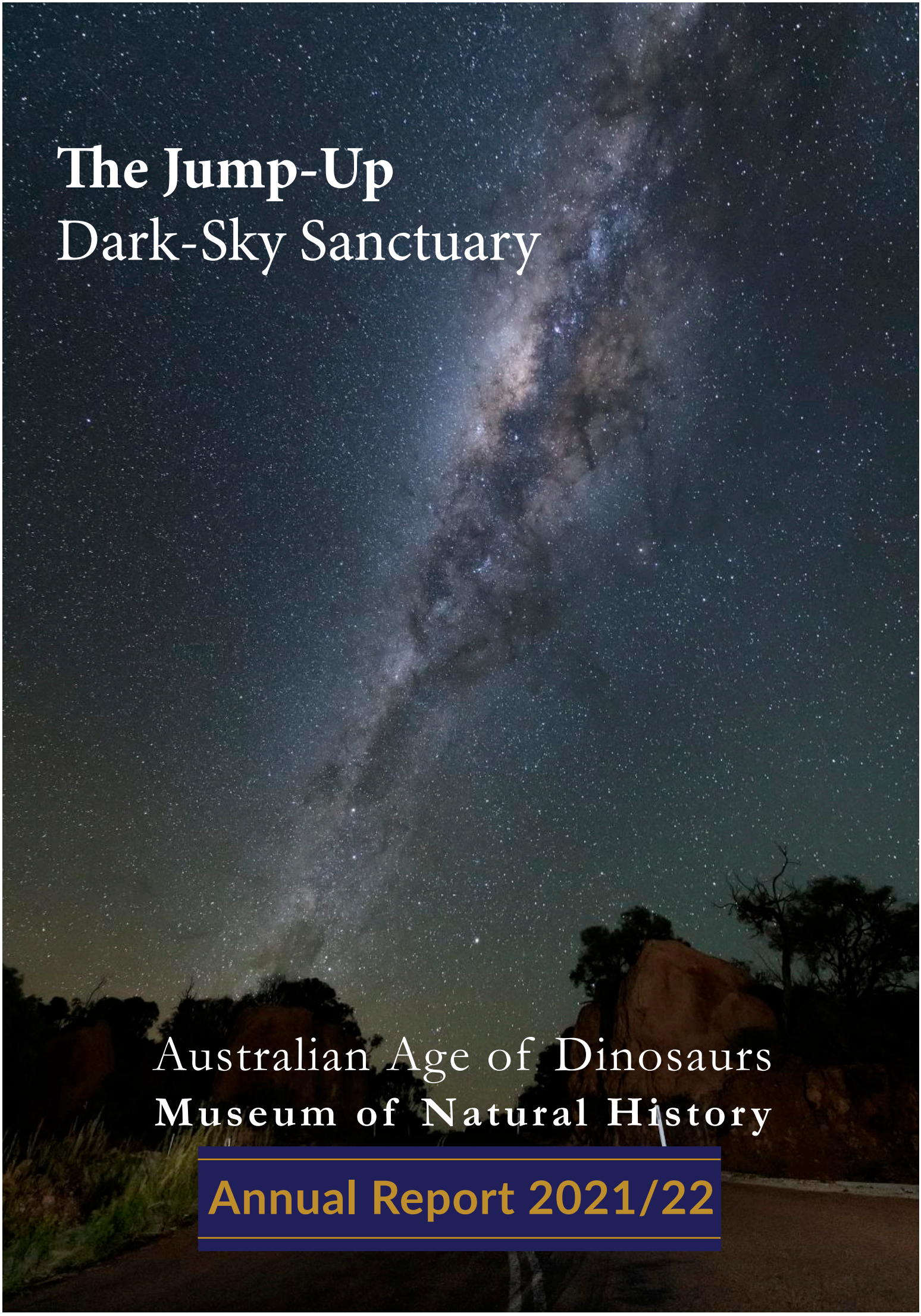


The Jump-Up
Dark-Sky Sanctuary

Australian Age of Dinosaurs
Museum of Natural History

Annual Report 2021/22

COVER PHOTO **PETER BYRNES**

Site information

Designation type	International Dark-Sky Sanctuary
Designation date	27 April 2019
Site name	The Jump-Up Dark-Sky Sanctuary
Site size	1,400 hectares
Site contact (primary)	Naomi Miles naomi.miles@aaod.com.au
Site contact (secondary)	Grant Salmond grant.salmond@aaod.com.au

The Jump-Up statistics (1 July to 30 June)

	2019/2020	2020/2021	2021/2022
Permanent Jump-Up population	1	1	1
Visitors to The Jump-Up	25,458	60,713	52,205
Total average or typical zenith night-sky brightness (MPSAS)	21.63	21.67	21.63

	2019/2020	2020/2021	2021/2022
Online visitors to the Museum's Dark-Sky page	1,755	3,546	3,689
Average time on the Dark-Sky page (minutes)	2:20	2:18	2:13

Measurements
Comparative sky-quality distribution across The Jump-Up using averaged data.

Table 1 Dinosaur Canyon (SQM 1.0)

	Period	20 to 22.5 MPSAS monthly average	20 to 22.5 MPSAS monthly average corrected -0.1 glass cover	Average temp (°C)
2021	Oct	21.71	21.61	20.60
	Nov	21.66	21.56	21.52
	Dec	21.65	21.55	25.44
2022	Jan	21.68	21.58	26.58
	Feb	21.59	21.49	24.88
	Mar	21.36	21.26	23.87
	Apr	21.45	21.35	22.28
	May	21.48	21.38	16.91
	Jun	21.56	21.46	12.77
	Jul	21.50	21.40	11.60
	Aug	21.56	21.46	14.71
	Sep	21.61	21.51	18.05
	Oct	21.68	21.58	22.44
	Nov	21.71	21.61	22.91
	Average	21.59	21.49	20.33

Table 2 The Jump-Up base (SQM 2.0)

	Period	20 to 22.5 MPSAS monthly average	20 to 22.5 MPSAS monthly average corrected -0.1 glass cover	Average temp (°C)
2021	Oct	21.74	21.64	22.18
	Nov	21.69	21.59	22.71
	Dec	21.73	21.63	25.21
2022	Jan	21.78	21.68	26.76
	Feb	21.76	21.66	24.09
	Mar	21.70	21.60	24.79
	Apr	21.62	21.52	22.54
	May	21.69	21.59	16.60
	Jun	21.74	21.64	11.97
	Jul	21.69	21.59	9.84
	Aug	21.78	21.68	13.39
	Sep	21.82	21.72	17.42
	Oct	21.77	21.67	21.71
	Nov	21.76	21.66	22.51
	Average	21.73	21.63	20.12

Table 3 The Jump-Up western side (SQM 3.0)

	Period	20 to 22.5 MPSAS monthly average	20 to 22.5 MPSAS standard deviation	Average temp (°C)
2021	Oct	21.67	21.57	22.88
	Nov	21.61	21.51	23.47
	Dec	21.64	21.54	27.28
2022	Jan	21.76	21.66	28.07
	Feb	26.65	21.67	26.65
	Mar	20.83	20.73	28.21
	Apr	21.49	21.39	24.19
	May	21.57	21.47	18.61
	Jun	21.66	21.56	14.39
	Jul	21.62	21.52	13.17
	Aug	21.66	21.56	16.51
	Sep	21.70	21.60	19.88
	Oct	21.72	21.62	24.36
	Nov	21.68	21.58	24.13
	Average	21.95	21.50	22.27

Introduction

The Jump-Up Dark-Sky Sanctuary was designated an International Dark-Sky Sanctuary on 27 April 2019 and at the time of submitting this report remains the only International Dark-Sky Sanctuary in Australia. Only two other International Dark-Sky places have been designated in Australia: the Warrumbungle National Park in New South Wales and the River Murray Dark-Sky Reserve in South Australia. The Australian Age of Dinosaurs Museum of Natural History (the Museum) is a prominent science-based not-for-profit museum and major tourist attraction located on The Jump-Up Dark-Sky Sanctuary, 24km south-east of Winton in Central West Queensland. Over the reporting period the promotion of dark-sky conservation and education has continued through the Museum's adherence to its Lighting Management Plan, guided tours of the Gondwana Stars Observatory, employment of an Education & Astronomy Manager, community engagement and media publicity. As evidenced in the Museum's night-sky data, the sky above The Jump-Up remains pristine and free from light pollution.

