HEGGIES

REPORT 10-6970-R1

Revision 2

Independent Print Media Group Pty Ltd
Proposed Printing Facility
23 Scrivener Street, Warwick Farm
Acoustical Assessment

PREPARED FOR

IPMG Pty Ltd
Level 2
83 O'Riordan Street
ALEXANDRIA NSW 2015

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Independent Print Media Group Pty Ltd
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23 Scrivener Street, Warwick Farm
Acoustical Assessment

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DOCUMENT CONTROL

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1 INTRODUCTION

Independent Print Media Group Pty Ltd (IPMG) is proposing to expand its Sydney operations by refurbishing and extending the existing Kimberley Clark manufacturing plant at 23 Scrivener Street, Warwick Farm into a new facility for print production, warehousing and distribution. The plant will produce a variety of printed material including magazines, inserts, catalogues, brochures, books and the like.

An Environmental Assessment Report (EAR) has been commissioned by IPMG, to assess the potential impacts of the proposed new operation.

Heggies Pty Ltd (Heggies) has been engaged by IPMG to prepare an assessment of the noise impacts associated with the project. This report presents the results of this assessment and forms part of the EAR.

2 SITE LOCATION

The site is located at Warwick Farm as shown in **Figure 1**. The site is currently owned and operated by Kimberley Clark. The KCC facility has operated since the early 1970s for the manufacture, storage and distribution of paper products. Kimberley Clark are relocating and centralising their operations to another location.

Figure 1 Site Location

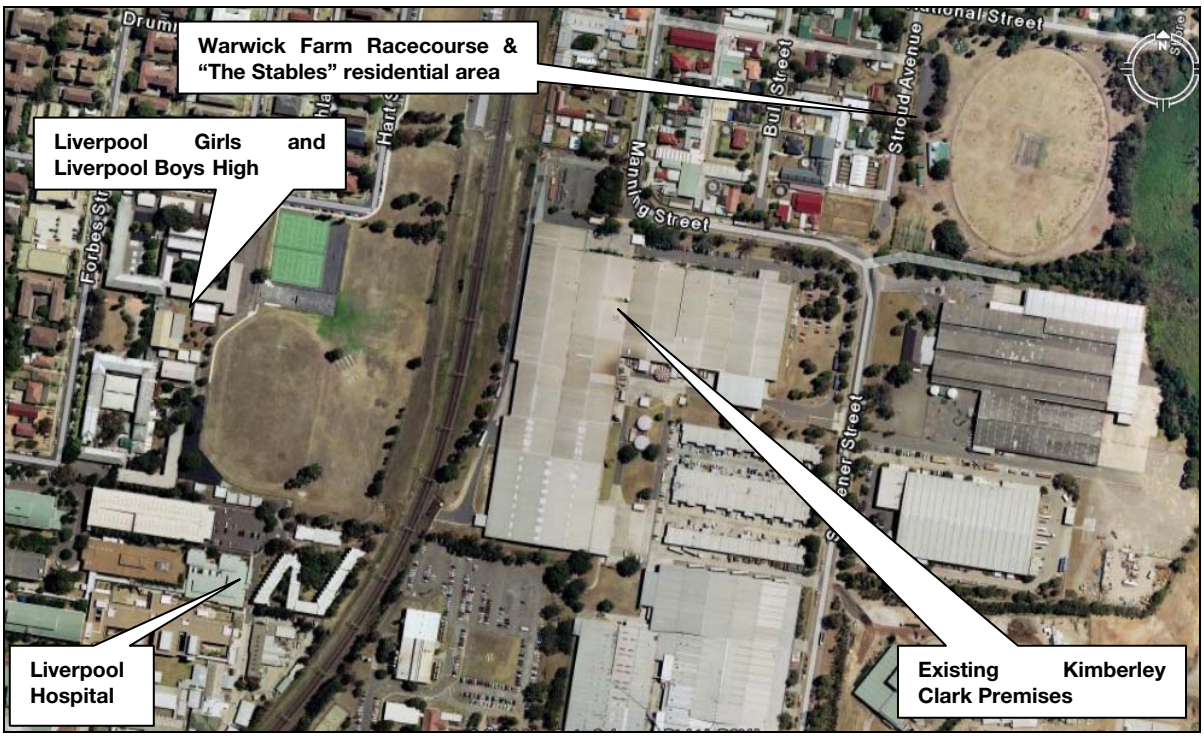


Image courtesy of Google Earth

The site is located at the northern end of an established industrial precinct. It is bounded by the Main South Railway Line to the west, Priddle Street to the north and Scrivener Street and industrial units to the east and industrial premises and a Liverpool Hospital carpark to the south.

Currently operating in the area are a number of large industrial operations, including Visy Australia, light industrial units, Warwick Farm Racecourse and the associated stables and residential premises and ancillary buildings and carparking belonging to Liverpool Hospital.

