

CALDERWOOD MODIFICATION 4

NOISE ASSESSMENT

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VERSION A

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GLOSSARY OF ACOUSTIC TERMS

Most environments are affected by environmental noise which continuously varies, largely as a result of road traffic. To describe the overall noise environment, a number of noise descriptors have been developed and these involve statistical and other analysis of the varying noise over sampling periods, typically taken as 15 minutes. These descriptors, which are demonstrated in the graph below, are here defined.

Maximum Noise Level (L_{Amax}) – The maximum noise level over a sample period is the maximum level, measured on fast response, during the sample period.

L_{A1} – The L_{A1} level is the noise level which is exceeded for 1% of the sample period. During the sample period, the noise level is below the L_{A1} level for 99% of the time.

L_{A10} – The L_{A10} level is the noise level which is exceeded for 10% of the sample period. During the sample period, the noise level is below the L_{A10} level for 90% of the time. The L_{A10} is a common noise descriptor for environmental noise and road traffic noise.

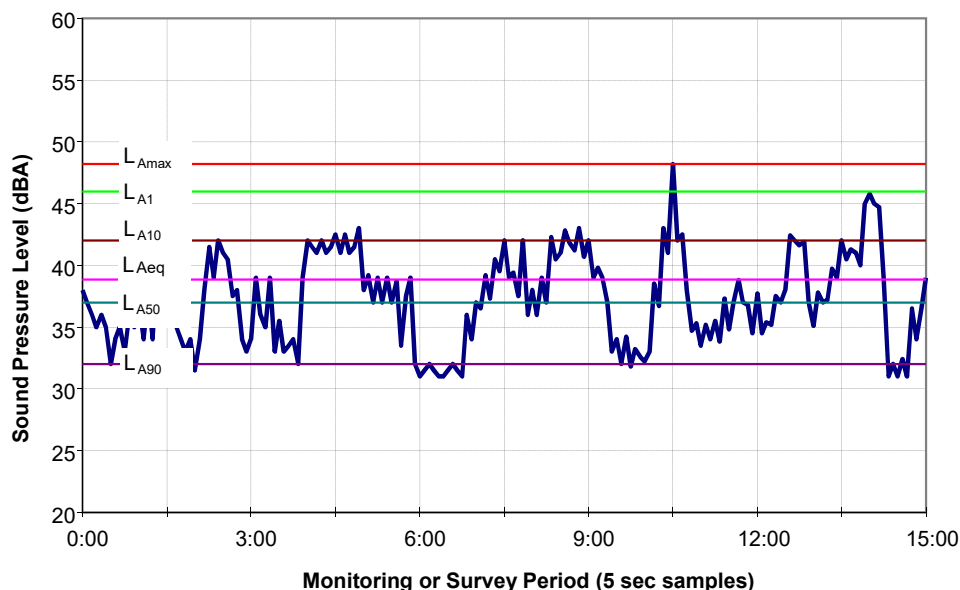
L_{A90} – The L_{A90} level is the noise level which is exceeded for 90% of the sample period. During the sample period, the noise level is below the L_{A90} level for 10% of the time. This measure is commonly referred to as the background noise level.

L_{Aeq} – The equivalent continuous sound level (L_{Aeq}) is the energy average of the varying noise over the sample period and is equivalent to the level of a constant noise which contains the same energy as the varying noise environment. This measure is also a common measure of environmental noise and road traffic noise.

ABL – The Assessment Background Level is the single figure background level representing each assessment period (daytime, evening and night time) for each day. It is determined by calculating the 10th percentile (lowest 10th percent) background level (L_{A90}) for each period.

RBL – The Rating Background Level for each period is the median value of the ABL values for the period over all of the days measured. There is therefore an RBL value for each period – daytime, evening and night time.

Typical Graph of Sound Pressure Level vs Time



1 INTRODUCTION

This report has been prepared by Wilkinson Murray in response to SEARs to accompany an Environmental Assessment Report (EAR) for a proposed S75W Modification Application to the Calderwood Concept Plan Approval (MP09_0082) (Approved Concept Plan) for the Calderwood Urban Development Project (CUDP).

The Calderwood Urban Development Project is a master planned community development mostly by Lendlease and other private developers.

The CUDP site is located within the Calderwood Valley in the Illawarra Region. It is approximately 700 hectares in area with approximately 107 hectares of land in the Wollongong LGA (15%) and the balance in the Shellharbour LGA (85%). Refer to Location Plan at Figure 1-1 and Concept Plan at Figure 1-2.

The EPA contact officer Paul Wearne was consulted by telephone on Monday 4 June 2018, prior to the issue of the report.

Calderwood Valley is bound to the north by Marshall Mount Creek (which forms the boundary between the Shellharbour and Wollongong LGAs), to the south by the Macquarie Rivulet, to the south-west by Johnston's Spur and to the west by the Illawarra Escarpment. Beyond Johnston's Spur to the south is the adjoining Macquarie Rivulet Valley within the locality of North Macquarie. The CUDP site extends south from the intersection of North Marshall Mount Road and Marshall Mount Road to the Illawarra Highway.

