

Report on Outdoor Lighting Standards and the Problem of Light Pollution



FY 2004-2005



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Executive Summary

The lights in the night sky are perhaps one of nature's most wondrous treasures. The stars, constellations, and celestial bodies have been a constant source of inspiration for mankind throughout human history.

The unforeseen consequences of certain human activities are, however, threatening the ability of future generations to see beautiful views of the night sky. The projection of light towards the sky by the bright outdoor lighting fixtures used to illuminate streets, signs, and parking lots, among other uses for light at night, is leading to the degradation of the view of certain celestial bodies at night. It is also leading to the more localized problems of glare and light trespass.

Recognizing this problem, many localities in the Commonwealth of Virginia have undertaken initiatives to reduce glare, fight light trespass, and lessen the impact of development and of excessive outdoor lighting upon the natural treasure represented by the stars in the sky. Indeed, some localities in our region provide for some restriction of outdoor lighting in their zoning and land use regulations. However, some of the more recent outdoor lighting regulations in the State have been hailed by certain environmental interests as truly innovative and extremely effective in limiting light pollution. These new lighting regulations are explored in the following pages for possible application to the region.

This report also discusses some of the existing research on the degree of night sky degradation in urban areas in America today in addition to discussing some of the local measures undertaken to protect the night sky from light pollution.

Nationally, the loss of American 'dark areas' or areas where night sky views are unhindered by artificial light has accelerated since the end of World War II. Recent articles on night sky visibility state that already two-thirds of Americans cannot see the Milky Way from their backyards. If that is not alarming enough, computer models project that remaining 'dark areas' in the American West will be lost completely in approximately twenty years.

Light pollution has taken its toll locally, as well. It is clear to the average observer that some portions of the Roanoke Valley-Alleghany Region have already lost their dark skies. Indeed, in the urbanized area, it is difficult to observe many constellations. There is a notable difference between night sky views in the urban and rural portions of the region.

Numerous methodologies exist for the measurement of sky glow, many involving expensive photographic and computerized equipment. For the purposes of this study, staff made use of "The First World Atlas on Artificial Night Sky Brightness." The results of these efforts can be found on pages 4-7.

A collection of model ordinances and examples of lighting ordinances applied in other Virginia localities can be found in Appendix C. In general, it has been found that the most effective lighting ordinances contain the following common elements: lighting zones, maximum permitted light, provisions for required shielding on certain fixtures, and lighting curfews.

Introduction

The night sky is one of the Earth's most beautiful natural treasures. The stars in the sky have served as navigational guides and inspirations for art since the dawn of man. In modern times, starry skies are known for their aesthetic worth and scientific value. Annually, thousands flock to the nation's largest national parks for some of the most beautiful, unhindered views of the natural night sky in the country. Indeed, among those who study the night sky and those who frequently enjoy outdoor recreation, the night sky is considered a resource unto itself.

What many may not realize is that the night sky that can be seen on Earth today is not the same view man had a mere century ago before electrification dotted the landscape with outdoor lighting fixtures. Very few areas remain where the view has not been subjected to degradation due to the effects of urban light pollution and sky glow. According to theoretical models of light pollution, even remote areas many miles away from an urban area are affected by the sky glow produced in cities by light pollution.



Figure 1: The first picture on the left was taken in Ontario, Canada during the Eastern North American Power Blackout of August, 2003. The second picture on the right was taken in the same location after power was restored.

The phenomenon of light pollution has grown to the point that now approximately two-thirds of the nation's population cannot see the Milky Way from their backyards. Indeed, the view available in most of America's cities is that of only a few of the brightest stars in the sky. Figure 1¹ above illustrates the effect of inefficient outdoor lighting and urban artificial sky glow upon the night-sky view.

What is light pollution and how does it affect the night sky? Light pollution is defined as the result of the inefficient use of artificial light at night. Most importantly to this discussion, light pollution usually leads to several associated problems and nuisances including glare, light trespass, visual clutter, and sky glow.

Artificial sky glow is caused by aging and/or inefficient fixtures that project large quantities of light at angles approaching or above 90 degree downward angles (horizontal to the ground) or

¹ Photo courtesy of the International Dark-Sky Association. <http://www.darksky.org/images/night_scapes.html>.

lights that are too bright, thus causing light to bounce off of the ground or other surfaces and project skywards. This light energy is then scattered errantly throughout the atmosphere and reflected off of clouds. The effect of this light pollution is effectively a lessening of the darkness of the night sky, which leads to the loss of the contrast between the brightness of the stars and the dark background of the sky. The sky glow phenomenon is considered troublesome by many, especially astronomers and nature enthusiasts. Indeed, an important element of the outdoor experience for many is a relatively unspoiled view of the night sky. Therefore, preserving natural night sky views could be crucial for a region like the Roanoke Valley – Alleghany Regional Commission’s service area, parts of which rely heavily upon outdoor recreation and natural amenities for purposes of economic development.

In addition to the effects upon the ability to see stars caused by sky glow, light trespass, visual clutter, and glare are equally troublesome. Glare off of unshielded lights can present safety hazards to drivers or pedestrians walking through dark areas by adversely affecting visibility. Glare can be disabling if too powerful, causing motorized collisions. See Figure 2 for an illustration of glare. Light trespass occurs when unwanted light shines on another’s personal property or windows and is quite a nuisance in and of itself. Examples of light trespass might include light coming into one’s bedroom window at night from streetlights, the nearby car dealer or mall, or from a neighbor’s security light. Another possible form of light pollution according to the American Planning Association is Visual Clutter and Confusion, which is defined as light “noise” in the field of view that is both distracting and annoying (i.e. too many brightly lit signs or lights).



Figure 2: These unshielded streetlights present an example of fixtures causing glare at night.

Outdoor lighting ordinances are an effective means that a locality may employ to regulate and control certain types of lighting. An outdoor lighting control ordinance restricts lighting types, when they can be used, and other factors relating to qualities of lighting used.

Several localities presently employ some form of outdoor lighting ordinance. Demand for these sorts of measures is constantly growing, as awareness of the light pollution issue increases. The American Planning Association’s Planning Advisory Service states that it has received more than 400 lighting-related inquiries over the past decade.

Land use policies and other general zoning regulations that a locality can choose to adopt to mitigate light pollution and its associated problems are examined in this document and several examples of such policies adopted in Virginia localities are included in Appendix C.

Light Pollution Assessment

In order to assess the problem of light pollution in the region, this document will focus mostly on sky glow. The other effects of light pollution are truly too localized for staff to measure properly. It can be said that, in general, where there is light pollution on a mass scale, as there is in most urban areas in the world today, there is sky glow. Therefore, the presence of sky glow almost certainly suggests that there is widespread glare and perhaps even light trespass in an area.

The question we must ask is how widespread is the use of inefficient lighting in the region and to what degree has the night sky been degraded by its use? This is an extremely difficult question to answer. There are numerous methodologies available to the researcher for answering this question; however, many of them involve the use of expensive, specialized digital cameras, customized computer programs, and lots of time to process the data and to attain some scientific result. Due to the work of three scientists using data obtained from orbiting satellites, however, the entire world now has access to “The First World Atlas of Artificial Night Sky Brightness”, the first such data set of its kind available to the scientific community in 2001.

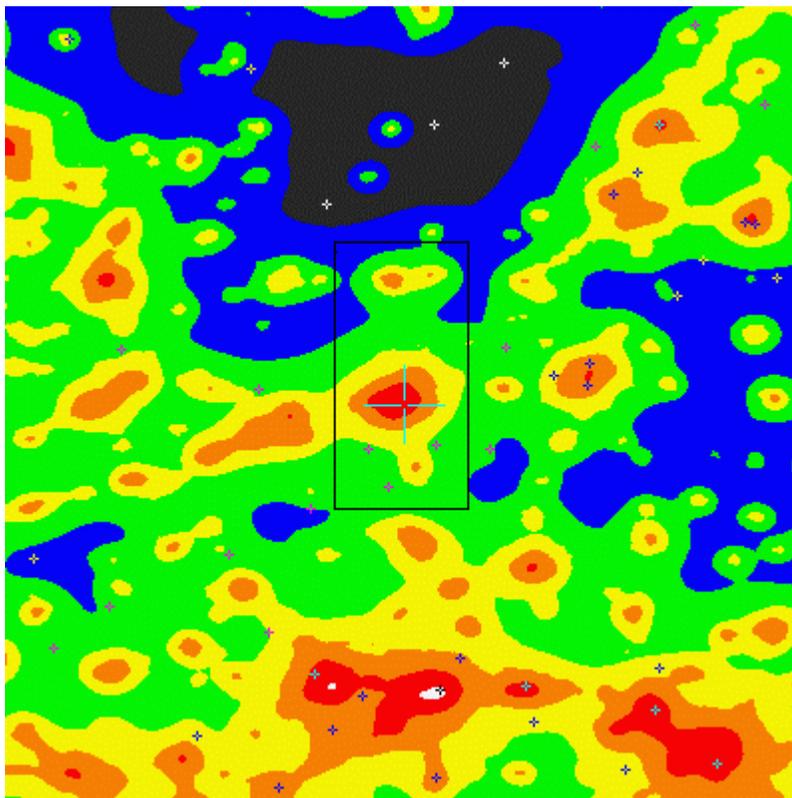


Figure 3: Light Pollution map for Southwest Virginia, West Virginia and North Carolina.

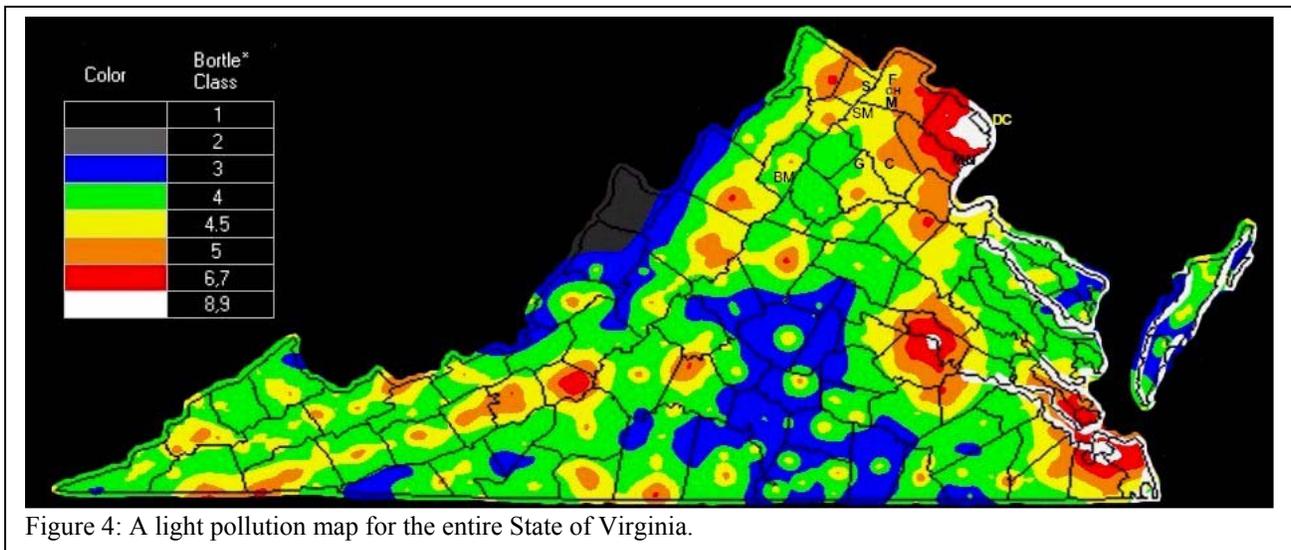
A small excerpt of this atlas illustrating light pollution in portions of Southwest VA, West Virginia, and North Carolina can be found in Figure 3² below.

