Northern Beaches Hospital

Stage 1: Concept Design, Site Clearance & Preparatory Works

Appendix P

Aviation Airspace Assessment

Northern Beaches Health Service Redevelopment
A new wave in healthcare

Northern Beaches Hospital

Aviation Airspace Assessment

REHBEIN Airport Consulting

12 July, 2012
Our File Ref: S12074AL003.docx
Contact: Michael Ward

Health Infrastructure
c/o Senior Consultant
Johnstaff Projects
Level 8, 16 O'Connell Street
SYDNEY NSW 2000

Attention: James Holbrook

RE: NORTHERN BEACHES HOSPITAL PRESCRIBED AIRSPACE ASSESSMENT

REHBEIN Airport Consulting was commissioned by Health Infrastructure to assess the impact the proposed new Northern Beaches Hospital (NBH) will have on Sydney International Airport (SIA) prescribed airspace.

This assessment is based on the following information provided directly to REHBEIN Airport Consulting by Project Architects BVN Architecture.

- Drawings M-AR-PW-104 to Drawing M-AR-PW-113, dated 14 November 2012; and
- Drawing 18170 Sheets 1 to 7 dated June 2012.

No site visit was conducted by REHBEIN Airport Consulting personnel.

1. PROPOSED NORTHERN BEACHES HOSPITAL

The proposed Northern Beaches Hospital is located between Warringah Road and Frenchs Forest Road West, and between Wakehurst Parkway and The Forest High School in Frenchs Forest, NSW as shown in **Figure 1** attached.

The main hospital building will consist of eleven (11) levels excluding the roof. The building is 'L' shaped above level 5 and oriented approximately north-south.

The maximum height of the NBH is RL 218.6m.

2. PRESCRIBED AIRSPACE

Sydney Airport and Bankstown Airport are leased federal airports operated by Sydney Airport Corporation Limited (SACL) and Bankstown Airport Limited (BAL) respectively. As leased federal airports, they are subject to the Airports Act 1996 and the regulations made pursuant to it, including the Airports (Protection of Airspace) Regulations 1996.

Those Regulations prescribe airspace around the airports for protection from intrusion by obstacles, namely the airspace defined by the airport's Obstacle Limitation Surfaces (OLS) and the PANS-OPS protection surfaces and includes those surfaces planned to accommodate future expansion or new procedures at the airport.

No permanent penetration of prescribed PANS-OPS protection surfaces is permitted. Temporary penetrations of prescribed PANS-OPS protection surfaces and permanent or temporary penetrations of the prescribed OLS may be permitted, with or without conditions.

The general nature of the OLS and PANS-OPS surfaces are expanded upon in Section 2.1 and Section 2.2 respectively.

2.1 OBSTACLE LIMITATION SURFACES (OLS)

The OLS is 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 or during the final visual segment of an instrument approach procedure. These surfaces are of a permanent nature and comprise the reference datum which defines an obstacle. Anything above the vertical limits of the OLS is regarded as an obstacle.

The Manual of Standards for Part 139 of the Civil Aviation Safety Regulations (MOS Part 139) defines the OLS for certified aerodromes such as Sydney Airport and Bankstown Airport.

Some penetrations of the OLS are permissible if they are judged not to interfere with the safety, efficiency or regularity of existing or future operations at an airport. Pursuant to the Airports (Protection of Airspace) Regulations 1996, this is a matter for the Department of Infrastructure and Transport to determine on advice from the CASA and the airport operator. An approval may also be granted with conditions, such as requirements to mark or light the structure in a particular way.

2.2 PANS-OPS SURFACES

Airspace associated with aircraft instrument procedures is defined by the Procedures for Air Navigation Services – Aircraft Operations (PANS-OPS) protections surfaces for an aerodrome. These surfaces are ascertained in accordance with the criteria in the International Civil Aviation Organisation (ICAO) *Procedures for Air Navigation Services - Aircraft Operations* (Doc 8168, PANS-OPS) and are also protected by the Airports (Protection of Airspace) Regulations 1996.

The PANS-OPS surfaces are intended to safeguard an aircraft from collision with obstacles when the pilot is flying by reference to instruments. Protection of these surfaces is critical as pilots may be navigating without any visual reference outside the aircraft.

3. SYDNEY AIRPORT PRESCRIBED AIRSPACE ASSESSMENT

Sydney Airport accommodates both international and domestic flights on three runways. Two parallel runways orientated at 155°/335° magnetic are designated as Runways 16L/34R and 16R/34L and a cross runway designated Runway 07/25 is orientated 062°/242° magnetic. All runways have associated instrument approach procedures and there are also a number of instrument departure procedures.

The Sydney Airport Master Plan 2009 does not foreshadow any changes to the airport that would impact upon the current OLS or the PANS-OPS protection surfaces.

The proposed NBH is outside a 15,000m radius from Sydney Airport and therefore beyond the furthest extent of any OLS.

A preliminary review of instrument procedure charts published in the AIP Departure and Approach Procedures (AIP-DAP) indicates that the critical PANS-OPS protection surface over the proposed NBH is associated with the Sydney Airport's 10 Nautical Mile Minimum Safe Altitude (10NM MSA).