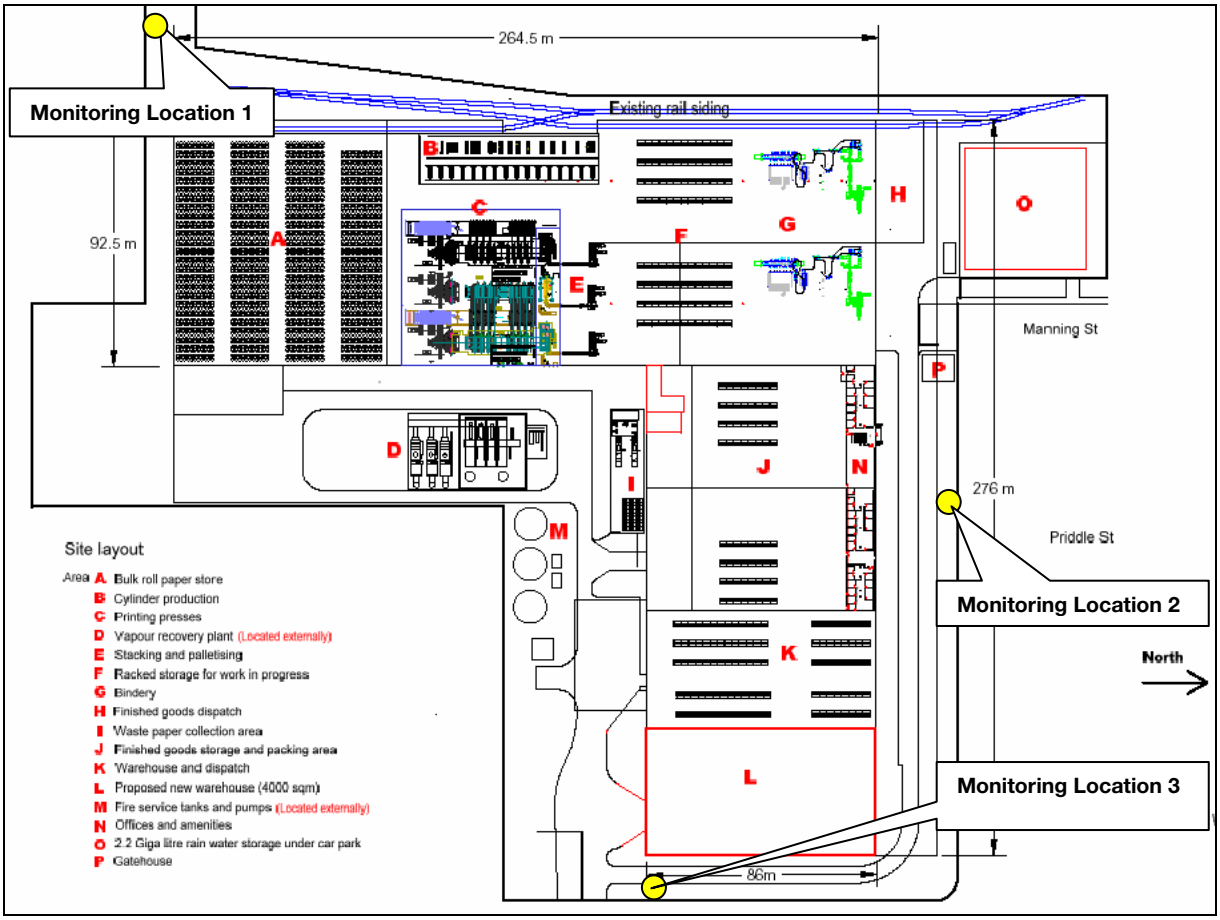
Potentially sensitive receivers surrounding the site include "The Stables" precinct to the north, Liverpool Girls and Boys High Schools to the west, Liverpool Hospital to the southwest and ancillary hospital buildings to the south.

3 PROJECT DESCRIPTION

3.1 Proposed Development

The project involves modifying, extending and fitting out the existing industrial premises into a new plant for printing, warehousing and distribution. The proposed layout of the new development is shown in **Figure 2**.

Figure 2 Development Layout



The proposed facility will include a press room and bindery, materials storage and distribution areas and office and amenities. Part of the existing roof will be raised from the current 8 m to heights of 12 m and 14 m. The eastern end of the existing building will be extended to provide a new 4,000 m^2 warehouse area. A vapour recovery plant and ink supply system will be installed.

The staged renovation of the main areas (A, B, C and N) with construction in areas (D, I and M) will commence in January 2009 with completion anticipated in September 2009. Warehouse (L) construction will commence late 2010 with completion in May 2011.

3.2 Printing Production Process

The printing production process is as follows:

Paper receiving and storage

- Paper is stored within Area A (**Figure 2**). The paper rolls are delivered by semi-trailer to the south eastern factory apron and unloaded to the paper store by two (2) 10t forklifts.

Cylinder preparation

- The images to be printed are electromechanically etched onto electroplated copper cylinders (Area B). The cylinders are hard chrome plated and stored prior to distribution to the press room.

