number of supply wells within the study area and known water usage rates for residences within Stafford County's municipal water service area. Stafford County's Mr. Keith Dayton informed ECS that an average of 220 gallons per day (gpd) per residence is consumed by residences serviced by municipal water utilities within Stafford County's municipal water service area, where water consumption is monitored by Stafford County (K. Dayton, personal communication, July 13, 2017). Multiplying this consumption rate by the number of suspected wells within the study area (6,741) yields an overall domestic groundwater usage rate of 1.48 mgal/day.

Domestic groundwater supply calculation method two consisted of utilizing the number of wells within the study area, the average number of residents per structure, and the USGS-estimated individual water usage rate for Stafford County (i.e., 75 gpd per person). U.S. Census Bureau data from 2011–2015 indicates that an average of 3.08 people live in each household in Stafford County (U.S. Census Bureau, 2017). Multiplying this rate (3.08 people per household) by the USGS-estimated individual water usage rate for Stafford County (75 gpd) yields an estimated household groundwater usage rate of 231 gpd, which is slightly higher than the average measured water usage rate within Stafford County's municipal water service area (220 gpd per residence). Multiplying this consumption rate (231 gpd) by the number of suspected wells within the study area (6,741) yields an overall domestic groundwater usage rate of 1.56 mgal/day.

Based on findings from domestic groundwater supply calculation methods one and two, the daily domestic groundwater withdrawal rate from the study area is estimated to be 1.48–1.56 mgal/day. A significant portion of the withdrawn groundwater is likely to be returned to the hydrogeologic system via septic systems, as the majority of residences that utilize groundwater supply wells also likely utilize private septic systems. As such, the daily domestic groundwater withdrawal rate of 1.48–1.56 mgal/day should be considered a conservative over-estimation of actual groundwater losses.

6.1.2.2 Irrigation Groundwater Supply

The USGS subdivides irrigation groundwater usage into crop and golf course subcategories. USGS-estimated crop irrigation withdrawal and golf course irrigation withdrawal for all of Stafford County was 0.02 mgal/day and 0.03 mgal/day, respectively, in 2010 (Maupin et al., 2014). However, because these values represent withdrawals throughout Stafford County, it was necessary to evaluate study area-specific withdrawals.

Crop irrigation groundwater withdrawal within the study area was estimated based on the USGS-estimated Stafford County crop irrigation groundwater withdrawal rate (0.02

mgal/day) and the ratios of agricultural land within the study area versus the Coastal Plain. A GIS analysis of agricultural land within the study area versus the Coastal Plain revealed that 53.2% of Stafford County's agricultural land is within the study area and the remaining 46.8% is within the Coastal Plain. Based on this information, ECS has estimated that approximately half of the county's USGS-estimated crop irrigation groundwater withdrawal rate is from within the study area. As such, it is assumed that 0.01 mgal/day is withdrawn from the study area for the purpose of crop watering. As with domestic withdrawals, it is likely that a portion of the used crop irrigation water infiltrates to the underlying aquifer.

Extensive irrigation is typically required to maintain a golf course, especially from late May to early September in the Virginia Piedmont region. Three 18-hole golf courses are located within the study area. These golf courses consist of Augustine Golf Club, The Gauntlet Golf Club, and Cannon Ridge Golf Club (Figure 9). Irrigation for all three of these courses is supplied by surface water, as discussed in further detail below.

ECS spoke with Augustine Golf Club's Superintendent, Mr. Tim Crowley, to discuss irrigation practices at their facility (T. Crowley, personal communication, September 5, 2017). Mr. Crowley informed ECS that irrigation water is pumped from a pond that is fed by streams. He stated that the course is typically irrigated three times per week between Memorial Day and Labor Day, and that approximately 200,000–400,000 gallons is pumped from the pond during each irrigation event. Mr. Crowley stated that four or five wells are present at the site, but that these wells have not been used for irrigation since he has worked at the property during the past year. He mentioned that a well provides water to the property's maintenance shop, but that the water is only used for bathrooms. Based on this information, groundwater usage at the Augustine Golf Club property is likely to be similar or less than groundwater usage at a typical residential property.

ECS contacted Cannon Ridge Golf Club and spoke with the property's Superintendent, Mr. Brian Guilbeau (B. Guilbeau, personal communication, September 1, 2017), to discuss irrigation practices at their facility. Mr. Guilbeau informed ECS that their golf course is irrigated entirely from a pond that is fed by stormwater. He stated that the course is typically irrigated every evening during dry periods and that approximately 230,000 gallons is pumped from the pond during each irrigation event, depending on weather conditions. Mr. Guilbeau stated that two wells are present at the property, but that these wells have been inactive since 2004 or 2005. Based on this information, groundwater usage at the Cannon Ridge Golf Club property appears to be minimal.

ECS corresponded with the Head General Manager of The Gauntlet Golf Club, Mr. Mike Byrd (M. Byrd, personal communication, September 1, 2017), regarding irrigation practices at their facility. Mr. Byrd informed ECS that all of their irrigation water is pumped from Curtis Lake, and that 11.14 million gallons were used to irrigate the course in 2016. He also stated that both the clubhouse and maintenance shop are supplied by groundwater from a well at the property. Based on this information, it appears as though a relatively minor amount of groundwater is utilized at the facility, although utilization of groundwater for the clubhouse likely utilizes more water than a typical residential property.

In summary, all three of the golf courses located within the study area utilize surface water for irrigation. Relatively minor groundwater usage does occur at Augustine Golf Club for bathrooms within the property's maintenance shop and at The Gauntlet Golf Club for supplying the property's clubhouse and maintenance shop. Based on this information, ECS has conservatively estimated that Augustine Golf Club and The Gauntlet Golf Club utilize a combined 0.01 mgal/day of groundwater.

6.1.2.3 Industrial Groundwater Supply

Land use data from within the study area indicated that the only potentially large industrial groundwater user within the portion of the study area located outside of the municipal service area was likely to be the 562.5-acre Vulcan Materials Stafford Quarry (see Section 5.1). ECS contacted the Vulcan quarry to inquire about typical groundwater dewatering rates from their mining pits and/or process wells. ECS spoke with the quarry's Plant Manager, Mr. Stephen Jetter, via phone and email correspondence (S. Jetter, personal communication, August 21 and 23, 2017).

Mr. Jetter indicated that most, if not all, of the water that is pumped from their active quarry pit is sourced from surface water runoff during rain events, as all of the runoff from the 562.5-acre site is contained on-site and some of this runoff is discharged to the active quarry pit. He indicated that the dewatering pumps are not used unless a rain event has discharged runoff to the pit. Mr. Jetter researched past annual discharge volumes from the active quarry pit and found that approximately 80 million gallons per year of combined stormwater and groundwater are pumped from the pit, and that an estimated 2% or less of this water volume (i.e., 0.004 mgal/day or less) is from groundwater that seeped into the pit.

Mr. Jetter also stated that there are no active wells at the quarry site. Water that is pumped from an on-site abandoned quarry pit is utilized as mining process water and municipal water is used to meet the site's remaining water needs. The source of water within the abandoned quarry pit is also primarily surface water runoff from rain events. Water that is pumped from this pit to be utilized as mining process water is part of a closed-loop system, where the water is pumped back into the pit after it is utilized as process water. Mr. Jetter also indicated that they have recently needed to discharge water from this pit to maintain the pit's water level, since stormwater inflows to the pit exceed consumptive withdrawals.

Based on information provided by Mr. Jetter, ECS considers the Vulcan Materials Stafford Quarry to be a relatively minor groundwater user, as the site appears to withdraw 0.004 mgal/day or less from the hydrogeologic system. Additionally, information provided by Mr. Jetter indicates that bedrock fracturing at the location of the site's quarry pits is minimal, as indicated by the lack of groundwater flowing into the quarry pits.

Overall, ECS considers the USGS's 2010 industrial groundwater usage estimate of 0 mgal/day for Stafford County (Maupin et al., 2014) to be an accurate estimation of industrial groundwater usage within the study area, based on Vulcan Quarry's low rate of groundwater withdrawal. However, for the purpose of this study, an industrial groundwater usage rate of 0.01 mgal/day has been assigned to reflect a conservative estimate of industrial groundwater usage within the study area.

6.1.2.4 Livestock Watering Groundwater Supply

The USGS estimated that groundwater withdrawal for livestock watering in all of Stafford County was 0.01 mgal/day in 2010 (Maupin et al., 2014). It was not possible to quantitatively determine what portion of this is from the Piedmont Province versus the portion from the Coastal Plain Province. As such, and based in part on the relatively low overall livestock groundwater withdrawal rate, ECS has assumed that all of this withdrawal occurs within the study area to provide a worst-case estimation of withdrawals from the study area.

6.2 Piedmont Aquifer Groundwater Withdrawal Capacity

Over-pumping an aquifer can result in adverse impacts to groundwater levels, availability, quality, stream baseflow, etc. As such, an important step toward maintaining a healthy hydrologic system is estimating an aquifer's practical safe yield. The concept of practical safe yield balances an aquifer's recharge rate with the need to provide groundwater discharge to hydrologic features, such as springs, wetlands, and streams. As a result, a practical safe yield groundwater withdrawal rate is considered to be a sustainable rate that minimizes adverse impacts caused by over-pumping.

6.2.1 Groundwater Withdrawal Capacity Calculation Methodology

ECS estimated the practical safe yield for the entire study area based on a modified version of groundwater appropriations criteria utilized by the Maryland Department of the Environment (MDE) for fractured crystalline rock aquifer systems. MDE uses the water appropriation calculations to determine maximum groundwater withdrawals for proposed developments within the Piedmont portion of Maryland. ECS considers the MDE water appropriations methodology to be an appropriate basis for assessing the maximum groundwater withdrawal capacity of Stafford County's Piedmont Aquifer due to the similar hydrogeologic setting of Maryland's Piedmont Province to that of the study area and the lack of existing water appropriations criteria within Virginia. Additionally, ECS considers the MDE methodology to be congruent with Stafford County's desire to prevent aquifer over-pumping, as the method requires the maintenance of a certain amount of baseflow to hydrologic features. Findings from this maximum groundwater withdrawal capacity assessment should be considered an estimate due to the regional-scale focus of the evaluation.

The MDE water appropriations methodology utilizes drought-condition effective recharge rates and 7Q10 stream baseflow rates to calculate maximum allowable groundwater withdrawals. A 7Q10 stream flow is a hydrologically-based design flow referring to the lowest 7-day average flow that occurs, on average, once every 10 years. Permeable versus impervious areas and recharge versus discharge zones are considered as part of this analysis. The MDE criteria necessitates that sufficient drought year effective recharge occur on permeable land to support groundwater withdrawals while minimally preserving 7Q10 baseflow conditions. Currently, Stafford County utilizes 7Q10 baseflow data as part of permitting involved with discharge minimum flows from Smith Lake and Lake Mooney.

The original MDE groundwater appropriations equation is as follows:

Maximum Groundwater Withdrawal Capacity = Drought-Condition Effective Recharge – 7Q10 Stream Baseflow.

ECS did not use the original MDE equation as part of this study, but rather, used a modified version of the MDE water appropriations method to make the estimate of maximum groundwater withdrawal capacity significantly more conservative. Although the MDE method does include the necessitation of 7Q10 baseflow to streams under drought conditions, ECS considers this level of long-term baseflow to be excessively low. Additionally, reduction in baseflow to 7Q10 drought levels would result in other undesirable effects, such as reduction in groundwater levels, reduction in reservoir levels, and reduction in subsurface outflow to the adjoining Coastal Plain Province. As such, ECS modified the MDE water appropriations method by including two additional conservation factors.

The first conservation factor that was added to the original MDE equation consisted of modifying the equation to require the maintenance of existing net subsurface outflow rates under normal conditions (i.e., 3.35 mgal/day; see Section 5.2.2). This was added to recognize that a certain amount of groundwater outflow from the study area would occur regardless of the rate of pumping withdrawals and stream baseflow. The second conservation factor that was added to the original MDE equation consisted of reducing the maximum groundwater withdrawal capacity value, as calculated by the modified MDE equation, by one order of magnitude. ECS considers this to be a significant level of added conservation, as it results in a maximum groundwater withdrawal capacity that is 10% of the value that would otherwise be allowable by the modified MDE equation. ECS considers it likely that these added conservation factors to the original MDE equation would minimize adverse impacts to components of the hydrologic system that could otherwise be affected by excessive pumping, such as stream baseflow rates, groundwater levels, and subsurface outflow to the Coastal Plain Province.

The modified MDE groundwater appropriations equation that was utilized as part of this study is as follows:

Maximum Groundwater Withdrawal Capacity = (Drought-Condition Effective Recharge – 7Q10 Stream Baseflow – Net Subsurface Groundwater Outflow) x 10%.

A description of the calculations and values utilized to solve this equation are discussed below and are included in Appendix A.

6.2.2 Effective Recharge Calculation

The effective recharge rate utilized within the calculations was determined based on effective recharge data published within Sanford et al. (2012) and drought conditions were represented by a 35% reduction in this rate, based on the Virginia Drought Response Technical Advisory Committee's position that drought conditions occur when actual precipitation is 65% or less of the average 30-year normal precipitation total over a 12-month period. Sanford et al. (2012) indicates that the effective recharge of the entire Stafford County area is 12.1 inches/year. However, ECS considered it unlikely that this value is representative of the study area since the value represents the combined effective recharge of the Piedmont and Coastal Plain Provinces. To examine whether this effective recharge value was appropriate, ECS evaluated effective recharge rates of other Virginia counties located primarily (95% or greater) within either the Piedmont Province or the Coastal Plain Province. Only counties located 95% or more within non-Mesozoic sedimentary basin portions of the Piedmont Province (i.e., only

counties located within portions of the Piedmont Province underlain by crystalline rocks) were considered as part of the Piedmont Province evaluation.

ECS found that 11 Virginia counties were located primarily within the Piedmont Province and 21 Virginia counties were located primarily within the Coastal Plain Province. Average and median effective recharge rates of Piedmont Province counties were both 11.4 inches/year and ranged from 10.5–12.0 inches/year. Effective recharge rates within Coastal Plain Province counties were higher, as average and median effective recharge rates were 13.7 inches/year and 13.2 inches/year, respectively, and ranged from 12.0–16.8 inches/year. Findings from this evaluation confirmed that the overall Stafford County effective recharge rate (12.1 inches/year) is likely higher than the effective recharge rate of the study area as a result of influence from the Coastal Plain portion of the county. Based on the fairly narrow range of published effective recharge rates of Piedmont Province counties and the similarities in geologic setting between these counties and the study area, ECS considered the average and median effective recharge rate of these counties (11.4 inches/year) to be an appropriate approximation of effective recharge within the study area. As such, this effective recharge rate was used as part of modified MDE water appropriation calculations and was reduced by 35% (7.41 inches/year) to represent drought conditions.

The aforementioned effective recharge rate was applied to the portion of the study area capable of allowing infiltration of precipitation. Areas deemed capable of permitting infiltration were assumed to be pervious portions of the study area and groundwater recharge zones. ECS utilized a publically-available GIS shapefile provided by Stafford County to quantify the area of impervious surfaces within the study area. This shapefile displays impervious surfaces, such as roads, sidewalks, driveways, parking lots, and buildings, during the years 2013 and 2014. Groundwater recharge zones were assumed to be all land within the study area located outside of groundwater discharge zones. As such, the groundwater recharge area was determined by subtracting the area of groundwater discharge zones from the study area's total area. Groundwater discharge zones were delineated by assuming that land within 10 feet of a hydrologic feature was a groundwater discharge zone. As such, groundwater discharge zones were delineated within a GIS database by assigning a 10-foot buffer to all streams and reservoirs within the study area. Based on the linear nature of streams, the total widths of the stream buffers were 20 feet (i.e., 10 feet on both sides of the stream).

In total, the combined area of impervious surfaces and groundwater discharge zones, after eliminating overlap, was 5,077.2 acres. Subtracting this acreage from the study area's total area (70,400 acres) yielded an area of 65,322.8 acres capable of allowing infiltration of precipitation. Multiplying this area by the normal and drought-condition effective recharge rates (11.4 inches/year and 7.41 inches/year, respectively) yielded total daily groundwater recharge rates of 55.40 mgal/day and 36.01 mgal/day, respectively.

6.2.3 7Q10 Baseflow Calculation

ECS researched 7Q10 baseflow data for streams located within or at the boundary of the study area and found that data existed for Aquia Creek and the Rappahannock River (Hayes, 1991). The Rappahannock River forms the entire southern boundary of the study area and Aquia Creek forms either a portion of the study area's northern boundary or is located entirely within the study area, as discussed in Section 5.2.2.

Rappahannock River streamflow data were collected at USGS gauging station 01668000, which is located within the Piedmont Province approximately 4.5 miles upstream of the Fall Line. The portion of the Rappahannock River's watershed located up-gradient from gauging station 01668000 has a drainage area of approximately 1,596 square miles (Hayes, 1991) and is located primarily within the Piedmont Province, although the watershed's uppermost tributary streams are located within the Blue Ridge province.

Aquia Creek streamflow data were collected at USGS gauging station 01660400, which is located within the Piedmont Province approximately 3.1 miles upstream of the Fall Line. The portion of Aquia Creek's watershed located up-gradient from gauging station 01660400 has a drainage area of approximately 35 square miles (Sanford et al., 2012) and is located entirely within the Piedmont Province.

Hayes (1991) found that 7Q10 streamflows for Aquia Creek and the Rappahannock River at their respective gauging stations were 0.01 cubic feet per second (cfs) and 48 cfs, respectively. Based on the area of the Aquia Creek and Rappahannock River watersheds and the 7Q10 flows, ECS calculated 7Q10 flow rates across the watersheds as 0.0039 inches/year and 0.4083 inches/year, respectively. These flow rates equate to 0.02 mgal/day and 2.14 mgal/day, respectively, when applied throughout the study area. Although both stream watersheds appear to generally be representative of subsurface conditions within the study area, the Rappahannock River 7Q10 daily flow rate is significantly higher than the Aquia Creek flow rate. As such, ECS has utilized the higher Rappahannock River daily flow rate within the modified MDE water appropriation calculations to provide a more conservative assessment of available groundwater withdrawals. Calculations performed to support this value are included in Appendix A.

6.2.4 Total Maximum Groundwater Withdrawal Capacity

After estimating drought-condition effective recharge and 7Q10 baseflow within the study area it was possible to calculate the maximum groundwater withdrawal capacity within the study area. As previously discussed, the modified MDE water appropriations equation used to estimate maximum groundwater withdrawal capacity is as follows:

Maximum Groundwater Withdrawal Capacity = (Drought-Condition Effective Recharge – 7Q10 Stream Baseflow – Net Subsurface Groundwater Outflow) x 10%.

Based on findings discussed in Sections 5.2.2, 6.2.2, and 6.2.3, drought-condition effective recharge is approximately 36.01 mgal/day, 7Q10 stream baseflow is approximately 2.14 mgal/day, and net subsurface groundwater outflow under normal conditions is approximately 3.35 mgal/day. Solving the modified MDE water appropriations equation using these values yielded a maximum groundwater withdrawal capacity of 3.05 mgal/day. This maximum groundwater withdrawal rate is 1.43 mgal/day greater than current groundwater withdrawals within the study area, which are estimated as 1.62 mgal/day (see Section 6.1). Based on Stafford County's estimated residential water usage rate of 220 gpd (see Section 6.1.2.1), this 1.43 mgal/day groundwater "surplus" could theoretically supply an additional 6,500 households within the study area. Parameters and values utilized as part of the modified MDE water appropriations equation are summarized in Table 6. In addition to the drought-condition effective

Table 6: Study Area Maximum Groundwater Withdrawal Capacity^a.

Parameter	Basis for Parameter Value	Normal Effective Recharge Conditions (mgal/day ^b)	Drought Effective Recharge Conditions (mgal/day)
Effective Recharge	See Section 6.2.2	55.40	36.01
7Q10 Stream Baseflow	See Section 6.2.3	2.14	2.14
Net Subsurface Groundwater Outflow	See Section 5.2.1	3.35	3.35
Conservation Multiplier	See Section 6.2.1	44.92	27.47
Maximum Groundwater Withdrawal Capacity	= (Effective Recharge – 7Q10 Stream Baseflow – Net Subsurface Groundwater Outflow) x 10% Conservation Multiplier.	4.99	3.05
Existing Groundwater Pumping Withdrawals	See Section 5.2.1	1.62	1.62
Net Groundwater “Surplus”	= Maximum Groundwater Withdrawal Capacity – Existing Groundwater Pumping Withdrawals	3.37	1.43
Number of Additional Residences Capable of Being Supplied by “Surplus” Groundwater	= Net Groundwater “Surplus” ÷ 220 gpd ^c typical residential usage rate	15,318	6,500

^aMaximum groundwater withdrawal capacity calculations are based on the modified MDE water appropriations equation methodology described in Section 6.2.1.

^bmgal/day = million gallons per day.

^cgpd = gallons per day.

recharge value utilized as part of the modified MDE water appropriations equation, a version of the equation using the normal precipitation effective recharge value has also been included in Table 6 for the sake of comparison.

7.0 WELL RECORD DATABASE AND YIELD CHARACTERIZATION

ECS utilized Stafford County’s georeferenced well record database to evaluate spatial variations in well yield and the relationship between well yield and a variety of natural and well construction factors. The purpose of this analysis was to characterize well yields throughout the study area and assess potential correlations between well yield and several natural and well construction-related factors. Well yields throughout the study area were evaluated in relation to bedrock lithology, well depth, casing depth as a

proxy for unconsolidated overburden thickness, proximity to streams, well density, elevation, topographic slope, and well installation year.

7.1 Stafford County Digital Well Log Database

ECS utilized Stafford County's well record GIS database as the basis for the well yield characterization effort. The well log database, which is referred to herein as the Stafford County Attribute Data Well Database, contains information from a total of 1,801 well records within the study area and was compiled as part of two separate digitization efforts by Stafford County. The Stafford County Attribute Data Well Database is different from the previously discussed Stafford County Non-Attribute Piedmont Well Database (see Section 5.1) in that the former contains numerous data fields associated with well construction and performance for 1,801 wells and the latter only contains information pertaining to the physical locations of wells at 5,729 locations. A total of 789 well records within the Stafford County Attribute Data Well Database were also contained within the Non-Attribute Piedmont Well Database, resulting in a total of 4,940 unique Non-Attribute Piedmont Well Database records. Overall, by combining the number of Attribute Data Well Database records (1,801) and unique Non-Attribute Data Well Database records (4,940), it was possible to calculate a total of 6,741 known or suspected wells within Stafford County's Piedmont Province.

The initial well log digitization effort was completed as part of the 2004 Stafford County Groundwater Management Plan project (Draper Aden, 2004). A total of 1,780 hard copy VDH well records throughout all of Stafford County were digitized to create a well log database, as discussed in Section 4.1. Information from 48 data fields within the well logs, including well yield, well depth, casing depth, casing intervals, parcel identification, address, etc., was entered into a digital well log database. The well records were then manually georeferenced based on parcel identification numbers, aerial photography, and a GIS layer showing structures within Stafford County. Georeferencing consisted of assigning the wells to the location of the building contained within the corresponding land parcel. This was done under the assumption that the wells were likely to be located in proximity to the residence or structure being serviced by the well. Of the 1,780 Stafford County well records within the database, a total of 1,669 of the records were able to be georeferenced. A total of 1,000 of the georeferenced well records were located within the Piedmont Province and the remaining 669 records were either located within the Coastal Plain Province or were duplicative entries. Two of the 1,000 well records within the Piedmont Province appeared to contain bad data and were discarded by ECS for the purpose of this effort. As such, 998 well records that were compiled as part of the 2004 digitization effort were utilized as part of this Groundwater Resources Evaluation.

The second well log digitization effort was conducted by Stafford County, with guidance provided by ECS, between July and October 2017 as part of this Groundwater Resources Evaluation. This effort involved the collection and digitization of data from well logs that were not digitized as part of the initial 2004 well log digitization effort. ECS identified fifteen zones within the study area (Figure 11), which were referred to as well record selection zones, where additional well record information was deemed to be especially useful due to either a lack of existing well records or a prevalence of low-yielding wells. The well record selection zones were located outside of the municipal service area since future domestic groundwater development within the study area

would be expected to be primarily outside of this area. Stafford County staff searched VDH hard copy well records within the well record selection zones and compiled and digitized well log information related to 19 data fields that ECS deemed to be especially useful for the purpose of well yield characterization. A total of 803 well records were digitized by Stafford County staff as part of this effort.

It was necessary to georeference the well records utilized as part of this study since parcel numbers and addresses were recorded during digitization but geospatial coordinate information was not available for most well records. Additionally, it was necessary to re-georeference the well records compiled as part of the 2004 Stafford County Groundwater Management Plan project since certain georeferencing files associated with the database could not be located. As such, it was necessary to georeference all of the well logs that were utilized as part of this Groundwater Resources Evaluation. The well georeferencing process was conducted by Stafford County and involved assigning well locations to the centroid of their respective land parcel. ECS further adjusted the placement of wells located within 5-acre or larger parcels by manually assigning the well locations to coincide with the locations of structures present at the parcels. This was done to provide a more accurate placement of wells within large parcels, where a parcel's centroid may be at a greater distance from the actual well location.

7.2 Study Area Well Characteristics

Stafford County Attribute Data Well Database records were utilized to characterize existing wells within the study area. Evaluation of the well records revealed that the 91% of the records were for drilled wells and the remaining 9% were for bored wells. The average bored well was 11 years older than the average drilled well and the most recent bored well was installed in 2000, as shown in Table 7. This is consistent with conversations that ECS had with the Stafford County Environmental Health Department (personal communication, October 19, 2017) and Mr. Scott Miller (S. Miller, personal communication, October 19, 2017) with Northern Virginia Drilling, Inc., who provides drilling services in the study area. Both the Health Department representative and Mr. Miller stated that it is extremely rare for a bored well to be installed within the Piedmont portion of Stafford County.

Evaluation of well records within the study area showed that most drilled wells are significantly deeper than bored wells (Table 7). This would be expected, as bored wells typically extend to the overburden-bedrock interface, at deepest, and drilled wells extend into bedrock. Drilled well casing depth is typically a function of the depth to stable bedrock, as casing is usually installed a few feet into bedrock. Review of well records with casing depths provided revealed that the average drilled well's casing depth was 79 feet bgs. The average casing depth in bored wells, which represents the well's total depth since joint casing is installed to the base of the well, was revealed to be 53 feet. Well yields in drilled wells were found to be significantly higher than that of bored wells. This would also be expected, as drilled wells are typically more productive and less susceptible to drought conditions.

Table 7: Summary of Study Area Well Characteristics.

Parameter		Drilled Wells	Bored Wells
Number of Well Records		1,645	156
Installation Year	Average	1998	1987
	Range	1963 - 2017	1983 - 2000
Well Depth (feet)	Average	292	53
	Range	35 - 1,000	29 - 81
Surface Casing Depth (feet)	Average	79	53
	Range	7 - 244	29 - 81
Well Yield (gallons per minute)	Average	15	3
	Range	0 - 160	0 - 45

The majority of drilled wells within the study area (1,432 wells) appear to be constructed using an open-borehole completion and the remaining 213 wells appear to be screened wells. Both open-borehole wells and screened wells in the Piedmont are constructed by installing surface casing through unconsolidated sediment and/or weathered rock (i.e., saprolite) into stable bedrock. A production boring, which is typically 6.0–6.5 inches in diameter, is then drilled into bedrock. Whereas open-borehole wells are considered to be completed at this point, screened wells must undergo an additional construction step. Screened wells are completed by installing slotted screen and riser pipe directly into the production boring from the base of the well to the well's pitless adapter, which is located within a few feet of the ground surface. Mr. Scott Miller with Northern Virginia Drilling, Inc. indicated that screened wells are commonly installed in the Piedmont to provide borehole stability when heavily fractured rock is encountered during drilling (S. Miller, personal communication, October 19, 2017).

7.3 Parameter Correlations to Well Yield

ECS utilized Stafford County's Attribute Data Well Database to evaluate spatial variations in well yield and the relationship between well yield and a variety of natural and well construction factors. Well yields were evaluated in relation to bedrock lithology, casing depth as a proxy for unconsolidated overburden thickness, proximity to streams, well density, topographic slope, well type, elevation, and well depth to assess whether any correlations or trends appeared to exist.

Only drilled well records were utilized as part of the well yield correlation exercise. Bored well records were not used because it is rare for modern-day wells to utilize this type of construction within the study area. As such, it was deemed to be unnecessary to evaluate bored well yield characteristics for the purpose of aiding future decision-making. ECS utilized a total of 1,645 drilled well records as part of the well yield correlation evaluation, which are shown in Figure 12.

The findings presented in this section are classified based on average well yield, median well yield, and the percentage of low-yielding wells. Additional classification categories are used for the evaluation of well yield based on geology. Low-yielding wells are considered to be wells with yields ranging from 0 gpm to less than 3 gpm. ECS used a yield of less than 3 gpm as the criteria for a low-yielding well because additional water storage requirements are imposed on such wells. Virginia private well regulation 12VAC5-630-460 states that private wells yielding less than 3 gpm must have a capacity to produce and store 150 gallons per bedroom per day per connection. Additional water storage is not required for wells that produce three or more gpm.

7.3.1 Well Yield Correlation to Geologic Units

Well yield and well characteristics were evaluated throughout the study area based on the geologic unit in which the wells were located. ECS individually evaluated well records for wells located in unconsolidated deposits and formations within the study area, such as Miocene and Pliocene sand and gravel deposits (Tms and Tps), the Potomac Formation (Kp), and alluvium deposits (Qal), and found that wells located in these units appear to seal off the unconsolidated material with casing and produce water from the consolidated Piedmont bedrock underlying the relatively thin, unconsolidated veneer of sediment. As such, all of the well records were evaluated based on the consolidated bedrock unit in which the wells are located. ECS manually modified the geologic map of the study area (Figure 6) to remove unconsolidated sediment deposits and geologic contacts of the underlying consolidated units were inferred to create a geologic map of consolidated bedrock geologic units. Figure 13 depicts the resulting consolidated bedrock geologic map of the study area that was used to complete the well yield evaluation.

Consolidated geologic units and drilled well locations were assessed within a GIS database to segregate well records based on geologic unit. Well record data were then analyzed by geologic unit to obtain each unit's lowest yield, highest yield, average yield, median yield, percentage of low-yielding wells within the unit, average well depth, and average surface casing depth. Findings pertaining to well yield statistics are summarized in Table 8 and findings pertaining to well construction statistics are summarized in Table 9. Graphs plotting well yield statistics by geologic unit and well construction statistics by geologic unit are included as Figures 14a and 14b, respectively. Only geologic units containing more than 50 well records are included within Figures 14a and 14b.

Of the 15 consolidated geologic units evaluated as part of this evaluation, nine geologic units contained more than 50 well records. ECS considers these datasets to be sufficiently robust to enable lump statistical evaluation of well records from within the geologic units. The remaining six geologic units contained 21 or less well records. As such, ECS considers these datasets to be too small to draw conclusions from a lump statistical evaluation of well records. Findings discussed in this section pertain only to well records located within the nine geologic units containing more than 50 well records, as follows: Opg, Ol, Oc, OZgm, Oq, O(C)p, Sf, O(C)u, and Oam.

Table 8: Summary of Well Yield Statistics by Geologic Unit.

Geologic Unit	Number of Wells	Lowest Yield (gpm^a)	Highest Yield (gpm)	Average Yield (gpm)	Median Yield (gpm)	Percentage of Low-Yielding Wells^b
Opg	379	0	100	16.5	12	7.7%
OI	320	0.5	80	10.2	6	17.8%
Oc	224	1	120	19.4	15	3.1%
OZgm	214	0	150	15.5	12	11.2%
Oq	124	0	150	17.2	10	16.1%
O(C)p	114	0	160	18.6	15	3.5%
Sf	88	0	60	12.3	10	19.3%
O(C)u	69	2	60	16.8	15	1.4%
Oam	59	0.75	60	13.2	10	13.6%
O(C)gg	21	1	30	13.8	15	23.8%
O(C)tj	18	1.5	30	12.9	10	16.7%
Ygn	5	4	12	6.3	5	0.0%
Oqq	5	1.2	70	22.6	6	20.0%
PMf	3	6	30	18.7	20	0.0%
Ogb	2	6	7	6.5	6.5	0.0%
<i>Combined Study Area</i>	<i>1,645</i>	<i>0</i>	<i>160</i>	<i>15.3</i>	<i>12</i>	<i>10.7%</i>

^agpm = gallons per minute.

^bLow-yielding wells are classified as wells with yields less than 3 gpm.

Plotting well yields by geologic unit revealed that there appears to be a correlation between the two factors. This correlation is indicated by variable average and median well yields, according to geologic unit, and a correlation between well yields and the percentage of low-yielding wells. If there was not a correlation between well yields and geologic unit it would be expected that well yields and the percentage of low-yielding wells in each geologic unit would be similar. Average well yields by geologic unit ranged from 10.2–19.4 gpm, with an average of 15.3 gpm. Median well yields by geologic unit ranged from 6–15 gpm, with an average of 12 gpm. The percentage of low-yielding wells (i.e., less than 3 gpm) within each geologic unit ranged from 1.4–19.3%, with an average of 10.7%.

Well yield data indicate that there appears to be a correlation between high average well yields and high median well yields, and vice versa. The exception to this is within the Quantico Formation (Oq), which exhibits a relatively high average well yield and a relatively low median well yield. The reason for this variation within the Quantico Formation appears to be the presence of several high-yielding wells, which resulted in an increased average well yield value. The average well yield in each geologic unit is 37% higher, on average, than the median well yield. This appears to be the result of several anomalous high-yielding wells within each geologic unit, resulting in higher

Table 9: Summary of Well Construction Statistics by Geologic Unit.

Geologic Unit	Number of Wells^a	Average Well Depth (feet)	Average Surface Casing Depth (feet)
Opg	379 & 332	277	82
OI	320 & 307	309	74
Oc	223 & 186	259	76
OZgm	214 & 189	267	76
Oq	124 & 109	340	76
O(C)p	114 & 106	262	95
Sf	88 & 66	372	69
O(C)u	69 & 62	279	88
Oam	59 & 49	331	76
O(C)gg	21 & 21	365	94
O(C)tj	18 & 12	304	87
Ygn	5 & 5	302	72
Oqq	5 & 5	290	84
PMf	3 & 3	255	60
Ogb	2 & 1	273	66
<i>Combined Study Area</i>	<i>1,644 & 1,453</i>	<i>292</i>	<i>79</i>

^aThe first number represents the number of wells with available well depth data and the second number represents the number of wells with available surface casing data.

average values. As a result, ECS considers median well yield values to be more representative of the well yield that is most likely to be encountered when drilling in a particular geologic unit.

The Oc, O(C)p, and O(C)u geologic units contained the highest median well yield value (15 gpm) and the OI geologic unit contained the lowest median well yield value (6 gpm) (Figure 14a). The median well yield values for the remaining geologic units were either 10 gpm or 12 gpm. In general, the lowest median values were found within geologic units located at the southeastern and northern portions of the study area and the highest median values were found at the northeastern, central, and western portions of the study area. Median well yield values by geologic unit are depicted in Figure 15a.

The Oc, O(C)p, and O(C)u geologic units contained the lowest percentage of low-yielding wells (1.4–3.5%) and the OI and Sf geologic units contained the highest percentage of low-yielding wells (17.8–19.3%). A correlation appears to exist between well yield and the percentage of low-yielding wells within a geologic unit. The highest percentages of low-yielding wells were found in geologic units with the lowest median well yields and the lowest percentages of low-yielding wells were found in geologic units with the highest median well yields (Figure 14a). As such, mapped percentages of low-yielding wells by geologic unit (Figure 15b) resembles mapping of median well yields (Figure 15a).

Of the geologic units with more than 50 well records, average well depths by geologic unit ranged from 259 feet in the Chopawamsic Formation (Oc) to 372 feet in the Falls Run Granite Gneiss (Sf). Well depths were found to be greatest, on average, in lower yielding geologic units and lowest in higher yielding geologic units (Figure 14b). The four geologic units with the lowest median well yields (Ol, Sf, Oam, and Oq) also had the four greatest average well depths, ranging between 309–372 feet. Conversely, of the three geologic units with the highest median well yields (Oc, O(C)p, and O(C)u), two of the three units had the lowest average well depths (259 feet and 262 feet). This relationship between well yield and well depth is unsurprising, as a well driller would be more likely to continue advancing a low-yielding well to greater depths to provide additional water storage and to attempt to encounter additional water. A map depicting average well depths by geologic unit is included as Figure 15c.

Of the geologic units with more than 50 well records, average surface casing depths by geologic unit ranged from 69 feet in the Falls Run Granite Gneiss (Sf) to 95 feet in the phyllite formation (O(C)p). Surface casing depth can provide an estimate of unconsolidated overburden thickness, as surface casing is typically installed a few feet into stable bedrock through unconsolidated sediment and/or saprolite. Evaluation of average surface casing depth by geologic unit revealed a possible minor correlation between casing depth and well yield. Average casing depths, and by proxy overburden thickness, appear to be slightly greater at geologic units with higher yielding wells and slightly less at units with lower yielding wells (Figure 14b). Average casing depths in the four lowest yielding geologic units ranged between 69–76 feet and average casing depths in the remaining five higher yielding geologic units ranged between 76–95 feet. A map depicting average surface casing depths by geologic unit is included as Figure 15d.

7.3.2 Well Yield Correlation to Well Depth

In addition to evaluating well depth based on geologic unit, well depths were also evaluated based on depth range classifications, as shown in Table 10. As with the evaluation of well depth based on geologic unit (Section 7.3.1), the evaluation of well yield as a function of well depth showed a strong correlation between these two factors. The median well yield was greatest (20 gpm) and the percentage of low-yielding wells was lowest (0.6%) at the shallowest well depth range (less than or equal to 159.9 feet). At increasing well depths, median well yields either stayed the same or incrementally decreased and the percentage of low-yielding wells increased. The deepest well depth range (greater than or equal to 410 feet) had the lowest median well yield (3.25 gpm) and the highest percentage of low-yielding wells (39.2%). As discussed in Section 7.3.1, this relationship between well yield is likely the result of low-yielding wells being advanced to greater depths to provide additional water storage and to attempt to encounter additional water. A chart depicting median well yields and percentages of low-yielding wells as a function of well depth is included as Figure 16.

Well yields appear to be especially low and the percentage of low-yielding wells increases significantly for wells deeper than approximately 360 feet. Well depth ranges shallower than 360 feet had median well yields that were either greater than or within 2 gpm of the combined study area median value (12 gpm) and had percentages of low-

Table 10: Summary of Well Yield Statistics as a Function of Well Depth.

Well Depth (feet)	Number of Wells	Average Yield (gpm^a)	Median Yield (gpm)	Percentage of Low-Yielding Wells^b
≤ 159.9	168	26.3	20	0.6%
160 - 209.9	349	19.6	15	1.1%
210 - 259.9	278	19.7	15	1.8%
260 - 309.9	267	14.3	10	3.4%
310 - 359.9	136	12.8	10	4.4%
360 - 409.9	196	7.5	5	27.0%
≥ 410	250	5.5	3.25	39.2%
<i>Combined Study Area^c</i>	<i>1,644</i>	<i>15.3</i>	<i>12</i>	<i>10.7%</i>

^agpm = gallons per minute.

^bLow-yielding wells are classified as wells with yields less than 3 gpm.

^cIncludes all drilled wells with available well depth data.

yielding wells that were less than half that of the average for the combined study area. Conversely, the median yields of well depth ranges in excess of 360 feet (3.25–5 gpm) were 2–3 times lower than the next shallowest well depth range (i.e., 310–359.9 feet). Additionally, there were 6–9 times as many low-yielding wells for well depth ranges in excess of 360 feet than in the next shallowest well depth range. This suggests that the majority of domestic wells will encounter adequate water supply by drilling a well to a depth of 360 feet or less, and that the likelihood of drilling a well with a desirable yield is reduced if it is necessary to drill deeper than 360 feet to find adequate supply.

7.3.3 Well Yield Correlation to Surface Casing Depth

Surface casing depth can provide an estimate of unconsolidated overburden thickness, as surface casing is typically installed a few feet into stable bedrock through unconsolidated sediment and/or saprolite. This unconsolidated overburden/saprolite can oftentimes be beneficial to crystalline bedrock aquifers, as it can function as a source of groundwater storage.

In addition to evaluating surface casing depth based on geologic unit, ECS also evaluated surface casing depths based on depth range classifications, as shown in Table 11. As with the evaluation of surface casing depth based on geologic unit (Section 7.3.1), the evaluation of well yield as a function of surface casing depth showed a partial correlation between these two factors. Median well yields and percentages of low-yielding wells for wells with greater than approximately 50 feet of surface casing were similar. However, the median yield of wells with less than 50 feet of casing (7 gpm) was at least 3 gpm less than median well yields for wells with deeper casing. Additionally, wells with less than 50 feet of surface casing had a significantly higher percentage of low-yielding wells (27.3%) than was found in wells with deeper casing (8.3–11.2%). A chart depicting median well yields and percentages of low-yielding wells as a function of well depth is included as Figure 17.

Table 11: Summary of Well Yield Statistics as a Function of Surface Casing Depth.

Surface Casing Depth (feet)	Number of Wells	Average Yield (gpm ^a)	Median Yield (gpm)	Percentage of Low-Yielding Wells ^b
≤ 49.9	55	9.7	7	27.3%
50 – 69.9	578	15.9	10	11.2%
70 – 89.9	451	15.6	12	10.4%
90 – 109.9	204	12.9	10	8.3%
≥ 110	165	15.9	12	9.1%
<i>Combined Study Area^c</i>	<i>1,453</i>	<i>15.2</i>	<i>10</i>	<i>10.9%</i>

^agpm = gallons per minute.

^bLow-yielding wells are classified as wells with yields less than 3 gpm.

^cIncludes all drilled wells with available surface casing depth data.

Well yields appear to be negatively impacted when less than 50 feet of overburden/saprolite is present. Although there appears to be a slightly lower percentage of low-yielding wells in wells with 90 or more feet of casing than in wells with 50–90 feet of casing, the overall median well yields and percentages of low-yielding wells are similar. This suggests that there appears to be a benefit to installing a well at locations where at least 50 feet of overburden is present, but that minimal added benefit is achieved by drilling at locations where deeper overburden/saprolite is present.

7.3.4 Well Yield Correlation to Stream Proximity

ECS evaluated well yields as a function of proximity to streams, as mapped within the USGS's National Hydrography Dataset. This evaluation was completed to assess whether wells in closer proximity to streams have higher yields than wells further from streams. Well yields were evaluated at 50-foot distance classification ranges, starting at a distance of less than 99.9 feet and ending at a distance of greater than 300 feet (Table 12). Findings from this evaluation should be considered an approximation because well locations are estimated, as discussed in Section 7.1, and because a relatively low number of wells were located within 150 feet of a stream, thereby limiting the robustness of the dataset.

The evaluation of well yields as a function of proximity to streams did not reveal a strong correlation between these two factors (Figure 18). Median well yields for each classification range were within 2 gpm of other classification ranges. The percentages of low-yielding wells in each classification range were more variable, although a strong correlation was not apparent. The relatively low percentage of low-yielding wells within 99.9 feet of a stream (3.2%) provides possible evidence that wells in close proximity to streams are less likely to be low yielding, but additional well records would be necessary to confirm this potential relationship, as only 31 wells were found to be within this distance of a stream. The evaluation of well yields based on proximity to streams also revealed a high percentage of low-yielding wells at a distance of 200–249.9 feet from a

Table 12: Summary of Well Yield Statistics as a Function of Proximity to Streams.

Distance from Mapped Stream (feet)	Number of Wells	Average Yield (gpm ^a)	Median Yield (gpm)	Percentage of Low-Yielding Wells ^b
≤ 99.9	31	20.4	12	3.2%
100 – 149.9	47	14.3	12	8.5%
150 – 199.9	82	16.2	10	11.0%
200 – 249.9	70	12.8	10	25.7%
250 – 299.9	83	14.8	12	10.8%
≥ 300	1,332	15.3	12	10.1%
<i>Combined Study Area^c</i>	<i>1,645</i>	<i>15.3</i>	<i>12</i>	<i>10.7%</i>

^agpm = gallons per minute.

^bLow-yielding wells are classified as wells with yields less than 3 gpm.

^cIncludes all drilled wells within study area.

stream. The reason for this relationship is unknown and may simply be the result of anomalous conditions within a dataset comprised of a fairly low number of well records (70 records).

7.3.5 Well Yield Correlation to Well Density

ECS evaluated well yields as a function of drilled well density to assess whether wells located in high density areas are more likely to have lower yields. ECS did this by creating a raster dataset within a GIS database of well density per square mile, based on Stafford County's Non-Attribute Piedmont Well Database (see Section 5.1), using a 1,000-foot neighborhood radius. Stafford County's Non-Attribute Piedmont Well Database and Attribute Data Well Database were utilized to create the well density raster because these combined databases contain georeferenced well records of all 6,741 known or suspected supply wells within the study area. The drilled well database containing 1,645 georeferenced well records and accompanying well construction and yield information was then populated with the well density raster value at each well's location. Well density within the study area at locations of drilled wells ranged from 8.9–822.5 wells per square mile. Data were sorted and analyzed based on the well density classification ranges shown in Table 13.

The evaluation of well yields as a function of drilled well density did not reveal a strong correlation between these two factors (Figure 19). Median well yields for all evaluated classification ranges were within 3 gpm of the study area's median yield and the occurrence of low-yielding wells varied from 7.3–12.4%. Overall, well yields appear to fluctuate independent of well density. The reason for the lack of correlation between these factors may be due to the residential nature of the vast majority of groundwater withdrawn from within the study area. Unlike commercial and industrial withdrawals, most of the pumped residential groundwater is returned to the hydrogeologic system with minimal losses via septic systems.

Table 13: Summary of Well Yield Statistics as a Function of Well Density.

Well Density (wells per square mile)	Number of Wells	Average Yield (gpm^a)	Median Yield (gpm)	Percentage of Low-Yielding Wells^b
≤ 74.9	249	14.4	10	12.0%
75 – 114.9	233	16.5	12	7.3%
115 – 154.9	284	15.7	10	12.3%
155 – 194.9	249	16.9	12	8.8%
195 – 234.9	211	16.9	15	9.5%
≥ 235	419	13.1	10	12.4%
<i>Combined Study Area^c</i>	<i>1,645</i>	<i>15.3</i>	<i>12</i>	<i>10.7%</i>

^agpm = gallons per minute.

^bLow-yielding wells are classified as wells with yields less than 3 gpm.

^cIncludes all drilled wells within study area.

Although there does not appear to be a correlation between well density and well yield, ECS considered the high well density occurrence and relatively low well yields within the Lunga Reservoir Formation (Ol) at the northern portion of the study area to warrant further evaluation. ECS evaluated well yields within the Lunga Reservoir Formation based on the year in which the wells were drilled to assess whether yields have a tendency to decline over time, which would presumably be the result of increased well development. This evaluation revealed the absence of such a correlation, as the median yield of wells drilled prior to 1995 was 5 gpm, the median yield of wells drilled from 1995 to 2005 was 7 gpm, and the median yield of wells drilled from 2006 to present was 7 gpm. As such, it appears that the relatively low well yields within the Lunga Reservoir Formation are the result of hydrogeologic properties and fracturing within the bedrock aquifer, as opposed to increasing regional well development.

7.3.6 Well Yield Correlation to Elevation

ECS evaluated well yields as a function of elevation to assess whether a relationship exists between these two factors. Elevation within the study area at locations of drilled wells ranged from 140–416 feet above mean sea level. Data were sorted and analyzed based on the elevation classification ranges shown in Table 14.

The evaluation of median well yields as a function of drilled well elevation did not reveal a strong correlation between these two factors (Figure 20), as median well yields for all evaluated classification ranges were within 2 gpm of the study area's median yield. However, there appears to be a potential minor correlation between elevation and the percentages of low-yielding wells, as the percentage of low-yielding wells appears to decrease as elevation increases (Figure 20). The highest percentage of low-yielding wells (14.1%) was found in the lowest elevation classification range (i.e., wells at elevations of less than 250 feet). Conversely, the lowest percentage of low-yielding wells (4.8%) was found in the highest elevation classification range (i.e., wells at

Table 14: Summary of Well Yield Statistics as a Function of Elevation.

Elevation (feet above mean sea level)	Number of Wells	Average Yield (gpm^a)	Median Yield (gpm)	Percentage of Low-Yielding Wells^b
≤ 249.9	184	17.1	12	14.1%
250 – 274.9	233	14.2	10	11.6%
275 – 299.9	332	14.0	10	11.7%
300 – 324.9	361	15.3	12	10.8%
325 – 349.9	295	16.0	12	9.8%
350 – 374.9	177	14.7	12	7.3%
≥ 375	63	19.4	12	4.8%
<i>Combined Study Area^c</i>	<i>1,645</i>	<i>15.3</i>	<i>12</i>	<i>10.7%</i>

^agpm = gallons per minute.

^bLow-yielding wells are classified as wells with yields less than 3 gpm.

^cIncludes all drilled wells within study area.

elevations of greater than 375 feet). Although results from the classification range consisting of wells at elevation of greater than 375 feet are considered suspect due to the relatively low number of wells within this range (63 records), the percentage of low-yielding wells in the next lower elevation classification range (350–374.9 feet) also support the presence of a trend. Based on these findings, it appears that wells at lower elevations have a slightly higher tendency to have yields less than 3 gpm than wells at higher elevations.

7.3.7 Well Yield Correlation to Topographic Slope

ECS evaluated well yields as a function of topographic slope to assess whether a relationship exists between these two factors. Topographic slope within the study area at locations of drilled wells ranged from 1.8–103.0%. Data were sorted and analyzed based on the topographic slope classification ranges shown in Table 15.

The evaluation of median well yields as a function of topographic slope did not reveal a strong correlation between these two factors, as median well yields for all evaluated classification ranges were within 2 gpm of the study area's median yield (Figure 21). Additionally, there does not appear to be a correlation between topographic slope and the occurrence of low-yielding wells. The percentages of low-yielding wells in each classification range were fairly similar and only ranged from 9.9% at the 10–19.99% slope classification range to 15.4% at the greater than or equal to 50% slope classification range. However, the 15.4% value is considered suspect, as only 26 wells were within this classification category. Based on these findings, it does not appear that topographic slope has a significant effect on well yield.

Table 15: Summary of Well Yield Statistics as a Function of Topographic Slope.

Topographic Slope (% grade)	Number of Wells	Average Yield (gpm^a)	Median Yield (gpm)	Percentage of Low-Yielding Wells^b
≤ 9.99	190	14.0	10	14.2%
10 – 19.99	684	15.3	12	9.9%
20 – 29.99	473	15.6	12	10.4%
30 – 39.99	206	16.2	12	10.2%
40 – 49.99	66	12.8	10	10.6%
≥ 50	26	17.9	11	15.4%
<i>Combined Study Area^c</i>	<i>1,645</i>	<i>15.3</i>	<i>12</i>	<i>10.7%</i>

^agpm = gallons per minute.

^bLow-yielding wells are classified as wells with yields less than 3 gpm.

^cIncludes all drilled wells within study area.

7.3.8 Well Yield Correlation to Well Installation Year

ECS evaluated well yields as a function of well installation year to assess whether well yields have declined as more wells have been installed over time. Data were sorted according to geologic unit and were analyzed based on whether the wells were installed before or after year 2000. Year 2000 was used as the separation point because a similar number of wells were installed pre- and post-2000. Pre-2000 drilled wells were installed as early as 1963 and wells installed since 2000 wells were installed as recently as 2017.

The evaluation of median well yield as a function of drilled well installation year revealed that wells installed since 2000 generally have yields that are slightly higher than or equal to that of wells installed prior to 2000 (Table 16) (Figure 22a). This relationship was found to be true for all of the analyzed geologic units except Oam, where the median yield for wells installed since 2000 was 2 gpm less than the pre-2000 median yield. Overall, median well yields for wells installed since 2000 for all geologic units except O(C)p were within 3 gpm of the median well yield for wells installed prior to 2000 within the same geologic unit. The 9 gpm yield discrepancy between pre-2000 wells and wells installed since 2000 in O(C)p may be due to the unit's small sample size, as only 36 wells were installed prior to 2000 in this unit. Similarly, wells installed prior to 2000 generally have a slightly higher probability of being low yielding than wells installed since 2000 (Table 16) (Figure 22b). This relationship was found to be true for all of the analyzed geologic units except Oc, O(C)u, and Oam, where the pre-2000 percentages of low-yielding wells were 1.8–3.3% lower than that of the wells installed since 2000 in the same geologic unit. In all other geologic units the percentages of low-yielding wells for wells installed since 2000 were 2.2–9.3% lower than that of the pre-2000 wells in the same geologic unit. Based on these findings, it appears that more recently installed wells generally have yields that are similar to or slightly higher than the yields of older wells. As such, there does not appear to be evidence that increased well development within the Piedmont Province of Stafford County has adversely impacted the well yields of more recently installed wells within this area.

Table 16: Summary of Well Yield Statistics as a Function of Well Installation Year.

Geologic Unit	Pre-2000 Well Installation Year			2000 to Present Well Installation Year		
	Number of Wells	Median Yield (gpm ^a)	Percentage of Low-Yielding Wells ^b	Number of Wells	Median Yield (gpm)	Percentage of Low-Yielding Wells
Oc	96	15	2.1%	128	17.5	3.9%
O(C)p	36	10	5.6%	78	19	2.6%
O(C)u	36	13.5	0.0%	33	15	3.0%
Opg	258	12	8.5%	121	15	5.8%
OZgm	127	12	15.0%	87	12	5.7%
Oq	64	9.5	17.2%	60	12	15.0%
Oam	33	12	12.1%	26	10	15.4%
Sf	37	8	21.6%	51	10	17.6%
OI	174	6	20.7%	146	7	14.4%
<i>Combined Study Area^c</i>	<i>888</i>	<i>10</i>	<i>11.9%</i>	<i>757</i>	<i>12</i>	<i>9.2%</i>

^agpm = gallons per minute.

^bLow-yielding wells are classified as wells with yields less than 3 gpm.

^cIncludes all drilled wells within study area.

7.3.9 Well Yield Correlation Summary

ECS utilized Stafford County's Attribute Data Well Database to evaluate spatial variations in well yield and the relationship between well yield and a variety of natural and well construction factors. Well yields were evaluated in relation to bedrock lithology, well depth, casing depth as a proxy for unconsolidated overburden thickness, proximity to streams, well density, topographic slope, elevation, and well installation year to assess whether any correlations or trends appeared to exist. Only drilled well records were utilized as part of this evaluation because it is rare for modern-day wells to utilize this type of construction within the study area. Results of the analysis revealed that well yield and the occurrence of low-yielding wells appears to be related to some of the analyzed factors, as discussed below. A summary of well yield correlation to the aforementioned analyzed factors is included as Table 17.

Well yield and the occurrence of low-yielding wells appear to be strongly influenced by the geologic composition of the aquifer into which the wells are drilled. ECS classified each geologic unit as having either a high, moderate, low, or unclassified well yield potential, based on the median well yields and the percentages of low-yielding wells in each geologic unit. Geologic units rated as being unclassified are listed as such because insufficient well record data were available for analysis. Relatively high-yielding geologic units with low occurrences of low-yielding wells include the Oc, O(C)p, and

Table 17: Summary of Well Yield Correlation Findings.

Evaluated Parameter	Correlation to Well Yield?	Correlation to the Occurrence of Low-Yielding Wells^a?
Geology	Yes, a strong correlation appears to exist.	Yes, a strong correlation appears to exist.
Well Depth	Yes, a strong correlation appears to exist, as shallower wells are generally higher yielding than deeper wells. This is most likely a result of low-yielding wells being advanced to greater depths to provide additional water storage and to attempt to encounter additional water.	Yes, a strong correlation appears to exist, as shallower wells are less likely to be low-yielding than deeper wells. This is most likely a result of low-yielding wells being advanced to greater depths to provide additional water storage and to attempt to encounter additional water.
Surface Casing Depth	Yes, well yields appear to be lower in wells with less than 50 feet of surface casing (i.e., where shallower overburden material is present) than in wells with more than 50 feet of surface casing.	Yes, the likelihood of installing a low-yielding well appears to be higher in areas where less than 50 feet of surface casing is necessary (i.e., where shallower overburden material is present).
Proximity to Streams	No, there does not appear to be a correlation between well yield and proximity to streams.	Data may indicate that wells within 100 feet of a stream are less likely to be low-yielding than wells at further distances from a stream. However, it would be necessary to analyze additional well record data to confirm this potential relationship.
Well Density	No, there does not appear to be a correlation between well yield and well density.	No, there does not appear to be a correlation between the occurrence of low-yielding wells and well density.
Elevation	No, there does not appear to be a correlation between well yield and elevation.	Data may indicate that higher elevation wells are slightly less likely than lower elevation wells to be low-yielding. However, it would be necessary to analyze additional well record data to confirm this potential relationship.
Topographic Slope	No, there does not appear to be a correlation between well yield and topographic slope.	No, there does not appear to be a correlation between the occurrence of low-yielding wells and topographic slope.

Evaluated Parameter	Correlation to Well Yield?	Correlation to the Occurrence of Low-Yielding Wells ^a ?
Well Installation Year	Yes, wells installed since 2000 generally have yields that are slightly higher than or equal to that of wells installed prior to 2000.	Yes, wells installed since 2000 generally are slightly less likely to be low yielding than wells installed prior to 2000.

^aLow--yielding wells are classified as wells with yields less than 3 gpm.

O(C)u units. Moderately-yielding geologic units with moderate occurrences of low-yielding wells include the Opg and OZgm units. Low-yielding geologic units with high occurrences of low-yielding wells include the Oq, Oam, Sf, and Ol units.

Overall, 23.37% of the study area is comprised of geologic units with high potential well yields, 40.13% of the study area is comprised of geologic units with moderate potential well yields, 25.48% of the study area is comprised of geologic units with low potential well yields, and the remaining 11.03% of the study area is unclassified. However, 55.77% of the land within the unclassified units is located within the municipal water service area, where extensive future groundwater development is unexpected. As such, only 4.88% of the study area is located in an unclassified zone outside of the municipal water service area. A map depicting the aforementioned geologic units based on their overall well yield classification rating (i.e., high, moderate, or low) is included as Figure 23a and Table 18 summarizes the geologic units based on their classification rating. Figure 23b depicts the well yield classification ratings with the inclusion of known or suspected wells within the study area.

It is important to note that potential well yield ratings are approximations based on available well record data and are not a guarantee that such conditions exist throughout the geologic unit. Zones of low-yielding wells are documented to exist within high potential yield zones, and conversely, zones of high-yielding wells exist within low potential yield zones. Site-specific evaluation would be required to more accurately assess well yield potential at a given site.

A strong correlation also appears to exist between well yield, the occurrence of low-yielding wells, and well depth. Well yield decreases, and the occurrence of low-yielding wells increases, with increased well depth. This is likely the result of low-yielding wells being drilled to greater depths with the hope of encountering additional water. In addition, well yields appear to decline sharply and the occurrence of low-yielding wells appears to rise sharply past a depth of approximately 360 feet. This suggests that the majority of domestic wells will encounter adequate water supply by drilling a well to a depth of 360 feet or less, and that the likelihood of drilling a well with a desirable yield is reduced if it is necessary to drill deeper than 360 feet to find adequate supply.

Table 18: Summary of Geologic Unit Well Yield Classification Ratings.

Well Yield Potential	Geologic Unit	Median Well Yield (gpm ^a)	Percentage of Low-Yielding Wells ^b	Percentage of Study Area
High	Oc, O(C)p, O(C)u	15	1.4 – 3.5%	23.37%
Moderate	Opg, OZgm	12	7.7 – 11.2%	40.13%
Low	Sf, Ol, Oq, Oam	6 – 10	13.6 – 19.3%	25.48%
Not Classified ^c	O(C)gg, Ogb, O(C)tj, Oqq, PMf, Ygn	-	-	11.03%

^agpm = gallons per minute.

^bLow--yielding wells are classified as wells with yields less than 3 gpm.

^cNot classified due to insufficient well record data.

Surface casing depth can provide an estimate of unconsolidated overburden thickness, as surface casing is typically installed a few feet into stable bedrock through unconsolidated sediment and/or saprolite. Well yields appear to be negatively impacted when less than 50 feet of overburden/saprolite is present, as well yields are lower and the occurrence of low-yielding wells is higher than when casing is deeper. Well yields and the occurrence of low-yielding wells are comparable when surface casing is installed to depths exceeding 50 feet. This suggests that it is beneficial to install wells at locations where at least 50 feet of overburden is present, but that minimal added benefit is achieved by drilling at locations where deeper overburden/saprolite is present.

There does not appear to be a correlation between well yield and proximity to a stream. It appears possible that wells within approximately 100 feet of a stream are less likely to have a yield less than 3 gpm, although additional records from wells within this 100-foot zone would need to be examined to further evaluate this potential relationship.

There does not appear to be a correlation between well yield and elevation. A minor correlation may exist between elevation and the occurrence of low-yielding wells, as the percentage of low-yielding wells appears to decrease as elevation increases. Based on these findings, it appears that wells at lower elevations have a slightly higher tendency to have yields less than 3 gpm than wells at higher elevations.

There does not appear to be a correlation between well yield and topographic slope, nor does there appear to be a correlation between the occurrence of low-yielding wells and topographic slope. Likewise, there does not appear to be a correlation between well yield and well density, nor does there appear to be a correlation between the occurrence of low-yielding wells and well density. Based on these findings, it does not appear that topographic slope or current well density concentration has a significant effect on well yield.

A minor relationship does appear to exist between the yields of wells installed prior to the year 2000 and wells installed since 2000. The evaluation of median well yield as a function of drilled well installation year revealed that wells installed since 2000 generally have yields that are slightly higher than or equal to that of wells installed prior to 2000. Similarly, wells installed prior to 2000 generally have a higher probability of being low yielding than wells installed since 2000. Based on these findings, it appears that more recently installed wells generally have yields that are similar to or slightly higher than the yields of older wells. As such, there does not appear to be evidence that increased well development within the Piedmont Province of Stafford County has adversely impacted the well yields of more recently installed wells within this area.

8.0 GROUNDWATER MONITORING AND DOMESTIC WELLS

8.1 Long-Term Groundwater Monitoring

Using monitoring wells to measure long-term groundwater levels can be an effective way to differentiate short-term, weather-induced groundwater level fluctuations from long-term trends that could be indicative of over-pumping or climate-induced shifts. Stafford County does not currently conduct long-term groundwater level monitoring within the Piedmont and no municipal monitoring wells are known to exist. A USGS monitoring well (site number 383423077245901) located in the Piedmont Province of Prince William County appears to be the closest monitoring well to the study area. Groundwater level data have been collected at this monitoring well since 1973, as discussed in Section 5.2. The well is located approximately 0.7 mile north of Stafford County and has a total depth of 490 feet.

ECS evaluated county-owned properties within the study area to assess the viability of prospective monitoring well locations. A total of 217 county-owned properties were evaluated as part of this assessment. The evaluated properties consisted of vacant land, schools, radio tower sites, undeveloped floodplains, surface water, libraries, parks, county-owned apartments, municipal buildings, etc. Properties were considered to be poor prospective monitoring well sites if they met any of the following criteria: (1) located in close proximity to a significant stream or reservoir, (2) parcel size of less than one-quarter acre or an irregularly shaped parcel that would make monitoring well drilling impractical, (3) located in close proximity to the Coastal Plain Province, or (4) existing site developments restrict available drilling space. Removing properties that met the aforementioned undesirable criteria left 19 county-owned prospective monitoring well properties. The locations of these 19 properties are shown in Figure 24.

The 19 prospective monitoring well properties were further evaluated based on site acreage, location within the study area, the geologic unit in which the property is located, whether the property is located within the municipal water service area, and the regional supply well density of the surrounding area. The evaluation showed that 15 of the 19 prospective monitoring well locations were located within the municipal service area and that the majority of the properties were located at the northeastern portion of the study area. Additionally, the evaluation showed that the majority of the prospective monitoring well properties were located within either the OZgm, Opg, or Oc geologic units, which are classified as having either high or moderate well yield potential (Section 7.3.9). Only one prospective monitoring well property, the T. Benton Gayle Middle School property,

was located in a different geologic unit (Ygn). A well yield potential rating for the Ygn geologic unit was not assigned as part of this Groundwater Resources Evaluation due to a lack of well records within the Ygn formation. However, it is located in the area of geologic units with low well yield potential ratings. With the exception of a 0.50-acre parcel, property acreages ranged between 3.24–128.43 acres. Well development densities in the vicinity of the prospective monitoring well properties ranged between 0–151.5 supply wells per square mile. Table B-1 in Appendix B contains a list of the 19 prospective monitoring well properties, location information, and data that was used to evaluate the viability of the properties as monitoring well sites.

ECS identified four preferred monitoring well properties from the list of 19 prospective sites. These sites are as follows, in order of preferential ranking: (1) Willowmere Park property, (2) Radio Tower site, (3) T. Benton Gayle Middle School, and (4) vacant land near the intersection of Ramoth Church Road and Dog Patch Lane (Figure 24). Monitoring wells at these four sites would provide good spatial coverage of the study area and would be located within four separate geologic units (OZgm, Oc, Ygn, and Opg). Additionally, there appears to be sufficient space at these sites to install a monitoring well without impacting existing development. Two of the four sites are located outside of the municipal water service area and the other two sites are located within the municipal water service area, near its furthest extent. Well development densities in the vicinity of these four sites ranged between 8.9–26.6 supply wells per square mile. As such, the degree of supply well development in the vicinity of the sites was relatively low. Based on typical well depths within the study area, ECS estimates that it would be sufficient to drill prospective monitoring wells to a total depth of 350–400 feet. Measuring depth to groundwater in the well(s) on a daily basis using automatic data collection equipment over a long-term time period would provide an excellent indicator of groundwater level trends within the monitored portions of the study area.

In addition to the aforementioned prospective monitoring sites, Stafford County may want to consider obtaining access to install a monitoring well within the Lunga Reservoir Formation (Ol), where well development is high and well yields are relatively low. ECS's evaluation of county-owned land parcels revealed an absence of county-owned properties within the Lunga Reservoir Formation. ECS believes that it would be prudent to install a monitoring well within this formation to aid in assessing whether the relatively high degree of well development may be adversely impacting groundwater levels.

Although preferred monitoring well sites have been identified as part of this study, further evaluation would be recommended prior to installing monitoring wells at the selected location(s). ECS anticipates that further evaluation would include well siting and data collection methodology planning. Additionally, all monitoring wells should be logged by a Certified Professional Geologist during drilling to ensure that an accurate record of geologic conditions and water-bearing fractures is compiled. ECS estimates that it would cost approximately \$19,050 to install a 400-foot deep monitoring well, \$3,100 to purchase and install groundwater level monitoring equipment, and \$12,880 annually to conduct quarterly groundwater level data download events, equipment maintenance, and reporting. A breakdown of cost assumptions and estimated monitoring well installation and data collection costs are included in Appendix C.

8.2 Domestic Well Types and Regulations

8.2.1 Overview of Domestic Wells within Stafford County's Piedmont Region

A large number of Stafford County residents within the study area utilize private domestic wells for water supply. The Stafford County's well database indicates that approximately 91% of these wells are drilled and the remaining 9% are bored. Drilled wells within the Piedmont Province pump water from bedrock formations, whereas bored wells draw water from unconsolidated overburden material overlying bedrock. Drilled well advantages over bored wells include a lower risk of adverse impacts from short-term drought conditions and surface contamination (Bourne, 2001; Whitsell and Hutchinson, 1973). Additionally, bored wells are at a greater risk of requiring replacement over time due to a lack of water. An advantage of bored wells over drilled wells is that they typically have fewer problems associated with excessive mineralization. Overall, for most situations it is recommended that drilled wells be installed for domestic supply due to the more reliable water supply and greater protection from surface contamination. Currently, it is extremely rare for a bored well to be installed within the Piedmont portion of Stafford County, according to a representative with the Stafford County Environmental Health Department (personal communication, October 19, 2017) and Mr. Scott Miller with Northern Virginia Drilling, Inc., who provides drilling services in the study area (S. Miller, personal communication, October 19, 2017).

Drilled wells within Virginia's Piedmont Province are typically drilled using either a percussion or rotary hydraulic drilling rig where air, water, and sometimes additives are used to bring rock cuttings to the surface. Drilled wells are installed by drilling a surface boring through unconsolidated overburden sediment and into competent bedrock. Steel or polyvinyl chloride (PVC) casing is then installed within the surface boring and a portion of the annular space between the casing and boring is sealed using a cement- or clay-based grout. A typically 6-inch diameter production boring, although smaller or larger borings may also be drilled, is then drilled through bedrock until adequate water yield is encountered. A pumping system, which typically consists of a submersible pump, piping, and a pressure tank, is then installed and the well is chlorinated for disinfection purposes.

In the past, bored wells within Virginia's Piedmont Province were typically drilled with a large-diameter auger that is advanced until it is restricted by saturated sediment or hard geologic material. Sectioned concrete pipe is then installed within the boring and gravel is poured into the bottom of the pipe and into the saturated portion of annular space between the pipe and boring. Cement- or clay-based grout is then installed within the remaining annular space up to the ground surface. As with drilled wells, a pumping system, which typically consists of a submersible pump, piping, and a pressure tank, is then installed and the well is chlorinated for disinfection purposes. Bored wells are typically 24–36 inches in diameter.

8.2.2 Domestic Well Regulatory Requirement Summary

Domestic wells in Virginia are regulated under Virginia Administrative Code 12VAC5-630, titled Private Well Regulations. Domestic wells used for private water supply are considered Class III wells and are further classified as either Class IIIA, IIIB, or IIIC wells, depending on well depth, overburden sediment thickness, grout seal thickness, and type of well. Class IIIA wells must be drilled and cased to a depth of at least 100 feet, must penetrate at least 50 feet of unconsolidated, collapsing sediment, and must be

grouted to a minimum depth of 20 feet. Class IIIB wells must be drilled and cased to at least 50 feet and must be grouted to at least 50 feet. Class IIIC wells consist of drilled, bored, driven, or jetted wells that do not qualify as Class IIIA or IIIB wells.

Domestic wells are subject to setback requirements required under 12VAC5-630-380. All Class III wells must be setback, at a minimum, 10 feet from non-treated building foundations and 50 feet from termite-treated building foundations, house sewer lines, sewer mains, sewage systems, and sewage pre-treatment systems (i.e., septic tank). Additionally, Class IIIA and IIIB wells must be at least 50 feet from sewage disposal systems (i.e., septic drainfields, barnyards, etc.), cemeteries, and sewage dump stations, and Class IIIC wells must be at least 100 feet from these features. Some exemptions, which mainly pertain to situations where more protective sewage systems are constructed, do exist. Additional setback distances are required if a well will be installed down-gradient of potential sources of pollution, such as the aforementioned features, underground storage tanks, pesticide-treated soil, or other sources of physical, chemical, or biological contamination.

Class IIIA and IIIB wells must be drilled and cased to minimum depths of 100 feet and 50 feet, respectively. Class IIIC wells must be drilled and cased to a minimum depth of 20 feet or terminated at least one foot into bedrock when bedrock is encountered at a depth less than 20 feet. Exceptions pertaining to mandatory casing depths may be made for bored and driven Class IIIC wells under certain circumstances. Casing for Class IIIA and IIIB wells must be comprised of steel, stainless steel, or plastic and must extend at least one foot above the ground surface. A larger list of casing material options is available for Class IIIC wells, including concrete tile, clay tile, steel, and plastic. Well casings must extend at least one foot above the ground surface for all classes of domestic wells.

All Class III domestic wells must be grouted using either a cement grout, a mixture of bentonite and cement, or bentonite clay grout to seal the annular space between the well's casing and the boring wall. The installation of a grout seal is necessary to prevent surface water and contamination from entering the well. Class IIIA wells must be grouted to a minimum depth of 20 feet and Class IIIB wells must be grouted to a minimum depth of 50 feet. Class IIIC wells typically must be grouted to at least 20 feet, although exceptions exist for shallower wells and driven wells.

Any Class III domestic well that yields less than 3 gpm, as determined by a certified water well systems provider, must have the capacity to produce and store 150 gallons per bedroom per day and be capable of delivering a sustained flow of 5 gpm per connection. Domestic wells capable of yielding 3 gpm or more are not required to provide additional storage. Prior to using a well for domestic water supply, the entire system must be disinfected by maintaining a 100 milligrams per liter solution of chlorine in the well for 24 hours.

8.2.3 Domestic Well Best Practices

Proper domestic well construction and maintenance practices can protect groundwater resources and reduce the likelihood of contamination within a well. In addition to constructing domestic wells in accordance with Virginia water well regulations (see Section 8.2.2), several non-mandated best practices can be followed to protect a well's water quality and ensure that a well continues to operate properly.

A site-specific hydrogeologic evaluation of a property's groundwater resources can increase the chances of drilling a successful supply well. This is especially true in areas that are prone to low yielding or dry wells. Such services can be provided by Certified Professional Geologists at hydrogeologic consulting firms. Regarding well installation timeline, the National Groundwater Association recommends that property owners drill their well prior to building a house to ensure the availability of a viable water supply.

Hazardous chemicals, such as paint, fertilizer, oil, pesticides, and solvents should be stored at least 100 feet from domestic supply wells. Homeowners should also periodically inspect a well's cap and casing to ensure that the cap remains sealed and the casing is in good condition. Care should be taken when landscaping and working around a well, as damaged casing can allow contaminants to enter a well. Trees and shrubs should not be planted in the vicinity of a well, since tree roots can cause damage to the well (National Groundwater Association [NGWA], 2008).

A licensed water well system contractor or driller should always be contracted when a well is drilled, a pump is installed, or the system is serviced and cleaned (NGWA, 2008). Contracting a well driller to conduct these activities provides the well owner with an experienced professional who is trained in the proper installation and maintenance of domestic well systems. It is recommended that a licensed water system contractor be hired to conduct annual inspections of the pumping system, including pump performance, well seal/cap integrity, storage tanks, pressure tanks, and water treatment equipment (NGWA, 2008).

Water well systems can deteriorate over time and, as result, require periodic maintenance. A licensed water well system contractor or driller should be contracted at least once every five years to clean the well (NGWA, 2011). Although well chlorination may temporarily prevent gas production and other taste and/or odor issues, chlorination will not provide a long-term remedy if a well is in need of cleaning. Well cleaning should include the removal of the pump, removal of all debris from the well bottom, and brushing and cleaning the well casing and water-bearing zones within the well's production zone (NGWA, 2008). Additionally, the well should be flushed with proper chemicals to remove bacteria from within the aquifer in the vicinity of the well (NGWA, 2008). Finally, the cleaned well should be disinfected using a chlorine solution.

Water quality testing of domestic well water should be conducted annually. The USEPA recommends that domestic wells should be tested every year for total coliform bacteria, nitrates, total dissolved solids, and pH levels, especially following the repair or replacement of well system piping, casing, or pumps (USEPA, 2005). Additionally, sulfate, chloride, iron, manganese, hardness, and corrosion should be tested every three years if the well experiences taste, odor, and/or staining issues (USEPA, 2005). Nitrate concentrations should be tested in the early months of pregnancy and also within the first six months of a baby's life, as infants are susceptible to methemoglobinemia resulting from nitrate poisoning. Well water should be tested for lead if the owner suspects that the water system may contain lead piping. Additional chemicals of concern should be tested at least annually under certain circumstances; for example, wells located in proximity to gas stations or other handlers of hazardous waste should test their water for volatile organic compounds and other pertinent chemicals of concern.

Water quality sampling can be arranged by contacting a Virginia-accredited laboratory or an environmental consulting firm experienced in water quality sampling.

8.3 Utilization of Public Supply Wells

Many counties and cities within Virginia utilize groundwater as a source of public water supply. According to USGS county-level water usage data for 2010 (Maupin et al., 2014), 78 out of 134 counties/independent cities in Virginia utilize groundwater as a source of public water supply. Public supply groundwater withdrawals are listed as being greatest in Augusta County (5.87 mgal/day), Rockingham County (5.37 mgal/day), Suffolk City (4.99 mgal/day), and Roanoke City (4.86 mgal/day). Stafford County does not currently utilize public supply wells as a water source. All of the county's water is currently sourced from surface water features, such as Smith Lake, Lake Mooney, and the Rappahannock River.

Utilization of groundwater for public supply has several advantages and disadvantages in comparison to surface water. Some of the advantages of groundwater over surface water for public supply are that groundwater is typically less expensive to develop, operation and maintenance is typically less expensive, and environmental disruption associated with reservoir development is avoided (Veley, 1992). Additionally, groundwater obtained from confined aquifers is typically less susceptible to contamination than water obtained from streams and reservoirs. Some of the disadvantages of groundwater over surface water are that groundwater quantity and/or quality may be inadequate and groundwater source recharge areas require protection to prevent contamination (Veley, 1992). Overall, the decision to develop groundwater resources for public supply is oftentimes based on groundwater availability, as evidenced by three of the four largest public groundwater supply users in Virginia (Augusta County, Rockingham County, and Roanoke City) being underlain by karst geology, where high-yield wells are relatively common.

