AVIATION IMPACT ASSESSMENT REPORT

DUE TO THE CONSTRUCTION OF THE NEW LIVERPOOL PUBLIC SCHOOL (NLPS) NSW EDUCATION

PREPARED BY:

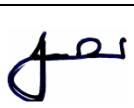
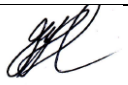
AviPro

a division of Resolution Response Pty Ltd
ABN: 94 154 052 883

Revision 1.3

AviPro
Document Verification
Page 1 of 1

Job title:	Aviation Impact Assessment Report: New Liverpool Public School (NLPS) NSW Education
Document title:	NSW Education SSC
Document ref:	AIA NLPS V1.3

Revision	Date	File name			
V1.1	28 Mar 21	Description	Initial issue AIA - Draft		
			Prepared by	**Checked by**	**Approved by**
		Name	S.J Graham	J.W Stark	S.J Graham
		Signature			
Revision	Date	File name			
V1.2	18 Apr 21	Description	Draft post crane details		
			Prepared by	**Checked by**	**Approved by**
		Name			
		Signature			
Revision	Date	File name			
V1.3	13 Jun 21	Description			
			Prepared by	**Checked by**	**Approved by**
		Name			
		Signature			

This Report on the airspace implications, both during and following construction of the development is prepared for NSW Education Department through CBRE Project managers by Resolution Response Pty. Ltd. ABN: 94 154 052 883, trading as 'AviPro'.

The Report relates to the coordination aspects associated with aviation operations associated with the Helicopter Landing Site (HLS) at the Liverpool Hospital due to the establishment and site design of the proposed development at the New Liverpool Public School. It is intended to inform design and planning.

SEARS Statement

This report is prepared by a suitably qualified aviation expert and identifies and assesses the potential impacts of the NLPS development on the aviation operations of the nearby Liverpool Hospital HLS and associated flight paths in accordance with the relevant sections of the National Airports Safeguarding Framework.

There are no direct impacts on the helicopter flight operations into/from the Liverpool HLS as a consequence of the development and position of the NLPS buildings.

The detailed assessment is in the table at para 4.17.

AviPro is an appropriately qualified and competent business practicing in the relevant area of work. AviPro is holding appropriate current professional indemnity insurance to the satisfaction of the building developer or the principal authorising the work being certified.

Contents

1. BACKGROUND

1.1. Project Establishment and Context

NSW Education Department is seeking to build the new Liverpool Public School (NLPS) located within the grounds of the existing Liverpool Boys and Girls High School in the Liverpool Central Business District (CBD), at 18 Forbes Street, Liverpool. The development is 339m from the edge of the Liverpool Hospital Helicopter Landing Site (HLS).

AviPro has been engaged to provide advice regarding the aviation specific impacts that the NLPS development will have on the HLS at the Liverpool Hospital. This includes an assessment of the impacts caused by the construction crane, and also the building itself once complete.

1.2. Background Material

Reference material drawn by Fitzpatrick and Partners Pty Ltd and provided by CBRE in support of the report include early planning designs and concept drawings.

1.3. Methodology

Criteria from all relevant references were assessed, with the NSW Health Guidelines for Hospital HLS used as the primary tool.

1.4. Explanation of Terms

Aircraft. Refers to both aeroplanes (fixed wing) and helicopters (rotorcraft).

Approach/Departure Path (VFR). The flight track helicopters follow when landing at or departing from the FATO of an HLS. Updated standards to align with ICAO recommendations now has the VFR Approach/Departure path extending outwards from the edge of the FATO with an obstacle free gradient of 2.5º or 4.5% or 1:22 vertical to horizontal, measured from the forward edge of the FATO, to a height initially of 500 feet above the FATO at a distance of ~3,500 m. The flight path commences at the forward edge of the FATO at a width of 25 m., and increases in width uniformly to 150 m. at a distance of 3,500 m. The path may be curved left or right to avoid obstacles or to take advantage of a better approach or departure path. Changes in direction by day below 300 feet should be avoided and there should be no changes in direction below 500 feet at night.

Design Helicopter. The Leonardo AW139 contracted to the NSW Ambulance. The type reflects the new generation Performance Class 1 capable helicopters used in HEMS and reflects the maximum weight and maximum contact load/minimum contact area.

Elevated Helicopter Landing Site. An HLS located on a roof top or some other elevated structure where the Ground Effect Area/Touchdown and Lift-off Area (TLOF) is at least 2.5 m. above ground level.

Final Approach. The reduction of height and airspeed to arrive over a predetermined point above the FATO of an HLS.

Final Approach and Takeoff Area (FATO). A defined area over which the final phase of the approach to a hover, or a landing is completed and from which the takeoff is initiated. For the purposes of these guidelines, the specification of 1.5 x Length Overall of the Design Helicopter is used and equates to 25 m diameter. Area to be load bearing.

Ground Taxi. The surface movement of a wheeled helicopter under its own power with wheels touching the ground.

Hazard to Air Navigation. Any object having a substantial adverse effect upon the safe and efficient use of the navigable airspace by aircraft, upon the operation of air navigation facilities, or upon existing or planned airport/heliport capacity.

Helicopter Landing Site (HLS). One or more may also be known as a Heliport. The area of land, water or a structure used or intended to be used for the landing and takeoff of helicopters, together with appurtenant buildings and facilities.

Helicopter Landing Site Elevation. At an HLS without a precision approach, the HLS elevation is the highest point of the FATO expressed as the distance above mean sea level.

Helicopter Landing Site PC1 Survey Reference Point. A position at eye height (1.5 m.) above the forward edge of the FATO in the centre of the flight path, from which the PC1 survey at 2.5º (4.5%) is initiated.

Helicopter Landing Site Reference Point (HRP). The geographic position of the HLS expressed as the latitude and longitude at the centre of the FATO.

Hospital Helicopter Landing Site. HLS limited to serving helicopters engaged in air ambulance, or other hospital related functions.

> ***Note:***
>
> *A designated HLS located at a hospital or medical facility is an emergency services HLS and **not** a medical emergency site.*

Heliport. Two or more co-existing helicopter landing sites (HLS).

Hover Taxi. The movement of a wheeled or skid-equipped helicopter above the surface, generally at a wheel/skid height of approximately one metre. For facility design purposes, a skid-equipped helicopter is assumed to hover-taxi.

Length (Overall) (L). The distance from the tip of the main rotor tip plane path to the tip of the tail rotor tip plane path or the fin if further aft, of the Design Helicopter.

Landing and Lift Off Area (LLA). A load-bearing, nominally paved area, normally located in the centre of the TLOF, on which helicopters land and lift off. Minimum dimensions are based on 1m clearance around the undercarriage contact points of the Design Helicopter.

Lift Off. To raise the helicopter into the air.

Movement. A landing or a lift off of a helicopter.

Object Identification Surface. The OIS are a set of imaginary surfaces associated with a heliport. They define the volume of airspace that should ideally be kept free from obstacles in order to minimise the danger to a helicopter during an entirely visual approach.

Obstacle Limitation Surface. The OLS are a set of imaginary surfaces associated with an aerodrome. They define the volume of airspace that should ideally be kept free from obstacles in order to minimise the danger to aircraft during an entirely visual approach.

Obstruction to Air Navigation. Any fixed or mobile object, including a parked helicopter, which impinges the approach/departure surface or the transitional surfaces.

Parking Pad. The paved centre portion of a parking position, normally adjacent to an HLS.

Performance Class 1 (PC1). Similar to Category A requirements. For a rotorcraft, means the class of rotorcraft operations where, in the event of failure of the critical power unit, performance is available to enable the rotorcraft to land within the rejected take-off distance available, or safely continue the flight to an appropriate

landing area, depending on when the failure occurs. PC1 also requires CASA approved flight path surveys to/from the HLS.

Performance Class 2 (PC2). For a rotorcraft, means the class of rotorcraft operations where, in the event of failure of the critical power unit, performance is available to enable the rotorcraft to safety continue the flight, except when the failure occurs early during the take-off manoeuvres, in which case a forced landing may be required. PC2 also requires CASA approved flight path surveys to/from the HLS.

Performance Class 3 (PC3). For a rotorcraft, means the class of rotorcraft operations where, in the event of failure of the critical power unit at any time during the flight, a forced landing:

- in the case of multi-engine rotorcraft – may be required; or
- in the case of single-engine rotorcraft – will be required.

Pilot Activated Lighting (PAL). A PAL system utilises a hospital-based VHF radio and timed switching device, activated by the pilot via a VHF radio transmission on a pre-set frequency, to turn on the HLS and associated lighting.

Prior Permission Required (PPR) HLS. An HLS developed for exclusive use of the owner and persons authorized by the owner, i.e: a hospital-based emergency services HLS.

Note:

The HLS owner and the HEMS operator are to ensure that all pilots are thoroughly knowledgeable with the HLS (including such features as approach/departure path characteristics, preferred heading, facility limitations, lighting, obstacles in the area, size of the facility, etc.).