This report briefly summarises the activities undertaken by the Museum from October 2021 to November 2022 under the following sections: measuring the night sky; lighting compliance; outreach, education and media; promotions and media relations, future threats and additional information.

Measuring the night sky

Summarise the night-sky quality across the sampling period.

The Museum has six permanent sky-quality meters at three sites on The Jump-Up. SQM 1.0 and its back-up 1.1 are located at Dinosaur Canyon, SQM 2.0 and its back-up 2.1 are located at the base of The Jump-Up at the Star Gallery and SQM 3.0 and its back-up 3.1 are located in the western corner of The Jump-Up (refer to *Map 1*). Night-sky brightness readings are taken continuously and collected quarterly. Reviews of these readings are undertaken every twelve months by the Museum Management Team to ensure the readings remain on par with International Dark-Sky Association (IDA) regulations.

In *Tables 1* to *3* the monthly data from October 2021 to November 2021 was filtered and averaged to include only measurements from 20 MPSAS to 22.5 magnitudes per square arcsecond (MPSAS). An allowance of -0.1 MPSAS was included for lens-glass distortion. Despite the two furtherest sky-quality meters being 5km apart (The Jump-Up base and The Jump-Up western side), all three SQMs presented similar data as summarised in *Table 4*. This sky-quality distribution shows an average reading of 21.49 to 21.63 MPSAS and a temperature of 20.12 to 22.33°C. The Jump-Up Night-Sky Brightness of 21.63 MPSAS at the zenith is stable and consistent and routinely satisfies the 21.5 MPSAS in the visual band threshold for International Dark-Sky Sanctuaries. The high percentage of measurements equal to or

Map 1 SQM locations across The Jump-Up Dark-Sky Sanctuary

Table 4 Summary of sky-quality distribution across The Jump-Up (based on Tables 1, 2 and 3)

	Dinosaur Canyon (SQM 1.0)			The Jump-Up base (SQM 2.0)			The Jump-Up western side (SQM 3.0)		
Period	20 to 22.5 MPSAS monthly average	20 to 22.5 MPSAS monthly average corrected -0.1 glass cover	Average temp (°C)	20 to 22.5 MPSAS monthly average	20 to 22.5 MPSAS monthly average corrected -0.1 glass cover	Average temp (°C)	20 to 22.5 MPSAS monthly average	20 to 22.5 MPSAS monthly average corrected -0.1 glass cover	Average temp (°C)
Oct 2021 to Nov 2022	21.59	21.49	20.33	21.73	21.63	20.12	21.95	21.50	22.27

greater than 21.5 MPSAS across The Jump-Up indicates it remains an excellent dark-sky site. On the Bortle scale these readings rate between a class 1 to 2 with a limiting magnitude of 6.8 to 7. The Milky Way is very visible and detailed, casting obvious diffused shadows on the ground as luminance dips below 0.2 mcd/m2. Refer to *Graphs 1* to *28* for a pictorial representation of each month over the reporting period.

Describe any changes detected in night-sky quality from receiving your certification to the present.

The Jump-Up Dark-Sky Sanctuary recorded night-sky quality on par with previously recorded and reported data outlined in the Museum's International Dark-Sky Sanctuary application and the Museum's previously submitted annual reports. The exceptional sky quality on The Jump-Up is best demonstrated in the data available in *Tables 5* to *7*. These tables demonstrate the monthly average MPSAS, standard deviation, monthly number of readings greater than 21.5 MPSAS from 9pm to 4am and the total number of records over the entire month exceeding 21.5 and 21.75 MPSAS, and include all the phases of the Moon. The lowest monthly average reading was recorded at 16.55 MPSAS and the highest monthly average reading was recorded at 20.54 MPSAS, both at The Jump-Up base. Further, the high percentage of monthly readings that range from 21.5 MPSAS to 21.74 MPSAS demonstrates an incredibly dark-night sky.

Table 5 Dinosaur Canyon SQM 1.0 (-22.481956, 143.171739)

	Period	MPSAS 9pm to 4am monthly average	9pm to 4am standard deviation monthly average	Monthly no. readings 21.5 to 21.74 MPSAS	Monthly no. readings ≥21.75 MPSAS	% monthly readings 21.5 to 21.74 MPSAS	% monthly readings ≥21.75 MPSAS
	Oct	20.38	1.34	906	715	20	16
	Nov	20.33	1.72	740	626	17	14
	Dec	20.35	1.28	608	443	14	10
2022	Jan	20.42	1.40	795	555	18	12
	Feb	20.30	1.21	669	377	17	9
	Mar	17.51	1.01	311	122	7	3
	Apr	19.57	1.86	649	202	15	5
	May	19.85	1.43	743	162	17	4
	Jun	19.38	1.33	827	401	20	10
	Jul	19.92	1.48	735	464	16	10
	Aug	19.99	1.36	937	625	19	14
	Sep	20.03	1.26	838	571	19	13
	Oct	20.12	0.82	893	661	20	15
	Nov	20.33	1.39	746	622	17	14

Table 6 The Jump-Up base SQM 2.0 (-22.463273, 143.193474)

	Period	MPSAS 9pm to 4am monthly average	9pm to 4am standard deviation monthly average	Monthly no. readings 21.5 to 21.74 MPSAS	Monthly no. readings ≥21.75 MPSAS	% monthly readings 21.5 to 21.74 MPSAS	% monthly readings ≥21.75 MPSAS
2021	Oct	20.36	1.48	921	736	21	16
	Nov	20.40	1.89	768	641	15	15
	Dec	20.53	1.33	797	593	18	13
2022	Jan	20.54	1.25	854	772	19	17
	Feb	20.46	1.33	773	655	19	16
	Mar	16.55	1.68	754	645	19	17
	Apr	19.44	2.03	778	567	18	13
	May	19.91	1.45	1,080	710	24	16
	Jun	19.28	1.77	1,057	832	25	20
	Jul	17.98	1.86	985	654	22	15
	Aug	17.62	2.37	887	685	20	15
	Sep	20.19	1.48	964	842	22	19
	Oct	20.37	1.71	914	813	21	19
	Nov	20.50	1.48	828	729	19	17

Table 7 The Jump-Up western side SQM 3.0 (-22.483736, 143.148186)

	Period	MPSAS 9pm to 4am monthly average	9pm to 4am standard deviation monthly average	Monthly no. readings 21.5 to 21.74 MPSAS	Monthly no. readings ≥21.75 MPSAS	% monthly readings 21.5 to 21.74 MPSAS	% monthly readings ≥21.75 MPSAS
2021	Oct	20.23	1.44	797	602	18	13
	Nov	20.39	1.57	714	580	17	13
	Dec	20.35	1.33	636	457	14	10
2022	Jan	20.38	1.48	831	637	19	15
	Feb	20.40	1.20	737	498	18	12
	Mar	18.46	0.84	344	208	8	5
	Apr	19.62	1.85	719	350	17	8
	May	19.91	1.42	693	289	16	6
	Jun	20.04	1.64	968	654	22	15
	Jul	19.99	1.54	954	596	21	13
	Aug	19.96	1.49	896	713	21	17
	Sep	20.10	1.23	923	723	21	17
	Oct	20.38	1.40	896	704	20	16
	Nov	20.52	1.53	795	649	18	15

Lighting compliance

What actions have you taken to meet the requirements of your Lighting Management Plan during this reporting period?

