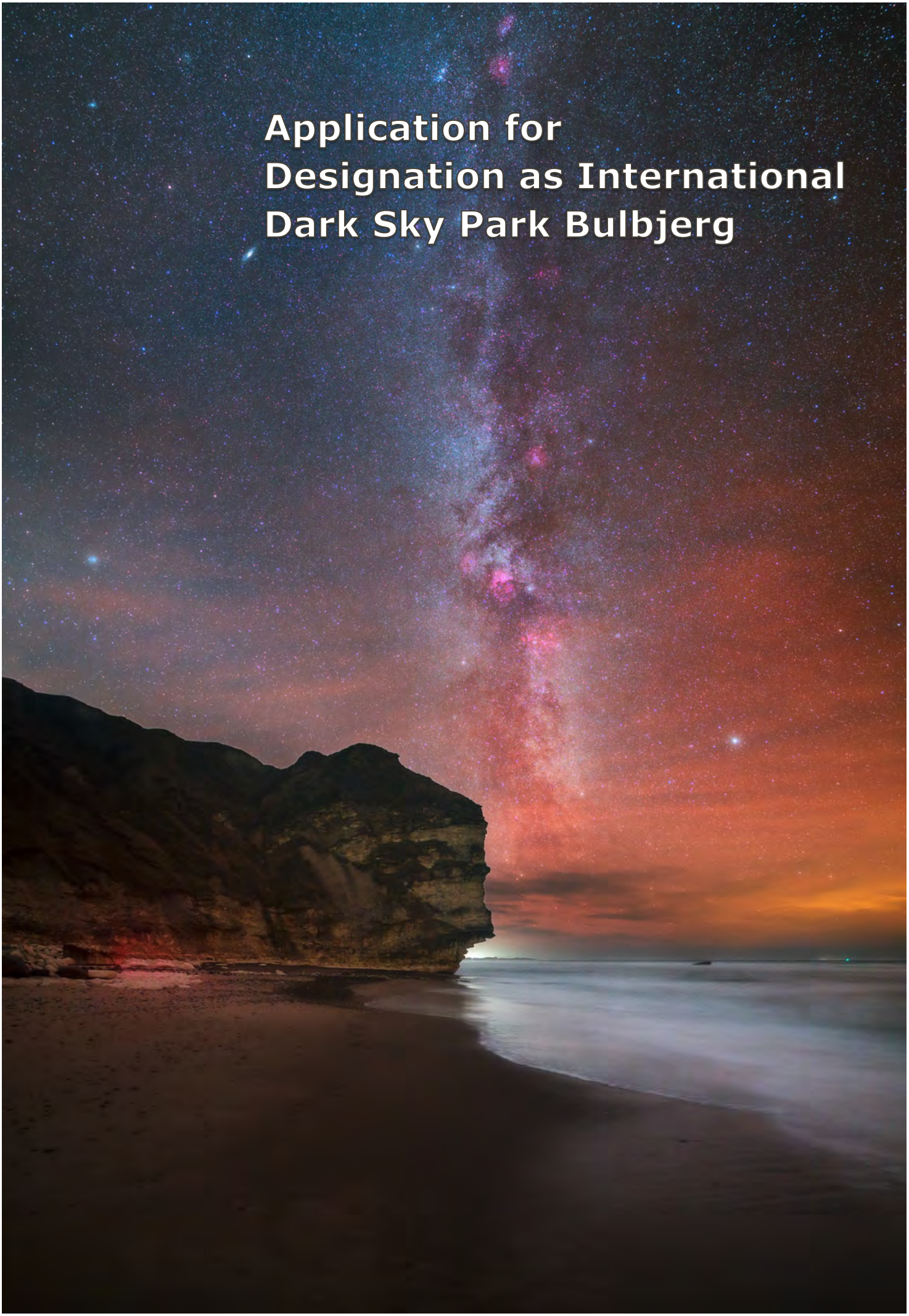
Application for Designation as International Dark Sky Park Bulbjerg



FUNDING OF APPLICATION :
Unpaid voluntary work by Hawboernes Forening’s Dark Sky Park Bulbjerg group
Expenses paid by donation from the foundation “Gudrun & Palle Mørchs Mindefond”, DK-Aalborg

GUDRUN & PALLE MØRCHS MINDEFOND

NIGHT SKY AT BULBJERG
Photo credit: Ruslan Merzlyakov

Contents

1	**Summary – Dark Sky Park Bulbjerg**	**6**
2	**Proposed area: Dark Sky Park Bulbjerg**	**7**
3	**IDA Member Letter of Nomination**	**11**
4	**Superintendent Letter of Support**	**12**
5	**Letters of Support – local actors and others**	**13**
6	**Partnership agreement – Danish Nature Agency and Hawboernes Forening**	**24**
6.1	The Danish Nature Agency	24
6.2	Hawboernes Forening (residents' association)	24
6.2.1	Lildstrand - A coalition for "small tourism" in a marginal place	25
6.3	The partnership agreement	26
6.4	Partnership agreement - in Danish	27
6.5	Partnership agreement - in English translation	31
7	**International Dark Sky Park Bulbjerg**	**36**
7.1	Description of area to be designated	36
7.1.1	Bulbjerg – a spectacular limestone slope and bird cliff	37
7.1.2	Troldsting	38
7.1.3	Lildstrand – a fishing hamlet surrounded by protected nature	38
7.1.4	Coastal nature in Thy in general	42
8	**Accessibility and ownership**	**44**
8.1	Public access 24/7 all year round	44
8.2	Ownership	44

9	**Outreach program**	**46**
9.1	Education of dark sky guides by Aarhus University	46
9.2	Events/Outreach 2022-2023	47
9.3	Planned Dark Sky events October-December 2023	60
9.4	Outreach on light pollution in the adjacent area	60
10	**Lighting legislation in dark skies context**	**65**
10.1	Regulation of road lighting in Denmark	65
10.1.1	HRL chapter 3.1.7 European standard DS/EN 13201	65
10.1.2	HRL chapter 3.2 Shielding classification	65
10.2	Signage and illumination in the open country	66
10.3	Inappropriate lighting of buildings	67
11	**Lightning Inventory and compliance**	**68**
12	**Lightscape Management Plan**	**70**
12.1	Lighting Inventory	70
12.2	Agreement with Thisted Municipality	71
12.3	Warranting	73
12.4	Light shielding	75
12.5	≤3000K CCT limit	75
12.6	Meets or surpasses local laws	75
12.7	Regulations for visitor nighttime use of light	75
12.8	Temporary lighting	76
12.9	Illuminated signage	76
13	**Night sky quality measurement report, SQM**	**77**
13.1	SQM measurement recording sheet 2021-September 2023	83
14	**Appendices to the DarkSky-application**	**87**
14.1	Fixtures TYPE 3 – Manufacturer's specification	88
14.2	Fixtures TYPE 4 – Manufacturer's specification	90
14.3	Examples of private outdoor lighting in Lildstrand	92
14.4	Accessibility 24/7 all year round	94
14.5	Nordic White Nights	95

14.6 Noctilucent clouds 97

Proposed Park: Dark Sky Park Bulbjerg - Denmark

Submitted by Hawboernes Forening, Rørslettevej 6, Lildstrand, DK-7741 Frøstrup (Denmark), CVR 36265159.

Affiliation: Dark Sky Park Bulbjerg project group set up by Hawboernes Forening.

Group members:

Birte Sivebæk (dark sky guide)
Chris Krogh (dark sky guide)
Susanne Fossgreen (dark sky guide)
Trine Græsbøl Eriksen (dark sky guide)
Thorkild Møller (dark sky guide)
Bjarne Sørensen (DarkSky member, DarkSky advocate, dark sky guide)
Anne-Mette Kristensen (DarkSky member, DarkSky advocate, dark sky guide)

HAWBOERNES FORENING
LILDSTRAND

A happy group of Lildstrand residents, Christmas 2021
Photo credit: Bjarne Sørensen

1 Summary – Dark Sky Park Bulbjerg

Dark Sky Park Bulbjerg is situated in the Thy region in the north-western part of Denmark along the shores of the North Sea. Bulbjerg coordinates are 57.1575° N, 9.0258° E. Park area Bulbjerg-Troldsting-Lildstrand: 12.54 km^2.

As part of Scandinavia northward on the globe, the Dark Sky Park Bulbjerg provides not only magnificent dark skies with an unspoiled view to moon, stars and the Milky Way. Also the Northern Lights are recurring occasionally.

Late April to start August in Dark Sky Park Bulbjerg is the season for the magnificent Nordic White Nights. See Appendix 14.4. – Very short and very bright nights, just the opposite of dark night skies, however also awesome in its own right.

Apart from scenic beauty with sea, dune heaths and dune forests, the Dark Sky Park area at Bulbjerg-Troldsting-Lildstrand offers visitors recreational opportunities, including wildlife viewing, photography and hiking. Due to its rather isolated yet easily accessible location in northwest Thy, the Dark Sky Park Bulbjerg is an ideal place to visit for night sky viewing all year round.

Northern Lights at Bulbjerg in springtime. Next stop: Norway.
Photo credit: Christian Faber
www.christianfaberfotos.dk

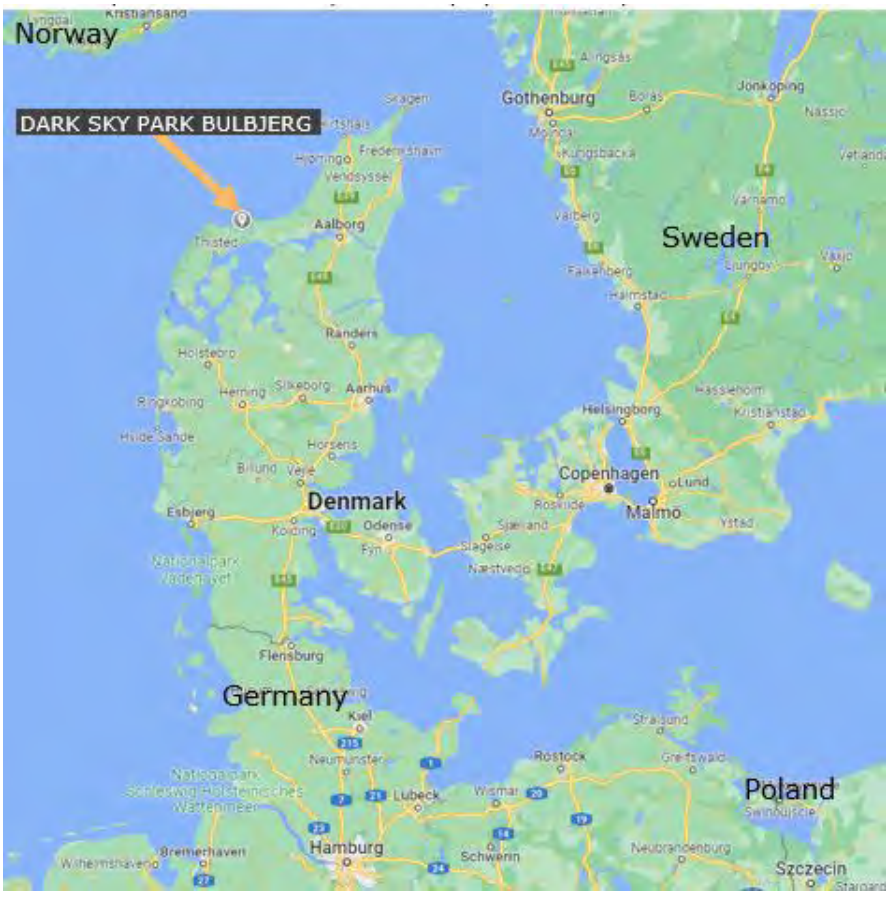
"Nordic White Night", Lildstrand East at midnight, June 2020. See Appendix 14.4.
Photo credit: Anne-Mette Kristensen

2 Proposed area: Dark Sky Park Bulbjerg

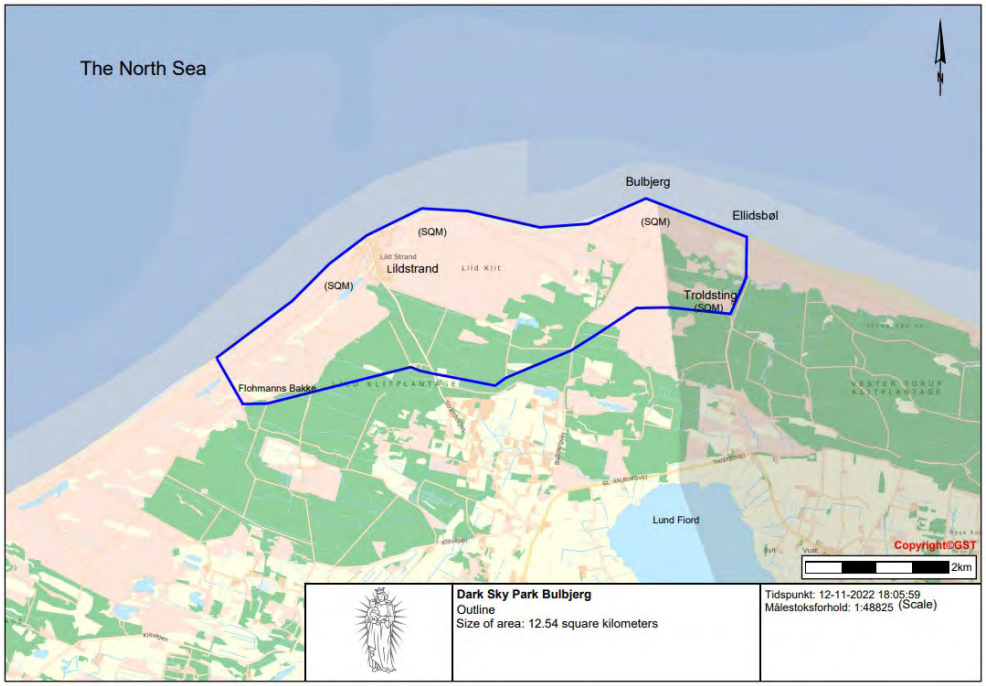
Dark Sky Park Bulbjerg (Bulbjerg-Troldsting-Lildstrand) is located in one of the darkest zones in Denmark: the northern part of region Thy. Size: 12.54 km^2. The category, the situation and the size of the park was approved by IDA, Diana del Solar and Adam Dalton in IDA-email dated December 11 2019 21:27 dianad@darksky.org and Cc adam@darksky.org.

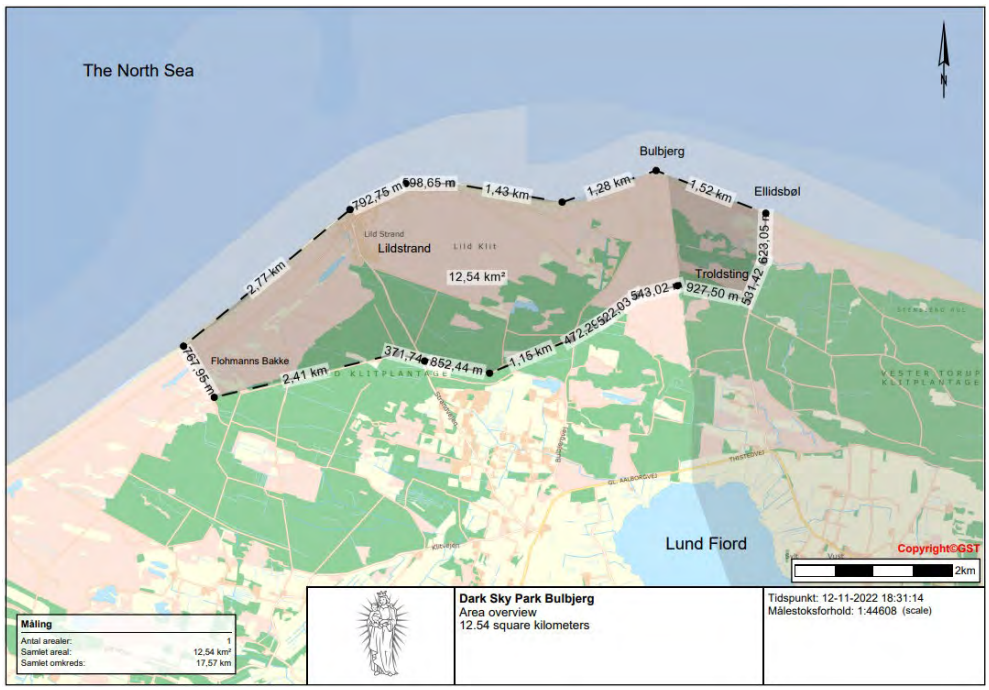
The Dark Sky Park Bulbjerg is stated as class 2 on the Bortle scale, 21.94-21.95 mag./arc sec2.

The small fishing hamlet Lildstrand is located in the southwestern end of the park area. Lighting from private households in Lildstrand (37 residents) is sparse and creates only a small amount of light pollution. Lildstrand is not considered a threat to the sky quality of the Dark Sky Park. The residents and the holiday home owners cherish the dark skies and therefore it is in their best interest to help Hawboernes Forening and the Danish Nature Agency maintain the Dark Sky Park. See description of the Dark Sky Park Bulbjerg area in Chapter 7.

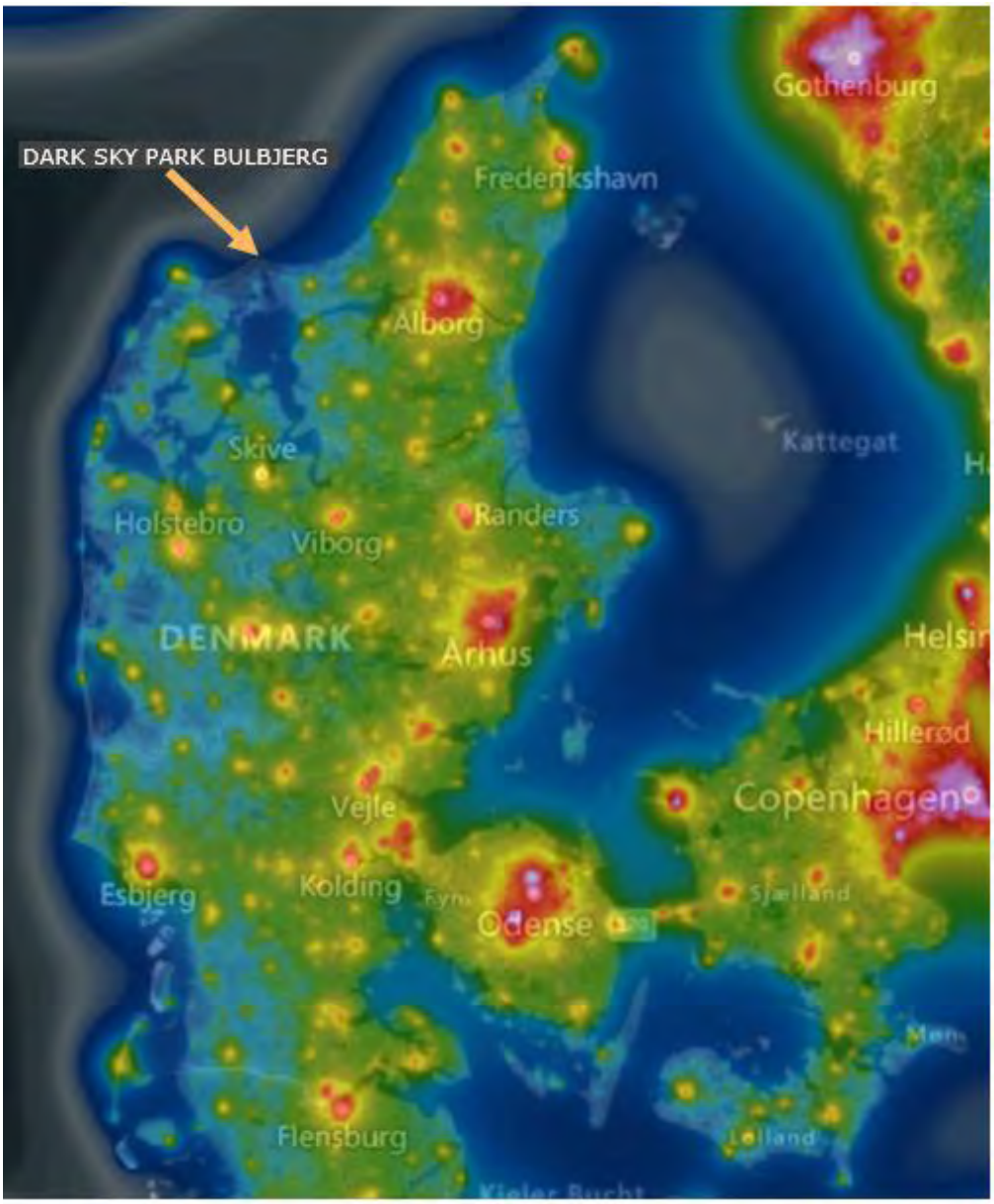


The two outlines below, “Outline” and “Area overview”, are made by the Hawboerne’s Forening’s Dark Sky Park group as appendices to the Dark Sky Park Bulbjerg partnership agreement with the Danish Nature Agency, see Chapter 6.





Light pollution map – Denmark



Website: https://www.lightpollutionmap.info – World Atlas 2015

The illustration above dates back to World Atlas 2015. As it appears from the map, Dark Sky Park Bulbjerg is situated close to the North Sea and to inland waterway Limfjorden. Except from urban area Lildstrand the Dark Sky Park is on protected unbuilt land. It borders to unbuilt land with dune heath and dune forest. Thus there seem to be no current or future threats to the Park's sky quality.