Printing process

- Printing is carried out by three (3) 8 unit Rotogravure presses located within the enclosed Area C. The paper rolls are automatically delivered from the paper store to reel loaders at the rear of the press. They are mounted on a reel stand and the press unwinds the paper into the printing units at the back of the reel stand. The paper is printed in full colour in a continuous process.
- The folder slit cuts the printed web of paper into smaller widths and folds them into smaller sizes ready for stacking.

Vapour Recovery

- The vapour recovery system is located in Area D. The system removes the ink carrier solvent produced by the ink drying process at the presses.
- The plant consists of 5 vessels containing beds of activated carbon through which the solvent-laden air is sequentially pumped. The solvent is recovered and cleaned air is exhausted.
- After each cycle the carbon is cleaned and reactivated by pumping steam through the tank. The solvent is recovered from the steam by cooling and phase separation with the recovered water returned to the boiler.
- The recovered solvent is stored and reused in the print process or by ink manufacturers.

Stacking and Storage

- Folded product is conveyed to the stacking equipment (Area E).
- The stackers place the sheets of folded product one on top of the other to form a log of product which is strapped on pallets and stored to await collation with other magazine sections.
- Product not requiring collation is stitched/glued and trimmed at the press, they are then palletised at the stackers for dispatch.
- Product from the presses is stored in the racked storage (Area F) whilst other sections of the publication are printed.

Binding

- Two high speed collating and stitching lines (Area G) collate up to 7 printed sections together, stitch them and trim the folded edges away to create a magazine with 3 open sides and a stapled spine ready for distribution.

Waste Paper Management

- Paper waste and dust is exhausted to the waste paper system located next to the southern driveway (Area I). The equipment in this area separates the dust and bales the off-cuts ready for transport to external recycling.

Dispatch

- Finished product from the press room and binding section is stored and dispatched onto delivery trucks (Areas H, K and L).
- Publications which form mixed bundles are sent for collation to Area J where other magazines and materials are collated and packed with other items for distribution to newsagents and other suppliers.

3.3 Vehicle Movements Into and Out of the Site

Delivery of raw materials and distribution of finished products will be by road. The primary means of staff access to the site is also by road.

According to Transport and Traffic Planning Associates report dated July 2008, the proposed development is expected to generate traffic which is at worst commensurate with, but is likely to be less than, that generated by the former Kimberley Clark operation.

The total workforce of the proposed development will be in the order of 185 to 190 staff over three shifts. During peak operations in 2007, Kimberley Clark had in excess of 300 staff. The IPMG day shift is expected to comprise up to half the 190 staff with the remaining staff spread evenly between the afternoon and evening shifts.

The number of heavy vehicle movements generated by Kimberley Clark is in the order of 98 per day. This number exceeds the proposed IPMG facility which is predicted to generate 44 heavy vehicle movements per day. A summary of the anticipated commercial vehicle activity is shown in **Table 1**.

Table 1 Commercial Vehicle Activity

Vehicle Type	Entry(per day)	Frequency	Time Period
Raw materials delivery (B –doubles)	9	5 days/week	24 hour
Final products shipment(semi-trailers)	7	7-days per week	7.00 am to 9.00 pm
Wastepaper removal (semi-trailers)	1	5 days/week	7.00 am to 7.00 pm
Ink deliveries (small tanker trucks)	0.3	5 days/week	7.00 am to 7.00 pm
Waste product removal (large refuse trucks)	1	5 days/week	7.00 am to 7.00 pm
Couriers	3	5 days/week	7.00 am to 7.00 pm
Total	**22**		

The estimated daily vehicle movements are presented in **Table 2**.

Table 2 Daily Vehicle Movements

Category	Morning 7:00 am – 8:00 am	Afternoon 2:45 pm – 3:45 pm	Daily
Employees	120	123	342
Commercial Vehicles	6	10	44
Other	-	8	20
Total	**126**	**141**	**406**

3.4 Hours of Operation and Staffing

The plant will operate on a 24 hours per day, 7 days per week basis and will employ approximately 185 – 190 full time equivalent staff over three 8-hour shifts. The shift commencement times are 7:00 am, 3:00 pm and 11:00 pm. These shift change times will generally apply to the majority of staff other than office staff (approximately 19) who work between 8:00 - 9:00 am to 4:00 - 5:00 pm.

