Western Sydney Amateur Astronomy Group Inc.

Western Sydney Amateur Astronomy Group Inc. (WSAAG)

Formal submission to alter the proposed flight paths

over Linden Observatory to and from Western Sydney airport

as described in Environmental Impact Statement (2016)

and updated on 24 October 2023

Version Control

Version	Date	Comment
1.0	12 November 2023	Final draft version for submission
1.1	15 November 2023	Addition of Appendix B – BMCC minute 240 of 31 Oct 2023
1.1a	29 November 2023	Final version submitted on 29 November 2023

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Executive Summary

Western Sydney Amateur Astronomy Group Inc (WSAAG) has significant concerns and objections in relation to the proposed flight paths as shown in the Environmental Impact Statement of 24 October 2023, over the Linden Observatory site (the site). We will show that air turbulence caused by aircraft passing overhead will render the site not fit for purpose and therefore unusable.

The aim of this submission is to propose a slight alteration to the flight paths that will negate the effects of air turbulence caused by aircraft that would otherwise render the site not fit for purpose.

The Evans 30 inch telescope operated by WSAAG at the site is the largest publicly accessible optical telescope in Australia. Some WSAAG members (past and present) have made confirmed and documented contributions to scientific research, including discoveries of supernovae, studies of variable stars and observations of asteroid occultations.

WSAAG had meetings with a number of groups, including Air Services representatives. These meetings indicate that the EIS authors did not know of the existence of Linden Observatory until about two months before publication. The published EIS corrects this but then describes the Observatory as a 'former' observatory in its technical paper. This is simply not true. The Linden Observatory is an active research and public outreach site (as demonstrated to Air Services representatives at the 17 August meeting). Refer to WSAAG.ORG website for further details.

Since Australia has adopted the 1977 International Astronomical Union (IAU) recommendations (figures 5 and 6 below) for observatories in relation to the effects of aircraft, the EIS needs to show consistency and abide by those recommendations, since the Linden Observatory is an active site.

The IAU, NASA, Harvard and Australian Geographic support our case that air turbulence is an issue. Evidence from these bodies are quoted in this submission.

The Federal Member for Macquarie (that covers Linden), Ms Susan Templeman, encouraged WSAAG to make a formal submission.

The Blue Mountains City Council (BMCC) unanimously passed a motion at their 31 October 2023 meeting supporting the WSAAG view that "the Linden Observatory is used for ongoing academic and professional research projects which will be jeopardised by the planned continuous overflights." The full transcript is at Appendix B below.

Scope

This submission mentions other factors such as light pollution, environmental factors and to a much lesser degree, noise. However, the focus of this submission is threefold:

1. Acknowledgement by the EIS that Linden Observatory is a working, active observatory.
2. Acknowledgement by the EIS that air turbulence caused by aircraft, from the perspective of WSAAG, will render the site unusable.
3. To ensure that the adverse effects on Linden Observatory, and our recommendations, will be taken into account when designing the final flight paths.

Any reference to air turbulence in this submission also includes condensation trails (contrails).

Preamble

The Western Sydney Amateur Astronomy Group (WSAAG) is a group of enthusiastic and dedicated amateur astronomers based in the western suburbs of Sydney, NSW. The website is WSAAG.ORG.

WSAAG uses the Linden Observatory site on a regular basis for astronomy and astrophotography. Members come from the western Sydney region and as far away as the eastern suburbs and northern beaches, as it is conveniently located and is a reasonably dark site.

The objectives of WSAAG (as reproduced from the website) are as follows:

1. To promote and practice the science of astronomy.
2. To serve the needs of amateur astronomers in Western Sydney and Blue Mountains areas.
3. To promote co-operation between amateur and professional astronomers.
4. To conduct astronomy outreach programs for:
    - General public of all ages.
    - School groups.
    - Special interest groups such as the scouts and girl guides.
    - Disadvantaged groups.
5. To acquire, upgrade and maintain Club equipment to enable the Club to undertake research and astronomy research.
6. To assist the Linden Observatory Trust maintain the Linden Observatory site.
7. To establish educational programs.
8. To establish a WSAAG observatory at the Linden Observatory site that can be used for research and provide the public with better observing facilities.

WSAAG continues to actively use the Linden Observatory site and has done so for many years. WSAAG has invested a considerable amount of capital in improving the site for the benefit of its members and visitors.

WSAAG continues to collaborate with other astronomical sites around the world, especially in the areas of occultations (see Appendix A). This work has been going on for a number of years.

Air Services, through the EIS, were unaware that WSAAG are stakeholders.

WSAAG Achievements

Club and member highlights are numerous. Awards and publications have acknowledged many achievements. Examples are included at the links below:

WSAAG Member Dave Gault has an asteroid named after him - (33748) Davegault
(4337) Arecibo discovered to be binary by WSAAG members Peter Nosworthy and Dave Gault
Precise astrometry and diameters of asteroids from occultations – a data-set of observations and their interpretation (Dave Herald, Dave Gault et al)
Tony Barry wins the 2020 IOTA Homer F. DaBoll Award
Two WSAAG and 3 Penrith Observatory members cited in paper on Saturn's moon Phoebe
Dave Gault wins a 2019 IOTA Homer F. Daboll Award
Award Winning Photographer - Ted Dobosz
Alan Plummer Clocks Up 60,000 Variable Star Observations
Seven WSAAG members cited in paper on Chariklo's rings
Dave Gault (WSAAG) and Dave Herald (CAS) Discover a New Double Star During Lunar Occultation
Seven WSAAG members cited in paper on Pluto's atmosphere
Upgrading the 30-inch Telescope at Linden Observatory
WSAAG Receives UWS Community Award 2015
Tony Barry, Dave Gault and Hristo Pavlov Publish Paper on ADVS
Tony Barry Publishes Paper on SEXTA
Verifying Timestamps of Occultation Observation Systems - SEXTA
UWS Partnership Awards 2012
IOTA-VTI - How it was Developed - Tony Barry
Hristo Pavlov wins the 2010 IOTA Homer F. DaBoll Award
Dave Gault wins the 2010 Berenice Page Medal
NACAA XXIII and TTSO2, Penrith 2008
Brett White Earns Two Nova Awards
The Evans 30inch Telescope Comes to Linden 1997-2003
Bob Evans - His Many Other Awards
Bob Evans - Winner of the 1986 Berenice Page Medal
Bob Evans - His Many Nova/Supernova Awards
Bob Evans Record Supernovae Discoveries

Evidence supporting this submission

In the Environmental Impact Statement 2016, and in its 2023 update, in relation to the environment, the Forum on Western Sydney Airport (FOWSA) does not take into consideration air turbulence, only breathable air quality. In the opinion of WSAAG, this is a critical oversite. The EIS states, in part:

> "The draft EIS will examine the noise, social and environmental impacts of the proposed flight paths."

