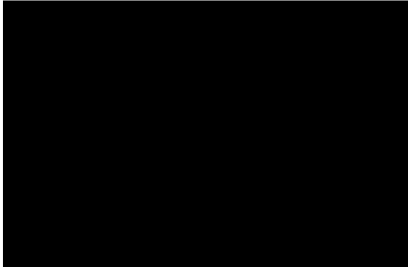


21 November 2023



References:

- A. ICAO Annex 14 Volume II: Heliports, 5th Edition 2020 (AL 9)
- B. ICAO Heliport Manual Doc 9261-AN/903 5th Edition 2021
- C. Advisory Circular (AC) 139.R-01 v1.0 Guidelines for heliports - design and operation
- D. NSW Health Policy GL2020\_014 Guidelines for NSW Hospital HLS dated 1 Jul 2020

Dear Rina,

**Scope and Purpose**

This letter assesses the potential impacts from retrieval helicopter operations at Westmead Hospital on patients, staff and visitors attending the proposed Westmead Palliative Care Unit. The assessment is based upon the BVN Architects' DRAFT Concept Design report dated 3 November 2023. The source documents that guide the advice within this letter are contained in references A-D.

This assessment addresses the potential impacts of:

- Helicopter main rotor downwash effects,
- Helicopter-induced noise and vibration,
- Helicopter exhaust fumes,
- Helicopter external lighting, and
- Helicopter-induced dust and airborne particulate matter.

**Background Information**

A number of factors and characteristics present at a Helicopter Landing Site (HLS) are immutable. They are tied to nature (e.g. average annual prevailing winds); terrain and topography (hills and mountains); surrounding obstructions (e.g. power lines and towers) and historical decisions (where the HLS is sited and those buildings adjacent to it). It is extremely difficult to change the existing approach and departure arrangements for an HLS. Helicopters, like aeroplanes, need to approach and depart into wind to the maximum extent possible. In addition, helicopters, like aeroplanes have crosswind limits.

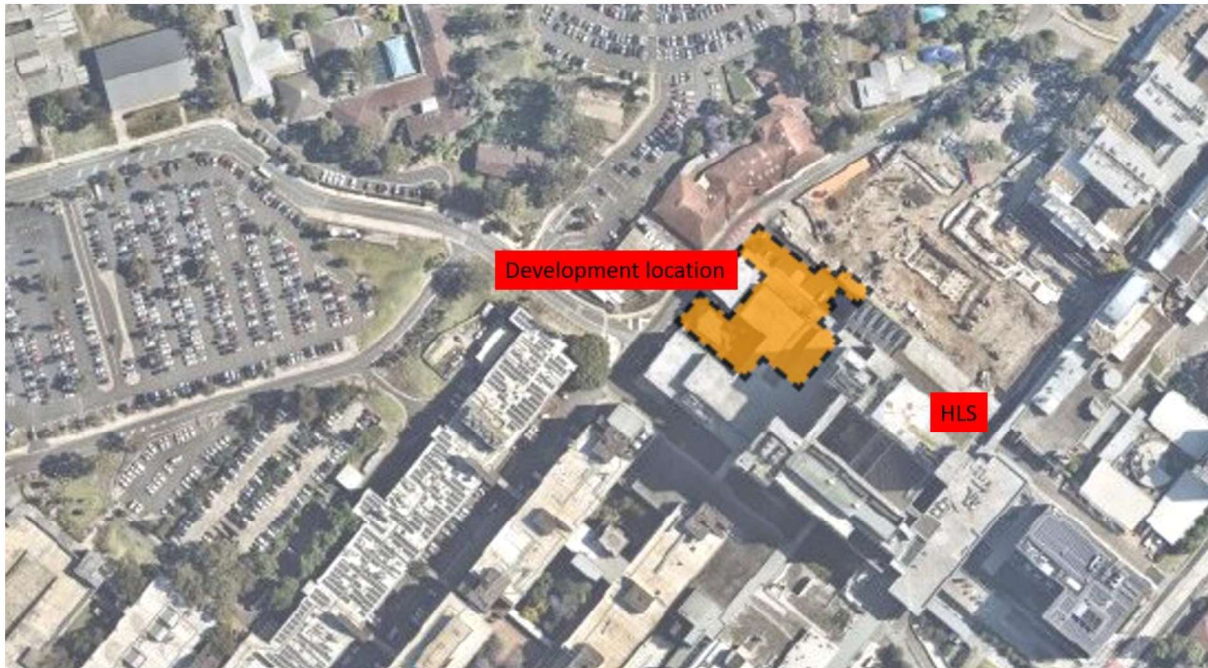
There are several HLSs at Westmead, however the only one that is relevant to this assessment is the HLS on the Central Acute Services Building (CASB), also known as K Block.