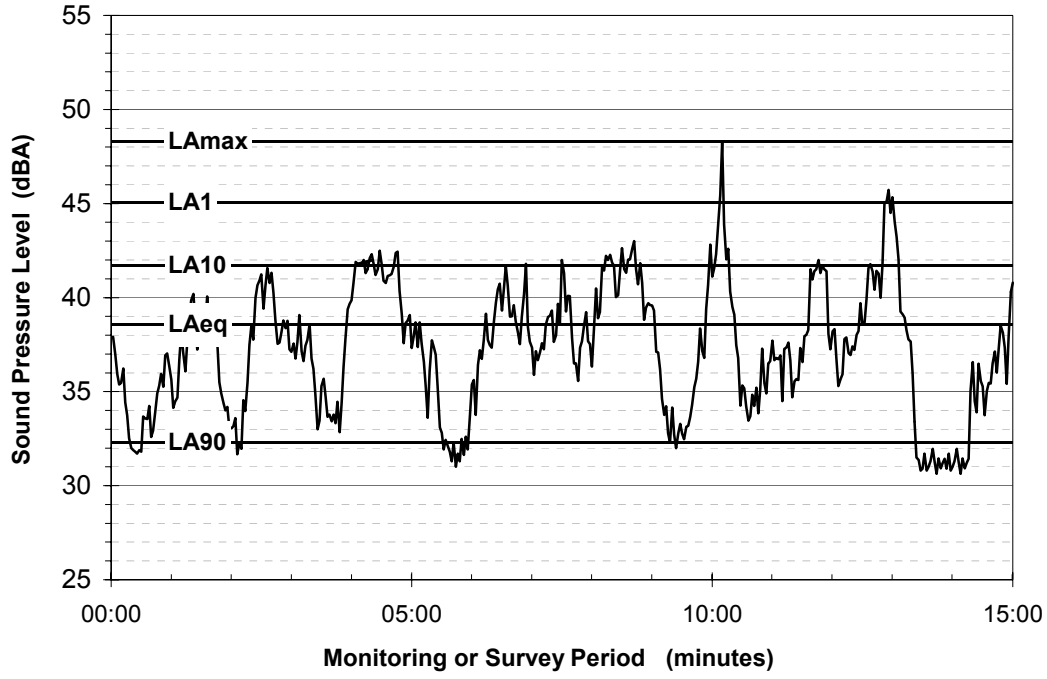
4 ACOUSTIC TERMINOLOGY USED IN THE REPORT

4.1 Acoustical Descriptors and Typical Noise Levels

This report makes repeated reference to certain statistical noise level descriptors, in particular the L_{A10}, L_{Aeq}, L_{A90}, L_{A1} and L_{Amax} noise levels, depicted graphically in **Figure 3**.

- The L_{A10} noise level is the A-weighted sound pressure level exceeded 10% of a given measurement period and is utilised normally to characterise typical average maximum noise levels.
- The L_{Aeq} is essentially the average sound level. It is defined as the steady sound level that contains the same amount of acoustical energy as a given time-varying sound over the same measurement period.
- The L_{A90} noise level is the A-weighted sound pressure level exceeded 90% of a given measurement period and is representative of the average minimum background sound level (in the absence of the source under consideration), or simply the "background" level.
- The L_{A1} noise level is the A-weighted sound pressure level exceeded 1% of a given measurement period and is utilised normally to characterise typical maximum noise levels.
- The L_{Amax} noise level is the maximum A-weighted sound pressure level measured over the given measurement period.

Figure 3 Graphical Display of Statistical Noise Level Descriptors



A range of typical noise levels is shown in **Table 3**.

Table 3 Typical Noise Levels

Sound Pressure Level (dBA)	Typical Source	Subjective Evaluation
130 120 110	Threshold of pain Heavy rock concert Grinding on steel	Intolerable Extremely noisy
100 90	Loud car horn at 3 m Construction site with pneumatic hammering	Very noisy
80 70	Kerb side of busy street Loud radio or television	Loud
60 50	Department store General Office	Moderate to Quiet
40 30	Inside private office Inside bedroom	Quiet to Very quiet
20	Unoccupied recording studio	Almost silent

4.2 A-Weighting or dBA Levels

The overall level of a sound is usually expressed in terms of dBA, as is the case in Australian Standards (AS) 1055 *Acoustics – Description and measurement of environmental noises*, which is measured using the "A-weighting" filter incorporated in sound level meters. These filters have a frequency response corresponding approximately to that of human hearing.

People's hearing is most sensitive to sounds at mid frequencies (500 Hz to 4000 Hz), and less sensitive at lower and higher frequencies. Thus, the level of a sound in dBA is a good measure of the loudness of that sound.

Different sources having the same dBA level generally sound about equally as loud, although the perceived loudness can also be affected by the character of the sound (eg the loudness of human speech and a distant motorbike may be perceived differently, although they are of the same dBA level).

4.3 Sensitivity to Noise Levels Changes

A change of up to 3 dBA in the level of a sound is difficult for most people to detect, whilst a 3 dBA to 5 dBA change corresponds to a small but noticeable change in loudness. A 10 dBA change corresponds to an approximate doubling or halving in loudness.

5 EXISTING NOISE ENVIRONMENT

5.1 Surrounding Receivers

The nearest potentially sensitive receiver locations in relation to the proposed facility are the training facilities with associated residences to the north of the development, specifically:

- Manning Street premises adjacent to the northern boundary and staff carpark;
- Premises located on the corner of Manning and Priddle Streets; and,
- Bull Street adjacent to Priddle Street, opposite the storage, packing and dispatch areas J, K and L.