It seems that the EIS does not cover all the social and environmental impacts. The relevant portion of the EIS is reproduced below, together with the URL:

> **Environment**
> **Addressing environmental impacts**
>
> The Western Sydney Airport Environmental Impact Statement released in 2016, is the result of a rigorous analysis of the airport project and its potential impact on the environment.
>
> The analysis took into consideration issues such as:
>
> - air quality
> - biodiversity
> - fuel jettisoning (fuel dumping)
> - the potential impact on the Greater Blue Mountains World Heritage Area
> - health
> - noise
> - water quality
>
> Measures will be implemented to avoid, reduce or mitigate impacts related to the airport development.
>
> **https://www.westernsydneyairport.gov.au/environment-heritage/environment**

On 27 June 2023, Ms Susan Templeman, Federal Member for Macquarie emailed the author of this document with the new proposed flight paths to and from WSI airport. She stated that the current proposed flight paths "are not the same flight paths that were included in the Environmental Impact Statement (EIS) of 2015".

WSAAG had discussions with members of the Linden community along with the federal member on August 5, BMCC Deputy Mayor Cr Romola Hollywood and representatives for the EIS on 17 August, and Ms Templeman attended Linden Observatory on September 16 to witness the operation of the site.

On 30 July 2023, Tim Barlass from the Sydney Morning Herald, published an article on the Linden Observatory after visiting the site on 19 July, and amongst other things, described the importance of this as both a heritage and a working site. The article is on-line at:

https://www.smh.com.au/national/nsw/light-pollution-haven-at-risk-as-flight-paths-threaten-sydney-s-heritage-20230725-p5dr1b.html

Key points from these discussions and the EIS statement include:

- The EIS was not aware of the existence of the observatory.
- The EIS was not aware that the WSAAG are a key stakeholder.
- Consideration of the proposed flight paths mainly considered noise and population.
- The EIS considered Hartley and Linden as least affected areas, based mainly on noise and population. In any case, population density does not appear to be considered.
- FOWSA only includes one Blue Mountains resident (from Blaxland). Blue Mountains is a city, Linden is a suburb of mid-mountains and Blaxland is in the lower Mountains. Blaxland is about a half-hour drive from the Linden Observatory. There is no community representation from the mid Mountains.

Impact of the new proposed flight paths

There is no argument that it is inevitable that flight paths to and from WSI will be over some parts of the Blue Mountains. WSAAG acknowledges that this is a given. The most significant adverse impact from the WSAAG perspective in relation to the flight paths is air turbulence. A breakdown of all known effects of flight paths are as follows:

Noise

From a noise perspective, the populations of both Linden and Hartley are similar (2021 Census put them at 273 and 478 respectively). However, the areas of both townships are approximately 6.5 and 72 square kms respectively. Based upon the 2021 census figures for population density alone, which is more accurate, 43 people from Hartley would be somewhat affected compared to 273 from Linden if everyone at Linden was affected by noise alone. If the flight paths continued at the same trajectory as recommended by WSAAG, the extra elevation over Hartley would lessen any noise impact.

From an astronomical, and in particular, astrophotography perspective, aircraft noise has insignificant to no adverse effect, and aircraft lights can be an inconvenience but can have simple work-arounds. Air turbulence, however, is a major issue and there is no work-around.

Air turbulence

Aircraft must keep a safe distance from each other, as air turbulence from the one in front will affect them.

In relation to air traffic, of the seven factors listed in the EIS, air quality needs to expand to ensure that not just aircraft noise, but aircraft turbulence in particular and aircraft lights are taken into consideration before there is any final decision.

Upper atmospheric air turbulence is generally a minor and accepted part of astronomy. However, that amount of turbulence is not as significant as the turbulence that aircraft would cause, especially around the approximately 5000 feet altitude (from sea level) above Linden as proposed in the current EIS. If an aircraft passes overhead in particular, this would probably result in the inability to create any worthwhile astrophotography images, since astronomers, and in particular astrophotographers, cannot compensate for aircraft air turbulence overhead when taking images. Figures 1 and 2 below illustrate this phenomenon. These two images were taken by our current president in 2021 during a lunar eclipse. It shows a plane flying in front of the moon and the turbulence is clearly visible after the plane passes.