In the case of the Westmead CASB HLS, it is sited on the easterly side of Level 15 of the CASB. The proposed Westmead Palliative Care Unit is situated towards the western end of the CASB at Level 5.



## The HLS Location

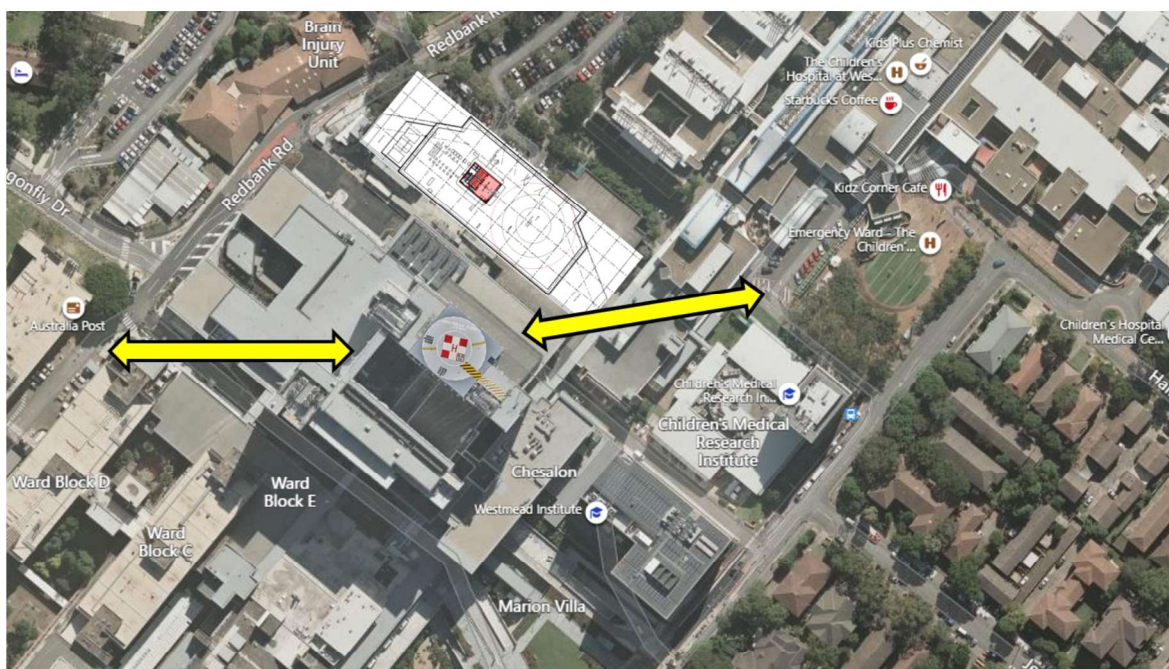
The Westmead CASB HLS location is depicted in Figure 1 below. The site of the proposed Westmead Palliative Care Units is also shown:



**Figure 1:** Westmead CASB HLS and Proposed Westmead Palliative Care Unit

## HLS Preferred Approach and Departure Directions

The preferred approach and departure directions for the Westmead CASB HLS are shown in Figure 2 below. In some extreme wind conditions, other directions will be used, but these events will be rare.



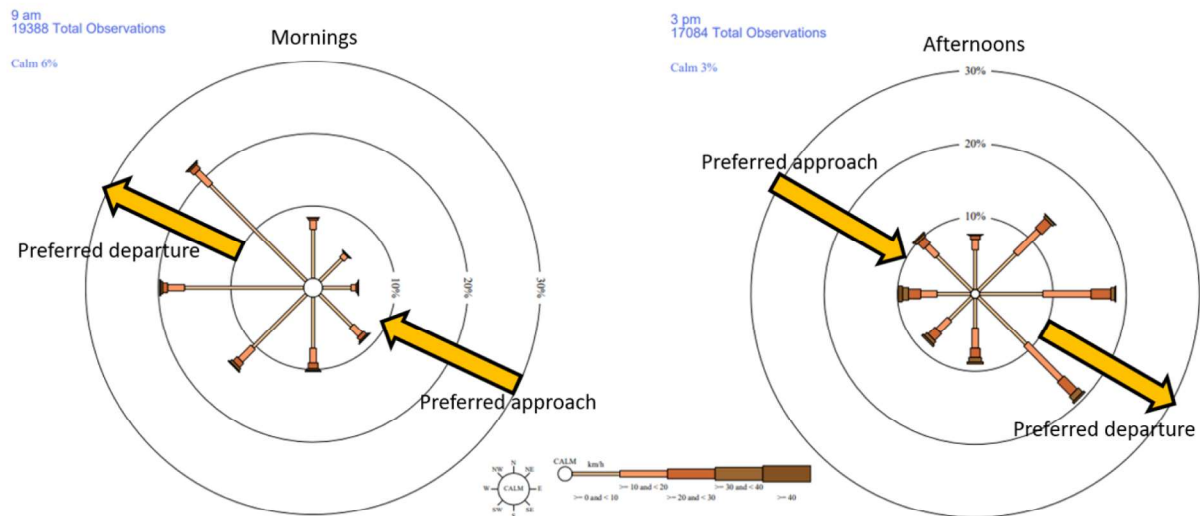
**Figure 2:** Westmead CASB HLS Preferred Approach and Departure Directions



