

AOTEA GREAT BARRIER DARK SKY SANCTUARY

RISK MANAGEMENT AND GOVERNANCE ISSUES

R B SOMERVILLE-RYAN

1. INTRODUCTION

It is clear that the Sanctuary has been a resounding success so far, and the Local Board deserves immense credit for its support and leadership. Several new businesses have started to take advantage of the appeal of the sanctuary, and there appears to have been a significant effect on both visitor numbers and visitor spend. Outreach activities have been enthusiastic. There can be few other sanctuaries in the world which manage to hold not one but three multi-activity programmes introducing aspects of astronomy to their resident population in an 18 month period. This is an excellent situation, not least as it reduces the pressure on the DAG or future governance group to be involved in intensive outreach programmes in future. There are no factors which appear to put the island's status at risk from island-based light sources. Guidance on light types is available from the Council, and we can rely on the local service centre to ensure that light pollution is an issue with resource consent and building processes. This aspect may need a little tweeking. Few changes have been made to the outstanding lights which were identified in the application. This is not a major risk as the basic curfew situation of the island being off –the-grid is the main on-island protection. But, a Council information drive to encourage retrofitting of lighting would be a good idea. As the Board is reaching its final months, I think it is important that it deals with a number of long-term issues.

2. UNITARY PLAN

The application was made under the Operative Plan for the Hauraki Gulf Islands in anticipation of a pending movement to the Unitary Plan. For a variety of reasons this has not yet occurred. In fact, we are only entering into area spatial plan consultation. The island's intrinsic darkness and lack of lights should not mean this is a problem, but the Board should indicate a sense of urgency to planning authorities.

3. RISK MANAGEMENT

I believe there are a number of issues the Board should consider and structure into an action plan for the remainder of this triennium.

- a. **Light Pollution risks from 'organic' growth in Rodney**
- b. **NZTA and AT Street Lighting standards and practice**
- c. **Related 'blue light' issues**
- d. **Role of Aotea Great Barrier Local Board in planning in other Board areas.**

4. ORGANIC GROWTH

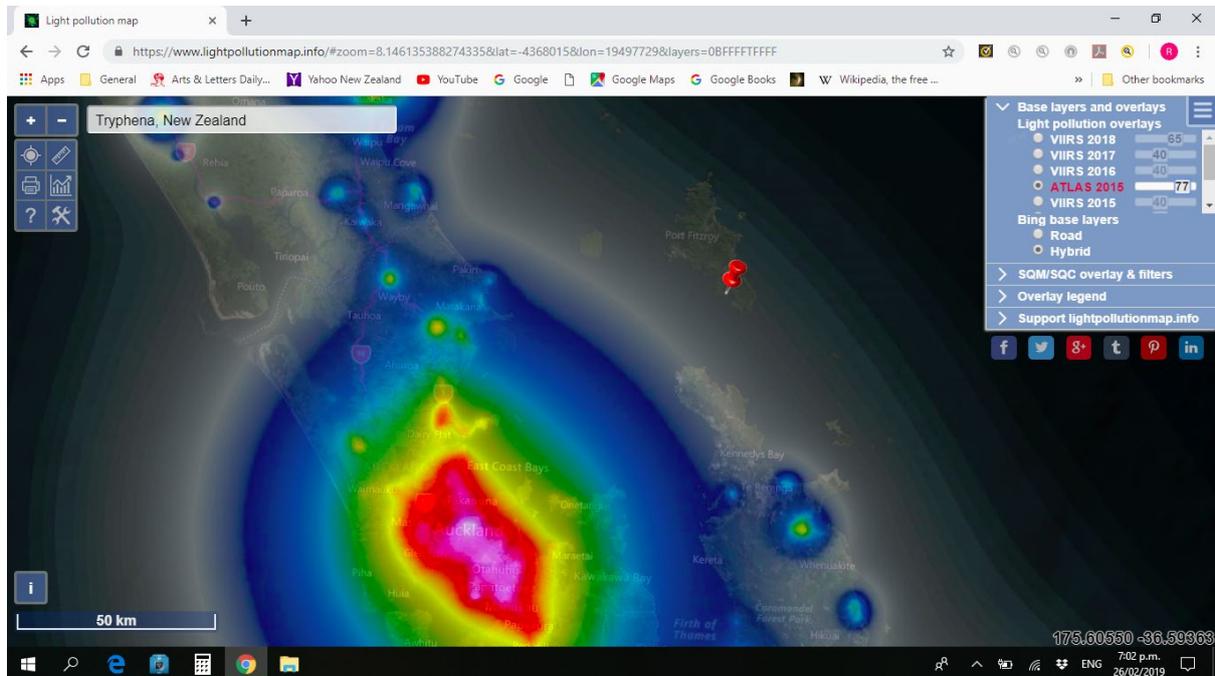
There is significant risk to the Barrier's dark sky measurements from 'organic' urban development in Rodney. There is considerable pressure for development on the Rural-Urban boundary of the city, and for intensification of development within the current urban limits. South of the city, and outside the boundary of the city proper, there has been very rapid development around Pokeno and Pukekohe East which is reflected in the attached

