

Children and educational impacts

Executive Summary

The proposed Western Sydney Airport will be detrimental to the education of the day-care, pre-school, primary school and high school children of Western Sydney and the Blue Mountains due to the constant disruption of noise pollution, air pollution and the associated health impacts.

Children in Western Sydney and (to a lesser level) the Blue Mountains are already subjected to negative impacts on schooling due to socioeconomic disadvantage. The impacts of noise pollution, sleep deprivation and air pollution from Western Sydney Airport will only serve to widen the gap between children's education in Western Sydney and inner Sydney suburbs.

Schools under the flight path (and point merge) will be subjected to constant 24 hour noise pollution from over flight. Schools near the airport will be subjected to 24 hour noise pollution from both over flight and ground operations. In some cases the noise pollution levels at these schools will exceed World Health Organisation (WHO) Guidelines during both the day and night. (The WHO European Centre for Environment and Health, 2011) Children's schooling will also be indirectly impacted as teachers are likely to suffer sleep deprivation, higher levels of anxiety and other impacts of noise and air pollution than teachers that are not exposed to 24/7 aircraft over flights.

Impacts to children's schooling have lifelong implications. Research shows high levels of aircraft noise leads to children learning to read (Boyles, 2002) and speak (Bistrup, 2011) more slowly as well as poorer school performance on national standardised tests (Jones & Rhodes, 2013). Other studies show effects on attention and concentration levels as well as impacts on memory (United States Environmental Protection Agency, 1999). Lead exposure from aviation fuel has been shown to lower children's cognitive abilities, increase behavioural problems such as impulsivity and hyperactivity and lower NAPLAN results (Dong, Taylor, Kristensen, & Zahran, 2015). Children exposed to higher lead levels are more likely to commit violent crimes later in life and more likely to be financially disadvantaged (John Paul Wright, 2008).

Western Sydney children have poorer health than their counterparts in inner Sydney suburbs; therefore, they face higher risks from the negative health impacts of WSA. Children's health will be further negatively impacted by the health risks from noise pollution, such as elevated blood pressure and stress levels (Boyles, 2002) Western Sydney and the Blue Mountains currently have the highest childhood and adult obesity levels in Sydney, this is of particular concern as noise pollution has been shown to lead to increases in the rates of stroke and heart disease by 10-25%. (Toscano, 2013)

Repeated exposure to toxins from aircraft emissions poses a serious threat to the health of children, and they are more at risk than adults of developing health problems from air pollution. Toxins from aircraft emissions do not just disappear into the air, they accumulate flight after flight, day after day, over time to settle in the environment. Toxic aircraft emissions can cause a plethora of health impacts, including premature mortality, lung and respiratory problems, cardiovascular disease, lower resistance to respiratory infections, headaches, dizziness, visual disorders and memory impairment, (United States Environmental

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Protection Agency, 1999) impairment of lung function and neurodevelopment in children, and exacerbation of asthma in children (Ritz & Wilhelm, 2008). Western Sydney already has the highest rate of asthma hospitalisations in Sydney. (Australian Institute of Health and Welfare, 2013)

These impacts all lead to further disadvantage in later life, which only serves to increase the educational, social, financial and health inequity between children of Western Sydney and the Blue Mountains and more affluent regions of Sydney.

1. Negative impacts to children and learning

Frequent over flight during the day will interrupt lessons and student’s concentration. Hours will be lost in lesson time as teachers and students pause for a plane to fly overhead. Aircraft noise during the evening and night will interrupt homework, family time and sleep.

A key factor in noise pollution is the difference between the noise and the ambient noise. Due to the general peaceful quiet of the Blue Mountains with soft ambient noise (around 40dBA), sounds travel far and seem louder than in the city and blending to the louder ambient noise. Every 10dBA increase in noise is approximately a doubling of the perceived loudness. (Vanderheiden, 2004) This means the impact of 60dB noise pollution in the Blue Mountains with an ambient background of 40dBA would seem 4 times as loud or double the loudness compared to the same noise over an inner Sydney suburb (with an ambient background of 50dBA). These factors are not taken into consideration in the sound modeling of the EIS.