## Westmead CASB HLS Prevailing Winds

Average annual prevailing winds have a very strong influence on the preferred approach and departure directions. There is no Bureau of Meteorology weather station in Westmead, so the wind roses in Figure 3 below are based on data from North Parramatta which is 4km away on Mason Drive. The winds at Westmead will be identical. As well as determining approach and departure directions, wind direction influence the direction of movement of helicopter main rotor downwash.

### North Parramatta



**Figure 3:** North Parramatta Wind Roses used for Westmead CASB HLS

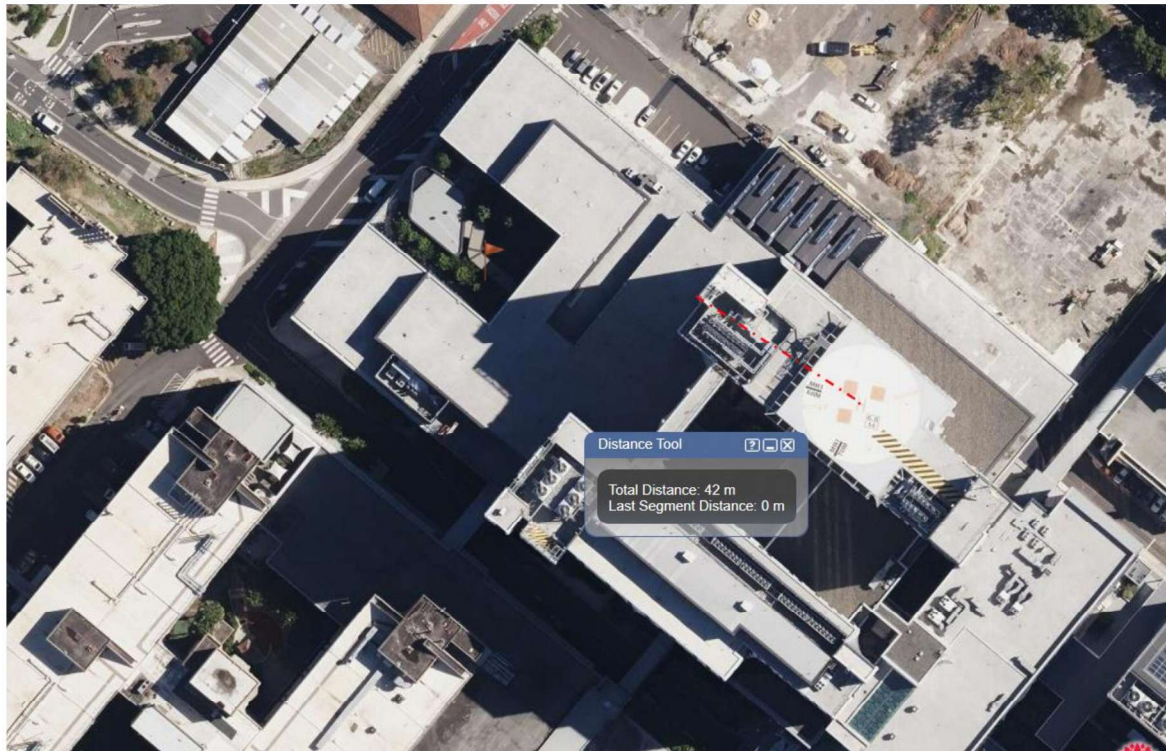
## Helicopter Main Rotor Downwash Considerations

When manoeuvring at slow speeds, especially during take-off and landing, helicopters generate significant rotor downwash extending out to a distance of two to three rotor diameters below the generating aircraft. The AW 139 helicopter used by NSW Ambulance has a main rotor diameter of slightly less than 14m so two to three rotor diameters equates to approximately 30-45m. This downwash produces effects comparable to high and gusty wind conditions which may cause light or insecure cladding and other light objects and structures to become detached.

