
ANNUAL REPORT ON THE ENVIRONMENT

CHAPTER IX

**NOISE, LIGHT
POLLUTION AND
VISUAL POLLUTION**

IX-1. NOISE

A. OVERVIEW

Noise is often considered to be unwanted sound. Sound becomes undesirable when its intensity is such that it interferes with one's ability to hear something more desirable or when there is a desire to not hear anything at all (i.e., “silence is golden”).

Noise is a byproduct of our everyday lives. Residents hear various noises and determine if the noise intensity is such that their quality of life is impacted—it’s often “in the ears of the beholder.” Noise that is perceived as a detriment to our quality of life due to its intensity, timing, duration and/or its source is defined as noise pollution.

Key elements of determining noise pollution are the measured intensity of noise, its duration and how these impact society as a whole. Noise is a major concern of our society, especially in urban areas. How it is regulated is based on scientific findings and not solely on human perception. Noise is measured by scientific instruments that receive the sound and determine its location and intensity as it radiates from the source. The resulting intensity levels and locations will allow for noise levels to be catalogued so noise can be regulated when society objects to noise pollution.

In a world of constant natural and manmade sounds, those that are perceived as “noise” vary among people in the community. The pivotal issue is the perceived impact or degree of annoyance from noise. To some, loud sounds coming from an airport are the sounds of the economy working and growing, while others feel that this noise deprives them of their privacy and quiet. People can be startled by unexpected noise and usually do not understand why the generation of such noise is necessary.

Recent studies suggest a growing intolerance among residents and communities for noise associated with airports, traffic, construction and athletic events, etc. The impacts of noise on a community include:

- Diminished privacy and quiet at home or at an outdoor recreation experience, vacation or rest site (private cabin at the lake, river or beach)
- Interrupted sleep
- Interrupted entertainment and conversation
- Interruptions at work or school
- Property damage such as broken windows

In response to an EQAC recommendation for the development and distribution of educational materials to the public regarding noise issues, county staff has established a Web site containing information and links addressing noise issues. The Web site is available at <http://www.fairfaxcounty.gov/dpz/environment/noise/> .

In the next sections of this report some key noise pollution concerns will be addressed, followed by recommendations to alleviate their impacts.

B. AIRPORT NOISE

1. Operations and Associated Noise Impacts at Ronald Reagan Washington National Airport and Washington Dulles International Airport

Fairfax County is served by Ronald Reagan Washington National Airport and Washington Dulles International Airport. According to the Metropolitan Washington Airports Authority's Web site, in 2007, 43.4 million passengers traveled through Ronald Reagan Washington National Airport (National) and Washington Dulles International Airport (Dulles) on roughly 660,000 flights. The number of flight operations and passengers at Dulles Airport increased from 2006 but was still considerably lower than 2005 due to the cessation of operations by Independence Air. While the number of flight operations at National Airport in 2007 was slightly lower than the number of operations in 2006, the airport set a record in terms of passenger service, with an 0.7 percent increase from 2006 and a 4.7% increase from 2005, the previous record years.

On a typical day, over 4,000 airplanes will fly in the skies over the Washington region. Most of these flights are to and from Ronald Reagan Washington National Airport, Washington Dulles International Airport, Baltimore-Washington International Airport or Andrews Air Force Base. Many additional flight operations also occur at the many general aviation airfields in the region. In addition, it is EQAC's perception that low-flying helicopter traffic has markedly increased over Fairfax County's residential neighborhoods in the last several years.

Both National and Dulles Airports are heavily used and are an important part of the region's overall economy; there was an average of roughly 55,000 total flights conducted per month at these airports in 2007. This activity is made up of commercial flights between the Washington area and 140 domestic and international destinations. At National, most flights are short to mid-range jet aircraft flights operated by major airlines. All types and sizes of aircraft operate at Dulles. The number of daily operations at Dulles Airport varies significantly, with weekday operations typically exceeding weekend day operations by several hundred flights. Most flights operate between 7:00 A.M. and 10:00 P.M., with many flights in some hours and a relatively small number in other hours. Peaks are typically at 7 A.M., 12 P.M., 5 P.M. and 8 P.M., with low times at 10 A.M., 2 P.M., 6 P.M. and between 10 P.M. and 6 A.M.

National has about half as many flights as Dulles, with more than 700 flights on a typical day. Weekday operations are typically greater than weekend day operations. Most flights occur between 7 A.M. and 10 P.M., with a fairly consistent number of

scheduled operations for each hour within this period. National is under the Federal Aviation Administration's High Density Rule, which limits, with some exceptions, the air carriers to 37 scheduled operations per hour and the commuter carriers to 13 scheduled operations per hour.

The Metropolitan Washington Airports Authority, which operates both National and Dulles Airports, has historically monitored aircraft and community noise around the clock at 32 locations in the Washington, D.C. Metropolitan Area. The monitoring equipment has evaluated different sound events and has separated those events likely to have been caused from aircraft from the remaining events, which have been attributed to the community. The Metropolitan Washington Council of Governments' Committee on Noise Abatement and Aviation at National and Dulles Airports (now known as the Aviation Policy Committee) and the Airports Authority selected the monitoring sites from recommendations offered by the local governments. Due to the age of the monitoring system, the system has become unreliable, and MWAA has discontinued publication of quarterly monitoring reports. A new monitoring system has been acquired and is currently being installed; it is anticipated that installation will be completed by the end of 2008. MWAA will now be monitoring noise at 40 locations throughout the metropolitan Washington area, including 15 locations in Fairfax County. These sites will include four new Noise Monitoring Terminals, one relocated site, and the replacement of Noise Monitoring Terminals at 10 of the previous monitoring locations.

Table IX-1-1 contains summary information regarding noise impacts based on past noise measurements taken from selected noise monitoring stations north of National Airport. This information has been excerpted from data compiled by Citizens for the Abatement of Airport Noise and does not reflect original data from MWAA. The information provided by CAAN shows pronounced changes in the noise intensity pattern. Decibel levels are measured on a logarithmic scale; thus, an increase of 3.0 dB represents an approximate doubling of sound intensity, while an increase of 10.0 dB represents a ten-fold increase.

Based on the CAAN information, it is immediately apparent that noise levels since the year 2000 (prior to the events of September 11, 2001, which resulted in substantial changes in operations at National Airport) have diminished, in some cases markedly, on the Maryland side of the Potomac River, while in some locations on the Virginia side they have roughly doubled. Some residents have observed changes in flight paths that bring planes at low altitude directly over neighborhoods in Virginia, where prior to September 11, 2001 such low overflights were a rarity. The data presented in Table IX-1-1 appear to correlate with these observations. The MWAA noise monitoring system that was used to obtain the measurements reported in Table IX-1-1 has been out of service for more than two years. As noted above, MWAA has indicated that installation of a replacement noise monitoring system will be completed by the end of 2008. EQAC looks forward to reviewing new airport noise monitoring data.

Table IX-1-1

**Day-Night Average Sound Levels in Decibels
for Noise Monitoring Stations North of National Airport**

Monitoring Station Location	Year 2000	April 2004-March 2005	April 2005-March 2006	Change between 2004/5 and 2005/6	Change since the year 2000 (pre-9/11/01)
Rosslyn	62.6	59.9	59.9	0.0	-2.7
Chain Bridge	66.6	58.2	57.8	-0.4	-8.58
Langley Forest	52.2	54.1	55.2	+1.1	+3.0
Great Falls	51.5	51.4	53.9	+2.5	+2.4
Chevy Chase	58.3	58.8	51.3	-7.5	-7.0
Cabin John	55.9	58.7	55.7	-3.0	-0.2
Avenal	59.2	60.2	49.0	-11.2	-10.2

Source: Citizens for the Abatement of Airport Noise Web site: <http://www.caan.org/factsfigs.html>

In 2007, the Airports Authority's noise complaint centers at National and Dulles reported receiving 214 noise complaints; National reported 102 complaints while Dulles reported 112 complaints.

MWAA reports that National Airport has one of the strictest noise regulations in place at any major airport in the United States. All aircraft operating between 10:00 P.M. and 7:00 A.M. must satisfy the airport's nighttime noise limits or face monetary fines of \$5,000.00 maximum per violation.

