



Meeting Sea Turtle Lighting Ordinances with DLC's LUNA Version 2.0 Turtle Lighting Specification

May 27, 2026

designlights.org

Welcome!

- **Slides and recorded webinar will be posted** on the *DLC News & Events* page at <https://designlights.org> shortly after today's presentation
- All attendees are automatically muted

The screenshot shows the website designlights.org/news-events/on-demand-past-events/. The page has a navigation bar with the DLC logo and menu items: FIND PRODUCTS, ABOUT US, OUR WORK, RESOURCES, NEWS & EVENTS, JOIN US, and a MyDLC button. Below the navigation is a breadcrumb trail: Home / News & Events / On-Demand & Past Events. The main content area is titled 'On-Demand / Past Events' and includes a search bar for past events and two filter buttons: 'FILTER BY CATEGORY' and 'FILTER BY YEAR'. Three event cards are displayed in a grid. Each card has a header image, a title, and a 'READ MORE' link. The first card is titled 'Webinar: Make the Savings Real! With a Standardized Networked Lighting Controls Configuration Report'. The second card is titled 'Specifying Controllable Low CCT and Amber Outdoor Lighting to Combat Light Pollution Webinar'. The third card is titled 'Interoperability, Integration, and Cybersecurity: Exploring the DLC NLC List'. The page also features a footer with a cityscape graphic and the DLC logo.

Webinar Orientation

- Questions will be held until the end during a live Q&A
 - Use the Question pane (not Chat) to submit for Q&A





The DesignLights Consortium is an independent, nonprofit organization providing decision makers with data and resources on quality lighting, controls, and integrated building systems to reduce energy, carbon, and light pollution.

Presenters



Leora Radetsky
*Senior Lighting Scientist/
LUNA Program Director*



Andrew Antares
Project Manager

Agenda

Welcome, Introductions & Agenda Review

Sea Turtle Disruption by ALAN

DLC Requirements – SSL V6.0 & LUNA V2.0

Testing Requirements

Application Materials

Resources

Q&A



**Sea Turtle Disruption due
to Electric Light at Night**

Sea Turtle /Human Conflicts

- Sea turtle populations are mostly rebounding
- Continuing conflicts
 - Climate change effects including nesting where humans are present
 - Light pollution
 - Coastal development



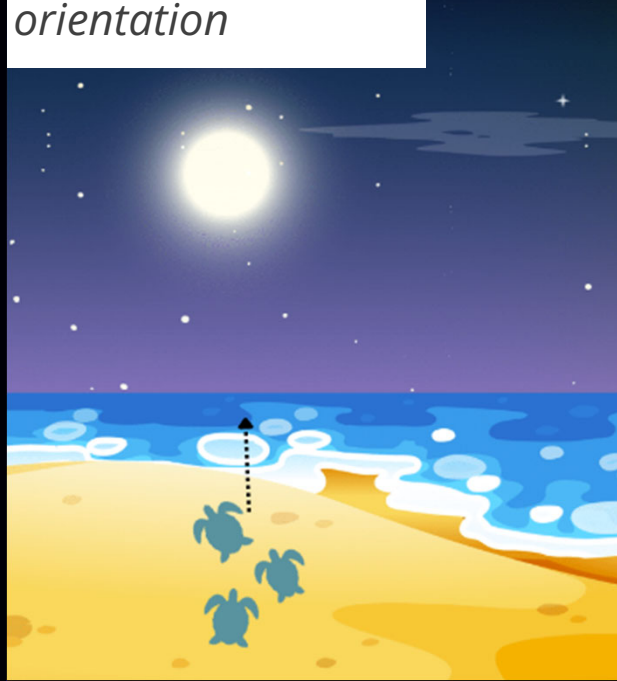
 Dan Rapp, USFW, Midway Atoll National Wildlife Refuge

