

## ■ RECOMMENDATIONS:

1. Recommendations regarding street lighting for full cut-off and shielded fixtures be used as existing infrastructure is replaced and new infrastructure is developed.
  2. Recommendations regarding full cut-off and shielded fixtures for parks, recreation and other municipal facilities be used as existing infrastructure is replaced and new infrastructure is developed.
  3. Recommendations to review and amend existing signage bylaws to include light pollution control standards currently established.
  4. Information regarding light pollution awareness, suitable light fixtures and mitigation of light pollution and wasted energy be posted on Maple Ridge's website.
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## ■ EXECUTIVE SUMMARY:

This Report presents the recommendations of the Light Pollution Abatement Committee (LPAC) for Council's information. The LPAC has been established to review lighting issues in cities and municipalities throughout British Columbia and to prepare recommendations for minimizing light pollution.

## ■ BACKGROUND:

The LPAC is a task force of the Royal Astronomical Society of Canada (RASC). The purpose of the LPAC is to review issues pertaining to lighting in all cities in British Columbia and to advise Council, regarding possible mitigation measures including education, evaluation criteria or standards that may be incorporated into existing or new Regulations and By-Laws. Specifically, the LPAC is tasked with the following:

1. Identifying issues and community concerns, and reviewing existing information pertaining to lighting impacts;
2. Review existing Regulations pertaining to all land uses including residential, commercial, industrial, institutional and public streets and lands/parks;
3. With the assistance of others, research light pollution abatement controls and techniques used in other municipalities or regions, including standards and criteria, illumination measures, and best available technologies; and
4. Report to Council with recommendations for light pollution abatement, including regulatory and non-regulatory approaches.

## ■ Lighting Concerns in Maple Ridge

The LPAC believes that the citizens of Maple Ridge need a commitment to future generations to preserve and protect the health and safety of the community's citizens, as well as the flora and fauna of the valuable ecological resources throughout the municipality of Maple Ridge. In addition to reduce the waste of energy, resources and dollars, and host of other problems may be caused when lighting is not undertaken correctly, Further, to preserve beauty and inspiration of the dark night sky.

Based upon the research, the following summarizes the main issues identified by the LPAC providing the rationale as to why wasted light<sup>1</sup> and light pollution should be addressed:

1. Worldwide, grid-based electric lighting consumes 19% of total global electricity production. Globally, lighting consumes more electricity than is produced by either hydro or nuclear power and results in CO<sub>2</sub> emissions equivalent to two thirds of the world's cars. Further, wasted electricity from poor lighting can lead to unnecessary air, water and ground pollution.
2. Leaving lights on throughout the night can be unnecessary and a waste of energy.
3. Across North America \$1 billion annually is wasted by artificial light shining wastefully upwards into the sky.
4. Glare<sup>2</sup> from poorly shielded lights can create unnecessary hazards by hampering visibility on roads or in other places. Glare is a problem for night drivers in particular, especially older drivers, and can lead to accidents.
5. Light trespass<sup>3</sup> infringes on the property rights of neighbours. Nuisance lights are usually bright spot lights that shine in windows, cause glare on highways, or cause centres of very bright sky glow, especially in rural areas where they stand out more (e.g., greenhouses, playing fields, billboards lit from below, ports and ferry terminals).
6. Excessive night time lighting can negatively affect human health. Increasing evidence points to how the disruption of the human circadian rhythms by light can contribute to cancer and other ailments. Sleeping habits can be altered where there are artificial

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<sup>1</sup> Light "waste" is lighting that is on when it need not be; lighting that is excessively bright; or unshielded lighting that spills out and upward instead of being directed at its intended subject.

<sup>2</sup> "Glare" occurs when light shines directly into the eyes, causing discomfort and reducing the ability to see objects..

<sup>3</sup> Light "trespass" is defined as light falling where it is not needed or wanted.

bright lights outside. This is a concern as sleeplessness is a major cause of workplace accidents and high stress levels.

7. The flora and fauna of Maple Ridge are sensitive to night time lighting shining indiscriminately across their habitats and potentially having negative effects on their behaviour and health. Lights at night impact habitat for nocturnal animals that depend on darkness, and reduce the effect of lunar cycles and seasonal day length cues that often trigger wildlife reproductive activities.
8. Light sent unnecessarily upwards causes sky glow<sup>4</sup>, limiting the visibility of stars in the night sky. Astronomers have documented the changes over the last thirty years. Increasing sky glow has meant a significant reduction in views of the beautiful night sky for scientific study or personal pleasure.
9. Contrary to belief, there is no evidence that more lighting decreases crime. It may increase one's sense of safety but it does not necessarily increase their security.