A box was drawn around an approximation of the Roanoke Valley – Alleghany Regional Commission's service area.

Note that the projection of this original source material and the lack of political boundaries make it difficult to determine the exact geography that one is viewing.

² Credit: P. Cinzano, F. Falchi (University of Padova), C. D. Elvidge (NOAA National Geophysical Data Center, Boulder). Copyright Royal Astronomical Society. Reproduced from the Monthly Notices of the RAS by permission of Blackwell Science. <<http://www.lightpollution.it/dmsp/>>.

Thankfully, the Northern Virginia Astronomy Club has posted several light pollution maps including one for the State of Virginia that includes both state and county lines, making interpretation much simpler. See Figure 4³ for this image.



³ Credit: P. Cinzano, F. Falchi (University of Padova), C. D. Elvidge (NOAA National Geophysical Data Center, Boulder). Copyright Royal Astronomical Society. Reproduced from the Monthly Notices of the RAS by permission of Blackwell Science. <<http://www.lightpollution.it/dmsp/>>.

Each of the colors on these maps has a corresponding value on the Bortle Scale. A tool for measuring light pollution, the Bortle Scale was created by the published astronomer John Bortle in 2001. Table 1 below shows the corresponding Bortle Scale values for each map color and what that Bortle Scale value means practically to the average observer standing in an area with any given Bortle Scale value.

Table 1: Explanation of the Bortle Scale

Map Color	Scale Value	Description
Black	1	Excellent dark sky site
Grey	2	Truly truly dark site
Blue	3	Rural sky
Green	4	Rural/suburban transition
Yellow	4, 5	Suburban sky
Orange	5	Suburban sky
Red	6, 7	Suburban/urban transition
White	8, 9	City and Inner-City sky

The Roanoke urbanized area is classified as suburban/urban transitional area (7 on the Bortle scale). According to the Bortle scale, the entire sky background has a vague, grayish white hue and strong light sources are evident in all directions. In an area characterized by a Bortle scale value of 7, the Milky Way is totally invisible and clouds are brilliantly lit. One should note that Lynchburg and the Blacksburg-Christiansburg area both have extremely small areas within their boundaries that exhibit brightness warranting a Bortle scale score of 7. It appears that the closest city with the same level of sky brightness over a similar sized area is Winston-Salem, North Carolina

The map suggests that, in general, light pollution lessens as distance increases from larger, central cities. However, the map also suggests that smaller settlements of people also contribute to background sky brightness. For instance, the Town of Rocky Mount, the Town of Christiansburg, and the City of Covington all register on the sky brightness map for the larger region.

These areas are all classified as Suburban skies on the Bortle scale. Analysis the map suggests that the brightness levels found in these areas are not linked to any nearby urban areas. In these areas, the Milky Way may be visible, but will be extremely washed out. Many constellations will be invisible to the naked eye and clouds may be noticeably brighter than the background sky.

Some areas in the region still offer the casual observer impressive views of the stars. Portions of Alleghany County, Craig County, Franklin County, and Botetourt County are classified as Rural/suburban transition areas. In these portions of the region, the Milky Way is impressive (although it still lacks some structure), certainly more stars are visible than in the population centers, and you can actually see the light domes over cities in the distance. In these areas, more stars, constellations, and ‘shooting star’ activity can be seen by the casual observer.

There is also a notable area with lower night sky brightness on the border of Alleghany County with West Virginia in the extreme southwestern portion of the County. In this area, visual observations are relatively unimpaired, the Milky Way appears amazingly complex, and stars are visible from horizon to horizon.

What does this data suggest about the region? The level of sky brightness exhibited in this data seems to suggest that nearly every area in the region could benefit from some outdoor lighting standards to preserve existing sky views. Even some of the smaller, rural settlements in the region exhibit an appreciable level of light pollution, as is evidenced by their levels of sky glow. Outdoor lighting standards could make future developments more energy efficient and environmentally friendly. Before appropriate standards for the region can be identified, the existing state of practice should be described.

Current State of Practice in the Roanoke Valley – Alleghany Region

Staff has reviewed zoning ordinances throughout the region in addition to several model lighting ordinances from other localities and several dark sky advocacy groups. Review Appendix A for a matrix of local ordinances and model ordinances detailing their most important features.

In the region, Botetourt County, Roanoke County, and the Town of Vinton all have passed general regulations relating specifically to outdoor lighting fixtures. One can see within the region a spectrum of outdoor lighting regulation, from the very simple to the more sophisticated.

The Town of Vinton’s Zoning Ordinance includes a small paragraph that serves as a simple ban on light trespass and a ban on excessive glare that could present a safety hazard. Vinton’s lighting ordinance applies to the entire town. While simple, it does at least provide a legal basis for the Town to require modifications to a site’s lighting if it is clear that certain fixtures result in unsafe glare or light trespass onto an adjoining property.

Language included in Roanoke County’s Zoning Ordinance is somewhat more sophisticated, yet still quite brief. Roanoke County’s lighting standards mirror the Town of Vinton in that the regulations simply ban light trespass on adjoining streets and residential properties. In the Clearbrook district of the County, however, the code regulates the height and shielding of lighting fixtures for uses and developments that require a site plan.



Figure 5: Experts in the field of light pollution recommend that signs be lit from the top so as to avoid projecting light into the atmosphere.

Botetourt County's effort at outdoor lighting regulation is presently the most sophisticated in the region. Botetourt County is one of seven counties in Virginia with outdoor lighting standards that aim not only to prevent glare and light trespass but also aim to limit atmospheric light pollution. The County's regulation of outdoor lighting includes many notable features. In the Zoning Ordinance, Botetourt County provides for full shielding for lights with outputs of greater than 2,000 lumens and for a 'light curfew', meaning that all outdoor lighting fixtures except those needed for security are to be turned off after close-of-business. In addition, the code directs those installing lights to ensure that the light is aimed no greater than 45 degree downward angle and that lights illuminating exterior signs are to be mounted at the top of the sign so that less light is projected into the atmosphere (See Figure 5⁴ for an illustration).

In many ways, Botetourt County's outdoor lighting standards mirror those found in other Virginia localities and in some of the model lighting ordinances promoted by groups like the

International Dark-Sky Association. Outdoor lighting standards in Fairfax County, which is considered by some in the State to be a model, include many of the same provisions.

A recent APA *Zoning Practice* issue focuses on the regulation of outdoor lighting and suggests that a strong outdoor lighting ordinance often contains the following elements: lighting zones, light curfew, maximum permitted light, and a requirement for shielding.

Lighting Zones

Lighting zones should be based on the highly varied lighting needs within a city or a region and are considered a vital element of a modern outdoor lighting ordinance. Zones are recommended by the International Dark-Sky Association (IDA), the main advocacy group for outdoor lighting regulations in the nation today. The purpose of implementing lighting zones is to allow different amounts of light in areas with different nighttime characteristics. These zones are often defined on the basis of ambient light levels, population density, and other community considerations. Downtown areas, for instance, would naturally require different standards for outdoor lighting than would a residential zone. Fairfax County is an example of a Virginia locality that utilizes the concept of lighting zones in its ordinance.

⁴ Photo courtesy of the International Dark-Sky Association. < <http://www.darksky.org/images/topbillb.jpg>>.

Light Curfew

Lighting curfews are useful additions to any outdoor lighting ordinance. Curfews dictate when light is needed and call for property owners to reduce lighting levels after their regular work day unless significant security concerns dictate otherwise. This helps to eliminate light pollution and the waste of energy.

Maximum Permitted Light

Several lighting ordinances include provisions setting a maximum level of light that is permitted. Some allow exceptions, but, in localities that include a maximum permitted light provision in their outdoor lighting ordinance, most fixtures must comply.

Shielding

Light output can be controlled by adding shielding fixtures that direct light where it is needed, enhancing performance through strategic light guidance. High-quality fixtures also are glare free. Some lighting ordinances call for the installation of shielding on fixtures meeting criteria. Botetourt County, for instance, requires full shielding on fixtures with an output greater than 2,000 lumens.

Review the collection of lighting ordinances in Appendix C for examples of lighting measures used in the Commonwealth today.

Legality

A note is in order on the legality of outdoor lighting ordinances in the Commonwealth of Virginia. Virginia law relies heavily upon the concept of “Dillon’s Rule”, which states that municipalities can exercise only those powers expressly granted by state constitutions and laws and those necessarily implied from granted powers. Enabling legislation introduced with the purpose of granting all localities the ability to regulate new outdoor lighting fixtures has failed in the State legislature. There is, however, enabling legislation that allows counties in Virginia to pass outdoor lighting ordinances (VA Code § 15.2-504.1 and § 15.2-742).

This is significant, because so far only counties have passed detailed lighting ordinances of the sort that the APA and IDA recommend. The legality of outdoor lighting ordinances passed by cities in Virginia is somewhat questionable at this point. Bob Parks of the Virginia Outdoor Lighting Task Force (VOLT) argues that cities and towns could regulate outdoor lighting as long as their comprehensive plans link the issue of lighting to public safety and to a citizen’s property rights (more specifically, the right to enjoy one’s property without intrusion from glare and light trespass). Mr. Parks feels like a challenge from the Commonwealth would be most unlikely if such regulations were properly grounded in the comprehensive plan. Cities and towns wishing to regulate outdoor lighting should consult their own counsel in determining the legality of outdoor lighting ordinances within their jurisdiction.

It should be noted that any locality, including counties, wishing to adopt an outdoor lighting ordinance must first include suitable language in its comprehensive plan to firm up its zoning ordinance. Indeed, a statement of intent to regulate outdoor lighting on the basis of safety or the abatement of public nuisance is a must in a locality's comprehensive plan before it can legally regulate outdoor lighting. See Appendix B for an example of Albemarle County's expression of intent.

Lastly, a few words are in order regarding the suitability of the ordinances in Appendix C when applied to this region. Certainly, the example from Fairfax County is perhaps a bit too complex for a region of this size; indeed, most localities in this region simply do not have staffing levels sufficient to enforce such a complex article. Localities in the region wishing to begin regulating outdoor lighting may be better suited by an ordinance like the one Botetourt County has passed or a modification of the Virginia Outdoor Lighting Task Force's Model Outdoor Lighting Ordinance.

APPENDIX A

Evaluation of Selected Outdoor Lighting Ordinances

Locality or Mod. Ordinance	Lighting Zones	Applicability	Maximum Illuminance	Light Curfew	Number of Exceptions	Light Plan	Permits Attainable
Albemarle County	No	New installation or replacement fixtures in certain districts.	Maximum illuminance is set for light trespass	No	6	Yes	Yes, waivers may be granted by local authorities
Botetourt County	No	Fixtures (over 2,000 lumens) installed or replaced after adoption	Maximum illuminance is set for light trespass	Yes	5	Yes	Board of Supervisors may waive a requirement
Chesterfield County	No	All Fixtures	Maximum illuminance is set for light trespass	No	None	Yes	No
Fairfax County	Yes	New installation or replacement fixtures	Yes	Yes	6	Yes	No
Fauquier County	No	New installation or replacement fixtures in certain districts.	Maximum illuminance is set for light trespass	Yes	8	Yes	Parcel owner may apply for temporary exemption
Roanoke County	No	All uses and developments requiring a site plan	No	No	None	No	No
Town of Vinton	No	All Fixtures	No (Simple ban on Light Trespass)	No	None	No	No
IDA Ordinance*	Yes	New installation	Yes	Yes	9	No	Yes, for certain uses, local authority may grant a permit
VOLT Ordinance	No	New installation	Yes	Yes	7	Yes (for installations over 100,000 lumens)	Yes

*Currently in draft format and therefore not included in Appendix C.