Light pollution map - Europe

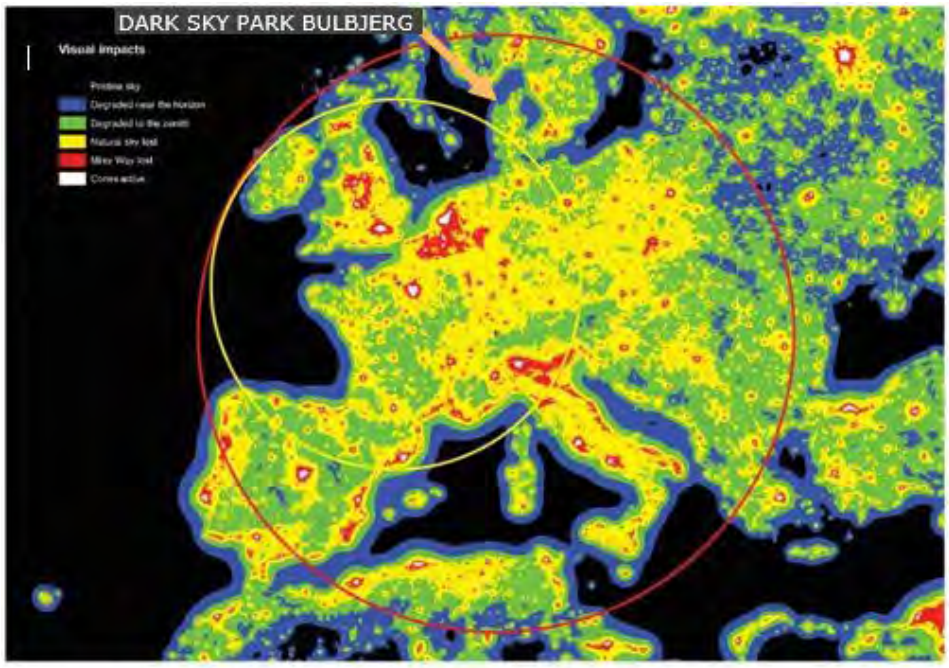


Fig. 9 Places on Earth farthest from pristine skies and unpolluted zenith skies.
The sky brightness levels used here indicate the following: up to 1% above the natural light (0 to 1.7 μcd/m^2; black); from 1 to 8% above the natural light (1.7 to 14 μcd/m^2; blue); from 8 to 50% above natural nighttime brightness (14 to 87 μcd/m^2; green); from 50% above natural to the level of light under which the Milky Way is no longer visible (87 to 688 μcd/m^2; yellow); from Milky Way loss to estimated cone stimulation (688 to 3000 μcd/m^2; red); and very high nighttime light intensities, with no dark adaption for human eyes (>3000 μcd/m^2; white). The circles indicate the distance toward arriving at large territories (that is, very small islands, such as Ile d'Ouessant, France, are not considered here), toward a sky relatively unpolluted at the zenith (yellow circle), and toward a pristine sky (red circle).

ScienceAdvances:

"More than 99% of the U.S. and European populations live under light-polluted skies. The Milky Way is hidden from more than one-third of humanity, including 60% of Europeans and nearly 80% of North Americans. Moreover, 23% of the world's land surfaces between 75°N and 60°S, 88% of Europe, and almost half of the United States experience light-polluted nights."

Website: https://www.science.org/doi/10.1126/sciadv.1600377

3 IDA Member Letter of Nomination

International Dark Sky Association
IDA Board of Directors
3223 N. First Avenue
Tucson Arizona 85719
USA

DK-Aalborg, January 13 2023

Letter of recommendation - Dark Sky Park Bulbjerg

Dear IDA Board of Directors,

In the spring of 2016, my wife and I had our new summer house built in Lildstrand, and we moved in at the start of the summer break, and did really enjoy the summer, featuring the fantastic bright Danish summer nights.

Being more familiar with the area, my wife had warned me that the winter nights are totally unique in that location, since it is one of the areas in Denmark with the very least amount of light pollution, and even the possibility occasionally to see the Northern Light in the horizon. Effectively one of the very few areas in Denmark with the maximum dynamic in the bright nights and dark skies.

One night in the fall that year we arrived late in a clear frosty evening, and I still vividly remember the overwhelmingly clear sight of the Milky Way and the endless sight to the universe - possible even just outside the summer house.
A unique sight we have enjoyed numerous times thereafter, and a sight we believe is uniquely important to cherish and protect.
Both my wife and I did grow an interest in protecting the Dark Skies and enrolled into the IDA first as members and now also Advocates.

And the learnings coming from being part of the IDA community are the reason for us to include the nomination of the area as a Dark Sky Park Bulbjerg as one of the cornerstones in the Masterplan for the area, that we both have been involved in over the last years, as voluntary work.

A designation of Dark Sky Park Bulbjerg will enable us to protect and promote the area and strengthen our opportunities as IDA Advocates to inform and educate inhabitants and visitors in the community regarding the protection of the dark sky.

The outreach we have had so far, do clearly show that there is a genuine interest in the project from all involved parties, and a designation of Dark Sky Park Bulbjerg will be a solid platform for expanding the IDA activities in this part of Denmark.

I hereby give the nomination of Dark Sky Park Bulbjerg my strongest recommendation.

Bjarne Sørensen

B.Sc. M.E.
Member and Advocate, International Dark Sky Association
Toften 29
9000 Aalborg, Denmark
Sandhojgaard.bjarne@gmail.com

4 Superintendent Letter of Support

HAWBOERNES FORENING

Lildstrand, January 15 2023

International Dark Sky Association
IDA Board of Directors
3223 N. First Avenue
Tucson Arizona 85719
USA

Superintendent Letter of Support – Nomination for an International Dark Sky Park Bulbjerg

Dear IDA Board of Directors,

It is with great pleasure that we are nominating Dark Sky Park Bulbjerg as an International Dark Sky Park.

Dark Sky Park Bulbjerg is a community driven project, starting from the idea of 2 members of Hawboernes Forening, a small local residents' association with approx. 175 members. The members are residents as well as holiday home owners in the local area, working together to preserve the unspoiled authenticity of the fishing hamlet Lildstrand and develop the local area based on the distinct values confined to the locality: tranquility, social cohesion, quiet tourism, artisanal fishing culture, scenic beauty, protected land and dark skies.

In general, residents, holiday home owners and Danish as well as foreign tourists choose the Lildstrand area just only out of love for the said distinct values which are very important for all of us to preserve and develop.

Locally, there is great enthusiasm for getting the asset of the Dark Skies above Bulbjerg-Troldsting-Lildstrand designated, appreciated and protected for generations to come. Also great enthusiasm for bringing astronomy to the attention of a wide audience and passion about the dark sky concept's benefits for nature, environment, biodiversity and human health, hence our partnership agreement with and recognition by the Danish Nature Agency. Also the local municipal authorities, the tourism industry and local accommodation providers welcome the Dark Sky Park Bulbjerg.

An IDA. designation is without doubt the best way of achieving this wider attention on issues, which are crucial not only for settlement and continued development in the local area Bulbjerg-Troldsting-Lildstrand but also for the larger Thy province as a whole. And also far beyond that!

Your approval of this application will encourage to further enthusiasm to maintain the uncorrupted dark skies, and where possible, improve them. It will create publicity at local as well as national level and generate increased "astro tourism" throughout the year.

Many thanks for the opportunity to apply for designation.

Dark Sky Park Group Hawboernes Forening Lildstrand / IDA-members and IDA Advocates

Bjarne Sørensen

Anne-Mette Kristensen

5 Letters of Support – local actors and others

NOTE! December 2022 the name of the proposed dark sky park was changed from "Dark Sky Park Thy" to "Dark Sky Park Bulbjerg".

Therefore, in the letters of support the dark sky park is called Dark Sky Park Thy. The dark sky area has not changed, but the letters of support were issued from May to October 2022. In December 2022, Hawboernes Forening's dark sky park group agreed with Director of Conservation, International Dark-Sky Association, Ashley Wilson, on changing the name into **DARK SKY PARK BULBJERG** thus reflecting a more precise location of the designated area.

On demand, each individual letter of support were made out in English by the issuing authority/organization. The letters are all reproduced on the following pages.

Ten important collaborators and congenial associations have willingly issued their individual letters of support to our project Dark Sky Park Bulbjerg (Thy):

1. Aarhus University, Department of Physics and Astronomy
2. Naturstyrelsen Thy (NST) – The Danish Nature Agency Thy
   website: https://eng.naturstyrelsen.dk/
3. Nationalpark Thy – National Park Thy
   website: https://eng.nationalparkthy.dk/
4. Thisted Kommune – Thisted Municipality
   website: https://www.thisted.dk/
5. Jammerbugt Kommune – Jammerbugt Municipality
   website: www.jammerbugt.dk
6. Danmarks Naturfredningsforening – The Danish society for Nature Conservation
   website: https://www.dn.dk/home/english-page/
7. Brorfelde Observatoriet – Brorfelde Observatory
   website: https://observatoriet.dk/
8. Destination Nordvestkysten – Tourist Organization working across municipal boarders
   website: https://www.visitnordvestkysten.dk/
9. Støtteforeningen Hannæs-Østerild – 8 resident organizations, all domiciled within or in the vicinity of the Dark Sky Park Bulbjerg
   (no website)
10. Per Tybjerg Aldrich, lysforureningsekspert – expert on light pollution, website www.lysforurening.dk

AARHUS UNIVERSITY
DEPARTMENT OF PHYSICS AND ASTRONOMY

Letter of support to:
DARK SKY PARK BULBJERG

Everyone can be amazed by staring into the seemingly endless stary night sky. To expirience a truly magnificant dark sky is something everyone should have easy access to. Therefore, we at Aarhus University, Department of Physics and Astronomy, support any initiative to make this available to the public and thereby strongly support the initiative of Dark Sky Park Bulbjerg.

Aarhus University is already supporting Dark Sky initiatives at Anholt and on Mandø and with Dark Sky Park Bulbjerg anyone in western Denmark will be able to expirience the stars in the best conditions possible.

Aarhus University hosts the Ole Rømer Observatory, Observatorievejen 1, 8000 Aarhus, which is being fully renovated (2022/2023) and will be the center for outreach activities in relation to the night sky in Aarhus. Even after renovation light pollution from Aarhus will highly affect the experience when visitors look at stars with or without a telescope from this location. Dark Sky Park Bulbjerg will be one of the closest Dark Sky Parks to Aarhus and will be an obvious location to suggest to visitors at the Ole Rømer Observatory, guest at public lectures and other outreach activities. Aarhus University additionally operates telescopes globally where light pollution is one factor to take into account when selecting a location to put up new telescopes. Activities to enlight and teach the general public in the effects of light pollution is therefore highly appreciated.

We, at Aarhus University, therefore recommend and fully support the application from Dark Sky Park Bulbjerg to become a certified Dark Sky Park in north western Denmark.

Department of Physics and Astronomy
Aarhus University

Mads Fredslund Andersen

Telescope and satellite manager

Mobile: +45 21527146
E-mail: madsfa@phys.au.dk

Date: January 24th 2023
Signed by:

Mads Fredslund Andersen

Department of Physics and Astronomy
Aarhus University
120 Ny Munkegade, Building 1520
DK-8000 Aarhus C

Hawboernes Forening
Attn.: Dark Sky Thy-gruppen
v. Bjarne Sørensen og Anne-Mette Kristensen
Strandvejen 83c, Lildstrand
DK-7741 Frøstrup

Thy
Ref. MOBST
J.nr. 21/15026
12. August 2022

Letter of support

Recommendation of Dark Sky Park ("Dark Sky Thy") at Bulbjerg, Troldsting and Lildstrand, Denmark

Hawboernes Forening, Lildstrand aims at achieving certification for the area Bulbjerg, Troldsting and Lild Strand as a Dark Sky Park. The development project was launched in 2019, and so far the certification process has been granted financial support from Gudrun and Palle Mørch's Memorial Foundation.

The Danish Nature Agency, Division Thy, under the Ministry of the Environment owns and manages the majority of the conservation areas which will form the basis of a Dark Sky Park at Bulbjerg, Troldsting and Lild Strand. The Danish Nature Agency manages the conservation areas with the aim of maintaining a subtle balance between protection of existing natural amenities and facilitation of unique experiences for the many visitors to the area.

The dark sky project benefits nature and the environment and, not least, the opportunity to enjoy stars in the night sky. Furthermore, the project has a number of positive effects for sustainable tourism in the municipality. The Danish Nature Agency supports the application for certification of the second Danish Dark Sky Park ("Dark Sky Thy") at Bulbjerg, Troldsting and Lild Strand. The Danish Nature Agency will however continue to manage and develop the state-owned areas included in the possible "Dark Sky Thy" area in accordance with the Danish Nature Agency's existing management priorities.

On behalf of Naturstyrelsen Thy / The Danish Nature Agency, Division Thy

Date: 12 August 2022

Forest superintendent Ole Noe

Naturstyrelsen Thy: The Danish Nature Agency https://eng.naturstyrelsen.dk/

NATIONALPARK THY

International Dark-Sky Association

Nationalpark Thy
Vesterhavsgade 168
Nr. Vorupør
DK-7700 Thisted

Tlf.: 72 54 15 00
CVR: 32995462
EAN: 5798000860568

thy@danmarksnationalparker.dk
www.nationalparkthy.dk

Ref. ELOES
Den 9. maj 2022

Letter of support – Dark Sky Thy

The association "Hawboernes Forening, Lildstrand" in Denmark (in the following called "HFL") works on an application for IDA certification of the area Bulbjerg – Troldsting – Lildstrand as Dark Sky Park, named Dark Sky Thy. We have learned, that the area is already pre-approved by IDA.

Thy National Park is the oldest Danish National Park, and was inaugurated in 2008. It covers 244 km^2, and is situated ca. 20 km from Lildstrand. The area in between comprises mainly of protected dune landscapes and forest plantations. Most of it is owned by the Danish Nature Agency.

In addition to the application for IDA certification, HFL has also proposed, that Thy National Park should be extended, and some time in the future also could include the Bulbjerg – Troldsting – Lildstrand area. This proposal lies at the moment at the desk of the Danish Minister of Environment.

Dark Sky Thy will be an attractive extra experience also for visitors to the Nationalpark Park. Furthermore Dark Sky Thy will also put into the mind of the locals, that the dark night sky is a vuluable asset in the modern world – and a value, that should be protected from pollution by light. If the proposal for expansion of Thy National Park with the area will be implemented in the years to come, Dark Sky Thy will be situated within the borders of Thy National Park.

Hereby we wish to confirm, that Thy National Park acknowledge the efforts to get the protected nature area as well as the little coastal village Lildstrand certified as a Dark Sky Park.

In general, together with the IDA objective, the Dark Sky Thy project focuses on environment, energy savings, sustainability, nature conservation, biodiversity and cultural dissemination. All issues of fundamental value to Thy National Park. Furthermore, certification is expected to have positive effects on year-round tourism and local business community in Northwest Jutland.

On this basis, Thy National Park can give our recommendation and full support to HFL's work with certification of Dark Sky Thy at Bulbjerg-Troldsting-Lildstrand.

Kind regards,

Else Østergaard Andersen
Chief Executive, M.Sc. & MPA
National Park Thy

Nationalpark Thy (Denmark's Greatest Wilderness): https://eng.national-parkthy.dk/

Hawboernes Forening
Harebakkevej 1
Lildstrand
7741 Frøstrup

THISTED KOMMUNE

Erhverv og Beskæftigelse, Erhverv og Virksomhedsservice

6. september 2022

SagsID.: 24.05.00-P20-2-19
Medarbejder: HEJ

Letter of Support – Dark Sky Park Thy

The association "Hawboernes Forening" in Lildstrand, Denmark, applies for IDA certification of the area Bulbjerg–Troldsting–Lildstrand as Dark Sky Park, named Dark Sky Park Thy. We are informed that the area is already pre-approved by the International Dark Sky Certification, IDA, and that the Danish Nature Agency Thy supports the initiative.

The Dark Sky Park Thy project focuses on the environment, sustainability, nature conservation, biodiversity, energy savings and cultural dissemination. All issues of fundamental value to our municipality and our region. Furthermore, Dark Sky Park Thy will make both locals and visitors aware that the dark night sky is a valuable asset in the modern world – and a value that should be protected from pollution by light. Last, but not least, certification is expected to have positive effects on all year tourism and local businesses in our municipality.

Therefore Thisted Municipality gives our recommendation and support to Hawboernes Forening's efforts for achieving certification of Dark Sky Park Thy at Bulbjerg-Troldsting-Lildstrand.

Kind regards,

Trine Engholm Christensen
Manager of Business and Employment

Thisted Kommune, Skolegade 4, 7700 Thisted
+4599171717 - thistedkommune@thisted.dk - www.thisted.dk - CVR 2918 9560

Thisted Municipality: https://www.thisted.dk

JAMMERBUGT KOMMUNE

Vækst og Udvikling
Erhverv og turisme
Toftevej 43, 9440 Aabybro
Tlf.: 7257 7777
raadhus@jammerbugt.dk
www.jammerbugt.dk

Anna Oosterhof
Direkte 4191 1185
aoo@jammerbugt.dk

14-10-2022

Hawboernes Forening
Harebakkevej 1
Lildstrand
7741 Frøstrup

Letter of Support – Dark Sky Park Thy

The association "Hawboernes Forening" in Lildstrand, Denmark, is applying for the IDA certification of the area Bulbjerg- Troldsting – Lildstrand as Dark Sky Park.

We´ve experienced, that the area already is pre-qualified by the International Dark Sky Certification (IDA) and the initiative is fully supported by Naturstyrelsen, the Danish Nature Agency.

The Dark Sky Park Thy is situated between Thisted- and Jammerbugt municipalities. The protected area will attract nature-based tourists, because of the natural attractions of the area. Nature Tourism is important for Jammerbugt Municipality, as it allows people to see and appreciate the beauty of our natural environment.

Therefore, Jammerbugt Municipality gives our recommendation and support to Hawboernes Forenings efforts, in order to achieve the certification of Dark Sky Park Thy at Bulbjerg- Troldsting – Lildstrand.

Venlig hilsen

Best regards

Anna Oosterhof
Head af local development and Tourism

DN THY

Formand: Ib Nord Nielsen, Michel Wester 17A, Klitmøller, 7700 Thisted
Telefon: +45 40 57 93 23, e-mail: ib.nord.nielsen@gmail.com

Danmarks Naturfredningsforening

Date: 10. august 2022

To: Hawboernes Forening – Harebakkevej 1 – Lildstrand – 7741 Frøstrup

Letter of Support to "Dark Sky Park Thy"

Hawboernes Forening, DK-Lildstrand, wish to be certified as Dark Sky Park Thy.

They launched the project in 2017, and the area suggested, Bulbjerg-Troldsting-Lildstrand, has already been pre-approved by IDA.

The Danish Society for Nature Conservation (DN Thy) supports the Dark Sky Park Thy project because it aims of protecting the natural environment and will call attention to the problems connected with the worldwide light contamination of our mutual night sky.

The project will also encourage people to enjoy and learn more about the night sky and increase awareness of opportune lighting equipment, both private and in public. Presumably, it will further develop the **quiet** tourism in respect of local nature and potentials which is a stated objective in the Master Plan Lildstrand elaborated by the residents and summerhouse owners in the area.

For these reasons we can recommend and give our full support to Hawboernes' application for certification as Dark Sky Park Thy and wish them the best of luck with the initiative.

On behalf of the Board of DN Thy

Ib Nord Nielsen
Chairman
DN Thy

The Danish society for Nature Conservation: https://www.dn.dk/home/english-page/

Observatoriet i Brorfelde den 29. august 2022

To:

Hawboernes Forening, Harebakkevej 1, Lildstrand, DK-7741 Frostrup

Letter of Support to Dark Sky Park Thy

The Observatory is a science park introducing visitors to the wonders of astronomy. We do what we can to make discovering the universe's secrets palpable to our visitors, hoping to make their visit both fun and meaningful. The preservation order of the area around The Observatory includes preservation of dark skies which means that we have unique opportunities to observe the night sky undisturbed by light pollution.

Dark Sky certification of the area Bulbjerg-Troldsting-Lildstrand in Thy at the Danish North Sea coast may help to create increased awareness of the importance of darkness for our culture and nature and help to dedicate more areas to observation of the night sky. We can also expect Dark Sky certification to encourage much more of a desirable interest and enthusiasm for astronomy and science generally among the public.

The Dark Sky Park Thy project will help to ensure that our actions are more environmentally friendly. The project itself is beneficial to the natural environment and, not least, it encourages people to enjoy the night sky.

For these reasons we can recommend and give our unconditional support to the creation of Dark Sky Park Thy. We support the project and will in future continue to give our support within the framework that is our mandate.

On behalf of The Observatory

Julie K. L. Bouchet
Head of the Observatory

Brorfelde Observatory: https://observatoriet.dk/

To:

Hawboernes Forening, Lildstrand, Harebakkevej 1, Lildstrand, DK-7741 Frøstrup

Date: 15 August 2022

Letter of Support – Dark Sky Park Thy

Hawboernes Forening and a number of stakeholders wish to obtain certification as Dark Sky Park Thy. The process was launched in 2018, proposed area became approved by the IDA 2019, and light measurements 2021-2022 have proved very satisfactory. The process is therefore well-established.

Destination Nordvestkysten holds the responsibility for developing Coastal Tourism along the Danish Northwest Sea coast and we aim to promote progress in the Danish Coastal Tourism sector.
We collaborate closely with local, regional and national stakeholders, such as, but not limited to, municipalities, key private stakeholders, commercial entities as well as public national tourism organizations.

We focus on five main tasks; Destination marketing, product development, hospitality, activation of the shoulder seasons and securing political support. The development of new attractions – as e.g. the Dark Sky Park Thy - and signature experiences capable of attracting international attention is vital to ensure the needed quality boost in the Danish Coastal Tourism industry.

So far, Denmark has only one certified Dark Sky Park: Møn-Nyord, two small islands situated in the Baltic in the south-easterly corner of Denmark. Situated in the direct opposite north-westerly corner of Denmark and in a quite different landscape , the Dark Sky Park Thy will utilize local nature potentials and facilities and add a new dimension to the experience of the famous magnificent, untamed nature in Thy.

However, a Dark Sky Park Thy will be of significance not only locally but also regionally, even nationally and internationally, providing tourists' with yet another great and sustainable experience in the landscape of Thy, Denmark's greatest wilderness and homeland of the famous Nationalpark Thy.

Offering a breathtaking experience during the long autumn and winter darkness, Dark Sky Park Thy will attract tourists during low-seasons and thus be of valuable benefit to the tourist trade.

Tourists are becoming more and more conscious of the need for sustainability. Apart from providing visitors with an ever memorable experience of the dark of night, the Milky Way and the myriad of stars, a Dark Sky Park also puts focus on nature, biodiversity, human health and consequences of light pollution, thus stimulating curiosity and awareness, no matter if you are an adult or a child.

For these reasons Destination Nordvestkysten fully supports the project and is looking forward to be able to advertise possibilities of nightly visits to a certified Dark Sky Park Thy in the northern part of Denmark.