### **Suggested Light Pollution Reduction Principles**

The LPAC vision is that all lighting installations in and around Maple Ridge minimize light pollution and its undesirable effects on humans and the natural environment, and reduce wasted energy. The following are basic lighting principles as defined by the LPAC:

1. Light should not go beyond the premises requiring illumination. Obtrusive lights should be shielded. This would avoid nuisance to neighbours and hazard to road users and wildlife.
2. There should be zero light directed upwards and minimal light reflected upwards to avoid contributing to sky glow effects and wasted energy.
3. Street lighting and other outdoor lighting, as appropriate, should ideally be full cut off flat type glass mounted horizontally. Additional shielding must be added where required to prevent light trespass and glare.
4. The intensity and duration of lighting should be the minimum required for the intended purpose to minimize upward reflection, energy consumption and reduce its deleterious effects on humans and the ecology.
5. Buildings with transparent walls and ceilings with lights on at night should be shaded after dark (e.g., atriums, greenhouses).

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<sup>4</sup> "Sky glow" is the result of upward-shining light, which is reflected off moisture and dust particles in the atmosphere to illuminate the nighttime sky and wash out all but the brightest stars.

6. Illumination should not be stronger than safety standards demand. If no safety standard applies, then luminance should not be over one candela per square metre. If the measurement of illuminances is used, it should not be over ten lux or one footcandle.
7. Lumen limits should be established based on the area to be lit on a property, as over lit areas are aesthetically displeasing and detract from property values.

■ **Financial Implications:**

There are no financial implications to Maple Ridge associated with this report. As infrastructure and building upgrades are undertaken any costs associated with lighting improvements and light pollution abatement are considered as part of the project budget at that time.

■ **CONCLUSION:**

The Light Pollution Abatement Committee has supplied comprehensive information that can provide technical information on lighting issues for Maple Ridge and light pollution minimizing technologies. Within this Report are recommendations for Council's consideration to address lighting issues that the LPAC identified.

It is requested that the LPAC recommendations be received for information and the recommendations within the Report be forwarded to the appropriate departments and organizations for action as directed by Council.

Mark Eburne, Chair, Light Pollution Abatement Committee  
Royal Astronomical Society of Canada

## **ATTACHMENTS**

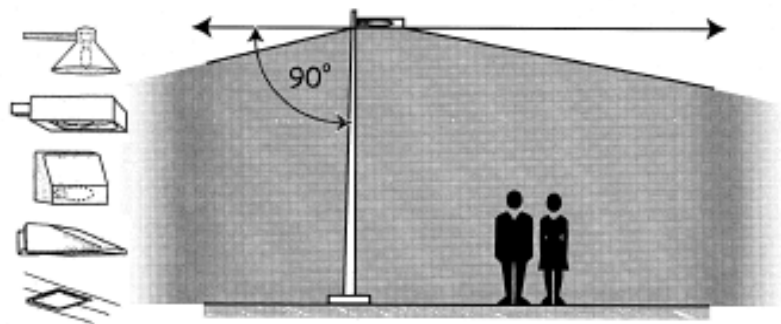
**Appendix A - Guidelines to Outdoor Lighting**

**Appendix B - Light Pollution Reduction (based on LEED Criteria)**

**Appendix C - Deterrent to Crime**

**Appendix D – What is Light Pollution**

## Appendix A - Guidelines for Outdoor Lighting



Example of Full Cut-off lighting

Allows no lighting at 90 degrees

100 candelas per 1000 lamp lumens at 80 degrees

The luminous intensity (measured in candelas) from 80° up to 90° cannot exceed 10% of the lumen rating of the bare lamp. Abbr. cd

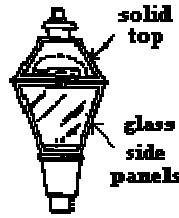
1. Candela is a unit of luminous intensity equal to 1/60 of the luminous intensity per square centimeter of a blackbody radiating at the temperature of solidification of platinum (2,046 °K).]

Full cutoff fixtures must also be installed correctly, so that the bottom of the fixture is level with the ground.

## Examples of Good and Bad Lighting Fixtures



**GOOD** Even post-top ornamental fixtures, like this Salem Cutoff from GE Lighting, can be cutoff with clear panels and lamp/reflector located above.



**GOOD** The Yorktown, another ornamental from Emery Fixtures, also has clear panels and bulb located above for maximum glare and spill light control.