APPENDIX B

(Albemarle County's Expression of Intent)

The Dark Sky (from Albemarle County's Comprehensive Plan)

Goal: Protect the dark sky of Albemarle County as one of our many natural, scenic, scientific and cultural resources, for the benefit of residents, visitors, and the larger scientific community, now and in the future.

Introduction

The night sky historically has been a source of beauty and value to people and cultures throughout the world. In this century, astronomical research has generated information and technology that we now use in our daily lives, and space exploration promises to grow. Aside from scientific and aesthetic considerations, cycles of daylight and darkness have ecological consequences. Bright lights on tall buildings confuse migratory birds, and deciduous trees near streetlights retain their leaves too late in the year. Our lives are affected by the night sky in numerous ways, some not yet fully understood.

Albemarle's clear skies and dark nights are more than just a scenic resource to the County. Our local appreciation for the dark sky may have begun with Thomas Jefferson and his design for an observatory at the Academical Village. Leander McCormick further encouraged the community's interest in astronomy with his generous endowment of the refracting telescope at University of Virginia. Later, with construction of the Fan Mountain station near Covesville, Albemarle County became home to the largest and only major optical observatory at a dark site east of the Mississippi River. The ability to see the stars clearly has been a strong if unexpressed part of the region's beauty, and a real influence on the county's development.

Light Pollution

Obtrusive lighting, often referred to as light pollution, obscures our view of the sky and primarily comes from inefficient and misdirected lighting sources costing this country alone more than \$1 billion each year. Scientists refer to it as urban sky glow; motorists know it as glare; consumer advocated lobby against it as energy waste; neighbors call it light trespass and, often, a nuisance. Simply defined, it is too much light shining in the wrong direction. It not only fails to accomplish its purpose, it often creates problems where there were none.

Urban sky glow results from unshielded light shining upward, creating a glow which obscures the night sky and can even disrupt ecological patterns in plants and animals. Under ideal conditions, 2,500 stars and the Milky Way galaxy are visible from horizon to horizon; in a moderately illuminated suburb, because of sky glow only 200 to 300 stars can be seen.

Glare occurs when one can see light directly from the fixture or bulb, dazzling the eye and reducing the effectiveness of the emitted light. In response to glare, the human eye undergoes a process known as transient adaptation: the pupil must rapidly adjust in size to go from extreme light back to darkness. Not only is this transition taxing to the eye, but at times it cannot be accomplished quickly enough to avoid accidents. With our eyes struggling to adapt from high to

low light, we are blind to things we would normally see. Glare degrades the quality of the built environment, as increasingly elevated levels of illumination are needed to overcome its impacts.

Lighting accounts for 20 to 25 percent of all electricity sold in the United States. According to some estimates, as much as \$1 billion may be wasted annually as a result of inefficient lighting sources. Quality lighting is well shielded, uses the right amount of light, directs the light where it is needed, and uses energy efficient lighting sources. In addition to the direct cost savings, installation of quality lighting would ultimately result in less coal burned (the source of most electrical power in the United States), thereby reducing air pollution and acid rain. The economic benefit of efficient energy use thus complements protection of the dark sky resource. Light trespass occurs when lighting is not confined to the originating property. Spill light falling over property lines can illuminate adjacent grounds or buildings in an objectionable manner, interfering with the owner's enjoyment of his property, privacy and view of the night sky. The nuisance resulting from light trespass often forces government to be the arbitrator of disputes. "Good neighbor development" includes careful attention to quality lighting, both in rural and urban neighborhoods.

Light pollution is not the inevitable price of progress. There are many remedies, and in fact this kind of pollution is not difficult to reduce. It does require education and commitment: education, because even some lighting professionals are not aware of the problem; and commitment, because there are many lights throughout this community and others which are inefficient and poorly installed.

Lighting Fallacies

Misconceptions about lighting abound, some so common we never question them and thus perpetuate the problem in our own homes and communities.

1. "The more lights the better." Although we need well lit main streets and pedestrian areas, security lights, and parking lot lighting, we do not need glare, competing lights, light trespass and energy waste. Lights should be effective, not just numerous.
2. "Light pollution only affects astronomers." School children need to see the Milky Way as much as astronomers do, if for different reasons. Our cultural traditions have developed around the mysteries of the natural world, part of which is the vast night sky. Space exploration, and the host of everyday applications it has brought with it, occupies a central part of twentieth century history, and there will be more discoveries in the future. School children today may be working in space tomorrow, and if not, they will be citizens charged with appreciating and protecting the world around them.
3. "You can get away from the lights if you drive out of town." One shouldn't have to take a vacation to see the night sky, when quality lighting is available and often less expensive than conventional fixtures. Many Americans live in urban corridors so large that it isn't practical to drive out of town just to enjoy the stars.

4. "It's too late to do anything." Our awareness of light pollution is recent, and it will take sustained effort to change the habit of overlighting. Nonetheless, it is a problem that can readily be solved with available technology. Education is the key.

5. "Security lights prevent crime." No one really knows if outdoor nighttime lighting prevents crime. It can deter illegal activity by making it more visible, and it can also make a house or business a more convenient target. Most crimes take place during the day. If outdoor security lights are needed, there are many to choose from and many installations that are effective but not polluting.

What is Good Lighting?

Good lighting serves the user, and thus will vary according to the site and circumstance. Characteristics of good lighting include but are not limited to:

1. It provides adequate lighting for the task, but does not over-light.
2. Lighting fixtures are fully shielded, so that no light is emitted above the horizontal plane and there is little or no glare.
3. Lighting fixtures are carefully installed to maximize effectiveness on the targeted area and minimize or eliminate adverse impact beyond the property borders.
4. It utilizes fixtures with high-efficiency lamps which meet the light-color needs of the design criteria.

Examples of common lighting fixtures are included in Figure 1.

Lighting Ordinance

On September 4, 1996, the Albemarle County Board of Supervisors adopted a Resolution of Intent to amend the Zoning Ordinance to regular outdoor lighting for all uses in all zoning districts, directing the Planning Commission to hold a public hearing and send its recommendation to the Board at the earliest possible date. Dark Sky tours were organized in the Spring of 1997 by the Department of Astronomy at University of Virginia for City and County officials, community businesses and citizen groups. The Planning Commission recommended approval of a lighting ordinance in April, 1998 and forwarded it to the Board of Supervisors. The ordinance was adopted by the Board of Supervisors on August 12, 1998.

Amendments to the Zoning Ordinance and other initiatives related to protection of the quality of our night sky should be based on the following objectives:

Objective: Reduce light pollution caused by uplighting, excessive overlighting, glare and light trespass.

Objective: Promote lighting energy efficiency, thereby conserving private and public funds, while providing adequate lighting for the task.

Objective: Provide a safe and secure developed environment, through quality lighting design which minimizes glare and avoids creating dark areas near well lit areas.

Objective: Protect the McCormick and Fan Mountain Observatories through Dark Sky initiatives, in the interest of scientific research, public education, and future economic development opportunities.

If the lighting ordinance is to be accepted and implemented in a timely and effective manner, the parties involved in the development process - property owners, the business community, government, and the construction industry - must understand the value of dark skies and good lighting. An educational program is needed, one which adopts a proactive approach and draws upon the resources available in the community.

Strategy: Establish an advisory committee composed of representatives from business, astronomy (professional and amateur), public utilities and/or agencies, design and construction industries, county residents (urban and rural), and local community organizations, to undertake the following tasks:

- Evaluate current lighting practices;
- Identify dark sky/lighting issues and concerns in Albemarle County;
- Review ordinances from other jurisdictions;
- Study and recommend as necessary additional lighting provisions to the Planning Commission, including by not limited to an ordinance to phase in shielding of existing lighting and establish maximum foot candle requirements for categories of uses.

Strategy: Develop a community-based educational program:

- Initiate public information and education programs about dark sky and lighting topics in cooperation with the University of Virginia McCormick and Fan Mountain Observatories and other interested parties;
- Develop workshops on technical lighting topics, for individuals in the building materials, electrical contracting, design, construction, and associated industries, and individual homeowners.

Strategy: The Board of Supervisors should adopt a resolution asking power companies to cease promoting unshielded and inefficient outdoor lighting in the County:

Strategy: Explore the feasibility of Albemarle County participating in the Green Lights Program established by the Environmental Protection Agency to promote energy efficiency in building design and maintenance.

Strategy: Albemarle County should take a leadership role in developing exemplary lighting in its public building projects, including playing fields and parking l

APPENDIX C

(Albemarle County’s Lighting Ordinance)

ORDINANCE NO. 98-18(1)

AN ORDINANCE TO AMEND CHAPTER 18, ZONING, OF THE CODE OF THE COUNTY OF ALBERMARLE, VIRGINIA

BE IT ORDAINED By the Board of Supervisors of the County of Albemarle, Virginia, that Chapter 18, Zoning, Article II, Basic Regulations, and Article IV, Procedure, of the Code of the County of Albemarle is amended as follows:

By Amending:

- Sec. 4.12.6.4 Lighting.
- Sec. 32.6.6 Untitled
- Sec. 32.7.8.2 Untitled.

By Adding:

- Sec. 4.17. Outdoor Lighting.
- Sec. 4.17.1. Purpose.
- Sec. 4.17.2. Applicability.
- Sec. 4.17.3. Definitions.
- Sec. 4.17.4. Standard.
- Sec. 4.17.5. Modification, waiver or variation.
- Sec. 4.17.6. Exempt outdoor lighting and related acts.

Chapter 18. Zoning

Article II. Basic Regulations

Sec. 4.12.6.4. Lighting.

Lights used to illuminate parking areas shall comply with the requirements of section 4.17 of this chapter.

(Amended 6-14-89; Ord. 98-18(1), 8-12-98)

Sec. 4.17. Outdoor Lighting.

Outdoor lighting regulations are set forth in sections 4.17.1, 4.17.2, 4.17.3, 4.17.4, 4.17.5 and 4.17.6. These regulations are in addition to the performance standard pertaining to glare set forth in section 4.14.3 of this chapter.

(Ord. 98-18(1), 8-12-98)

Sec. 4.17.1. Purpose.

The purposes of the outdoor lighting regulations are to protect dark skies, to protect the general welfare by controlling the spillover of light onto adjacent properties, and to protect the public safety by preventing glare from outdoor luminaires. To effectuate these purposes, these regulations regulate the direction of light emitted from certain luminaires, and limit the intensity of light on certain adjacent properties, as provided herein.

(Ord. 98-18(1), 8-12-98)

Sec. 4.17.2. Applicability.

Except as provided in section 4.17.6, these outdoor lighting regulations shall apply to each outdoor luminaire installed or replaced after the date of adoption of these regulations which is:

a. Located on property within a commercial or industrial zoning district, or is associated with a use for which a site plan is required by section 32.0, and is equipped with a lamp which emits three thousand (3,000) or more initial lumens; or b. Located on property within a residential or the rural areas zoning district and I associated with a use for which a site plan is not required by section 32.0, and is equipped with a high intensity discharge lamp, regardless of its initial lumens.

(Ord. 98-18(1), 8-12-98)

Sec. 4.17.3. Definitions.

The following definitions shall apply in the implementation and enforcement of these outdoor lighting regulations:

Decorative luminaire with full cutoff optics. The term "decorative luminaire with full cutoff optics" means an outdoor light fixture with manufacturer-provided or manufacture-installed full cut-off optics designed for aesthetic appeal. This term shall not include, among others, a canopy or shoebox luminaire.

Full cutoff luminaire: The term "full cutoff" means an outdoor light fixture shielded in such a manner that all light emitted by the fixture, either directly from the lamp or indirectly from the fixture, is projected below the horizontal plane.