Light Pollution maps. Development in the area around Silverdale and East of Orewa has been dramatic. This is not reflected yet in satellite pollution maps. Great Barrier is 85km from downtown Auckland. However, the growing urbanisation in Rodney (Orewa, Warkworth, Wellsford, Leigh and surrounding areas) raises some concerns. These centres are around 40 kms from the island. Intense development of this northern zone will have a significant effect on the light dome for greater Auckland, and will impact on the sky quality data we are able to achieve, especially on the East Coast of the island. Map 1. indicates Great Barrier's position at the edge of the current light dome.

World Atlas 2015

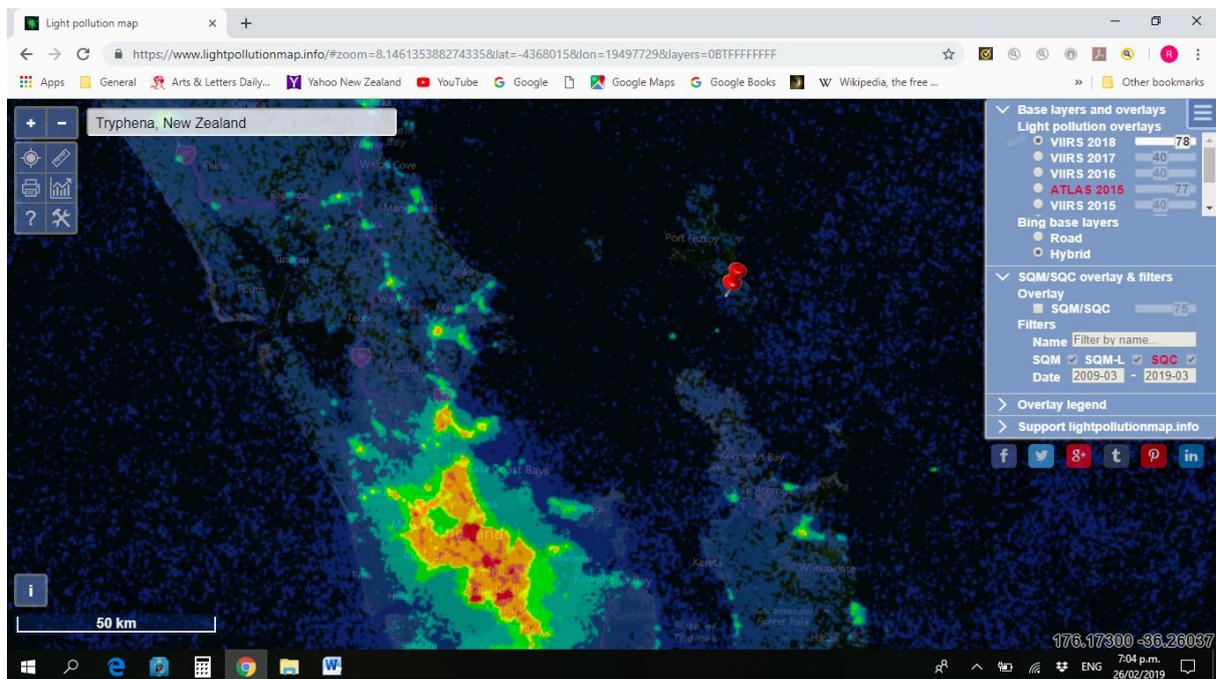
(www.lightpollution.com)

The scale on the following maps goes from Light Pink/white through red, yellow, green to black. Extending the bright epicentre in central Auckland and North Shore to Orewa would have the effect of bringing Great Barrier in to the Blue and Light Blue zones. Thus the Sanctuary status could be severely compromised.