**BAD** Non-cutoff fixtures like this "acorn" ornamental cause light pollution.



**GOOD** Flat-lens cobra head fixtures, like this American Electric Series 125 Roadway Cutoff luminaire, provide excellent roadway lighting with greatly reduced glare and no uplight.



**GOOD** This new generation of flat-lens cobra head fixture from American Electric, call the DuraStar 2000, provides superior lighting uniformity at standard mounting heights and spacings.



**BAD** The ubiquitous drop-lens cobra head luminaire produces a level of glare and uplight that is both unacceptable and unnecessary.



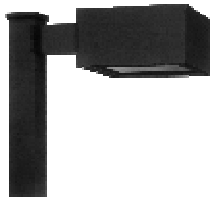
**GOOD** Many existing dusk-to-dawn security lights and residential streetlights can be retrofitted with the Hubbell Skycap.



**GOOD** The Hubbell Skycap turns any standard Barn Light into a full-cutoff light with wide area coverage.



**BAD** Barn Light style fixtures are very inefficient, sending about 20% of the light upward and another 20% horizontally outward, creating glare.



**GOOD** Flat-lens shoebox fixtures come in many forms; square, rectangular, circular, etc. All control the light with internal reflectors. Glare and light trespass are minimized; no uplight is produced.

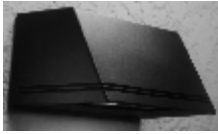


**GOOD** Post-top flat-lens shoebox fixtures like this one provide good area illumination without light pollution.



**BAD** (sometimes) The tell-tale sag lens gives this luminaire away as a possible problem. If the lens is clear and very shallow, and the bulb wattage is not too high, this type of light can cover a wider area without too much glare or uplight, but beware!





**GOOD** Full-cutoff wall packs such as this McPhilben 101 Wall Sconce make excellent entryway and building perimeter lights, and there is enough forward throw that adequate lighting is provided for near-building parking.



**GOOD** Recessed canister lights built into the eaves or canopy of a house, garage, or other building is the first choice for lighting building exteriors.



**BAD** Wall packs like this should never be used. They produce enormous glare and uplight.



**GOOD** If floodlights must be used, they should always have top and side shielding, and be pointed at least 45 ° below the horizontal.



**GOOD** Even sports lighting can be done well, if one uses cutoff light fixtures such as these from Soft Lighting Systems.



**BAD** Unshielded floodlights provide a trashy "prison yard" look and should not be used.

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More cost efficient.

Directs light down and to the sides as needed.

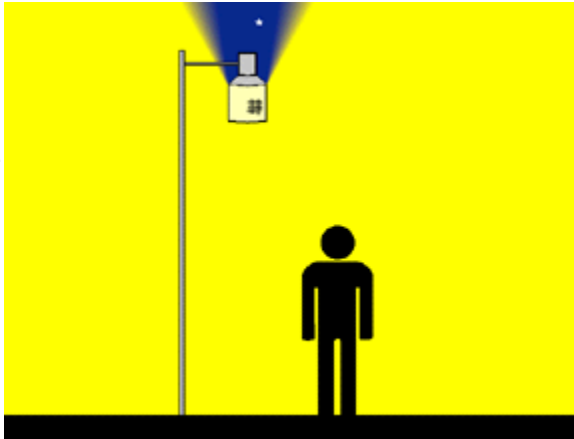
Reduces glare; more even illumination.

Reduces light trespass onto neighboring properties.

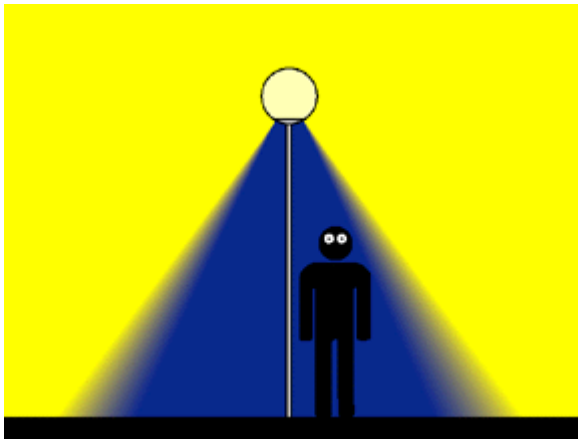
Helps preserve the dark night sky.

The Good

Wastes energy into the sky.  
Glare, light trespass and harsh illumination.



The Bad



Illuminates poorly.

Causes glare and trespass.