All lighting on The Jump-Up is 100% compliant with the Museum's Lighting Management Plan and the IDA regulations (refer to *Table 8*). This compliance includes the Gondwana Stars Observatory and the *March of the Titanosaurs* exhibition. All 12 rooms at the Maloney Lodge Precinct contain a guest compendium with the Museum's Lighting Management Plan and lighting curfew included.

Table 8 Summary of lighting compliance

Year of certification	2019
Compliance % in original application	90%
Current compliance %	100%
Anticipated % for next reporting period	100%

Were any new lighting projects completed this year? If so, please describe.

During the reporting period the Museum added shade cloth under the steel cutout panelling over the red lights at the Gondwana Stars Observatory. While the lighting was compliant beforehand, the cover has dramatically dimmed the peripheral glow from the lights and improved the atmosphere at the Observatory.

Outreach, education and media

Summarise all outreach efforts from the past reporting period.

The outreach efforts carried out by the Museum during the reporting period mainly consisted of staff training and the launch of the Deep-Time Astronomy tour at the Gondwana Stars Observatory. Training commenced in April 2022 with four Tour Guides, followed by the introduction of an Education & Astronomy Manager from June 2022. Tours through the Gondwana Stars Observatory are designed to be immersive naked-eye viewing sessions with telescope-viewing opportunities at the end of each experience. Tour Guides use 1 milliwatts (mW) handheld lasers* to explain the evolution of the night sky by linking the events on Earth to the extraordinary dark skies above, delving into time and space and our collective understanding and search for our place within it. Included in the tour is an introduction to light pollution, The Jump-Up's designation as an International Dark-Sky Sanctuary and our collective obligation to protect the night sky. From 5 July 2022 the Museum commenced paid public tours of the Gondwana Stars Observatory and will commence group and school bookings from 1 January 2023. A summary of the Museum's events has been included in *Table 9* while *Table 10* describes each of the events and how audiences were engaged and educated.

* The Museum's Lighting Management Plan prohibits handheld battery-operated laser pointers with a power greater than 1mW.

Table 9 Summary of events held at The Jump-Up Dark-Sky Sanctuary

Outreach summary	
Total number of events	4
Number of unique efforts* offered	2
Total number of attendees for all events	624

Note: "unique efforts" offered represent the number of different programs at your site.

Staff commenced training at the Gondwana Stars Observatory in April 2022. Sessions focused on tour delivery and how to align and identify deep-sky objects using the 15-and 6-inch telescopes.

Table 10 Detailed list of events held at The Jump-Up Dark-Sky Sanctuary

Date	Description	Number of attendees	Values promoted	Describe how you engaged with and educated your audience
1 Jun to 30 Nov 2022	**1. Staff training** Staff were trained how to interpret the seasonal southern night sky, light pollution, constellations and telescope operation. Based on this training, Tour Guides are able to deliver nightly tours to visitors regularly, connecting the events on Earth with those above. Extensive tour procedures have also been developed to allow additional Tour Guides to be trained.	Five (four Tour Guides and one Education & Astronomy Manager)	Astrotourism, education, IDSP status	Astronomy team members were involved in the development of the Deep-Time Astronomy tour and taught about the night sky through interactive work shops, planispheres and procedures.
20 May 2022	**2. Dark-Sky Serenade, Opera Queensland** An opera event on The Jump-Up featuring the music of Verdi, Tchaikovsky, Mozart and Tosti. The Dark-Sky Serenade embraced the romance of our Outback setting through some of the most beautiful love songs ever written.	300	Astrotourism, lighting conservation, culture, IDSP status	The annual Dark-Sky Serenade event promoted the dazzling night skies, crystal clear air and glorious music in regional Queensland and is marketed heavily through Opera Queensland. All lighting installations were temporary and minimal for the safe performance of night-time tasks. Guests were introduced to the values of the International Dark-Sky Sanctuary before performances commenced.
17 Jun to 29 Jul 2022	**3. Free staff, volunteer and locals nights** The Museum hosted several free sessions to introduce staff, volunteers and Winton locals to the new experience. Participants included Winton Shire Mayor Gavin Baskett and Deputy Mayor Tina Elliott.	85	Astrotourism, conservation, education, IDSP status	Informal and formal tours of the Gondwana Stars Observatory included question and answer sessions on how the Museum met the IDSP designation and the importance of protecting the night sky. Visitors were asked to provided feedback to improve the experience for paid visitors.
5 July to 30 Nov 2022	**4. Guided tours of the Gondwana Stars Observatory** Tours of the Observatory include transfers to and from Winton and are capped at 21 visitors per tour.	234	Astrotourism, education, IDSP status	While all tours have a flexible format they are designed to be immersive and interactive sessions between specially trained Museum Tour Guides and visitors. In this way visitors can follow interesting lines of enquiry depending on the seasonal night sky and group dynamics.

The first tour through the Gondwana Stars Observatory.

How did you promote the IDA and its mission during your outreach programs/events?
The Museum promoted the International Dark-Sky Association and its mission through the following outreach strategies.

- During tours of the Gondwana Stars Observatory and day tours of the *March of the Titanosaurs* exhibition an explanation of what an International Dark-Sky Sanctuary is and the importance of protecting the dark sky is provided to visitors. Excerpt from *6.5 AAOD Tour Procedures*: “In the next ten years, one of every 15 points of light in the night sky will be a moving artificial satellite. We invite you to take a moment to imagine what future night skies will look like. We are custodians of the night and it will be our legacy. Thank you for coming to the Gondwana Stars Observatory tonight and helping us continue to preserve this International Dark-Sky Sanctuary.”
- All tours of the Gondwana Stars Observatory include a booking confirmation with the following information: “The Jump-Up Dark-Sky Sanctuary was designated an International Dark-Sky Sanctuary in April 2019. Sanctuaries are the most remote (and often darkest) places in the world with the most fragile states of conservation. To learn more about how you can protect the night sky, visit https://www.darksky.org/”.
- The Museum website includes the International Dark-Sky Association logo on its footer.

Is there any programing ongoing or planned blending the arts and/or culture with dark skies?
In 2021 the inaugural Festival of Outback Opera presented by Opera Queensland, in association with Camerata Queensland’s Chamber Orchestra, was launched. The Dark-Sky Serenade on The Jump-Up attracted around 160 guests. The following year (2022) 300 guests attended the event. The fusion between opera and dark skies has received incredible feedback as visitors are able to reconnect with the dark and enjoy world-class operatic performances. This program is likely to continue to attract still more visitors interested in taking part in the blended experience.

What have you noticed about your visitors’ experiences? For example, is attendance/visitation of dark-sky programs consistent, growing, or dropping off? Have visitors provided any feedback on their experiences at your site?
Visitation to the Gondwana Stars Observatory is growing and expected to continue to do so during the next reporting period. Feedback from guests has been overwhelmingly positive, with many commenting that the content and tour experience was very enlightening and stimulated an interest in astronomy.

The Dark-Sky Serenade on The Jump-Up at the festival of Outback Opera presented by Opera Queensland.

Promotions and media relations

Has your Place participated in any IDA-led initiatives such as International Dark-Sky Week, the Under One Sky conference, or other relevant promotions during this reporting period?

