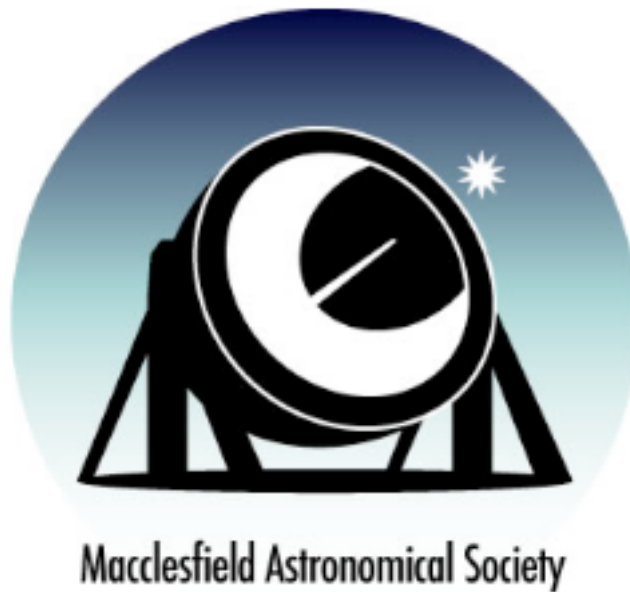


Light pollution and astronomy

– Response to the new inquiry proposed by the
Science and Technology Committee



Submitted for and on behalf of the Macclesfield Astronomical Society.

Action against light pollution

299,793,000 milliseconds ...

This, believe it or not, is the time it takes to completely eradicate light pollution from our environment.

Obviously, I speak of an ideal world scenario. However, the sad truth and reality of the situation is that we are doing little or nothing to help cure the source of its origin.

How wonderful it would be if other forms of environmental pollution could be remedied so very easily.

Society today is so very concerned by the way we affect the environment around us. So much so that, we are willing to make fundamental changes to the way we live our lives from day to day. Ask the public how they feel about light pollution and how it affects their everyday environment and they'll probably draw a blank. Enlighten them a little with some startling facts such as:

Wasted energy:

- Outdoor lighting is one of the most inefficient uses of energy today.
- It was estimated that in 1993, for the UK's entire street lighting, the annual electricity costs were around £190 million and annual maintenance costs were around £80 million. Given that the number of streetlights is increasing by approximately 2% per annum, one could argue that the figures are now 20% higher.
- The figures shown above relate to street lighting only and does not include the cost of security, decorative and sports floodlighting or advertising and merchandising lighting. It has been estimated that these installations consume ten times the energy requirements of street lighting.

Ecological implications:

- Deaths of migrating birds caused by collisions with lighted buildings and the disruption of bird behaviour caused by the effect of false dawn by street lights.

- The decline of our moth population due to their attraction to lights and ultimately their death.
- Disruption of urban tree, shrub and plant functions that are controlled by day length (e.g. leaf fall and flowering).

I'm confident you will find that most people will be quite taken aback by these statements.

Put simply, light pollution involves the shameful waste of energy. The principle is very simple: Every photon of light that shines up into the night sky represents energy that has been totally squandered.

In addition, it is often forgotten that the generation of the electricity which powers our lighting systems - 9 times out of 10 - uses finite, non-renewable resources. Perhaps even worse than the waste of non renewable energy is the accompanying production of environmental pollutants such as oxides of sulphur and nitrogen which directly give rise to acid precipitation. In addition to all of this, wasted energy results in the generation of greenhouse gases which are thought to be changing the climatic patterns of the Earth.

If the correct type of light fittings of the correct power were used and directed to shine their light where it is needed, then we could quite possibly light one city free for every two that we pay for. We would cut environmental pollution associated with light production by one third and conserve the precious non-renewable energy resources over a longer period of time. All this, and note that so far, there has been no mention of light pollution in the sense that is of concern to astronomers and astronomy.

As I am sure you are aware, the bigger picture is far more subtle than just the brash statements that can be made about wasted energy. Our recent generations do not realise that they only need travel back as little as 50 years to find that light pollution was almost non-existent or at least isolated - hardly the major problem it is today. And if encountered it was possible to travel a short distance to escape its grasp. Can you imagine being able to do that today? Without doubt, no.