9.0 EXISTING VIRGINIA GROUNDWATER REGULATIONS

Land use measures involving hydrogeologic assessment standards have been adopted for use by several counties within Virginia's Piedmont and nearby Blue Ridge Province regions. A summary of specific examples has been provided below, including details regarding components of the adopted measures as well as their stated intent/purpose and authority. Based on this review of hydrogeologic assessment standards adopted by six counties in Virginia, it is apparent that different approaches have been taken by individual counties toward achieving their stated intent/purpose. Ordinances from the following six counties were reviewed: Albemarle, Fairfax, Fauquier, Orange, Loudoun, and Rappahannock. While this review provides a brief summary of general assessment details within each of the ordinances, copies of specific assessment standard text and/or ordinance text, along with their stated intent/purpose and stated authority from the respective ordinances, have been provided as Appendix D.

9.1 Albemarle County

Hydrogeologic testing requirements were adopted as Chapter 17 of the Albemarle County Code in 1998. Specific requirements are provided in Chapter 17 – Water

Protection Ordinance. Albemarle County's public service area is provided water by the Albemarle County Service Authority and the City of Charlottesville provides water within Charlottesville's city limits. The source of water for the public service area is surface water associated with reservoirs and river intakes. Groundwater is utilized to supply systems outside of the public service areas.

The County's Subdivision of Land Ordinance (Chapter 14) does reference groundwater assessment information required by Chapter 17 – Water Protection Ordinance. The following excerpt of text from the Chapter 14 – Subdivision of Land Ordinance has been provided:

Sec. 14-308.1 Groundwater Assessment Information.

Groundwater assessments required by section 17-402 shall be initiated by the program authority upon the submittal of the preliminary plat. The draft groundwater management plans and aquifer testing workplans required by sections 17-403 and 17-404, as applicable, shall be submitted in conjunction with the submittal of the preliminary plat. The requirements of sections 17-402, 17-403 and 17-404 shall be satisfied prior to final plat approval. (Ord. 04-14(1), adopted 12-8-04, effective 2-8-05; Ord. 05-14(1), 4-20-05, effective 6-20-05).

State law reference -- Virginia Code §15.2-2121.

9.1.1 Authorization

The hydrogeologic testing requirements are provided in Chapter 17 – Water Protection Ordinance of the County Code. The authority and purpose of the ordinance is identified in *Section 17-101 Authority* and *Section 17-102 Purpose*. The following text excerpt from Chapter 17, which also includes the short title of the ordinance, has been provided below.

Sec. 17-100 Short title.

This chapter shall be known and may be cited as the "Water Protection Ordinance."

(2-11-98; Code 1988, § 19.3-1; § 17-100, Ord. 98-A(1), 8-5-98)

Sec. 17-101 Authority.

Articles I through IX of this chapter are adopted pursuant to the authority conferred by the Virginia Stormwater Management Act (Virginia Code § 62.1-44.15:24 et seq.), as authorized by Virginia Code § 62.1-44.15:27, the Erosion and Sediment Control Law (Virginia Code § 62.1-44.15:51 et seq.), as ALBEMARLE COUNTY CODE 17-4 Supp. #31, 7-14 authorized by Virginia Code § 62.1-44.15:54, the regulations implementing the Virginia Stormwater Management Act and the Erosion and Sediment Control Law in 9VAC25-830 through 9VAC25-890, as applicable, including the general Virginia Pollutant Discharge Elimination System permit for discharges from the County's small municipal separate storm sewer system, and Virginia Code § 62.1-44.15:73, which is a part of the Chesapeake Bay Preservation Act (Virginia Code § 62.1-44.15:67 et seq.). (§ 7-1, 6-18-75, § 2, 2-11-87, 3-18-92; § 19.2-3, 6-19-91, § 3; § 19.3-2, 2-11-98; Code 1988, §§ 7-1, 19.2-3, 19.3-2; § 17-101, Ord. 98-

A(1), 8-5-98; Ord. 14-17(1), 5-7-14, effective 7-1-14). State law reference – Va. Code §§ 62.1-44.15:27, 62.1-44.15:54, 62.1-44.15:73; 9VAC25-830 through 9VAC25-890.

Sec. 17-102 Purposes.

The purposes of this chapter are to:

A. Protect public health, safety and welfare. Protect the health, safety and general welfare of the citizens of the County and the Commonwealth of Virginia.

B. Protect quality and quantity of State waters from unmanaged stormwater. Protect the quality and quantity of State waters from the potential harm of unmanaged stormwater and to effectively control soil erosion, sediment deposition and nonagricultural runoff by requiring control measures that will maintain, protect and improve the water quality and quantity of receiving State waters.

C. Protect property and natural resources. Prevent the unreasonable degradation of properties, stream channels, waters, and other natural resources.

D. Reduce pollution and illicit discharges to protect water quality. Establish a comprehensive program to manage sources of stormwater. Runoff from lands modified by human activities can harm surface water resources by, among other things, changing natural hydrologic patterns, increasing runoff velocity, and by elevating pollutant concentrations and loadings. Runoff may

contain or mobilize high levels of contaminants, such as sediment, suspended solids, nutrients, heavy metals, pathogens, toxins, oxygen-demanding substances, and floatables.

E. Sustainability of groundwater resources. Promote the long-term sustainability of groundwater resources.

F. Implement State laws. Implement the applicable parts of the State Water Control Law (Virginia Code § 62.1-44.3 et seq.), including the Virginia Stormwater Management Act (Virginia Code § 62.1-44.15:24 et seq.), as required by Virginia Code § 62.1-44.15:27, and the Erosion and Sediment Control Law (Virginia Code § 62.1-44.15:51 et seq.), as required by Virginia Code § 62.1-44.15:54, and the regulations implementing the Virginia Stormwater Management Act and the Erosion and Sediment Control Law in 9VAC25-830 through 9VAC25-890, as applicable, and as required thereby, including the general Virginia Pollutant Discharge Elimination System permit for discharges from the County's small municipal separate storm sewer system, and to provide for the proper administration and enforcement of this chapter.

(§ 7-1, 6-18-75, § 2, 2-11-87, 3-18-92; § 19.1-4, 9-29-77, art. I, § 1, 7-11-90; § 19.2-2, 6-19-91, § 2; § 19.3-3, 2-11-98; Code 1988, §§ 7-1, 19.1-4, 19.2-2, 19.3-3; § 17-102, Ord. 98-A(1), 8-5-98; Ord. 04-17(1), adopted 12-8-04, effective 2-8-05; Ord. 07-17(1), 2-14-07; Ord. 14-17(1), 5-7-14, effective 7-1-14)

State law reference – Virginia Code §§ 62.1-44.15:25, 62.1-44.15:52; 9VAC 25-870-40, 9VAC 25-870-46, 9VAC 25-870-400.

The subdivision ordinance *Section 14-308.1 Groundwater Assessment Information* provides state law reference *Virginia Code §15.2-2121*.

9.1.2 Summary of Requirements

Hydrogeologic testing requirements apply to the establishment of land uses that will rely on privately owned wells serving as the primary source of potable water having not more than two connections or central water supplies. The applicable requirements are determined by the development approval sought and the land uses within the development.

There are four tier levels of assessment which represent increasing levels of assessment depending on the number of subdivided lots and the water usage.

A Tier I Assessment consists of the owner drilling a well on the lot and submitting a well completion report with latitude and longitude coordinates to the program authority. The information must be received and deemed complete by the administrator prior to issuance of a building permit.

A Tier II Assessment consists of the program authority reviewing and evaluating the county's well database, available hydrogeologic studies, and information from the Virginia Department of Health and the Virginia Department of Environmental Quality. Based on the evaluation, the administrator may require that the owner provide additional groundwater assessment data or may require that a Tier III Assessment be submitted.

A Tier III Assessment consists of preparing and submitting a draft Groundwater Management Plan that complies with requirements of the Design Standards Manual to the program administrator for review. If the draft Groundwater Management Plan identifies special areas of concern, such as off-site resources of high groundwater sensitivity or previously unknown sources of contamination, then additional groundwater data may be required prior to receipt of site plan approval. A final Groundwater Management Plan must then be submitted to and approved by the program authority to receive site plan approval. Any structural best management practice must be bonded as a subdivision plat or site improvement. Based on findings of the Tier III Assessment, the program authority may require that a Tier IV Assessment be conducted to further address identified issues that are not adequately addressed by the Tier III Assessment.

A Tier IV Assessment consists of preparing a draft Groundwater Management Plan and an Aquifer Testing Plan, each of which must comply with the requirements for the plans within the Design Standards Manual. The aquifer testing plan must be approved prior to testing activity. Following aquifer testing, a final Groundwater Management Plan and Groundwater Assessment Report must be prepared. The final plan and report must be approved by the program administrator prior to the final subdivision plat or site plan approval. As with Tier III Assessments, any structural best management practice shall be bonded as a subdivision plat or site plan improvement.

9.1.3 Administration

Albemarle County previously utilized a groundwater resource manager to administer the groundwater assessment program. At this time, the administration is understood to be

assigned to engineering staff within the county's Department of Community Development.

9.2 Fairfax County

A review of the Fairfax County Code identified regulations regarding groundwater use within Chapter 70.1 – Private Water Well Ordinance, Chapter 113 – Water Use, Emergency Regulations, and within Chapter 9-0000 – Water and Fire Regulations of the Public Facilities Manual (2011). Fairfax Water is the primary supplier of public water within Fairfax County. The sources of public water supply are the Potomac River and the Occoquan Reservoir. Groundwater is used to supply water systems outside of the public service area.

9.2.1 Authorization

While specific stated authority was not identified within documents during the review of Fairfax County Code Chapters 70.1 and 113, and Chapter 9-0000 of the Public Facilities Manual, there was stated authority within the Subdivision Ordinance, which frequently cites the Public Facilities Manual. The stated title, intent and authority within the Subdivision Ordinance have been provided below:

Title

This ordinance shall hereafter be known, cited and referred to as the "Subdivision Ordinance" of Fairfax County.(9-75-23: 1961 Code § 123-1.1.)

Purpose and intent:.The subdivision of land is a privilege conferred upon the subdivider by the laws of the Commonwealth of Virginia and Fairfax County through this Subdivision Ordinance. It is the subdivider who is seeking to acquire the advantages of lot subdivision and upon him rests the duty of compliance with reasonable conditions laid down by the Board of Supervisors for design, dedication, improvement, and restrictive use of land so as to confirm to the adopted comprehensive plan for the physical and economical development of the County and for the safety and general welfare of the future plot owners in the subdivision and of the community at large. (9-75-23; 1 Code, 961§ 123-1.2)

Authority

The Board of Supervisors pursuant to the recommendation of the Planning Commission and public hearing held in accordance with Va. Code Ann., § 15.2-2204, does hereby exercise the police power conferred by Va. Code Ann. Title 15.2, Article 6 to assure the orderly subdivision of land, and the police power conferred by Va. Code Code Ann. § 15.2-2224 to implement the comprehensive plan of Fairfax County, and the general police power as conferred under Va. Code Ann. § 15.2-1200. (9-75-23; 1961 Code, § 123-1.3; 39-97-101.)

A title and purpose was provided within Fairfax County Code Chapter 70.1, which has been provided below:

Title

Chapter 70.1 – Private Water Well Ordinance

Section 70.1-1-2 Purpose

The purpose of this Chapter is to protect the public health and the environment through locating, designing, inspecting, and approving functional private well water supplies and to provide for the licensing/registration of well water supply contractors (4-05-70.1)

A purpose and/or authorization for Fairfax County Code Chapter 113 and Public Facilities Manual Chapter 9-0000 were not observed in the ordinance/regulation text reviewed.

9.2.2 Summary of Requirements

County Code Chapter 70.1 – Private Water Well Ordinance

This ordinance adopts the Commonwealth of Virginia State Board of Health Private Well Regulations (Section 70.1-1-3 – Adoption of the Commonwealth of Virginia State Board of Health Private Well Regulations). However, modifications to the Virginia State Board of Health regulations are also adopted, resulting in additional requirements. Among the additional requirements includes the need to install and test the quality of a private well before issuance of a building/zoning permit. Required well construction materials and well set-back distances are also specified. In addition, Fairfax County requires licensing for well drillers working within the county.

County Code Chapter 113 – Water Use, Emergency Regulations

Chapter 113 addresses the ability of the county to curtail water use by public water supply systems during conditions deemed to be a water emergency. The regulations provide a means for restricting certain types of water uses during a water emergency.

Public Facilities Manual Chapter 9-0000 – Water and Fire Regulation

These regulations pertain to the required use of public water supplies for subdivision lots and residential development of certain lot numbers and minimum sizes. The regulations include the required use of a public water supply approved by the appropriate agencies to serve subdivision lots of less than 75,000 square feet and in residential developments containing 20 or fewer lots that are 20,000 feet square in size or greater.

9.2.3 Administration

The Fairfax County Health Department manages the permitting of groundwater wells. Requirements from County Code regarding the use of public water supply for certain size subdivisions and for emergency water restrictions are believed to be enforced by other offices within Fairfax County's government.

9.3 Fauquier County

Hydrogeologic testing requirements were adopted as Section 18 of the Subdivision Ordinance in 1991. It is understood that the requirements were initiated in response to the failure of several public well systems located outside of the existing public service areas. With the exception of the Town of Warrenton, who utilizes two surface water reservoirs, public service areas outside of the town of Warrenton rely on groundwater for supply. Public service areas both inside and outside of the Town of Warrenton are operated by the Water and Sanitation Authority (WSA).

9.3.1 Authorization

Hydrogeologic testing requirements are implemented through the County's Subdivision Ordinance within Section 18 – Hydrogeologic Testing. While the ordinance does not provide a State Code cited authority, it does provide a purpose and intent. An excerpt from Section 1 – Purpose and Intent of the Subdivision Ordinance has been provided below.

Sec. 1 Purpose and Intent

The purpose of this Ordinance is to establish subdivision standards and procedures for the County of Fauquier, Virginia, and such of its environs as may be under the jurisdiction of the governing body.

This Ordinance is to guide and facilitate the orderly, beneficial growth of the community by assuring the orderly subdivision of land and its development, and to promote the public health, safety, convenience, comfort, prosperity, and general welfare.

The Ordinance is known and may be cited as "Subdivision Ordinance of Fauquier County, Virginia, 1968".

9.3.2 Summary of Requirements

Hydrogeologic testing requirements are based on the number and size of lots within the planned subdivision, as well as the location of the planned subdivision. These requirements must be completed prior to the review of the preliminary plat for any new residential subdivision consisting of lots less than one acre in size, for residential district subdivisions that have seven or more lots, regardless of size, and for any subdivision within a public service area. The requirements also apply to any commercial or industrial subdivision that will extract more than 10,000 gallons of groundwater per day.

The hydrogeologic testing requirements include the preparation of a Testing Proposal, which is submitted to the county. The Testing Proposal must be approved in writing by the county and the WSA prior to the commencement of work. Pumping testing is required on a minimum of three wells, or on 30% of the proposed lots. The test duration is 48 hours for each well. A report is required that includes a groundwater budget analysis, documents adequacy of supply, and includes a calculated effect of all wells pumping at a normal daily consumption rate on the piezometric surface. A proposal pertaining to dealing with wells that have inadequate yield is also required within the report. A recommended operation plan is required for community wells.

9.3.3 Administration

Both the county and the WSA are tasked with reviewing and approving submitted work plans and reports. The county is understood not to have a hydrogeologist on staff and may utilize the services of a third party consultant when necessary.

9.4 Orange County

Hydrogeologic testing requirements were adopted within the Subdivision Ordinance of Orange County in 2010. Specific requirements are provided in Chapter 54 of the County Code. The Town of Orange and the Rapidan Service Authority provides public water

within portions of the county, including the Town of Orange and Gordonsville. The majority of the water is from surface water withdrawal, although some groundwater wells are also used. Groundwater is utilized to supply systems outside of the public service areas.

9.4.1 Authorization

Hydrogeologic testing requirements are implemented through the County's Subdivision Ordinance, Chapter 54 – Article VIII Hydrogeologic Test Requirements. A purpose is provided within Section 54-2, and both a stated authority and purpose are included within Section 54-211. An excerpt from these referenced sections is provided below:

Sec. 54-2 Purpose

This chapter is adopted pursuant to Code of Virginia, §§ 15.2-2240 et seq., which empowers any county in the commonwealth to "... adopt an ordinance to assure the orderly subdivision of land and its development." (Ord. of 3-9-2010).

Sec. 54-211 Authority and Purpose

To safeguard the public health and welfare, the county must protect the groundwater and ensure that new development will not unreasonably reduce the water supply of existing development. Hydrogeologic testing consistent with this standard is required to implement section 54-202, and to provide the county with the necessary information on which to base sound judgments in the review of applications for subdivision approval.

9.4.2 Summary of Requirements

Hydrogeologic testing requirements are based on the presence of unique geologic formations and the size of the planned subdivision. At least one test must be performed in each geologic unit or for each 50 acres. A Testing Proposal is required and must be submitted to the county. The proposal must be approved prior to the commencement of work. A 72-hour pumping test is required on each test well and two observation wells are required per test. A report must be prepared to include projected effects on the piezometric surface of all wells pumping at 300 gallons per day per lot, recharge and outflow from each geologic unit within the subdivision, net water consumption of the subdivision, and results of laboratory testing. Where both private wells and/or community wells are planned, the report must show that the geologic formation in which the wells are located are capable of producing 2 gpm per connection.

9.4.3 Administration

Orange County zoning officials are tasked with reviewing and approving submitted work plans and reports. The county is understood not to have a hydrogeologist on staff and may utilize the services of a third party consultant when necessary.

9.5 Loudoun County

Loudoun County first adopted hydrogeologic testing standards as policy in 1986 and in 1988 they were officially adopted into the county's Facility Standards Manual (FSM) as Section 6.200 – Hydrogeologic Testing. Testing outlined with Section 6.200 is designed to enable an evaluation of groundwater quantity and quality and the potential effects that a proposed land development would have on water resources.

The hydrogeologic testing standards are implemented through the Land Subdivision and Development Ordinance, which includes Chapters 1241–1246 of the County Code and the county's FSM. Loudoun County is believed to be among the first, if not the first, county in Virginia to adopt hydrogeologic testing standards.

Loudoun Water provides public water service to the county outside of incorporated towns. Loudoun water utilizes surface water withdrawal. Groundwater wells are also understood to be utilized within some small towns and outside of the public service area.

9.5.1 Authorization

The hydrogeologic testing standards are outlined within Loudoun County's Land Subdivision and Development Ordinance. The stated authority of the ordinance is identified in Chapter 1241 under General Provisions and Definitions. The following excerpt of text from Chapter 1241 is provided below:

Land Subdivision and Development Ordinance

Chapter 1241

General Provisions and Definitions

Sec. 1241.01 Authority

This Ordinance is authorized under Title 15.2, Chapter 22, Article 6 (Subdivision) and Article 7 (Zoning) of the Code of Virginia, 1950, as amended.

Sec. 1241.02 Title

This Ordinance shall hereafter be known and referred to as the "Land Subdivision and Development Ordinance of Loudoun County, Virginia." It shall consist of Chapters 1241 through 1246 of the Codified Ordinances of Loudoun County and the Loudoun County Facilities Standards Manual.

The authority of the ordinance is also identified in Section 1.0 Authority of the Loudoun County FSM. An excerpt from this section is provided below.

"Each land development application shall conform to the current stormwater management technical criteria in Chapter 5 of this manual, unless subject to 9VAC25-870-47 or grandfathered in accordance with the Virginia Stormwater Management Program (VSMP) grandfathering provisions of Chapter 1096 of the Codified Ordinances (and 9VAC25-870-48). Land development applications that are grandfathered shall meet the technical criteria of Part II.C (9VAC25-870-93 through 9VAC25-870-99)".

Loudoun County is also identified as having legislative authority to develop standards for private wells within the *Code of Virginia* §§ 32.176.4 *Powers and Duties of Board and Department; regulations; fees.*

9.5.2 Summary of Requirements

The standards are required and specifically defined for four general types of land development applications: (1) residential development not served by central water and

sewer (divided further into wells on individual lots and those with communal systems), (2) solid waste facilities, (3) resource extraction areas (quarries/mines), and (4) other types such as certain industrial, irrigation, commercial and recreational development.

Hydrogeologic testing is required for any new subdivision with 10 or more lots of less than 10 acres. If nine or less of the 10+ proposed lots are less than 10 acres, then 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. Additionally, hydrogeologic testing is required for all communal water systems. To add clarification to the requirements, the FSM includes a flow chart that identifies the types of water systems and the respective requirements (Figure 6.210-1 of the FSM).

Section 6.200 of the FSM requires a background information section for each type of land use. The background section includes an evaluation of hydrogeology based on the use of readily available existing resources. The background section requirements are more comprehensive for communal water systems and include a groundwater budget analysis and the completion of geophysical surveys. Pumping testing is also required on communal wells and, in some cases, on planned subdivisions using individual wells. The aquifer testing requirements are triggered by the size of the proposed lots. Testing is not required if proposed lots are greater than 10 acres and are serviced by individual wells.

9.5.3 Administration

Work plans and reports are reviewed by Loudoun County personnel within the Department of Building and Development. The county has a hydrogeologist on staff to perform reviews.

9.6 Rappahannock County

Rappahannock County adopted hydrogeologic assessment standards within their County Code in 1996. The county is rural in nature and, with the exception of the Town of Washington, no large-scale public water facilities exist. Groundwater is understood to be the sole source of water supply for residents within the county.

9.6.1 Authorization

Hydrogeologic testing requirements are implemented through the County Code, specifically the following: (1) Chapter 147 – Subdivision of Land, Article IV, (2) Section 147-20 – Public Water and Sewer, and (3) Section 147-21 – Private water and/or sewer. The purpose and authority is provided in Section 147-1 and an excerpt from this chapter has been provided below.

Chapter 147 – Subdivision of Land

Article I. General Provisions

Sec.147-1. Purpose and Authority

The purpose of this chapter is to establish certain subdivision standards and procedures for Rappahannock County, Virginia, and such of its environs as come under the jurisdiction of the governing body as provided for pursuant to Title 15.2, Chapter 22, Article 6, Land Subdivision and Development, § 15.2-2240 et seq., of the Code of Virginia 1950, as amended. [Amended 2-2-2015].

These are part of a long-range plan to guide and facilitate the orderly beneficial growth of the community and to promote the public health, safety, convenience, comfort, prosperity and general welfare. More specifically, the purposes of these standards and procedures are to provide a guide for the change that occurs when lands and acreage become urban in character as a result of development for residential, business or industrial purposes, to provide assurance that the purchasers of lots are buying a commodity that is suitable for development and use and to make possible the provision of public services in a safe, adequate and efficient manner. It is essential that no changes resulting from subdivisions or partitions of land within the County violate the purpose and intent of Chapter 170, Zoning, of the Code of Rappahannock County. Land management must protect and encourage the agricultural, conservation, recreational, and aesthetic characteristics which are the predominant assets of Rappahannock County. This chapter assists the County in meeting those responsibilities.

Sec.147-2. Title

This chapter is known and may be cited as the "Rappahannock County Subdivision Ordinance of 1987" or "1987 Subdivision Ordinance of Rappahannock County, Virginia." This chapter supersedes the ordinance known as the "Subdivision Ordinance of Rappahannock County, Virginia, 1973," as amended.

9.6.2 Summary of Requirements

The type of water distribution systems are determined by the number and size of the lots within a planned subdivision. Subdivisions with lots of five acres or less, in subdivisions of five lots or more, shall be required to provide water distribution systems. In subdivisions of 10 lots or more, each of which is five acres or less in size, the subdivision shall provide both water distribution and sewage collection systems.

Hydrogeologic testing is required for any new residential subdivision of three or more lots if any lot is less than five acres. In residential districts, any subdivision of 10 or more lots, regardless of size, are required to undergo hydrogeologic testing. Any commercial or industrial subdivision that will extract more than 10,000 gallons per day is also subject to hydrogeologic testing requirements.

Hydrogeologic testing requirements include the preparation of a Testing Proposal, which is submitted to the Zoning Administrator. The Testing Proposal must be approved in writing by the Zoning Administrator prior to the commencement of work. Pumping testing is required on a minimum of three wells or 30% of the proposed lots. The test duration is 48 hours for each well. A report is required that includes a groundwater budget analysis, documents adequacy of supply, and includes a calculated effect of all wells pumping at a normal daily consumption rate on the piezometric surface. A proposal pertaining to dealing with wells that have inadequate yield is also required within the report.

9.6.3 Administration

The county's Zoning Administrator receives documents for review and issues approval. The county is understood to not have a hydrogeologist on staff and may utilize the services of a second party consultant for technical document review when necessary.

9.7 Comparison of Hydrogeologic Assessment Standards

ECS has compiled hydrogeologic assessment requirements for six counties, as well as each ordinance's stated intent/purpose and stated authority, as part of this regulatory review. A tabulated summary with general information related to each county ordinance has been provided in Table 19.

Requirements within the ordinances can have an effect on the design of new proposed subdivisions. Assessment standards do represent an expense to the developer, and it is understood that oftentimes new proposed subdivisions are designed such that certain assessment standards can be avoided. An example scenario would be illustrated by an assessment standard requiring new subdivisions with greater than 10 lots to undergo hydrogeologic assessment. In this scenario, the developer may opt to propose a new subdivision with only nine lots in an effort to avoid additional work and expense associated with assessment standards. Assessment standards for planned community well systems are usually the most stringent and together with costs associated with the construction and operation of a community water system, may create a desire from the developer to utilize individual wells when possible. Rappahannock represents the only county among those evaluated that actually requires community water distribution systems and sewage distribution systems based on the number and size of the parcels within the proposed development. Such a requirement may deter development of new subdivisions within a very rural county, based on the associated expense of implementing both water and sewer distribution systems. Fairfax County has a requirement for public water supply for subdivisions, based on the number and size of the lots. Albemarle County and Fairfax County ordinances both require the completion of a well prior to issuance of a building and/or zoning permit.

Of the six counties reviewed, hydrogeologic testing requirements were implemented within the subdivision ordinances of four of the six counties. Albemarle County's testing requirements were implemented within a Groundwater Protection Ordinance. However, their Groundwater Protection Ordinance was referenced within their Subdivision Ordinance. Fairfax County adopted Commonwealth of Virginia Private Well regulations within their Private Water Well Ordinance. The Private Water Well Ordinance is not part of the Subdivision Ordinance. However, Water and Fire regulations within the Public Facilities Manual addressed requirements for public water systems based on the number and size of subdivision or residential development lots. The Public Facilities Manual was referenced within the Subdivision Ordinance.

The Counties of Loudoun, Orange and Rappahannock reference Virginia Code §15.2-2240 as part of their stated authority. A copy of Virginia Code §15.2-2240 has been provided in Appendix E. Fauquier County does not reference the Virginia Code but does use text that includes: "the orderly subdivision of land", which appears to be based on similar language within Virginia Code §15.2-2240. The County of Albemarle references

Table 19: Summary of Hydrogeologic Assessment Standards.

County	General Assessment Details	Authority or Stated Purpose (includes excerpts from ordinance text)
Albemarle	<ul style="list-style-type: none"> a) Drill well prior to receiving building permit. b) Requires development of a Groundwater Management Plan (to include testing plan if applicable). c) Tiered approach toward assessment requirements for residential use, non-residential use (2,000 gallon per day (gpd) average), and community water systems. d) Pumping tests 48-72 hour duration. e) Best Management Plan (BMP) structures required to be bonded to plat or site plan. 	<p><i>Articles I through IX of this chapter are adopted pursuant to the authority conferred by the Virginia Stormwater Management Act (Virginia Code § 62.1-44.15:24 et seq.), as authorized by Virginia Code §62.1-44.15:27, the Erosion and Sediment Control Law (Virginia Code § 62.1-44.15:51 et seq.), as ALBEMARLE COUNTY CODE 17-4 Supp. #31, 7-14 authorized by Virginia Code § 62.1-44.15:54, the regulations implementing the Virginia Stormwater Management Act and the Erosion and Sediment Control Law in 9VAC25-830 through 9VAC25-890, as applicable, including the general Virginia Pollutant Discharge Elimination System permit for discharges from the County's small municipal separate storm sewer system, and Virginia Code § 62.1-44.15:73, which is a part of the Chesapeake Bay Preservation Act (Virginia Code § 62.1-44.15:67 et seq.). (§ 7-1, 6-18-75, § 2, 2-11-87, 3-18-92; § 19.2-3, 6-19-91, § 3; § 19.3-2, 2-11-98; Code 1988, §§ 7-1, 19.2-3, 19.3-2; § 17-101, Ord. 98-A(1), 8-5-98; Ord. 14-17(1), 5-7-14, effective 7-1-14).</i></p> <p><i>State law reference – Virginia Code §§ 62.1-44.15:27, 62.1-44.15:54, 62.1-44.15:73; 9VAC25-830 through 9VAC25-890.</i></p> <p><i>The subdivision ordinance Sec. 14-308.1 – Groundwater Assessment Information</i></p>
Fairfax	<ul style="list-style-type: none"> a) Adopts Private Well Regulations from Commonwealth of Virginia with some additional requirements. b) Drill well and test water quality prior to issuance of building/zoning permit. c) Public water supply systems required based on size of planned subdivision of residential development. d) Emergency water regulations enable County Administrator to require restriction of water use by public water systems during water emergencies. 	<p><i>Chapter 70.1 Private Water Well Ordinance</i></p> <p><u><i>Section 70.1-1-2 Purpose</i></u> <i>The purpose of this Chapter is to protect the public health and the environment through locating, designing, inspecting, and approving functional private well water supplies and to provide for the licensing/registration of well water supply contractors. (4-05-70.1)</i></p>

County	General Assessment Details	Authority or Stated Purpose (includes excerpts from ordinance text)
Fauquier	<ul style="list-style-type: none"> a) Testing proposal required. b) Testing on three wells or 30% of lots. c) Applies to any subdivision with lots less than one acre. d) Applies to any subdivision with seven or more lots in a residential district. e) Applies to commercial/industrial subdivision uses of greater than 10,000 gpd. f) 48-hour duration pumping test. 	<p><u>Sec. 1 Purpose and Intent</u> <i>The purpose of this Ordinance is to establish subdivision standards and procedures for the County of Fauquier, Virginia, and such of its environs as may be under the jurisdiction of the governing body.</i></p> <p><i>This Ordinance is to guide and facilitate the orderly, beneficial growth of the community by assuring the orderly subdivision of land and its development, and to promote the public health, safety, convenience, comfort, prosperity, and general welfare.</i></p>
Loudoun	<ul style="list-style-type: none"> a) Applies to 10 or more lots of less than 10 acres. b) If nine or less of the 10+ proposed lots are less than 10 acres, then 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. c) Applies to any community water system. d) 8-hour duration pumping test for individual wells. e) 72-hour duration pumping test for community wells. f) Observation well locations to be approved by county. 	<p><u>Sec. 1241.01 Authority</u> <i>This Ordinance is authorized under Title 15.2, Chapter 22, Article 6 (Subdivision) and Article 7 (Zoning) of the Code of Virginia, 1950, as amended.</i></p> <p>Loudoun County is also identified as having authority to develop standards for private wells within the Code of Virginia § 32.176.4 – <i>Powers and Duties of Board and Department; regulations; fees.</i></p>
Orange	<ul style="list-style-type: none"> a) Testing proposal required. b) One test well per geologic formation or one test well every 50 acres. c) 72-hour duration pumping test. d) 2 gpm per connection requirement. 	<p><u>Sec. 54-2 Purpose</u> <i>This chapter is adopted pursuant to Code of Virginia, §§ 15.2-2240 et seq., which empowers any county in the commonwealth to "... adopt an ordinance to assure the orderly subdivision of land and its development."</i></p>

County	General Assessment Details	Authority or Stated Purpose (includes excerpts from ordinance text)
Rappahannock	<ul style="list-style-type: none"> a) Testing proposal required. b) Applies to any subdivision with three or more lots if one lot is less than five acres. c) Applies to any subdivision with 10 or more lots within a residential district. d) Applies to commercial/industrial subdivision uses of greater than 10,000 gpd. e) Testing on three wells or 30% of lots. f) 48-hour duration pumping test. g) Use of central water and sewer linked to number of lots and their size. 	<p><u>Sec.147-1. Purpose and Authority</u> <i>Title 15.2, Chapter 22, Article 6, Land Subdivision and Development, § 15.2-2240 et seq., of the Code of Virginia 1950, as amended.</i></p>

Virginia Code §15.2-2121 within their Subdivision Ordinance and also references Virginia Code §§ 62.1-44.15:25, 62.1-44.15:52; 9VAC 25-870-40, 9VAC 25-870-46, 9VAC 25-870-400 as authority within their groundwater ordinance. A copy of Virginia Code §15.2-2121 has also been included in Appendix E. The Fairfax County Subdivision Ordinance references Virginia Code §15.2-2224 as part of their stated authority. A reference of authority was not identified for Fairfax County's Private Water Well Ordinance or the Water Use, Emergency Regulations Ordinance. In addition to reference of *Virginia Code §15.2-2240.*, the County of Loudoun was also identified as having authority to develop standards for private wells within Virginia Code §§ 32.176.4 – *Powers and Duties of Board and Department; regulations; fees.* A copy of Virginia Code §§ 32.176.4 has also been provided in Appendix E.

9.8 Adoption of Hydrogeologic Testing Standards

Counties within Virginia's Piedmont and nearby Blue Ridge Province regions have adopted hydrogeologic testing standards and/or ordinances that address use of groundwater. Hydrogeologic testing standards and/or groundwater regulations were either adopted within a Subdivision Ordinance or within a specific groundwater-related ordinance in all six of the counties reviewed during this study. The Subdivision and/or Groundwater Ordinances cited either Code of Virginia Law as authorization or text that appeared to be based on Code of Virginia Law. Albemarle County's Hydrogeologic Assessment Standards are located within a Groundwater Protection Ordinance and they appear to focus on Groundwater Management. Their stated authorization cites Virginia Code that references Virginia Stormwater Management Programs (*Virginia Code §§ 62.1-44.15:25, 62.1-44.15:52, 9VAC 25-870-40, 9VAC 25-870-46, 9VAC 25-870-400*).

The effectiveness of hydrogeologic testing standards and/or ordinance language hinges largely on the purpose and intent of the regulation and the ability to utilize the findings from the assessment to achieve that purpose. The process for a county considering the development and adoption of hydrogeologic testing standards and/or groundwater ordinances should be guided by an attorney familiar with Virginia law. Identifying the intent and purpose of the testing standards and/or ordinances, as well as the authority to implement the standards, is deemed to be of the utmost importance. Review of existing assessment standards, as well as their stated intent/purpose and authority, would be expected to provide useful information that could be used to aid in the planning and/or development of new assessment standards by a county government.

10.0 CONCLUSIONS

ECS is pleased to provide this report documenting our findings from a Groundwater Resources Evaluation of the Piedmont Aquifer in Stafford County. The purpose of this study was to provide a comprehensive evaluation of Stafford County's Piedmont Aquifer with a focus on better understanding the aquifer's capacity as a water resource and current usage of the resource. The study's findings are intended to be used as a tool for aiding future land use and planning decisions. The Groundwater Resources Evaluation consisted of the following tasks: (1) conducting a literature review, (2) calculating the study area's hydrologic budget, (3) quantifying the Piedmont Aquifer's maximum capacity and current groundwater withdrawals, (4) evaluating well record information to identify potential correlations between well yield and several analyzed parameters, (5)

examining groundwater monitoring options and domestic well best practices, and (6) reviewing existing groundwater withdrawal regulations in other counties located within the Piedmont Province or nearby Blue Ridge Province.

The study area consists of the Piedmont Province portion of Stafford County. Virginia's Piedmont Province extends from the Blue Ridge Mountains on the west to the Coastal Plain Province on the east. Bedrock within the Piedmont Province generally consists of hard, resistant igneous rock and metamorphosed igneous and sedimentary rock, although sedimentary basin deposit formations are also present in distinct areas of the Piedmont. Consolidated bedrock within the Piedmont Province is overlain by unconsolidated regolith and/or saprolite of variable thickness.

Two separate Stafford County supply well databases were instrumental in completing this Groundwater Resources Evaluation. These databases have been referred to within this report as the Attribute Data Well Database and the Non-Attribute Piedmont Well Database. Stafford County's Attribute Data Well Database contains information from a total of 1,801 georeferenced well records within the study area and was compiled as part of two separate digitization efforts. The first well log digitization effort was completed as part of the 2004 Stafford County Groundwater Management Plan project and the second well log digitization effort was completed as part of this Groundwater Resources Evaluation. Information from numerous data fields within the well logs, including well yield, well depth, casing depth, casing intervals, parcel identification, address, etc., is contained within the Attribute Data Well Database. Conversely, Stafford County's georeferenced Non-Attribute Piedmont Well Database contains 4,940 well records that lack well construction and performance information, but do contain information pertaining to the physical locations of the wells. By combining the aforementioned well databases it was possible to calculate a total of 6,741 known or suspected supply wells within the study area.

ECS utilized the aforementioned supply well databases to estimate current groundwater withdrawals within the study area. Evaluation of well database information, in addition to several other data resources, revealed that the vast majority of groundwater withdrawals in the study area are for domestic water supply. Of the estimated 1.62 mgal/day of groundwater withdrawn from the study area, approximately 96.3% of this water is used for domestic supply. The remaining 3.7% is used for industrial, irrigation, and livestock watering purposes.

A mass-balance hydrologic budget of the study area was developed under both normal and drought conditions by ECS using the aforementioned groundwater withdrawal estimates, climate data, stream baseflow data, and data contained within pertinent geologic publications. ECS found that groundwater withdrawals under normal conditions comprise approximately 0.72% of total outflow from the study area. The vast majority of hydrologic outflow from the study area is from evapotranspiration (64.4%), groundwater seepage to streams (22.7%), and stormwater runoff to streams (10.7%) under normal conditions.

The hydrologic budget, groundwater withdrawal estimation information, and 7Q10 stream baseflow data were used to assess whether additional groundwater could be pumped from the Piedmont Aquifer without detrimentally impacting the hydrologic system. A modified version of groundwater appropriations criteria utilized by the MDE

for fractured crystalline rock aquifer systems was utilized to assess the Piedmont Aquifer's maximum safe yield. The MDE version was modified to add two significant conservation factors. As such, the safe yield value calculated as part of this study is greater than ten times more conservative than the non-modified MDE calculation method. Overall, the maximum safe yield calculations revealed that an additional 6,500 households within the study area could withdraw groundwater at typical residential usage rates without causing significant negative impacts to the study area's hydrologic system.

ECS utilized Stafford County's Attribute Data Well Database to evaluate spatial variations in well yield and the relationship between well yield and a variety of natural and well construction factors. The purpose of this analysis was to characterize drilled well yields throughout the study area and assess potential correlations between well yield and several natural and well construction-related factors. Drilled well yields throughout the study area were evaluated in relation to bedrock lithology, well depth, casing depth as a proxy for unconsolidated overburden thickness, proximity to streams, well density, elevation, and topographic slope.

Findings from the well yield analysis revealed that well yield and the occurrence of low-yielding wells appear to be strongly influenced by the geologic composition of the aquifer into which the wells are drilled. ECS classified each geologic unit as having either a high, moderate, low, or unclassified well yield potential, based on the median well yields and the percentages of low-yielding wells (i.e., wells with yields less than 3 gpm) in each geologic unit. Relatively high-yielding geologic units with low occurrences of low-yielding wells include the Oc, O(C)p, and O(C)u geologic units. Moderately-yielding geologic units with moderate occurrences of low-yielding wells include the Opg and OZgm units. Low-yielding geologic units with high occurrences of low-yielding wells include the Oq, Oam, Sf, and Ol units. Overall, 23.37% of the study area is comprised of geologic units with high potential well yields, 40.13% of the study area is comprised of geologic units with moderate potential well yields, 25.48% of the study area is comprised of geologic units with low potential well yields, and the remaining 11.03% of the study area is unclassified. However, 55.77% of the land within the unclassified units is located within the municipal water service area, where extensive future groundwater development is unexpected. As such, only 4.88% of the study area is located in an unclassified zone outside of the municipal water service area. It is important to note that potential well yield ratings are approximations based on available well record data and are not a guarantee that such conditions exist throughout the geologic unit. Zones of low-yielding wells are documented to exist within high potential yield zones, and conversely, zones of high-yielding wells exist within low potential yield zones. Site-specific evaluation would be required to more accurately assess well yield potential at a given site.

Evaluation of well yield in relation to well depth revealed that yields appear to progressively decline with increased well depth. This is most likely a result of low-yielding wells being advanced to greater depths to provide additional water storage and to attempt to encounter additional water. Surface casing depth can provide an estimate of unconsolidated overburden thickness, as surface casing is typically installed a few feet into stable bedrock through unconsolidated sediment and/or saprolite. Well yields appear to be negatively impacted when less than 50 feet of overburden/saprolite is present, as well yields are lower and the occurrence of low-yielding wells is higher than

when casing is deeper. Well yields and the occurrence of low-yielding wells are comparable when surface casing is installed to depths exceeding 50 feet. Evaluating well yields in relation to proximity to streams, supply well density, elevation, and topographic slope showed that only minor correlations or an absence of correlations exist. A minor relationship does appear to exist between the yields of wells installed prior to the year 2000 and wells installed since 2000. The evaluation of well yield as a function of drilled well installation year revealed that wells installed since 2000 generally have yields that are slightly higher than or equal to that of wells installed prior to 2000. As such, there does not appear to be evidence that increased well development within the Piedmont Province of Stafford County has adversely impacted the well yields of more recently installed wells within this area.

Using monitoring wells to measure long-term groundwater levels can be an effective way to differentiate short-term, weather-induced groundwater level fluctuations from long-term trends that could be indicative of over-pumping or climate-induced shifts. Currently, there are no known public groundwater monitoring wells within the Piedmont portion of Stafford County. ECS evaluated 217 county-owned properties within the study area to assess the viability of prospective monitoring well locations. The evaluated properties consisted of vacant land, schools, radio tower sites, undeveloped floodplains, surface water, libraries, parks, county-owned apartments, municipal buildings, etc. Potential groundwater monitoring locations were evaluated based on proximity to surface water features, parcel size, proximity to the Coastal Plain Province, existing site developments, geologic unit, whether the site is located within or outside of the municipal water service area, and the regional supply well density of the surrounding area. ECS identified four preferred monitoring well target properties from the list of 217 county-owned properties. These sites include the Willowmere Park property, a radio tower site, T. Benton Middle School, and a vacant land parcel located near the intersection of Ramoth Church Road and Dog Patch Lane. ECS also recommends that Stafford County consider obtaining access to install a monitoring well within the Lunga Reservoir Formation (OI) to aid in assessing whether the area's relatively high degree of well development may be adversely impacting groundwater levels within the formation. Although preferred monitoring well sites have been identified as part of this study, further evaluation would be recommended prior to installing monitoring wells at the selected location(s). Estimated costs for monitoring well installation and ongoing groundwater level data collection have been provided within an appendix to this report.

Land use measures involving hydrogeologic assessment standards have been adopted for use by several counties within Virginia's Piedmont and Blue Ridge Province regions. ECS identified and reviewed ordinances from Albemarle, Fairfax, Fauquier, Orange, Loudoun, and Rappahannock Counties to provide a summary of general assessment details. Hydrogeologic testing standards and/or groundwater regulations were either adopted within a Subdivision Ordinance or within a specific groundwater-related ordinance in all six of the counties reviewed during this study. The Subdivision and/or Groundwater Ordinances cited either Code of Virginia Law as authorization or text that appeared to be based on Code of Virginia Law. Stated authorization was not identified within all reviewed ordinances. The process for a county considering the development and adoption of hydrogeologic testing standards should be guided by an attorney familiar with Virginia law.

11.0 LIMITATIONS

The work performed in conjunction with this project, and the data developed, are intended as a description of available information at the specified locations and dates. Generally accepted industry standards were used in the preparation of this report. This Groundwater Resources Evaluation was intended to evaluate the study area's hydrologic budget, existing groundwater usage, spatial well yield characteristics, etc. based largely on existing data and information. As such, the evaluation is dependent on the accuracy of utilized data and records. Well yield geologic unit rankings presented within the report are meant to provide a general approximation of conditions. Site-specific conditions may vary.

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Figures

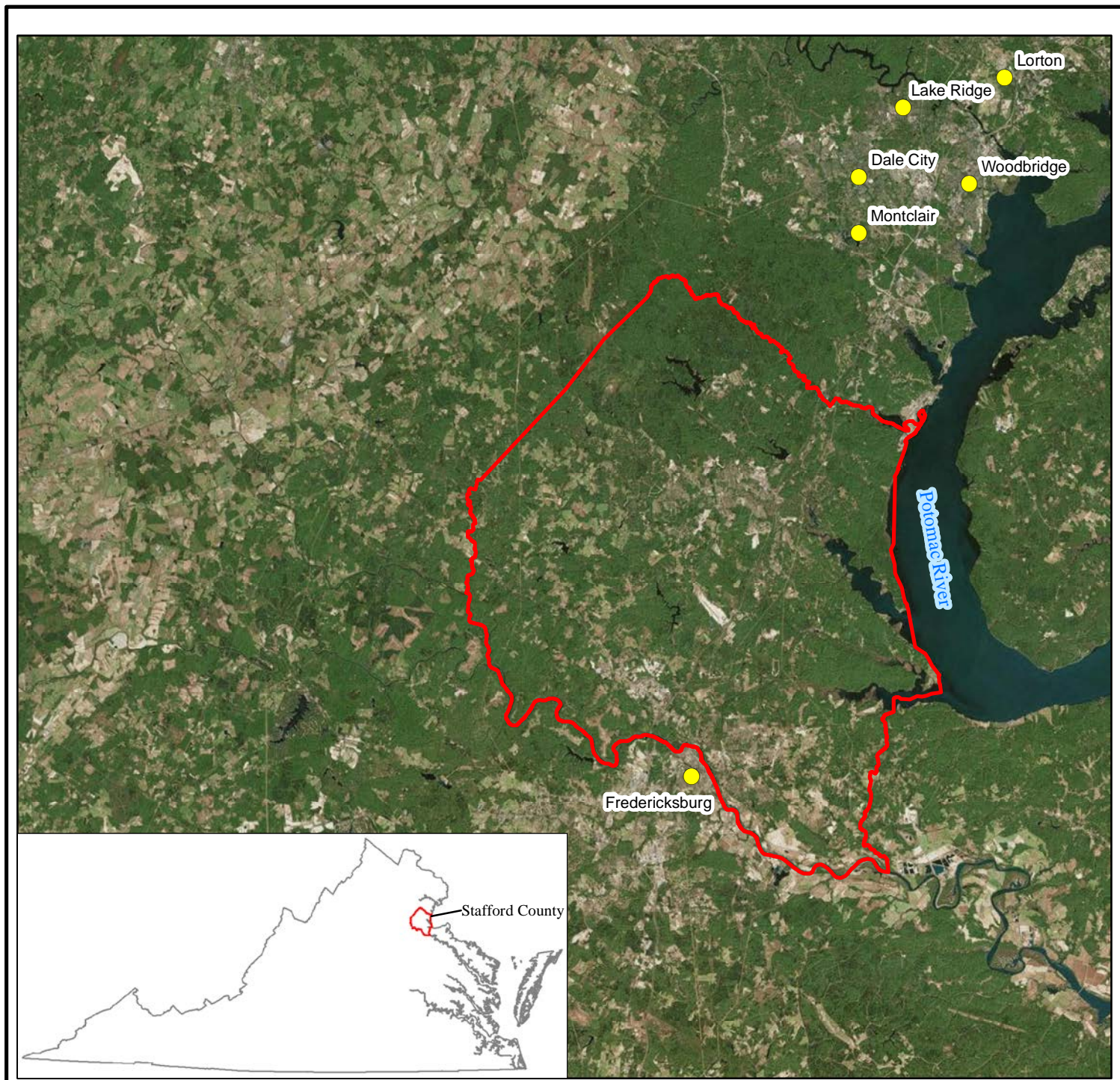


Figure 1: Stafford County and Vicinity Aerial Map

Legend

- Stafford County
- City (Population 10,000+)

Groundwater Resources Evaluation
Piedmont Province
Stafford County, VA

0 3 6 12
Miles



ECS Project No. 47-4330

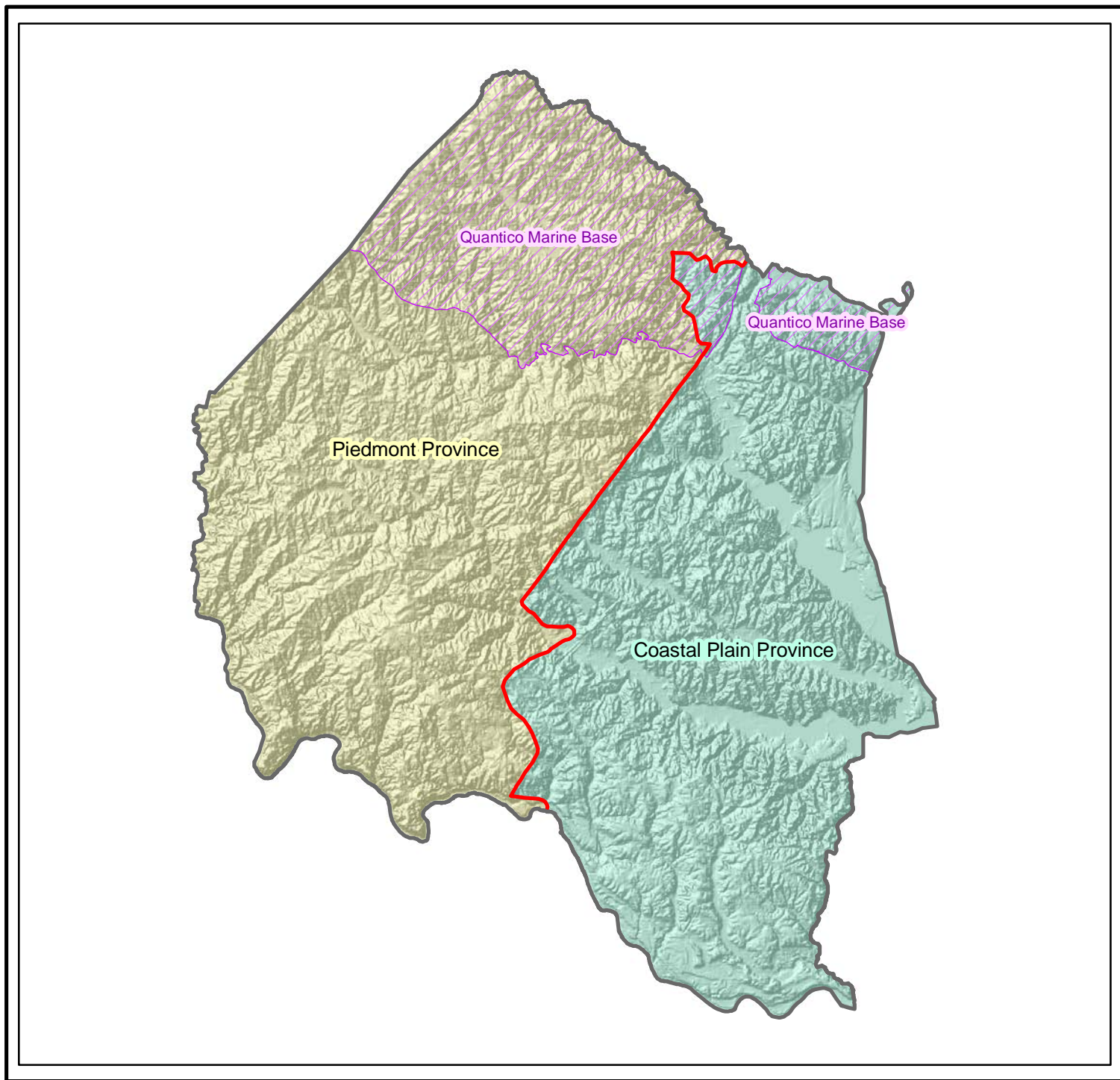







Figure 2: Physiographic Province Map

Legend

-  Stafford County
-  Fall Line
-  Piedmont Province
-  Coastal Plain Province
-  Quantico Marine Base

Groundwater Resources Evaluation
Piedmont Province
Stafford County, VA



0 2 4 8
Miles



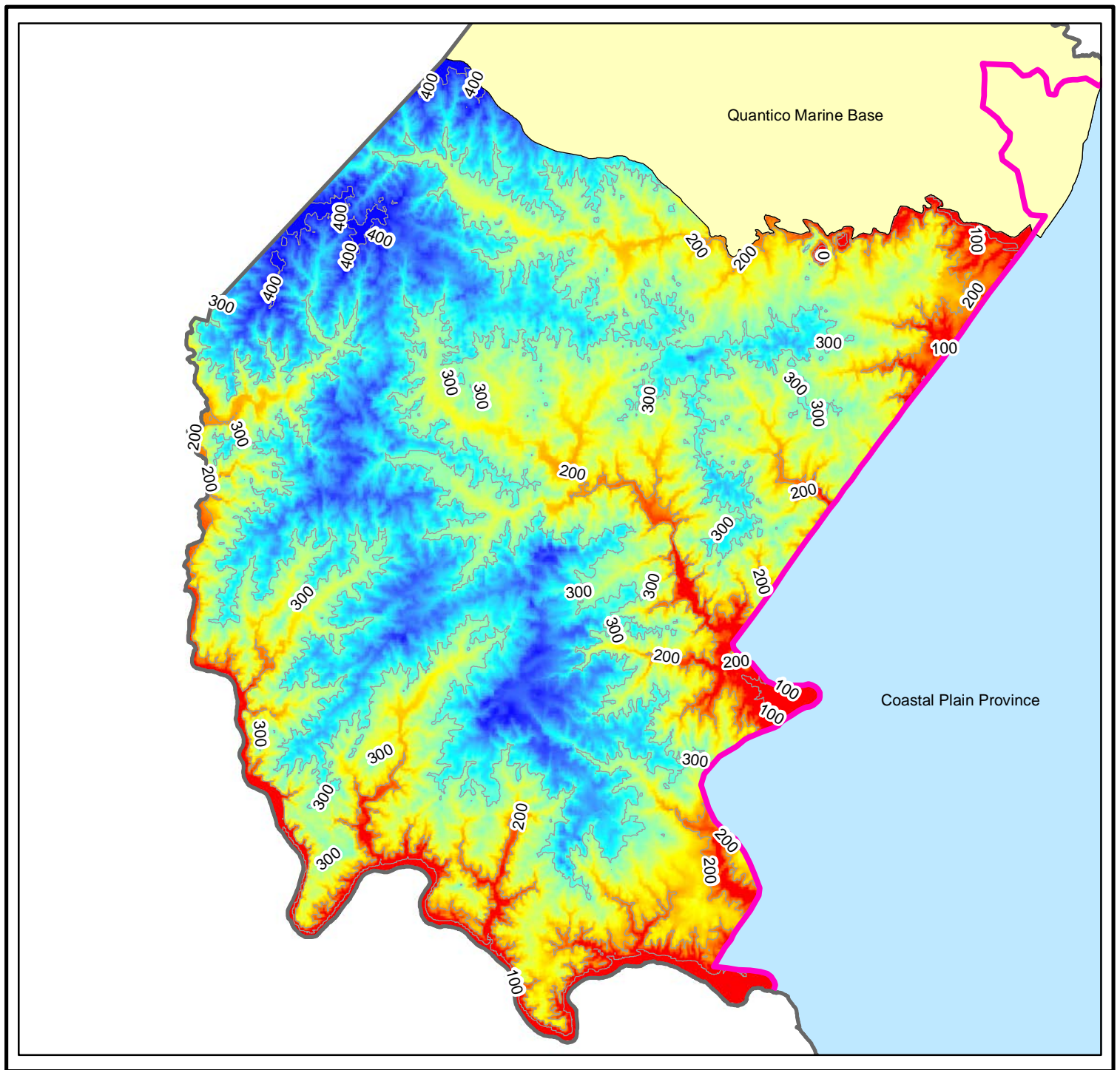



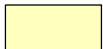
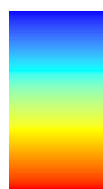


Figure 3: Study Area Topography

Legend

-  Stafford County
-  Coastal Plain Province
-  Fall Line
-  Quantico Marine Base

Elevation

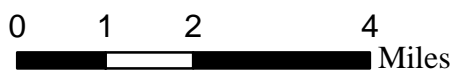


High : 439.8 ft

Low : -4.6 ft

— Topographic Contour (C.I. = 100 feet)

Groundwater Resources Evaluation
Piedmont Province
Stafford County, VA



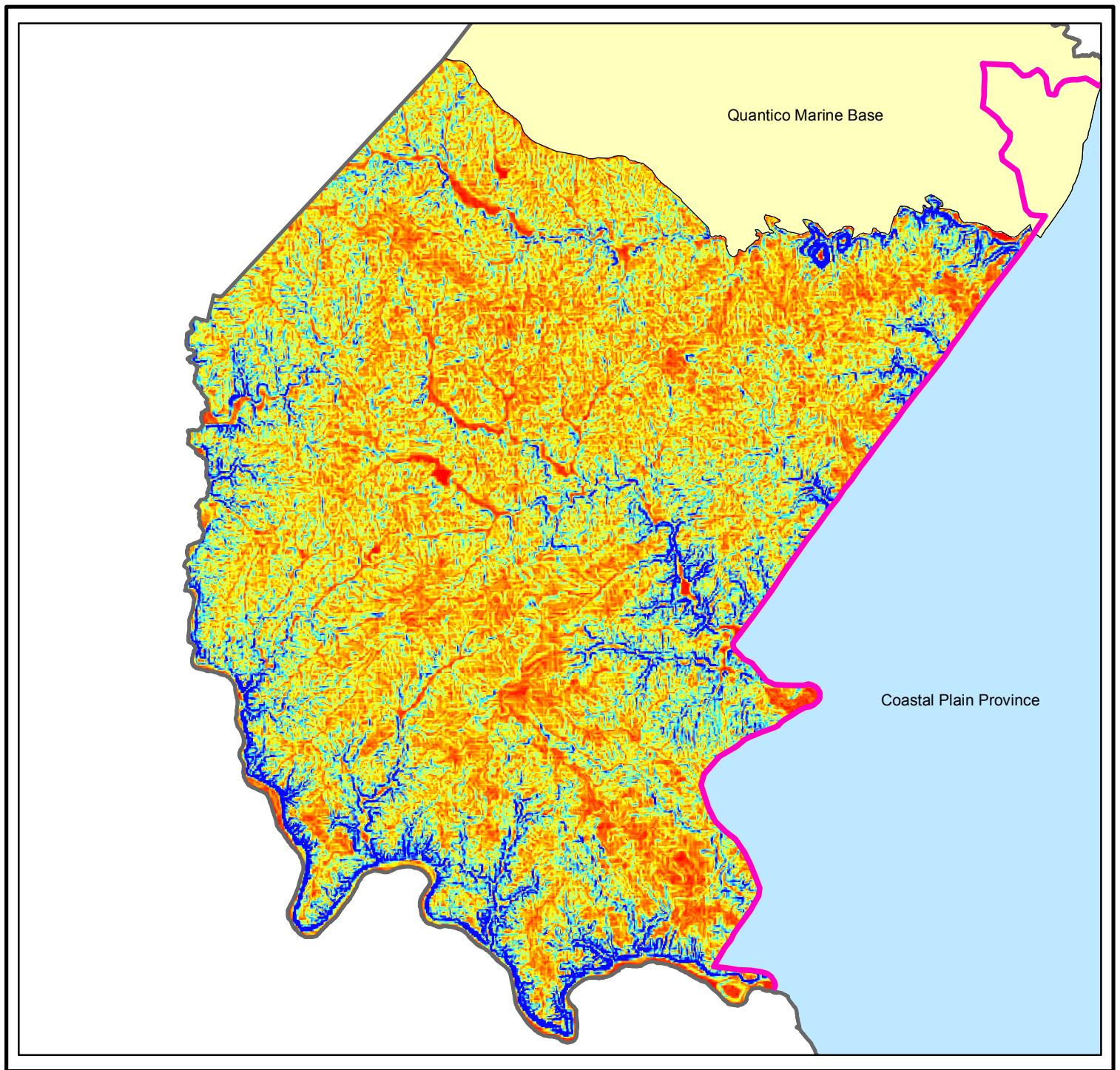
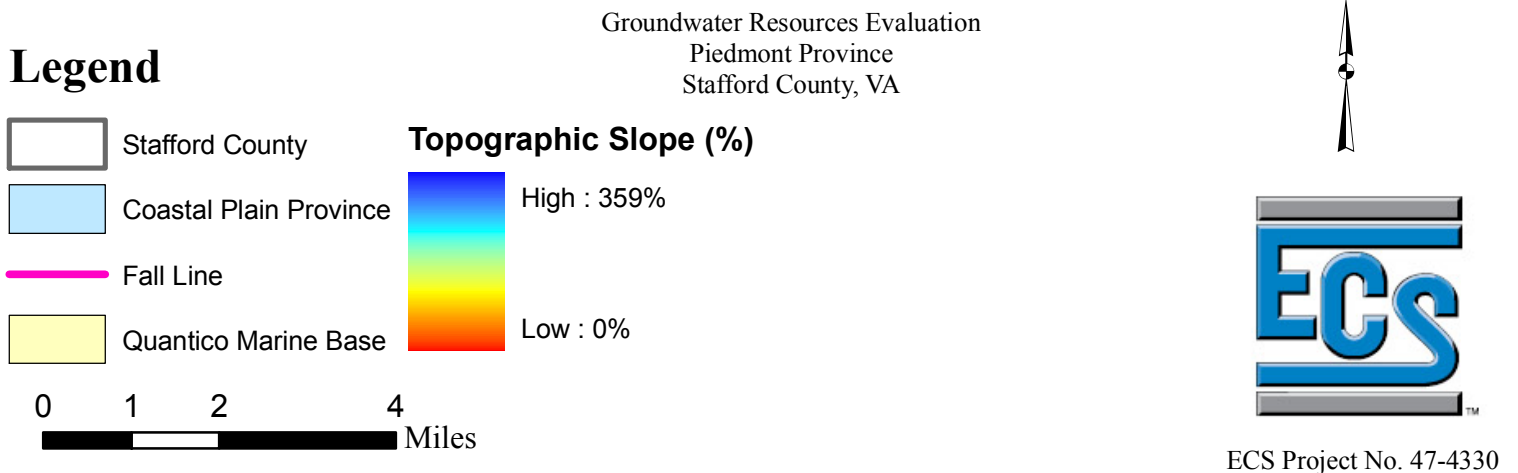


Figure 4: Study Area Topographic Slope



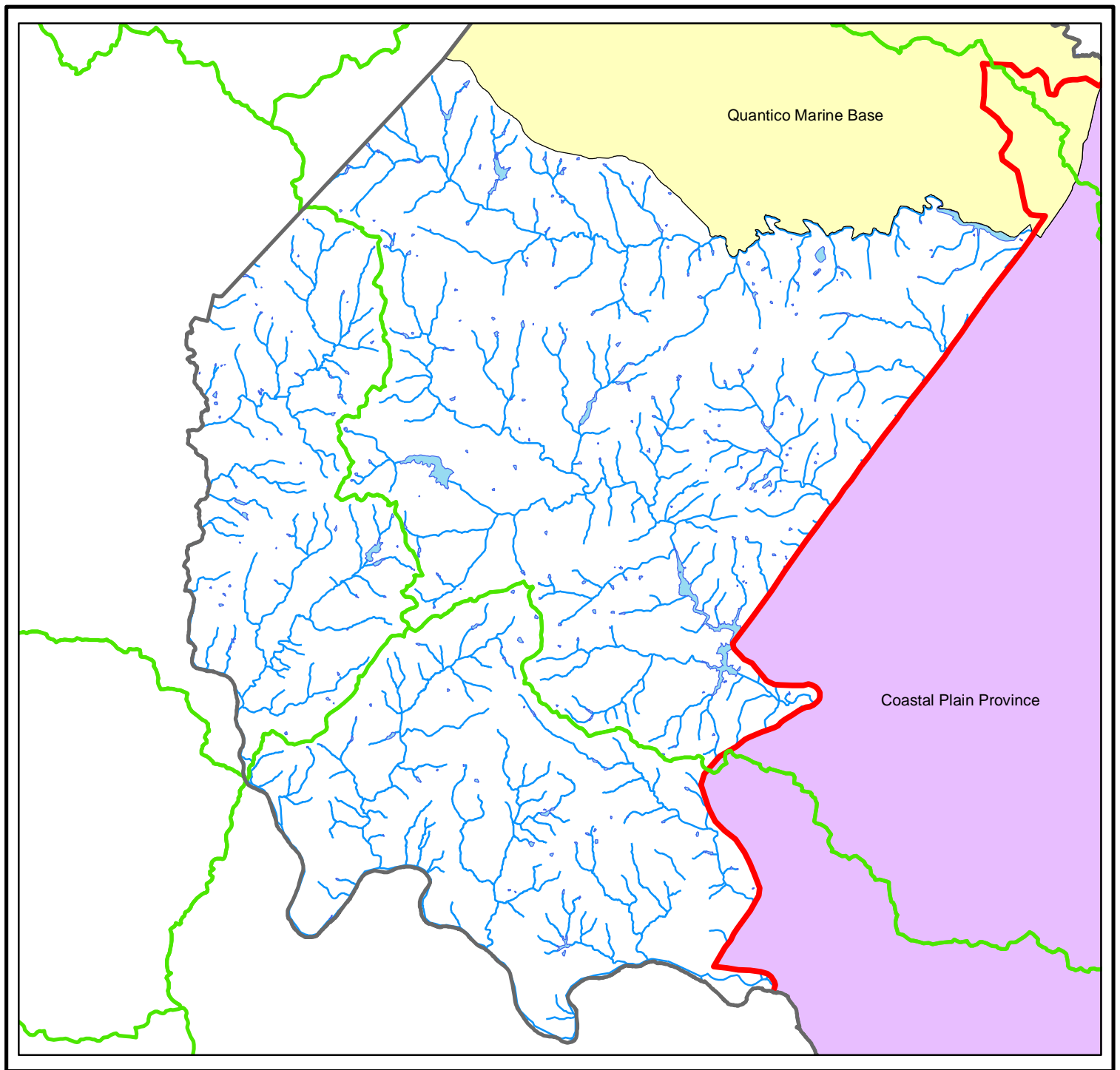









Figure 5: Hydrologic Features

Groundwater Resources Evaluation
Piedmont Province
Stafford County, VA



Legend

- | | |
|---|--|
|  Stafford County |  Watershed Boundary |
|  Fall Line |  Stream |
|  Quantico Marine Base |  Reservoir |
|  Coastal Plain Province | |

0 1 2 4
Miles

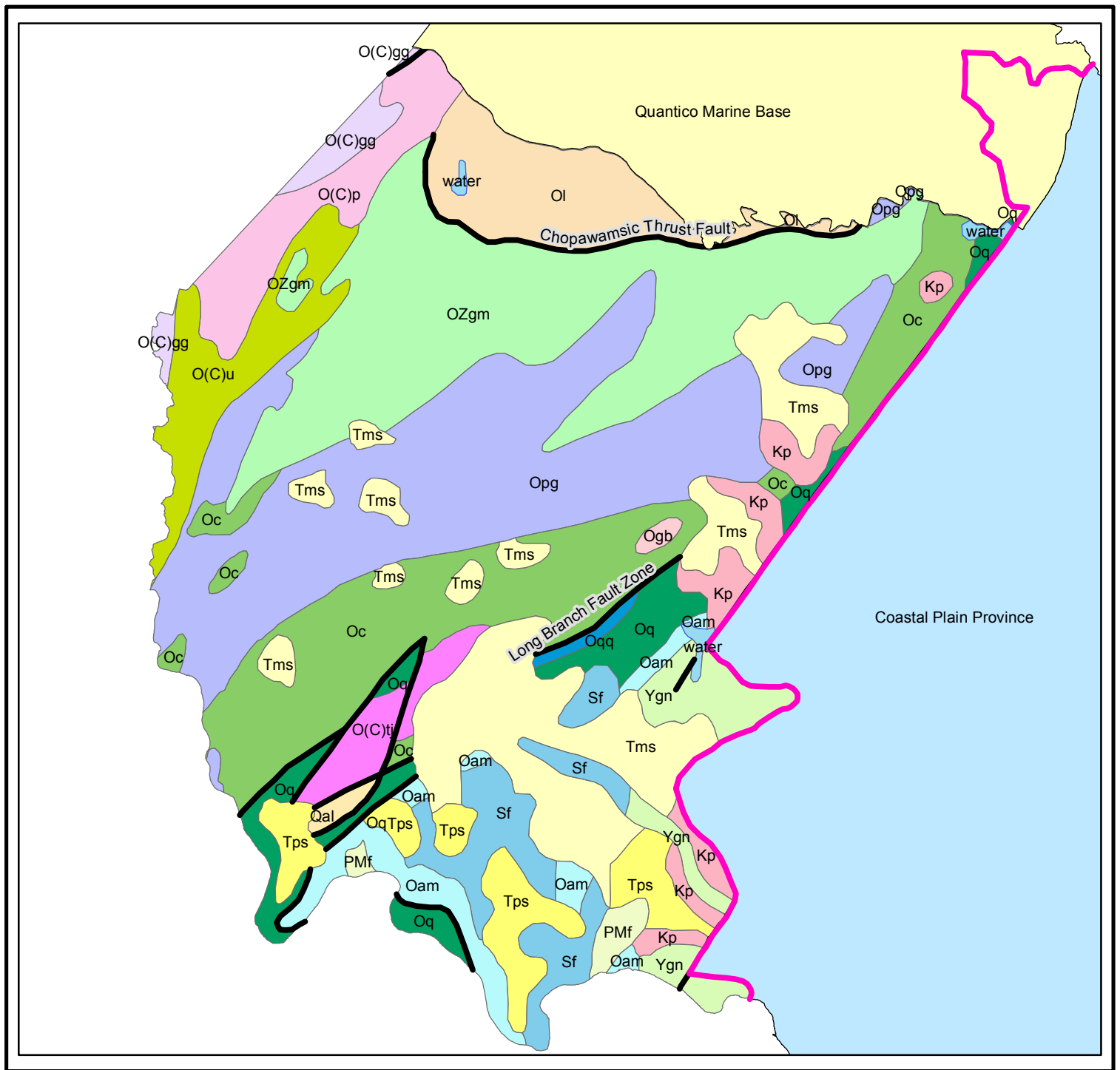


Figure 6: Geologic Mapping

Legend

- Fall Line
- Quantico Marine Base
- Coastal Plain Province
- Fault

Groundwater Resources Evaluation
Piedmont Province
Stafford County, VA

Map Notes:

- (1) Mapping by Rader and Evans (1993) and Mixon et al. (2005);
- (2) See Table 1 within Groundwater Resource Evaluation Report for geologic unit descriptions.



0 1.25 2.5 5
Miles

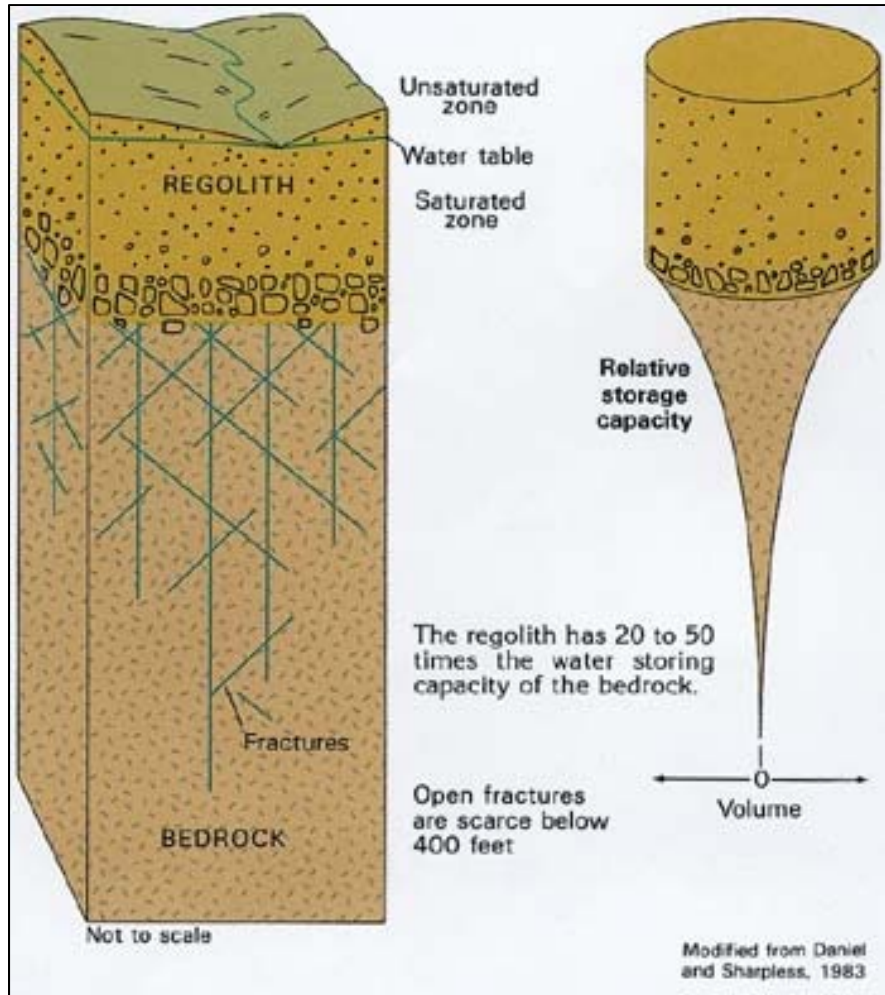


Figure 7: Cross-sectional diagram showing typical hydrogeologic conditions in Virginia's Piedmont Province. Groundwater is stored in the unconsolidated regolith, or saprolite, layer and percolates to fractures within the underlying consolidated bedrock aquifer. Bedrock fracturing is most prevalent at shallow depths and is largely absent below depths of approximately 400 feet. The cross-sectional diagram is unmodified from the USGS's Hydrologic Investigations Atlas 730-G (Miller, 1990).