Disorients migrating birds who rely on stars

The Ugly

## Calculating FCO\* Fixture Placement to Prevent Light Trespass

Freestanding luminaires on private property shall be mounted at a height (H) equal to or less than the sum of  $(D/3) + 1 = H$ , where D is the distance in meters to the nearest property boundary, but shall not be higher than 5 meters from ground level to the top of the luminaire, and not exceeding the height of the building, whichever is less. Low-mounted (less than 1 meter above ground) luminaires are not to exceed 400 lumens.

### Pole Height (H) Distance to Property Line

Where:

H = Height of fixture in meters

D = Distance to fixture from a property line in meters

The formula:

$$H = D/3 + 1 \text{ meters}$$

$$D = (H - 1) * 3 \text{ meters}$$

is used to determine fixture placement and height.

**Example 1:** A fixture 6 meters inside a property line must be no higher than 3 meters.

**Example 2:** A fixture atop a 2 meter pole would have to be 3 meters inside a property line.

\*Assumes common full cut-off fixture with a symmetrical cutoff angle of 70°. Asymmetrical "sharp cutoff" FCO fixtures that have steeper cutoff angles at the "house side" may be placed closer to property boundaries provided their cutoff angles do not result in light trespass.

**Table 1 Mounting Height/Lamp Output Recommendations**

<b>Mounting Height (feet)</b>	<b>Max Lumens</b>
6	1,000
8	600 to 1,600
10	1,000 to 2,000
12	1,600 to 2,400
16	2,400 to 6,000
20	4,000 to 8,000

**Table 2 - Mounting Height Recommendations Per Lamp Type - High Pressure Sodium**

<b>Wattage</b>	<b>100W</b>	<b>70W</b>	<b>50W</b>	<b>35W</b>
Mounting heights	24 feet	20 feet	16 feet	12 feet
Initial lumens	9,500	6,300	4,000	2,250
Mean lumens	8,550	5,470	3,600	2,025
Lamp wattage	100	70	50	35
Circuit wattage	115	88	66	46
Initial lum/watt	73	72	61	49
Mean lum/watt	66	64	55	44
Annual KWH use	533	361	271	189

**Metal Halide (filtered)\***

<b>Wattage</b>	<b>100W</b>	<b>70W</b>	<b>50W</b>	<b>32W</b>
Mounting heights	>20 feet	>16 feet	>12 feet	>10 feet
Initial lumens	9,000	5,500	3,500	2,500
Mean lumens	6,400	4,000	2,500	1,900
Lamp wattage	100	70	50	32
Circuit wattage	124	88	62	43
Initial lum/watt	78	63	56	58
Mean lum/watt	56	45	40	44
Annual KWH use	472	361	254	176

\*This table is a guide to lumen output ranges only. Refer to the lamp manufacturer's data for specific lumen values.

**Table of Limits of Illumination Targets for Various Common Tasks\***

<b>Task</b>	<b>Average Maintained Illuminance lux (footcandles)</b>
Parking lot	15 (1.5)
Active building entrance	50 (5)
Gas station approach or driveway	20 (2)
Gas station pump island	50 (5)
Gas station service area	30 (3)
Sidewalks and bikeways	15 (1.5)
Signs, measured vertically on the face of the sign	20 (2)
Nonprofessional sports field and Little League (according to requirements)	250 (25)

\*The illuminances are average calculated values. Existing guidelines for the Core Commercial area on the National Register of Historic Places: call for the use of incandescent lighting.

(Based on the ordinances of **Village of East Hampton, New York**)

## **Appendix B - Light Pollution Reduction (based on LEED Criteria)**

### **Intent**

Minimize light trespass from the building and site, reduce sky-glow to increase night sky access, improve nighttime visibility through glare reduction, and reduce development impact on nocturnal environments.

### **Requirements**

#### **FOR INTERIOR LIGHTING**

All non-emergency interior lighting, with a direct line of sight to any openings in the envelope (translucent or transparent), shall have its input power reduced (by automatic device) by at least 50% between the hours of 11 PM and 5 AM. After hours override may be provided by a manual or occupant sensing device provided that the override last no more than 30 minutes.

OR

All openings in the envelope (translucent or transparent) with a direct line of sight to any non-emergency lighting shall have shielding (for a resultant transmittance of less than 10%) that will be controlled/closed by automatic device between the hours of 11 PM and 5 AM.