During the reporting period the astronomy team virtually attended the following initiatives and information sessions:

- Light Pollution – Cultural Connection with Duane Mamacher (Oct 2021)
- IDA Advocates Monthly Meeting (Oct 2021) and
- IDA Under One Sky conference (Nov 2021 and Nov 2022).

In April 2022 the Museum also participated in the International Dark-Sky Week through a series of Facebook posts on light pollution and the importance of conserving the night sky.

How has your Place been promoted?

The Jump-Up continues to receive excellent regional and national coverage following the announcement of its International Dark-Sky Sanctuary designation. This coverage has ranged from radio, TV, internet outlets and print media. The Museum has maintained a consistent social media presence highlighting the positive effects of dark skies and the ways to prevent light pollution.

Describe any permanent or temporary exhibits that have been created this reporting period (these may include trails, informative waysides, interpretation signs, gift shop items, etc.)

- Over the reporting period six 3D-printed and cast-bronze star-gazing ornithopods were installed at the Gondwana Stars Observatory. These permanent sculptures arrived on The Jump-Up in June and were positioned on concrete plinths at the southern end of the Observatory's viewing deck, with concrete texture added to simulate the look and feel of The Jump-Up. The group are all looking at a fixed position in the sky as if watching a meteorite burning brightly as it enters Earth's atmosphere. The ornithopod models were kindly funded by Denise O'Boyle and make a stunning addition to the Observatory experience.
- The Museum Shop introduced *Constellations: A Folding Guide* (available online and instore). It is a beautifully illustrated guide that includes 36 well-known constellations or celestial arrangements and star charts of the Southern Hemisphere.

Briefly describe any efforts undertaken to reach new audiences. If this was not part of your efforts last year, describe what you plan to do to engage new visitors in the 2023 reporting period:

- On 24 February 2022 the Museum participated in the Outback Queensland Tourism Association Muster to promote the Gondwana Stars Observatory during Outback Queensland's 2022 travel season and to travel agents.
- The Museum included the Observatory in its group-rate and school-rate sheets for 2023.
- The Museum participated in Tourism and Events Queensland's Seize the Day campaign offering visitors 10% off all tickets purchased before 16 October 2022 for use until 30 November 2022.

Three of six cast bronze star-gazing ornithopods installed at the Gondwana Stars Observatory.

- The Museum offers 50% off Observatory tours for locals, Prep-A-Dino participants, work-experience students and interns, and free tours for current Museum staff members.
- The Museum received a highly commended award at this year's Museums Australasia Multimedia and Publication Design Awards, in the Children's Book category, for *Gordo the Guardian: A Night-Time Adventure* by Inge Daniels. The book is set at night and uses digital art to tell the story of animals coming to life when the sun sets.

Future threats

Provide a brief description of how you will continue to manage "threats" over the next year.

In the Museum's International Dark-Sky Sanctuary application, the identified threat to certification was private development. Given The Jump-Up's remote location, it faces few risks to its dark-sky status. Isolation from the nearest urban centre means that light pollution is not noticeable. Public lighting is controlled by the Museum and adheres to the QPR, QEPA, AS 4282 and IDA regulations. As the majority of private titles in the Winton Shire consist of large blocks of pastoral land, development rights and subdivision is notoriously difficult. Although pastoral property homesteads are all located well away from The Jump-Up, property owners wishing to install any infrastructure that requires lighting within 10km of The Jump-Up will be encouraged to adopt IDA regulations, and a revised Lighting Management Plan will be submitted to the IDA.

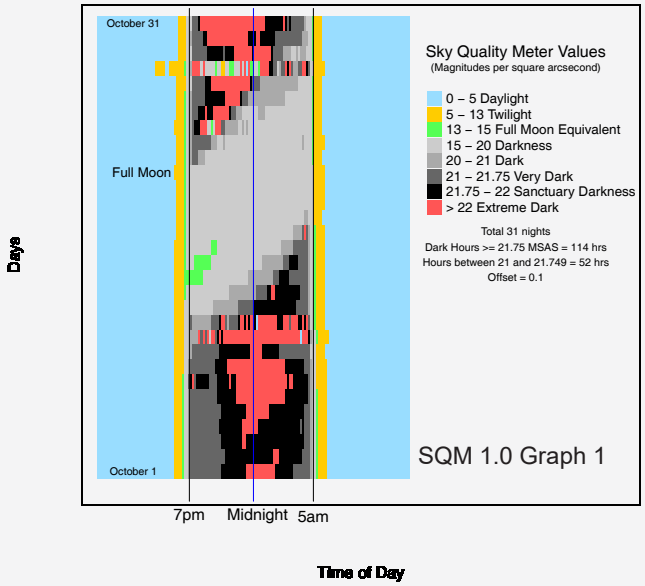
Additional information

What do you consider the greatest single benefit of the IDA certification to your location?

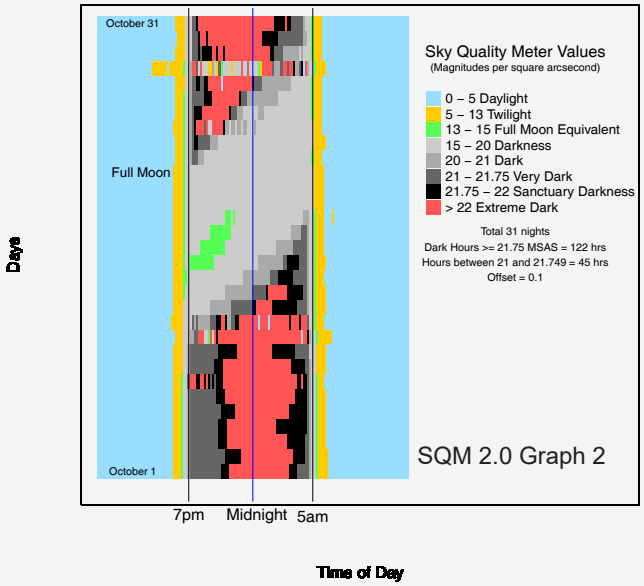
The greatest single benefit of The Jump-Up's IDA certification has been visitor awareness and interest in experiencing truly dark skies. Since becoming an International Dark-Sanctuary in 2019 the Museum has experienced a 61% increase in visitation. The rise of astrotourism has grown rapidly over the last few years as visitors seek deeper and more meaningful connections with the world around them, including being away from artificial light.

Comparative monthly sky-darkness graphs based on a full day/night cycle from SQM 1.0 Dinosaur Canyon and 2.0 The Jump-Up base.