Resources:

Metropolitan Washington Airports Authority

Community Relations and Noise Abatement	703-417-8745
National Airport Noise Complaints	703-417-8020
Dulles International Airport Noise Complaints	703-572-8215

Federal Aviation Administration

Washington National Airport	703-413-1530
Dulles International Airport	703-471-1270
FAA Noise Ombudsman	202-493-5047

Other Aviation Facilities

Andrews Air Force Base-(auto information line)	301-981-1110
Baltimore-Wash Int'l Airport-complaints	410-859-7021

2. Additions to Washington Dulles International Airport

On October 14, 2005, the Federal Aviation Administration published a Record of Decision for the construction of new runways, terminal facilities and related facilities at Dulles Airport. The publication of this document completed the lengthy Environmental Impact Statement process for this project, providing the Metropolitan Washington Airports Authority with the approval needed to proceed. Two new runways have been authorized: a north-south oriented runway to be constructed parallel to and 4,300 feet west of the westernmost of two existing north-south runways and a runway roughly oriented east-west that will be constructed parallel to and 4,300 feet south of the existing east-west runway.

Construction of the fourth runway began in May 2006. The new concrete runway will be 9,400 feet long and 150 feet wide. The project includes the new runway, a parallel taxiway, connector taxiways and cross-field taxiways that will connect to the terminal and existing airfield areas. The fourth runway is scheduled to be operational in November 2008. It is anticipated that one of the existing north-south runways will be taken out of operation for maintenance purposes for at least several months after the new north-south runway opens. Therefore, normal four-runway operations will not be likely until the second half of 2009. MWAA staff has suggested that a considerable amount of time will be needed after that (MWAA staff has suggested that at least one year is needed) to fully evaluate experiences under the new runway configuration to determine if operational changes should be pursued to reduce noise impacts. Both county staff and EQAC have recommended in the past that MWAA and FAA be requested to evaluate flight operations under the new runway configuration and to identify operational approaches that can be pursued to minimize noise impacts. EQAC continues to feel that such an analysis is warranted and should be requested. Further, EQAC strongly believes that evaluation of noise impact (to include both 24-hour noise monitoring and operational analysis) should begin at the time the new runway is opened for use and should continue in perpetuity, especially through the time period incorporating one year beyond the reopening of the runway that is taken out of service for maintenance. The results of all such noise evaluations should be reported quarterly and should be provided to a number of stakeholders including the Fairfax County Board of Supervisors, EQAC and relevant county staff.

Construction dates for the fifth runway will be set in the future.

There are many other projects under way at Dulles Airport, including:

- The construction of an “AeroTrain” system to replace the existing Mobile Lounges with an underground rail system (scheduled to open in the second half of 2009)
- Improvements to the airport roadway system and connections to Route 28 and the Dulles Access Road
- Expansion of Concourse B to add 12 new airline gates
- Expansion of the International Arrivals Building

In addition, the new air traffic control tower became operational in 2007.

3. Part 150 Noise Compatibility Planning for Ronald Reagan Washington National Airport

Portions of the following discussion have been excerpted and modified slightly from the Web site of the Metropolitan Washington Council of Governments:

MWAA has prepared a major update of the Noise Compatibility Study for Ronald Reagan Washington National Airport. This study, conducted in accordance with the provisions of the Federal Aviation Administration's "Part 150" process, has been designed to forecast future noise contours at Reagan National and to propose abatement and mitigation actions to reduce community noise impacts. A study report containing a series of recommended noise abatement and mitigation measures was released in September 2004. Noise abatement recommendations include, among other things, the application of improved technology to keep arriving and departing aircraft over the Potomac River up to their designated turning points, an improved distribution of turning points from the Potomac River between five and ten miles south of the River and the improvement of the Airport's noise monitoring and flight tracking system. In October 2004, the Fairfax County Board of Supervisors endorsed staff comments concerning these recommendations; the comments were generally supportive of the noise abatement recommendations but recommended a follow-up assessment of the effectiveness of these measures.

Because of the importance of this issue to the community, the Metropolitan Washington Council of Governments' Committee on Noise Abatement and Aviation at National and Dulles Airports (now known as the Aviation Policy Committee) partnered with MWAA throughout the process of development of the noise abatement and mitigation recommendations. A Part 150 Study Advisory Committee was established to assist and advise the Airport Authority in this study; indeed the Advisory Committee's recommendations were incorporated into the Part 150 Study document. In all, the Part 150 Study recommended eight noise abatement measures (measures designed to reduce noise impacts) and six noise mitigation measures (measures taken to promote compatibility with and awareness of noise impacts). The recommended noise abatement measures were:

- Efforts supporting the use of advanced navigation technology.
- Two measures addressing the dispersal of flight paths in the area between five and ten miles south of the airport
- Revision to the Airport Facility Directory reflecting current noise abatement procedures
- Phasing out of "hushkitted" Stage 3 aircraft
- Updating the airports noise monitoring and flight tracking system
- Establishing a system to report airline compliance with noise abatement measures
- Enhancement of the noise complaint system

Five of the six mitigation measures were directed toward neighboring localities (e.g., disclosure of noise impacts; building code modifications; noise overlay zoning) and the sixth recommended an expanded MWAA airport noise information program.

MWAA submitted the Part 150 study to the Federal Aviation Administration, and FAA completed its review of, and issued a Record of Approval for, the Noise Compatibility Program in early 2008. Four of the eight proposed noise abatement measures were approved, and all six of the mitigation measures were approved with the acknowledgment that these measures were beyond the authority of FAA. Four noise abatement measures were disapproved for the purposes of Part 150—in disapproving these measures, FAA noted that the noise exposure model and noise compatibility program for the airport showed “no present or forecasted incompatible land uses within the DNL 65 dB” contour. Effectively, FAA is precluding expenditures of agency funds for noise abatement projects that would support actions that would be applied in areas outside the DNL 65 dBA contour, with the recognition that MWAA or Air Traffic Control could pursue similar or supportive actions at their discretion (and in the case of noise monitoring and flight tracking, at MWAA’s expense). As noted in FAA’s Record of Approval, a working group has been formed to develop advanced navigation procedures for arrivals and departures and to encourage the use of this technology, and MWAA is updating the noise monitoring and flight tracking system.

Nevertheless, EQAC continues to share the concerns of communities both north and south of National Airport regarding noise impacts associated with airport operations and holds that noise impacts do not stop at the DNL 65 dBA model contour shown in the Part 150 study. The DNL 65 dBA contour for National Airport encompasses a relatively small area that is located largely on airport property and within the Potomac River; some commercial, industrial and governmental areas are also located within this area, as is park land. No residences are located in areas that are currently exposed to, or that are projected to be exposed to, noise impacts of DNL 65 dBA or above. However, there have been significant concerns about airport noise impacts well outside this area, and operational noise abatement procedures have been established to minimize such impacts both north and south of the airport. Deviations to noise abatement procedures north of the airport have been documented by the McLean Citizens Association in collaboration with Congressman Wolf’s office. While these impacts have occurred well beyond the DNL 65 dBA contour, they have had a significant and adverse impact to residents of the area.

4. The Aviation Policy Committee

The Aviation Policy Committee is a committee of the Metropolitan Washington Council of Governments that provides guidance to the COG Board of Directors on airport and aviation policy-related matters and that has been delegated by the COG Board of Directors to speak on its behalf on noise policy matters. The committee, which changed its name in 2006 from the Committee on Noise Abatement and Aviation at National and Dulles Airports, provides a broad, balanced and integrated perspective on matters relating to airport and aircraft policies.

The APC has collaborated and will continue to collaborate with MWAA in implementing major recommendations resulting from the Part 150 Noise Compatibility Study for Reagan National Airport. The committee will also continue to focus on noise abatement strategies for implementation at both Reagan National and Dulles Airports, with emphasis on review of emerging national legislation and studies on their impact on local noise strategies. Toward this end, the Committee drafted a resolution that was adopted by the COG Board in June 2008 opposing efforts to usurp regional and local authority over the region's airports and to weaken the slot and perimeter rules affecting operations at National Airport. The committee will also focus on the growing role general aviation plays in economic development and quality of life in the region.

The APC will also continue to focus on developing implementation strategies for the recently completed Regional Helicopter System Plan.

C. HIGHWAY NOISE

1. Background

Traffic in the Washington metropolitan area continues to grow, resulting in increasing traffic on the region's roads. Increasing traffic volumes on the county's roadways have had the consequence of increasing transportation-related noise impacts to residential areas adjacent to these roadways. As more lanes are added and some new roads are constructed, increased traffic generates more noise that creates demands for noise attenuation or abatement measures such as:

- The construction of barriers/walls or raised berms
- The provision of landscaping/vegetation
- The provision of acoustical design techniques

Barriers have become the most popular choice. Since the early 1990s in Fairfax County, barriers constructed by the Virginia Department of Transportation have consisted of a solid wall of absorptive concrete that breaks the line of sight between vehicles and homes. Although noise barriers typically have a maximum decibel reduction of 20 dBA, most only provide 10-12 decibel reductions.