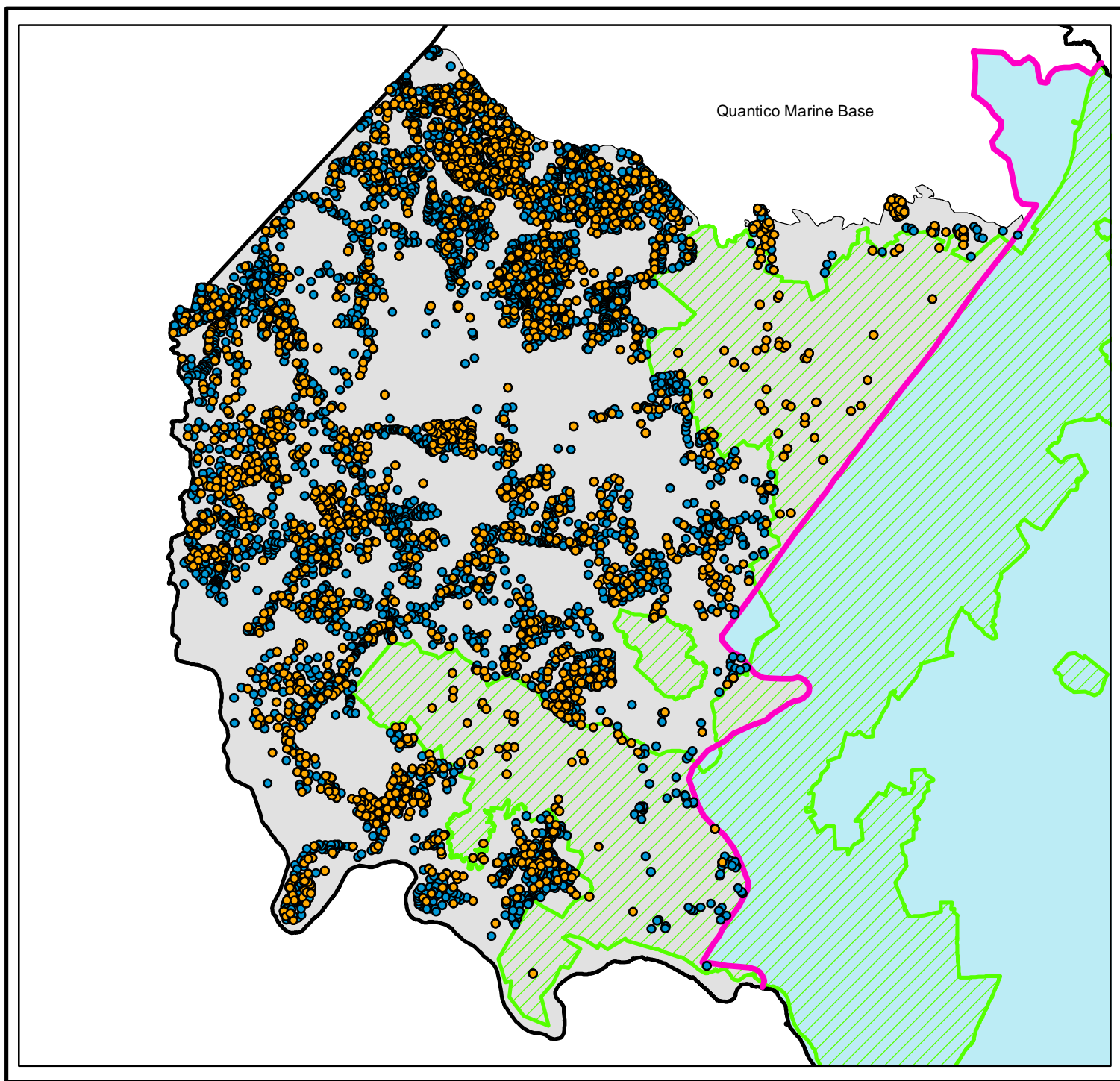









Figure 8: Well Database Records

Legend

-  Stafford County Boundary
-  Study Area
-  Coastal Plain Province
-  Fall Line
-  Municipal Service Area

-  Stafford County Attribute Data Well Database Record (with attribute data; 1,801 records)
-  Non-Attribute Data Well Database Record (without attribute data; 4,940 records)

Groundwater Resources Evaluation
Piedmont Province
Stafford County, VA



0 1 2 4 Miles



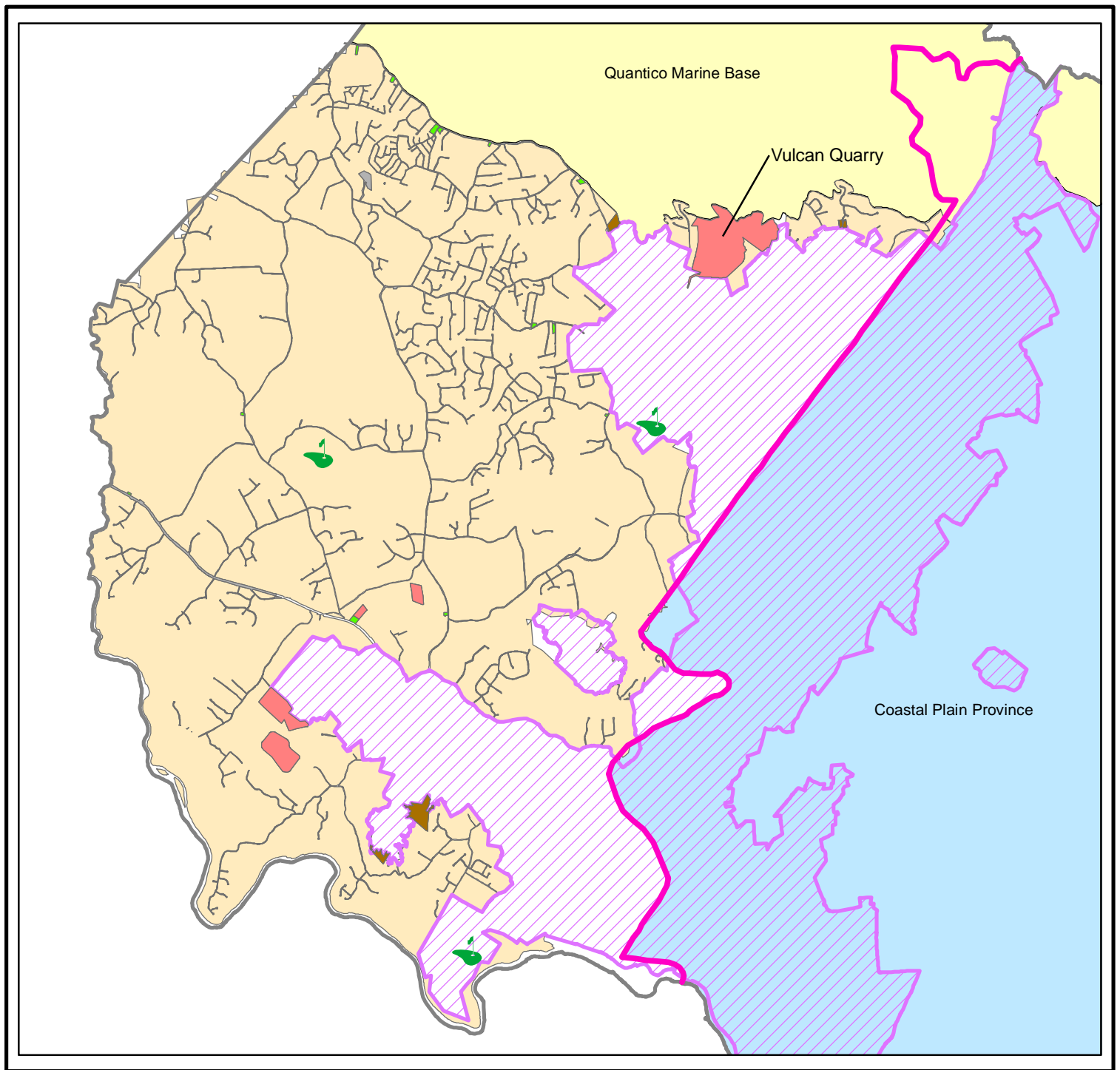


Figure 9: Land Use Map

Legend

	Stafford County	Zoning Classifications	
	Municipal Water Service Area		Agricultural (A1, A2)
	Golf Course		Road
	Fall Line		Industrial (M1, M2)
	Coastal Plain Province		Residential (R1, R2)
	Quantico Marine Base		Commercial (B1, B2)

0 1 2 4
Miles



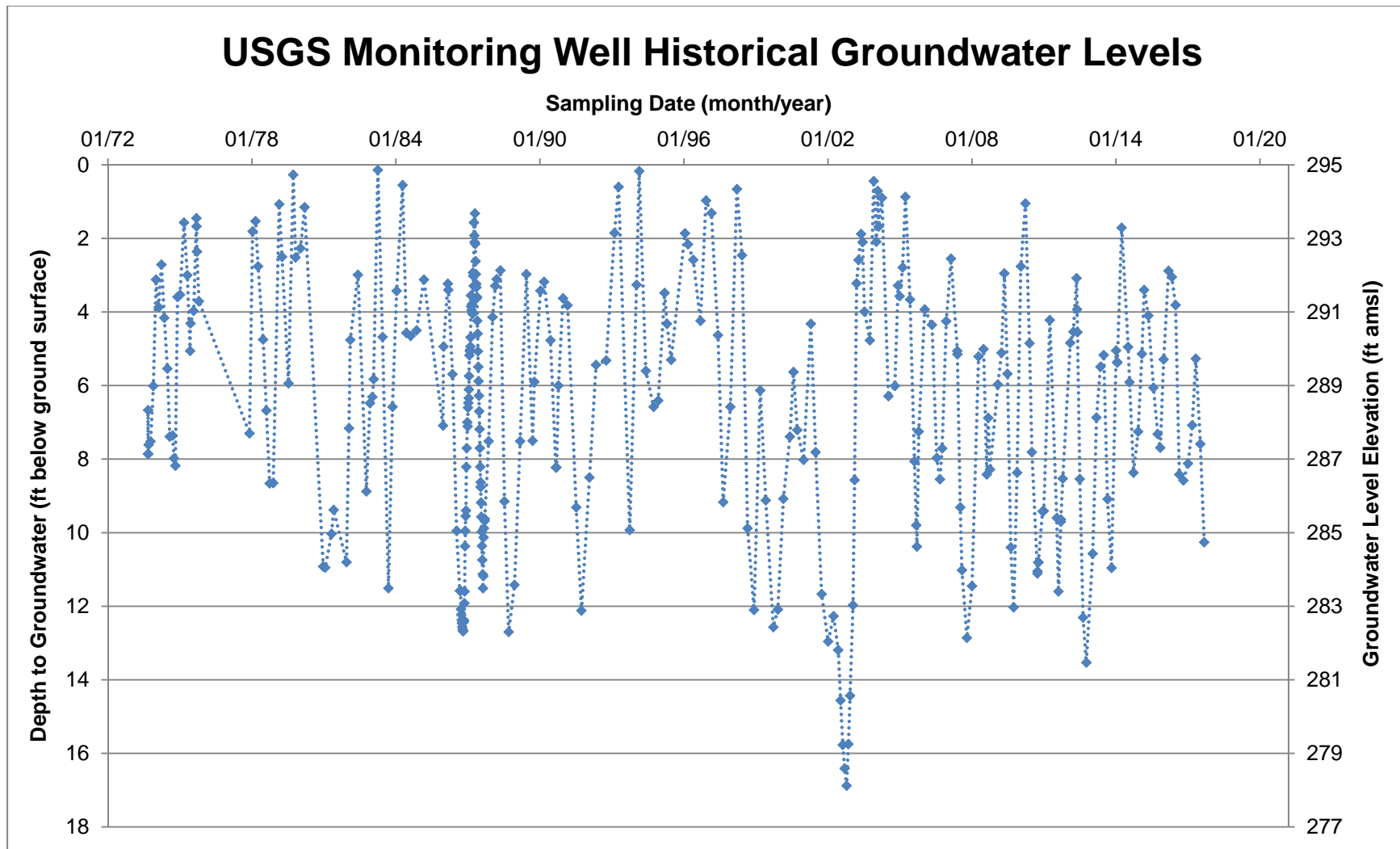


Figure 10: Groundwater level monitoring data from USGS monitoring well 383423077245901, located in the Piedmont province of Prince William County approximately 0.7 mile north of Stafford County.

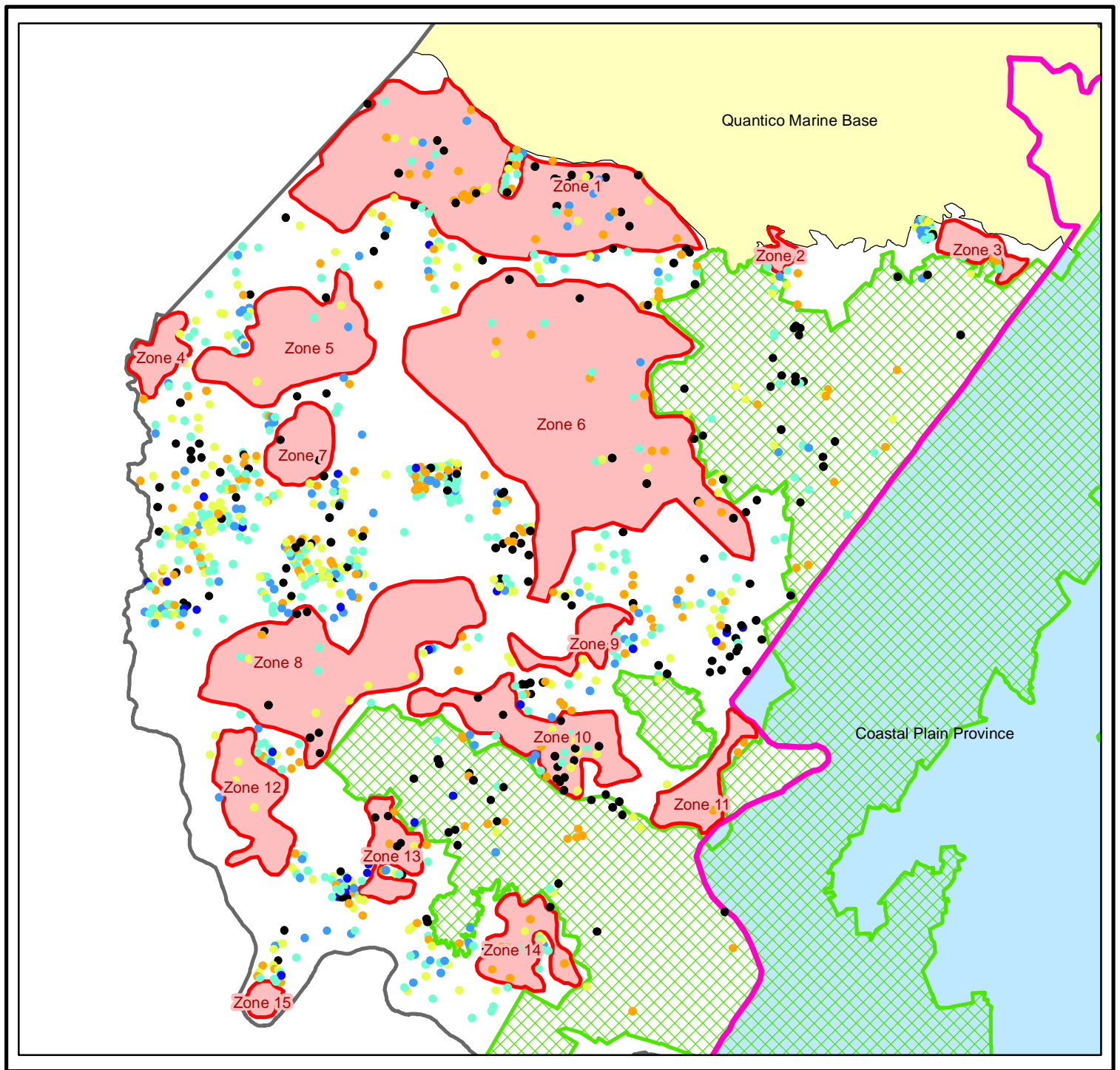
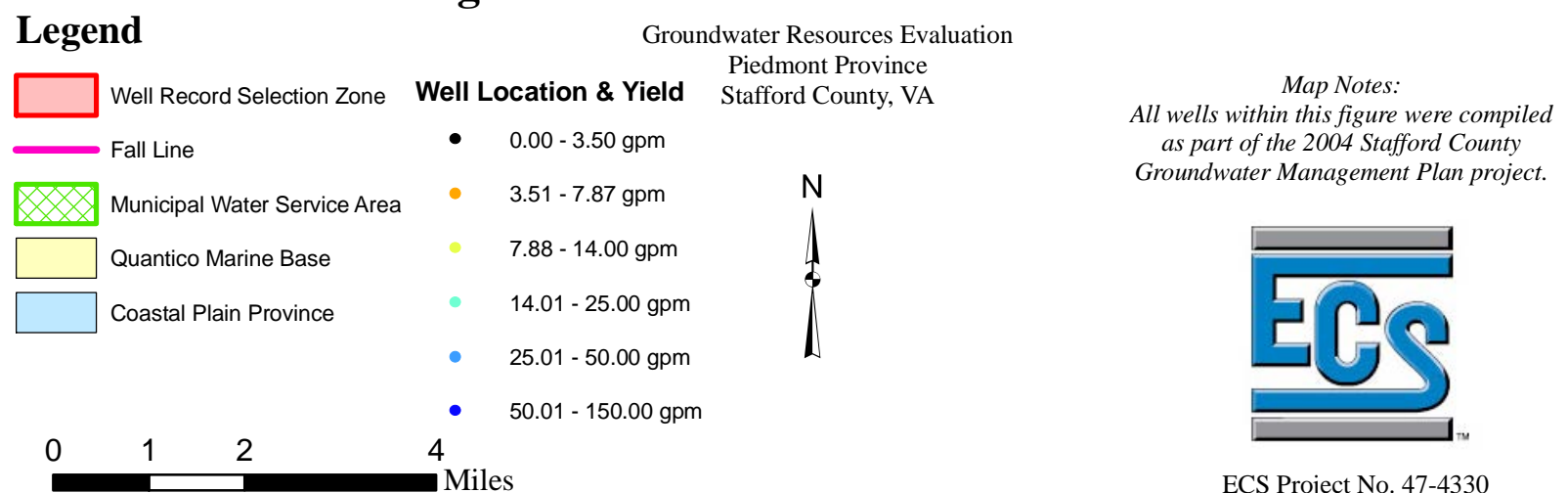


Figure 11: Well Record Selection Zones



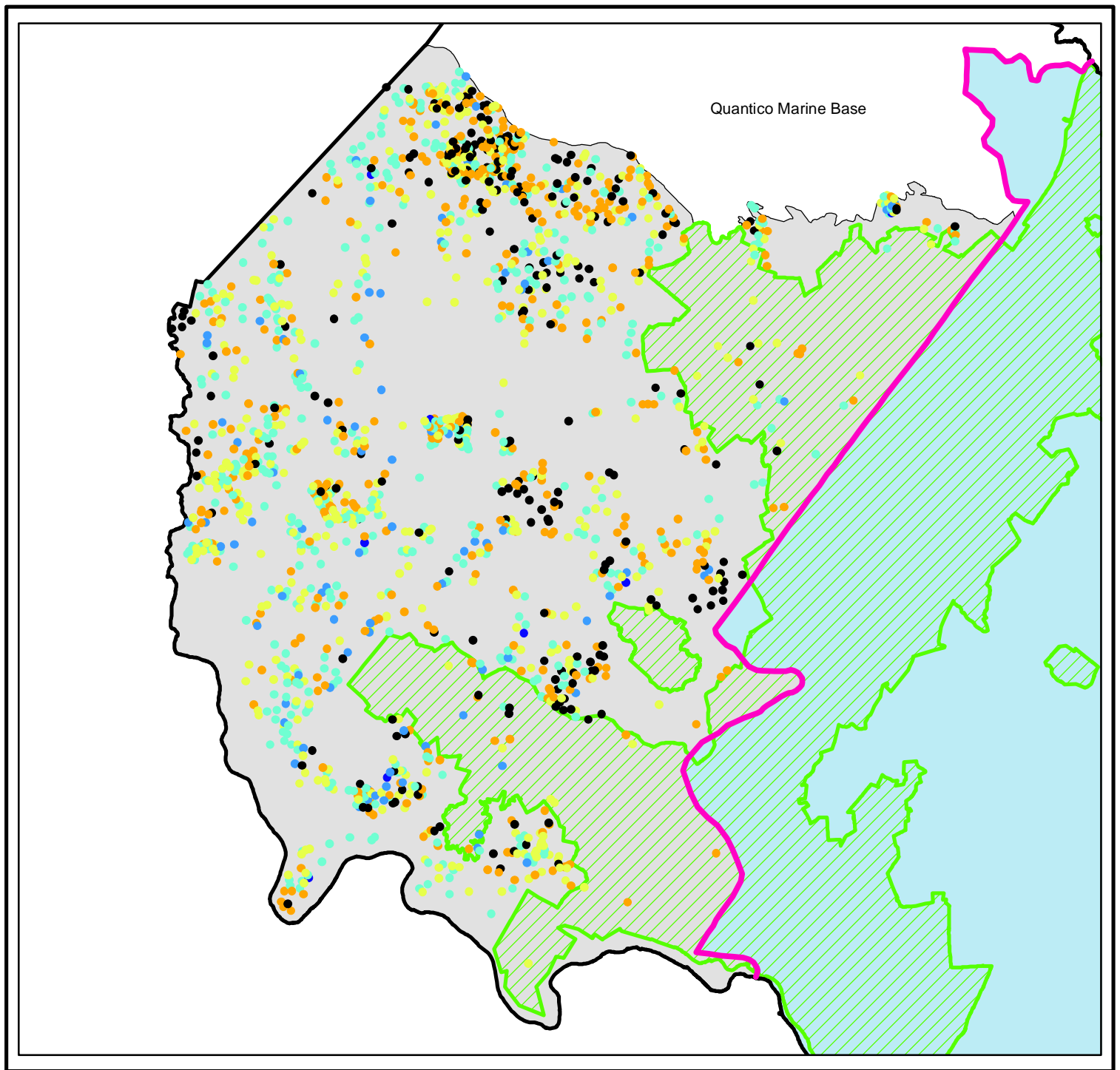
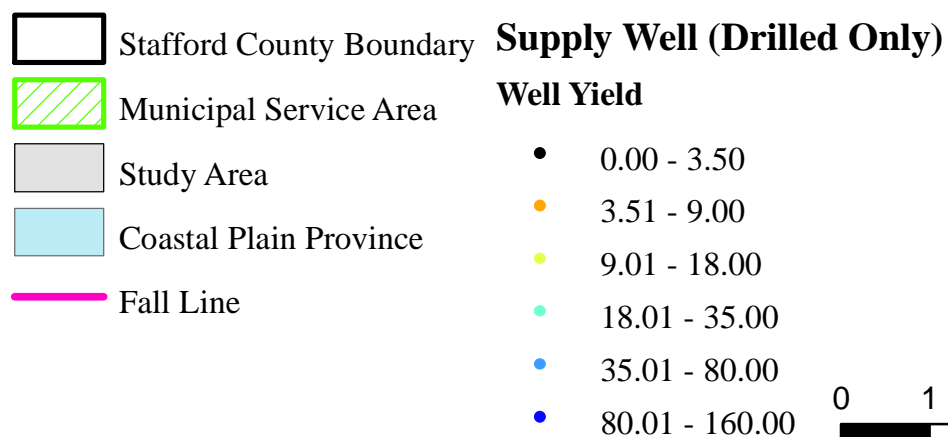


Figure 12: Drilled Wells Used for Yield Characterization

Legend



0 1 2 4 Miles

Groundwater Resources Evaluation
Piedmont Province
Stafford County, VA



ECS Project No. 47-4330

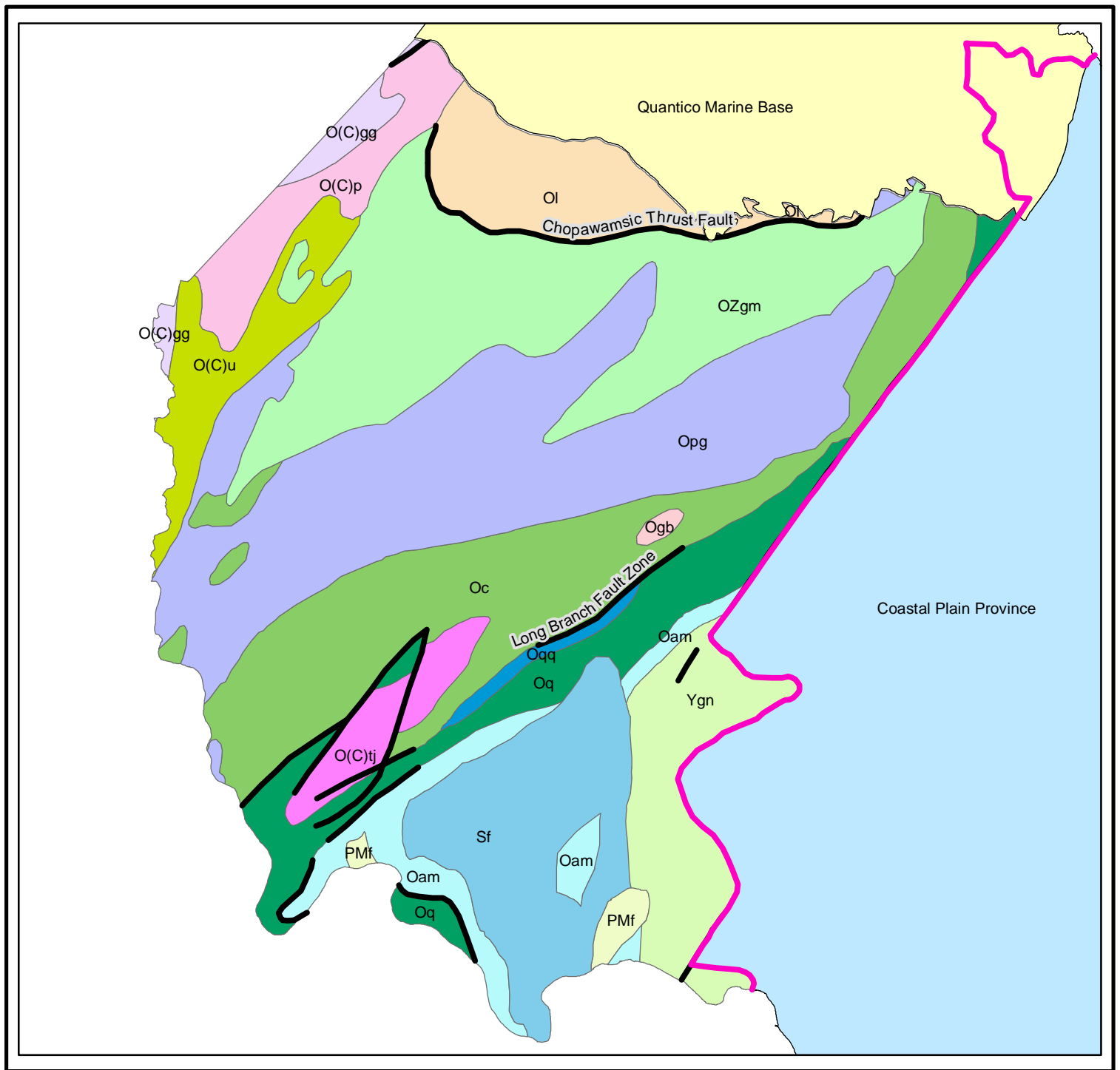


Figure 13: Consolidated Bedrock Geologic Mapping

Legend

- Fall Line
- Quantico Marine Base
- Coastal Plain Province
- Fault

Groundwater Resources Evaluation
Piedmont Province
Stafford County, VA

Map Notes:

- (1) Mapping by Rader and Evans (1993) and Mixon et al. (2005) was modified by ECS to remove unconsolidated formations and to infer contacts of the underlying consolidated bedrock units; as such, the map only contains consolidated bedrock geologic units;
- (2) See Table 1 within Groundwater Resource Evaluation Report for geologic unit descriptions.

0 1.25 2.5 5
Miles



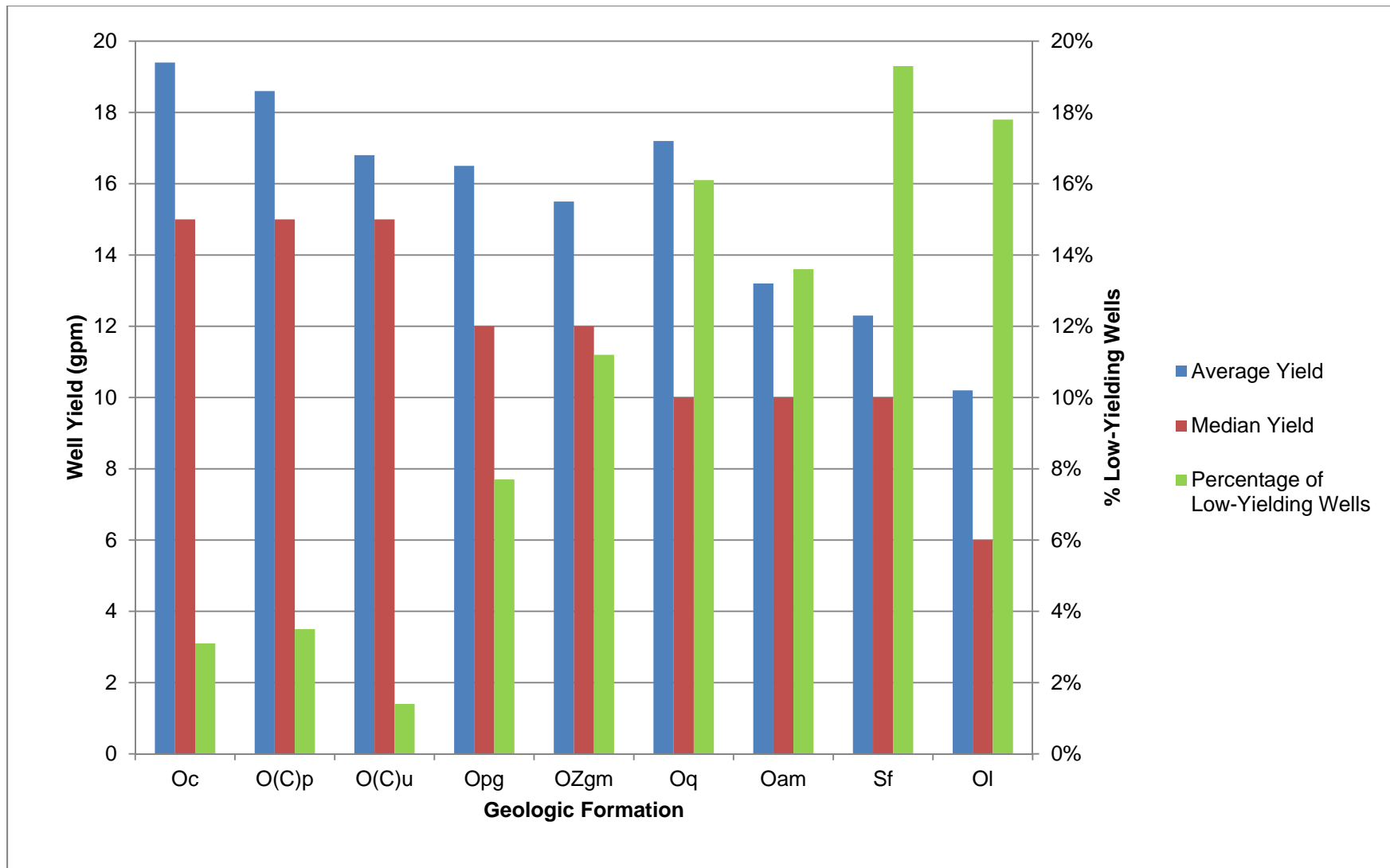


Figure 14a: Well yield statistics by geologic unit. Only geologic units containing greater than 50 well records are included within the chart. Low-yielding wells are defined as wells with yields less than 3 gpm.

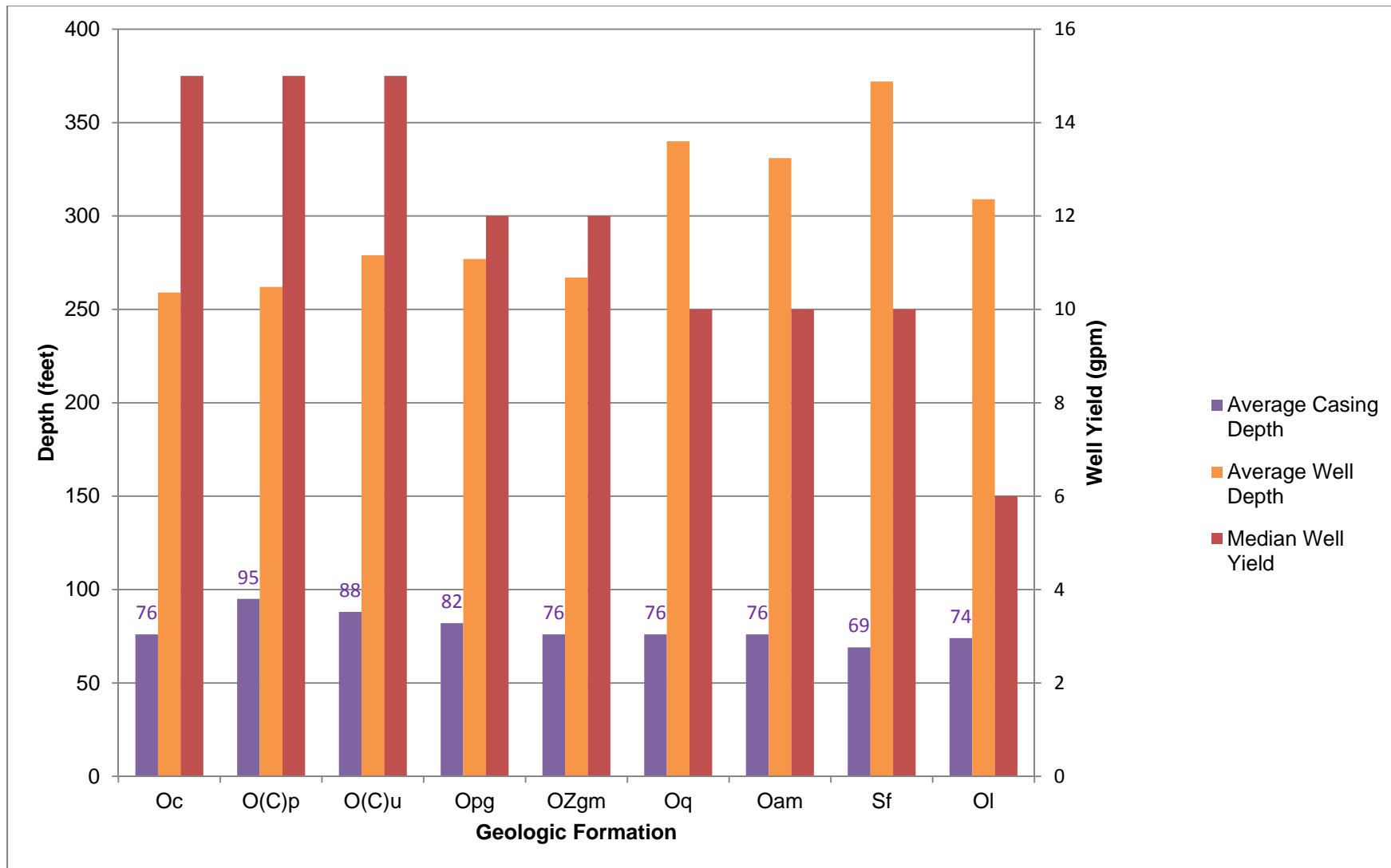


Figure 14b: Well construction statistics by geologic unit. Only geologic units containing greater than 50 well records are included within the chart.

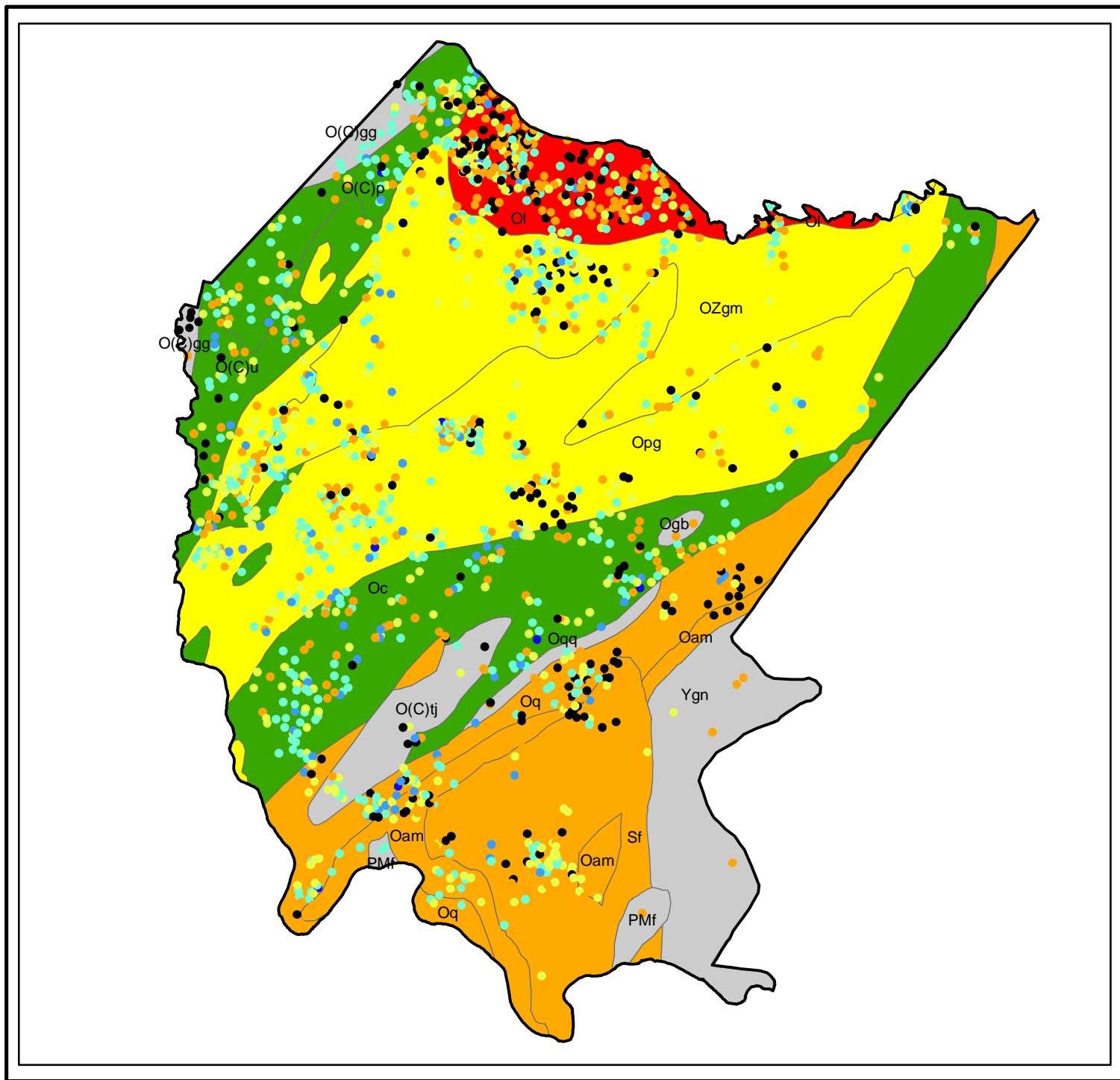

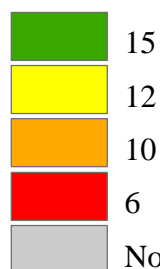


Figure 15a: Median Well Yields By Geologic Unit

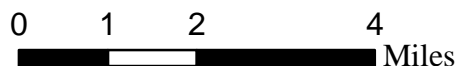
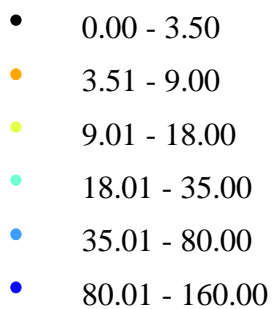
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 Study Area Boundary

Median Well Yield (gpm)



Supply Well Yield (gpm)



Groundwater Resources Evaluation
Piedmont Province
Stafford County, VA



ECS Project No. 47-4330

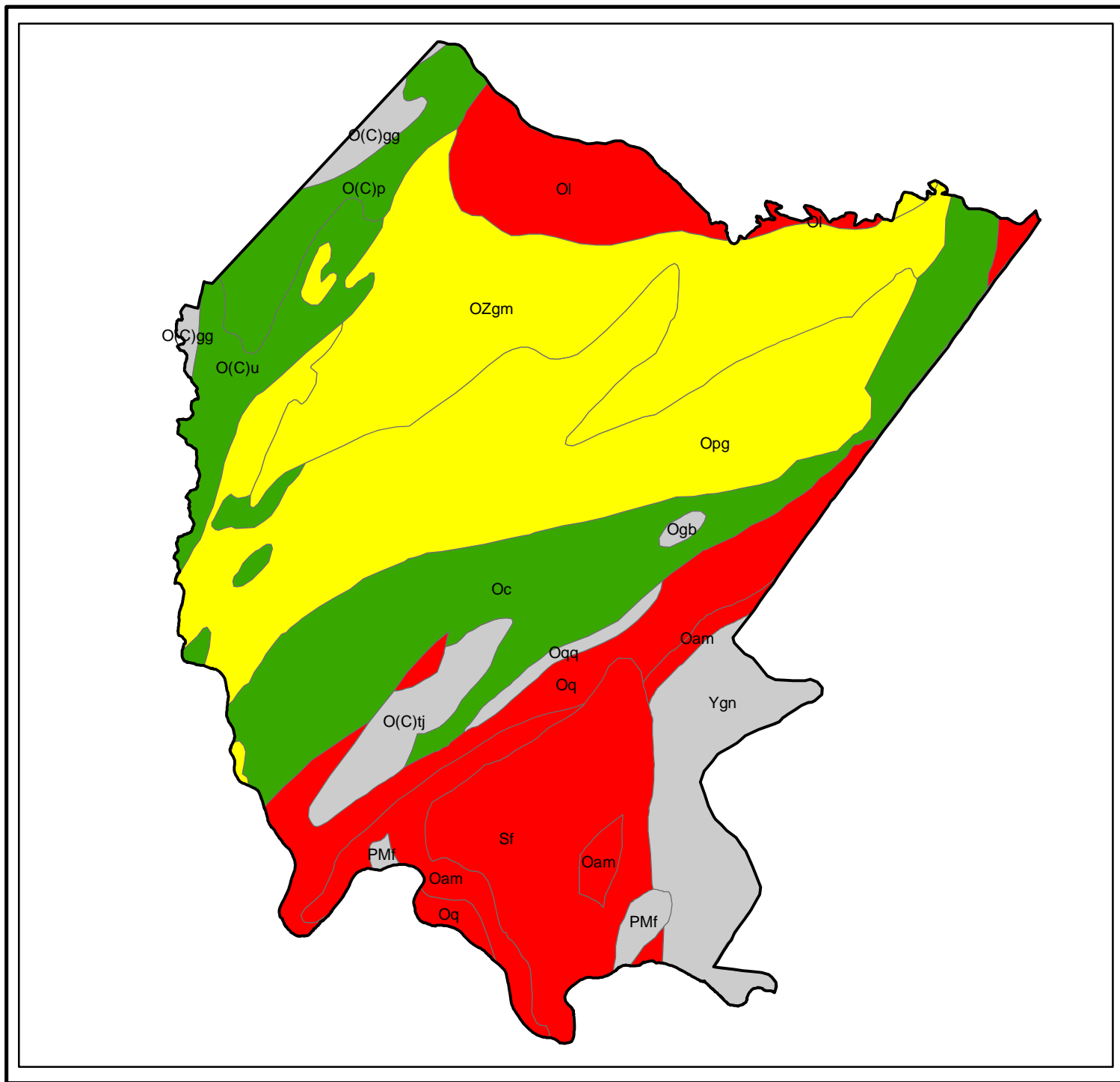


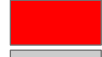



Figure 15b: Percentage of Low-Yielding Wells By Geologic Unit

Legend

 Study Area Boundary

Percentage of Low-Yielding Wells

 1.4 - 3.5%
 7.7 - 11.2%
 13.6 - 19.3%
 Not Classified



0 1 2 4
Miles

Groundwater Resources Evaluation
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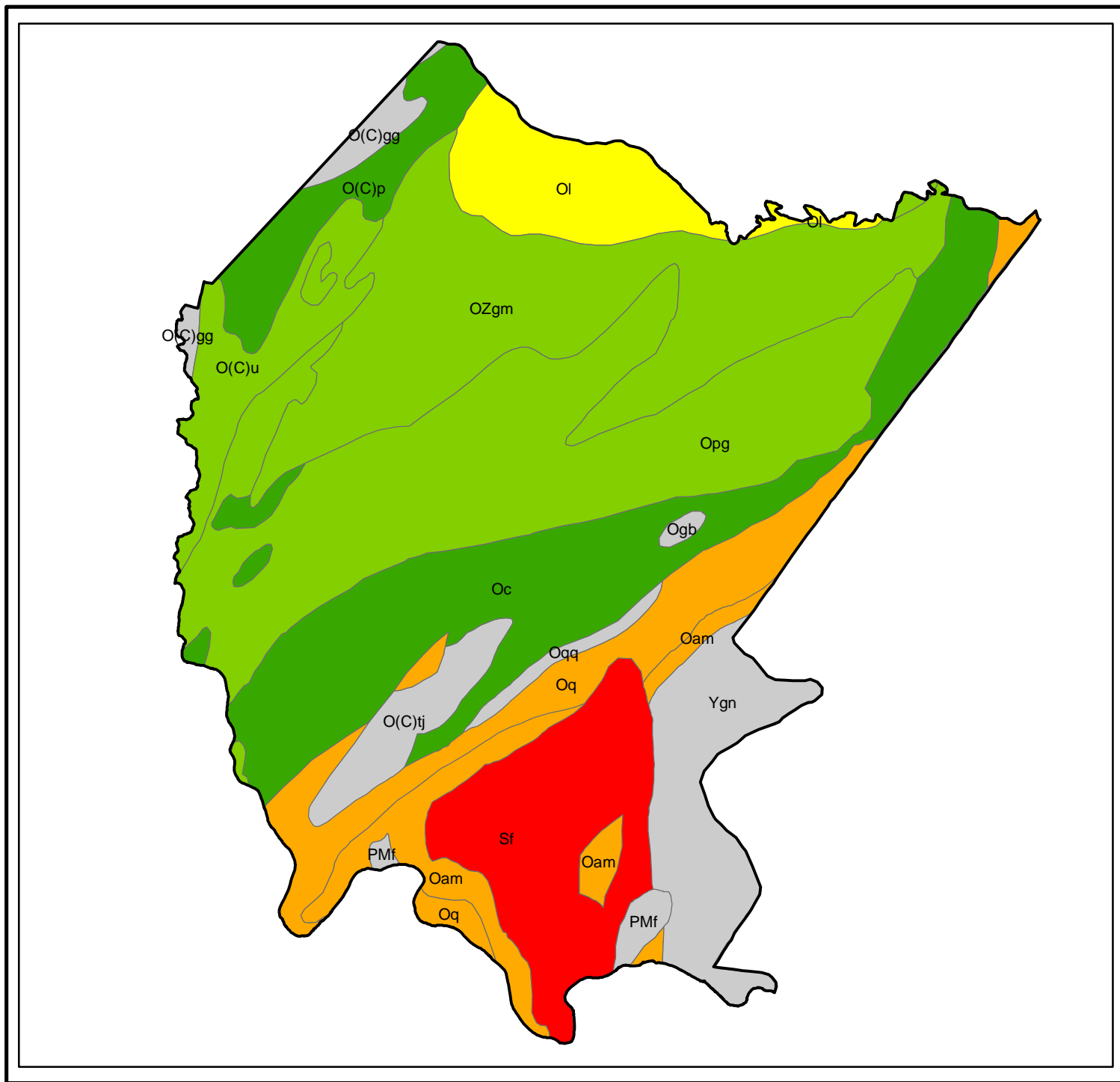
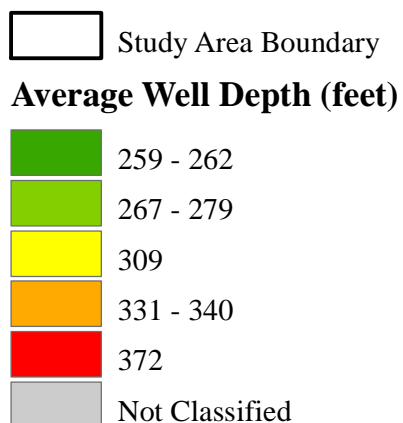


Figure 15c: Well Depth By Geologic Unit

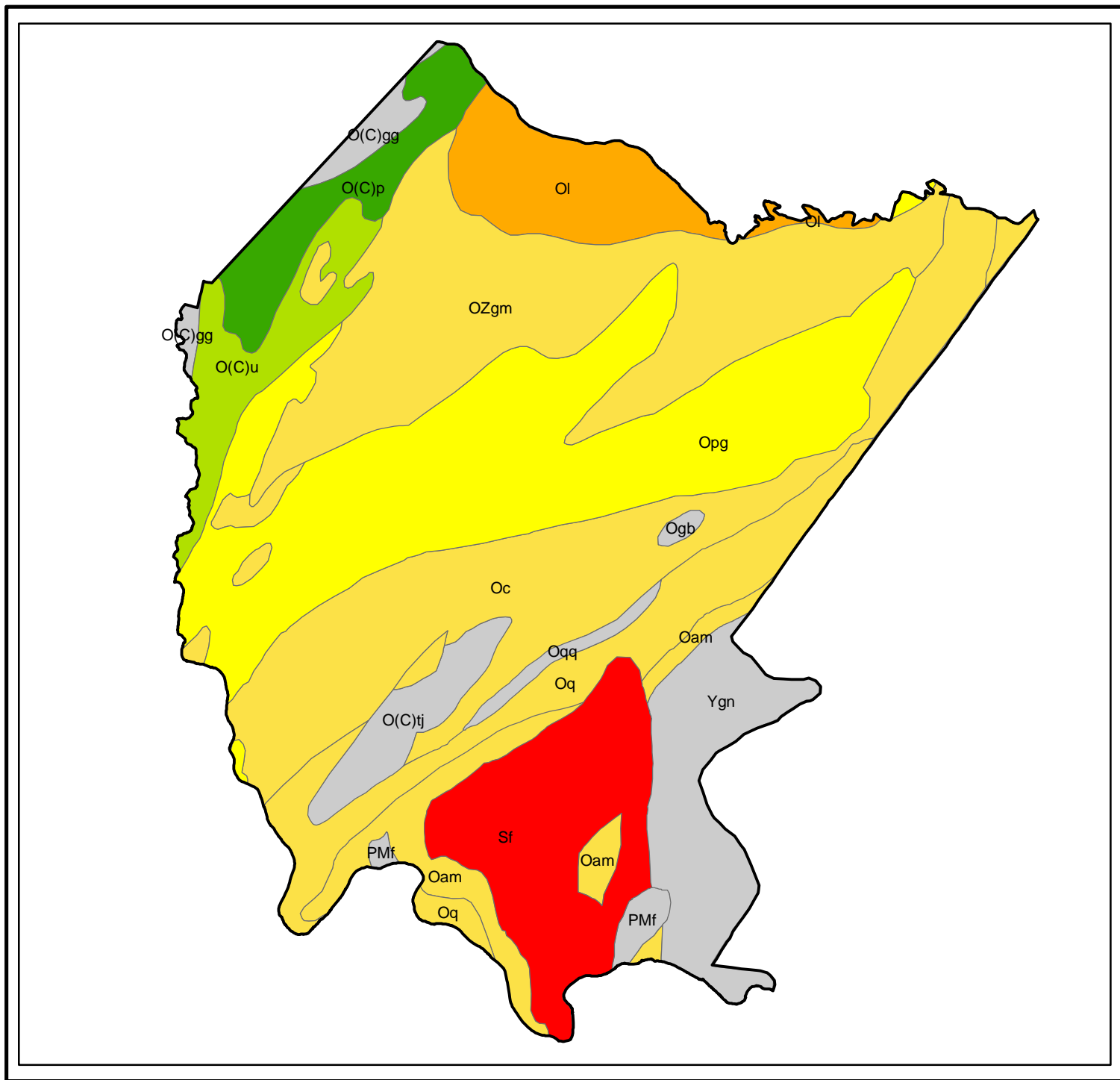
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Groundwater Resources Evaluation
Piedmont Province
Stafford County, VA



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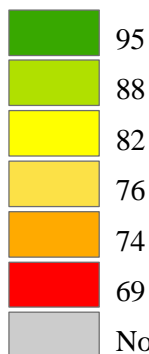


Legend

Figure 15d: Surface Casing Depth By Geologic Unit

Study Area Boundary

Average Surface Casing Depth (feet)



0 1 2 4 Miles

Groundwater Resources Evaluation
Piedmont Province
Stafford County, VA



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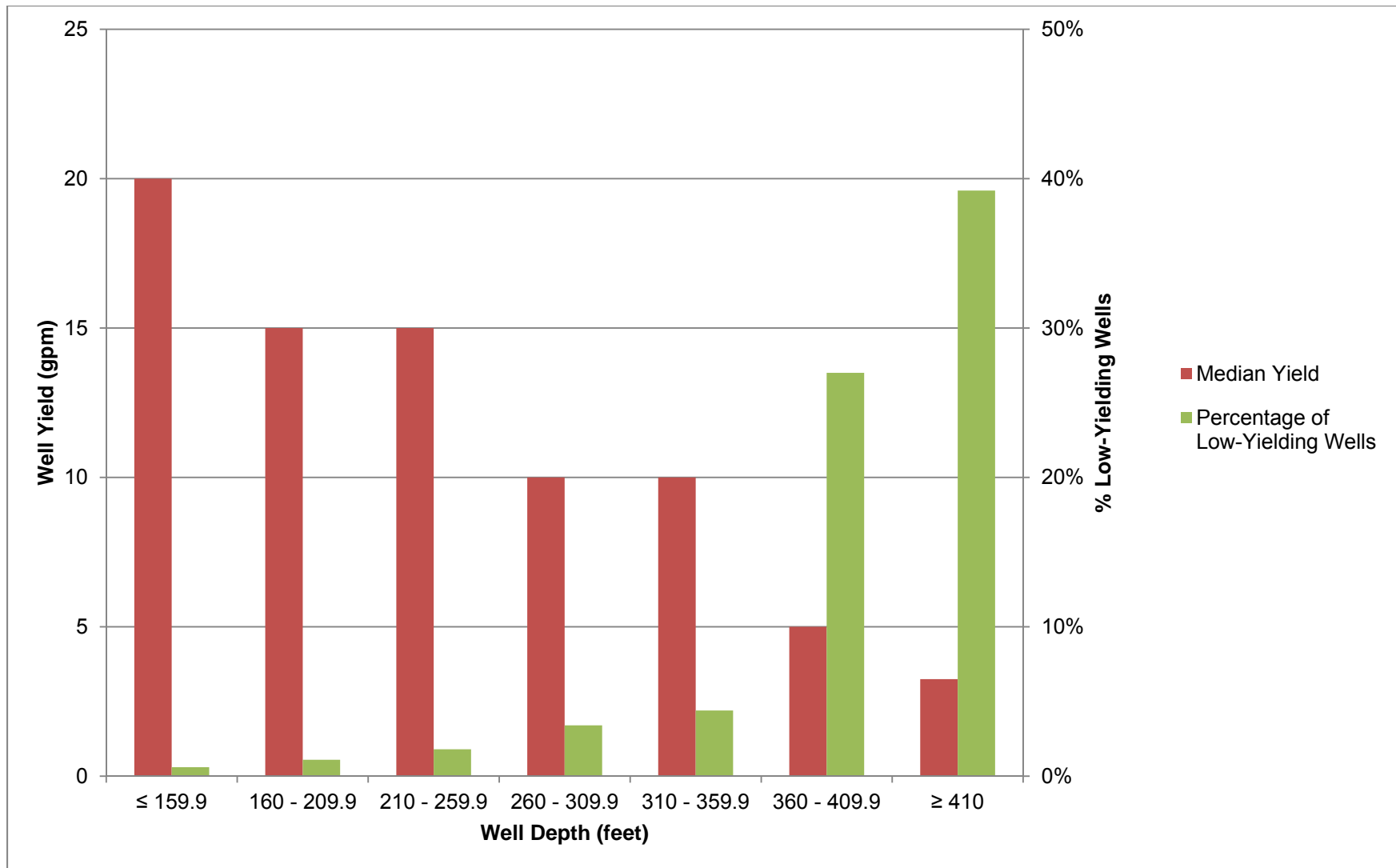


Figure 16: Well yield statistics based on well depth. Low-yielding wells are defined as wells with yields less than 3 gpm.

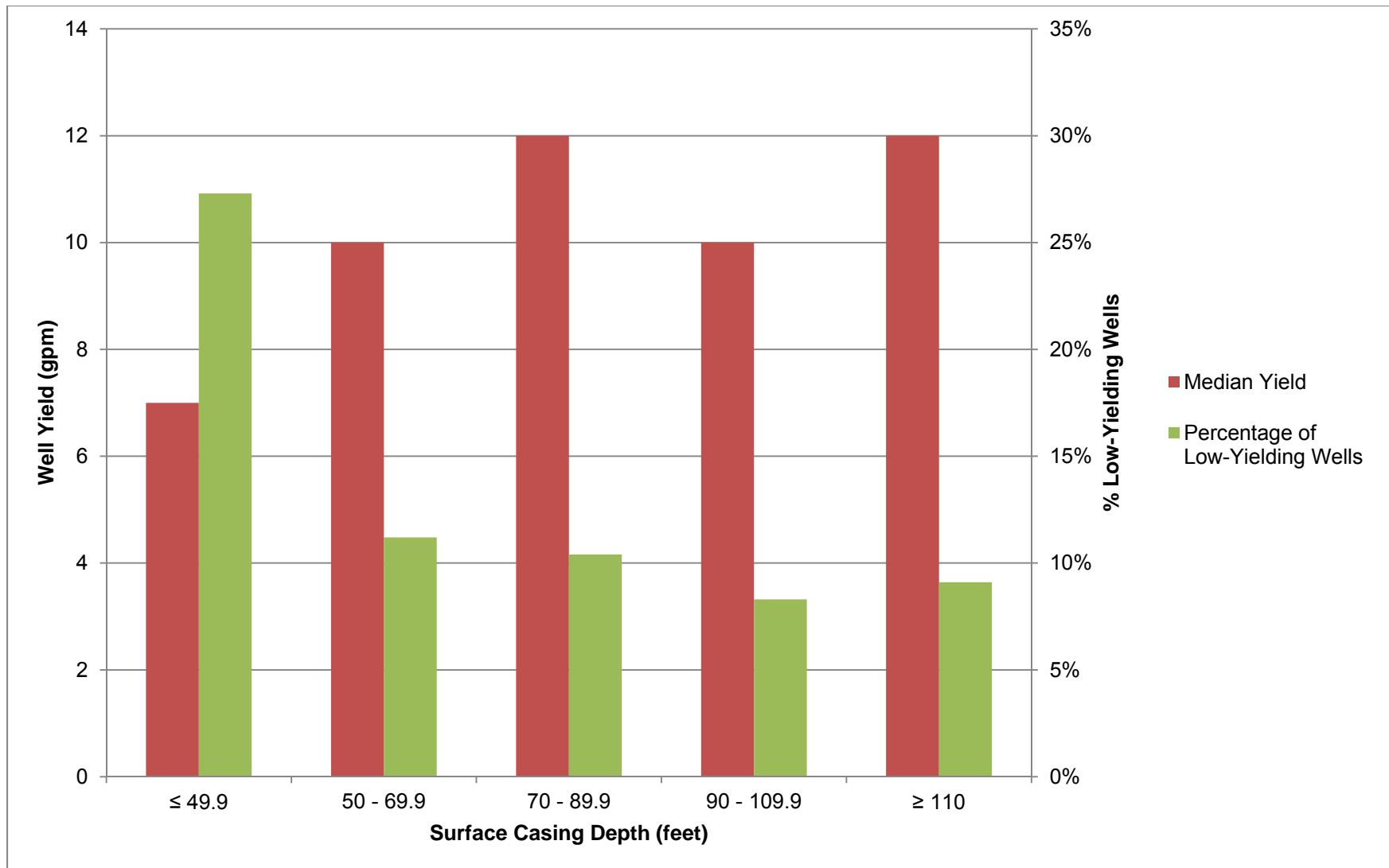


Figure 17: Well yield statistics based on surface casing depth. Low-yielding wells are defined as wells with yields less than 3 gpm.

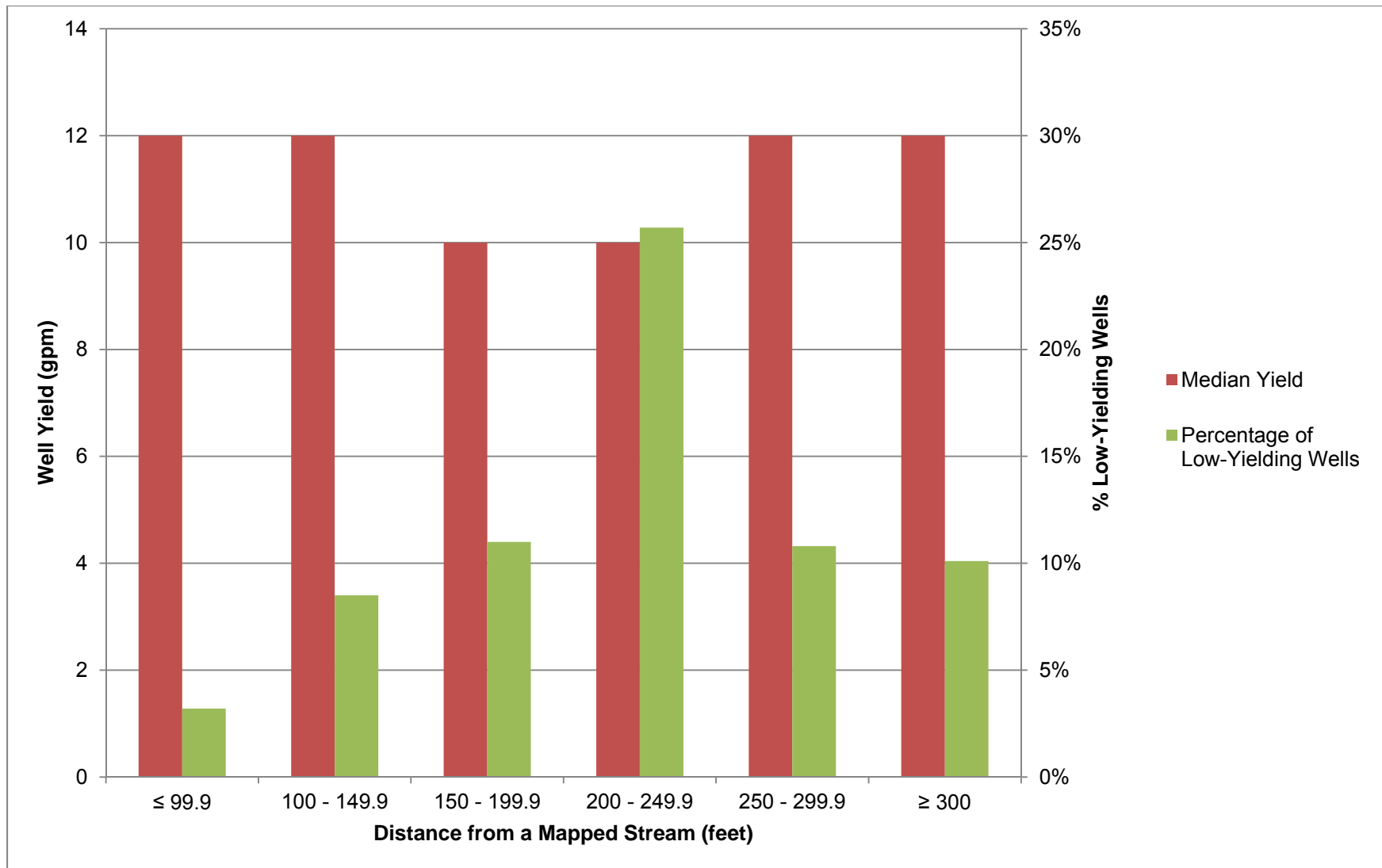


Figure 18: Well yield statistics based on proximity to mapped streams. Low-yielding wells are defined as wells with yields less than 3 gpm.

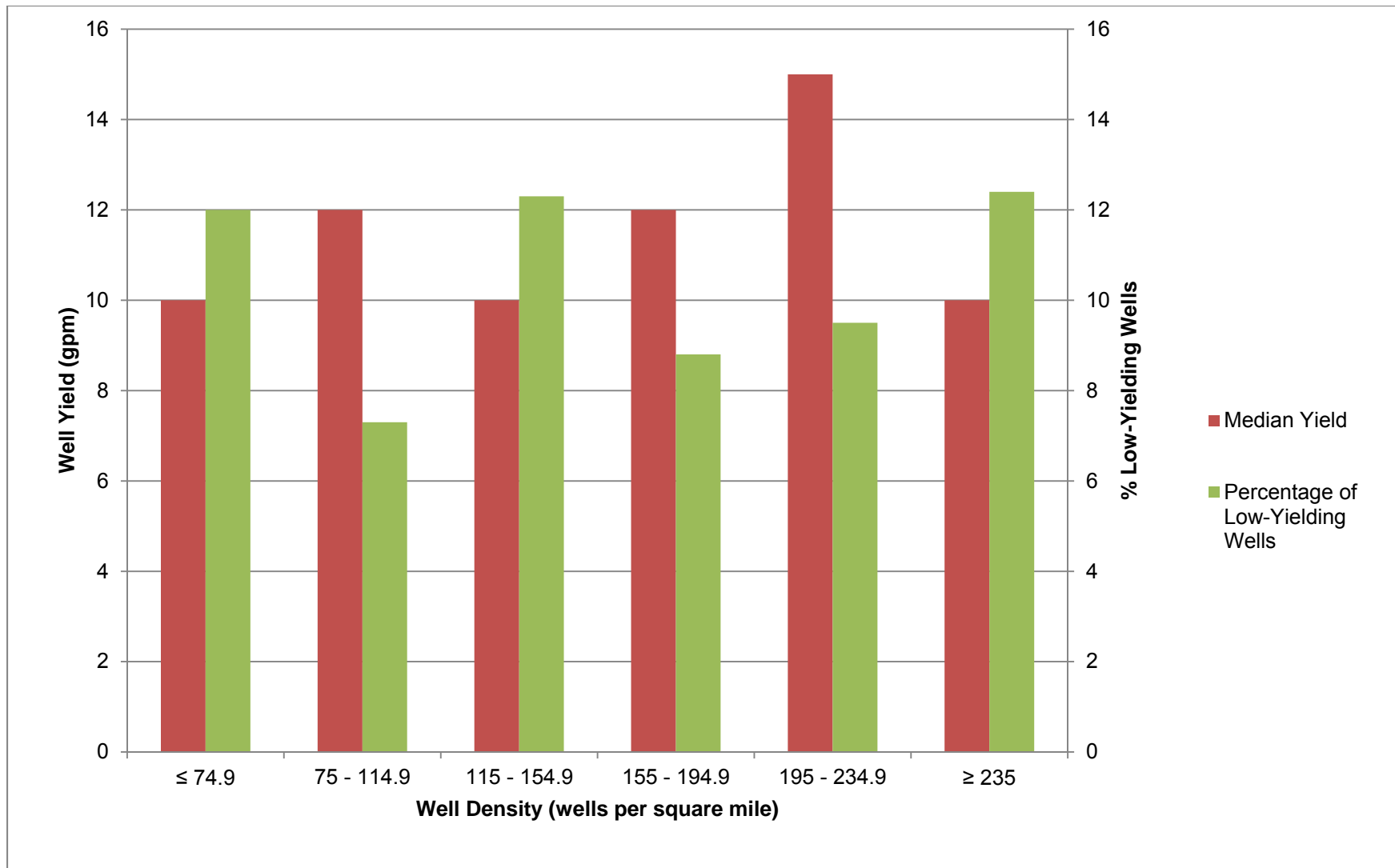


Figure 19: Well yield statistics based on well density. Low-yielding wells are defined as wells with yields less than 3 gpm.

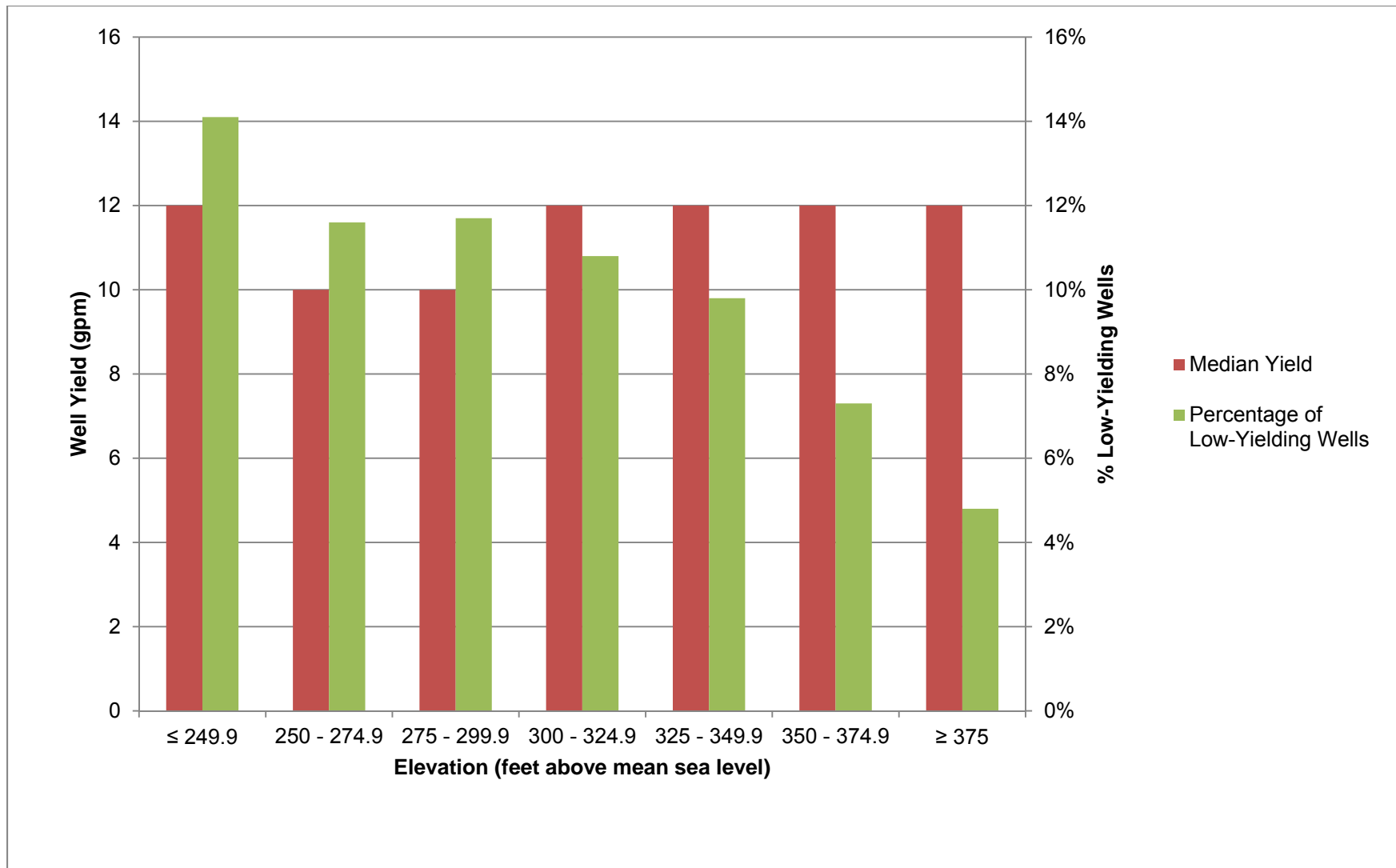


Figure 20: Well yield statistics based on elevation. Low-yielding wells are defined as wells with yields less than 3 gpm.

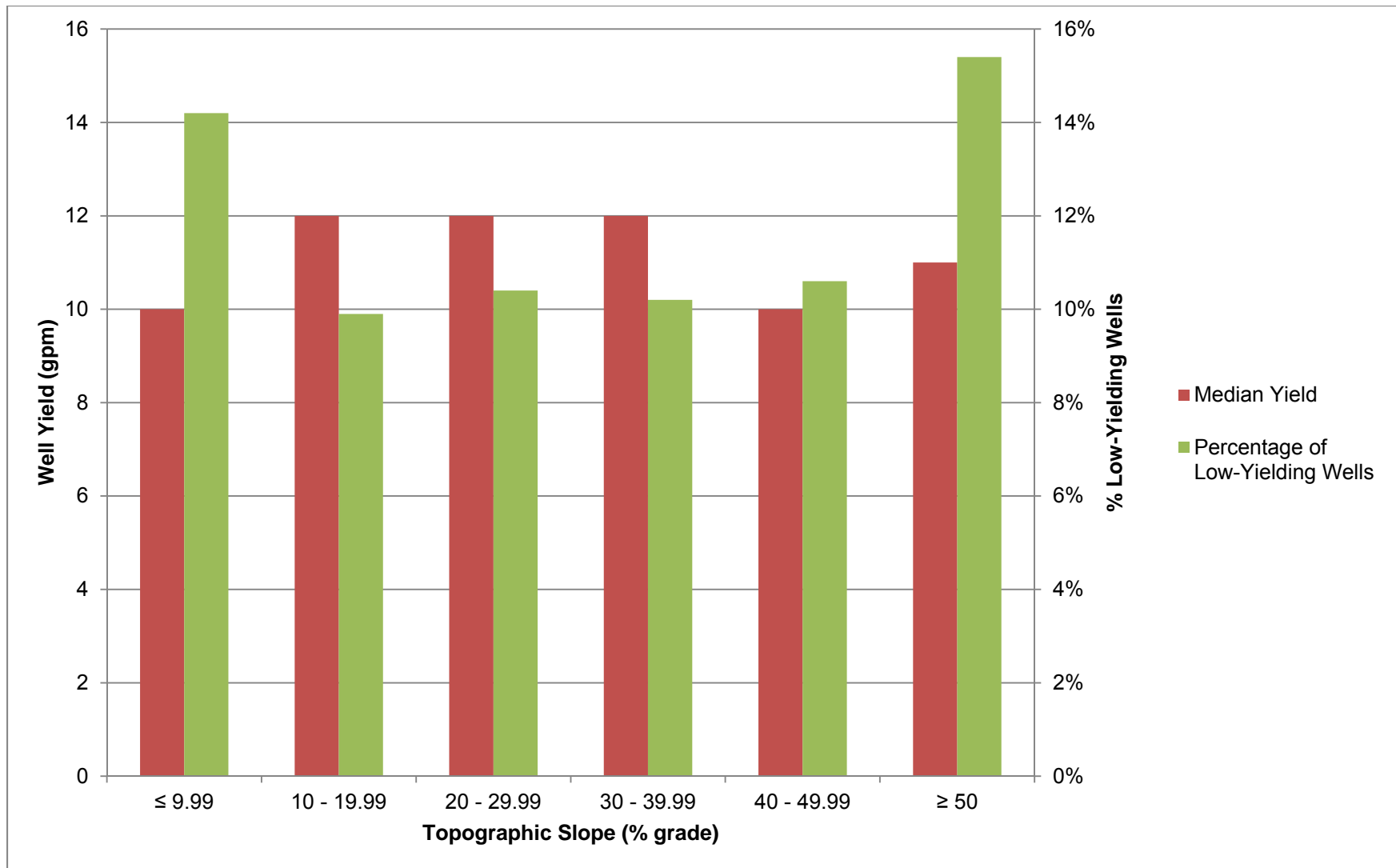


Figure 21: Well yield statistics based on topographic slope. Low-yielding wells are defined as wells with yields less than 3 gpm.

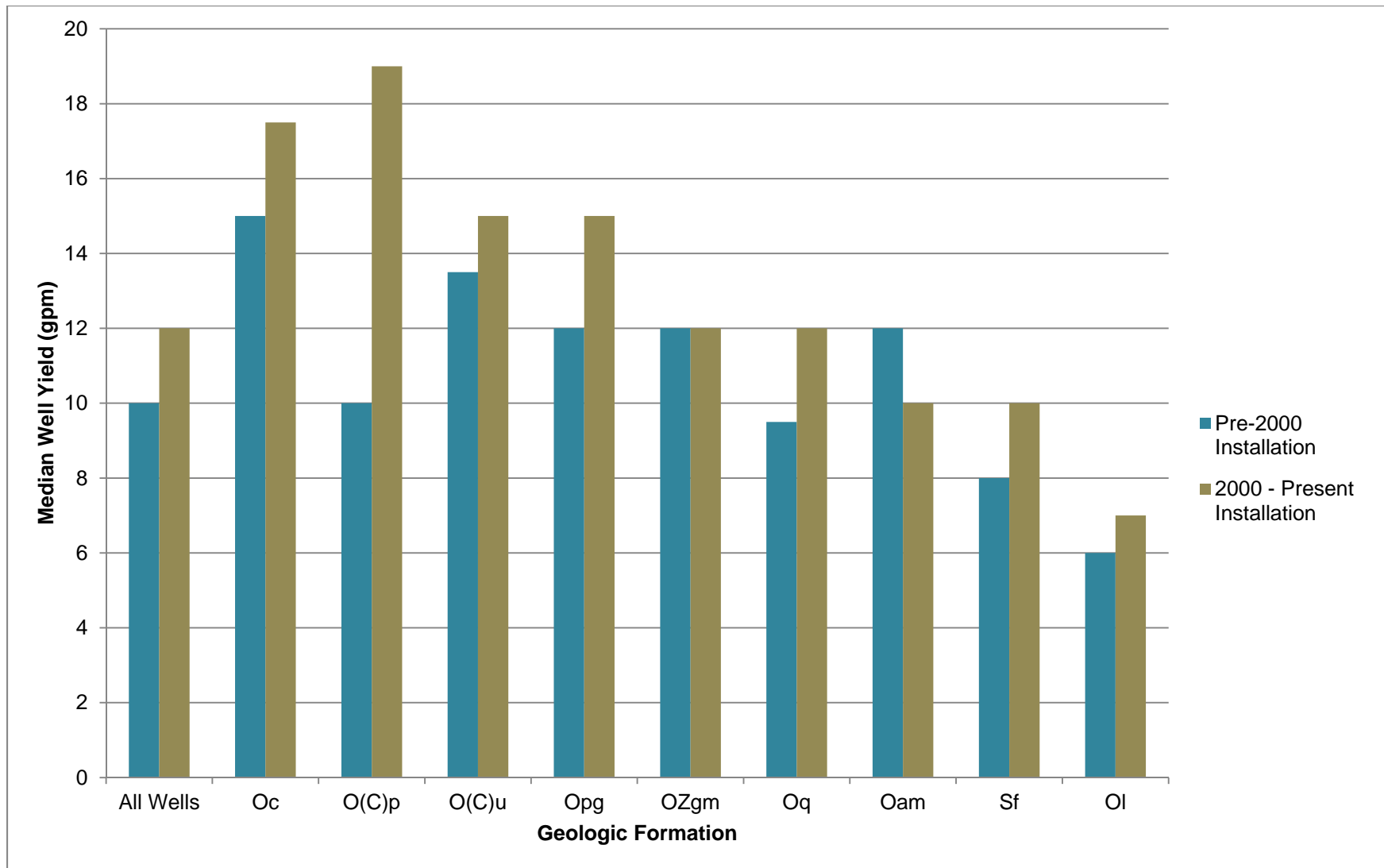


Figure 22a: Well yield statistics based on well installation year. Only geologic units containing greater than 50 well records are included within the chart.

