HEGGIES

Incorporating

Eric Taylor Acoustics

REPORT 70-1306

Revision 0

# Interlink Industrial Estate - Development of Lots 1,2 & 5

# Noise Impact Assessment

PREPARED FOR

Goodman International LTD
Level 10, 60 Castlereagh Street
Sydney NSW 2000

19 OCTOBER 2007

# Interlink Industrial Estate - Development of Lots 1,2 & 5

# Noise Impact Assessment

PREPARED BY:

Heggies Pty Ltd
ABN 29 001 584 612
15 Dundas Court Phillip ACT 2606 Australia
(PO Box 4216 Weston ACT 2611 Australia)
Telephone 61 2 6202 3900 Facsimile 61 2 6202 3999
Email canberra@heggies.com Web www.heggies.com



DOCUMENT CONTROL

| Reference | Status | Date | Prepared | Checked | Authorised |
|---|---|---|---|---|---|
| 70-1306 | Revision 0 | 19 October 2007 | Nicholas Uzubalis | Jerremy Lofts | Jerremy Lofts |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |

**EXECUTIVE SUMMARY**

Heggies Pty Ltd (Heggies) has been commissioned by Goodman International Ltd, to conduct a noise impact assessment for a proposed Interlink Industrial Estate. This report presents the results and findings of the noise assessment including consideration of construction, road traffic and operational noise from the proposed development.

Ambient noise monitoring program was based on previous nearby projects conducted by Heggies in 2003. Ambient noise levels were monitored at two separate locations, considered to be representative of the nearest potentially affected receivers. The objective of this survey was to measure $L_{A90(period)}$ and $L_{Aeq(15minute)}$ noise levels at the nearest potentially affected residential locations during the day, evening and night-time periods to enable the determination of the intrusiveness and amenity criteria for the proposed development.

## OPERATIONAL NOISE PREDICTIONS

A computer model was used to predict noise emissions from the industrial estate. The Environmental Noise Model (ENM) used has been produced in conjunction with the Department of Environment and Climate Change (DECC). Noise levels were predicted for the general operational scenario summarised in Section 6.5.1.

Operational noise levels are predicted meet the project specific noise criteria at all nearby residential receivers under calm and prevailing weather conditions. In addition, noise levels at the Mamre Christian College and Trinity Catholic Primary Schools are predicted to meet the acceptable project specific noise criteria and predicted noise levels are below the recommended maximum amenity level during all periods.

Since the operational scenario modelled is likely to represent an acoustically worst-case scenario, actual operational noise levels from Interlink Industrial Estate operation are likely to be less than those predicted.

## SLEEP DISTURBANCE ASSESSMENT

It is calculated that under normal operational conditions there is minimal risk of sleep disturbance to surrounding residences. The highest $L_{Amax}$ noise level at any residential area is predicted to occur when sudden metal on metal impact and truck reversing alarms occur. Such events are predicted to result in a $L_{Amax}$ level at the nearest receiver of 40dBA. Hence, predicted noise levels meet the recommended sleep disturbance noise goal of $L_{Amax}$ 49 dBA.

## ROAD TRAFFIC NOISE ASSESSMENT

The increase in traffic noise due to the proposed Interlink Industrial Estate will be negligible once the construction phase is complete. It is however expected that during construction there will be some additional vehicle traffic along Mamre Road. According to the US Federal Highway Predicted traffic during the construction phase of the proposed warehouse(s) will result in an increase in traffic noise of less than 1dBA. This increase is unlikely to be perceptible to residential receivers along Mamre Rd. Hence, the inclusion of industrial estate related traffic is predicted to meet the requirements of the Environmental Criteria for Road Traffic Noise (ECRTN).

## CONSTRUCTION NOISE ASSESSMENT

Construction noise levels are predicted to be below the relevant noise goals at residential receivers. Noise from land clearing and heavy earth moving equipment has been modelled operating at the edge of the proposed warehouse site to represent the acoustically worst case scenario.

**TABLE OF CONTENTS**

**TABLE OF CONTENTS**

# 1 INTRODUCTION

Heggies Australia Pty Ltd (Heggies) has been commissioned by Goodman International Ltd to conduct a noise impact assessment for the proposed Interlink Industrial Estate. This report presents the results and findings of the noise assessment including consideration of construction, road traffic and operational noise from the proposed development.

Broadly, the objective of the noise assessment was to identify the potential impacts of noise from the proposed development, including construction and operation of the facility, and to provide advice with regard to effective mitigation strategies where necessary.

The noise assessment has been prepared with reference to Australian Standard AS 1055:1997 *Description and Measurement of Environmental Noise* Parts 1, 2 and 3 and in accordance with the Department of Environment and Climate Change (DECC) NSW Industrial Noise Policy (INP). Reference has also been made to the NSW Environmental Criteria for Road Traffic Noise (ECRTN). Where issues relating to noise are not addressed in the INP, such as sleep disturbance, rail traffic noise and construction noise goals, reference has been made to the NSW Environmental Noise Control Manual (ENCM).

# 2 PROJECT DESCRIPTION

## 2.1 Project Details

The proposed Interlink Industrial Estate development consists of 4 warehouses of varying size to be operated by 4 different companies. Each warehouse has an associated loading dock and an unloading area. The Estate is to be in operation 24 hours per day and will have heavy vehicles operating on site.

## 2.2 Acoustically Significant Plant and Equipment

Acoustically significant plant and equipment to be used on site, and the associated sound power levels, are provided in **Table 1**. To simulate manufacturing within building 2, we have provided noise levels from a Heggies database of an operation involving heavy metal fabrication. While we now understand that the manufacturing will be primarily cardboard carton construction, we have retained the heavy manufacturing noise levels in the noise model. This being the case, the predictions do represent worst-case conditions that are unlikely to be exceeded.

Table 1 Warehouse Operation Sound Power Levels

| **Plant and Equipment** | **$L_{Aeq}$ Sound Power Level*** |
|---|---|
| Trucks unloading and loading | 94 dBA |
| Gas powered fork lifts | 98 dBA |
| **Building 2 Heavy Manufacturing** | |
| Aluminium Saw | 107 |
| 60 t geared press | 114 |
| 240 t press | 112 |
| Tube Cutting | 98 |
| Guillotine | 108 |
| Lathe - metal | 102 |
| Grinder | 106 |

## 2.3 Hours of Operation

The Industrial Estate will be in operation operates 24 hours a day, 7 days per week.