Noise is an important environmental consideration for highway planners and designers. The U.S. Department of Transportation and state transportation agencies are charged with the responsibility of optimizing compatibility of highway operations with environmental concerns. Highway noise problems have been addressed by numerous investigations, including evaluations of the following:

- Noise sources and highway noise reference energy mean emission levels
- Noise impacts at receptor locations

- Effects of site geometry, meteorology, ground surface conditions, and barriers on noise propagation
- Alternative methods of mitigating noise impacts

Precise, uniform, state-of-the-art highway traffic noise measurement procedures for assessing impacts in the vicinity of roadways, and designing effective cost-efficient noise barriers, are recognized needs in the highway noise community.

2. State Policy

Virginia adopted its original noise abatement policy in 1989. The policy established criteria for providing noise protection in conjunction with proposed highway projects in the state. Implementation of the policy has aided in the construction, or construction approval, of more than 100 federally-funded sound barriers. Experience with this policy created considerable feedback from residents and elected officials. As a result, the Commonwealth Transportation Board decided to evaluate the policy for possible changes. The major source of information used was a survey of 15 state departments of transportation in the eastern U.S. The culmination of this process was the adoption of changes to the state policy in November 1996, which became effective in January 1997.

The key changes to the policy were to:

- Raise the cost-effectiveness ceiling from \$20,000 per protected receptor to \$30,000 per protected residential property based other state practices.
- Clarify that Virginia will not participate in any retrofit project along an existing highway when not in conjunction with an improvement for that highway.
- Add the possibility for third party funding of the amount above VDOT's \$30,000 ceiling if the abatement measure otherwise satisfies the criteria.

3. State Projects in Fairfax County

VDOT has constructed the following sound barriers in FY 07-08:

- One sound barrier with third party funding, associated with the West Ox Road widening between Penderbrook Road and Ox Trail
- One new sound barrier system along the I-95 Outer Loop west of the Richmond Highway (U.S. Route 1) interchange (associated with the Woodrow Wilson Bridge Project)

Consistent with federal/state policies and guidelines, noise barriers have been approved for the following highway construction projects underway in FY 08-09:

- One replacement and enhanced noise barrier system and two new noise barrier systems associated with the Interstate 95/Telegraph Road interchange improvements (Woodrow Wilson Bridge Project)

- One replacement and five new noise barrier systems associated with the Interstate 95 4th lane widening project
- Nine replacement and enhanced noise barrier systems, six new noise barrier systems and one new noise barrier system with third party funding associated with the I-495 Capital Beltway High Occupancy Toll/Bus/High Occupancy Vehicle lanes project

4. Noise Study Submission Guidelines

On July 24, 2000, the Board of Supervisors adopted Zoning Ordinance Amendment ZO 00-330, which permits noise barriers in excess of the Zoning Ordinance fence/wall height limitations where needed to reduce adverse impacts of highway noise on properties adjacent to major thoroughfares, or to reduce adverse noise impacts of commercial and industrial uses on adjacent properties. A noise impact study is required to demonstrate the need for the noise barrier and the proposed height and level of mitigation to be achieved by the noise barrier.

D. COMMENTS AND ONGOING CONCERNS

1. Continue to support airport noise-compatible land use planning near airports in the county through the implementation of policies and regulations that reference the most current airport noise contour projections for the airports and that are at least as stringent as federal noise compatibility guidelines.
2. Continue to encourage the use of opportunities provided by the Virginia Department of Transportation that allow for third party contributions to noise barrier construction when the VDOT cost criteria preclude VDOT's construction of such barriers. Through this VDOT policy, neighborhoods affected by high levels of highway noise can participate in the funding of barriers that would not otherwise be constructed.
3. Staff should continue to review all airport and highway studies that require Environmental Assessments or Environmental Impact Statements under the National Environmental Policy Act for consistency with county policies addressing transportation-related noise and mitigation and report its findings to the board. In turn, the Board of Supervisors should, when appropriate, adopt resolutions with specific requests and/or recommendations and transmit these to the Metropolitan Washington Airports Authority, Federal Aviation Administration, Commonwealth Transportation Board, Virginia Department of Transportation and other state and federal agencies as applicable.
4. Encourage the retention and planting of noninvasive vegetation to provide visual shielding of residents from highways. Where possible, support the provision of vegetated areas adjacent to highways that are wide enough and dense enough to provide noise reduction benefits to residential areas near the highways. Where feasible and appropriate, pursue such approaches in lieu of noise walls.

E. RECOMMENDATIONS

1. In recognition of the anticipated opening of a new fourth runway at Washington Dulles International Airport in late 2008 and the future construction of a fifth runway, EQAC recommends that the Board of Supervisors formally request the Metropolitan Washington Airports Authority and the Federal Aviation Administration to evaluate options for the operation of the existing and new runways to identify approaches that will optimize flight operations in a manner that minimizes community noise exposure. This evaluation should include both an assessment of 24-hour noise monitoring and an analysis of operational approaches. The evaluation of noise impacts should begin at the time the first of the new runways is opened for use and should continue in perpetuity, especially through the time period incorporating one year beyond the reopening of any runway that is taken out of service for maintenance. The results of all such noise evaluations should be reported quarterly and should be provided to a number of stakeholders including the Fairfax County Board of Supervisors, EQAC and relevant county staff.
2. EQAC is pleased that a series of Web pages have been established on the county's Web site addressing noise issues. The county should ensure that this page is kept current through regular updates.

REFERENCES

Cuttler, William C., July 3, 2008 letter to James P. Zook, Director, Fairfax County Department of Planning and Zoning.

Fairfax County Virginia Noise Web site: <http://www.fairfaxcounty.gov/dpz/environment/noise/>

Federal Aviation Administration, 2007, Ronald Reagan Washington National Airport, Volume 1, FAR Part 150 Noise Exposure Maps and Noise Compatibility Program (available at http://www.metwashairports.com/_/File/_/NCProgramUpdate.PDF)

Metropolitan Washington Airports Authority Web sites:
<http://www.metwashairports.com/> (Home page)

Metropolitan Washington Council of Governments Web sites: (<http://www.mwcog.org> (Home page))

Metropolitan Washington Council of Governments, Aviation Policy Committee Web site:
<http://www.mwcog.org/environment/airport/conaanda/>

Phillips, Neal, June 23, 2008 letter to James P. Zook, Director, Fairfax County Department of Planning and Zoning

IX-2. LIGHT POLLUTION

A. OVERVIEW

Light pollution is a general term used to describe light output, primarily from exterior (outdoor) sources, in commercial, residential and roadway settings that is excessive in amount and/or that causes harmful glare to be directed into the path of travel or into residential neighborhoods. Light pollution is thus both a safety issue and a quality of life issue. With the increasing urbanization of Fairfax County, exterior (outdoor) lighting and light pollution in its many forms have become pressing issues to our communities. In the past, Fairfax County had some regulations regarding exterior lighting, but they were minimal and out of date. A major effort was undertaken in 2002 to write a totally new and modern Outdoor Lighting Ordinance that took into account the numerous advances that have been made in lighting technology in recent years. This highly successful effort utilized several workshops, in which EQAC and a number of local experts participated, and came to fruition in the early summer of 2003 with the adoption of the new Outdoor Lighting Ordinance. It is regarded by experts in the outdoor lighting community as being one of the best such ordinances in the mid-Atlantic region and has been cited and largely copied by localities in Connecticut, Illinois and California. However, there are one or two areas that could not be adequately addressed by the new ordinance, since suitable standards and convenient measurement technology were not available. This report will focus on these areas.

B. RESPONSE OF THE HUMAN EYE TO LIGHT

To put the following sections in proper context, it is helpful to briefly review how the human eye perceives and reacts to light. The various cells of the retina of the eye contain what are called visual pigments. These pigments, in the fully dark-adapted condition, are complex proteins consisting of two linked components. The pigments respond to light by “bleaching” (actually the dissociation of the two protein moieties). The brighter the light, the greater is the bleaching and the longer the regeneration time. The greater the bleaching, the lower is the sensitivity of the retinal cell. The retina contains three types of sensory cells:

1. The rods, which are most numerous toward the periphery of the retina and contain the visual pigment rhodopsin. They are useful primarily in low light and provide monochromatic images.
2. Three types of cones, mostly concentrated in the central portion of the retina and which provide color vision. They contain respectively photopsin I (erythrolabe), photopsin II (chlorolabe) and photopsin III (cyanolabe). Their peak sensitivities are in the red, green and blue portions of the spectrum just like the sensor chip in a digital camera. (George Wald received the 1967 Nobel Prize in Medicine for his work on the three kinds of cone photopsins.)