The later map (2.) demonstrates the light sources, though does not highlight the light dome as well.

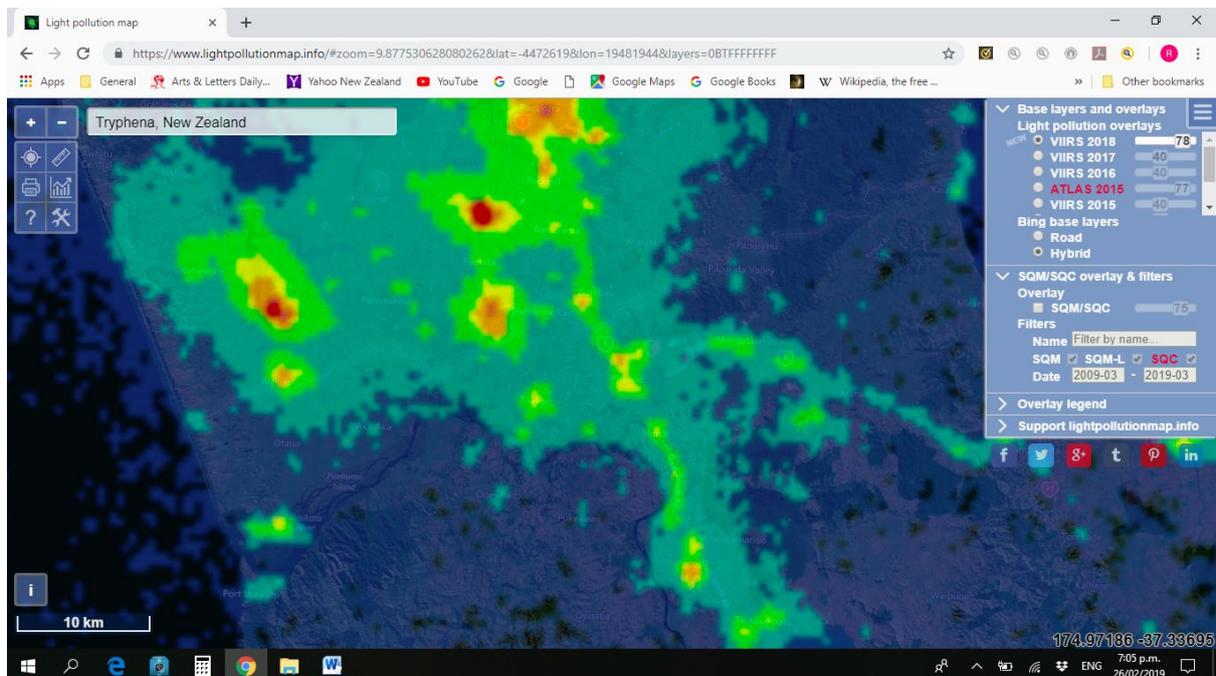
Maps 2 VIIRS 2018



The final maps highlight the growth of lighting in Pokeno and Pukekohe East. These areas have been chosen to indicate the potential growth and risk which will occur with development from Orewa north.