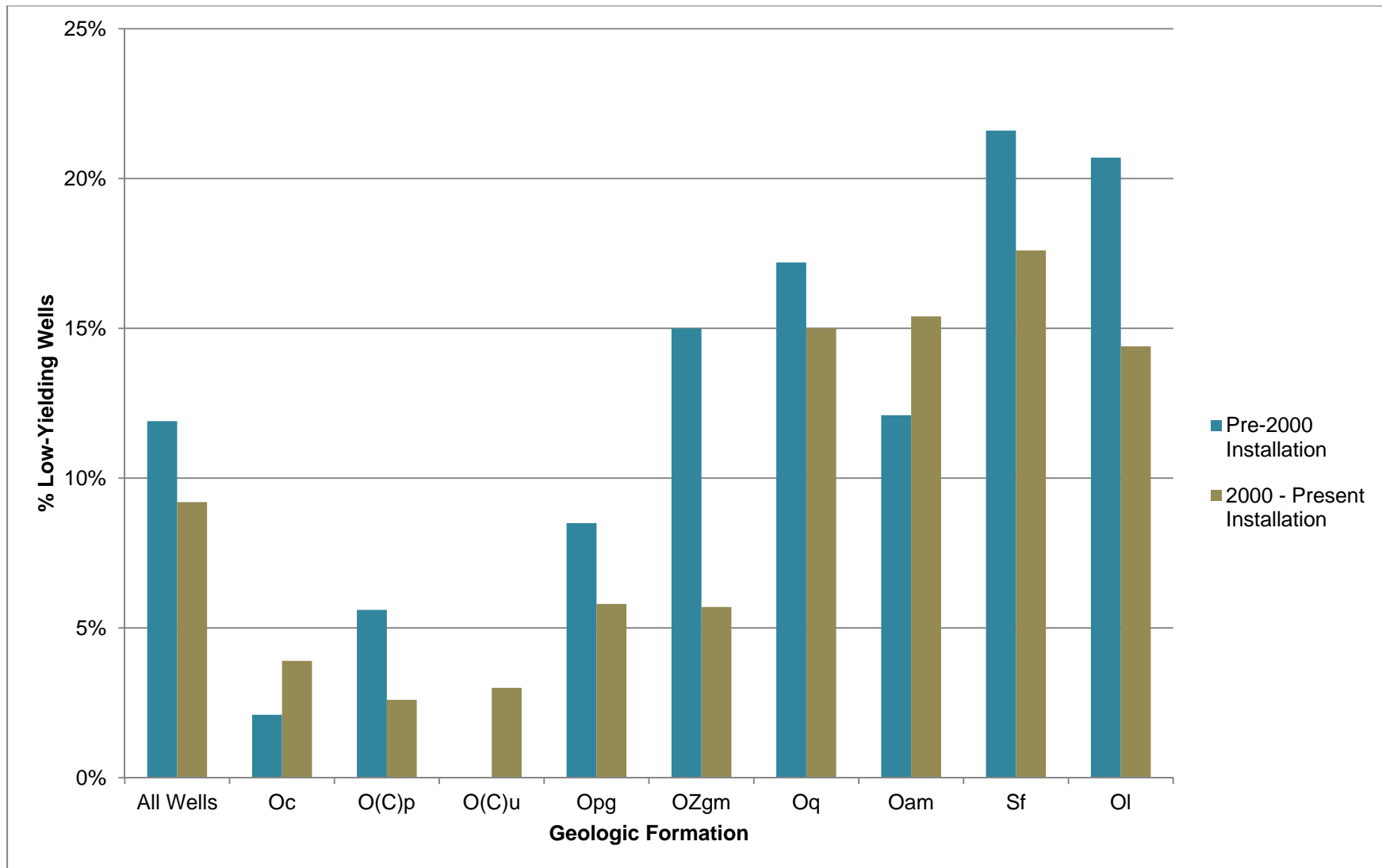


Figure 22b: Low-yielding well statistics based on well installation year. Only geologic units containing greater than 50 well records are included within the chart. Low-yielding wells are defined as wells with yields less than 3 gpm.

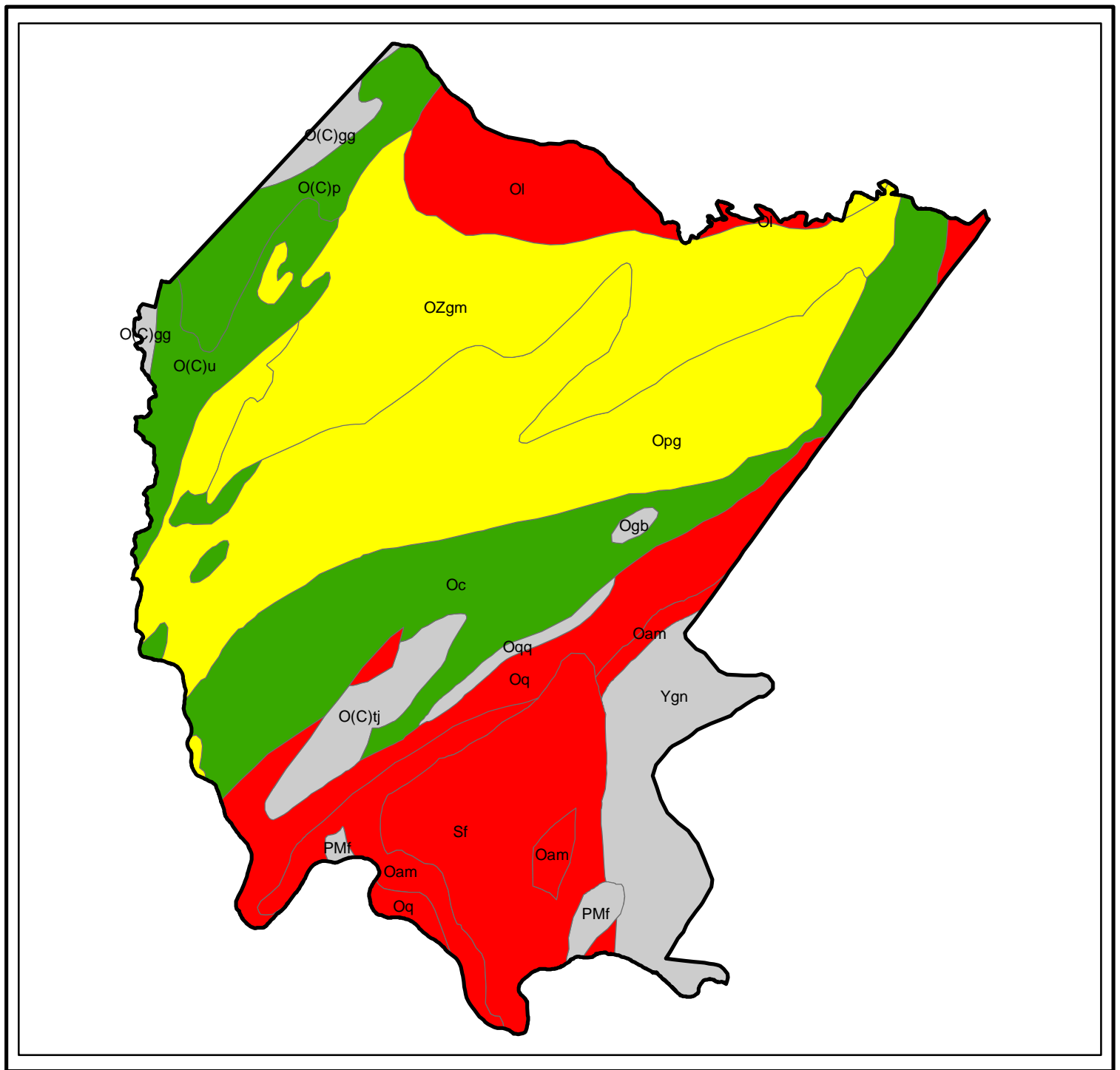







Figure 23a: Well Yield Classification Ratings by Geologic Unit

Legend

 Study Area Boundary

Well Yield Potential

-  HIGH: Median Well Yield = 15 gpm; Percentage of Low-Yielding Wells = 1.4 - 3.5%
-  MODERATE: Median Well Yield = 12 gpm; Percentage of Low-Yielding Wells = 7.7 - 11.2%
-  LOW: Median Well Yield = 6 - 10 gpm; Percentage of Low-Yielding Wells = 13.6 - 19.3%
-  Not Classified (Insufficient Well Data)

Groundwater Resources Evaluation
Piedmont Province
Stafford County, VA



0 1 2 4
Miles

ECS Project No. 47-4330

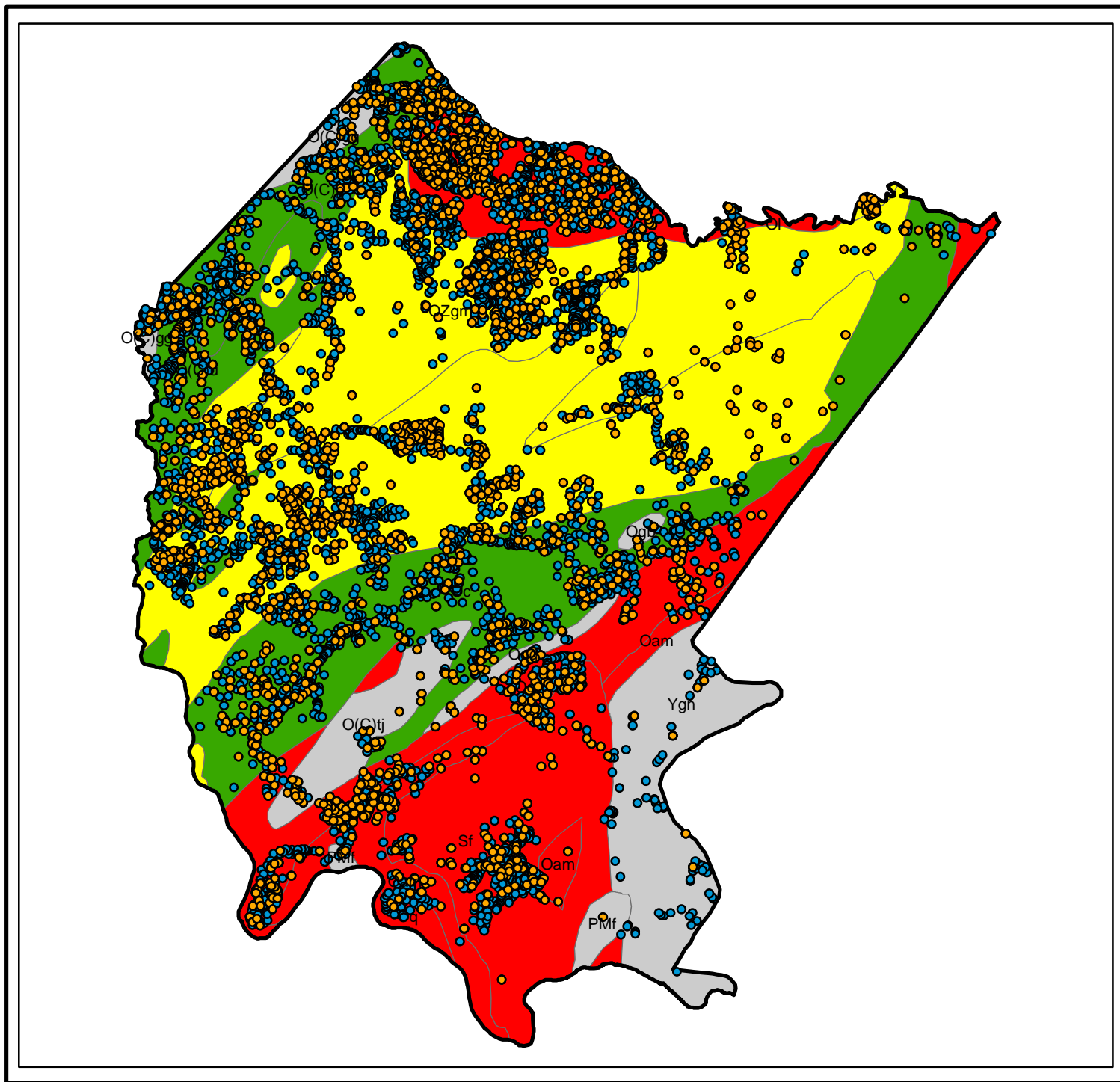


Figure 23b: Well Yield Classification Ratings and Well Locations

Legend

- Stafford County Attribute Data Well Database Record (with attribute data)
- Non-Attribute Data Well Database Record (without attribute data)

Groundwater Resources Evaluation
Piedmont Province
Stafford County, VA

Well Yield Potential

- HIGH:** Median Well Yield = 15 gpm; Percentage of Low-Yielding Wells = 1.4 - 3.5%
- MODERATE:** Median Well Yield = 12 gpm; Percentage of Low-Yielding Wells = 7.7 - 11.2%
- LOW:** Median Well Yield = 6 - 10 gpm; Percentage of Low-Yielding Wells = 13.6 - 19.3%
- Not Classified** (Insufficient Well Data)

0 1 2 4
Miles



ECS Project No. 47-4330

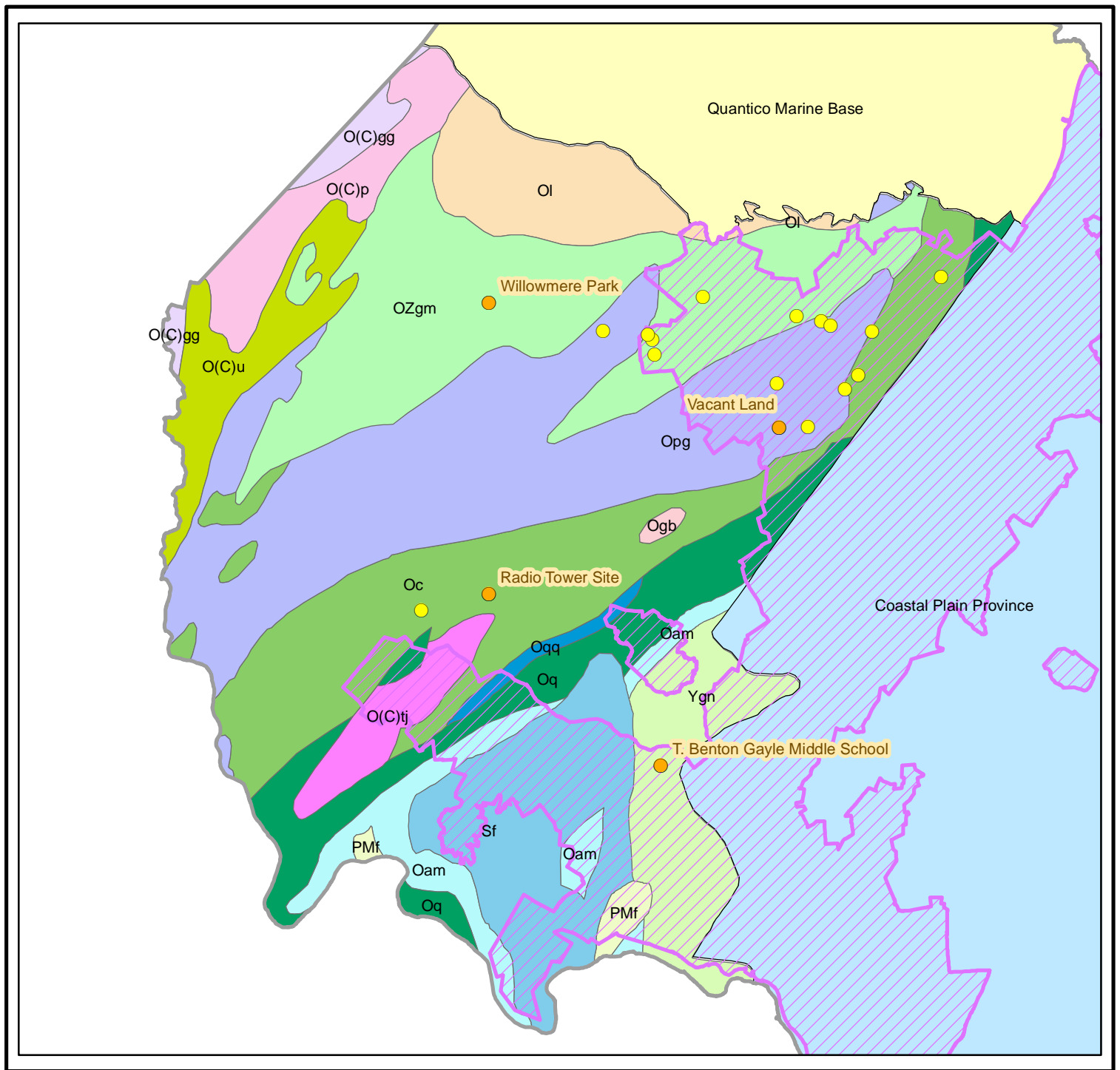


Figure 24: Prospective Monitoring Well Locations

Legend

- Prospective Monitoring Well Location
- Preferred Monitoring Well Location

- Municipal Water Service Area
- Quantico Marine Base
- Coastal Plain Province

Groundwater Resources Evaluation
Piedmont Province
Stafford County, VA

Map Notes:

- (1) Mapping by Rader and Evans (1993) and Mixon et al. (2005);
- (2) Map only contains consolidated bedrock geologic units;
- (3) Contacts overlain by unconsolidated sediment have been inferred;
- (4) See Table 1 within Groundwater Resource Evaluation Report for geologic unit descriptions.



0 1 2 4
Miles

Appendix A

Hydrologic Budget & Water Availability Calculations

Appendix A.1: Hydrologic Budget Calculations

A.1.1: Hydrologic Equation and Assumptions:

- General Hydrologic Equation: $\text{Inflow} = \text{Outflow} + \text{Change in Storage}$
- It is assumed that change in storage is negligible; as such, the general equation can be reduced to the following, which was used for the calculations: $\text{Inflow} = \text{Outflow}$.
 - o Inflow component: total precipitation (P)
 - o Outflow components: total evapotranspiration (ET), stormwater runoff to streams (SR), groundwater seepage to streams (GS), groundwater pumping withdrawals (GP), and net subsurface groundwater flow (GN).
 - o Inflow and outflow components are described in detail in Section 5.2.
- Inflow and outflow flow rates were obtained or modified from Sanford et al. (2012) or from values estimated as part of this study. The area of the study area (110.0 mi^2 or $3.0666 \times 10^9 \text{ ft}^2$) was calculated as part of a GIS analysis.
- The hydrologic budget was calculated under normal and drought precipitation conditions. Drought conditions are represented by a 35 percent reduction to all inflow and outflow components except groundwater pumping withdrawals, which remained constant.

A.1.2: Calculation of Hydrologic Component Rates:

- (1) Hydrologic Inflow Rates:
 - a. Precipitation: Based directly on rate provided within Sanford et al. (2012) for Stafford County, Virginia.
- (2) Hydrologic Outflow Flow Rates:
 - a. Evapotranspiration: Based directly on rate provided within Sanford et al. (2012) for Stafford County, Virginia.
 - b. Stormwater Runoff to Streams: Based directly on rate provided within Sanford et al. (2012) for Stafford County, Virginia.
 - c. Groundwater Seepage to Streams: Based on data provided by Sanford et al. (2012) from the portion of the Aquia Creek watershed located within the Piedmont Province, as detailed below.
 - i. $\text{Rate} = \text{Total Streamflow (feet}^3/\text{second [cfs])} * \text{Unit Conversion (seconds to year)} \div \text{Aquia Creek Watershed Area (ft}^2) * \text{Unit Conversion (feet to inches)} * \text{Percentage of Total Streamflow Attributed to Baseflow}$.
 - ii. $\text{Rate} = (35.9 \text{ cfs}) * (31,536,000 \text{ sec/yr}) \div (975,744,000 \text{ ft}^2) * (12 \text{ in/ft}) * (70\%) = 9.75 \text{ in/year}$.
 - d. Groundwater Pumping Withdrawals: Based on data collected as part of this Groundwater Resources Evaluation (see Section 6.1).
 - e. Net Subsurface Groundwater Flow: Based on net difference between hydrologic inflows and outflows.

A.1.3: Normal Precipitation Conditions Calculations:

- Calculations of component volumes were conducted as follows:
 - o $\text{Daily Flow Volume (million gallons per day [mgal/day])} = \text{Rate (inches/year)} \div \text{Unit Conversion (inches to feet)} * \text{Area of Study Area (} 3.0666 \times 10^9 \text{ feet}^2) * \text{Unit Conversion (feet}^3 \text{ to mgal)} \div \text{Unit Conversion (year to day)}$.

(1) Hydrologic Inflow Calculations:

a. $P = (43.0 \text{ in/yr}) \div (12 \text{ in/ft}) * (3.0666 \times 10^9 \text{ ft}^2) * (7.48052 \times 10^{-6} \text{ mgal/ft}^3) \div (365 \text{ day/yr}) = 225.21 \text{ mgal/day}$

(2) Hydrologic Outflow Calculations:

a. $ET = (27.7 \text{ in/yr}) \div (12 \text{ in/ft}) * (3.0666 \times 10^9 \text{ ft}^2) * (7.48052 \times 10^{-6} \text{ mgal/ft}^3) \div (365 \text{ day/yr}) = 145.08 \text{ mgal/day}$

b. $SR = (4.6 \text{ in/yr}) \div (12 \text{ in/ft}) * (3.0666 \times 10^9 \text{ ft}^2) * (7.48052 \times 10^{-6} \text{ mgal/ft}^3) \div (365 \text{ day/yr}) = 24.09 \text{ mgal/day}$

c. $GS = (9.75 \text{ in/yr}) \div (12 \text{ in/ft}) * (3.0666 \times 10^9 \text{ ft}^2) * (7.48052 \times 10^{-6} \text{ mgal/ft}^3) \div (365 \text{ day/yr}) = 51.06 \text{ mgal/day}$

d. $GP = (0.31 \text{ in/yr}) \div (12 \text{ in/ft}) * (3.0666 \times 10^9 \text{ ft}^2) * (7.48052 \times 10^{-6} \text{ mgal/ft}^3) \div (365 \text{ day/yr}) = 1.62 \text{ mgal/day}$

e. $GN = (0.64 \text{ in/yr}) \div (12 \text{ in/ft}) * (3.0666 \times 10^9 \text{ ft}^2) * (7.48052 \times 10^{-6} \text{ mgal/ft}^3) \div (365 \text{ day/yr}) = 3.35 \text{ mgal/day}$

A.1.4: Drought Precipitation Conditions Calculations:

- Drought conditions are represented by a 35 percent reduction to all inflow and outflow components except groundwater pumping withdrawals, which remained constant.

(1) Hydrologic Inflow Calculations:

a. $P = (27.95 \text{ in/yr}) \div (12 \text{ in/ft}) * (3.0666 \times 10^9 \text{ ft}^2) * (7.48052 \times 10^{-6} \text{ mgal/ft}^3) \div (365 \text{ day/yr}) = 146.39 \text{ mgal/day}$

(2) Hydrologic Outflow Calculations:

a. $ET = (18.0 \text{ in/yr}) \div (12 \text{ in/ft}) * (3.0666 \times 10^9 \text{ ft}^2) * (7.48052 \times 10^{-6} \text{ mgal/ft}^3) \div (365 \text{ day/yr}) = 94.30 \text{ mgal/day}$

b. $SR = (3.0 \text{ in/yr}) \div (12 \text{ in/ft}) * (3.0666 \times 10^9 \text{ ft}^2) * (7.48052 \times 10^{-6} \text{ mgal/ft}^3) \div (365 \text{ day/yr}) = 15.71 \text{ mgal/day}$

c. $GS = (6.34 \text{ in/yr}) \div (12 \text{ in/ft}) * (3.0666 \times 10^9 \text{ ft}^2) * (7.48052 \times 10^{-6} \text{ mgal/ft}^3) \div (365 \text{ day/yr}) = 33.21 \text{ mgal/day}$

d. $GP = (0.31 \text{ in/yr}) \div (12 \text{ in/ft}) * (3.0666 \times 10^9 \text{ ft}^2) * (7.48052 \times 10^{-6} \text{ mgal/ft}^3) \div (365 \text{ day/yr}) = 1.62 \text{ mgal/day}$

e. $GN = (0.30 \text{ in/yr}) \div (12 \text{ in/ft}) * (3.0666 \times 10^9 \text{ ft}^2) * (7.48052 \times 10^{-6} \text{ mgal/ft}^3) \div (365 \text{ day/yr}) = 1.55 \text{ mgal/day}$

Appendix A.2: Maximum Groundwater Availability Calculations

A.2.1: Maximum Groundwater Availability Equation:

- Modified Maryland Department of the Environment (MDE) Water Appropriations Method for Fractured Crystalline Rock Aquifers Equation:
 - o *Maximum Groundwater Withdrawal Capacity = (Drought-Condition Effective Recharge – 7Q10 Stream Baseflow – Net Subsurface Groundwater Outflow) x 10%.*
 - o Parameter values are discussed in Sections 6.2.2 and 6.2.3.
- Drought-Condition Effective Recharge:
 - o $\text{Drought-Condition Effective Recharge} = \text{effective recharge rate (inches/year)} \div \text{Unit Conversion (inches to feet)} \div \text{Unit Conversion (year to day)} * \text{recharge area (feet}^2\text{)} * \text{Unit Conversion (feet}^3\text{ to mgal)}$

- Drought-Condition Effective Recharge = $(7.41 \text{ in/yr}) \div (12 \text{ in/ft}) \div (365 \text{ days/yr}) * (2,845,461,168 \text{ ft}^2) * (7.48052 \times 10^{-6} \text{ mgal/ft}^3) = 36.01 \text{ mgal/day}$
- 7Q10 Stream Baseflow:
 - 7Q10 Rate = $7Q10 \text{ Streamflow (feet}^3\text{/second [cfs])} * \text{Unit Conversion (seconds to year)} \div \text{Watershed Area (feet}^2) * \text{Unit Conversion (feet to inches)}$
 - Aquia Creek 7Q10 Rate = $(0.01 \text{ cfs}) * (31,536,000 \text{ sec/yr}) \div (975,744,000 \text{ ft}^2) * (12 \text{ in/ft}) = 0.0039 \text{ in/yr.}$
 - Rappahannock River 7Q10 Rate = $(48 \text{ cfs}) * (31,536,000 \text{ sec/yr}) \div (44,493,926,400 \text{ ft}^2) * (12 \text{ in/ft}) = 0.4083 \text{ in/yr.}$
 - 7Q10 Daily Flow = $7Q10 \text{ Rate} \div \text{Unit Conversion (inches to feet)} \div \text{Unit Conversion (year to day)}$
 - * Study Area Effective Recharge Area (feet²) * Unit Conversion (feet³ to mgal)
 - Aquia Creek 7Q10 Daily Flow = $(0.0039 \text{ in/yr}) \div (12 \text{ in/ft}) \div (365 \text{ day/yr}) * (3,066,624,000 \text{ ft}^2) * (7.48052 \times 10^{-6} \text{ mgal/ft}^3) = 0.02 \text{ mgal/day}$
 - Rappahannock River 7Q10 Daily Flow = $(0.4083 \text{ in/yr}) \div (12 \text{ in/ft}) \div (365 \text{ day/yr}) * (3,066,624,000 \text{ ft}^2) * (7.48052 \times 10^{-6} \text{ mgal/ft}^3) = 2.14 \text{ mgal/day}$
- Net Subsurface Groundwater Outflow: 3.35 mgal/day under normal conditions (see Section 5.2.2)
- Maximum Groundwater Withdrawal Capacity Calculation:
 - *Maximum Groundwater Withdrawal Capacity = (Drought-Condition Effective Recharge – 7Q10 Stream Baseflow – Net Subsurface Groundwater Outflow) x 10%.*
 - Maximum Groundwater Withdrawal Capacity = $(36.01 \text{ mgal/day} - 2.14 \text{ mgal/day} - 3.35 \text{ mgal/day}) \times 10\% = 3.05 \text{ mgal/day}$

Appendix B

Prospective Monitoring Well Property Evaluation Table

Table B-1: Prospective monitoring well properties and associated evaluation information.

Site Name	Parcel Identification	Address	Property Owner	Property Size (acres)	Geologic Unit	Within Municipal Water Service Area?	Regional Supply Well Density (wells per square mile)	Overall Site Ranking
Willowmere Park	17 58F (2 lots)	21 Willowmere Pond Rd, Stafford, VA	The Board of Supervisors of Stafford	55.57	Ozgm	No	26.6	1
Radio Tower Site	35 95	Near the end of Lillie Ln, off of Shackelford Well Rd	County of Stafford	33.00	Oc	No	17.7	2
T. Benton Gayle Middle School	45 14D	100 Panther Dr, Fredericksburg, VA	Stafford County School Board	39.98	Ygn	Yes	8.9	3
Vacant Land	28 65A	Near intersection of Ramoth Church Rd & Dog Patch Ln	Stafford County Board of Supervisors	11.34	Opg	Yes	8.9	4
Vacant Land	18 74	Near intersection of Mountain View Rd and Clover Hill Dr	County of Stafford	0.50	Opg	No	151.5	-
Central Rappahannock Regional Library	20 18	2001 Parkway Blvd, Stafford, VA	The Board of Supervisors of Stafford	3.24	Opg	Yes	0	-
Woodlands Pool	20 117F	2 Northampton Blvd, Stafford, VA	Board of Supervisors of Stafford County	3.70	Opg & Oc	Yes	8.9	-
Vacant Land	19 35E	Adjoining Garrisonville Elementary School	Stafford County	5.71	Ozgm	Yes	0	-
The Gardens of Stafford Apartments	28 9A	2191 Mountain View Rd, Stafford, VA	Board of Supervisors of Stafford	7.23	Ozgm	Yes	17.7	-

Site Name	Parcel Identification	Address	Property Owner	Property Size (acres)	Geologic Unit	Within Municipal Water Service Area?	Regional Supply Well Density (wells per square mile)	Overall Site Ranking
Anne E. Moncure Elementary	20 136A	75 Moncure Ln, Stafford, VA	Stafford County School Board	10.00	Oc	Yes	0	-
Vacant Land	28 9B	Adjoining Mountain View High & The Gardens of Stafford Apartments	Board of Supervisors of Stafford	11.31	OZgm	Yes	0	-
Autumn Ridge Park	29 49L (3 lots)	900 Eustace Rd, Stafford, VA	Board of Supervisors of Stafford County	12.88	Opg & Oc	Yes	0	-
Park Ridge Elementary	20 20B	2000 Parkway Blvd, Stafford, VA	Stafford County School Board	20.00	Opg & OZgm	Yes	0	-
Winding Creek Elementary	29 17A	475 Winding Creek Rd, Stafford, VA	Stafford County School Board	20.89	Opg	Yes	8.9	-
Hartwood Elementary	35 58C	14 Shackelford Well Rd, Fredericksburg, VA	Stafford County School Board	29.31	Oc	No	88.7	-
H.H. Poole Middle School	29 5H	800 Eustace Rd, Stafford, VA	County School Board of Stafford County	36.62	Oc	Yes	8.9	-
Rodney Thompson Middle School	28 116E	75 Walpole St, Stafford, VA	The School Board of Stafford County VA	43.68	Opg	Yes	0	-
North Stafford High	20 13	839 Garrisonville Rd, Stafford, VA	Stafford County School Board	88.50	Ozgm & Opg	Yes	0	-
Mountain View High	28 9	2135 Mountain View Rd, Stafford,	Board of Supervisors	128.43	Ozgm & Opg	Yes	0	-

Site Name	Parcel Identification	Address	Property Owner	Property Size (acres)	Geologic Unit	Within Municipal Water Service Area?	Regional Supply Well Density (wells per square mile)	Overall Site Ranking
		VA	of Stafford					

Appendix C

Estimated Monitoring Well Installation & Data Collection Costs

Estimated Monitoring Well Installation & Data Collection Costs

Cost Assumptions:

- Well Diameter: 6.125 inches
- Well Depth: 400 feet
- Surface Casing: 6.25-inch inner diameter, 0.375-inch wall thickness, steel casing
- Surface Casing Depth: 80 feet
- Grouting includes up to 10 bags of bentonite-mixture grout. Additional bags would cost approximately \$27.00/bag
- Air-lift well development beyond 1 hour, if necessary, would cost approximately \$175.00/hour
- The groundwater level monitoring system would consist of the following: An In-Situ® LevelTroll 500 vented pressure transducer (30 psi) would be installed within the well and attached to a vented, polyethylene direct-read cable
- Cost assumes that 100 feet of polyethylene direct-read cable would be installed within the well
- Groundwater level data would be manually downloaded on a quarterly basis. Desiccant attached to the vented transducer cable would be replaced during each data download event
- A groundwater level monitoring report would be generated on a quarterly basis

Table C-1: Estimated Monitoring Well Installation and Data Collection Costs.

Task Description	Quantity	Price	Pricing Unit	Estimated Cost
<i>Task One: Monitoring Well Installation</i>				
Driller Mobilization	1	\$2,400.00	Lump Sum	\$2,400.00
Well Drilling	400	\$16.00	Linear Foot	\$6,400.00
Surface Casing	80	\$15.00	Linear Foot	\$1,200.00
Well Grouting (bentonite mix)	1	\$1,200.00	Per Well	\$1,200.00
Locking Well Cap	1	\$100.00	Per Well	\$100.00
Air-Lift Well Development	-	\$175.00	Per Hour	-
Geologist: Driller Coordination & Planning	6	\$125.00	Per Hour	\$750.00
Geologist: Geologic Logging	24	\$125.00	Per Hour	\$3,000.00
Well Installation Report & Geologic Well Log	1	\$4,000.00	Lump Sum	\$4,000.00
			Subtotal	\$19,050.00
<i>Task Two: Monitoring Equipment & Installation</i>				
Pressure Transducer	1	\$1,450.00	Lump Sum	\$1,450.00
Vented Direct-Read Cable (100 feet)	1	\$650.00	Lump Sum	\$650.00
Wellhead Cable Docking System & Desiccant Attachment	1	\$250.00	Lump Sum	\$250.00
Transducer Installation Labor	1	\$750.00	Lump Sum	\$750.00
			Subtotal	\$3,100.00
Total Estimated Cost: Tasks One & Two				\$22,150.00

<i>Task Three: Annual Monitoring and Reporting</i>				
Quarterly Data Download & Logging Equipment Maintenance	4	\$700.00	Per Quarter	\$2,800.00
Desiccant Refill	4	\$25.00	Per Quarter	\$100.00
Quarterly Groundwater Level Monitoring Report	4	\$2,500.00	Per Quarter	\$10,000.00
Total Estimated Annual Cost: Task Three				\$12,900.00

Appendix D

Pertinent Virginia Hydrogeologic County Regulations

Albemarle County

CHAPTER 14

SUBDIVISION OF LAND

Sections:

ARTICLE I. GENERAL PROVISIONS

14-100	Short title.
14-101	Purposes.
14-102	Applicability.
14-103	Acts prohibited without complying with chapter.
14-104	Relation of chapter to other laws and private contracts.
14-105	Rules of construction.
14-106	Definitions.
14-107	Procedure to amend chapter.
14-108	Filing of chapter.

ARTICLE II. ADMINISTRATION AND PROCEDURE

DIVISION 1. ADMINISTRATION

14-200	Designation of agent; powers and duties.
14-201	Designation of commission; powers and duties.
14-202	Establishment of site review committee; powers and duties.
14-203	Fees.
14-203.1	Variations and exceptions.
14-203.2	Appeals of decisions pertaining to variations and exceptions.
14-204	Enforcement and penalties.

**DIVISION 2. PROVISIONS OF CHAPTER APPLICABLE TO
SUBDIVISIONS AND EASEMENT PLATS**

14-205	General.
14-206	Subdivisions other than rural subdivisions, two lot subdivisions, subdivisions following final site plan approval, subdivisions creating one special lot and one residue lot, family subdivisions, boundary line adjustments and easement plats.
14-207	Rural subdivisions, two lot subdivisions, subdivisions following final site plan approval, and subdivisions creating one special lot and one residue lot.
14-208	Family subdivisions.
14-208.1	Boundary line adjustments.
14-208.2	Easement plats.
14-208.3	Plats creating a special lot and one residue lot.

**DIVISION 3. PROCEDURES FOR RURAL SUBDIVISIONS, TWO LOT SUBDIVISIONS,
SUBDIVISIONS FOLLOWING FINAL SITE PLAN APPROVAL, SUBDIVISIONS CREATING
ONE SPECIAL LOT AND ONE RESIDUE LOT, FAMILY SUBDIVISIONS, BOUNDARY LINE
ADJUSTMENTS, EASEMENT PLATS AND VACATIONS**

14-209	Rural subdivisions; family subdivisions, subdivisions creating a special lot and one residue lot; subdivisions resulting in not more than two lots; subdivisions after approval of a final site plan, easement plats; boundary line adjustments; procedure.
14-211	Family subdivisions; conditions precedent.
14-212	Family subdivisions; conditions of approval.
14-212.1	Boundary line adjustment; conditions precedent.
14-212.2	Vacation of plat or part thereof; procedure.

ALBEMARLE COUNTY CODE

DIVISION 4. PROCEDURE FOR ALL OTHER SUBDIVISIONS

- 14-213 General.
- 14-214 Preapplication conference.
- 14-215 Form and style of preapplication schematic plat.
- 14-216 Contents of preapplication schematic plat.
- 14-217 Review of preapplication schematic plat.
- 14-218 Submittal of preliminary plat; determination of completeness.
- 14-219 Review of preliminary plat by site review committee.
- 14-220 Revisions to preliminary plat to address required changes.
- 14-221 Deferral of review of preliminary plat; when application deemed withdrawn.
- 14-222 Review and action on preliminary plat by agent.
- 14-223 Appeal and judicial review of disapproval of preliminary plat.
- 14-224 Period of validity of approved preliminary plat.
- 14-225 Effect of approval of preliminary plat on other future and pending approvals.
- 14-225.1 Effect of approval of preliminary plat.
- 14-226 Submittal of final plat; determination of completeness.
- 14-227 Review of final plat by site review committee.
- 14-228 Revisions to final plat to address required changes.
- 14-229 Deferral of review of final plat; when application deemed withdrawn.
- 14-230 Review and action on final plat by agent.
- 14-231 Appeal and judicial review of disapproved final plat.
- 14-231.1 Period of validity of approved final plat.

**DIVISION 5. PROCEDURES FOR THE APPROVAL OF PRIVATE STREETS,
SHARED DRIVEWAYS AND ALLEYS**

- 14-232 When private streets in rural areas may be authorized.
- 14-233 When private streets in development areas may be authorized.
- 14-234 Procedure to authorize private street and related matters.
- 14-235 Effect of approval of private street.
- 14-236 When shared driveways and alleys may be authorized.

**ARTICLE III. SUBDIVISION PLAT REQUIREMENTS
AND DOCUMENTS TO BE SUBMITTED**

DIVISION 1. PLAT REQUIREMENTS

- 14-300 Persons authorized to prepare plat.
- 14-301 Form and style of plats.
- 14-302 Contents of preliminary plat.
- 14-303 Contents of final plat.

**DIVISION 2. DOCUMENTS AND INFORMATION TO BE SUBMITTED
WITH PRELIMINARY OR FINAL PLAT**

- 14-304 Request to disturb steep slopes.
- 14-305 Stormwater management information.
- 14-306 Private streets information.
- 14-307 Stream crossings.
- 14-307.1 Dam break inundation zones.
- 14-308 Floodplain and topographic information; information to demonstrate that damage from flooding will be minimized.
- 14-308.1 Groundwater assessment information.
- 14-309 Soil evaluations.
- 14-310 Health director approval of individual private wells and/or onsite sewage systems.
- 14-311 Infrastructure improvement plans, computations and documents.

ALBEMARLE COUNTY CODE

- 14-312** **Location of existing buildings.**
- 14-313** **Reserved.**
- 14-314** **Identification of all interests of the county in property.**
- 14-315** **Reserved.**
- 14-316** **Approval of entrance onto public streets.**

DIVISION 3. DOCUMENTS AND INFORMATION TO BE SUBMITTED WITH FINAL PLAT

- 14-317** **Instrument evidencing maintenance of certain improvements.**
- 14-318** **Dam break inundation zones; engineering study and mapping information.**

ARTICLE IV. ON-SITE IMPROVEMENTS AND DESIGN

DIVISION 1. LOTS AND BLOCKS

- 14-400** **Minimum lot requirements.**
- 14-401** **Double frontage lots.**
- 14-402** **Lot shape.**
- 14-403** **Lot frontage.**
- 14-404** **Lot location to allow access from lot onto street or shared driveway.**
- 14-405** **Side lot lines.**
- 14-406** **Remnants.**
- 14-407** **Block width.**
- 14-408** **Block orientation.**

DIVISION 2. STREETS AND ALLEYS

- 14-409** **Coordination and extension of streets.**
- 14-410** **Standards for all streets and alleys.**
- 14-411** **Standards for public streets only.**
- 14-412** **Standards for private streets only.**
- 14-413** **Improvement of existing public streets.**

DIVISION 3. WATER, SEWERS AND OTHER IMPROVEMENTS

- 14-414** **Public water and sewerage systems.**
- 14-415** **Central water supplies and sewerage systems.**
- 14-416** **Individual private wells and onsite sewage systems.**
- 14-417** **Stormwater management facilities and other control measures.**
- 14-418** **Fire protection.**
- 14-419** **Landscaping for double frontage lots.**
- 14-420** **Location of utilities above- and underground.**
- 14-421** **Monuments.**
- 14-422** **Sidewalks and planting strips.**
- 14-423** **Street signs.**

DIVISION 4. CONTRIBUTIONS, DEDICATIONS, RESERVATIONS AND TRANSFERS

- 14-424** **Contributions for off-site improvements.**
- 14-425** **Reserved.**
- 14-426** **Dedication of land for public use.**
- 14-427** **Reservation of land for public use.**
- 14-428** **Dedication of streets, alleys, curbs, gutters, sidewalks, stormwater management facilities, bicycle trails, pedestrian trails.**
- 14-429** **Reservation of land for streets, alleys, walkways, waterways or public areas shown on map.**

ALBEMARLE COUNTY CODE

- 14-430** **Dedication of water and sewerage systems.**
- 14-431** **Easements for stormwater management facilities and other control measures.**
- 14-432** **Easements for cable television and public service corporations.**
- 14-433** **Effect of recordation of plat on dedications and certain easements.**

DIVISION 5. COMPLETION OF ON-SITE IMPROVEMENTS AND SURETY

- 14-434** **Completion of on-site improvements required prior to plat approval.**
- 14-435** **Agreement and surety.**
- 14-435.1** **Surety for maintenance of streets until accepted into state system.**
- 14-436** **Release of surety.**
- 14-437** **Effect of acceptance or approval of improvements.**
- 14-438** **Inspections; right of entry.**
- 14-439** **Improvements completed at expense of subdivider; exception.**
- 14-440** **County and other public entities not obligated to maintain improvements.**
- 14-441** **Dam break inundation zones; prerequisite to development.**

ARTICLE I. GENERAL PROVISIONS

Sec. 14-100 Short title.

This chapter shall be known and may be cited as the “Subdivision Ordinance of Albemarle County, Virginia” or as the “Subdivision Ordinance.”

(Ord. 98-A(1), 8-5-98; Ord. 05-14(1), 4-20-05, effective 6-20-05)

State law reference--Va. Code § 15.2-2240.

Sec. 14-101 Purposes.

The purposes of this chapter are to:

- A. Improve the public health, safety, convenience and welfare of the citizens of the county by assuring the orderly division of land and its development;
- B. Provide residential areas with healthy surroundings for family life by assuring that land is divided and developed in a manner that is harmonious with its surrounding lands;
- C. Implement the comprehensive plan and the policies stated in section 1.4 of the zoning ordinance through the standards and procedures established herein;
- D. Assure that the development of the county is consonant with efficient and economical use of public funds;
- E. Assure that all improvements required by this chapter will be designed, constructed and maintained so as not to become an undue burden on the community; and
- F. Establish standards for lot development that are specific to, and most appropriate for, the lands within the development and rural areas of the county.

((§18-1: § 2, 8-28-74; § 18-1, 9-5-96)(§ 18-14: §3, 8-28-74; § 18-14, 9-5-96); §§ 18-1, 18-14; § 14-101, Ord. 98-A(1), 8-5-98; Ord. 05-14(1), 4-20-05, effective 6-20-05)

State law reference--Va. Code § 15.2-2240.

CHAPTER 17

WATER PROTECTION

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ARTICLE I. GENERAL

Sec. 17-100 Short title.

This chapter shall be known and may be cited as the “Water Protection Ordinance.”

(2-11-98; Code 1988, § 19.3-1; § 17-100, Ord. 98-A(1), 8-5-98)

Sec. 17-101 Authority.

Articles I through IX of this chapter are adopted pursuant to the authority conferred by the Virginia Stormwater Management Act (Virginia Code § 62.1-44.15:24 *et seq.*), as authorized by Virginia Code § 62.1-44.15:27, the Erosion and Sediment Control Law (Virginia Code § 62.1-44.15:51 *et seq.*), as

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authorized by Virginia Code § 62.1-44.15:54, the regulations implementing the Virginia Stormwater Management Act and the Erosion and Sediment Control Law in 9VAC25-830 through 9VAC25-890, as applicable, including the general Virginia Pollutant Discharge Elimination System permit for discharges from the County's small municipal separate storm sewer system, and Virginia Code § 62.1-44.15:73, which is a part of the Chesapeake Bay Preservation Act (Virginia Code § 62.1-44.15:67 *et seq.*).

(§ 7-1, 6-18-75, § 2, 2-11-87, 3-18-92; § 19.2-3, 6-19-91, § 3; § 19.3-2, 2-11-98; Code 1988, §§ 7-1, 19.2-3, 19.3-2; § 17-101, Ord. 98-A(1), 8-5-98; Ord. 14-17(1), 5-7-14, effective 7-1-14)

State law reference – Va. Code §§ 62.1-44.15:27, 62.1-44.15:54, 62.1-44.15:73; 9VAC25-830 through 9VAC25-890.

Sec. 17-102 Purposes.

The purposes of this chapter are to:

- A. *Protect public health, safety and welfare.* Protect the health, safety and general welfare of the citizens of the County and the Commonwealth of Virginia.
- B. *Protect quality and quantity of State waters from unmanaged stormwater.* Protect the quality and quantity of State waters from the potential harm of unmanaged stormwater and to effectively control soil erosion, sediment deposition and nonagricultural runoff by requiring control measures that will maintain, protect and improve the water quality and quantity of receiving State waters.
- C. *Protect property and natural resources.* Prevent the unreasonable degradation of properties, stream channels, waters, and other natural resources.
- D. *Reduce pollution and illicit discharges to protect water quality.* Establish a comprehensive program to manage sources of stormwater. Runoff from lands modified by human activities can harm surface water resources by, among other things, changing natural hydrologic patterns, increasing runoff velocity, and by elevating pollutant concentrations and loadings. Runoff may contain or mobilize high levels of contaminants, such as sediment, suspended solids, nutrients, heavy metals, pathogens, toxins, oxygen-demanding substances, and floatables.
- E. *Sustainability of groundwater resources.* Promote the long-term sustainability of groundwater resources.
- F. *Implement State laws.* Implement the applicable parts of the State Water Control Law (Virginia Code § 62.1-44.3 *et seq.*), including the Virginia Stormwater Management Act (Virginia Code § 62.1-44.15:24 *et seq.*), as required by Virginia Code § 62.1-44.15:27, and the Erosion and Sediment Control Law (Virginia Code § 62.1-44.15:51 *et seq.*), as required by Virginia Code § 62.1-44.15:54, and the regulations implementing the Virginia Stormwater Management Act and the Erosion and Sediment Control Law in 9VAC25-830 through 9VAC25-890, as applicable, and as required thereby, including the general Virginia Pollutant Discharge Elimination System permit for discharges from the County's small municipal separate storm sewer system, and to provide for the proper administration and enforcement of this chapter.

(§ 7-1, 6-18-75, § 2, 2-11-87, 3-18-92; § 19.1-4, 9-29-77, art. I, § 1, 7-11-90; § 19.2-2, 6-19-91, § 2; § 19.3-3, 2-11-98; Code 1988, §§ 7-1, 19.1-4, 19.2-2, 19.3-3; § 17-102, Ord. 98-A(1), 8-5-98; Ord. 04-17(1), adopted 12-8-04, effective 2-8-05; Ord. 07-17(1), 2-14-07; Ord. 14-17(1), 5-7-14, effective 7-1-14)

State law reference – Va. Code §§ 62.1-44.15:25, 62.1-44.15:52; 9VAC 25-870-40, 9VAC 25-870-46, 9VAC 25-870-400.

Sec. 17-103 Applicability.

This chapter, or the applicable parts thereof, shall apply to:

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- A. *Land disturbing activity within the County and the Town of Scottsville.* Any land disturbing activity within the County and within the Town of Scottsville, including that portion of the Town of Scottsville located within the County of Fluvanna, to which the VESCP, the VSMP, or both, apply under this chapter and under State and Federal law.
- B. *Erosion impact areas.* Any land identified by the administrator as an erosion impact area within the County and the Town of Scottsville, to which the parts of this chapter pertaining to erosion and sediment control, including the requirement for the submittal and approval of an erosion and sediment control plan, shall apply.
- C. *Stream buffers.* Any area within the County and the Town of Scottsville designated as a stream buffer under this chapter.
- D. *Permanent stormwater management facilities.* Any areas served by a public permanent stormwater management facility.
- E. *Discharges, connections and dumping.* All activities that cause or allow to be caused direct or indirect illicit discharges, illicit connections, and the prohibited dumping of refuse and pollutants, or which negatively impede the flow capacity of the County's MS4 or State waters.

(Ord. 14-17(1), 5-7-14, effective 7-1-14)

State law reference – Va. Code §§ 62.1-44.15:27, 62.1-44.15:33, 62.1-44.15:34, 62.1-44.15:54, 62.1-44.15:55, 62.1-44.15:73; 9VAC25-890-40.

Sec. 17-104 Land disturbing activity prohibited without approved plans; responsibility.

No owner shall engage in land disturbing activity subject to the requirements of this chapter, or allow land disturbing activity to occur, on his property, until:

- A. *Erosion and sediment control plan approved under the VESCP.* The owner has submitted to the administrator an erosion and sediment control plan for the land disturbing activity and the plan has been reviewed and approved by the administrator, and all other prerequisites to engaging in land disturbing activity have been satisfied, as provided in section 17-400 *et seq.*; and
- B. *Permit approved under the VSMP.* The owner has submitted to the administrator an application for a VSMP permit to conduct land disturbing activity and the permit has been reviewed and approved by the administrator, and all other prerequisites to engaging in land disturbing activity have been satisfied, as provided in section 17-400 *et seq.*

(Ord. 14-17(1), 5-7-14, effective 7-1-14)

State law reference – Va. Code §§ 62.1-44.15:27, 62.1-44.15:34, 62.1-44.15:55; 9VAC25-890-40.

Sec. 17-105 Assumptions.

The administration of the requirements of this chapter is assumed to comply with the County's obligations under its MS4 permit, that the control measures and best management practices approved by the administrator in conjunction with any erosion and sediment control plan or VSMP permit are effective based upon current control technologies and best management practices. It also is assumed that control technologies and best management practices are constantly being refined and improved and, as a result, the requirements of State law, this chapter, and the Design Standards Manual will be responsive to these refinements and improvements in administering this chapter.

(Ord. 14-17(1), 5-7-14, effective 7-1-14)

State law reference – 9VAC25-870-400.

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Sec. 17-106 Integration with other programs.

The requirements of this chapter shall be integrated and implemented in conjunction with any project requiring compliance prior to any land disturbing activity, including subdivisions, site plans, and any other plans of development, those projects within the flood hazard overlay district established in the Zoning Ordinance, and any dam break inundation zone that has been mapped as provided in Virginia Code § 10.1-606.3.

(§ 17-107, Ord. 07-17(1), 2-14-07; § 17-106, Ord. 14-17(1), 5-7-14, effective 7-1-14)

State law reference – Va. Code §§ 62.1-44.15:27, 62.1-44.15:54.

Sec. 17-107 Obligation to comply with all State laws.

Neither any provision in this chapter, nor any omission from this chapter of a self-executing requirement of State law, shall relieve any owner from any responsibilities, liabilities, or penalties established under applicable State law nor preclude the institution of any legal action by the County, the Virginia Department of Environmental Quality, or any other public entity with enforcement powers under State law.

(Ord. 14-17(1), 5-7-14, effective 7-1-14)

State law reference – 9VAC25-880-70.

Sec. 17-108 Saving provision.

The adoption of this chapter, which shall be effective July 1, 2014, shall not abate any pending action, liability, or penalty of any person accruing or about to accrue, nor waive any right of the County under chapter 17 in effect prior to July 1, 2014, unless expressly provided for in this chapter. Any erosion and sediment control plan, stormwater management plan, mitigation plan and, to the extent they pertain to stormwater management, any final site plan or subdivision plat, approved prior to July 1, 2014, shall remain in full force and effect, and all rights and remedies of the County in enforcing those plans, permits and plats are hereby preserved.

(2-11-98; Code 1988, § 19.3-7; § 17-106, Ord. 98-A(1), 8-5-98; § 17-108, Ord. 14-17(1), 5-7-14, effective 7-1-14)

ARTICLE II. ADMINISTRATION

Sec. 17-200 Designation of program authority.

The County of Albemarle, Virginia, is hereby designated the program authority (the “program authority”) for the purpose of administering the Virginia Erosion and Sediment Control Program (“VESCP”) and the Virginia Stormwater Management Program (“VSMP”) within the County and the Town of Scottsville. In addition, to further administer the VESCP and the VSMP:

- A. *Agreements.* The County may enter into agreements with soil and water conservation districts, adjacent localities, or other public or private entities to assist with administering and implementing the VESCP and the VSMP.
- B. *Cooperation with State and Federal agencies.* The County may cooperate and enter into agreements with any State or Federal agency in connection with the requirements for erosion and sediment control with respect to land disturbing activities or for land disturbing activities for stormwater management.

(§ 7-9, 4-21-76, 2-11-87, 3-18-92; § 19.3-6, 2-11-98; Code 1988, §§ 7-9, 19.3-6; § 17-105, Ord. 98-A(1), 8-5-98; Ord. 07-17(1), 2-14-07; § 17-200, Ord. 14-17(1), 5-7-14, effective 7-1-14)

State law reference – Va. Code §§ 62.1-44.15:27, 62.1-44.15:50, 62.1-44.15:54, 62.1-44.15:58, 62.1-44.15:61.

Sec. 17-201 Designation of program administrator; powers and duties; express designations.

The County engineer is hereby designated the program administrator (the “administrator”) for the purpose of administering this chapter. The administrator shall have the powers and duties to administer and enforce the VESCP and the VSMP, and to exercise all powers and perform those duties of the program authority as provided in this chapter. In addition, the following officers and employees are hereby designated specific tasks in order to assist the administrator in administering this chapter:

- A. *Plan reviewers and inspectors.* County employees qualified under section 17-202 and under State law are designated to act as certified plan reviewers and certified inspectors under the VESCP and the VSMP.
- B. *Administrator for post-construction stormwater management facilities and best management practices.* The director of the County’s Department of General Services is hereby designated to administer the VSMP for post-construction stormwater management facilities and best management practices.
- C. *Administrator for the County’s MS4 permit and MS4 program plan.* The director of the County’s Department of General Services is hereby designated as the administrator of the County’s MS4 permit in order to ensure compliance therewith, and to develop and administer the County’s MS4 program plan.

(Ord. 14-17(1), 5-7-14, effective 7-1-14)

State law reference – Va. Code §§ 62.1-44.15:27, 62.1-44.15:54.

Sec. 17-202 Administrator, plan reviewers and inspectors; certificates of competence.

The administrator, any person reviewing VESCP or VSMP plans, and each person conducting project inspections under either the VESCP or the VSMP, shall hold a valid certificate of competence for the classification of the task to be performed, or its equivalent, as provided in 9VAC25-850-10 *et seq.* The administrator and any other person may hold certificates for more than one classified task.

For purposes of program compliance reviews and evaluations by the State Water Control Board, the enrollment of persons in certification programs shall be deemed to meet the certification requirements as provided in 9VAC25-850-55.

(§ 7-9, 4-21-76, 2-11-87, 3-18-92; § 19.3-6, 2-11-98; Code 1988, §§ 7-9, 19.3-6; § 17-105, Ord. 98-A(1), 8-5-98; Ord. 07-17(1), 2-14-07; § 17-202, Ord. 14-17(1), 5-7-14, effective 7-1-14)

State law reference – Va. Code §§ 62.1-44.15:30, 62.1-44.15:54; 9VAC25-850-10 *et seq.*

Sec. 17-203 Administrator; reporting and recordkeeping.

The administrator, on behalf of the authority, shall report and keep records as follows:

- A. *Reporting.* On a fiscal year basis (July 1 to June 30), the administrator shall report to the Virginia Department of Environmental Quality by October 1 of each year in a format provided by the department. The information to be provided shall include the following:
 - 1. *Permanent stormwater management facilities completed.* Information on each permanent stormwater management facility completed during the fiscal year to include type of stormwater management facility, geographic coordinates, acres treated, and the surface waters or karst features into which the stormwater management facility will discharge.
 - 2. *Enforcement actions.* The number and type of enforcement actions during the fiscal year.

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3. *Exceptions granted.* The number of exceptions granted during the fiscal year.
- B. *Recordkeeping; period to retain.* The administrator shall keep records in accordance with the following:
 1. *Project records.* Project records, including approved stormwater management plans, shall be kept for three (3) years after the date of project completion or termination of the VSMP permit.
 2. *Inspection records.* Stormwater management facility inspection records shall be documented and retained for at least five (5) years after the date of inspection.
 3. *Construction record drawings.* Construction record drawings shall be maintained in perpetuity or until a stormwater management facility is removed.
 4. *Registration statements.* All registration statements submitted in accordance with section 17-401 shall be documented and retained for at least three (3) years after the date of project completion or termination of the VSMP permit.

(Ord. 14-17(1), 5-7-14, effective 7-1-14)

State law reference – Va. Code §§ 62.1-44.15:25, 62.1-44.15:28; 9VAC25-870-122, 9VAC25-870-126, 9VAC25-870-148(A)(9).

Sec. 17-204 Rules of construction.

This chapter protects paramount public interests and shall be liberally construed to effectuate its several purposes. In addition to the rules of construction set forth in Albemarle County Code § 1-101, the following rules of construction apply to the construction of this chapter, unless the application would be contrary to the purposes of this chapter or the context clearly indicates otherwise:

- A. All references to any statute, regulation, guideline, handbook, manual or standard are to that statute, regulation, guideline, handbook, manual or standard as it exists on the date of adoption of this chapter, and includes any amendment thereafter or reissue in a subsequent edition.
- B. All references to the “administrator” include, in the appropriate context, a certified plan reviewer, certified inspector, or any other person designated to act under this chapter.
- C. All references to the “owner” include, in the appropriate context, the applicant, the permittee, the operator.
- D. All references to the “County,” when referring to physical territory in articles I through IX of this chapter, include the physical territory of both the County of Albemarle and the Town of Scottsville.
- E. All references to “this chapter,” when used in articles I through IX, are referring to articles I through IX.
- F. The word “days” means calendar days, unless otherwise expressly provided.
- G. All distances and areas shall be measured in a horizontal plane unless otherwise expressly provided.
- H. The word “current” means the point in time at which a matter is under consideration and shall not mean the date of adoption of the most recent amendment to this chapter.

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- I. The word “maintain” or “maintenance” also includes, repair, replace and reconstruct.
- J. All provisions requiring that improvements be designed or constructed to prescribed standards, or otherwise comply with delineated standards, refer to the minimum standard and nothing in this chapter shall prohibit an improvement from exceeding the standard.
- K. Any word or phrase used in this chapter that is not defined in section 17-205 shall be defined as it is in the Virginia Stormwater Management Act (Virginia Code § 62.1-44.15:24 *et seq.*), the Erosion and Sediment Control Law (Virginia Code § 62.1-44.15:51 *et seq.*), and in the applicable regulations in 9VAC25-830 through 9VAC25-890. If the word or phrase is not defined therein, the meaning of the word or phrase shall be defined as it is in other chapters of this Code and if it is not defined therein, by resort to other sources determined to be appropriate.

(2-11-98; Code 1988, § 19.3-4; § 17-103, Ord. 98-A(1), 8-5-98; § 17-204, Ord. 14-17(1), 5-7-14, effective 7-1-14)

State law reference – Va. Code §§ 62.1-44.15:27, 62.1-44.15:54.

Sec. 17-205 Definitions.

The following definitions shall apply in the administration of this chapter:

Administrator. The term “administrator” means the County engineer.

Adequate channel. The term “adequate channel” means a watercourse that will convey the designated frequency storm event without overtopping its banks or causing erosive damage to the bed, banks and overbank sections of the same.

Agreement in lieu of a plan. The term “agreement in lieu of a plan” means a written contract between the County and the owner that specifies conservation measures that must be implemented in the construction of a single-family residence, in lieu of an erosion and sediment control plan.

Agreement in lieu of a stormwater management plan. The term “agreement in lieu of a stormwater management plan” means a written contract between the County and the owner or permittee that specifies methods that shall be implemented to comply with the requirements of the VSMP for the construction of a single-family residence, in lieu of a stormwater management plan.

Agricultural land. The term “agricultural land” means land used for horticulture, viticulture, silviculture or other gardening which may involve the tilling of soil for the raising of crops; the keeping of livestock and/or poultry; and/or agricultural industries or businesses, such as, but not limited to, orchards, fruit packing plants, dairies, nurseries or wayside stands.

Agricultural road. The term “agricultural road” means a road or portion of a road that is constructed exclusively for access to agricultural land and is located on or serves a lot which is not the subject of a pending or approved preliminary or final plat, initial or final site plan, zoning map amendment to a non-agricultural zoning district, or a special use permit for a use or activity not directly related to agriculture.

Amendment to approved plan. The term “amendment to approved plan” means an owner-requested change to an approved plan or to approved permit conditions.

Applicant. The term “applicant” means any person submitting an application for a permit or plan approval under this chapter.

Application. The term “application,” as used in Article IV, means an application for approval of an erosion and sediment control plan, for land disturbing activity for which a VSMP permit is not required, or an application for approval of a VSMP permit.

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Best management practice (BMP). The term “best management practice” or “BMP” means schedules of activities, prohibitions of practices, maintenance procedures, and other management practices to prevent or reduce the pollution of surface waters and groundwater systems, and includes both structural and nonstructural practices described as follows:

- A. *Structural best management practice.* Structural best management practices include storage practices such as wet ponds and extended-detention outlet structures; filtration practices such as biofilters, grassed swales, sand filters and filter strips; infiltration practices such as infiltration basins and infiltration trenches; and any post-construction BMP listed in the Virginia Stormwater BMP Clearinghouse Website (<http://vwrrc.vt.edu/swc/PostConstructionBMPs.html>).
- B. *Nonstructural best management practice.* Nonstructural best management practices are preventative actions that involve management and source controls such as: (i) policies and regulations that provide requirements and standards to direct growth to identified areas, protect sensitive areas such as wetlands and riparian areas, maintain and/or increase open space (including a dedicated funding source for open space acquisition), provide buffers along sensitive water bodies, minimize impervious surfaces, and minimize disturbance of soils and vegetation; (ii) policies or regulations that encourage infill development in higher density urban areas, and areas with existing infrastructure; (iii) education programs for developers and the public about project designs and maintenance activities that minimize water quality impacts; and (iv) measures such as minimizing the percentage of impervious area after development and minimizing directly connected impervious areas.

Board. The term “Board” means the State Water Control Board, unless the context indicates that the term refers to the board of supervisors.

Bypass. The term “bypass” means the intentional diversion of waste streams from any portion of a treatment facility.

Certified inspector. The term “certified inspector” means an employee or agent of the County who: (i) holds a certificate of competence from the State Water Control Board in the area of project inspection; or (ii) is enrolled in the State Water Control Board’s training program for project inspection and successfully completes the program within one year after enrollment.

Certified plan reviewer. The term “certified plan reviewer” means an employee or agent of the County who: (i) holds a certificate of competence from the State Water Control Board in the area of plan review; (ii) is enrolled in the State Water Control Board’s training program for plan review and successfully completes the program within one year after enrollment; or (iii) is licensed as a professional engineer, architect, landscape architect, land surveyor pursuant to Article 1 (Virginia Code § 54.1-400 *et seq.*) of Chapter 4 of Title 54.1 of the Virginia Code, or a professional soil scientist as defined in Virginia Code § 54.1-2200.

Certified program administrator. The term “certified program administrator” means an employee or agent of the County who: (i) holds a certificate of competence from the State Water Control Board in the area of program administration; or (ii) is enrolled in the State Water Control Board’s training program for program administration and successfully completes the program within one year after enrollment.

Channel. The term “channel” means a natural stream or manmade waterway.

Clean Water Act (CWA). The term “Clean Water Act” or “CWA” means the federal Clean Water Act (33 U.S.C. § 1251 *et seq.*), formerly referred to as the Federal Water Pollution Control Act or Federal Water Pollution Control Act Amendments of 1972, Public Law 92-500, as amended by Public Law 95-217, Public Law 95-576, Public Law 96-483, and Public Law 97-117, or any subsequent revisions thereto.

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Common plan of development or sale. The term “common plan of development or sale” means a contiguous area where separate and distinct construction activities may be taking place at different times on different schedules.

Construction activity. The term “construction activity” means any clearing, grading or excavation associated with large construction activity or associated with small construction activity.

Contiguous nontidal wetlands. The term “contiguous nontidal wetlands” means nontidal wetlands that lie within or adjacent to a stream channel or within the flood plain of that stream channel so that there is a hydrologic connection between the stream and the wetland, and which include impoundments of water along a natural stream channel.

Control measure. The term “control measure” means any best management practice or stormwater facility, or other method used to minimize the discharge of pollutants to State waters, or otherwise restrict or alter the hydraulics of stormwater flow and discharge.

Dam. The term “dam” means a barrier to confine or raise water for storage or diversion, to create a hydraulic head, to prevent gully erosion, or to retain soil, rock or other debris.

Denuded. The term “denuded” means land that has been physically disturbed and no longer supports vegetative cover.

Department of community development. The term “department of community development” means the County department of community development.

Department. The term “Department” means the Department of Environmental Quality, unless the context indicates that the term refers to a County department.

Department of general services. The term “department of general services” means the County department of general services.

Design Standards Manual. The term “Design Standards Manual” means the manual developed and maintained by the administrator that includes, among other things, the technical criteria required under the VESCP and the VSMP, and best management practices.

Development. The term “development” means: (i) for the purposes of the VESCP, a tract or parcel of land developed or to be developed as a single unit under single ownership or unified control which is to be used for any business or industrial purpose or is to contain three or more residential dwelling ; and (ii) for purposes of the VSMP, land disturbance and the resulting landform associated with the construction of residential, commercial, industrial, institutional, recreation, transportation, or utility facilities or structures or the clearing of land for nonagricultural or nonsilvicultural purposes; the regulation of discharges from development, for purposes of these regulations, does not include the exemptions found in 9VAC25-870-300.

Development area. The term “development area” means any portion of the County designated as such in the Comprehensive Plan.

Dike. The term “dike” means an earthen embankment constructed to confine or control water, especially one built along the banks of a river to prevent overflow of lowlands; a levee.

Discharge. The term “discharge,” when used without qualification, means the discharge of a pollutant.

Discharge of a pollutant. The term “discharge of a pollutant” means any addition of any pollutant or combination of pollutants to State waters from any point source, and includes additions of pollutants into surface waters from surface runoff that is collected or channeled by man; discharges through pipes, sewers, or other conveyances owned by the State, the County, or other person that do not lead to a treatment works;

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and discharges through pipes, sewers, or other conveyances, leading into privately owned treatment works; provided that this definition does not include an addition of pollutants by any indirect discharger.

Drainage area. The term “drainage area” means a land area, water area, or both from which runoff flows to a common point or boundary.

Erosion and sediment control plan. The term “erosion and sediment control plan” means a document containing material for the conservation of soil and water resources of a unit or group of units of land. It may include appropriate maps, an appropriate soil and water plan inventory and management information with needed interpretations, and a record of decisions contributing to conservation treatment. The plan shall contain all major conservation decisions and all information deemed necessary by the program authority to assure that the entire unit or units of land will be so treated to achieve the conservation objectives.

Erosion impact area. The term “erosion impact area” means an area of land not associated with current land disturbing activity but subject to persistent soil erosion resulting in the delivery of sediment onto neighboring properties or into State waters; provided that the area of land is not a lot or parcel of ten thousand (10,000) square feet or less used for residential purposes or a shoreline where the erosion results from wave action or other coastal processes.

Facility or activity. The term “facility or activity” means any point source or treatment works treating domestic sewage or any other facility or activity, including land or appurtenances thereto, that is subject to regulation under the VSMP.

Floodplain. The term “floodplain” means the area adjacent to a channel, river, stream, or other water body that is susceptible to being inundated by water normally associated with the one hundred (100) year flood or storm event, and includes, but is not limited to, the floodplain designated by the Federal Emergency Management Agency on a Flood Insurance Rate Map.

General permit. The term “general permit” means a general permit authorizing a category of discharges under the Clean Water Act and the Stormwater Management Act within a geographical area. The full title of the general permit is “General Permit for Discharges of Stormwater from Construction Activities” as provided in 9VAC25-880.

Hazardous substance. The term “hazardous substance” means any substance designated under the Code of Virginia or 40 CFR Part 116 pursuant to section 311 of the Clean Water Act.

Illicit discharge. The term “illicit discharge” means any discharge to a municipal separate storm sewer that is not composed entirely of stormwater, except discharges pursuant to a separate VPDES or general permit (other than the state permit for discharges from the municipal separate storm sewer), discharges resulting from firefighting activities, and discharges identified by and in compliance with 9VAC25-870-400(D)(2)(c)(3).

Inspection. The term “inspection” means an onsite review of a project’s compliance with an approved erosion and sediment control plan, an approved VSMP permit, the general permit, the VESCP, the VSMP, and any applicable design criteria, or an onsite review to obtain information or conduct surveys or investigations necessary for the implementation or enforcement of this chapter.

Intermittent stream. The term “intermittent stream” means a natural stream or portion of a natural stream that has a defined bed and defined banks within which water flows in response to precipitation, through near surface groundwater flow, or from springs, and which is not a perennial stream.

Land disturbance or land disturbing activity. The term “land disturbance” or “land disturbing activity” means: (i) for purposes of the VESCP, any man-made change to the land surface that may result in soil erosion from water or wind and the movement of sediments into State waters or onto lands in the State, including, but not limited to, clearing, grading, excavating, transporting, and filling of land, but does not include those land disturbing activities exempt under section 17-301; and (2) for purposes of the VSMP, a

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man-made change to the land surface that potentially changes its runoff characteristics including clearing, grading, or excavation, but does not include those land disturbing activities that are exempt under Virginia Code § 62.1-44.15:34 and section 17-303.

Large construction activity. The term “large construction activity” means construction activity, including clearing, grading and excavation resulting in the disturbance of five (5) acres or more of total land area; provided that the disturbance of less than five (5) acres of total land area is a large construction activity if it is part of a larger common plan of development or sale if the larger common plan will ultimately disturb five (5) acres or more. Large construction activity does not include routine maintenance that is performed to maintain the original line and grade, hydraulic capacity, or original purpose of the facility.

Layout. The term “layout” means a conceptual drawing sufficient to provide for the specified stormwater management facilities required at the time of approval.

Linear development project. The term “linear development project” means a land-disturbing activity that is linear in nature such as, but not limited to: (i) the construction of electric and telephone utility lines, and natural gas pipelines; (ii) construction of tracks, rights-of-way, bridges, communication facilities and other related structures of a railroad company; (iii) highway construction projects; (iv) construction of stormwater channels and stream restoration activities; and (v) water and sewer lines; provided that private subdivision roads or streets are not linear development projects.

Major modification. The term “major modification” means, for the purposes of this chapter, the modification or amendment of an existing general permit before its expiration that is not a minor modification.

Man-made. The term “man-made” means constructed by man.

Maximum extent practicable (MEP). The term “maximum extent practicable” or “MEP” means the technology-based discharge standard for municipal separate storm sewer systems established by CWA § 402(p) and which is achieved, in part, by selecting and implementing effective structural and nonstructural best management practices (BMPs) and rejecting ineffective BMPs and replacing them with effective best management practices (BMPs). MEP is an iterative standard, which evolves over time as urban runoff management knowledge increases. As such, the County’s MS4 program must continually be assessed and modified to incorporate improved programs, control measures, BMPs, and other practices, procedures and requirements, to attain compliance with water quality standards.

Minimize. The term “minimize” means to reduce or eliminate the discharge of pollutants to the extent achievable using stormwater controls that are technologically available and economically practicable.

Minor modification. The term “minor modification” means a minor modification or amendment of an existing general permit before its expiration for the reasons listed in 40 CFR 122.63 and as specified in 9VAC25-870-640, and other modifications and amendments not requiring extensive review and evaluation including, but not limited to, changes in United States Environmental Protection Agency-promulgated test protocols, increasing monitoring frequency requirements, changes in sampling locations, and changes to compliance dates within the overall compliance schedules. A minor general permit modification or amendment does not substantially alter general permit conditions, substantially increase or decrease the amount of surface water impacts, increase the size of the operation, or reduce the capacity of the facility to protect human health or the environment.

Mitigation plan. The term “mitigation plan” means a plan which meets the requirements of section 17-406 that describes how encroachments into a stream buffer will be mitigated through runoff treatment, revegetation, the addition of extra buffer areas, or other appropriate best management practices. A mitigation plan may be a component of a VSMP permit, or an erosion and sediment control plan if the land disturbing activity is subject solely to the VESCP.

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Municipal separate storm sewer. The term “municipal separate storm sewer” means a conveyance or system of conveyances otherwise known as a municipal separate storm sewer system, including roads with drainage systems, streets, catch basins, curbs, gutters, ditches, manmade channels, or storm drains: (i) owned or operated by a federal, state, city, town, county, district, association, or other public body, created by or pursuant to State law, having jurisdiction or delegated authority for erosion and sediment control and stormwater management, or a designated and approved management agency under § 208 of the CWA that discharges to surface waters; (ii) designed or used for collecting or conveying stormwater; (iii) that is not a combined sewer; and (iv) that is not part of a publicly owned treatment works.

Municipal separate storm sewer system (MS4). The term “municipal separate storm sewer system” or “MS4” means all separate storm sewers that are defined as “large” or “medium” or “small” municipal separate storm sewer systems or designated under 9VAC25-870-380(A)(1).

Natural stream. The term “natural stream” means a tidal or nontidal watercourse that is part of the natural topography, that usually maintains a continuous or seasonal flow during the year, and is characterized as being irregular in cross-section with a meandering course. Constructed channels such as drainage ditches or swales shall not be considered natural streams; however, channels designed using natural channel design concepts may be considered natural streams.

Necessary infrastructure. The term “necessary infrastructure” means components of a site development necessary for the protection of the public health, safety, or welfare, and environmental features and they include, but are not limited to, drainage channels, structures and facilities, best management practices, access roads for emergency vehicles, and access roads in order to maintain stormwater management facilities or water-dependent facilities, or both.

Nonpoint source pollution. The term “nonpoint source pollution” means pollution such as sediment, nitrogen, phosphorus, hydrocarbons, heavy metals, and toxics whose sources cannot be pinpointed but rather are washed from the land surface in a diffuse manner by runoff.

Nontidal wetlands. The term “nontidal wetlands” means wetlands other than tidal wetlands that are inundated or saturated by surface or groundwater at a frequency and duration to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions, as defined by the United States Environmental Protection Agency pursuant to section 404 of the Clean Water Act and its implementing regulations.

Nutrient credit. The term “nutrient credit” or “credit” means a nutrient credit certified pursuant to Virginia Code § 62.1-44.19:12 *et seq.*

Operator. The term “operator” means the owner or operator of any facility or activity subject to regulation under this Ordinance.

Other rural land. The term “other rural land” means any portion of the County that is designated Rural Area in the Comprehensive Plan but which is not within a water supply protection area.

Outfall. The term “outfall” means, when used in reference to municipal separate storm sewers, a point source at the point where a municipal separate storm sewer discharges to surface waters and does not include open conveyances connecting two municipal separate storm sewers, or pipes, tunnels or other conveyances which connect segments of the same stream or other surface waters and are used to convey surface waters.

Owner. The term “owner” means the Commonwealth or any of its political subdivisions including, but not limited to, sanitation district commissions and authorities, and any public or private institution, corporation, association, firm or company organized or existing under the laws of this or any other state or country, or any officer or agency of the United States, or any person or group of persons acting individually or as a group that owns, operates, charters, rents, or otherwise exercises control over or is responsible for any

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actual or potential discharge of sewage, industrial wastes, or other wastes or pollutants to state waters, or any facility or operation that has the capability to alter the physical, chemical, or biological properties of state waters in contravention of Virginia Code § 62.1-44.5, the Virginia Stormwater Management Act and 9VAC25-870.

Peak flow rate. The term “peak flow rate” means the maximum instantaneous flow from a prescribed design storm at a particular location.

Perennial stream. The term “perennial stream” means any stream that is depicted as a continuous blue line on the most recent United States Geological Survey 7.5 minute topographic quadrangle maps (scale 1:24,000), which is determined by the program authority to be perennial following a site-specific evaluation using the guidance entitled “Determinations of Water Bodies with Perennial Flow,” dated September 2003, issued by the Chesapeake Bay Local Assistance Department, or which is delineated as a perennial stream by the United States Army Corps of Engineers, the Virginia Department of Environmental Quality, or under the Virginia Water Protection program.

Permittee. The term “permittee” means the person to whom the County has issued a permit.

Person. The term “person” means any individual, corporation, partnership, association, state, municipality, commission, or political subdivision of a state, governmental body, including a Federal, State, or local entity as applicable, any interstate body or any other legal entity.