These premises range between distances of 50 m to 80 m from the loading dock areas and from 225 m to 250 m from the press area.

Liverpool Hospital and Liverpool Girls' and Boys' High Schools are located at distances of between approximately 265 m and 530 m to the closest and furthest operational areas of the plant.

The ancillary hospital buildings to the south of the site range between 200 m and 460 m from the closest and furthest operational areas of the plant.

5.2 Ambient Noise Survey

5.2.1 Ambient Noise Monitoring

A survey to quantify and characterise the existing ambient noise environment immediately surrounding the site was carried out at three locations, as shown in **Figure 2**.

The three locations selected were:

- Location 1 – Southwestern corner of the site. This location was chosen as representative of the acoustical environment of the area directly south and west of the development site. Noise levels at this location were dominated by plant noise emissions from the subject site and from the ancillary hospital buildings to the south and rail movements on the Main South Railway Line.
- Location 2 – Priddle Street Boundary. This location was chosen as representative of the acoustical environment at training facility residences to the north of the site. Noise levels at this location were dominated by traffic on Priddle Street and vehicle movements from the loading docks located on the northern facade.
- Location 3 – Scrivener Street Boundary. This location was chosen as representative of the acoustical environment to the east and southeast of the site. Noise levels at this location were dominated by traffic on Scrivener Street and vehicle movements in and out of the Scrivener Street entry and plant noise emissions from the subject site and other surrounding industries.

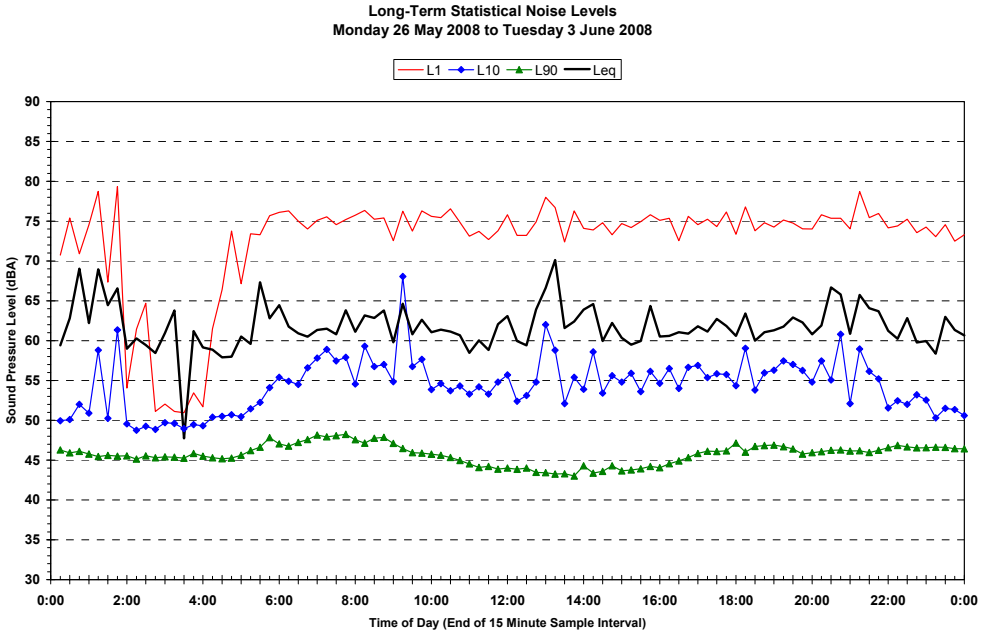
The measurements were carried out using ARL Environmental Noise Loggers Type EL 316 between Monday 26 May and Tuesday 3 June 2008. The noise loggers continuously sampled levels over the entire measurement duration, and calculated relevant statistical indices for each 15 minute period. The noise logger serial numbers are included in **Table 4**.

Table 4 Acoustic Instrumentation Schedule

Location	Description	Type or Class	Serial Number
1	ARL 316 Environmental Noise Logger	Type 1	16-207-042
2	ARL 316 Environmental Noise Logger	Type 1	16-207-046
3	ARL 316 Environmental Noise Logger	Type 1	16-207-049