3. The spidery retinal ganglion cells, containing the visual pigment melanopsin. These cells perform two different functions: control of the size of the pupil of the eye in response to light and as the control that resets the body's day-night cycle clock. Prolonged exposure of melanopsin to bright lights during normally dark periods of the evening and night can result in significant disturbances of the sleep-wake cycle.

C. ISSUES AND PROBLEMS

The main issues and problems of exterior lighting and light pollution may be summarized as follows:

1. Glare

Glare, as defined by the Illuminating Engineering Society of North America, falls into three main categories:

- Disability glare – Disability glare (sometimes less accurately referred to as veiling luminance) is caused by overly bright light sources that shine directly into one's eyes and is dangerous because it is blinding (i.e., it totally overloads the eye's light sensor cells).
- Discomfort glare – Discomfort glare may not necessarily reduce the ability to see an object, but it produces a sensation of discomfort due to high contrast or non-uniform distribution of light in the field of view.
- Nuisance or annoyance glare – Nuisance glare is that which causes complaints such as, "The light is shining in my window."

Glare is a significant and pervasive problem that seriously impairs both safety and quality of life. Glare demands attention in that one's eyes are naturally attracted to bright light, and at night this destroys the eye's dark adaptation (the eye's sensitivity to lower light levels), which is a serious hazard for both drivers and pedestrians.

Obtrusive lighting by commercial establishments to attract attention is a serious problem as is selection of inappropriate fixtures for exterior residential lighting. A major problem is the high intensity lighting of sports facilities, such as ball fields and tennis courts, adjacent to residential neighborhoods. Glare and excessive illumination (which are two separate problems) cast into surrounding residential neighborhoods not only detracts from the quality of life but can make it difficult for pedestrians and homeowners to see their surroundings.

2. Light Trespass

Light trespass is the poor control of outdoor lighting such that it crosses property lines and detracts from the property value and quality of life of those whose property is so invaded. It is particularly common when obtrusive commercial or recreational lighting

is immediately adjacent to residential neighborhoods or when a homeowner uses inappropriate fixtures, light levels and lighting duration, often in the interest of “security.” It is generally categorized in two forms:

- Adjacent property is illuminated by unwanted light.
- Excessive brightness (often called “glare”) occurs in the normal field of view.

Both of these forms may be present in a given situation. Illumination, that is, the amount of light energy falling on a surface, is readily measured by simple hand held instruments and is expressed in foot candles. The new ordinance establishes 0.5 foot candles as the limit of illumination at the property line of the property producing the illumination. Illumination levels above that are regarded as prohibited light trespass onto adjacent properties.

Glare or excessive brightness is a more complex and difficult-to-measure phenomenon. It is experienced when the light producing source (the bulb) is directly visible, but also depends on the luminance of the source and on the contrast between that source and the surrounding background. For example, even a very bright light source viewed against a noonday sky doesn’t seem particularly glaring or objectionable, but the same source viewed against a night sky is very objectionable and seems so bright as to be almost painful. One of the problems in addressing this kind of light trespass, or more properly glare trespass, is that there have not been good standards for acceptable limits, and instruments to measure this kind of glare are necessarily complex and difficult to operate.

3. Security

Much outdoor lighting is used in the interest of providing security. These safety concerns often result in bad lighting rather than real security. One reason often cited for today’s bright lights is that high wattage is needed to deter crime. However, studies have shown that if light is overly bright with excessive glare it makes it easier for a person to hide in the deep shadows created by objects in the harsh glaring light. This might actually encourage crime rather than discourage it. The debate as to whether or not additional light provides more safety has been emotional rather than factual. The few rigorous studies that have been done reveal no connection between higher lighting levels and lower crime rates. This may be due to people with nefarious intent taking more risks in better lit areas. For example, the National Institute of Law Enforcement and Criminal Justice found no statistically significant evidence that lighting impacts the level of crime (Upgren, 1996). Thus, the supposed correlation between a high level of security lighting and reduced crime appears to be nothing more than a popular myth.

4. Urban Sky Glow

Urban sky glow is brightening of the night sky due to manmade lighting that passes upward with the light rays reflected off of submicroscopic dust and water particles in

the atmosphere. Although urban sky glow was first noted as a problem by the astronomical community, it is by no means any longer solely an astronomical issue. With the increasing urbanization of many areas of the U.S., all residents in those areas are now being affected. In Fairfax County, which is now a mostly urban county, improper lighting has seriously degraded the darkness of our local night skies into a pallid luminescence that many of our residents find objectionable.

5. Energy Usage

Smart lighting techniques, which direct all of the light generated onto the target area, reduce energy consumption and hence the use of fossil fuels. Several engineering estimates suggest that at least 30 percent of outdoor lighting is being wasted through light energy spilling upward and outward rather than being directed downward onto the target area. Also, many installations are greatly over-illuminated as well as being lighted for unnecessary durations, further compounding the energy wastage. Inefficient lighting incurs both direct financial costs and hidden environmental costs. It has been estimated by national organizations studying light pollution that in excess of \$8 billion of electricity is being wasted annually on obtrusive and inefficient outdoor lighting (see data from Virginia Outdoor Lighting Task Force and the International Dark-Sky Association). Since electricity generation in the eastern part of this country is mostly from fossil fuels, every unnecessary kilowatt of electrical energy generated also produces air pollution, unnecessary greenhouse gases and acid rain.

D. CURRENT COUNTY STANDARDS AND REGULATIONS

In EQAC's view, Fairfax County now has an excellent ordinance that prescribes limits for the maximum wattage of light sources and for the amount of illumination and glare in commercial and residential districts. However, existing installations that were noncompliant under the new ordinance are allowed under state law to continue until such time as the fixture requires replacement. Also, these standards do not cover roadways that are under the jurisdiction of the Virginia Department of Transportation, and a number of these roadway fixtures represent a continuing source of glare and light pollution

An important shortcoming of the otherwise excellent ordinance is that the effects of glare into residential neighborhoods from sources such as nearby park lights and lights on nearby commercial buildings and school facilities are not fully addressed.

Fairfax County's *Policy Plan: The Countywide Policy Element of the Comprehensive Plan* (2000 Edition) recognizes the nuisance of light emissions arising from increasing urbanization and recommends that efforts be made to avoid creating sources of glare that interfere with residents' and/or travelers' visual acuity. To put this into practice, the county's Zoning Ordinance contains standards for illumination limits. **However, the issue of glare, as opposed to illumination level, has not yet been addressed adequately.**

E. ADDRESSING THE PROBLEM

While the new ordinance very adequately addresses new and replacement installations of outdoor lighting and fixtures in commercial and residential districts, much roadway lighting remains a problem because it is prescribed by VDOT, which is not subject to local control. The recently passed Virginia law and policy to use henceforth only fully shielded fixtures will eventually mitigate these problems as older fixtures are replaced. Ensuring that new residential installations meet code requirements represents a potentially significant compliance problem and will require that both review and inspection personnel be fully aware of the new code requirements and diligent in the application and enforcement of them.

One of the most common street lights in use, the drop-lens, cobra-head fixture, draws 150 watts. A fixture with reflective backing and shielding can direct all light below the horizontal plane with the same illumination of streets and homes and use only 100 watts. The same possibility exists with the popular 175 watt unshielded mercury vapor lamp. Both the 150-watt cobra-head fixture and the 175-watt mercury vapor lamp cast light laterally as well as down. As a result, substantial glare is often cast directly into the eyes of drivers. This glare destroys drivers' dark adaptation, creating potential safety hazards. In many cases the driver is not able to see the roadway as well as he or she would with lower-wattage properly shielded lights, and in many cases his or her vision is made much worse. Because they cut down on glare, shielded fixtures not only are safer for drivers, but, according to experts (see references), actually make it easier for pedestrians and home owners to see their surroundings.

By redirecting this wasted energy, lower wattage lights provide the same amount of illumination in the areas where it is needed. These fixtures have reflective backing and full cut-off shielding to direct all light below the horizontal plane, with 90 percent of the light directed below an angle of 20 degrees from the horizontal. For example, a 50-watt metal halide lamp with a reflective shield will provide as much illumination below the horizontal plane as the 150-watt cobra-head fixture or the 175-watt unshielded mercury vapor lamp. These newer types of fixtures, which are recommended by the Illuminating Engineering Society of North America, are widely available and direct all light below the horizontal plane, thereby eliminating lateral glare (see Figure IX-2-1). It is estimated that it takes only three years of energy savings to recoup the initial investment in these fixtures. The lower wattage fixtures provide energy savings, improved driver safety, better visibility for pedestrians and an improved ambiance and security for neighborhoods. Several municipalities, such as Tucson, Arizona, San Diego, California and Sanibel Island, Florida, have adopted street lighting ordinances requiring these newer fixtures.