ALAN and Biological Consequences

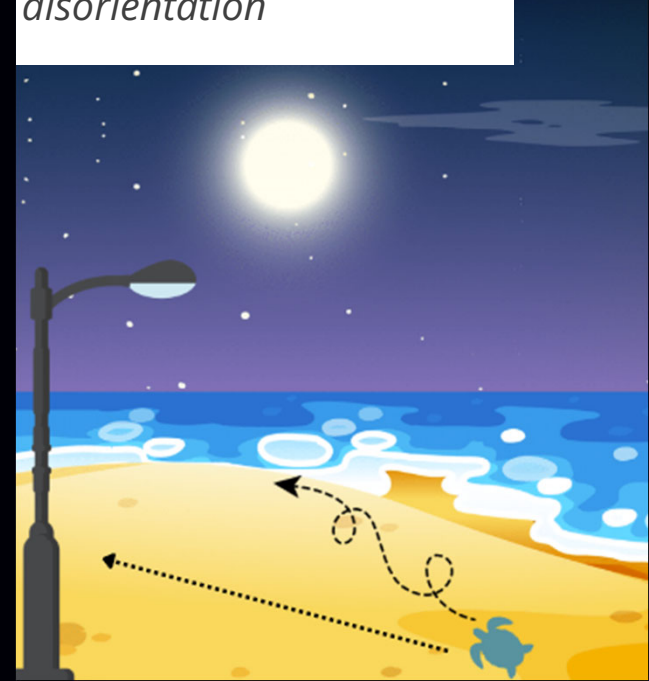
Nesting disruption



Normal hatchling orientation



Misorientation and disorientation



Why Outdoor Lighting is Still a Top Challenge

Biological mechanism is well established



But implementation is inconsistent



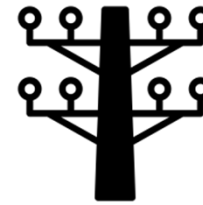
Regulators



Designers



Sales

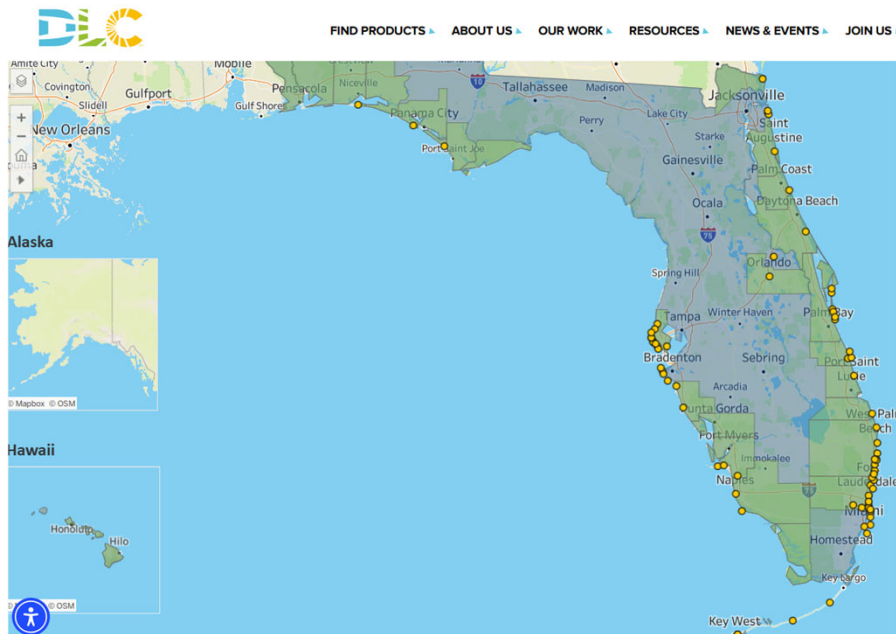


Utility/EE



Facility Managers

Turtle Lighting Ordinances



<https://designlights.org/outdoor-lighting-ordinances/>

2025 Hawaii Revised Statutes Title 13. Planning and Economic Development 201. Department of Business, Economic Development, and Tourism 201-8.5 Night sky protection strategy.

Universal Citation: HI Rev Stat § 201-8.5 (2025) ?

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§201-8.5 Night sky protection strategy. (a) Beginning July 1, 2014, all state agencies shall comply with shielded lighting fixture requirements under this section, whereby, except as specified otherwise in subsections (c) through (f), every new outdoor lamp light fixture emitting more than three thousand lumens shall be required to be fully shielded and to have a correlated color temperature of four thousand Kelvin or less; provided that the impact of artificial light on shoreline and ocean waters shall be subject to compliance with section 205A-71. A lighting fixture is considered to be fully shielded when the lighting fixture is shielded in such a manner that all light rays emitted by the fixture, either directly from the lamp, or indirectly from the fixture, are projected below a horizontal plane running through the lowest point of the fixture.