The proposed modification to the Approved Concept Plan seeks to increase the total provision of housing (approximate number of dwellings) within the overall CUDP to respond to market demand for the provision of smaller housing types / lot sizes at affordable price points and to ensure the efficient use of urban zoned land within this context for the supply of housing.

It is proposed to increase the overall number of dwellings to be delivered within the existing area of land zoned R1 General Residential and B4 Mixed Use and also approved for urban development as shown on the Approved Concept Plan from approximately 4,800 to approximately 6,500.

In accordance with the Secretary's Requirements this report has been prepared following consultation with Shellharbour City Council the owner of the Illawarra Regional Airport who provided updated noise data.

The SEARs are summarised below in **16. Noise and Vibration Assessment**

- *Provide an updated acoustic and vibration assessment for the proposed modification, including an assessment of aircraft noise associated with the Illawarra Regional Airport.*

Also, consideration of State Environmental Planning Policy (Infrastructure) 2007 is required, noting that this SEPP includes consideration of noise and vibration on busy roads. Further comments from the EPA have also been considered in preparing this report.

The previous Wilkinson Murray report (Report 09278 Version B, February 2010) only dealt with aircraft noise. This report updates the previous aircraft noise assessment based on communication with the Illawarra Regional Airport and also undertakes an assessment of other comments raised by the EPA where they are considered relevant to the proposal.

There are no known operational vibration sources, so this aspect is not considered further in this report.