The 10NM MSA for Sydney Airport sets a minimum safe height for flight of 2,100ft above mean sea level[1] within 10NM of the airport. This equates to approximately 640m AHD[2], to which a minimum obstacle clearance of 300m is applied, which results in a PANS-OPS protection surface at 340m AHD. Although the proposed building is located greater than 10NM from the airport, the protection surface incorporates a buffer of an additional 5NM, taking it to 15NM or approximately 27.8km. At a maximum height of RL 218.6m the proposed NBH will penetrate the existing PANS-OPS surfaces for Sydney Airport.

4. BANKSTOWN AIRPORT PRESCRIBED AIRSPACE ASSESSMENT

Bankstown Airport is a significant airport for flying training and other general aviation activity. It has three (3) parallel runways aligned at 111°/291° magnetic and designated Runways 11L/29R/ 11C/29C and 11R/29L.

A preliminary review of instrument procedure charts published in the AIP Departure and Approach Procedures (AIP-DAP) indicates that the critical PANS-OPS protection surface over the proposed NBH is associated with the Bankstown Airport's 25NM MSA.

The 25NM MSA for Bankstown Airport sets a minimum safe height for flight of 2,200ft above mean sea level[3] within 25NM and in the sector over the proposed NBH. This equates to approximately 671m AHD[4], to which a minimum obstacle clearance of 300m is applied, which results in a PANS-OPS protection surface at 371m AHD. At a maximum height of RL 218.6m the proposed NBH will penetrate the existing PANS-OPS surfaces for Bankstown Airport.

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[1] Altitude in aviation is measured in feet, at a recognised conversion to metres of 1m to 3.2808 feet.
[2] AHD is equivalent to height above mean sea level (AMSL).
[3] Altitude in aviation is measured in feet, at a recognised conversion to metres of 1m to 3.2808 feet.
[4] AHD is equivalent to height above mean sea level (AMSL).

5. CONCLUSIONS

The proposed NBH will not penetrate the existing or future OLS for Sydney Airport or Bankstown Airport.

Additionally, the proposed NBH will not penetrate the existing PANS-OPS protection surfaces for Sydney Airport or Bankstown Airport.

Yours faithfully
For and on behalf of
LAMBERT & REHBEIN (SEQ) PTY LTD

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SENIOR AVIATION CONSULTANT

Project:

NORTHERN BEACHES HOSPITAL

Client:
NSW HEALTH INFRASTRUCTURE

Title:
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SITE LAYOUT

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Rev.	Date
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FIGURE 1

Scale: 1,5:000 @ A3 — A3 (Sheet Size)

File Ref: S12074FIG001Rev0

REHBEIN Airport Consulting

6 December, 2012
Our File Ref: S12074AL002R1.docx
Contact: Michael Ward

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Attention: James Holbrook

RE: NORTHERN BEACHES HOSPITAL FEASIBILITY STUDY

REHBEIN Airport Consulting was commissioned by Health Infrastructure to provide specialist aviation advice in relation to a Helicopter Landing Site (HLS) on the roof of the proposed new Northern Beaches Hospital (NBH) in Frenchs Forest, NSW.

This assessment is based on the following information provided directly to REHBEIN Airport Consulting by Project Architects BVN Architecture.

- Drawings M-AR-PW-104 to Drawing M-AR-PW-113, dated 14 November 2012; and
- Drawing 18170 Sheets 1 to 7 dated June 2012.

Drawing M-AR-PW-105 is attached for reference. No site visit was conducted by REHBEIN Airport Consulting personnel.

1. PROPOSED NORTHERN BEACHES HOSPITAL

The proposed Northern Beaches Hospital is located between Warringah Road and Frenchs Forest Road West, and between Wakehurst Parkway and The Forest High School in Frenchs Forest, NSW as shown in **Figure 1**.

The main hospital building will consist of eleven (11) levels excluding the roof as shown in Drawings M-AR-PW-100 to Drawing M-AR-PW-113 attached. The building is 'L' shaped above level 5 and oriented approximately north-south.

A HLS is proposed to be located on the roof of the main hospital building approximately 37m north of the southern façade at a height of approximately RL 213.6m as shown in Drawing M-AR-PW-105 attached.

1. APPLICABLE STANDARDS

The State Government of New South Wales Department of Health has developed NSW Health Policy Directive PD2005_128 (25 January 2005) incorporating Circular 98/61 *Guidelines for Medical Helipads*. At present it is a requirement of NSW Health for

hospital HLS in NSW to comply with criteria within this document. However, this document is set to be superseded by a more comprehensive set of guidelines being developed by NSW Health for the planning, design, operation and management of Department of Health HLS and is currently in draft form.

Meeting the criteria in the draft NSW guidelines will be a requirement of NSW Health when they are finalized, and accordingly the draft NSW guidelines criteria for physical dimensions and obstacle restriction have been used as the primary guidance material for assessment purposes.

2. PHYSICAL CHARACTERISTICS

Elements of a surface level hospital HLS and minimum required dimensions based on the draft NSW Guidelines are described in the following sections.