Radar Terrain Clearance Chart. A Radar Terrain Clearance Chart (RTCC) which may also be known as a Radar Minimum Altitude Chart, is an aeronautical overlay used by Air Traffic Controllers (ATC) to determine the lowest altitude to which an aircraft may safely descend while under ATC direction for radar vectoring using surveillance radar.

Rotor Downwash. The volume of air moved downward by the action of the rotating main rotor blades. When this air strikes the ground or some other surface, it causes a turbulent outflow of air from beneath the helicopter.

Safety Area. A defined area on an HLS surrounding the FATO intended to reduce the risk of damage to helicopters accidentally diverging from the FATO (0.3 x RD of the Design Helicopter). This area should be free of objects, other than those frangible mounted objects required for air navigation purposes. The Safety Area for the Design Helicopter extends 4 m. beyond the FATO circumference forming a 33 m. diameter.

Safety Net. Surrounds the outer edge of a rooftop HLS. Is to be a minimum of 1.5 m. wide and have a load carrying capacity of not less than 122 kg/m^2. The outer edge is not to project above the HLS deck, and slope back and down to the deck edge at approximately 10^o. Both inside and outside edges of the safety net are to be secured to a solid structure.

Shielded Obstruction. A proposed or existing obstruction that does **not** need to be marked or lit due to its close proximity to another obstruction whose highest point is at the same or higher elevation.

Standard HLS. A place used as an aerodrome for helicopter operations by day and night.

Take off. To accelerate and commence climb at the relevant climb speed.

Take off Position. A load bearing, generally paved area, normally located on the centreline and at the edge of the TLOF, from which the helicopter takes off. Typically, there are two such positions at the edge of the TLOF, one for each of two takeoff or arrival directions.

Touchdown and Lift-off Area (TLOF). A load bearing, generally paved area, normally centred in the FATO, on which the helicopter lands or takes off, and that provides ground effect for a helicopter rotor system. Size is based on 1 x main rotor diameter of Design Helicopter and is 14 m. diameter.

Transitional Surfaces. Starts from the edges of the FATO parallel to the flight path centre line and extends outwards (to the sides) at a slope of 2:1 (two-units horizontal in one-unit vertical or 26.6°) from the outer edges of approach/departure surface. The outer sides are 75 m. from the centreline, i.e: the outer edges are 150 m wide. The transitional surfaces start at the forward edge of the FATO, overlaid over the approach/departure path (surfaces) and extend to the end of the approach/departure surface at 3,500 m.

Unshielded Obstruction. A proposed or existing obstruction that may need to be marked or lit since it is **not** in close proximity to another marked and lit obstruction whose highest point is at the same or higher elevation.

1.5. Applicable Abbreviations

Acronym	Meaning
AC	US FAA Advisory Circular
ACC	Aeromedical Control Centre (HQ Eveleigh). Responsible for control and tasking of HEMS
CAAP	Civil Aviation Advisory Publication (Australia)
CASA	Civil Aviation Safety Authority (Australia)
CAOs	Civil Aviation Orders (Australia)
CARs	Civil Aviation Regulations (1988) Australia
CASRs	Civil Aviation Safety Regulations (1998) Australia
CCCC	Children's Comprehensive Cancer Centre
DDO	Design and Development Overlay
DIFFS	Deck Integrated Fire Fighting System
FAA	Federal Aviation Administration, USA
FATO	Final approach and Take-Off Area (1.5 x helicopter length)
FARA	Final Approach Reference Area
GPS	Global Positioning System
HEMS	Helicopter Emergency Medical Service
HLS	Helicopter Landing Site
HLSRO	HLS Reporting Officer (AirServices requirement)
ICAO	International Civil Aviation Organisation
IFR	Instrument Flight Rules
IMC	Instrument Meteorological Conditions - requiring flight under IFR
L	Length (also referred to as Overall Length), in relation to a helicopter, the total distance between the main rotor and tail rotor tip plane paths when rotating

Acronym	Meaning
LDP	Landing Decision Point (Category A/Performance Class 1 operations)
LHAP	Liverpool Health and Academic Precinct
LLA	Landing and Lift Off Area. Solid surface meeting dynamic loading requirements, with undercarriage contact points + I metre in all directions
MoH	Ministry of Health NSW
MRI	Magnetic Resonance Imagers
MTOW	Maximum Take Off Weight
NLPS	New Liverpool Public School
NOTAM	Notice to Airmen. Issued by AirServices in relation to airspace and navigation warnings
NVG	Night Vision Goggle(s)
OIS	Object Identification Surface(s) (Heliport/HLS)
OLS	Obstacle Limitation Surface(s) (Aerodrome)
PC1	Performance Class 1
PC2	Performance Class 2
PC3	Performance Class 3
RD	Main Rotor Diameter
RTCC	Radar Terrain Clearance Chart
SACL	Sydney Airports Corporation Limited
SCH	Sydney Children's Hospital
SARPS	Standards and Recommended Practices developed by ICAO and promulgated in the Annexes to the Convention of International Civil Aviation
TDP	Takeoff Decision Point (Category A/Performance Class 1 operations)
TLOF	Touch Down and Lift Off Area. Load bearing min. 1 x main rotor diameter.
VFR	Visual Flight Rules
VHF	Very High Frequency radio
VMC	Visual Meteorological Conditions - allowing flight under VFR
V_{TOSS}	Take off Safety Speed

1.6. List of Figures

Figure	Description
1	Example of Obstacle Limitation Surfaces
2	Example of RTCC Chart
3	HLS VFR Approach/Departure and Transitional Surfaces
4	Object Identification Surfaces
5	Location of the NLPS Site

Figure	Description
6	NLPS Elevation
7	NLPS Building Elevation (based on mobile crane)
8	Airport Locations in Western Sydney
9	Sydney Airport OLS Surfaces
10	Sydney Airport PANS-OPS Surfaces
11	Bankstown Airport OLS Surfaces
12	Bankstown Airport PANS-OPS Surfaces
13	OLS (proposed) for the Western Sydney Airport
14	NLPS the Sydney RTCC
15	Liverpool Hospital HLS Location Approach/Departure Paths
16	Existing flight paths and Stage 1 (red) Stage 2 (yellow) and MSCP (orange) cranes
17	North/south east flight path option and precinct crane obstructions

2. EXECUTIVE SUMMARY

The aim of this report is to provide insights into the impacts of constructing the NLPS development on the aviation operations into and out the Liverpool Hospital HLS. The report analyses likely impact of the construction crane, and how these impacts might be managed; the necessary flight path options as a consequence of the Liverpool Health and Academic Precinct (LHAP) development as well as the impacts of the completed building on those same aviation activities.

The following key outcomes arose from the assessment:

- The NLPS building development, can be managed successfully against the National Airports Safeguarding Framework Guideline H – Protecting Strategically Important HLS.
- The NLPS building once constructed, will not protrude into the aviation protected airspace (Sydney/ Bankstown Airports or the Western Sydney Airport.
- The NLPS building once constructed, will not protrude into the Sydney RTCC.
- The NLPS building, once constructed, will not impact the current and planned Liverpool Hospital HLS approach and departure paths.
- The NLPS mobile crane will require enhanced aviation-standard lighting obstacle lighting during periods of darkness and when the site is not operational, unless the crane can be lowered below RL40.00 for these periods.
- The NLPS mobile crane will not protrude into the aviation protected airspace (Sydney Airport or Bankstown Airport).
- The NLPS mobile crane will not protrude through the Sydney RTCC.
- The NLPS mobile crane, will not protrude into the Liverpool Hospital HLS northern approach and departure path that will be established for the Stage 1 LHAP development.

On assessment, the mobile crane is unlikely to impact the Liverpool Hospital HLS northern approach and departure path, however some additional risk management notification activities in the form of HLS Notification to aeromedical and additional OzRunways information are recommended to ensure helicopter operators are fully apprised of the mobile crane activities during the construction phase.

3. GENERAL AIRSPACE REQUIREMENTS AND CONSIDERATIONS

3.1. Purpose of this Section

It is important that the reader has a good understanding of the fundamentals of airspace protection for aerodromes and heliports/HLS in order to be able to understand the analysis later in this report. Section 3 provides this general overview.

3.2. Airspace Regulation in Australia - Aerodromes

Approvals will be required if primary prescribed airspace could be impinged. The normal contact for this process is the Sydney Airport Corporation Limited (SACL).

Primary prescribed airspace includes an airport's Obstacle Limitation Surfaces (OLS) involving a set of imaginary surfaces associated with an aerodrome that should be kept free of obstacles. Additionally, the Procedures for Air Navigation Services – Aircraft Operations (PANS-OPS) surfaces that takes account of the airspace associated with aircraft instrument procedures, must be considered.

3.3. Airspace Management in Australia – Heliports and Helicopter Landing Sites

Currently within Australia, there are no set rules or regulations applicable to the design, construction or placement of HLS'. The appropriate national regulatory guidance at present for the use of HLS' is Civil Aviation Regulation (CAR) 92 which places the onus on the helicopter pilot to determine the suitability of a landing site. The Civil Aviation Safety Authority (CASA) as the regulator of aviation in Australia divested itself of direct responsibility for regulating HLS' in the early 1990s and currently provides only basic operating guidelines via Civil Aviation Advisory Publication (CAAP) 92-2 (2) Guidelines for the Establishment and Operation of Onshore Helicopter Landing Sites.