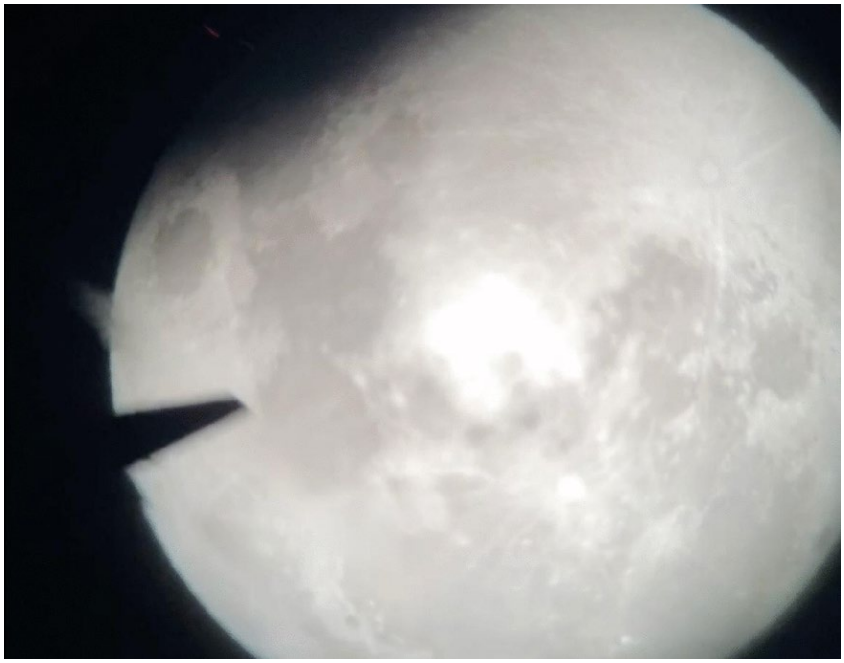

Figure 1 – 2021 - lunar eclipse with aircraft in shot. Picture: Peter Nosworthy

Figure 2 - Air turbulence (circled) stays well after aircraft passes. Picture: Peter Nosworthy

The following comments are from a WSAAG member, Narayan Mukkavilli. His comments highlight problems that face astrophotography:

> "In general, astrophotographers take lots - hundreds of images and stack (add) them to achieve the long (total) exposure necessary to reveal faint detail for two primary reasons:
>
> 1. Digital noise is reduced (noise is random, signal isn't) so averaging or median combining many images "cancels out" the noise.
> 2. If a few images are ruined by planes or satellites or cosmic rays, the imager can toss those sub exposures or by using special stacking algorithms, eliminate those when stacking.
>
> The problem is when it's not an isolated plane trail. If every three or four minutes a plane is going overhead then virtually EVERY sub frame will be ruined. Stacking can't deal with this, and instead of the situation today where you may have 90-95% good, usable frames, you'd have only maybe 1-5% usable frames.
>
> That's an astrophotography killer. There can be no mitigation except to physically move the observatory out from under the flight path or the flight path is moved from over the observatory."

The next image is an example taken from another member, Ted Dobosz home on 12 June 2022 using his equipment and a camera at 85 frames per second. This image was the result of the best 400 of 20,000 frames taken.

Figure 3 - Rima Sirsalis and Rima Mersenius. Picture Ted Dobosz

Finally, another image by Ted Dobosz of NGC 6357 (Lobster nebula) in Scorpius (figure 4 below), was the result of a total of 20 hours of 40 x 30 minute exposures. The stars were removed to better show the structures in the dust and emissions. If air turbulence were around, it would have been impossible to get this image.

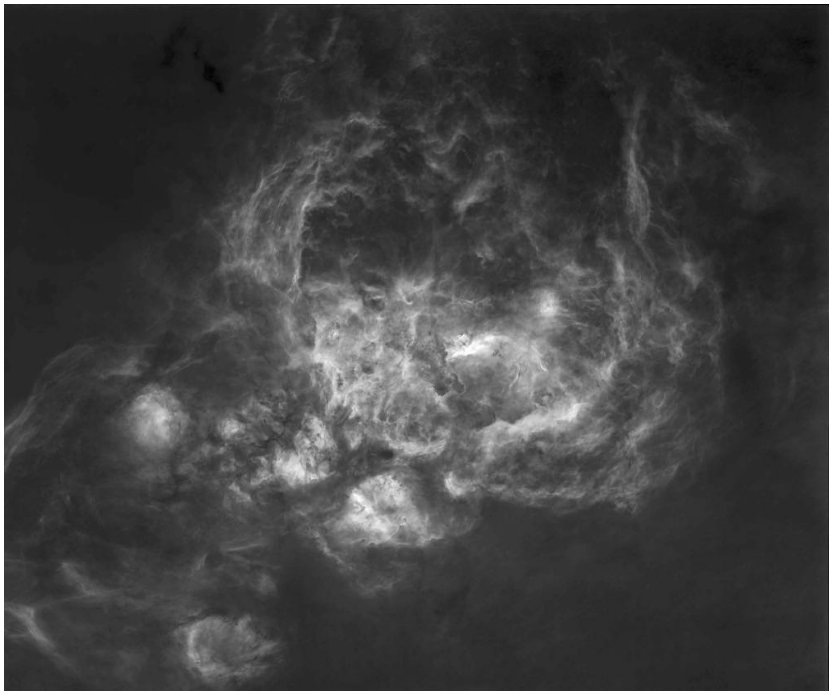

Figure 4 - NGC 6357 in Scorpius. Picture: Ted Dobosz

An exhaustive paper in relation to air turbulence produced by the International Astronomical Union (IAU), as provided by NASA, explains in detail the issue WSAAG brings to the attention of the EIS. The full document can be found at:

https://adsabs.harvard.edu/full/2001IAUS..196..173P

Importantly, the outtakes from this document, on pages 173 and 174, are below:

1. Introduction

Already in 1977, the IAU recognized that airplane lights, heat, exhaust, and condensation trails could seriously degrade observational astronomy, and it was recommended (Graham Smith 1977) that aviation near observatories should be limited to below 10° above the horizon, and that low-flying aircraft should not come closer than 5 km.

It appears that these recommendations have been successfully adopted by Spain and Australia for some of their observatories, whereas many other countries have not adopted the rules or do not enforce them.

Figure 5 - Extract from page 173, IAU Symposium 196

2. Aircraft Lights, Heat Emission

What are the major effects on observational astronomy? Stroboscopic and fixed aircraft lights may contaminate wide-angle imaging, and with the advent of wide-angle CCD imaging, the problem will be felt more. However, this effect, and the actual appearance of aircraft in solar imaging, for example [2], is a minor problem compared to the influence of engine exhaust and the resultant condensation trail (contrail). Heat emission can be traced far behind an airliner, where it may limit good 'seeing' conditions. Using the power law dependency given by Schumann et al. (1998) it can be estimated that the temperature difference with ambient air is 0.1 K or more at a distance of 25 km behind the aircraft, corresponding to 100 seconds of flight time. During this time an exhaust plume in an orthogonal jet stream field will have swept over ~1000 square degrees, as seen from a mountain top observatory.