The design of a FATO should minimize the exposure of persons or loose objects to the downwash of helicopters. Within a distance of three rotor diameters from the FATO, no loose objects or light cladding should be allowed in areas which might be overflown by helicopters at low level, and no non-essential personnel should be present in these areas during helicopter operations.

Figure 4 below depicts the distance from the centre of the Final Approach and Takeoff Area (FATO) at the Westmead CASB HLS to the edge of the proposed Westmead Palliative Care Unit development location. This distance is approximately 42m. There is then a drop of nine storeys from HLS level to the rooftop of the proposed development on Level 5. This is a very significant amount of separation. The point at which the helicopter hovers over the HLS has no line of sight to the rooftop of the proposed Westmead Palliative Care Unit. There will therefore be no detrimental impacts from helicopter main rotor downwash on the Westmead Palliative Care Unit development.

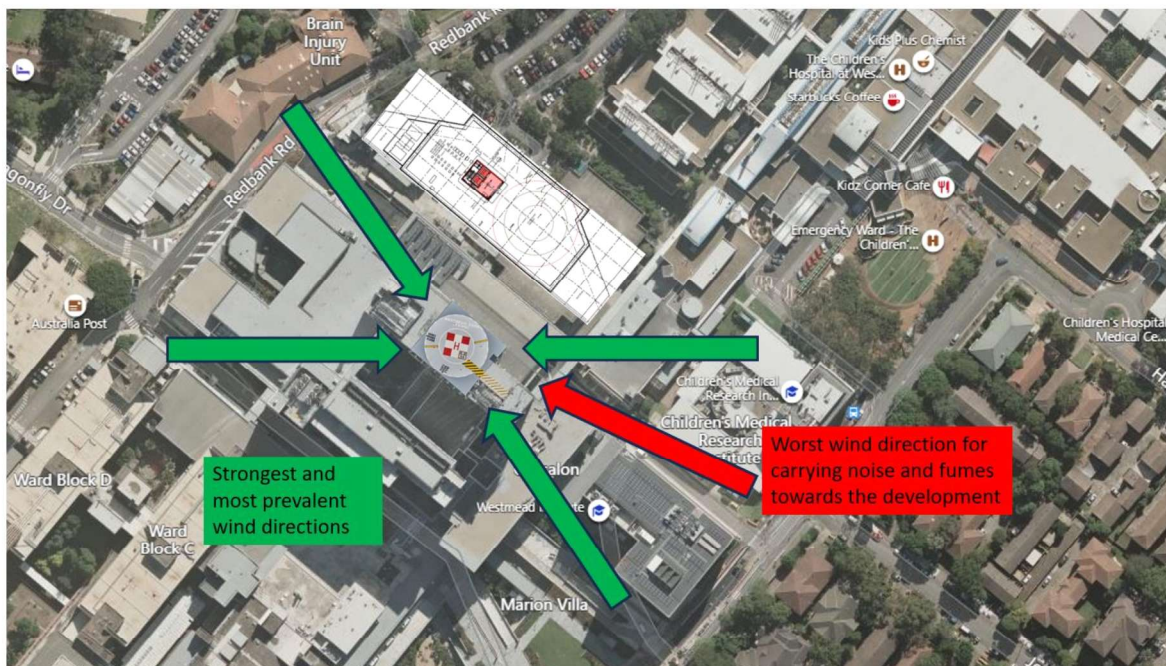




**Figure 4:** Distance from HLS FATO centre to proposed Westmead Palliative Care Unit

#### Wind Impacts on Main Rotor Downwash

The winds at Westmead are very favourable to preventing helicopter main rotor downwash from drifting towards the site of the proposed Westmead Palliative Care Unit. See Figure 5 below. The depictions in Figure are drawn from Figure 3 above. The main directions of movement of the main rotor downwash are to the north-west, south-east, west and east, thus mostly avoiding the site of the proposed Westmead Palliative Care Unit.



**Figure 5:** Wind Impacts on Main Rotor Downwash at Westmead Palliative Care Unit



## Helicopter Noise and Vibration

Helicopters generate high noise levels and, although most HLSs are not intended to accommodate continuous traffic flows, the overflight of even infrequent helicopter operations can generate a significant disturbance to third parties. The AW 139 helicopter is a product of modern design and rotor blade technology and has been selected for its reduced vibration characteristics. As a consequence, the impact of noise and vibration in the vicinity of the HLS and during flight is markedly reduced over older types of medical retrieval helicopters.