Because no Federal or State (NSW) legislation is in place to protect VFR approach and departure paths and the transitional surfaces associated with hospital HLS', in May 2018, the Commonwealth Department of Infrastructure, Transport, Regional Development and Communications issued Guideline H: Protecting Strategically Important Helicopter Landing Sites under the National Airports Safeguarding Framework (NASF). Whilst this publication has no legal effect in NSW as yet, its content is gradually being aligned within the NSW Health Guidelines for Hospital Helicopter Landing Sites in NSW.

3.4. State Government Requirements

The various legislative/regulatory requirements relating to HLS' in NSW are complex. Current regulation excludes emergency service landing sites from the definition of "designated development" in the Environmental Planning and Assessment Regulation (which otherwise includes most HLS'). Generally, hospital HLSs are considered "ancillary-uses" to hospital purposes and are thus not separate "development". The same cannot necessarily be said about off-site emergency medical HLS, e.g., local sports fields.

To ensure that all requirements are met, close consultation with an NSW Ambulance approved Aviation Consultant should be maintained throughout the design and construction phases.

3.5. Local Government Requirements

Requirements emanate from the Airports Act 1996 and the Airports (Protection of Airspace) Regulations 1996. Clause 6.8 of the Kogarah Local Environment Plan 2012 contains also a paragraph which states that "The consent authority must not grant development consent to development that is a controlled activity within the meaning of Division 4 of Part 12 of the Airports Act 1996 of

the Commonwealth unless the applicant has obtained approval for the controlled activity under regulations made for the purposes of that Division."

The Airports (Protection of Airspace) Regulations 1996 differentiate between short-term (less than 3 months) and long-term controlled activities. The Regulations provide for the airport operator to approve short-term controlled activities that penetrate the OLS, and for the Commonwealth Department of Infrastructure, Transport, Regional Development and Communications for approval of long-term controlled activities and those short-term controlled activities referred to it by the airport operator. However, the airport operator must refer short-term PANS-OPS infringements to the Department for approval. Long term intrusions of the PANS-OPS surface are prohibited.

3.6. Obstacle Limitation Surfaces

The objective of the OLS is to define a volume of airspace in proximity to the airport which should be kept free of obstacles that may endanger aircraft in visual operations, or during the visual stages of an instrument approach.

The intention is not to restrict or prohibit all obstacles, but to ensure that either existing or potential obstacles are examined for their impact on aircraft operations and that their presence is properly taken into account. Since they are relevant to visual operations, it may sometimes be sufficient to ensure that the obstacle is conspicuous to pilots, and this may require that the obstacle be marked or lit.

In reality, there is little issue with breaching the OLS as pilots will be visual with the obstruction and can work on "see and avoid" principles. OLS at a multi-runway aerodrome look akin to Figure 1 below:

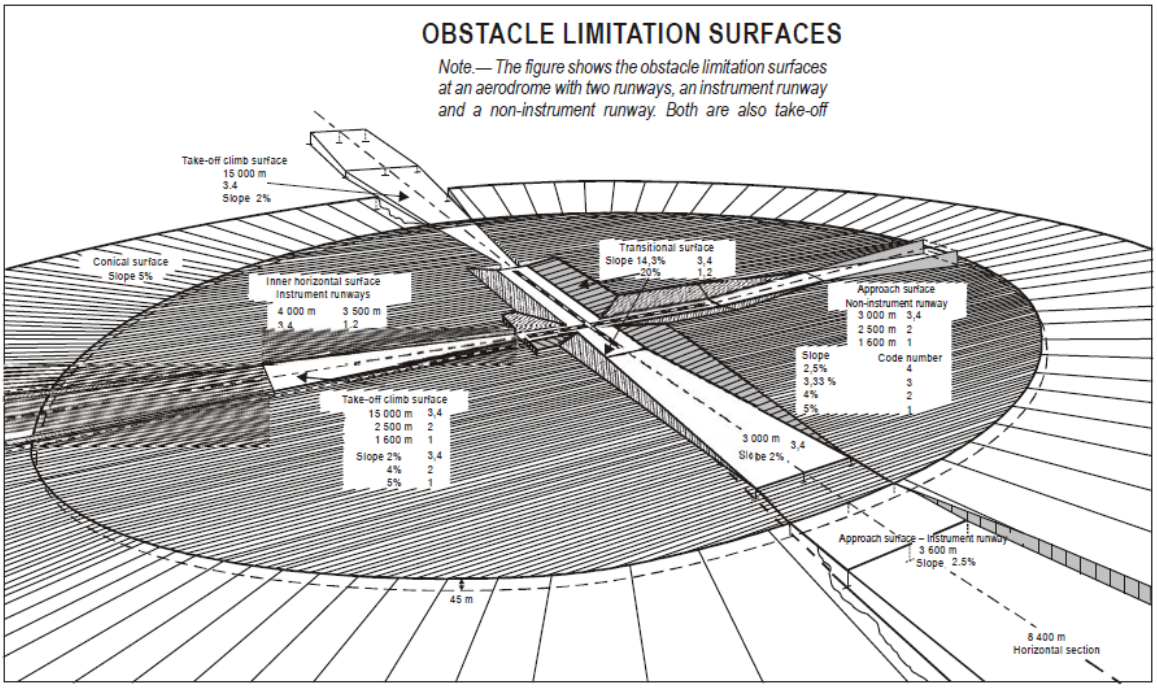


Figure 1: Example of Obstacle Limitation Surfaces

3.7. Procedures for Air Navigation – Aircraft Operations (PANS-OPS) Surfaces

PANS-OPS surfaces detail essential areas and obstacle clearance requirements for the achievement of safe, regular instrument flight operations into and from airports.

The instrument flight procedures enable pilots to either descend from the high enroute environment of cruise type flight to establish visual contact with the

landing runway, or climb from the runway to the enroute environment, with a prescribed safe margin above terrain and obstacles, by use of aircraft instruments and radio navigation aids or GPS in conditions where the pilot cannot maintain visual contact with the terrain and obstacles due to inclement weather conditions.

Pilots must be protected against protrusions into the PANS-OPS surfaces as they have no way of avoiding obstructions if they get off track and they cannot see such obstructions.

3.8. Radar Terrain Clearance Charts

The Radar Terrain Clearance Chart defines an area in the vicinity of an aerodrome, in which the minimum safe levels allocated by an Air Traffic Controller (ATC) vectoring Instrument Flight Rules (IFR) flights with Primary and/or Secondary Surveillance RADAR equipment have been predetermined. The figure shown on the chart is the lowest altitude which an ATC may assign to a pilot. An example of an RTCC is in Figure 2 below. It shows the lowest height is RL 152.

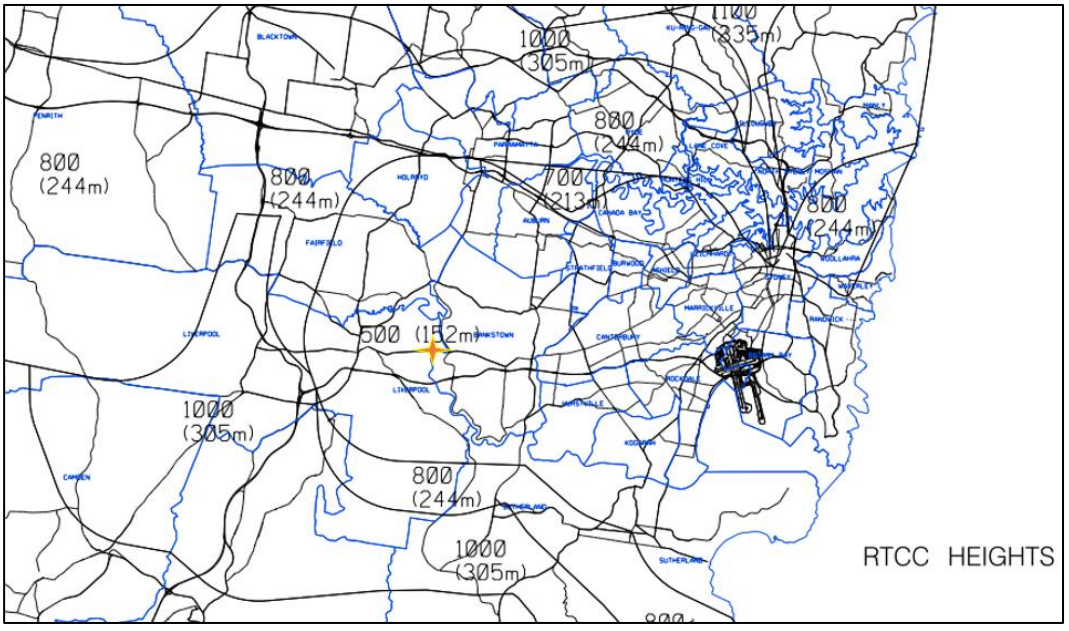


Figure 2: Example of a Radar Terrain Clearance Chart (RTCC)

3.9. HLS VFR Approach/Departure Paths

The purpose of designating approach and departure paths is to provide sufficient airspace clear of hazards to allow safe approaches to, and departures from, an HLS.