Figure 1-1 Location Plan

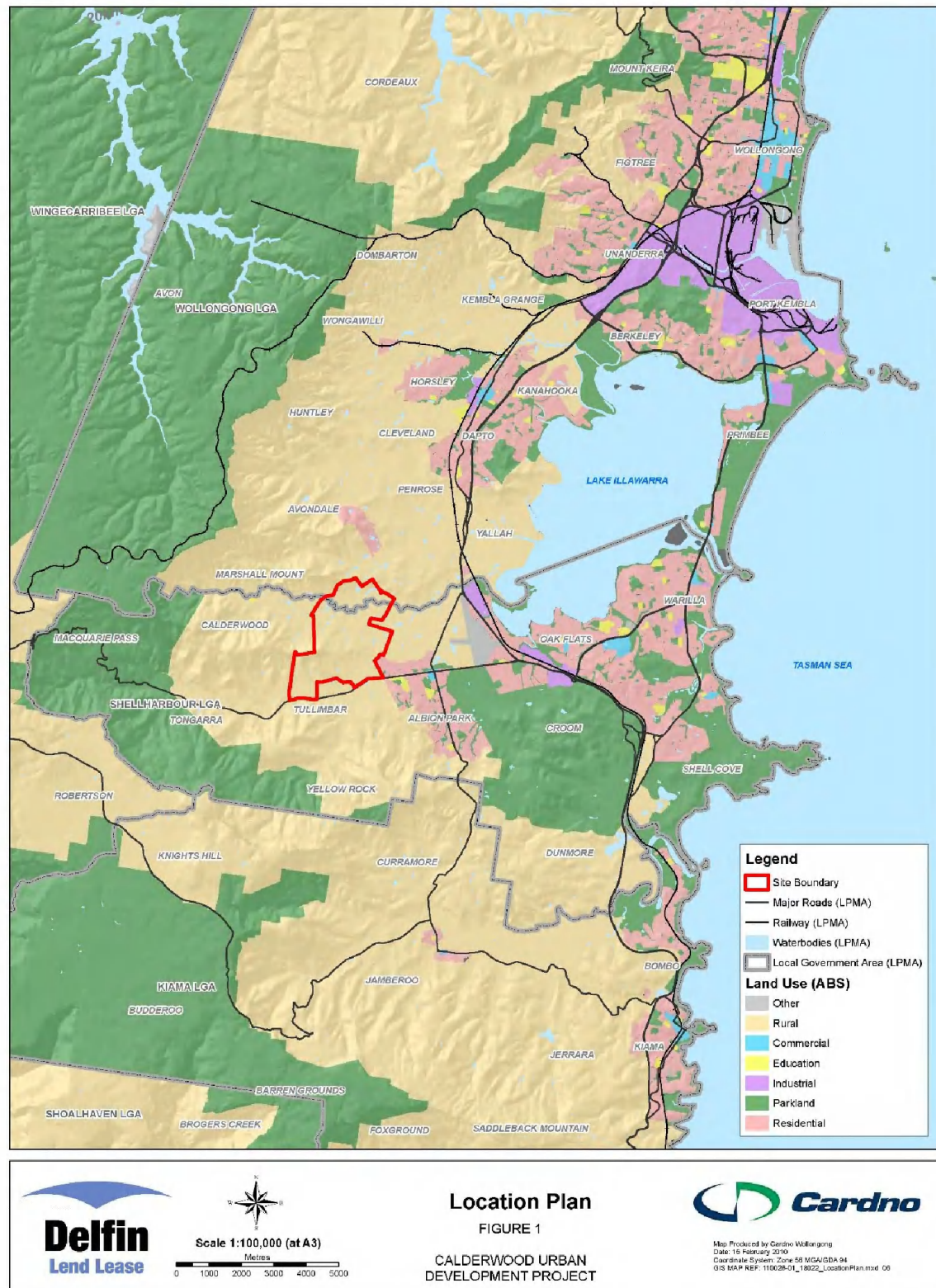
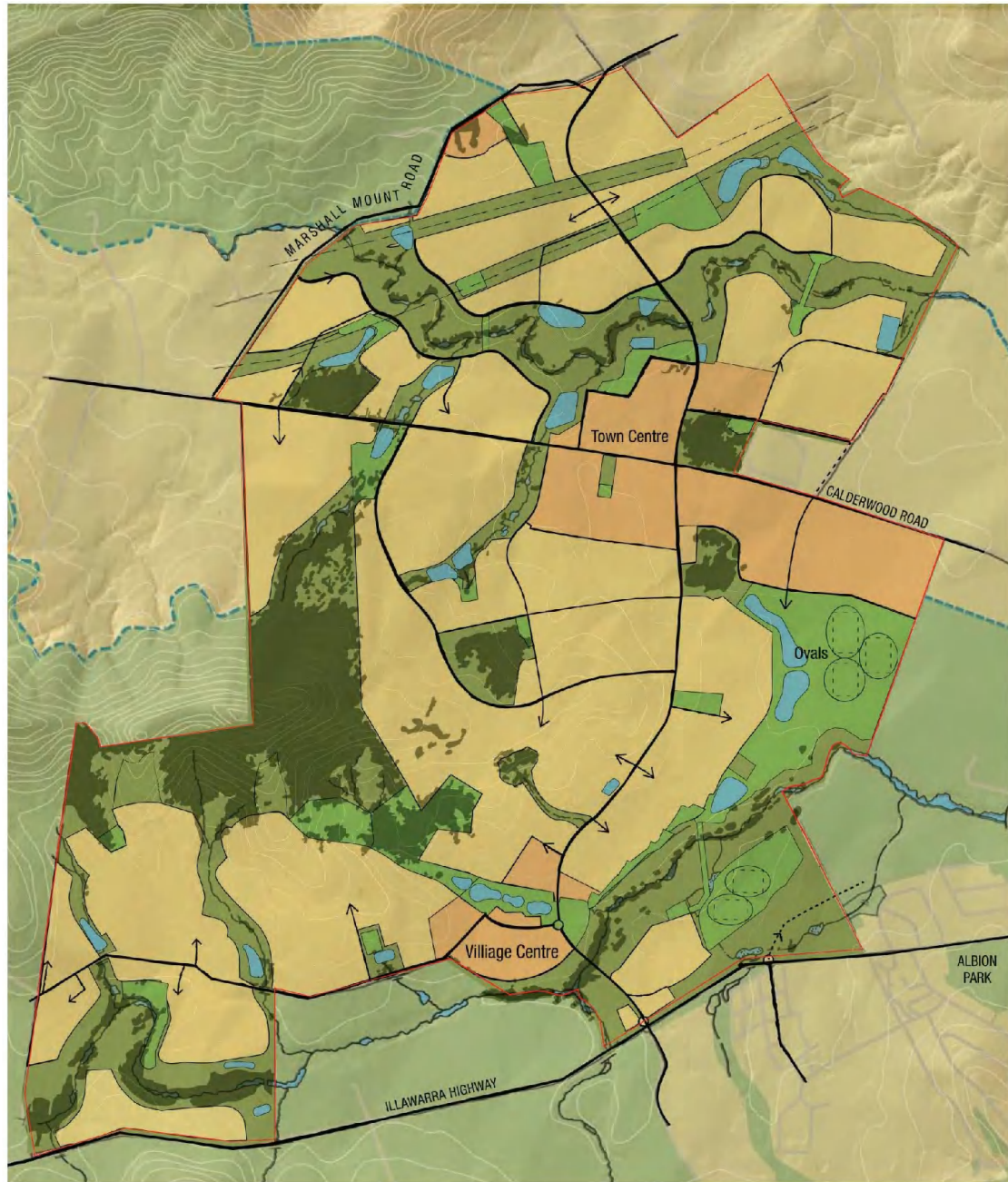
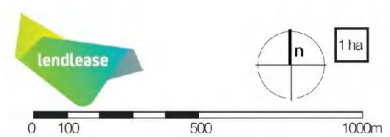