3. Young Contrails

The condensation trail that forms in the wake of many flights is possibly the greatest threat to astronomy. As the trail sweeps over the sky, optical and infrared observations are affected by increased sky background, lesser transmission, and possibly by spectroscopic signatures.

Figure 6- Extract from page 174, IAU Symposium 196

The EIS meeting of 14 October mentions 7 to 14 night flights (per hour, one-way). There was also mention of a second runway in the future. This would be devastating to the Linden site with just one runway operating, let alone two.

Another example of the effects of air turbulence can be seen at night by most people, ie why do stars 'twinkle"?.

A quote (from Australiangeographic.com.au) describes this phenomenon as follows:

> Twinkling arises because the moving blobs of air act to alternately focus and defocus the starlight arriving at our eyes. The effect is that the star gets rapidly brighter and dimmer – that is, it twinkles, or scintillates. Looking through a telescope, you can detect this focusing and defocusing as the star image seems to contract and expand.
> For 300 years, astronomers have referred to the degree of turbulence in the atmosphere as "seeing". When the seeing is good, the star images in their telescopes are stable points of light. When it's not, they become inflated, trembling blobs, and the exquisite detail that the telescope is capable of revealing is lost altogether in the shaking of the air.
> Generally, the seeing gets better as you look higher in the sky – and thus the twinkling seen with the unaided eye is reduced. That is because the path of starlight through the atmosphere is shortest for stars that are overhead. For the same reason, high-altitude sites like mountain tops have better image quality for astronomers than sea-level locations – there is less turbulent air above them.

The key outtake here is that "twinkling" has always been a problem for astronomy, but with added turbulence caused by aircraft, especially at lower levels, and specifically overhead, the added turbulence would have catastrophic effects.

Environment

There are several articles available on-line on the effects of aviation fuel on the environment. A few examples to highlight the environmental impacts are below.

An article published by NASA on the effects of contrails supports the fact that contrails by jet fuels are a real problem. According to that publication, there were 29 contributors to the paper. The URL is:

> https://www.nasa.gov/news-release/nasa-dlr-study-finds-sustainable-aviation-fuel-can-reduce-contrails/

A key point from this is quoted below:

> "Jet engine exhaust includes water vapor and soot particles. As the water vapor cools, it condenses. Ice crystals form when that supercooled water interacts with either exhaust soot or particles naturally present in the air."

An article below was published by The US National Oceanic and Atmospheric Administration (NOAA)

> https://response.restoration.noaa.gov/sites/default/files/Kerosene-Jet-Fuel.pdf

An article below (in great technical detail) explains the effect of aviation fuels on waterways in particular.

> https://pubs.acs.org/doi/10.1021/acs.energyfuels.7b02844

Lake Woodford is on the other side of the road from Linden Observatory. Any pollution caused by aircraft flying overhead would affect the site. See figure 7 below obtained from Google maps.

Figure 7 - Linden Observatory area map

The EIS Aircraft hazard and risk states that it focuses primarily on an aircraft crash, not day-to-day activity. It states:

- **Fuel jettisoning is a rare occurrence that has no impact at ground level when conducted in accordance with relevant procedures outlined in the Manual of Air Traffic Services.**

Evidence from NASA and NOAA above suggests otherwise. No reference to support the conclusion made by the EIS was evident.

Visual impact, according to the EIS, particularly around Katoomba (around the Three Sisters), was briefly mentioned and considered to be of minor inconvenience.

Financial

WSAAG has invested a substantial amount in providing infrastructure and equipment to enable its members and visitors to enjoy astronomy at the Linden site.

A convergence between amateur and professional astronomy equipment has resulted in a blurring of their roles. High quality amateur equipment is now more affordable, but still expensive. A reasonable setup can cost anywhere between $10K to $20K. Any adverse impact from the effects of the proposed flight paths would essentially render members' equipment useless at the Linden Observatory.

If the site is inoperable, members would have no other alternative than to travel great distances and at increased costs of travel and accommodation to a suitable site or sell their equipment.

EIS Technical Paper

The technical paper in the EIS is factually incorrect. It states:

> This area also includes the Linden Observatory, a former observatory and NSW State Heritage Registered place. This observatory is located on the northern outskirts of Linden (outside of the GBMA) and is currently used by amateur astronomy groups. There are existing flights passing above these areas which would be generally at higher elevations and not strongly influence the character of views at night.
>
> With respect to the potential impacts on the former Linden Observatory, aircraft may be viewed in the night sky to the east of the former Linden Observatory, including one arrival flight path and 2 departure flights paths. There would be maximums of up to about 14 and 25 flights per night in total in 2033 and 2055 respectively. Aircraft are likely to be at relatively high altitudes of between 8,000 to 10,500 feet (2.4 to 3.2 km).
>
> Overall, the effect of lighting from the proposed night-time flight paths would be experienced across a small portion of the landscape and seen as distant flashing lights at high altitudes, resulting in a low magnitude of change (noting this is an assessment of the amenity, not a technical assessment of the impact of additional lighting on the usefulness of the observatory). Due to the high sensitivity, there would be Moderate-Low visual impact.

With respect to these comments:

1. The EIS contradicts itself by stating it is a former observatory as well as one being currently used.
2. The comment only addresses the effects of light on viewing, not astrophotograpy.
3. Just to illustrate a point, a single 5-second exposure will produce an image as in figure 8 below that shows the trail of two space satellites on the left side plus a meteorite on the right. A 5-minute exposure, which is common, with aircraft turbulence in it, will be much worse.
4. Typically, astrophotography will take multiple long exposures and stack them to achieve reasonable results.
5. A single image could take in some cases, hours of long exposures. See figures 3 and 4 above.

Figure 8 - Photo showing satellite trails and one meteorite. Picture: Barney Cservak

Dark sky sites

Due to problems of urban light pollution affecting astronomy, 'Dark Sky' sites have been declared in a number of countries and action taken to reduce the effects of light pollution.