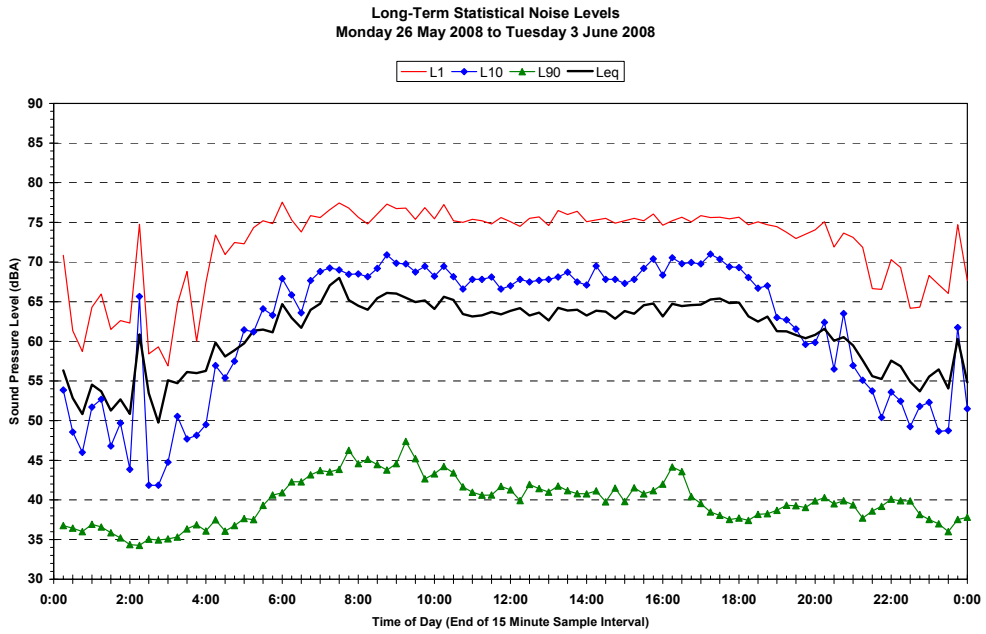
The following graphs presented in **Figure 4**, **Figure 5** and **Figure 6** show representative 24 hour periods of ambient noise levels at each of the three monitoring locations.

Figure 4 Monitoring Location 1 – Ambient Noise Levels - 24 Hour Summary



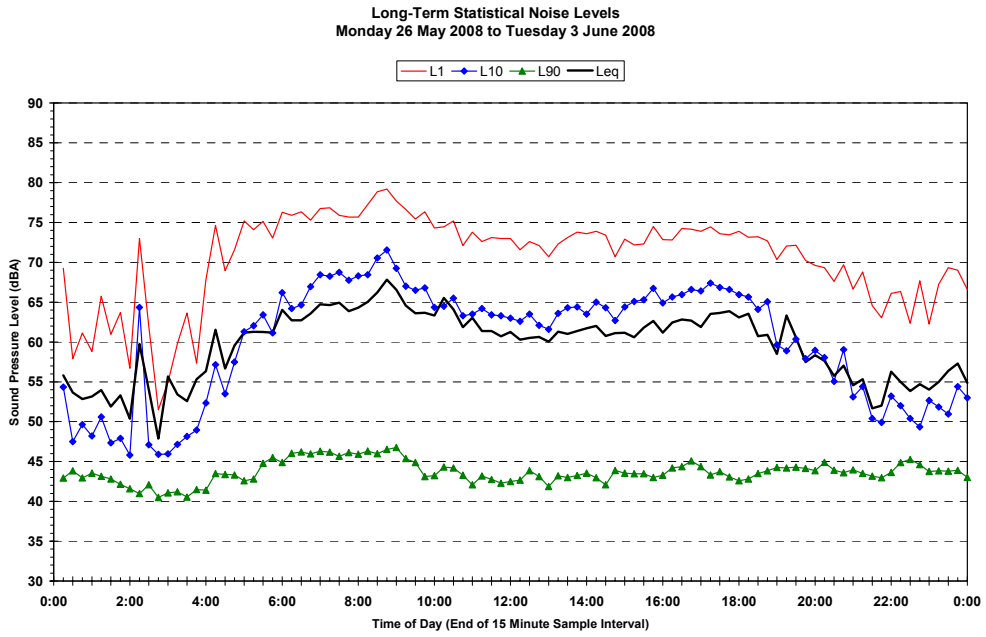
The survey results reflect a noise environment predominantly controlled by industrial operations and mechanical noise emissions from the subject site and ancillary hospital buildings to the south. Rail movements on the Main South Railway Line also contributed to the ambient noise environment. The measurements show background L_{A90} noise levels generally ranging between 42 dBA and 49 dBA during the daytime. The evening background L_{A90} levels range between 45 dBA and 49 dBA and the night-time background L_{A90} levels range between 45 dBA and 48 dBA.

Figure 5 Monitoring Location 2 – Ambient Noise Levels – 24 Hour Summary



The survey results at Location 2 reflect a noise environment typically dominated by industrial site operations and by vehicle movements on the surrounding road network. The measurements show background L_{A90} noise levels ranging between 38 dBA and 48 dBA during the daytime. The evening background L_{A90} levels range between 36 dBA and 44 dBA and the night-time background L_{A90} levels range between 34 dBA and 38 dBA.

Figure 6 Montoring Location 3 – Ambient Noise Levels - 24 Hour Summary



The survey results at Location 3 also reflect a noise environment typically dominated by industrial site operations and by vehicle movements on the surrounding road network. The measurements show background L_{A90} noise levels ranging between 42 dBA and 46 dBA during the daytime. The evening background L_{A90} levels range between 41 dBA and 46 dBA and the night-time background L_{A90} levels range between 41 dBA and 44 dBA.