VFR approach/departure paths should be such that there are no downwind operations and crosswind operations are kept to a minimum. To accomplish this, an HLS must have more than one approach/departure path which provides an additional safety margin and operational flexibility.

The preferred flight approach/departure path should, where possible, be aligned with the predominant wind when taking account of potential obstacles. Other approach/departure paths should also be based on an assessment of the prevailing winds and potential obstacles. The separation between such flight paths should not be less than 150°, and preferably180°.

3.10. HLS VFR Approach/Departure and Transitional Surfaces

An approach/departure surface is centred on each approach/departure path. Under the Guidelines, the approach/departure path starts at the forward edge of the Final Approach and Takeoff Area (FATO) and slopes upward at 2.5°/4.5%/22:1

(22 units horizontal in 1 unit vertical) for a distance of ~3,500 m. The approach/departure path commences at the FATO width of 25 m. and expands uniformly to a width of 150 m. at a distance of 3,500 m., where the height is 500 feet above the elevation of FATO surface. For PC1 survey purposes, the survey commences from the forward edge of the FATO in the flight path direction, from a datum point 1.5 m. above the FATO edge. The VFR approach/departure paths are to be obstacle free. It is important to achieve 2.5° obstacle free to account for the performance requirements of one engine inoperative (OEI) flight following an emergency.

The transitional surface starts from the edges of the FATO parallel to the flight path centre line and extends outwards (to the sides) at a slope of 2:1 (2 units horizontal in 1 unit vertical or 26.6°) from the outer edges of approach/departure surface. The outer sides are 75 m. from the centreline, i.e: the outer edges are 150 m. wide. The transitional surfaces start at the forward edge of the FATO, overlaid over the approach/departure path (surfaces) and extend to the end of the approach/departure surface at 3,500 m.

> ***Note:*** *The transitional surface is not applied on the FATO edge opposite the approach departure surface.*

The approach/departure surface is to be free of penetrations. Any penetration of the transitional surface is to be considered a hazard.

Figure 3 illustrates the VFR approach/departure and transitional surfaces.

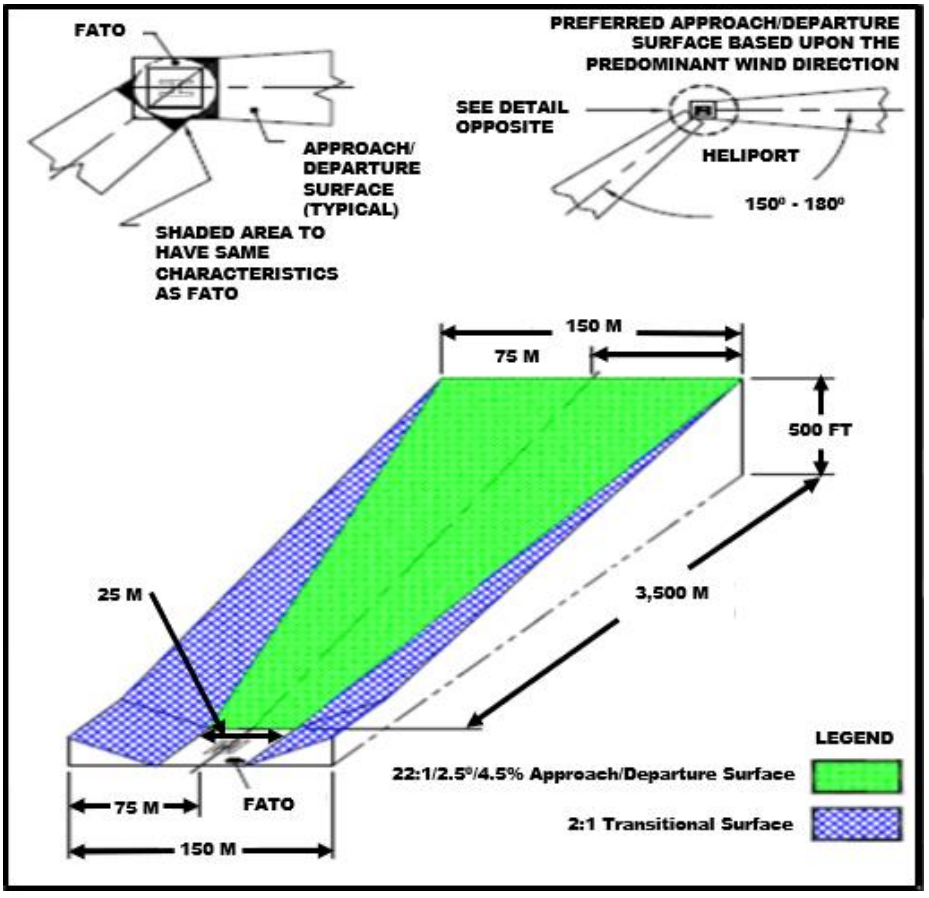


Figure 3: HLS VFR Approach/Departure and Transitional Surfaces

3.11. Object Identification Surfaces (OIS)

The OIS is used for the purpose of the Design and Development Overlay (DDO) and sits below each VFR approach and departure path to provide flight path protection. The OIS below a VFR approach and departure path is the limit for the penetration of obstructions below the flight path. That is, there should be no future

development penetrating the OIS. The OIS extends out to 3.5 km. from the forward edge of the FATO. It is permissible under some circumstances to have minor penetration of the OIS, as long as the obstruction can be appropriately marked or lit.

Where possible, the OIS as specified in the Guidelines are to be met. However, at most hospital HLS, existing obstructions do not allow for this standard to be met. It can normally only be accommodated at a “new” rural hospital “green field” location or on a roof top HLS which is high above the surroundings

The OIS can be described as:

- In all directions from the Safety Area, except under the approach /departure paths, the OIS starts at the Safety Area perimeter and extends out horizontally for a distance of ~30 m.
- Under the approach/departure surface, the OIS starts from the outside edge of the FATO and extends horizontally out for a distance of ~700 m. From this point, the OIS extends out for an additional distance ~2,800 m. while rising on a 2.5º or 22:1 slope (22 units horizontal in 1 unit vertical). From the point ~700 m. from the FATO perimeter, the OIS is ~30 m. beneath the approach/departure surface.
- Safety surface width increases as a function of distance from the Safety Area. From the Safety Area perimeter, the OIS extends laterally to a point ~30 m. outside the Safety Area perimeter. At the upper end of the surface, the OIS extends laterally ~60 m. on either side of the approach/departure path. See Figure 4.

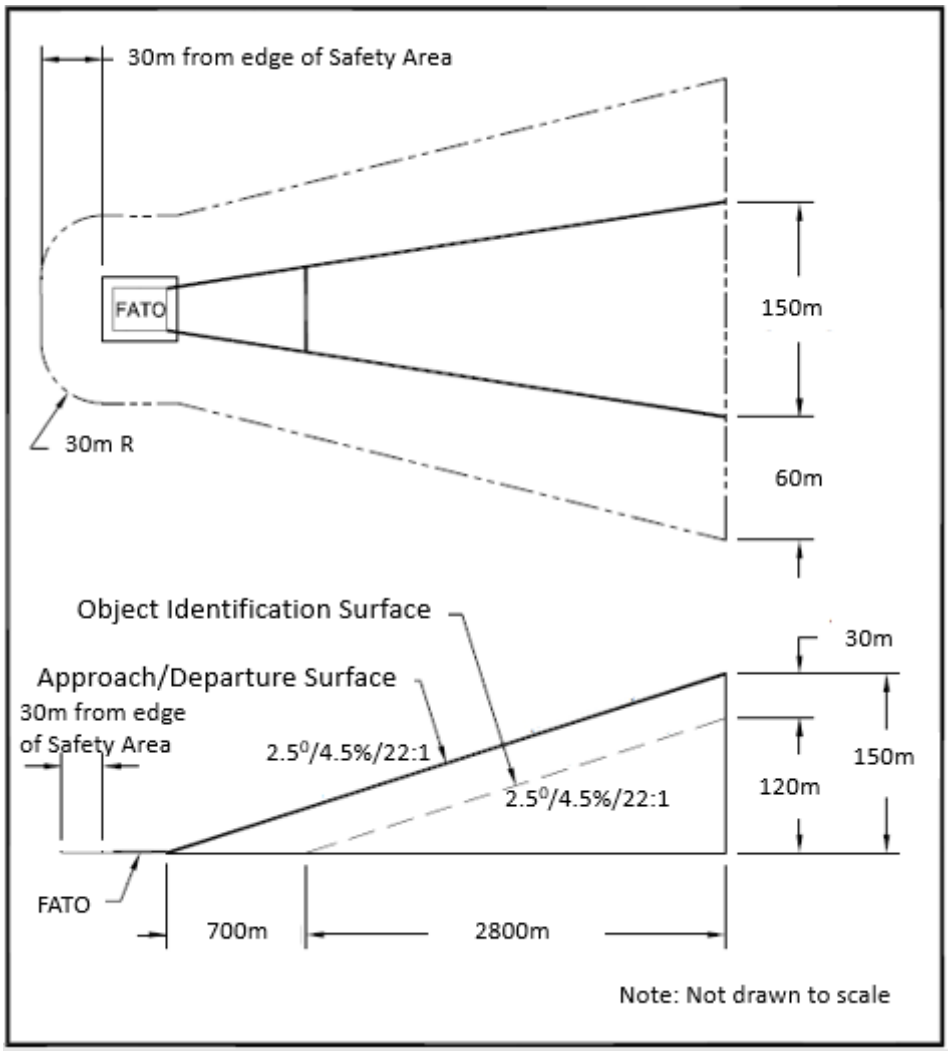


Figure 4: Object Identification Surfaces

3.12. Obstructions on or in the Vicinity of the HLS

The adverse effect of an object presumed or determined to be a hazard to air navigation may be mitigated by:

- Removing the object.
- Altering the object, e.g.: reducing its height.
- Marking and/or lighting the object, provided that the object would not be a hazard to air navigation if it were marked and lit.