Figure 1-1 Concept Plan



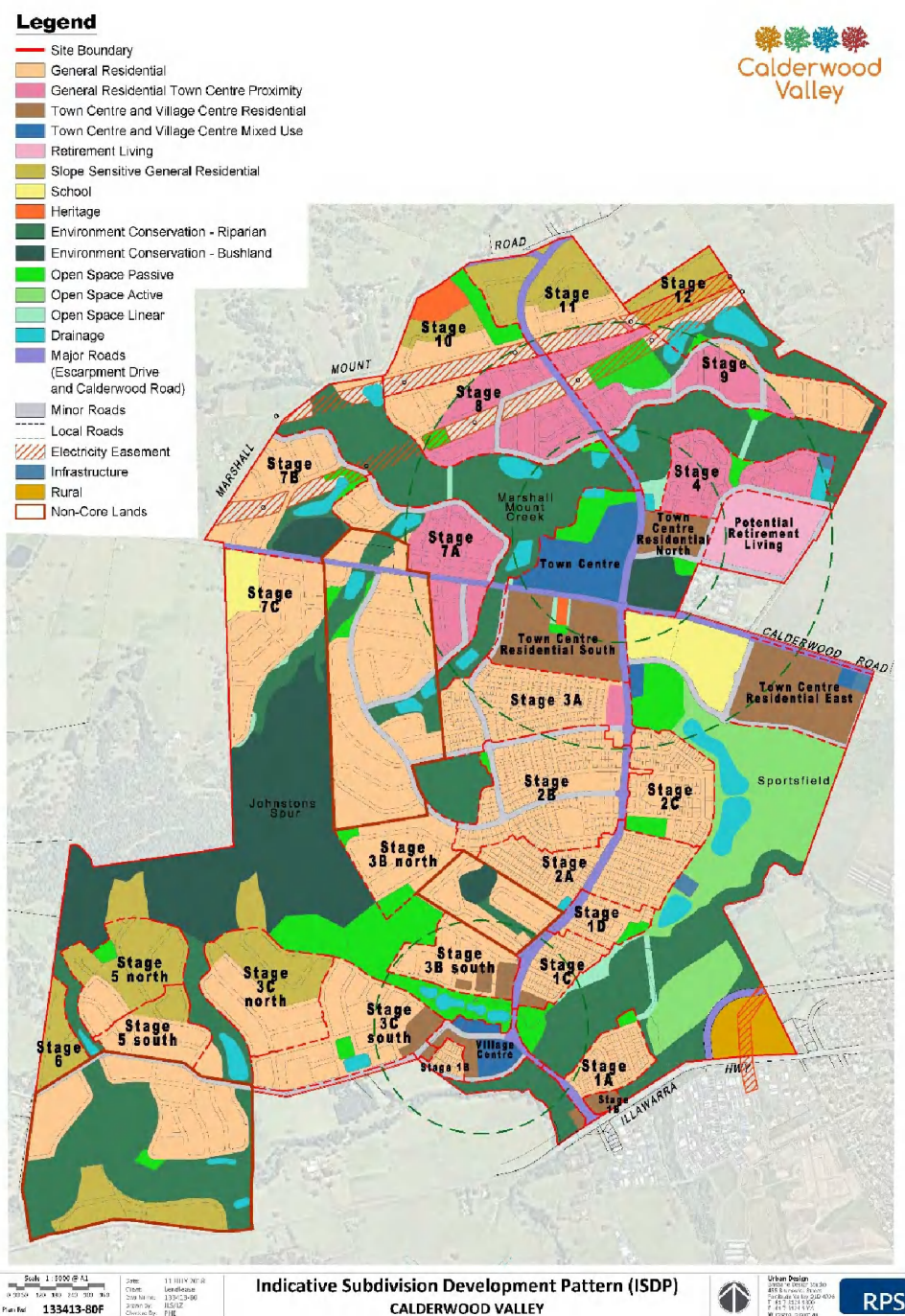
Concept Plan (MOD 4)



Subject to verification and detailed site survey 1:20,000 @ A4 10m Contours July 2018

The proposed development is illustrated on Figure 2-1 and shows the concept for the development which includes areas allocated to residential uses, mixed use areas, educational facilities and employment areas. The residential areas up to Stage 3A are approved and are either developed and occupied or under construction. To date, Lendlease has sold 1,100 lots in those stages, with development applications lodged for Stages 3B South and 3C. The later stages and Town Centres are yet to be developed.

Figure 2-1 Indicative Layout Plan



3 AIRCRAFT NOISE

3.1 Introduction

Aircraft noise can become a source of community disturbance in residential areas near airports. Land-use planning provides a means of reducing potential aircraft noise impact, by restricting the development of land affected by aircraft noise to uses that suit the forecast level of noise exposure. Potential noise impact on Calderwood Urban Development Area from IRA is initially assessed in the following Sections.

With respect to noise, the development has been assessed primarily in accordance with the Australian Standard 2021-2015 *Acoustics – Aircraft Noise Intrusion – Building siting and construction* (AS 2021).

The Australian Noise Exposure Forecast (ANEF) aircraft noise descriptor was developed to provide guidance to land-use planning authorities to assist in the decision-making process. It is aimed at controlling inappropriate urban encroachment on airports. AS 2021 uses the ANEF values to determine land use compatibility for various building types within the vicinity of an Airport.

3.2 Australian Standard 2021-2015

From a land use planning perspective, Table 2.1 of AS 2021 provides zoning information for sites subjected to aircraft noise. The table lists three ANEF Zones, namely, 'Acceptable', 'Conditional' and 'Unacceptable', and recommends suitable ANEF levels for different types of buildings. Table 2.1 from AS 2021 is reproduced as Table 3-1 below, as relevant to various land use zones.