In 2020, Blue Mountains Council, recognising this issue, gave unanimous support to help the Linden Observatory become an official "Urban Night Sky Place".

The Dark Sky Alliance website has a clear and pointed reference to light pollution causing serious issues with astronomy. The link is:

https://www.australasiandarkskyalliance.org/astronomical

Light pollution is a serious problem in astronomy. Air turbulence would add an extra level that cannot be resolved.

Summary

Linden Observatory is more than just a historical site (and acknowledged by the EIS). The site is used by amateur astronomers (and the public) to do both observing and research work. These include visual observing, astrophotography, variable star observations, occultations and the site also operates as an educational facility.

Its recent past also includes the discovery of supernovae.

Noise is an issue but not of primary concern for WSAAG. Figure 17 below of the current EIS noise map shows that the levels of noise around Linden would not be significant.

Aircraft lights could be a concern at the crucial time of an occultation.

Air turbulence is a major concern for night astrophotography and is a show-stopper.

Blue Mountains City Council reiterated its support for dark sky accreditation for Linden Observatory in its October 31 meeting. See Appendix B below.

The recommendation in this submission that the flight paths be slightly altered so that aircraft travel an extra 2-3 minutes in a westerly direction on the same course is not a big ask and would fully address the WSAAG concerns.

Conclusion and Recommendations

The EIS technical paper in relation to the Linden Observatory is factually incorrect. As a result, any conclusions and recommendations drawn from that paper are flawed.

The main point of difference is that WSAAG focuses on the effects of air turbulence caused by aircraft and the EIS focuses on the effects of noise. Had the EIS known of the existence of the observatory, which it now does, its limited terms of reference does not take into consideration other important factors apart from aircraft noise that would be an issue.

WSAAG members have agreed that any future use of the site as intended is dependent upon the proposed flight paths being slightly altered, namely that departing and arriving aircraft keep to the same path towards Hartley for an extra 2 to 3 minutes before changing course. If, and only if this happens, this would no longer be an issue for WSAAG.

As mentioned above, air turbulence caused by aircraft cannot co-exist with the Linden Observatory. A 3-minute extra climb at the same trajectory as suggested by WSAAG would equate to about an additional 10000 feet over Hartley, so noise (at least) would be relatively insignificant to that community.

In putting together this submission, evidence above and evidence from earlier meetings suggests that the EIS needs to modify those flight paths to take into consideration aircraft air turbulence in such a way as to enable unimpeded use at the site.

Unless the EIS modifies the proposed flight paths, WSAAG has no doubt that the Linden Observatory will no longer be suitable to be used as designed and as it is currently being actively used.

Proposed changes to flight paths

Below are screen-shots obtained from **https://wsiflightpaths.aerlabs.com/**. These were sourced on 21 October 2023. The marker indicates the location of Linden Observatory. Proposed changes to these flight paths are roughly indicated using a dark blue highlighter.

Note: At the on-line meeting on 14 October with Air Services and the public, Air Services admitted that their modelling was incorrect, in that the altitudes shown are based on sea levels, but noise takes into account ground levels above sea level. Based on this, in reality, flights over Linden could be as low as 3,500 feet above ground level there.

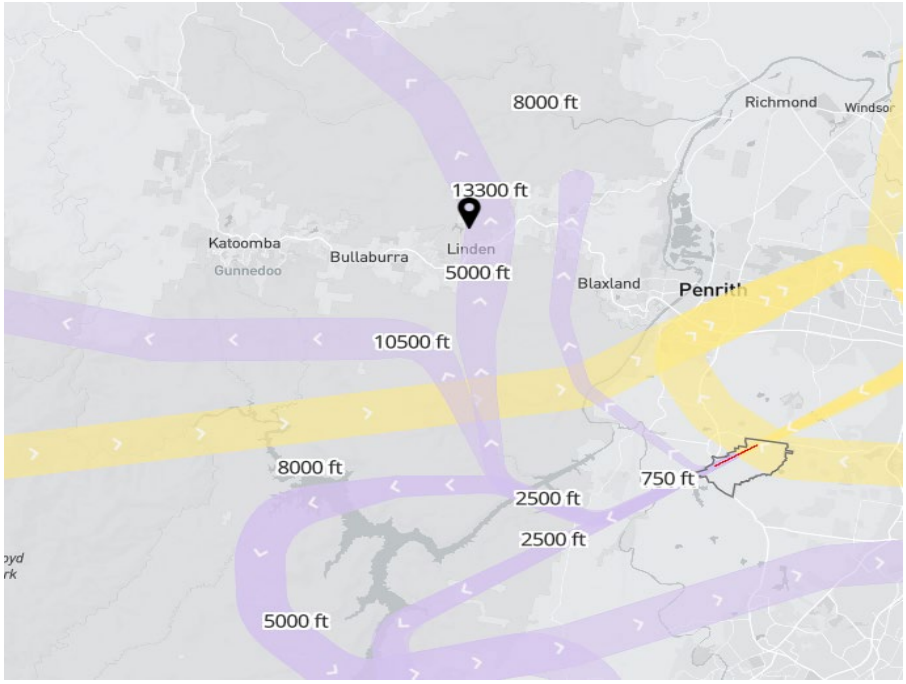

Figure 9 - Current proposed flight paths (from Runway 23, 5.30am to 11.00pm)

Figure 10 - Proposed altered flight paths (from Runway 23, 5.30am to 11.00pm)