An example of an obstruction light required close to the HLS would be that required to be positioned on the top of the windsock. Other obstacles in close proximity to the HLS deck may include radio aerials or exhaust stacks etc. attached to the main building, other buildings in the vicinity such as a lift lobby, or stand alone. All such obstacles are required to have red obstacle lights fitted.

3.13. Obstructions in close Proximity but Outside/Below the Approach/Departure Surface

Unmarked wires, antennae, poles, cell towers, and similar objects are often difficult to see in time for a pilot to successfully take evasive action, even in the best daylight weather. Pilots can avoid such objects during enroute operations by flying well above them. Approaches and departures require operations where obstacles may be in closer proximity. Where possible, obstructions are to be moved however if this is impractical, markings and/or obstruction lighting is to be affixed.

3.14. Flight Path Protection – Safeguarding Guidelines

This document provides guidance to State/Territory and local government decision makers as well as the owners/operators of identified strategically important HLS (SHLS) to ensure:

- The ongoing operation of those SHLS.
- The use of those SHLS are not compromised by any proposed development encroaching into flight paths.
- New developments (and associated activities) do not present a hazard to helicopters arriving or departing from those SHLS. And,
- Any new SHLS are appropriately located.

4. SPECIFIC NLPS CONSIDERATIONS

4.1. The NLPS Location

The location of the lot is legally described as Lot 1 in DP 1137425 and is shown in Figure 5 below. It is 339m north of the Liverpool Hospital HLS.

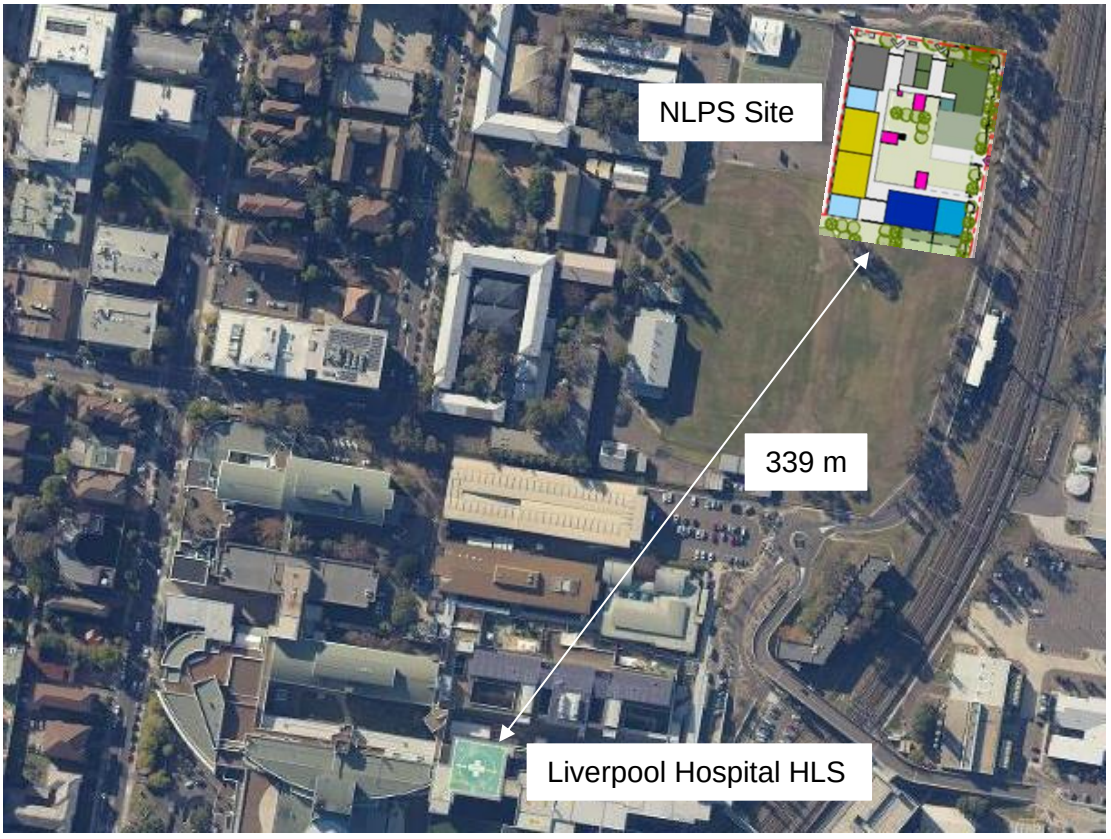


Figure 5: Location of the NLPS Site

4.2. The NLPS Building Elevation

The highest point of the NLPS building is planned at 14.8 metres above ground level or RL24.10. This is a low-set building. See Figure 6 below:

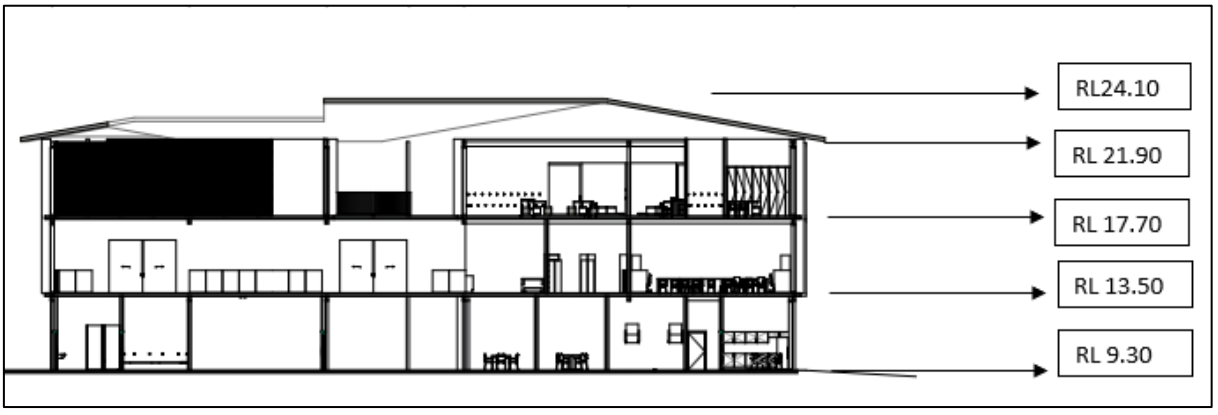


Figure 6: NLPS Building Elevation

4.3. The NLPS Crane Elevation (anticipated)

As stated in 4.2 above, the highest point of the NLPS building is planned at 14.8 metres above ground level or RL24.10. The crane operator is planning a

mobile crane that will reach a maximum height of RL 53.90. See Figure 7 below. This crane will need to be lowered below RL 40.00 during hours of darkness or in-activity. This will ensure the highest point during these times is below the HLS deck level of the Liverpool Hospital.

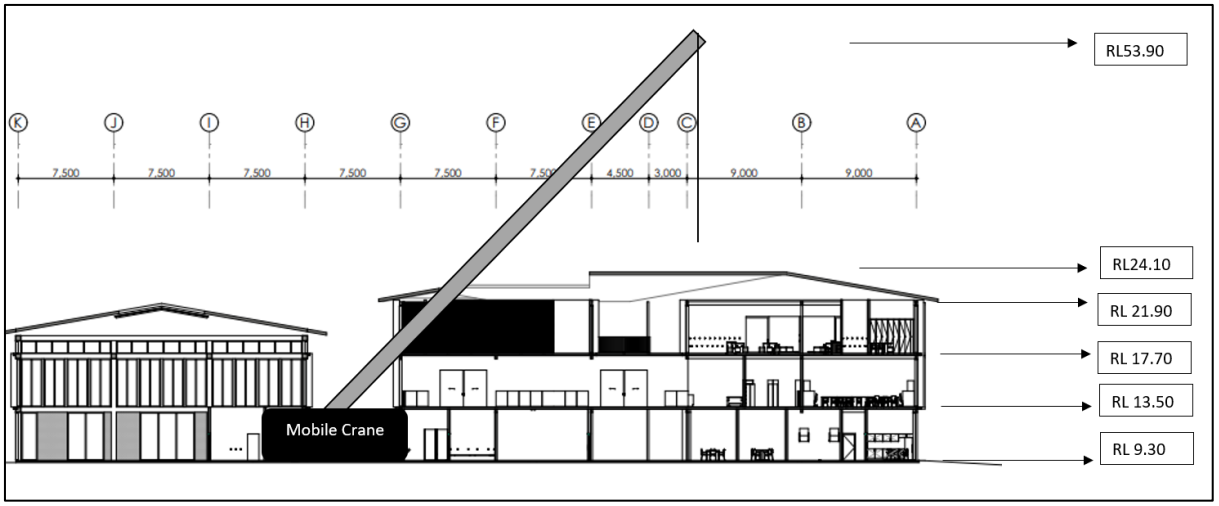


Figure 7: NLPS Building Elevation (based on mobile crane)

Therefore, the planned elevation for the crane and therefore any airspace impact, is RL54.00.