1.1 Economic disadvantage and school performance

Many of the children impacted are already subject to socioeconomic disadvantage, and many of the schools already underperform due to disadvantage. Western Sydney currently ranks as the most socio-economically disadvantaged area in Sydney. (Australian Bureau of Statistics, 2006)

GREATER SYDNEY Statistical Local Areas

Most disadvantaged

Rank in Sydney	Statistical Local Area (SLA)	Usual Resident Population
1	Fairfield - East	110,302
2	Blacktown - South-West	93,663
3	Parramatta - South	31,506
4	Bankstown - North-East	56,401
5	Wyong - North-East	72,188
6	Campbelltown - North	74,765
7	Bankstown - North-West	62,353
8	Liverpool - East	96,497
9	Canterbury	129,963
10	Campbelltown - South	68,310

Further detrimental impacts would therefore serve to widen the gap between the privileged and underprivileged in Sydney.

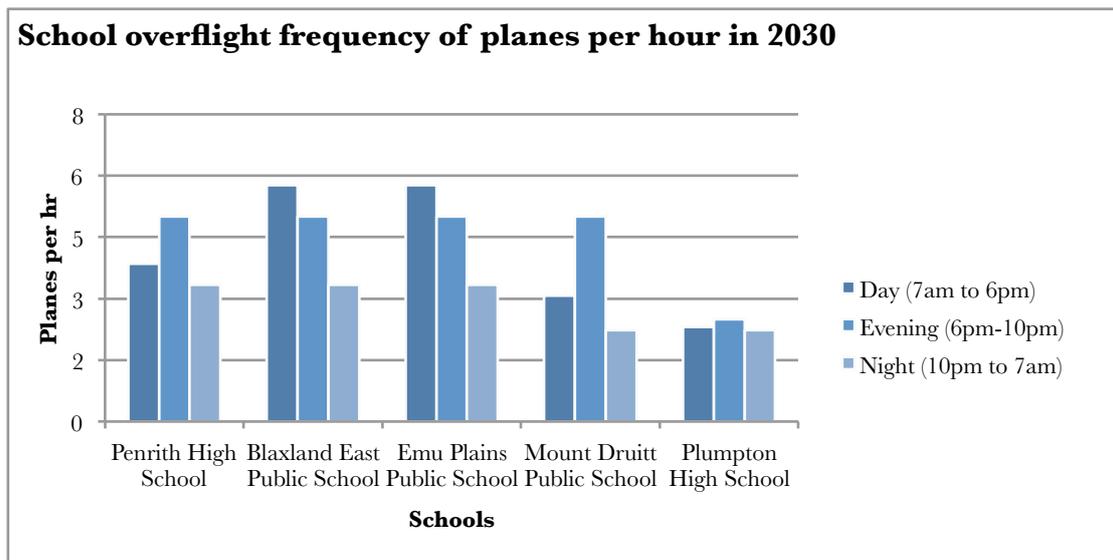
1.2 Children and aircraft noise

The EIS states that children are more sensitive to aircraft noise because they are more likely to play outside. (Department of Infrastructure and Regional Development, 2015) Studies show outdoor play teaches essential skills and is important to a child’s physical development and emotional wellbeing. (Council for Learning Outside the Classroom, 2009)