Here are some statistics that refer to light pollution in 1996-97. The situation is undoubtedly worse today:

- More than 99% of European Union (EU) populations and two thirds of the world's population suffer from some degree of light pollution.
- In areas where 96% of the EU population and half the world's population live, the sky is always at least as bright as it is when there is a half Moon shining at one of the world's best observatory sites (where the air is dry and clear). For many the sky is as bright as it is on days close to a full Moon. 'Night' never really comes to such places and the sky is always as bright as nautical twilight (the period of time

when the Sun is between 6 and 12 degrees below the horizon).

- About half the EU population and one fifth of the world's population live where they no longer have the possibility of seeing the Milky Way with the naked eye.
- For one sixth of the EU population and one tenth of the world's population, it is never dark enough at night for human eyes to become properly adapted to night vision.

This indicates that all but 1% of the UK's population have grown up with the pervading orange glow that floods our night-time sky. As a result, people expect and know no different. Can you imagine how startled they would be to step back in time 100-150 years and look up at an inky-black sky full of stars. This is not just a romantic notion. It wasn't so long ago in history that man required the stars to navigate the globe, know what season it was, even what the date and time was. Essential crops were sown and harvested by the rising and setting of certain stars. The night sky was fundamental to our existence. If light pollution had existed during that time, I suspect humankind may well not be as advanced as it is today. That is a brash statement to make, but may not be as far fetched as it sounds. I quote:

'It is indeed a feeble light that reaches us from the starry sky. But what would human thought have achieved if we could not see the stars?'
Jean Perrin 1870-1942 - French physicist; Nobel prize for physics 1926.

To bolster this argument, were it not for man's imagination and burning desire to explain and quantify the interactions occurring between the stars and the planets travelling across the the night sky, individuals such as Johannes Kepler and Isaac Newton may not have developed Calculus to the extreme degree that they did. Without this it would not be possible to have modern engineering solution and design as sophisticated as we know it today.

The sorry truth is that a priceless part of our human heritage is fading into a pseudo-night sky. As a fine painting by a renowned artist will fade away to a shadow of its former self if left to the ravages of uncontrolled lighting, the same can be said for the sky at night. I believe the parallel is very apt.

The sky is part of humanity's cultural inheritance, a door to the Universe, part of the rural environment, and a social amenity. Sky glow reduces this vast celestial spectacle to a pale imitation - a few pinpricks of light - and robs us of a source of inspiration that has been available to us for thousands of years and which until quite recently could be taken for granted.

I can only begin to think of the unbelieving gasps that would be heard if just for a few minutes city lights across the country were extinguished and people were encouraged to simply look up and appreciate the wonders above. I cannot think of a better way to raise awareness of the damaging effects of light pollution. It's such a good idea that earlier this month people living in the Eastern, Mountain, Central,

Pacific and Hawaiian time zones of the USA were asked to turn off all nonessential lighting from 22:00 until 00:00 as part of National Dark-Sky Week.

A simple question:

How many people have **never** seen a truly dark sky or the Milky Way from their home?

A positively shameful answer:

About 99% of the population in western Europe.

The Milky Way is our place in the Universe and it's all but lost to us. As humans we have a desire to understand our place within it and how we fit within the grand scheme of things. Most people do not realise it, but everyone has a deep fascination with 'what's up there' and it doesn't take much to awaken this. Just the briefest look at Saturn, the beautiful ringed planet, can lead to a lifelong interest in astronomy. Perhaps this inbuilt fascination is something we may lose completely in years to come simply because we'll have no reason to look up at the night sky - there'll be nothing to see. This could quite easily become the case here in the UK in relation to some of our European neighbours - we share the unwanted accolade of being the most light polluted country in Europe along with the Netherlands.

Light pollution has been advancing relentlessly in the last few decades. This means that the one percent of the UK's population who still have a dark sky now, are unlikely to have so in the next 5-10 years. So why is nothing being done? In the UK, one of the greatest barriers to effective control is the lack of inclusion of light pollution in any kind of environmental protection act as a statutory nuisance. It is vital that this is addressed.