High intensity discharge lamp. The term "high intensity discharge lamp" means a mercury vapor, metal halide, or high pressure sodium lamp, and for purposes of this section 4.17, a low pressure sodium lamp.

Initial lumens. The term "initial lumens" means the lumens emitted from a lamp, as specified by the manufacturer of the lamp.

Lamp. The term "lamp" means the component of a luminaire that produces light. A lamp is also commonly referred to as a bulb.

Lumen. The term "lumen" means a standard unit of measurement of luminous flux.

Luminaire. The term "luminaire" means a complete lighting unit consisting of a lamp or lamps together with the components designed to distribute the light, to position and protect the lamps, and to connect the lamps to the power supply. A luminaire is also commonly referred to as a fixture.

Outdoor luminaire. The term "outdoor luminaire" means a luminaire which is permanently installed outdoors including, but not limited to, devices used to illuminate any site, structure, or sign, except that it does not include an internally illuminated sign.

(Ord. 98-18(1), 8-12-98)

Sec. 4.17.4 Standards.

The following standards shall apply to each outdoor luminaire:

a. Except as provided in section 4.17.6, each outdoor luminaire subject to these outdoor lighting regulations shall be a full cutoff luminaire or a decorative luminaire with full cutoff optics.

1. For each outdoor luminaire subject to these outdoor lighting regulations pursuant to section 4.17.2.a, whether a lamp emits three thousand (3,000) or more initial lumens shall be determined from the information provided by the manufacturer of the lamp including, but not limited to, information on the lamp or on the lamp's packaging materials.

2. For each outdoor luminaire subject to these outdoor lighting regulations pursuant to section 4.17.2a, the following rated lamp wattages shall be deemed to emit three thousand (3,000) or more initial lumens unless the zoning administrator determines, based upon information provided by a lamp manufacturer, that the rate wattage of a lamp emits either more or less than the three thousand (3,000) initial lumens:

- a. Incandescent lamp: one hundred sixty (160) or more watts.
- b. Quartz halogen lamp: one hundred sixty (160) or more watts.
- c. Florescent lamp: thirty-five (35) or more watts.
- d. Mercury vapor lamp: seventy-five (75) or more watts.
- e. Metal halide lamp: forty (40) or more watts.
- f. High pressure sodium lamp: forty-five (45) or more watts.
- g. Low pressure sodium lamp: twenty-five (25) or more watts.

3. If a luminaire is equipped with more than one lamp, the lumens of the lamp with the highest initial lumens shall determine the lumens emitted.

b. The spillover of lighting from parking area luminaries onto public roads and property in residential or rural areas zoning districts shall not exceed one half (0.5) foot candle.

(Ord. 98-181(1), 8-12-98)

Sec. 4.17.5. Modification, waiver or variation.

A modification, waiver or variation from the standard set forth in section 4.17.4 may be granted by the commission, as provided herein:

a. The commission may modify, waive or vary the standard set forth in section 4.17.4 in a particular case, and the commission may impose conditions on such a modification, waiver or variation which it deems appropriate to further the purposes of these outdoor lighting regulations, in either of the following circumstances:

1. Upon finding that strict application of the standard would not forward the purposes of this chapter or otherwise serve the public interest, or that alternatives proposed by the owner would satisfy the purposes of these outdoor lighting regulations at least to an equivalent degree.

2. Upon finding that an outdoor luminaire, or system of outdoor luminaries, required for a baseball, softball, football or soccer field cannot reasonably comply with the standard and provide sufficient illumination of the field for its safe use, as determined by recommended practices adopted by the Illuminating Engineering Society of North America for that type of field and activity or other evidence if a recommended practice is not applicable.

b. Prior to considering a request to modify, waive or vary, five (5) days' written notice shall be provided to the owner, owner's agent or occupant of each abutting lot or parcel and each parcel immediately across the street or road from the lot or parcel which is the subject of the request. The written notice shall identify the nature of the request and the date and time the commission will consider the request.

(Ord. 98-181(1), 8-12-980)

Sect. 4.17.6. Exempt outdoor lighting and related acts.

The following outdoor lighting and related acts shall be exempt from the requirements of these outdoor lighting regulations:

a. Lighting which is not subject to this chapter by state or federal law.

b. Construction, agricultural, emergency or holiday decorative lighting, provided that the lighting is temporary, and is discontinued within seven (7) days upon completion of the project or holiday for which the lighting was provided.

c. Lighting of the United State of America or Commonwealth of Virginia flags and other non-commercial flags expressing constitutionally protected speech.

- d. Security lighting controlled by sensors which provides illumination for fifteen (15) minutes or less.
- e. The replacement of an inoperable lamp or component which is in a luminaire that was installed prior to the date of adoption of section 4.17.
- f. The replacement of a failed or damaged luminaire which is one of a matching group serving a common purpose.

(Ord. 98-18(1), 8-12-98)

Article IV. Procedure

Sec. 32.6.6(j) Untitled.

Outdoor lighting information including a photometric plan and location, description, and photograph or diagram of each type of outdoor luminaire.

(Ord. 98-18(1), 8-12-98)

Sec. 32.7.8.2. Untitled.

Outdoor lighting shall comply with the requirements of section 4.17 of this chapter.

(Botetourt County's Lighting Ordinance)

DIVISION 500 OUTDOOR LIGHTING

Sec. 4-501 Purpose

The purposes of the outdoor lighting regulations are to regulate the design, size, height, placement, orientation, distribution patterns, and fixture types of outdoor lighting in order to:

1. Ensure the provision of lighting that provides safety, utility, and security
2. Prevent dangerous conditions caused by glare on public roadways and nuisance glare onto adjacent properties
3. Protect the privacy of neighbors by limiting light trespass
4. Limit atmospheric light pollution, and
5. Conserve energy.

Sec. 4-502 Applicability

1. General

These outdoor lighting regulations shall apply to each outdoor lighting fixture installed or replaced after the date of adoption of these regulations which is equipped with a lamp which emits two thousand (2,000) or more initial lumens and is:

- A. Located on property within a commercial, mixed-use or industrial zoning district, or
- B. To be installed in conjunction with a use for which a site plan is required by this ordinance, or
- C. To be installed in conjunction with a public or municipal use such as schools, parks, fire / rescue stations and libraries, or
- D. Located on property within a residential or agricultural zoning district and involves the use or installation of a high intensity discharge lamp, regardless of its initial lumens, or
- E. The replacement of inoperable bulbs, fixtures or other components shall be subject to the requirements of this ordinance. However, if the failed component is part of a multi-fixture installation, it may be replaced with a similar fixture if necessary to maintain the appearance or performance of the entire installation.

2. Exemptions

The following outdoor lighting and related acts shall be exempt from The requirements of these outdoor lighting regulations:

- A. Lighting which is not subject to this chapter by state or federal law.

B. Temporary lighting for construction activities, agricultural uses, emergency activities, fairs, civic activities, carnivals or holiday decorative purposes, provided that the lighting is temporary, and is discontinued within fourteen (14) days upon completion of the activity, project or holiday for which the lighting was used, and does not begin before thirty-one (31) days prior to the activity, project or holiday.

C. Security lighting controlled by sensors which provides illumination for ten (10) minutes or less

D. The replacement of an inoperable lamp or component which is in a luminaire that was installed prior to the date of adoption of this ordinance

E. Public Airport lighting

Sec. 4-503 **Lighting Plan Required**

1. Required Plan Submission. The applicant for any permit required by any provision of the Botetourt County Code which involves any proposed work affecting or involving outdoor lighting fixtures shall submit, as part of the application for such permit, a lighting plan that provides evidence that the proposed work will comply with all aspects of the outdoor lighting requirements of this Code. Even if no other such permit be required, the installation or modification of any exterior lighting shall require submission of the information described herein, except for cases of routine servicing and same-type lamp replacement. Should any outdoor light fixture or the type of light source therein be changed after any such permit has been issued, a written change request must be submitted to the zoning administrator for written approval, together with adequate information to assure compliance with this Code, which must be received and approved prior to substitution of the light fixture or source.

All such required lighting plans shall include the following:

A. Plans indicating the location on the premises of all lighting fixtures, both proposed and already existing on the site, including a schematic layout of proposed outdoor lighting fixture locations that demonstrate adequate intensities and uniformity, and the light coverage resulting from the proposed lighting layout

B. Description of all lighting fixtures, both proposed and existing, which shall include but are not limited to catalog cuts and illustrations by manufacturers that describe the equipment, including, lamp types, wattages and initial lumen outputs, glare control devices, lamps, switching devices, proposed placement of all fixtures, including engineering detail of fixtures, manufacturer, model, and installation of same

C. Photometric data, such as that furnished by manufacturers, or similar showing the angle cut-off light emissions and glare-control devices

D. Mounting heights and methods proposed hours of operation and maintenance schedule

E. The provision for adequate measures to mitigate nuisance from light pollution and disabling glare to both on-site and off-site uses

2. Plan Approval. If the zoning administrator determines that the proposed lighting plan does not comply with the Botetourt County Code, the permit shall not be issued nor the plan approved. The zoning administrator shall provide the applicant with a written description of the deficiencies of the plan, and the applicant may submit a revised plan for review and approval.

Sec. 4-504 Lighting Standards

1. General Standards

A. Control of Nuisance and Disabling Glare

1) All outdoor lighting on residential, commercial, industrial, municipal, recreational or institutional property shall be aimed, located, designed, fitted and maintained so as not to present a significant amount of glare to drivers, pedestrians, or users of neighboring properties.

2) Directional fixtures such as flood lights, spot lights and sign lights shall be installed or aimed so that they do not shine directly into the window of a neighboring residence, directly into a roadway, or skyward.

3) All outdoor lighting fixtures, including display lighting, shall be turned off after close-of-business, unless needed for safety and security, in which case the lighting shall be reduced to the minimum level necessary for such purpose.

4) Vegetation screens shall not be the primary means for controlling glare. Rather, such control shall be achieved primarily through the use of full cut-off fixtures, the appropriate application of mounting height, wattage, aiming angle, fixture placement and fixture design, and the addition of louvers, shields and baffles as necessary.

5) Externally illuminated signs shall be lighted by fixtures mounted at the top of the sign, shielded and aimed down or by fixtures mounted at the bottom of the sign and aimed and shielded such that the light falls only on the sign surface so as to limit skylighting impacts, and that no glare is created off of the sign face.

6) Neon lighting extending beyond the sign area shall conform to all provisions of this Code.

B. Installation

1) Lighting fixtures shall not be mounted in excess of twenty-five (25) feet above grade.

2) Electrical feeds to lighting standards shall run underground, not overhead.

3) Lighting standards in public parking areas shall be placed outside the paved area, or behind tire stops, or on reinforced concrete pedestals at least 30 inches high above the pavement, or by other acceptable protective means.

4) Wallpacks shall be shielded.

5) If the output of a lamp is greater than 2,000 lumens, it shall be fully shielded. If the output is less than 2,000 lumens, the lamp shall be aimed at no greater than 45-degree downward angle (halfway between straight down and straight to the side).

C. Maintenance

Lighting fixtures shall be maintained so as to always meet the requirements of this Ordinance.

D. Required Cut-Off

1) All light fixtures that are required to be full cut-off fixtures shall be installed and maintained so that the shielding is effective as described in the definition of a full cut-off fixture in Article VI - Definitions.

2) Lamp types that are required to have full cut-off fixtures include Low/High Pressure Sodium, Mercury Vapor, Metal Halide and Fluorescent over 50 watts and Incandescent (including tungsten-halogen (quartz) lamps) over 160 watts.

Lamp types that are not required to have full cut-off fixtures include Incandescent 160 watts or less, fossil fuel, any light source of 50 watts or less.