It is recommended the FATO and the take-off and approach procedures and paths be designed to limit the effective perceived noise in decibels (EPNdB) of the helicopters the HLS is intended for, to 60 dB calculated on the outside walls of residential buildings and 60 dB inside other buildings such as offices and facilities open to the public where noise disturbance is sensitive.

The AW139 helicopter has been assessed by the US Federal Aviation Administration (FAA) and the International Civil Aviation Organisation (ICAO) for its noise outputs. Figures from these independent studies differ slightly however the combined worst-case noise readings for an AW139 at 6400kg (this weight will almost never be exceeded) registered the following levels of Effective Perceived Noise in Decibels (EPNdB):

- Takeoff: 90.5
- Fly over: 89.8
- Approach: 93.0

Helicopters may generate vibration either through transmission of the engine and rotor mechanical vibrations or through the buffeting of the rotor airflow against surrounding horizontal or vertical building surfaces. Vibration effects can be exacerbated by reverberation due to the pressure waves emitted by a helicopter reflecting off, and being amplified by, surrounding vertical surfaces.

At nine storeys of separation between the Westmead CASB HLS and the proposed Westmead Palliative Care Unit, it is not recommended that the development is assessed by an Acoustic Engineer to determine what preventative measures should be recommended.

## Helicopter Engine Exhaust Fumes and Air Pollution

Helicopters may generate some fumes and emit various levels of pollutants depending on engines types and operational procedures. Newer generation helicopter engines tend to be cleaner but turbine engine operations, especially at low power settings may generate fumes and unpleasant hydrocarbon smells. The AW 139 helicopter uses approximately 450kg of kerosene per flight hour and of this quantity, 99.9% is burnt. At "idle" on the HLS, 99% of the fuel is burnt.

Under particular wind conditions, exhaust gases emitted from the helicopter engines can travel for some distance. Hospital air conditioning air intake systems should not be positioned facing an HLS. They should be positioned as far away as possible and shielded from rotor downwash emanating from the HLS.

At nine storeys of separation between the Westmead CASB HLS and the proposed Westmead Palliative Care Unit, it is not recommended that the development is assessed for the likelihood of ingestion of helicopter exhaust fumes.

### **Helicopter External Lighting**

The lights on some helicopters can be debilitating to some people. At night, the Civil Aviation Safety Authority (CASA) requires the pilots of medical retrieval helicopters to use Night Vision Goggles (NVG). Significant helicopter lighting interferes with the successful operation of NVGs and as such, modern NVG-operated helicopters use only minimal lighting.

It can be safely assessed that external helicopter lights will not adversely impact the functions of the proposed Westmead Palliative Care Unit.

### **Helicopter-Induced Dust and Particulate Matter**

Helicopters can cause soil, grass clippings, pollen and other matter to become airborne around an HLS, especially in dry weather. It is a basic requirement of good HLS management that bare areas are treated such that they do not become a source of dust etc. As the Westmead CASB HLS is elevated and on concrete, this issue is not applicable to the proposed Westmead Palliative Care Unit development.

### **Conclusion**

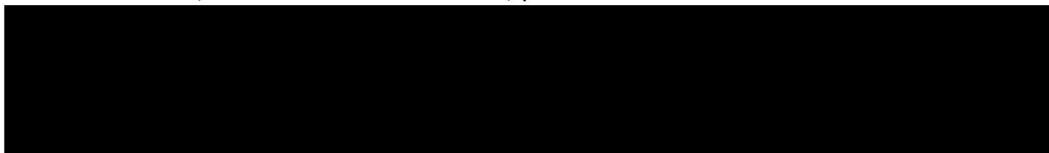
There are no significant areas of concern with developing the proposed Westmead Palliative Care Unit in its intended location, given the position and operations of the Westmead CASB HLS. There are no specific areas of primary advice from this assessment.

### **ATTESTATION REGARDING AVIATION ASSESSOR QUALIFICATIONS AND EXPERIENCE**

This assessment was undertaken by Jeffrey Wayne Stark (CASA ARN: 221067) who is a licensed commercial helicopter pilot, qualified helicopter flying instructor/examiner and helicopter NVG instructor/examiner. He has in excess of 3,500 hours of helicopter flight time in a range of single-engine and multi-engine helicopters, including over 1,200 hours as a helicopter instructor/examiner. From 2011 to 2016 he was the Australian Army's Director of Airworthiness, responsible for the regulation and governance of all Army flying operations including those operations involving Army HLS' and Army aerodromes.

### **FURTHER INFORMATION AND POINT OF CONTACT**

For further information, notices and clarifications, please contact:



Sincerely,



**Managing Director**  
**AviPro**  
**Aviation Management and Safety Advisers**  
**Accredited Aviation Safety & Compliance Auditors**