(b) No new mercury vapor lamps shall be sold or installed after July 1, 2014.

(c) As applicable, retrofit work or replacement of existing lighting fixtures shall:

(1) Limit the rated correlated color temperature of emitted light (lamp, fixture, and filter if used) to less than or equal to four thousand Kelvin, except in the case of outdoor athletic facilities as described in subsection (d);

(2) Not be subject to the shielding requirement for lamp-by-lamp replacement work; and



Case Study: O'ahu Misorientation After LED Retrofit

📍 Sandy Beach, Oahu

📷 Sheldon Plentovich



- HPS, 2019 (Google Maps)

📷 Leora Radetsky



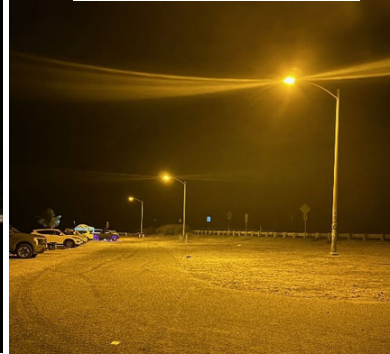
- 3000 K LED installed, 2023

Nests: 6 (Sept. 2023)
9 Hatchlings misoriented



- 3000 K lights switched off, Sept. 2023
- Lights turned back on in mid November

📷 Tina Halfpenny



- Lights replaced with direct-emission Amber LED, Feb 2024

Nests: 1 (2024)
0 Hatchlings misoriented

📷 Leora Radetsky

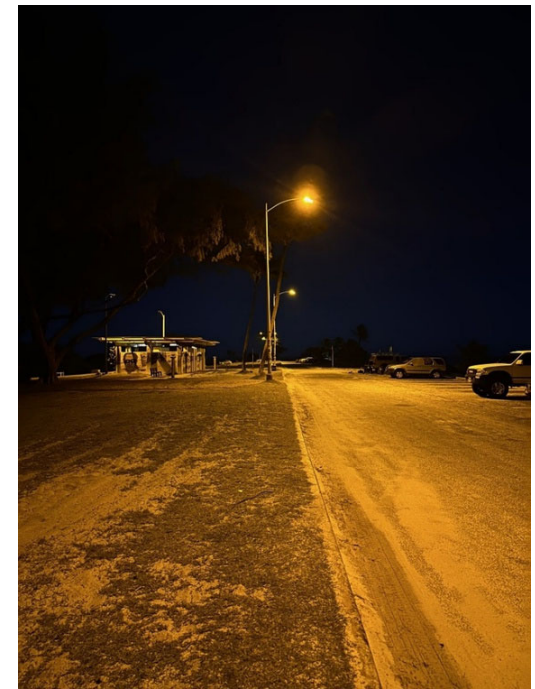
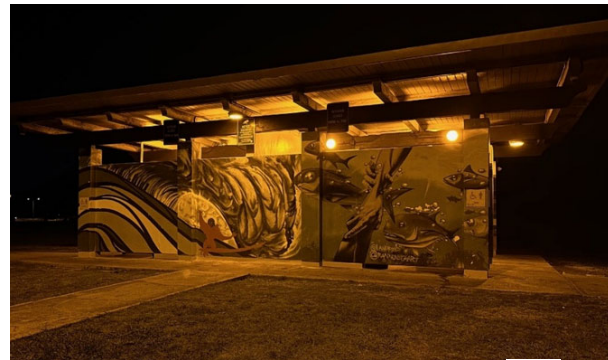