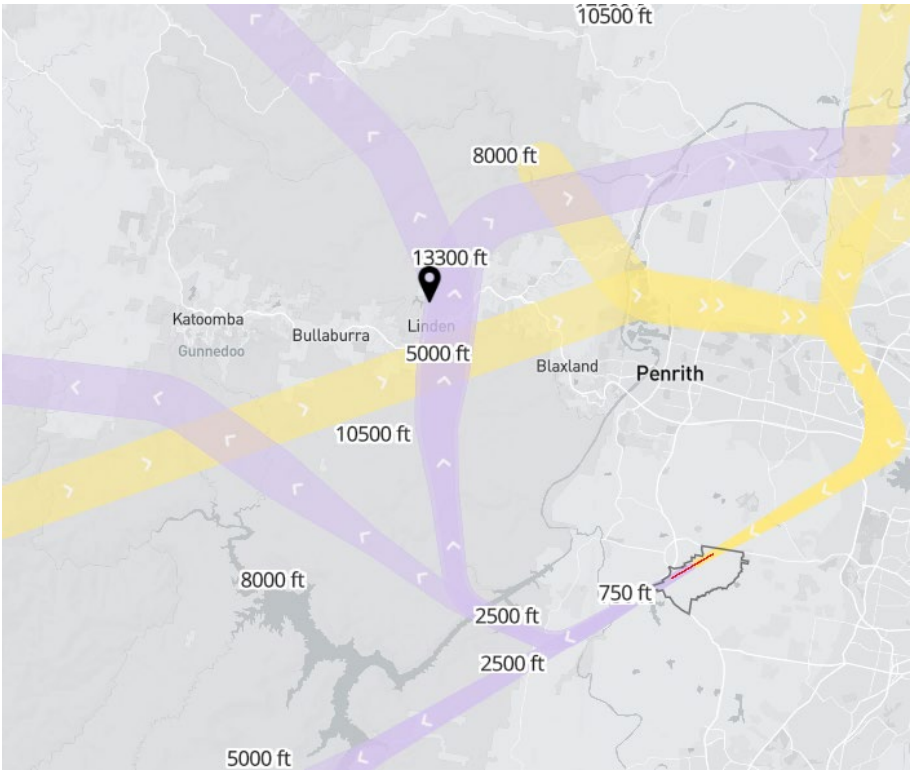

Figure 11 - Current flight paths (from Runway 23, 11.00 pm to 5.30 am)

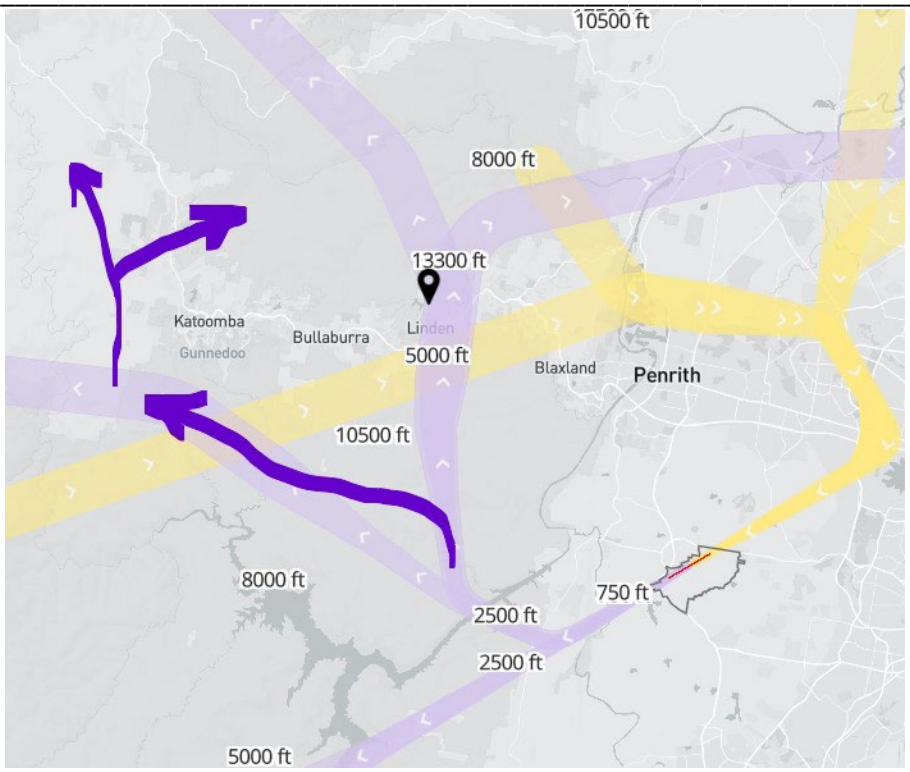

Figure 12 - Proposed flight paths (from Runway 23, 11.00 pm to 5.30 am)

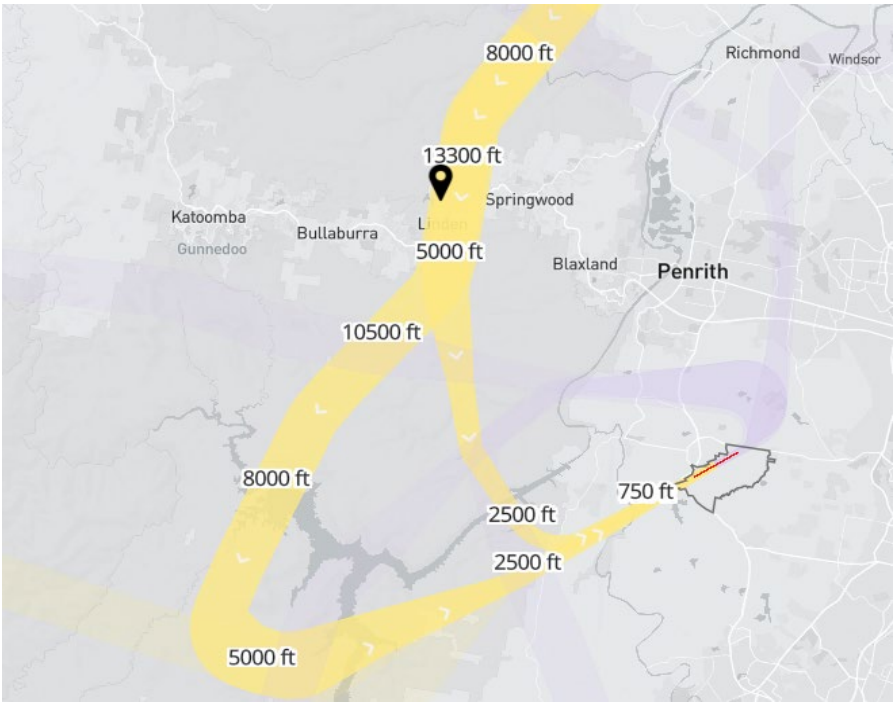

Figure 13 - Current flight paths (from Runway 05, 11.00 pm to 5.30 am)

Note: We do not know why the overnight flight paths for Runway 5 should be different to the Day-Evening routes.