Table 3-1 Building Site Acceptability Based on ANEF Zones (Table 2.1 – AS 2021)

Building Type	ANEF Zone of Site		
	Acceptable	Conditional	Unacceptable
House, home unit, flat, caravan park	Less than ANEF 20 ¹	20 to 25 ANEF ²	Greater than 25 ANEF
Hotel, motel hostel	Less than ANEF 25	25 to 30 ANEF	Greater than 30 ANEF
School, university	Less than ANEF 20 ¹	20 to 25 ANEF ²	Greater than 25 ANEF
Hospital, nursing home	Less than ANEF 20 ¹	20 to 25 ANEF	Greater than 25 ANEF
Public building	Less than ANEF 20 ¹	20 to 30 ANEF	Greater than 30 ANEF
Commercial building	Less than ANEF 25	25 to 35 ANEF	Greater than 35 ANEF
Light industrial	Less than ANEF 30	30 to 40 ANEF	Greater than 40 ANEF
Heavy industrial	Acceptable in all ANEF zones		

Notes: 1. The actual location of the ANEF 20 contour is difficult to define accurately, mainly because of variation in aircraft flight paths.

2. Within ANEF 20 to ANEF 25, some people may find that the land is not compatible with residential or educational uses. Land use authorities may consider that the incorporation of noise control features in the construction of residences or schools is appropriate.

In Acceptable zones there is usually no need for the building construction to provide protection specifically against aircraft noise. However, it should not be inferred that aircraft noise will not be noticeable outside the ANEF 20 contour. Other descriptors describe the number of times per day a noise level from aircraft overflight will be above a certain noise level. For example N70 = 20 is the contour where 20 flights per day are expected to be at or above 70dBA. A combination N60 and N70 descriptors are used to better describe this aspect.

In conditional zones the maximum aircraft noise levels for the relevant aircraft and the required noise reduction should be determined from the procedures of Clause 3.1 and 3.2 of AS 2021, and the aircraft noise attenuation to be expected from the proposed construction should be determined in accordance with Clause 3.3.

In unacceptable zones, construction of the proposed development should not normally be considered. In no case should new development take place in 'greenfield' sites deemed unacceptable because such development may impact on planned airport operations.

3.3 Illawarra Regional Airport – ANEC/ANEF Contours

The Illawarra Regional Airport is a security controlled, licensed airport that is owned and operated by Shellharbour City Council under the control of Civil Aviation Safety Authority (CASA). It is the base for a growing light aeronautics industry, which provides maintenance and engineering services for aircraft ranging from ultra-light to medium size turbo prop and jet aircraft.

Contours for the Airport were provided to assist in the Calderwood Environmental Assessment. This included an undated document entitled ANEF Noise Contours and a January 2010 report prepared by AMPC entitled Illawarra Regional Airport Stage 1 Flight Operational Capacity Study Aircraft Noise Technical Report.

This document contains a number of ANEC contours for the year 2008 and two options for a year 2026/27. The report also includes N60 and N70 contours which relate to the number of events per day above either 60 or 70dBA. N60 is normally used to address flights at night-time and N70 flights at daytime.

The current ANEF / ANEC contours have been plotted as a composite contour on an aerial photo representing the greatest potential impacts to conduct an assessment of potential land use conflicts (Figure 3-1).

The current N60/N70 = 10 contours have also been plotted as a composite contour on an aerial photo. This information is normally used to better describe the impacts from new or a change in aircraft noise (Figure 3-1).

3.4 Review of Potential Aircraft Noise Impacts

A review of the ANEF contours in relation to the Calderwood Urban Development Project site, as shown in Figure 3-1, indicates that according to AS 2021 it is outside the ANEF 20 contour and as such acceptable for development of all building types without the need for acoustic mitigation measures.

For information purposes, a review of the composite N60 and N70 future contours indicate that there are less than 10 flights per day above 70dBA, but in the eastern part of the site there may be some areas where there will be 10 flights per day above 60dBA. This primarily affects the Town Centre East precinct but is not of sufficient magnitude to require acoustic mitigation measures, although future residents should expect some overflight and may individually wish to address aircraft noise.