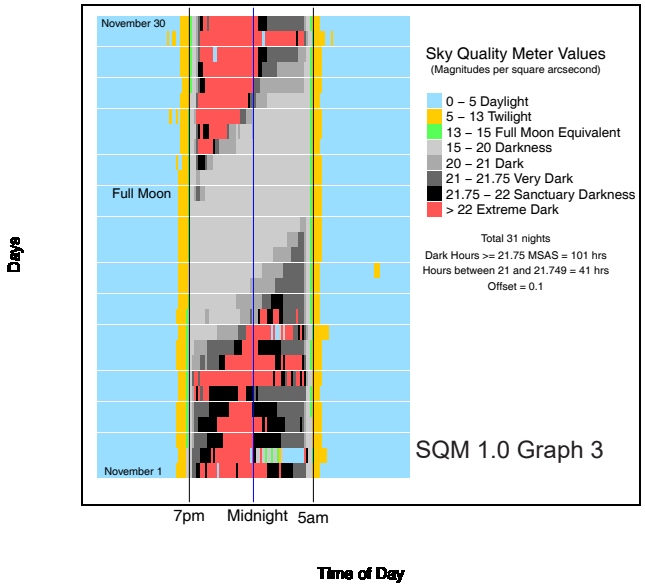
Sky Darkness Plot October 1 to October 31, 2021
Dinosaur Canyon SQM 1.0



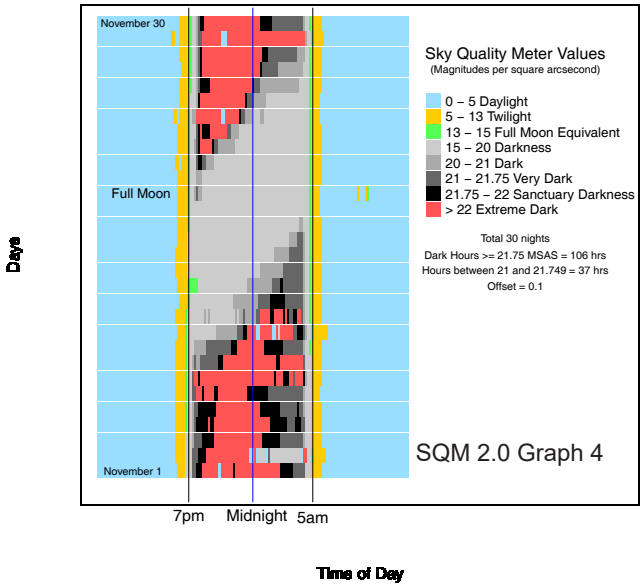
Sky Darkness Plot October 1 to October 31, 2021
Jump−Up Base SQM 2.0



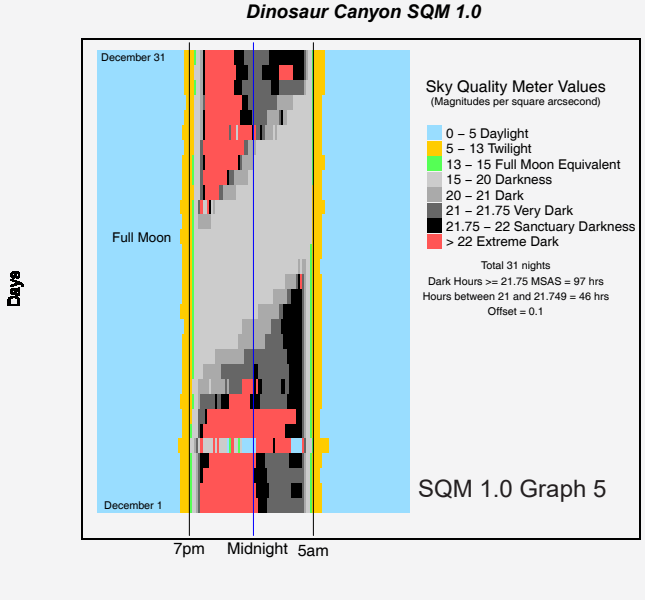
Sky Darkness Plot November 1 to November 30, 2021
Dinosaur Canyon SQM 1.0



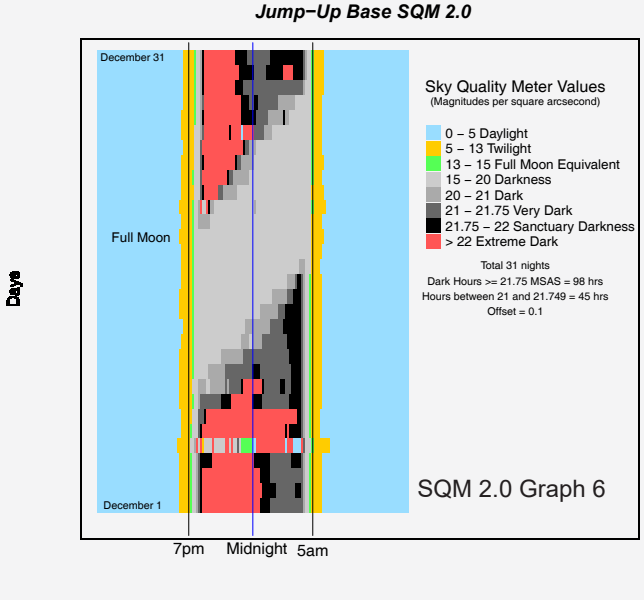
Sky Darkness Plot November 1 to November 30, 2021
Jump−Up Base SQM 2.0



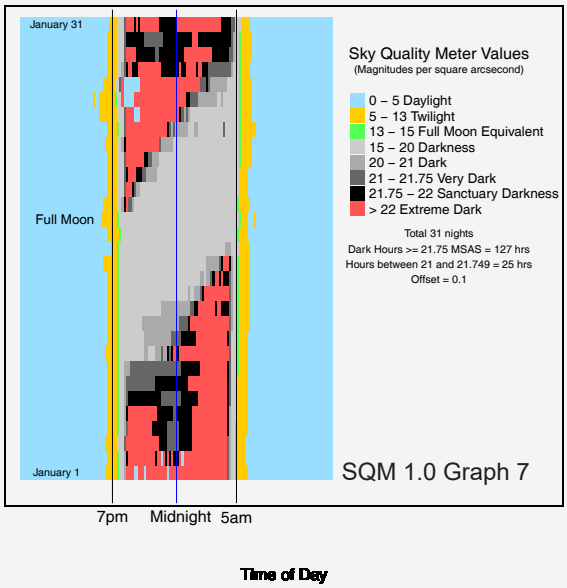
Sky Darkness Plot December 1 to December 31, 2021
Dinosaur Canyon SQM 1.0



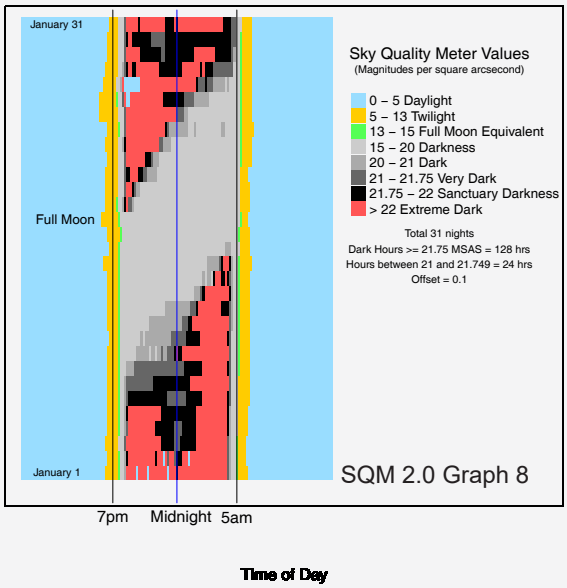
Sky Darkness Plot December 1 to December 31, 2021
Jump−Up Base SQM 2.0



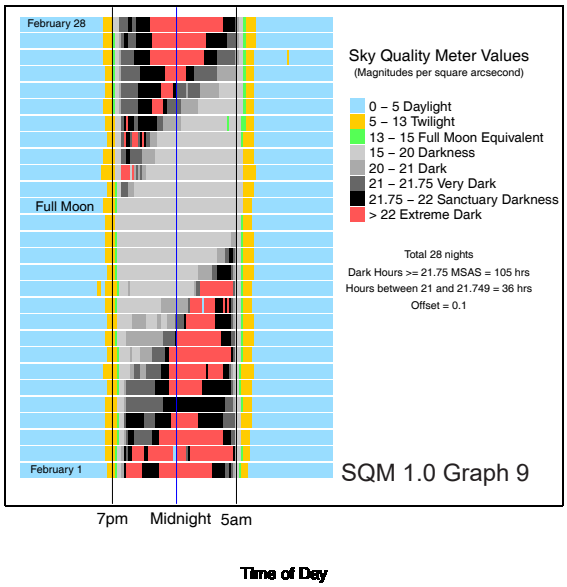
Sky Darkness Plot January 1 to January 31, 2022
Dinosaur Canyon SQM 1.0