5.2.2 Survey Results

Industrial Noise

The results of the noise monitoring have been processed with reference to the procedures contained in the NSW Government's Industrial Noise Policy (Jan 2000) (INP), which is administered by the Department of Environment and Climate Change (DECC). The results establish noise levels which are representative of receiver locations relevant to the proposed development.

The Rating Background Noise Level (RBL) is the background noise level used for assessment purposes at the nearest potentially affected receiver. It is the median of the daily background noise levels during each assessment period, being day, evening and night. RBL levels ($L_{A90\ (15minute)}$) and L_{Aeq} noise levels are presented in **Table 5**.

Table 5 Measured Ambient Noise Levels

Location	Noise Level - dBA re 20 µPa					
	Daytime 0700 hrs - 1800 hrs		Evening 1800 hrs – 2200 hrs		Night-time 2200 hrs - 0700 hrs	
	RBL	LAeq	RBL	LAeq	RBL	LAeq
1	45	62	48	63	46	63
2	43	65	41	61	37	59
3	44	64	45	59	43	59

Industrial noise is assessed for each of the day (i.e. 7:00 am to 6:00 pm), evening (6.00 pm to 10.00 pm) and night-time (i.e. 10.00 pm to 7.00 am) periods in accordance with the INP.

Road Traffic Noise

The NSW Government's Environmental Criteria for Road Traffic Noise (Dec 1999) (ECRTN) recommends assessment of road traffic noise over the day (i.e. 7:00 am to 10:00 pm) and night-time periods (i.e. 10:00 pm to 7:00 am). The noise logger results have also been processed in accordance with these procedures. Traffic affects all three monitoring locations, with Locations 2 and 3 being the most influenced. The survey results reflecting the total road traffic noise are presented in **Table 6**.

Table 6 Measured Road Traffic Noise Levels

Location	Daytime LAeq(15hour) 0700 hrs – 2200 hrs	Night-time LAeq(9hour) 2200 hrs - 0700 hrs	Daytime LAeq(1hour)[1] 0700 hrs – 2200 hrs	Night-time LAeq(1hour)[1] 2200 hrs - 0700 hrs
1	63	63	65	65
2	64	59	67	64
3	63	59	66	64

Note 1 The LAeq is the equivalent continuous noise level, and is based on the logarithmic average of the 15 minute samples in each assessment period. The average maximum hourly value over the time period is shown.

6 ASSESSMENT CRITERIA

6.1 INP 2000 Criteria for Operational Noise Emissions

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

The INP criteria for industrial (eg mechanical plant and material production and handling equipment) noise sources have two components:

- Controlling the *intrusive* noise impacts for residents and other sensitive receivers in the short term; and
- Maintaining noise level *amenity* for particular land uses for residents and sensitive receivers in other land uses.

Intrusiveness Criterion

In setting an "Intrusive" noise goal, a statistically rigorous estimate of the ambient (background) L_{A90} noise level, termed the RBL, needs to be established at the nearest sensitive receivers. An "RBL plus 5 dBA" criterion is then applied to the 15-minute L_{Aeq} noise emissions of the noise source in question at the receivers of interest (normally at their property boundary).

- **Intrusive Design Goal**: $L_{Aeq(15minute)} \leq$ RBL + 5 dBA

Section 3.1 of the INP recommends that, where the RBL is found to be below 30 dBA, it is set at 30 dBA. This requirement is not relevant to this situation.

Amenity Criterion

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. If present, the existing noise level from industry is generally 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.

The cumulative effect of noise from industrial sources needs to be considered in assessing the impact. In order to determine the amenity noise goal, the maximum ambient L_{Aeq} noise levels within an area should not normally exceed the acceptable noise levels specified in **Table 7**. Where existing L_{Aeq} noise levels approach or exceed the acceptable noise levels given in **Table 7**, L_{Aeq} noise design goals are set below the existing L_{Aeq} levels in order to limit any further increase or "creep" in the ambient levels.

An extract from the NSW INP that relates to the amenity criteria recommended for residential and other receiver types relevant to this assessment is given in **Table 7**.

Table 7 Residential Amenity Criteria - Recommended L_{Aeq} Noise Levels from Industrial Noise Sources

Type of Receiver	Indicative Noise Amenity Area	Time of Day	Recommended L_{Aeq}[1] Noise Level	
			Acceptable	Recommended Maximum
Residence	Urban	Day	60 dBA	65 dBA
		Evening	50 dBA	55 dBA
		Night	45 dBA	50 dBA
	Urban/Industrial	Day	65 dBA	70 dBA
		Evening	55 dBA	60 dBA
		Night	50 dBA	55 dBA
School Classroom - internal	All	Noisiest 1-hour period	40[2]	45
- external (inferred)			50	55
Hospital ward -internal	All	Noisiest 1-hour period	35	40
-external			50	55
Commercial premises	All	When in use	65	70
Industrial premises	All	When in use	70	75

Notes:

1 The L_{Aeq} index corresponds to the level of noise equivalent to the energy average of noise levels occurring over a measurement period.