4.4. Western Sydney Airport Locations

The location of the NLPS development and associated cranes is located between a number of aviation operations centres as seen in Figure 8 below.

Figure 8: Airport locations in Western Sydney

The significance of Figure 8 is that the NLPS development needs to be checked against the protected airspace areas associated with the following airports:

- Sydney Kingsford Smith Airport
- Bankstown Airport,
- Western Sydney Airport, and
- Holsworthy Airport (Military).

4.5. The Sydney OLS Overlay

The Sydney Aerodrome OLS is depicted in Figure 9 below. The approximate location of the NLPS is indicated.

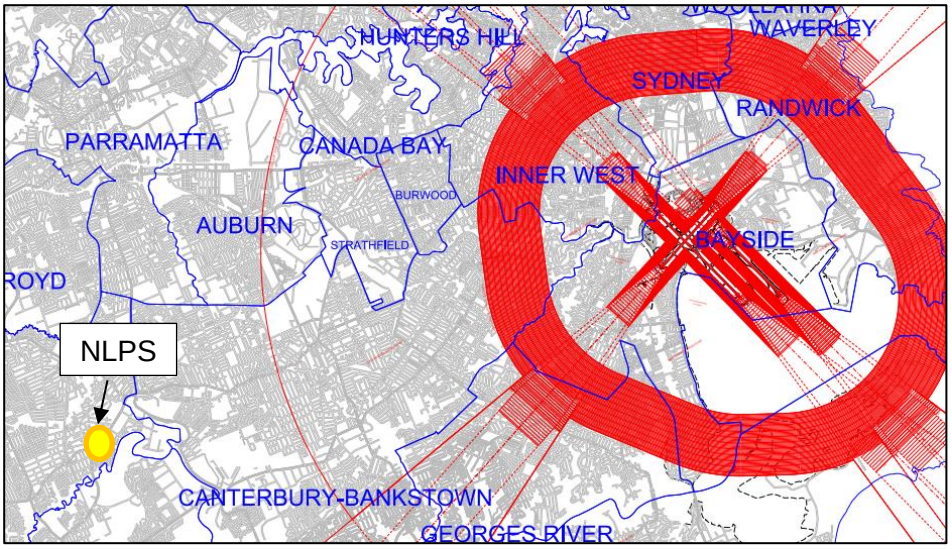


Figure 9: Sydney Airport Obstacle Limitation Surfaces

Sydney Kingsford Smith OLS is not impacted by the NLPS mobile crane maximum height of RL54.00.

4.6. The Sydney PANS-OPS Overlay

The Sydney Aerodrome PANS-OPS overlay is depicted in Figure 10 below. The approximate location of the NLPS is indicated.

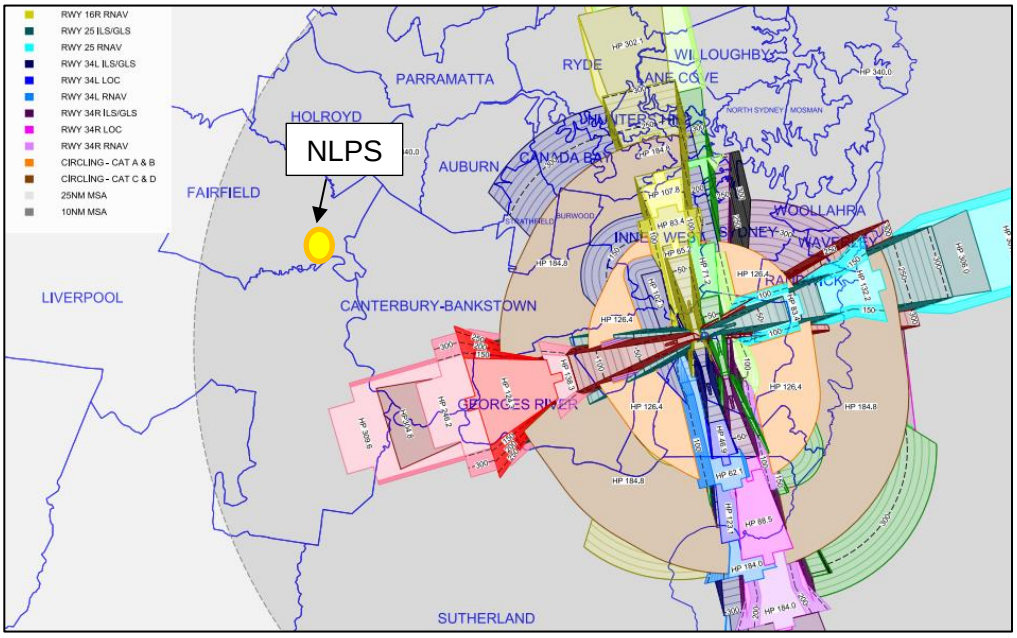


Figure 10: Sydney Airport PANS-OPS Surfaces

Sydney Kingsford Smith Airport PANS-OPS is not impacted by the NLPS mobile crane maximum height of RL54.00.

4.7. The Bankstown Airport OLS Overlay

The Bankstown Aerodrome OLS overlay is depicted in Figure 11 below. The approximate location of the NLPS is indicated and is located outside the inner horizontal surface.

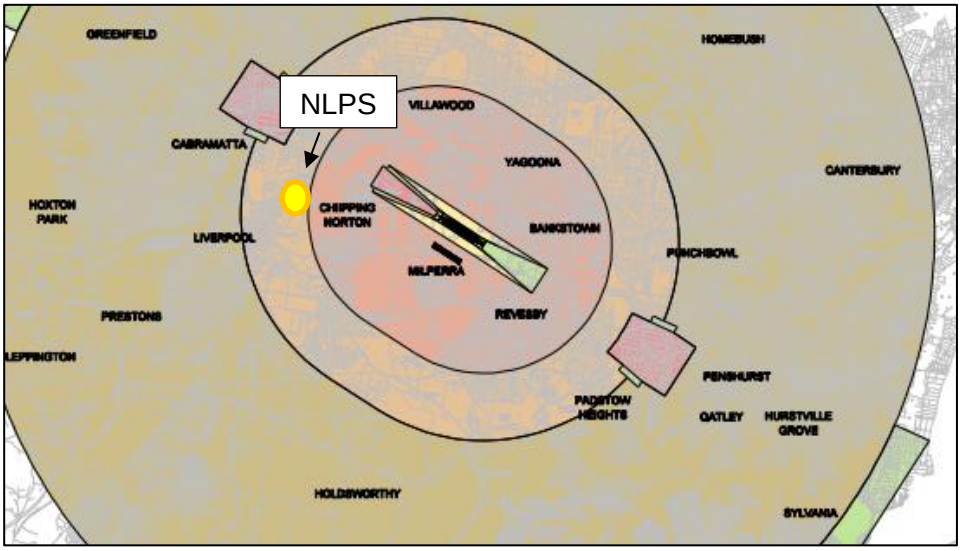


Figure 11: Bankstown Airport OLS Surfaces

The Bankstown OLS is not impacted by the NLPS mobile crane maximum height of RL54.00.

4.8. The Bankstown Airport PANS-OPS Overlay

The Bankstown Aerodrome PANS-OPS overlay is depicted in Figure 12 below. The approximate location of the NLPS is indicated.