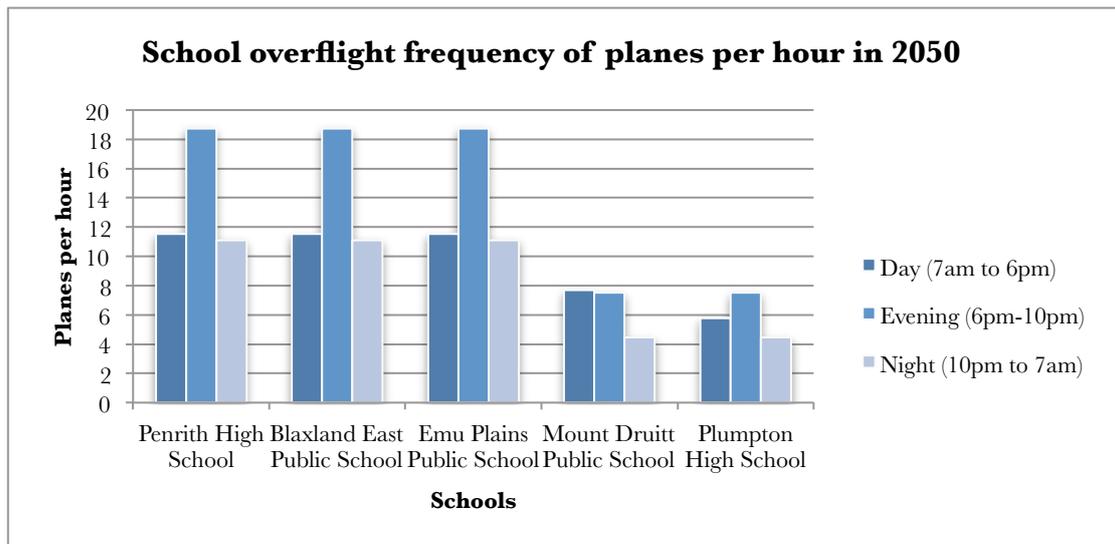
Research suggests that children, in particular, have a high-risk of suffering from the effects of chronic noise exposure. A study into *Effects of chronic aircraft noise exposure to child stress responses and cognition*, including a 12 month follow up study, indicated that children do not adapt to the noise, for it has sustained effects. Chronic aircraft noise exposure was associated with higher levels of annoyance and perceived stress, poorer reading comprehension and sustained attention measured by standardized scales after adjustment for age, social deprivation and main language spoken. *“The reading and annoyance effects do not habituate over a one-year period and do not provide strong evidence of adaptation.”* (Haines, Stansfeld, Job, Berglund, & Head, 2001)

1.3 Noise from over flight affecting schools

These graphs shows the results from the online WSA Noise-Modeling Tool over some example schools in Western Sydney and the Blue Mountains under the flight path to indicate the number of planes flying overhead per hour. There are many more schools, which are not shown below, that will be impacted by WSA.



In 2030 there will be one flight every 10-15 minutes during school hours and once every 12-18 minutes at night over Penrith and the Lower Blue Mountains schools causing 60-65dBA of noise pollution.



In 2050 there will be a flight every 5 minutes during school hours and every 3-5 minutes during the night over Penrith and the Lower Blue Mountains’ schools and residences causing 60-65dBA of noise pollution. Plumpton High School will suffer from both over flight and ground operation noise.

1.4 Noise from ground operations at airport affecting schools

Noise pollution from Airport ground operations will affect many schools in the area near the airport namely:

- 1. Luddenham Public School**
2. Warragamba Preschool
- 3. Bringelly Public School**
4. Emmaus Catholic College, Kemps Creek
- 5. Blackwell Public School**
- 6. Banks Public School**
- 7. St Clair High School**
- 8. St Marys South Public School**
9. Horsley Park Public School
10. Bennett Road Public School
11. Colyton High School
12. Mount Druitt Public School
13. Plumpton High School

Ground operations’ noise levels in Schools shown above in bold will exceed the WHO Guidelines of a maximum of 40 dB night target levels and cause sleep disturbances.