Plan of development. The term “plan of development” means the process for site plan or plat review to ensure compliance with Virginia Code § 62.1-44.15:74 and this chapter which is required as a precedent to clearing, grading, or other land disturbing activity on a site or the issuance of a building permit.

Plat. The term “plat” means a preliminary or final plat, or a plat for any other class of subdivision as provided in the Subdivision Ordinance.

Point of discharge. The term “point of discharge” means a location at which concentrated runoff is released.

Point source. The term “point source” means any discernible, confined, and discrete conveyance including, but not limited to, any pipe, ditch, channel, tunnel, conduit, well, discrete fissure, container, rolling stock, concentrated animal feeding operation, landfill leachate collection system, vessel, or other floating craft from which pollutants are or may be discharged. This term does not include return flows from irrigated agriculture or agricultural stormwater runoff.

Pollutant. The term “pollutant” means dredged spoil, solid waste, incinerator residue, filter backwash, sewage, garbage, sewage sludge, munitions, chemical wastes, biological materials, radioactive materials (except those regulated under the Atomic Energy Act of 1954, as amended (42 USC § 2011 *et seq.*)), heat, wrecked or discarded equipment, rock, sand, cellar dirt and industrial, municipal, and agricultural waste discharged into water; provided that this term does not mean: (i) sewage from vessels; or (ii) water, gas, or other material that is injected into a well to facilitate production of oil or gas, or water derived in association with oil and gas production and disposed of in a well if the well used either to facilitate production or for disposal purposes is approved by the State Water Control Board and if it determines that the injection or disposal will not result in the degradation of groundwater or surface water resources.

Pollutant discharge. The term “pollutant discharge” means the average amount of a particular pollutant measured in pounds per year or other standard reportable unit as appropriate, delivered by runoff.

Pollution. The term “pollution” means the alteration of the physical, chemical or biological properties of any State waters as will or is likely to create a nuisance or render the waters:(i) harmful or detrimental or injurious to the public health, safety or welfare, or to the health of animals, fish or aquatic life; (ii) unsuitable with reasonable treatment for use as present or possible future sources of public water supply; or

(iii) unsuitable for recreational, commercial, industrial, agricultural, or other reasonable uses, provided that (a) an alteration of the physical, chemical, or biological property of State waters, or a discharge or deposit of sewage, industrial wastes or other wastes to State waters by any owner which by itself is not sufficient to cause pollution, but which, in combination with such alteration of or discharge or deposit to State waters by other owners, is sufficient to cause pollution; (b) the discharge of untreated sewage by any owner into State waters; and (c) contributing to the contravention of standards of water quality duly established by the State Water Control Board, are “pollution” for the purposes of this chapter.

Pollution prevention plan. The term “pollution prevention plan” means a plan which meets the requirements of section 17-404 for implementing pollution prevention measures during construction activities and which details the design, installation, implementation, and maintenance of effective pollution prevention measures to minimize the discharge of pollutants. A pollution prevention plan is a component of a VSMP permit.

Postdevelopment. The term “postdevelopment” means the conditions that reasonably may be expected or anticipated to exist after completion of the land development activity on a specific site.

Predevelopment. The term “predevelopment” means the conditions that exist at the time that plans for the land development of a tract of land are submitted to the authority. Where phased development or plan approval occurs (preliminary grading, demolition of existing structures, roads and utilities, and similar acts), the existing conditions at the time prior to the first item being submitted shall establish predevelopment conditions.

Program. The term “program” means the Virginia Erosion and Sediment Control Program or the Virginia Stormwater Program or, in the appropriate context, both.

Regulations. The term “regulations,” when referring to State regulations, means those regulations implementing the Virginia Stormwater Management Act and the Erosion and Sediment Control Law in 9VAC25-830 through 9VAC25-890.

Reinspection. The term “reinspection” means any inspection necessary to determine whether any deficiency or violation in a notice of violation or a stop work order has been corrected.

Runoff. The term “runoff” means that portion of precipitation that is discharged across the land surface or through conveyances to one or more waterways.

Runoff characteristics. The term “runoff characteristics” includes maximum velocity, peak flow rate, volume, flow duration, and any other measure of the nature of the discharge.

Runoff volume. The term “runoff volume” means the volume of runoff that runs off the site from a prescribed design storm.

Sediment basin. The term “sediment basin” means a temporary impoundment built to retain sediment and debris with a controlled stormwater release structure.

Sewage disposal system. The term “sewage disposal system” means a sewerage system or treatment works composed of a facility or combination of facilities constructed for the transport or treatment, or both, of domestic, commercial or industrial sewage, but not including plumbing, fixtures, lateral pipes from a dwelling unit to a septic tank, lateral pipes from a dwelling unit to a publicly owned sewerage facility, or publicly owned facilities for the transport or treatment, or both, of sewage.

Site. The term “site” means the land or water area composed of one or more parcels where any facility or land disturbing activity is physically located or conducted, including adjacent land used or preserved in connection with the facility or land disturbing activity.

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Small construction activity. The term “small construction activity” means:

- A. Construction activities including clearing, grading, and excavating that results in land disturbance of equal to or greater than ten thousand (10,000) square feet, and less than five (5) acres, or a land disturbance of less than ten thousand (10,000) square feet that is part of a larger common plan of development or sale if the larger common plan will ultimately disturb equal to or greater than ten thousand (10,000) square feet and less than five (5) acres. Small construction activity does not include routine maintenance that is performed to maintain the original line and grade, hydraulic capacity, or original purpose of the facility. The State Water Control Board may waive the otherwise applicable requirements in a general permit for a stormwater discharge from construction activities that disturb less than five (5) acres where stormwater controls are not needed based on an approved “total maximum daily load” (TMDL) that addresses the pollutant(s) of concern or, for nonimpaired waters that do not require TMDLs, an equivalent analysis that determines allocations for small construction sites for the pollutant(s) of concern or that determines that such allocations are not needed to protect water quality based on consideration of existing in-stream concentrations, expected growth in pollutant contributions from all sources, and a margin of safety. For the purpose of this subdivision, the pollutant(s) of concern include sediment or a parameter that addresses sediment (such as total suspended solids, turbidity or siltation) and any other pollutant that has been identified as a cause of impairment of any water body that will receive a discharge from the construction activity. The operator must certify to the State Water Control Board that the construction activity will take place, and stormwater discharges will occur, within the drainage area addressed by the TMDL or equivalent analysis; or
- B. Any other construction activity designated by either the State Water Control Board or the United States Environmental Protection Agency’s regional administrator, based on the potential for contribution to a violation of a water quality standard or for significant contribution of pollutants to surface waters.

Source. The term “source” means any building, structure, facility, or installation from which there is or may be a discharge of pollutants.

Stabilized. The term “stabilized” means land that has been treated to withstand normal exposure to natural forces without incurring erosion damage.

State. The term “State” means the Commonwealth of Virginia.

State Water Control Law. The term “State Water Control Law” means Chapter 3.1 (Virginia Code § 62.1-44.2 *et seq.*) of Title 62.1 of the Virginia Code.

State waters. The term “State waters” means all water, on the surface and under the ground, wholly or partially within or bordering the State or within its jurisdiction, including wetlands.

Stormwater. The term “stormwater” means precipitation that is discharged across the land surface or through conveyances to one or more waterways and that may include runoff, snow melt runoff, and surface runoff and drainage.

Stormwater conveyance system. The term “stormwater conveyance system” means a combination of drainage components that are used to convey stormwater discharge, either within or downstream of the land disturbing activity, and includes a man-made, natural, or restored stormwater conveyance system described as follows:

- A. *Man-made stormwater conveyance system.* The term “man-made stormwater conveyance system” means a pipe, ditch, vegetated swale, or other stormwater conveyance system constructed by man except for restored stormwater conveyance systems.

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- B. *Natural stormwater conveyance system.* The term “natural stormwater conveyance system” means the main channel of a natural stream and the flood-prone area adjacent to the main channel.
- C. *Restored stormwater conveyance system.* The term “restored stormwater conveyance system” means a stormwater conveyance system that has been designed and constructed using natural channel design concepts, and they include the main channel and the flood-prone area adjacent to the main channel.

Stormwater detention. The term “stormwater detention” means the process of temporarily impounding runoff and discharging it through a hydraulic outlet structure to a downstream stormwater conveyance system.

Stormwater discharge. The term “stormwater discharge” means a discharge of runoff from sites where one or more of the following are located: (i) land disturbing activities including, but not limited to, clearing, grading, or excavation; (ii) construction materials or equipment storage or maintenance including, but not limited to, fill piles, borrow area, concrete truck washout, fueling; or (iii) other industrial stormwater directly related to the construction process including, but not limited to, concrete or asphalt batch plants.

Stormwater management facility. The term “stormwater management facility” means a control measure that controls stormwater runoff and changes the characteristics of that runoff including, but not limited to, the quantity and quality, the period of release or the velocity of flow.

Stormwater management plan. The term “stormwater management plan” means a plan which meets the requirements of section 17-403 containing information for describing methods for complying with the applicable requirements of this chapter, and which typically contains two major components: (i) measures addressing stormwater detention for water quantity and discharge characteristics impacts; and (ii) measures addressing nutrient loadings and water quality. A stormwater management plan is a component of a VSMP permit.

Stormwater pollution prevention plan (SWPPP). The term “stormwater pollution prevention plan” or “SWPPP” means a document that is prepared in accordance with good engineering practices and that identifies potential sources of pollutants that may reasonably be expected to affect the quality of stormwater discharges. An SWPPP required under the VSMP for construction activities shall identify and require the implementation of control measures, and shall include, but not be limited to the inclusion of, or the incorporation by reference of, an approved erosion and sediment control plan, an approved stormwater management plan, and a pollution prevention plan.

Stream buffer. The term “stream buffer” means an area of land at or near a tributary streambank or nontidal wetland, or both, that has an intrinsic water quality value due to the ecological and biological processes it performs or is otherwise sensitive to changes which may result in significant degradation to the quality of State waters.

Subdivision. The term “subdivision” means the same as defined in the Subdivision Ordinance.

Subdivision Ordinance. The term “Subdivision Ordinance” means the subdivision regulations of the County of Albemarle, Virginia codified in Chapter 14 of the Albemarle County Code.

Surface waters. The term “surface waters” means: (i) all waters that are currently used, were used in the past, or may be susceptible to use in interstate or foreign commerce, including all waters that are subject to the ebb and flow of the tide; (ii) all interstate waters, including interstate wetlands; (iii) all other waters such as intrastate lakes, rivers, streams (including intermittent streams), mudflats, sandflats, wetlands, sloughs, prairie potholes, wet meadows, playa lakes, or natural ponds the use, degradation, or destruction of which would affect or could affect interstate or foreign commerce including any such waters that are or could be used by interstate or foreign travelers for recreational or other purposes; from which fish or

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shellfish are or could be taken and sold in interstate or foreign commerce; or that are used or could be used for industrial purposes by industries in interstate commerce; (iv) all impoundments of waters otherwise defined as surface waters under this definition; (v) tributaries of waters identified in subdivisions (i) through (iv) of this definition; and (vi) wetlands adjacent to waters (other than waters that are themselves wetlands) identified in subdivisions (i) through (v) of this definition; provided that waste treatment systems, including treatment ponds or lagoons designed to meet the requirements of the Clean Water Act and the law, are not surface waters, and surface waters do not include prior converted cropland as determined by the United States Environmental Protection Agency.

Ten-year storm. The term “ten-year storm” means a storm that is capable of producing rainfall expected to be equaled or exceeded on the average of once in ten (10) years, and which also may be expressed as an exceedance probability with a ten (10) percent chance of being equaled or exceeded in any given year.

Total maximum daily load (TMDL). The term “total maximum daily load” or “TMDL” means the sum of the individual wasteload allocations for point sources, load allocations (LAs) for nonpoint sources, natural background loading and a margin of safety, and which can be expressed in terms of either mass per time, toxicity, or other appropriate measure.

Town of Scottsville. The term “Town of Scottsville” means all of that territory within the incorporated boundaries of the Town of Scottsville, Virginia, located within the County of Albemarle, Virginia and the County of Fluvanna, Virginia.

Tract. The term “tract,” as used in the definition of “development,” means more than one parcel, or any part thereof, including more than one parcel shown on a subdivision plat or a site plan.

Two-year storm. The term “two-year storm” means a storm that is capable of producing rainfall expected to be equaled or exceeded on the average of once in two (2) years, and which also may be expressed as an exceedance probability with a fifty (50) percent chance of being equaled or exceeded in any given year.

Twenty-five year storm. The term “twenty-five year storm” means a storm that is capable of producing rainfall expected to be equaled or exceeded on the average of once in twenty-five (25) years, and which also may be expressed as an exceedance probability with a four (4) percent chance of being equaled or exceeded in any given year.

Upset. The term “upset” means an exceptional incident in which there is unintentional and temporary noncompliance with technology based general permit effluent limitations because of factors beyond the reasonable control of the operator; provided that the term does not include noncompliance to the extent caused by operational error, improperly designed treatment facilities, inadequate treatment facilities, lack of preventive maintenance, or careless or improper operation.

VESCP. The acronym “VESCP” means the Virginia Erosion and Sediment Control Program.

VSMP. The acronym “VSMP” means the Virginia Stormwater Management Program.

Virginia Erosion and Sediment Control Program (VESCP). The term “Virginia Erosion and Sediment Control Program” means the program established by this chapter and approved by the State Water Control Board for the effective control of soil erosion, sediment deposition, and nonagricultural runoff associated with a land disturbing activity to prevent the unreasonable degradation of properties, stream channels, waters, and other natural resources and include this chapter and all other applicable rules, permit requirements, annual standards and specifications, policies and guidelines, technical materials, and requirements for plan review, inspection, enforcement, and evaluation consistent with the requirements of the Erosion and Sediment Control Law and related regulations.

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Virginia Stormwater BMP Clearinghouse Website. The term “Virginia Stormwater BMP Clearinghouse Website” means a website that contains the authorized detailed design standards and specifications for control measures that may be used in the State to comply with the requirements of the Virginia Stormwater Management Act and related State regulations, and whose ISP address as of July 1, 2014 is <http://vwrrc.vt.edu/swc/PostConstructionBMPs.html>.

Virginia Stormwater Management Act. The term “Virginia Stormwater Management Act” means Article 2.3 (Virginia Code § 62.1-44.15:24 *et seq.*) of Chapter 3.1 of Title 62.1 of the Virginia Code.

Virginia Stormwater Management Program (VSMP). The term “Virginia Stormwater Management Program” means the program established by this chapter and approved by the State Water Quality Control Board to manage the quality and quantity of runoff resulting from land disturbing activities and includes this chapter and all other applicable rules, permit requirements, annual standards and specifications, policies and guidelines, technical materials, and requirements for plan review, inspection, enforcement, and evaluation consistent with the requirements of the Virginia Stormwater Management Act and related regulations.

VSMP authority. The term “VSMP authority” means an authority approved by the State Water Control Board after September 13, 2011, to operate a Virginia Stormwater Management Program or, until such approval is given, the Virginia Department of Environmental Quality. An authority may include a locality; state entity, including the department; federal entity; or, for linear projects subject to annual standards and specifications in accordance with Virginia Code § 62.1-44.15:31(B), electric, natural gas, and telephone utility companies, interstate and intrastate natural gas pipeline companies, railroad companies, or authorities created pursuant to Virginia Code § 15.2-5102. Prior to approval, the State Water Control Board must find that the ordinances adopted by the locality’s VSMP authority are consistent with the Virginia Stormwater Management Act and 9VAC25-870 including the General Permit for Discharges of Stormwater from Construction Activities (9VAC25-880). Within the boundaries of the County of Albemarle and the Town of Scottsville, the County is the VSMP authority.

VSMP permit or permit. The terms “VSMP permit” and “permit” mean an approval to conduct a land-disturbing activity issued by the County for the initiation of a land-disturbing activity after evidence of general permit coverage has been provided where applicable.

Wasteload allocation (WLA). The term “wasteload allocation” or “WLA” means the portion of a receiving surface water’s loading or assimilative capacity allocated to one of its existing or future point sources of pollution, and is a type of water quality-based effluent limitation.

Water-dependent facility. The term “water-dependent facility” means a development that cannot exist outside of the stream buffer and must be located on the shoreline because of the intrinsic nature of its operation and which include, but are not limited to: (i) the intake and outfall structures of power plants, sewage treatment plants, water treatment plants, and storm sewers; (ii) public water-oriented recreation areas; and (iii) boat docks and ramps.

Water supply protection area. The term “water supply protection area” means those areas of land within the County that are within the watershed of a public water supply reservoir or water supply intake, and those areas shall consist of all land within the County that drains naturally to the South Fork Rivanna Reservoir, Beaver Creek Reservoir, Totter Creek Reservoir, Sugar Hollow Reservoir, Ragged Mountain Reservoir, Chris Greene Lake, the North Fork Rivanna River intake, and to any impoundment or water supply intake designated in the future by the board of supervisors as a public water supply reservoir.

Watershed. The term “watershed” means a defined land area drained by a river or stream, karst system, or system of connecting rivers or streams such that all surface water within the area flows through a single outlet; provided that in karst areas, the karst feature to which water drains may be considered the single outlet for the watershed.

Wetlands. The term “wetlands” means those areas that are inundated or saturated by surface water or groundwater at a frequency and duration sufficient to support, and that under normal circumstances do

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support, a prevalence of vegetation typically adapted for life in saturated soil conditions, and which generally include swamps, marshes, bogs, and similar areas.

Written notice. The term “written notice” means a written communication from the administrator that is delivered either mailed by first class mail, personal delivery, or, if consented to by the owner in writing, in conjunction with submitting an application or otherwise, by fax or email.

Zoning Ordinance. The term “Zoning Ordinance” means the zoning regulations of the County of Albemarle, Virginia codified in Chapter 18 of the Albemarle County Code.

(§ 7-2, 6-18-75, § 4, 7-9-80, 2-11-87, 3-18-92, § 19.1-5, 9-29-77, art. I, § 2, 9-13-78, 7-11-90, 8-3-94; § 19.2-4, 6-19-91; § 19.3-5, 2-11-98; Code 1988, §§ 7-2, 19.1-5, 19.2-4, 19.3-5; § 17-104, Ord. 98-A(1), 8-5-98; Ord. 07-17(1), 2-14-07; Ord. 08-17(1), 2-6-08; Ord. 08-17(3), 8-6-08; § 17-205, Ord. 14-17(1), 5-7-14, effective 7-1-14)

State law reference – Va. Code §§ 62.1-44.15:24, 62.1-44.15:51; 9VAC25-840-10, 9VAC25-870-10.

Sec. 17-206 Records; disclosure and exemptions.

Any records required by the administrator to be submitted by the owner or in the possession of the administrator are subject to disclosure to the public as follows:

- A. *Records not exempt from disclosure.* The following records are not exempt from disclosure: (i) personal information, to the extent as may be authorized under the Virginia Freedom of Information Act (Virginia Code § 2.2-3700 *et seq.*); (ii) records related to inspection reports, notices of violation, and documents detailing the nature of any land disturbing activity that may have occurred, or similar documents; (iii) the name and address of any general permit applicant or permittee; (iv) general permit applications, general permits, and effluent data; and (v) information required by general permit application forms provided by the Virginia Department of Environmental Quality, including information submitted on the forms themselves and any attachments used to supply information required by the forms.
- B. *Records exempt from disclosure.* The following records are exempt from disclosure to the public: (i) any records relating to active Federal environmental enforcement actions that are considered confidential under Federal law; and any records relating to enforcement strategies, including proposed sanctions for enforcement actions; provided that, upon request, the records are subject to disclosure after a proposed sanction resulting from the investigation has been determined by the State Water Control Board, the Virginia Department of Environmental Quality, or the administrator; and (ii) any secret formula, secret processes, or secret methods other than effluent data submitted to the Virginia Department of Environmental Quality pursuant to State law may be claimed as confidential by the submitter in accordance with 40 CFR 122.7 .
- C. *Freedom of Information Act.* Except as expressly provided in subsection (B), any other public record of the County pertaining to this chapter and any record submitted by an owner under this chapter shall be subject to disclosure, or may be exempt from disclosure, as provided under the Virginia Freedom of Information Act (Virginia Code § 2.2-3700 *et seq.*).

(Ord. 14-17(1), 5-7-14, effective 7-1-14)

State law reference – Va. Code §§ 62.1-44.15:40; 9VAC25-870-340.

Sec. 17-207 Fees for land disturbing activity subject solely to the VESCP.

The following fees are for any land disturbing activity subject solely to the VESCP and shall apply to the services provided by the County under this chapter. Any required fee shall be paid upon submittal of an application and prior to each reinspection. Neither the County nor the County school board shall be required to pay any fee if it is the applicant:

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Land disturbing activity pertaining to single family dwelling unit	
Agreement in lieu of a plan if single family dwelling unit located in a residential development	\$150
Agreement in lieu of a plan if single family dwelling unit not located in a residential development	\$150
Plan review for a single family dwelling unit	\$150
Permit and first year inspection fees for a single family dwelling unit	\$150
Annual permit renewal and inspection fees for a single family dwelling unit, starting with second year	\$150
Each reinspection	\$150
Land disturbing activity pertaining to non-exempt agricultural land	
Plan review	\$150 per review
Permit and first year inspection fees	\$150
Each reinspection	\$150
Annual permit renewal and inspection fees, starting with second year	\$150
All other land disturbing activity	
Plan review, disturbed area less than one acre	\$150 per review
Permit and first year inspection fees, disturbed area less than one acre	\$200
Annual permit renewal and inspection fee, disturbed area less than one acre	\$200
Plan review, disturbed area one acre or larger	\$300 per review
Permit and first year inspection fees, disturbed area one acre or larger	\$100 per disturbed acre
Annual permit renewal and inspection fee, disturbed area one acre or larger, starting with second year	\$100 per disturbed acre
Each reinspection	\$250
Each request for partial or full release of surety	\$250
Amendment to approved plan	\$200 per plan review
Other services	
Review of mitigation plan pertaining to a land disturbing activity in a stream buffer	\$150
Variances	\$150 per request

(§ 7-4, 6-18-75, § 6, 10-22-75, 4-21-76, 11-10-76, 3-2-77, 4-17-85, 2-11-87, 12-11-91, 3-18-92; § 19.3-17, 2-11-98; Code 1988, §§ 7-4, 19.3-17; § 17-209, Ord. 98-A(1), 8-5-98; Ord. 98-17(1), 11-11-98; Ord. 02-17(1), 7-3-02; Ord. 08-17(3), 8-6-08; Ord. 11-17(1), 10-5-11; § 17-207, Ord. 14-17(1), 5-7-14, effective 7-1-14)

State law reference – Va. Code § 62.1-44.15:54; 9VAC25-840-30.

Sec. 17-208 Fees for land disturbing activity under VSMP.

Each owner seeking coverage under the general permit, each owner requesting a transfer or modification of its existing registration statement for coverage under the general permit, each owner requesting a major modification to a general permit, and each owner covered under the general permit required to maintain permit coverage shall pay a fee upon submittal of the VSMP permit application or, for the permit maintenance fee, annually, in the amounts according to the following schedule:

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Fee Type	Permit Issuance Fee ¹	State Portion of Permit Issuance Fee ²	Transfer or Modification Fee Amount ³	Permit Maintenance Fee ⁴
Small construction activity or land clearing that is less than 1 acre/if involves construction of a sole single family detached dwelling	\$290/\$209	\$81/None	\$20	\$140
Small construction activity or land clearing that is equal to or greater than 1 acre and less than 5 acres/ if involves construction of a sole single family detached dwelling	\$2,700/\$209	\$756/None	\$200	\$1,350
Large construction activity or land clearing that is equal to or greater than 5 acres and less than 10 acres	\$3,400	\$952	\$250	\$1,700
Large construction activity/land clearing that is equal to or greater than 10 acres and less than 50 acres	\$4,500	\$1,260	\$300	\$2,250
Large construction activity/land clearing that is equal to or greater than 50 acres and less than 100 acres	\$6,100	\$1,708	\$450	\$3,050
Large construction activity/land clearing that is equal to or greater than 100 acres not involving construction of a sole single family detached dwelling	\$9,600	\$2,688	\$700	\$4,800
Other services			Fee	
Each reinspection			\$250	
Bond agreement with surety; establish, amend or replace			\$250	
Each request for partial or full release of surety			\$250	
Amendment to approved plan			\$200 per plan review	
Review of mitigation plan pertaining to a land disturbing activity in a stream buffer			\$150	
Exceptions			\$240 per request	
Construction record drawing; review			\$300	

1. The fees imposed by this column are the total fees to be paid by the owner to cover the County's costs to review a stormwater management and other required plans, VSMP registration statement review, if such a statement is required under sections 17-401(C) and 17-405(A)(1), VSMP permit issuance, general permit coverage verification, inspections, reporting and compliance associated with a land disturbing activity. Any land disturbing activity subject to the fees in this section is not subject to the separate fees under section 17-207. For any site that has been purchased for development within a previously permitted common plan of development or sale, the applicant shall be subject to the applicable fees required by this column. The reduced fee if the construction or land clearing involves construction of a sole single family detached dwelling applies regardless of whether the activity and the dwelling are within or outside a common plan of development or sale.
2. The amounts in this column are not a separate fee but reflect the portion of the fee required by column 1 that must be paid by the County to the Virginia Department of Environmental Quality pursuant to Virginia Code § 62.1-44.15:28(A)(5)(a). These amounts are twenty-eight (28) percent of the fee required by column 1.
3. The fees imposed by this column are intended to cover the County's costs to review a request to modify or transfer registration statements from the general permit and major modifications to the general permit that result in changes to stormwater management plans that require additional review by the County. The applicable fee shall be based on the total disturbed acreage of the site. In addition to the general permit

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modification fee, any modification resulting in an increase in total disturbed acreage shall pay the difference in the fee imposed by column 1 that was initially paid and the permit fee imposed by column 1 that would have applied for the modified total disturbed acreage. No fee shall be required for a minor modification.

4. The fees imposed by this column are an annual permit maintenance fee, and include fees imposed on expired permits that have been administratively continued. The fee, which shall be prorated in the first year, shall be paid at the time provided in section 17-209(B). With respect to the general permit, these fees shall apply until the general permit coverage is terminated.

(§ 19.3-34, 2-11-98; § 19.1-8, 9-29-77, art. II, § 3, 7-11-90; Code 1988, §§ 19.1-8, 19.3-34; § 17-310, Ord. 98-A(1), 8-5-98; Ord. 02-17(1), 7-3-02; Ord. 08-17(3), 8-6-08; Ord. 11-17(1), 10-5-11; § 17-208, Ord. 14-17(1), 5-7-14, effective 7-1-14)

State law reference – Va. Code §§ 62.1-44.15:28, 62.1-44.15:31, 62.1-44.15:34, 62.1-44.15:36; 9VAC25-870-730, 9VAC25-870-820, 9VAC25-870-825, 9VAC25-870-830.

Sec. 17-209 Fees; payment.

Each owner shall pay the fees imposed by sections 17-207 and 17-208 as follows:

- A. *Form.* Each fee shall be in the form of cash or a check payable to the “County of Albemarle.”
- B. *When payment to be made.* Payments shall be made as follows:
 1. *VESCP.* Each owner seeking approval of an erosion and sediment control plan shall pay all applicable fees upon submittal of the application.
 2. *VSMP; permit issuance.* Each owner required to pay the permit issuance fee shall pay one-half of the applicable total fee required by column 1 of the table in section 17-208 upon submittal of the application, and the remaining one-half shall be paid prior to issuance of coverage under the general permit.
 3. *VSMP; transfer or modification.* Each owner required to pay the transfer or modification fee required by column 3 of the table in section 17-208 shall pay the fee upon submittal of the application to transfer or modify.
 4. *VSMP; annual maintenance fee.* Each owner required to pay the general permit coverage maintenance fee required by column 4 of the table in section 17-208 shall pay the fee annually to the County until a notice of termination is effective. The maintenance fee shall be due by April 1 of each year. On the first April 1 after the land disturbing activity has begun, this fee shall be prorated on a monthly basis, and the full fee shall be paid by April 1 of each year thereafter. No fee shall be refunded for land disturbing activity that is completed in months other than April.
- C. *Required information to be included with VSMP permit application payments.* Each owner shall submit the following information with the fee payment, or submit a completed Virginia Department of Environmental Quality permit application fee form:
 1. Applicant name, address and daytime phone number.
 2. The name of the facility or activity and its location.
 3. The type of general permit applied for.
 4. Whether the application is for a new general permit issuance, general permit reissuance, general permit maintenance, or general permit modification.

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5. The amount of fee submitted.
 6. The existing general permit number, if applicable.
 7. Other information as required by the administrator.
- D. *Use of fees.* The County's portion of the fees imposed under sections 17-207 and 17-208 shall be used solely to carry out the County's responsibilities under the Virginia Stormwater Management Act, the Erosion and Sediment Control Law, the applicable regulations in 9VAC25-830 through 9VAC25-890, this chapter and any other applicable standards and specifications.

(Ord. 14-17(1), 5-7-14, effective 7-1-14)

State law reference – Va. Code §§ 62.1-44.15:36, 62.1-44.15:54; 9VAC25-840-30, 9 VAC25-870-700, 9VAC25-870-750, 9VAC25-870-760, 9VAC25-870-780, 9VAC25-870-820.

Sec. 17-210 Fees; incomplete and late payments.

Incomplete and late payments of fees required by sections 17-207 and 17-208 shall be subject to the following:

- A. *Incomplete payments.* The failure of an owner to pay the fee due as required by this chapter for the application or service shall be deemed to be a nonpayment of the fee and: (i) the application shall not be processed; and (ii) no service shall be provided by the County. The administrator shall provide written notice to the owner of any incomplete payment within ten (10) days after the determination that the payment is incomplete.
- B. *Late payments.* Any late payment shall be subject to interest at the underpayment rate provided in Virginia Code § 58.1-15 and shall be calculated on a monthly basis at the applicable periodic rate. A ten (10) percent late payment fee shall be charged to any account more than ninety (90) days past due.
- C. *Remedies.* The County may pursue any remedies provided by State law to collect any past due amount. In addition, the County or the administrator may pursue the remedies provided in section 17-900 *et seq.*, including revocation of any approval.

(Ord. 14-17(1), 5-7-14, effective 7-1-14)

State law reference – 9VAC25-870-770.

Sec. 17-211 Review of administrator's action by the board of supervisors; judicial review.

Any person aggrieved by an action or inaction of the administrator may request that the program authority review the action or inaction and may thereafter request judicial review of the program authority's final decision, as provided herein:

- A. *Actions that may be reviewed.* Any of the following actions by the administrator may be reviewed: (i) the disapproval of an erosion and sediment control plan or VSMP permit; (ii) the approval of an erosion and sediment control plan or VSMP permit with conditions the owner objects to; (iii) the disapproval of a variance or exception; (iv) any determination made under sections 17-300 through 17-306; (v) any general permit decision made by the administrator; (vi) any enforcement decision made by the administrator; (vii) the failure of the administrator to act within the time periods required by this chapter; and (viii) the approval of an erosion and sediment control plan or VSMP permit where the issue is compliance with 9VAC25-840-40(19).
- B. *Standing.* Any owner who is an applicant, permittee, operator or any other person subject to general permit requirements under the VSMP who is aggrieved by any action or inaction under

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subsection (A)(i) through (vii) has standing to seek review under this section. Any downstream owner who is aggrieved by an action under subsection (A)(viii) has standing to seek review under this section.

- C. *Request for hearing and time in which to make request; contents.* Any person who has standing under subsection (B) (hereinafter, the “appellant”) may request in writing that the program authority conduct a hearing, provided that the request is filed with the clerk of the board of supervisors: (i) within thirty (30) days after the date of notice of the action, when review is sought under subsection (A)(i) through (A)(vi); (ii) within thirty (30) days after the date by which the administrator was required to act but failed to do so, when review is sought under subsection (A)(vii); or (iii) within thirty (30) days after the date of the administrator’s approval of the erosion and sediment control plan or VSMP permit, when review is sought under subsection (A)(viii). The request shall specify the grounds for the appeal. The thirty (30) day period within which the hearing shall be held shall not begin unless and until the request specifies the grounds for the appeal.
- D. *Conduct of hearing.* The hearing shall be conducted as follows:
1. *Hearing officer.* The hearing before the program authority shall be conducted by the director of community development, who shall act as the hearing officer for the program authority.
 2. *When the hearing shall be held.* The hearing shall be held within thirty (30) days after receipt of the petition requesting a hearing. The hearing shall be held on a date and at a time at which both the appellant and the administrator may be present. At the request of the appellant, the hearing officer may extend the hearing date beyond the thirty (30) day period. The failure of the hearing officer to conduct the hearing within the thirty (30) day period or any extension thereof shall not divest the hearing officer of jurisdiction to consider the appeal.
 3. *Evidence and law.* When reviewing the administrator’s action or inaction, the hearing officer shall consider relevant and material laws and evidence presented by the owner, the administrator, and any other person as he deems to be necessary for a complete review of the matter.
 4. *Record.* The record of the hearing shall be composed of relevant files, a recording of the hearing, and other writings. The recording of the hearing shall be transcribed only if judicial review of the decision is sought under subsection (F).
- E. *Decision.* The hearing officer shall make a final decision within forty five (45) days after the hearing is concluded. The hearing officer may affirm, reverse, or modify the action of the administrator, or he may take any action the administrator failed to take. The decision shall be in writing and state the date of the decision and the reasons for the decision. Notice of the hearing officer’s decision shall be provided to the administrator and to the appellant.
- F. *Judicial review.* A final decision by the hearing officer under this section may be subject to judicial review, provided that an appeal is filed by the person aggrieved in the circuit court within thirty (30) days after the date of the hearing officer’s written decision. Judicial review shall be conducted as provided in Virginia Code § 62.1-44.15:46.

(§ 17-210: § 7-7, 6-18-75, § 9, 2-11-87, 3-18-92; § 19.3-18, 2-11-98; Code 1988, §§ 7-7, 19.3-18; §17-210, Ord. 98-A(1), 8-5-98) (§ 17-311: 2-11-98; Code 1988, § 19.3-35; § 17-311, Ord. 98-A(1), 8-5-98; § 17-211, Ord. 14-17(1), 5-7-14, effective 7-1-14)

State law reference – Va. Code §§ 62.1-44.26, 62.1-44.15:45, 62.1-44.15:46, 62.1-44.15:62; 9VAC25-870-118.

**ARTICLE III. APPLICABILITY OF THE VESCP AND THE VSMP
TO A LAND DISTURBING ACTIVITY OR A SITE CONDITION**

Sec. 17-300 Land disturbing activities and site conditions subject to the VESCP.

The following land disturbing activities and site conditions are subject to the VESCP, and the owner shall comply with all applicable requirements of the VESCP in this chapter and under State law:

- A. *Land disturbance of 10,000 square feet or more.* Any land disturbance of ten thousand (10,000) square feet or more, including the harvesting of forest crops, unless the activity is exempt under section 17-301.
- B. *Land disturbance of less than 10,000 square feet; common plan of development or sale.* Any land disturbance of less than ten thousand (10,000) square feet if the disturbance is part of a common plan of development or sale whose total land disturbance will exceed ten thousand (10,000) square feet, unless the activity is exempt under section 17-301.
- C. *Erosion impact area.* The administrator determines that a site is an erosion impact area under section 17-304, regardless of whether the activity resulting in the condition is otherwise exempt under section 17-301.
- D. *Agricultural road included within a plan of development.* The administrator determines that any previously constructed agricultural road, exempt at the time of its construction under section 17-301, is no longer exempt because the owner submitted an initial site plan, preliminary plat, any other subdivision plat, or special use permit for a use or activity not directly related to agriculture, for the site on which the agricultural road is located, and: (i) the initial site plan, subdivision plat, or special use permit application was submitted within twenty-four (24) months after construction of the agricultural road began; and (ii) the administrator determines that the dimensions and alignment of the agricultural road substantially correspond to the dimensions and alignment of a road proposed on the plan, plat, or any document submitted as part of the special use permit application.

(§ 7-3, 6-18-75, § 5, 2-11-76, 4-21-76, 2-11-87, 3-18-92; § 19.3-8, 2-11-98; Code 1988, §§ 7-3, 19.3-8; § 17-200, Ord. 98-A(1), 8-5-98; Ord. 08-17(1), 2-6-08; § 17-300, Ord. 14-17(1), 5-7-14, effective 7-1-14)

State law reference – Va. Code § 62.1-44.15:51; 9VAC25-890-40.

Sec. 17-301 Land disturbing activities exempt from the VESCP.

The following land disturbing activities are exempt from the VESCP:

- A. *Minor residential-related activities.* Minor residential-related land disturbing activities such as home gardens and individual home landscaping, repairs, and maintenance work.
- B. *Connections.* Individual service connections.
- C. *Public utility lines.* Installing, maintaining, or repairing any underground public utility lines when the activity occurs on an existing hard surfaced road, street, or sidewalk, provided that the land disturbing activity is confined to the area of the road, street, or sidewalk that is hard surfaced.
- D. *Conventional onsite sewage systems.* Septic tank lines or drainage fields for a conventional onsite sewage system unless they are included in an overall plan for land disturbing activity related to constructing the building to be served by the system.
- E. *Mining, oil and gas operations and projects.* Permitted surface or deep mining operations and projects, and oil and gas operations and projects conducted pursuant to Title 45.1 of the Virginia Code.

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- F. *Agricultural, horticultural, and forestal activities.* Tilling, planting, or harvesting of agricultural, horticultural, or forest crops, livestock feedlot operations, the construction of agricultural roads unless and until a plan of development is submitted and the road is no longer exempt as provided in section 17-300(D), or as additionally set forth by the State Water Control Board in regulations; provided that this exemption shall not apply to the harvesting of forest crops unless the area on which the harvesting occurs is reforested artificially or naturally in accordance with the provisions of Chapter 11 (Virginia Code § 10.1-1100 *et seq.*) of Title 10.1 of the Virginia Code or is converted to bona fide agricultural or improved pasture use as described in Virginia Code § 10.1-1163(B).
- G. *Agricultural engineering operations.* Agricultural engineering operations including, but not limited to, constructing terraces, terrace outlets, check dams, desilting basins, dikes, ponds not required to comply with the provisions of the Dam Safety Act (Virginia Code § 10.1-604 *et seq.*), ditches, strip cropping, lister furrowing, contour cultivating, contour furrowing, land drainage, and land irrigation.
- H. *Railroad improvements.* Repairing or rebuilding the tracks, rights-of-way, bridges, communication facilities, and other related structures and facilities of a railroad company.
- I. *Posts and poles.* Installing fence and sign posts or telephone and electric poles and other kinds of posts or poles.
- J. *Emergency work.* Emergency work to protect life, limb, or property, and emergency repairs; provided that if the land disturbing activity would have required an approved erosion and sediment control plan if the activity was not an emergency, then the land area disturbed shall be shaped and stabilized in accordance with the requirements of the County.

(§ 7-3, 6-18-75, § 5, 2-11-76, 4-21-76, 2-11-87, 3-18-92; § 19.3-8, 2-11-98; Code 1988, §§ 7-3, 19.3-8; § 17-200, Ord. 98-A(1), 8-5-98; Ord. 08-17(1), 2-6-08; § 17-301, Ord. 14-17(1), 5-7-14, effective 7-1-14)

State law reference – Va. Code § 62.1-44.15:51.

Sec. 17-302 Land disturbing activities subject to the VSMP.

The following land disturbing activities are subject to the VSMP, and the owner shall comply with all applicable requirements of the VSMP in this chapter and under State law:

- A. *Land disturbance of 10,000 square feet or more.* Any land disturbing activities that disturb ten thousand (10,000) square feet or more, including the harvesting of forest crops, unless the activity is exempt under section 17-303.
- B. *Land disturbance of less than 10,000 square feet; common plan of development or sale.* Any land disturbing activities that disturb less than ten thousand (10,000) square feet if the disturbance is part of a common plan of development or sale whose total land disturbance will exceed ten thousand (10,000) square feet, unless the activity is exempt under section 17-303.

(§ 19.1-6, 9-29-77, art. II, § 1, 10-19-77, 9-13-78, 10-22-80, 7-11-90, 8-3-94; § 19.2-5, 6-19-91, § 5; § 19.3-24, 2-11-98; Code 1988, §§ 19.1-6, 19.2-5, 19.3-24; § 17-300, Ord. 98-A(1), 8-5-98; Ord. 07-17(1), 2-14-07; § 17-302, Ord. 14-17(1), 5-7-14, effective 7-1-14)

State law reference – Va. Code §§ 62.1-44.15:24, 62.1-44.15:34; 9VAC25-890-40.

Sec. 17-303 Land disturbing activities exempt from the VSMP.

The following land disturbing activities are exempt from the VSMP requirements of this chapter, unless otherwise required by federal law:

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- A. *Mining, oil and gas operations and projects.* Permitted surface or deep mining operations and projects, and oil and gas operations and projects conducted pursuant to Title 45.1 of the Virginia Code.
- B. *Agricultural, horticultural, and forestal activities.* Clearing of lands specifically for agricultural purposes and the management, tilling, planting, or harvesting of agricultural, horticultural, or forest crops, livestock feedlot operations, or as additionally set forth by the State Water Control Board in regulations, including engineering operations as follows: construction of terraces, terrace outlets, check dams, desilting basins, dikes, ponds, ditches, strip cropping, lister furrowing, contour cultivating, contour furrowing, land drainage, and land irrigation; however, this exception shall not apply to harvesting of forest crops unless the area on which harvesting occurs is reforested artificially or naturally in accordance with the provisions of Chapter 11 (Virginia Code § 10.1-1100 *et seq.*) of Title 10.1 of the Virginia Code or is converted to bona fide agricultural or improved pasture use as described in Virginia Code § 10.1-1163(B).
- C. *Single-family residences.* Single-family residences separately built and disturbing less than one acre and not part of a larger common plan of development or sale, including additions or modifications to existing single-family detached residential structures.
- D. *Land disturbance of less than 10,000 square feet.* Land disturbing activities that disturb less than ten thousand (10,000) square feet of land area except for land disturbing activities that are part of a larger common plan of development or sale that is ten thousand (10,000) square feet or greater of disturbance
- E. *Discharges.* Discharges to a sanitary sewer or a combined sewer system.
- F. *Reclamation of abandoned property.* Activities under a State or Federal reclamation program to return an abandoned property to an agricultural or open land use.
- G. *Project maintenance.* Routine maintenance that is performed to maintain the original line and grade, hydraulic capacity, or original construction of the project. The paving of an existing road with a compacted or impervious surface and reestablishment of existing associated ditches and shoulders shall be deemed routine maintenance if performed in accordance with this subsection.
- H. *Emergencies.* Conducting land disturbing activities in response to a public emergency where the related work requires immediate authorization to avoid imminent endangerment to human health or the environment. In a public emergency, the owner shall advise the administrator of the disturbance within seven (7) days after commencing the land disturbing activity, and compliance with the administrative requirements of this chapter to obtain approval of a VSMP permit is required within thirty (30) days after commencing the land disturbing activity.

(§ 19.1-6, 9-29-77, art. II, § 1, 10-19-77, 9-13-78, 10-22-80, 7-11-90, 8-3-94; § 19.2-5, 6-19-91, § 5; § 19.3-24, 2-11-98; Code 1988, §§ 19.1-6, 19.2-5, 19.3-24; § 17-300, Ord. 98-A(1), 8-5-98; Ord. 07-17(1), 2-14-07; § 17-303, Ord. 14-17(1), 5-7-14, effective 7-1-14)

State law reference – Va. Code §§ 62.1-44.15:24, 62.1-44.15:34.

Sec. 17-304 Determining the status of a land disturbing activity or a site condition.

The administrator shall determine:

- A. *Whether an activity is subject to this chapter.* Whether an activity is a land disturbing activity and, if it is so, whether it is subject to the VESCP, the VSMP, or both, or whether it is exempt therefrom.
- B. *Whether an erosion impact area exists.* Whether an erosion impact area exists on a site.

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- C. *Whether an agricultural road is part of a plan of development.* Whether a road is an agricultural road and whether it is part of a plan of development under section 17-300(D).
- D. *Related offsite land disturbing activity.* When a land disturbing activity includes activity at a separate location, including but not limited to borrow and disposal areas, whether: (i) the offsite activity should be considered as being part of the proposed land disturbing activity; or (ii) to require the power to provide proof of an approved erosion and sediment control plan if the owner asserts that the offsite activity is already covered by an approved erosion and sediment control plan, and to require that the owner certify that the plan will be implemented in accordance with applicable VESCP regulations in this chapter.
- E. *Adjacent offsite land disturbing activity.* When a land disturbing activity or plan requires land disturbing activity on adjacent or abutting property, whether: (i) the owner of the adjacent or abutting property must be a signatory on the application; or (ii) to require a recorded easement and agreement for the offsite land disturbing activity before further land disturbing activity occurs, or in the case of a proposed plan, prior to further review or approval.

(§ 17-200: § 7-3, 6-18-75, § 5, 2-11-76, 4-21-76, 2-11-87, 3-18-92; § 19.3-8, 2-11-98; Code 1988, §§ 7-3, 19.3-8; § 17-200, Ord. 98-A(1), 8-5-98; Ord. 08-17(1), 2-6-08) (§ 17-201: 2-11-98; Code 1988, § 19.3-9; § 17-201, Ord. 98-A(1), 8-5-98) (§17-202: § 7-3, 6-18-75, § 5, 2-11-76, 4-21-76, 2-11-87, 3-18-92; § 19.3-10, 2-11-98; Code 1988, §§ 7-3, 19.3-10; § 17-202, Ord. 98-A(1), 8-5-98; § 17-304, Ord. 14-17(1), 5-7-14, effective 7-1-14)

State law reference – Va. Code §§ 62.1-15.44:27, 62.1-15.44:54, 62.1-15.44:55; 9VAC25-840-80.

Sec. 17-305 Notice of determination regarding status of land disturbing activity or site condition.

The administrator shall provide notice to the owner of any determination under section 17-304(A) that a proposed land disturbing activity is subject to this chapter where an owner asserts that the activity is exempt, any determination under section 17-304(B) that an erosion impact area exists, any determination under section 17-304(C) that an agricultural road is now subject to the VESCP, as follows:

- A. *Notice.* Upon making a determination, the administrator shall immediately inform the owner of the determination. The notice may either be informal, by the administrator speaking to the owner by telephone or in person, or a written notice. The written notice shall: (i) state the basis for the determination; (ii) instruct the owner to submit an erosion and sediment control plan for review and approval; and (iii) for determinations pertaining to erosion impact areas or agricultural roads, state the date by which the plan shall be submitted.
- B. *When written notice required.* If informal notice as provided in subsection (A) is first provided to the owner and the owner either requests written notice or fails to comply with the informal notice, the administrator shall then provide written notice to the owner as provided in subsection (A).

(§ 17-201: 2-11-98; Code 1988, § 19.3-9; § 17-201, Ord. 98-A(1), 8-5-98) (§17-202: § 7-3, 6-18-75, § 5, 2-11-76, 4-21-76, 2-11-87, 3-18-92; § 19.3-10, 2-11-98; Code 1988, §§ 7-3, 19.3-10; § 17-202, Ord. 98-A(1), 8-5-98; § 17-305, Ord. 14-17(1), 5-7-14, effective 7-1-14)

State law reference – Va. Code §§ 62.1-15.44:27, 62.1-15.44:54.

Sec. 17-306 Owner's obligation upon receipt of notice of determination.

Upon receipt of the notice provided by the administrator under section 17-305, the owner shall be obligated to act as follows:

- A. *Determination that land disturbing activity is subject to the VESCP or the VSMP, or both.* If the administrator determines that a land disturbing activity is subject to the VESCP, the VSMP, or

both, under section 17-305(A) or (C), the owner shall immediately comply with the applicable requirements of this chapter and the applicable requirements of this chapter shall be immediately enforced.

- B. *Determination that an erosion impact area exists.* If the administrator determines that an erosion impact area exists under section 17-305(B), the owner shall: (i) not permit any portion of that land to remain in a condition so that soil erosion and sedimentation causes reasonably avoidable damage or harm to adjacent or downstream property, roads, streams, lakes, or ponds; and (ii) immediately comply with the applicable requirements of the notice and this chapter. If good cause is shown, the administrator may grant to an owner an extension of time to comply with the requirements of this subsection and this chapter.

(2-11-98; Code 1988, § 19.3-9; § 17-201, Ord. 98-A(1), 8-5-98; § 17-306, Ord. 14-17(1), 5-7-14, effective 7-1-14)

State law reference – Va. Code §§ 62.1-15.44:27, 62.1-15.44:54, 62.1-15.44:55; 9VAC25-840-80.

ARTICLE IV. PROCEDURE FOR SUBMITTING, REVIEWING AND ACTING ON APPLICATIONS; POST-APPROVAL RIGHTS AND OBLIGATIONS

DIVISION 1. APPLICATION REQUIREMENTS

Sec. 17-400 Responsibility to prepare, submit and obtain approval of applications; multi-jurisdictional developments.

The procedures in this article, and all related requirements of this chapter, apply to any land disturbing activity subject to the VESCP and the VSMP, as well as any land disturbing activity subject to the VESCP but not the VSMP. Any land disturbing activity subject only to the VESCP shall be subject only to the requirements of this chapter applicable under the VESCP. An application shall be submitted as follows:

- A. *Responsibility of the owner.* Each owner is responsible for preparing, submitting, and obtaining approval of an application prior to engaging in land disturbing activity subject to this chapter. When the land disturbing activity will be required of a contractor performing construction work pursuant to a construction contract, the preparation, submission, and obtaining approval of the plan shall be the responsibility of the owner.
- B. *Submittal of application to the administrator.* Subject to subsection (C), each application shall be submitted to the administrator as provided in this chapter.
- C. *Multi-jurisdictional developments.* If a proposed land disturbing activity involves lands under the jurisdiction of the County's program and another public entity's program, in lieu of the owner submitting separate applications to each program, either:
1. *Request that State review plan.* The administrator or the other program, or both, may request that the application be submitted to the Virginia Department of Environmental Quality for review and action; or
 2. *Agreement that single program administer the project.* The administrator may enter into an agreement on behalf of the County with the other program regarding the administration of the project, whereby the program containing the greater portion of the project shall be responsible for all or part of ensuring that the applicable program requirements are satisfied. The greater portion of the project shall include all anticipated future phases and development of the project, as determined by the administrator.

(§ 17-203; § 19.3-11, 2-11-98; § 7-3, 6-18-75, § 5, 2-11-76, 4-21-76, 2-11-87, 3-18-92; § 7-4, 6-18-75, § 6, 10-22-75, 4-21-76, 11-10-76, 3-2-77, 4-17-85, 2-11-87, 12-11-87, 12-11-91, 3-18-92; Code 1988, §§ 7-3, 7-4, 19.3-11; § 17-203, Ord. 98-A(1), 8-5-98; Ord. 01-17(1), 7-11-01; Ord. 09-17(1), 8-5-09, effective 9-5-

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09) (§ 17-303; § 19.1-6, 9-29-77, art. II, § 1, 10-19-77, 9-13-78, 10-22-80, 7-11-90, 8-3-94; § 19.1-7, 9-29-77, art. II, § 2, 7-11-90; § 19.3-27, 2-11-98; Code 1988, §§ 19.1-6, 19.2-7, 19.3-27; § 17-303, Ord. 98-A(1), 6-17-98; § 17-400, Ord. 14-17(1), 5-7-14, effective 7-1-14)

State law reference – Va. Code §§ 62.1-44.15:34, 62.1-44.15:55; 9VAC25-890-40.

Sec. 17-401 VSMP permit application; form and content.

Any owner whose proposed land disturbing activity is subject to the VSMP shall submit an application for a VSMP permit that includes all of the following, in the form required by the administrator:

- A. *Application form.* A completed application on an application form provided by the administrator, signed by the owner.
- B. *Fees.* All applicable fees required by section 17-207 and the applicable fee form.
- C. *Registration statement.* A complete and accurate registration statement, if such a statement is required, from the operator on the official form provided by the Virginia Department of Environmental Quality in order to apply for general permit coverage. The registration statement shall be signed by the owner in accordance with 9VAC25-870-370 and 9VAC25-880-70. A registration statement is not required for construction of a detached single-family dwelling within or outside of a common plan of development or sale, provided that the project complies with the requirements of the general permit.
- D. *Erosion and sediment control plan.* An erosion and sediment control plan satisfying the requirements of sections 17-402.
- E. *Stormwater management plan.* A stormwater management plan satisfying the requirements of sections 17-403 or an executed agreement in lieu of a stormwater management plan.
- F. *Pollution prevention plan.* A pollution prevention plan satisfying the requirements of section 17-404.
- G. *Stormwater pollution prevention plan.* A stormwater pollution prevention plan satisfying the requirements of section 17-405.
- H. *Mitigation plan.* A mitigation plan satisfying the requirements of section 17-406 if land disturbing activity is proposed within a stream buffer under section 17-604.
- I. *Requested variations or exceptions.* A request for any variation or exception as provided in sections 17-407 and 17-408.
- J. *Construction record drawings.* Construction record drawings if existing stormwater management facilities are used, satisfying the requirements of section 17-422.

(Ord. 14-17(1), 5-7-14, effective 7-1-14)

State law reference – Va. Code § 62.1-44.15:34; 9VAC25-870-59, 9VAC25-870-370, 9VAC25-880-70.

Sec. 17-402 Erosion and sediment control plans, and agreements in lieu of a plan; form and content.

Any owner whose proposed land disturbing activity is subject to the VSMP, or is subject solely to the VESCP, shall submit an erosion and sediment control plan for review that includes the following, in the form required by the administrator:

- A. *Application form.* A completed application on an application form provided by the administrator, if the land disturbing activity is subject only to the VESCP and a VSMP permit is not required.

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- B. *Fee.* The fee required by section 17-207, if the land disturbing activity is subject only to the VESCP, and a VSMP permit is not required.
- C. *Elements of plan.* Except as provided in subsection (D), an erosion and sediment control plan that contains all of the following elements:
1. *Temporary and permanent controls.* The specifications for temporary and permanent controls of soil erosion and sedimentation in such detail as the administrator deems to be reasonably adequate, considering the nature and extent of the proposed land disturbing activity, implementing appropriate erosion and sediment control best management practices and satisfying the requirements of 9VAC25-880-70, Part II(A)(2). All control measures required by the plan shall be designed and installed in accordance with good engineering practices.
 2. *Maintenance responsibilities.* A statement describing the maintenance responsibilities of the owner to ensure that the land disturbing activity will satisfy the purposes and requirements of this chapter.
 3. *Technical criteria.* The technical criteria required by section 17-500.
 4. *Identification of land disturber.* Identify the person holding a certificate of competence required by Virginia Code § 62.1-44.15:54, who shall be in charge of and responsible for carrying out the land disturbing activity.
 5. *Additional information.* Additional information required by the administrator as determined to be necessary for a complete review of the plan.
 6. *Certification.* A certification on a form provided by the administrator and signed by the owner stating that all requirements of the approved plan will be complied with.
- D. *Agreement in lieu of a plan.* Notwithstanding subsection (C), if the land disturbing activity is for the purpose of establishing or modifying a single family dwelling unit, the administrator may allow an agreement in lieu of a plan for the land disturbing activity required for constructing the dwelling; provided:
1. *Eligibility.* The single family dwelling unit is on an individual lot of one (1) acre or less which is not subject to an active erosion and sediment control plan or is not part of a common plan of development or sale.
 2. *Other factors to be considered by administrator.* In determining whether to allow an agreement in lieu of a plan under this section, the administrator shall consider the potential threat to water quality and to adjacent land resulting from the land disturbing activity, and whether the land disturbing activity is within the mountain overlay district identified in the Comprehensive Plan.
 3. *Contents and form of the agreement in lieu of a plan.* The contents of any agreement in lieu of a plan shall be established by the administrator, and they shall: (i) be sufficient to ensure that the purposes and requirements of the VESCP, including the requirements of 9VAC25-880-70, Part II(A)(2) are satisfied; and (ii) identify the person in charge of and responsible for carrying out the land disturbing activity and holding a valid certificate of competence for that task. The form of the agreement shall be subject to review and approval by the County attorney.
 4. *Effect of agreement in administration of the VESCP.* Except as provided in subsection (C) and section 17-500 pertaining to the content and technical criteria applicable to erosion and sediment control plans, all other references in this chapter to an erosion and sediment

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control plan shall include an agreement in lieu of a plan, and the County and the owner shall have all of the rights, responsibilities and remedies set forth in this chapter as though the agreement in lieu of a plan was an erosion and sediment control plan.

(§ 17-203: § 19.3-11, 2-11-98; § 7-3, 6-18-75, § 5, 2-11-76, 4-21-76, 2-11-87, 3-18-92; § 7-4, 6-18-75, § 6, 10-22-75, 4-21-76, 11-10-76, 3-2-77, 4-17-85, 2-11-87, 12-11-87, 12-11-91, 3-18-92; Code 1988, §§ 7-3, 7-4, 19.3-11; § 17-203, Ord. 98-A(1), 8-5-98; Ord. 01-17(1), 7-11-01; Ord. 09-17(1), 8-5-09, effective 9-5-09) (§ 17-205: § 7-4, 6-18-75, § 6, 10-22-75, 4-21-76, 11-10-76, 3-2-77, 4-17-85, 2-11-87, 12-11-91, 3-18-92; § 19.3-13, 2-11-98; Code 1988, §§ 7-4, 19.3-13; § 17-205, Ord. 98-A(1), 8-5-98; Ord. 01-17(1), 7-11-01; § 17-402, Ord. 14-17(1), 5-7-14, effective 7-1-14)

State law reference – Va. Code § 62.1-44.15:55; 9VAC25-840-60, 9VAC25-870-400, 9VAC25-880-70, 9VAC25-890-40.

Sec. 17-403 Stormwater management plans; form and content.

Any owner whose proposed land disturbing activity is subject to the VSMP shall submit a stormwater management plan for review that includes the following, in the form required by the administrator:

- A. *Elements of plan.* Except as provided in subsection (B), a stormwater management plan for the entire land disturbing activity, where applicable, which shall be considered to be a single land disturbing activity even when there are individual parcels in a new residential, commercial, or industrial development. The plan shall contain all of the following elements:
1. *Stormwater discharges and features.* The plan shall consider all sources of surface runoff and all sources of subsurface and groundwater flows converted to surface runoff, and shall include information on the type of and location of stormwater discharges, information on the features to which stormwater is being discharged including surface waters, and predevelopment and postdevelopment drainage areas.
 2. *Contact information.* Contact information including the name, address, telephone number, and email address of the owner and the tax reference number and parcel number of the property or properties affected.
 3. *Details pertaining to, or narrative of, current and final site conditions.* Either sufficient plan information provided and documented during the review process that addresses the current and final site conditions, or a narrative that includes a description of current site conditions and final site conditions or
 4. *Description of proposed stormwater management facilities.* A detailed plan of the proposed stormwater management facilities, including all best management practices, that will satisfy the requirements of this chapter and a description of all facilities and best management practices that will prevent or minimize water quality impacts for any new development or redevelopment project that will result in land disturbing activity of ten thousand (10,000) square feet or more.
 5. *Description of long-term operation and maintenance.* A description of the mechanism through which the facilities, including all best management practices, will be operated and maintained after construction is complete, provided that this description is satisfied if the stormwater management facility will be subject to the agreement required by section 17-415.
 6. *Information about proposed stormwater management facilities.* The following information about the proposed stormwater management facilities, including: (i) the type of facilities; (ii) the location, including geographic coordinates; (iii) acres treated; (iv) the surface waters into which the facility will discharge; and (v) any other information

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required by the administrator in order to comply with any requirements of the County's MS4 permit.

7. *Documentation demonstrating compliance.* Documentation and calculations, including all hydrologic and hydraulic computations and runoff characteristics, verifying compliance with the water quality and quantity requirements of the technical criteria in section 17-501.
 8. *Maps.* One or more maps of the site depicting the topography of the site and: (i) all contributing drainage areas; (ii) existing streams, ponds, culverts, ditches, wetlands, other water bodies, and floodplains; (iii) soil types, geologic formations if karst features are present in the area, forest cover, and other vegetative areas; (iv) current land use including existing structures, roads, and locations of known utilities and easements; (v) sufficient information on adjoining parcels to assess the impacts of stormwater from the site on these parcels; (vi) the limits of clearing and grading, and the proposed drainage patterns on the site; (vii) proposed buildings, roads, parking areas, utilities, and stormwater management facilities; (viii) proposed land uses, with tabulation of the percentage of surface area to be adapted to various uses, including but not limited to planned locations of utilities, roads, and easements; and (ix) other site information deemed necessary by the administrator.
 9. *Offsite compliance options.* If an owner intends to meet the requirements established in section 17-502, which implements 9VAC25-870-63 and 9VAC25-870-66, through the use of off-site compliance options, where applicable, a letter of availability from the off-site provider.
 10. *Additional information.* Additional information deemed necessary by the administrator for a complete review of the plan.
- B. *Agreement in lieu of a stormwater management plan.* Notwithstanding subsection (A), if the land disturbing activity is for the purpose of establishing a single family dwelling unit, the administrator may allow an agreement in lieu of a stormwater management plan for the land disturbing activity required for constructing the dwelling.
- C. *Seals and signatures.* Any elements of the stormwater management plan that include activities regulated under Virginia Code § 54.1-400 *et seq.* shall be appropriately sealed and signed by a professional registered in the State pursuant to Virginia Code § 54.1-400 *et seq.* Any stormwater management plan requiring an appropriate seal and signature shall be deemed to be incomplete under section 17-409 if it is not sealed and signed as required by this section.

(§ 19.1-6, 9-29-77, art. II, § 1, 10-19-77, 9-13-78, 10-22-80, 7-11-90, 8-3-94; § 19.1-7, 9-29-77, art. II, § 2, 7-11-90; § 19.3-27, 2-11-98; Code 1988, §§ 19.1-6, 19.2-7, 19.3-27; § 17-303, Ord. 98-A(1), 6-17-98; § 17-403, Ord. 14-17(1), 5-7-14, effective 7-1-14)

State law reference – Va. Code § 62.1-44.15:34; 9VAC25-870-55, 9VAC25-870-108, 9VAC25-870-400, 9VAC25-890-40.

Sec. 17-404 Pollution prevention plans; form and content.

Any owner whose proposed land disturbing activity is subject to the VSMP shall submit a pollution prevention plan for review that includes the following, in the form required by the administrator:

- A. *Elements of plan.* A pollution prevention plan containing all of the following elements:
1. *Sources of pollutants.* Identify potential pollutant generating activities and the pollutant that is expected to be exposed to stormwater.

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2. *Location of pollutant generating activities.* Describe the location where the potential pollutant generating activities will occur, or if identified on a site plan, refer to the site plan.
 3. *Non-stormwater discharges.* Identify all non-stormwater discharges as provided in 9VAC25-880-70, Part I(E), that are or will be commingled with stormwater discharges from the construction activity, including any support activity.
 4. *Person responsible.* Identify the person responsible for implementing the pollution prevention practices for each pollutant generating activity, if different from the person listed as the qualified personnel in the stormwater pollution prevention plan.
 5. *Practices and procedures.* Describe the pollution prevention practices and procedures that will be implemented to respond to the categories of leaks, spills and discharges in 9VAC25-880-70, Part II(A)(4)(e).
 6. *Pollution prevention awareness.* Describe the procedures for providing pollution prevention awareness of all applicable wastes, including any wash water, disposal practices and applicable disposal locations of these wastes to personnel in order to comply with the State.
- B. *Details of measures to minimize the discharge of pollutants.* The pollution prevention plan shall detail the design, installation, implementation, and maintenance of effective pollution prevention measures in accordance with 40 CFR 450.21(d) to minimize the discharge of pollutants. The following are the minimum requirements for minimizing the discharge of pollutants:
1. *Minimum control measures.* At a minimum, the control measures shall be designed, installed, implemented, and maintained to address the following:
 - a. *Wash waters.* Minimize the discharge of pollutants from equipment and vehicle washing, wheel wash water, and other wash waters. Wash waters must be treated in a sediment basin or alternative control that provides equivalent or better treatment prior to discharge.
 - b. *Minimization of exposure to precipitation and stormwater.* Minimize the exposure of building materials, building products, construction wastes, trash, landscape materials, fertilizers, pesticides, herbicides, detergents, sanitary waste, and other materials present on the site to precipitation and to stormwater.
 - c. *Minimize discharges from spills and leaks.* Minimize the discharge of pollutants from spills and leaks and implement chemical spill and leak prevention and response procedures.
 2. *Best management practices.* The pollution prevention plan shall provide effective best management practices to prohibit the following discharges in accordance with 40 CFR 450.21(e):
 - a. *Washout of concrete.* Wastewater from the washout of concrete.
 - b. *Washout of stucco and other materials.* Wastewater from washout and cleanout of stucco, paint, form release oils, curing compounds, and other construction materials.
 - c. *Vehicle and equipment maintenance and operation.* Fuels, oils, or other pollutants used in vehicle and equipment operation and maintenance.

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- d. *Vehicle and equipment washing.* Soaps, solvents or detergents used in vehicle and equipment washing.
3. *Discharges from dewatering activities prohibited.* Discharges from dewatering activities, including discharges from dewatering trenches and excavations, are prohibited unless managed by appropriate controls in accordance with 40 CFR 450.21(c).
4. *Control of waste.* The pollution prevention plan shall include measures for controlling waste such as discarded building materials, chemicals, litter, and sanitary waste at the construction site that may cause adverse impacts to water quality.

(Ord. 14-17(1), 5-7-14, effective 7-1-14)

State law reference – 9VAC25-870-54, 9VAC25-870-56, 9VAC25-870-400, 9VAC25-880-70, 9VAC25-890-40.

Sec. 17-405 Stormwater pollution prevention plan; form and content.

Any owner whose proposed land disturbing activity is subject to the VSMP shall submit a stormwater pollution prevention plan for review that includes the following, in the form required by the administrator:

- A. *Elements of plan.* A stormwater pollution prevention plan containing all of the following elements:
 1. *Registration statement.* A signed copy of the registration statement, if such a statement is required, for coverage under the general permit. A registration statement is not required for construction of a detached single-family dwelling within or outside of a common plan of development or sale, provided that the project complies with the requirements of the general permit.
 2. *Notice of general permit coverage.* Upon receipt, a copy of the notice of coverage under the general permit.
 3. *General permit.* A copy of the general permit.
 4. *Nature of activity.* A narrative description of the nature of the construction activity, including the function of the project (e.g., low density residential, shopping mall, highway).
 5. *Plan of the site.* A plan of the site, satisfying the form and style for such a plan as provided in the Design Standards Manual, identifying:
 - a. *Direction of stormwater flow.* Directions of stormwater flow and approximate slopes anticipated after major grading activities.
 - b. *Limits of land disturbance.* Limits of land disturbance including steep slopes and natural buffers around surface waters that will not be disturbed.
 - c. *Major structural and nonstructural control measures.* Locations of major structural and nonstructural control measures including sediment basins and traps, perimeter dikes, sediment barriers, and other measures intended to filter, settle, or similarly treat sediment that will be installed between disturbed areas and the undisturbed vegetated areas, in order to increase sediment removal and maximize stormwater infiltration;
 - d. *Surface waters.* Locations of surface waters.

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- e. *Concentrated stormwater.* Locations where concentrated stormwater is discharged.
 - f. *Support activities.* Locations of support activities, when applicable and when required by the administrator, including but not limited to: (i) areas where equipment and vehicle washing, wheel wash water, and other wash water is to occur; (ii) storage areas for chemicals such as acids, fuels, fertilizers and other lawn care chemicals; (iii) concrete wash out areas; (iv) vehicle fueling and maintenance areas; (v) sanitary waste facilities, including those temporarily placed on the construction site; and (vi) construction waste storage.
6. *Requirements of 40 CFR 450.21.* The plan must address the following requirements as specified in 40 CFR 450.21, to the extent not otherwise addressed in the erosion and sediment control plan submitted for the site:
- a. *Runoff volume and velocity.* Control runoff volume and velocity within the site to minimize soil erosion.
 - b. *Stormwater discharges.* Control stormwater discharges, including both peak flow rates and total stormwater volume, to minimize erosion at outlets and to minimize downstream channel and stream bank erosion.
 - c. *Minimize soil exposure.* Minimize the amount of soil exposed during construction activity.
 - d. *Minimize disturbance of steep slopes.* Minimize the disturbance of slopes of twenty-five (25) percent or greater.
 - e. *Minimize sediment discharges.* Minimize sediment discharges from the site by designing, installing and maintaining erosion and sediment controls that address factors such as the amount, frequency, intensity and duration of precipitation, the nature of resulting runoff, and soil characteristics, including the range of soil particle sizes expected to be present on the site.
 - f. *Buffers.* Provide and maintain natural buffers around surface waters, direct stormwater to vegetated areas to increase sediment removal and maximize stormwater infiltration, unless infeasible.
 - g. *Soil compaction.* Minimize soil compaction and, unless infeasible, preserve topsoil.
 - h. *Stabilize disturbed areas.* Stabilization of disturbed areas must, at a minimum, be initiated immediately whenever any clearing, grading, excavating, or other earth disturbing activities have permanently ceased on any portion of the site, or temporarily ceased on any portion of the site and will not resume for a period exceeding fourteen (14) calendar days. Stabilization must be completed within the period of time determined by the administrator. In arid, semiarid, and drought-stricken areas where initiating vegetative stabilization measures immediately is infeasible, alternative stabilization measures must be employed as specified by the administrator.
 - i. *Outlet structures.* Use outlet structures that withdraw water from the surface, unless infeasible, when discharging from basins and impoundments.
7. *Discharges to impaired waters, surface waters within an applicable TMDL wasteload allocation, and exceptional waters.* Discharges to impaired waters, surface waters within

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an applicable TMDL wasteload allocation established and approved prior to July 1, 2014, and exceptional waters shall include the information required by 9VAC25-880-70, Part II(A)(5).

- B. *Qualified personnel.* The name, telephone number, and qualifications of the qualified personnel conducting inspections.
- C. *Delegation of authority.* The persons or positions with authority to sign inspection reports or to modify the stormwater pollution prevention plan.
- D. *Additional elements of an approved plan.* In addition to the elements in subsection (A), an approved stormwater pollution prevention plan is composed of, once they are approved, the approved erosion and sediment control plan, including the elements of that plan addressing the requirements of 9VAC25-870-54(F), the approved stormwater management plan, and the pollution prevention plan for the land disturbing activity to which the stormwater pollution prevention plan applies.
- E. *Signature.* The plan shall be signed by a person authorized under 9VAC25-880-70, Part III(K).

(Ord. 14-17(1), 5-7-14, effective 7-1-14)

State law reference – 9VAC25-870-54, 9VAC25-880-70, 9VAC25-890-40.

Sec. 17-406 Mitigation plan if development allowed in stream buffer; form and content.

Each owner who seeks to develop in a stream buffer pursuant to section 17-604 shall submit a mitigation plan that includes the following in the form required by the administrator:

- A. *Elements of plan.* Except as provided in subsection (B), each mitigation plan shall contain all of the following:
 - 1. *Identify impacts and specify mitigation measures.* Identify the impacts of the proposed development on water quality and lands within the stream buffer, and specify the mitigation measures that will address water quality and stream buffer impacts.
 - 2. *Disturbance to land and vegetation minimized.* Ensure that, where development takes place within a stream buffer: (i) the proposed development, including the alignment and design of any stream crossing, shall be located on those portions of a site and in a manner that will be least disruptive to the natural functions of the stream buffer; (ii) no more land shall be disturbed than is necessary to allow a development that is permitted in the underlying zoning district under the applicable regulations of the Zoning Ordinance; and (iii) native vegetation shall be preserved to the fullest extent possible, consistent with the proposed development.
 - 3. *Multiple stream crossings; demonstrate environmental advantage over single stream crossing.* If an owner seeks to establish more than one stream crossing as provided in section 17-604(C)(7), demonstrate that the environmental impacts from the entire road, street or driveway necessitated by a single stream crossing would be greater than the environmental impacts caused by an additional crossing and its associated road, street or driveway. For the purposes of this subsection, the environmental impacts considered by the administrator include, but are not limited to, impacts to soil, soil erosion, stormwater quantity, water quality, loss of vegetated stream buffer, impacts to stream beds and stream banks, the creation of impervious surfaces, and the disturbance of slopes of twenty-five (25) percent or greater.
 - 4. *Additional information.* Additional information deemed necessary by the administrator for a complete review of the plan.

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- B. *Building permit in lieu of satisfying requirements of subsection (A).* For any mitigation plan pertaining to the development of one single-family detached dwelling, the administrator may, in his discretion, accept the building permit for the dwelling in lieu of satisfying the requirements of subsection (A).

(§ 19.3-46, 2-11-98; § 19.2-8, 6-19-91, § 8; § 19.1-13, 6-19-91, § 13; Code 1988, §§ 19.1-13, 19.2-8, 19.3-46; § 17-322, Ord. 98-A(1), 8-5-98; Ord. 08-17(2), 5-7-08; Ord. 11-17(1), 10-5-11; § 14-406, Ord. 14-17(1), 5-7-14, effective 7-1-14)

State law reference – Va. Code § 62.1-44.15:73; 9VAC25-890-40.

Sec. 17-407 Variances from requirements of the VESCP.

The administrator may waive or modify any applicable requirements of the VESCP that he deems to be inappropriate or too restrictive for the site conditions, by granting a variance in conjunction with his review of the erosion and sediment control plan, subject to the following:

- A. *When variance may be requested.* An owner may request that a variance be granted at the time the plan is submitted or while it is under review by the administrator.
- B. *Reason for variance.* The owner shall explain in writing the reasons for requesting any variance.
- C. *Factors to be considered.* The administrator shall consider the reasons given by the owner for requesting the variance, the purposes of this chapter, and the competing need of the owner to maximize cost effectiveness and the need to protect offsite properties and resources from damage.
- D. *Variance incorporated into approved plan.* Any approved variance shall become part of, and be documented in, the approved plan.

(Ord. 14-17(1), 5-7-14, effective 7-1-14)

State law reference – 9VAC25-840-50.

Sec. 17-408 Exceptions from the requirements of the VSMP.

The administrator may grant exceptions from the requirements of the VSMP as follows:

- A. *When exception may be requested.* At the time the VSMP permit application is submitted and while it is under review, an owner may request an exception from any technical criteria in 9VAC25-870-62 through 9VAC25-870-92 or in 9VAC25-870-93 through 9VAC25-870-99.
- B. *Factors to be considered.* The administrator may grant an exception if: (i) the exception is the minimum necessary to afford relief; (ii) reasonable and appropriate conditions are imposed as necessary to ensure that the intent of the Virginia Stormwater Management Act and this chapter are preserved; (iii) granting the exception will not confer any special privileges that are denied in other similar circumstances; and (iv) the exception request is not based upon conditions or circumstances that are self-imposed or self-created. Economic hardship alone is not a sufficient reason to grant an exception.
- C. *Certain exceptions expressly prohibited.* The following exceptions are expressly prohibited:
1. *Requirement for general permit.* Any exception to the requirement that the land-disturbing activity obtain any required general permits
 2. *Using unapproved BMP.* Any exception to allow using a best management practice that is not found on the Virginia Stormwater BMP Clearinghouse Website

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(<http://vwrrc.vt.edu/swc/PostConstructionBMPs.html>), except where allowed under 9VAC25-870-93 *et seq.*, or is not found in the Design Standards Manual

3. *Phosphorous reductions.* Any exception to allow phosphorous reductions, unless offsite options available through 9VAC25-870-69 have been considered and found not available.
4. *Postdevelopment nonpoint nutrient runoff compliance.* Any exception from postdevelopment nonpoint nutrient runoff compliance requirements, unless offsite options have been considered and found not available.

(2-11-98; Code 1988, § 19.3-32; § 17-308, Ord. 98-A(1), 8-5-98; § 17-408, Ord. 14-17(1), 5-7-14, effective 7-1-14)

State law reference – Va. Code § 62.1-44.15:35; 9VAC25-870-57, 9VAC25-870-122.

DIVISION 2. SUBMITTAL, REVIEW AND ACTION

Sec. 17-409 Submittal of application; determination of completeness.

The administrator shall determine whether a submitted application is complete as follows:

- A. *Date of official submittal.* An application shall be deemed to be officially submitted on the date of the next application deadline established by the administrator after the application has been submitted and the administrator has determined that the application is complete.
- B. *Timing of review to determine completeness.* The administrator's review to determine whether an application is complete shall be made within ten (10) days after he receives the application.
- C. *Effect of failure to make timely determination of completeness.* If a determination of completeness is not made and timely communicated to the applicant, the permit application shall be deemed to be complete on the date the application was submitted.
- D. *Determination that application is incomplete; notice.* An application omitting any information required by sections 17-401 through 17-408 shall be deemed to be incomplete and shall not be accepted for official submittal by the administrator. The administrator shall inform the owner in writing of the reasons the plan is incomplete, with citation to the applicable section of this chapter or other law, and what corrections or modifications must be made for the application to be complete. The administrator shall inform the owner or his or her agent of the determination by written notice.
- E. *Resubmittal.* Within fifteen (15) days after the date the written notice under subsection (D) was mailed or delivered by the administrator, the owner may resubmit the application. If the owner fails to resubmit the application within the fifteen (15) day period, the application shall be deemed to be disapproved and a new application and fee shall be required to resubmit.

(Ord. 14-17(1), 5-7-14, effective 7-1-14)

State law reference – Va. Code § 62.1-44.15:55; 9VAC25-870-108.

