Campaign for Dark Skies

A systematic approach to recording night-sky quality

John Prockter of the North Norfolk Astronomy Society describes how they used Sky Quality Meters to find the best observing sites in their locality.

The availability of the affordable Unihedron Sky Quality Meter (SQM) has allowed astronomers and others concerned about light pollution to measure night sky quality accurately and to compare sky brightness quantitatively at different sites. In 2010 the North Norfolk Astronomy Society obtained a set of sky-quality recording equipment, including these meters.

The original Unihedron SQM was designed by Dr Doug Welch and Anthony Tekatch. The meter is a small hand-held instrument, about the size of a TV remote control, which quantifies sky brightness. The instrument is held overhead and aimed at the zenith and 'sees' a cone of about 80° width of sky. The user must be careful not to allow any other light source into the cone. The meter will beep and then a digital display shows a number, usually between 15 and 20 for most night-time observers.

A typical meter reading of 20 is obtained at a fairly dark site, and 15 represents a very light-polluted sky. So, the larger the number, the darker the sky. In 2009, in one of England's darkest places, Exmoor, David Brabban recorded a meter reading of 21.85 at Prayway Head, making it one of the best observing sites in the country. Our equipment is of the same type used for the Galloway and Exmoor projects and their use was instrumental in earning these areas IDA sky-quality awards.

In the spring of 2010, an initial survey of the entire North Norfolk coast was carried out. This area is designated an Area of Outstanding Natural Beauty and has traditionally been an excellent location for observing. Many BAA members are aware of and attend the annual Equinox star camp on Kelling Heath, now probably the largest star party in the UK.

Figure 2. The simple clip-on window mounting for the SQM. The lead plugs into a laptop computer on the passenger seat.

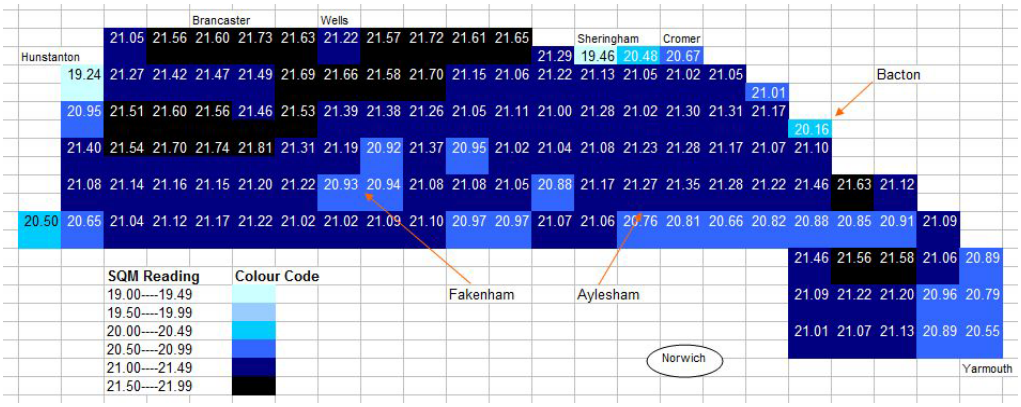

Figure 1. Tesselated chart of the north Norfolk coast showing SQM readings taken between 2010 October and 2011 May.

The initial objective was to produce an accurate database of light quality across this area. The resulting report, Norfolk Nightscape Phase 1, is available at **http://nightscape.nnas.org/survey_phase_1.pdf**

Several problems with the methodology were soon identified, the main one being that because we were using a rather haphazard approach to the locations of the readings, it was difficult to interpret the results. Also, we began to question the levels of some of our readings. At this time we were using the rather vague rule of taking readings when there was a clear moonless night.

For Phase 2, which began in the autumn of 2010 and completed in spring 2011, we adopted a different approach using the SQM-LU, which 'sees' a 40° light cone giving greater accuracy, and has a USB computer connection.

We use the standard Ordnance Survey map with its basic grid system of 4km by 4km boxes. A survey location is identified on a road or track as close as possible to the centre of a box, and using Google Earth, we obtain an accurate latitude and longitude reading. This information is fed into a satnav, allowing us to drive to the required series of locations. Typically, between 10 and 20 locations can be surveyed in a 3-hour period but it is important to plan the route carefully.

As all the surveying takes place at night, 3 hours proves a suitable period especially when a vehicle-mounted SQM is used, as there is normally no need to leave the vehicle. When we arrive at the location, a series of SQM readings is downloaded along with a GPS reading (used as a check on location) and an averaged SQM reading is stored in a laptop computer file along with other data. One of our members has written a simple program that controls these downloads. The data is later added to a master database.

We now pay greater attention to prevailing weather conditions: no moon or twilight and absolutely no cloud.

The highest reading obtained so far is 21.81 at a location east of Bircham Newton, probably the darkest site in Norfolk and one of the darkest in England.

Presentation of results proved one of the biggest problems. Creating a database of readings and accompanying information is relatively straightforward. Putting the information into a format that is accessible and understandable by people outside the survey is not! Various methods of presentation have been tried but up to now tessellation (tiling) has proved the simplest as it allows the results to be presented using a colour-coded spreadsheet page. We are also investigating the possibility of creating contour maps using these data.

Figure 3. The SQM in use.

The Norfolk Nightscape Phase 2 report including mapped results for North Norfolk is available at **http://nightscape.nnas.org/survey_phase_2.pdf**

It is hoped that, if our work inspires similar surveys by those concerned at the loss of the night sky in other areas, we may finally be able to combat light pollution with carefully detailed factual arguments, producing maps even more detailed than those produced by the Campaign to Protect Rural England and the BAA CfDS several years ago showing the extent of light pollution in various regions of England.

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