## 2.4 Transportation

All road transport to the Industrial Estate access the site via Mamre Rd which connects Elizabeth Road to the M4 Motorway and the Great Western Highway. It is a two lane dense graded asphalt road with moderate to heavy traffic throughout the day period including moderate heavy vehicle use. The road off Mamre Rd to access the warehouse site only services those facilities and thus experiences light traffic flow.

# 3 SITE DETAILS

The site is situated on development lots 1, 2 and 5, Mamre Road in the suburb of Erskine Park, Western Sydney. To the immediate south of the site are the proposed Kimberly Clark and Woolworths Warehouses (currently under preconstruction), major Sydney water pipelines and two local Schools; The Mamre Christian College and Trinity Catholic Primary. To the immediate north of the site are ReadyMix Concrete plant and other industrial facilities. To the immediate east of the site is Bio Diversity land.

The Estate site is bounded primarily by industrial or Crown land areas including the following land uses;

- North by Readymix Concrete, other warehouses and industrial facilities. Suburb of Erskine Park and St Clair in the distance;
- East by Biodiversity land;
- West by Mamre Road and rural areas; and
- South by Kimberly Clark and Woolworths Proposed warehouse Sydney water pipeline, two local Schools, a retirement village and rural land.

The area around the proposed site is sparsely populated with residences. There is a single rural property and School area to the south is the nearest receivers. There are isolated single residences along Mamre Rd but there is no major residential development until the suburb of St Clair over 1.5 km to the north.

# 4 IMPACT ASSESSMENT PROCEDURES

## 4.1 General Objectives

Responsibility for the control of noise emission in New South Wales is vested in Local Government and the Department of Environment and Climate Change (DECC). The Industrial Noise Policy (INP) was released in January 2000 and provides a framework and process for deriving noise criteria for consents and licences that will enable the DEC to regulate premises that are scheduled under the Protection of the Environment Operations Act, 1997.

The specific policy objectives are:

- To establish noise criteria that would protect the community from excessive intrusive noise and preserve amenity for specific land uses;
- To use the criteria as the basis for deriving project specific noise levels;
- To promote uniform methods to estimate and measure noise impacts, including a procedure for evaluating meteorological effects;
- To outline a range of mitigation measures that could be used to minimise noise impacts;
- To provide a formal process to guide the determination of feasible and reasonable noise limits for consents or licences that reconcile noise impacts with the economic, social and environmental considerations of industrial development; and
- To carry out functions relating to the prevention, minimisation and control of noise from premises scheduled under the Act.

## 4.2 Assessing Intrusiveness

For assessing intrusiveness, the background noise level must be measured. The intrusiveness criterion essentially means that the equivalent continuous noise level ($L_{Aeq}$) of the source should not be more than five decibels above the measured background level ($L_{A90}$).

## 4.3 Assessing Amenity

The amenity assessment is based on noise criteria specific to land use and associated activities. The criteria relate only to industrial-type noise and do not include road, rail or community noise. The existing noise level from industry is measured. If it approaches the criterion value, then noise levels from new industries need to be designed so that the cumulative effect does not produce noise levels that would significantly exceed the criterion. For high-traffic areas there is a separate amenity criterion.

An extract from the INP that relates to the amenity criteria is given in Table 2 and Table 3.

Table 2 Amenity Criteria - Recommended $L_{Aeq}$ Noise Levels from Industrial Noise Sources

| **Type of Receiver** | **Indicative Noise Amenity Area** | **Time of Day** | **Recommended $L_{Aeq(Period)}$ Noise Level (dBA)** | |
|---|---|---|---|---|
| | | | **Acceptable** | **Recommended Maximum** |
| Residence | Rural | Day | 50 | 55 |
| | | Evening | 45 | 50 |
| | | Night | 40 | 45 |
| | Suburban | Day | 55 | 60 |
| | | Evening | 45 | 50 |
| | | Night | 40 | 45 |
| | Urban | Day | 60 | 65 |
| | | Evening | 50 | 55 |
| | | Night | 45 | 50 |
| | Urban/Industrial Interface (for existing situations only) | Day | 65 | 70 |
| | | Evening | 55 | 60 |
| | | Night | 50 | 55 |
| School classrooms - internal | All | Noisiest 1 hour period when in use | 35 | 40 |
| Hospital wards | All | Noisiest 1 hour period | | |
| - internal | | | 35 | 40 |
| - external | | | 50 | 55 |
| Place of worship - internal | All | When in use | 40 | 45 |
| Area specifically reserved for passive recreation (eg National Park) | All | When in use | 50 | 55 |
| Active recreation area (eg school playground, golf course) | All | When in use | 55 | 60 |
| Commercial premises | All | When in use | 65 | 70 |
| Industrial premises | All | When in use | 70 | 75 |

Table 3 Modification to Acceptable Noise Level (ANL)* to Account for Existing Levels of Industrial Noise

| **Total Existing $L_{Aeq}$ noise level from Industrial Noise Sources** | **Maximum $L_{Aeq}$ Noise Level for Noise from New Sources Alone, dBA** |
|---|---|
| ≥ Acceptable noise level plus 2 dBA | If existing noise level is *likely to decrease* in future acceptable noise level minus 10 dBA<br>If existing noise level is *unlikely to decrease* in future existing noise level minus 10 dBA |
| Acceptable noise level plus 1 dBA | Acceptable noise level minus 8 dBA |
| Acceptable noise level | Acceptable noise level minus 8 dBA |
| Acceptable noise level minus 1 dBA | Acceptable noise level minus 6 dBA |
| Acceptable noise level minus 2 dBA | Acceptable noise level minus 4 dBA |
| Acceptable noise level minus 3 dBA | Acceptable noise level minus 3 dBA |
| Acceptable noise level minus 4 dBA | Acceptable noise level minus 2 dBA |
| Acceptable noise level minus 5 dBA | Acceptable noise level minus 2 dBA |
| Acceptable noise level minus 6 dBA | Acceptable noise level minus 1 dBA |
| < Acceptable noise level minus 6 dBA | Acceptable noise level |

* ANL = recommended acceptable $L_{Aeq}$ noise level for the specific receiver, area and time of day from Table 2

The DECC has acknowledged that *"where early morning (5 am - 7 am) operations are proposed, it may be unduly stringent to expect such operations to be assessed against the night-time criteria - especially if existing background noise levels are steadily rising in these early morning hours".* For this reason, the morning shoulder period (6.00 am - 7.00 am) has been considered separately as part of this assessment.