Luddenham Public School will also exceed WHO guidelines for daytime and night time noise levels. (Department of Infrastructure and Regional Development, 2015, Table 32)

2. Effects of continuous noise pollution on children’s learning

Aircraft noise is a chronic environmental stressor for school children, and “schools exposed to high levels of aircraft noise are not healthy educational environments.” (Clarke, Crombie, Head, van Kempen, & Stansfield, 2012)

The WHO has written about the dangers of aircraft noise in *Burden of disease from environmental noise*: “There is sufficient evidence from large-scale epidemiological studies linking the population’s exposure to environmental noise with adverse health effects. Therefore, environmental noise should be considered not only as a cause of nuisance but also a concern for public health and environmental health.” (The WHO European Centre for Environment and Health, 2011).

Research has established that the effects on children of high levels of environmental noise, such as aircraft noise, include:

1. Deficits in sustained attention and visual attention;
2. Difficulties in concentrating (based on teachers’ reports);
3. Poorer auditory discrimination and speech perception;
4. Poorer memory requiring high processing demands; and
5. Poorer reading ability and school performance on national standardised tests (Jones & Rhodes, 2013).
6. Children learning to read more slowly (Boyles, 2002)
7. Developmental delays in language and speech acquisition in children (Bistrup, 2011).

3. Increased risk to children’s health

3.1 Risks from noise pollution

Detailed studies on children show the link between aircraft noise exposure and increased health risks. In particular, elevated blood pressure and stress hormone levels compared with kids living in quieter areas. (Boyles, 2002)

Studies in the British Medical Journal have linked aircraft noise to a 10-25% higher rate of stroke and heart disease that increases with closer proximity to an airport or aircraft noise. (Toscano, 2013) This is of particular concern as Western Sydney already has higher rates of heart failure hospitalisations than other regions in Sydney (Close, 2014).

3.2 Risks from toxic aircraft emissions

Children are more at risk than adults of developing health problems from air pollutants due to their immature physical development as well as increased lung surface area. Children breathe in 50% more air per kilogram of body weight than adults (Ritz & Wilhelm, 2008). Also, children are more likely than adults to play outside.

Repeated exposure to toxins from aircraft emissions poses a serious threat to the health of children. These toxins do not just disappear into the air but accumulate flight after flight, day after day, over time to settle in the environment.

According to United States Environmental Protection Agency (1999) the following contaminants resulting from airline emissions can cause serious harm to humans and the environment: “Ozone, Carbon Monoxide, Nitrogen Oxide, Sulphur Oxides, Particulate Matter and Volatile Organic compounds.”

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The United States Environmental Protection Agency (1999) has found that exposure to toxic aircraft emissions can cause a wide range of negative health problems in children such as

- lung and respiratory problems
- cardiovascular disease
- lower resistance to respiratory infections
- premature mortality
- headaches
- dizziness
- visual disorders
- memory impairment.

“Early childhood is also a critical period for the continued development and maturation of several biological systems such as the brain, lung, and immune system and air toxics can impair lung function and neurodevelopment, or exacerbate existing conditions, such as asthma” (Ritz & Wilhelm, 2008)

3.3 The dangers of lead exposure on children

The EIS states an estimated 5 percent of flights at WSA will use leaded fuel. However, the EIS fails to investigate the dangers of lead exposure in regards to airport operations. Lead has no known safe level (NHMRC 2015). Even small quantities of lead particles in the air, household dust or soil can be a health hazard if they are swallowed or inhaled. (Laidlaw, 2008)