3) All lights in open areas such as parking lots are required to have full cut-off fixtures.

E. Glare Control

1) No lighting shall be permitted which shines directly into neighboring residential units or buildings on adjacent properties or on the public right-of-way.

2) Light fixtures, including mounting base, shall not exceed twentyfive (25) feet in height above finished grade unless the Zoning Administrator determines that an increase in height, not to exceed ten (10) additional feet, would reduce the total number of light fixtures required for the site and still meet the intent of the Ordinance.

3) Illuminated signs shall have an indirect lighting source or shielded source. Fixtures used for architectural lighting, such as facade, feature and landscape lighting, shall be aimed or directed so as to preclude light projection beyond the immediate objects intended to be illuminated.

4) The Zoning Administrator may require that lighting be controlled by automatic timing devices to extinguish light sources during specific periods to mitigate the adverse impacts on adjacent properties.

2. Special Standards

A. For all uses within Industrial and Commercial Zoning Districts, and all industrial, commercial, and institutional uses in any zoning district:

- 1) Outdoor lighting fixtures shall comply with the requirements of Section 4-504-1-D.
- 2) The amount of illumination projected onto a non-residential use from another property shall not exceed 0.5 vertical foot-candles at a height of five feet at the property line.
- 3) The amount of illumination projected onto a residential use from another property shall not exceed 0.2 vertical foot-candles at a height of five feet at the property line.

B. For auto/truck service stations and convenience retail uses, lighting in island canopy ceilings shall be recessed, full cut-off fixtures with flat lenses and shall not exceed 40 initial output lumens per square foot of canopy.

3. Prohibitions

A. The operation of searchlights for advertising purposes shall be prohibited.

Sec. 4-505 Waivers and Modifications

The Board of Supervisors may modify or waive one or more of the standards set forth in Section 4-504 in a particular case, and may impose conditions on such a modification or waiver which it deems appropriate to further the purposes of these outdoor lighting regulations, in the following circumstances:

1. Upon finding that strict application of the standard would not forward the purposes of this chapter or otherwise serve the public interest, or that alternatives proposed by the owner would satisfy the purposes of these outdoor lighting regulations at least to an equivalent degree.
2. Upon finding that an outdoor luminaire, or system of outdoor luminaries, required for a publicly owned baseball, softball, football or soccer field cannot reasonably comply with the standard and provide sufficient illumination of the field for its safe use, as determined by recommended practices adopted by the Illuminating Engineering Society of North America (IESNA) for that type of field and activity or other evidence if a recommended practice is not applicable. Outdoor lighting of sports fields and facilities shall be extinguished after the completion of the event.

Prior to the Board of Supervisors considering a request for modification or waiver, the applicant for the modification or waiver shall provide written notice no less than fourteen (14) days and no greater than ninety (90) days to the owner, owner's agent or occupant of each abutting lot or parcel and each parcel immediately across the street or road from the lot or parcel which is the

subject of the request. The written notice shall identify the nature of the request and the date and time the Board will consider the request.

ARTICLE IV - Supplemental Regulations

(Chesterfield County's Lighting Ordinance)

COUNTY-WIDE STANDARDS: Regulation & Intent

Sec.19-573. All exterior lights shall be arranged and installed so that the direct or reflected illumination does not exceed five-tenths (0.5) footcandle above background, measured at the lot line of any adjoining A, R, R-TH or R-MF district. Except in village districts where light standards may be required to be compatible with unique architectural styles, lighting standards shall be of a directional type capable of shielding the light source from direct view from any adjoining A, R, R-TH or R-MF district or public right-of-way.

INTENT:

- To protect agricultural and residential uses from excessive night-time lighting (measured as 0.5 footcandles maximum at the property line and light glare.
- To protect motorists from light glare along public rights-of-way.
- All light fixtures that are seen from public roads or from A, R, R-TH or R-MF districts shall be of a sharp cut-off design in a fixed position which orients the light down and prevents light glare. This includes pole mounted lights and wall mounted lights (wall-packs). See pages 10-a and 10-b.

The lighting plan for a site is reviewed and approved for these aesthetic considerations by the Planning Department. They may be included with the site plan or approved at time of the building permit. Provide two (2) copies along with manufacturer cut sheets of each type of light to be used to the Planning Department for review. Footcandle diagrams are only needed next to residential and agricultural districts.

Note: As a CPTED (Crime Prevention through Environmental Design) concern, it is highly recommended that the lighting plan be coordinated with the landscape plan. County requirements for landscaping call for trees to be installed in parking lot islands. Eventual tree growth can block lighting patterns and make a parking lot unsafe. Parking lot lights should be located between planting islands at the juncture of four (4) parking spaces.

SITE LIGHTING REQUIREMENTS FOR CHESTERFIELD COUNTY

Attached is a page from our Design Standards Manual (page 10) that gives an overview of Chesterfield County's lighting requirements. In all cases, we highly recommend that businesses provide sufficient lighting to deter crime and help prevent night-time pedestrian and/or vehicular accidents. As our Zoning Ordinance requires that light glare be minimized off-site, this may mean that some sites need more light fixtures because we do not allow generally floodlighting or light fixtures having a high visibility of the light source. To expand on this information, we list below some of the specific lighting issues that we ask you to follow when advising your clients in Chesterfield County.

Gasoline Canopies: All lights should have completely flush-mounted lenses to either the canopy ceiling or to ceiling mounted boxes. Floodlights lighting the canopy are not allowed unless information is provided that clearly determines that the floodlights will not cause glare off-site.

Wall-pack lights: Wall-packs internal to a site that are not visible to a public road or a residential or agricultural district may be of any design. Wall-packs visible to public roads and residential/agricultural districts must shield the light source, preferably with a sharp cutoff design that orients the light downward.

Parking lot lights: No specific limitation on mounting height unless specified as a condition of a zoning case. Lights must be designed with a sharp cutoff, typically a shoe-box style. Vertically mounted bulbs with a convex lens and prismatic lenses that extend below the shoe-box are no longer allowed due to poor glare control. Lights are to be mounted with a fixed tenon mount to the pole, parallel with the ground. Parking islands are required for tree plantings and not light poles. However, when small maturing trees are proposed (up to 50 percent in a parking lot), light poles may be located in the parking islands. Otherwise, we suggest locating the poles on a concrete base at the juncture of 4 parking spaces. We also suggest poles adjacent to curb lines be located in a manner that prevents cars/trucks from hitting them.

Recommendation: Chesterfield County is willing to pre-approve (or not approve) exterior lights for use in Chesterfield. Please submit cut sheets to Greg Allen at the Planning Department. We will return to you an approval letter and stamped approved cut sheet for your marketing use.

(Fairfax County's Lighting Ordinance)

PART 9 14-900 OUTDOOR LIGHTING STANDARDS

14-901 Purpose and Intent

The purpose and intent of this Part is to establish outdoor lighting standards that reduce the impacts of glare, light trespass and overlighting; promote safety and security; and encourage energy conservation.

14-902 Applicability and General Provisions

1. Except as provided in Sect. 905 below, the Part shall apply to the installation of new outdoor lighting fixtures or the replacement of existing outdoor fixtures. Replacement of a fixture shall mean a change of fixture type or change to the mounting height or location of the fixture. Routine lighting fixture maintenance, such as changing lamps or light bulbs, ballast, starter, photo control, housing, lenses and other similar components, shall not constitute replacement and shall be permitted provided such changes do not result in a higher lumen output.

Outdoor lighting fixtures lawfully existing prior to June 17, 2003, that do not conform to the provisions of this Part shall be deemed to be a lawful nonconforming use and may remain. A nonconforming lighting fixture that is changed to or replaced by a conforming lighting fixture shall no longer be deemed nonconforming, and thereafter such lighting fixture shall be in accordance with the provisions of this Part.

Notwithstanding the above, for existing service stations, service station/mini-marts, vehicle sale, rental and ancillary service establishments and outdoor recreation/sports facilities that do not comply with the applicable maintained lighting levels specified in Sections 903 and 904 below, replacement of or the addition of new lighting fixtures may be permitted in accordance with the following:

- A. There may be a replacement of or the addition of new lighting fixtures to an existing service station or service station/mini mart canopy, display area of a vehicle sale, rental and ancillary service establishment or lighted playing field/court of an outdoor recreation/sports facility, only when the lighting fixture meets the provisions of this Part and such replacement or addition will not increase the noncompliance with the applicable maintained lighting level requirements of Sections 903 and 904 below.
- B. A new canopy, display area or lighted field/court may be added to an existing service station, service station/mini-mart, vehicle sale, rental and ancillary service establishment or outdoor recreation/sports facility, provided the lighting for such new canopy, display area or playing field/court is in conformance with all the requirements of this Part.

2. Except as provided in Sections 904 and 905 below, all outdoor lighting fixtures shall comply with the following:

- A. Full cut-off lighting fixtures shall be mounted horizontal to the ground and shall be used for all walkway, parking lot, canopy and building/wall mounted lighting, and all lighting fixtures located within those portions of open-sided parking structures that are above ground. For the purposes of this provision, an open-sided parking structure shall be a parking structure which contains exterior walls that are not fully enclosed between the floor and ceiling. (Reference Plates 1 and 5 of Illustration 4 in Appendix 2)
- B. Except for internally illuminated signs, the use of lighting fixtures, which are enclosed in clear or translucent white, off-white or yellow casing, shall not be permitted on the roofs of buildings or on the sides of canopies.

- C. Lighting used to illuminate flags, statues, signs or any other objects mounted on a pole, pedestal or platform, spotlighting or floodlighting used for architectural or landscape purposes, shall consist of full cut-off or directionally shielded lighting fixtures that are aimed and controlled so that the directed light shall be substantially confined to the object intended to be illuminated. Directional control shields shall be used where necessary to limit stray light. In addition, such lighting shall be shielded to protect motorists and pedestrians from glare. (Reference Plates 2 and 3 of Illustration 4 in Appendix 2)
- D. Internally illuminated signs, except those which bear a state or federal registered trademark, shall have an opaque background and translucent text and symbols, or shall have a translucent background that is not white, off-white or yellow in color.

In addition, internally illuminated signs must comply with the provisions of Article 12. All illuminated signage located on the sides of a canopy shall be internally illuminated or backlit.

- E. In addition to the above and Sect. 10-104, on lots which abut property that is residentially zoned and developed, vacant or homeowner's association open space, all outdoor lighting, to include light poles located on top of any parking deck or structure, shall be:
- (1) Mounted at a height which is measured from grade to the bottom of the lighting fixture, including the height of the parking deck or structure when located on top of a parking deck or parking structure, and is equal to or less than the value $3 + (D/3)$, where D is equal to the horizontal distance in feet from the light source to the nearest residential lot line extended vertically; or
 - (2) Equipped with supplemental opaque shielding on the residential property side of the lighting fixture to reduce glare caused by direct light source exposure. (Reference Plate 4 of Illustration 4 in Appendix 2)
- F. On all nonresidentially developed lots which contain a minimum of four (4) parking lot light poles, parking lot lighting levels for ground surface parking lots and the top levels of parking decks or parking structures shall be reduced by a least fifty (50) percent of full operational levels within thirty (30) minutes after the close of business. This reduced lighting level shall be achieved by extinguishing at least fifty (50) percent of the total number of pole mounted lamps, by dimming lighting levels to no more than fifty (50) percent of the levels used during business or activity hours, or by some combination thereof; provided, however, that this provision shall not require parking lot lighting levels to be reduced to less than 0.2 footcandles as measured horizontally at the surface on which the light pole is mounted.
- G. Lighting used for construction sites shall consist of the following:
- (1) All construction site lighting, with the exception of lighting that is used to illuminate the interiors of buildings under construction which is provided for in the following paragraph, shall use full cut-off or directionally shielded fixtures that are aimed and controlled so the directed light shall be substantially confined to the object intended to be illuminated. Directional control shields shall be used where necessary to limit stray light.
 - (2) Frosted light bulbs shall be used to light the ten (10) foot outermost perimeter area of the interiors of the buildings under construction which contain five (5) or more stories.

