

# SYNERGETICS

23 February 2024

Dear Sir/Madam

**RE: NASF Guideline B review of proposed new awning at 125 Nancy Ellis Leebold Dr, Bankstown Airport**

## Introduction

I am writing to provide a desktop windshear and turbulence assessment, in accordance with NASF B (DIRD, 2018), for a proposed awning, at 125 Nancy Ellis Leebold Drive, located on the north eastern side of Bankstown Airport as shown in Figure 1. The proposed awning is intended to provide shelter for vans which are loading.

## Building and site description

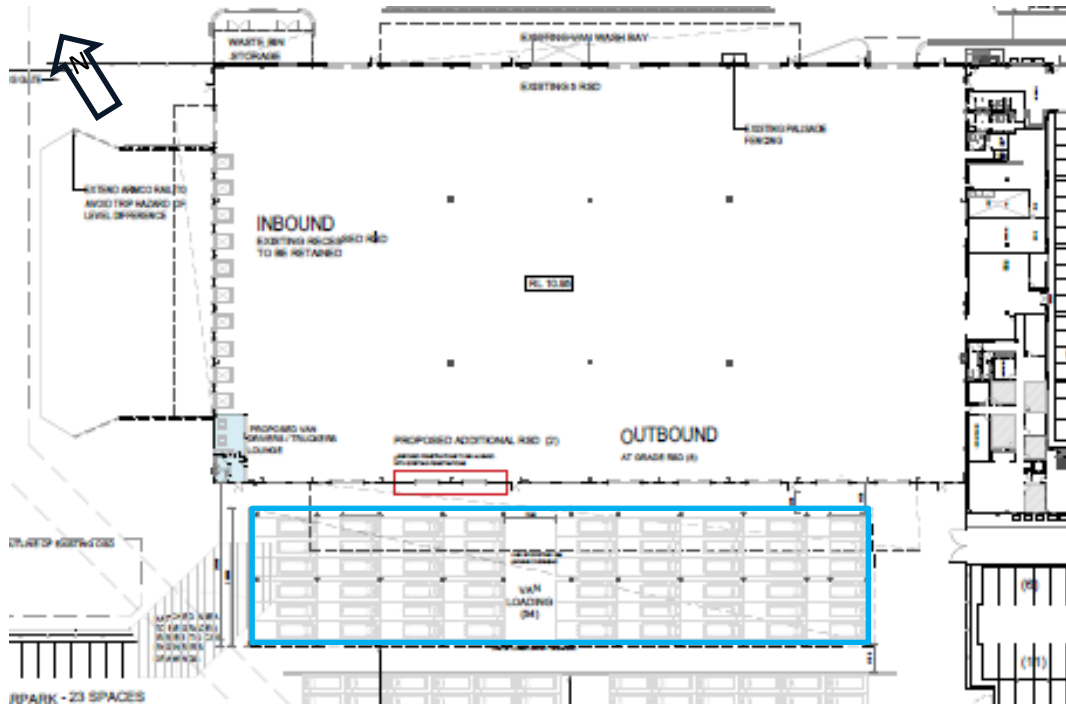
The existing building's ridge is approximately 12 m high<sup>1</sup>, with eaves approximately 10.5 m high. It features an existing 10.5 m high, 9.5 m wide, 93 m long canopy. The proposed awning, marked in Figure 2 and Figure 3, is 6.4 m high, 94 m long and 20.8 m wide. It sits directly between the building and runways, partially beneath the existing canopy.



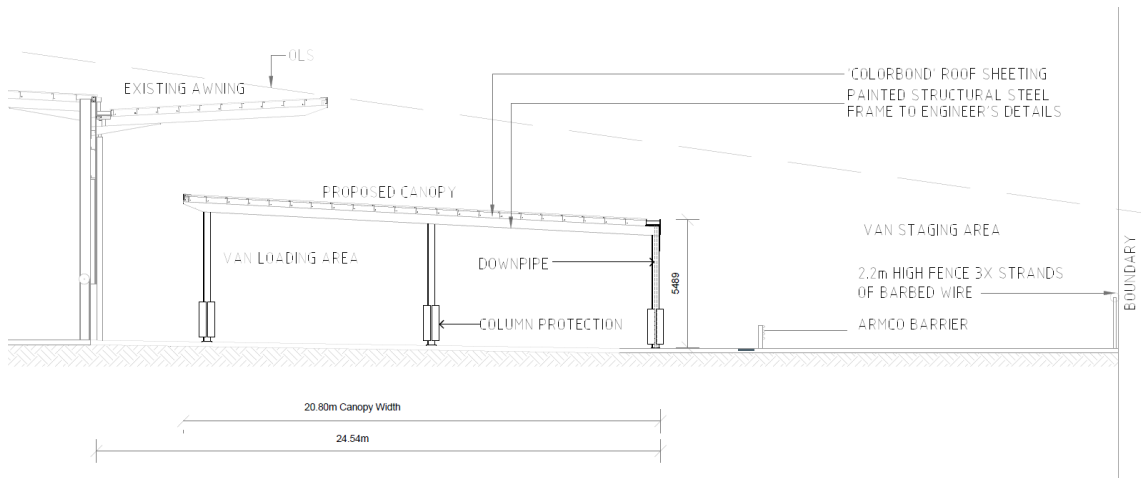
**Figure 1 - Aerial photograph of Bankstown Airport. The location of the warehouse and is marked in green. North is to the top of the image. Image accessed from Nearmap, on 10 October 2023.**

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<sup>1</sup> Heights and elevations are relative to local ground level.