On behalf of Destination Nordvestkysten

Peter Krusborg, CEO

Destination Nordvestkysten: https://www.visit-nordvestkysten.com/

To: Hawboernes Forening – Harebakkevej 1 – Lildstrand – 7741 Frøstrup

Date: August 2022

Letter of Support to "Dark Sky Park Thy"

Hawboernes Forening, DK-Lildstrand, and a number of stakeholders wish to be certified as Dark Sky Park Thy. Hawboernes Forening launched the Dark Sky Thy project in 2017, and the area suggested, Bulbjerg-Troldsting-Lildstrand, became pre-approved by IDA in 2020.

The umbrella body "Støtteforeningen Hannæs-Østerild" - representing eight residents organizations from different towns and villages in our local region - makes a plea for the Dark Sky Park Thy project because it supports the local wish for quiet sustainable tourism, aims of protecting the natural environment and because it will call attention to the problems connected with the worldwide light pollution of our mutual night sky.

The project will also encourage people to enjoy and learn more about the night sky and increase awareness of opportune lighting equipment, both private and in public. Moreover, it is an initiative which supports the objectives described in Master Plan Hannæs-Østerild elaborated by "Støtteforeningen Hannæs-Østerild" in order to promote business development, quiet sustainable all year tourism and the environment locally.

We recommend and give our whole-hearted support to Hawboernes' application for certification as Dark Sky Park Thy and are looking forward to having a certified dark sky park in our region.

On behalf of "Støtteforeningen Hannæs-Østerild"

Frank Koldsgaard
Chairman

2022 September 13

Hawboernes Forening
Hawboernes Hus
Harebakkevej 1, Lildstrand
7741 Frøstrup

Letter of Support – Dark Sky Park Thy

Hawboernes Forening at Lildstrand wish to create a Dark Sky Park Thy in the area Bulbjerg-Troldsting-Lildstrand and to obtain a Dark Sky Park certificate from the International Dark-Sky Association.

A Dark Sky Park represents an opportunity to let tourists and other people experience the natural darkness at night and a night sky relatively free from light pollution. At the same time, a Dark Sky Park can inform and educate visitors about light pollution, its causes, its consequences for humans, fauna and flora, and its solutions – i.e., how to reduce light pollution. In this way Dark Sky Parks can pave the road for artificial light at night with less environmental impact at large.

The area Bulbjerg-Troldsting-Lildstrand is one of the darkest locations in Denmark. Thus, it is obvious to create a Dark Sky Park in the area. Geographically it will also complement the certified Dark Sky Park Møn-Nyord and the Dark Sky Parks *in spe* at Mandø, Anholt and Samsø.

From these reasons **lysforurening.dk** – a site devoted to objective information about all aspects of light pollution since 1998 – can recommend and give its full support to the application for certification of Dark Sky Park Thy and wish Hawboernes Forening best of luck with the initiative.

On behalf of **lysforurening.dk**

Per Tybjerg Aldrich
Editor in Chief

Redaktør	Telefon	E-mail	www
Per Tybjerg Aldrich	+45 23 72 89 91	per@aldrich.dk	lysforurening.dk

[Lysforurening = Light pollution]

6 Partnership agreement – Danish Nature Agency and Hawboernes Forening

6.1 The Danish Nature Agency

The Danish Nature Agency is an agency under the Danish Ministry of Environment which manages tasks in forest, natural areas and along the shores of Denmark.

The Danish Nature Agency manages the Ministry's approximately 200,000 hectares of forests and protected land to create the greatest possible value for society in terms of good conditions for outdoor recreation, nature protection and efficient operation of the Agency's forests and other nature reserves.

The Danish Nature Agency carries out practical tasks within hunting and game management and specific outdoor and nature projects – often in collaboration with other organizations and volunteers.

The Danish Nature Agency, local unit Thy, carries out nature guidance in the form of public events, which can be found on website www.nst.dk. It is also possible for school classes, associations and other groups to book trips and propose events by contacting the Danish Nature Agency, Thy.

The Agency's operational plans describe how forests and natural areas are to be managed and cared for. The plans are valid for 15 years at a time, with a planned revision once or twice during the period.

The Agency's Natura 2000 care plans follow up on the Danish Natura 2000 plans, and they describe the measures to be taken to care for and protect the habitat nature and a number of special animal and plant species.

Natura 2000: Stretching over 18% of the EU's land area and more than 8% of its marine territory, Natura 2000 is the largest coordinated network of protected areas in the world. It offers a haven to Europe's most valuable and threatened species and habitats.

6.2 Hawboernes Forening (residents' association)

Hawboernes Forening has approx. 180 members, both permanent residents in Lildstrand and holiday home owners in the area.

The association works on a voluntary unpaid basis to maintain social cohesion and to promote a positive development in Lildstrand, including entering into dialogue with local authorities about development projects.

The development group under the Hawboernes Forening has prepared Master Plan Lildstrand 2018-2025 based on debates and input at general meetings and public meetings in 2017-2022. Dark Sky Park Bulbjerg is part of this master plan.

The development projects in Lildstrand, initiated by Hawboernes Forening, have been subject of a research study during the Innocoast project 2016-2019.
See links and abstract article/peer-review under 6.2.1.

6.2.1 Lildstrand - A coalition for “small tourism” in a marginal place

The voluntary work of the development group was described in peer-review “A coalition for “small tourism” in a marginal place: Configuring a geo-social position”. Roskilde University, Denmark.
ELSEVIER, Journal of Rural Studies, Volume 87, 12 pages (from-to) 169-180, ISSN 0743-0167, published October 2021.

Abstract

This paper analyses a case of mobilisation for ‘small tourism’ where a coalition of actors in distant rural communities unite to cope with limited possibilities in ways that are meaningful to them. The theoretical bases for the analysis are resilience theory and the concept of geo-social position, the latter of which implies a reorientation to an ‘earthly’ commitment to the environment where people live ‘down to earth’ (Latour, 2018). The case study focuses on the coastal hamlet of Lildstrand, a marginal place in Northern Jutland, Denmark, whose permanent population and fisheries are in decline. Since 2017, a coalition of locals and second-home owners have mobilised for several parallel initiatives, including a series of development workshops and other events, a master plan for Lildstrand 2030, plans for the extension of a national park, new small-scale tourist designs, mass-media presence, and various lobbying for development. It is a case of citizen-driven tourism where a coalition of actors enthusiastic about the place seek slow and modest tourism activities, drawing on resources belonging to the area and its natural and cultural heritage. Key findings include how engagements emerged from familiarity with, detailed descriptions of, and plans for the local environment, and how the coalition managed to come about by uniting voluntary work across permanent and temporary residents as well as other actors committed to developing the location. Common to the commitments of this coalition is the relationship and engagement with the local environment as a common good. We suggest that the making of the coalition should be understood as a configuration of a geo-social position that is central in driving the mobilisation. This research illuminates general conditions and possibilities for the development of rural communities in peripheral regions. There is a need to collect knowledge on how different types of tourism can be used to help actors address local needs in such areas.

UN SDGs
This output contributes to the following UN Sustainable Development Goals (SDGs)

Link to document
10.1016/j.jrurstud.2021.09.010
Licence: CC BY-NC-ND

A coalition for ‘small tourism’ in a marginal place: Configuring a geo-social position
Final published version, 4.64 MB
Licence: CC BY-NC-ND

Links:https://forskning.ruc.dk/en/publications/a-coalition-for-small-tourism-in-a-marginal-place-configuring-a-g

Bærenholdt, J. O., Fuglsang, L., & Sundbo, J. (2021). A coalition for 'small tourism' in a marginal place: Configuring a geo-social position. *Journal of Rural Studies*, *87*, 169-180. https://doi.org/10.1016/j.jrurstud.2021.09.010

Website (DK) https://hawboerne.dk/lildstrand-som-case

Website (DK) https://hawboerne.dk/masterplan-lildstrand

Late evening at Bulbjerg
Photo credit:Katharina Fossgreen

6.3 The partnership agreement

Hawboernes Forening and the Danish Nature Agency have signed a mutual partnership agreement with rules and regulations for IDA (DarkSky)-certified Dark Sky Park Bulbjerg.

Park area, purpose, communication, organization, responsibility, access and use are specified in the signed agreement.

The partnership agreement is reproduced on the next pages, in Danish as well as the English translation hereof.

6.4 Partnership agreement - in Danish

HAWBOERNES FORENING LILDSTRAND

Miljøministeriet
Naturstyrelsen

Naturstyrelsen Thy
Ref. MOBST
Den 5. januar 2023

Partnerskabsaftale vedr. Dark Sky Park Bulbjerg

1. Aftaleparter
Denne aftale er indgået mellem:

Naturstyrelsen Thy, Vester Vandet, Søholtvej 6, 7700 Thisted, CVR 33157274 (herefter NST)

NSTs kontaktperson på denne aftale er: Morten Brown Stummann, tlf. 72543981/22221650 og e-mail: mobst@nst.dk

og

Hawboernes Forening, Lild Strand, Rørslettevej 6, 7741 Lildstrand, CVR 36265159 (herefter Hawboernes Forening)

Hawboernes Forenings kontaktpersoner på denne aftale er: Bjarne Sørensen og Anne-Mette Kristensen, hawboerne@gmail.com

2. Omfang
Denne aftale omfatter dele af Lild og Vester Thorup plantager. Se kortbilag.

Aftalen omfatter alene certificering af Dark Sky Park Bulbjerg på arealet. Evt. faciliteter medtages i en tillægsaftale.

Naturstyrelsen stiller – qua statens forvalter af naturarealer i Thy – de omhandlede skov- og naturarealer til rådighed som Dark Sky Park Bulbjerg med adgang jævnfør den til enhver tid gældende lovgivning. Naturstyrelsen skal også fortsat kunne disponere over og udvikle de statsejede arealer.

Formidling af Dark Sky Park Bulbjerg på styrelsens arealer vil ske i dialog med NST THY og inden for styrelsens design og gældende skilte- og formidlingsprogram. Partnerskabet forpligter ikke Naturstyrelsen herudover. Der skal indgås separate aftaler og hjemsøges de nødvendige myndighedstilladelser ifm. anlæggelse af evt. friluftsfaciliteter.

3. Formål
Området Bulbjerg-Troldsting-Lildstrand er et af de få steder i Danmark med meget dybt nattemørke. Dette fænomen har inspireret parterne til et samarbejde om certificering.

Denne skal bruges aktivt til at tilbyde særlige naturoplevelser og formidle viden om nattemørkets betydning for at vække interesse, nysgerrighed og påvirke til bæredygtig adfærd. Certificering forventes dermed at motivere flere børn og voksne til at opleve nattehimlen og generelt skabe øget interesse for friluftsliv, natur og astronomi.

Specifikt:

* at sætte fokus på den stadigt voksende lysforurenings skadelige virkninger på natur, mennesker, miljø og klima og påpege nødvendigheden af at beskytte nattemørket.

* at formidle viden om, hvordan man som individ kan være med til at beskytte nattemørket ved hensigtsmæssig brug af belysning.

4. Etablering af Dark Sky Park Bulbjerg

Certificeringen af Dark Sky Park Bulbjerg foretages af Hawboernes Forening efter forudgående aftale med NST. Den videre planlægning af Dark Sky Park Bulbjerg skal foregå i dialog mellem parterne.

5. Anvendelse af Dark Sky Park Bulbjerg

Arealet er offentligt tilgængeligt. Enhver begrænsning af offentlighedens adgang til det af partnerskabet omfattede areal skal godkendes af NST.

6. Retningslinjer for brug af arealet

Der skal søges tilladelse hos NST, hvis der ønskes afholdt aktiviteter, som kræver NST's tilladelse: https://naturstyrelsen.dk/naturoplevelser/skal-jeg-have-tilladelse-til-min-aktivitet/.

NST kan kræve betaling ved brug af NSTs arealer i forbindelse med afholdelse af arrangementer. Se NSTs retningslinjer for betaling på hjemmesiden her: https://naturstyrelsen.dk/naturoplevelser/skal-jeg-have-tilladelse-til-min-aktivitet/hvornaar-skal-jeg-betale/

De konkrete retningslinjer for det aktuelle arrangement, der kræver NSTs tilladelse, aftales nærmere med NST inden arrangementet.

7. Fordeling af arbejdsopgaver

Hawboernes Forening står for udarbejdelse af ansøgning om IDA-certificering, for afholdelse af årlige arrangementer samt for udarbejdelse af den årlige rapport, som er beskrevet i IDA's regelsæt.

Foreningens arrangementer tilrettelægges i samråd med Naturstyrelsen Thy, så dark sky-arrangementer koordineres parterne imellem. Hawboernes direkte formidling af Dark Sky Park Bulbjerg-området skal være så afdæmpet som muligt af hensyn til naturen i området, herunder særligt dyrelivet.

- 2 -

Naturformidling i form af dark sky-arrangementer i regi af Naturstyrelsen sker alene i den udstrækning og form, som Naturstyrelsen løbende finder formålstjenligt i henhold til eget regelsæt, økonomi og øvrigt publikumsprogram.

8. Kommunikation

Aftaleparterne forpligter sig til at promovere faciliteten og samarbejdet generelt.

På alle materialer om det aftalte i nærværende partnerskabsaftale, på kort, skilte, foldere, nyhedsbreve eller annoncer skal begge parter angives. Ved skriftlig formidling om samarbejdet, herunder ved anvendelse af NSTs logo, skal NST kontaktes, da designet skal overholde retningslinjerne i NSTs designmanual. Retningslinjerne udleveres efter behov.

Specifik omtale i medierne af projektet og samarbejdet mellem parterne må kun ske efter forudgående aftale med NST.

NST sørger for, at Dark Sky Park Bulbjerg lægges ind på på www.udinaturen.dk samt opdaterer ved behov, fx beskrivelse, billeder mv.

9. Aftalens varighed og opsigelse

Aftalen træder i kraft den 1. januar 2023 og løber indtil videre. Aftalen kan i aftaleperioden af parterne skriftligt varsles til genforhandling og/eller forlængelse med et varsel på 6 måneder til den 1. i en måned.

Aftalen kan af parterne skriftligt opsiges med et varsel på 12 måneder til den 1. i en måned. Ved opsigelse af aftalen har Hawboernes Forening ingen rettigheder i forhold til arealet og/eller faciliteten udover de rettigheder, der er tilsikret offentligheden.

10. Misligholdelse

Såfremt Hawboernes Forening væsentligt misligholder sine forpligtelser i henhold til denne aftale, og misligholdelsen ikke bringes til ophør inden udløbet af en af NST rimelig meddelt tidsfrist, er NST berettiget til at ophæve aftalen med øjeblikkelig virkning.

Ved ophævelse af aftalen har Hawboernes Forening ingen rettigheder i forhold til arealet og/eller faciliteten udover de rettigheder, der er tilsikret offentligheden.

Ved misligholdelse kan NST/parterne i øvrigt påberåbe sig sædvanlige misligholdelsesbeføjelser.

11. Overdragelse

Hawboernes Forening kan ikke uden NSTs skriftlige accept overdrage sine rettigheder og forpligtelser i henhold til denne aftale til tredjemand.

12. Underskrifter

På vegne af Hawboernes Forening:

5. januar 2023

Anne-Mette Kristensen

Bjarne Sørensen

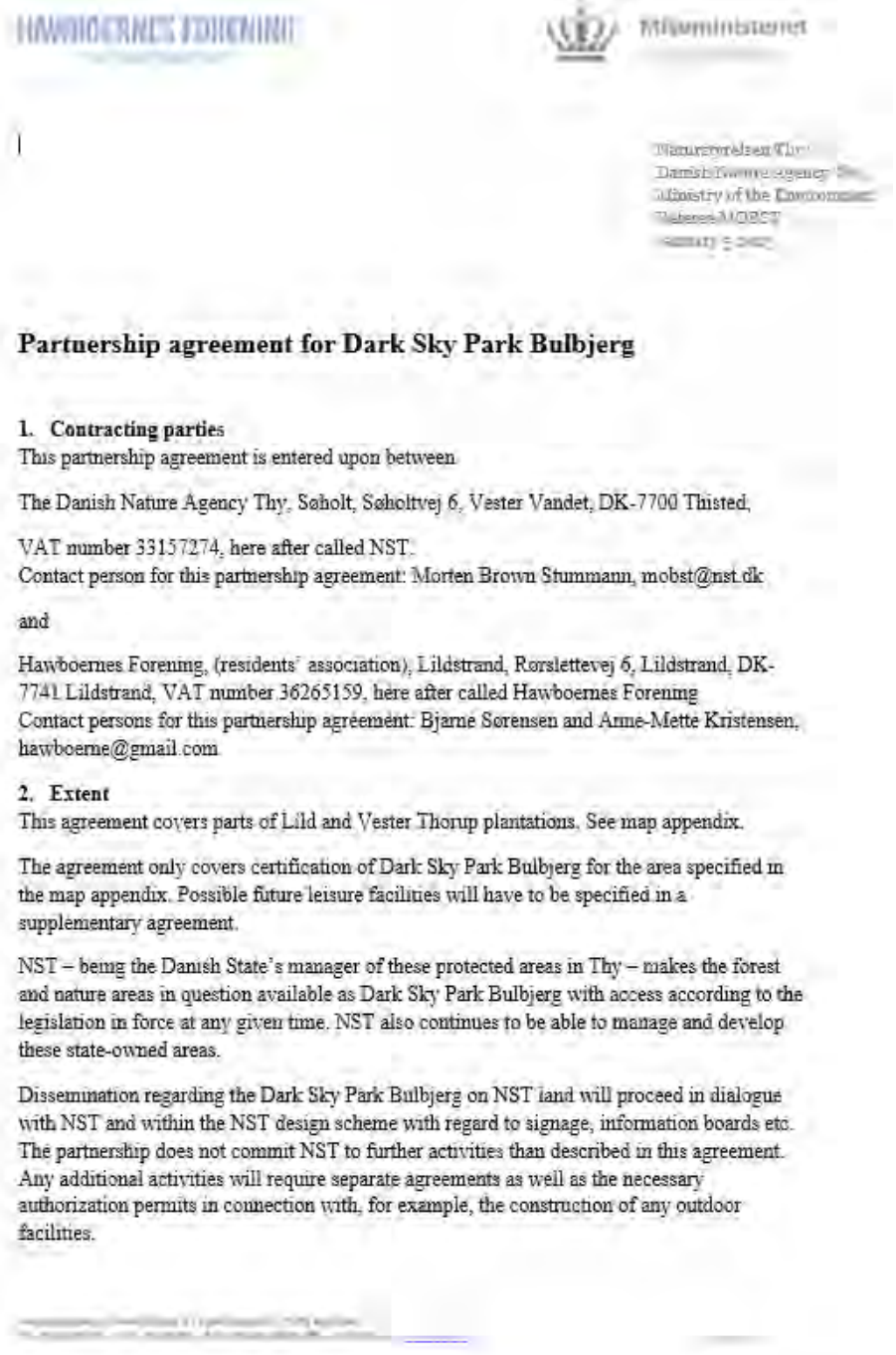
På vegne af Naturstyrelsen:

5. januar 2023

Ole Noe

Skovrider, Naturstyrelsen Thy

6.5 Partnership agreement - in English translation



Partnership agreement for Dark Sky Park Bulbjerg

1. Contracting parties

This partnership agreement is entered upon between

The Danish Nature Agency Thy, Søholt, Søholtvej 6, Vester Vandet, DK-7700 Thisted,

VAT number 33157274, here after called NST.
Contact person for this partnership agreement: Morten Brown Stummann, mobst@nst.dk

and

Hawboernes Forening, (residents' association), Lildstrand, Rørslettevej 6, Lildstrand, DK-7741 Lildstrand, VAT number 36265159, here after called Hawboernes Forening
Contact persons for this partnership agreement: Bjarne Sørensen and Anne-Mette Kristensen, hawboerne@gmail.com

2. Extent

This agreement covers parts of Lild and Vester Thorup plantations. See map appendix.

The agreement only covers certification of Dark Sky Park Bulbjerg for the area specified in the map appendix. Possible future leisure facilities will have to be specified in a supplementary agreement.

NST – being the Danish State's manager of these protected areas in Thy – makes the forest and nature areas in question available as Dark Sky Park Bulbjerg with access according to the legislation in force at any given time. NST also continues to be able to manage and develop these state-owned areas.

Dissemination regarding the Dark Sky Park Bulbjerg on NST land will proceed in dialogue with NST and within the NST design scheme with regard to signage, information boards etc. The partnership does not commit NST to further activities than described in this agreement. Any additional activities will require separate agreements as well as the necessary authorization permits in connection with, for example, the construction of any outdoor facilities.

3. Purpose

The area Bulbjerg-Troldsting-Lildstrand is one of the few places in Denmark with truly dark skies at night. This phenomenon has inspired the parties to cooperate on IDA-certification. The IDA-certification will be used actively to offer special nature experiences and disseminate knowledge about the importance of protecting our dark skies in order to arouse public interest, curiosity and inspire sustainable behavior. Certification is thus expected to motivate more children and adults to experience the night sky and generally promote interest in outdoor life, nature and astronomy.

Specifically:
* to highlight and communicate the harmful effects of ever-growing light pollution on nature, people, the environment and climate and to point out the need to protect the natural darkness of the night.
* to disseminate knowledge about how individuals can help protect the darkness of the night by appropriate use of lighting.

4. Establishent of Dark Sky Park Bulbjerg

The IDA-certification of Dark Sky Park Bulbjerg is fulfilled by Hawboernes Association prior to agreement with NST. The further planning of Dark Sky Park Bulbjerg will take place in dialogue between the parties.

5. Access to Dark Sky Park Bulbjerg

The area is open to the public. Any restriction of public access to the dark sky area covered by the partnership agreement must be approved by NST.

6. Guidelines for the use of the dark sky park area

A permit must be sought from NST if activities that require NST's permission are desired. https://naturstyrelsen.dk/naturoplevelser/ansoeg-om-aktiviteter/.

NST may require payment when using NST's land in connection with organization of events. See NST's guidelines for payment: https://naturstyrelsen.dk/naturoplevelser/ansoeg-om-aktiviteter/hvornaar-skal-jeg-betale/

Specific guidelines for events which require NST's permission are to be agreed upon with NST in advance.

7. Organization and responsibility

Hawboernes Forening is responsible for preparing the application for IDA-certification, for holding annual events and for preparing the annual report, which is described in IDA's rules.