### 4.3.1 Assessment in Areas of High Traffic Noise

The NSW INP states that, in some areas, the level of road traffic noise may be high enough to make noise from an industrial source effectively inaudible, even though the $L_{Aeq}$ noise level from that industrial noise source may exceed the recommended acceptable amenity noise level shown in Table 2. In such cases, the amenity criterion for noise from the industrial application becomes the $L_{Aeq(Period),\ traffic}$ minus 10 dBA and replaces the amenity criteria provided in Table 2 and Table 3.

This criterion may be applied only if all of the following apply;

- Traffic noise is identified as the dominant noise source at this site;
- The existing traffic noise level is 10 dB or more above the acceptable noise level for the area; and
- It is highly unlikely the road traffic noise levels would decrease in the future.

## 4.4 Assessing Sleep Disturbance

The DECC has acknowledged that the relationship between maximum noise levels and sleep disturbance is not currently well defined. Criteria for assessing sleep disturbance has not been identified under the INP and hence, sleep arousal has been assessed using the guidelines set out in the ENCM Chapter 19-3.

To avoid the likelihood of sleep disturbance the ENCM recommends that the $L_{A1(1minute)}$ noise level of the source under consideration should not exceed the background noise level ($L_{A90}$) by more than 15 dBA when measured outside the bedroom window of the receiver during the night-time hours (10.00 pm to 7.00 am).

## 4.5 Road Traffic Noise

The Environment Protection Authority released the "*Environmental Criteria for Road Traffic Noise*" in May 1999. The policy sets out noise criteria applicable to different road classifications for the purpose of defining traffic noise impacts.

## 4.6 Construction Noise

The ENCM, Chapter 171, sets out noise criteria applicable to construction site noise for the purpose of defining intrusive noise impacts. Based upon this document the project specific construction noise goals outlined in **Table 4** will apply to the construction period of the proposed industrial facility at the nearest potentially affected residential locations.

Table 4 Construction Noise Goals

| **Construction Period** | **Acceptable $L_{A10}$ Noise Level*** |
|---|---|
| 4 weeks and under | Background $L_{A90}$ plus 20 dBA |
| 4 weeks to 26 weeks | Background $L_{A90}$ plus 10 dBA |
| Greater than 26 weeks | Background $L_{A90}$ plus 5 dBA |

* Applicable between the hours of 7.00 am and 6.00 pm Monday to Friday, and 8.00 am to 1.00 pm Saturdays. For all other times construction noise must be inaudible at the receiver. No construction work is to take place on Sundays or Public Holidays.

# 5 EXISTING ACOUSTICAL AND METEOROLOGICAL ENVIRONMENT

## 5.1 General Methodology

All acoustic instrumentation employed throughout the monitoring programme has been designed to comply with the requirements of AS 1259.2-1990, “Sound Level Meters” and carries current NATA or manufacturer calibration certificates. Instrument calibration was checked before and after each measurement survey, with the variation in calibrated levels not exceeding ±0.5 dBA.

## 5.2 Unattended Continuous Noise Monitoring

Background noise levels were monitored by Heggies. The objective of the background noise survey was to measure $L_{A90(period)}$ and $L_{Aeq(15minute)}$ noise levels at the nearest potentially affected residential locations during the day, evening and night-time periods to enable the determination of the intrusiveness and amenity criteria for the proposed development.

Background noise levels were monitored at two separate locations considered to be representative of the nearest potentially affected receivers. Details of noise monitoring locations are given in **Table 5**. Background noise levels were monitored for a previous project at the given locations from Thursday 4 December to Thursday 11 December 2003, inclusive.

Table 5 Background Monitoring Locations

| Location | Details |
|---|---|
| NM1 | 41 Horseshoe Circuit, St Clair |
| NM2 | 103 Blackwell Avenue, St Clair |

ARL Type EL316 environmental noise loggers were used to monitor the ambient noise levels at each location. The noise loggers were programmed to record statistical noise level indices continuously in 15 minute intervals, including the LAmax, LA1, LA10, LA50, LA90, LA99, LAmin and the LAeq.

Weather data for the survey periods was obtained from the Bureau of Meteorology station at Horsley Park. Noise data during periods of any rainfall and/or wind speed in excess of 5 m/s (approximately 9 knots) were discarded in accordance with INP data exclusion. A summary of the results of the background noise surveys is given in Table 6.

Table 6 Summary of Existing Ambient Noise Levels

| Location | Period | Background $L_{A90}$ Noise Level | Measured $L_{Aeq(Period)}$ | Estimated Existing Industrial Contribution $L_{Aeq}$ |
|---|---|---|---|---|
| | | Rating Background Level | | |
| 41 Horseshoe Circuit, St Clair (**NM1)** | Morning Shoulder | 44 dBA | 58 dBA | < 47 dBA |
| | Day | 43 dBA | 60 dBA | < 54 dBA |
| | Evening | 41 dBA | 56 dBA | < 46 dBA |
| | Night | 34 dBA | 54 dBA | < 39 dBA |
| 103 Blackwell Avenue, St Clair (NM2) | Morning Shoulder | 44 dBA | 55 dBA | < 47 dBA |
| | Day | 43 dBA | 55 dBA | < 54 dBA |
| | Evening | 38 dBA | 50 dBA | < 46 dBA |
| | Night | 34 dBA | 47 dBA | < 39 dBA |

Note: Daytime 7.00 am to 6.00 pm; Evening 6.00 pm to 10.00 pm; Night-time 10.00 pm to 7.00 am
Morning Shoulder 6.00 am to 7.00 am
On Sundays and Public Holidays, Daytime 8.00 am to 6.00 pm; Evening 6.00 pm to 10.00 pm; Night-time 10.00 pm to 8.00 am
The $L_{A90}$ represents the level exceeded for 90% of the interval period and is referred to as the average minimum or background noise level
$L_{Aeq}$ - The equivalent continuous noise level is defined as the level of noise equivalent to the energy average of noise levels occurring over a measurement period
The RBL for the morning shoulder period has been determined as the midpoint between the RBL's measured for the two assessment periods either side of the morning shoulder, ie day and night time periods

## 5.3 Operator Attended Noise Monitoring

Operator attended noise measurements were conducted during the daytime period at each monitoring location. Each measurement was conducted over a 15 minute period using a B & K 2231 sound level meter. The results of the operator attended noise measurements are given in **Table 7**. Ambient noise levels given in the table include all noise sources such as road and rail traffic, insects, birds, as well as any industrial operations.