**Figure 2 - Detailed plan view of the proposed awning (marked in blue). Image reproduced from (SBA Architects, 2024) with added markings to highlight the awning.**



**Figure 3 - Cross section of the proposed canopy extension. Image reproduced from (SBA Architects, 2024).**

## Determination if an assessment is required

Our assessment begins with an examination of all five runways against the following NASF B criteria to determine which runways require assessing in detail:

- 1) 'within the assessment trigger area' (DIRD, 2018) Paragraph 49 which is used to identify buildings that could pose a safety risk against three assessment distances:
  - a) <1200 m perpendicular distance<sup>2</sup> from runway centreline;
  - b) <900 in front of runway threshold; and
  - c) <500 along runway threshold; and
- 2) '>1:35 height to distance ratio' NASF B (DIRD, 2018) Paragraphs 51, 52 and 53 used to rule out buildings that clearly *will not* pose a risk.

The 'within the assessment trigger area' NASF B (DIRD, 2018) criterion is assessed against three distances (Paragraph 49a, 49b and 49c) as shown in Attachment A. If all three of the assessment distances are satisfied, then the 'within the assessment trigger area' criterion is satisfied.

The relevant assessment distances were calculated as summarised in Table 1. These distances show that the proposed hangar is within the assessment trigger area for all three runways, and hence requires assessment.

**Table 1 – 'Within assessment trigger area' assessment criteria summary.**

NASF B	Para 49a		Para 49b		Para 49c		All three distance criteria satisfied?
	Distance (m)	<1200 m?	Distance (m)?	<900 m?	Distance (m)?	<500 m?	
Runway	<1200 m from runway centreline <sup>3</sup> ?		<900 in front of runway threshold <sup>4</sup> ?		<500 along runway threshold <sup>5</sup> ?		
11L/29R	120	YES	N/A	YES	300	YES	YES
11C/29C	230	YES	N/A	YES	300	YES	YES
11R/29L	335	YES	N/A	YES	200	YES	YES

The '>1:35 height to distance area' criterion, referred to in (DIRD, 2018) Paragraphs 51, 52 and 53, was assessed by calculating the ratio of building height to the perpendicular distance to each runway, with building height referenced to the local ground level.<sup>6</sup> As summarised in Table 2, Runway 11L/29R does not satisfy the '>1:35 height to distance ratio', and hence requires further assessment.

<sup>2</sup> Measured from the closest point of proposed building to the runway centreline in a direction perpendicular to the runway centreline.

<sup>3</sup> Measured from the closest point of building to the runway centreline in a direction perpendicular to the runway centreline.

<sup>4</sup> Measured along the runway centreline from the closest point of building in the landside direction.

<sup>5</sup> Measured along the runway from the closest point of building in the airport direction.

<sup>6</sup> The 1:35 ratio in NASF B Paragraph 51, 52 and 53 references the building height relative to the runway level and will hence increase the distance to height ratio for buildings on lower ground, or decrease it for buildings built on higher land. In the case of the gentle topology at Bankstown Airport, the width, length and strength of the building wake will not be materially affected by changes in relative level of the building Site and the runway as the air flow will be parallel to the ground level. In cases such as this building height referenced to local ground level is more relevant for assessment of potential turbulence and wind shear effects.