Most security lighting is overdone, with high wattage lights burning from dusk to dawn. As noted earlier, constant levels of illumination tend to be largely ignored because they are commonplace, and they waste a huge amount of energy. The large amount of glare produced by high intensity sources creates shadows that provide hiding places for intruders. Moreover, the constant glare and light trespass onto adjacent properties is a major source of annoyance to their occupants. On the other hand, lights that are activated

by motion within a controlled area attract immediate attention and, at the same time, use very little energy and create intrusion on adjacent properties only when such attention is desired. For example, if one is using 300 watts of security lighting for an average of 10 hours each night and converts to an infrared motion sensor control that turns on the lights only when there is motion in the controlled area, energy cost is reduced to almost nil. In addition, the cost of the added sensor-control hardware can be recovered in as little as two to four months due to the energy saving. At the same time, security is increased rather than decreased and glare and light trespass onto adjacent properties is largely eliminated.

Glare is a significant and pervasive problem, but one that is relatively easily solved by installing “full cut-off”, i.e., fully shielded light fixtures, or in some cases using supplementary shielding panels, to prevent light trespass onto adjacent residential properties. Where it is not possible to completely eliminate glare through the use of shielded fixtures, inexpensive motion detector controls can limit the harsh light to only a few minutes when it is really needed.

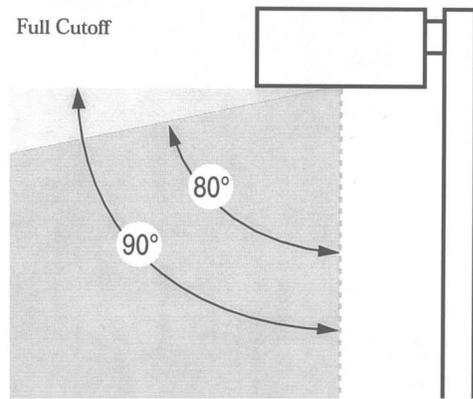
Light trespass is a term of relatively recent origin and denotes (1) glare that is generated by sources on one property that lie within the normal field of view of the occupants of another property and (2) light that spills over the boundaries of one property onto another, thereby producing unwanted illumination of it. Increasingly, such light intrusions are being regarded as trespass violations every bit as serious as physical trespass of a person onto the property of another. Such problems can now be readily avoided by the selection of proper fixtures, intensity levels and the use of timers and sensors/controllers.

Sky glow is also readily addressed by the selection of properly designed modern fixtures for new installations and phased retrofit of current inadequate installations. The cost of such retrofits is normally recoverable within a reasonable time period (usually estimated at about three years) through efficiently placing all of the light onto the desired area and the resulting lower energy usage.

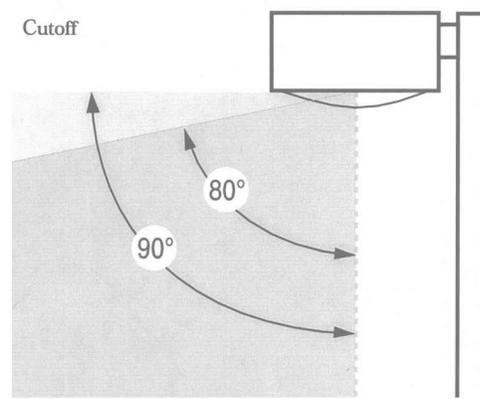
Adherence to the following four principles will do much to mitigate or eliminate light pollution.

- Always illuminate with properly shielded fixtures that prevent the light source itself, and the resultant glare, from being directly visible. This is done by using cutoff fixtures or supplementary shielding that keeps all of the illumination below the horizontal plane and directed onto the target area.
- Do not over-illuminate. Never use more illumination than needed for the task at hand. Using a 400 watt floodlight to illuminate a small parking area or a flag at night is overkill and wastes a great deal of energy. A properly shielded and adjusted 250 watt luminaire (light source + fixture) can illuminate an area just as effectively as an older style 1,000 watt light source.

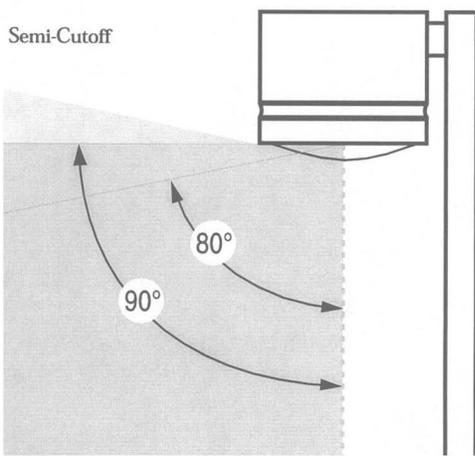
Figure IX-2-1
Effects of Cut-off and Non Cut-off Luminaires



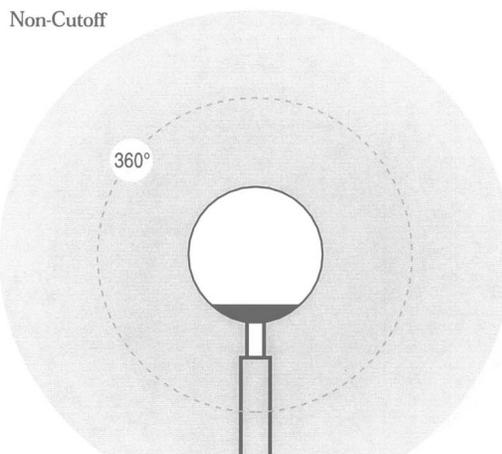
- Full Cutoff**
- ALLOWS:**
- No light at 90 degrees
 - 100 cd per 1000 Lamp Lumens at 80 degrees



- Cutoff**
- ALLOWS:**
- 25 cd per 1000 Lamp Lumens at 90 degrees
 - 100 cd per 1000 Lamp Lumens at 80 degrees



- Semi-Cutoff**
- ALLOWS:**
- 50 cd per 1000 Lamp Lumens at 90 degrees
 - 200 cd per 1000 Lamp Lumens at 80 degrees



- Non-Cutoff**
- ALLOWS:**
- Unrestricted distribution of light at any angle

(Sources: Paulin, Douglas, *Full Cutoff Lighting: The Benefits*, IESNA Web site, and Shaflik, Carl, *Environmental Effects of Roadway Lighting*, Information Sheet Number 125, International Dark-Sky Association, Tucson, Arizona, August 1997.)

- Always aim lighting downward, keeping all of its distribution within the property lines and below the horizontal plane so that it is not a source of glare. Light trespass onto adjacent properties is unnecessary, inconsiderate and potentially illegal.
- Do not burn lighting all night long with the intention of improving security. Using infrared motion sensor-controlled lighting that comes on instantly when there is motion in the designated area is far more effective as a security measure. That rapid change from dark to light draws the immediate attention of everyone in the surrounding area, including security and law enforcement personnel on patrol, and may well be unsettling enough to cause illicit intruders to immediately flee. Lighting that stays on all night draws no special attention and is an enormous waste of energy.

F. PUBLIC AGENCY RESPONSIBILITIES

Ensuring compliance with glare standards for residences and other private property is the responsibility of the county's Zoning Enforcement Branch. The county has 18 Zoning Inspectors (two per magisterial district) to oversee all Zoning Ordinance enforcement. Any enforcement activity dealing with light is complaint-driven. Typically, light-related complaints represent about 0.5 percent of total complaints. The county does not respond to anonymous complaints. Complaints are either filed directly with the Zoning Enforcement Branch or are forwarded by the staff of a member of the Board of Supervisors. The causes of the complaints have usually been fast food establishments, security lighting for residences, athletic facilities (e.g., ball fields, driving ranges), or churches. The Zoning Inspectors typically resolve violations with informal enforcement such as a verbal warning that there is a violation and how it may be remedied. A written notice of violation or civil action can be used if needed. Beyond the general glare standards, the county frequently is able to impose additional "before-the-fact" restrictions through the rezoning, special permit and special exception processes

The Fairfax County Park Authority and the Fairfax County Public Schools are the two largest users of recreational and sports field lighting in the county. Parks and schools by their very nature are usually located in the midst of residential communities where their outdoor lighting, if inadequately designed, can seriously impact the surrounding residents. Schools, particularly high schools, often have sports practice sessions extending into the early evening hours and games that begin after the dinner hour and run into the later evening hours. In addition, schools of all categories often have "security" lights that burn from dusk to dawn. Our park system, faced with increasing demand for team athletic facilities, will necessarily have to turn to synthetic turf and lighting during the evening to enable greater utilization of its existing fields. It is the responsibility of both organizations to utilize better designs and better equipment than employed heretofore in addressing these needs. To do less unnecessarily and unfairly impacts the surrounding neighborhoods and diminishes both property values and quality of life.