Table 7 Operator Attended Noise Survey Results

| Location | Date/ Start time/ Weather | Primary Noise Descriptor (dBA re 20 μPa) | | | | | Description of Noise Emission, Typical Maximum Levels LAmax (dBA) and Estimated Existing LAeq Contribution |
|---|---|---|---|---|---|---|---|
| | | $L_{Amax}$ | $L_{A1}$ | $L_{A10}$ | $L_{A90}$ | $L_{Aeq}$ | |
| 41 Horseshoe Circuit, St Clair (NM1) | 04/12/03 1325<br>Day<br>W= calm<br>Temp=27°C | 77 | 68 | 61 | 51 | 58 | Light traffic on Mamre Rd to 62, heavy vehicles to 70<br>Air conditioning unit on side of house ~ 51<br>Birds/cicadas to 51<br>LAeq set by traffic |
| 103 Blackwell Avenue, St Clair (NM2) | 04/12/03 1440<br>Day<br>W= 1 m/s East<br>Temp=27°C | 65 | 61 | 53 | 40 | 50 | Lawn mower in distance<br>Birds to 60<br>Far traffic < 36<br>Industry audible ~ 38<br>Trucks engine braking to 49<br>Reverse alarm audible<br>Wind in palm trees to 49<br>Near traffic to 51<br>Thunder to 49<br>Aeroplane to 65 |

* Results of the operator attended noise surveys indicate that traffic is the main contributor to ambient noise levels at each residential location.

## 5.4 Effects of Meteorology on Noise Levels

### 5.4.1 Wind

Wind has the potential to increase noise at a receiver when it is light and stable and blows from the direction of the source of the noise. As the strength of the wind increases the noise produced by the wind will obscure noise from most industrial and transport sources.

Wind effects need to be considered when wind is a feature of the area under consideration. Where wind blows from the source to the receiver at speeds up to 3 m/s for more than 30% of the time in any season, then wind is considered to be a feature of the area and noise level predictions must be made under these conditions.

Weather data was obtained, for a period of 12 months, from a Bureau of Meteorology weather station located at Horsley Park. This data was analysed to determine the frequency of occurrence of winds up to speeds of 3 m/s for daytime, evening and night in each season. A summary of the most frequently occurring winds is contained within **Table 8**, **Table 9** and **Table 10**. The percentage occurrence figures provided in magenta are those approaching the 30% threshold and those shown in red exceed the 30% threshold.

Table 8 Seasonal Frequency of Occurrence of Wind Speed Intervals - Daytime

| Period | Calm | Wind Direction | 0.5 to 2 m/s | 2 to 3 m/s | 0.5 to 3 m/s |
|---|---|---|---|---|---|
| **Summer** | 1.6% | NNW | 2.6% | 5.3% | 7.9% |
| **Autumn** | 13.3% | N | 6.1% | 7.0% | 13.2% |
| | 21.7% | SSW | 5.9% | 7.3% | 13.2% |
| **Winter** | 20.4% | NNW | 7.8% | 6.7% | 14.5% |
| **Spring** | 0.5% | NNW | 1.7% | 6.8% | 8.5% |

Table 9 Seasonal Frequency of Occurrence of Wind Speed Intervals - Evening

| Period | Calm | Wind Direction | 0.5 to 2 m/s | 2 to 3 m/s | 0.5 to 3 m/s |
|---|---|---|---|---|---|
| **Summer** | 1.1% | E | 1.0% | 7.4% | 8.4% |
| **Autumn** | 26.2% | S | 7.1% | 10.0% | 17.1% |
| **Winter** | 20.6% | WSW | 11.0% | 8.5% | 19.5% |
| **Spring** | 5.5% | NE | 4.0% | 7.6% | 11.5% |

Table 10 Seasonal Frequency of Occurrence of Wind Speed Intervals - Night

| Period | Calm | Wind Direction | 0.5 to 2 m/s | 2 to 3 m/s | 0.5 to 3 m/s |
|---|---|---|---|---|---|
| **Summer** | 16.4% | SSW | 6.3% | 17.0% | 23.3% |
| **Autumn** | 41.4% | SW | 8.8% | 16.6% | 25.3% |
| **Winter** | 48.2% | WSW | 9.9% | 9.4% | 19.2% |
| **Spring** | 17.6% | WSW | 8.7% | 14.1% | 22.8% |

Seasonal wind records indicate that certain winds are a feature of the area. The frequency of winds below 3 m/s (predominantly up to 2 m/s) is not above the 30% threshold in any season or period so modelling under prevailing wind was therefore not required as part of this investigation.

### 5.4.2 Temperature Inversion

Temperature inversions, when they occur, have the ability to increase noise levels by focusing sound waves. Temperature inversions occur predominantly at night during the winter months. For a temperature inversion to be a significant characteristic of the area it needs to occur for approximately 30% of the total night-time during winter, or about two nights per week.

Meteorological data, obtained from a Bureau of Meteorology weather station located at Horsley Park, indicates that temperature inversions are a feature of the area. The proposal is for operations to be undertaken 24 hours a day, seven days a week. Hence, the occurrence of temperature inversion during the night-time period has been considered as part of this noise assessment.

# 6 PROJECT SPECIFIC NOISE CRITERIA

## 6.1 Operational Noise Criteria

The noise emission criteria for the proposed industrial estate have been established with reference to the INP outlined in **Section 4** of this report.

The current $L_{Aeq}$ noise levels around the proposed site are dominated by road traffic noise, predicted to be primarily from Mamre Road and the M4 motorway with noise from surrounding industrial facilities also prevalent.

The amenity criteria have been established using the results of ambient noise measurements and with reference to assessment in areas of low industrial noise contribution at the residential test sites. Where it was predicted that existing industrial noise contributed to ambient noise levels at potentially affected areas in the vicinity of the subject site appropriate adjustments have been made to the amenity criteria for these locations.

The acoustical environment at location 1 (Horseshoe Circuit) was observed to be most exposed to noise and was dominated by road traffic noise, particularly during the night-time period. A 54 dBA $L_{Aeq}$ was recorded during this period, which is 14dBA higher than the acceptable amenity criterion provided in the INP for a suburban area. Accordingly the INP policy for areas of high traffic noise will be applied for the amenity criteria at this location.

The Mamre Christian College and Trinity Catholic Primary are subject to an internal amenity criterion of 40dBA maximum during the noisiest 1 hour period while the building is in use, as well as an external maximum of 60dBA throughout the school day.