The issue is not being ignored in other countries around the World though, the International Dark Sky Association (IDA) has done enormous amounts to make the citizens of the United States aware of the problem and through their efforts many States now have regulations in place to prevent the use of poor and inefficient lighting.

In the Czech Republic there has been a notable breakthrough in the fight against light pollution. In March 2002, they became the first country in the world to enact national legislation aimed at eliminating it. Known as the 'Protection of the Atmosphere Act', the bill was passed and signed into law by President Vaclav Havel on February 27 2002. It took effect June 1 2002.

The law defines light pollution as 'Every form of illumination by artificial light which is dispersed outside the areas it is dedicated to, particularly if directed above the level of the horizon.' Under the law, Czech Republic citizens and organisations are obliged to 'Take measures to prevent the occurrence of light pollution of the air.'

It is no accident that the city of Prague has become a world leader with its legislation to protect the night sky. The tradition of astronomy extends back to the

16th century, when the city was transformed into a scientific and cultural centre by Emperor Rudolf, who invited history's most significant astronomers, such as Johannes Kepler and Tycho Brahe, to study at his court.

The landmark legislation closely resembles the Lombardy Law, which was enacted in the Lombardy region of Italy after 25,000 citizens signed petitions demanding action against obtrusive outdoor lighting. Key to compliance with the new Czech Republic law is the use of fully shielded light fixtures. Citizens and organisations found in violation of the law's anti-light pollution provisions will be subject to fines ranging from 500 to 150,000 Czech crowns.

Czech Republic astronomer Jenik Hollan, a member of the IDA, was instrumental in promoting and drafting the legislation. 'Support was very good and no serious objections have appeared' said Hollan, a resident of Brno who works at the Nicholas Copernicus Observatory and Planetarium.

Pavel Suchan, of the Stefanik Observatory in Prague, and the Czech Astronomical Society also lobbied for the new legislation, which Hollan says is already paying off. 'In downtown Brno, fully shielded fixtures are becoming the norm and the improvement is spectacular.' Comments such as this confirm everything that astronomers in the UK passionately argue against when it comes to the subject of light pollution. It also makes us extremely envious ... We applaud the Czechs for listening and totally embracing the issue. Because of this, we will continue to remain committed to persuading the UK government to enact similar legislation.

Further information on the Protection of the Atmosphere Act can be obtained from:

Jenik Hollan (hollan@ped.muni.cz or <http://www.astro.cz/darksky>)
Nicholas Copernicus Observatory and Planetarium
Kraví hora 2, Brno 616 00
Czech Republic

Here in the UK, because of the lack of legislation, the British Astronomical Association's Campaign for Dark Skies has worked hard, but with effectively one hand tied behind its back, has experienced difficulty in achieving notable success. The Institute of Lighting Engineers has some very good technical information and guidance on their website, but unfortunately few lighting engineers follow it.

What must be done?

In summary, the main issues and solutions are listed below:

Glare

The basic rule of thumb is if you can see the bright bulb within a luminaire from a distance, it is a bad light. A good light, will only show lit ground instead of the dazzling bulb. Glare is termed the light that beams directly from a bulb into your eye. It serves no purpose and hampers the vision of pedestrians, cyclists, and drivers.

Light Trespass

Poor outdoor lighting shines onto neighbours properties through windows and into rooms within a house. This reduces privacy and hinders sleep.

Energy waste

Many outdoor lights waste energy by spilling much of their light where it is not needed, such as up into the sky. This waste results in high electricity costs. Each year we waste millions of pounds needlessly lighting the night sky.

Excess lighting

Some homes and businesses are flooded with light that is much stronger than necessary for safety and security.

Use only the light needed

There is no need to over-light our roads, or spill light off buildings. Specifying enough light for a given purpose is sometimes hard to do on paper. A full Moon can light an area quite brightly, yet some lighting systems illuminate areas 100 times more brightly than this. More importantly, by choosing properly shielded lights, it is possible to meet needs without bothering neighbours or polluting the sky.

Aim lights down

Use full-cut off shielded fixtures that stop light from uselessly shining up or sideways. Full-cut off fixtures produce minimum glare and create a pleasant-looking environment. They increase safety because they illuminate people, cars, and terrain without causing glare.