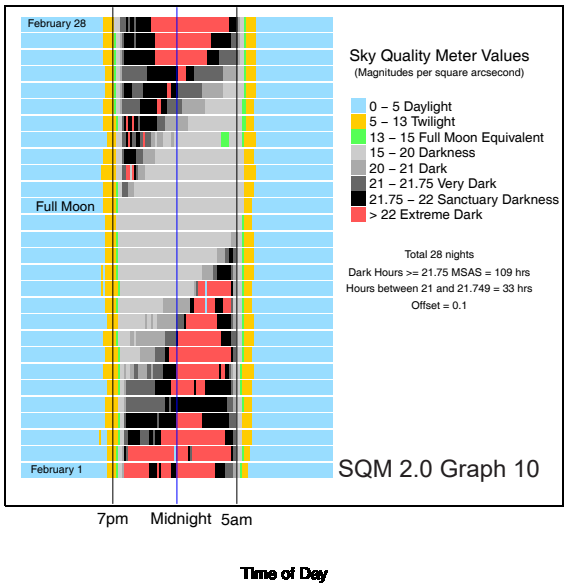
Sky Darkness Plot January 1 to January 31, 2022
Jump-Up Base SQM 2.0



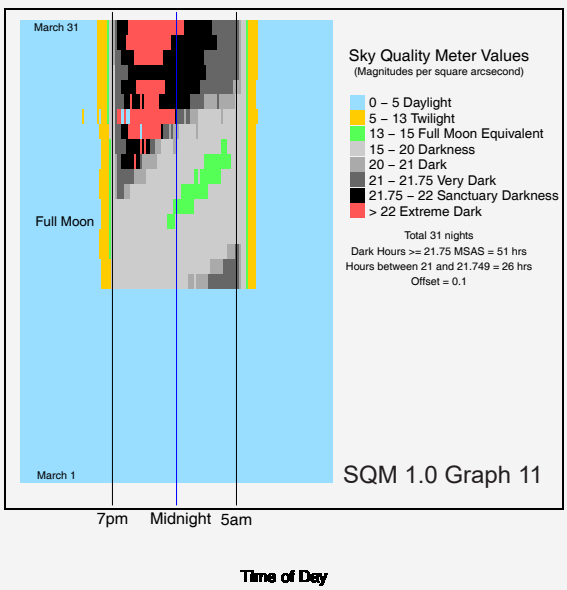
Sky Darkness Plot February 1 to February 28, 2022
Dinosaur Canyon SQM 1.0



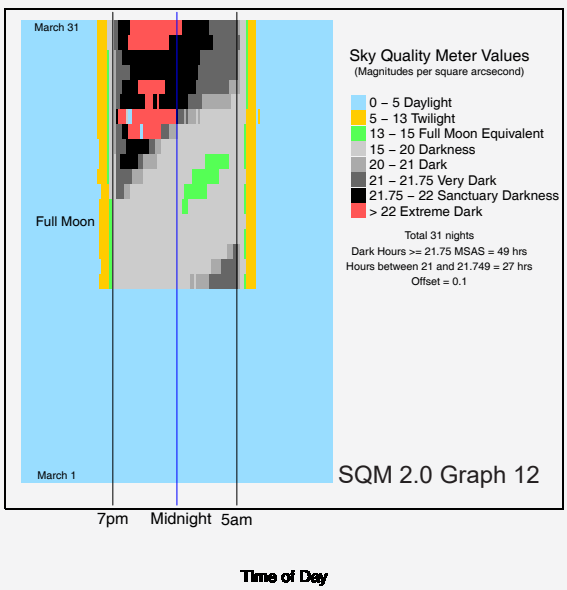
Sky Darkness Plot February 1 to February 28, 2022
Jump-Up Base SQM 2.0



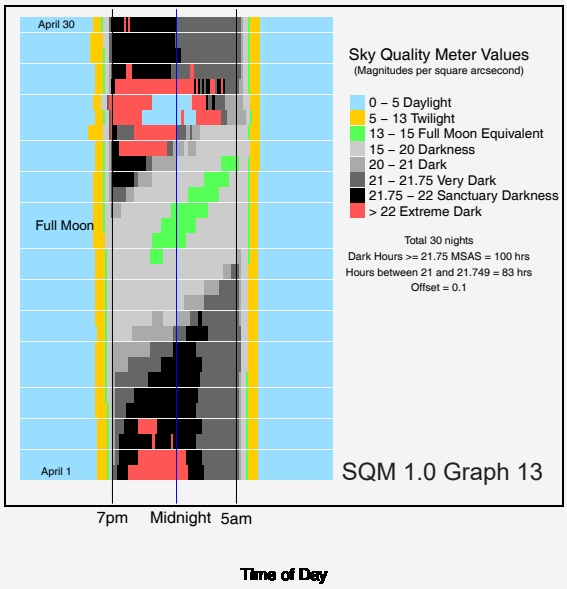
Sky Darkness Plot March 1 to March 31, 2022
Dinosaur Canyon SQM 1.0



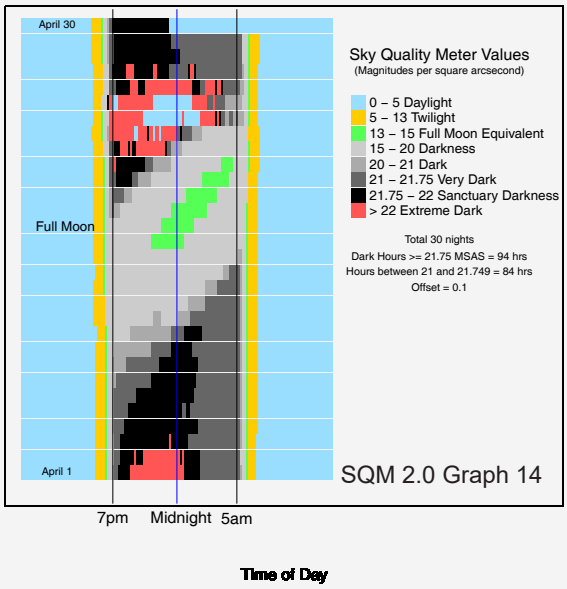
Sky Darkness Plot March 1 to March 31, 2022
Jump-Up Base SQM 2.0



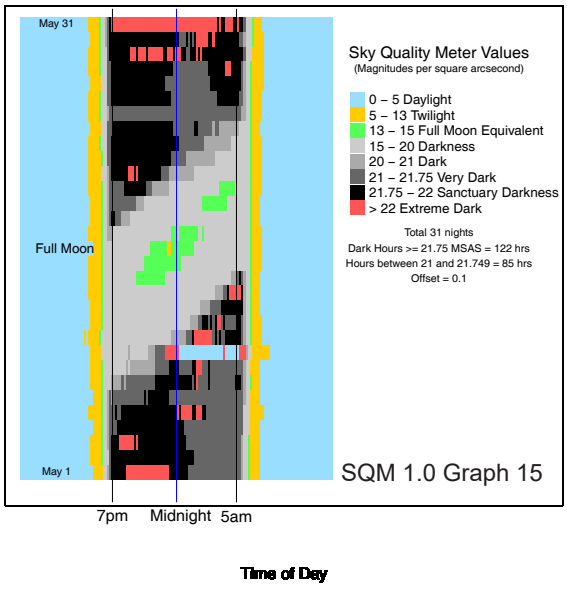
Sky Darkness Plot April 1 to April 30, 2022
Dinosaur Canyon SQM 1.0