AND

#### **FOR EXTERIOR LIGHTING**

Only light areas as required for safety and comfort. Do not exceed 80% of the lighting power densities for exterior areas and 50% for building facades and landscape features as defined in ASHRAE/IESNA Standard 90.1-2004, Exterior Lighting Section, without amendments. All projects shall be classified under one of the following zones, as defined in IESNA RP-33, and shall follow all of the requirements for that specific zone:

#### **LZ1 — Dark (Park and Rural Settings)**

Design exterior lighting so that all site and building mounted luminaires produce a maximum initial illuminance value no greater than 0.1 (0.01) horizontal and vertical lux (footcandles) at the site boundary and beyond. Document that 0% of the total initial designed fixture lumens are emitted at an angle of 90 degrees or higher from nadir (straight down).

#### **LZ2 — Low (Residential areas)**

Design exterior lighting so that all site and building mounted luminaires produce a maximum initial illuminance value no greater than 1.0 (0.10) horizontal and vertical lux (footcandles) at the site boundary and no greater than ) 0.1 (0.01) horizontal lux (footcandles) 3 meters (10 feet) beyond the site boundary. Document that no more than 2% of the total initial designed fixture lumens are emitted at an angle of 90 degrees or higher from nadir (straight down). For site boundaries that abut public rights-of-way, light trespass requirements may be met relative to the curb line instead of the site boundary.

#### **LZ3 — Medium (Commercial/Industrial, High-Density Residential)**

Design exterior lighting so that all site and building mounted luminaires produce a maximum initial illuminance value no greater than 2.0 (0.20) horizontal and vertical lux (footcandles) at the site boundary and no greater than 0.1 (0.01) horizontal lux (footcandles) 3 meters (15 feet) beyond the site. Document that no more than 5% of the total initial designed fixture lumens are

emitted at an angle of 90 degrees or higher from nadir (straight down). For site boundaries that abut public rights-of-way, light trespass requirements may be met relative to the curb line instead of the site boundary.

**LZ4 — High (Major City Centers, Entertainment Districts)**

Design exterior lighting so that all site and building mounted luminaires produce a maximum initial illuminance value no greater than 6.0 (0.60) horizontal and vertical lux (footcandles) at the site boundary and no greater than 0.1 (0.01) horizontal footcandles 3 meters (15 feet) beyond the site. Document that no more than 10% of the total initial designed site lumens are emitted at an angle of 90 degrees or higher from nadir (straight down). For site boundaries that abut public rights-of-way, light trespass requirements may be met relative to the curb line instead of the site boundary.

**Potential Technologies & Strategies.**

Adopt site lighting criteria to maintain safe light levels while avoiding off-site lighting and night sky pollution. Minimize site lighting where possible and model the site lighting using a computer model. Technologies to reduce light pollution include full cutoff luminaires, low-reflectance surfaces and low-angle spotlights.

**Submittals**

Provide the LEED-NC Letter Template, signed by an appropriate party, declaring that the credit requirements have been met.

Verify light trespass requirements are met by providing a site plan showing initial horizontal lux (footcandle) levels on a 1.5 meter (5 foot) grid at the site boundary and 1.5m, 3m, 5m (5', 10' & 15') past the site boundary. Calculate initial horizontal lux (footcandles) at grade level.

Verify light trespass requirements are met by providing a site plan showing initial vertical lux (footcandles) at the property line on a 1.5 meter (5 foot) horizontal and 0.25 meter (1 foot) vertical grid. Calculate initial vertical lux (footcandles) perpendicular to the property line facing the site at 0 meter (feet) to the maximum luminaire mounting height above the grade level.

Verify light pollution requirements are met by providing catalog cut-sheets of all site and building mounted luminaires including zonal lumen distribution summary. Additionally, provide spreadsheet documentation similar to below. Note: luminaires without photometric distribution and ALL adjustable luminaires shall be assumed to have 100% of its lumens at or above 90 degrees.

Luminaire type	Number of luminaires	Initial lumens	Total Luminaire lumens	Lumens at or above 90 degrees	Total lumens at or above 90 degrees
A	10	4600	46000	100	1000
B	20	11900	238000	0	0
C	5	2000	10000	2000	10000
<b>Total</b>			<b>294000</b>		<b>11000</b>

<b>Percent lamp lumens at or above 90 degrees</b>	<b>3.74%</b>
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**References:**

LEED-NC Application Guide and LEED for Core and Shell

<http://www.usgbc.org/DisplayPage.aspx?CMSPageID=276&>

## **Examples of modeling software to be used**

<http://www.visuallightingsoftware.com/Downloads/Documents/Documents.asp>

<http://www.lightingreality.com/index.htm>

<http://www.vialattea.net/bonata/stskyen.htm> freeware



## Appendix C - Deterrent to Crime

*Dec 1, 2001 12:00 PM*

*By David Sowell*

[http://asumag.com/mag/university\\_lighting\\_deterrent\\_crime/](http://asumag.com/mag/university_lighting_deterrent_crime/)

The power supply in America — which already has been strained by the shortages experienced in California and elsewhere this year — is a constant concern for schools. As the cost of electricity has soared in many regions, institutions have taken steps to implement a number of conservation measures.