Figure 3-1 Composite ANEF/ANEC Contours

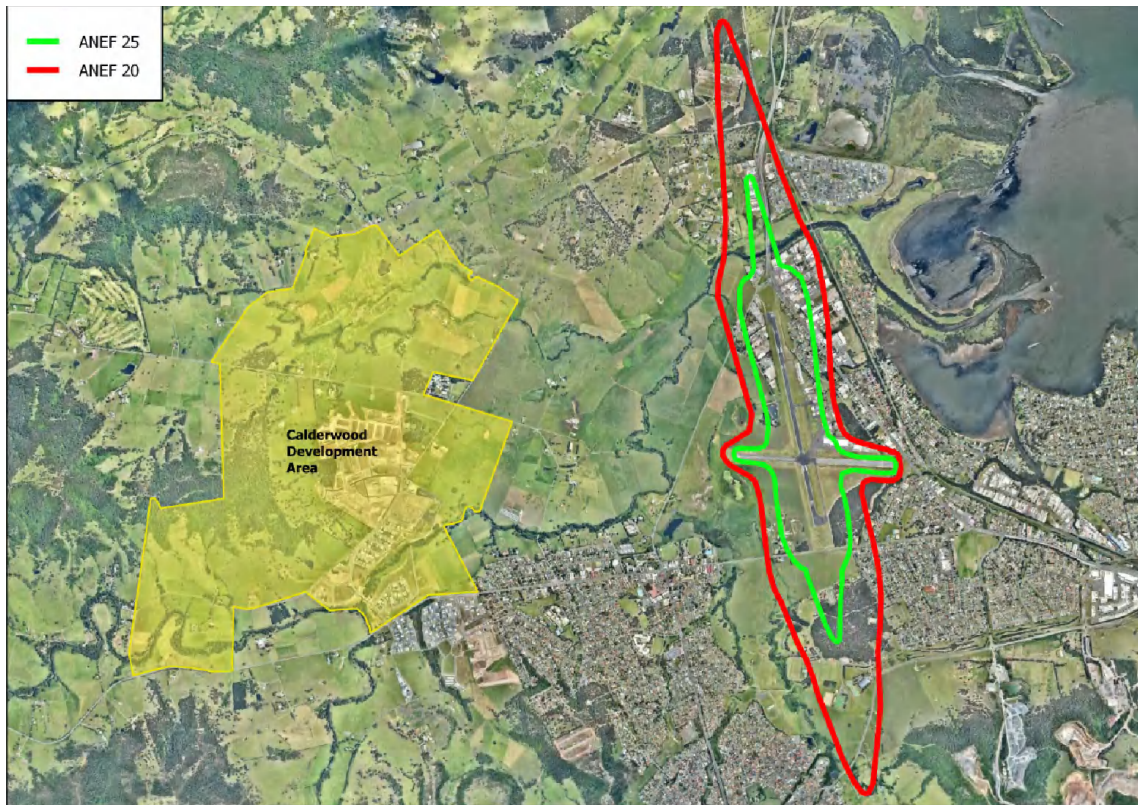
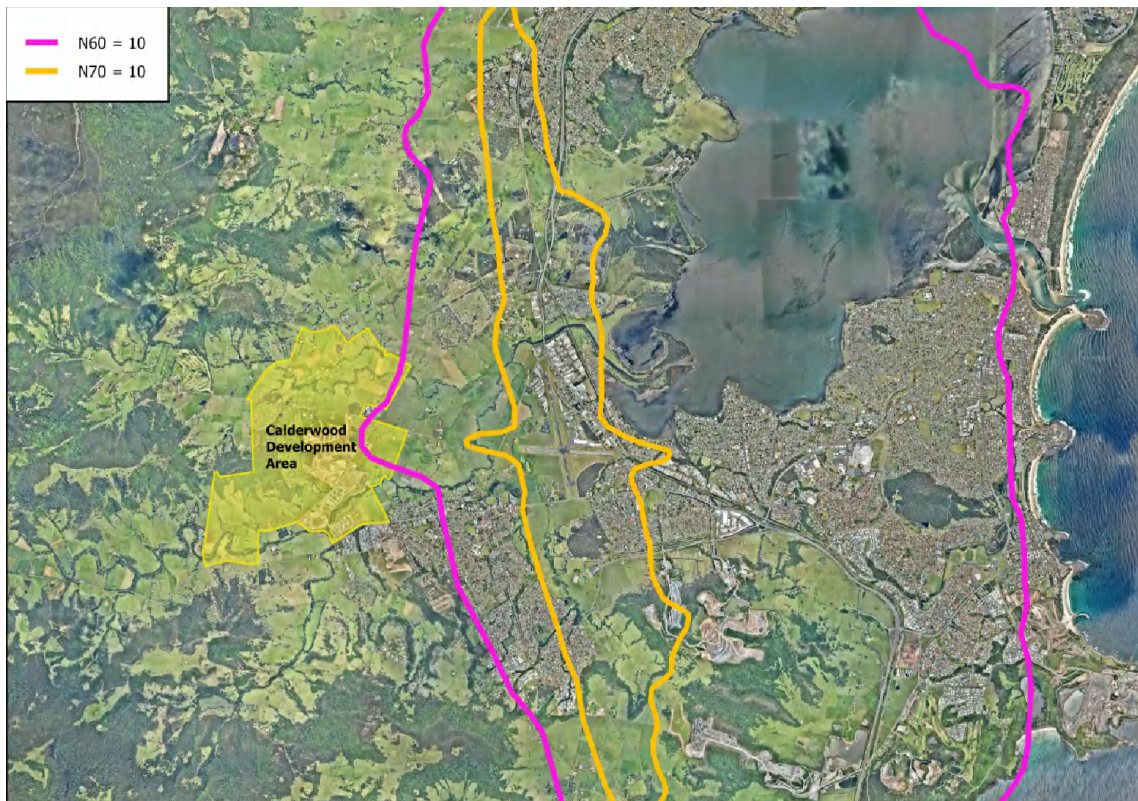


Figure 3-2 Composite N60 & N70 = 10 Contours



4 TRAFFIC NOISE

The SEARS require consideration of traffic noise in relation to the iSEPP. The iSEPP also calls up consideration of the DoPE *Development Near Rail Corridors and Busy Roads – Interim Guideline*. There is also the requirement to consider the Road Noise Policy.

There are two roads through the development which have the highest traffic volumes, particularly post development. These are Escarpment Drive, which runs north south connecting the Illawarra Highway with Marshall Mount Road via the Town Centre and Calderwood Road which primarily runs east west via the Town Centre and shown in Figure 4-1. The traffic volumes along portions of these roads are predicted to be in the order of 10-15,000 vehicles per day (vpd) by 2036.