For the purposes of this provision, a building is no longer considered under construction once exterior walls and windows are installed and permanent

lighting replaces temporary lighting as the primary source of light for the building.

- H. All outdoor lighting fixtures shall be aimed, located and maintained so as not to produce disability glare. (Reference Plate 5 of Illustration 4 in Appendix 2)

3. High intensity light beams in the form of outdoor search lights, lasers or strobe lights shall not be permitted.

14-903 Lighting Standards for Certain Commercial Uses

In addition to Sect. 902 above, outdoor lighting fixtures associated with service stations, service station/mini-marts and vehicle sale, rental and ancillary service establishments shall be subject to the following:

1. Service station and service station/mini-mart canopy lighting shall not exceed a maintained lighting level of thirty (30) footcandles under the canopy as measured horizontally at grade. However, a higher or lower maintained lighting level, not to exceed fifty (50) footcandles, may be specified by the Board in conjunction with the approval of a special exception, development plan or proffered rezoning. All underside canopy lighting shall consist of full cut-off lighting fixtures.

2. Outdoor display area lighting used in conjunction with a vehicle sale, rental and ancillary service establishment shall not exceed a maintained lighting level of thirty (30) footcandles as measured horizontally at grade. However, a higher or lower maintained lighting level, not to exceed fifty (50) footcandles, may be specifically approved by the Board in conjunction with the approval of a special exception, development plan or proffered rezoning. For the purposes of this Part, outdoor display areas shall include all display/storage areas for vehicles offered for sale or rent and the associated travel lanes.

3. A photometric plan shall be required for these uses in accordance with one of the following:

- A. As part of the submission of a Category 5 or 6 special exception, development plan or rezoning application for a service station, service station/mini-mart, or vehicle sale, rental and ancillary service establishment. A photometric plan shall be subject to approval by the Board in conjunction with a special exception, development plan or proffered rezoning and a photometric plan approved by the Board shall be submitted as part of a site plan submission for such use. Upon written request with justification, the Zoning Administrator may modify a submission requirement of Par. 4 below for a special exception, development plan or rezoning application if it is determined that the requirement is not necessary for an adequate review of the photometric plan.
- B. As part of a site plan submission or as a separate submission, when site plan approval is not required. Upon written request with justification, the Director may modify a submission requirement of Par. 4 below if it is determined that the requirement is not necessary for an adequate review of the photometric plan. Such photometric plan shall be subject to review and approval by the Director.

4. A photometric plan shall be prepared by a lighting professional that is certified by the National Council on Qualifications for the Lighting Professions (NCQLP), or a State licensed professional engineer, architect, landscape architect or land surveyor and shall contain the following information:

- A. Location and limits of the canopy or outdoor display area at a scale of not less than 1 inch equals fifty feet (1" = 50').
- B. Location and height of all canopy lighting for service stations and service station/mini-marts and all pole, building or ground mounted lighting fixtures for an outdoor display area at a vehicle sale, rental and ancillary service establishments.

- C. A photometric diagram showing predicted maintained lighting levels produced by the proposed lighting fixture facilities.

5. When site plan approval is not required and the plan is submitted as a separate submission, five (5) copies of a photometric plan shall be submitted to the Director for review and approval and shall be subject to a fee as provided for in Article 17.

14-904 Outdoor Recreation/Sports Facility Lighting Requirements

When an outdoor recreation/sports facility has illuminated playing fields/courts that, individually or cumulatively, exceed 10,000 square feet in area, and/or associated light poles that exceed 20 feet in height, the playing fields/courts shall be subject to the provisions of this Section.

Other components of such facilities, to include, but not limited to, parking lots, administrative offices, restrooms, ticket sales, concession stands and bleachers or other spectator viewing areas, shall not be subject to this Section, but shall be subject to the provisions of Sect. 902 above. An outdoor recreation/sports facility that has illuminated playing fields/courts, either individually or cumulatively, that are 10,000 square feet or less in area and/or contain associated light poles 20 feet or less in height, shall not be subject to this Section. For the purposes of this Section, the perimeter area defined in Par. 2B below shall be included in the area of the playing field/court.

1. A sports illumination plan shall be required in accordance with one of the following:

- A. As part of the submission of a Group 4, 5 or 6 special permit, Category 3 or 5 special exception, development plan or rezoning application for outdoor recreation/sports facilities. A sports illumination plan shall be subject to approval by either the BZA in conjunction with a special permit or the Board in conjunction with a special exception, development plan or proffered rezoning and a sports illumination plan approved by the BZA or Board shall be submitted as part of a site plan submission for such use. Upon a written request with justification, the Zoning Administrator may modify a submission requirement of Par. 2 below for a special permit, special exception, development plan or rezoning application if it is determined that the requirement is not necessary for an adequate review of the sports illumination plan.
- B. For an outdoor recreation/sports facility that is permitted by right in the zoning district in which located, as part of the site plan submission or as a separate submission, when site plan approval is not required. Upon a written request with justification, the Director may modify a submission requirement of Par. 2 below if it is determined that the requirement is not necessary for an adequate review of the sports illumination plan. Such sports illumination plan shall be subject to review and approval by the Director.

2. A sports illumination plan shall be prepared by a lighting professional that is certified by the National Council on Qualifications for the Lighting Professions (NCQLP) or a State licensed professional engineer, architect, landscape architect or land surveyor and shall contain the following information:

- A. The boundaries, dimensions and total land area of the outdoor recreation/sports facility property at a designated scale of not less than one inch equals fifty feet (1" = 50'). For proposed uses on large tracts of land where the lighted playing field/court occupies a small portion of the site, the boundaries, dimensions and total land area of just the lighted playing field/court with perimeter areas, as required by Par. 2B below, shall be provided, at a designated scale of not less than one inch equals fifty feet (1" = 50'), with a graphic that depicts the location of the fields/courts in relation to the perimeter lot lines of the entire property.

- B. Location and limits of playing fields/courts, to include a perimeter area. For baseball/softball fields, the perimeter area shall extend thirty (30) feet in a direction perpendicular to the foul lines and away from the field. The perimeter area for rectangular playing fields, such as soccer, football, lacrosse and field hockey, shall extend twenty (20) feet from the side lines and thirty (30) feet from the end lines. The perimeter area for all other playing fields/courts shall extend ten (10) feet beyond the playing field/court boundary.
- C. Location, height and illustration of each style of all pole, building, and ground mounted lighting fixtures for the playing field/court.
- D. A photometric diagram showing predicted maintained lighting levels for the proposed playing field/court and associated perimeter area lighting.

3. The lighting for playing field/courts and associated perimeter areas shall comply with the maximum footcandle levels indicated for the specific uses listed in Table IV below, unless a lesser limit is specifically approved by the BZA in conjunction with the approval of a special permit, or by the board in conjunction with the approval of a special exception, development plan or proffered rezoning. Footcandle measurements shall be measured horizontally three (3) feet above grade level and shall represent maintained lighting levels. The Zoning Administrator shall determine maximum permitted lighting levels for outdoor recreation/sports facilities which are not listed in Table IV.

4. All playing field/court lighting fixtures shall use full cut-off or directionally shielded lighting fixtures, aimed toward the playing field/court and shielded in directions away from the playing field/court so as to minimize glare and light trespass onto adjacent properties.

5. The use of outdoor playing field/court lighting shall not be permitted between the hours of 11:00 PM and 7:00 AM, unless other hours are specifically approved by the BZA in conjunction with the approval of a special permit, or by the Board in conjunction with the approval of a special exception development plan or proffered rezoning.

6. When site plan approval is not required and the plan is submitted as a separate submission, five (5) copies of the plan shall be submitted to the Director for review and approval and shall be subject to a fee as provided for in Article 17.

**TABLE IV
MAXIMUM PERMITTED LEVELS OF ILLUMINATION
FOR OUTDOOR RECREATION/SPORTS FACILITY PLAYING
FIELD/COURT**

Recreation/Sport Facility Use	Specific Lighted Area	Footcandles*
Archery Ranges		10
Baseball/Softball	Infield	60
	Outfield	40
Baseball (Professional)	Infield	150
	Outfield	100
Baseball Hitting Ranges		50
Basketball, Volleyball		30

Field Hockey, Football, Soccer, Lacrosse, Track & Field		50
Go-Cart Tracks		30
Golf Courses	Tee Boxes, Greens	5
	Fairways	3
Golf Driving Ranges	Tee Boxes	20
	Fairways	3
	Greens	5
Golf (Miniature)		20
Horse Riding Rings/Show Areas		30
Ice Skating, Ice Hockey, Roller Skating Rinks		50
Swimming Pools Pool Surface		10
Pool Deck		30
Tennis Courts (College/High School)		60
Tennis Courts (Recreational)		40

*Maintained Lighting Level

14-905 Exemptions

The following shall be exempt from the provisions of this Part, provided that such fixtures, except for those set forth in Paragraphs 1 and 2 below, do not cause disability glare:

1. Lighting fixtures and standards required by the Federal Communications Commission, Federal Aviation Administration, Federal and State Occupational Safety and Health Administrations, or other federal, state or county agencies, to include street lights within the public right-of-way.
2. Outdoor lighting fixtures required by law enforcement, fire and rescue, the Virginia Department of Transportation or other emergency response agencies to perform emergency or construction repair work, or to perform nighttime road construction on major thoroughfares.
3. Holiday lighting fixtures.
4. Neon lighting used to outline a structure.
5. Motion activated light fixtures located as follows:
 - A. On lots developed with single family dwellings when such lighting fixtures emit initial lighting levels of 6000 lumens or less, are extinguished within five (5) minutes upon cessation of motion and are aimed such that the lamp or light bulb portion of the lighting fixture is not visible at five (5) feet above the property boundary; or

- B. On all other lots when such lighting fixtures are aimed such that the lamp or light bulb portion of the lighting fixture is not directly visible at five (5) feet above the property boundary.
6. On lots developed with single family dwellings, outdoor lighting fixtures with initial light outputs of 2000 lumens or less shall not be subject to the provisions of Par. 2 of Sect. 902 above.

(Fauquier County's Lighting Ordinance)

Article 9

Part 9 9-1000 OUTDOOR LIGHT CONTROL

9-1001 Purpose and Intent

The purpose of this section is to regulate the placement, orientation, distribution and fixture type and size of outdoor lighting. The intent of this section is to encourage lighting that provides safety, utility and security, as well as preventing glare on public roadways, and to protect the privacy of adjoining properties.

9-1002 Conformance with Applicable Codes and Ordinances

All outdoor artificial illuminating devices shall be installed in conformance with the provisions of this Article, and applicable provisions of the Zoning Ordinance. Where there is conflict between the provisions of this Article and applicable provisions of the Zoning Ordinance, the most restrictive shall govern.

9-1003 Approved Materials and Methods of Installation

The provisions of this Article are not intended to prevent the use of any equipment, material or method of installation not specifically prescribed by this Article provided the alternative has been approved by the Zoning Administrator. The Zoning Administrator may approve any such alternative provided that the proposed design provides the approximate equivalence to the specific requirements of this Article.