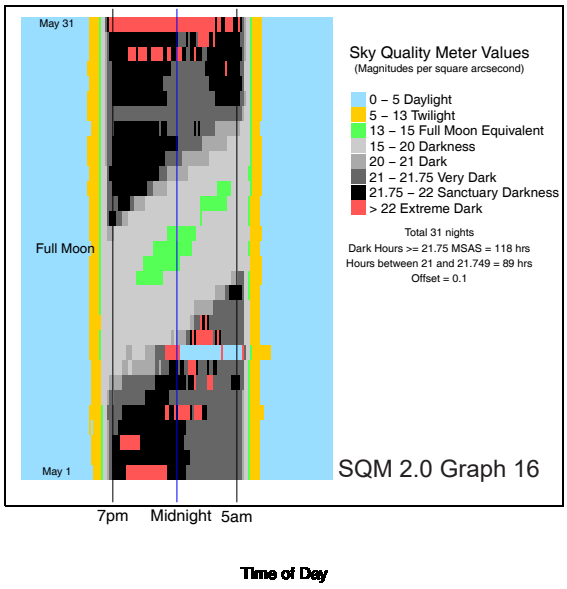
Sky Darkness Plot April 1 to April 30, 2022
Jump-Up Base SQM 2.0



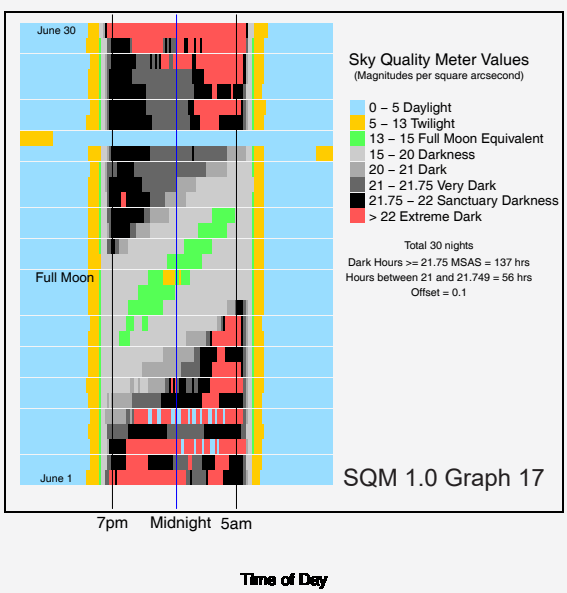
Sky Darkness Plot May 1 to May 31, 2022
Dinosaur Canyon SQM 1.0



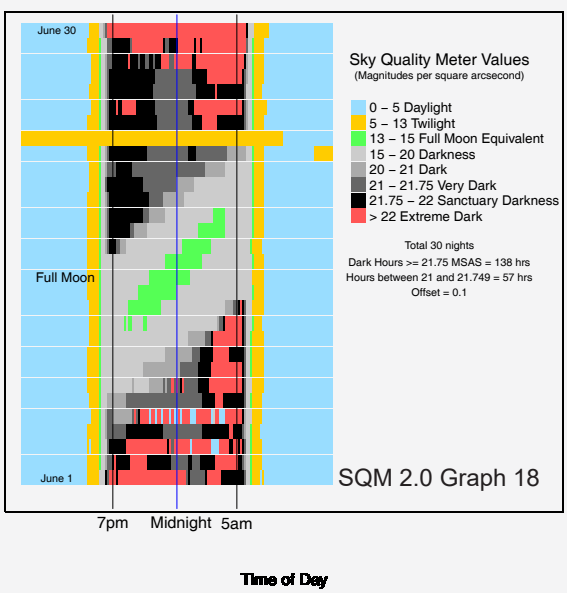
Sky Darkness Plot May 1 to May 31, 2022
Jump-Up Base SQM 2.0



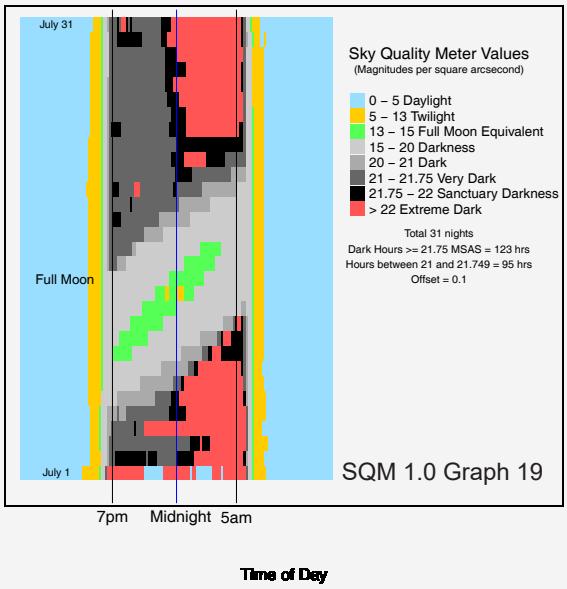
Sky Darkness Plot June 1 to June 30, 2022
Dinosaur Canyon SQM 1.0



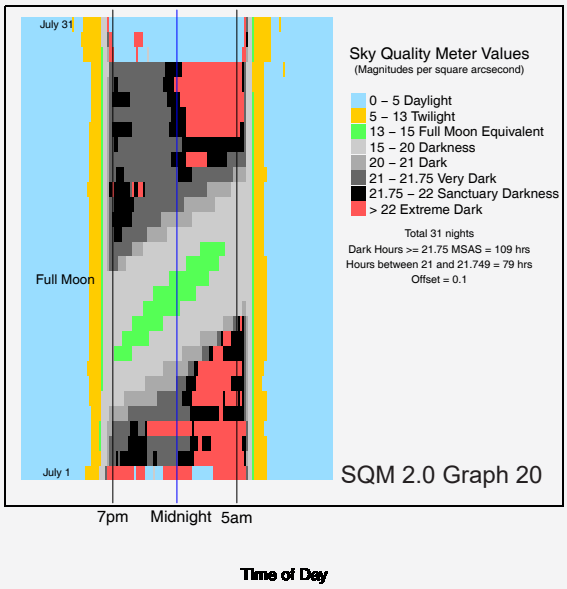
Sky Darkness Plot June 1 to June 30, 2022
Jump-Up Base SQM 2.0



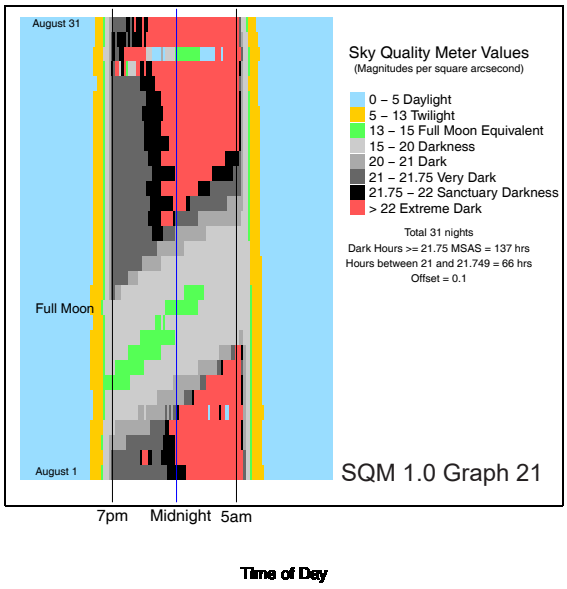
Sky Darkness Plot July 1 to July 31, 2022
Dinosaur Canyon SQM 1.0