Hawboernes Forening's events will be organized in consultation with NST; in other words dark sky events shall be coordinated between the parties. Hawboernes Forening's direct

public communication of the Dark Sky Park Bulbjerg area shall be limited to avoid negative impacts on the area, particularly on wildlife.

Dissemination in the form of dark sky events under the auspices of NST shall take place only to the extent/form that NST deems appropriate according to the NST's rules, finances and other public programs/events.

8. Communikation

The parties agree undertake to promote the dark sky area and effective cooperation.
Both parties must be mentioned on maps, signage, leaflets, newsletters and advertisements.
When communicating in writing, including use of the NST logo, NST must be contacted in the design process to ensure compliance with NST's design manual.

Specific media coverage of the project and the cooperation between the parties may only be made by prior agreement with NST.

NST makes sure that Dark Sky Park Bulbjerg is added to the website www.udinaturen.dk and is updated as needed, e.g. description, pictures etc.

9. Validity and denunciation clause of the agreement

The agreement enters into force on January 1st 2023 and runs until further notice. During the agreement period, the parties may be notified in writing for renegotiation and/or extension with a notice of 6 monts to the 1st of a month.

The agreement may be terminated by the parties by giving 12 months' notice to January 1st. Upon termination of the agreement, Hawboernes Forening holds no rights in relation to the area and/or facility other than the rights guaranteed to the public.

10. Non-compliance

If Hawboernes Forening materially breaches its obligations under this partnership agreement and the breach is not terminated within a reasonable period of time provided by NST, NST shall be entitled to terminate this partnership agreement with immediate effect.

Upon termination of the agreement, Hawboernes Forening holds no rights in relation to the area and/or facility other than the rights guaranteed to the public.

In the event of non-compliance, NST/the parties can invoke customary remedies for breach.

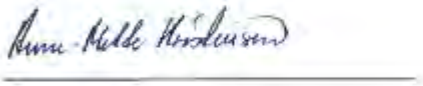
11. Transfer of partnership agreement

Hawboernes Forening cannot transfer its rights and obligations under this partnership agreement to third parties without NST's prior written consent.

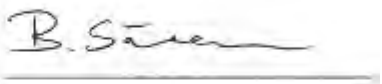
12. Signatures

On behalf of Hawboernes Forening:

January 5 2023



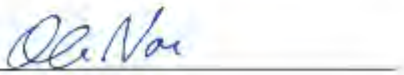
Anne-Mette Kristensen



Bjarne Sørensen

On behalf of NST:

January 5 2023



Ole Noe

Forest Superintendent, Naturstyrelsen Thy

MAP APPENDIX referred to in the partnership agreement (chapter 2)

7 International Dark Sky Park Bulbjerg

7.1 Description of area to be designated

The area Bulbjerg-Troldsting-Lildstrand is situated in Thy – holding all the multi-facetted scenic beauty characterizing the landscapes of Thy.

Facts about the Bulbjerg-Troldsting-Lildstrand-dark sky park area:

- protected land, mainly owned by the Danish State
- managed by The Danish Nature Agency
- situated in Denmark, County Northern Jutland, (approx. 590,000 inhabitants, area 7,884 square kilometres)
- situated in Thy, Thisted Municipality (approx. 43,000 inhabitants, population density 40 persons per square kilometre, area 1,074 square kilometres)
- the dark sky park area borders on Thy National Park (244 square kilometres / "Denmark's greatest wilderness").
  The dark sky park area Bulbjerg-Troldsting-Lildstrand aspires to achieve status as part of the Thy National Park, presumably 2024.
  website: https://eng.nationalparkthy.dk

1. *Bulbjerg cliff (see 7.1.1)*
2. *Skarreklit (leftover from a fallen cliff)*
3. *Jammerbugten, bay in the North Sea*
4. *Troldsting (see 7.1.2)*
5. *Vester Thorup dune plantation*
6. *Lild dune plantation*
7. *Bunker from World War II*
8. *Dune heath (internationally protected nature reserve)*

7.1.1 Bulbjerg – a spectacular limestone slope and bird cliff

The elevated layer of chalk in the subsurface is visible in the steep 47 m high limestone cliff Bulbjerg from the Stone Age. Bulbjerg is the only bird cliff on the Danish mainland.

Black-legged kittiwake (Rissa tridactyla), a North Atlantic gull, breeds every year in large numbers on Bulbjerg. Many other birds find space on Bulbjerg.

Occasionally, the fulmar which is a rare bird in Denmark breeds at Bulbjerg.

BULBJERG:
Website: https://natursty-relsen.dk/naturoplevelser/naturguider/bulbjerg/sevaerdigheder/
Photo credit: Anne-Mette Kristensen

Kittiwakes brooding on Bulbjerg
Photo credit: Erik Andersen

7.1.2 Troldsting

Troldsting is the ridge that stretches from Bulbjerg inland to the south.
At Troldsting there are remains of burial mounds from the Bronze Age. Stone circles, menhirs and various tools show that people lived here in both the Stone Age and the Bronze Age. The large granite boulders were brought to Troldsting by ice age glaciers about 18,000 years ago.

Troldsting
Photo credit:Biologisk Forening for Nordvestjylland website: https://biologiskforening.dk/gallery-page-wild-free/troldsting/

7.1.3 Lildstrand – a fishing hamlet surrounded by protected nature

Lildstrand, view from Graabakke
Photo credit: Erik Andersen

Lildstrand's DNA is small town with houses in traditional building style, fishing boats on the beach, church, village hall, fish monger, smoke house, artware shop and art gallery.

Isolated location, tranquility, seashore, protected nature of great scenic beauty and wonderful night skies with moonlight, multiple stars and the Milky Way.
40 residents and 200 holiday cottage owners willingly share the scenic beauty of Lildstrand and its protected surroundings with Danish as well as foreign tourists searching for authencity and tranquility away from modern mass tourism.

Coastal terrace in Lildstrand, well suited for star-gazing by night. Access free of charge. Photo credit: Else Dam

Popular picnic house with sea view in Lildstrand, access free of charge. Photo credit: Else Dam

Working area, beach, Lildstrand
Photo credit: Anne-Mette Kristensen

Clinker built coastal vessel "Skarreklit", registered in Lildstrand.

In December 2021, the Nordic clinker boat tradition inscribed on UNESCO's intangible cultural heritage list.

It is the building, navigation, maintenance, all the linked crafts etc., which are recognized as cultural heritage.

Photo credit: Else Dam

Working area with winch house in Lildstrand
Photo credit: Erik Andersen

Lildstrand Church, a former life saving station built in 1883. Open to the public all day. Photo credit: Carsten Krogh Pedersen

Dull and dreary winter's day in Lildstrand. Photo credit: Anne-Mette Kristensen

7.1.4 Coastal nature in Thy in general

Dunes
Thy comprises a large part of Denmark's total dune area. The dune landscape is dynamic and can hold great variation, even within small distances. The dune vegetation is influenced by physical conditions, such as the drifting of sand, lime content, nutrients, dune slope orientation and distance to the groundwater table.

Different types of dunes are represented in Thy. There are sea shores with incipient dune formation and the white dunes characterised by continued sand drift, as well as the more stable dune shapes such as the calcareous and vigorous green dune and the grey dune with its permanent cover of lichen and dwarf shrubs.

Coastal dune heaths
Coastal dune heaths: European Environment Agency, EUNIS habitat type code B1.5, Bern Convention, Resolution 4 habitat type (used for designation of Emeral sites)

The dune heaths are internationally protected nature reserves, characterised by coherent vegetation of dwarf shrubs. The dune heath is a mosaic of plains and massive dune formations dominated by crowberry and heather as well as sand plains with temporary lakes and wet sand hollows where bell heather, bog myrtle and bog bilberry dominate the landscape.

Dune plantations
The first attempts to plant trees in west Thy were in 1816-20. The attempts were unsuccessful, but by the middle of the century the planters had discovered methods and foreign tree species such as mountain pine that could grow in the sandy, salty and windy climate.

Since then many other species of conifer from distant regions have been planted between the mountain pines. One of the objectives of is to create more species-rich forests with indigenous, deciduous trees and a more natural water level.

Nature preservation

Marsh fritillary

The nature in Danish dune heaths is vulnerable. The largest threats are overgrowing by invasive species of conifers and dog rose in particular. Previous drainage and high nitrogen levels in the air have a negative impact on the dune heath.

In order to bolster the original heath vegetation, some parts of the heath are being grazed. Occasionally the vegetation is cleared or burned in order to bolster the original heath vegetation. A growing population of red deer also help ensure survival of the dune heaths.

The natural water level in the open dune landscapes will be restored by gradual removal of drainage and ditches. The objective is for more close-to-nature forestry which, in the long term, will ensure stable, species-rich and recreationally valuable forests.

Information source: Thy Nationalpark and the Danish Nature Agency.

White dune
Photo credit: Pixabay

Coastal dune heath and dune plantation
Photo credit: Bjarne Sørensen

Coastal dune heath
Photo credit: Bjarne Sørensen

8 Accessibility and ownership

8.1 Public access 24/7 all year round

Lildstrand as built-up area/small town has public access 24/7 all year round.

The protected areas in question have public access 24/7 all year round.
The protected areas situated as an extension of the dark sky park area have public access 24/7 all year round. Cf. Appendix 14.5.

The unbuilt private plots of protected land in the park area, see below, have public access 24/7 all year round.

8.2 Ownership

The protected land is owned by the Danish state and operated by the Danish Nature Agency.

Ministry of Environment of Denmark
Nature Agency

In Denmark, public access to beaches and protected land are regulated in the Danish Nature Conservation Act (Act No. 1392 of October 4 2022, Chapter 4, §22, 3): *"Public access must not be impeded or prevented."*

The entire park area is provided with public infrastructure consisting of strategically located facilities such as shelters, coastal terraces, picnic house, toilets, paths, roads and parking spaces.

Three private plot owners of protected land situated within the borders of the protected land operated by the Danish Nature Agency have been asked for formal consent. They have all willingly supported the Dark Sky Park Bulbjerg project.
Except for two plots, 8d and 8y, all plots of unbuilt ground.
The plots' title numbers in the Danish Cadastre Office registry are:
7g, 8y, 8o, 8d, 8l og 9b Lund by Lild.

Mail correspondance with the private plot owners is shown on the next page. However, due to the general data protection regulation, GDPR, their email addresses have been omitted.

Fra: **Birgitte Alex Jensen**
Date: fre. 28. okt. 2022 kl. 08.39
Subject: Re: Matrikel (plots) 8y, 8o, 8d, 7g, Lund by Lild - Dark Sky Park Bulbjerg
To: Anne-Mette Kristensen <hawboerne@gmail.com>

Kære alle

Vi er helt indforstået med, at samtlige af vores matrikler indgår i projekt Dark Sky Park Bulbjerg.
We fully agree that all of our plots are part of the Dark Sky Park Bulbjerg project.

Bedste hilsener Birgitte og Hans, Bulbjergvej 65, 7741 Frøstrup

---

tor. 3. nov. 2022 08.58 Helene Threms,
Subject: Matrikel (plot) 8l Lund by Lild

Hej.

Jeg vil være mere end tilfreds med at blive en del af Dark Sky Park. I will be more than happy to be part of Dark Sky Park.

Spændende projekt. Exciting project

Venlig hilsen Helene

From: Jørgen Kjær
Sent: 27. oktober 2022 22:17
To: Anne-Mette Kristensen hawboerne@gmail.com
Cc: Kjersti Lien
Subject: Matrikel (plot) 9b, Lund by Lild - Dark Sky Park Bulbjerg

Hej Bjarne og Anne-Mette,

Vi er med på ideen om denne certificering, fordi vi netop elsker stedet for dette skønne og sjældne nattemørke. We are on board with the idea of this certification because we love the place for this beautiful and rare night darkness.

Held og lykke videre i arbejdet! Good luck getting on with the work!

Vh Kjersti og Jørgen

---

9 Outreach program

Hawboernes Forening's Dark Sky Park group has performed several activities during 2022. Public meeting, study trip, television program, newspaper article, inauguration, speech, door-to-dor info material. See the following pages.

In connection with elaboration of the Dark Sky Park designation application the group is in running dialogue with **Thisted Municipality** on street lighting adaptation and the **Danish Nature Agency** on land use, upgrading of shelter facilities and future events. Further, continued dialogue with **National Test Center for wind turbines** on reduction of light pollution, see Chapter 9.2.

November 2022, the group has established contact with **Aarhus University**, **Stellar Astrophysics Centre,** communications officer Ole J. Knudsen, who can guide about dissemination activities and help us establish contact with two other Danish Dark Sky Park applicants **Mandø** and **Anholt** as well as IDA (DarkSky)-certified **Dark Sky Park and Community Møn-Nyord** for future mutual co-operation on exchange of ideas and knowledge in relation to our varied dark sky park projects.

9.1 Education of dark sky guides by Aarhus University

Outreach has been made to **Aarhus University, Department of Physics and Astronomy**, see Letter of Support no. 1. This outreach has been very successful. Aarhus University, Department of Physics and Astronomy, Ole J. Knudsen, offers free training (12 hour course) of dark sky guides in cooperation with the Hawboernes Forening's Dark Sky group.
Target audience: Our Dark Sky Group, Thy National Park, tourist organization Destination Nordvestkysten and local people demonstrating interest in nature, astronomy and communication. Conditions, cf. OJK-mail below.
Start 1st course: August 21-August 28-September 11 2023 with 9 participants.

From: Ole J. Knudsen <ojk@phys.au.dk>
Sent: 28 March 2023 10:48
To: Anne-Mette Kristensen (MET) <MET@NIRAS.DK>
Cc: Mads Fredslund Andersen <madsfa@phys.au.dk>; Hans Kjeldsen <hans@phys.au.dk>
Subject: Re: Dark Sky Park Bulbjerg - forslag til mødedatoer

Hi, Anne-Mette and Bjarne.

Kursus for guider, som jeg har afholdt dem indtil nu, er rettet imod de personer, som har til hensigt at fungere som betalte eller frivillige natguider hos relevante partnere. Omfanget er 3 gange á 4 timer. Deltagerne skal forpligte sig til at udbyde guidede ture i samarbejde med fx Nationalpark Thy eller lignende.
Translation: Training for guides, as I have held them so far, is aimed at those who intend to act as paid or voluntary night guides with relevant partners. The scope is 3 times of 4 hours. Participants must commit to offering guided tours in collaboration with, for example, Thy National Park or similar.

Regards, Ole.

Ole J. Knudsen
Communications officer, Aarhus Space Centre, Stellar Astrophysics Centre, ESON-Denmark
Institute for Physics and Astronomy, Aarhus University, DK-8000 Aarhus C, mobile phone +45 4059 4520,
e-mail ojk@phys.au.dk,

9.2 Events/Outreach 2022-2023

Miljøministeriet
Naturstyrelsen

pleje Naturprojekter

eder > 2022 > August > Oplev natten i Vestjylland

Oplev natten i Vestjylland

26-08-2022

På lørdag d. 27. august kan du få en oplevelse ud over det sædvanelige. Hele Danmark inviteres ud i naturen efter mørkets frembrud som del af den landsdækkende begivenhed Nat i Naturen.

Nat i Naturen. Foto: Adam Grønne

Vores fælles natur indeholder mange både små og store eventyr. Om natten har du mulighed for helt andre oplevelser såsom en stille tur i mørket, at lytte til naturens lyde og træne dit nattesyn efter mørkets frembrud, eller at opleve at falde i søvn og vågne under åben himmel.

Læs mere om Nat i Naturen her.

The Danish Nature Agency facilitates annual events for the public called "Night in Nature". Local events with rangers from the Agency. Purpose: Experience dark skies and nature by night. Access free of charge. Photo credit: the Danish Nature Agency

Public Dark Sky-event at Bulbjerg April 5 2023. External guide Destination Nordvestkysten: astrophotographer Ruslan Merzlyakov

On July 25 2023 our dark sky park group facilitated a 2½ hours night hike without any use of light from Lildstrand to the western border of the dark sky-area.Start at sunset. Return to Lildstrand around mid-night.
White, but cloudy, night over Flommaens Hill.

18 persons participated in the hike. Local people and tourists. Including 3 tourists from Maryland, USA.
Great success. Events like this will definitely be re-peated in Lildstrand by the Dark Sky Park Bulbjerg group.

July 2023:
The Dark Sky Park Bulbjerg group has bought informative pictures telling about the starry sky and the solar system respectively.

The two pictures are now placed in Lildstrand's popular picnic house at the landing stage.

Chris and Bjarne from the dark sky group are the handy men.

July 2023.
The Dark Sky Park Bulbjerg group has applied for funds and received money to buy binoculars, head lamps and large telescope for use in outreach events. Lending out binoculars and head lamps to participants, telescope for speaker.

***LEFT**: Bed & Breakfast [Tiendegaarden](), Møn. Advice about how to watch dark skies to be seen in the B&B's "Dark Sky equipment room" where blankets, sleeping mats, deck chairs, literature on stars and night skies are on loan free of charge.*

***RIGHT:** Flyer from [Brorfelde Observatory]() with information on how to book their beautifully designed [star shelters]().*

Every 14 days, the Brorfelde Observatory sends out a free digital newsletter, "Himmelfif", with a guide to the current starry sky and information on new developments in space operations.

Article (page 1) and local as well as nationwide television programme:
https://www.tvmidtvest.dk/thisted/lild-strand-vil-finde-lyset-i-moerket-vil-vaere-en-del-af-moerke-elskende-forening
Dark Sky Thy April 20 2022.
Photo credit: TV Midt/Vest

Lild Strand vil finde lyset i mørket: Vil være en del af mørke-elskende forening

Det er få steder i landet, hvor nattehimlen ikke bliver forstyrret af lys fra byer eller firmaer. Et sted er dog Lild Strand, og nu vil de forsøge at få certifikatet som Dark Sky Park.

Bjarne Sørensen er netop i gang med at lave målinger af hvor meget kunstigt lys, der kommer ind ude fra området.
Foto: Lars Lauridsen, TV MIDTVEST

20. apr 2022, kl. 16:41
Artiklen er mere end 30 dage gammel

Janne Dalby Ewert
Journalist

AUTOMATISK OPLÆSNING

De fleste steder i Danmark vil stjernehimlen være påvirket af kunstigt lys fra byer eller virksomheder, når man vil studere nattehimlen.

Men der er få steder i landet, hvor der næsten ikke er nogen lysforurening. Et af de allermørkestes steder er i Lild Strand lidt vest for Bulbjerg, og derfor vil de lokale nu forsøge at udnytte det.

Bjarne Sørensen ejer et sommerhus i Lild Strand, og han er netop i gang med at måle, hvor meget kunstigt lys, der kommer ind ude fra.

- Vi er et af de steder i Danmark, hvor der er det dybeste nattemørke, det er jo ikke noget, som man kan bygge sig til. Hvis du har for meget by og for meget aktivitet, så har man ikke det dybe nattemørke, siger Bjarne Sørensen.

Målingerne, som Bjarne Sørensen laver, skal bruges til en ansøgning til den nonprofitorganisation, der udvælger de såkaldte Dark Sky Parker.

Om lysforurening og certificering som Dark Sky

Dark Sky-certificering er naturbeskyttelse

Se mere

Eftertragtet og særligt certifikat

Lild Strand er omgivet af hav, hede og fjord, og derfor er der ikke lysforureninger, som eksisterer de fleste steder.

Af den grund vil Hawboernes Forening gøre området til en Dark Sky Park, som betyder, at det er et sted med en klar nattehimmel.

Men der kræver et certifikat, før man må bruge titlen, og den arbejder de nu for at få.

- Det er jo en del af den udviklingsplan, som går på at sørge for, at stedet bliver ved med at udvikle sig, og vi har i udviklingsgruppen lagt det kriterie, at der skal være stille turisme på stedets betingelser, forklarer Bjarne Sørensen.

Herhjemme er det kun Møn/Nyord, der har fået den eftertragtede status af Dark Sky Park, og selv om det vil tiltrække mange turister, så er det ikke hovedformålet.

I Lild Strand gælder det nemlig ikke om at få mange turister, men i stedet at få de rigtige turister.

- Det helt specielle ved en Dark Sky certificering er, at man rammer turister uden for højsæsonen, siger han.

Bjarne Sørensen her med sin måler.
Foto: Lars Lauridsen, TV MIDTVEST

Article (page 2) and local as well as nationwide television programme: https://www.tvmidtvest.dk/thisted/lild-strand-vil-finde-lyset-i-moerket-vil-vaere-en-del-af-moerke-elskende-forening
Dark Sky Thy April 20 2022.
Photo credit: TV Midt/Vest

Inauguration of coastal terraces in Lildstrand June 24 2022 with official speeches including mentioning of dark sky program in progress. Participation of the the Danish Secretary of Trade and Industry, Simon Kollerup, and other VIPs.

Ribbon cutting ceremony led by Simon Kollerup Photo credit: Else Dam

Inaugural address by Anne-Mette Kristensen, promoter and fundraiser of project coastal terraces in Lildstrand Photo credit: Birte Sivebæk

Citizens' meeting on September 17 2022. Facilitated by the dark sky park grop in Lildstrand. Theme Dark Sky and IDA-certification. Video from external specialist developed for the meeting. Aavailable at YouTube: https://www.youtube.com/watch?v=5JCK6qmfGFw

Door-to-door flyer (page 1) delivered in the local area on dark sky and advice how to realize appropriate out-door lighting

Hvorfor IDA-certificering som DARK SKY PARK BULBJERG?

I mere end fire milliarder år var døgnets vekslen mellem den lyse dag og den mørke nat et absolut vilkår på jorden. Omkring 1880 begyndte glødepæren at oplyse vores stuer og gader. I dag lever mere end 80% af verdens befolkning under lysforurenet himmel.

Lysforurening er en gennemgribende form for miljøændring, men mere abstrakt end andre forureningsformer. Alligevel er det en forurening, som mærkbart påvirker både biodiversitet, dyr og mennesker.

At bo et sted som Hannæs med så lidt lysforurening, at natten kan kaldes naturlig mørk, er en skat. En skat, vi som bor her, sætter pris på og kan være stolte af. Men også en skat, som er sårbar. En certificering som Dark Sky Park Bulbjerg vil ikke redde verden fra lysforurening. Men Dark Sky Park Bulbjerg kan hjælpe os til i fællesskab at værdsætte og beskytte nattemørket og gøre opmærksom på betydningen af nattemørket for både kulturen, naturen og for menneskers helbred.