- Shields added to direct-emission Amber LED, August 2025

Nests: 1 (2025)
0 Hatchlings misoriented

Why the Amber Replacements are Still Underperforming

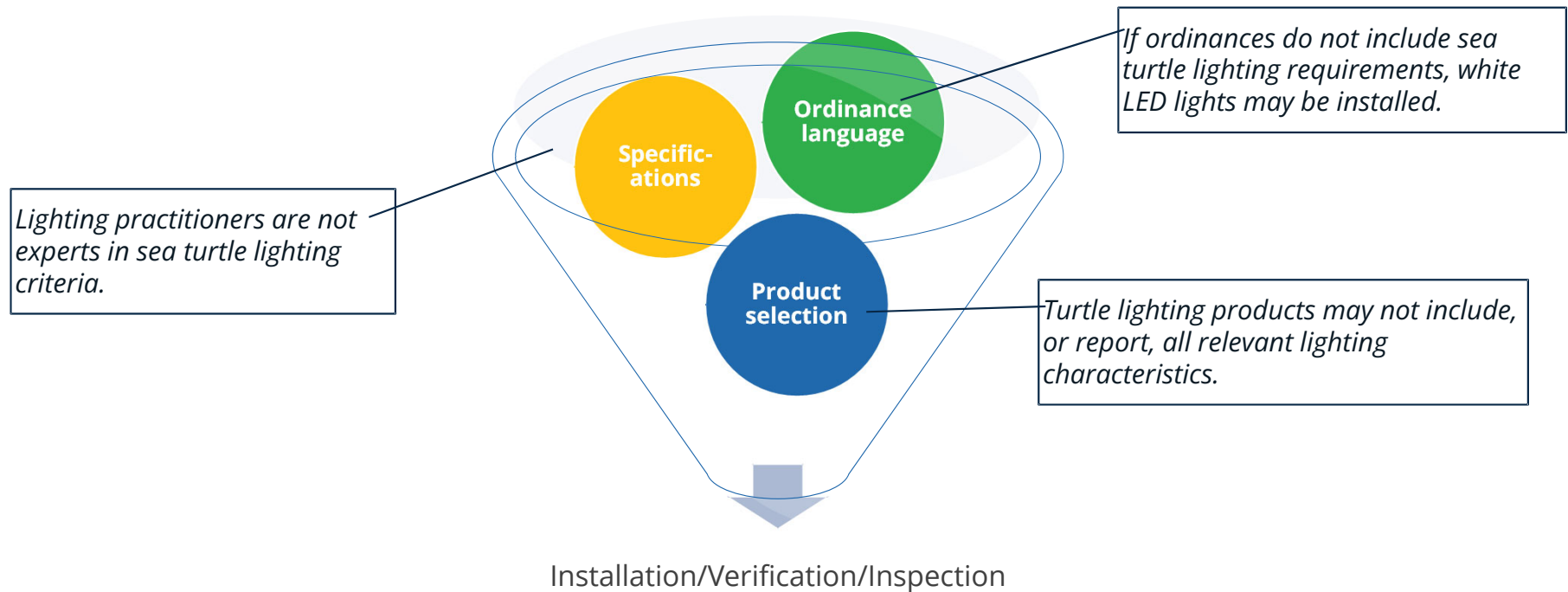
- Parking area and paths are significantly overlighted
- Beach-facing lights in bathroom are not downward directed and visible