One tactic considered by administrators at many schools and universities has been to reduce lighting on their campuses. At first glance, this seems logical — and, indeed, in many cases it may be prudent. However, this strategy raises the possibility of security problems and an increase in liability exposure.

Lighting is one of the most efficient ways to prevent crimes from occurring on school campuses. A well-lighted environment creates a deterrent for prospective vandals — or thieves, drug dealers and rapists — because it raises the risk that they will be caught in the act.

### **Plan of action**

Before creating an action plan to reduce lighting, school officials should consider several factors:

- Purchase high-intensity discharge lights that are 400 percent more efficient than a standard incandescent bulb and provide 10,000 to 24,000 hours of operation, as opposed to 750 hours.
- Choose lights that illuminate the ground, but not the air above. These lights must penetrate rain.
- Design the lighting system to provide overlapping light distribution. Equipment selection should be designed to resist the effects of environmental conditions. All components of the lighting system should be positioned to provide maximum protection from vandalism.
- Situate light sources so that the illumination is directed toward likely avenues of approach and provides lighting directed at the gates or entry points.
- Install infrared motion detectors (IMDs) that turn on lights when any motion is detected in the monitoring area. These systems are programmed to react to the body heat of humans from as far away as 70 feet, so they will not be triggered by animals passing in the night. They should be installed above the ground in a tree, or perhaps near the roof, to cover a broader area.
- Avoid drawing unwanted attention to specific areas with posted signs (e.g., "Computer Lab").
- Restrict normal entrances to only one or two locations in order to significantly reduce the number of security personnel or necessary security devices. Also, install new fencing or other physical barriers to restrict access to campus.
- Consider using security video cameras, and take into account the future requirements of closed-circuit television systems. Where recognition of colors

will be a factor, full-spectrum lighting (high-pressure sodium vapor) should be used rather than single-color lighting.

- Trim all shrubs and bushes to no higher than two feet, and use security plants around the window areas. Keep tree limbs and branches away from the roof and windows, and do not allow them to block existing lighting.
- Notify the local police department of the new lighting policy and encourage local residents to report any suspicious activity to the police.

Deterrence is one of the most basic elements of a security program, and the key to deterrence is high visibility. Effective lighting can eliminate dark areas and shadows that serve as hiding places, reducing the threat of intruders. Moreover, it also reduces the exposure of a school to liability from "slip and fall" injuries suffered by staff members and local residents using school or campus facilities.

The reality is that an energy crunch can pose a real budget problem for institutions. This problem is not going away soon, so school officials are going to be forced to find ways to reduce energy usage without causing more problems. By effectively controlling the use of lights and other electrical systems, schools can reduce their use of electricity and still not jeopardize their security programs.

#### **NOTABLE FACTS**

- **70**  
Maximum number of feet at which some infrared motion detectors can detect human body heat.
- **750**  
Usage hours of a standard incandescent bulb.
- **10,000 to 24,000**  
Hours of operation of a high-intensity discharge light.
- **2**  
Height (in feet) at which bushes should be trimmed to enhance security.
- Schools with no outdoor lighting turned on at night have reduced vandalism.

# Dark Sky International InSky Association

## LIGHT AT NIGHT MYTHS

**A brightly-lit home is more secure.**



**Not true.** Extensive glare from overly bright lights can make homeowners feel less secure.



**Shielding lights outdoors gives you better nighttime visibility.**

**Brighter lights mean better driving conditions.**



**Not true.** Glare from some types of lighting makes it difficult for drivers to see and dramatically reduces visibility.



**Shielded lights increase visibility for both drivers and pedestrians.**



Photo: Lightology / Better Lighting



**Light at night only affects our view of the stars.**

**Not true.** All life on earth developed in concert with natural circadian rhythms (day/night cycles). Sea turtles, migratory birds, plants, and humans are all adversely affected by light pollution.