One of the most onerous sources of light pollution is the obtrusive lighting of commercial and industrial facilities, particularly commercial retail and service establishments. While

their desire to attract attention to themselves is understandable, abusive excesses degrade the overall ambience of our commercial areas and materially degrade the quality of life in adjacent residential neighborhoods. This is of particular concern in the case of “by-right” development, where there are no public hearings (e.g., Planning Commission, Board of Zoning Appeals, Board of Supervisors) at which adjacent property owners and neighborhoods can register their concerns and see approval conditioned on appropriate restrictions. In such “by-right” cases, the initial responsibility would necessarily fall almost entirely upon the Land Development Services function of the Department of Public Works and Environmental Services, which reviews all proposed plans before a building permit is issued and subsequently conducts inspections to ensure that the work is in compliance with regulations. Evaluation of plans for compliance would add a small amount of effort to the review process but would add only a negligible amount to the inspection process.

At this time, the county has no formal policies regarding street lighting. Some neighborhoods within the county prefer to have local streets lighted, while others do not. Whether or not the county provides street lighting is often driven by budget priorities, and, unless there is a demonstrable public safety need, the priority for retrofitting an established community is usually low. More often, street lighting is addressed in the overall planning of new subdivisions. In these cases, the Land Development Services function of DPWES would have responsibilities for both reviewing the plan and inspecting the implementation of it.

Responsibility for the lighting of main roadways is under the jurisdiction of the Virginia Department of Transportation. Historically, local communities and neighborhoods have had to deal directly with VDOT or through their local Supervisor’s office over roadway lighting issues. It has proven very difficult to influence VDOT’s choice of fixtures and technical standards, even when it can be demonstrated that their proposed implementation will result in unacceptable levels of glare and light trespass in adjacent residential neighborhoods. However, quite recently, encouraging headway has been made in getting VDOT to recognize the severity of the problem and to take some limited first steps to address it.

G. PUBLIC EDUCATION AND AWARENESS NEEDS

The general public needs awareness of the sources and problems of light pollution and of the methods by which these can be best addressed. The county staff has prepared an excellent and very informative 16 page booklet to explain the new Outdoor Lighting Ordinance (available at www.fairfaxcounty.gov/DPZ/Zoning/lightingbrochure.PDF). It can also be made available in printed version to individuals, homeowners groups and community associations directly through appropriate county offices and through the district offices of the members of the Board of Supervisors. The complete ordinance in convenient form is available on the Fairfax County Web site at www.fairfaxcounty.gov/DPZ/Zoningordinance/articles/Art14.PDF. In addition, the International Dark Sky Association and the Illuminating Engineering Society of North

America maintain Web sites with a variety of technical information on lighting issues and technology.

Our county's 16 page booklet provides much of the information that architects, contractors and electricians need to familiarize themselves with our lighting codes and specifically what is not permitted (e.g., unshielded security lights, angle-directed post or building mounted fixtures, wall packs without shielding or baffling, excessive wattage or unshielded floodlights, light-trespass onto other properties, etc.) and what practices are recommended. Our county review and inspection personnel should make sure that members of the development, contractor and building management communities with whom they deal will be fully aware from the outset of the revised standards in the new ordinance and how best to address them.

There is an excellent Web site (www.qualityoutdoorlighting.com) that illustrates many examples of good, bad and ill-conceived lighting practices right here in our local area. It can play a central role in education of the public.

H. CONCLUSIONS

The principal means to prevent poor exterior lighting practices is a comprehensive code or ordinance, because this provides well thought out standards for, and enforceable legal restrictions on, specific lighting practices that affect the community and its quality of life. Numerous jurisdictions have adopted codes and ordinances that have proven very effective in reducing light pollution and preventing light trespass. A properly conceived and well written code permits all forms of necessary illumination at reasonable intensities, but requires shielding and other measures to prevent light pollution and light trespass. A good code applies to all forms of outdoor lighting, including streets, highways and exterior signs, as well as lighting on dwellings, parks, schools, commercial and industrial buildings, parking areas and construction sites. A good code also provides for reasonable exceptions for special uses within acceptable time periods and subject to effective standards. In EQAC's opinion, Fairfax County's recently adopted Outdoor Lighting Ordinance is an outstanding example of such a code. As the county has gained experience with application of the new ordinance, some areas have been identified where adjustments and fine-tuning are urgently needed, but the solid foundation has been laid and should serve us well into the future.

The Fairfax County Park Authority, because of its need to increase the hours of utilization of existing sports fields by installing lights to illuminate them, bears a special responsibility to ensure that such lighting systems do not adversely impact adjacent residential properties. The results with a test rectangular field that was outfitted with lights and artificial turf have been very unfortunate. While the illumination of the field surface is excellent and the illumination at the property line with respect to light spillover meets the ordinance standards, the glare from the fully exposed, 1,500 watt lamps on 70 foot poles facing a residential neighborhood is intense (in the range of 12,000 lumens at 200 feet). A second field outfitted with an advanced

model of fixtures of the same type shows no improvement in glare. The Park Authority's recently drafted specifications do not begin to address the problem. However, the International Dark-Sky Association in its outdoor lighting handbook has colored illustrations of a field lighted with full cutoff fixtures that has no such glare problem. Specification of such better-engineered fixtures should make it possible for the Park Authority to expand the use of lighting for fields without creating public outrage. This same concern applies equally to the Fairfax County Public Schools, which also uses lighted sports fields and security lighting which burns all night.

The county needs to work closely with VDOT to achieve better lighting practices on roadways within Fairfax County that are under VDOT jurisdiction. Current VDOT lighting and proposed new installations are regarded as being very intrusive by adjacent neighborhoods. However, it should be noted that a newly enacted law requiring the commonwealth to acquire only shielded fixtures should materially improve VDOT practices in this regard on new installations and as old fixtures are replaced.

Much of the security lighting, both residential and commercial, in Fairfax County is poorly conceived, excessive in intensity and improperly directed and controlled. These deficiencies could be corrected at relatively low initial costs that would be rapidly recovered through the energy savings realized. This will require considerable public education to familiarize the using public with the issues and the available technology.

Much lighting in residential neighborhoods uses old style fixtures (or new but poorly designed ones) that cause excessive glare and light trespass onto adjacent properties. The new comprehensive ordinance and an intensive public awareness campaign should be used to address correction of these problems. Single family dwellings especially need to be brought into compliance with the spirit and provisions of the revised ordinance, for that is where the majority of us live and where our quality of life is most affected by intrusive lighting.

Poor lighting design, particularly in commercial areas, is contributing to excessive and highly objectionable sky glow. The new ordinance and retrofitting or adjustment of fixtures can eliminate the worst of this effect.

I. COMMENTS AND ONGOING CONCERNS

- 1. In response to a recommendation in earlier EQAC Annual Reports on the Environment, the Fairfax County Park Authority commissioned a study of sports field lighting design and technology. EQAC feels that this study had serious flaws in terms of the study objectives, the methodology and the evaluation criteria. The Park Authority issued a set of specifications, dated November 2006 (and largely based on this study), for new athletic field lighting installations that, in EQAC's view, does not address the issue of glare adequately. The Park Authority also commissioned a consultant to prepare a "White Paper" that would serve to justify the specifications.**

EQAC feels that this document contained serious scientific errors and thus created confusion rather than clarity. The Park Authority Director of Planning and Development has recently informed us that they have done extensive rework of this material and proposed that we hold meetings to review the revised material.

- 2. The EQAC 2004 Annual Report recommendation that the Department of Planning and Zoning place high on its work plan priorities for 2005 a modest revision of the Outdoor Lighting Ordinance to address the glare issue was not addressed. Unfortunately, following the same recommendation in the 2005 Annual Report, the issue was placed on the “Priority 2” list of the Adopted 2006 Zoning Ordinance Amendment Work Program and has therefore not been addressed. In 2007 this item was moved to the DPZ Priority 1 list, but to date work on it has not yet begun.**
3. EQAC recommends that the Board of Supervisors work with VDOT and Virginia elected officials to eliminate unnecessary roadway lighting and whenever possible to accelerate replacement of existing poorly designed fixtures under the control of VDOT with full cut-off fixtures.