2.1 GEA/TLOF

The Ground Effect Area (GEA) or Touchdown and Lift-off Area (TLOF) is a load bearing generally sealed surface capable of supporting the dynamic loads of the helicopters intended to use the HLS and providing ground effect. Additionally, the GEA/TLOF should provide a firm smooth working surface for hospital personnel and the wheeled equipment used for moving patients on gurneys. The draft NSW guidelines state the minimum dimension of the GEA/TLOF is 14m diameter or 14m x 14m square.

2.2 LLA

The Landing and Lift-off Area (LLA) is a load bearing generally sealed surface normally centred within the GEA/TLOF on which helicopters land and lift-off. The draft NSW guidelines state the minimum dimensions of the LLA are determined as 6.35m diameter or 6.35m x 6.35m square.

2.3 FATO

The Final Approach and Take-off Area (FATO) contains the GEA/TLOF and is the area on which arriving helicopters terminate their approach and from where departing helicopters take-off. The FATO outside of the TLOF does not have to be load bearing. The draft NSW guidelines state the minimum dimension of the FATO is 25m diameter or square.

2.4 Safety Area

The Safety Area is an area required around the FATO which is to be free of all obstacles and intended to reduce the risk of damage to helicopters accidentally diverging from the FATO. The draft NSW guidelines state the minimum dimension of the Safety Area is 4m around the FATO or 33m diameter or square.

3. OBSTACLE RESTRICTIONS

In addition to the provision of physical facilities for the helipad, flight path envelopes that are clear of obstacles need to be provided. These are referred to as Obstacle Limitation Surfaces (OLS) and are based around the proposed flight path centre line.

The OLS consist of several sections each with differing requirements in terms of horizontal and vertical geometry. A section showing the

3.1 Approach and Departure Surfaces

The approach and departure surfaces provide sufficient airspace clear of hazards for the safe approach and departure of helicopters from an HLS.

For a non-instrument FATO an Approach and Departure Surface starts at the edge of the FATO and slopes upwards at 8:1 or 7.5° for a distance of 1,219m while to a height of 152m above the elevation of the HLS. The surface also diverges away from the flight path centreline to a width of 152m. However, where possible an obstacle free slope better than 7.5° (preferably 2.5°) should be tried to be achieved.

3.2 Transitional Surfaces

In addition to the approach and departure surfaces the draft NSW guidelines allow for transitional surfaces. Transitional surfaces start from the edge of the FATO parallel to the flight path centre line and from the outer edges of the approach and departure surfaces and extend outwards at a slope of 2:1 for a distance of 62.5m from the edge of the FATO.

However, the transitional surfaces can be overlooked if lateral extensions of the approach and departure surface on each side are provided for a distance of 610m. For assessment purposes lateral extensions have been applied.

3.3 Object Identification Surfaces

The draft NSW guidelines also allow for an Object Identification Surface (OIS) within which the marking and lighting of obstacles is recommended. The OIS starts at the Safety Area perimeter and extends outwards horizontally in all directions for 30m except under the approach and departure surface. Under the approach and departure surface the OIS starts from the edge of the FATO and extends horizontally out for a distance of 250m. From this point the OIS extends outwards for an additional distance of 1,000m while sloping upwards at 8:1.

4. FLIGHT PATHS

The draft NSW guidelines recommend that a surface level HLS has at least two flight paths separated by not less than 150 degrees and that flight paths should be oriented such that the usability factor is 95% for the helicopters the HLS is intended to serve. The usability factor is based on the angle and speed of wind relative to the helicopters flight path.

Drawing M-AR-PW-105 attached indicates that there are cooling towers on the south east corner of the roof and an elevator serving the HLS to the north. However, with the exception of the elevator and cooling towers, the proposed main hospital building and

HLS will be the tallest structure in the immediate area and helicopters should be able to approach and depart in most directions.

Figure 2 attached shows sectors available for flight paths that avoid the cooling towers and elevator. The assumed available sectors are 052° - 107° and 180° - 316° relative to true north.

Analysis of historical wind data has been conducted to assess the usability of the assumed available obstacle free sectors. The wind data was obtained from the Bureau of Meteorology (BoM) records for Riverview Observatory (BoM WS 066131) for the period 01 January 1990 to 30 April 2011. A 10 knot crosswind and 0 knot tailwind limit was selected for assessment purposes based on the helicopter types that use the HLS. The usability was determined to be 89.3% for the assumed available sectors. This is less than the minimum usability of 95% recommended by the draft NSW guidelines. However, ASNSW advise that a sector available for approach and take-off greater than 150° provides their aircraft with close to 100% usability.

5. FLIGHT PATH PROTECTION

If the HLS is at a higher elevation than all other hospital building elements then there are no obstacle threats to flight path protection and OLS protection slopes of 0° can be achieved. A drawing showing the slope of the approach and departure surface from the proposed HLS is shown in **Figure 3** attached.