Lead exposure from aviation fuel in children, has been shown to

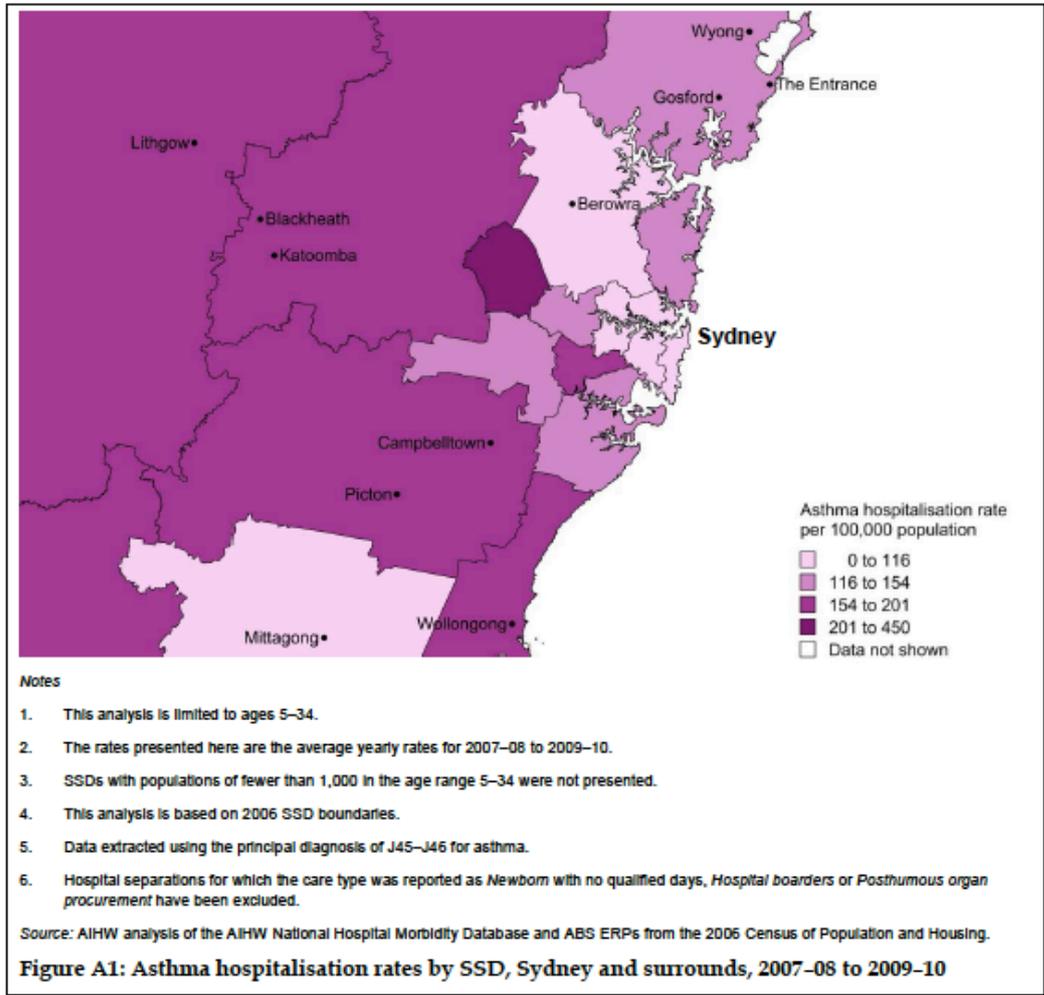
- decrease children’s cognitive abilities (even with low blood lead levels) (Lanphear, 2000, 2005; Caneld et al., 2003 and Jusko, 2008)
- lower NAPLAN results (Dong, Taylor, Kristensen, & Zahran, 2015)
- cause behavioral problems, such as poor attention, impulsivity and hyperactivity,
- have lifelong implications: increased violence and financial disadvantage (John Paul Wright, 2008).
- delay sexual maturation or puberty onset in adolescent girls and boys.

Lead exposure can have life long impact. Children exposed to lead in early childhood experience more rapid cognitive functioning decline in old age. Another study by Macquarie University showed that children exposed to higher lead levels are more likely to commit violent crimes later in life. (Scott, 2016)

3.4 Increased risk of asthma hospitalisation

The EIS states there will be an increase in emergency hospital admissions for children suffering from asthma as a result of the air pollution. This is concerning as Western Sydney already has the highest rate of asthma hospitalisations in Sydney. (Australian Institute of Health and Welfare, 2013)

Asthma hospitalisations



There are no limits set in the EIS for air pollution levels from the airport operations and flight paths based on Australian Air Quality guidelines set in the Air NEPM (Commonwealth of Australia).