 Leora Radetsky

The Policy/Procurement Gap

Process can break down without the right tools



A Common Barrier: Spectrum-Only Compliance

What policies/ordinances often specify

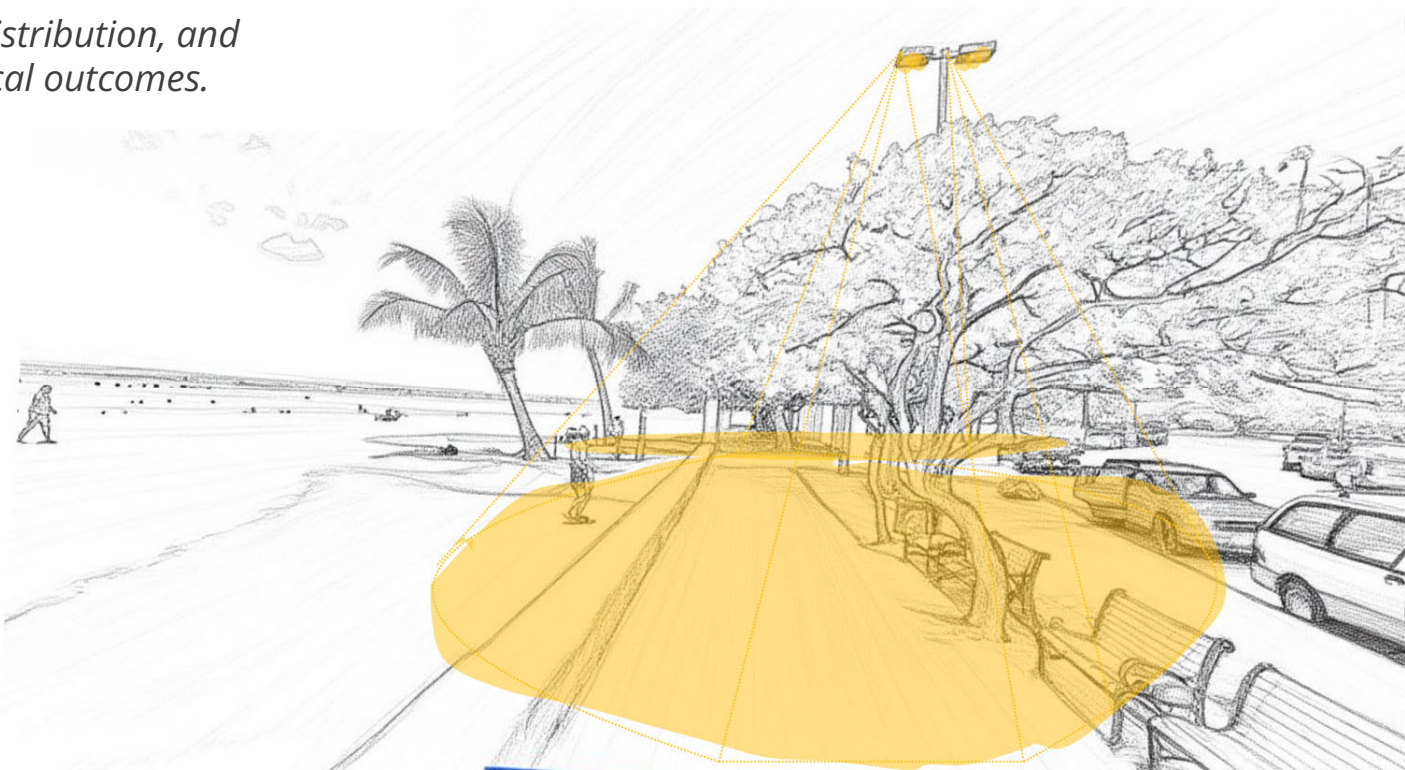
- Amber /turtle friendly/turtle safe

What is needed

- Direct emission amber LED
- Zero uplight
- Limit on high-angle light (60° – 90° vertical)
- Cap on illuminance/total light output
- Light trespass thresholds
- Controls (curfew/dimming)

Comprehensive Lighting Specifications are Needed

Spectrum matters, but intensity, distribution, and controllability also impact ecological outcomes.



Ala Moana Beach, Oahu, HI (Adapted from Google Maps)



DLC SSL V6.0 Requirements

DLC SSL V6.0 Specifications



Average retail price of electricity, monthly



eia Data source: U.S. Energy Information Administration



SSL V6.0 Amber LED Specifications

Characteristic	Criteria	Metrics	DLC SSL V6.0 Req.
Energy efficiency & Power Quality	Luminaire efficacy	Lumens/Watt	≥ 30 lum/W
	Power Quality	Total Harmonic Distortion (THD)	$\leq 20\%$
	Power Quality	Power Factor	≥ 0.90

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Direct-emission (de-) Amber Spectrum	≤1% light below 560 nm	$\frac{\sum \phi_{380-560nm}}{\sum \phi_{380-730nm}} \leq 1\%$	Validated with DLC Amber pre-submission tool
	Spectral data is available	SPDX file, SPD image	Representative SPDX file is published, image created from DLC Amber pre-submission tool

Baseline requirements for all Amber LED products



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Minimum light output	Luminaires provide useful light	Minimum lumens	Area/roadway lights: ≥ 250 lm Wall-mounted lights: ≥ 250 lm Bollards: ≥ 150 lm

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Performance reporting	Supplemental performance data	Safety certification provided, warranty	≥ 5 year warranty
	Supplemental performance data		Spec sheets, images



DLC Turtle Lighting Requirements



DLC LUNA V2.0 Turtle Lighting Specification

Characteristic	Criteria	Metrics	DLC LUNA V2.0 Req.
Distribution	Zero uplight	IES U-Rating % uplight	U Rating = 0
	Constraint on high angle light (60 – 90 degrees)	IES G Rating, or % light from 60 – 90°	Area/roadway lights: ≤ G1 Wall-mounted lights: G0 Bollards: G0
	Product is not tilted	Fixed or rigid mounting arms, or Vertical rotation is limited to ±10°	Compliant mounting arms are in qualified model number
	Shields are available		Orderable shields
	QPL shows luminous intensity distribution	Image on QPL of each parent distribution	Validated with DLC LUNA pre-submission tool

A qualification tool for luminaires intended for sensitive coastal habitats.