Drawing M-AR-PW-105 attached indicates that there are cooling towers on the south east corner of the roof and an elevator serving the HLS to the north. The proposed elevation of the top of the cooling towers is approximately RL 214.2m. At a distance of approximately 19m from the edge of the proposed FATO the top of the cooling towers should be approximately 1.7m below the OLS. However, it should be noted that warm exhaust and plume rise could also pose a hazard to helicopters arriving or departing over the cooling towers. Further information and assessment is required to determine the full extent of the hazard posed, if any.

The proposed elevation of the top of the elevator shaft is approximately RL 218.6m. At a distance of approximately 9m from the edge of the proposed FATO the elevator would penetrate the OLS by approximately 4m.

6. NOISE

Noise modelling has been conducted using the US Federal Aviation Administration (FAA) Integrated Noise Model (INM) v7.0c. Although the Agusta Westland AW139 is the design helicopter for which the draft NSW guidelines are based, the Eurocopter EC130 has been chosen to be representative of the loudest helicopter expected to use the HLS.

For noise assessment purposes representative flight paths within the assumed available sectors.

Single event noise contour maps based on the LAMAX noise metric for an EC130 approach and departing along the assumed representative flight paths are shown in **Figures 4 - 7** attached.

The noise modelling shows that noise levels on the HLS up to 140 dB(A) can be expected during a helicopter departure and 105 dB(A) during a helicopter arrival.

7. CONCLUSIONS AND RECOMMENDATIONS

As the proposed new hospital building will be the tallest structure in the immediate area only hospital building elements have the potential of infringing the OLS. If no hospital building elements infringe the OLS than helicopters can approach and depart in all directions providing 100% usability.

However, helicopters may not be able to approach or depart over the proposed cooling towers or elevator if they penetrate the OLS or if the cooling towers pose an unacceptable plume rise hazard. Further information and assessment is required to accurately determine the plume rise hazard of the cooling towers.

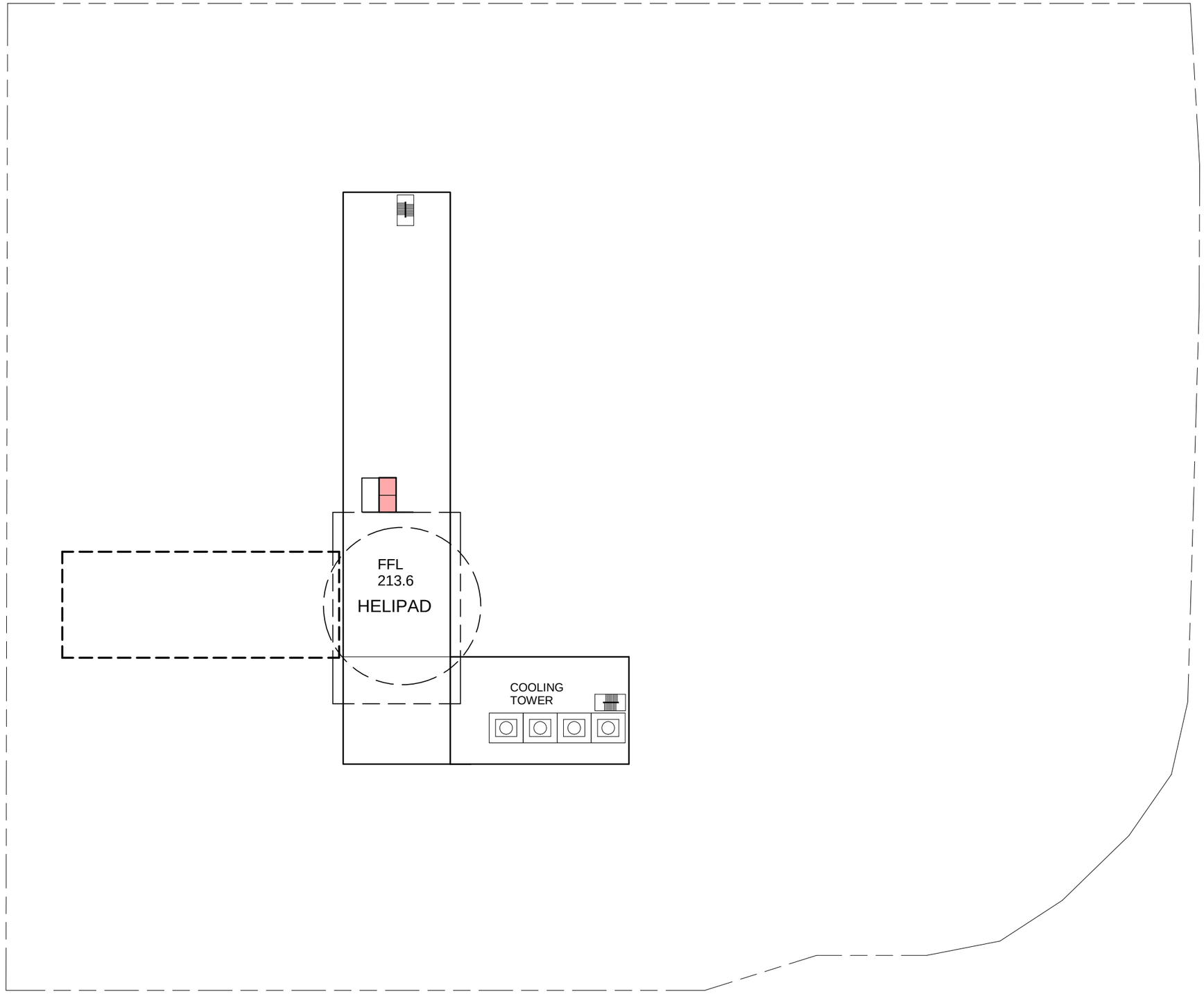
If helicopter flights paths avoid the elevator and cooling towers than approximately 90% usability can be achieved which is greater than minimum recommended standards.