Sec. 17-410 Review and action on application.

The administrator shall review and act on an application as follows:

- A. *Review.* The administrator shall ensure that the plan is reviewed by a certified plan reviewer (but referred to herein as the "administrator") who shall review the plan for compliance with the technical requirements for an application in sections 17-400 through 17-408 and other applicable

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laws. This review shall be completed within forty-five (45) days after the application was deemed to be complete under section 17-409.

- B. *Identification of required changes.* Upon completion of review, the administrator shall identify all applicable requirements of this chapter that must be addressed in order for the application to be approved.
- C. *Revisions required.* The owner shall revise the application to address all of the required changes before the application may be approved.
- D. *Time for action.* The administrator shall act on the application within sixty (60) days after the date the application was deemed to be complete, provided:
 - 1. *Time for action if changes required; notice of required changes.* If the administrator requires or recommends changes to the application, he shall issue within forty-five (45) days after the application was deemed to be complete a written notice to the owner identifying the required changes that must be made and the recommended changes that may, in the owner's discretion, be made.
 - 2. *Suspension of running of time for action.* The running of the time by which the administrator must act on an application shall be suspended: (i) from the date the appeal of the disapproval of a variance or exception is submitted until the date the board of supervisors acts on the appeal under section 17-211; (ii) from the date of the written notice to the owner until the date the revised application addressing the required changes is submitted; (iii) from the date of the owner's request for a deferral of review under section 17-411(A); (iv) during any extension granted under section 17-411(C); and (v) for any multi-jurisdictional land disturbing activity, from the date either Virginia Department of Environmental Quality review was requested or a multi-jurisdictional agreement was identified as necessary until the date the Virginia Department of Environmental Quality informs the administrator in writing that it will accept review or the date of the multi-jurisdictional agreement.
- E. *Action to approve and notice of approval.* If the administrator determines that the application complies with all applicable requirements, he shall approve the application and promptly either indicate by stamp or signature on every plan that it is approved or issue a written notice to the owner informing him of the approval.
- F. *Action to disapprove and notice of disapproval.* If the administrator determines that the application does not satisfy all applicable requirements, he shall disapprove the application and promptly issue a written notice to the owner stating the reasons for disapproval by identifying the application's deficiencies and citing the applicable sections of this chapter or other applicable laws, and what modifications, terms and conditions will permit approval of the application.
- G. *Failure to timely act.* If the administrator fails to act on an application within the time specified in subsection (D), the application shall be deemed approved, subject to compliance with the requirements of sections 17-414 through 17-422.

(§ 17-204: § 7-5, 6-18-75, § 7, 2-11-76, 4-21-76, 6-2-76, 7-9-80, 7-8-81, 2-11-87, 3-18-92; § 19.3-12, 2-11-98; Code 1988, §§ 7-5, 19.3-12; § 17-204, Ord. 98-A(1), 8-5-98; Ord. 08-17(3), 8-6-08; Ord. 09-17(1), 8-5-09, effective 9-5-09) (§ 17-304: § 19.1-7, 9-29-77, art. II, § 2, 7-11-90; § 19.1-8, 9-29-77, art. II, § 3, 7-11-90; § 19.3-28, 2-11-98; Code 1988, §§ 19.1-7, 19.1-8, 19.3-28; § 17-304, Ord. 98-A(1), 8-5-98; Ord. 09-17(1), 8-5-09, effective 9-5-09; Ord. 11-17(1), 10-5-11; § 17-410, Ord. 14-17(1), 5-7-14, effective 7-1-14)

State law reference – Va. Code §§ 62.1-44.15:34, 62.1-44.15:53, 62.1-44.15:55; 9VAC25-870-108.

Sec. 17-411 Deferral of review of application; when application deemed withdrawn.

The administrator's review and action on an application may be deferred, and the application may be deemed withdrawn, as follows:

- A. *Request to defer by owner.* An owner may request that review or action on the application be deferred for a specified period up to six (6) months. If during the deferral period the owner does not request the administrator to take action on the application as provided in section 17-408 within six (6) months after the date the deferral was requested, the application shall be deemed to have been voluntarily withdrawn.
- B. *Failure to submit revised application.* If an owner fails to submit a revised application to address all of the requirements within six (6) months after the date of the written notice as provided in section 17-410(D)(1), the application shall be deemed to have been voluntarily withdrawn by the owner.
- C. *Extension of deferral period or period to submit revised plan.* Before the deferral period in subsection (A) expires, the owner may request that the administrator extend the period before the application is deemed to have been voluntarily withdrawn. The request must be received by the administrator before the deferral period expires. The administrator may grant one extension for a period not to exceed three (3) months, taking into consideration the size or nature of the proposed development, the complexity of the review, and the laws in effect at the time the extension request is made.

(Ord. 14-17(1), 5-7-14, effective 7-1-14)

State law reference – Va. Code §§ 62.1-44.15:34, 62.1-44.15:54.

Sec. 17-412 Coordination of review of erosion and sediment control plans with the review of subdivision plats and site plans.

The review and action on any application shall be coordinated with the review of a subdivision plat or site plan, to the extent authorized by law.

- A. *Site plans.* An application may be approved for early (or mass) grading upon approval of an initial site plan under section 18-32.4.2.8, provided that the developer has satisfied any conditions of approval identified by the agent in the letter required by section 18-32.4.2.5(c). An application for land disturbing activity within a planned development district may be approved prior to approval of an initial site plan as provided in section 18-8.5.5.4(b). However, no grading permit, building or other permit shall be issued and no land disturbing activity may begin until the developer satisfies the requirements of sections 17-414 through 17-417; provided that land disturbing activity may occur prior to approval of a stormwater management plan if the activity was previously covered under the general permit issued July 1, 2009.
- B. *Subdivision plats.* An application may be approved for early (or mass) grading upon approval of a preliminary plat for a subdivision within a planned development district under Albemarle County Code § 14-225, provided that the subdivider has satisfied any conditions of approval identified by the agent in the letter required by section 14-222(C), and further provided that an application for land disturbing activity within a planned development district may be approved prior to approval of a preliminary plat as provided in section 18-8.5.5.4(b). However, no grading, building or other permit shall be issued and no land disturbing activity may begin until the subdivider satisfies the requirements of sections 17-414 through 17-417; provided that land disturbing activity may occur prior to approval of a stormwater management plan if the activity was previously covered under the general permit issued July 1, 2009.
- C. *Other circumstances.* The administrator may approve an erosion and sediment control plan prior to approval of an initial site plan or a preliminary plat in the following circumstances:

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1. *Correct existing condition.* To correct erosion or excessive sedimentation which is occasioned by any violation of this chapter or by accident, act of God or other cause beyond the control of the owner; provided that the activity proposed shall be strictly limited to correcting the condition.
2. *Install underground utility improvements.* To install underground public utility mains, interceptors, transmission lines and trunk lines for which plans have been previously approved by the operating utility and approved by the County as being substantially in accord with the comprehensive plan, if necessary.
3. *Borrow, fill or waste areas.* To establish borrow, fill or waste areas in accordance with sections 18-5.1.28 and 18-10.2.1.18.

(Ord. 14-17(1), 5-7-14, effective 7-1-14)

State law reference – Va. Code §§ 62.1-44.15:27, 62.1-44.15:55; 9VAC25-870-54, 9VAC25-890-40.

Sec. 17-413 Appeal of decision of the administrator.

Any decision of the administrator under section 17-411 may be appealed by the owner as provided in section 17-211.

(§ 17-210: § 7-7, 6-18-75, § 9, 2-11-87, 3-18-92; § 19.3-18, 2-11-98; Code 1988, §§ 7-7, 19.3-18; §17-210, Ord. 98-A(1), 8-5-98) (§ 17-311: 2-11-98; Code 1988, § 19.3-35; § 17-311, Ord. 98-A(1), 8-5-98; § 17-413, Ord. 14-17(1), 5-7-14, effective 7-1-14)

State law reference – Va. Code §§ 62.1-44.15:26, 62.1-44.15:44, 62.1-44.15:45, 62.1-44.15:46, 62.1-44.15:62; 9VAC25-870-118.

DIVISION 3. REQUIRED AGREEMENTS AS PREREQUISITES TO APPROVAL: SURETY AND MAINTENANCE

Sec. 17-414 Agreement with surety.

Any agreement with surety required by this chapter shall be provided by the owner as a prerequisite to approval of the application, as follows:

- A. *Purpose for agreement.* The owner shall enter into an agreement with the County to take all appropriate measures required by the approved plan or a condition of the VSMP permit (collectively, the “conservation actions”).
- B. *Form of the agreement.* The agreement accompanying the surety shall be on a form prepared by the County attorney and any proposed amendment to the agreement shall be subject to review and approval by the County attorney.
- C. *Purpose for surety; type of surety permitted amount.* The owner shall provide a surety to guarantee that the conservation actions will be taken and satisfied. The applicant shall furnish to the administrator a cash escrow, certified check, official check, bond with surety, letter of credit, or collaterally assign funds in a manner satisfactory to the County attorney (collectively, the “surety instrument”), in an amount sufficient for and conditioned upon the satisfactory performance of all conservation actions. Any proposed surety instrument shall be subject to being acceptable to the administrator, shall be in a form and have the substance approved by the County attorney, and shall be subject to review and approval by the County attorney.
- D. *Estimate.* The owner shall submit a request for an estimate of the surety amount to the administrator. The administrator shall prepare an estimate of the total estimated cost to initiate and maintain appropriate all conservation actions based on the unit price for new public or private

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sector construction in the County and a reasonable allowance for estimated administrative costs and inflation, which shall not exceed twenty-five (25) percent of the estimated cost of the conservation actions.

- E. *Use of surety.* The County may make use of monies guaranteed by the surety instrument if either: (i) the owner fails to timely renew the bond with surety, letter of credit, or the collaterally assigned funds; or (ii) the administrator, in his discretion, determines that the owner, after written notice, failed within the time specified in the notice to initiate, maintain or complete appropriate conservation actions required by the approved plan or by a condition of the permit.
- F. *Right to collect shortfall.* If the County takes a conservation action because the owner failed to do so, the County may collect from the owner the difference if the amount of the reasonable cost of the conservation action exceeds the amount of the security held.
- G. *Release of surety.* The surety shall be released as provided in section 17-423.

(§ 17-207: § 7-5, 6-18-75, § 7, 2-11-76, 4-21-76, 6-2-76, 7-9-80, 7-8-81, 2-11-87, 3-18-92; § 19.3-15, 2-11-98; Code 1988, §§ 7-5, 19.3-15; § 17-207, Ord. 98-A(1), 8-5-98; Ord. 09-17(1), 8-5-09, effective 9-5-09) (§ 17-306: § 19.1-7, 9-29-77, art. II, § 2, 7-11-90; § 19.3-30, 2-11-98; Code 1988, §§ 19.1-7, 19.3-30; § 17-306, Ord. 98-A(1), 8-5-98; Ord. 09-17(1), 8-5-09, effective 9-5-09; § 17-414, Ord. 14-17(1), 5-7-14, effective 7-1-14)

State law reference – Va. Code §§ 62.1-44.15:34, 62.1-44.15:57; 9VAC25-870-104.

Sec. 17-415 Stormwater management maintenance agreement.

The long-term maintenance of permanent stormwater facilities and other techniques shall be subject to the following:

- A. *Responsibility.* The owner shall enter into an agreement with the County providing for the owner's obligation to maintain, repair, replace, reconstruct any permanent stormwater facilities and other techniques required in conjunction with the approval of the stormwater management plan, including as it may be amended, or modified as provided in this chapter. The agreement shall be subject to acceptance by the administrator.
- B. *Form and substance of the agreement.* The agreement shall be in a form and have the substance approved by the County attorney, and shall be subject to review and approval by the County attorney. At a minimum, the agreement shall: (i) be submitted to the administrator for review and approval prior to approval of the stormwater management plan; (ii) be stated to run with the land; (iii) provide for all necessary access by the administrator to the property to inspect the facility or technique and to maintain the facility in the event the owner fails to do so; (iv) provide for periodic inspections and maintenance by the owner according to the schedule included in the agreement, and the owner's obligation to submit periodic inspection and maintenance reports to the administrator; provided that nothing herein shall preclude the administrator from conducting inspections in lieu of any owner-conducted inspection; and (v) be enforceable by the County and any other public entity having authority to enforce the requirements of the Virginia Stormwater Management Act or this chapter.
- C. *Recordation.* The agreement shall be recorded in the records of the clerk of the circuit court of the County.
- D. *When agreement not required.* In his discretion, the administrator is authorized not to require an agreement for any stormwater management facility designed to treat runoff primarily from an individual residential lot on which it is located, provided that the owner demonstrates to the satisfaction of the administrator that future maintenance of the facility will be addressed through an agreement or other enforceable mechanism at the discretion of the administrator.

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(§ 19.1-7, 9-29-77, art. II, § 2, 7-11-90; § 19.1-8, 9-29-77, art. II, § 3, 7-11-90; § 19.3-28, 2-11-98; Code 1988, §§ 19.1-7, 19.1-8, 19.3-28; § 17-304, Ord. 98-A(1), 8-5-98; Ord. 09-17(1), 8-5-09, effective 9-5-09; Ord. 11-17(1), 10-5-11; § 17-415 Ord. 14-17(1), 5-7-14, effective 7-1-14)

State law reference – 9VAC25-840-60, 9VAC25-870-58, 9VAC25-870-112, 9VAC25-880-70.

DIVISION 4. POST-APPROVAL RIGHTS AND OBLIGATIONS

Sec. 17-416 Effect of approvals.

The effect of an approval of an erosion and sediment control plan for any land disturbing activity subject solely to the VESCP, or a VSMP permit, is as follows:

- A. *Erosion and sediment control plan.* When an erosion and sediment control plan is approved for any land disturbing activity subject solely to the VESCP, the owner may engage in the land disturbing activity as provided in the erosion and sediment control plan and the mitigation plan, if applicable, subject to any applicable requirements of this chapter, including, but not limited to, sections 17-417 through 17-424, and the affirmative duties in sections 17-800 and 17-801, and State and Federal law. Any land disturbing activity shall be conducted only as it was approved under the erosion and sediment control plan and the erosion and sediment control plan shall be implemented only as it was approved.
- B. *VSMP permit.* When a VSMP permit is approved, the permit is a consolidated permit authorizing the owner to engage in land disturbing activity as provided by the approved erosion and sediment control plan, the approved stormwater management plan, the pollution prevention plan, the stormwater pollution prevention plan, and the mitigation plan, if applicable, and the general permit, subject to any applicable requirements of this chapter including, but not limited to, sections 17-417 through 17-424, and sections 17-800 through 17-807, and State and Federal law. The consolidated permit shall include a copy of, or a reference to, the general permit coverage to discharge stormwater. Any land disturbing activity shall be conducted only as it was approved under the VSMP permit. Any plan approved in conjunction with a VSMP permit shall be implemented only as it was approved.
- C. *Stormwater management plans for residential, commercial or industrial subdivisions govern development.* The approved stormwater management plan shall govern the development of the individual parcels until development of the project is complete, including those parcels developed under subsequent owners.

(§ 17-207: § 7-5, 6-18-75, § 7, 2-11-76, 4-21-76, 6-2-76, 7-9-80, 7-8-81, 2-11-87, 3-18-92; § 19.3-15, 2-11-98; Code 1988, §§ 7-5, 19.3-15; § 17-207, Ord. 98-A(1), 8-5-98; Ord. 09-17(1), 8-5-09, effective 9-5-09) (§ 17-306: § 19.1-7, 9-29-77, art. II, § 2, 7-11-90; § 19.3-30, 2-11-98; Code 1988, §§ 19.1-7, 19.3-30; § 17-306, Ord. 98-A(1), 8-5-98; Ord. 09-17(1), 8-5-09, effective 9-5-09; § 17-416, Ord. 14-17(1), 5-7-14, effective 7-1-14)

State law reference – Va. Code §§ 62.1-44.15:28(7); 9VAC25-840-90, 9VAC25-890-40.

Sec. 17-417 Prerequisites to land disturbing activity.

Upon the approval of an erosion and sediment control plan for any land disturbing activity subject solely to the VESCP, or a VSMP permit, no land disturbing activity shown on the approved erosion and sediment control plan or stormwater management plan shall occur until all of the following are satisfied:

- A. *Land disturbing activity subject only to the VESCP.* If the land disturbing activity is subject solely to the VESCP, no land disturbing activity shall occur and no County department or office or any other public entity authorized under any other law to issue grading, building, or other permits for activities involving land disturbing activities regulated under this chapter shall issue any such permit unless: (i) the owner submits with his application the approved erosion and sediment

control plan and certification that the plan will be followed; (ii) the person responsible for carrying out the plan provides to the administrator the name of the person holding a certificate of competence who will be in charge of and responsible for carrying out the land disturbing activity; and (iii) an agreement with surety is provided as required by section 17-414.

- B. *Land disturbing activity subject to the VSMP.* If the land disturbing activity requires a VSMP permit, no land disturbing activity shall occur and no County department or office or any other public entity authorized under any other law to issue grading, building, or other permits for activities involving land disturbing activities regulated under this chapter shall issue any such permit unless: (i) the owner submits with his application the approved VSMP permit, including the approved erosion and sediment control plan and the approved stormwater management plan, evidence of general permit coverage to discharge stormwater, if such evidence is required under sections 17-401(C) and 17-405(A)(1), and certification that the plans will be followed; (ii) the person responsible for carrying out the plan provides to the administrator the name of the person holding a certificate of competence who will be in charge of and responsible for carrying out the land disturbing activity; and (iii) an agreement with surety is provided as required by section 17-414; provided that land disturbing activity may occur prior to approval of stormwater management plan if the activity was previously covered under the general permit issued July 1, 2009.
- C. *Revocation of approval.* The administrator is authorized to revoke the approval of the plan if the person responsible fails to provide the name of a person holding a certificate of competence prior to engaging in the land disturbing activity and the person responsible for carrying out the plan shall be subject to the penalties provided by State law.

(§ 17-207: § 7-5, 6-18-75, § 7, 2-11-76, 4-21-76, 6-2-76, 7-9-80, 7-8-81, 2-11-87, 3-18-92; § 19.3-15, 2-11-98; Code 1988, §§ 7-5, 19.3-15; § 17-207, Ord. 98-A(1), 8-5-98; Ord. 09-17(1), 8-5-09, effective 9-5-09) (§ 17-306: § 19.1-7, 9-29-77, art. II, § 2, 7-11-90; § 19.3-30, 2-11-98; Code 1988, §§ 19.1-7, 19.3-30; § 17-306, Ord. 98-A(1), 8-5-98; Ord. 09-17(1), 8-5-09, effective 9-5-09; Ord. 14-17(1), 5-7-14, effective 7-1-14)

State law reference – Va. Code §§ 62.1-44.15:27, 62.1-44.15:34, 62.1-44.15:55; 9VAC25-870-54, 9VAC25-890-40.

Sec. 17-418 Modifications and variances to approved erosion and sediment control plans.

Any approved erosion and sediment control plan shall or may be changed as follows:

- A. *Required modifications.* An approved plan shall be modified as follows:
1. *Plan inadequate to satisfy VESCP requirements.* The administrator shall require that an approved plan be modified if, after an inspection of the site, the administrator determines that the approved plan: (i) is inadequate to effectively control soil erosion, sediment deposition, and runoff to prevent the unreasonable degradation of properties, stream channels, waters, and other natural resources; (ii) is unable to be physically implemented as approved; or (iii) fails to satisfy any other VESCP requirement. If an amendment is required, the administrator may also require the time by which the amendment to the plan shall be submitted and approved.
 2. *Re-evaluation if land disturbing activity not begun within 180 days or ceases for more than 180 days.* If land disturbing activity is not begun within one hundred eighty (180) days after the plan was approved, or if land disturbing activity ceases for more than one hundred eighty (180) days, the administrator may evaluate the approved plan to determine whether it still satisfies the applicable VESCP requirements of this chapter and other applicable laws and to verify that all design factors are still valid. If the administrator determines that the approved plan is inadequate, no longer satisfies all applicable VESCP requirements, or that the design factors are no longer valid, he shall require the person responsible for carrying out the approved plan to submit and obtain approval of a modified plan before starting or resuming the land disturbing activity.

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- B. *Modification by agreement.* The administrator may agree to allow an approved plan to be modified if the person responsible for carrying out the approved plan finds that because of changed circumstances or for other reasons, the approved plan cannot be effectively carried out, and proposed amendments to the plan, consistent with all VESCP requirements, are agreed to by the administrator and the person responsible for carrying out the plan. The agreement may be memorialized in a stand-alone agreement or by a note added to the approved plan and signed by the administrator.
- C. *Variances.* The administrator may waive or modify any applicable requirement of the VESCP otherwise applicable to an approved plan that he deems to be inappropriate or too restrictive for the site conditions, by granting a variance, subject to the following:
1. *When variance may be requested.* During construction, the person responsible for implementing the approved plan may request a variance.
 2. *Reason for variance.* The owner shall explain in writing the reasons for requesting any variance.
 3. *Factors to be considered.* The administrator shall consider variance requests judiciously, keeping in mind both the need of the applicant to maximize cost effectiveness and the need to protect off-site properties and resources from damage.
 4. *Action on request.* The administrator shall respond to the request in writing by either approving or disapproving the variance. If the administrator does not approve the variance within ten (10) days after receipt of the request, the variance shall be considered to be disapproved. After disapproval, the applicant may resubmit a variance request with additional documentation.
 5. *Variance incorporated into approved plan.* Any approved variance shall become part of, and be documented in, the approved plan.

(§ 7-5, 6-18-75, § 7, 2-11-76, 4-21-76, 6-2-76, 7-9-80, 7-8-81, 2-11-87, 3-18-92; § 19.3-16, 2-11-98; Code 1988, §§ 7-5, 19.3-16; § 17-208, Ord. 98-A(1), 8-5-98; Ord. 08-17(3), 8-6-08; § 17-418, Ord. 14-17(1), 5-7-14, effective 7-1-14)

State law reference – Va. Code § 62.1-44.15:55; 9VAC25-840-50, 9VAC25-840-80, 9VAC25-890-40.

Sec. 17-419 Amendments and modifications to approved stormwater management plans.

Any approved stormwater management plan shall be amended or may be modified as follows:

- A. *Stormwater management plan; amendment.* The administrator shall require that an approved stormwater management plan be amended if, after an inspection of the site or submittal and review of the construction record drawing, the administrator determines that the plan fails to satisfy any VSMP requirement. If an amendment is required, the administrator also may require the time by which the amendment to the plan shall be submitted and approved.
- B. *Stormwater management plan; modification.* An owner may request that the administrator allow its approved stormwater management plan be modified. Any modification is subject to review and approval by the administrator. The administrator shall act on the request and either approve or disapprove the proposed modification in writing within sixty (60) days after the administrator receives the request.

(§ 19.3-31, 2-11-98; § 19.1-6, 9-29-77, art. II, § 1, 10-19-77, 9-13-78; 10-22-80, 7-11-90, 8-3-94; Code 1988, §§ 19.1-6, 19.3-31; § 17-307, Ord. 98-A(1), 8-5-98; § 17-419, Ord. 14-17(1), 5-7-14, effective 7-1-14)

State law reference – 9VAC25-870-54, 9VAC25-870-108, 9VAC25-880-70, 9VAC25-890-40.

Sec. 17-420 Amendments to pollution prevention plans.

An owner shall obtain approval of an amendment to a pollution prevention plan whenever:

- A. *Change affects discharge of pollutants.* There is a change in design, construction, operation, or maintenance that has a significant effect on the discharge of pollutants to State waters which has not previously been addressed in the plan.
- B. *Inadequate control measures, best management practices, or waste control.* As construction proceeds, any control measure, best management practice or waste control measure in the plan fails to achieve the purposes of the plan.
- C. *Pollutants not identified in the plan.* As construction proceeds, new potential sources of pollutants not identified in the plan may reasonably be expected to affect the quality of stormwater discharges from the construction site.

(Ord. 14-17(1), 5-7-14, effective 7-1-14)

State law reference – 9VAC25-870-56.

Sec. 17-421 Amendments to stormwater pollution prevention plans.

An owner shall obtain approval of an amendment to a stormwater pollution prevention plan in the circumstances delineated in subsections (A) through (D). Any amendment to the plan shall be updated within seven (7) days after amendment to its implementation and include the information required by 9VAC25-880-70, Part II(B)(4) and be signed in accordance with 9VAC25-880-70, Part III(K).

- A. *Change affects discharge of pollutants.* There is a change in design, construction, operation, or maintenance that has a significant effect on the discharge of pollutants to surface waters and that has not been previously addressed in the plan.
- B. *Correction of ineffective control measures.* During inspections or investigations by the owner's qualified personal, the administrator, or any State or Federal official, it is determined that the existing control measures are ineffective in minimizing pollutants in discharges from construction activity. Any required amendment to the plan shall include additional or modified control measures designed and implemented to correct the problems identified. If approval of the control measure by the administrator is required, the plan revisions shall be completed within seven (7) days after the control measure is approved.
- C. *Discharge, release, or spill from high priority facility.* Whenever deemed necessary by the administrator to accurately reflect any discharge, release, or spill from any high priority facility reported in accordance with 9VAC25-890-40(III)(G). For each such discharge, release, or spill, the amended plan must include the following information: (i) the date of the incident; (ii) the material discharged, released, or spilled; and (iii) the quantity discharged, released or spilled.
- D. *Change in contractor.* Any change in the name and required contact information in the contractor that will implement and maintain any control measure.

(Ord. 14-17(1), 5-7-14, effective 7-1-14)

State law reference – 9VAC25-870-54, 9VAC25-870-108, 9VAC25-880-70, 9VAC25-890-40.

Sec. 17-422 Construction record drawing; submittal.

When construction of any permanent stormwater management facility is completed, a construction record drawing for the permanent stormwater management facility shall be submitted for review and action as follows:

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- A. *Submittal of drawing to the administrator.* Each construction record drawing shall be submitted by the owner to the administrator.
- B. *Fee.* The applicable fee for review and action on the construction record drawing required by section 17-208 shall be paid when the drawing is submitted.
- C. *Form and style.* The construction record drawing shall satisfy the minimum requirements of the form and style of a construction record drawing as provided in the Design Standards Manual.
- D. *Signature and certification.* The construction record drawing shall be appropriately sealed and signed by a professional registered in the State, certifying that the stormwater management facility has been constructed in accordance with the approved plan.
- E. *Required measurements and calculations.* If the construction record drawing shows any changes from the approved plan, including changes to any features of the facility, including, but not limited to, outlet structures, elevations, available volumes, plantings, spillways, and materials, the owner shall also submit all as-built measurements and calculations necessary to demonstrate compliance with all applicable regulations. Any other technical requirements of the construction record drawing shall be as provided in the Design Standards Manual.
- F. *Determination of completeness, review and action.* The procedure for the review and action on a construction record drawing shall be as provided in sections 17-409 and 17-410, as applicable, provided that the failure of the administrator to act within any time provided in those sections shall not be deemed to be approval of the construction record drawing.
- G. *Required amendments.* If the as-built stormwater management facility does not comply with all applicable regulations, the owner shall make all required changes to the facility in order to comply with the regulations and the administrator may require that the approved stormwater management plan be amended as provided in section 17-417(A).

(Ord. 14-17(1), 5-7-14, effective 7-1-14)

State law reference – 9VAC25-870-55.

Sec. 17-423 Release of surety.

Any surety required by this chapter shall be released as follows:

- A. *Partial release.* In order for any surety to be partially released:
 - 1. *Request by owner.* The owner shall submit a statement to the administrator on a form provided by the administrator that adequate stabilization of the land disturbing activity has been achieved, and pay the fee for a partial release required by sections 17-207 or 17-208, or both.
 - 2. *Response by administrator.* Within thirty (30) days after receipt of the statement required by subsection (A)(1), the administrator shall provide written notice to the owner that responds to the request in one of the following ways: (i) grant the partial release, if an inspection of the project by a certified inspector confirms that the requirements for partial release are satisfied; or (ii) inform the owner that an inspection of the project by a certified inspector confirms that the requirements for partial release are not satisfied and identify any specified defects, deficiencies or further conservation action required.
 - 3. *Release.* If the administrator grants the partial release as provided in subsection (A)(2), the surety shall be partially release within sixty (60) days after receipt of the request

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required by subsection (A)(1). The amount of the release shall be based upon the percentage of stabilization accomplished determined by the inspection.

B. Full release. In order for any surety to be fully released:

1. *Request by owner.* The owner shall submit a statement to the administrator on a form provided by the administrator and pay the fee for a full release required by sections 17-207 or 17-208, or both. For any surety required in conjunction with an erosion and sediment control plan, the owner shall state that adequate permanent stabilization of the land disturbing activity has been achieved. For any surety required in conjunction with a VSMP permit, the owner shall state that the requirements of the permit have been satisfied.
2. *Response by administrator.* Within thirty (30) days after receipt of the statement required by subsection (B)(1), the administrator shall provide written notice to the owner that responds to the request in one of the following ways: (i) grant the full release, if an inspection of the project by a certified inspector confirms that the requirements for full release are satisfied; or (ii) inform the owner that an inspection of the project by a certified inspector confirms that the requirements for full release are not satisfied and identify any specified defects, deficiencies or further conservation action required.
3. *Release.* If the administrator grants the full release as provided in subsection (B)(2), the surety shall be fully released within sixty (60) days after receipt of the request required by subsection (B)(1).

(§ 17-207: § 7-5, 6-18-75, § 7, 2-11-76, 4-21-76, 6-2-76, 7-9-80, 7-8-81, 2-11-87, 3-18-92; § 19.3-15, 2-11-98; Code 1988, §§ 7-5, 19.3-15; § 17-207, Ord. 98-A(1), 8-5-98; Ord. 09-17(1), 8-5-09, effective 9-5-09) (§ 17-306: § 19.1-7, 9-29-77, art. II, § 2, 7-11-90; § 19.3-30, 2-11-98; Code 1988, §§ 19.1-7, 19.3-30; § 17-306, Ord. 98-A(1), 8-5-98; Ord. 09-17(1), 8-5-09, effective 9-5-09; § 17-423, Ord. 14-17(1), 5-7-14, effective 7-1-14)

State law reference – Va. Code §§ 62.1-44.15:34; 62.1-44.15:57.

Sec. 17-424 Effect of failure to obtain grading, building or other permit; void for inactivity.

An approved erosion and sediment control plan, if the land disturbing activity is subject solely to the VESCP, or the VSMP permit, shall be void if the owner fails to obtain a grading, building or other permit for activities involving land disturbing activities to implement the plan within one year (1) year after the date of its approval; provided that any plan or permit associated with a subdivision plat or site plan whose period of validity is extended by Virginia Code § 15.2-2209.1(A) shall likewise be extended for the same time period.

(§ 17-204: § 7-5, 6-18-75, § 7, 2-11-76, 4-21-76, 6-2-76, 7-9-80, 7-8-81, 2-11-87, 3-18-92; § 19.3-12, 2-11-98; Code 1988, §§ 7-5, 19.3-12; § 17-204, Ord. 98-A(1), 8-5-98; Ord. 08-17(3), 8-6-08; Ord. 09-17(1), 8-5-09, effective 9-5-09) (§ 17-304: § 19.1-7, 9-29-77, art. II, § 2, 7-11-90; § 19.1-8, 9-29-77, art. II, § 3, 7-11-90; § 19.3-28, 2-11-98; Code 1988, §§ 19.1-7, 19.1-8, 19.3-28; § 17-304, Ord. 98-A(1), 8-5-98; Ord. 09-17(1), 8-5-09, effective 9-5-09; Ord. 11-17(1), 10-5-11; § 17-424, Ord. 14-17(1), 5-7-14, effective 7-1-14)

State law reference – Va. Code § 62.1-44.15:73; 9VAC25-890-40.

ARTICLE V. TECHNICAL CRITERIA

Sec. 17-500 Erosion and sediment control plans; applicable technical criteria.

Each erosion and sediment control plan shall satisfy the following, as applicable:

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- A. *Erosion and sediment control minimum standards.* The criteria, techniques and methods provided in 9VAC25-840-40.
- B. *Annual standards and specifications.* Any applicable annual standards and specifications approved by the Virginia Department of Environmental Quality.
- C. *Stormwater pollution prevention.* If the land disturbing activity also requires a VSMP permit, the requirements in 9VAC25-870-54(F) and as specified in 40 CFR 450.21.
- D. *Stream buffers.* The procedures and requirements for land disturbing activity and development in stream buffers, as provided in section 17-600 *et seq.*
- E. *County design standards.* The technical criteria, including County notes and details, as provided in the Design Standards Manual.

(§ 19.3-11, 2-11-98; § 7-3, 6-18-75, § 5, 2-11-76, 4-21-76, 2-11-87, 3-18-92; § 7-4, 6-18-75, § 6, 10-22-75, 4-21-76, 11-10-76, 3-2-77, 4-17-85, 2-11-87, 12-11-87, 12-11-91, 3-18-92; Code 1988, §§ 7-3, 7-4, 19.3-11; § 17-203, Ord. 98-A(1), 8-5-98; Ord. 01-17(1), 7-11-01; Ord. 09-17(1), 8-5-09, effective 9-5-09; § 14-500, Ord. 14-17(1), 5-7-14, effective 7-1-14)

State law reference – Va. Code §§ 62.1-44.15:52, 62.1-44.15:73; 9VAC25-840-40, 9VAC25-870-54, 9VAC25-890-40.

Sec. 17-501 VSMP permit application; applicable technical criteria.

Each VSMP permit application shall satisfy the criteria, techniques and methods provided as follows:

- A. *Land disturbing activity that obtained general permit coverage or commenced land disturbing activity prior to July 1, 2014.* Any land disturbing activity that obtained general permit coverage or commenced land disturbing activity prior to July 1, 2014 shall be conducted in accordance with the technical criteria in 9VAC25-870-93 through 9VAC25-870-99. These projects shall remain subject to the technical criteria in 9VAC25-870-93 through 9VAC25-870-99 for an additional two general permit cycles. After that time, the portions of the project not under construction shall become subject to any new technical criteria adopted by the State Water Control Board.
- B. *Land disturbing activity that obtains initial general permit coverage on or after July 1, 2014.* Any land disturbing activity that obtains initial general permit coverage on or after July 1, 2014 shall be conducted in accordance with the technical criteria in 9VAC25-870-62 through 9VAC25-870-92, except as provided in subsection (C). These projects shall remain subject to the technical criteria in 9VAC25-870-62 through 9VAC25-870-92 for an additional two general permit cycles. After that time, the portions of the project not under construction shall become subject to any new technical criteria adopted by the State Water Control Board.
- C. *Land disturbing activity related to certain development approvals prior to July 1, 2012.* Any land disturbing activity shall be subject to the technical criteria in 9VAC25-870-93 through 9VAC25-870-99, provided all of the following apply:
 - 1. *Prior qualifying approval.* A proffered or conditional zoning plan, zoning with a plan of development, preliminary or final subdivision plat, preliminary or final site plan, or any document determined by the County to be equivalent thereto (i) was approved by the County prior to July 1, 2012; (ii) provided a layout, (iii) the technical criteria in 9VAC25-870-93 through 9VAC25-870-99; and (iv) has not been subsequently modified or amended in a manner resulting in an increase in the amount of phosphorus leaving each point of discharge, and such that there is no increase in the volume or rate of runoff.
 - 2. *General permit not issued.* A general permit has not been issued prior to July 1, 2014.

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3. *Land disturbing activity not commenced.* Land disturbing activity did not commence prior to July 1, 2014.
 4. *Duration.* These projects shall remain subject to the technical criteria in 9VAC25-870-93 through 9VAC25-870-99 for one additional general permit cycle. After that time, the portions of the project not under construction shall become subject to any new technical criteria adopted by the State Water Control Board.
- D. *Land disturbing activity related to County, State or Federal funded projects.* County, State and Federal projects shall be subject to the technical criteria in 9VAC25-870-93 through 9VAC25-870-99, provided all of the following apply:
1. *Prior qualifying obligation.* There has been an obligation of County, State or Federal funding, in whole or in part, prior to July 1, 2012, or the Virginia Department of Environmental Quality has approved a stormwater management plan prior to July 1, 2012.
 2. *General permit not issued.* A general permit has not been issued prior to July 1, 2014.
 3. *Land disturbing activity not commenced.* Land disturbing activity did not commence prior to July 1, 2014.
 4. *Duration.* These projects shall remain subject to the technical criteria in 9VAC25-870-93 through 9VAC25-870-99 for one additional general permit cycle. After that time, the portions of the project not under construction shall become subject to any new technical criteria adopted by the State Water Control Board.
- E. *Land disturbing activity related where government bonds or other instruments of public debt financing issued.* For any project for which government bonds or other instruments of public debt financing have been issued, the project shall be subject to the technical criteria in 9VAC25-870-93 through 9VAC25-870-99.
- F. *TMDLs.* The Chesapeake Bay TMDL as provided in 9VAC25-890-40 and any other local TMDLs applicable to a regulated land disturbing activity.
- G. *Stream buffers.* Any land disturbing activity under subsections (A) through (E) also shall comply with the requirements for stream buffers in section 17-600 *et seq.*
- H. *Pre-existing County requirements.* Any criterion more stringent than the technical criteria set forth in subsections (A) through (F) existing prior to January 1, 2005 that is set forth in this chapter or in the Design Standards Manual.
- I. *Technical criteria applicable to entire common plan of development or sale.* Any land disturbing activity subject to the technical criteria under this section shall apply the applicable stormwater management technical criteria to the entire common plan of development or sale where applicable. Individual lots in a residential, commercial, or industrial common plan of development or sale shall not be considered to be separate land disturbing activities. Instead, the common plan, as a whole, shall be considered to be a single land disturbing activity. Hydrologic parameters that reflect the ultimate land disturbance shall be used in all engineering calculations.

(§ 19.1-6, 9-29-77, art. II, § 1, 10-19-77, 9-13-78, 10-22-80, 7-11-90, 8-3-94; § 19.1-7, 9-29-77, art. II, § 2, 7-11-90; § 19.3-27, 2-11-98; Code 1988, §§ 19.1-6, 19.2-7, 19.3-27; § 17-303, Ord. 98-A(1), 6-17-98; § 17-500, Ord. 14-17(1), 5-7-14, effective 7-1-14)

State law reference – Va. Code §§ 62.1-44.15:33, 62.1-44.15:49; 9VAC25-870-47, 9VAC25-870-48, 9VAC25-870-95, 9VAC25-870-104, 9VAC25-870-400, 9VAC25-890-40.

Sec. 17-502 VSMP permit application; offsite nutrient credits.

An owner shall be allowed to use offsite nutrient credits, subject to the following:

- A. *Eligibility to use offsite nutrient credits.* An owner is eligible to use offsite nutrient credits if one or more of the following are satisfied:
 - 1. *Less than 5 acres disturbed.* Less than five acres of land will be disturbed.
 - 2. *Pollution control.* The postconstruction pollution control (measured in phosphorous) requirement is less than ten (10) pounds per year.
 - 3. *Most phosphorus nutrient reductions are achieved onsite.* At least seventy-five (75) percent of the required phosphorus nutrient reductions are achieved onsite. If at least seventy-five (75) percent of the required phosphorus nutrient reductions cannot be achieved onsite, and the owner can demonstrate to the satisfaction of the administrator that: (i) alternative site designs have been considered that may accommodate onsite best management practices; (ii) onsite best management practices have been considered in alternative site designs to the maximum extent practicable; (iii) appropriate onsite best management practices will be implemented; and (iv) full compliance with postdevelopment nonpoint nutrient runoff compliance requirements cannot practicably be met onsite, then the required phosphorus nutrient reductions may be achieved, in whole or in part, through the use of offsite compliance options.
- B. *Eligibility to use offsite nutrient credits as a substitute for existing onsite nutrient controls.* An owner satisfying one or more of the criteria in subsection (A) is eligible to use offsite nutrient credits as full or partial substitutes of perpetual nutrient credits for existing onsite nutrient controls when: (i) the nutrient credits will compensate for ten (10) or fewer pounds of the annual phosphorous requirement associated with the original land disturbing activity; or (ii) existing onsite controls are not functioning as anticipated after reasonable attempts to comply with applicable maintenance agreements or requirements and the use of nutrient credits will account for the deficiency. Upon the use of the offsite credits, the party responsible for maintenance shall be released from maintenance obligations related to the onsite controls for which the nutrient credits are substituted.
- C. *Documentation of credits.* The owner shall provide documentation of its acquisition of nutrient credits to the administrator and the Virginia Department of Environmental Quality. The documentation shall be composed of a certification from the credit provider documenting the number of nutrient credits acquired and the associated ratio of nutrient credits at the credit-generating entity.
- D. *Minimum performance requirements.* The use of offsite nutrient credits shall satisfy the following:
 - 1. *Ratio and perpetual credits.* For that portion of a site's compliance with stormwater nonpoint nutrient runoff water quality criteria being obtained through nutrient credits, the owner shall: (i) comply with a 1:1 ratio of the nutrient credits to the site's remaining postdevelopment nonpoint nutrient runoff compliance requirement being met by credit use; and (ii) use credits certified as perpetual credits pursuant to Virginia Code § 62.1-44.19:12 *et seq.*
 - 2. *Nutrient reductions prior to land disturbing activity.* Any offsite nutrient credit used shall achieve the necessary nutrient reductions prior to the owner starting any land disturbing activity. If a project is phased, the owner may acquire or achieve the offsite nutrient reductions prior to starting each phase of the land disturbing activity in an amount sufficient for each phase.

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- E. *Prohibited use of nutrient credits.* Offsite nutrient credits may not be used in the following cases:
1. *Water quantity control requirements.* Offsite nutrient credits may not be used to address water quantity control requirements.
 2. *Water quality based limitations.* Offsite nutrient credits may not be used in contravention of County water quality based limitations at the point of discharge that are: (i) consistent with the determinations made pursuant to Virginia Code § 62.1-44.19:7(B); (ii) contained in the County's MS4 program plan; or (iii) as otherwise may be established or approved by the State Water Control Board.
- F. *Crediting nutrient reductions.* Nutrient reductions obtained through offsite nutrient credits shall be credited toward compliance with any nutrient allocation assigned to the County's MS4 permit or any applicable TMDL to the location where the activity for which the nutrient credits are used takes place. If the activity for which the nutrient credits are used does not discharge to a municipal separate storm sewer system, the nutrient reductions shall be credited toward compliance with the applicable nutrient allocation.

(Ord. 14-17(1), 5-7-14, effective 7-1-14)

State law reference – Va. Code § 62.1-44.15:35; 9VAC25-870-69.

ARTICLE VI. STREAM BUFFERS

Sec. 17-600 Extent of stream buffers; retention and establishment.

Except as provided in section 17-602, each erosion and sediment control plan and each VSMP permit shall provide for stream buffers for the purposes of retarding runoff, preventing erosion, filtering nonpoint source pollution from runoff, moderating stream temperature, and providing for the ecological integrity of stream corridors and networks, as provided herein:

- A. *Development within a development area.* If the development is located within a development area, stream buffers shall be retained if present and established where they do not exist on any lands subject to this chapter containing perennial streams, contiguous nontidal wetlands, or both. The stream buffer shall be no less than one hundred (100) feet wide on each side of any perennial stream and contiguous nontidal wetlands, measured horizontally from the edge of the contiguous nontidal wetlands, or the top of the stream bank if no wetlands exist.
- B. *Development within a water supply protection area or other rural land.* If the development is located within a water supply protection area or other rural land, stream buffers shall be retained if present and established where they do not exist on any lands subject to this chapter containing perennial or intermittent streams, contiguous nontidal wetlands, and flood plains. The stream buffer shall extend to whichever of the following is wider: (i) one hundred (100) feet on each side of any perennial or intermittent stream and contiguous nontidal wetlands, measured horizontally from the edge of the contiguous nontidal wetlands, or the top of the stream bank if no wetlands exist; or (ii) the limits of the flood plain. The stream buffer shall be no less than two hundred (200) horizontal feet wide from the flood plain of any public water supply impoundment.

(§ 17-301: § 19.2-6, 6-19-91, § 6; § 19.3-25, 2-11-98; Code 1988, §§ 19.2-6, 19.3-25; § 17-301, Ord. 98-A(1), 8-5-98; Ord. 07-17(1), 2-14-07) (§ 17-317: § 19.3-41, 2-11-98; § 19.2-8, 6-19-91; Code 1988, §§ 19.2-8, 19.3-41; § 17-317, Ord. 98-A(1), 8-5-98; Ord. 08-17(1), 2-6-08; § 17-600, Ord. 14-17(1), 5-7-14, effective 7-1-14)

State law reference – Va. Code § 62.1-44.15:73; 9VAC25-890-40.

Sec. 17-601 Management of stream buffer.

Each stream buffer required to be retained or established pursuant to section 17-600 shall be managed as provided herein:

- A. *Target vegetative cover.* The preferred vegetative cover in a stream buffer shall be a native riparian forest with ground cover, shrub, and tree canopy layers.
- B. *Preservation of native vegetation.* When evaluating a development design under subsection (C), when native vegetation may be disturbed or removed under subsection (D) and sections 17-603 and 17-604, and when stream buffers are maintained under subsection (E), native vegetation shall be preserved to the fullest extent possible.
- C. *Incorporation into development design.* Each stream buffer shall be incorporated into the design of the development by keeping stream buffers in open or natural spaces, and out of residential lots or areas of active use, to the fullest extent possible.
- D. *Retaining native vegetation; disturbance or removal.* In order to maintain the runoff, erosion, nonpoint source pollution control, stream temperature, and ecological values of the stream buffer, no native vegetation within the stream buffer shall be disturbed or removed, regardless of the size of the area affected, except to maintain the stream buffer as provided in subsection (E), provided that native vegetation may be removed to construct, install, operate or maintain any improvement, or engage in any activity, authorized by sections 17-603 and 17-604.
- E. *Maintaining the stream buffer.* Each stream buffer shall be maintained in as natural a condition as possible.

(§ 19.3-42, 2-11-98, § 19.2-8, 6-19-91, § 8; Code 1988, §§ 19.2-8, 19.3-42; § 17-318, Ord. 98-A(1), 8-5-98; § 17-601, Ord. 14-17(1), 5-7-14, effective 7-1-14)

State law reference –Va. Code § 62.1-44.15:73; 9VAC25-890-40.

Sec. 17-602 Types of improvements and activities exempt from duties to retain, establish, or manage a stream buffer.

The following types of improvements and activities shall not be required to retain, establish, or manage a stream buffer, provided that the requirements of this section are satisfied:

- A. *Utility and transportation improvements.* The construction, installation, operation and maintenance of electric, gas and telephone transmission lines, railroads, and activities of the Virginia Department of Transportation, and their appurtenant structures, which are accomplished in compliance with the Erosion and Sediment Control Law (Virginia Code § 62.1-44.15:51 *et seq.*) or an erosion and sediment control plan approved by the State Water Control Board.
- B. *Public water and sewer improvements.* The construction, installation, and maintenance by public agencies of water and sewer lines, including water and sewer lines constructed by private interests for dedication to public agencies, provided that all of the following are satisfied:
 - 1. *Location.* To the extent practical, as determined by the Albemarle County Service Authority or the Rivanna Water and Sewer Authority, the location of the water or sewer lines shall be outside of all stream buffer areas.
 - 2. *Disturbance minimized.* No more land shall be disturbed than is necessary to construct, install and maintain the water or sewer lines.
 - 3. *Compliance with applicable requirements.* All construction, installation, and maintenance of the water or sewer lines shall comply with all applicable Federal, State and local requirements and permits and be conducted in a manner that protects water quality.

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- C. *Silvicultural activities.* Silvicultural activities, provided that they are conducted in compliance with the water quality protection procedures established by the Virginia Department of Forestry in its “Virginia’s Forestry Best Management Practices for Water Quality.”
- D. *Public airport improvements.* The construction, installation and maintenance of runways, taxiways, and other similar or appurtenant improvements at public airports, including the expansion or extension of those improvements, provided that all applicable Federal, State and local permits are obtained.

(§ 19.3-43, 2-11-98; § 19.2-12, 6-19-91, § 12; Code 1988, §§ 19.2-12, 19.3-43; § 17-319, Ord. 98-A(1), 8-5-98; Ord. 08-17(4), 9-3-08; § 17-602, Ord. 14-17(1), 5-7-14, effective 7-1-14)

State law reference –Va. Code § 62.1-44.15:73; 9VAC25-890-40.

Sec. 17-603 Types of structures, improvements and activities authorized in a stream buffer.

If otherwise authorized by the applicable regulations of the Zoning Ordinance, the following types of structures, control measures and activities shall be allowed in a stream buffer, provided that the requirements of this section are satisfied:

- A. *Pre-existing buildings or structures.* Any building or structure which existed on February 11, 1998 may continue in its location on that date. However, nothing in this section authorizes the continuance, repair, replacement, expansion or enlargement of any such building or structure except as provided in sections 18-6 and 18-30.3.
- B. *Temporary erosion and sediment control measures.* Temporary erosion and sediment control measures, provided that to the extent practical, as determined by the administrator, the control measures shall be located outside of the stream buffer and disturbance impacts are minimized.
- C. *Water-dependent facilities and miscellaneous uses.* Water-dependent facilities; water wells; passive recreation access, such as pedestrian trails and bicycle paths; historic preservation; archaeological activities; provided that all applicable Federal, State and local permits are obtained.

(§ 19.3-44, 2-11-98; § 19.2-7, 6-19-91, § 7; § 19.2-8, 6-19-91, § 8; Code 1988, §§ 19.2-7, 19.2-8, 19.3-44; § 17-320, Ord. 98-A(1), 8-5-98; Ord. 08-17(2), 5-7-08; § 17-603, Ord. 14-17(1), 5-7-14, effective 7-1-14)

State law reference –Va. Code § 62.1-44.15:73; 9VAC25-890-40.

Sec. 17-604 Types of structures, improvements and activities which may be allowed in a stream buffer by program authority.

Structures, improvements and activities may be authorized by the administrator in the circumstances described below, provided that a mitigation plan satisfying the requirements of section 17-406, is submitted to, and approved, by the administrator:

- A. *Within the landward 50 horizontal feet.* On a lot within the fifty (50) horizontal feet of a stream buffer that is the most landward (furthest from the stream), if the structures, improvements or activities either: (i) would be for necessary infrastructure to allow reasonable use of the lot; or (ii) would be on a lot that is within a water supply protection area where the stream buffer protects an intermittent stream and the lot is within a development area. In all cases under this subsection, any new building site and sewage disposal system shall be located outside of the stream buffer.
- B. *Lakes, ponds or restoration projects.* On a lot on which the development in the stream buffer will consist of a lake, pond, or ecological/wetland restoration project.

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- C. *Stream crossings.* Stream crossings of perennial and intermittent streams for roads, streets or driveways, provided they meet the following minimum criteria:
1. *Bridges and culverts.* Bridges and culverts shall satisfy the following:
 - a. *Perennial streams.* For crossings of perennial streams, bridges, arch culverts, or box culverts shall be used for the stream crossing and shall be sized to pass the ten (10) year storm, or the twenty-five (25) year storm if the design standards in either section 14-410 or 18-32.7.2.1 apply, without backing water onto upstream properties. Bridges or arch culverts shall either leave the stream section, consisting of the stream bed and the stream bank, undisturbed or shall allow the stream to return to a natural stabilized cross-section upon completion of installation. The lowest interior elevation (invert) of a box culvert installation shall be a minimum of six (6) inches below the stream bed. Culvert walls and bridge columns should be located outside the stream banks wherever possible.
 - b. *Intermittent streams.* For crossings of intermittent streams, bridges or culverts shall be used for the stream crossing and sized to pass the ten (10) year storm, or the twenty-five (25) year storm if the design standards in either section 14-410 or 18-32.7.2.1 apply, without backing water onto upstream properties.
 2. *Stream stabilization and energy dissipation.* Stream stabilization and energy dissipation measures below each bridge or culvert shall be provided.
 3. *Disturbance minimized.* The stream buffer disturbance shall be the minimum necessary for the lot(s) to be used and developed as permitted in the underlying zoning district and under the applicable regulations of the Subdivision Ordinance. Stream crossings shall not disturb more than thirty (30) linear feet of stream for driveways and sixty (60) linear feet for roads or streets, provided that the administrator may allow additional length of stream disturbance where fill slopes or special conditions necessitate additional length.
 4. *Stream bed and stream bank stabilization.* The stream bed and stream banks shall be stabilized within seven (7) days from the start of backfilling for the bridge or culvert.
 5. *Establishment of buffer vegetation.* For stream crossings where any portion of the pre-construction stream buffer is not fully vegetated as determined by the administrator, and for any portion of a vegetated stream buffer that is disturbed during the installation of the stream crossing, buffer vegetation shall be established and maintained within the stream buffer but outside of the stream crossing at a ratio of two (2) square feet of stream buffer restored for every one (1) square foot of stream buffer that was either not fully vegetated or is disturbed during the installation of the stream crossing. Buffer vegetation shall be established and maintained at the 2:1 ratio to the extent that the stream buffer is fully vegetated outside of the stream crossing, provided that the owner shall not be required to establish vegetation outside of the stream buffer in order to satisfy the 2:1 ratio. The administrator may require that the owner enter into an agreement providing for the ongoing maintenance of the plantings in the stream buffer, and may require a bond with surety or other acceptable instrument as provided in section 17-414. Stream buffer plantings shall be consistent with guidance supplied by the administrator.
 6. *Evidence of required permits.* The owner shall provide the administrator with copies of approved State and Federal permits associated with the stream crossing, if applicable.
 7. *Limitation on number of stream crossings; exception.* In order to ensure that the encroachment into or across the stream buffer is minimized, on and after May 7, 2008, it shall be presumed that one stream crossing is adequate to serve the owner's lot(s) existing on that date and all lots created therefrom on and after that date. The administrator shall

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allow only one stream crossing to serve all lots, provided that it may allow additional crossings under subsection (D).

- D. *Stream crossings not allowed under subsection (C).* On a lot on which the development in the stream buffer will consist of the construction and maintenance of a road, street or driveway that would not satisfy the requirements of subsection (C) and the administrator determines that the stream buffer would prohibit access to the lot necessary for the lot to be used and developed as permitted in the underlying zoning district and under the applicable regulations of the Subdivision Ordinance, or to establish more than one stream crossing.
- E. *Water and sewer facilities or sewage disposal systems on pre-existing lots.* On a lot which was of record prior to February 11, 1998, on which the development in the stream buffer will consist of the construction, installation and maintenance of water and sewer facilities or sewage disposal systems, and the administrator determines that the stream buffer would prohibit the practicable development of those facilities or systems. Any sewage disposal system must comply with all applicable State laws.
- F. *Sole building sites on pre-existing lots.* On a lot which was of record prior to February 11, 1998, if the stream buffer would result in the loss of a building site, and there are no other available building sites outside the stream buffer on the lot, or to allow redevelopment as permitted in the underlying zoning district.

(§ 19.3-45, 2-11-98; § 19.2-8, 6-19-91, § 8; Code 1988, §§ 19.2-8, 19.3-45; § 17-321, Ord. 98-A(1), 8-5-98; Ord. 08-17(1), 2-6-08; Ord. 08-17(2), 5-7-08; Ord. 11-17(1), 10-5-11; Ord. 12-17(1), 5-9-12; § 17-604, Ord. 14-17(1), 5-7-14, effective 7-1-14)

State law reference – Va. Code § 62.1-44.15:73; 9VAC25-890-40.

ARTICLE VII. ILLICIT DISCHARGES, ILLICIT CONNECTIONS, AND PROHIBITED DUMPING

Sec. 17-700 Applicability.

This article shall apply to all activities that cause or allow to be caused direct or indirect illicit discharges, illicit connections, and the prohibited dumping of refuse and pollutants, or which negatively impede the flow capacity of the County's MS4 or State waters that: (i) are not covered by other articles of this chapter; and (ii) are not expressly exempt from this article.

(§ 17-500; Ord. 07-17(1), 2-14-07; § 17-700, Ord. 14-17(1), 5-7-14, effective 7-1-14)

State law reference – Va. Code §§ 62.1-44.15:27, 62.1-44.15:33; 9VAC25-890-40.

Sec. 17-701 Illicit discharges prohibited; exempt and authorized discharges.

No person shall throw, drain, or otherwise discharge, cause or allow others under their control to throw, drain, or otherwise discharge into the County's MS4 or State waters any pollutants or waters containing any pollutants, other than stormwater. Commencing, conducting or continuing any illicit discharge to the County's MS4 or State waters is prohibited, subject to the following:

- A. *Conditionally exempt discharges.* The following discharges are not prohibited discharges provided that the administrator determines that the discharge is not adversely impacting State waters:
1. Discharges pursuant to a Virginia Pollutant Discharge Elimination System ("VPDES") or Virginia Storm Management Program ("VSMP") permit (other than a VSMP permit for discharges from the municipal separate storm sewer).

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2. Discharges resulting from fire fighting and other public safety activities.
3. Discharges associated with the maintenance or repair of public water, sanitary, and storm sewer lines, and public drinking water reservoirs and drinking water treatment or distributions systems conducted in accordance with applicable federal and state regulations and standards.
4. Discharges associated with any activity by the County, its employees and agents, in the maintenance of any component of a County-maintained stormwater management facility conducted in accordance with applicable State and Federal regulations and standards.
5. Discharges specified in writing by the administrator as being necessary to protect public health and safety.
6. Water line flushing.
7. Irrigation water, landscape irrigation, and lawn watering.
8. Diverted stream flows.
9. Rising groundwaters.
10. Uncontaminated groundwater infiltration (as defined in 40 CFR 35.2005(20)).
11. Uncontaminated pumped groundwater.
12. Discharges from potable water sources.
13. Foundation drains.
14. Air conditioning condensation.
15. Springs.
16. Water from crawl space pumps.
17. Footing drains.
18. Individual residential car washing.
19. Flows from riparian habitats and wetlands.
20. Dechlorinated swimming pool discharges having less than one (1) part per million chlorine.
21. Street wash water.
22. Water from washed parking lots or sidewalks to remove algae or oil buildup;
23. Application of salts or other de-icing substances to streets, sidewalks and parking lots;
24. Discharges associated with dye testing, provided that the program authority is notified in writing before the test.

If the administrator determines that any of these conditionally exempted activities are causing adverse impacts to State waters in a specific case, he may revoke the exemption for that specific

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case. The revocation shall be effective from the date the administrator provides written notice to the person responsible for the discharge of the determination that the exemption is revoked.

- B. *Discharges authorized by VPDES permit, waiver or waste discharge order.* The prohibition shall not apply to any non-stormwater discharge permitted under a VPDES permit, including the general permit, waiver, or waste discharge order issued to the discharger and administered under the authority of the United States Environmental Protection Agency (EPA), provided that the discharger is in full compliance with all requirements of the permit, waiver, or order and other applicable laws and regulations and further provided that written approval has been granted by the EPA for any discharge to the County's MS4.

(§ 17-501; Ord. 07-17(1), 2-14-07; § 17-701, Ord. 14-17(1), 5-7-14, effective 7-1-14)

State law reference – Va. Code §§ 62.1-44.15:27, 62.1-44.15:33; 9VAC25-870-400, 9VAC25-890-40.

Sec. 17-702 Illicit connections prohibited.

Constructing, using, maintaining, or allowing the continued existence of an illicit connection to the County's MS4 is prohibited, subject to the following:

- A. *Pre-existing illicit connections.* Any illicit connection authorized prior to February 14, 2007 is in violation of this section unless the administrator expressly extended the date by which to comply beyond December 31, 2007 upon good cause shown by the person requesting the extension, and the date by which compliance is required has not passed.
- B. *Disconnection and redirection.* Any illicit connection shall be disconnected and redirected, if necessary, to an approved onsite wastewater management system or the sanitary sewer system upon approval of the Albemarle County Service Authority.
- C. *Locating undocumented connections.* Any drain or conveyance that has not been documented in plans, maps, or their equivalent and which appears to be connected to the County's MS4 shall be located by the owner, occupant, lessee, principal, agent, employee or otherwise, of that property within the time period specified in the written notice of violation from the administrator requiring that the connection be located. The notice shall require that: (i) the location of the drain or conveyance be determined; (ii) the drain or conveyance be identified as a storm sewer, sanitary sewer, or other; and (iii) the outfall location or point of connection to the County's MS4, sanitary sewer system, or other discharge point be identified. The results of these investigations shall be documented and provided to the administrator.

(§ 17-502; Ord. 07-17(1), 2-14-07; § 17-702, Ord. 14-17(1), 5-7-14, effective 7-1-14)

State law reference--Va. Code §§ 62.1-44.15:27, 62.1-44.15:33; 9VAC25-890-40.

Sec. 17-703 Dumping prohibited.

No person, whether the owner, occupant, lessee, principal, agent, employee or otherwise, may dump or discharge, or allow any other person to dump or discharge, refuse, as that term is defined in Albemarle County Code § 13-100, or any other material or pollutant, natural or synthetic, into the County's MS4, State waters, or a natural stream, unless the dumping or discharge is expressly authorized by the Albemarle County Code.

(§ 17-503; Ord. 07-17(1), 2-14-07; § 17-703, Ord. 14-17(1), 5-7-14, effective 7-1-14)

State law reference – Va. Code §§ 62.1-44.15:27, 62.1-44.15:33; 9VAC25-890-40.

ARTICLE VIII. COMPLIANCE

Sec. 17-800 Duty to comply.

Each owner has the following duties to comply:

- A. *Upon a determination that land disturbing activity is subject to this chapter.* Upon the administrator's determination that a land disturbing activity is subject to the VESCP, the VSMP, or both, the owner shall immediately comply with the applicable requirements of this chapter and the applicable requirements of this chapter shall be immediately enforced.
- B. *Upon approval of a VSMP permit or erosion and sediment control plan.* Upon the administrator's approval of any VSMP permit or erosion and sediment control plan required by this chapter, the owner shall comply with all of the terms and conditions of the approved permit or plan at all times the permit or plan is in effect, including when any activities allowed under the permit or plan are being performed. In addition, the owner shall comply with the requirements of the general permit even though a registration statement was not required under sections 17-401(C) and 17-405(A)(1).
- C. *All other applicable requirements of this chapter.* The owner is obligated to comply with all other applicable requirements of this chapter not addressed in subsections (A) and (B), including, but not limited to, the express duties in the following sections.

(§ 17-211: 2-11-98; Code 1988, § 19.3-19; § 17-211, Ord. 98-A(1), 8-5-98; Ord. 10-17(1), 7-11-01) (§ 17-323: § 19.3-47, 2-11-98; § 19.1-6, 9-29-77, art. II, § 1, 10-19-77, 9-13-78, 10-22-80, 7-11-90, 8-3-94; Code 1988, §§ 19.1-6, 19.3-47; § 17-323, Ord. 98-A(1), 8-5-98; § 17-800, Ord. 14-17(1), 5-7-14, effective 7-1-14)

State law reference – Va. Code §§ 62.1-44.15:27, 62.1-44.15:28, 62.1-44.15:58, 62.1-44.15:73.

Sec. 17-801 Duty to maintain structures, systems, facilities, and techniques.

Each owner has the duty to maintain and repair all structures, systems, facilities and techniques required under the VESCP and the VSMP as follows:

- A. *Erosion and sediment control structures and systems.* Any erosion and sediment control structures and systems shall be maintained and repaired as needed to ensure continued performance of their intended function at their intended level. The owner also shall perform all of the maintenance responsibilities delineated in the approved erosion and sediment control plan. All control measures required by the plan shall be maintained in accordance with good engineering practices.
- B. *Stormwater management facilities and techniques.* Any permanent stormwater management facility or technique specified in the approved stormwater management plan to manage the quality and quantity of runoff shall be maintained for so long as the stormwater management facility or technique exists, in a manner that meets or exceeds the maintenance standards in the agreement entered into under section 17-415. The owner's obligation to maintain any such permanent stormwater management facility or technique shall continue until all such obligations are the responsibility of the County or another public entity empowered to own and maintain stormwater management facilities and to implement the techniques described in the stormwater management plan.
- C. *Stormwater pollution prevention plan control measures; duty to maintain.* Any control measure in the approved stormwater pollution prevention plan, including any control measure otherwise subject to subsections (A) or (B), shall be properly maintained in effective operating condition in accordance with good engineering practices and, where applicable, manufacturer specifications.

(§ 17-211: 2-11-98; Code 1988, § 19.3-19; § 17-211, Ord. 98-A(1), 8-5-98; Ord. 10-17(1), 7-11-01) (§ 17-323: § 19.3-47, 2-11-98; § 19.1-6, 9-29-77, art. II, § 1, 10-19-77, 9-13-78, 10-22-80, 7-11-90, 8-3-94; Code 1988, §§ 19.1-6, 19.3-47; § 17-323, Ord. 98-A(1), 8-5-98; § 17-801, Ord. 14-17(1), 5-7-14, effective 7-1-14)

State law reference – 9VAC25-840-60, 9VAC25-870-58, 9VAC25-870-112, 9VAC25-880-70.

Sec. 17-802 Duty to maintain the functional performance of storm drainage systems and streams.

Each owner of property through which a privately-maintained storm drainage system or natural stream passes shall maintain the functional performance of the system or stream, regardless of whether they are subject to a VSMP permit or an erosion and sediment control plan, as follows:

- A. *Keeping the storm drainage system and natural streams free of refuse and other obstacles.* The owner shall maintain the part of storm drainage system or natural stream on the property free of refuse, as that term is defined in section 13-100, and other obstacles that would pollute, contaminate, or adversely impact the system's or the stream's functional performance.
- B. *Maintaining structures within the flood hazard overlay district.* The owner shall maintain all existing privately owned structures on the property that are within the flood hazard overlay district established under section 18-30.3 so that the structures do not become a hazard to the use, function, or physical or ecological integrity of the stream.

(§ 17-504, Ord. 07-17(1), 2-14-07; § 17-802, Ord. 14-17(1), 5-7-14, effective 7-1-14)

State law reference – Va. Code §§ 62.1-44.15:27, 62.1-44.15:33; 9VAC25-890-40.

Sec. 17-803 Duty to maintain general permit, stormwater pollution prevention plan, and other documents onsite.

If the land disturbing activity is subject to a VSMP permit, each owner shall maintain the general permit, the general permit coverage letter, the registration statement, if such a statement was required under sections 17-401(C) and 17-405(A)(1), and the stormwater pollution prevention plan, at a central location at the construction site. If an onsite location is unavailable to store the documents when no personnel are present, notice of the documents' location must be posted near the main entrance at the construction site.

(Ord. 14-17(1), 5-7-14, effective 7-1-14)

State law reference – 9VAC25-870-54, 9VAC25-880-70.

Sec. 17-804 Duty to inspect and take corrective action.

Each owner shall ensure that any inspections required by the general permit are conducted by the qualified personnel identified in the stormwater pollution prevention plan. Any inspection shall be conducted according to the schedule and satisfy the requirements of 9VAC25-880-70, Part II(F). Any corrective action identified in an inspection shall be completed as follows:

- A. *Control measure not operating effectively.* If an inspection identifies a control measure that is not operating effectively, corrective action shall be completed as soon as practicable, but no later than seven (7) days after discovery or a longer period allowed in writing by the administrator.
- B. *Control measure inadequate.* If an inspection identifies an existing control measure that needs to be modified or if an additional control measure is necessary, implementation shall be completed prior to the next anticipated measureable storm event. If implementation before the next anticipated measureable storm event is impractical, then it shall be implemented no later than seven (7) days after discovery or a longer period allowed in writing by the administrator.

(§ 17-206: 2-11-98; Code 1988, § 19.3-14; § 17-206, Ord. 98-A(1), 8-5-98) (§ 17-305: 2-11-98; Code 1988, § 19.3-29; § 17-305, Ord. 98-A(1), 8-5-98; § 17-804, Ord. 14-17(1), 5-7-14, effective 7-1-14)

State law reference – 9VAC25-880-70.

Sec. 17-805 Duty to provide information pertaining to discharges and compliance.

Each owner shall provide within a reasonable time the following information pertaining to discharges upon the request of the administrator:

- A. *Effect of discharges and wastes.* Any application materials, plans, specifications, and other pertinent information as may be necessary to determine the effect of: (i) the discharge on the quality of State waters, or such other information as may be necessary to accomplish the purposes of the Virginia Stormwater Management Act and 9VAC25-870; and (ii) the wastes from the discharge on the quality of State waters, or such other information as may be necessary to accomplish the purposes of the Clean Water Act and the Virginia Stormwater Management Act.
- B. *Determine compliance or other cause to change general permit.* Any information request to determine whether cause exists for modifying, revoking and reissuing, or terminating the general permit or to determine compliance with the general permit.

(§ 17-206: 2-11-98; Code 1988, § 19.3-14; § 17-206, Ord. 98-A(1), 8-5-98) (§ 17-305: 2-11-98; Code 1988, § 19.3-29; § 17-305, Ord. 98-A(1), 8-5-98; § 17-805, Ord. 14-17(1), 5-7-14, effective 7-1-14)

State law reference – Va. Code § 62.1-44.15:40; 9VAC25-870-340, 9VAC25-880-70.

Sec. 17-806 Duty to report discharges or noncompliance.

Each owner shall report discharges or noncompliance as follows:

- A. *Discharge of stormwater not authorized by general permit.* Except in compliance with a general permit, any person who discharges, causes, or allows a discharge of stormwater into or upon State waters from the County's MS4 or from a land disturbing activity, or who discharges, causes, or allows a discharge that may reasonably be expected to enter State waters, shall notify the Virginia Department of Environmental Quality and the administrator of the discharge immediately upon discovery of the discharge but in no case later than twenty-four (24) hours after discovery of the discharge. In addition, a written report of the unauthorized discharge shall be submitted by the owner, to the Virginia Department of Environmental Quality and to the administrator within five (5) days after discovery of the discharge. The contents of the written report shall be as provided in 9VAC25-870-310.
- B. *Discharge of sewage, wastes, noxious, deleterious, or hazardous substances, or oil.* Any owner who discharges or causes or allows a discharge of sewage, industrial waste, other wastes or any noxious or deleterious substance or a hazardous substance or oil in an amount equal to or in excess of a reportable quantity established under either 40 CFR Part 110, 40 CFR Part 117, 40 CFR Part 302, or Virginia Code § 62.1-44.15:19 that occurs during a twenty-four (24) hour period into or upon State waters or who discharges or causes or allows a discharge that may reasonably be expected to enter state waters, shall notify the Virginia Department of Environmental Quality of the discharge immediately upon discovery of the discharge, but in no case later than within twenty-four (24) hours after the discovery. A written report of the unauthorized discharge shall be submitted to the Virginia Department of Environmental Quality and the administrator within five (5) days after discovery of the discharge. The written report shall satisfy the requirements of 9VAC25-880-70, Part III(G).
- C. *Unusual or extraordinary discharges.* The owner shall promptly notify, in no case later than within twenty-four (24) hours, the Virginia Department of Environmental Quality and the administrator by telephone after the discovery of any unusual or extraordinary discharge, including a "bypass" or "upset," from a facility and the discharge enters or could be expected to enter State waters. The notification shall include the information required by 9VAC25-880-70, Part III(H).

- D. *Reports of noncompliance.* The owner shall report any noncompliance which may adversely affect State waters or may endanger public health. An oral report shall be provided to the Virginia Department of Environmental Quality within twenty-four (24) hours after discovery of the noncompliance. A written report of the noncompliance shall be submitted to the Virginia Department of Environmental Quality and the administrator within five (5) days after discovery of the noncompliance. The oral and written reports shall include the information required by 9VAC25-880-70, Part III(I).

(§ 17-506, Ord. 07-17(1), 2-14-07; § 17-806, Ord. 14-17(1), 5-7-14, effective 7-1-14)

State law reference – 9VAC25-870-310, 9VAC25-880-70.

Sec. 17-807 Duty to provide records and notice pertaining to general permit.

Each owner operating under a general permit shall provide the following records and notice to the administrator upon request or as required by the general permit:

- A. *Records required to be kept by general permit.* Copies of records required to be kept by the general permit.
- B. *Reports pertaining to compliance schedules.* Reports of compliance or noncompliance with, or any progress reports on, interim and final requirements contained in any compliance schedule of the general permit, which shall be submitted no later than fourteen (14) days after each schedule date.
- C. *Notice of planned changes.* Notice to the Virginia Department of Environmental Quality and the administrator as soon as possible of any planned physical alterations or additions to the permitted facility or activity, when the alteration or addition requires notice under 9VAC25-880-70(III)(J).

(Ord. 14-17(1), 5-7-14, effective 7-1-14)

State law reference – 9VAC25-880-70.

Sec. 17-808 Duty to stabilize denuded areas with permanent vegetation within nine months after commencing land disturbing activity.

In addition to the authority of the administrator to require that any disturbed area be stabilized under an approved stormwater pollution prevention plan, any owner shall install permanent vegetation on all denuded areas on the site, subject to the following:

- A. *When permanent vegetation required.* The owner shall install on all denuded areas on the site within nine (9) months after the date the land disturbing activity commenced, except for areas that the administrator determines are necessary parts of the construction that are subject to an active building permit and areas where erosion is prevented by a non-erosive surface, including, but not limited to, the following surfaces: (i) roadways and sidewalks covered by gravel, asphalt pavement, or concrete; (ii) trails or paths covered by gravel, stone dust, or mulch; (iii) buildings and other permanent structures; and such other surfaces that the administrator determines would adequately provide a permanent barrier to erosion.
- B. *Extension.* The time limit for installing permanent vegetation may be extended by either the administrator or the board of supervisors, or both, as follows:
1. *By the administrator.* The administrator may extend the time limit for installing permanent vegetation up to an additional six (6) months, provided the owner submits a written request to the administrator no less than one (1) month prior to the deadline for installing the permanent vegetation. The administrator may grant the extension if it finds that: (i) the additional time is necessary due to factors beyond the control of the owner; (ii) the owner had made good faith efforts to comply with the time limit; and (iii) the owner has effectively controlled erosion and sedimentation on the site during the land

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disturbing activity. In granting an extension, the administrator may impose reasonable conditions.

2. *By the board of supervisors.* The board of supervisors may extend the time limit for installing permanent vegetation for any duration it determines to be appropriate, provided the owner submits a written request to the clerk of the board of supervisors no less than two (2) months prior to the deadline for installing the permanent vegetation. The administrator shall provide an opinion to the board as to the condition of the site with respect to complying with this chapter and an estimate of the minimum time needed to complete grading and install permanent vegetation for the land disturbing activity covered by the approved erosion and sediment control plan or the VSMP permit. The board may grant the extension if it finds that: (i) the additional time is necessary due to factors beyond the control of the owner; (ii) the owner had made good faith efforts to comply with the time limit; and (iii) the owner has plans to effectively control or has effectively controlled erosion and sedimentation on the site during the land disturbing activity. In granting an extension, the board shall set a time limit and may impose other reasonable conditions.
- C. *Changes to approved plans or permits do not extend time.* An application to modify, vary, or otherwise amend an approved erosion and sediment control plan, or to amend or modify a stormwater management plan or any other plan approved under the approved VSMP permit, for the site, shall not extend the time limit for installing permanent vegetation required by this section.
- D. *Land disturbing activity subject to this section.* The installation of permanent vegetation required by this section shall be required for those land disturbing activities subject to an erosion and sediment control plan approved on or after September 5, 2009, or an erosion and sediment control plan that was approved prior to that date but was renewed on or after September 5, 2009, regardless of whether the land disturbing activity is subject to the VSMP, or is subject solely to the VESCP.

(§ 7-5, 6-18-75, § 7, 2-11-76, 4-21-76, 6-2-76, 7-9-80, 7-8-81, 2-11-87, 3-18-92; § 19.3-15, 2-11-98; Code 1988, §§ 7-5, 19.3-15; § 17-207, Ord. 98-A(1), 8-5-98; Ord. 09-17(1), 8-5-09, effective 9-5-09; § 17-808, Ord. 14-17(1), 5-7-14, effective 7-1-14)

State law reference – Va. Code § 62.1-44.15:65.

Sec. 17-809 Right of administrator to enter to obtain information, conduct surveys, or in accordance with a performance bond.

In the administration and enforcement of the VESCP and the VSMP, the administrator or any duly authorized agent of the County may:

- A. *To obtain information or conduct surveys.* At reasonable times and under reasonable circumstances, enter any establishment or upon any property, public or private, for the purpose of obtaining information or conducting surveys. If the purpose to enter the site is to conduct an inspection to either administer or enforce this chapter, the administrator or any duly authorized agent of the County shall comply with sections 17-810 or 17-811.
- B. *In accordance with an agreement with surety.* In accordance with an agreement with surety provided by the owner under section 17-414, enter any establishment or upon any property, public or private, for the purpose of initiating or maintaining appropriate conservation actions that are required by the approved plan or any condition of the VSMP permit associated with a land disturbing activity when the owner, after proper notice, has failed to take acceptable conservation actions within the time specified.

(Ord. 14-17(1), 5-7-14, effective 7-1-14)

State law reference – Va. Code §§ 62.1-44.15:39, 62.1-44.15:60.

Sec. 17-810 Inspections by the administrator under the VESCP.