Lysforurening og søvnproblemer

Langt inde i menneskers hjerne findes en kirtel, Koglekirtlen. Koglekirtlen danner hormonet melatonin. Fra naturens side stiger produktionen af melatonin med nattens mørke. I dagens lys falder produktionen til ca. det halve. Omgives vi af for meget lys om aftenen og natten, registrerer Koglekirtlen dette og producerer mindre melatonin. Så får vi sværere ved at sove. Sammenhængen mellem melatonin og vores helbred er et emne, som videnskaben først for alvor er begyndt at interessere sig for de senere år. Spørgsmålene er derfor mange, men det, man med sikkerhed kan sige, er, at for meget lys om natten påvirker menneskers helbred i negativ retning.

Også dyr og planter påvirkes negativt af lys om natten. Fx trækfuglenes natnavigation. Lysforurening påvirker ikke kun mennesket, men både arts- og biodiversiteten.

Brug lys klogt og spar penge og CO2-udledning

En anden og mere konkret ulempe er spildt lys. Energipriserne er skyhøje. Det er dyrt og helt unødvendigt at oplyse stjernehimlen (eller naboens tag) med uhensigtsmæssige udendørslamper, og spildt lys gør det ikke nemmere at finde vej hen til hoveddøren. At bruge lys klogt vil sige kun at have udendørs lys, hvor og når det er nødvendigt, og benytte en varm lyskilde, der er rettet nedad uden at lyse opad eller til siderne.

Sender lampen kun lyset hen, hvor det skal bruges, udnyttes lyspærens lumens bedre. (Lumens er den mængde af lys, som en pære udsender.) Så kan en pære på færre lumens bruges i stedet. Dermed vil mere effektiv udnyttelse af lyset kunne mindske energiforbruget. Det er lig med sparede kroner og ører til udendørsbelysning – og også lig med mindre C02-udledning.

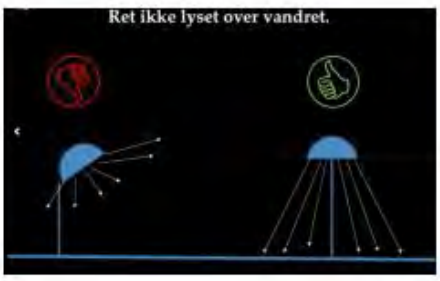
Se enkle råd til miljøvenlig udendørs belysning på næste side.

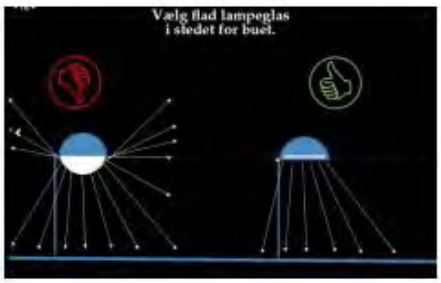
-.

Door-to-door flyer (page 2) delivered in the local area on dark sky and advice how to realize appropriate out-door lighting

Enkle råd til miljøvenlig udendørs belysning:

- Brug kun udendørs belysning, når det er nødvendigt.
- Brug timer eller sensor. (Så sparer du også energi.)
- Oplys kun det område, der er nødvendigt.
- Brug ikke lys over vandret.
- Benyt fuldt afskærmede løsninger, der lyser nedad.
- Vælg fladt lampeglas i stedet for buet
- Undgå at lyset er skarpere end nødvendigt.
- Minimér brugen af gulgrønt og blåt skær og vælg hellere varme farver. (Så undgår du også at tiltrække insekter.)
- Åbne armaturer med synlige pærer skal være varme i lyset (2000-2300 Kelvin) og ikke afgive mere end 130 lumen





Kilder:
Vordingborg Kommune og House of Moen: Folder *Dark Sky Møn & Nyord*
www.lysforurening.dk
www.darksky.org

Speech in the local church (Lildstrand) on dark sky and IDA (DarkSky)-certification delivered on July 26 2022 by Bjarne Sørensen and Anne-Mette Kristensen

Speech as well as article delivered on request from the local parish church council.

Article written on demand from the parish church council to be published in the local parish magazines

Dark Sky Park Thy
Lokalt er ideen med udvidelsen af Nationalpark Thy, at også Hannæs bør have del i de positive effekter på bosætning og erhverv, som Nationalpark Thy har afledt sydpå i Thy. Ikke som "Cold Hawaii", men som "stillekupé", så Hannæs bevarer og beskytter sin stille turisme samtidig med, at der sker en vis udvikling. Og her kommer certificering som Dark Sky Thy ind i billedet som en del af Masterplan Lildstrand.
Med områdets dybe nattemørke skal Dark Sky Thy være med til at formidle fortællingen om Hannæs' helt særlige naturværdier: hav, fjord, klithede, skov og stjernehimmel, og dermed understøtte erhverv og den stille helårsturisme baseret på områdets naturværdier.

For os på Hannæs føles det helt naturligt at se måne, mælkevej og stjerner i tusindtal. Men ca. 90% af Europas befolkning lever under lysforurenet himmel og har ikke mulighed for at glæde sig/undres over en dybsort nattehimmel og al dens stjernevrimmel. Samtidig medfører lysforurening energispild. Og lys døgnet rundt kan være til skade for både biodiversitet og menneskers sundhed. Hensigten med dark sky certificering er derfor at beskytte og bevare områder med dybt nattemørke, oplyse om mørkets betydning for mennesker, dyr og planter og tilbyde en oplevelse til mennesker, der til daglig må leve med lysforurening.

En certificeret dark sky park er et område med dokumenteret dybt nattemørke kombineret med et bysamfund med belysning. P.t. findes godt 100 certificerede dark sky parks på verdensplan.
Certificering sker gennem International Dark Sky Association (IDA) i USA, som er en non-profit organisation. Dark Sky-gruppen i Hawboernes Forening i Lildstrand har i 2020 opnået IDA's godkendelse af arealforslaget Bulbjerg-Troldsting-Lildstrand som Dark Sky Park Thy. I god forståelse med Naturstyrelsen Thy, forstås. De nødvendige lysmålinger er foretaget, resultaterne er særdeles gode, og i efteråret 2022 udarbejder og indsender gruppen den endelige ansøgning om certificering til IDA.

Har du lyst til at høre mere om Dark Sky Thy, så holder Hawboernes Forening borgermøde i Hawboernes Hus, Harebakkevej 1, Lildstrand, lørdag den 17. september 2022, kl. 14-16.30. Alle er velkomne.

31.08.2022
Bjarne Sørensen / Anne-Mette Kristensen
Hawboernes Forening, Lildstrand
https://hawboerne.dk/dark-sky-thy

Ved Bulbjerg og det mørke hav er udsigten til Mælkevejen usædvanlig. Her kan man i skyfri nætter opleve stjernebilleder, satellitter og måske et stjerneskud. Foto: Katherine Pongrem

Nattehimlens magi i mulm og mørke

I udkanten af Thy arbejder en gruppe borgere på at etablere Dark Sky Park Bulbjerg for at sætte fokus på en tabt naturoplevelse.

JAN SKRIVER
Journalist og naturkonsulent
indland@jp.dk

Stik nord er der 100 kilometer til kysten af Sydnorge, og stik vest himsides det mørke hav ligger Skotland 600 kilometer borte. Bag klitter og en knold af kalk er Hanstholm den nærmeste "storby".

Vi er i landsbyen Lildstrand en klitrække efter to vest for Bulbjerg, den 47 meter høje klint af ilmsten, der fra sin top giver en storslået udsigt både horisonten rundt.

Men den bedste udsigt går ofte hen over hovedet på folk, for den hører nattens stjernehimmel til.

Derfor arbejder Hawboernes Forening, hvis medlemmer er fastboende og sommerhusejere i Lildstrand, på at få området certificeret som Dark Sky Park, der er et område fattig på lys, men rig på muligheder for et dig ud i verdensrummet. En sådan status kan sætte fokus på de naturoplevelser, der særligt i vinterhalvåret udspiller sig i himmelrummet over det såkaldt mørke hjørne mod nordvest. I storbyernes oceaner af kunstigt lys er den vanlige udsigt til stjernerne for længst gået fløjten.

Lys visker stjernevrimlen ud

Verden over står 120 lokaliteter opført på en liste over Dark Sky Parker. 20 af dem ligger i Europa. Kun én, nemlig Møn & Nyord, har i Danmark paptr på at være Dark Sky Park.

»Vi har lavet målinger, der dokumenterer, at området omkring Lildstrand og Bulbjerg er en af de lokaliteter i Danmark, der har det dybeste nattemørke, altså har de færreste forstyrrelser af kunstige lyskilder. I større danske byer vil man på denne tid af året højst kunne få øje på 20-30 klare stjerner i løbet af en skyfri aften. Tager man derimod til Lildstrand og Bulbjerg, vil man om vinteren kunne opleve op imod 3.000 stjerner i nattemørket. Som stiftsgevinst på en klar mørk nattehimmel vil man med lidt held kunne se satellitter og måske den internationale rumstation ISS bevæge sig over himlen,« siger Bjarne Sørensen, der sammen med Anne-Mette Kristensen er initiativtagere til Dark Sky-projektet, der vil sætte Lildstrand på verdenskortet som en mørk plet i en oplyst tidsalder.

Gadebelysning på vågeblus

På borgermøder i byen har der været opbakning til at lade mørket og stjernehimlen blive et vartegn for egnen, uden at det dog på nogen måder skal betyde i neon. Tværtimod er der planer om at skifte pæerne i landsbyens i forvejen beskedne gadebelysning til LED-pærer, der giver blødt lys i dæmpede farvetoner. I det hele taget opfordrer Hawboernes Forening til, at man som beboer i området bruger lys med omtanke og til husbehov, mens man tænker på mørket som en værdi og en kilde til inspiration og astronomiske oplevelser.

Naturstyrelsen og Nationalpark Thy støtter tanken om en Dark Sky Park Bulbjerg - ligesom Jammerbugt og Thisted Kommuner.

En ansøgning fra Hawboernes Forening i Lildstrand vil snart lande i indbakken hos International Dark Sky Association (IDA), der er en nonprofitorganisation, som står bag certificeringen af de parker, hvor den mørke nattehimmel er kriteriet over alle.

»Vi har fået en forhåndsgodkendelse fra IDA med hensyn til parkens størrelse og placering, så vi forventer at have vores nye status på plads i løbet af nogle måneder,« siger Bjarne Sørensen.

Spar på energien

Idéen bag Dark Sky Parker er at åbne befolkningens øjne for de oplevelser, som nattens mørke kan åbenbare på himlen. Men mørkets parker er også med til at mindre om det store energiforbrug og den lysforurening, som dan tige del af verden står bag.

»Mere end 80 pct. af Jordens befolkning og stort set alle europæere lever under en mere eller mindre lysforurenset himmel. Mennesskabt lys som gadelamper, reklamer, oplyste bygninger, biltrafik og vejo giver en form for forurening, der kan påvirke både mennesker og dyr negativt. Siden tiderne morgen har dyr og mennesker tilpasset sig årstiderne vekslen mellem dag og nat, men i vores tidsalder er forskellen mellem nat og dag, mørke og lys visket ud mange steder. Med vores projekt vil vi minde om, at vi taber herlighedsværdier ved at omgive os med så mange kunstige lyskilder, at der er kupler og kaos af lys over vores byer,« siger Bjarne Sørensen.

DARK SKY PARK

Møn og Nyord var de første områder i Norden, der blev udnævnt til Dark Sky Park uden lokal lysforurening.

De fleste af verdens 120 certificerede Dark Sky Parker findes i USA.

6 af Europas 20 Dark Sky Parker ligger i Storbritannien.

International Dark Sky Association (IDA) står bag certificeringen af Dark Sky Parker.

Den såkaldte Bortle-skala gør det muligt at måle "kvaliteten" af nattemørket i et givent område. Skalaen opererer med ni nivauaer.

Et er den lyse himmel over centrum af en storby, og ni er topkarakter til en mørk himmel i et område uden menneskeskabte lyskilder.

Den stille turisme

Når området nær nakken af Jylland efter planen i løbet af foråret 2023 kan kalde sig Dark Sky Park Bulbjerg, er der måske sommer, lyse nætter og badeturisme i sigte.

Men i sensommeren vil nattens tøjen blive sorte, og næste år i december vil der på ny være højsæson for nattemørke med 17 timer lange nætter omkring vintersolhverv.

»Vi håber at tiltrække, hvad man kan kalde den stille turisme, hvor de besøgende kommer for at opleve naturen og nattemørket på egnens og himmelrummets betingelser. Det gælder ikke om at få mange turister, men om at tiltrække dem, der værdsætter områdets egenart og en stille stjernestund,« siger Bjarne Sørensen.

Nationwide newspaper Jyllands-Posten (printed and on-line editions) December 25 2022.
Headline translated: "Night sky magic in the dead of night"

9.3 Planned Dark Sky events October-December 2023

- Media coverage (TV MidtVest and newspapers) when the entire street lighting in Lildstrand is being updated with dark sky approved fixtures not later than November 3 2023 (scheduled by supplier as well as the Thisted Municipality).
- Inauguration and celebration of certificate as Dark Sky Park Bulbjerg November
- Organization and accomplishent of Dark Sky guide courses, cf. item 9.1.
- A public meeting in Lildstrand about dark sky friendly outdoor lighting
- Dark Sky-outing at Christmas time in the surroundings of Lildstrand

9.4 Outreach on light pollution in the adjacent area

At the opening of the National Test Center for large-scale wind turbines in region Thy 10 years ago, light pollution from very strong white flashes from the center's marker lights, day and night, was an awful nuisance to local people who were used to magnificent dark skies. Therefore the value of dark skies and protection hereof came into strong focus in the public mind. Luckily, test center owner and manager DTU, Technical University of Denmark, proved very co-operative about discussing the light pollution problems with the locals.

Over the years, a number of positive results have come out of this running dialogue. By implementing radar controlled lighting, light pollution from the center has been significantly reduced. At regular intervals, DTU holds public information and dialogue meetings where problems, progress and possible solutions are discussed for common good. But there is still room for improvement and the parties are working together on it.

One remaining problem is white flashes from marker lights during daytime. This is a demand from Danish authorities. From sunset to dawn, the white flashes change to red non-flashing lights, interrupted only by white flashes when airplanes (or flocks of birds!) pass over the test center area. Other problems are a nightly long-term white flash periods (30 minutes) when airplanes fly over the test center area – and white flashes as false signals when released by birds. A flock of birds with back winds can fly so fast that the radar may perceive it as an airplane.

It is, of course, a MUST that flight safety constantly is fully taken into account. In Denmark, however, the Danish Civil Aviation and Railway Authority requires that the white flashes are activated for 30 minutes once they have been triggered by an airplane (or as a false signal). In our neighbouring country Germany, the authorities operate with six minutes only.

For years, DTU and the radar manufacturer TERMA A/S have been working intensely together to develop and fine-tune the radar technology at the test center. Recently, TERMA has refined the sensitivity of the radar in order to avoid false signals released by birds. The innovative TERMA-developed radar solution can reduce light pollution from technical facilities not only at the test center in Thy but

throughout Denmark and also worldwide. Now it is now up to the Danish authorities whether they will A) allow DTU to switch off the white flash during daytime and replace it with radar-controlled non-flashing red light, B) allow a reduction of the 30 minutes white flash period at night.

3 members of Hawboernes Forening's Dark Sky Park group participated in the meeting on November 30: Lars Lundgaard, Susanne Fossgreen and Anne-Mette Kristensen

November 30 2022: DTU held yet another public meeting, this time focusing on radar control of flash lights. The radar control system can fulfil the local population's desire for reduction of light pollution. Official approval requires political will and action. Hawboernes Forening's Dark Sky Park group, together with like-minded local people, will lead the efforts to influence the politicians in charge and hereby contribute to reduce light pollution.

See DTU letter on reduction of light pollution on the following two pages:

DTU

To Whom It May Concern

Development of technologies that can result in more gentle light marking of tall structures and buildings, including wind turbines

24 January 2023
peja

At the request of the Dark Sky Park Bulbjerg Group under the Hawboernes Forening, Lildstrand, DTU Wind will briefly explain the development of radar technology to limit light exposure from light markings from wind turbines.

As part of the establishment of Test Center Østerild, DTU Wind has together with the radar manufacturer Terma, installed a radar system to control light markings for air traffic.

The radar system controlling the light markings at Test Center Østerild has been approved by the Danish Transport Authority as a time-limited deviation permit.

The deviation permit allows the radar control during the period from sunset to sunrise to turn off the light markings when the radar detects that there are no aircraft, helicopters, or other airborne elements in the air. The approval is given on the condition to the radar system, that the system must be "failsafe", so that the light markings are turned on when the radar system does not work properly.
Likewise, in the event that a radar signal "disappears", the light markings must be turned on for a fixed period of time. If the radar does not see planes, helicopters, or other aircraft in the air after the defined period, the light can be turned off again.

Together with Terma, we have been working for several years to optimize the radar management system so that there are not too many "false" registrations of aircraft. "Fake" registrations can be birds or, for example, rainy weather.

We are now so far with the development of the radar control system - also due to increasing international use of these systems - that it appears that

DTU Wind
Department of Wind and Energy Systems
Frederikaborgvej 399
Building 118
4000 Roskilde
Denmark
Tel. +45 46 77 50 85
Dir. +45 4677 50 37
peja@dtu.dk
www.windenergy.dtu.dk

DTU

we for some time have had an "extinguishing efficiency" of more than 90%, which looks very promising in terms of developing the technology for use in connection with light marking of wind turbines. One could also imagine that the technology with radar control could be used for tall masts, high-rise buildings etc. and in this way in the long term reduce the light exposure from wind turbines.

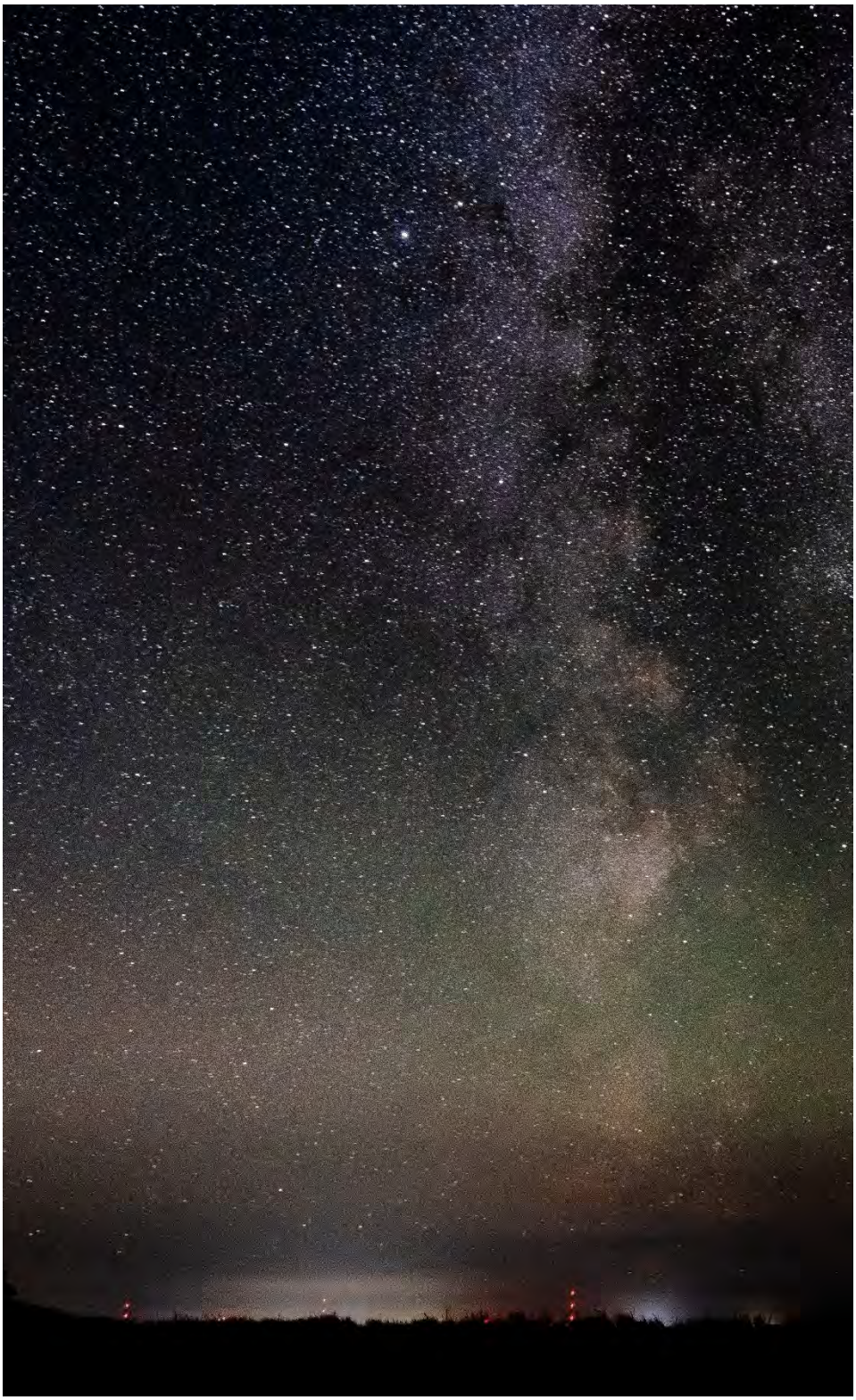
Best regards,

Peter Hjuler Jensen
Deputy Head of Department

DTU

Peter Hjuler Jensen
Viceinstitutdirektør

Dir. 46 77 50 37
Mob. 40 45 5 03 7
peje@dtu.dk
Frederiksborgvej 399
Bygning 114
4000 Roskilde
www.dtu.dk



The Danish National Test Center for large-scale wind turbines in Thy is situated in the best wind field in Europe. The wind turbines tested are up to 280 m – the largest in the world.

The centre is owned and managed by DTU, Technical University of Denmark.

———————

The New York Times has voted the Danish region Thy as no 27 at their 2022-list of "52 Places for a Changed World"

Thy's fascinating wilderness of nature and the unique wind turbine test centre being an epicenter for wind energy research were instrumental parameters for the designation.