3.5 Increased health risk for low socioeconomic areas

The EIS states children living in lower socio-economic areas are more at risk of negative health impacts from air and ground pollution as they already have a higher rate of poor health.

Western Sydney and the Blue Mountains have a higher rate of obesity and asthma hospitalization than the rest of metropolitan Sydney. (Harrison, 2015) *“Suburbs in Sydney’s west were found to be among the nation’s most high-risk areas for childhood obesity - with Fairfield East the highest risk.”* (Hornsby Advocate, 2014)

Exposure to toxic aircraft emissions will lower the already poor health levels of children in this region.

3. The effects of sleep deprivation on children

3.1 Western Sydney Airport's night operations

It is of particular concern that according to the EIS Vol 1, 7.9.1 *“Western Sydney Airport would operate on a 24 hour basis”* (Department of Infrastructure and Regional Development, 2015). The EIS Vol 4, 7.9.2 further states: *“Although the airport is proposed to operate on a 24-hour curfew free basis, there is predicted to be relatively few aircraft movements occurring during the night-time period, particularly for the Stage 1 development. Indicative aircraft movements per hour are presented on Figure 7–11.”* This statement is misleading.

According to *Figure 7–11 – Aircraft movements per hour* there is a approximately 38 aircraft per hour at 11pm (a plane every minute and a half), 20 aircraft per hour at midnight (a plane every 3 minutes), and 15 aircraft per hour at 1am (a plane every 4 minutes), then averaging 5 aircraft per hour until 5.30 am when it then rises sharply to 75 aircraft per hour. A plane every minute is not *“relatively few aircraft”*. It is more aircraft than any inner Sydney suburbs experience near Sydney Kingsford Smith Airport during the daylight hours let alone during the night.

3.2 Restrictions on Sydney Airport operations

Sydney Kingsford Smith Airport operations are limited by a daily curfew and hourly cap. According to Air Services Australia: *“Sydney Airport has a curfew that restricts both aircraft type and runway usage between the hours of 11.00pm and 6.00am.”* (Airservices Australia, 2012) In addition, Sydney Kingsford Smith Airport has a Movement cap of maximum 80 aircraft movements per hour and cannot be exceeded. (Airservices Australia, 2010) Sydney Kingsford Smith Airport also uses a STAR system rather than a point merge system to share the noise pollution equitably across Sydney suburbs.

Unlike residents in close proximity to Sydney Kingsford Smith Airport, children living in Western Sydney and the Blue Mountains will be forced to live with frequent all-night aircraft noise as a result of the proposed Western Sydney Airport. This is an inequitable proposition that will interrupt sleep and cause sleep deprivation.

3.3 Health & learning risks from night-time noise pollution

The Health Risk Assessment Western Sydney Airport EIS p. 751 states: The results for the HRA show that ground-based operations may lead to a small increase in sleep disturbance (assessed as awakenings), increases in risk of cardiovascular disease and potential delays in childhood learning and cognitive development.

The World Health Organisation guidelines advise that night-time aircraft noise over 40dB affects vulnerable groups such as children, the chronically ill, and the elderly (World Health Organisation, 2009). The EIS admits that exposure to night-time noise pollution 50dBA and over causes people to wake up. Planes are predicted to cause 60-65dBA of noise pollution over Penrith and the Blue Mountains.

In Blaxland (in 2030) children can be woken up 30–50 times a night between 6pm and 7am - that is a flight every 12 minutes. In 2050 it grows to a staggering 125-175 times a night. This high level will interrupt sleep and cause sleep deprivation.

Sleep deprivation has been proven to lead to health and social issues in adults and children in numerous studies. Studies detail cardiovascular, metabolic and psychiatric problems, as well as, negative social outcomes in adults and children. Also children suffer the day after an

interrupted night's sleep from sleepiness, annoyance, mood swings and decreased cognitive performance (Halperin, 2014).

Tired children have problems concentrating in class, which leads to delays in learning.