Install fixtures carefully

Maximise the effectiveness of lighting on the targeted area and minimise impact elsewhere. The proper aiming of fixtures is crucial. Most are aimed at an angle which is much too high. Correctly aimed and shielded lights save money. It is

possible to illuminate a target with a low-wattage bulb just as brightly as wasteful light using a high-wattage bulb.

Place lights on timers wherever possible

Superfluous business lighting should be switched off at a given time during the night. Home security lights should always use a motion-detector switch, which turns them on only when someone enters the area. This provides a much greater deterrent than a light which is constantly lit.

Consider this question and statement:

Who gains the most from exterior lighting during the small hours of the night? Someone asleep in bed, an astronomer, or a criminal?

If there was a water pipe in your house that lost 40% of its water every time you turned a tap on, you'd be upset. Yet many of the outdoor light fixtures in use today throw away a similar percentage of light (and therefore energy).

It is clear that the need for lighting is not disputed. Lights are required for our safety and security. But often this lighting is completely misused or inappropriate. One unshielded security light seen from a mile away is many times brighter than the brightest stars in the night sky. Additionally, lighting that is too bright leaves areas of very dark shadow. This affects our ability to see in the dark and therefore compromises safety and security.

The good news is that the principles of good outdoor lighting can be explained in a few minutes. The bad news is once these principles are understood, almost all lighting we see in our night-time environment is unsuitable.

As well as stealing the wonders of the night's sky, light pollution affects our quality of life in other ways too, and many of us do not even realise it. Significantly, light pollution robs us of our right to privacy and fair legal use of our land when glaring unshielded lights shine artificial illumination onto our property at night. It is an unwelcome violation of our space.

There are many ways of improving the situation. A simple and effective solution is to install a reflective 'skirt' around lighting fixtures, which will redirect most of the wasted light spillage back towards its intended target. This increases the lamp's efficiency and provides better illumination at no extra cost. Alternatively, a properly shielded lamp of lower power can provide the same illumination with the added bonus of lower running costs.

The Government has so far not recognised that light pollution is a statutory nuisance, or that there is a need to tighten planning controls over lighting installation for highways, sporting arenas, car parks, shopping centres and for security purposes (to name but a few).

Public safety and security at night obviously requires a certain amount of illumination, and there is clear evidence that improved lighting leads to reductions

in crime. However, rather than increased surveillance and other types of deterrent, the benefits of improved lighting are usually attributable to increased community pride and confidence, which results in a decrease in both daytime and night-time crime.

Consider someone moving through a garden. Contrary to belief, security lighting can actually impair an observer looking for the impostor in several ways:

- Glare from the light reduces the chance of suspicious movements being detected, partly because shadows are turned inky-black. Similarly, glare from improperly directed lighting detracts from security in the same way that a driver's ability to see the road ahead is impaired by an oncoming car's headlights.
- Bright illumination gives the illusion of occupancy, so neighbours or passers-by are less likely to be vigilant, or alarmed if suspicious sounds are heard.
- Constant bright lighting provides the perpetrator with a source to assist their activities.

As previously mentioned, we all want and need security and safety at night. The task is to be safe, not just to feel safe. This means that we need effective and efficient lighting. Visibility is the goal. We want to be able to see well, rather than lighting the criminal's way. This goal exists for us at home, on the streets, in car parks and at work. Good lighting can be a help, poor lighting always compromises safety.

Most crime actually occurs during the day, or inside buildings. However, we want the feeling and the reality of being safe outside at night. This does not mean installing the brightest light we can find. What we need is effective lighting, lighting that puts light where we need it (and nowhere else) and where it will help visibility. To do this there must be no glare, no light trespass, no uplighting, no harsh shadows, or steep transitions from light to dark. Lighting by itself does not ensure safety, but quality lighting rather than poor lighting is essential for any real security.