Noise levels of 70 dB(A) to 140 dB(A) can be expected over areas of the hospital site and measures to reduce noise levels within sensitive areas should be undertaken in the design.

Yours faithfully
For and on behalf of
LAMBERT & REHBEIN (SEQ) PTY LTD

M. WARD DIP, M.SC, MILTA
SENIOR AVIATION CONSULTANT

Enc: Drawing M-AR-PW-105
Figure 1
Figure 2
Figure 3
Figure 4
Figure 5
Figure 6
Figure 7



NOTE : DEPARTEMENTS PROVIDED BY PRIVATE ARE IN ITALIC

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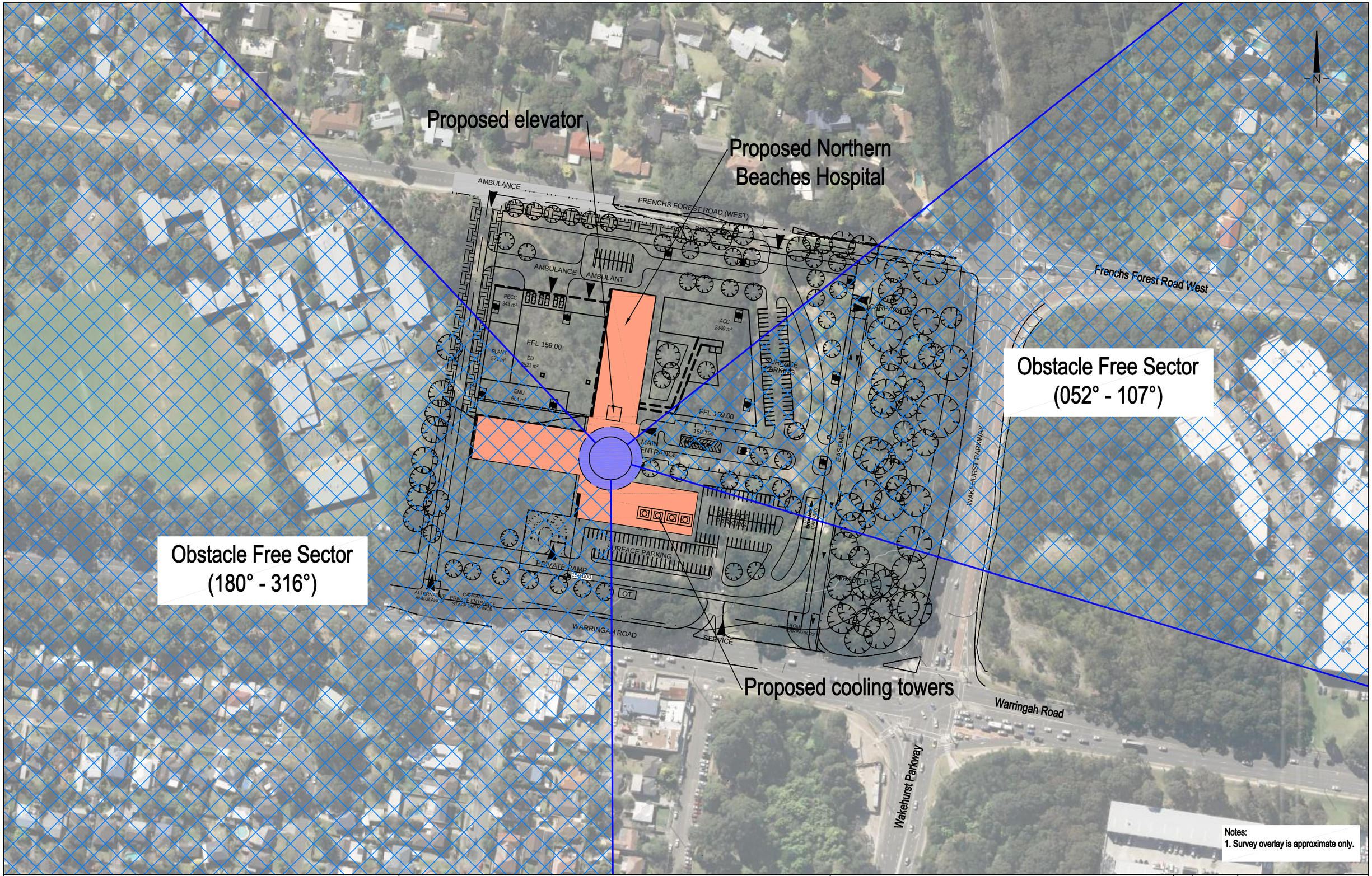
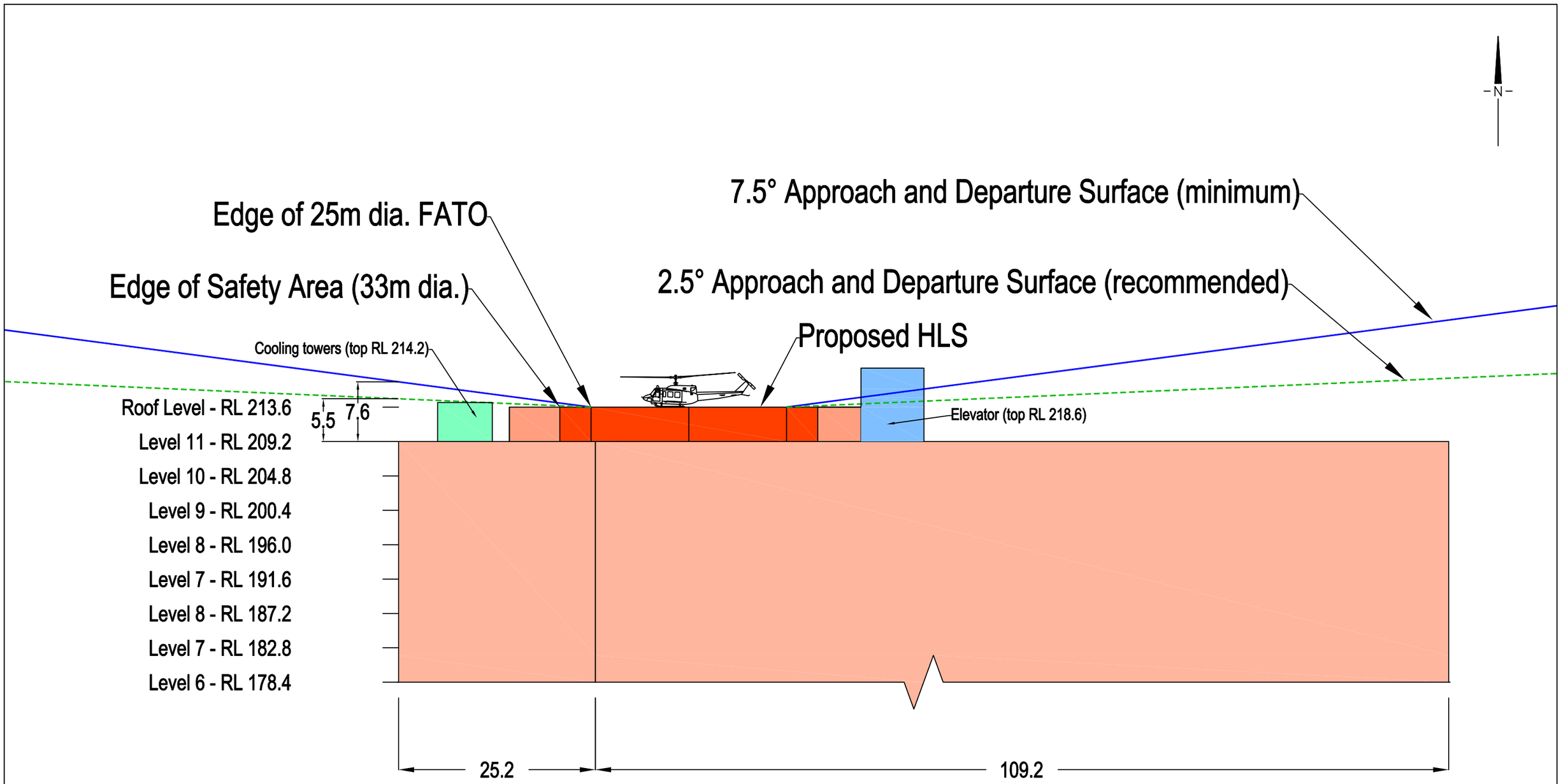
North	Principal Consultant	Project Manager	Client							
	MSJ | HDR | ARCHITECTS	JOHNSTAFF	NSW GOVERNMENT Health Infrastructure	NORTHERN BEACHES HOSPITAL FRENCHS FOREST NEW SOUTH WALES	**OPTION 1** **PUBLIC/PRIVATE COLLOCATION**	Drawing PINWHEEL - ROOF LEVEL	Drawing No M-AR-PW-105	Rev	Issue Date 14/11/12	Scale 1 : 1000 AT A3 SIZE



Notes:
1. Survey overlay is approximate only.