In conjunction with the administration of the VESCP, the administrator shall inspect all land disturbing activity as follows:

- A. *Notice of inspection.* The administrator shall provide either prior written or verbal notice of the inspection to the owner or other person responsible for carrying out the erosion and sediment control plan; provided that notice shall not be required if the owner has consented to the inspection in writing or granted a written right of entry. The administrator may request that an owner consent to inspections on the application form or make owner consent a condition of the erosion and sediment control plan approval.
- B. *Who may conduct inspection.* Any inspection shall be conducted by a person holding a certificate of competence as an inspector; provided that the administrator may waive the certificate of competence requirement for an inspection of land disturbing activity authorized by an agreement in lieu of a plan for the construction of a single-family dwelling.
- C. *Scope of inspection.* The inspection shall be conducted for the purpose of determining the land disturbing activity's compliance with the approved erosion and sediment control plan.
- D. *When inspections conducted.* Unless an alternative inspection program is approved by the State Water Control Board, inspections shall be conducted during or immediately following initial installation of erosion and sediment controls, at least once in every two-week period, within forty-eight (48) hours after any runoff producing storm event, and at the completion of the project prior to the release of any surety.

(§ 7-6, 6-18-75, § 8, 2-11-76, 4-21-76, 2-11-87, 3-18-92; § 19.3-20, 2-11-98; Code 1988, §§ 7-6, 19.3-20; § 17-212, Ord. 98-A(1), 8-5-98; Ord. 08-17(3), 8-6-08; § 17-810, Ord. 14-17(1), 5-7-14, effective 7-1-14)

State law reference – Va. Code § 62.1-44.15:53, 62.1-44.15:58; 9VAC25-840-60.

Sec. 17-811 Inspections by the administrator under the VSMP.

In conjunction with the administration of the VSMP, the administrator shall inspect all land disturbing activity as follows:

- A. *During construction.* The administrator shall inspect all land disturbing activity during construction as follows:
 - 1. *Notice of inspection.* The administrator shall provide either prior written or verbal notice of the inspection to the owner or other person responsible for carrying out the VSMP permit; provided that notice shall not be required if the owner has consented to the inspection in writing or granted a written right of entry. The administrator may request that an owner consent to inspections on the application form or make owner consent a condition of VSMP permit approval.
 - 2. *Who may conduct inspection.* Any inspection shall be conducted by a person holding a certificate of competence as an inspector
 - 3. *Scope of inspection.* The inspection shall be conducted for the purpose of determining the land disturbing activity's compliance with: (i) the approved erosion and sediment control plan; (ii) compliance with the approved stormwater management plan; (iii) development, updating, and implementation of a pollution prevention plan; and (iv) development and implementation of any additional control measures necessary to address a TMDL.

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4. *When inspections conducted.* Unless an alternative inspection program is approved by the State Water Control Board, inspections shall be conducted at least once per month until the adequate stabilization of the land disturbing activity has been achieved, and at the completion of the project prior to the release of any performance bonds.
- B. *Post-construction.* The administrator shall inspect all stormwater management facilities at least once every five (5) years, including facilities for which there is no long-term maintenance agreement or those serving an individual residential lot, after the land disturbing activity has ended. If the owner and the County have entered into an agreement as provided in section 17-415, any inspection shall be conducted as provided in that agreement. If the owner and the County have not entered into an agreement under section 17-415, any inspection shall be completed as follows:
1. *Notice of inspection.* The administrator shall provide either prior written or verbal notice of the inspection to the owner; provided that notice shall not be required if the owner has consented to the inspection in writing or granted a written right of entry.
 2. *Who may conduct inspection.* Any inspection shall be conducted by a person holding a certificate of competence as an inspector, other than the owner, provided that the administrator may, in his sole discretion, use the inspection report of the owner of the stormwater management facility as part of the facility's inspection program if the inspection is conducted by a person who is: (i) licensed as a professional engineer, architect, landscape architect, or land surveyor pursuant to Virginia Code § 54.1-400 *et seq.*; (ii) a person who works under the direction and oversight of the licensed professional engineer, architect, landscape architect, or land surveyor; or (iii) a person who holds an appropriate certificate of competence.
 3. *Scope of inspection.* The inspection shall be conducted for the purpose of determining the condition of the stormwater management facility.
 4. *When inspections conducted.* Inspections shall be conducted for each stormwater management facility at least once every five (5) years or more frequently as provided in the County's MS4 permit. For any other stormwater management facility, the timing of the inspection shall be in the discretion of the administrator.

(§ 19.3-48, 2-11-98; § 19.1-9, 9-29-77, art. III, § 4, 10-19-77, 7-11-90; Code 1988, §§ 19.1-9, 19.3-48; § 17-324, Ord. 98-A(1), 6-17-98; § 17-811, Ord. 14-17(1), 5-7-14, effective 7-1-14)

State law reference – Va. Code § 62.1-44.15:37; 9VAC25-870-114.

Sec. 17-812 Inspections by the administrator under the VPDES and of storm drainage channels and natural streams.

The administrator shall inspect, in the manner authorized by law, storm drainage systems and natural streams to determine compliance with an applicable general permit and to detect illicit discharges, illicit connections and dumping. At the written or oral request of the administrator, any owner shall promptly remove any temporary or permanent obstruction to safe and easy access to the permitted facility to be inspected, sampled, or both, and the obstructions shall not be replaced. The costs of removing such obstructions shall be borne by the owner.

(§ 17-505, Ord. 07-17(1), 2-14-07; § 17-812, Ord. 14-17(1), 5-7-14, effective 7-1-14)

State law reference – Va. Code §§ 62.1-44.15:27, 62.1-44.15:33, 62.1-44.15:39, 62.1-44.15:40.

Sec 17-813 Monitoring and sampling equipment by the administrator on VPDES permitted facilities.

The administrator is authorized, either under a condition of the VSMP permit, with the owner's consent, or by court order: (i) to establish on any permitted facility any device deemed to be necessary by the

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administrator to conduct monitoring, sampling, or both, of the facility's stormwater discharge; and (ii) to require the owner to install monitoring equipment deemed to be necessary by the administrator. The facility's sampling and monitoring equipment shall be maintained at all times in a safe and proper operating condition by the owner at its own expense. All devices used to measure stormwater flow and quality shall be calibrated to ensure their accuracy.

(§ 17-505, Ord. 07-17(1), 2-14-07; § 17-813, Ord. 14-17(1), 5-7-14, effective 7-1-14)

State law reference – Va. Code §§ 62.1-44.15:48, 62.1-44.15:49; 9VAC25-870-116, 9VAC25-870-460.

Sec. 17-814 Third party complaints regarding impacts from land disturbing activities.

An aggrieved landowner sustaining pecuniary damage resulting from a violation of an erosion and sediment control plan or a required permit, or from the conduct of land disturbing activities commenced without an approved erosion and sediment control plan or a required permit under the VESCP, may provide written notice of the alleged violation to the administrator and to the director of the Virginia Department of Environmental Quality. If an investigation determines that a violation exists, but the administrator has not responded to the alleged violation in a manner that causes the violation to cease and abates the damage to the aggrieved owner's lands within thirty (30) days following receipt of the notice from the aggrieved owner, the aggrieved owner may pursue the remedies available under Virginia Code § 62.1-44.15:64.

(Ord. 14-17(1), 5-7-14, effective 7-1-14)

State law reference – Va. Code § 62.1-44.15:64.

ARTICLE IX. ENFORCEMENT

Sec. 17-900 Notice to comply.

If, after an inspection, the administrator determines that the owner has failed to comply with any requirement of this chapter:

- A. *Notice to owner or other person responsible.* The administrator shall provide written notice to the owner and any other person responsible for carrying out the terms of the permit, plan or any other applicable requirement of this chapter.
- B. *Contents of notice.* The notice shall specify the measures needed to comply with the permit, plan or other applicable requirement of this chapter, and shall specify the time within which such measures shall be completed.
- C. *How notice delivered.* The notice shall be mailed by certified mail, with confirmation of delivery, to the address specified in the permit application, the plan certification, or, if the owner and the County have entered into an agreement as provided in section 17-415, to the address specified therein, or to another address provided by the owner to administrator in writing, or by personal delivery at the site of the land disturbing or development activities to the agent or employee.

(§ 17-213: § 7-6, 6-18-75, § 8, 2-11-76, 4-21-76, 2-11-87, 3-18-92; § 19.3-21, 2-11-98; Code 1988, §§ 7-6, 19.3-21; § 17-213, Ord. 98-A(1), 8-5-98); § 17-325: § 19.3-49, 2-11-98; § 19.1-9, 9-29-77, art. III, § 4, 10-19-77, 7-11-90; Code 1988, §§ 19.1-9, 19.3-49; § 17-325, Ord. 98-A(1), 8-5-98; § 17-900, Ord. 14-17(1), 5-7-14, effective 7-1-14)

State law reference – Va. Code §§ 62.1-44.15:37, 62.1-44.15:58; 9VAC25-870-116.

Sec. 17-901 Failure to comply with notice; revocation, order to stop work, enforcement.

Upon the owner's or any other responsible person's failure to comply with the permit, plan or other applicable requirement within the time specified in the notice provided under section 17-900, one or more of the following actions may be taken:

- A. *Revocation.* The County or the administrator may revoke any permit issued in conjunction with the land disturbing activity.
- B. *Order to stop work.* The administrator may issue a stop work order as provided in section 17-902.
- C. *Enforcement.* The administrator may pursue enforcement as provided in sections 17-903 and 17-904 as applicable.

(§ 17-213: § 7-6, 6-18-75, § 8, 2-11-76, 4-21-76, 2-11-87, 3-18-92; § 19.3-21, 2-11-98; Code 1988, §§ 7-6, 19.3-21; § 17-213, Ord. 98-A(1), 8-5-98); § 17-325: § 19.3-49, 2-11-98; § 19.1-9, 9-29-77, art. III, § 4, 10-19-77, 7-11-90; Code 1988, §§ 19.1-9, 19.3-49; § 17-325, Ord. 98-A(1), 8-5-98; § 17-901, Ord. 14-17(1), 5-7-14, effective 7-1-14)

State law reference – Va. Code §§ 62.1-44.15:37, 62.1-44.15:58.

Sec. 17-902 Stop work orders; procedure.

The administrator is authorized to issue stop work orders as follows:

- A. *When stop work order may be issued.* A stop work order may be issued after a notice to comply under section 17-901 has been issued when the owner has not timely satisfactorily addressed the noncompliance identified in the notice to comply; provided that:
 - 1. *Emergency stop work order; erosion and sediment control; notice to comply not prerequisite.* A notice to comply is not required before an emergency stop work order may be issued if: (i) the alleged noncompliance is causing or is in imminent danger of causing harmful erosion of lands or sediment deposition in waters within the watersheds of the State; or (ii) the land disturbing activity commenced without an approved erosion and sediment control plan or any required permits.
 - 2. *Emergency stop work order; stormwater management; notice to comply not prerequisite.* A notice to comply is not required before an emergency stop work order may be issued if the administrator finds that any violation of the VSMP permit is grossly affecting or presents an imminent and substantial danger of causing harmful erosion of lands or sediment deposition in waters within the watersheds of the State or otherwise substantially impacting water quality.
- B. *Contents of the stop work order.* The stop work order shall order the owner to stop all land disturbing activity on the site until all of the specified corrective measures have been taken to the satisfaction of the administrator, until any violation of the permit, plan or other applicable requirement of this chapter is determined by the administrator to have abated, or that any required plan or permit be obtained from the administrator, or any combination thereof; provided that any emergency stop work order to be issued under subsection (A)(1) or (A)(2) also shall direct the owner to cease immediately all land disturbing activity on the site and inform the owner of the date, time and location of a hearing before the administrator under subsection (F), at which time the administrator may affirm, modify, amend, or cancel the emergency stop work order.
- C. *How stop work order delivered.* The stop work order shall be delivered as follows:

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1. *Noncompliance with VSMP permit or erosion and sediment control plan.* If the alleged violation is the owner's noncompliance with the VSMP permit or the erosion and sediment control plan, the stop work order shall be mailed by certified mail, with confirmation of delivery, to the address specified in the permit application or the plan certification, or by personal delivery at the site of the land disturbing activity or development activity to the agent or employee.
 2. *Land disturbing activity without a VSMP permit or erosion and sediment control plan.* If the alleged violation is the owner engaging in land disturbing activity without either a VSMP permit or an approved erosion and sediment control plan, the stop work order shall be mailed by certified mail, with confirmation of delivery, to the address specified in the land records of the County, and shall be posted on the site where the land disturbing activity is occurring.
- D. *Duration of order.* A stop work order shall remain in effect for the following periods:
1. *Noncompliance with VSMP permit or erosion and sediment control plan.* If the alleged violation is the owner's noncompliance with the VSMP permit or the approved erosion and sediment control plan, the stop work order shall remain in effect for seven (7) days after the date of service pending application by the County or the alleged violator to the circuit court for appropriate relief.
 2. *Land disturbing activity without a VSMP permit or erosion and sediment control plan.* If the alleged violation is the owner engaging in land disturbing activity without either a VSMP permit or an approved erosion and sediment control plan, the stop work order shall remain in effect until all required permits and plans are obtained from the administrator, subject to the additional procedures and requirements in subsection (E).
- E. *Subsequent order and service; land disturbing activity without a VSMP permit or an erosion and sediment control plan; failure to obtain approval within 7 days.* If the alleged violation is the owner engaging in land disturbing activity without either a VSMP permit or an approved erosion and sediment control plan, and the owner has submitted a permit application or a plan but has not obtained approval within seven (7) days after the date of service of the stop work order, the administrator may issue a subsequent order to the owner requiring that all construction and other work on the site, other than corrective measures, be stopped until approval of the required permits or plans is obtained. The subsequent order shall be served upon the owner by certified mail, with confirmation of delivery, to the address specified in the permit application or the land records of the County.
- F. *Administrative hearing on emergency stop work order.* Within a reasonable time after the issuance of an emergency stop work order under subsection (A)(1) or (A)(2), the administrator shall conduct a hearing at which time the owner may respond to the order, explain the corrective measures taken, if any, raise any defenses, if any, and present any other relevant and material information. Upon conclusion of the hearing, the administrator may affirm, modify, amend, or cancel the emergency stop work order. A hearing is not required if the owner does not appear and does not submit any information in writing. Nothing in this subsection compels the owner to participate in a hearing.
- G. *Right to appeal.* The owner may appeal the issuance of any order under subsection (A) or (E) to the circuit court; provided that the owner shall have no right to appeal an order issued under subsection (A)(1) or (A)(2) unless the owner participated in the administrative hearing provided under subsection (F).
- H. *Authority to enforce order.* The County may enforce any order issued by the administrator under subsections (A) and (E) in an action seeking injunctive relief, mandamus, or any other appropriate remedy.

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- I. *Compliance; lifting order.* Any order issued by the administrator under subsections (A) and (E) shall be immediately lifted when the corrective measures have been completed and approved by the administrator, or when all required permits or plans are obtained from the administrator, or when the administrator determines that the requirements of this chapter have been satisfied; provided that nothing in this section prevents the County or the administrator from pursuing any other action or seeking any other remedy in the enforcement of this chapter.

(§ 17-214: § 7-6, 6-18-75, § 8, 2-11-76, 4-21-76, 2-11-87, 3-18-92; § 19.3-22, 2-11-98; Code 1988, §§ 7-6, 19.3-22; § 17-214, Ord. 98-A(1), 8-5-98); § 17-325: § 19.3-49, 2-11-98; § 19.1-9, 9-29-77, art. III, § 4, 10-19-77, 7-11-90; Code 1988, §§ 19.1-9, 19.3-49; § 17-325, Ord. 98-A(1), 8-5-98; § 17-902, Ord. 14-17(1), 5-7-14, effective 7-1-14)

State law reference – Va. Code §§ 62.1-44.15:37, 62.1-44.15:42, 62.1-44.15:58; 9VAC25-870-116.

Sec. 17-903 Remedies under the VESCP.

The following shall apply to the enforcement of the VESCP:

- A. *Violations subject to this section.* The County may seek the remedies provided in this section against any person who commence land disturbing activity without an approved erosion and sediment control plan or who violates, fails, neglects, or refuses to obey any applicable State statute or regulation or any County regulation pertaining to the VESCP, the approved erosion and sediment control plan for the land disturbing activity or any condition thereof, any permit or condition issued by the County as a result of the approved erosion and sediment control plan, any stop work order, and any emergency stop work order.
- B. *Civil penalties.* The County may seek civil penalties as follows:
1. *Procedure.* Proceedings seeking civil penalties for any violation delineated in subsection (A) shall commence by filing a civil summons in the general district court.
 2. *Amount of civil penalty.* Any violation shall be subject to a civil penalty of five hundred dollars (\$500.00) for the initial summons, and a civil penalty of one thousand dollars (\$1000.00) for each additional summons arising from the same set of operative facts; provided that if the violation arises from commencing land disturbing activities without an approved plan, the violation shall be subject to a civil penalty of one thousand dollars (\$1,000.00) for the initial and each subsequent summons.
 3. *Maximum aggregate civil penalty.* The total civil penalties from a series of violations arising from the same set of operative facts shall not exceed ten thousand dollars (\$10,000.00).
 4. *Each day a separate offense.* Each day during which a violation is found to exist shall be a separate offense.
 5. *Option to prepay civil penalty and waive trial.* Any person summoned for a violation under this subsection may elect to pay the civil penalty by making an appearance in person or in writing by mail to the County's department of finance prior to the date fixed for trial in court. A person so appearing may enter a waiver of trial, admit liability, and pay the civil penalty established for the offense charged. A signature to an admission of liability shall have the same force and effect as a judgment of court. However, such an admission shall not be deemed a criminal conviction for any purpose. If a person charged with a violation does not elect to enter a waiver of trial and admit liability, the violation shall be tried in the general district court in the same manner and with the same right of appeal as provided by law. A finding of liability shall not be deemed a criminal conviction for any purpose.

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6. *Civil penalties are in lieu of criminal penalties.* A violation enforced under this subsection shall be in lieu of any criminal penalty.
7. *Civil penalties; use.* Civil penalties shall be paid into the treasury of the County.
- C. *Civil charges.* In lieu of the civil penalties sought under subsection (B) and with the consent of any person who has committed a violation described in subsection (A), the administrator may provide, in an order he issues against the person, for the payment of civil charges for violations in a specific sum, not to exceed the limits specified in subsections (B)(3) and (B)(4). Civil charges shall be paid into the treasury of the County.
- D. *Injunctive relief.* Any violation, or the threat of any violation, described in subsection (A), may be enforced in a proceeding brought by the County seeking injunctive relief without the necessity of showing that an adequate remedy at law does not exist.
- E. *Other remedy.* Without limiting the remedies that may be obtained in this section, any person violating or failing, neglecting, or refusing to obey any injunction, mandamus, or other remedy obtained pursuant to this section shall be subject, in the discretion of the court, to a civil penalty not to exceed two thousand dollars (\$2,000.00) for each violation.
- F. *Violation of agreement in lieu of plan; additional information.* If a violation occurs during the land disturbing activity authorized under an agreement in lieu of a plan, then the person responsible for carrying out the agreement in lieu of a plan shall correct the violation and provide the name of a person holding a certificate of competence.

(§ 7-8, 6-18-75, § 10, 2-11-87, 3-18-92; § 19.3-23, 2-11-98; Code 1988, §§ 7-8, 19.3-23; § 17-215, Ord. 98-A(1), 7-15-98; § 17-903, Ord. 14-17(1), 5-7-14, effective 7-1-14)

State law reference – Va. Code §§ 62.1-44.15:54, 62.1-44.15:55, 62.1-44.15:63.

Sec. 17-904 Remedies under the VSMP.

The following shall apply to the enforcement of the VSMP:

- A. *Violations subject to this section.* The County may seek the remedies provided in this section against any person who: (i) violates or fails, neglects or refuses to obey any applicable State statute or regulation or any County regulation pertaining to the VSMP, including any regulation, standard or condition adopted pursuant to the conditions of the County's MS4 permit, including discharging stormwater into State waters from the County's MS4, or from land disturbing activities, except in compliance with a general permit issued by the State Water Control Board pursuant to the Virginia Stormwater Management Act; (ii) engages in or allows any illicit discharge, illicit connection, or dumping; (iii) fails, neglects, or refuses to comply with any order of the administrator, including, but not limited to, any order to maintain a stormwater management facility; (iv) violates, fails, neglects, or refuses to obey any injunction, mandamus, or other remedy obtained pursuant to this section.
- B. *Civil penalties.* The County may seek civil penalties as follows:
 1. *Procedure.* Proceedings seeking civil penalties for any violation delineated in subsection (A) shall commence by filing a civil summons in the appropriate court.
 2. *Amount of civil penalty.* Any violation shall be subject to a civil penalty of up to thirty-two thousand five hundred dollars (\$32,500.00) for each violation, in the discretion of the court. The amount of the penalty should reflect the degree of harm caused by the violation and take into account the economic benefit to the violator from noncompliance.

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3. *Each day a separate offense.* Each day during which a violation is found to exist shall be a separate offense.
 4. *Civil penalties; use.* Civil penalties shall be paid into the treasury of the County and are to be used for the purpose of minimizing, preventing, managing, or mitigating pollution of the waters of the County and abating environmental pollution in the County therein in such a manner as the court may, by order, direct.
- C. *Civil charges.* In lieu of the civil penalties sought under subsection (B) and with the consent of any person who has committed a violation described in subsection (A), the administrator may provide, in an order he issues against the person, for the payment of civil charges for violations in a specific sum, not to exceed the limits specified in subsection (B)(2). Civil charges shall be paid into the treasury of the County.
- D. *Criminal penalties.* Any person who willfully and knowingly violates any provision of the VSMP regulations in this chapter is guilty of a Class 1 misdemeanor. Criminal penalties shall not be available as a remedy for a violation of subsection (A)(iii).
- E. *Injunctive relief.* Any violation, or the threat of any violation, described in subsection (A), may be enforced in a proceeding brought by the County seeking injunctive relief without the necessity of showing that an adequate remedy at law does not exist.
- F. *Use of offsite nutrient credits.* To the extent available and with the consent of the applicant, the administrator may include the use of nutrient credits or other offsite measures in resolving enforcement actions to compensate for: (i) nutrient control deficiencies occurring during the period of noncompliance; and (ii) permanent nutrient control deficiencies.

(§ 17-326: § 19.3-50, 2-11-98; § 19.1-10, 9-29-77, art. III, 4-13-88, 7-11-90, § 19.2-15, 6-19-91, § 15; Code 1988, §§ 19.1-10, 19.2-15, 19.3-50; § 17-326, Ord. 98-A(1), 8-5-98) (§ 17-507: Ord. 07-17(1), 2-14-07; § 17-904, Ord. 14-17(1), 5-7-14, effective 7-1-14)

State law reference – Va. Code §§ 62.1-44.15:35, 62.1-44.15:42, 62.1-44.15:48, 62.1-44.15:49; 9VAC25-870-116, 9VAC15-870-310.

Sec. 17-905 Enforcement of general permits and other State permits.

Any general permit or other State-issued permit shall be enforced by the State, including but not limited to the State Water Control Board and the Virginia Department of Environmental Quality, rather than by the County or the administrator.

(Ord. 14-17(1), 5-7-14, effective 7-1-14)

State law reference – Va. Code § 62.1-44.15:27.

ARTICLE X. GROUNDWATER ASSESSMENTS

Sec. 17-1000 Applicability.

This article shall apply to the establishment of land uses that will rely on privately owned wells serving as the primary source of potable water and having not more than two (2) connections (hereinafter, “individual wells”) or central water supplies, as defined in Albemarle County Code § 16-101. The applicable requirements of this article are determined by the development approval sought by the owner and the land uses within the development, as follows:

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Development Approval and Timing of Submittal for Required Assessment	Assessment Required
Prior to the issuance of a building permit for a new structure on a lot of record less than twenty-one acres in size existing prior to the effective date of this article that will be served by one or more individual wells	Tier 1
Prior to the issuance of a building permit for a new structure: (1) on a lot of record created after February 8, 2005 that is subject to a Tier 2 or Tier 3 assessment that will be served by one or more individual wells; or (2) associated with a use that is subject to a Tier 3 or Tier 4 assessment that will be served by one or more individual wells	Tier 1
Prior to approval of a preliminary subdivision plat creating lots of less than twenty-one acres that will be served by individual wells	Tier 2
Prior to approval of a preliminary subdivision plat creating four or more lots where at least three lots are five acres or less	Tier 3
Prior to approval of an initial site plan for a new nonresidential or nonagricultural use using less than 2,000 gallons/day (average)	Tier 3
Prior to approval of an initial site plan for a new nonresidential or nonagricultural use using more than 2,000 gallons/day (average)	Tier 4
Prior to approval of any central water supply under chapter 16 of the Albemarle County Code	Tier 4

The administrator may require that development approvals subject to Tier 2 or Tier 3 assessments be subject to Tier 3 or Tier 4 assessments, respectively, as provided in sections 17-1002 and 17-1003.

If an owner submits a final subdivision plat or site plan without first submitting and obtaining approval of a preliminary subdivision plat or an initial site plan, the assessment required by section 17-1002 shall begin upon submittal of the final subdivision plat or site plan, and the assessment required by sections 17-1003 or 17-1004 shall be submitted by the owner with the final subdivision plat or site plan.

(§ 17-400, Ord. 04-17(1), 12-8-04, effective 2-8-05; § 17-1000, Ord. 14-17(1), 5-7-14, effective 7-1-14)

Sec. 17-1001 Tier 1 assessments.

A Tier 1 assessment shall consist of the owner drilling a well on the lot and submitting the following information to the program authority: (i) a Virginia well drilling completion report (form GW-2) for each well drilled; and (ii) the latitude and longitude coordinates of each well's location. The information submitted must be accepted as complete and accurate by the administrator prior to issuance of the building permit.

(§ 17-401, Ord. 04-17(1), 12-8-04, effective 2-8-05; § 17-1001, Ord. 14-17(1), 5-7-14, effective 7-1-14)

Sec. 17-1002 Tier 2 assessments.

A Tier 2 assessment shall consist of the program authority reviewing and evaluating the county's well database, available hydrogeologic studies, and information from the Virginia Department of Health and the Virginia Department of Environmental Quality, as provided in the Design Standards Manual. Based on this evaluation, the administrator may require that the owner provide additional groundwater assessment data prior to subdivision plat or site plan approval, or may require that a Tier 3 assessment be submitted.

(§ 17-402, Ord. 04-17(1), 12-8-04, effective 2-8-05; Ord. 07-17(1), 2-14-07; § 17-1002, Ord. 14-17(1), 5-7-14, effective 7-1-14)

Sec. 17-1003 Tier 3 assessments.

A Tier 3 assessment shall consist of the following:

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- A. *Draft groundwater management plan.* The owner shall submit a draft groundwater management plan with the preliminary plat or the initial site plan. The groundwater management plan shall comply with the requirements for such plans in the Design Standards Manual. If the groundwater management plan identifies special areas of concern, such as an off-site resource of high groundwater sensitivity or a previously unknown source of contamination, then the administrator may require additional groundwater assessment data prior to preliminary subdivision plat or site plan approval.
- B. *Final groundwater management plan.* The owner shall submit a final groundwater management plan that must be approved by the administrator prior to approval of the final plat or site plan.
- C. *Surety.* Any structural best management practices shall be bonded as a subdivision plat or site plan improvement.

The administrator may require that a Tier 4 assessment be submitted instead of a Tier 3 assessment if the special areas of concern identified in subsection (A) have not been adequately addressed by the additional groundwater assessment data.

(§17-403, Ord. 04-17(1), 12-8-04, effective 2-8-05; Ord. 07-17(1), 2-14-07; § 17-1003, Ord. 14-17(1), 5-7-14, effective 7-1-14)

Sec. 17-1004 Tier 4 assessments.

A Tier 4 assessment shall consist of the following:

- A. *Draft groundwater management plan; aquifer testing workplan.* The owner shall submit a draft groundwater management plan and an aquifer testing workplan complying with the requirements for these plans in the Design Standards Manual, with the preliminary plat, initial site plan, or the application for a central water supply. The groundwater management plan must demonstrate to the administrator's satisfaction that the site's groundwater conditions have been considered with the subdivision or site plan's layout and design. The aquifer testing workplan must be approved by the program authority before the owner may conduct aquifer testing as required by subsection (B).
- B. *Aquifer testing workplan.* After the program authority approves the aquifer testing workplan, the owner shall conduct aquifer testing as provided in the workplan.
- C. *Final groundwater management plan; groundwater assessment report.* The owner shall submit a final groundwater management plan and a groundwater assessment report complying with the requirements for the report in the Design Standards Manual, based upon the results of the aquifer testing. The final groundwater management plan and the groundwater assessment report must be approved by the administrator prior to final subdivision plat or site plan approval.
- D. *Surety.* Any structural best management practices shall be bonded as a subdivision plat or site plan improvement.

(§17-404, Ord. 04-17(1), 12-8-04, effective 2-8-05; Ord. 07-17(1), 2-14-07; § 17-1004, Ord. 14-17(1), 5-7-14, effective 7-1-14)

Sec. 17-1005 Fees.

Each owner seeking approval of a tier assessment required by this article shall pay a fee as provided by Albemarle County Code § 18-35.1 and Albemarle County Code § 14-203, as applicable.

(§17-405, Ord. 04-17(1), 12-8-04, effective 2-8-05; § 17-1005, Ord. 14-17(1), 5-7-14, effective 7-1-14)

State law reference--Va. Code §§ 15.2-2241(9), 36-98.



Albemarle County Design Standards Manual

Last updated: 2 Dec 2014



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I. Engineering; policies and procedures administered by the County Engineer and Program Authority.

1. General Provisions

A. Purpose and Intent: This is intended to be a current source for administrative policies of the county engineer, as provided for in the County Code. It is intended to be an on-line resource and supplement.

B. Administration: These policies are administered by the county engineer, or designee.

1. Amendments: This manual will be amended as needed to keep current with practice, and to address issues raised with development. Amendments will follow these steps:
 - a. Draft amendments will be posted on the county website.
 - b. Comments received on draft amendments will be posted on the website with responses.
 - d. Unless pulled off to address comments, draft amendments will become official changes after 30 days from the initial post.
2. Waivers or Exceptions: Waivers or exceptions for any of these administrative policies or procedures can be granted by the county engineer as allowed for in the ordinances.



2. Water and Wastewater

The county engineer is charged with review, inspection and recommendations to the Board of Supervisors for private water and wastewater systems in Chapter 16 of the County Code. The County Engineer is the Program Authority for the Water Protection Ordinance, Chapter 17 of the County Code, of which Article IV is Groundwater Assessments.

A. Public systems: Please refer to the Albemarle County Service Authority (www.acsanet.com), and Code Chapters 14, and 18.

B. Private central well and septic systems: County engineer review and inspection of private central water and sewer systems will be according to Chapter 16 of the County Code, and Chapter 14 section 415. Please see this chapter (16-103) for administrative details. A review and approval by ACSA may be requested, in addition to the required state approvals (Thomas Jefferson Health District, Virginia Department of Health, Virginia Department of Environmental Quality, etc.).

1. Central Well Testing: County engineer inspection of well tests (16-107) must follow these steps:
 - a. Prior to start of the test the following items will be provided
 1. Three copies of complete technical data on the test pump and motor and generator
 2. An all weather access road to the site
 3. Three copies of the applicant's proposed test schedule (48-hour or a 72-hour test. No tests inspections on weekends, holidays, or nights.)
 - b. During the pump test the following items must be complied with;
 1. The individual performing the testing must be qualified and familiar with the operation.
 2. A county engineering inspector must be present.
 3. Flow will be metered continually in gallons per minute directly.
 4. Water height will be continuously monitored and recorded.
 5. A tap or sample outlet for taking water samples will provided.
 6. When existing wells are within 300 feet of the well being tested, the existing wells will be pumped at their capacity throughout the duration of the test. In addition to the well being tested, the monitoring and recording of the water level in the existing wells is required during the pump test. Should one well be rated less than 25 G.P.M., and another rated greater than 25 G.P.M., both tests will be run continuously for 72 hours.
 7. Discharge will be adequately dissipated to prevent impacts to adjacent properties.
 8. A pump log will be kept in a format approved by the county inspector.
 9. During the last six hours of the test, flow and water level readings will be taken at a minimum interval of every fifteen minutes.
 10. Recovery data of the well will be recorded on the pump test log. Readings will be taken at ten-minute intervals or less, until the well has reached 90% recovery.



11. Significant interruption of the test, due to power failure, pump or meter malfunction, or other cause as determined by the county inspector, will void the test and require retest of the well from start.
- c. Upon completion of the pump test the following items must be provided;
 1. Two copies of the pump test log.
 2. Two copies of the well completion report after drilling and grouting.
 3. A copy of the well operations permit.
 4. Two copies of all water sample testing reports.
 5. Yield results of the well based on the monitored readings.

C. Individual private wells and septic systems, and other systems: These systems must meet the requirements of Code Chapters 14, 16 and 18, and the State Code.

D. Groundwater assessments: Article IV of the Water Protection Ordinance requires groundwater assessments. See section 17-400 for a table stating when assessments are required, and the Subdivision Ordinance section 14-308.1. Groundwater assessments are reviewed by the Program Authority or designee.

1. Tier 3 and 4 assessment requirements: (there are no requirements for Tier 1 and 2)
 - a. A report certified by a licensed geologist containing
 1. a graphics section or plans containing
 - a. topography with land and water features
 - b. proposed development
 - c. geological contacts and features
 - d. surrounding property 1000ft beyond property lines with wells and septic system locations
 - e. all potential and known contamination sources
 - f. graphic depiction of groundwater recharge areas and flow
 - g. any other relevant information
 2. A narrative containing
 - a. review of existing hydro-geologic information
 - b. field survey summary
 - c. review and analysis of graphic and plan information
 - d. groundwater management plan addressing practices during and after construction, in addition to a contingency plan if wells dry up or become contaminated.
 - e. assessment of well drilling and testing



3. Erosion and Sediment Control

The County Engineer is the designated Program Administrator for the erosion and sediment control program, as well as the Program Authority for the Water Protection Ordinance. Please reference the Virginia Department of Environmental Quality for the state program requirements.

A. Additional plan requirements: The County has some plan requirements beyond those contained in the state minimum standards and guidelines, such as details and notes. These are given in the review checklist.

B. Variances: Variance requests must be submitted in writing (letter or e-mail) to the county engineer. Please include the minimum standard, proposed alternate, and an explanation of the hardship or constraint that makes this necessary. Below are some variances that have been used in the past;

1. dry basins/traps: elimination of the wet storage in sediment basins and traps where safety is a major concern.
2. mud traps: use of wire reinforced silt fence with rock weirs to act as silt traps where space constraints cannot be overcome.

C. Exceptions: In order to claim an exception under code section 17-407 or 14-408 a landowner must complete and submit to the program administrator an Erosion and Sediment Control Screening Form For Land Disturbance, available in the forms center of the county website.

Ponds: It is possible for ponds to be an allowable use under section 17-301G (and 17-604B). However, in most cases, the agricultural exemption for constructing them without an erosion control plan and permit is no longer looked upon favorably. Section 17-304 requires a determination on whether an activity is subject to the regulation. Ponds, for the most part, are built on estates as an amenity, and therefore subject to the regulation. The environmentally preferred methods for watering crops or livestock are through wells, which are much cheaper to construct, less expensive to maintain properly, and preserve streams and wetlands.

D. Bonding: Bonds estimates for erosion control plans per 17-414 are handled in plan review by the review engineers. Inspections and bond reductions and releases are handled by the Erosion Control Officer and Inspectors, who are the county engineer's designees in this regard. The form of agreement and surety acceptable to the county engineer are handled administratively. See the Community Development Document Center on the county website.

E. Agreement in Lieu of Plan: An Agreement in Lieu of an Erosion and Sediment Control plan per 17-402 may be provided for single family residences which disturb less than 1 acre. These are processed with building permits. In the rural areas, a **Critical Resource Plan** is



required to accompany the agreement, which identifies critical slopes and stream buffers, and verifies the access requirements of the Zoning Ordinance. Critical resource plan requirements are available with building permit information, and on the county website document center.

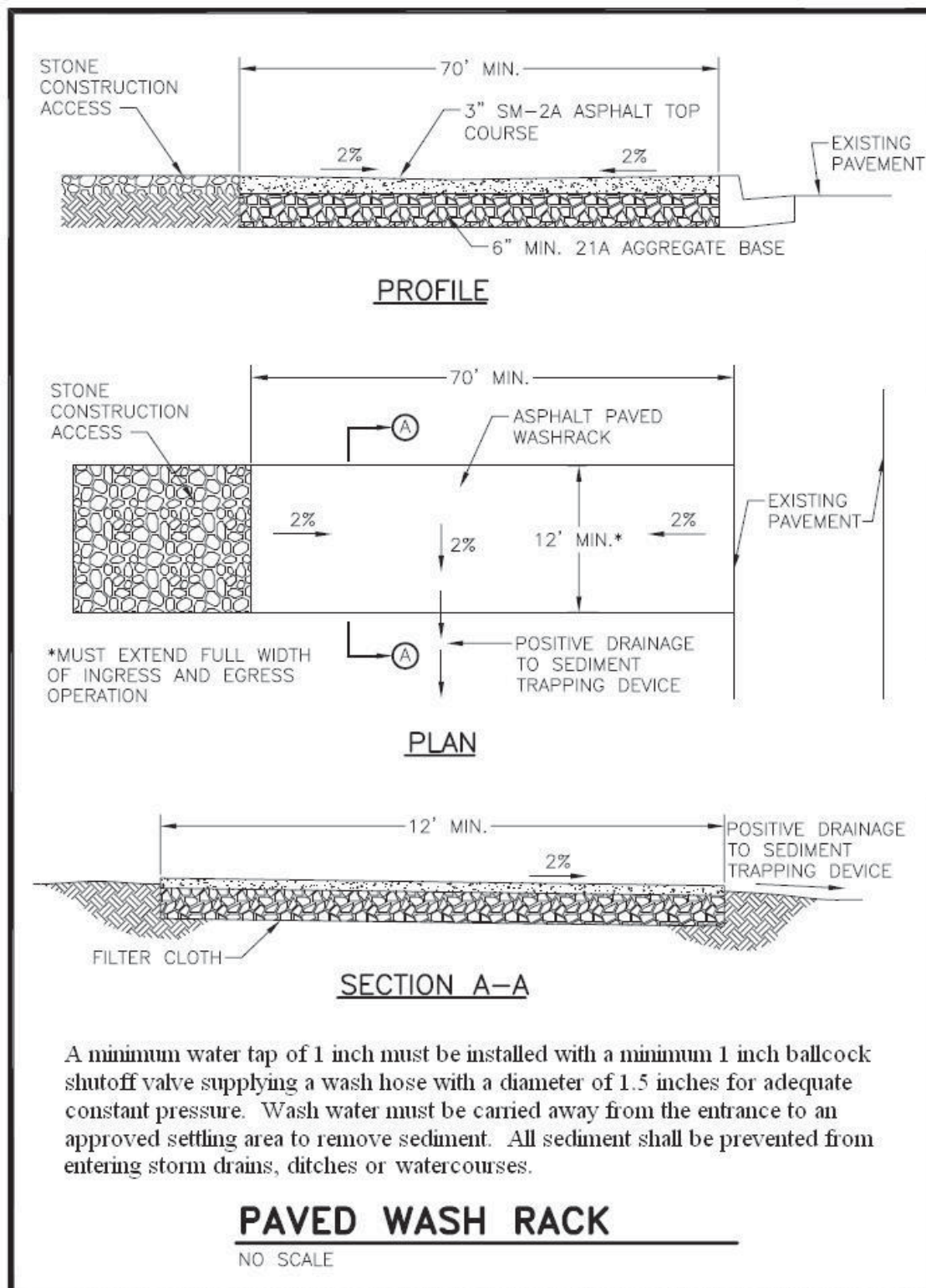
F. Adequate Channels: Where a demonstration of adequate channels is required by the state regulations;

A survey and evaluation of downstream channels is expected. This evaluation should provide as-built data. A demonstration of adequacy must include the following;

1. A plan view and/or aerial photograph depicting the system, along with the points studied.
2. For pipe systems, actual diameters, inverts, slopes, inlets, etc.
3. For channels, a contour map (if not on the plan view) with the channel longitudinal slope estimated, or field run topography to estimate the longitudinal slope.
4. A photo of each representative channel, inlet, or section at the points referenced in the plan view.
5. For channels, a detail or sketch and field measurements of the cross-sections in the photos, with bed, banks, etc, dimensioned.
6. Hydrology and a drainage area map for the system and points studied.
7. Hydraulic models for each point studied estimating the relative velocities in the channel, or capacity of the system. Roughness values and velocities should vary along a natural channel's width. For pipe systems, a pipe which does not flow within its open channel capacity will be considered inadequate.

For off-site improvements, permanent easements will be required.

F. Paved Wash Rack: The county requires paved wash racks on construction sites. This can be waived in rural areas on small jobs where water is not available and a stone construction entrance proves effective. A detail is provided;





4. Floodplain

The county engineer reviews impacts to the floodplain according to the Zoning Ordinance, section 30, and the Subdivision Ordinance section 14-308. In this regard, the plan review engineers of the Current Development division of Community Development are the designees of the county engineer.

Any development, including cut or fill, activity in the floodplain requires a Floodplain Development Permit. If there is a potential impact, then a special use permit may be required.

A. Special Use Permits for fill in the FEMA floodplain: special use permits, and landfill permits are subject to review by the county engineer according to Zoning Ordinance sections 18-30.3

1. Information required for review:
 - a. drainage area map.
 - b. plan drawing of the existing and proposed floodplain limits, and the extent of the fill in the floodplain.
 - c. actual measured cross-sections of the existing stream and banks
 - d. proposed cross-sections, including any pipes, culverts, bridges, etc. It is the County's preference that existing stream dimensions, bed and banks, be preserved where possible.
 - e. hydrologic computations for the drainage area. Flows should be computed and correlated to known FEMA data.
 - f. the limits of the floodway must be established by calculation and shown on the existing cross-sections.
 - g. hydraulic computations verifying the existing flood level, and computing the proposed, including any backwater affects at crossings.
2. If the limits of the floodplain change, a FEMA amendment or revision will be a condition of approval.

B. Non-FEMA areas: Subdivision Ordinance 14-308 and Zoning Ordinance 18-32.6.6 allow for the delineation of flood areas that drain 50 acres or more. In this case, items to be submitted with final subdivision or site plans are as listed above.



5. Stormwater Management and Water Quality

The county is a local Virginia Stormwater Management Program (VSMP) authority. The Program Administrator is the County Engineer. For information on the state program and local authority responsibilities, see the Department of Environmental Quality (DEQ) website; <http://www.deq.virginia.gov/Programs/Water.aspx>.

10,000 square feet: The county's threshold for permit requirements is 10,000 square feet of land disturbance. This is stricter than the state requirement, which is 1 acre for stormwater management. See 17-300.

Application and Templates; The county Water Protection Ordinance (WPO) application serves as the VSMP application. This application also serves for all amendments and revisions. Templates are also required for the Stormwater Pollution Prevention Plan (SWPPP) and Pollution Prevention Plan (PPP). See <http://www.albemarle.org/deptforms.asp?department=cdengwpo>.

Process: A summary of the process in flow chart form is contained on the following page. Please be aware the County only administers the state program. This means review and enforcement only of General Construction Permits for the Virginia Pollution Discharge Elimination System (VPDES). The county does not approve, or issue, or terminate permits. The state has retained the sole authority to issue and terminate permits. The County issues a separate grading permit to authorize land disturbance and construction, after all fees are paid, bonds posted, and the General Permit issued by DEQ.

9-Month Permanent Stabilization Deadline: The county has a 9-month deadline for installing permanent stabilization on a project. This is stricter than state minimum standards, which are based on the last grading activity. See section 17-808.

Late Fees: Late payment of inspection and permit maintenance fees will incur interest and enforcement actions per 17-210. After a Notice to Comply, if fees are not paid, the grading permit revoked, and a Stop Work Order will be issued

Fees Based on Permit Disturbed Acreage: Acreage for the purpose of fee computations will be the entire permitted acreage. This is the disturbed acreage on approved plans and applications. If fees are to be reduced, an application for plan amendment must be made, and areas reduced by changes in limits of disturbance and appropriate plan changes. Such amendments must be *approved* prior to the fee due date. Amendments to remove disturbed areas can only be approved when such areas are completely stabilized and all erosion control measures (including traps and basins) removed.



Refunds: The County does not have a refund program. Fees will not be refunded based on completion within the year. Fees will not be pro-rated at payment, other than the first year VSMP fee as indicated in code section 17-209B.

Re-inspection Fees: Re-Inspection Fees will be charged for inspections following a Notice to Comply or a Stop Work Order. Fees are \$250 per inspection, or as given in code sections 17-207 and 17-208.

Best Management Practices for Stormwater Management: All practices must have adequate vehicle access; 10' width graded at less than 20%. Anything over 20% must be surfaced with gravel or pavement. Access must be to all structures and forebay cleanout areas. Easements must be provided over all access and facilities, to accompany deeds and agreements as available on the county website;

<http://www.albemarle.org/deptforms.asp?department=cdengwpo>

Some helpful links to DEQ information;

DEQ guidance; VRRM spreadsheets, grandfathering, technical bulletins:

<http://www.deq.virginia.gov/Programs/Water/Laws.Regulations.Guidance/Guidance/StormwaterManagementGuidance.aspx>

DEQ publications; stormwater manual:

<http://www.deq.virginia.gov/Programs/Water/StormwaterManagement/Publications.aspx>

BMP Clearinghouse; for stormwater BMP facility specifications:

<http://www.vwrrc.vt.edu/swc/>

State VSMP, VPDES, CGP Regulations;

<http://www.deq.virginia.gov/Programs/Water/Laws.Regulations.Guidance.aspx>

Albemarle County Regulations:

http://www.albemarle.org/upload/images/Forms_Center/Departments/County_Attorney/Forms/Albemarle_County_Code_Ch17_Water_Protection.pdf

DEQ Plan Review training; provides explanation of VRRM:

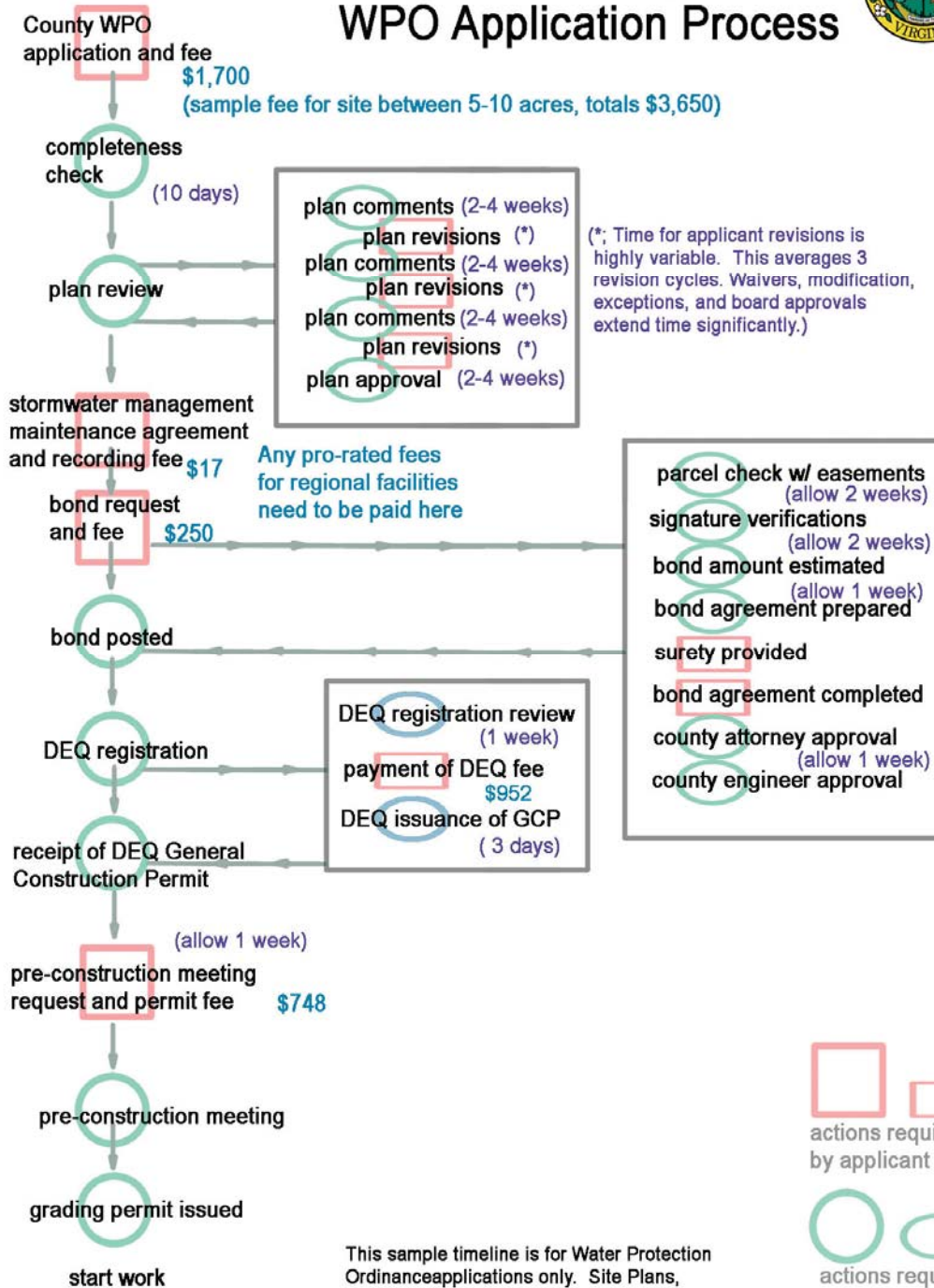
<http://www.deq.virginia.gov/ConnectWithDEQ/TrainingCertification/SWMTraining/PlanReviewerSWM.aspx>

DEQ Construction General Permit (CGP); Registration Statement, HUC codes, lat. and long:

<http://www.deq.virginia.gov/Programs/Water/StormwaterManagement/VSMPPermits/ConstructionGeneralPermit.aspx>



Albemarle County WPO Application Process



This sample timeline is for Water Protection Ordinance applications only. Site Plans, Subdivision Plats, Street Plans, Zoning Map Amendments, Special Use Permits, and other plans and processes which may affect reviews, approvals, or permits are not shown.

1 July 2014



6. Drainage systems (collection and conveyance)

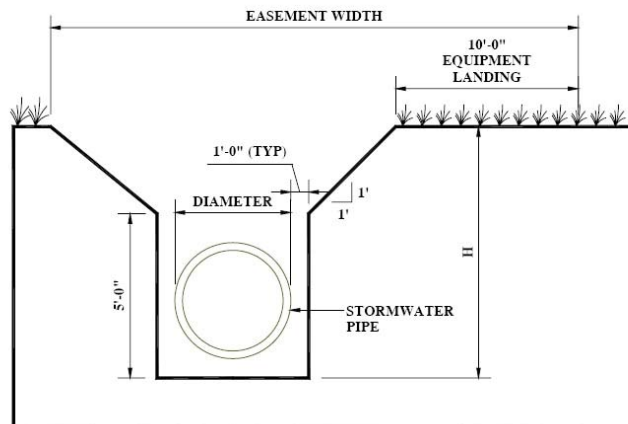
Drainage systems, or storm sewers, are reviewed by engineering reviewers at the county as part of the Site Review Committee. Refer to the Zoning Ordinance section 18-32 (which refers to a department of engineering and public works, now part of Community Development), and the Subdivision Ordinance sections 14-311, 14-417 and 14-431.

A. Plans: for plan requirements please refer to the review checklist at <http://www.albemarle.org/deptforms.asp?department=cdengwpo>.. For purposes of this design manual, the review checklist sets review policy, and is an integral part of the manual.

1. Design Guidelines; in general, designs must follow the VDOT Drainage Manual and the Road and Bridge Standards, with the following additional specific points; (see www.virginiadot.org/business/locdes)
 - a. overland flow relief must be provided to avoid flooding of structures
 - b. all pipes and drainage structures must be within open channel flow capacities. (no designed pressure flow)
 - c. for any drainage area over 20 acres, more than one hydrologic method must be used to verify flow rates.
 - d. public system designs are subject to additional criteria; A public system is defined here as one which carries water through the site from off-site, or from a public right-of-way or public property.
 1. minimum pipe sizes of 15 inch diameter.
 2. junction angles of 90 degrees or more
 3. provision of headwalls for pipe outlets over 48 inches, and ends sections for all others
 4. design velocities between 3 and 20 fps, with appropriate outlet protection
 5. maximum pipe slope of 16%
 6. drainage easements
2. Computations; all plans must be accompanied by computations, as indicated in the review checklist.
3. Drainage Easements (for public systems): drainage easements must be shown on final plats, and shown on site plans. For site plans, easement documents must be recorded prior to final approvals. Easements must include the following;
 - a. Locations on plats must be by centerline bearings or dimensions to property corners. Easement boundaries must be locatable in the field in case ditches or structures are incorrectly located.
 - b. Drainage easements must be dimensioned as indicated below and in the review checklist.



$$\text{EASEMENT WIDTH} = \text{DIAMETER} + 2' + 2 (H-5') + 10' \text{ (20' MIN.)}$$



- c. Drainage easements are to be labeled on plans and plats; “Drainage Easement” and “dedicated to public use”.
- d. Drainage easement plats must be accompanied by a deed. Standard deeds are provided by the Count Attorney, along with administrative guidelines. These are also available in the documents forms center of the county website;
<http://www.albemarle.org/deptforms.asp?department=cdengwpo>.



7. Streets, Alleys, Travelways, Parking, Sidewalks and Trails

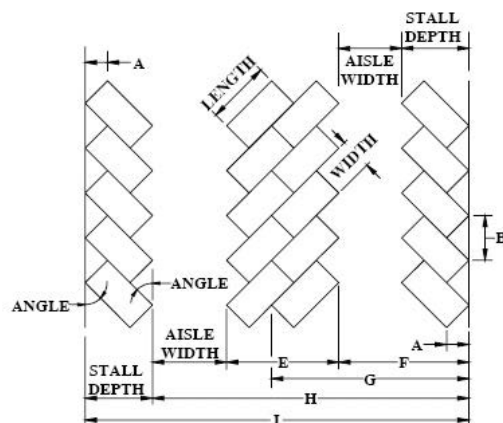
Streets, Alleys, Sidewalks, Travelways and Parking are reviewed by the county engineer as required by the Zoning and Subdivision Ordinances.

A. Design Plans: for plan requirements please refer to the review checklist, found at <http://www.albemarle.org/deptforms.asp?department=cdengwpo>.

B. Traffic studies: traffic studies (typically for rezoning applications) are to be prepared according to the VDOT Land Development Manual. For larger studies, applicants should schedule a scoping meeting with VDOT and the county.

C. Parking lots and travelways: These are subject to county engineer approval per 18-32.7.2.7. All design elements are expected to be to VDOT standards, including curb, gutter, pavement, striping, etc., unless an alternative is approved.

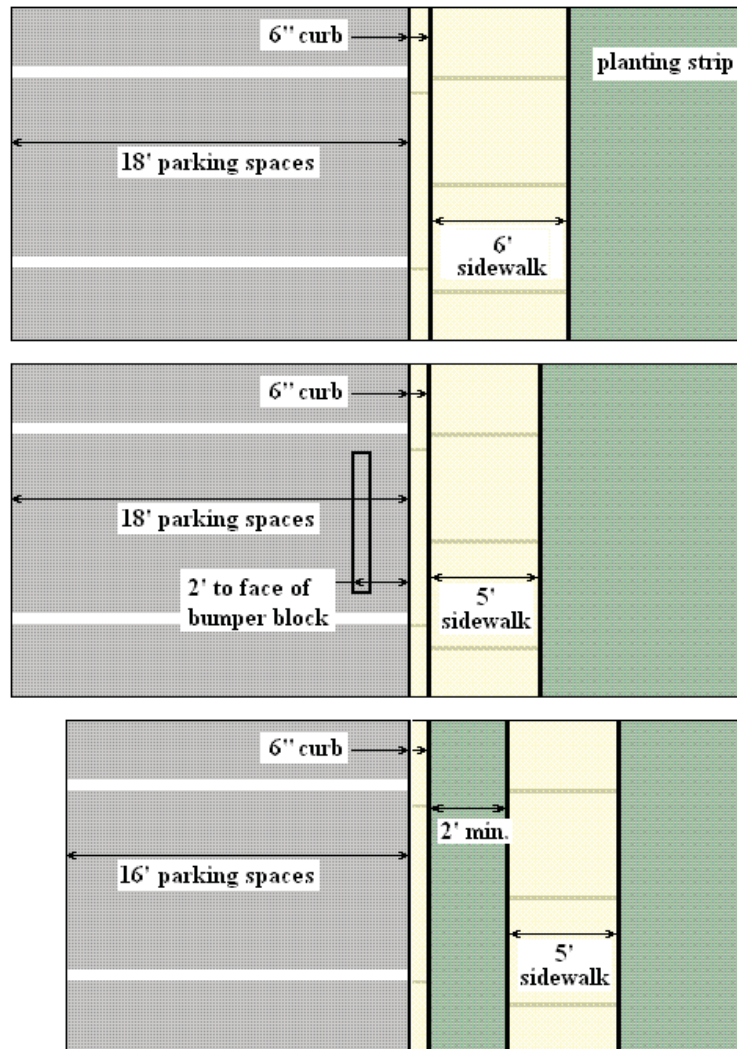
1. Sight distance: where the Zoning Ordinance refers to 100' sight distance (18-4.12.15.d), this is to be measured from a point in an intersection 10' off of the edge of pavement of the intersected travelway, to a point on the travelway centerline. A waiver to reduce this sight distance may be requested where all vehicles are required to stop, or between storage buildings where the travelways measure 30 feet in width. (This section is formerly design manual section 602 as referenced in 18-4.12.15.d)
 - a. For parking on the inside of a curved travelway, a minimum centerline radius of 120' is required to maintain sight distance
 - b. Private road standards will be requested (with profiles) per 18-4.12.15.d where travelways exceed 100 feet in length without parking.
2. Angled Parking: The following graphic serves to clarify the table contained in Zoning Ordinance section 18-4.12.16.c.3; (This is formerly design manual section 602.1)



3. Surface Materials: Please use the VDOT pavement design sheet from the VDOT Subdivision Street Pavement Design Guide, App. IV.



4. Aisle grades: increases in access aisle grades per 18-4.12.17.a must be based on demonstrated hardships, but in no case may exceed the maximum grade allowed for private roads.
5. Circulation: in general, entrance and lot arrangements which force site circulation onto the street must not be used.
6. Parking dimensions; the following graphics is helpful in understanding the zoning ordinance parking dimensions;



D. Alleys: Standards for alleys are provided here to clarify the county engineer determination of public safety and welfare, and adequate access in alley design per Subdivision Ordinance section 14-410.D;

1. Alleys must be centered within a 20 wide private access easement or right-of-way.
2. Surface must be paved to VDOT standards, with a width of at least 12 feet.
3. Grades must not exceed 20%.



4. Alleys must intersect streets at two locations. Dead-end alleys with turnarounds may be permitted by waiver from the county engineer.

VDOT DI-7, DI-1, or similar type grates should not be placed in the center of alleys. These have been causing significant grade and paving problems where used. Drainage should be taken to a side inlet or alternate system.

D. Private street authorization requests: The following information is that deemed necessary by the county engineer per 14-232.A.1.(a) & (b) for an earthwork or environmental comparison for private street authorization requests;

1. A plan and profile of the proposed private streets, with all significant trees and environmentally sensitive areas shown (see 14-234.A.1) with a statement of the date of the field run profile per 14-234.A.1.(a)
2. A plan and profile of the alternative public streets. Applicants are encouraged to meet with engineering reviewers to agree on alternative alignments. Both streets should have the same turnaround types, etc, so that this does not skew the earthwork comparisons.
3. Earthwork computations per 14-232.A.1 should be for each separate street per station or half-station. (Please do not submit only result totals for the entire project or street). This allows staff and the commission to see which areas of cut or fill on the street create the difference in earthwork, and if a design modification is reasonable.

E. Street Bonding and Inspection:

1. The form of agreement and surety acceptable to the county engineer per 14-435.A are handled administratively. Bond forms are available at the Community Development Bond Forms Center on the county website. Required bond estimate requests, bond schedules, inspection requests, and the different types of surety are all provided.
2. The public or private road acceptance procedure (available in the forms center of the county website) must be followed during construction. Additional procedures or inspections may be necessary based on field conditions.
3. As built plans are required and must follow the as-built plan policy, available in the forms center of the county website.
4. Partial release of bonds are only allowed at the discretion of the roads engineer with a signed and sealed certification of as-built data listing exactly what items are complete and any variances or inconsistencies with applicable standards and approved plans. The following items must be included;
 - a. recorded easements and right-of-way plats.
 - b. as-built plans
 - c. demonstration that all downstream systems are complete for drainage improvements.

F. Street Standards: Requirements for streets are as indicated in the Subdivision and Zoning Ordinances. All street standards not otherwise specified by ordinance follow the VDOT standards. Traffic Calming measures, roundabouts, and other related design elements should follow VDOT, FHWA, or ITE guidelines and standards. For street naming and addressing please contact the GDS division of Community Development. County street



sign requirements are specified in the Road Naming and Property Numbering Ordinance and Manual. For specific review items please refer to the review checklist. For purposes of this design manual, the review checklist sets review policy, and is an integral part of the manual.

The following table summarizes private street standards;

Private Street Standards for Albemarle County *										
Street	Design Speed mph	Min. CL radius ft.	Max. Grade	Min. . K-cres t	Min. . K-sag	Min. Stopping Sight Dist. Ft.	Min. travelway width ft.	Min. ROW or easement width	Min. shoulder width	Sources
rural 2-lot	(no standard)							30	n/a	14-412A1
rural 3-5 lots	15	40	20%	5	15	100	14	30	3	14-412A2, 410, 415
6 lots or more	same as VDOT standards, see Detail 5									14-412A3, 415
multifamily, nonresidential	n/a	40	10%	5	15	100	20 (curb to curb) **	30	n/a	14-412B
Alleys	n/a	n/a	20%	n/a	n/a	100	12***	20	n/a	14-410

* where standards are not specified (for guardrail or drainage for example) standards are to be as required by VDOT

** or 24' next to perpendicular parking spaces (Zoning Ordinance parking lot requirements, 18-4.12.15)

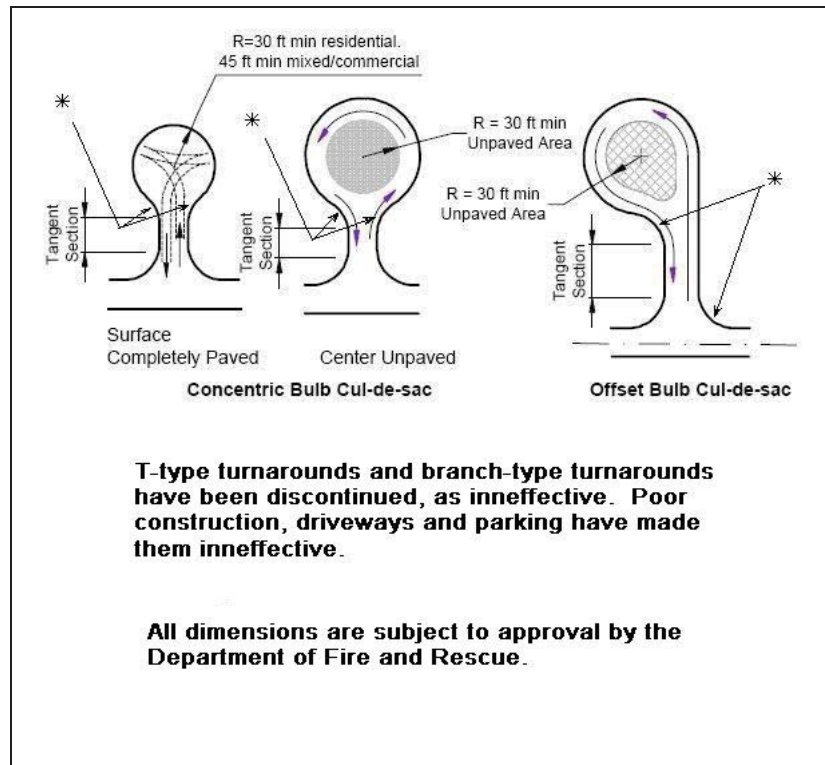
*** with 14' wide stone base

1. Angle of intersection shall be 80 degrees minimum

2. Temporary turnaround shall be provided on phased streets more than 300ft in length. Cul-de-sacs must be provided for permanent street ends. See the graphic below.

3. Reserved or spite strips are prohibited

4. In the development areas, curb and gutter, sidewalks (5' min.), and planting strips (6' min) are required



* 25' radii added by the County

G. Sidewalk Standards: All sidewalks must use VDOT standards unless otherwise specified by an approved zoning plan or code of development.

H. Trail Standards:

Classification	Min. surface requirements	Min. width	Design alignment	Other design considerations
Class B – type 1 primitive nature trail	Earth, mulch, or stone dust	enough to mark the location	20% maximum grade (this is a minimum impact nature trail)	Trail breaks to prevent erosion, with foot bridges over major obstacles
Class B -type 2 high-maintenance pedestrian path	Stone dust, gravel, or equivalent semi-permanent Surface	5' surface	10% maximum longitudinal grade, 2% maximum cross-grade	Drainage design as given below
Class A – type 1 low-maintenance pedestrian path	2" asphalt over 4" aggregate base	5' surface	10% maximum longitudinal grade, 2% maximum cross-grade	Drainage design as given below



Class A – type 2 low-maintenance multi-use, shared use path	2” asphalt over 6” aggregate base	10’ surface and 2’ cleared shoulders	Grades to be ADA accessible.	Drainage design as for a public road
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All trails are required to have appropriate signage and markings at road crossings per VDOT standards. At a minimum crossing signs and sidewalk pavement markings must be placed on the roadway, with stop signs and warning signs on the trail.

Trails should be in common areas, and maintained through neighborhood covenants or private agreements. When not in common areas, all trails are required to have easements, which must be a minimum of 10’ wide.

These standards are not sidewalk standards. Sidewalks are to follow VDOT requirements. These trails are intended to be independent and separate from streets, although they may parallel a street alignment.

Drainage provisions where referenced above are to follow VDOT standards for a 2year design storm. Concentrated runoff must not run across the trail, and culverts or footbridges are to be provided, especially where the trail crosses ditches. Where the trial crosses swampy areas, provisions such as boardwalks are to be provided for a dry surface. Where a non-paved surface is used, trail breaks and erosion prevention measures must be used on grades above 7% to prevent repeated washout of the surface.

I. Driveways: Driveways in the rural areas must meet requirements of the Zoning Ordinance, section 18-4.6.6. Driveways follow the VDOT standards in the right-of-way, and general safety and access provisions of the zoning ordinance and building code as administered by the agent, the zoning administrator and the building official. The Zoning Administrator has a policy regarding adequate access before certificates of occupancy can be issued, and this policy is available from zoning officials.



8. Grading

Grading issues are regulated by the county engineer as part of the site plan provisions of the Zoning Ordinance, sections 18-32, 18-30, the erosion and sediment control provisions of the Water Protection Ordinance, Article II, and with respect to walls and steep grades per the safety and welfare provisions of the Subdivision Ordinance, section 14-101 and Zoning Ordinance section 18-1.4 and 18-30.

A. Steep Slopes: for plan requirements please refer to the review checklist.

1. For constructed slopes, the maximum steepness is 2:1 (horizontal:vertical).
2. For grass stabilization on constructed slopes, the maximum steepness is 3:1. Slopes steeper than 3:1 must be permanently stabilized with landscaping vegetation hardier than grass, which will not require mowing.
3. Constructed slopes steeper than 2:1 must have a waiver from the county engineer. Requests for waiver should include demonstrable hardship, and provisions for permanent stabilization and structural stability.
4. Concentrated drainage must not be discharged over slopes.
5. The construction standards for managed slopes in the steep slopes overlay district (18-30) of the zoning ordinance are a guideline for the development of slopes.

B. Retaining Walls:

1. A building permit is required for walls. Please refer to the Building Official.
2. Engineering details and computations may be required on site plans where walls will support or potentially conflict with stormwater facilities, travelways, parking, or present a safety concern. This includes where walls are placed too close (a distance equal to the wall height) to property lines, such that they may affect neighboring property. In such cases the following items will be required.
 - a. A typical detail. (VDOT standard walls are acceptable)
 - b. specific details as required for unusual or possibly conflicting areas. An example is where utilities are expected to go through walls or footings.
 - c. certified computations to support the design. All soil and bearing assumptions, as well as reinforcement materials and assumed loadings must be included.
3. Safety provisions for vehicles and pedestrians may be required for walls over 30" high. This is typically a guardrail, wall, or fencing.

C. Off-site Work: plans which show off-site work (in the opinion of the plan reviewer) will require easements. A letter of permission from an off-site property owner is sufficient as an easement in this case, but only for the purposes of plan review. Bonds will need to be signed by the owners of all properties on which construction takes place, or legal easements will be needed.

1. As a general guideline, where slopes or diversions are expected, at least 5' distance must be maintained between final contours and the property line in order to safely stay off neighboring property. For retaining walls, at least the height of the wall should be maintained from the property line.



9. Certified Engineer's Report

According to Zoning Ordinance section 18-4.14.8, Albemarle County requires a certified engineer's report for uses of an industrial character prior to issuing a zoning compliance clearance, which must be reviewed by the County Engineer (or designee).

A certified engineers report shall consist of;

Type 1: For uses which will have no discharge, noise, vibration, smell, lighting, emissions, impulses or radiation beyond a normal office use, and will not store any hazardous materials, a letter from the owner with the following information will suffice as a certified engineer's report;

1. a description of the business and the physical process involved.
2. a description of any machinery and operations.
3. a statement or explanation for meeting each of the performance standards of section 18-4.14; noise, vibration, glare, air pollution, water pollution, radioactivity, electrical interference.

Examples of type 1 uses might be offices or warehouse storage of clothes. An example letter is available.

Type 2: For uses which will have any discharge, noise, vibration, smell, lighting, emission, impulse or radiation which might reasonable be expected to exceed the performance standards of 18-4.14.4 at any time, or which have any permit requirements from DEQ, EPA, or other local, state or federal agency, a full certified engineers report is required. This report must contain a signed and dated seal from a professional engineer. It must contain copies of any local, state or federal permits. It must contain plans and descriptions of physical and operational measures to meet all of the performance standards, with actual supporting measurements and data where applicable. Examples of type 2 uses might be a contractor's office and storage yard or equipment repair shop, or a manufacturer of electrical components.

Fairfax County

County Code: Fairfax County, VA

CHAPTER 70.1. - Private Water Well Ordinance

- **ARTICLE 1. - General Provisions**

- **Section 70.1-1-1. - Title.**

This Chapter shall be known and cited as "Private Well Water Ordinance" of Fairfax County, Virginia. (4-05-70.1.)

- **Section 70.1-1-2. - Purpose.**

The purpose of this Chapter is to protect the public health and the environment through locating, designing, inspecting, and approving functional private well water supplies and to provide for the licensing/registration of well water supply contractors.(4-05-70.1.)

- **Section 70.1-1-3. - Adoption of the Commonwealth of Virginia State Board of Health Private Well Regulations.**

Parts I through III, inclusive, and all forms and appendices of the Commonwealth of Virginia State Board of Health Private Well Regulations, hereafter referred to as the "Regulations", including the modifications of the Regulations that are set out in Section 70.1-1-4 below, are hereby adopted and incorporated in their entirety into this Chapter as if fully set forth herein. In the event of conflict or inconsistency between this Chapter and the Private Well Regulations, the provisions of this Chapter shall control.(4-05-70.1.)

- **Section 70.1-1-4. - Modifications to Private Well Regulations.**

The following sections of the Commonwealth of Virginia State Board of Health Private Well Regulations, as incorporated into the Fairfax County Code are adopted with the following changes:

Section 12 VAC 5-630-100. Right of entry and inspections is adopted with the following changes.

In accordance with the provisions of 32.1-25 and 32.1-12 and 32.1-176.6 of the Code of Virginia, the commissioner or his designee shall have the right to enter any property to ensure compliance with this Chapter. There shall be no fee assessed for a compliance inspection. In the event that a compliance inspection reveals major deficiencies that require a re-inspection or a compliance inspection is cancelled by the licensed well water contractor with less than 24 hours notice, the licensed well water contractor shall pay a re-inspection fee in accordance with the fee schedule established in Section 70.1-3-1 prior to the re-inspection being performed. No re-inspection fee will be assessed for minor deficiencies or deficiencies not due to contractor fault.

Section 12 VAC 5-630-220. "Permits and inspection statement; general" is adopted with the following changes.

- E. No person shall obtain a building/zoning permit for a structure to be served by a private ground water well without first constructing and testing the water well for quantity.

Section 12 VAC 5-630-340. "Requirement for easement" is not adopted.

Section 12 VAC 5-630-370. "Water quality and quantity" is adopted with the following changes:

- D. Sampling. After operating the well to remove any remaining disinfectant, a sample of the water from the well shall be collected for bacteriological examination. The sample shall be collected by the local health department in accordance with procedures established by the department and analyzed by a laboratory certified by the Department of General Services, Division of Consolidated Laboratory Services.

Section 12 VAC 5-630-380. "Well location" is adopted with the following changes.

Table 3.1 Distances (in feet) Between a Well and a Structure or Topographic Feature

Structure or Topographic Feature	Class III C or IV	Class III A or B
Building Foundation	15	15
Building Foundation (Termite Treated)	50 ¹	50 ¹
House Sewer Line	50 ²	50 ²
Sewer Main including force mains	50 ³	50 ³
Sewerage System	50	50
Pretreatment System (e.g. Septic Tank, Aerobic Unit, etc.)	50	50
Sewage Disposal System or other contaminated source (e.g. drainfield, underground storage tank, barnyard, hog lot, etc.)	100	100
Cemetery	100	100
Sewage Dump Station	100	100
Seepage Pit (Drilled Wells)	150	150
Seepage Pit (Bored Wells)	200	200

- H. A private water supply system is an integral part of the principal use and, therefore, shall be located on the same lot as the principal use.

Section 12 VAC 5-630-400. "Materials" is adopted with the following changes.

- B. Casing. Materials used for casing shall be watertight and shall consist of wrought iron or stainless steel, all designed for water well use or other suitable materials as determined by the division. The division shall maintain a list of approved casing materials.
 - 2. Casings used for Class IIIA or IIIB wells shall be steel or stainless steel.

Section 12 VAC 5-630-410. "Construction; general" is adopted with the following changes.

- C. Grouting.
 - 2. Purpose. The annular space between the casing and well bore is one of the principal avenues through which undesirable water and contaminants may gain access to a well. The goal of grouting a well is to preclude the entrance of undesirable water and contaminants. Therefore, the annular space shall be filled with a neat cement grout

specifically approved by the manufacturer for use as a grouting material.

3. Specifications. The grouting material used shall meet the appropriate specification listed below:
 - b. Is not adopted.
 - c. Is not adopted.

D. Is not adopted.(4-05-70.1; 26-09-70.1.)

- **ARTICLE 2. - License to Install a Well Water Supply**

- **Section 70.1-2-1. - License to install a well water supply required; fee; renewal.**

A. It shall be unlawful for any person to install or repair for another or contract to install or repair for another a well water supply, private or public, without first having obtained an annual license and paying a license fee in accordance with the fee schedule established in Section 70.1-3-1. The annual license will not be renewed to any well water contractor that has outstanding fees assessed against it. (4-05-70.1; 26-09-70.1.)

- **Section 70.1-2-2. - Bond prerequisite to installing of well water supply; amount; term; renewal.**

A. All persons contracting to install or repair for another a well water supply must furnish bond payable to the County in the penalty of \$10,000.00 and conditioned to indemnify and save harmless the County, as well as any person, from all expenses and damages that may be caused by any neglect, defective or inadequate work done by such person.

B. The "defective or inadequate" provisions of this Section shall not apply to the quantity or quality of water provided by the well.

C. When such work shall be deemed defective or inadequate by the approving authority and if such persons fail to correct such defective or inadequate work to the satisfaction of the approving authority within ten days after written notice from the approving authority to do so, such bond shall be forfeited, and the principal and surety on such bond shall be and become liable for such work. The principal and surety shall pay so much on account of such bond as may be necessary to perfect such defective or inadequate work and in addition thereto shall pay any and all damages which may be occasioned to any person by reason of such defective or inadequate work.

D. Such bond shall be deposited with the Director of Health. The bond shall be for a period of not less than six months after the expiration of the license year during which the bond was posted and shall be renewed annually so that the bond shall not be terminated for a period less than six months after the installation or repair of the last individual water supply system or any part thereof.(4-05-70.1.)

- **ARTICLE 3. – Fee Schedule**

- **Section 70.1-3-1. – General**

This fee schedule establishes fees for services provided by Fairfax County and are separate from, and in addition to, fees that are, or may be, required by the Commonwealth of Virginia.

- A. Well Water Permit.....\$200.00
- B. Well Water Contractor License.....\$150.00
Late renewal fee after January 31.....\$200.00
- C. Routine Water Sample.....\$25.00
- D. Written Evaluation of Existing Private Water Well Supply.....\$50.00
- E. Re-inspection Fee.....\$100.00

Plan review fees pertaining to water well systems, such as site development, subdivision, and building permit reviews are set forth in Fairfax County Code Section 68.1-9-1.

(4-05-70.1; 26-09-70.1.)