Here are some examples of bad security lighting, which can often compromise safety:

- The 175-watt dusk-to-dawn security light. This fixture was designed when good lighting fixture designs were not available and when the adverse effects of bad lighting were not well appreciated. It sells for around £20-30, but uses over 200 watts of power. That means it costs about £50-70 per year to operate in most locations. Much of the light output is wasted, directed upwards or sideways where it does no good at all. It has a great deal of glare, often blinding the homeowner and others, casts harsh shadows behind trees and buildings and allows criminals plenty of dark areas to hide in. It is a prime example of bad lighting, yet hundreds of thousands (probably millions) are

used throughout the country. Why? Because they are cheap and bright.

- Globe lighting. Once again, the light emitted is sent in all directions. This fixture wastes so much light that it is essential to use a high-wattage bulb to get any kind of useful light on to the ground. This results in a tremendous amount of glare being produced, so much that in some cases it is difficult to see the ground over a distance. Why are so many of these inefficient fixtures used? Mainly because they are aesthetically pleasing to look at in the daytime.

- Poorly designed or installed flood lights. Flood lighting can do an excellent job, if used in a controlled fashion, is well-designed and installed to take advantage of its benefits. This kind of lighting is often used at sports facilities and is very rarely shielded or aimed correctly towards the intended area of usage. In slightly hazy weather conditions it is possible to see domes of light pollution above the fixtures for many miles around.

Here are some examples of good quality security lights:

- Well-shielded low pressure sodium (LPS) fixtures control light well, are energy efficient and produce no glare. Visibility is excellent when this kind of LPS lighting is used. Lack of colour rendering is not a disadvantage for most security lighting.

- Full cut-off high pressure sodium (HPS) or metal halide (MH) fixtures, similar to those mentioned above create no uplighting and no glare. However HPS lighting is not particularly favoured by astronomers because unlike LPS lighting, it is not possible to filter-out this wavelength of light using specially designed light pollution filters which many amateur astronomers use with their telescopes.

- Infrared sensors used in conjunction with spot lights which come on only when someone walks into the field of view of the (IR) detector. These are very cost-effective and are most effective type of security lighting. This type of lighting is more likely to make intruders think twice about committing crime as their presence is more likely to be given away by an intermittent flashing light. However, they must be installed correctly so as to place light only where it is needed, not spilling up into the sky or onto a neighbour's property. The best location for such a lighting fixture is under the eaves of a roof.

Well designed lighting fixtures are starting to be used, but only in isolated areas. Such places are benefiting from better lighting for their citizens, considerable energy savings and darker skies - but not darker streets. We all really do win if the correct action is taken.

In the US, it has been found that one effective method for communities to help solve

the problem of light pollution is to appoint an Outdoor Lighting Working Group, which considers the issues and recommends specific solutions tailored to local needs. It has been reported that such committees have been very effective in areas where they have been implemented. The added bonus here is that many people become educated regarding the issues.

However, the overriding problem is that there is still a vast lack of public awareness with regard to the issues, problems, and common sense solutions. Education is the key. The second major problem is apathy. Even with awareness, action is needed. Some consider light pollution too big an issue to become involved with and others feel that it is not important enough. Neither is a good enough reason to be indifferent.

As I have reiterated throughout this document, our ultimate goal should be to restore the dark night sky here in the UK - and around the world - as close to the condition it previously existed for our historical ancestors, many generations back in time. Then finally, we can all enjoy the splendour of a profound natural resource offering a stellar vista that provides a view of over 10,000 stars on any cloudless summer night of the year.

I very much hope the efforts in researching, compiling and writing of this document do not go unnoticed or unacknowledged. Amateur and professional astronomers alike in the UK are desperate for action to be taken against light pollution.

In conclusion

The Science and Technology Committee inquiry sets out five specific questions with regard to light pollution and astronomy. I believe each of the questions are covered in depth within the supporting documentation included along with this extensive overview. However, in answer to the main questions raised by your document calling for responses the following statements apply:

- What has been the impact of light pollution on UK astronomy?

The impact can and would be described by astronomers as devastating. The spread of light pollution, especially during the last four decades, has seemingly been uncontrolled and as a result has eroded the true beauty of the night sky from view. It is a sad fact that only one per cent of the UK's population have access to truly dark skies and the celestial wonders they contain.

- Are current planning guidelines strong enough to protect against light pollution?

We think not. Without enforced legislation light pollution will always be an issue. Developers will generally use inefficient lighting fixtures, which do not offer effective light shielding properties in order to cut costs.