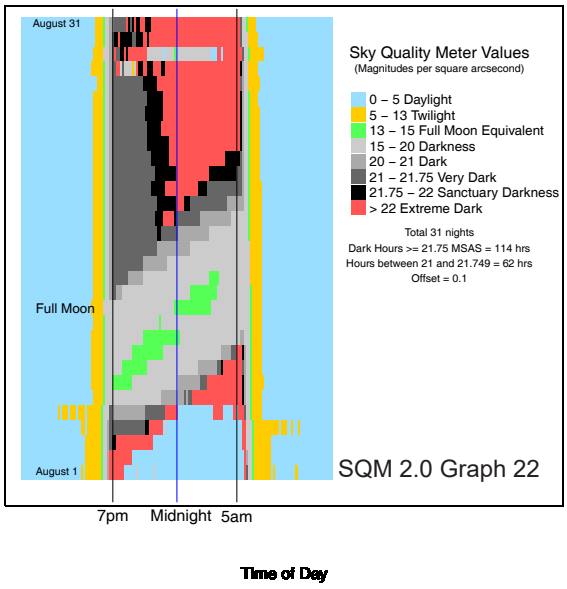
Sky Darkness Plot July 1 to July 31, 2022
Jump-Up Base SQM 2.0



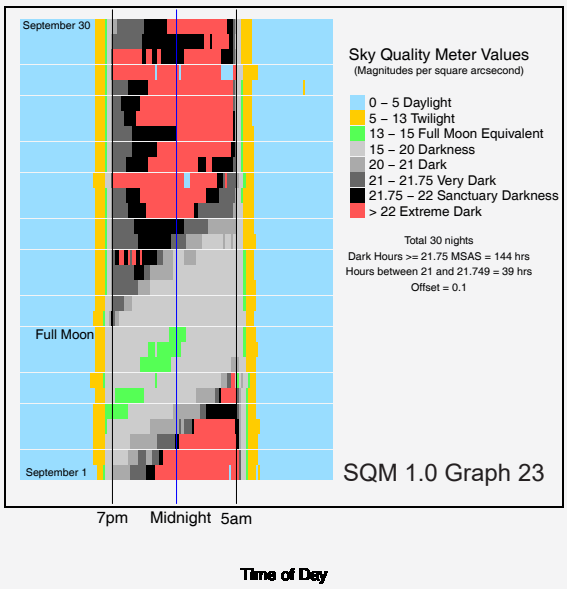
Sky Darkness Plot August 1 to August 31, 2022
Dinosaur Canyon SQM 1.0



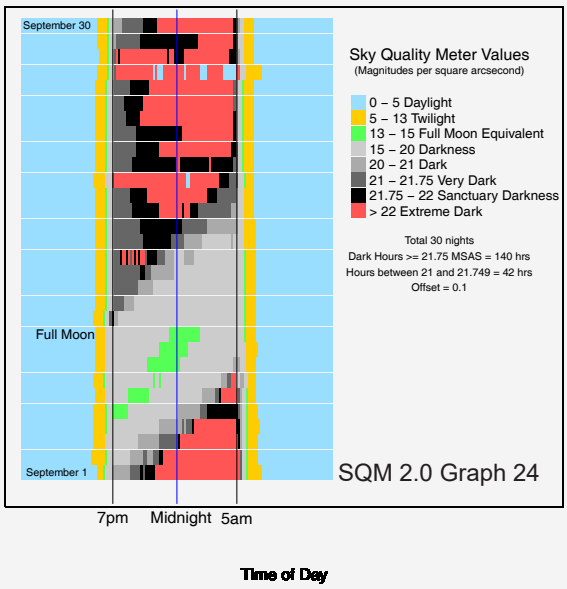
Sky Darkness Plot August 1 to August 31, 2022
Jump-Up Base SQM 2.0



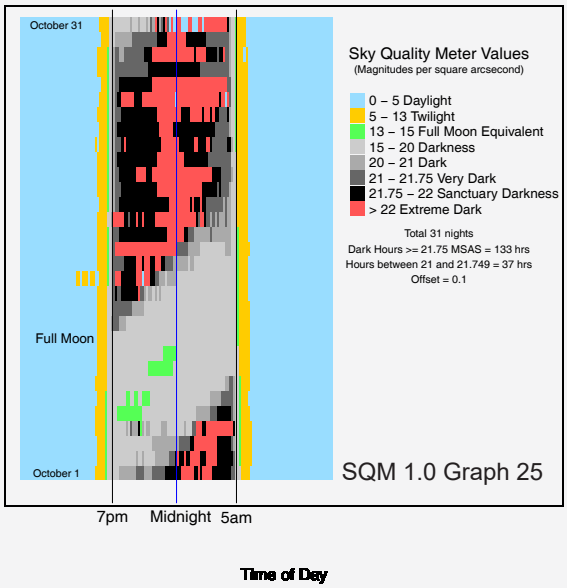
Sky Darkness Plot September 1 to September 30, 2022
Dinosaur Canyon SQM 1.0



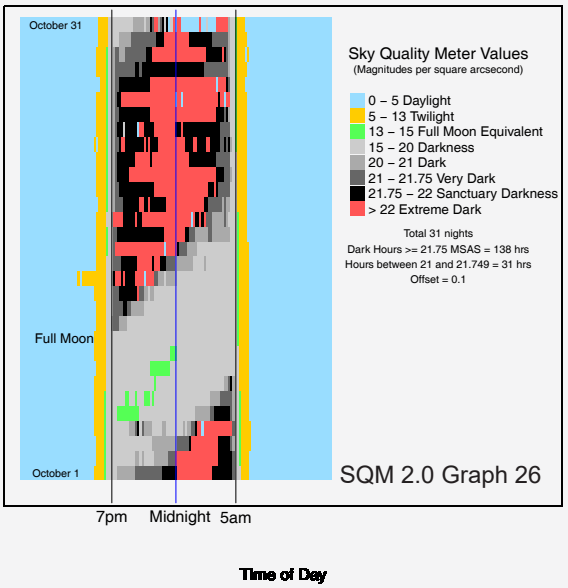
Sky Darkness Plot September 1 to September 30, 2022
Jump-Up Base SQM 2.0



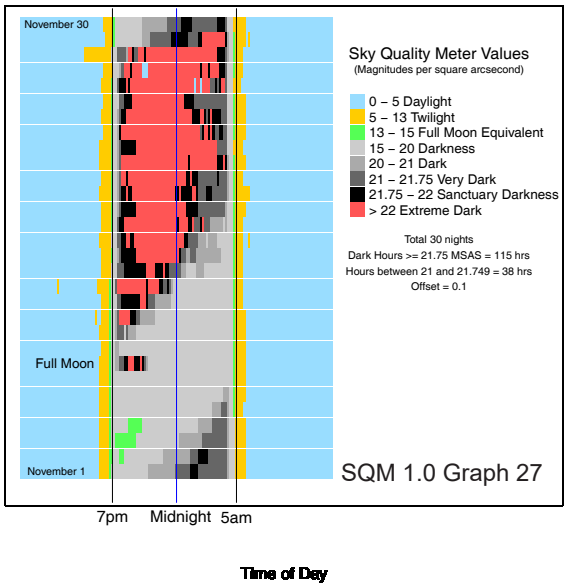
Sky Darkness Plot October 1 to October 31, 2022
Dinosaur Canyon SQM 1.0



Sky Darkness Plot October 1 to October 31, 2022
Jump-Up Base SQM 2.0



Sky Darkness Plot November 1 to November 30, 2022
Dinosaur Canyon SQM 1.0



Sky Darkness Plot November 1 to November 30, 2022
Jump-Up Base SQM 2.0