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Spectrum	Does it meet Hawai'i codes? No filtered LEDs	% blue , "traffic color compliant" Direct-emission Amber LEDs only	Validated with DLC LUNA pre-submission tool
Total light output	Low enough to meet safety req. without overlighting	Maximum lumens, and/or Maximum illuminances	Area/roadway lights: ≤ 8000 lm Wall-mounted lights: ≤ 2500 lm Bollards: ≤ 1000 lm

A qualification tool for luminaires intended for sensitive coastal habitats.

Mapping turtle lighting requirements to conservation mechanisms

Turtle Lighting Requirements		Conservation Mechanism
Energy efficient	→	Population-level scale → local government adoption
Direct-emission amber LED products	→	Behavioral orientation → preserve “sea-finding”
No amber-lensed LED products	→	Behavioral orientation → preserve “sea-finding”
Zero uplight + limits on high angle light	→	Behavioral orientation → preserve “sea-finding”
Shields available for pole-mounted lights	→	Behavioral orientation → preserve “sea-finding”
Maximum light output cap	→	Altered adult nesting → reduces habitat exposure
Maximum 10° tilt	→	Altered adult nesting → reduces habitat exposure Behavioral orientation → preserve “sea-finding”

QPL Demonstration





DLC Application Process

DLC LUNA V2.0 Turtle Lighting Application Process Testing Requirements

- Review process page:
 - Level 1: <https://designlights.org/our-work/luna/submit-a-product/>
 - Level 2: <https://designlights.org/our-work/solid-state-lighting/submit-a-product/level-2-applications/>
- Sphere and goniometric testing must be conducted on worst-case direct-emission amber LED products within product family submission
 - Minimum Light Output, color rendition reporting – LM-79 Color report
 - Minimum Luminaire Efficacy – LM-79 report
 - U-Rating/G-Rating compliance – LM-79 Distribution Report – at the highest submitted light output for each unique optic

Complete
Excel App
Form

Use LUNA
Pre-submission
Tool

Submit
Application

Initial
Review

Pay Invoice

Comprehensive
Review

Listing on
CPL

DLC LUNA V2.0 Turtle Lighting Application Process

Application Materials

- Completed SSL V6.0 & LUNA V2.0 Application Form
- Manufacturer product specification sheet
- LED package/module/array specification sheet
- IES LM-79 report(s) for products that require testing
- Supplemental power quality test report or LM-79 with worst-case PF & THD measurements (If not included in primary LM-79)
- IES photometric files
- SPD files
- Output from DLC Amber and LUNA Presubmission Tools
- Legal warranty document explaining warranty terms and conditions
- Proof of safety certification from an appropriate safety certification body relevant in the US or Canada (.pdf file format required)
- Lumen maintenance information, including In-Situ Temperature Measurement Testing (ISTMT), LM-80 testing, and TM-21 calculator(s)



Resources/References



- LUNA V2.0 Technical requirements: <https://designlights.org/our-work/solid-state-lighting/ssl-v6-luna-v2/>
- Witherington, B. E., R. E. Martin and R. N. Trindell. 2014. Understanding, assessing, and resolving light pollution problems on sea turtle nesting beaches, revised. Florida Fish and Wildlife Research Institute Technical Report TR-2. vii + 83 p.
- Daniel F. Gomez Isaza, Ross Jones, Phillipa Wilson, Kellie Pendoley, Sabrina Fossette, Michele Thums. 2025. The effect of artificial light at night on sea turtle hatchling early dispersal: A systematic review of methods, impacts and findings. *Biological Conservation*, Volume 309, <https://doi.org/10.1016/j.biocon.2025.111327>
- Hays, G.C., Laloë, JO. & Seminoff, J.A. Status, trends and conservation of global sea turtle populations. *Nat. Rev. Biodivers.* **1**, 119–133 (2025). <https://doi.org/10.1038/s44358-024-0001-y>
- <https://www.fisheries.noaa.gov/feature-story/most-sea-turtles-rebounding-worldwide-conservation-efforts-protect-nests-and-habitat>

Q&A

Please submit questions through the question pane.