Figure 4-1 Major Roads



The predicted traffic volumes don't trigger the 40,000 vpd where an iSEPP assessment is required or even the 20,000 vpd where assessment is recommended.

Nevertheless, traffic noise has been considered as part of the master planning process and where feasible and reasonable mitigation measures included in the DoPE *Development Near Rail Corridors and Busy Roads – Interim Guideline* and the EPA *Road Noise Policy* should be adopted. Detailed assessment of this guideline will occur in relation to each of the subsequent development applications to follow in relation to each of the stages of development.

The iSEPP provides screening tests for single dwelling/dual occupancy (1a), as well as multi dwelling residential (3a) to allow the proposed residential construction to be determined.

Screen Test 1(a) – Habitable Areas 60/70 km/h

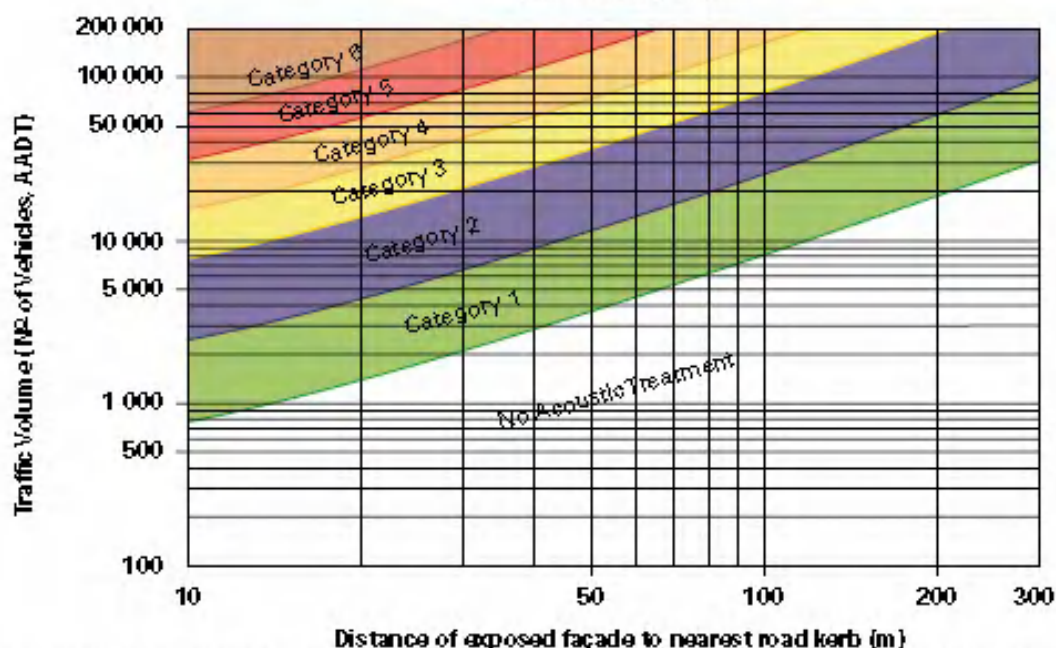


Figure 3.3(a): Screen tests for habitable areas of single/dual occupancy dwellings (if any exposed façade is direct line-of-sight)

Screen Test 2(a) – Habitable Areas 60/70 km/h

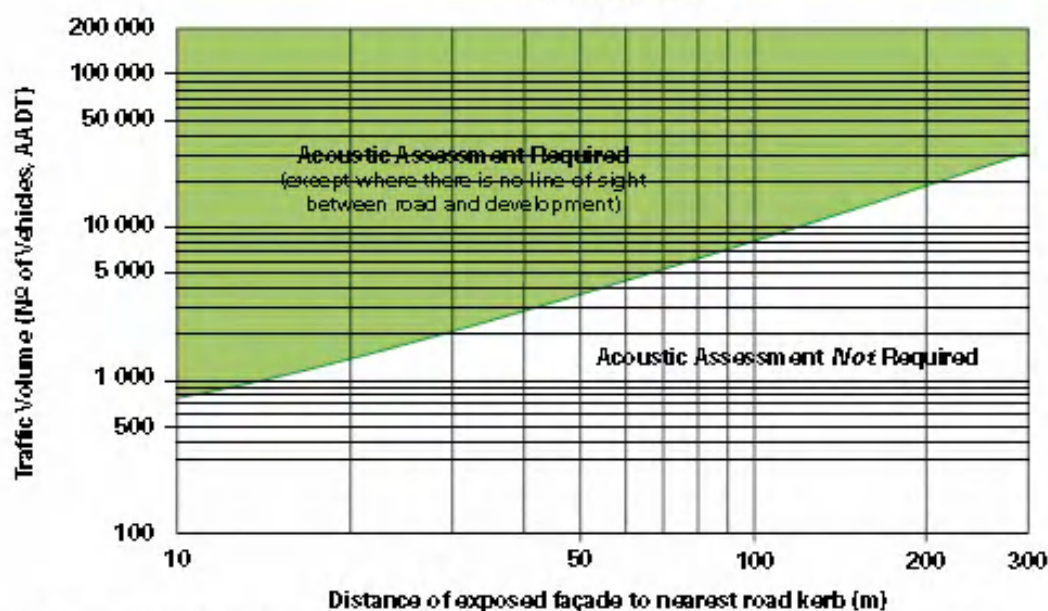








Figure 3.4(a): Screen tests for habitable areas of multiple dwellings (noting that any exposed façade is direct line-of-sight)

At Calderwood, some single occupancy dwellings may fall into Category 3 buildings and the multi dwelling require acoustic assessment.