9-1004 Definitions

1. Outdoor Light Fixtures shall mean outdoor artificial illuminating devices, outdoor fixtures, lamps or other devices, permanent or portable, used for illumination, direction or advertisement. Such devices shall include, but are not limited to search, spot, or flood lights for:

- a. buildings and structures, including canopies and overhangs
- b. recreational areas
- c. parking lot lighting
- d. landscape lighting
- e. signs, including billboards
- f. display and service areas

2. Installed shall mean the initial installation of outdoor light fixtures defined herein, following the effective date of this Article but shall not apply to those outdoor light fixtures installed prior to such date.

3. Shielded, Fully shall mean fixtures that are shielded in such a manner that light emitted by the fixture, either directly from the lamp or indirectly from the fixture, are projected below a horizontal plane running through the lowest point on the fixture where light is emitted. This means that a fully shielded fixture is one used in such a way that it allows no direct or internally reflected light to shine above the light fixture.

4. Footcandle. A quantitative unit of measure referring to the measurement of illumination incident at a single point. One footcandle is equal to one lumen uniformly distributed over an area of one square foot.

5. Full Cutoff Angle. The angle formed by a line drawn from the light source and a line perpendicular to the ground from the light source, beyond which no light is emitted. Refer to example graphics. (Refer to Figure 2)

6. Initial Lumens. The lumens emitted from a lamp, as specified by the manufacturer of the lamp.

7. Lamp. The component of a luminaire that produces light. A lamp is also commonly referred to as a bulb.

8. Lumen. A standard unit of measurement referring to the amount of light energy emitted by a light source, without regard to the effectiveness of its distribution.

9. Luminaire. A complete lighting unit consisting of a lamp or lamps together with the components designed to distribute the light, to position and protect the lamps, and to connect the lamps to the power supply. A luminaire is also commonly referred to as a fixture.

10. Outdoor Luminaire. A luminaire which is permanently installed outdoors including, but not limited to, devices used to illuminate any site, structure, or sign.

11. Photometric Plan. A point by point plan depicting the intensity and location of lighting on the property.

9-1005 Shielding

All outdoor light fixtures except those exempted by Section 9-1007 and those regulated by Section 9-1006.2 shall be fully shielded as identified in Section 9-1006. A fully shielded fixture must be a full cutoff luminaire or a decorative luminaire with full cutoff optics, and is defined as an outdoor lighting that is shielded or constructed so that all light emitted is projected below a horizontal plane running through the lowest part of the fixtures. The light source visibility shall be shielded from the adjoining property.

9-1006 General Requirements for all Zoning Districts

1. Public or Private Recreational Facilities:

a. Primary Playing Areas. Where playing fields or other recreational areas are to be illuminated, lighting fixtures shall be specified in the Lighting Plan, mounted and aimed so that the illumination falls within the primary playing area and immediate surroundings so that no direct light illumination is directed off site.

b. Recreation Parking Areas. Lighting for these parking areas shall meet the requirements identified in 9-1006.5.

2. Outdoor Illumination of Building, Landscaping and Signs. The unshielded outdoor illumination of any building or landscaping is prohibited. Lighting fixtures used to illuminate an outdoor advertising sign either shall be by directed ground lighting sign or mounted on the top of the sign, and shall comply with shielding requirements.

3. All outdoor lighting fixtures, including display lighting, shall be turned off after the close of business, unless needed for safety or security, in which case the lighting shall be reduced to the minimum level necessary.

4. Gasoline Station/Convenience Store Aprons and Canopies.

a. The Lighting fixture bulbs shall be recessed into a canopy ceiling so that the bottom of the fixture is flush with the ceiling so that light is restrained to no more than 85 degrees from vertical as shown in Figure 1.

b. As an alternative to recessed ceiling lights, indirect lighting may be used where the light is directed upward and then reflected down from the underside of the canopy. In this case, light fixtures shall be shielded so that direct illumination is focused exclusively on the underside of the canopy.

c. Lights shall not be mounted on the top or sides (facia) of the canopy, and the sides of the canopy shall not be illuminated.

d. The lighting for new facilities (pump islands and under canopies) shall have a minimum of 1.0 footcandle at grade, and the average horizontal illumination cannot exceed 10 footcandles at grade level, subject to a uniformity ratio (ratio of average to minimum illuminance) no greater than 4:1. The standards herein are based on the Illuminating Engineering Society of North America (IESNA) RP-33, Lighting for Exterior Environments.

5. All Parking Lots, Loading and Display Areas. This lighting requirement applies to townhouse and multi-family, educational, institutional, commercial recreation, public, commercial business and retail, motor vehicle related, wholesaling, and limited and general industrial use categories identified within the Zoning Ordinance.

a. Lighting for all parking, display and loading areas shall not exceed an average horizontal illumination level of 2.5 footcandles. All lighting fixtures serving these areas shall be cut-off fixtures as defined by the Illuminating Engineering Society of North America (IESNA);

b. Maximum Mounting Height*

Residential: 20 feet

Non-Residential: 25 feet

* Height is measured from the ground surface to the bottom of the lighting fixture.

6. Mercury Vapor. The installation of mercury vapor fixtures is prohibited, except for agricultural buildings, paddocks and similar use areas in RA and RC zoning districts. For residential structures on agricultural property, lighting must be full cut-off fixtures, or retrofitted with, for example, the Hubble Sky Cap and illumination shielded downward.

7. Spillover light, vertical or horizontal, from parking area luminaires onto public roads and property in residential or rural Rural Agricultural (RA) and Rural Conservation (RC) zoning districts shall not exceed one-half (1/2) footcandle at the property line.

9-1007 Exemptions

1. Nonconforming Fixtures. Outdoor light fixtures installed prior to the effective date of this Article are exempt from the provisions of this Article, provided, however, that no change in use, replacement, and structural alteration of outdoor light fixtures shall be made unless it thereafter conforms to the provisions of this Article.

2. Lighting which is not subject to this chapter by state or federal law.

3. Roadway and Airport lighting and security lighting controlled and activated by motion sensor devices for a duration of fifteen (15) minutes or less.

4. Lighting of the United States of America or Commonwealth of Virginia flags and other non-commercial flags expressing constitutionally protected speech.

5. Temporary circus, fair, carnival, or civic uses.

6. Special Conditions. The Zoning Administrator may grant an exemption to the requirements of Section 9-1006 only upon a written finding that there are conditions warranting the exemption and that there are no conforming fixtures that would suffice.

7. Construction and Emergency Lighting. Lighting necessary for construction or emergencies is exempt from the provisions of this Article provided said lighting is temporary and is discontinued immediately upon completion of the construction work or abatement of the emergency necessitating said lighting.

8. Lighting associated with agricultural uses structures, such as a barn, paddock area. Residential buildings and parking associated with a farm or other agricultural uses are not exempted from the lighting requirements contained herein.

9-1008 Applications

1. Any person submitting a site plan or applying for a building, electrical or sign permit to install outdoor lighting fixtures shall as a part of said application submit evidence that the proposed work will comply with this Article.

2. The lighting plan application shall include at least the following:

- a. A site plan drawn to scale showing building(s), landscaping, parking areas and proposed exterior lighting fixtures;
- b. Location of all post, canopy, supports and light fixtures, including the height of each fixture, for any building, structure, parking, display and loading areas;
- c. Specifications of the illuminating devices, lamps, supports, and other Devices, including designation as Illuminating Engineering Society of North America (IESNA) "cut-off" fixtures. This description may include but is not limited to manufacturers catalog cuts, and drawings including sections where required;
- d. Plan shall show locations of all pole mounted and building mounted fixtures and a numerical 25 foot by 25 foot grid of lighting levels, in footcandles, that the fixtures will produce on the ground (photometric report). The photometric report will indicate the minimum and maximum footcandle levels within the lighted area of the site. The minimum (lowest number) is usually at the outer edges of the illuminated area or between two fixtures. The average light level is determined by adding the footcandle value of all the points in the grid and dividing by the total number of points.

This information is available from the manufacturer of the specified fixture. (Refer to Figure 3 for an example of this report style)

3. The above required plans and descriptions shall be sufficiently complete to enable the Zoning Administrator to readily determine whether compliance with the requirements of this Article will be secured. If such plans and descriptions cannot enable this ready determination, by reason of the nature or configuration of the devices, fixtures or lamps proposed, the applicant shall submit evidence of compliance by certified test reports as performed by a recognized testing lab.

9-1009 Issuance of Permit for Lighting on Private Property

Prior to issuance of a building, electrical or sign permit, the Zoning Administrator shall determine that the submitted plans and details for said permit are in conformance with this Article. The stamping of the plans and the signature of the director or his designated representative and the date of the signature shall indicate that the plans are in conformance.

9-1010 Amendment to Permit for Lighting on Private Property

Should the applicant desire to substitute outdoor light fixtures or lamps to be installed on private property after a permit has been issued, the applicant shall submit all changes to the Zoning Administrator for approval, with adequate information to assure compliance with this Article.

9-1011 Appeals

Except for street lighting within the right-of-way and for temporary exemptions as provided in Section 9-1007.1-5, any applicant's appeal of the Zoning Administrator's decision shall be made to the Board of Zoning Appeals, and the procedures of the Zoning Ordinance and shall apply.

9-1012 Request for Temporary Exemptions

1. Request. Any person may submit a written request on a form prepared by the Zoning Administrator for a temporary exemption to the requirements of this Article.

The Request for Temporary Exemption shall contain the following information:

- a. Specific exemptions requested.
- b. Type and use of exterior light involved.
- c. Duration of time for requested exemption.
- d. Type of lamp and calculated lumens.
- e. Total wattage of lamp or lamps.

- f. Proposed location of exterior light.
- g. Previous temporary exemptions, if any.
- h. Physical size of exterior light and type of shielding provided.

In addition to the above data, the Zoning Administrator may request any additional information which would enable a reasonable evaluation of the Request for Temporary Exemption.

The fee for a temporary exemption shall be as required for a variance to the Zoning Ordinance.

2. Appeal. The Zoning Administrator, within five (5) days from the date of the properly completed Request for Temporary Exemption, shall approve or reject in writing the Request.

If rejected, the individual making the Request shall have the right of appeal to the Board of Zoning Appeals.

(Hanover County's Lighting Ordinance)

Hanover County's Lighting Ordinance was adopted on November 27, 1991. This ordinance was effective on the date of adoption.

Article 7, Section 2(7)

Lighting: Adequate lighting shall be provided if off-street parking spaces are to be used at night. Directional lighting shall be used for all free-standing lights on site, of an intensity measured to be no greater than 0.5 footcandles above background at the property line. Such lighting shall be shielded from direct view from any adjoining residential district or from any public right-of-way. All exterior lighting shall be reduced to the minimum level necessary for security following the close of business.

(Warren County's Lighting Ordinance)

Section 180-49.2 Lighting.

A. Purpose and intent.

The purpose of this section is to regulate the placement, orientation, distribution patterns, and fixture types of outdoor lighting. The intent of this section is to encourage lighting that provides safety, utility, and security; also to prevent glare on public roadways, protect the privacy of residents, and reduce atmospheric light pollution.

B. Outdoor Lighting Compliance Statement.

The applicant for any permit for work involving outdoor lighting fixtures governed by this Section shall submit, as part of the site plan, evidence that the proposed work will comply with this Section.

This information shall contain but not be limited to the following:

- (1) The location, height, make, model, lamp type, and wattage of each outdoor lighting fixture; and
- (2) certification that the angle of total light cutoff is no more than 90 degrees; and
- (3) additional information the Zoning Administrator may determine is necessary, including but not limited to illuminance level profiles.

C. Approved Materials and Methods of Construction, Installation, or Operation.

The provisions of this Section are not intended to prevent the use of any design, material, or methods of installation or operation not specifically prescribed by this Section, provided any such alternate has been approved. The Zoning Administrator may approve any such proposed alternative provided it:

- (1) provides at least approximate equivalent to the applicable specific requirement of this Section; and
- (2) is otherwise satisfactory and complies with the purpose and intent of this Section.