———————

The test center is situated outside the Dark Sky Park Bulbjerg-area. The red night light can be seen at the photo (January 2022).

Photo credit: Katharina Fossgreen

10 Lighting legislation in dark skies context

Relevant Danish legislation in a dark cloud context is contained in:

- "Håndbog Vejbelysning": Danish Road Directory Handbook Road Lighting (autumn 2020)
- The Danish Nature Conservation Act (October 4 2022)
- The Danish Building Act (September 23 2016)

Relevant chapters of the individual laws are translated below, 10.1, 10.2 and 10.3 respectively.

10.1 Regulation of road lighting in Denmark

Vejdirektoratet

In the autumn of 2020, the Danish Road Directory published a revised version of updated with the latest rules for lighting roads, cross roads intersections and roundabouts, as well as the latest road types. New lighting classes with better consistency have been introduced in the E-series. The use of LED for lighting, including when and how much it is recommended to dim the lighting, is inscribed in the new manual.

10.1.1 HRL chapter 3.1.7 European standard DS/EN 13201

The common European standard for road lighting, DS/EN 13201 includes:

DS/EN 13201-2:2015 "Road lighting – Part 2: Functional requirements"
DS/EN 13201-3:2015 "Road lighting – Part 3: Calculation of function"
DS/EN 13201-4:2015 "Road lighting – Part 4: Methods for measuring function of illuminating engineering units"
DS/EN 13201-4:2015 "Road lighting – Part 5: Energy efficiency indicators".

10.1.2 HRL chapter 3.2 Shielding classification

*The shielding class describes the limitation of disability glare and remote effects from luminaires in a lighting system. Figure 3.9 Shielding classes define shielding classes G*1, G*2, G*3, G*4, G*5, and G*6. (See translation below.)*

Afskærmningsklasse	Maksimum lysstyrke i retninger under vandret i forhold til den udsendte lysstrøm, [cd/klm]			Total afskærmning
	ved 70° og højere 1)	ved 80° og højere 1)	ved 90° og højere 1)	
G*1		200	50	Ingen krav
G*2		150	30	Ingen krav
G*3		100	20	Ingen krav
G*4	500	100	10	fra og med 95° 1) 2)
G*5	350	100	10	fra og med 95° 1) 2)
G*6	350	100	0	fra og med 90° 1) 2)

1) Enhver retning, som danner den angivne vinkel med lodlinjen med armaturet monteret som i belysningsanlægget.
2) Lysstyrker op til 1 cd/klm kan betragtes som værende 0.

Figur 3.9 Afskærmningsklasser.

Shielding class	Maximum intensity in directions under horizontally in relation to the emitted luminous flux (dc/klm) Starting at 70° 1)	Starting at 80° 1)	Starting at 90° 1)	Total shielding
G*1		200	50	No requirements
G*2		150	30	No requirements
G*3		100	20	No requirements
G*4	500	100	10	Starting at 95° 1) 2)
G*5	350	100	10	Starting at 95° 1) 2)
G*6	350	100	0	Starting at 90° 1) 2)

1) Any direction that forms the specified angle with the plumb line with the fixture mounted as in the lighting system
2) Any brightness up to 1 cd/klm can be considered 0

Figure 3.9 Shielding classes

*Classes G*1, G*2, G*3, G*4, G*5 and G*6 correspond to a series of increasingly strengthened limitations on disability and remote effects from luminaires in a lighting system where G*6 has the most stringent requirements.*

*G*1, G*2 and G*3 correspond to terms used in some countries and are referred to as "semi cut-off" and "cut-off". The classes are used on local roads, etc., when some shielding of the luminaires is required and when a relevant class for disability glare figures is simultaneously met.*

*G*4 and G*5 correspond to a more powerful shielding achieved with flush luminaires with a limited tilt. The classes are used for lighting traffic roads, cross road intersections and the like.*

*G*6 corresponds to luminaires with a flat screen positioned in a horizontal position. The intention is to limit the illumination of the night sky. The class is used for all types of roads and traffic areas.*

10.2 Signage and illumination in the open country

The Danish Nature Conservation Act (Act. No. 1392 of October 4 2022, Chapter 3, §21) states

"In the open country, posters, depictions, freestanding signs, light advertisements and other devices must not be erected for advertising and propaganda purposes. Service directions signs and tourist information signs erected by the authorities in accordance with road and traffic legislation are not considered erected for advertising and propaganda purposes."

No light advertisements or similar lightning occur in the Dark Sky Park area. Signage erected by authorities (Thisted Municipality and the Danish Nature Agency) in the area Bulbjerg-Troldsting-Lildstrand is not/will not be illuminated.

10.3 Inappropriate lighting of buildings

Byggeloven, the Danish Building Act (Act no. 1178 of September 23 2016, chapter 6D.)
Chapter 6D gives the municipal council the authority to intervene in case of inappropriate lighting of buildings.

"§6D, 1: The municipal council may make a permit under the Building Act conditional on the building being given such an external design that a good overall effect is achieved in connection with its surroundings.

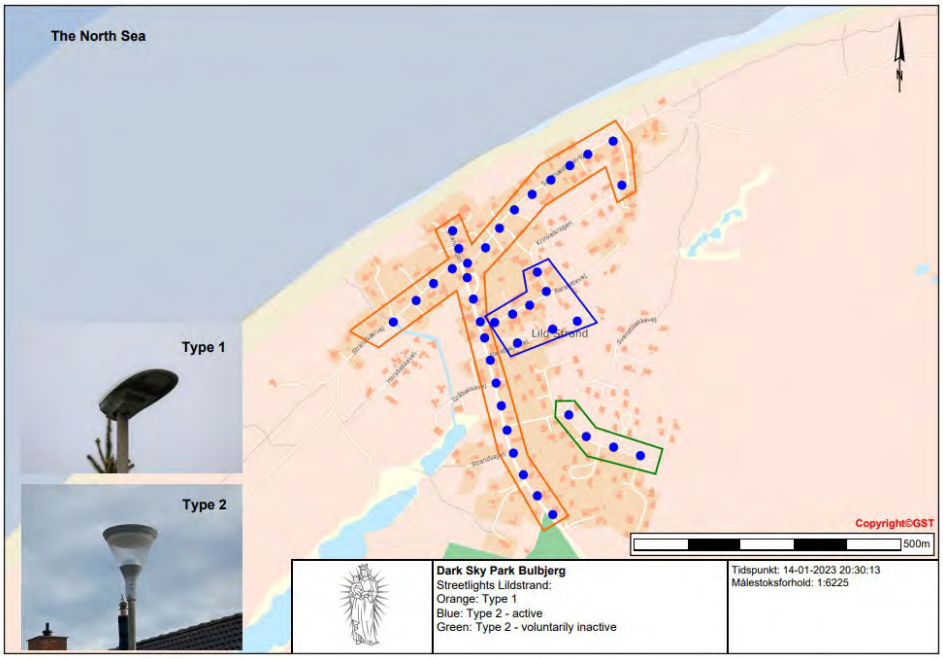
§6D, 2: "Signage, lighting installations and the like must not be a disadvantage or disfiguring to the surroundings. The municipal council may, by prohibition or injunction, ensure compliance with section 1."

As regards the entire Dark Sky Park Bulbjerg-area we can confirm that there is no artificial lighting on any buildings, facilities, or other non-street lighting public lights.

11 Lightning Inventory and compliance

There is no lighting fixtures in the area managed by Naturstyrelsen Thy as it is a protected nature reserve.

40 street lamp fixtures are placed in the Lildstrand urban zone and managed by Thisted Municipality.



Status 7'th of November 2023: 2 types of fixtures:
Type 1 within orange lines – 28 pcs, now replaced with Type 3
Type 2 within blue and green lines – 12 pcs., now replaced with Type 4

All fixtures are with 50% light reduction between 23.00-05.00.

All of the above mentioned fixtures are now compliant with the requirements from IDA (DarkSky) – both shielding and color temperature is within the requirements, and pre-approved by IDA (DarkSky).

TYPE 3: Peak 380 FF-DA MEW

TYPE 4: Focus Spot 38grW

The Dark Sky Group of Hawboernes Forening has raised 12,000 USD for the exchange of all lighting fixtures to be compliant with IDA (DarkSky) requirements, as preparation for the certification.

Given the age of the fixtures and the harsh climate at the coast, it has been decided by the Municipality that all fixtures should be replaced.

All type 1 fixtures is now replaced with Type 3, which is compliant with IDA (DarkSky) requirements, as it is a FCO and 3000 K CCT type. Type 3 is on existing 6 meter poles.

All Type 2 fixtures is now replaced with Type 4, which is compliant with IDA (DarkSky) requirements, as it is a FCO and 3000K CCT type. The fixtures is modified before installing, so that they are positively locked in the directly downwards position, and impossible to adjust again. Type 4 is on existing 3 meter poles.

The Municipality has special requirements for the surface treatment in the harsh coastal climate, and using Anodized Die-Cast Aluminium was mandatory. This determined the manufacturer specifically to be Focus Lighting, as they have developed and own this specific process.

Specification sheets for Type 3 and Type 4: See Appendix 14.1.

12 Lightscape Management Plan

12.1 Lighting Inventory

Fixture ID	Location	Function	No. of Fixtures	Lamps per Fixture	Fixture Type	Lamp Type	Color Temp (K)	Lumens	Hazards	Shielding State	Operable?	Adaptive Controls?	LMP Compliant?	Closeup Photo	Context Photo	Notes
3	Lildstrand	Streetlight	28	1	Post 6 m	LED	3000	TBD	Shared space - cars and pedestrians	Fully (G6 and D6)	No	Dimming	Yes			Focus-lighting Peak 380 FF-DA MEW
4	Lildstrand	Streetlight	12	1	Post 3 m	LED	3000	TBD	Shared space - cars and pedestrians	Fully	No	Dimming	Yes		Same location type as above	Focus-lighting Tum-Spot 38grW Locked in downwards direction

12.2 Agreement with Thisted Municipality

HAWBOERNES FORENING
LILDSTRAND

Thisted Kommune
Asylgade 30
7700 Thisted
Telefon: 99 17 17 17
CVR: 29 18 95 60

Agreement for Dark Sky Park Bulbjerg – Lighting Management

1. Contracting parties
This agreement is May 2023 entered upon between

Thisted Municipality, DK-7700 Thisted
CVR number 29189560, hereinafter called **TM**.
Contact persons: NN and Road manager Morten Lillelund Berthelsen, dept. Facility and Infrastructure

and

Hawboernes Forening, (residents' association), Lildstrand, Rørslettevej 6, Lildstrand, DK-7741 Lildstrand, CVR number 36265159, hereinafter called **HF**.
Contact persons: Bjarne Sørensen and Anne-Mette Kristensen, hawboerne@gmail.com

2. Extent
This agreement covers public lighting in Lildstrand. Currently this comprises only street lighting fixtures.
Lildstrand is the only location in Dark Sky Park Bulbjerg with street lighting / public lighting.

3. Purpose
The purpose of the agreement is to ensure that public lighting is in compliance with IDA-requirements regarding shielding and colour temperature.

4. Goal achievement
Prior to certification September 2023, all public street lighting fixtures in Lildstrand are exchanged to a fully IDA-compliant version.

For future maintenance and renewal of public street lighting in Lildstrand, TM undertakes to install lighting that is fully IDA compliant. The HF Dark Sky group should be consulted prior to maintenance/replacement.

Hawboernes Forening is responsible for preparing the annual report described in IDA's rules, including lighting management review.

5. Validity and denunciation clause of the agreement
The agreement enters into force on Juni 1st 2023 and runs until further notice.

The agreement is valid as long as the HF Dark Sky Group maintains the IDA certification.

6. Transfer of partnership agreement

Hawboernes Forening cannot transfer its rights and obligations under this partnership agreement to third parties without TM's prior written consent.

7. Signatures

On behalf of Hawboernes Forening:

May 9 2023

Anne-Mette Kristensen

Bjarne Sørensen

On behalf of Thisted Municipality:

May 9 2023

Ejgil Haurum

Drifts- og Anlægschef
Thisted Kommune

12.3 Warranting

The Danish Nature Agency is responsible for signage and lighting in the protected areas of Dark Sky Park Bulbjerg. Signage observes the regulations stipulated in the Danish Nature Conservation Act (Act. No. 1392 of October 4 2022, Chapter 3, §21). (See chapter 10.2 in this application.)

Part of the preserved area is furthermore classified as Stillezone ("Quiet zone"), where even stronger limitations to use of the area are enforced.

Thisted Municipality manages street and pathway lighting in Lildstrand and the municipality must obey regulations regarding road safety regulated by law.
(See description in chapter 10.1. in this application.)

The streets of Lildstrand are shared space for motor vehicles, cyclists and pedestrians. Therefore the street lighting must provide safe conditions also for soft road users.

Signage erected by authorities (Thisted Municipality and the Danish Nature Agency) in the area Bulbjerg-Troldsting-Lildstrand is not illuminated.
Illuminated signage erected by shops or private persons does not occur within the dark sky park area, including Lildstrand.
(See regulations described in chapters 10.2. and 10.3 in this application.)

Given that Lildstrand is an urban zone inside the designated area, it is not under the jurisdiction of the Danish Nature Agency/the Nature Conservation Act. Lighting in Lildstrand is governed by legislation described in chapter 10.1. and 10.3.

Working area on the beach in Lildstrand: The urban beach area where the fishing boats are hauled up by winch and where fish catch is processed is defined as a working area, and as such with its auxiliary infrastructure regulated by the Danish Working Environment act. The working area (beach area) has 1 piece of outdoor lighting (fixture) used for fishery related activities and safety.

The fixture is in operation by night, partly for work purposes, partly, and primarily, as an essential security safeguard for the fishermen when they go fishing, at sea for landfall and when they return from the sea.

This particular lighting facility will be exchanges to Type 3, FCO and 3000K . See photo on the page below showing the current fixture .

The FCO fixture for safety at the working area.
Photo credit: Bjarne Sørensen

Private permanent residences and holiday homes in the Dark Sky Park area:
Many houseowners in Lildstrand have chosen not to install outdoor lighting.
Where outdoor lighting is installed, the quality is not uniform by now.
In general, there are many very good and compliant solutions in Lildstrand and the awareness of the various harmful effects of light pollution is steadily increasing among the locals.

As it appears from the photos in Appendix 14.2 showing examples of private lighting in Lildstrand, there are many very good and fully compliant private solutions, and the awareness of the various harmful effects of light pollution is steadily increasing among the local residents and holiday home owners.

Installations with room for improvement can also be found. Often it is outdoor lighting installations of long standing which are inappropriate. Many of the oldest holiday homes are not in use in the cold and dark wintertime.

In 2022 Hawboernes Forening distributed a folder with guidelines for ideal DSP lighting to both permanent residents and holiday home owners. It will be a continous effort from the IDA Chapter in the area to seek improvements and optimization of current as well as new installations.

In Lildstrand, there is no artificial lighting on any buildings, facilities, or other non-street lighting public lights. Only public building in Lildstrand is the church.

12.4 Light shielding

Any lighting controlled by the Danish Nature Agency or Thisted Municipality in the Dark Sky Park Bulbjerg must be of the Full Cut Off Type with no radiation upwards.

12.5 ≤3000K CCT limit

All lighting controlled by the Danish Nature Agency or Thisted Municipality in the Dark Sky Park Bulbjerg must be with a 3000K CCT limit.

12.6 Meets or surpasses local laws

Byggeloven, the Danish Building Act, Act no. 1178 of September 23 2016, chapter 6DC gives the municipal council the authority to intervene in case of inappropriate lighting of buildings. (See chapter 10.3 in this application.)

12.7 Regulations for visitor nighttime use of light

The Danish Nature Agency provides facilities free of charge for people who want to sleep in the open in the great outdoors. As for the Dark Sky Park Bulbjerg area, for the present time there is one shelter area, at Troldsting, in the designated area. General guidelines to be obeyed are issued by the Danish Nature Agency. ***Responsible use of light is included herein. See item 12.8 and 12.9.***

Website: Overnatning i den danske natur (naturstyrelsen.dk); Sov i skovbunden (naturstyrelsen.dk), Appendix 14.3
Photo credit: The Danish Nature Agency

Shelters and "primitive accommodations" are intended for individuals, families and small groups who want to spend the night in nature with or without a tent. Shelter areas are open to everyone both for accommodation and for cosy get together around a campfire. Maximum 2 nights. Access is free of charge.
Website https://naturstyrelsen.dk/naturoplevelser/overnatning

Sleeping in the open: "Everywhere in the forests owned by the Danish state, you are allowed to stay the night on the forest's floor using sleeping mats and/or sleeping bags or put up your hammock. Using tarp is not allowed. The rules also apply to beaches."

Free tenting: The Danish state owns 275 forests where you may put up your tent for the night - without asking permission. Limitation: Max one night with two tents of the 3-man type. Tents must be put up under trees and must not be a nuisance to other visitors. Tents must not be visible from buildings or to other visitors using paths and forest roads.
Website: https://naturstyrelsen.dk/naturoplevelser/overnatning/fri-teltning/

Website: https://naturstyrelsen.dk/naturoplevelser/overnatning/fri-teltning/
Photo credit: The Danish Nature Agency

12.8 Temporary lighting

In case of necessary maintenance or extraordinary activities, temporary lighting may be necessary. In due course, to the greatest possible extent maintenance / activities should be executed in accordance with the general requirements of FCO and 3000K CCT limit.

12.9 Illuminated signage

No illuminated signs can be found in the Dark Sky Park area. Neither at protected land, nor in the village Lildstrand.

Illuminated signs must not be installed in the protected part of Dark Sky Park area due to the Danish Nature Conservation act. See Chapter 10.2 of this application.

Public use of illuminated signs in the Lildstrand built up area will not occur due to non-existing need hereof.

Private use of illuminated signs, floodlight, searchlight, decorative and seasonal lighting is an unlikely option due to local conditions and an occupational structure with only 3 small shops run by local residents. Further, the Danish Building Act authorizes the municipal authorities to intervene. See Chapter 10.3 of this application.

Should any issues occur, they will be reported in the annual IDA-report and dealt with by the dark sky-group in cooperation with Thisted Municipality and in accordance with Danish law and the appurtenant IDA-regulations.

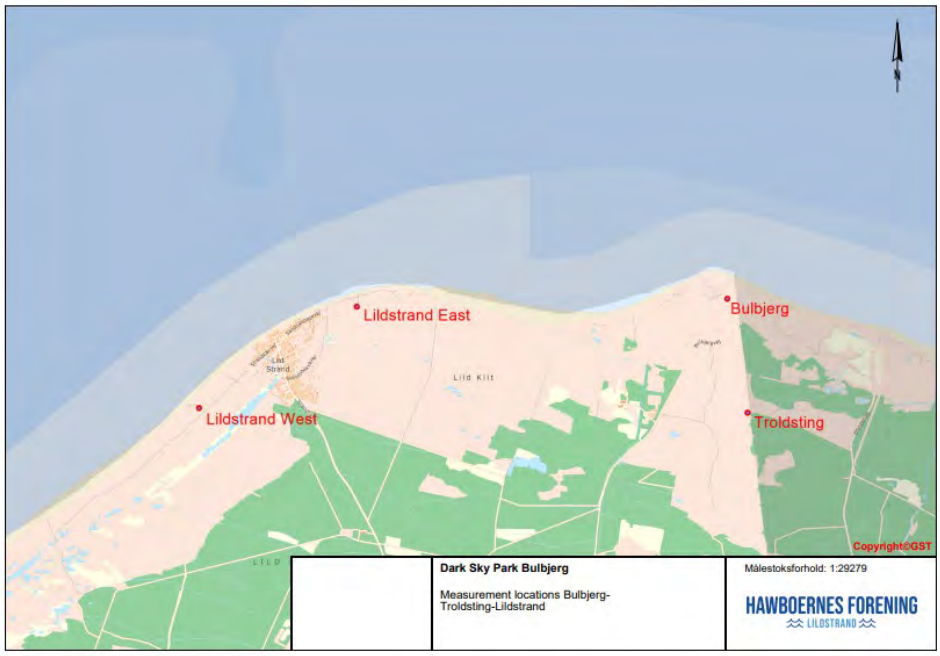
13 Night sky quality measurement report, SQM

All measurements accomplished by: Bjarne Sørensen, Hawboernes Forening
Equipment: Unihedron Fotometer Sky Quality Meter 1-M-128-02 and Unihedron tripod adapter for SQM. Measurement locations: See illustration on the next page.

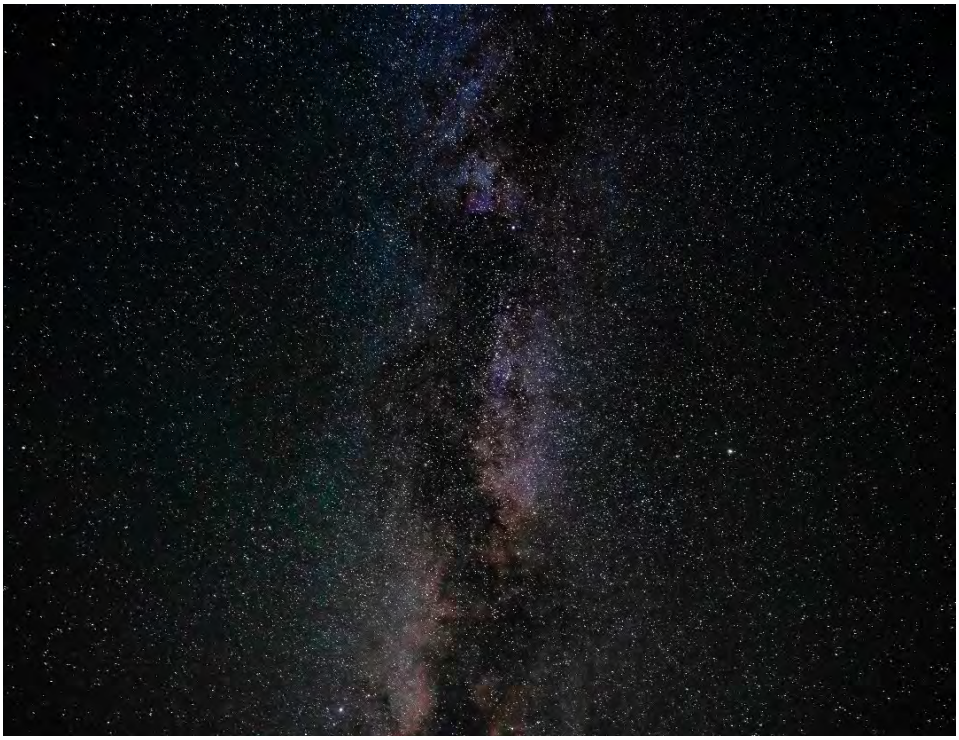
Initially, the SQM measurements were executed at different times in the evening, and some of them with the Milky Way visible above the measurement location.