The acoustical environment typifies suburban/rural environment near a major sub-arterial road with moderate to continuous traffic flows. Therefore, the residences in the general area have been assessed as “suburban” receiver types.

The resulting operational project specific noise criteria for the proposed industrial facility are shown in **Table 11**. Intrusiveness criterion for the morning shoulder period has been based on Rating Background Levels (RBL’s) calculated as the midpoint between the RBL’s measured for the two assessment periods either side of the morning shoulder, ie day and night-time. Amenity criterion has been selected as the midpoint value of the amenity criteria for the two assessment periods either side of the morning shoulder.

Table 11 Proposed Interlink Industrial Estate facility Project Specific Noise Criteria

| Location | Period | Intrusiveness Criteria $L_{Aeq(15minute)}$ | Amenity Criteria $L_{Aeq(Period)}$ | Project Specific Noise Criteria |
|---|---|---|---|---|
| NM1 (Horseshoe Circuit) | Morning Shoulder | 49 dBA | 53 dBA | 49 dBA |
| | Day | 48 dBA | 60 dBA | 48 dBA |
| | Evening | 46 dBA | 50 dBA | 46 dBA |
| | Night | 39 dBA | 45 dBA | 39 dBA |
| NM2 (Blackwell Ave) | Morning Shoulder | 49 dBA | 53 dBA | 49 dBA |
| | Day | 48 dBA | 60 dBA | 48 dBA |
| | Evening | 43 dBA | 50 dBA | 43 dBA |
| | Night | 39 dBA | 45 dBA | 39 dBA[1] |

This criterion has been determined as per the INP for assessment in areas where industrial noise is 6dBA below the background level.

[1] Assessed under the INP - Areas of high traffic noise criterion.

Daytime 7.00 am to 6.00 pm; Evening 6.00 pm to 10.00 pm; Night 10.00 pm to 7.00 am; Morning Shoulder 6.00 am to 7.00 am

On Sundays and Public Holidays, Daytime 8.00 am to 6.00 pm; Evening 6.00 pm to 10.00 pm; Night-time 10.00 pm to 8.00 am

The INP states that these criteria have been selected to protect at least 90% of the population, living in the vicinity of industrial noise sources, from the adverse effects of noise for at least 90% of the time. Provided the criteria in the INP are achieved, it is unlikely that most people would consider the resultant noise levels excessive.

## 6.2 Sleep Disturbance Noise Goals

The relevant sleep disturbance noise goals for each residential area are provided in **Table 12**.

Table 12 Sleep Disturbance Noise Goals

| Location | Period | Measured Background Noise Level ($L_{A90}$) | Sleep Disturbance Noise Goal |
|---|---|---|---|
| NM1 (Horseshoe Circuit) | Morning Shoulder | 44 dBA** | 59 dBA |
| | Night | 34 dBA | 49 dBA |
| NM2 (Blackwell Ave) | Morning Shoulder | 44 dBA ** | 59 dBA |
| | Night | 34 dBA | 49 dBA |

** These background noise levels are the *lowest* LA90 recorded for the morning shoulder period during the noise monitoring survey.

## 6.3 Road Traffic Noise Criteria

Road traffic noise criteria are set out in the ECRTN. The criteria recommended in the policy document are based on the functional categories of the subject roads, as applied by the RTA. All traffic to and from the proposed industrial estate site travels along Mamre Rd. This road is classified as a sub-arterial road, which connect the arterial roads to areas of development and carry traffic from one part of a region to another. Additional traffic flow as a result of Interlink Industrial Estate operation is likely to occur through out the day and night with increased heavy vehicle flow.

The relevant road traffic noise criteria for the subject development are provided in **Table 13**.

Table 13 Road Traffic Noise Criteria

| Type of Development | Criteria | | |
|---|---|---|---|
| | Day 7 am - 10 pm | Night 10 pm - 7 am | Where Criteria are Already Exceeded |
| Land use developments with potential to create additional traffic on existing freeways/ arterials | LAeq(15hour) 60 dBA | LAeq(9hour) 55 dBA | Where feasible, existing noise levels should be mitigated to meet the noise criteria. Examples of applicable strategies include appropriate location of private access roads; regulating times of use; using clustering; using 'quiet' vehicles; and using barriers and acoustic treatments.<br>In all cases, traffic arising from the development should not lead to an increase in existing noise levels of more than 2 dB. |

The ECRTN also draws the following conclusions with regard to maximum noise levels and the likelihood of sleep disturbance:

- Maximum internal noise levels below 50-55 dBA are unlikely to cause awakening reactions; and
- One or two noise events per night, with maximum internal noise levels of 65-70 dBA, are not likely to affect health and wellbeing significantly.

## 6.4 Construction Noise Goals

The daytime background noise level ($L_{A90}$) has been determined at 2 potentially affected residential locations. A daytime $L_{A90}$ of 40 dBA was measured at 50 Border St, 44 dBA at 8A Border St and 33 dBA at 53 Point Piper Road). This infers the project specific construction noise goals presented in **Table 14** for the nearest potentially affected residential locations.

Table 14 Construction Noise Goals - Residential Areas

| Construction Period | Construction Noise Goal ($L_{A10}$)[1] | |
|---|---|---|
| | NM1 (Horseshoe Circuit) | NM2 (Blackwell Ave) |
| 4 weeks and under | 63dBA | 63 dBA |
| 4 weeks to 26 weeks | 53 dBA | 53 dBA |
| Greater than 26 weeks | 47 dBA | 47 dBA |

1. Applicable between the hours of 7.00 am and 6.00 pm Monday to Friday, and 8.00 am to 1.00 pm Saturdays. For all other times construction noise must be inaudible at the receiver. No construction work is to take place on Sundays or Public Holidays. Assessment of Noise Impacts

## 6.5 Operational Noise Modelling

### 6.5.1 Operational Noise Modelling Parameters

A computer model was used to predict noise emissions from the proposed Interlink Industrial Estate. The Environmental Noise Model (ENM) used has been produced in conjunction with the DECC. A three-dimensional digital terrain map giving all relevant topographic information was used in the modelling process. The model used this map, together with noise source data, attended measurement data, ground cover, shielding by barriers and/or adjacent buildings and atmospheric information to predict noise levels at the nearest potentially affected receivers.

Prediction of noise under calm and prevailing atmospheric conditions (temperature inversion) was conducted. Atmospheric parameters under which noise predictions were made are given in **Table 15**.