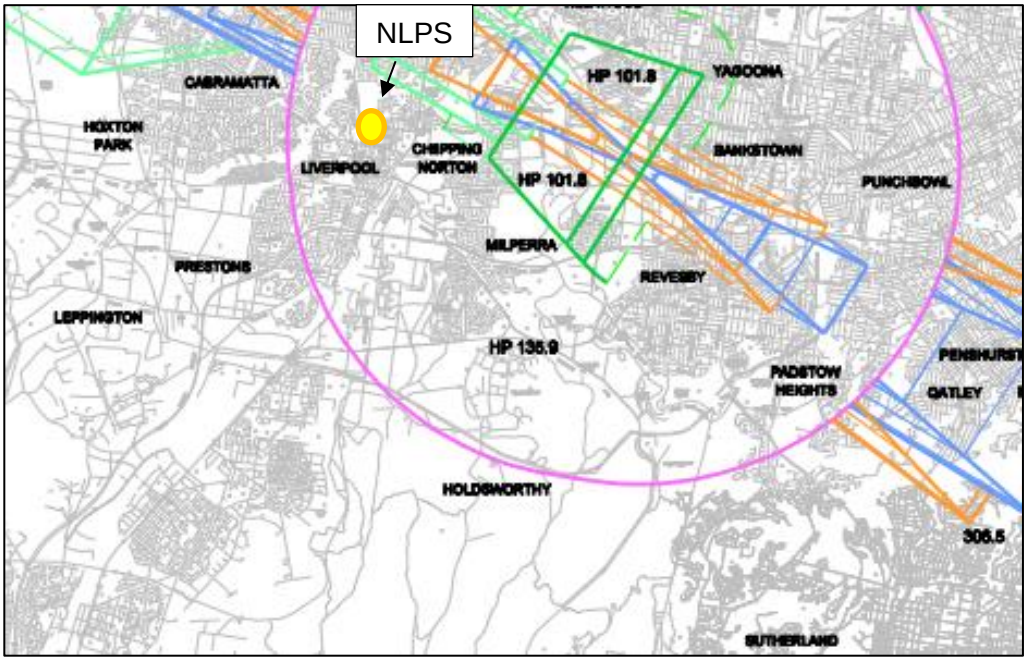


Figure 12: Bankstown Airport PANS-OPS Surfaces

The Bankstown Airport PANS OPS is not impacted by the NLPS mobile crane maximum height of RL54.00.

4.9. The New Western Sydney Airport OLS Overlay

The OLS associated with the new Western Sydney Airports depicted in Figure 13 below, over the Liverpool site do not present any constraints for this development. The approximate location of the NLPS is indicated.

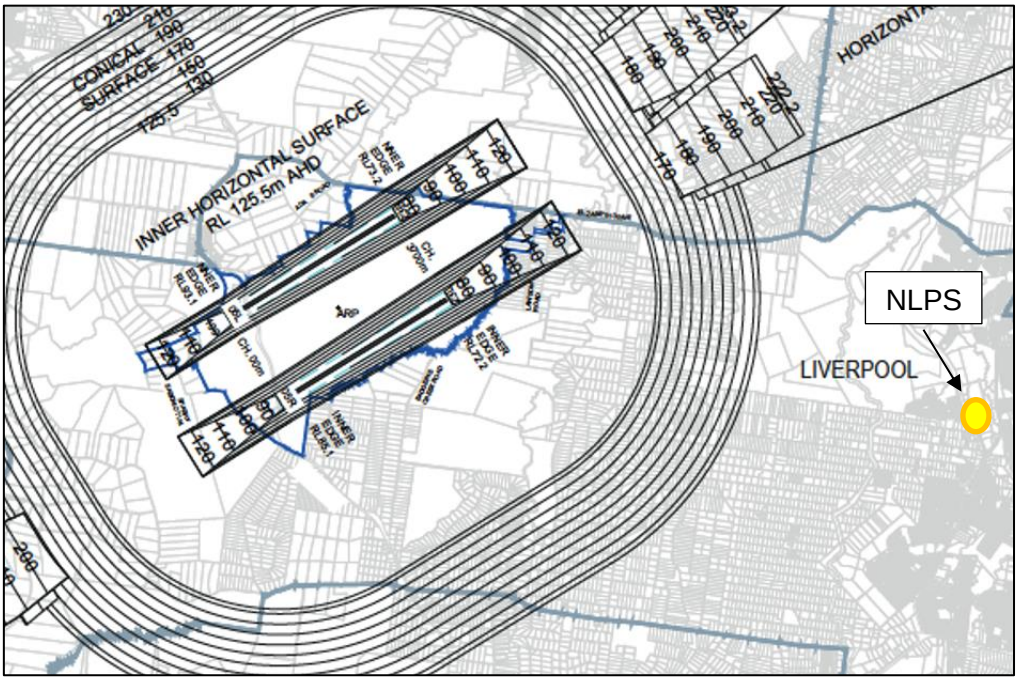


Figure 13: OLS (proposed) for the Western Sydney Airport

The Western Sydney Airport OLS is not impacted by the NLPS mobile crane maximum height of RL54.00.

4.10. The Sydney Radar Terrain Clearance Chart (RTCC) Overlay

The Sydney Aerodrome RTCC overlay is depicted in Figure 14 below. The approximate location of the NLPS is shown.

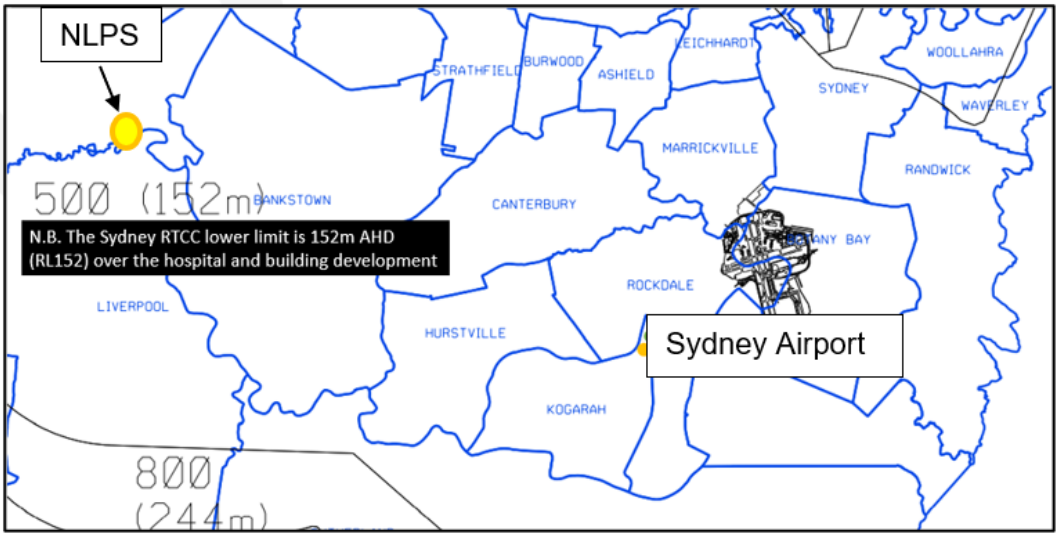


Figure 14: NLPS the Sydney RTCC

The Sydney Airport RTCC levels are not impacted by the NLPS mobile crane maximum height of RL54.00.

4.11. Holsworthy Aerodrome R555 (Military).

The Holsworthy helicopter base is located within a Restricted Area R555 from surface to 1,500'AMSL. As such, any OLS or other airspace surfaces remain within that Restricted Area. The NLPS development is outside Restricted Area R555 and therefore are not impacted by the NLPS development.

4.12. Assessment of the NLPS Building Impacts on OLS, PANS-OPS and RTCC

The development, based upon the design presented (including anticipated crane height at RL40.00), will not protrude into PANS-OPS, OLS or RTCC surface for the Sydney Basin airport and runway airspace relevant to this development.

4.13. Location of the NLPS in Relation to the Liverpool Hospital HLS

The existing approach and departure path for the Liverpool Hospital HLS is depicted in Figure 15 below. The flight paths are not impacted by the NLPS development or planned mobile crane location.

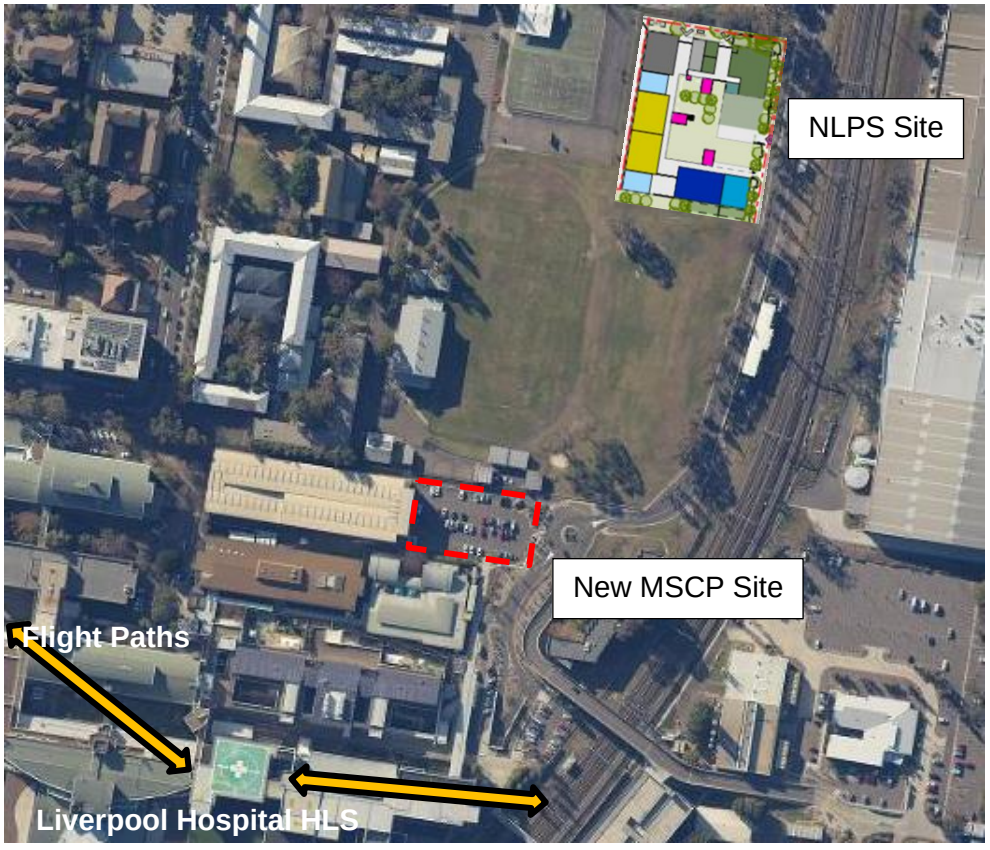


Figure 15: Liverpool Hospital HLS Location Approach/Departure Paths

4.14. Precinct Cranes

The LHAP development will occur in three distinct phases:

Phase 1: Development of the new multi-story carpark (MSC).