- Are planning guidelines being applied and enforced effectively?

Not unless everyone concerned is aware of the need to educate and inform. It is clear that the issue of light pollution is not well understood by the majority of people - there is a significant lack of awareness. If this remains the case, light pollution will always be a major issue.

- Is light measurable in such a way as to make legally enforceable regulatory controls feasible?

Of course. At its most basic level, the spillage of excess light into the sky is very easy to measure. Slightly misty weather conditions are all that's needed. In these conditions it is easy to see the path of light emitted from any luminaire. More often than not, unless the fixture is of a full cut-off design or sufficiently shielded, light can be seen

streaming in all directions beyond the area it is required and also into the sky.

Obviously, there are many more stringent tests which could be carried by organisations such as the The Institution of Lighting Engineers that go beyond the remit of this documentation. Our overriding concern is of the effect bad lighting is having on astronomy.

- Are further controls on the design of lighting necessary?

We believe this goes hand in hand with the need to raise awareness. Awareness leads to knowledge, which leads to more effective and informed solutions to lighting problems.

From an amateur astronomers point-of-view, all the necessary light pollution-friendly luminaire fixtures are available to contractors and the general public alike, which will allow us to effectively stop and significantly reduce the effects of light pollution.

Let us not forget that it's certainly not too late to take action and restore our skyward environment and the thousands of stars that go with it to its former glory ... And that it would only take us 299,793,000 milliseconds to do so.

Starlight lost - a poem

Open your eyes to the nascent glow,
Watch as it starts on the horizon low.

As twilight deepens, the lights they come,
Another ton of coal's job is done.

Deep in country the celestial show delights,
'Tis only a dream of longing suburbanites.

Youngsters wonder of Milky Way lost,
The old man knows how much the cost.

Cruel fixtures that light the night,
Stealing the stars from our sight.

Comets die, northern lights disappear,
We have lost what we once held so dear.

Thoughts from an anonymous starlight-starved astronomer.

Pictorial evidence

Imagery can often speak louder than words. For this reason it was felt that examples of poor lighting should be included to show the issues astronomers have to contend with every time they observe the night sky. Firstly, in my own locality (Kerridge, Cheshire) and secondly showing atrocious conditions endured by a member of the Macclesfield Astronomical Society who lives in Runcorn, Cheshire.

It is worth noting that Kerridge has conservation area status. As a result strict planning and development regulations are enforced. Surely street and security lighting should be subject to the same stringent regulations?



Above: **View of Adelphi Mill from Kerridge**

This is a very good example of the way we waste light and energy unnecessarily. This beam of light is produced by a spotlighting illuminating a 19th Century mill. It serves no purpose, except to pollute the night sky. The building is used commercially during normal trading hours, so why does it have to be lit at night? This spotlighting has been installed during the last 14 days, proving that light pollution is increasing unabated without any consideration for the wider issues.



Above: **View of a farm building in Kerridge**



Above: **Light spillage from the security light shown in previous image, Kerridge**
This security light has been installed during the last 6 months. Beforehand, the trees shown in this picture were never illuminated. The luminaire has no shielding whatsoever. The second image shows the light spillage as seen from my garden. The direction we are facing in is East - all celestial objects rise from this point. The trees are approximately 75' away from the source of the light, demonstrating the inefficiency of if the fixture. The light is not on a timer.



Above: **Hollin Hall Hotel, Kerridge**



Above: **Hollin Hall Hotel, Kerridge**

The top image shows roughly how this building looks to the naked eye. The second image is a 2 second exposure taken directly after the first. We can clearly conclude that the lighting is unacceptable. There is glare and light trespass in all directions. When the weather conditions are misty it is possible to see a 'dome' of light pollution suspended above the building. There are about 7 flood lights shining on and around the hotel, none of which are correctly positioned or shielded.



Above: **View towards Jackson Lane from 11 Jackson Close, Kerridge**



Above: **View towards Jackson Lane from 11 Jackson Close, Kerridge**

The difference is unquestionable. This light is approximately 175-200' away from my garden looking West, yet its light falls into my garden from where I observe. Up until 10 months ago there had not been a street light in this position. So, why has one been installed if there wasn't a previous requirement? If you look carefully it is possible to see the way the luminaire displaces the light - not down as required, but horizontally in all directions.