Table 15 Meteorological Parameters for Noise Predictions

| | Temperature | Humidity | Wind Speed | Wind Direction (degrees from north) | Temperature Gradient |
|---|---|---|---|---|---|
| Calm (All periods) | 20°C | 65% | N/A | N/A | N/A |
| Temperature Inversion (Night) | 10°C | 90% | N/A | N/A | 3°C/100 m |

Other assumptions made in modelling the proposed development include the following:

- Load/unloading and dispatch will occur 24 hours per day;
- Truck movement and loading was modelled in the centre of the complex;
- Two forklifts will operate continuously (both daytime and night-time) in the building 5A and the building 2 outdoor storage areas;
- Sound Power Data for truck and forklift operation were obtained from the Heggies database; and
- Noise model based on existing topography.

### 6.5.2 Operational Scenario – Noise Model Summary

The operational scenario modelled during each period is summarised in **Table 16**. A tick (✓) indicates that the equipment is in operation during the relevant period. A cross (×) indicates that the equipment is not in operation during the relevant period. Where there is a number in brackets following a tick, this represents the number of pieces of the equipment that has been considered in the noise model during the relevant period. It should be noted that the operational scenario modelled is likely to represent an acoustically worst-case scenario.

Table 16 Operational Scenario Considered in Noise Model

| **Plant and Equipment** | **Morning Shoulder** | **Day** | **Evening** | **Night** |
|---|---|---|---|---|
| Truck Loading and unloading | ✓ (10) | ✓ (10) | ✓ (5) | ✓ (5) |
| Gas Powered Forklift operation | ✓ (5) | ✓ (5) | ✓ (5) | ✓ (5) |
| Heavy Manufacturing in Building 2 | ✓ (7) | ✓ (7) | ✓ (7) | ✓ (7) |
| Outdoor forklift operation for ecternal storage at Buildings 2 and 5A (in addition to the proposed 5 loading and unloading forklifts mentioned above) | ✓ (2) | ✓ (2) | ✓ (2) | ✓ (2) |

### 6.5.3 Operational Noise Modelling Results and Discussion

Noise emission levels were predicted from the proposed development for the typical operational scenario, described in **Table 16** Noise from all sources that contribute to the total noise from the site have been examined to identify characteristics that may cause greater annoyance (for example tonality, impulsiveness etc). The appropriate modifying factors, as outlined in the INP, have been applied where these characteristics are considered to be present. Noise levels predicted at the specific receiver locations (shown in **Appendix A**) are provided in **Table 17**.

Operational noise levels are predicted to meet the project specific noise criteria at all nearby residential receivers and schools.

Due to the nature of sound, noise level values do not add together the same way as ordinary numbers. If an existing noise level is 10 dBA (or more) above the noise level produced by a new source then the new source will not increase the existing noise level.

Existing noise levels, during the night-time period, have been measured at 2 locations on Horseshoe Circuit and Blackwell Avenue with typical average noise levels ($L_{Aeq}$) of 54 dBA and 47dBA respectively. Operational noise predictions show that noise levels from the proposed industrial facility during a typical night-time operational scenario will be no greater than 30 dBA at the either location. At these locations average night-time noise levels not are expected to increase as a result of the proposed industrial estate.

Table 17 Interlink Industrial Estate Predicted Noise Levels

| Location | Period | Predicted Interlink Industrial Operational noise level $L_{Aeq(15minute)}$ | | Design Goal $L_{Aeq}$ |
|---|---|---|---|---|
| | | Calm Weather | Temperature inversion | |
| **NM!** **(Pine Creek Circuit)** | Day | < 30 dBA | N/A | 48 dBA |
| | Evening | < 30 dBA | N/A | 46 dBA |
| | Night | < 30 dBA | < 30 dBA | 39 dBA |
| | Morning Shoulder | < 30 dBA | < 30 dBA | 44 dBA |
| **NM2** **(Blackwell Ave)** | Day | < 30 dBA | N/A | 48 dBA |
| | Evening | < 30 dBA | N/A | 43 dBA |
| | Night | < 30 dBA | < 30 dBA | 39 dBA |
| | Morning Shoulder | < 30 dBA | < 30 dBA | 44 dBA |
| **3** **(Lenore Lane)** | Day | < 30 dBA | N/A | 48 dBA |
| | Evening | < 30 dBA | N/A | 43 dBA |
| | Night | < 30 dBA | < 30 dBA | 39 dBA |
| | Morning Shoulder | < 30 dBA | < 30 dBA | 44 dBA |
| **4** **(Emmaus Retirement Village)** | Day | < 30 dBA | N/A | 48 dBA |
| | Evening | < 30 dBA | N/A | 43 dBA |
| | Night | < 30 dBA | < 30 dBA | 39 dBA |
| | Morning Shoulder | < 30 dBA | < 30 dBA | 44 dBA |
| **5** **(School Playground)** | When in use | < 30 dBA | N/A | 55 dBA |
| **6** **(Mamre Road, south-east of site)** | Day | < 30 dBA | N/A | 48 dBA |
| | Evening | < 30 dBA | N/A | 46 dBA |
| | Night | < 30 dBA | < 30 dBA | 39 dBA |
| | Morning Shoulder | < 30 dBA | < 30 dBA | 44 dBA |

n/a: the meteorological condition is not relevant during this period

### 6.5.4 Cumulative Noise Assessment

The Estate site is situated within an area in that also encompasses concrete distribution and other industrial facilities including the adjacent Kimberly Clark and Woolworths warehouse facilities which are currently in pre-construction.

Potential cumulative noise impacts from existing and successive developments are embraced by the INP procedures by ensuring that the appropriate noise emission criteria (and consent limits) are established with a view to maintaining acceptable noise *amenity* levels for residences. Therefore, the cumulative impact of the Interlink Estate with existing industrial noise sources has been assessed in the determination of the amenity levels at surrounding potentially noise sensitive areas.

## 6.6 Sleep Disturbance Analysis

Sudden metal on metal contact at a warehouse or truck reversing alarm will result in additional noise being emitted. In assessing sleep disturbance, typical $L_{Amax}$ noise levels of acoustically significantly plant and equipment to be used at the subject site (refer to **Table 18**) were used as input to the ENM acoustic model and predictions were made at the nearest residential areas under adverse weather conditions at night. It is unlikely that there will be any sharp impact noise under normal operational conditions.

The use of the $L_{Amax}$ noise level provides a worst-case prediction since the $L_{A1(1minute)}$ noise level of a noise event will to be less than the $L_{Amax}$.