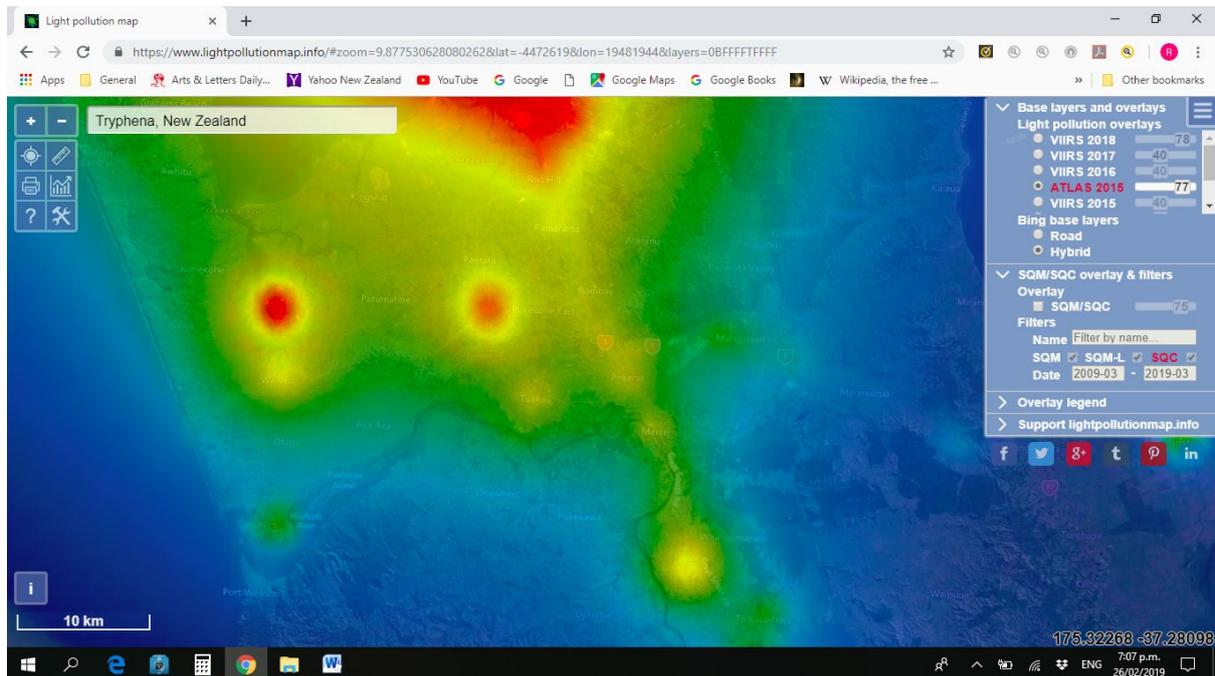
Map 3. Pukekohe and Pukekohe East

VIIRS 2018



Map 4. Pokeno and Pukekohe East

Light Pollution World Atlas 2015



The risk to the Barrier is that a significant light dome will develop from Orewa North over the next 15 to 20 years. The shorter distance from the epicentre of that development (40-45kms) means the light dome will overlap the boundaries of the Sanctuary.

5. NZTA AND AT STANDARDS AND PRACTICE

Across New Zealand the NZTA is funding the replacement of old-style street lights with dramatically more efficient LED technology. This is principally driven by efficiency cost savings. The shift offered an opportunity for a reconsideration of the level of light in urban areas. Unfortunately, internationally the upgrades have led to significantly brighter night environments. Other problems are related to the light colour temperature adopted with the new technology. The NZTA has set a standard of 4000Kelvins. This is at the 'middle' of a spectrum from blueish light to amber. Unfortunately, the Sanctuary standard is 3000K—toward the more amber end of the scale. The NZTA has recently approved standards for Tekapo and Stewart Island at the lower end of this scale (<3000K). This is not an immediate problem for Great Barrier as we have no street lights. But, street lights are the single greatest contributor to sky glow and the light domes in urban areas. It appears that the scattering effect of the bluer light adds to this problem, and that the problem affects areas a considerable distance from the light source. (Lui...reference). NZTA's standards (NZS1158) and practice are not seen to meet best practice from the IDA perspective. Auckland Transport has dramatically reduced light pollution through digital control systems, reducing the intensity of all lights after 11:00. This is very positive. However, from the Sanctuary's perspective, the impact of a dramatically increased light dome north of the current city centre warrants attention.