**Table 2 – '>1:35 height to distance ratio' assessment criteria summary.**

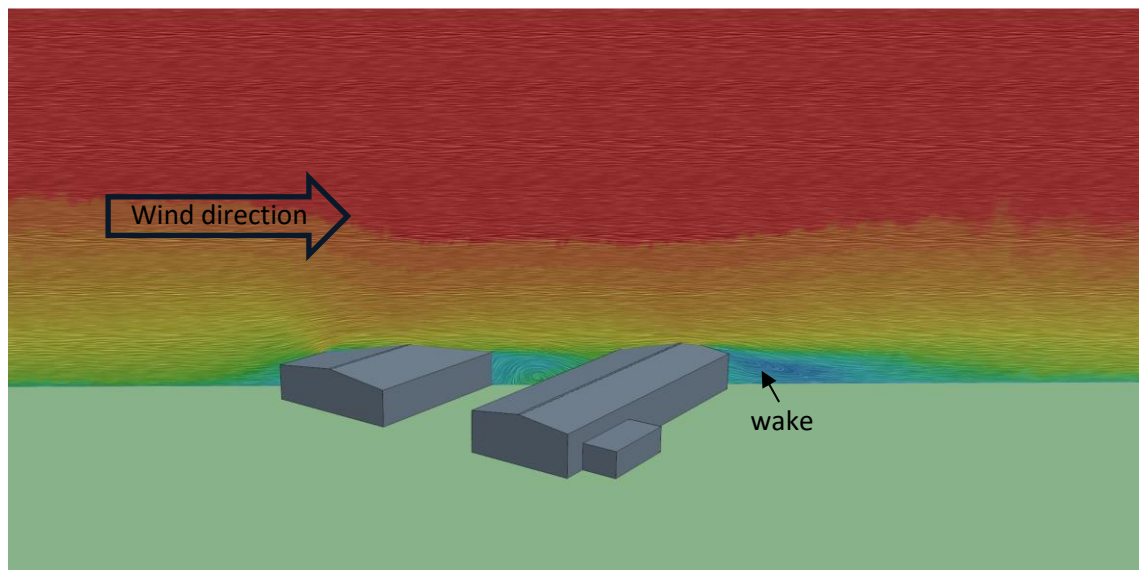
Runway	Distance <sup>1</sup> to runway centreline (m)	Building height (m)	Distance to height ratio	> 1:35 height to distance ratio satisfied?
11L/29R	120	6.4	19	NO
11C/29C	230	6.4	36	YES
11R/29L	335	6.4	52	YES

### Assessment methodology

This desktop assessment considers both the windshear and turbulence generated by the proposed awning. The assessment criteria in the latest draft of NASF B (DIRD, 2018), as summarised in Attachment A, have been applied where possible. Our expert judgement and experience with similar assessments has been employed where necessary.

### Analysis

The proposed awning has the potential to generate windshear and turbulence. However, for wind directions of relevance to aircraft taking off and landing at Bankstown Airport, the proposed canopy extension will lie within the wake (e.g., Figure 4) of the existing building and will therefore not materially affect the wind shear and turbulence experienced by aircraft using the subject runways.



**Figure 4 - An example of the wake that occurs downwind of a building. Image taken from a previous Synergetics study.**

## Concluding comments

Windshear and turbulence levels experienced by aircraft using Bankstown Airport's runways are not expected to be materially affected by the proposed awning.

Regards,



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BE (Hons) BSc MEngSc PhD  
Principal Modelling Engineer

## References

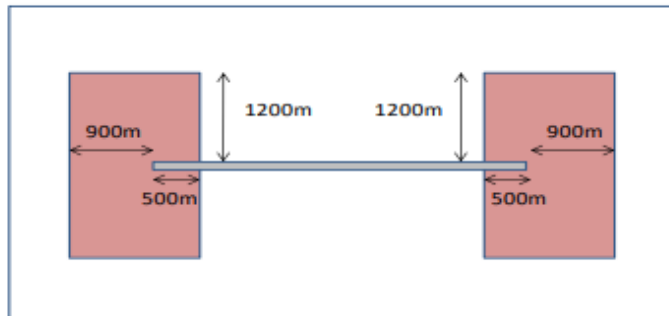
DIRD. (2018). *NASF Guideline B Managing the risk of building generated windshear and turbulence at airports.*

SBA Architects. (2024). *DNS5- Bankstown drawing set - 23221 - DNS5, 23 Feb 2024.*



## Attachment A – NASB B summary (DIRD, 2018)

49. Buildings that could pose a safety risk are those located within a rectangular 'assessment trigger area' around the runway ends (see Figure 1, below):
- 1200m or closer perpendicular from the runway centreline (or extended runway centreline<sup>1</sup>);
  - 900m or closer in front of runway threshold (towards the landside of the airport); and
  - 500m or closer from the runway threshold along the runway.



**Figure 1: Assessment trigger area around runways, within which buildings should be assessed**

### Mitigation of risk by use of a height limitation surface

51. For buildings within the assessment trigger area, the first step is to consider the height of the building to determine its acceptability. The rule adopted in Australia is based on one developed in the Netherlands. This proposes that buildings should not penetrate a 1:35 surface extending perpendicular from the runway centreline (or extended runway centreline within the assessment trigger area). As the 1:35 surface extends from the runway centreline, when considering buildings against the 1:35 surface the building height should be measured above runway level.
52. In other words, the distance from the runway centreline to the closest point of the building should be more than 35 times the height (above runway level) of the building. Thus, a building with a height of 10 metres would be acceptable if it is located more than 350 metres perpendicular from the runway centreline (or extended runway centreline) and a building with a height of 20 metres would need to be located more than 700 metres from the runway centreline (or extended runway centreline).
53. The 1:35 surface can be applied to rule out buildings that will clearly not pose a risk. This will therefore be the first test that will be applied when approval authorities/decision makers are presented with a building to assess within the trigger area. This approach will enable the vast majority of developments at regional airports to be assessed very quickly. The 1:35 surface is very conservative and any building that does not penetrate the surface is not expected to create unsafe wind effects.