(a) After the Board of Supervisors has found that a water supply emergency exists, and after notice has been given to the general public, the County Executive is authorized to implement this Ordinance by ordering the restricted use or absolute curtailment of the use of water for certain non-essential purposes for the duration of the water shortage or for a lesser period, in the stages set forth below.

(b) In exercising authority granted to him by this Ordinance, the County Executive shall give due consideration to applying water use restrictions or absolute curtailments only to the users of those water supply systems, or elements thereof, which are affected by the water shortage, or which can assist the affected systems in mitigating adverse effects of such shortage.

(c) The provisions of this Ordinance shall not apply to any governmental activity, institution, business or industry which shall be declared by the County Executive to be specifically excepted therefrom as necessary for the public health, safety and welfare.

(d) *Stage I.* Assuming that moderate but limited supplies of water are available, the County Executive is authorized to call on the general population to employ prudent restraint in water usage, and to conserve water voluntarily by whatever methods are available.

(e) *Stage II.* Assuming that very limited supplies of water are available, the County Executive is authorized to order restricted use or absolute curtailment of less essential uses of water including but not limited to one or more of the following:

(1) Watering of shrubbery, trees, lawns, grass, plants, or any other vegetation, except from a watering can or other container not exceeding three (3) gallon capacity.

(2) The washing of automobiles, trucks, trailers, or any other type of mobile equipment, excepting in facilities operating with a water re-cycling system approved by the County, or except from a bucket or other container not exceeding three (3) gallon capacity; provided, however, that any facility operating with a water re-cycling system must prominently display in public view a sign stating that such a re-cycling system is in operation.

(3) The washing of streets, driveways, parking lots, service station aprons, office buildings, exteriors of homes or apartments, or other outdoor surfaces, except from a bucket or other container not exceeding three (3) gallon capacity.

(4) The operation of any ornamental fountain or other structure making a similar use of water.

(5) The filling of swimming and/or wading pools, or the refilling of swimming and/or wading pools which were drained after the effective date of the order.

(6) The operation of any industrial or commercial activity or process, including construction activity, which uses water beyond the sanitary and drinking needs of employees, customers and visitors.

(7) The use of water from fire hydrants for any purpose other than fire suppression.

(8) The operation of any water-cooled comfort air conditioning which does not have water conserving equipment in operation.

(f) *Stage III.* Assuming that critically limited supplies of water are available, the County Executive is authorized to restrict use of water to purposes which are absolutely essential to life, health and safety.

(21-77-113; 13-81-113.)

Public Facilities Manual



Fairfax County, Virginia
2011

9-0000 WATER AND FIRE REGULATIONS

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9-0100 PUBLIC WATER SUPPLY

9-0101 General Requirements (103-09-PFM)

9-0101.1 A public water supply approved by the appropriate agencies shall be provided to serve subdivision lots of less than 75,000 square feet in size.

9-0101.2 All extensions of public water supply systems required by § 9-0100 *et seq.* shall conform to the requirements established by § 70-1-13 of the Code and § 9-0200 *et seq.*

9-0101.3 In residential developments containing twenty or fewer lots which are 20,000 square feet in size or greater and in which the nearest boundary is located more than an average of 125 feet per lot¹ from the nearest existing water main:

9-0101.3A (80-03-PFM) The County Executive may waive the requirements set forth in § 9-0101.1 & .2 and § 70-1-13 of the Code which include a requirement that water capacity for fire flow complies with § 9-0202.2F.

9-0101.3B The County Executive may refuse to grant such a waiver if he determines from the plans and plats submitted to the County for approval that substantial development is anticipated for the areas surrounding the proposed development.

9-0101.3C Wherever such waiver is granted:

9-0101.3C(1) (80-03-PFM) Either a central well water supply system, with all necessary water mains and facilities or individual wells, shall be designed and installed as required by the approved water supply agency or the County; and

9-0101.3C(2) Requisite fire hydrants shall be furnished or payment to the value of said hydrants at time of waiver, and an installation fee therefore shall be paid to the approved water supply agency; provided, however that where the County Executive determines that, based on the adopted Comprehensive Plan and capital improvements program of the County, the installation of a public water main within an average of 125 feet per lot¹ from the nearest boundary of the proposed development is not expected within the next ten years, individual wells may be installed without providing dry water mains and fire hydrants.

9-0101.4 (80-03-PFM) In residential developments with lots 75,000 square feet in size or greater, when the developer elects to install a central well water supply system with all necessary appurtenant water facilities, the requirements set forth in § 70-1-13 of the Code regarding fire flow availability and water storage capacity need not be provided.

9-0101.5 All requests for the above waivers shall be submitted in writing to the Site Development and Inspections Divisions, Land Development Services, DPWES.

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9-0101.6 (80-03-PFM) Plan approval of any outside agency (i.e., City of Fairfax, City of Falls Church, Town of Vienna, and the Town of Herndon) shall be obtained by the County prior to plan approval.

9-0102 Public Water Supply Agency Data (80-03-PFM)

9-0102.1 Any person proposing an extension of a public water supply system shall, at the time of submitting subdivision plans, profiles and specifications, agree by written contract approved by the public water supply agency that, upon completion of the extension of such water system and the approval and acceptance thereof by the proper official, the water system so constructed shall become the property of the public water supply agency.

9-0102.2 All water mains, their sizes, valves and fire hydrants, and their relationship to gas lines shall be shown as indicated below:

9-0102.2A In subdivision streets, the water main shall be located 8 feet north or east of the street centerline, and the gas main shall be located 8 feet south or west of the centerline.

9-0102.2B On loop streets the water main shall be located 8 feet north or east of the predominate centerline of the street. The gas main shall be located 8 feet south or west of the predominate centerline of the street. The water and gas mains shall then continue on the same side of the centerline as determined above for their entire length of the streets.

9-0102.2C Due to space restrictions of most townhouse streets, it is not feasible to specify the side of the street on which the water line should be located. Developers of townhouse sites shall confer with the public water supply agency and the Washington Gas Light Company for satisfactory utility locations.

9-0102.2D Service connections must be stubbed to the property line before the street paving section is constructed.

9-0102.3 Design and Construction Guidelines:

9-0102.3A All water main design and construction shall comply with the standard specifications and plans of the public water supply agency serving the location.

9-0102.3B All water mains shall have a cover of 4 feet unless otherwise designated.

9-0102.3C The developer shall request inspection by the public water supply agency three days prior to commencing construction of any water mains.

9-0102.3D No underground electric, telephone, television cable, gas, chilled water lines or any other underground utilities shall be installed within the public water supply easement parallel to the proposed water main. In addition, no permanent structures shall be placed within the public

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water supply easement. Plan and profiles of all utility crossings of water mains within the easements shall be submitted to the public water supply agency for approval prior to construction. With the exception of sanitary sewers and laterals described in § 9-0102.3T, the horizontal separation between water mains and all utilities or structures including poles, tracks, pipes, wires, conduits, vaults, manholes, and other appurtenances, shall be a minimum of 5 feet or as approved by the public water supply agency.

9-0102.3E Any relocation of existing water mains and appurtenances due to development shall be provided for by the developer.

9-0102.3F No water main valves are to be open or closed prior to notification of the appropriate water supply agency. Authorized personnel only are allowed to operate valves.

9-0102.3G Water mains shall not be installed on a site until easements are recorded and the developer has furnished proper forms for water main installations.

9-0102.3H All water mains 4 inches through 12 inches shall be Class 52, Ductile Iron Pipe Water Main unless otherwise designated.

9-0102.3I For oversize water mains and appurtenances requested by Fairfax Water, the developer is required to submit unit prices for Fairfax Water approval thirty days prior to construction of the oversize portion of water main. Approval by the Fairfax County Planning Commission of the oversize water main alignment may be required under provisions of § 15.2-2232 of the Code of Virginia, as amended.

9-0102.3J All hydrant, water service, fire line and stub-out valves shall be restrained. Swivel fittings are optional.

9-0102.3K When the property is located in areas where the pressure is less than 35 psi, booster pumps shall be required to provide adequate pressure.

9-0102.3L The developer shall make provision for discharge of water as required by the public water supply agency for water meter repairs and testing with proper arrangements for erosion and sediment control during discharge.

9-0102.3M The working pressure shall be shown on the plans. In accordance with the Virginia USBC, a pressure regulating valve must be installed by the property owner in the building plumbing system where the working pressure exceeds 80 psi in order to eliminate water hammer and unnecessary wastage of water. Thermal expansion protection may also be required to reduce potential discharge from water heater relief valves.

9-0102.3N The developer shall agree to assume complete responsibility and all costs for the installation of the mains and appurtenances and for any adjustments in alignment and grade, location, repairs, and maintenance which may be required prior to finish grading and surfacing of

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streets and/or easements and final acceptance of the facilities. Final acceptance shall not be considered until after the streets have been surfaced or the easements finally graded.

9-0102.3O Corrosion control measures shall be used in accordance with the guidelines of the public water supply agency to protect water mains.

9-0102.3P Prior to any water main installation all required sanitary sewers, including laterals, and storm sewers must be installed, their ditches compacted for full depth according to current requirements, the sanitary sewer accepted for service by DPWES, and the streets and/or easements rough graded to meet current standards.

9-0102.3Q When connecting to existing water mains, the locations of existing valves requiring operation shall be indicated on plans.

9-0102.3R Where feasible, all water mains shall be looped to promote better water quality and increase fire protection.

9-0102.3S All water mains shall be installed in travel areas where possible. Proposed water mains within dedicated rights-of-way maintained by or to be maintained by VDOT must comply with VDOT established guidelines for water main placement. Profiles are required for all water mains.

9-0102.3T Horizontal and vertical separation between sanitary sewer mains and laterals and water mains shall be in accordance with the Virginia Department of Health's Waterworks Regulations.

9-0102.3U Air releases and blow-offs shall be installed on all mains 12 inches and larger. Hydrants should be utilized for this purpose where feasible.

9-0102.3V When utilities are proposed in close proximity to an existing water main, or when grade changes are proposed above an existing water main, test holes shall be required prior to the plan approval, unless otherwise noted.

9-0102.3W Depending upon test hole results, sheeting or bracing may be required when other facilities cross an existing water main.

9-0102.4 Service Connections

9-0102.4A All water meters and service connections shall be installed, tested, repaired and maintained in accordance with the rules and regulations of the public water supply agency.

9-0102.4B More than two pipestem lots shall require a 4-inch water main installation for water service.

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9-0102.4C Water meters 3 inches and larger shall be located inside the building with a bypass. The bypass valve shall be sealed by the water supply agency. When required, the remote register shall be installed on the outside of the building.

9-0102.4D Commercial development such as office buildings, warehouses, churches, etc., which require a fire line to the building shall have separate fire and domestic lines for service, unless otherwise noted.

9-0102.4E The developer shall notify the public water supply agency prior to the installation of interior plumbing to determine the location of the water meter and any pre-wiring for remote register.

9-0102.4F The approximate location of water meters shall be shown on the plans by symbol.

9-0102.5 Miscellaneous Notes

9-0102.5A Two advanced copies of easement plats are required for Fairfax Water approval prior to plat recordation.

9-0102.5B Plan approval by Fairfax Water may be subject to developer acceptance of satisfactory agreement for the installation of off-site or oversize facilities.

9-0102.5C All off-site water main extensions require a formal proposal from Fairfax Water as per the current design standards.

9-0102.5D FCWA approval may be contingent upon the installation of water mains in other sections or subdivisions and connections thereto.

9-0103 Fire Hydrants (80-03-PFM)

9-0103.1 Fire hydrant installation requires plan approval from the public water supply agency.

9-0103.2 All fire hydrants shall be installed in accordance with current specifications of the public water supply agency and the Fire Marshal's Office.

9-0103.3 Fire hydrants shall be of 3-way class, with one 4½-inch pumper outlet and two 2½-inch hose outlets all with National Standard fire hose coupling threads.

9-0103.4 (100-07-PFM) Fire hydrants shall conform to the American Waterworks Association Specifications, C-502.64, and will be provided a 6-inch connection to the main with a minimum - 5¼-inch valve opening. The center of the hydrant shall be located a maximum of 30 inches from the face of curb. The closest part of the hydrant (4½-inch nozzle cover) shall be a minimum 18 inches from top face of curb.

9-0000 WATER AND FIRE REGULATIONS

9-0103.5 Fire hydrants placed on streets without curb and gutter shall be in accordance with the standard and the terms of the permit. The 2½-inch hose connection shall have a minimum clearance of 5 feet from the side slopes.

9-0103.6 The bottom of the safety flange shall be 2½ inches above the elevation of the edge of the shoulder on streets without curb and gutter and above the elevation of curb on streets with curb and gutter.

9-0103.7 Provisions for adequate drainage of the hydrant is required.

9-0103.8 The location of all existing and proposed fire hydrants relevant to the development project shall be shown on the plans.

9-0103.9 The hydrant shall be located so that the thrust block is placed in undisturbed soil. In those cases where this is not practical, the soil beneath and surrounding the thrust block shall be compacted to 95 percent of maximum density in accordance with VDOT Sections 200, 302, 303 and 520.

9-0103.10 Fire hydrant branch connections placed in fill material shall be installed using restrained joint pipe as approved by the public water supply agency.

9-0103.11 The 4½-inch nozzle shall face the street, travel lane, service drive or normal vehicular travelway, whichever applies.

9-0103.12 Easements shall be required for hydrants located on ditch section streets where there is less than 5-foot clearance from hydrant to the property line.

9-0103.13 Whenever possible hydrants shall be placed in grassy areas.

9-0200 FIRE MARSHAL REQUIREMENTS

9-0201 General Data. (51-96-PFM) In accordance with § 901.8 of the Fire Prevention Code of the County of Fairfax, as adopted by the County pursuant to § 62-2-7 *et seq.*, of the Code:

9-0201.1 No person shall use, tamper with, damage or destroy any fire hydrants, valves or water mains within the County; except that a fire department may use such hydrants for firefighting and training purposes. Also a person who has obtained a permit for use from the public water authority or utility having proper jurisdiction over said items may use the items.

9-0201.2 When use is by a person under permit from the authority having jurisdiction, the user shall comply with all policies that are outlined on said permit or application.

9-0202 Construction Requirements²

9-0202.1 Fire Hydrant Information

9-0202.1A All fire flow requirements shall be determined by the Fire Marshal.

9-0202.1B Fire flow waivers shall be requested through DPWES (§ 9-0100 *et seq.*).

9-0202.1C (80-03-PFM) If hydrants are to be located in an area of possible guardrail construction, plans should be checked for notes regarding possible obstruction.

9-0202.1D (80-03-PFM) Hydrants shall be installed either 5 feet from the point of curvature of curb returns or on the property line in subdivisions.

9-0202.1E (80-03-PFM) Steel posts shall be installed around hydrants as needed for industrial and commercial development where curbs are not available.

9-0202.1F (80-03-PFM) All fire hydrants shall be located a minimum of 50 feet from all buildings.

9-0202.1G (80-03-PFM) No plantings or other obstructions shall be made within 4 feet of any fire hydrant, or within 10 feet of a siamese connection.

9-0202.1H (80-03-PFM) Where standpipes or sprinkler systems are required within buildings, a fire hydrant will be located within 100 feet of the fire department connection.

9-0202.1I (80-03-PFM, 51-96-PFM) Fire hydrants shall be located so as to maximize the coverage potential of each hydrant. Maximum coverage distances, as set out below, are measured along the fire department vehicular access way as defined in § 9-0202.2J(1). The maximum distances set forth in Table 9.1 shall be measured from the fire hydrant to the most remote point of access along the fire department vehicular access way.

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Table 9.1 Fire Hydrant Maximum Coverage Distance

Building Type	Maximum Distance (ft.)
Industrial buildings and warehouses	250
Schools, day care centers	300
Offices, commercial, church, hospitals, nursing homes	350
Apartments, multi-family dwellings, townhouses	350
Single family dwellings	500

9-0202.1J (80-03-PFM, 51-96-PFM) All fire hydrants and water mains located in or on parking structures shall be protected from freezing. Heat tape is inadequate for this purpose.

9-0202.1K (80-03-PFM, 51-96-PFM) Siamese connections shall be located on the street front, address side of buildings and shall be visible and accessible from the street.

9-0202.2 Guideline Criteria

9-0202.2A All hydrant branches shall have a minimum cover of 3 feet at the ditch line.

9-0202.2B All fire hydrant locations shall be reviewed by the County for conformity to the Fairfax County Standards as shown in Plates 1-9 thru 5-9.

9-0202.2C It has been requested by the Fire Marshal's Office that all site plans submitted for review include the following information:

9-0202.2C(1) Use group classification (defined by the Virginia USBC).

9-0202.2C(2) Type of construction (defined by the Virginia USBC).

9-0202.2C(3) Existing and proposed water mains.

9-0202.2C(4) Existing and proposed fire hydrants.

9-0202.2C(5) Water main size.

9-0202.2C(6) Available water pressure and flow capability, static pressure, residual pressure, flow in GPM (LPM).

9-0202.2C(7) Type of fire suppression or detection equipment to be provided; e.g., sprinklers, standpipes, smoke or heat detectors. (See current edition of the Virginia USBC for requirements.)

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9-0202.2C(8) Location and size of underground fire lines.

9-0202.2C(9) Location of fire department siamese connections (street front of building).

9-0202.2C(10) Height of building in feet and stories.

9-0202.2C(11) Breakdown of building interiors such as firewalls, tenant separations, etc.

9-0202.2C(12) (51-96-PFM) Footprint area of building and gross floor area of building.

9-0202.2D If a fixed fire suppression or detection system is to be provided, the type of system shall be clearly indicated. The installation shall be subject to the applicable section of the Virginia USBC.

9-0202.2E Private bridges must have a design satisfactory to the Director to carry fire equipment where necessary. AASHTO "Standard Specifications for Highway Bridges" and the VDOT Bridge Engineer will be consulted for guidance on a case by case basis.

9-0202.2F Fire Flow Requirements

9-0202.2F(1) One- and two-family dwellings - maximum exposure distances.

Table 9.2 Fire Flow

Minimum Exposure Distance	Fire Flow GPM
0 ft. – 10 ft.	1500 – 2000
11 ft. – 30 ft.	1000 – 1500
31 ft. and greater	1000

9-0202.2F(2) Townhouses or multiplex units - residential or professional 2500 GPM.

9-0202.2F(3) Other uses - fire flow requirements established by the procedures and formulas delineated below.

9-0202.2G Fire Flow Requirement Determination³:

9-0202.2G(1) Definitions (for this determination only):

Required Fire Flow: Fire flow water to the site required for the fire fighting for any and all structures and appurtenances on the site.

Floor level: Any occupiable level of a structure whether above or below grade.

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F: Required fire flow in GPM.

C: Coefficient related to the type of construction (see Table 9.3).

A: The total area of all floor levels in the structure being considered. (Gross floor area of the whole structure.)

Table 9.3 Fire Flow Coefficient

C	TYPE OF CONSTRUCTION
1.5	for wood construction (USBC, types VA, VB)
1.0	for ordinary construction (USBC, types IIIA, IIIB)
0.9	for heavy timber construction (USBC, type IV)
0.8	for noncombustible construction (USBC, types II2A, IIIB)
0.6	for fire resistive construction (USBC, types IA, IB)

9-0202.2G(2) Maximums - Fire flow required shall not exceed the following maximums (before any reductions are taken):

Table 9.4 Maximum Fire Flow

GPM	TYPE OF CONSTRUCTION
8000	Wood, heavy timber or ordinary construction
6000	Noncombustible or fire-resistive construction

9-0202.2G(3) Minimums - Fire flow required shall never be less than 500 gpm for a structure. Fire flow required for single-family detached dwellings shall never be less than 1000 gpm. Both values are absolute minimums after all reductions are taken.

9-0202.2G(4) Complete automatic sprinkler protection reduction - Value obtained from the formula given below may be reduced 50 percent only if the structure or structures under consideration are completely covered with a sprinkler system. Partial protection will not be allowed for any reduction in fire flow.

9-0202.2G(5) Calculation formula: $F = 18 CA^{1/2}$ where F, C, A are defined in § 9-0202.2G(1). This formula must be applied sequentially to each structure on the site. The largest fire flow calculated then applies.

9-0202.2G(6) Exposure surcharges - The value calculated in the above formula shall be increased by a percentage for exposure of other structures within 150 feet of the structure under consideration. The percentage increase for any one side shall be:

Table 9.5 Exposure Surcharges

Separation ft.	Percentage (%)
0-10	25
10.1-30	20
30.1-60	15
60.1-100	10
100.1-150	5

Total exposure surcharge shall be the sum of the percentages for all sides of the building but shall not exceed 75%.

9-0202.2G(7) Special consideration - The above calculation procedure does not apply to: high hazard structures; lumber yards or lumber storage; petroleum storage; refineries; chemical plants; grain storage; power generating facilities; hazardous manufacturing processes; and paint storage, high piled combustible storage, flammable liquids storage, etc. All of the above require special consideration and direct consultation with the Fire Prevention Division regarding fire flow requirement.

9-0202.2G(8) Occupancy reductions - The following percentage reductions to the value calculated by the above formula may be taken:

Table 9.6 Occupancy Reductions

Type Occupancy	%	Type Occupancy	%
Asylums	15	Prisons	10
Churches	15	Public Buildings	10
Clubs	10	Rooming Houses	10
Dormitories	25	Schools	15
Hospitals	20	Parking Structures (stand alone, not under buildings)	25
Hotels	10		
Nursing Homes	15		
Office Buildings	10		

9-0202.2G(9) Procedure for Calculation of Required Fire Flow:

9-0202.2G(9)(a) Determine type of construction and hence "C."

9-0202.2G(9)(b) Determine the gross floor area (A).

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9-0202.2G(9)(c) Determine the occupancy reductions, if any.

9-0202.2G(9)(d) Apply the sprinkler reduction, if fully covered by a sprinkler system.

9-0202.2G(9)(e) Determine the total surcharge for exposures.

9-0202.2G(9)(f) Perform the following multiplication:

$$9-0202.2G(9)(f)(1) \quad F = 18CA^{\frac{1}{2}}$$

9-0202.2G(9)(f)(2) (F) (occupancy reduction) (sprinkler reduction) (exposure surcharge) equals total required fire flow for the structure under consideration.

Note: Occupancy reduction is 100% - % given in Table 9.6. Sprinkler reduction is 50%.
Exposure surcharge is 100% + % given in Table 9.5

9-0202.2H Central Well Systems

9-0202.2H(1) Central well systems apply to one and two-family developments where public water is not available within specified distances required for public water main extension.⁴

9-0202.2H(2) Central well systems shall be designed for a minimum 30,000-gallon storage capacity with adequate pressure for fire fighting activities.

9-0202.2I Fire Protection Modification Procedures (113-13-PFM)

9-0202.2I(1) The following information is to be provided when requesting a modification of any fire protection requirement of the PFM.

9-0202.2I(2) All requests must be submitted and addressed to the Fairfax County Fire Marshal, and include the following:

9-0202.2I(2)(a) A plan or sketch showing the proposed location of all improvements on the site and the type of construction involved.

9-0202.2I(2)(b) The address, tax map reference number and the proposed use of the property.

9-0202.2I(2)(c) The current zoning classification of the property and if recently rezoned, the rezoning number and the date of approval by the Board.

9-0202.2I(2)(d) Copies of any required special exception or special permit with date of approval.

9-0202.2I(2)(e) The specific item requested to be modified.

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9-0202.2I(2)(f) The length of time for which the modification is requested.

9-0202.2I(2)(g) Any proposed alternate form of fire protection.

9-0202.2I(2)(h) The name, address and telephone number of the person making the request.

9-0202.2I(2)(i) The County assigned number for site and subdivision plans and modification requests associated with the property.

9-0202.2J Fire Department Access (113-13-PFM)

Regulations governing fire department access established under the Virginia Statewide Fire Prevention Code (SFPC) and Fairfax County Fire Prevention Code (Chapter 62 of the County Code) are set forth below. When requesting a code modification of any fire department access requirement, refer to the procedure set forth in Chapter 1 of the SFPC.

9-0202.2J(1) (51-96-PFM) Access for emergency vehicles shall be provided to within 100 feet of the main or principal entrance of every building. The fire department vehicular access may be provided by a public or private street, parking lot, and/or fire lanes.

9-0202.2J(2) When buildings are more than five stories or 50 feet in height, ladder truck access shall be provided to both the front and rear of the building.

9-0202.2J(3) The access to the rear may be provided by either a street, parking lot, or fire lane.

9-0202.2J(4) The inner surface of the ladder truck access way shall be no less than 15 feet and no more than 30 feet from the exterior building wall.

9-0202.2J(5) (51-96-PFM) When fire lanes are required, they shall have an unobstructed width of not less than 20 feet, exclusive of shoulders. Fire lanes shall have parking, curb painting and signage as further described on Plate 6-9.

9-0202.2J(6) (51-96-PFM) Dead-end fire apparatus access roads in excess of 100 feet in length shall be provided with an approved area for turning around fire apparatus. (Due to the size of the ladder truck, it is suggested that guidance be obtained from the Fire Prevention Division to determine adequate turnaround dimensions.)

9-0202.2J(7) A 12-foot wide access lane to within 50 feet of the edge of swimming pools, with an 8-foot personnel gate in the fence at the point of access is required except for individually owned pools located on single family lots.

9-0202.2J(8) (51-96-PFM) A minimum height clearance of 15 feet is required for overheads, canopies and other obstructions which are located over emergency access ways.

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9-0202.2J(9) (51-96-PFM) For ladder truck access on parking garages where a parking garage is attached to a building structure in such a manner that such garage constitutes a portion of the fire department vehicular access way, design calculations shall be provided by a PE which show that the deck of such garage is designed to support an 80,000-pound vehicle and all outrigger (pad) point loads or that such garage is designed for a nominal 450 lb/sf uniform live load.

¹Such footage shall be computed as follows: distance between nearest existing water main and nearest boundary of the proposed development divided by number of proposed lots shall equal more than 125 feet.

²See § 9-0103 and Plates 1-9 through 5-9 for fire hydrant details.

³All required fire flow shall be calculated at a minimum 20 psi residual pressure remaining on the public water or central well system to be in conformance with Commonwealth of Virginia Waterworks Regulations.

⁴Specified distance required equals 125 times the number of proposed lots to the nearest boundary line of the proposed development.

Fauquier County

SECTION 1 - PURPOSE AND INTENT

The purpose of this Ordinance is to establish subdivision standards and procedures for the County of Fauquier, Virginia, and such of its environs as may be under the jurisdiction of the governing body.

This Ordinance is to guide and facilitate the orderly, beneficial growth of the community by assuring the orderly subdivision of land and its development, and to promote the public health, safety, convenience, comfort, prosperity, and general welfare.

The Ordinance is known and may be cited as "Subdivision Ordinance of Fauquier County, Virginia, 1968".

SECTION 18 - HYDROGEOLOGIC TESTING

A hydrogeologic report is a detailed geotechnical report assessing groundwater quantity and quality. The hydrogeologic report shall be prepared by a Virginia Certified Professional Geologist or Professional Engineer licensed to practice in Virginia who has demonstrated expertise in hydrogeology.

18-1 Central Water Supplies

A) Applicability of Hydrogeologic Testing (Amended by Board of Supervisors on September 9, 1999 and July 12, 2012.)

- 1) The hydrogeologic testing requirements and procedure must be completed prior to approval of the preliminary plat for any new residential subdivision consisting of lots less than one (1) acre in size in all zoning districts. In residential districts and villages, new residential subdivisions which have seven (7) or more lots, regardless of lot size, will require hydrogeological testing. This requirement may be waived by the Planning Commission in accordance with Section 4-27 of this Ordinance on the recommendation of the WSA where a public system is proposed. Where a private water system is proposed, these requirements may be waived on the basis of adequate engineering data demonstrating that the proposed water system will not adversely impact present or future water supplies and that testing is unnecessary or would create an undue hardship.
- 2) Any commercial or industrial subdivision that will extract more than 10,000 gallons/day.
- 3) Any proposed development in a service district unless the requirement for hydrogeologic testing is waived by the Planning Commission in accordance with Section 4-27 of this Ordinance on recommendation of the WSA on the basis that testing is unnecessary or would create an undue hardship.

B) Testing Proposal

- 1) The applicant shall submit a testing proposal to the County at the time of filing the preliminary plat application. This proposal shall be prepared based on Section 18-1.C, Field Testing.
- 2) The proposal shall include a map at a scale of not greater than 1:6000 (1"=500') showing the watershed units which are the subject of the hydrogeologic test and report. This map shall include planimetric features, topography, geological contracts, and

major structural features. The map shall show proposed well sites, subdivision layout and sources of potential contamination within 1000 feet of any proposed production well(s), to include, but not be limited to, existing or abandoned wells, septic drainfields, underground storage tanks, and houses. The map shall also show springs, watershed boundaries, and groundwater flow. All information is to be gathered from existing records and actual field conditions. Information concerning existing wells and septic drainfields is available from the local Health Department.

- 3) The proposal shall include a management plan to control the runoff of pumped water and assurances that all adjacent property owners will be notified of the time and duration of field testing.
- 4) After submission of a proposal for performing a hydrogeologic test, the applicant shall meet with representatives of the Department of Community Development and the WSA to review the proposal. The County or WSA may direct changes in the proposed location of test wells, and other changes as appropriate. This review shall take no more than 30 days from the submission date. No work is to be performed until approvals of proposals are granted in writing by both the County and the WSA.

C) Field Testing for Adequacy of Supply.

- 1) The production well(s):
 - a) All wells shall be placed and drilled in accordance with all State, local and WSA ordinances. A Virginia Certified Professional Geologist shall complete drilling logs (SWCB Form GW2) for the production well(s). The geologist shall take at least one rock sample from each geologic formation and shall take samples at no less than twenty (20) foot intervals when in the same geologic formation and upon request shall provide these samples to the WSA.
 - b) A two (2) hour initial air lift test is to be conducted in order to estimate yield.
 - c) A drawdown test shall be performed to provide evidence that such a system is capable of furnishing the needs of the full build-out of the proposed development.
 - (1) A standard continuous constant rate draw down test shall be performed on all proposed production wells. If more than one production well is proposed

to be in operation at the same time, simultaneous draw-down tests shall be performed.

- (2) The duration of the drawdown test shall be not less than forty-eight (48) hours with a minimum of twelve (12) hours at steady-state conditions.

- (a) Steady-state conditions are defined as a static pumping water level that varies by 0.5% at a pumping rate that varies by 3%.

- (3) The pumping rate shall be such that the static pumping water level does not come within ten (10) feet of any fracture zone that produces more than or equal to 25% of the well's total capacity.

d) Minimum Well Yields

- (1) Within any existing service district, yields must be greater than 50 gallons per minute in order for the well to be accepted as a public water supply well.

- (2) Outside of any existing service district, yields must be capable of providing not less than one (1) gallon per minute per each dwelling unit to be connected.

2) The observation wells:

- a) A minimum of two (2) observation wells will be drilled with each potential production well. The location of those observation wells shall be proposed by the consulting hydrogeologist and reviewed jointly by the Department of Community Development and the WSA.

- b) Where practical, existing wells may be used as observation wells. The consulting hydrogeologist shall provide location, well depth, casing size and depth, static water level, and usage information for any existing well which is proposed to be used as an observation well.

- c) Where new observation wells are to be drilled, 2-inch diameter piezometers drilled in hydrogeologically acceptable locations and to appropriate depths may be used.

- d) Water levels accurate to 10ths of a foot are to be monitored for drawdown effects continually while the drawdown test is performed.
- e) Recovery of water levels in the pumping wells and observation wells shall be recorded until at least 90% recovery is reached. Water levels shall be measured with the following schedule:

<i>ELAPSED TIME</i>	<i>MEASUREMENT</i>
1-10 minutes.....	every minute
10-100 minutes.....	every 10 minutes
100-1000 minutes*	every 60 minutes (*or as long as needed to reach 90% recovery)

D) Laboratory Testing for Water Quality

- 1) Field testing shall be done at each water bearing zone for the following parameters: Fe, S04, Mn, and hardness. If any values exceed existing State Waterworks Regulations Standards during drilling, the WSA shall be contacted to discuss possible remediation measures.
- 2) All water supplies shall conform to minimum standards as expressed by the latest divisions of the Waterworks Regulations of the Virginia Department of Health. Final water quality sampling shall be done at the last four (4) hours of the drawdown test and shall consist of one sample per hour.

18-2 Private Individual Wells

- i. Applicability of Hydrogeologic Testing (Amended by Board of Supervisors on September 9, 1999 and July 12, 2012.)
 - 1) The hydrogeological testing requirements and procedure for individual wells must be completed prior to the approval of the preliminary plat for any new subdivision consisting of seven (7) or more lots less than ten (10) acres in size where individual wells are permitted, unless this requirement is waived in accordance with the provisions of Section 4-27 on the basis of adequate engineering data demonstrating that the proposed water system will not adversely impact present or future water supplies and that testing is unnecessary or would create an undue hardship.

ii. Testing Proposal

- 1) The applicant shall submit a testing proposal to the County. This proposal shall be prepared based on Section 18-2.C., Field Testing.
- 2) The proposal shall include a map at a scale of not greater than 1:6000 (1"=500') showing the subdivision layout and proposed well sites for each building lot, planimetric features, topography, geological contracts, and major structural features. The map shall show sources of potential contamination within 200 feet of each proposed well site, to include, but not be limited to, existing or abandoned wells, springs, septic drainfields, underground storage tanks, and houses. All information is to be gathered from existing records and actual field conditions. Information concerning existing wells and septic drainfields is available from the local Health Department.
- 3) The proposal shall include a management plan to control the runoff of pumped water and assurances that all adjacent property owners will be notified of the time and duration of field testing.
- 4) After submission of a proposal for performing a hydrogeologic test, the applicant shall meet the representatives of the Department of Community Development and the WSA to review the proposal. The County and WSA will review each well location in order to insure that each geologic formation and major land form is tested. The County or WSA may direct changes in the proposed location of test wells, and other changes as appropriate. This review shall take no more than 30 days from the submission date. No work is to be performed until approval of proposals is granted in writing by both the County and the WSA.

iii. Field Testing for Adequacy of Supply.

- a. The applicant shall drill a minimum of three (3) test wells or 30% of the total number of lots proposed, whichever is greater. Each test well location should be a site approved by the local Health Department.
- b. A yield test shall be performed on each test well to provide assurance that the proposed wells will be capable of providing sustained long-term use.
- c. Each test well shall be pumped at a constant rate for a minimum of twelve (12) continuous hours.

- d. The test well shall be pumped at the rate of the estimated yield determined by the drilling contractor. Well yields must be capable of providing not less than three (3) gallons/minute.
- e. The two closest test wells shall be used as observation wells during the pumping test. Water levels in the observation wells shall be measured throughout the entire pumping test for drawdown effects.
- f. Recovery of water levels in the pumping wells and observation wells shall be recorded until at least 90% recovery is reached. Water levels shall be measured in accordance with the following schedule:

<i>ELAPSED TIME</i>	<i>MEASUREMENT</i>
1-10 minutes.....	every minute
10-100 minutes.....	every 10 minutes
100-1000 minutes*.....	every 60 minutes
(*or as long as needed to reach 90% recovery)	

- g. The applicant shall submit a drilling log (SWCB Form GW2) for each well.

D) Laboratory Testing for Water Quality

- 1) Sampling shall be done in accordance with the current revision of the State of Virginia Sewage Handling and Disposal Regulations.

18-3 Submission Requirements

A) Hydrogeologic Report.

- 1) The report shall contain a graphic lithology of each well and a narrative discussing the geologic setting, watershed units, hydrogeologic units, relief, occurrence, and movement of groundwater, and interpretation of water data from surrounding areas, including groundwater quality.
- 2) The report shall contain a map or set of maps at a scale of not greater than 1:6000 (1"=500') which shall cover the development proposal. This map shall contain all existing planimetric features, topography with 5' contour intervals, Virginia planar grid coordinates, all proposed roads, proposed lot lines, proposed house

sites and proposed septic drainfields, and surface water features, including springs. Flow net (i.e., groundwater contours and direction of groundwater flow) shall be illustrated.

The map shall contain one or more cross-sections, at true horizontal scale and vertical scale (exaggerated as required) which depict at least the following information:

- drill log data
- well site locations
- respective elevations of rock and static water surfaces
- stabilized pump-down levels of the water surface.

The location of each cross-section shall be shown on the plan view map.

- 3) The report shall develop groundwater mass balance and recharge estimates for the study area. It must include a discussion of the following information, including appropriate supporting calculations and diagrams:
 - a) Identification of the form and source of recharge.
 - b) The calculated effect of all lots (wells) pumping at a normal daily consumption rate on the piezometric surface (if applicable).
 - c) The average recharge for the subdivision, the recharge in drought years, and the average outflow from the subdivision or geologic unit.
 - d) The net daily water consumption of the subdivision.
 - e) Proposals addressing what to do with wells of inadequate yield on individual lots (if applicable).
 - f) The transmissivity of the various materials evaluated by aquifer tests interpreted using professionally-accepted methods.
 - g) The average storage coefficient of the water-bearing materials.
 - h) The specific capacity of each well.

- i) Table showing Virginia planar grid coordinates for each test well (if the well location is more than two (2) kilometers from any geodetic control monument that is accessible to the public, the coordinate values may be assumed).
- j) Results of the laboratory testing for water quality.
- k) For public wells, a recommended operation plan for the well(s) being utilized, to include:
 - a recommended "setting depth" for the installation of final production pumps.
 - the most desirable pumping rate for each well.
 - a time management schedule as to how the well should be pumped over an extended period of time.

18-4 Review

Hydrogeological reports shall be approved jointly by the Department of Community Development (County) and the Water and Sanitation Authority (WSA), except in cases where the WSA will not ultimately operate the proposed water system. In such cases the County shall be the approval authority and the WSA shall make a recommendation on the hydrogeological report to the County.

Four (4) copies of the report shall be submitted to the County for distribution. The County shall retain one copy for public view. The County and WSA shall have fifteen (15) days to review the report in order to determine that the submission and content requirements have been met. Once the report is accepted, written notification shall be sent to the applicant and the report shall be considered officially filed.

The County and WSA shall have sixty (60) days from the filing date to review the technical contents of the report. All written comments from outside parties must be submitted within thirty (30) days of the filing date.

Loudoun County

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.

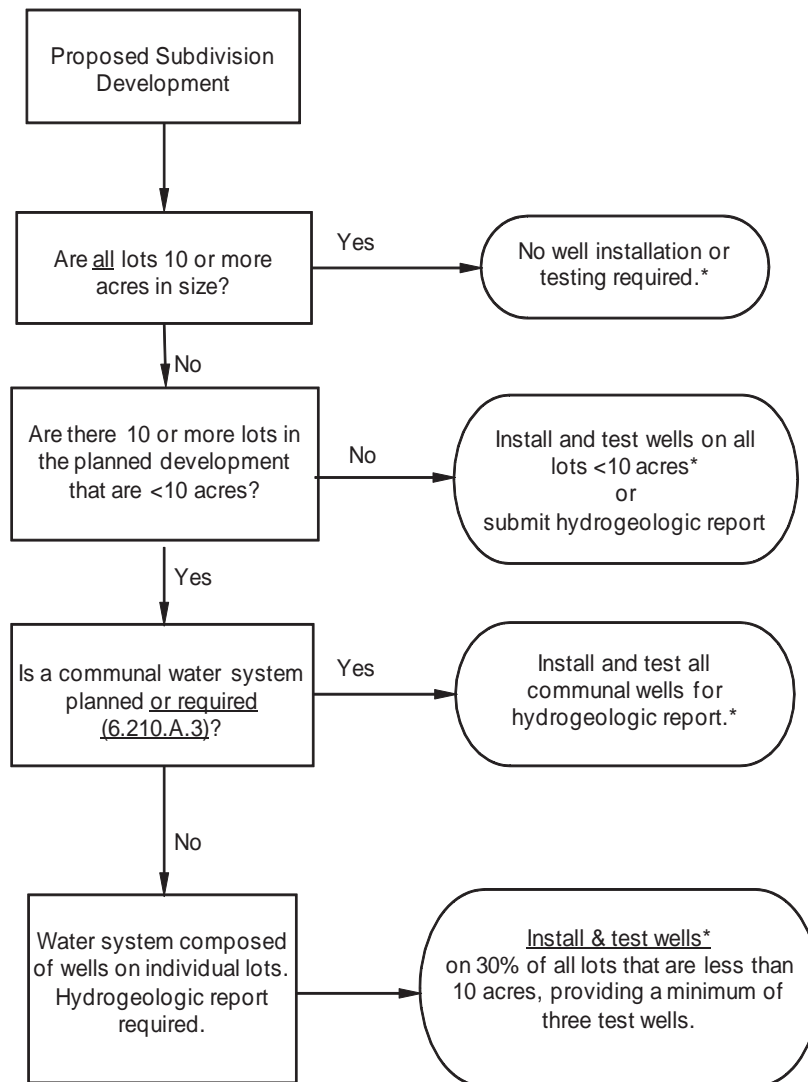
Subdivisions not served by central water and sewer can be divided into two groups based on the type of water supply system; those having a private well on each individual lot and those having communal (community) water systems serving multiple lots. Many of the requirements for hydrogeologic evaluation 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 ten (10) or more lots of less than ten (10) acres.
2. If the number of proposed lots less than ten (10) acres 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 the Revised 1993 Zoning Ordinance, shall obtain a Locational Clearance from the County prior to the issuance of 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 (Loudoun Water) 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. Test wells shall be installed and tested on thirty percent (30%) of the proposed lots that are less than 10 acres.
 - d. 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 plane (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:
 - 1. 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.
 - 2. 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.
 - 3. 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 effects 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 cannot 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 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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Fetter, C.W., 1994, [Applied Hydrogeology](#), Merrill Publishing Company, Columbus, OH.

Freeze, R. Allan and Cherry, John A., [Groundwater](#) (Prentice Hall, Inc., Englewood, CA, 1979).

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Kruseman, G. P. and N. A. de Ridder, 1990, Analysis and Evaluation of Pumping Test Data. International Institute for Land Reclamation and Improvement, Wageningen, The Netherlands.

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LAND SUBDIVISION AND DEVELOPMENT ORDINANCE

CHAPTER 1241

GENERAL PROVISIONS AND DEFINITIONS

1241.01 Authority

This Ordinance is authorized under Title 15.2, Chapter 22, Article 6 (Subdivision) and Article 7 (Zoning) of the Code of Virginia, 1950, as amended.

1241.02 Title

This Ordinance shall hereafter be known and referred to as the "Land Subdivision and Development Ordinance of Loudoun County, Virginia."

It shall consist of Chapters 1241 through 1246 of the Codified Ordinances of Loudoun County and the Loudoun County Facilities Standards Manual.

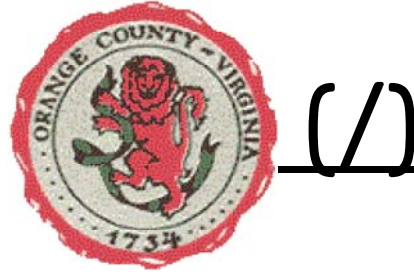
1241.03 Purpose

The purpose of this Ordinance is to establish subdivision and site plan standards and procedures for all unincorporated areas of Loudoun County, excluding subdivision and boundary line adjustment standards and procedures for unincorporated areas within: the Town of Hamilton Subdivision Control Area, as specified on the maps prepared by the County of Loudoun entitled "Purcellville and Hamilton Urban Growth Areas" and "Parcels within 1 mile of Hamilton" (hereby incorporated by reference), the Town of Purcellville Subdivision Control Area, as specified in the "Town of Purcellville/County of Loudoun Annexation Agreement", dated November 16, 1994, and in the Purcellville Urban Growth Area Management Plan (hereby incorporated by reference), and the Town of Middleburg Subdivision Control Area, as specified on the map prepared by the County of Loudoun entitled "Town of Middleburg One Mile Subdivision Control Limit" (hereby incorporated by reference). Specifically, it is the purpose of this Ordinance to insure that residential, industrial, and business centers are developed with adequate highway, utility, health, educational, and recreational facilities. This Ordinance is intended as an aid in the implementation of the Comprehensive Plan, which is designed to guide and facilitate the orderly, beneficial growth of the community and to promote the public health, safety, convenience, comfort, prosperity, and general welfare.

The provisions of this Ordinance and the Facilities Standards Manual shall be the minimum requirements for the submission, preparation, and recordation of all plans and plats.

12/06/06

Orange County



Orange County, Virginia

Code of Ordinances

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Chapter 70 - Zoning

Chapter 70-A - Airport Zoning (/index.php?option=com_content&view=article&id=57&Itemid=187)

Sec. 54-1. - Title.

These regulations shall officially be known, cited, and referred to as the Orange County Subdivision Ordinance, or "this ordinance" or "these regulations."

(Ord. of 3-9-2010)

Sec. 54-2. - Purpose.

This chapter is adopted pursuant to Code of Virginia, §§ 15.2-2240 et seq., which empowers any county in the commonwealth to "... adopt an ordinance to assure the orderly subdivision of land and its development."

(Ord. of 3-9-2010)

Sec. 54-4. - Jurisdiction.

This chapter shall apply to all lands in the county, including those covered by water, except for the areas within the corporate limits of the Town of Gordonsville or the Town of Orange.

(Ord. of 3-9-2010)

Sec. 54-5. - Definitions.

The following words, terms and phrases, when used in this chapter, shall have the meanings ascribed to them in this section, except where the context clearly indicates a different meaning:

Agent, subdivision means the county administrator or his designee(s).

Alley means a serviceway providing a secondary means of public access to abutting property and not intended for general traffic circulation.

Block means a tract of land bounded by streets or by a combination of streets and public land, railroad rights-of-way, waterways, or any other barrier to the continuity of development.

Board of supervisors means the board of supervisors of Orange County, Virginia; the governing body.

Boundary line adjustment means any straightening or minor realignment of property lines that would not change the number of lots and would not substantially change the area of any lot. This term includes the even exchange of property between two contiguous parcels.

Boundary survey means a plat showing the metes and bounds of an existing lot of record.

Building means any structure having a roof supported by columns or walls, for the housing or enclosure of persons, animals or property.

Circuit court means the Circuit Court of Orange County, Virginia.

Commission or planning commission means the Orange County, Virginia Planning Commission.

County means Orange County, Virginia.

Cul-de-sac means any street with an outlet at one end and a turnaround at the other.

Dam break inundation zone refers to the area downstream of a dam that would be inundated by the failure of the dam. (Va code definition)

Development means a tract of land developed or to be developed as a unit under single ownership or unified control which is to be used for any business or industrial purpose or is to contain one or more residential dwelling units.

Double frontage means frontage of a lot upon two parallel streets or upon two streets which do not intersect at the boundaries of the lot.

Easement means the legal authorization, as shown in a legal instrument or on a plat, by a property owner to a person, a partnership, a corporation, the general public, or a government agency to use a designated part of his property for specific purposes.

Easement survey means a plat on which is illustrated the creation or relocation of utility, drainage, road or other easements.

Engineer means a person licensed by the Commonwealth of Virginia as a professional engineer.

Family or immediate family means a person's natural or legal offspring, spouse, sibling, parent, grandparent, grandchild, niece, nephew or stepchild.

Floodplain means any area designated on the flood insurance rate maps issued by the Department of Housing and Urban Development as subject to inundation by a 100-year flood.

Front lot line means the lot line common to the street right-of-way or easement from which the property is accessed. If the required minimum frontage is along more than one road or street, the front lot line shall be along whichever is the shortest.

Frontage means the continuous uninterrupted distance along which a parcel abuts an adjacent road, street, right-of-way or easement.

Governing body means the board of supervisors of Orange County, Virginia.

Health department means the Orange County Health Department or its designated agent or representative.

Lot means a parcel of land, including a residue, whether described by metes and bounds or shown on a plat, intended as a unit of real estate for the purpose of ownership, conveyance, taxation or development.

Lot, corner, means a lot having two adjacent sides abutting on streets.

Lot depth means the average horizontal distance between the front and rear lot lines.

Lot of record means a parcel of land recorded by the clerk of the circuit court as an individual unit of real estate for the purpose of ownership, conveyance or taxation.

Open space means land reserved only for conservation of natural resources.

Parent parcel means:

a) In the agricultural zoning district, a parcel of land that is at least twice the minimum lot size required by the zoning chapter and that is of record upon the effective date of this chapter (as amended by the board of supervisors on May 25, 2010);

b) In any residential zoning district, a parcel of land that is of record upon the effective date of this chapter; or

c) For the purposes of continued division, the residue as defined herein.

Plat means a schematic representation of a parcel or subdivision drawn by a certified land surveyor or a professional engineer to the standards of the Virginia Public Records Act.

Plat, final, means a plat showing new property lines and certain features and improvements pursuant to the preliminary plat, and prepared for recordation.

Plat, preliminary, means a plat showing the existing boundaries and certain existing features of a parcel to be subdivided, together with the property lines of proposed lots and certain proposed features and improvements.

Property owners' or homeowners' association means an entity established pursuant to Code of Virginia, § 55-508 et seq., usually for the purpose of maintaining land or property owned in common by the owners of property in a subdivision.

Public or community water, wastewater or sewer systems means a water or sewer system owned and operated by a municipality, a public service authority, or an individual, partnership or corporation licensed by the state corporation commission and approved by the board of supervisors (see zoning ordinance definition).

Public street requirements means VDOT's most current Secondary Street Acceptance Requirements.

Recreational area means any portion of land reserved for any active or passive outdoor activity or facility, including but not limited to sports fields; playgrounds; picnic areas; walking, horseback riding or bicycle trails; equestrian facilities; ball courts; fitness courses; fishing and boating facilities; swimming pools; and golf courses.

Reserve strip means a strip of land between a street and adjacent property which is reserved or held in private ownership for future street extension or widening or as a means of controlling access to land dedicated or intended to be dedicated for public use.

Residue means the remainder of a lot after a subdivision has detached one or more lots.

Resubdivision means the adjustment of property lines which reallocates land area of contiguous lots or parcels, provided that the adjustment of property lines does not result in the creation of any additional lots or parcels of land, and does not result in any increased impact on public infrastructure.

Right-of-way means either a strip or other parcel of land owned by VDOT or others for the purpose of constructing and maintaining a road.

Right-of-way dedication survey means a plat on which is shown the dedication of a portion of a lot or lots for the purpose of dedicating said property for a future right-of-way.

State Department of Transportation or VDOT means the Virginia Department of Transportation or its designated agent or representative.

State Department of Health or VDH means the Virginia Department of Health or its designated agent or representative.

Street means a thoroughfare for vehicular traffic, including all of the area within an easement or right-of-way, and is interchangeable with the terms alley, avenue, boulevard, court, drive, highway, lane, road, or any similar term.

Subdivider means any individual, partnership, corporation or group, owning or having an interest in land, or representing the owners of any land proposing to subdivide such land.

Subdivision means the division of any lot of record into two or more lots, parcels or building sites, including residue, for the purpose of recordation in the county land records, transfer of ownership, or building development. Where a tract of land is bisected by the dedication of right-of-way, that lot is effectively subdivided. As the context requires, the term "subdivision" may mean the land divided, the process of division, or both.

Subdivision, agricultural, means any bona fide partition of agricultural land for agricultural purposes.

Subdivision, court-ordered, means any division or partition of land ordered by a court of competent jurisdiction other than as the result of an appeal pursuant to Code of Virginia, § 15.2-2259.

Subdivision, family, means a single division of a lot or parcel for the purpose of sale or gift to a member of the immediate family of the property owner.

Subdivision, major, means the division of a parcel, or the division of two or more contiguous parcels, that simultaneously or cumulatively creates eight or more lots served by one or more new streets to access the lots or the extension of any public water or public sewer.

Subdivision, minor, means the division of a parcel that creates, simultaneously or cumulatively, seven or fewer lots.

Subdivision, nonresidential, means a subdivision whose intended use is other than residential, such as commercial or industrial.

Subdivision, part-and-parcel, means the division of a tract of land where the portion divided off is made a bona fide part of an adjoining tract of land through the vacation of a common boundary line and no additional lots are created.

Survey, see plat.

Surveyor means a person licensed by the Commonwealth of Virginia to survey land.

Vacation of property lines means the vacating of boundary lines of any lot or parcel of land which consolidates land area of contiguous lots or parcels.

Vacation of property lines survey means a plat on which is displayed the vacation of property lines.

(Ord. of 3-9-2010; Ord. of 12-02-2014)

Sec. 54-6. - Enforcement, violations, and penalties.

1. General.

a. It shall be the duty of the subdivision agent to enforce these regulations and to bring to the attention of the county attorney or his designated agent any violations of these regulations.

b. No owner, or agent of the owner, of any parcel of the land located in a proposed subdivision shall transfer or sell any part of the parcel before a final plat of the subdivision has been approved by the subdivision agent in accordance with the provisions of these regulations and recorded with the clerk of the circuit court.

c. The subdivision of any lot or any parcel of land only by the use of a metes and bounds description for the purpose of sale, transfer, lease, or development is prohibited.

d. No building permit shall be issued for the construction of any building or structure located on a lot or plat subdivided or sold in violation of these regulations, nor shall the county have any obligation to issue certificates of occupancy or to extend utility services to any parcel created in violation of these regulations.

e. No clerk of any court shall file or record a plat of a subdivision required by this article to be recorded until the plat has been approved as required herein.

2. Violations and penalties. Any person who violates any of these regulations shall be subject to a fine of not more than \$500.00 for each lot or parcel of land so subdivided or sold; such fine shall be pursuant to Code of Virginia, § 15.2-2254.

3. Civil enforcement. Appropriate actions and proceedings may be taken to prevent any violation of these regulations, to prevent unlawful construction, to recover damages, to restrain, correct, or abate a violation, and to prevent illegal occupancy of a building structure or premises. These remedies shall be in addition to the penalties described above.

(Ord. of 3-9-2010)

Sec. 54-7. - Interpretation and severability.

Conflicts between this chapter and public or private provisions shall be as follows:

a. Public provisions. These regulations are not intended to interfere with, abrogate, or annul any other ordinance, rule or regulation, statute, or other provision of law except as provided in these regulations. Where any provision of these regulations imposes restrictions different from those imposed by any other provision of these regulations or any other ordinance, rules or regulation, or other provision of law, the provision which is more restrictive or imposes higher standards shall apply.

b. Private provisions. These regulations are not intended to abrogate any easement, covenant, or any other private agreement or restriction, provided that where the provisions of these regulations are more restrictive or impose higher standards or regulations than such easement, covenant, or other private agreement or restriction, the requirements of these regulations shall govern. Private provisions, restrictions, or covenants are not enforced by the county.

c. Severability. If any part or provision of these regulations or the application of these regulations to any person or circumstances is adjudged invalid by any court of competent jurisdiction, the judgment shall not affect or impair the validity of the remainder of these regulations or the application of them to other persons or circumstances. The board of supervisors hereby declares that it would have enacted the remainder of these regulations even without any such part, provision, or application that is judged to be invalid.

(Ord. of 3-9-2010)

Sec. 54-8. - Pending applications.

An application for subdivision submitted prior to the effective date of these regulations and under active review shall be reviewed under the regulations in effect at the time of application submittal if the final plat is submitted within one year of the approval of the preliminary plat.

(Ord. of 3-9-2010)

Sec. 54-9. - Saving provision.

These regulations shall not be construed as abating any action now pending under, or by virtue of, prior existing subdivision regulations, or as discontinuing, abating, modifying, or altering any penalty accruing or about to accrue, or as affecting the

liability of any person, firm, or corporation, or as waiving any right of the county under any section or provision existing at the time of adoption of these regulations, or as vacating or annulling any rights obtained by any person, firm, or corporation by lawful action of the county except as shall be expressly provided for in these regulations.

(Ord. of 3-9-2010)

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Sec. 54-211. - Authority and purpose.

To safeguard the public health and welfare, the county must protect the groundwater and ensure that new development will not unreasonably reduce the water supply of

At least one aquifer test shall be performed in each geologic unit. If a geologic unit is larger than 50 acres, one aquifer test shall be performed in each 50 acres, or fraction thereof, of the unit. In unusual conditions the county may require more tests, as the geology requires.

(Ord. of 3-9-2010)

Sec. 54-215. - Proposal required.

After mapping the geology and before testing the aquifer, the subdivider shall submit a proposal identifying the location of all test wells and observation wells, and describing the tests to be performed on each. The proposal shall include a map at one inch equals 200 feet scale, showing all watershed units and boundaries, planimetric features, topography, geologic contacts and structural features, groundwater table contours and direction of groundwater flow as available from published sources, existing springs, wells and septic systems on the property, and buildings and wells within 1,000 feet of the subject property. The subdivider shall meet with the county's representatives to review and approve the proposal.

(Ord. of 3-9-2010)

Sec. 54-216. - Testing the aquifer for adequate quantity.

A standard continuous constant-rate test of at least 72 hours' duration shall be performed on each test well using professionally accepted methods (as described in the most recent edition of Groundwater and Wells by Fletcher Driscoll, Johnson Division, St. Paul, MN). The geologist or engineer shall submit well logs (VWCB form GW2) for all test wells. Test wells shall be constructed and abandoned in compliance with VDH regulations.

(Ord. of 3-9-2010)

Sec. 54-217. - Observation wells.

Two observation wells shall be drilled near each test well and shall be monitored continuously during each test. One observation well shall be approximately 100 feet from the test well. The other shall be approximately 300 feet from the test well and

aligned with the test well and the first observation well. Observation wells need not be constructed to water well standards but must be abandoned in compliance with VDH regulations.

(Ord. of 3-9-2010)

Sec. 54-218. - Depth to water.

Aquifer tests shall be performed with submersible pumps. Depth-to-water measurements shall be accurate to the nearest tenth of a foot. Discharge rates of the test wells shall be measured, not estimated, and the measurements recorded in the field at the time of the test.

(Ord. of 3-9-2010)

Sec. 54-219. - Recovery period.

Each aquifer pump test shall include a recovery period of 24 hours, or to a residual drawdown equal to 20 percent of the maximum drawdown, whichever is less.

(Ord. of 3-9-2010)

Sec. 54-220. - Quantity standard.

Such tests shall show that the aquifer is capable of producing two gallons of water per minute multiplied by the number of dwelling units to be constructed over the life of the development, without undue change in the piezometric surface of the aquifer or the yield of existing wells in the area.

(1) Where individual wells are proposed, the tests shall show that each geologic unit is capable of producing two gallons of water per minute multiplied by the number of dwelling units to be constructed in that geologic unit.

(2) Where community well systems are proposed, the tests shall show that the geologic units in which the production wells will be located are capable of producing two gallons of water per minute multiplied by the number of dwelling units to be constructed in the development.

(Ord. of 3-9-2010)

Sec. 54-221. - Testing for adequate quality.

One representative sample shall be drawn from each test well near the end of the yield test. It shall be tested by a laboratory certified by the commonwealth for bacteria, primary and secondary contaminants as established in 12VAC5-590-380, 390 and 1280:15 of VDH waterworks regulations. For any proposal in any area of the county west of Routes 231 and 646, where well water is likely to contain radioactivity, one representative sample shall be drawn from each test well near the end of the yield test and tested for radioactivity as established in 12VAC5-590-400 of VDH waterworks regulations.

(Ord. of 3-9-2010)

Sec. 54-222. - Primary contaminants.

If the tests show that bacteria or one or more primary contaminants are present at a level exceeding the maximum acceptable level, the subdivider shall either retest the well, drill and test another well, or submit a proposal to treat the water to remove or reduce the contaminant to acceptable levels.

(Ord. of 3-9-2010)

Sec. 54-223. - Secondary contaminants.

If the tests show that one or more secondary contaminants are present at a level exceeding the maximum acceptable level, the subdivider shall show on the plat that the well water was tested and determined to be contaminated, but is not necessarily unsafe.

(Ord. of 3-9-2010)

Sec. 54-224. - Radioactivity.

If the test results show that radioactivity is present at a level exceeding the maximum acceptable level, the subdivider shall either retest the well, drill and test another well, or submit a proposal to treat the water to reduce the radioactivity to acceptable levels.

(Ord. of 3-9-2010)

Sec. 54-225. - Report of results.

The applicant shall submit a report containing a graphic lithology of each well and a narrative discussing the geologic setting, watershed units, hydrogeologic units, relief, occurrence and movement of groundwater, water quality and interpretation of water data from the surrounding area.

(Ord. of 3-9-2010)

Sec. 54-226. - General map.

The report shall include a legible map at least 1:6000 (1" = 500') scale showing the boundaries of the proposed subdivision, adjacent owners, existing land use, existing wells or other sources of drinking water, and any known or suspected source of groundwater pollution (including but not limited to landfills, hazardous waste facilities, junkyards, or federal or state "superfund" sites).

(Ord. of 3-9-2010)

Sec. 54-227. - Specific map.

The report shall include a legible map at least 1:2400 (1" = 200') scale showing all existing planimetric features, topography, surface water, state planar grid system, estimated groundwater contours and direction of flow, and all proposed roads, lot lines, building sites and septic systems.

(Ord. of 3-9-2010)

Sec. 54-228. - Cross sections.

The report shall include at least two generally orthogonal cross sections showing geologic formations, drill log data, well locations, elevations of rock, elevations of static water surfaces, and stabilized drawdown levels of the water surface. The location of each cross section shall be shown on the plan view map.

(Ord. of 3-9-2010)

Sec. 54-229. - Raw data.

The report shall show all raw data necessary to support its calculations and conclusions. It shall develop groundwater mass balance and recharge estimates, and shall discuss the following:

- (1) Identification of the form and source of recharge;
- (2) Calculated projected effects on the piezometric surface of all wells pumping at 300 gallons per day per lot;
- (3) Average recharge for each geologic unit in the subdivision, the recharge in drought years, and the average outflow from each geologic unit in the subdivision;
- (4) Net water consumption of the subdivision;
- (5) For individual wells, proposals to address wells of inadequate yield;
- (6) Transmissivity, storativity, hydraulic gradient, hydraulic conductivity, and groundwater flow of the various materials evaluated by aquifer tests, interpreted using professionally accepted methods;
- (7) Specific capacity of each well;
- (8) Observed boundary effects and effective radius of influence of each well;
- (9) State planar grid coordinates for each well;
- (10) Results of the laboratory testing of water quality; and

(11) Potential sources of groundwater contamination, and recommendations for ameliorating their impact.

(Ord. of 3-9-2010)

Sec. 54-230. - Application fee.

The application fee for subdivision proposals requiring such tests shall include an amount, as adopted by the board of supervisors, to defray the cost to the county of retaining a consultant to review the proposal and report and assist the county at the public hearing.

(Ord. of 3-9-2010)

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Rappahannock County

*Rappahannock County, VA
Thursday, September 21, 2017*

Chapter 147. Subdivision of Land

Article I. General Provisions

§ 147-1. Purpose and authority.

- A. The purpose of this chapter is to establish certain subdivision standards and procedures for Rappahannock County, Virginia, and such of its environs as come under the jurisdiction of the governing body as provided for pursuant to Title 15.2, Chapter **22**, Article 6, Land Subdivision and Development, § 15.2-2240 et seq., of the Code of Virginia 1950, as amended.
[Amended 2-2-2015]
- B. These are part of a long-range plan to guide and facilitate the orderly beneficial growth of the community and to promote the public health, safety, convenience, comfort, prosperity and general welfare. More specifically, the purposes of these standards and procedures are to provide a guide for the change that occurs when lands and acreage become urban in character as a result of development for residential, business or industrial purposes, to provide assurance that the purchasers of lots are buying a commodity that is suitable for development and use and to make possible the provision of public services in a safe, adequate and efficient manner. It is essential that no changes resulting from subdivisions or partitions of land within the County violate the purpose and intent of Chapter **170**, Zoning, of the Code of Rappahannock County. Land management must protect and encourage the agricultural, conservation, recreational, and aesthetic characteristics which are the predominant assets of Rappahannock County. This chapter assists the County in meeting those responsibilities.

§ 147-2. Title.

This chapter is known and may be cited as the "Rappahannock County Subdivision Ordinance of 1987" or "1987 Subdivision Ordinance of Rappahannock County, Virginia." This chapter supersedes the ordinance known as the "Subdivision Ordinance of Rappahannock County, Virginia, 1973," as amended.

*Rappahannock County, VA
Thursday, September 21, 2017*

Chapter 147. Subdivision of Land

Article IV. Plats and General Regulations

§ 147-20. Public water and sewer.

Where approved public water and sewer are available the services shall be extended to all lots sold within a subdivision. If public water and sewer are not available, the subdivider shall comply with § 147-21.

§ 147-21. Private water and/or sewer.

- A. Nothing in this chapter shall prevent the installation of privately owned water distribution systems or sewage collection and treatment facilities; provided, however, that any such installation must meet all of the requirements of the State Water Control Board, the State Health Department and any other such state or local regulation having authority over such installations. Any such system shall be approved by the governing body of Rappahannock County as provided in Title 15.2, Chapter 21, Articles 4 (§ 15.2-2126 et seq.) and 6, (§ 15.2-2149 et seq.) of the Code of Virginia 1950, as amended. Public sewage treatment facilities must provide treatment of liquified effluent equal to that of the drinking water standard as determined by the Health Official. Treatment facilities must be of permanent design.
[Amended 2-2-2015]
- B. All lots of five acres or less in size, in subdivisions of five lots or more, shall provide water distribution systems, at the discretion of the governing body and with consultation with the Health Official.
- C. In all subdivisions of 10 lots or more, each of which is five acres or less in size, the subdivider shall provide water distribution and sewage collection systems. Where the sewage collection system is proposed to be a community on-site system the CPSS, AOSE and engineer shall meet all the requirements of the Department of Environmental Quality and the State Health Department. Each system shall have maintenance and monitoring documents in which all necessary maintenance requirements are enumerated, a copy of which must be submitted to the Health Department prior to system approval. All such systems shall be designed to be permanent systems and have available a two-hundred-percent repair area. Each system shall have an approved business plan to ensure that the system will be financially self-sustaining and which clearly demonstrates how the routine maintenance and monitoring will be financed. Each community on-site system shall, at the option of the Rappahannock County Water and Sewer Authority, be deeded to such Authority along with the required repair area.
[Amended 11-1-2004]
- D. Hydrogeologic testing.
[Added 1-2-1996]

- (1) Private individual wells.
 - (a) Hydrogeologic report. A hydrogeologic report is a detailed geotechnical report assessing groundwater quantity and quality. The hydrogeologic report shall be prepared by a Virginia certified professional geologist or a professional engineer licensed to practice in Virginia who has demonstrated expertise in hydrogeology.
 - (b) Applicability of hydrogeologic testing.
 - [1] The hydrogeologic testing requirements and procedure must be conducted on any new residential subdivision of three lots or more, any one of which less than five acres in size in all zoning districts. In residential districts and villages, new residential subdivisions which have 10 or more lots, regardless of lot size, will require hydrogeological testing. All residential lots created from a parcel of land (including adjacent parcels under the same ownership at the time of subdivision) within the preceding 10 years shall be counted towards this total.
[Amended 1-5-2000]
 - [2] Any commercial or industrial subdivision that will extract more than 10,000 gallons per day.
 - (c) Testing proposal.
 - [1] The applicant shall submit a testing proposal to the County. This proposal shall be prepared based on § 147-21C, field testing for adequacy of supply.
 - [2] The proposal shall include a map at a scale of not greater than 1 to 6,000 (one inch equals 500 feet) showing the watershed units which are the subject of the hydrogeologic test and report. This map shall include planimetric features, topography, geological contracts and major structural features. The map shall show proposed well sites, subdivision layout and sources of potential contamination within 1,000 feet of any proposed production well(s) to include, but not be limited to, existing or abandoned wells, septic drainfields, underground storage tanks and houses. The map shall also show springs, watershed boundaries and groundwater flow. All information is to be gathered from existing records and actual field conditions. Information concerning existing wells and septic drainfields is available from the local Health Department.
 - [3] The proposal shall include a management plan to control the runoff of pumped water and assurances that all adjacent property owners will be notified of the time and duration of field testing.
 - [4] After submission of proposal for performing a hydrogeologic test, the applicant shall meet with representatives of the Zoning Administrator to review the proposal. The Zoning Administrator may direct changes in the proposed location of test wells, and other changes as appropriate. This review shall take no more than 30 days from the submission date. No work is to be performed until approvals of proposal are granted in writing by the Zoning Administrator.
 - (d) Field testing for adequacy of supply.
 - [1] The applicant shall drill a minimum of three test wells or 30% of the total number of lots proposed, whichever is greater. Each test well location should be a site approved by the local Health Department.
 - [2] A yield test shall be performed on each test well to provide assurance that the proposed wells will be capable of providing sustained long-term use.

- [3] Each test well shall be pumped at a constant rate for a minimum of 48 continuous hours.
- [4] The test well shall be pumped at the rate of the estimated yield determined by the drilling contractor. Well yields must be capable of providing not less than three gallons/minute.
- [5] The two closest test wells shall be used as observation wells during the pumping test. Water levels in the observation wells shall be measured throughout the entire pumping test for drawdown effects.
- [6] Recovery of water levels in the pumping wells and observation wells shall be recorded until at least 90% recovery is reached. Water levels shall be measured in accordance with the following schedule:

Elapsed time	Measurement
1 to 10 minutes	Every minute
10 to 100 minutes	Every 10 minutes
100 to 1,000 minutes*	Every 60 minutes
(* or as long as needed to reach 90% recovery)	

- [7] The applicant shall submit a drilling log (SWCB Form GW2) for each well.
- (e) Laboratory testing for water quality. Sampling shall be done in accordance with the current revision of the State of Virginia Sewage Handling and Disposal Regulations.
- (2) Submission requirement; hydrogeologic report.
 - (a) The report shall contain a graphic lithology of each well and a narrative discussing the geologic setting, watershed units, hydrogeologic units, relief, occurrence and movement of groundwater and interpretation of water data from surrounding areas, including groundwater quality.
 - (b) The report shall contain a map or set of maps at a scale of not greater than 1 to 6,000 (one inch equals 500 feet) which shall cover the development proposal. This map shall contain all existing planimetric features, topography with five-foot contour intervals, Virginia planar grid coordinates, all proposed roads, proposed lot lines, proposed house sites and proposed septic drainfields and surface water features, including springs. Flow net (i.e., groundwater contours and direction of groundwater flow) shall be illustrated.
 - (c) Map cross sections.
 - [1] The map shall contain one or more cross sections, at true horizontal scale and vertical scale (exaggerated as required) which depict at least the following information:
 - [a] Drill log data.
 - [b] Well, site locations.
 - [c] Respective elevations of rock and static water surfaces.
 - [d] Stabilized pump-down levels of the water surface.
 - [2] The location of each cross-section shall be shown on the plan view map.

- (d) The report shall develop groundwater mass balance and recharge estimates for the study area. It must include a discussion of the following information, including appropriate supporting calculations and diagrams:
 - [1] Identification of the form and source of recharge.
 - [2] The calculated effect of all lots (wells) pumping at a normal daily consumption rate on the piezometric surface (if applicable).
 - [3] The average recharge for the subdivision, the recharge in drought years and the average outflow from the subdivision or geologic unit.
 - [4] The net daily water consumption of the subdivision.
 - [5] Proposals addressing what to do with wells of inadequate yield on individual lots (if applicable).
 - [6] The transmissivity of the various materials evaluated by aquifer tests interpreted using professionally accepted methods.
 - [7] The average storage coefficient of the water-bearing materials.
 - [8] The specific capacity of each well.
 - [9] Table showing Virginia planar grid coordinates for each test well (if the well location is more than two kilometers from any geodetic control monument that is accessible to the public, the coordinate values may be assumed).
 - [10] Results of the laboratory testing for water quality.
- (3) Review. Hydrogeological reports shall be approved by the Zoning Administrator or his or her designee. Four copies of the report shall be submitted to the Zoning Administrator for distribution. The Zoning Administrator shall retain one copy for public view. The Zoning Administrator shall have 15 days to review the report in order to determine that the submission and content requirements have been met. Once the report is accepted, written notification shall be sent to the applicant, and the report shall be considered officially filed. The Zoning Administrator shall have 60 days from the filing date to review the technical contents of the report. All written comments from outside parties must be submitted within 30 days of the filing date.

Appendix E

Pertinent Virginia State Regulations

Code of Virginia

Title 15.2. Counties, Cities and Towns

Chapter 21. Franchises; Sale and Lease of Certain Municipal Public Property; Public Utilities

§ 15.2-2121. Regulations as to water, sewer and other facilities in subdivisions and development plans.


Any locality which has adopted regulations under Chapter 22 (§ 15.2-2200 et seq.) governing the use and development of land may also adopt regulations, subject to the provisions of Chapter 3.1 (§ 62.1-44.2 et seq.) of Title 62.1, fixing requirements as to the extent to which and the manner in which water, sewer and other utility mains, piping, conduits, connections, pumping stations and other facilities in connection therewith shall be installed as a condition precedent to the approval of an original plat of a subdivision or a development plan adopted pursuant to § 15.2-2286, or alteration of any such plat or a development plan adopted pursuant to § 15.2-2286. Such regulations may (i) require the water source to be an approved source of supply capable of furnishing the needs of the eventual inhabitants of such subdivision proposed to be served thereby, (ii) include requirements as to the size and nature of the water and sewer and other utility mains, pipes, conduits, connections, pumping stations or other facilities installed or to be installed in connection with the proposed water or sewer systems and (iii) include requirements to extend and connect to abutting or adjacent public water or sewer systems.

Code 1950, § 15-719.1; 1954, c. 592; 1962, c. 623, § 15.1-299; 1970, c. 572; 1997, c. 587; 2005, c. 567.

The chapters of the acts of assembly referenced in the historical citation at the end of this section may not constitute a comprehensive list of such chapters and may exclude chapters whose provisions have expired.

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Code of Virginia
Title 15.2. Counties, Cities and Towns
Chapter 22. Planning, Subdivision of Land and Zoning



§ 15.2-2240. Localities to adopt ordinances regulating subdivision and development of land.


The governing body of every locality shall adopt an ordinance to assure the orderly subdivision of land and its development.



Code 1950, §§ 15-781, 15-967; 1950, p. 183; 1962, c. 407, § 15.1-465; 1975, c. 641; 1997, c. 587.

The chapters of the acts of assembly referenced in the historical citation at the end of this section may not constitute a comprehensive list of such chapters and may exclude chapters whose provisions have expired.

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VIRGINIA LAW

Code of Virginia

Code of Virginia

[Table of Contents](#) » [Title 32.1. Health](#) » [Chapter 6. Environmental Health Services](#) » § 32.1-176.4. Powers and duties of Board and Department; regulations; fees

§ 32.1-176.4. Powers and duties of Board and Department; regulations; fees.

A. The Board shall adopt regulations pertaining to the location and construction of private wells in the Commonwealth. These regulations shall include minimum storage capacity and yield requirements for residential drinking wells. The certified water well systems provider shall certify the storage capacity and the yield of the well on a form provided by the Department at the time the well is completed. The Department shall enforce the provisions of this article and any rules and regulations adopted pursuant thereto. However, for private wells located in the Counties of Fairfax, Goochland, James City, Loudoun, Powhatan, and Prince William and the City of Suffolk, the governing body of such county or city may, by ordinance, establish standards which are consistent with Board standards pertaining to location and testing of water therefrom and more stringent than those adopted by the Board pertaining to construction and abandonment. However, any county or city granted these additional powers shall not require certification for drillers of monitoring wells and any recovery wells associated with such monitoring wells.

B. A fee of \$40 shall be charged for filing an application for a private well construction permit with the Department. Funds received in payment of such charges shall be transmitted to the Comptroller for deposit. The funds from the fees shall be credited to a special fund to be appropriated by the General Assembly, as it deems necessary, to the Department for the purpose of carrying out the provisions of this title. The Board, in its regulations, shall establish a procedure for the waiver of fees for persons whose incomes are below the federal poverty guidelines established by the United States Department of Health and Human Services or when the application is for replacement of a well. If the Department denies the permit for land on which the applicant seeks to construct his principal place of residence, then such fee shall be refunded to the applicant.

From such funds as are appropriated to the Department from the special fund, the Board shall apportion a share to the local or district health departments to be allocated in the same ratios as provided for the operation of such health departments pursuant to § [32.1-31](#). Such funds shall be transmitted to the local or district health departments on a quarterly basis.

C. The Board's regulations shall provide for the issuance of an express geothermal permit allowing, upon proper registration and payment of application fees, the construction of wells used solely for a closed loop geothermal heating system. The express geothermal permit shall include:

1. A requirement that all well construction be performed by a person holding a valid, appropriate contractor license with water well classification pursuant to Chapter 11 (§ [54.1-1100](#) et seq.) of Title 54.1;
2. A requirement that the contractor provide a registration statement to the Department prior to beginning construction of the geothermal heating system certifying that the location and construction of the geothermal heating system will comply with the private well regulations;
3. A requirement that the registration statement accurately identify the property location, the owner's name, address, and contact information, and the contractor's name, address, and contact information;
4. A requirement that the registration statement include a detailed site plan, drawn to scale, showing the location of the geothermal heating system and any potential sources of contamination;
5. A provision that construction of the geothermal heating system may begin immediately upon submittal of a proper registration statement; and
6. A provision that a single application and a single fee be required for any geothermal well system. The fee will be equal to the fee for a single private well.

1986, c. 401; 1988, c. 203; 1991, c. 514; 1992, c. 599; 1993, cc. 85, 728, 794; 1994, cc. [141](#), [747](#); 1999, c. [633](#); 2004, c. [72](#); 2009, cc. [105](#), [710](#).