Table 18 $L_{Amax}$ Sound Power Levels

| **Source** | **Maximum Sound Power Level** |
|---|---|
| Sudden Metal on Metal contact | 115 dBA |
| Truck reversing alarm | 105 dBA |

The highest $L_{Amax}$ noise level at any residential receiver is predicted to occur in the presence of a temperature inversion. External noise levels up to $L_{Amax}$ 37 dBA may occur at Blackwell Av and Pine Creek Circuit residences in this situation. Hence, predicted noise levels meet the recommended sleep disturbance noise goal of 49 dBA.

The ECRTN provides further guidance with regard to sleep disturbance and calls upon a number of studies that have been conducted into the effect of maximum noise levels on sleep. The DECC policy document acknowledges that, at the current level of understanding, it is not possible to establish absolute noise level criteria that would correlate to an acceptable level of sleep disturbance. However, the ECRTN provides that maximum internal noise levels below 50 dBA to 55 dBA are unlikely to cause awakening reactions and one or two events per night, with maximum internal noise levels of 65 dBA to 70 dBA (inside dwellings) are not likely to significantly affect health and wellbeing. Maximum noise predictions have shown that external noise levels up to 37 dBA may occur at some residences during the night-time period as a result of Interlink industrial estate operation. This correlates to noise levels significantly below 50 dBA inside dwellings. Based on the preceding, maximum noise levels produced by industrial estate operation are not likely to cause sleep disturbance at the nearest residential areas to the subject site.

## 6.7 Road Traffic Noise Assessment

### 6.7.1 Road Traffic Noise Modelling Parameters

The proposed industrial facility will result in an increase in traffic along Mamre Rd. During the construction phase there will also be minor additional traffic on Mamre Rd. TEF Consulting undertook a traffic impact study (7151 Rep 01a os 14/8/2007) of the proposed Interlink Estate based on warehouse usage. This report's traffic number calculation will be used as a basis for road traffic noise impact. Based on their estimate there will be approximately 450 heavy vehicle and 1650 light vehicle movements per day from the Interlink Estate clustered during the daytime period.

Calculation of road traffic noise levels has been conducted using the United States Federal Highways road traffic noise model (USFH). The USFH method for prediction of $L_{Aeq(period)}$ road traffic noise levels is an internationally accepted theoretical traffic noise prediction model which takes into account the $L_{Amax}$ noise levels of vehicles, receiver offset distance, pass by duration, vehicle speed, ground absorption (based on the ratio of soft ground and average height of propagation), number of vehicle movements, receiver height, truck exhaust height and the height and location of any intervening barriers.

The noise from road traffic was predicted at a distance of 20 m, which relates to the distance of the nearest residential dwellings from the Mamre Rd, at a receiver height of 1.5 m above the ground.

It is expected that the industrial estate operational traffic will use both the northern and southern sections of Mamre Rd.

Table 19 Estimated Peak Estate operational traffic.

| **Type of Vehicle** | **Average Daily Movements** |
|---|---|
| Light vehicles | 1650 |
| Heavy Vehicle | 450 |

### 6.7.2 Existing Mamre Road Traffic

Existing Mamre Road traffic data is presented in Table 20

Table 20 Existing Mamre Rd Traffic

| **Road** | **Count Station** | **AADT** |
|---|---|---|
| Mamre Rd | RTA 2002 | 25,724 |

### 6.7.3 Road Traffic Noise Modelling Results

**Table 21** provides the predicted 'existing' traffic numbers for the Mamre Rd and predicted traffic noise increase with the operation of the Interlink industrial Estate. The traffic numbers provided in the table are AADT. The figures were estimated with and dominant daytime flow 8% heavy vehicle traffic which would be indicative for this type of sub arterial road.

Table 21 Road Traffic Noise Assessment Details

| | Existing' Mamre Rd Traffic | | Including industrial estate Vehicle Movements | | Predicted Increase in Road Traffic Noise (dBA) |
|---|---|---|---|---|---|
| | Light | Heavy | Light | Heavy | |
| **Day** | 20826 | 2840 | 22160 | 3238 | 0.6 |
| **Night** | 1811 | 246 | 2127 | 298 | 0.8 |

The results of traffic noise predictions indicate that the inclusion of warehouse operation traffic on Mamre Rd will increase 'existing' road traffic noise levels by less than 1 dBA. This increase is unlikely to be perceptible to residential receivers along the Mamre Rd route. Hence, the inclusion of Interlink Industrial Estate operation traffic movements on Mamre Road is predicted to meet the requirements of the ECRTN.

## 6.8 Construction Noise Assessment

### 6.8.1 Construction Noise Modelling Parameters

Plant and equipment considered in assessing noise from construction of the proposed development are provided, with the associated sound power levels, in **Table 22**. Sound power levels of construction equipment were obtained from a Heggies database. Noise from the land clearing operation will occur separately construction.

Proposed construction equipment was modelled at potential worst case locations on the subject site; the south western boundary of the proposed site.

Construction noise levels have been predicted assuming existing topography at the reservoir site.

Table 22 Construction Plant and Equipment

| Plant and Equipment | Number required | Sound Power Level ($L_{A10}$) |
|---|---|---|
| Scraper | 2 | 111 dBA |
| Dozer D11 size | 2 | 110 dBA |
| Front End Loader | 3 | 103 dBA |
| Generator | 4 | 95 dBA |
| Cement Mixer | 3 | 101 dBA |

### 6.8.2 Construction Noise Modelling Results and Discussion

The results of construction noise predictions are provided in **Table 23** for the nearest residential areas. These noise levels were predicted assuming construction evenly distributed around the site and focused at the north western corner, which presents the worst case scenario for nearby residents. This modelling assumes the Kimberly Clark and Woolworths warehouses are already constructed, which provides some shielding to the south

Table 23 Construction Noise Predictions - Residential Areas

| Construction Plant and Equipment Location | Highest $L_{A10}$ Noise Level Expected at Nearest Residential Area |
|---|---|
| North Western corner of proposed site | 40 dBA |
| Evenly Distributed over site | 38 dBA |

It is anticipated that each of the proposed warehouses will take greater than 4 weeks but less than 26 weeks to complete. Hence, predicted construction noise levels have been compared to the "between 4 and 26 weeks" criteria, provided in **Table 14**, for the residential areas. The peak noise levels are generated by the land clearing activities which will not be present for the entire construction period. It is predicted that during the later periods noise levels at the receiver are under likely to be under 40dBA.