**Show I light my house doesn't affect others.**

**Not true.** Light that shines into your neighbor's windows and is absorbed by called "light trespass" and often affects their quality of life.

Some countries and communities are starting to legislate how much light trespass is reasonable.



**Only astronomers really care about light pollution.**

**Not true.** While astronomers need dark skies to make their observations and take photos like the ones below with their telescopes, light pollution affects everyone.

Shielding lights and directing light downward where it is needed allows lower wattage or compact fluorescent lighting to do the most of what we're doing, decreasing the amount of wasted energy and money. Shielding stars and light trespass yields a safer and healthier environment for all life.



**Fact:**

While places like the above of the earth at night are beautiful to look at, the light you see here is stored up, causing air to stay and wasting energy. This problem is getting worse at an alarming rate.

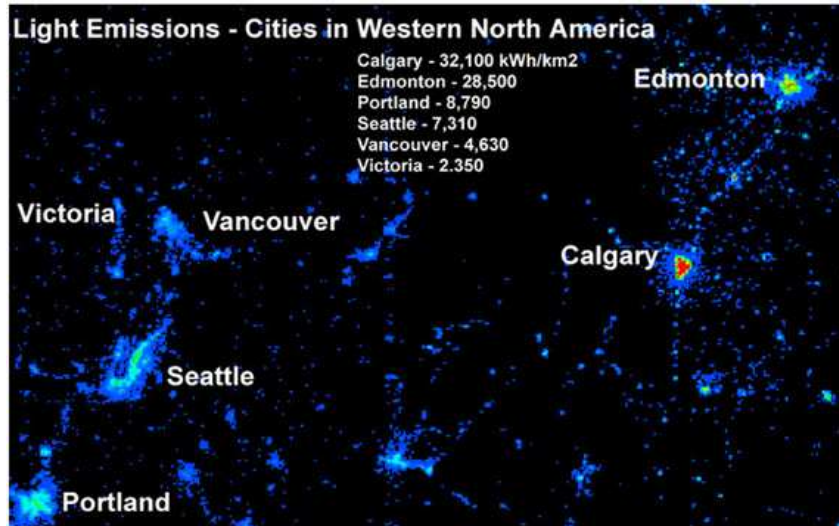
Experts estimate that the U.S. alone wastes over 65 billion a year in energy lighting.

**FOR MORE INFORMATION:**  
[WWW.DARKSKY.ORG](http://WWW.DARKSKY.ORG)

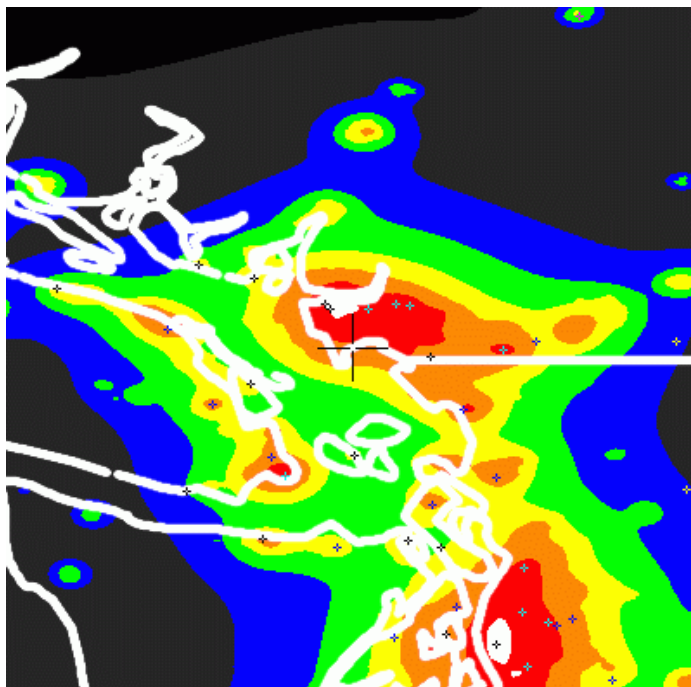


## Appendix D – What is light pollution?

Light pollution is the alteration of the natural levels of light.



<http://content.calgary.ca/CCA/City+Hall/Business+Units/Roads/Street+Lights/Satellite+Photograph+-+Full+Size.htm>



Red = 18.1 ~ 19.1 (6.2 ~ 2.5); Orange = 19.1 ~ 20.1 (2.5 ~ 1.0) ; Yellow = 20.1 ~ 20.8 (1.0 ~ 0.5) ; Green = 20.8 ~ 21.3 (0.5 ~ 0.3) Magnitude/arcsec<sup>2</sup> (Candelas/m<sup>2</sup>)

<http://cleardarksky.com/lp/BndryByBClp.html>

**Light Pollution map around Greater Vancouver**

**All of the following are forms of light pollution:**

**Glare:** Light shining directly into your eyes, causing discomfort and reducing your ability to see.

**Light trespass:** Light falling where it is not needed or wanted -- for example, spilling over onto your property or into your home.