Recommendations

To minimize the negative effects of WSA on children and learning in Western Sydney and the Blue Mountains we make the following recommendations:

- Alternative locations to an airport at Badgerys Creek be prioritised, given the concerns which have led to Badgerys Creek being rejected twice already as a second airport site. These alternatives could include:
 - Fully engaging Kingsford Smith Airport to 100% capacity.
 - Locating a second airport in a location which will not send large volumes of flights over low socioeconomic areas, World Heritage Listed National Parks and communities with low ambient noise levels
 - developing a high speed rail alternative.

If the airport proposal for WSA is to proceed, the EIS must include:

- A full independent investigation that goes into more detail than the current EIS and addresses gaps and inaccuracies in the current EIS. These investigations should examine:
 - The health effects of the proposed airport, including the effects of noise pollution and air pollution (including lead) on children's health and their cognitive, psychological and physical development, and in doing so:
 - Calculate the expected volume of emissions of air pollutants
 - Provide modeling showing whether these estimated emissions would produce levels of lead in the air that exceed current NEPM guidelines.
 - Investigate the potential spread of air pollutants over the Blue Mountains and Western Sydney, with a particular focus on areas of potentially higher concentrations due to merge points, climbing and approach modes, as well as, flight manoeuvres.
 - Investigate the topography of the area and how weather, such as wind patterns, will affect the accumulation or dispersal of air pollutants
 - Model the effects of inversion on levels of contamination of pollutants
 - Use climate change models to determine how factors, such as wind patterns, aridity and temperature, will affect the accumulation or dispersal of air pollutants.
 - The educational impacts of airport ground operations and over flight on day-care facilities, pre-schools, primary schools and high schools;
 - Economic modeling on the combined effects of low socioeconomic status, educational disadvantage, poor health and airport operations on children's health and learning and its associated long-term effects on the economy.
 - Testing and exploration of alternative flight paths and management systems that minimise over flight of residential areas and school grounds, as well as, share the noise pollution equitably.

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- A curfew consistent with the curfew in place for Sydney Kingsford Smith Airport restricting the types of aircraft and operations allowed between 11:00pm and 6:00am, as well as, on Saturdays and Sundays, particularly regarding older and noisier aircraft used for freight planes.
- An hourly cap of 80 aircraft movements, consistent with the cap in place for Sydney Kingsford Smith Airport.
- Equal distribution of flight paths in all directions from the airport using the STAR system to minimise the impact on local communities and environments, consistent with the STAR system for flight sharing in place for Sydney Kingsford Smith Airport.
- Restrictions at WSA regarding the curfew, hourly cap and flight sharing protected by legislation consistent with the legislative protection in place for Sydney Kingsford Smith Airport.
- The quantification and capping of the noise levels of flights during Stage 1 and 2, particularly given the likelihood of older and noisier freight planes using the airport.
- The application of World Health Organisation Night Noise Guidelines for Europe (World Health Organisation, 2009) on night over flights, including a target of maximum 40dB for night noise, which incorporates a 10dB penalty for night flights and a 5dB penalty to protect the public, particularly the most vulnerable groups, such as children, the chronically ill, and the elderly.
- The baseline levels of current air pollutants, ambient noise and public health in the Lower, Mid and Upper Blue Mountains, which will enable prediction and amelioration of the effects of increased air and noise pollution - this information is missing from the EIS.
- Restrictions that prevent fuel dumping over, in or in close proximity to the GBMWA.
- Limits to air pollution levels affected by WSA operations and flight paths based on Australian Air Quality guidelines set in the Air NEPM (Commonwealth of Australia).
- A noise insulation programme to assist residential properties and public buildings implement noise abatement strategies, such as roof and wall cavity insulation or double glazing, consistent with the *Sydney Airport Noise Insulation Programme* established in 1995 in relation to the construction of the third runway. This programme should include consideration of the impact of low ambient noise levels, as found in the Blue Mountains LGA.

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