Project: NORTHERN BEACHES HOSPITAL	Client: NSW HEALTH INFRASTRUCTURE Title: NORTHERN BEACHES HOSPITAL OBSTACLE FREE SECTOR MAP	REHBEIN Airport Consulting CBD House, level 3 Wickham Street, Fortitude Valley QLD 4006 PO Box 112, Fortitude Valley QLD 4006 L&R (SEQ) Pty Ltd A.C.N. 126 939 768 A.B.N. 77 126 939 768 TELEPHONE (07) 3250 9000 FACSIMILE (07) 3250 9001 EMAIL mail@ler.net.au The Association of Consulting Engineers Australia Drawn: MMW Checked: BJH Approved: BJH	0 Rev. 06/12/12 Date FIGURE 2 Scale: 1,2:000 @ A3 A3 Sheet Size File Ref: S12074FIG002Rev0



Eastern Elevation

Project:
NORTHERN BEACHES HOSPITAL

Client:
NSW HEALTH INFRASTRUCTURE

Title:
NORTHERN BEACHES HOSPITAL
APPROACH AND DEPARTURE SURFACE SECTION

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Rev.	Date
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FIGURE 3

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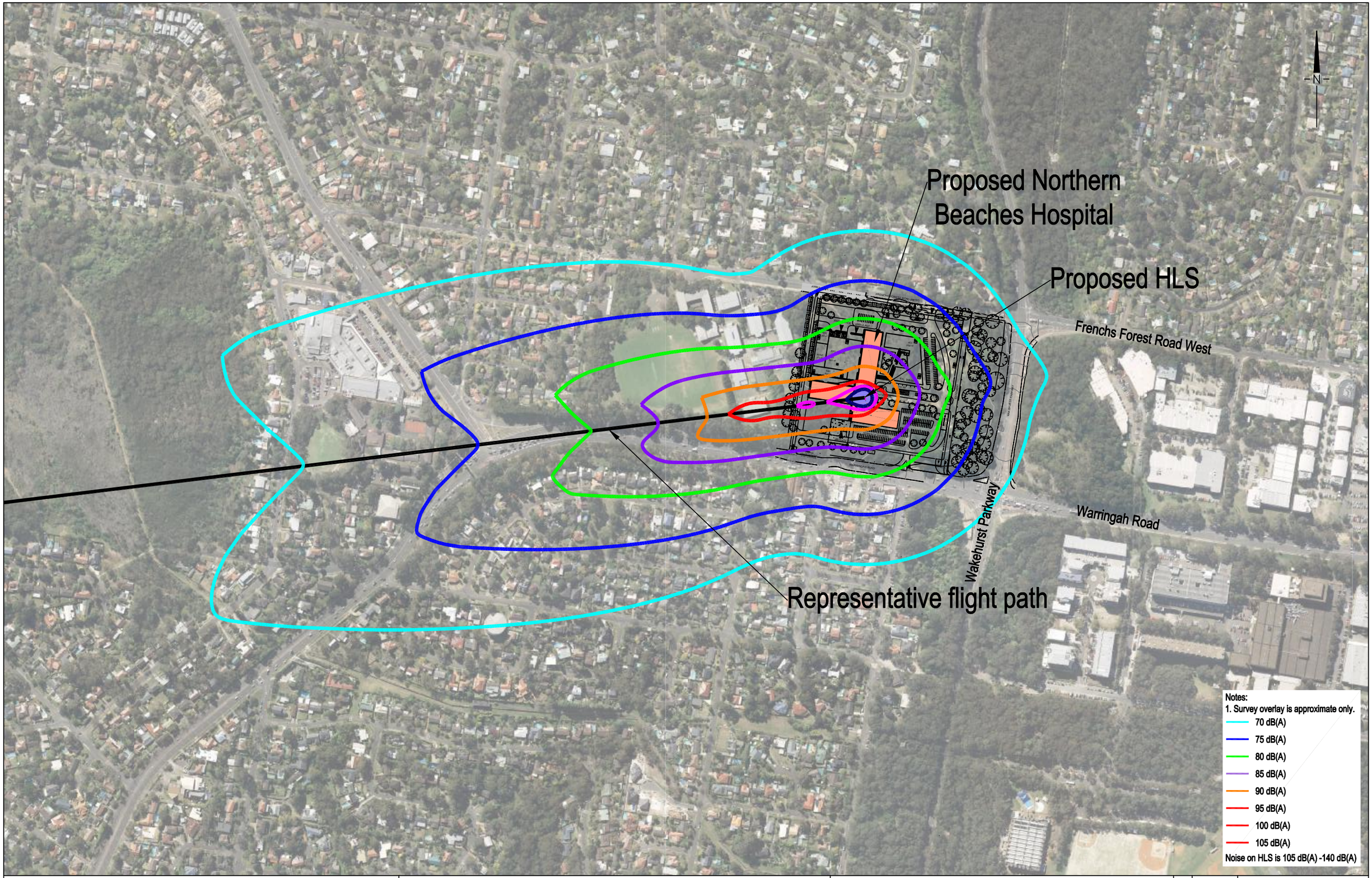
File Ref: S12074FIG003Rev0



Project:

NORTHERN BEACHES HOSPITAL

Client:
NSW HEALTH INFRASTRUCTURE

Title:
NORTHERN BEACHES HOSPITAL PROPOSED HLS
EC130 DEPARTURE TO NORTH EAST LAMAX NOISE CONTOURS

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Rev.	Date
1	06/12/2012
0	30/11/2012

FIGURE 4

Scale: 1,5:000 @ A3 — A3

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Project:

NORTHERN BEACHES HOSPITAL

Client:

NSW HEALTH INFRASTRUCTURE

Title:

NORTHERN BEACHES HOSPITAL PROPOSED HLS
EC130 ARRIVAL FROM NORTH EAST LAMAX NOISE CONTOURS

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Figure No:

FIGURE 5

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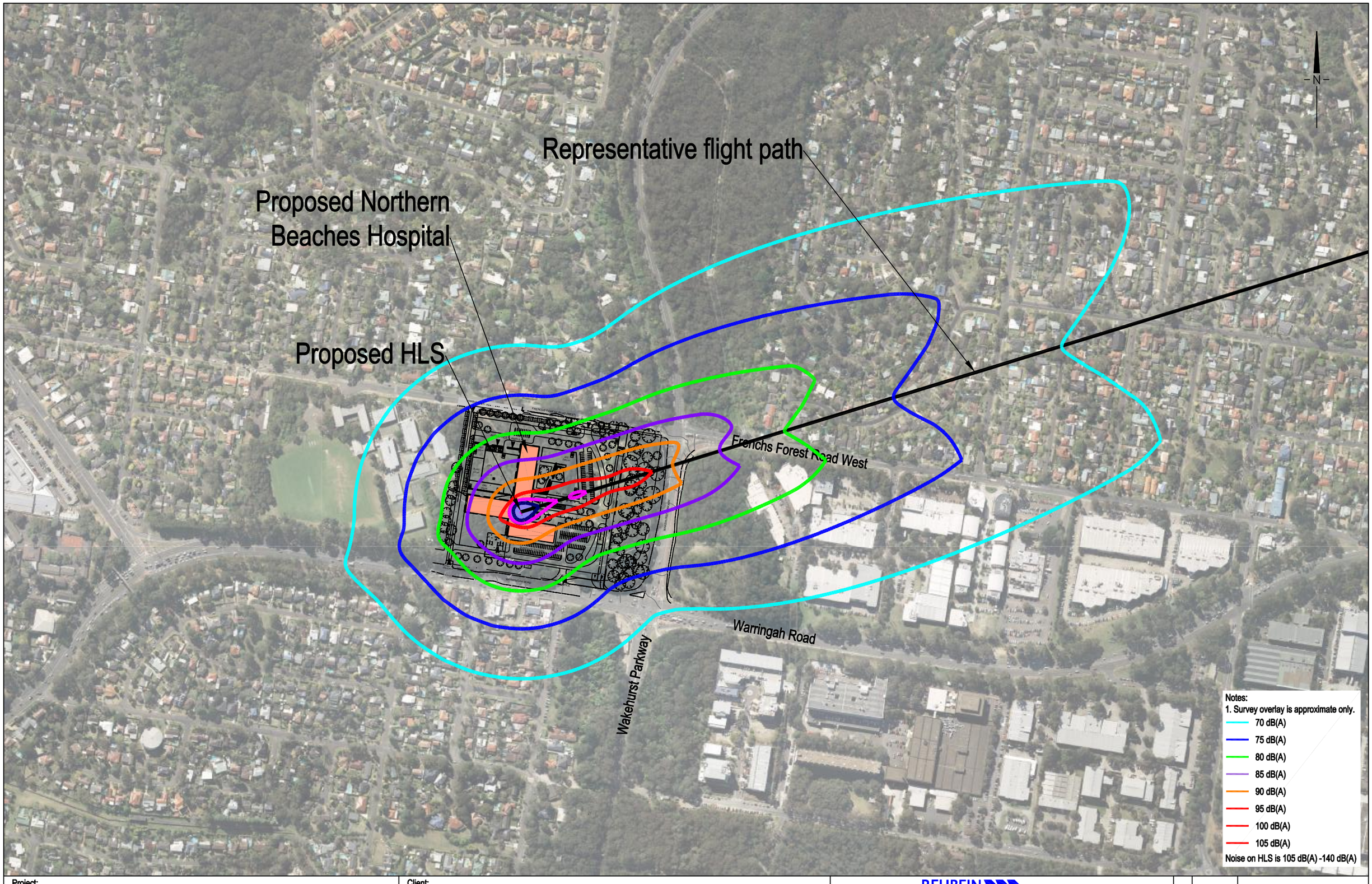

Project:

NORTHERN BEACHES HOSPITAL

Client:

NSW HEALTH INFRASTRUCTURE

Title:

NORTHERN BEACHES HOSPITAL PROPOSED HLS
EC130 DEPARTURE TO SOUTH EAST LAMAX NOISE CONTOURS

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MMW	BJH	BJH

Rev.	Date
1	06/12/2012
0	30/11/2012

FIGURE 6

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A3

File Ref: S12074FIG006Rev1

Sheet Size

Project:

NORTHERN BEACHES HOSPITAL

Client:
NSW HEALTH INFRASTRUCTURE

Title:
NORTHERN BEACHES HOSPITAL PROPOSED HLS
EC130 ARRIVAL FROM SOUTH EAST LAMAX NOISE CONTOURS

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MMW	BJH	BJH

Rev.	Date
1	06/12/2012
0	30/11/2012

Figure No:
FIGURE 7

Scale: 1,5:000 @ A3 (A3)
File Ref: S12074FIG007Rev1