**Waste:** Lighting that's on when it needn't be; lighting that's excessively bright; unshielded lighting that spills out and upward instead of being directed at its intended subject.

**Sky glow:** The result of upward-shining light, which is reflected off moisture and dust particles in the atmosphere to illuminate the nighttime sky and wash out all but the brightest stars. See image above.

To get the current predicted seeing conditions around GVRD, including Maple Ridge, assuming no light pollution, take a look at: <http://www.cleardarksky.com/c/UBCFst1BCkey.html?1>

## Why should it be curbed?

**Wasted light wastes money.**

It has been estimated that a third of outdoor lighting spills out and upward, totally wasted; a conservative calculation of the cost comes to around \$4.5 billion annually in North America. Added to that figure, is the waste from excessively bright lighting and the 100% waste from lighting that's on when it needn't be. You are paying the price through higher taxes for public lighting and inflated costs for consumer products and services. Energy saved can be sold by BC.

**Wasted light causes unnecessary air pollution.**

Most electricity in North America for lighting is generated by burning coal and oil. Every year this process spills out billions of tons of sulfur dioxide (an ingredient of acid rain), carbon dioxide (a greenhouse gas), and smog-causing nitrogen oxides.

**Wasted light squanders irreplaceable natural resources.**

In North America the annual waste just from unshielded lighting has been estimated at more than 8 million tons of coal or 30 million barrels of oil.

**Light pollution can affect our health.**

Potential links between disruption of our circadian rhythms and our susceptibility to cancer are being increasingly reported in the medical literature

**Light pollution does harm plants and animals.**

All earth's creatures have evolved over millions of years by adapting to a world that is dark at night. The loss of true darkness can alter the growth cycle of trees, weakening them and making them more susceptible to disease and severe weather. Birds, fish, frogs, moths, and plankton are just some of the animals whose behavior has been shown to be affected by increasing nighttime light - often with disastrous results.

**Light pollution creates unnecessary hazards.**

Glare from bad roadway and roadside lighting that blinds a motorist, even momentarily, can be fatal; older people are particularly at risk. The eye takes time to adjust from excessive brightness (common at gasoline service stations) to less bright areas (as you pull out onto the darker roadway). Impaired vision during such "transient adaptation" can pose hazards for pedestrians as well.

**While outdoor lighting may reduce the fear of crime, it can also attract criminals,** illuminating their tasks and creating deep shadows to hide in. In 1977 and again in 1997,

investigations in Australia, United Kingdom and by the U.S. Justice Department concluded that there is no meaningful evidence that street lighting affects the level of crime.

**Sky glow is obliterating the stars.** Satellite images show one huge blob of light around Greater Vancouver. The epidemic of wasted upright has become so severe that two thirds of Canadians can no longer see the Milky Way. A dark sky full of shimmering stars is a thing of great beauty -- a source of inspiration and information to diverse cultures across the centuries. Shouldn't we preserve it for ourselves and for our children?

(Based on: SELENE <http://www.selene-ny.org> )

## How can the people of Maple Ridge help?

1. Learn more about the problem in Maple Ridge and Greater Vancouver.
2. [It's easy](#) to eliminate any light pollution that may be coming from your property.
  - a) If an outdoor light is aimed down and the bulb fully recessed inside a cap or shield, stray rays will not escape into the sky or onto your neighbor's property.
  - b) If you have any dusk-to-dawn lighting, a motion-sensor control will save money on your electric bill and be more effective at discouraging intruders. To compare operating costs of different lights used with or without motion-sensor controls, try the [online calculator](#).
3. Encourage your neighbors and the businesses you deal with to do the same, as well as access the information resources available online and forthcoming on Delta's website.
4. Provide awards for night sky friendly buildings and homes.
5. Contact your national, provincial and local government representatives and let them know you support legislation and building code amendments requiring fully shielded lighting.
6. Identify the most egregious light polluters every six months, e.g., similar to that which GVRD does for air pollution.

### For additional information:

The Royal Canadian Astronomical Society, Light Pollution Committee  
<http://www.rasc.ca/light/home.html>

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End of report