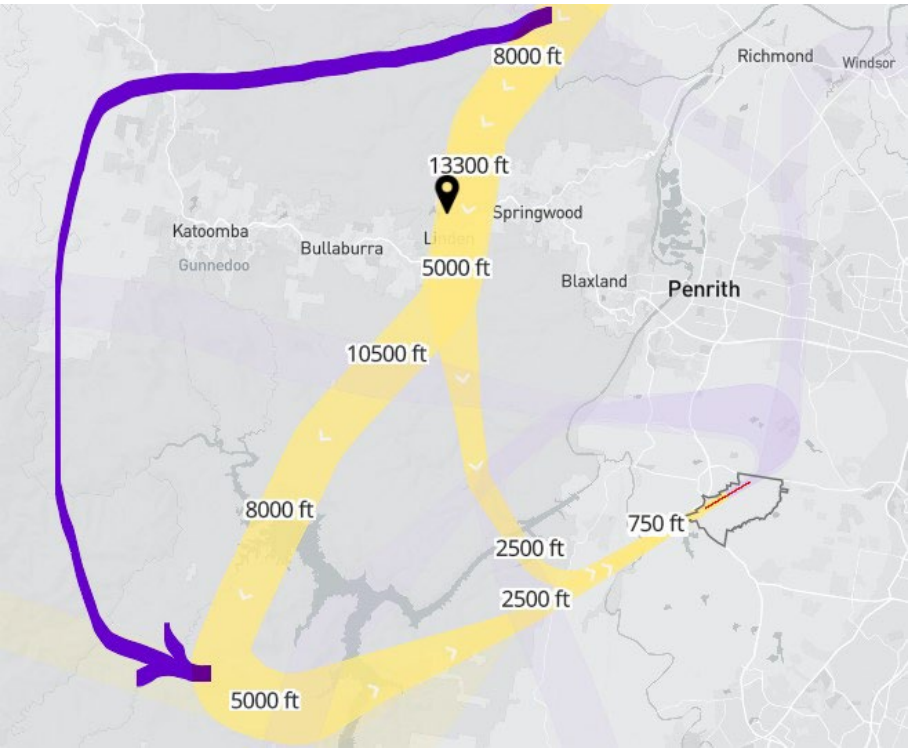

Figure 14 - Proposed flight paths (from Runway 05, 11.00 pm to 5.30 am)

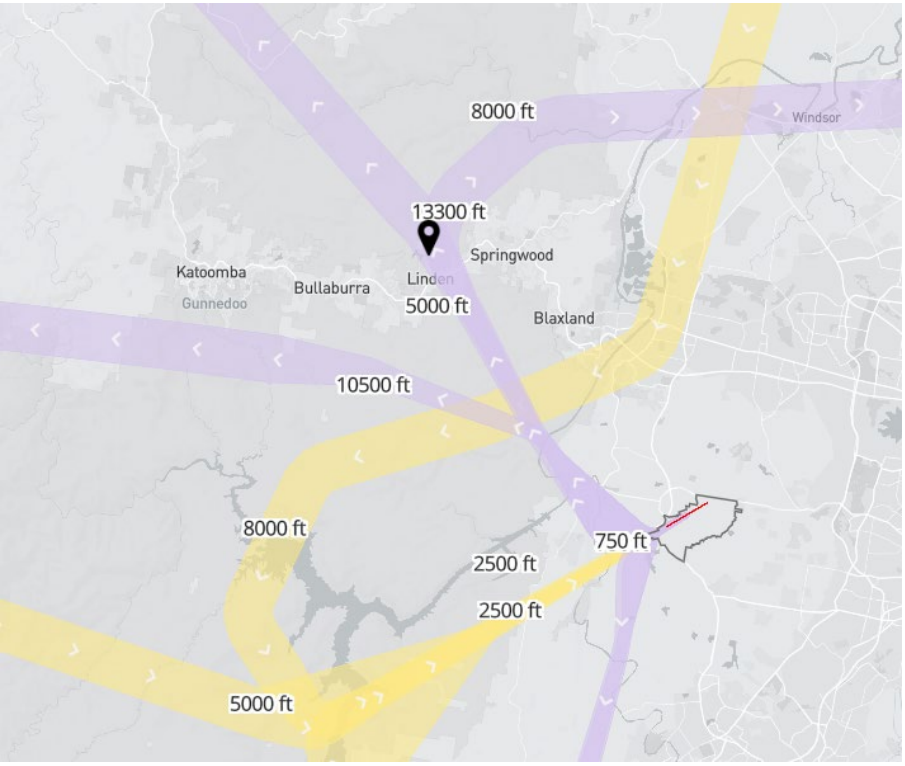

Figure 15 - Current flight paths (from RRO, 11.00 pm to 5.30 am)