Above: **View towards Macclesfield from Kerridge**

Notice that very few lighting fixtures can be seen, but the heavy orange glow produced by hundreds of poorly designed and installed light fixtures is unmistakable. This image only represents a 2 second exposure. What hope have astronomers got if they wish to do any kind of astrophotography? To capture faint galaxies or nebulosity within our night sky, exposures lasting tens of minutes have to be made.



Above: **Security lighting, Kerridge**

Apart from the obvious glare seen from the unshielded lighting in the foreground, a more subtle but just as destructive form of light pollution can be seen on the right-hand side of this image. It is a typical demonstration of the effect of light being shone directly into the sky. It is undoubtedly a single powerful security light. Think of the sheer number of fixtures that are in use every night in this country, which spill their light in the same way. This gives an idea of how serious the issue of light pollution is.

The imagery shown below has been supplied by Andrea Haddock, who is a member of the Macclesfield Astronomical Society.



Above: **View from front path of 32 Millersdale Grove, Runcorn**

This is the view that greets Andrea when she steps outside her front door. What incentive can there possibly be to consider using a telescope to explore the wonders of the Universe when presented with light pollution such as this? Glare, light trespass, wasted energy ... Need I go further?



Above: **View towards ICI, the A56 and Frodsham from Frodsham Hill**

If it is possible to see glare from fixtures even when looking **down** on to lighting, as shown in this image, what hope is there of being able to see any stars whatsoever? The light pollution escaping from the fixtures at ground-level is no brighter than when viewed at considerable elevation. Does this not without doubt prove that strict guidelines and legislation is needed to control the effects of sky glow?



Above: **View towards ICI chemical works from Marsh Lane Bridge, Frodsham**

Is it really necessary to light an area or series of buildings as extensively as shown here? The effect of light pollution is so strong in this image that it is not possible to see a gradual dissipation of sky glow to reveal any kind of indication of the night sky from the horizon to the top of the image.



Above: **Mersey View car park, Runcorn**

Security lighting. Bright lighting might make us feel like we are safe, but in reality it does little to help when lights produce as much glare as this. Poor lighting always compromises safety. How on earth would it be possible to see criminal activity when facing towards so much light? The installation of full cut-off luminaire fixtures would transform this scene by only shining light on to the ground, where it is needed. As a result of this we would not only feel safe but also be more secure.

Petition signatures

B.A. Hayes.
 Denis Walker
 Peter Walker
 R. Dale
 Sarah Beattie
 P.S. Hunt.
 A. Dutt.
 Benjamin Jones
 Adam Morris
 Chris Mandy
 Jim Coase.
 Richard Jackson
 Stephen P. Longley
 Maurice Hulme.
 Ian Robson
 John Armstrong
 J.C. Ogden
 G. G. Stratford
 H. G. B. O.
 K. W. B. O.
 Megan Age.

Rachael Clark.
 P. L. L.
 G. W. L.
 Kristina Leigh
 R. Franklin
 Peter Franklin
 G. Hill
 J. A. L.
 Paul Shum
 N. P. S.
 D. J. S.
 C. S. S.
 J. S. S.
 E. N. S.
 R. F. S.
 David Longley
 Ann Hadsce
 P. Hadsce
 Liz Ward
 G. W. M.

Chris ~~Hay~~
MCRANEN

Julia Clowd
Tom Cople
Stuart Martin

Alan Broadhead

~~John~~

~~John~~
Chair Boat

~~John~~

Chris Palmer
Adrian Palmer
R. Almqvist
I. Barclay
R. Clarke

John

John

John

Tom

Ben

~~John~~

J. O. Carlson

J. Quinn

S. Elliott
Kendra Peckeringill

P. Goss
John Goss (John Goss)

John
J. S. Carlson

John
John

T. A. Marsland

John

J. E. Smith

John

J. S. Smith

Elizabeth Williams

Alan Banta

Colin H. Jackson

Janet Jackson

Gill Keatley

Malcolm Beasley