In the upcoming SQM measurements, we'll ensure to follow the guidelines of 5 measurements after the initial one. We have now purchased a suitable camera and lens for Astrophoto, and will accompany the measurements with photos of the sky during the measurement. Future measurements will be performed around mid-night.

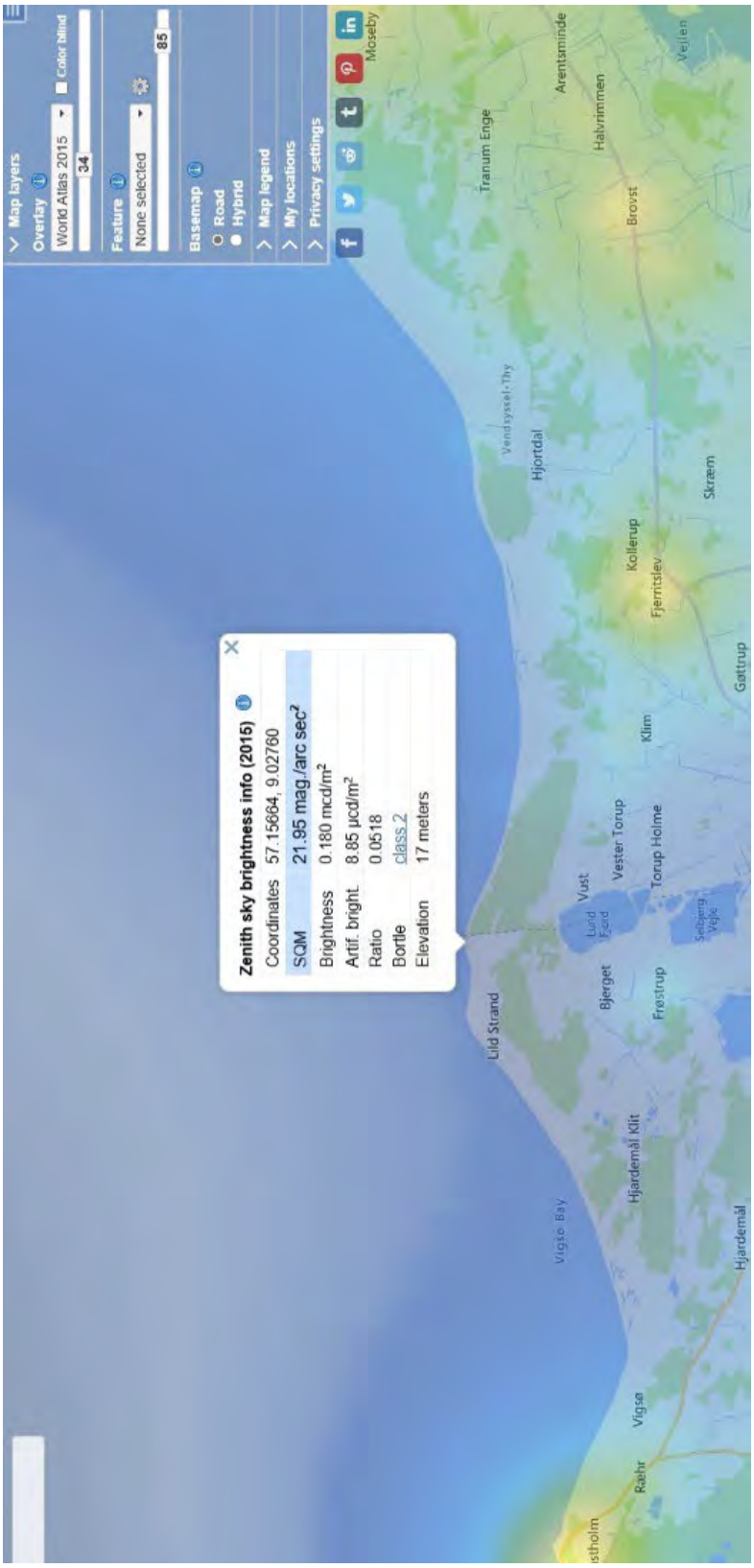
SQM measurement at Troldsting
Photo credit: Kristian Amby



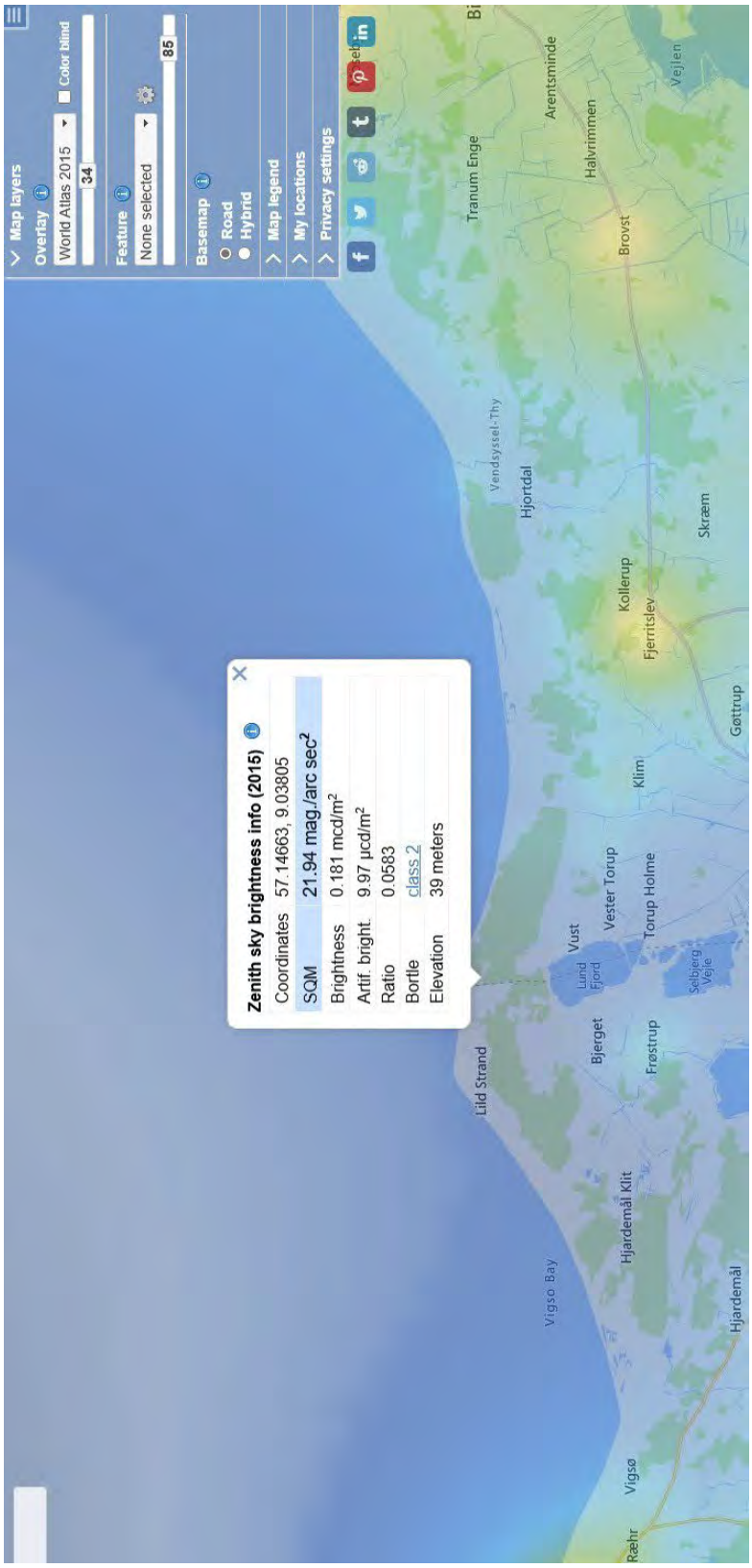
Measurement locations – overview elaborated by Hawboernes Forening's Dark Sky Park group



Night sky at Lildstrand Photo credit: Katharina Fossgreen



Bulbjerg. Coordinates 57.15664, 9.02760, SQM 21,95 mag./arc sec2 Bortle class 2
https://www.lightpollutionmap.info



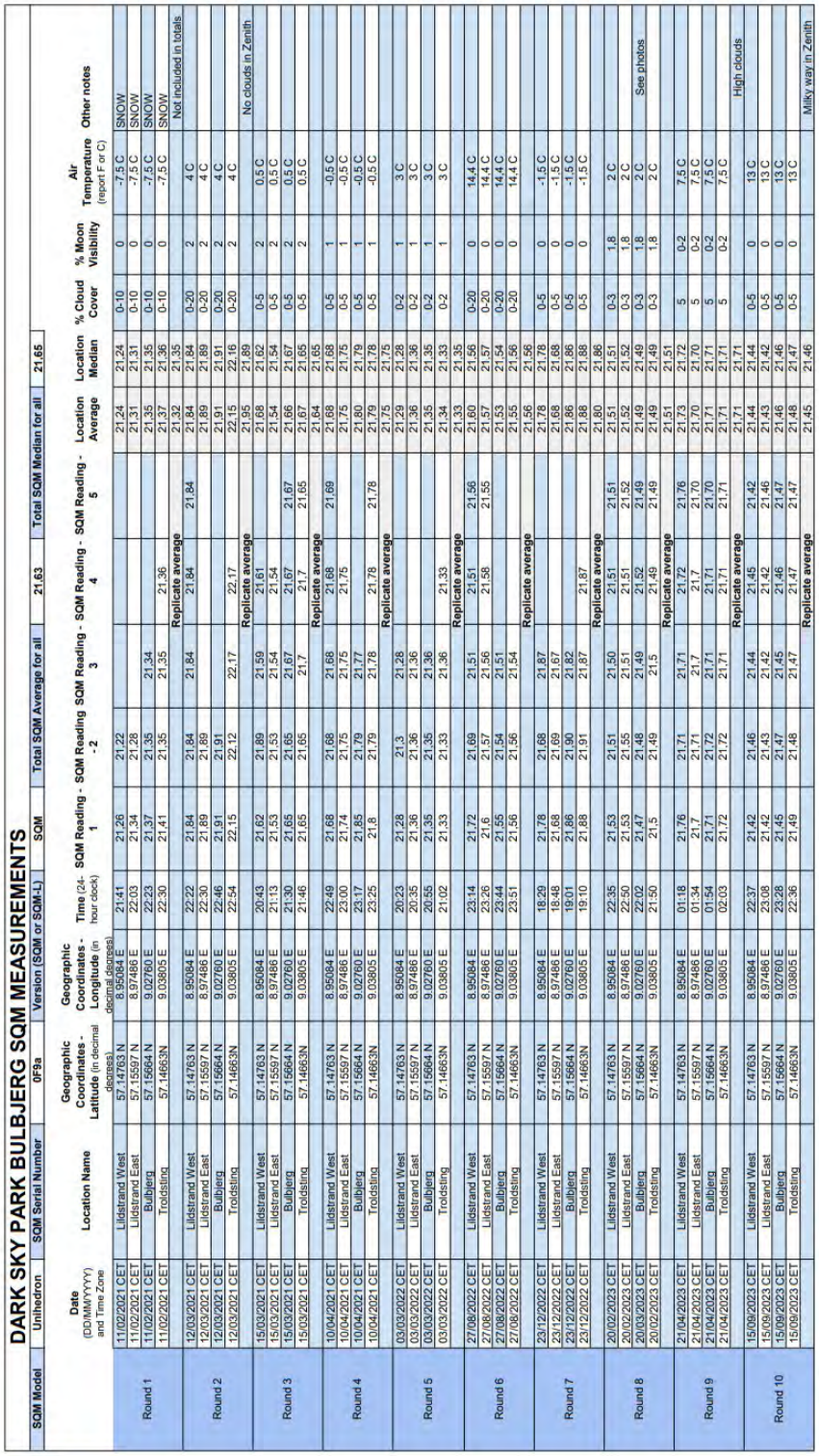
Troldsting. Coordinates 57.14663, 9.03805, SQM 21,94 mag./arc sec2 Bortle class 2
https://www.lightpollutionmap.info

Lildstrand East. Coordinates 57.15597,8.97486, SQM 21,95 mag./arc sec2 Bortle class 2
https://www.lightpollutionmap.info

Lildstrand West. Coordinates 57.14763, 8.95084, SQM 21,95 mag./arc sec2 Bortle class 2
https://www.lightpollutionmap.info

13.1 SQM measurement recording sheet 2021-September 2023

No SQM-measurements April-August due to NORDIC WHITE NIGTHS: See Appendix 14.4.



DARK SKY PARK BULBJERG SQM MEASUREMENTS

SQM Model	Unihedron	SQM Serial Number	0F9a	Version (SQM or SQM-L)	SQM	Total SQM Average for all	21,63	Total SQM Median for all	21,65										
	Date (DD/MM/YYYY) and Time Zone	Location Name	Geographic Coordinates - Latitude (in decimal degrees)	Geographic Coordinates - Longitude (in decimal degrees)	Time (24-hour clock)	SQM Reading - 1	SQM Reading - 2	SQM Reading 3	SQM Reading - 4	SQM Reading - 5	Location Average	Location Median	% Cloud Cover	% Moon Visibility	Air Temperature (report F or C)	Other notes
Round 1	11/02/2021 CET	Lildstrand West	57,14763 N	8,95084 E	21:41	21,26	21,22				21,24	21,24	0-10	0	-7,5 C	SNOW
	11/02/2021 CET	Lildstrand East	57,15597 N	8,97486 E	22:03	21,34	21,28				21,31	21,31	0-10	0	-7,5 C	SNOW
	11/02/2021 CET	Bulbjerg	57,15664 N	9,02760 E	22:23	21,37	21,35	21,34	21,36		21,35	21,35	0-10	0	-7,5 C	SNOW
	11/02/2021 CET	Troldsting	57,14663N	9,03805 E	22:30	21,41	21,35	21,35			21,37	21,36	0-10	0	-7,5 C	SNOW
									Replicate average		21,32	21,35				
Round 2	12/03/2021 CET	Lildstrand West	57,14763 N	8,95084 E	22:22	21,84	21,84	21,84	21,84	21,84	21,84	21,84	0-20	2	4 C	Not included in totals
	12/03/2021 CET	Lildstrand East	57,15597 N	8,97486 E	22:30	21,89	21,89				21,89	21,89	0-20	2	4 C	
	12/03/2021 CET	Bulbjerg	57,15664 N	9,02760 E	22:46	21,91	21,91				21,91	21,91	0-20	2	4 C	
	12/03/2021 CET	Troldsting	57,14663N	9,03805 E	22:54	22,15	22,12	22,17	22,17		22,15	22,16	0-20	2	4 C	
									Replicate average		21,95	21,89				No clouds in Zenith
Round 3	15/03/2021 CET	Lildstrand West	57,14763 N	8,95084 E	20:43	21,62	21,89	21,59	21,61		21,68	21,62	0-5	2	0,5 C	
	15/03/2021 CET	Lildstrand East	57,15597 N	8,97486 E	21:13	21,53	21,53	21,54	21,54		21,54	21,54	0-5	2	0,5 C	
	15/03/2021 CET	Bulbjerg	57,15664 N	9,02760 E	21:30	21,65	21,65	21,67	21,67	21,67	21,66	21,67	0-5	2	0,5 C	
	15/03/2021 CET	Troldsting	57,14663N	9,03805 E	21:46	21,65	21,65	21,7	21,7	21,65	21,67	21,65	0-5	2	0,5 C	
									Replicate average		21,64	21,65				
Round 4	10/04/2021 CET	Lildstrand West	57,14763 N	8,95084 E	22:49	21,68	21,68	21,68	21,68	21,69	21,68	21,68	0-5	1	-0,5 C	
	10/04/2021 CET	Lildstrand East	57,15597 N	8,97486 E	23:00	21,74	21,75	21,75	21,75		21,75	21,75	0-5	1	-0,5 C	
	10/04/2021 CET	Bulbjerg	57,15664 N	9,02760 E	23:17	21,85	21,79	21,77			21,80	21,79	0-5	1	-0,5 C	
	10/04/2021 CET	Troldsting	57,14663N	9,03805 E	23:25	21,8	21,79	21,78	21,78	21,78	21,79	21,78	0-5	1	-0,5 C	
									Replicate average		21,75	21,75				
Round 5	03/03/2022 CET	Lildstrand West	57,14763 N	8,95084 E	20:23	21,28	21,3	21,28			21,29	21,28	0-2	1	3 C	
	03/03/2022 CET	Lildstrand East	57,15597 N	8,97486 E	20:35	21,36	21,36	21,36			21,36	21,36	0-2	1	3 C	
	03/03/2022 CET	Bulbjerg	57,15664 N	9,02760 E	20:55	21,35	21,35	21,36			21,35	21,35	0-2	1	3 C	
	03/03/2022 CET	Troldsting	57,14663N	9,03805 E	21:02	21,33	21,33	21,36	21,33		21,34	21,33	0-2	1	3 C	
									Replicate average		21,33	21,35				
Round 6	27/08/2022 CET	Lildstrand West	57,14763 N	8,95084 E	23:14	21,72	21,69	21,51	21,51	21,56	21,60	21,56	0-20	0	14,4 C	
	27/08/2022 CET	Lildstrand East	57,15597 N	8,97486 E	23:26	21,6	21,57	21,56	21,58	21,55	21,57	21,57	0-20	0	14,4 C	
	27/08/2022 CET	Bulbjerg	57,15664 N	9,02760 E	23:44	21,55	21,54	21,51			21,53	21,54	0-20	0	14,4 C	
	27/08/2022 CET	Troldsting	57,14663N	9,03805 E	23:51	21,56	21,56	21,54			21,55	21,56	0-20	0	14,4 C	
									Replicate average		21,56	21,56				
Round 7	23/12/2022 CET	Lildstrand West	57,14763 N	8,95084 E	18:29	21,78	21,68	21,87			21,78	21,78	0-5	0	-1,5 C	
	23/12/2022 CET	Lildstrand East	57,15597 N	8,97486 E	18:48	21,68	21,69	21,67			21,68	21,68	0-5	0	-1,5 C	
	23/12/2022 CET	Bulbjerg	57,15664 N	9,02760 E	19:01	21,86	21,90	21,82			21,86	21,86	0-5	0	-1,5 C	
	23/12/2022 CET	Troldsting	57,14663N	9,03805 E	19:10	21,88	21,91	21,87	21,87		21,88	21,88	0-5	0	-1,5 C	
									Replicate average		21,80	21,86				
Round 8	20/02/2023 CET	Lildstrand West	57,14763 N	8,95084 E	22:35	21,53	21,51	21,50	21,51	21,51	21,51	21,51	0-3	1,8	2 C	
	20/02/2023 CET	Lildstrand East	57,15597 N	8,97486 E	22:50	21,53	21,55	21,51	21,51	21,52	21,52	21,52	0-3	1,8	2 C	
	20/03/2023 CET	Bulbjerg	57,15664 N	9,02760 E	22:02	21,47	21,48	21,49	21,52	21,49	21,49	21,49	0-3	1,8	2 C	See photos
	20/02/2023 CET	Troldsting	57,14663N	9,03805 E	21:50	21,5	21,49	21,5	21,49	21,49	21,49	21,49	0-3	1,8	2 C	
									Replicate average		21,51	21,51				
Round 9	21/04/2023 CET	Lildstrand West	57,14763 N	8,95084 E	01:18	21,76	21,71	21,71	21,72	21,76	21,73	21,72	5	0-2	7,5 C	
	21/04/2023 CET	Lildstrand East	57,15597 N	8,97486 E	01:34	21,7	21,71	21,7	21,7	21,70	21,70	21,70	5	0-2	7,5 C	
	21/04/2023 CET	Bulbjerg	57,15664 N	9,02760 E	01:54	21,71	21,72	21,71	21,71	21,70	21,71	21,71	5	0-2	7,5 C	
	21/04/2023 CET	Troldsting	57,14663N	9,03805 E	02:03	21,72	21,72	21,71	21,71	21,71	21,71	21,71	5	0-2	7,5 C	
									Replicate average		21,71	21,71				
Round 10	15/09/2023 CET	Lildstrand West	57,14763 N	8,95084 E	22:37	21,42	21,46	21,44	21,45	21,42	21,44	21,44	0-5	0	13 C	High clouds
	15/09/2023 CET	Lildstrand East	57,15597 N	8,97486 E	23:08	21,42	21,43	21,42	21,42	21,46	21,43	21,42	0-5	0	13 C	
	15/09/2023 CET	Bulbjerg	57,15664 N	9,02760 E	23:28	21,45	21,47	21,45	21,46	21,47	21,46	21,46	0-5	0	13 C	
	15/09/2023 CET	Troldsting	57,14663N	9,03805 E	22:36	21,49	21,48	21,47	21,47	21,47	21,48	21,47	0-5	0	13 C	
									Replicate average		21,45	21,46				Milky way in Zenith

Initially in the process, we wre sadly not aware of the requirement for 5 measurements/location, so that was rectified in the later measurements.

Bulbjerg zenit
SQM March 20 2023

Photo specification:
Samyang MF 14. F2,8.
Canon RF mount
Canon EOS R6.

20 seconds exposure, ISO 3200.

Zenit and 45 degrees angled towards North, East, South and West.

1,8 % moon

SQM Bulbjerg north
March 20 2023

Photo specification:
Samyang MF 14. F2,8.
Canon RF mount
Canon EOS R6.

20 seconds exposure, ISO 3200.

Zenit and 45 degrees angled towards North, East, South and West.

1,8 % moon

Bulbjerg south
SQM March 20 2023

Photo specification:
Samyang MF 14. F2,8.
Canon RF mount
Canon EOS R6.

20 seconds exposure, ISO 3200.

Zenit and 45 degrees angled towards North, East, South and West.

1,8 % moon

SQM Bulbjerg east
March 20 2023

Photo specification:
Samyang MF 14. F2,8.
Canon RF mount
Canon EOS R6.