J. RECOMMENDATIONS

1. EQAC recommends that the Board of Supervisors direct the Department of Planning and Zoning to move ahead as rapidly as possible on revisions to the Outdoor Lighting Ordinance. The revisions need to address glare and several minor issues.
2. EQAC recommends that the Board of Supervisors designate EQAC to work with the Fairfax County Park Authority to review and fine tune its specifications for athletic field lighting to correct the current deficiencies, including but not necessarily limited to:
 - Treatment of glare (as opposed to surface illumination)
 - Hardware specifications that may be overly restrictive or inappropriate or that give the appearance being selective for a particular manufacturer or supplier
 - Explanatory documentation for public consumption, particularly that posted on the Web site, to ensure scientific accuracy and understandability of subject matter

LIST OF REFERENCES

Fairfax County Department of Planning and Zoning, *A guide to Fairfax County's Outdoor Lighting Standards*, 16 pp.

Arthur R. Upgren, *Night Blindness*, [The Amicus Journal](#), Winter 1996, page 22-25.

Examples of Good and Bad Lighting Fixtures, Information Sheet Number 122, International Dark-Sky Association, Tucson, Arizona, May 1997.

Douglas Paulin, *Full Cutoff Lighting: The Benefits*, (corrected version), Illuminating Engineering Society of North America Web site, www.iesna.org.

Shaflik, Carl, *Environmental Effects of Roadway Lighting*, Information Sheet Number 125, International Dark-Sky Association, Tucson, Arizona, August 1997.

Some Lighting Myths, Information Sheet Number 42, International Dark-Sky Association, Tucson, Arizona, January 1991.

Fairfax County, Virginia, *Policy Plan: The Countywide Policy Element of the Comprehensive Plan*, 2000 Edition.

Fairfax County, Virginia, Zoning Ordinance (Chapter 112 of the *Fairfax County Code*)

Illuminating Engineering Society of North America Web site, www.iesna.org (There are numerous subsidiary and related Web sites)

International Dark-Sky Association Web site, www.darksky.org/

National Electrical Manufacturers Association Web site, www.nema.org/ (Particularly see their White Paper on Outdoor Lighting Code Issues.)

Virginia Outdoor Lighting Taskforce Web site, www.volt.org/.

Quality Outdoor Lighting Web site, www.qualityoutdoorlighting.com/.

IX-3. VISUAL POLLUTION AND URBAN BLIGHT

A. OVERVIEW

Historically, the term “pollution” has referred primarily to the fouling of air, water and land by wastes or from the byproducts of human activities. In recent years it has come to signify a wider range of disruptions to environmental quality. Both noise pollution and light pollution issues have been addressed earlier in this chapter. This section focuses on visual blight/pollution issues, including such things as proliferation of signs, billboards, litter, dumps, junkyards and the like, which are important components of visual pollution.

Simply stated, “blight” is something that impairs or destroys appearance and results in a deteriorated condition. In recent times, urban blight has come to include a wide range of visual pollutants that degrade the ambience of our communities, including such things as trash and litter on roadsides, unkempt properties, above-ground power and communications transmission lines, communication towers, intrusive and objectionable advertising signage and other forms of visual impairments. Without doubt, signage that is excessive in amount and inappropriate in placement is the most ubiquitous of these “pollutants.”

B. SIGNS AND BILLBOARDS

Unnecessary signs and billboards, almost always placed as some kind of advertising, have been called "visual pollution," "sky trash," "litter on a stick," and "the junk mail of American roadways." Nothing can destroy the distinctive character of our communities and countryside more quickly or thoroughly than uncontrolled signs and billboards.

Signs in the public rights-of-way have been around for as long as there have been public rights-of-way, but the numbers have spiraled out of control in recent years. Between fields of “popsicle-stick” signs for homebuilders and politicians and signs for weight loss, work-at-home businesses, painting, hauling and other signs plastered on every available traffic sign and utility pole, everyone in Fairfax County has something to hate about the proliferation of signs.

Communities can regain control of their visual environment, preserve their distinctive character and protect natural beauty and the environment by enacting and enforcing ordinances that control signage and billboards. Reducing sign and billboard blight helps communities reclaim local beauty and character. Excellent alternatives to large intrusive signs and billboards, such as wayfinding signs, logo signs and tourist-oriented directional signs, can help people locate local businesses and are minimal in their visual impact.

C. TELECOMMUNICATION TOWERS AND UTILITY TRANSMISSION LINES

In 1996, Congress passed the landmark Federal Telecommunications Act to encourage the rapid development and growth of new telecommunications technology such as wireless telephones and digital television. However, antenna towers, often of considerable height, have been built near people's homes, next to historic buildings, or in rural, scenic areas. Towering above trees, neighborhoods and protruding into the skyline, such towers often have a very unappealing visual impact (see the Web site www.scenic.org for examples). Reconciling the requirements of communications engineering and community aesthetics is a difficult and growing problem but one that must be directly addressed if both needs are to be properly served.

The visual blight associated with above ground utility lines besets both our residential and commercial areas. These lines and poles are particularly objectionable in our local shopping areas where they obstruct the vision of drivers and greatly impair the visual attractiveness of the locale.

D. ADDRESSING THE PROBLEM

Creating sign regulations developed with community input encourages business owners to erect less intrusive signs that reflect an area's spirit, contributing to civic pride and helping to revitalize commercial districts. Regulations should encourage signs that quickly communicate their message, complement their surroundings and enhance the visual character of the community. Attractive on-premise signs can help encourage residents and business owners to work together to improve and revitalize local appearance.

The Fairfax County Zoning Ordinance, Article 12, deals with signs and signage regulations. It deals comprehensively and at length with permitted and non-permitted signage and what kind of sign needs a permit versus signage not requiring a permit. **The ordinance appears to cover the subject thoroughly, but the fact that impermissible signage is overabundant indicates that enforcement is lacking and perhaps that county staff functions are not organized in a way that could provide cost effective enforcement.** In addition, the ordinance has a significant shortcoming in Article 12, in that there is no explicit provision therein for civil penalties (i.e., fines) for failure to obey it. Rather, it relies on Article 18-903.1.H and I to deal with Infractions and Civil Penalties. However, these two provisions deal only with Sections 12-301 and parts of 12-104. Thus, the entirety of Sections 102, 103 and part of Section 104 are not addressed. This is very important, since adequate civil penalties can readily pay for an effective enforcement program.

The other key component of an effective enforcement program is the requisite political will on the part of the Board of Supervisors. It is a given that the well-organized real estate and development industries will vigorously resist any enforcement

program that would impose limits, no matter how reasonable, on their current practice of often excessive and obtrusive signage. The many small business enterprises that litter the roadsides and telephone poles with illegally placed signs will complain that enforcement will deprive them of livelihoods. Finally, political campaign signage, in which the lawmakers themselves have a vested interest, is a sensitive issue despite recognition of the current abusive practices.

The Board of Supervisors initiated the Fairfax County Sign Task Force in August, 2000. In September, 2001, the Task Force issued its report, *“Illegal Signs in the Right of Way”* which:

- Examined current Fairfax County practices and enforcement procedures regarding signs within and along the roadways
- Evaluated other jurisdictions’ best practices in dealing with illegal signs
- Recommended amendments to the county’s sign ordinance and suggested new legislative approaches to address this problem.

Thus far the report and its recommendations have met with inaction.

Communities can do much to regulate the height, number and location of wireless telecommunication towers by enacting strong ordinances. Without good ordinances, communities are at the whim of telecommunication companies that avidly seek sites for towers and property owners who may willingly lease land for a tower. Fairfax County recently prevailed at the Virginia Supreme Court in a decision that required VDOT to reasonably comply with the Fairfax County Zoning Ordinance in siting monopole towers in the VDOT right-of-way within Fairfax County.

E. PUBLIC AGENCY RESPONSIBILITIES

The Sign Task Force concluded that there is no one agency within the county government that is devoted to removing impermissible signs or prosecuting persons who erect the signs in violation of the law. The Task Force concluded that cleanup efforts are inadequate unless a county official receives complaints or VDOT receives complaints. Therefore, it appears that what little effort there is to remove signs is reactive rather than proactive. Some neighboring communities assign specific persons to this job, but Fairfax County does not have such a system. In fact, Zoning Inspectors do have authority delegated to them from VDOT to remove illegal signs. However, on many occasions when county inspectors have removed signs (e.g., on a Friday afternoon), they are back up by Monday morning or sooner.

The ordinance needs to be changed to empower the citizenry to take action, but this would be facilitated by State enabling legislation. Good citizens attempting to help the county by removing signs themselves are not clearly authorized to do so; therefore, they are inviting a liability action when they do remove signs. At present, about the only way the ordinary citizen can be involved with removing signs without some risk of liability action is through

the VDOT Adopt-a-Road Program. In this program, a group agrees to become responsible for keeping a stretch of roadside cleaned of debris and litter and is, in effect, deputized with authority to remove impermissibly placed signs along with other litter. However, this program applies only to VDOT rights-of-way. A comparable program is needed with respect to utility poles which are most often placed within easements.