D. General Requirements: All zoning districts.

- (1) All outdoor lighting fixtures, including display lighting, shall be turned off after close-of-business, unless needed for safety or security, in which case the lighting shall be reduced to the minimum level necessary.
- (2) Auto/Truck filling stations. Island canopy ceiling fixtures shall be recessed.

(3) Recreational facilities, public or private. Lighting for outdoor recreational facilities shall be shielded according to Table F of this Section.

(4) All light fixtures that are required to be fully shielded shall be installed and maintained so that the shielding is effective as described in the definition of a full-shielded fixture in Section 180-49.2 (h) Definitions.

E. Special Requirements.

Industrial and Commercial Zoning Districts, and industrial, commercial, and institutional uses in any zoning district.

(1) Outdoor lighting fixtures shall comply with the shielding requirements of Table F of this Section.

(2) Light trespass from a property shall be designed not to exceed 0.5 footcandles at the property line.

F. TABLE OF SHIELDING REQUIREMENTS

Fixture Lamp Type	Shielded
Low/High Pressure Sodium, Mercury Vapor, Metal Halide and Fluorescent over 50 watts	FULLY
Incandescent over 160 watts	FULLY
Incandescent 160 watts or less	NONE
Fossil fuel	NONE
Any light source of 50 watts or less	NONE
Other sources	As approved by Section 180-49.2

Note: Incandescent includes tungsten-halogen (quartz) lamps

G. Exemptions.

The following uses shall be exempt from the provisions of this ordinance:

- (1) Roadway and Airport lighting and lighting activated by motion sensor devices.
- (2) Temporary circus, fair, carnival, or civic uses.

(3) Construction or emergency lighting, provided such lighting is temporary and is discontinued immediately upon completion of the construction work or abatement of the emergency necessitating said lighting.

(4) Temporary lighting.

(5) Lighting associated with agricultural pursuits.

H. Definitions

FULLY SHIELDED FIXTURE. An outdoor lighting fixture that is shielded or constructed so that all light emitted is projected below a horizontal plane running through the lowest part of the fixtures.

GLARE. Light that causes annoyance, discomfort, or loss in visual performance and ability.

OUTDOOR LIGHTING FIXTURE. An electrically powered illuminating device or other outdoor lighting fixture including all parts used to distribute the light and/or protect the lamp, permanently installed or portable, used for illumination. Such devices shall include, but are not limited to, search, spot flood and area lighting.

RECESSED CANOPY FIXTURE. An outdoor lighting fixture recessed into a canopy ceiling so that the bottom of the fixture is flush with the ceiling.

(Roanoke County's Lighting Ordinance)

SEC. 30-94. EXTERIOR LIGHTING.

(A) The following exterior lighting standards shall apply to all uses and developments requiring a site development plan pursuant to Section 30-90 of this ordinance.

1. All exterior lighting fixtures shall be designed, located and arranged so as not to direct glare on adjoining streets or residential properties. The intensity at adjoining streets or residential properties shall not exceed 0.5 foot candles.

2. Within the Clearbrook village overlay district, no freestanding light pole, including fixture, shall be more than eighteen (18) feet above grade. All exterior lights, including security lighting, within the district shall be down-lit or shielded so as not to direct glare onto adjoining streets or residential properties. The intensity at adjoining streets or residential properties shall not exceed 0.5 foot candles.

(B) All exterior lighting fixtures within residential zoning districts shall be designed, located and arranged so as not to direct glare on adjoining streets or residential properties. The lighting intensity at adjoining residential properties shall not exceed 0.5 foot candles.

(Ord. No. 121900-11, § 7, 12-19-00)

(Town of Vinton's Lighting Ordinance)

Sec. 5-22. Outdoor lighting.

Outdoor lighting, provided as accessory to any use or to illuminate any parking area, sign or similar device, shall be located, directed or shielded so as not to shine directly on or to result in glare on nearby properties or to create a potential traffic hazard on adjacent streets as a result of glare or similarity to or confusion with traffic signals, warning lights or lighting on emergency vehicles. The exterior of a building, structure or portion thereof shall not be illuminated by outlining such with lights, except for purposes of temporary seasonal decoration or illumination of display windows of permitted businesses.

(VOLT's Model Outdoor Lighting Ordinance)

VOLT Model Lighting Ordinance

Section 1: Purpose and Intent

The purpose of this ordinance is to provide outdoor lighting standards that will improve safety, minimize glare and light trespass, and conserve energy for businesses and residents of (*County**).

Section 2: Applicability

All new commercial, industrial and residential outdoor lighting installations shall meet the requirements of this Code.

Section 3: Outdoor Lighting Standards

3.1 Shielding Standards

- a. All nonexempt outdoor lighting fixtures with an initial output greater than or equal to 7000 lumens shall be Full Cutoff.
- b. All nonexempt outdoor lighting fixtures with an initial output between 2000 and 7000 lumens shall be Semi-Cutoff, Cutoff, or Full Cutoff.
- c. All outdoor lighting fixtures with initial output less than 2000 lumens are exempt from the requirements of this Code.
- d. All outdoor lighting fixtures that have Semi-Cutoff, Cutoff, Full Cutoff restrictions shall be installed and maintained in such a manner as to be horizontal to the ground so that the cutoff characteristics of the fixture are maintained.
- e. Beyond the cutoff requirements of Section 3.1 a-d, all light fixtures shall be located, aimed or shielded so as to minimize light trespass across property boundaries. Where applicable, all commercial installations shall utilize house-side shielding to minimize light trespass on residential properties.

3.2 Maximum maintained illuminance levels

No outdoor lighting shall be installed to exceed the maximum maintained illuminance levels as recommended by the IESNA for the designated activity. When no maximum level is defined by IESNA, no lighting shall be installed to exceed 175% of the minimum maintained illuminance levels as recommended by the Illuminating Engineering Society of North America (IESNA) for the designated activity unless otherwise permitted in this Code.

3.3 Reduced Lighting Levels

Lighting levels shall be reduced to security levels within 30 minutes after the close of business or the end of the business activity.

Section 4: Special Uses and Exemptions

4.1 Recreational Sports Facilities Lighting

a. Shielding. Full Cutoff lighting is strongly recommended. Where Full Cutoff fixtures are not utilized, acceptable outdoor light fixtures shall include those which:

1. Are provided with internal and/or external glare control louvers and installed so as to minimize uplight and offsite light trespass, and;
2. Are installed and maintained with aiming angles that permit no greater than five percent (5%) of the light emitted by each fixture to project above the horizontal.

b. Off-Site Spill. The installation shall also limit off-site spill (off the parcel containing the sports facility) to the maximum extent possible consistent with the illumination constraints of the design. A design goal of .75 fc at any location on any non-residential property, and .25 fc at any location on any residential property, as measurable from any orientation of the measuring device, shall be sought.

4.2 Service Station Canopies

(Optional): Maximum maintained illuminance levels of 35 foot candles.

4.3 Outdoor Advertising Signs

- a. Internally illuminated signs shall have dark backgrounds with light lettering.
- b. Externally illuminated signs shall be lighted from the top down and lighting will be directed to minimize glare and light spill to non-sign areas.
- c. Signs using logos or graphics that are legally registered trademarks may apply for a waiver if compliance with this provision would have a commercial or legal impact on the business.

4.4 Facade Lighting

The lighting of building facades is allowed and Cutoff fixtures as defined by the IESNA are not required so long as shielded and directional fixtures are used. Fixtures must be installed and aimed so as to minimize glare, sky glow and light trespass.

4.5 Holiday Lighting

Holiday lighting is exempt from the provisions of this Code .

4.6 Flag Lighting

The lighting of flags is allowed and Cutoff fixtures as defined by the IESNA are not required so long as shielded and directional fixtures are used. Fixtures must be installed and aimed so as to minimize glare, sky glow and light trespass.

4.7 Emergency Lighting

Emergency lighting, used by police, firefighting, or medical personnel, or at their direction, is exempt from all provisions of this code for as long as the emergency exists.

4.8 Temporary Lighting

Temporary Lighting, such as that used at construction sites or other uses of a temporary nature, is exempt from the provisions of this code. However temporary lighting shall be aimed so as to minimize glare and light trespass to adjacent properties and turned off upon the completion of the project.

4.9 State Maintained Roadways

Lighting for state maintained roadways is exempt from the provisions of this Code.

4.10 Waivers

Waivers may be granted if an applicant can document that meeting specific provisions of this Code would result in an unsafe condition, impede normal operations or inflict undue financial hardship. The applicant shall complete a waiver form and provide a full explanation as to what provision cannot be met, why they cannot be met and what alternative is proposed. Waivers shall be submitted to the lighting administrator and will be decided on a case by case basis. Waivers will not be denied without justification and the specific reasons for denial will be provided in writing to the applicant in a timely manner.

Section 5: Certification

For installations over 100,000 total initial lumens the applicant must provide a photometric lighting plan and the installer must certify that the lighting system design and installation conforms to all applicable provisions of this Code.

Section 6: Measurement

Unless otherwise stated all illuminance measurements for the purpose of this ordinance shall be made at ground level with the meter oriented horizontally.

Section 7: Definitions

- 7.1 Glare: The sensation produced by a bright source within the visual field that is sufficiently brighter than the level to which the eyes are adapted to cause annoyance, discomfort, or loss in visual performance and visibility. The magnitude of glare depends on such factors as the size, position, brightness of the source, and on the brightness level to which the eyes are adapted.
- 7.2 Light Trespass: Light falling where it is not wanted or needed, typically across property boundaries. This is the most common citizen complaint associated with outdoor lighting.
- 7.3 Uplight: Light projected above the horizontal.
- 7.4 Outdoor Lighting Fixture: The complete lighting assembly, less the support assembly. Such devices shall include, but are not limited to lights used for:
 - a. Parking lot lighting
 - b. Roadway lighting
 - c. Buildings and structures
 - d. Recreational areas
 - e. Landscape lighting
 - f. Billboards and other signs (advertising or other)
 - g. Product display area lighting
 - h. Building overhangs and open canopies
- 7.5 Full Cutoff: A Full Cutoff outdoor lighting fixture emits 0% of its light above 90 degrees and 10% above 80 degrees from horizontal. A standard IESNA definition.

- 7.6 Cutoff: A Cutoff outdoor lighting fixture emits no more than 2.5% of its light above 90 degrees and 10% above 80 degrees from horizontal. A standard IESNA definition.
- 7.7 Semi-Cutoff: A Semi-Cutoff outdoor lighting fixture emits no more than 5% of its light above 90 degrees and 20% above 80 degrees from horizontal. A standard IESNA definition.
- 7.8 Lumen: Unit of luminous flux; used to measure the amount of light emitted by lamps.
- 7.9 Initial Lumens: Amount of luminous flux emitted by a lighting fixture at initial installation. Initial Lumens are usually listed by the manufacturer. Ex. A 100 watt incandescent light bulb emits approximately 1800 lumens.
- 7.10 Illuminance: Illuminance is the amount of luminous flux per unit area in the Imperial system and is equal to one lumen per square foot. Illuminance is measured in footcandles. The metric system uses the lux. One footcandle equals approximately 0.1 (0.093) lux.
- 7.11 Maintained Illuminance Level: Lamps emit less luminous flux over time and therefore illuminance levels of an installation will decrease over time. The maintained illuminance level is usually determined as a percentage of the initial illuminance level. The percentage is different for the various types of lamp sources. This number is reported as a part of the photometric plan.
- 7.12 Total Initial Lumens: Derived by summing the individual initial lumens output for all the lighting fixtures of an installation. For example, six fixtures with 10,000 initial lumens output per fixture would equal 60,000 total initial lumens.