Phase 2: Development of LHAP Stage 1.

Phase 3: Development of LHAP Stage 2.

Of relevance to this Impact Assessment, is the location of the MSCP (see Figure 15) and associated cranes, and the impact of the LHAP Stage 1 development immediately to the west of the HLS, and associated cranes.

From an aviation flight path perspective, each development has a varying impact on the continued access to the Hospital HLS. Management of the flight paths is key to providing assurance to the Hospital of continued HLS access.

By way of summary, the Stage 1 and Stage 2 LHAP development to the immediate west of the Hospital HLS will constrain the use of a western approach/departure path. Consequently, the only available option includes the use of a north/southeast flight path corridor per the illustration in Figure 16.

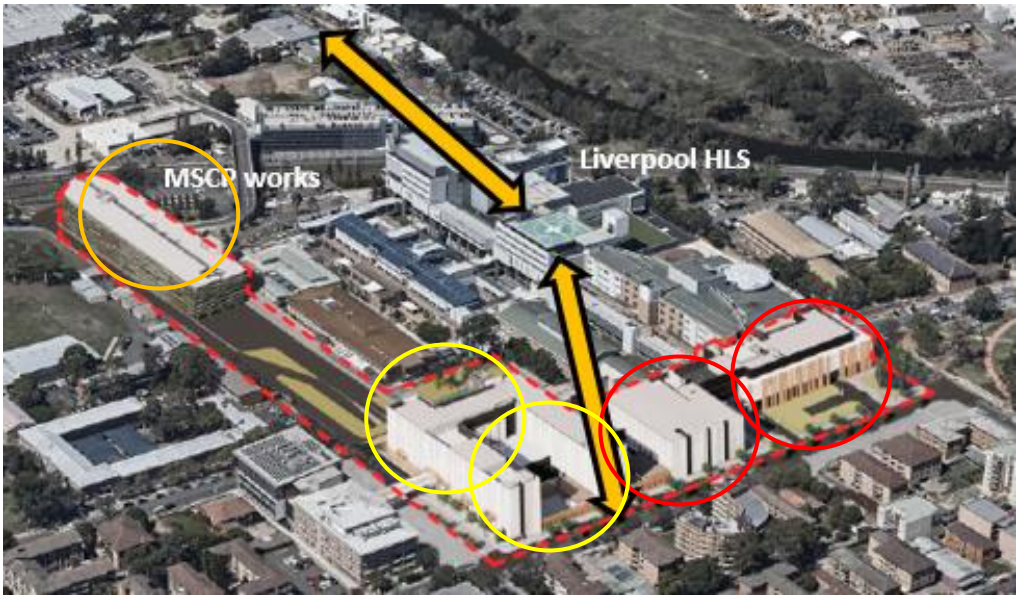


Figure 16: Existing flight paths and Stage 1 (red) Stage 2 (yellow) and MSCP (orange) cranes

During Stage 1 and Stage 2, it is expected the western flight path will be obstructed, therefore leaving only a north/south east approach/departure path available for the duration of the works (see Figure 17).

Figure 17: North/south east flight path option and precinct crane obstructions

Figure 17 illustrates the crane 'jungle' that will be created at various times (presently not concurrently planned). What is clear is the western flight path per Figure 16, will not be available for the duration of Stage 1 and Stage 2. Based on current work, the MSCP crane should be removed by the time Stage 1 commences. With the crane strategy for Stage 2 not yet developed, it is feasible that the northern flight path as illustrated in Figure 17 may need to transition further right towards the NLPS building site (blue mobile crane operating area).

4.15. The NLPS Crane

The outcome of the brief crane review in para 4.14 is that the northern flight path will be to the west of the NLPS development site.

The NLPS site is planning to use a mobile crane being at its highest, approximately RL54.00. As the deck level of the Liverpool HLS is RL 42.71, the mobile crane will be higher for the periods it operates at the maximum height. Importantly, the location of the crane will not be a vertical obstruction for the normal flight paths into/from Liverpool Hospital HLS.

It is not the practice for NSW Ambulance helicopters to fly over/under construction cranes and this will apply to the NLPS site. There will however, be a need for augmented illumination on the crane jib to ensure the pilots can identify the position of the jib relevant the flight path at night.

4.16. NLPS Crane Illumination

The expected proximity of the NLPS crane to the realigned northern flight path for the hospital's LHAP Stage 1 and Stage 2 developments, the end of the mobile crane will need to be illuminated – unless the crane can be lowered when not in use and at night.

4.17. National Airports Safeguarding Framework (NASF).

The SEARS reference required a be report prepared by a suitably qualified aviation expert that identifies and assesses the potential impacts of the development on the aviation operations of any nearby on shore helicopter landing sites and associated flight paths in accordance with the relevant sections of the National Airports Safeguarding Framework (NASF).

The specific areas of Guideline H of the NASF requires any development activity applications in the vicinity of an identified SHLS should be reviewed to determine if there is any conflict in respect to:

- Intrusions into the flight path (buildings. Cranes, gaseous plumes);
- Operational hazards (reflective glare, dust, smoke, EM interference);
- Lighting that may cause distraction;
- Lighting installed to illuminate obstructions that is not visible when using night vision goggles; wildlife/bird strikes; and
- Building induced windshear/turbulence.

Guideline H goes onto state: "Where development, including temporary structures ancillary to that development (for example, cranes) has the potential to impact upon the safe operation of SHLS, it is important that the relevant helipad owner is notified and has an opportunity to make a meaningful contribution to the outcome of the development proposal."

This Report has addressed the requirements above and these are summarized in the following table.

NASF Guideline	AviPro Assessment Reference	Outcome
Intrusions into the flight path	4.14	Realigned flight path to be established to ensure continued operations
Operational hazards	4.14, 4.15	Realigned flight path to ensure continued operations Crane strategy timelines
Lighting that may cause distraction	4.1	NLPS site is 339m away from the HLS. Not a distraction issue.
Lighting installed to illuminate obstructions	4.16	NVG compatible lighting is required on the crane jib
Building induced windshear/turbulence	4.2	N/A to this site
HLS Design	N/A	N/A as the HLS is extant
Obstacle Limitation Surface	4.14, Figure 17	Realigned flight path OLS (or OIS) will not be impacted by the crane/building activity
HLS Flight Path	4.14	Realigned flight path to be established to ensure continued operations

4.18. Deductions: Survey

The developer has provided details of the exact type, position, elevation and jib length of the mobile crane and the impact on the Liverpool Hospital HLS northern approach and departure path has been assessed. Given the current information prevails, there will be no impact on the flight path access to the HLS.

To ensure this is the case, a flight path survey should to be completed to ensure obstructions are noted, mapped and marked where possible.

4.19. Deductions: Airspace, Cranes, Obstructions and HLS

The following key deductions can be made:

- The NLPS building development, can be managed successfully against the National Airports Safeguarding Framework Guideline H – Protecting Strategically Important HLS.
- The NLPS building once constructed, will not protrude into the aviation protected airspace (Sydney/ Bankstown Airports or the Western Sydney Airport.
- The NLPS building once constructed, will not protrude into the Sydney RTCC.
- The NLPS building, once constructed, will not impact the current and planned Liverpool Hospital HLS approach and departure paths.

- The NLPS mobile crane will require enhanced aviation-standard lighting obstacle lighting unless it can be lowered when not in use and at night.
- The NLPS mobile crane will not protrude into the aviation protected airspace (Sydney Airport, Bankstown Airport, and Western Sydney Airport).
- The NLPS mobile crane will not protrude through the Sydney RTCC.
- The NLPS mobile crane, depending on its position, height and jib length may protrude into the Liverpool Hospital HLS northern approach and departure path established for the Stage 1 LHAP development, and a management arrangement will be required to treat the risk.

4.20. Conclusion

The NLPS building development can be completed within the NASF Guideline H Framework (SEARS requirement 19, dated 9 Jan 21).

A flight path survey should be conducted of the realigned northern flight path. This will include the NLPS building site area.

The mobile crane for the NLPS site will need NVG compatible lighting as described in para 4.16.

Some additional risk management notification activities including HLS Notification and additional OzRunways information will be required to ensure HEMS operators are fully apprised of the crane hazard in the vicinity of Liverpool Hospital's HLS during the construction phase.

The mobile crane will need to be lowered below RL40.00 during periods of darkness and when the site is not operational.