20 seconds exposure, ISO 3200.

Zenit and 45 degrees angled towards North, East, South and West.

1,8 % moon

SQM Bulbjerg west
March 20 2023

Photo specification:
Samyang MF 14. F2,8.
Canon RF mount
Canon EOS R6.

20 seconds exposure, ISO 3200.

Zenit and 45 degrees angled towards North, East, South and West.

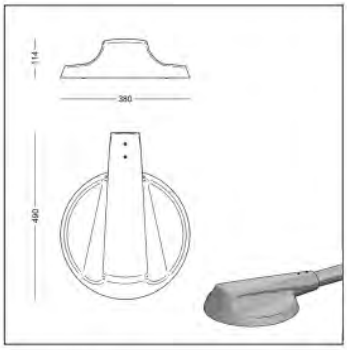
1,8 % moon

14 Appendices to the DarkSky-application

14.1 Fixtures TYPE 3 – Manufacturer's specification

Peak 380 - FastFlex + MEW

Design: A-ART Designers



Luminaire specification:

Material:	Cast aluminium
Powder coating:	Graphite grey: YW355F Silver grey: Y2370I Black: Noir 900 Sablé, SN351F
Shade:	3 mm hardened glass, coated on the edge
Mounting:	On pole, 60 or 76 mm top diameter, or on arm, 42, 48, or 60 mm
Connection:	In the pole. The luminaire is delivered with lead according to pole height, 2 x 1 mm²
Classification:	IP66, class II
Impact resistance:	IK09
Corrosion class:	C4, option for C5
Weight:	6-7 kg
Lamp type:	Exchangable LED module

Driver specification:

Driver, 1xFF:	Xitanium Full Xi FP 40 W 0.2-0.7 A, program.
Inrush current:	max 22 A (50% after 290 µs)
Operational input voltage: 198-264 Vac	
Driver, 2xFF:	Xitanium Full Xi FP 75 W 0.2-0.7 A, program.
Inrush current:	max 46 A (50% after 250 µs)
Operational input voltage: 80-264 Vac	
Driver, 3xFF:	Xitanium Full Xi FP 110 W 0.2-0.7 A, program.
Inrush current:	max 47 A (50% after 250 µs)
Operational input voltage: 80-264 Vac	
Nominal voltage:	AC: 220-240 Vac, DC: 186-250 Vdc
Operational input voltage: 168-275 Vdc	
Nominal input frequency: 50-60 Hz	
Operational input frequency: 45-66 Hz	
Max preprotection:	16 A
Surge protection:	L/N-GND: 10 kV, L-N: 6 kV, (SR driver: 8 kV)
Operationel life:	min 100,000 hours
Dimming:	5 steps dimming within the lumen intervals
Alternatively:	DALI-2 (4/5-conductor cable), LineSwitch, or via Zhaga book 18 socket

Lamp specification:

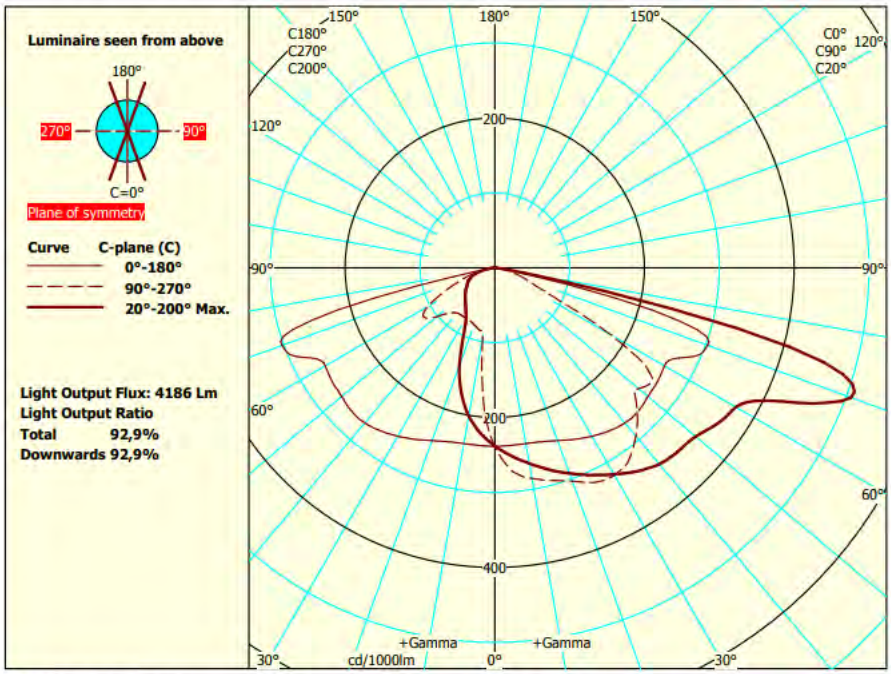
FastFlex LED:	FF-DA, MEW lenses, for traffic roads, M classes, 1, 2, or 3 modules
Operational life:	min. 100,000 hours at ta max 25°, L90B10 Constant lumen output
Temperature range:	-30 to +35° C
Colour temperature:	2700, 3000, or 4000 Kelvin
Colour rendering:	min 70 Ra, 80 Ra optional
Colour accuracy:	5 steps SDCM
Luminous intensity:	G*6
Glare index class:	D6
Luminous flux:	The luminous flux range quoted below is from the LED light source. Apply output ratio in order to calculate luminous flux out of the luminaire.
LED-lumen, 1xFF:	
70 Ra	3000K: 450-4500 lm, energy eff class: D 4000K: 475-4850 lm, energy eff class: D
80 Ra	2700K: 375-3800 lm, energy eff class: E 3000K: 400-4000 lm, energy eff class: E 4000K: 420-4250 lm, energy eff class: D
LED-lumen, 2xFF:	
70 Ra	3000K: 875-9000 lm, energy eff class: D 4000K: 950-9700 lm, energy eff class: D
80 Ra	2700K: 725-7600 lm, energy eff class: E 3000K: 775-8000 lm, energy eff class: E 4000K: 825-8500 lm, energy eff class: D
LED-lumen, 3xFF:	
70 Ra	3000K: 1310-13500 lm, energy eff class: D 4000K: 1420-14600 lm, energy eff class: D
80 Ra	2700K: 1100-11400 lm, energy eff class: E 3000K: 1175-12000 lm, energy eff class: E 4000K: 1250-12700 lm, energy eff class: D
Output ratio:	93%

Find our sales partner in your country under Contacts at www.focus-lighting.dk

FOCUS-LIGHTING

Focus Lighting

				PhotoFiler/2010.10/EULumdat 1			
Luminaire:	Peak_1xFFg5DA_T3_730	Lightsources	1	Dimensions	Luminous	Physical	
Type No.:		Type:	FFg5DA_2x8/730_630mA	Length	mm	370	380
Test Report:	VFR-180606-0122-MS	Total luminous flux:	4506 lm	Width (Circular=0)		0	0
Date / name:	22-06-2021 - serial: 2316635689	Colour temp:	3000	Heigth C0° side		0	114
Tilt-angle:	0°	CRI:	71.7	Heigth C90° end		0	
Conv.factor:	1	Watt total:	32,5 W	Heigth C180° side		0	
File Name:	Peak_1xFFg5DA_T3_730.ldt			Heigth C270° end		0	

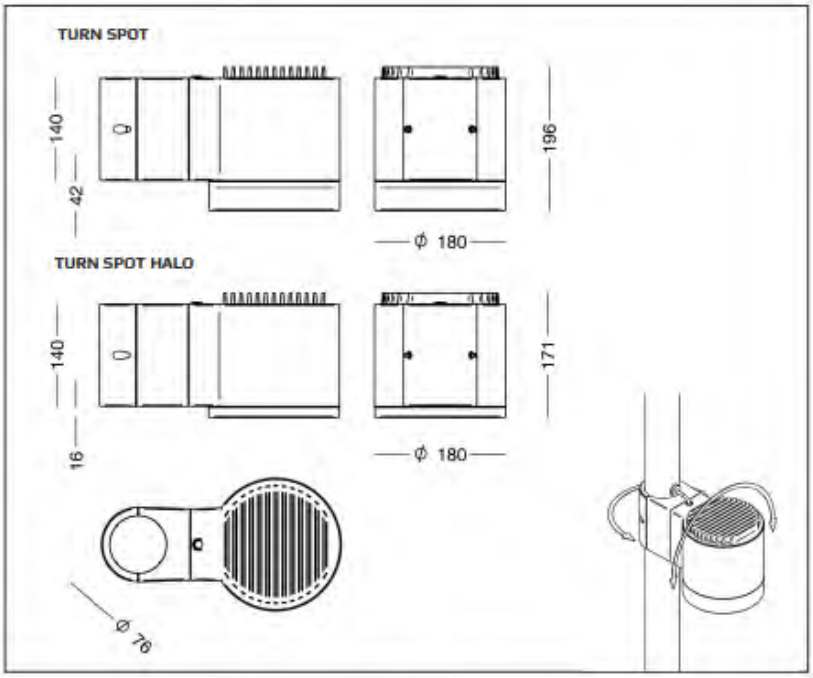


Some part of the I-table and luminous flux is missing. Thus the output flux and ratios are uncertain.

14.2 Fixtures TYPE 4 – Manufacturer's specification

Turn Spot

Design FMS & MOLTKE Design



Luminaire specification:

Material:	
Turn Spot:	Cast aluminium
Turn Spot Halo:	Cast aluminium and opal-white acrylate
Coating:	Graphite grey: YW355F Silver grey: Y2370I Corten brown: YX355F Black: Noir 900 Sablé, SN351F
Shade:	Clear glass with silk coating at the edge Honeycomb filter optional
Mounting:	At conical post, or design post with 76 mm cylindrical extension Adapter for 60 mm post optional
Lead:	8.5 m lead, 2 x 1 mm², is included
Connection:	In the post
Classification:	IP66, class II
Impact resistance:	IK08
Corrosion class:	C4
Wind sweeping area:	0.053 m²
Weight:	6 kg

LED and driver specification:

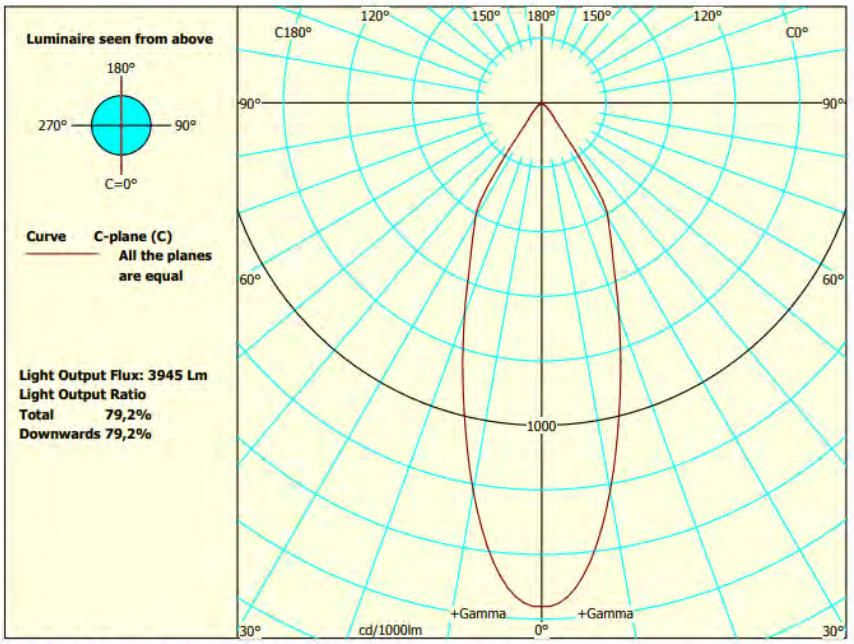
LED:	Bridgelux V18
Beam angles:	wide (38°), medium (19°), or narrow (12°)
Operational life:	min 100,000 hours at ta max 25°C, L90B10
Colour temperature:	2700, 3000, or 4000 Kelvin
Colour rendering:	min 80 Ra
Colour accuracy:	3 steps SDCM
Luminous power:	2700K: 400-4700 lm, CLO, energy eff class E 3000K: 410-5000 lm, CLO, energy eff class E 4000K: 425-5100 lm, CLO, energy eff class E
Driver:	Xitanium Full Xi FP 40 W 0.3-1.0 A programmable
Innush current:	max 22 A (50% after 290 µs)
Surge protection:	L/N-GND: 10 kV (SR driver: 8 kV) L-N: 6 kV
Operational life:	min 100,000 hours
Dimming:	5-steps dimming within the lumen intervals,
Alternatively:	DALI-2 (4/5-conductor cable), LineSwitch, or via Zhaga book 18 socket

Find our sales partner in your country under Contacts at www.focus-lighting.dk

FOCUS-LIGHTING

Focus Lighting AS

Luminaire:	Turn_38grW_830	Lightsources	1	PhotoFiler/2010.10/EULumdat 1			
Type No.:		Type:	V18_30E4000-C-83_900mA	Dimensions		Luminous	Physical
Test Report:	VFR-180604-0120-MS	Total luminous flux:	4982 lm	Length	mm	166	180
Date / name:	18-08-2020 - serial: 2316635689	Colour temp:	3000	Width (Circular=0)		0	0
Tilt-angle:	0°	CRI:	81.7	Heigth C0° side		0	200
Conv.factor:	1	Watt total:	34,03 W	Heigth C90° end		0	
File Name:	Turn_38grW_830.ldt			Heigth C180° side		0	
				Heigth C270° end		0	



Some part of the I-table and luminous flux is missing. Thus the output flux and ratios are uncertain.

14.3 Examples of private outdoor lighting in Lildstrand

The major part of private outdoor lighting in Lildstrand is shielded appropriately. Outreach will be made currently as to informing about night sky friendly lighting. None of the shops in Lildstrand has outdoor lighting.

Outdoor lighting at shops, church and village hall – notice three shops are without any outdoor lighting

Outdoor lighting at private permanent residences

Outdoor lighting at holiday homes

14.4 Accessibility 24/7 all year round

Ministry of Environment of Denmark
Nature Agency

General information on The Danish Nature Agency:
https://eng.naturstyrelsen.dk/

Free access 24/7 all year round to forest and natural areas managed by the Danish Nature Agency.
It is allowed to stay overnight: Sov i skovbunden (naturstyrelsen.dk)

Sov i skovbunden og ved vandet

Du må sove under åben himmel i skovbunden på Naturstyrelsens arealer – fx i en sovepose på et liggeunderlag eller med et tæppe over. Du må også spænde din hængekøje ud mellem to træer, og vær opmærksom på, at du ikke beskadiger træet, fx barken, som især er sårbar om foråret.

Hvis du ønsker at sætte en tarp op over din hængekøje, skal du gøre det i en skov med fri telтning, da de fleste tarpkonstruktioner giver udstyret samme funktion som et telt – og telтning er kun tilladt i skove med fri telтning eller på primitive overnatningspladser.

Som i skoven må du også sove på stranden med fx sovepose på liggeunderlag – og uden telt eller tarpkonstruktioner, der har samme funktion som et telt.

Translation:

Sleep on the forest floor and on the beach

You are allowed to sleep in the open air on the forest floor on the Danish Nature Agency's areas – e.g. in a sleeping bag on a sleeping mat or with a blanket over it. You must also stretch your hammock between two trees. Be careful that you do not damage the trees, such as the bark, which is especially vulnerable in spring.

If you want to put a tarp over your hammock, do it in a forest with free tenting, as most tarp constructions give the equipment the same function as a tent – and tenting is only allowed in forests with free tenting or on primitive overnight sites.

As in the forest, you are also allowed to sleep on the beach with, for example, a sleeping bag on sleeping mats – and without tents or tarp constructions that have the same function as a tent.

Generelt

Din hund er velkommen og skal føres i snor – også på overnatningspladsen.

Motorkørsel er ikke tilladt i statens skov- og naturområder.

Du må gerne lytte til eller spille musik, men ikke på en støjende måde.

Tak fordi du tager dit affald med hjem.

Generally

Your dog is welcome and must be kept on a leash – also at the overnight site.

Motor driving is not allowed in the state's forest and natural areas.

You are allowed to listen to or play music, but not in a noisy way.

Thank you for taking your trash home.

14.5 Nordic White Nights

DMI

https://www.dmi.dk/nyheder/2017/nu-begynder-sommerens-lyse-natter/

DMI: Danish Meteorological Institute

Nu begynder sommerens lyse nætter

De lyse nætter gør nu deres indtog længst mod nord i Danmark, og i løbet af de næste 14 dage breder fænomenet sig til hele landet.

Når vi har lyse nætter i Danmark, er Solen selv midt om natten så lidt under horisonten at dens stråler formår at lyse himlen en smule op. Det bliver med andre ord ikke på noget tidspunkt rigtigt mørkt, men kun tusmørkt så at sige.

Tommelfingerreglen for lyse nætter hedder fra 5/5 til 8/8 i København og fra 28/4 til 14/8 i Skagen. Dog kan der være forholdsvis stor forskel på, hvornår de lyse nætter begynder, alt efter hvor du befinder dig i landet.

I København, der udgør den såkaldte astronomiske reference for hele landet, begynder de lyse nætter først natten til den 6. maj og varer indtil begyndelsen af august måned, nemlig natten til den 7. august.

Danmarks sydligste punkt må dog vente lidt endnu med at se lyset - det sker nemlig først i slutningen af natten til den 10. maj i Gedser.

Typer af tusmørke

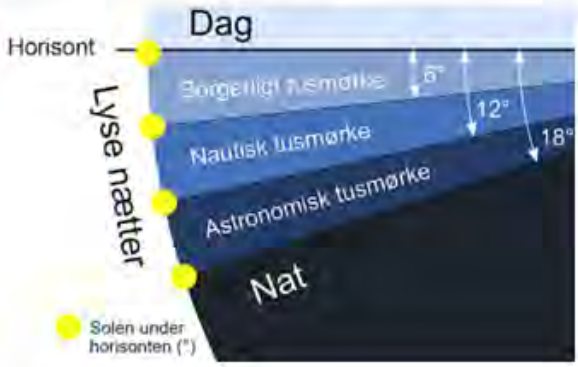
Vi skelner mellem tre former for tusmørke:

- Borgerligt tusmørke:
  ...er det, vi almindeligvis blot betegner som tusmørke, og ordet borgerligt er her modsætningen til nautisk. Er defineret ved, at Solens centrum er mindre end 6 grader under horisonten. Udendørs aktiviteter kan i reglen foregå uden kunstlys, og både horisontlinjen og genstande på jorden kan tydeligt ses.

- Nautisk tusmørke:
  ...er defineret ved, at Solens centrum er mindre end 12 grader under horisonten. Som regel kan man se omridset af genstande på jorden, mens horisonten er vanskelig at skelne.
- Astronomisk tusmørke:
  ...er defineret ved, at Solens centrum er mindre end 18 grader under horisonten. Man ser et mere eller mindre kraftigt genskær af Solens lys på himlen.

De lyse nætter er altså den periode, hvor der som minimum er astronomisk tusmørke hele natten.

SEE TRANSLATION BELOW



DMI

https://www.dmi.dk/nyheder/2017/nu-begynder-sommerens-lyse-nætter

DMI: Danish Meteorological Institute

Now the Nordic White Nights of summer begin

The white nights now make their appearance in the far north of Denmark, and over the next 14 days the phenomenon will spread to the whole country.

When we have white nights in Denmark, the Sun itself in the middle of the night is so little below the horizon that its rays manage to light up the sky a bit. In other words, it does not get really dark at any time, but only twilight, so to speak.

The rule of thumb for white nights is from May 5 to August 8 in DK-Copenhagen and from April 28 to August 14 in DK-Skagen. However, there can be a relatively big difference in when the white nights begin, depending on where you are in the country.

In Copenhagen, which is the so-called astronomical reference for the whole country, the white nights do not begin until the night of May 6 and last until the beginning of August, namely the night of August 7.

However, Denmark's southernmost point will have to wait a little longer to see the light - it will not happen until the end of the night of May 10 in DK-Gedser.

Types of twilight

We distinguish three forms of twilight:

- **Bourgeois twilight**:... is what we commonly refer to simply as twilight, and the word bourgeois here is the antithesis of nautical. Is defined by the fact that the center of the Sun is less than 6 degrees below the horizon. Outdoor activities can usually take place without artificial lighting, and both the horizon line and objects on the ground can be clearly seen.
- **Nautical twilight:**... is defined by the centre of the Sun being less than 12 degrees below the horizon. As a rule, you can see the outline of objects on the ground, while the horizon is difficult to distinguish.
- **Astronomical twilight**: ... is defined by the centre of the Sun being less than 18 degrees below the horizon. You see a more or less powerful glare of the Sun's light in the sky.

The Nordic white nights are thus the period when there is at least astronomical twilight throughout the night.

14.6 Noctilucent clouds

Noctilucent (or “night-shining”) clouds, NLCs, are the highest, driest, coldest and rarest clouds on Earth. NLCs are often observed in Dark Sky Park Bulbjerg during summertime.

These shimmering, night-shining clouds appear in the mesosphere — a layer of the Earth’s atmosphere above the stratosphere and below the thermosphere, about 47 to 53 miles (76 to 85 kilometers) above Earth's surface. Sometimes dubbed "space clouds," NLCs form just below the invisible boundary where Earth's atmosphere ends and outer space begins, roughly 62 miles (100 km) above the planet's surface.

NLCs occur when water vapor freezes into ice crystals that cling to dust and particles left by falling meteors high in the atmosphere, which reflect sunlight. The peak season for observing NLCs from the Northern Hemisphere is around the summer solstice in late June through the end of July, when they're most easily visible from about 50 to 70 degrees north latitude. In colder, northern regions like Denmark, NLCs can be spotted from early June.

For the best chance to see some NLCs in the evening, you'll need a good view low to the northern horizon as the stars begin to shine in late twilight. It's typical to see displays in the bottom 20 to 25 degrees of the northern sky. Naked eye viewing is the best way to find noctilucent clouds, but with a pair of binoculars you'll get a close-up of the structure of one of the summer's most elusive and impressive sky sights.

Noctilucent clouds form only in the summertime and are only visible at dawn and dusk where you may see ethereal blue, silver or golden streaks in the Northern Hemisphere's northern skies. New research suggests they are becoming more visible and forming more frequently due to climate change.