The acoustic performances assumed of each building element in deriving the Standard Constructions for each category of noise control treatment presented in the preceding Table, are presented below in terms of Weighted Sound Reduction Index (R_w) values, which can be used to find alternatives to the standard constructions presented in this Appendix:

Category of Noise Control Treatment	R _w of Building Elements (minimum assumed)				
	Windows/Sliding Doors	Frontage Facade	Roof	Entry Door	Floor
Category 1	24	38	40	28	29
Category 2	27	45	43	30	29
Category 3	32	52	48	33	50
Category 4	35	55	52	33	50
Category 5	43	55	55	40	50

Deemed to comply constructions for dwellings are summarised below. In some locations property boundary fences may be used to reduce external noise levels, most likely at ground floor level, which would reduce requirements for building construction and improve amenity in private open space.

Category No.	Building Element	Standard Constructions	sample
3	Windows/Sliding Doors	Openable with minimum 6.38mm laminated glass and full perimeter acoustic seals	
	Frontage Facade	Brick Veneer Construction: 110mm brick, 90mm timber stud or 92mm metal stud, minimum 50mm clearance between masonry and stud frame, 10mm standard plasterboard internally.	
		Double Brick Cavity Construction: 2 leaves of 110mm brickwork separated by 50mm gap	
	Roof	Pitched concrete or terracotta tile or sheet metal roof with sarking, 1 layer of 13mm sound-rated plasterboard fixed to ceiling joists, R2 insulation batts in roof cavity.	
	Entry Door	45mm solid core timber door fitted with full perimeter acoustic seals	
	Floor	Concrete slab floor on ground	

5 CONSTRUCTION NOISE & VIBRATION

The staging of development and noise implications have been considered. This means that future stages are being developed while recently completed stages are occupied.

We consider construction noise should comply with the requirements of the EPA *Interim Construction Noise Guideline (ICNG)*. Vibration should be considered in accordance with the EPA *Vibration – A Technical Guideline*.

For daytime activities this requires all feasible and reasonable mitigation measures to be considered and establishes a Noise Management Level of 10dB above the Rating Background Level (RBL). The *ICNG* also establishes a Highly Noise Affected Level ($L_{Aeq,15min}$) of 75dBA.

Construction noise Sound Power Levels for major earthworks are likely to fall in the range of 110-115dBA. The highly affected noise levels will be achieved beyond approximately 30-40m set back. Achieving the Noise Management Level will depend on future background noise levels once the areas are developed. However, it is common when major construction is in close proximity to residences that the Noise Management Level may be exceeded at times.

Construction is not expected to involve activities which generate high levels of vibration or if those activities are required they are unlikely to occur in close proximity (less than 20m) from occupied parts of the development.

It is recommended that Construction Environmental Management Plans and conditions of development consent in relation to any of the future development applications address noise and vibration and identify all feasible and reasonable noise mitigation and management measures.

6 MIXED USE ZONES

The town centre and village centre may have new commercial/retail and residential uses in close proximity to each other. Adopting a standard intrusiveness or sleep disturbance assessment approach in these precincts is not appropriate and either the amenity criteria or a specific masterplan should address potential noise impacts. In particular, dealing with the location and hours of operation of loading docks and retail premises (such as restaurants and pubs with outdoor dining and particularly with music) need careful consideration.

This approach is critical so that other approval requirements (such as liquor licenses) are documented to satisfy the masterplan and not standard Council or Liquor and Gaming NSW requirements.

7 CONCLUSION

Noise from aircraft, traffic and construction has been assessed at the proposed Calderwood Urban Development Project site.

A review of aircraft noise concluded that the site falls outside the ANEF20 contour for Illawarra regional Airport is acceptable for development of all building types without any additional noise mitigation. However, the site will experience some overflight and aircraft noise will be audible at times.

A review of traffic volumes indicates the major sub arterial roads are not predicted to carry more than 20,000 vehicles per day, so do not require consideration of the internal noise levels nominated in the iSEPP. However, guidance is given for appropriate residential construction for dwellings which front these busier roads and a map showing the portions of these roads should be included in the Development Control Strategy to guide future assessment of development applications for future stages.

Construction noise affecting the already occupied parts of the site has the potential to cause annoyance. Whilst no receivers are expected to be Highly Noise Affected, it is recommended that the Construction Environmental Management Plans and conditions of future development applications considers feasible and reasonable noise mitigation and management measures.

Recommendations have been made to consider noise in the mixed-use zones from commercial activities in close proximity to residences within the same zones and buildings. This can be achieved through careful design and establishing specific noise criteria for these zones, something that should be included in the Development Control Strategy for the precinct