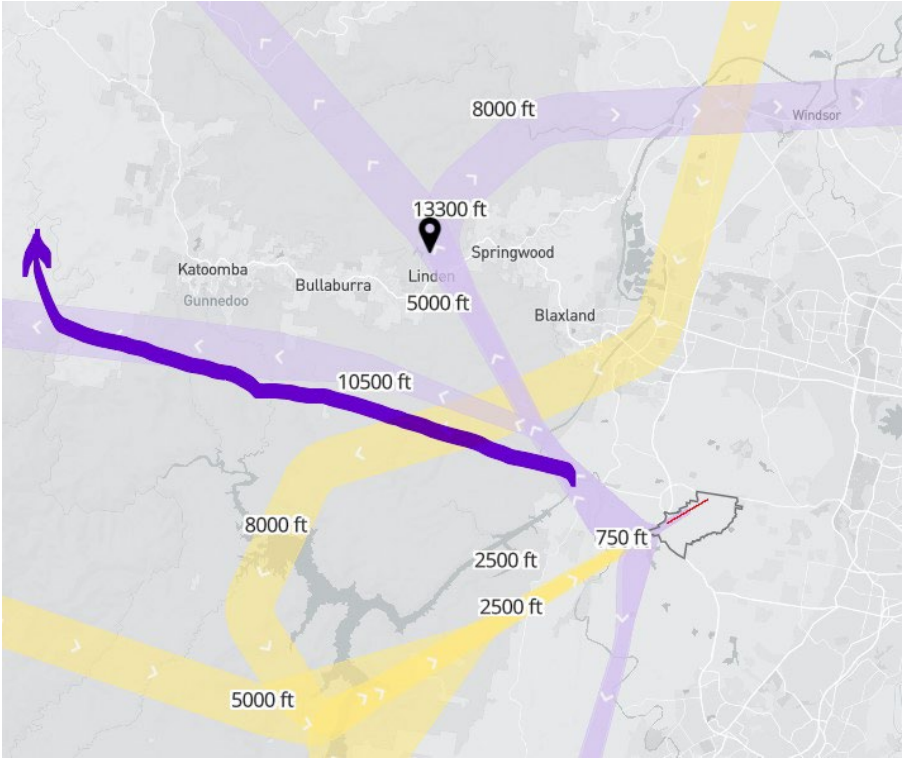

Figure 16 - Proposed flight paths (from RRO, 11.00 pm to 5.30 am)

Aircraft Noise Map

The noise map of the current EIS below shows that aircraft noise over Linden Observatory is not significant.

Figure 17 - Current EIS noise map

Contributors

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Appendix A

Occultations with the Evans-30 at Linden				
Date	**Name of Body**	**Type of Body**	**Mag**	**Members Involved**
27/5/2023	Quaoar	TNO - Rings & Weywot	14.8	Tony, Peter, Rob, Anu
25/5/2023	Quaoar	TNO - Rings	15.3	Tony, Peter, Rob, Anu
19/9/2021	C/2014 UN271	Big Comet C/2014 UN 271	16	Tony, Peter, Rob
28/12/2020	20000 Varuna	TNO	17	Tony, Peter, Rob
9/7/2019	28978 Ixion	TNO	14	Tony, Peter, Rob, Anu
31/7/2018	Quaoar	TNO	17	Tony, Peter, Rob
27/7/2018	Quaoar	TNO	16	Tony, Peter, Rob, Bob, Sel
1/7/2018	Chariklo	Centaur	17	Dave, Tony, Peter, Rob, Bob
1/10/2016	Chariklo	Centaur	15	Tony, Rob, Lachlan
15/8/2016	Chariklo	Centaur	15	Dave, Rob, Bob, Lachlan
2/7/2016	Chariklo	Centaur	16	Dave, Tony, Rob, Bob, Lachlan
12/6/2016	Chariklo	Centaur	16	Dave, Tony, Peter, Rob, Lachlan
11/6/2016	Chariklo	Centaur	16	Dave, Tony, Rob, Bob, Lachlan
30/6/2015	Pluto	Dwarf Planet	12	Dave, Rob, Lachlan
12/5/2014	2002 KX14	TNO	15	Tony, Rob
3/12/2013	2003 AZ84	TNO	15?	Dave, Tony, Peter, Rob
23/9/2013	55576 Amycus	Centaur	17	Dave, Tony, Rob, Lachlan
3/9/2013	2002 MS4	TNO	15	Dave, Tony, Rob, Lachlan, Gerry
31/8/2013	139 Juewa	Main Belt Asteroid	10	Rob, Peter, Gerry
16/8/2013	28978 Ixion	TNO (Plutino)	16	Dave, Tony, Rob
20/7/2013	Chariklo	Centaur	15?	Tony, Rob, Bob, Gerry
3/7/2013	Chariklo	Centaur	15	Tony, Rob, Lachlan, Gerry
2/7/2013	Chariklo	Centaur	17	Tony, Rob
4/1/2013	90377 Sedna	TNO	18	Dave, Tony, Rob, Mitch
27/12/2012	87 Sylvia	Main Belt Asteroid	13	Dave, Tony, Rob, Lachlan

Appendix B

BMCC motion of meeting on 31 October 2023 is below:

MINUTE NO. 240

A MOTION was MOVED by Councillors Hollywood and Fisher:

1. That the Council notes the release of the draft Environmental Impact Statement (EIS) for Western Sydney International Airport (WSIA) preliminary flight paths (draft EIS) on 24 October, and the Council's media release highlighting our continuing opposition to this airport due to the multiple adverse impacts the WSIA proposed flight paths will have on large parts of the Greater Blue Mountains World Heritage Area, and residential areas including Blaxland, Warrimoo, Mt Riverview and Linden

which will have high numbers of overflights above 60dB (see p.19-8).

2. That the Council notes, despite a recent meeting between the Linden Observatory and the Department of Infrastructure and Transport, the draft EIS incorrectly refers six times in one chapter to the Linden Observatory as "the Former Linden Observatory" and claims that only amateur astronomy activities take place there, even though the Linden Observatory is used for ongoing academic and professional research projects which will be jeopardised by the planned continuous overflights.

3. That the Council, via the Federal Member Susan Templeman MP, calls on the Federal Department of Infrastructure and Transport to immediately correct this error in the draft EIS.

4. That, notwithstanding the multiple issues to be raised in our Council's submission on the draft WSIA EIS, the Council includes reference to the impacts of overflights on the Linden Observatory, such as aircraft noise, light, turbulence and contrails and notes the Council's existing commitment to supporting the Linden Observatory plans for Dark Sky Accreditation.

5. The Council continues to encourage residents, businesses and organisations to review the draft WSIA Flight Paths EIS and to put in a submission on the draft Environmental Impact Statement (EIS) for the Western Sydney International Airport by the closing date of 31 January 2024.

Upon being PUT to the Meeting, the MOTION was CARRIED, the vote being UNANIMOUS

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