F. COMMENTS

Given that the Zoning Enforcement staff is heavily loaded with other duties, such as the special strike force for housing violations, in addition to its regular work, it may be worth exploring whether it is feasible to contract out the mechanics of an enforcement effort to reduce, or hopefully eliminate, the prevalence of illegal signs. The enforcement effort might well be paid for by the collection of fines for the violations. This would eliminate the need for hiring permanent staff, and the contracted effort could be reduced as the illegal signage diminishes in volume.

G. RECOMMENDATIONS

1. EQAC recommends that the county continue negotiations with the commonwealth to enable the county to remove signs from the VDOT right-of-way and to enforce limitations and restrictions on such signage in the same manner as though the signs were covered under the Fairfax County ordinances, including the application of civil penalties.
2. EQAC recommends that the lack of an explicit provision within Article 12-300 of the present ordinance for assessment of civil penalties be rectified at the earliest opportunity. It is recommended that Article 18-903 of the ordinance be amended by deleting items 1.H and 1.I. These provisions should be replaced by new, more comprehensive, language built directly into Article 12. (See Addendum 1 for suggested text.) It is further recommended that the modified ordinance be used in much the same manner as is done by the Department of Public Works and Environmental Services with its "Letter to Industry." When an illegally posted sign is observed by an inspector, or reported by a resident, such a letter, containing the text of the ordinance, including the penalties clause, could be sent to the offending party as a means of strongly discouraging continuance or repetition of the violation.

ADDENDUM 1

Suggested text for a subsection on civil penalties for the Sign Ordinance

PART 4 12-400 VIOLATIONS, INFRACTIONS, AND PENALTIES

12-401 General provisions

1. Any sign erected, placed, or affixed contrary to any of the provisions of this Article or contrary to any provisions of any permit issued under this Article shall be, and is hereby declared to be, unlawful.
2. Any person (whether owner, officer, lessee, principal, agent, employee or otherwise), corporation, or organization who violates any of the provisions of this Article, or permits such violation, or fails to comply with any of the requirements hereof shall be subject to the enforcement provisions of this Part.
3. Upon becoming aware of any violation of any provision of this Article, the Zoning Administrator shall serve notice of such violation on the person committing or permitting the same, which notice shall require the violation to cease within such reasonable time as is specified in the notice. After such notice is sent and such violation is not ceased within such reasonable time as is specified in the notice, then the Zoning Administrator may proceed to remedy the violation as provided in Section 402 below. The Zoning Administrator may also revoke a residential or non-residential use permit to terminate the violation. Any written notice of the Zoning Administrator shall include a statement informing the recipient that a right to appeal the notice of a zoning violation or a written order within thirty days may exist in accordance with Sect. 15.2-2311 of the Code of Virginia and Part 3 of Article 18 of the Zoning Ordinance, and that the decision shall be final and unappealable if not appealed within thirty days. The appeal period shall not commence until such statement is given.
4. In addition to the remedies provided in Par. 3 above, the Zoning Administrator may initiate injunction, mandamus, or any other appropriate action to prevent, enjoin, abate, or remove such erection, placement, or affixation in violation of any provision of this Article. Such action may also be instituted by any person who may be aggrieved or particularly damaged by any violation of any provisions of this Article.

12-402 Infractions and Civil Penalties

1. A violation of the provisions of this Article shall be deemed an infraction and shall be punishable by a civil penalty of \$100 for the first violation at a specific location; any subsequent violations at the same location arising from the same set of operative facts shall be punishable by a civil penalty of \$250 for each separate offense. Any violation arising from the same set of operative facts at the same location which persists for sixty (60) days or more may, at the discretion of the Zoning Administrator, thereafter be subject to injunction, mandamus, or any other appropriate action to prevent, enjoin, abate, or remove such violation.
2. Each day during which any violation of the provisions of this Article is found to have existed at the same location shall constitute a separate offense. However, in no event shall any such violation arising from the same set of operative facts at the same location be charged more frequently than once in any ten day period, nor shall a series of such violations arising from the same set of operative facts at the same location result in civil penalties which exceed a total of \$5000.
3. The designation of a particular violation of this Article at a particular location as an infraction pursuant to Par. 1 above shall be in lieu of criminal sanctions except for any violation resulting in injury to any person or persons.
4. After having served a notice of violation on any person committing or permitting a violation of the Zoning Ordinance provisions enumerated in this Article and if such violation has not ceased within such reasonable time as is specified in such notice, then, upon the approval of the County Attorney, the Zoning Administrator shall cause two (2) copies of a summons to be served upon such person.
5. Such summons shall contain the following information:
 - A. The name and address of the person, corporation or organization charged.
 - B. The nature of the infraction and the Ordinance provision(s) being violated.
 - C. The location, date, and time that the infraction occurred or was observed.

- D. The amount of the civil penalty assessed for the infraction.
 - E. The manner, location, and time in which the civil penalty may be paid to the County.
 - F. The right of the recipient of the summons to elect to stand trial for the infraction and the date for such trial.
6. The summons shall provide that any person, corporation, or organization summoned for a violation may elect to pay the civil penalty by making an appearance in person or in writing by mail to the Department of Finance at least seventy-two (72) hours prior to the time and date fixed for the trial and, by such appearance, may enter a waiver of trial, admit liability, and pay the civil penalty established for the offense charged. Such summons shall provide that the signature to an admission of liability shall have the same force and effect as a judgment of court, however, an admission shall not be deemed a criminal conviction for any purpose.
7. If a person, corporation, or organization charged with a violation does not elect to enter a waiver of trial and admit liability, the violation shall be tried in the General District Court in the same manner and with the same right of appeal as provided by law. A finding of liability shall not be deemed a criminal conviction for any purpose.
8. The remedies provided for in this section are cumulative and not exclusive and shall be in addition to any other remedies provided by law.

NOISE, LIGHT POLLUTION AND VISUAL POLLUTION: SUMMARY OF RECOMMENDATIONS

Noise

1. In recognition of the anticipated opening of a new fourth runway at Washington Dulles International Airport in late 2008 and the future construction of a fifth runway, EQAC recommends that the Board of Supervisors formally request the Metropolitan Washington Airports Authority and the Federal Aviation Administration to evaluate options for the operation of the existing and new runways to identify approaches that will optimize flight operations in a manner that minimizes community noise exposure. This evaluation should include both an assessment of 24-hour noise monitoring and an analysis of operational approaches. The evaluation of noise impacts should begin at the time the first of the new runways is opened for use and should continue in perpetuity, especially through the time period incorporating one year beyond the reopening of any runway that is taken out of service for maintenance. The results of all such noise evaluations should be reported quarterly and should be provided to a number of stakeholders including the Fairfax County Board of Supervisors, EQAC and relevant county staff.
2. EQAC is pleased that a series of Web pages have been established on the county's Web site addressing noise issues. The county should ensure that this page is kept current through regular updates.

Light Pollution

1. EQAC recommends that the Board of Supervisors direct the Department of Planning and Zoning to move ahead as rapidly as possible on revisions to the Outdoor Lighting Ordinance. The revisions need to address glare and several minor issues.
2. EQAC recommends that the Board of Supervisors designate EQAC to work with the Fairfax County Park Authority to review and fine tune its specifications for athletic field lighting to correct the current deficiencies, including but not necessarily limited to:
 - Treatment of glare (as opposed to surface illumination)
 - Hardware specifications that may be overly restrictive or inappropriate or that give the appearance being selective for a particular manufacturer or supplier
 - Explanatory documentation for public consumption, particularly that posted on the Web site, to ensure scientific accuracy and understandability of subject matter

Visual Pollution

1. EQAC recommends that the county continue negotiations with the commonwealth to enable the county to remove signs from the VDOT right-of-way and to enforce limitations and restrictions on such signage in the same manner as though the signs were covered under the Fairfax County ordinances, including the application of civil penalties.
2. EQAC recommends that the lack of an explicit provision within Article 12-300 of the present ordinance for assessment of civil penalties be rectified at the earliest opportunity. It is recommended that Article 18-903 of the ordinance be amended by deleting items 1.H and 1.I. These provisions should be replaced by new, more comprehensive, language built directly into Article 12. (See Addendum 1, provided earlier in this chapter, for suggested text.) It is further recommended that the modified ordinance be used in much the same manner as is done by the Department of Public Works and Environmental Services with its “Letter to Industry.” When an illegally posted sign is observed by an inspector, or reported by a resident, such a letter, containing the text of the ordinance, including the penalties clause, could be sent to the offending party as a means of strongly discouraging continuance or repetition of the violation.