Construction noise levels are predicted to be below the relevant noise goals at each of the nearest residential areas. .

Although not strictly required, the following general measures are recommended to reduce the construction noise impact on nearby residences:

- Keep equipment well maintained;
- Employ "quiet" practices when operating equipment (eg positioning and unloading of trucks in appropriate areas);
- A Construction Noise Management Plan should be prepared and implemented prior to commencement of construction works at the site. This should include the following:
  - Construction noise and vibration goals.
  - Recommendations regarding specific physical and managerial measures for controlling noise, noise and vibration monitoring programs and reporting procedures.
  - Measures for dealing with exceedances and mechanisms to provide ongoing community liaison.

With regard to potentially offensive noise events associated with construction activities AS 2436-1981 "*Guide to noise control on construction, maintenance and demolition sites"* provides the following:

> *If noisy operations must be carried out, then a responsible person should maintain liaison between the neighbouring community and the contractor. This person should inform the public at what time to expect noisy operations and also inform the contractor of any special needs of the public.*
>
> *Consultation and cooperation between the contractor and his neighbours and the removal of uncertainty and rumour can help to reduce the adverse reaction to noise.*

### 6.8.3 Construction Vibration

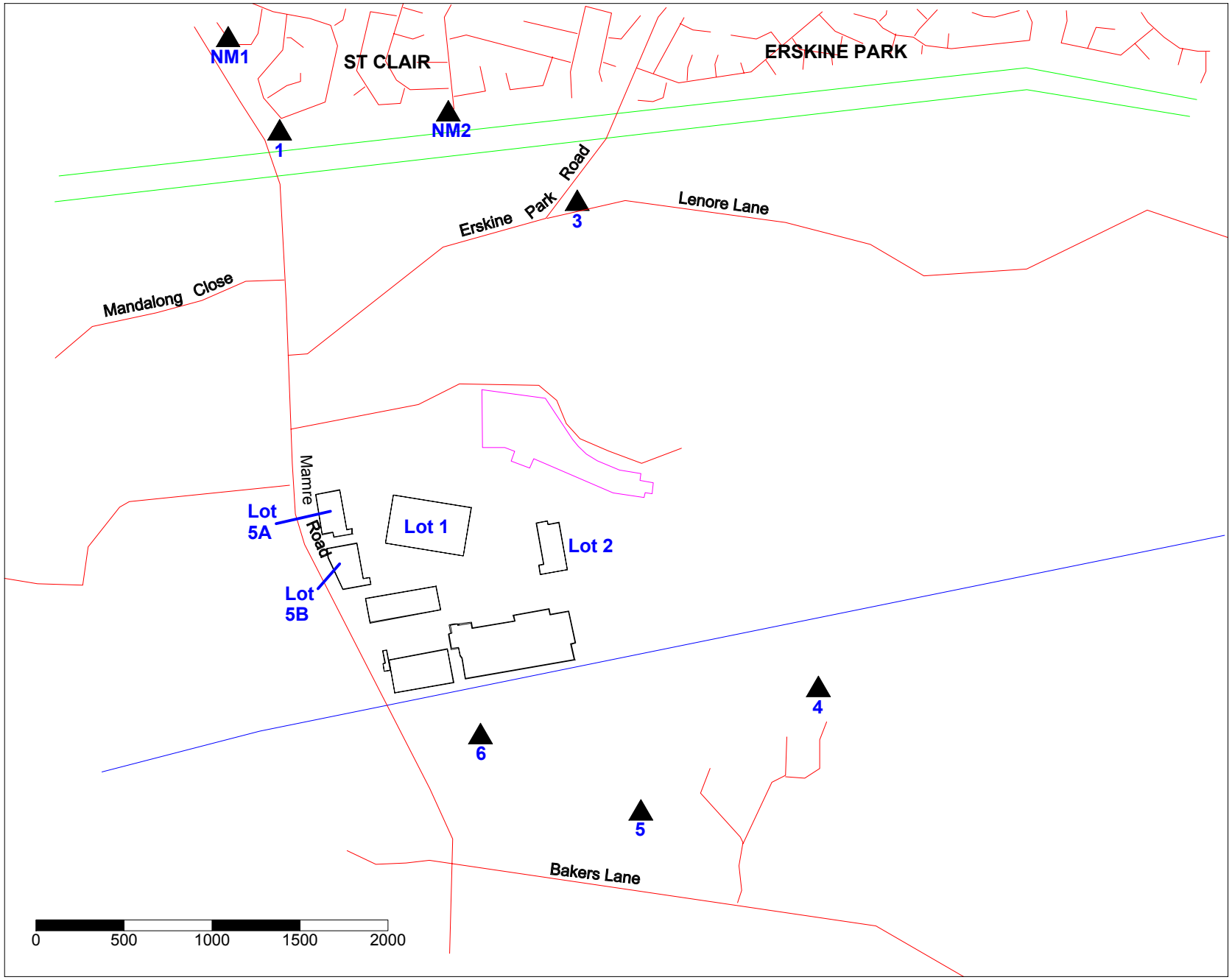
The major vibration generating activities will occur during the earthworks in preparing the site and placing the foundations of the warehouse; activities such as digging and the use of scrapers and rollers. The nearest residential premises to such construction activity is approximately 400m (proximity of Mamre Rd residence). Due to the large separation distance to this and other residences, the level of vibration caused by construction activities at the proposed warehouse site(s) is extremely unlikely to be perceptible at any of the nearest residential premises.

# 7 CONCLUSION

Heggies has conducted a noise and vibration impact assessment for 4 proposed buildings within Interlink Industrial Estate including consideration of construction, road traffic and operational noise from the proposed operation of the industrial estate.

Operational noise levels are predicted meet the project specific noise criteria at all nearby residential receivers under calm and prevailing weather conditions. In addition, predicted operational noise levels from the subject site do not exceed the acceptable noise levels at the Mamre Christian College and Trinity Catholic Primary. Predicted maximum noise levels from operation of the industrial estate during the night-time period are also predicted to meet the recommended sleep disturbance noise goal at all residences.

Construction noise levels are predicted to be below recommended guidelines at the nearest potentially affected residential receivers. Vibration levels generated by construction activities on the subject site are predicted to have a negligible impact on neighbouring residential and industrial locations.




**Appendix A**
**Report 70-1306**
**Location Map**
**Interlink Industrial Estate**
**Lots 1, 2 and 5**

Roads

Noise Monitoring and Noise Prediction Locations

Power transmission lines

Water supply pipeline

N