6. Blue Light Issues

Related to this issue, the Royal Society of New Zealand has recently published a paper on the harmful effects of blue light, which includes the white-blue component in the spectrum of modern LED street lights with K ratings >3000K.

7. PLANNING AND BOARD GOVERNANCE

It is worth stressing that the Sanctuary status goes beyond the island itself. It is not currently reflected in any city-wide planning documentation or regulatory structure. This needs to change. Casual activity in areas a long way from the Sanctuary can and will affect our light quality data. While the time frame is medium term, that is what plans are for: medium-term solutions to long-and-short term problems. I believe in this last stage of the triennium the Board needs to establish a case that it should be recognised as an interested party in all development proposals in areas which could affect our status. The Dark Sky criteria should be recognised within Auckland's Unitary planning documents at more than a local level.

8. ACTION STEPS

- a. Board Resolutions requesting an update on the Council's schedule for integrating the Hauraki Gulf District Plan into the Unitary Plan.
- b. Board resolutions requesting the Sanctuary be given formal planning status within the Council's parks management and planning regimes. Formal request that the Governing Body recognise the Sanctuary within its strategy planning documents
- c. Formal and informal Board approaches to Rodney Local Board to establish the status of the Sanctuary and recognising the Aotea Great Barrier Local Board as an interested party in planning decisions which might affect the night sky quality at Great Barrier
- d. Delegation to Auckland Transport regarding the establishment of CCT <3000Kelvin as the colour temperature rating for street lights north of Orewa.

9. CONSULTATION & SOURCES

This is not intended to be a technical paper. I have consulted widely with experts at the International Dark Sky Association, Auckland Transport, and Auckland Council's Planning officers. The errors, obviously, are my own. I have attached a short communication I have had with John Barentine from the IDA for your information.

Other sources include,

www.lightpollution.com

John Barentine Private Communication

Auckland Unitary Plan.

IDA private commentary re. NZS 1158 and street lighting practice in NZ



INTERNATIONAL DARK-SKY ASSOCIATION

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1 March 2019

Dear Richard,

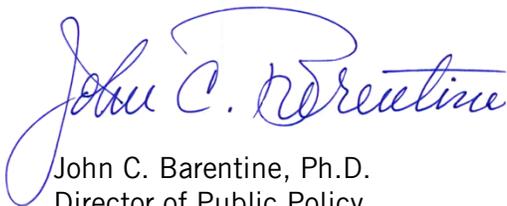
In follow up to our conversation on 27 February, this letter serves to communicate a few ideas relating to blue light that bear specifically on the issue of dark night skies.

Not all colours of light are the same in terms of how artificial light affects the nighttime environment. This is because light travels through the atmosphere between its source and the viewer. As it does, light interacts with molecules and small particles. Light behaves in different ways during these interactions depending on its colour. Rays of yellow, orange and red light are not affected very much by this. But the molecules and particles have a strong effect on other colours, in particular blue. The interaction is, in fact, so strong that blue light rays are often redirected in their travel. This is the main reason why the sky is blue during the day, rather than some other colour. It also explains why sunrises and sunsets, when the Sun is near the horizon, are often red and orange. The atmosphere scatters blue light rays away from their direction of travel, leaving the 'warmer' colours behind.

The same phenomenon yields an important effect on the brightness of the night sky. As it does to rays of sunlight, the atmosphere modifies rays from street lights. Most of this light reaches the ground, where it helps drivers see the road at night. But some of the light reflects from the ground and into the night sky. If care is not taken, street lights may emit some of their light directly into the sky. In many instances, that light travels at very shallow upward angles and traverses long paths through the atmosphere. These rays stand the best chance at being scattered back down to the ground rather than reaching space. These rays are most damaging to the quality of the night sky at large distances from the source.

To limit the influence of this effect, outdoor lighting should use the least amount of blue light possible. Lighting that appears 'warm' in colour to the eye tends to emit little blue light. The term "colour temperature" describes this quality. A larger number for colour temperature means that the source emits more blue than one with lower colour temperature. Lights with low colour temperature give enough light to ensure nighttime safety while helping to protect the night sky.

Regards,



John C. Barentine, Ph.D.
Director of Public Policy

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