2 In accordance with Section 2.2.1 Note 10 where existing schools are affected by noise from existing industrial noise sources, the acceptable LAeq noise level may be increased to 40 dBA LAeq(1hour)

3 For Monday to Saturday, Daytime 7.00 am – 6.00 pm; Evening 6.00 pm – 10.00 pm; Night-time 10.00 pm – 7.00 am.

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

The prevailing noise climate of the area is dominated by industry and the commercial operations of the stables and training facilities associated with the Warwick Farm Racecourse precinct. Whilst the receivers in close proximity to the industry operate on a commercial basis, the residential component of these premises can reasonably be classified as "Urban/Industrial interface" according to the definition of this classification given by the INP and the Policy Application Notes as follows:

The urban/industrial interface amenity category applies only to existing situations (that is, an existing receiver near an existing industry) and only for those receivers in the immediate area surrounding the industry, that is, the region that extends from the boundary of the existing industry to the point where the noise level of the existing industry (measured at its boundary) has fallen by 5 decibels.

Receivers in Manning and Priddle Streets would fall into the "Urban/Industrial interface" region since they are located adjacent to the industrial boundary.

For receivers beyond the "interface" region, the "Urban" amenity area classification would apply. This classification would include receivers north of those immediately adjacent to the industrial operations where the contributions from industry would be lower due to the shielding provided by the intervening premises.

6.2 Project Specific Noise Goals

The project-specific goals for plant and equipment noise emissions from the proposed facility covering all criteria (day, evening and night-time) are given in **Table 8.** For the residential receivers, the determining levels, being the lower of the intrusive and amenity criteria, are shown in bold.

Table 8 Assessment Criteria for Industrial Noise Emissions

Location	Area Classification	Period [1]	ANL [2] LAeq (period) dBA	Measured RBL [3] LA90(15min) dBA	Measured LAeq(period) Noise Level dBA	Criteria for New Sources[4]	
						Intrusive LAeq(15min)	Amenity LAeq(period)
Residence	Urban/Industrial Interface	Day	65	43	65	**48**	57
		Evening	55	41	61	**46**	51
		Night	50	37	59	**42**	49
School - external	All	Noisiest 1-hour period when in use	50	45	62	n/a[5]	50
Hospital - external	All	Day	50	45	62	n/a	50
		Evening	50	48	63	n/a	50
		Night	50	46	63	n/a	50
Commercial (Hospital Ancillery buildings)	All	Day	65	45	62	n/a	65
		Evening	65	48	63	n/a	65
		Night	65	46	63	n/a	65
Industrial	All	Day	70	44	64	n/a	70
		Evening	70	45	59	n/a	70
		Night	70	43	59	n/a	70

Note 1: DECC Governing Periods are Day: 7.00 am to 6.00 pm, Evening: 6.00 pm to 10.00 pm, Night: 10.00 pm to 7.00 am.

Note 2: Recommended - ANL Acceptable Noise Level

Note 3: RBL Rating Background Level

Note 4: Assuming existing noise levels unlikely to decrease in the future

Note 5: Intrusive criterion only applicable to residential receivers

Modifying Factor Adjustments

According to the INP guidelines Table 4.1 '*Modifying Factor Correction*' a 'modifying factor' adjustment is to be applied when the overall noise levels emitted from the facility contain certain characteristics such as tonality, impulsiveness, intermittency, irregularity or dominant low frequency content.

In general the modifying factor correction is in the form of a 5 dB penalty applied to the measured or predicted noise from the facility. The correction has to be added to the predicted noise levels at the receiver before comparison with the recommended project specific noise level criteria (as discussed in **Section 6.2**).

The general noise sources from the proposed IPMG facility are not of a tonal, impulsive or intermittent nature with the exception of the printing presses which exhibit a notable 1 kHz tone. There are certain operations which result in short duration high noise level emissions but these are not of sufficiently regular occurrence to apply a penalty for daytime emissions. The sleep disturbance criterion, discussed in **Section 6.4**, takes into account short duration, high level noises occurring during the night.

6.3 Road Traffic Noise

The DECC's ECRTN presents the NSW Government's noise design goals for the assessment of road traffic noise.

The ECRTN document contains recommended road traffic noise criteria for various types of road and land use developments. The relevant criteria relating to land use developments with the potential to generate additional traffic on 'collector' and 'local' roads is summarised in **Table 9**.

Table 9 DECC's Guidelines for Road Traffic Noise at Residences

Type of Development	Criteria		
	Day (7.00 am to 10.00 pm)	**Night (10.00 pm to 7.00 am)**	**Where Criteria are Already Exceeded**
Land use developments with potential to create additional traffic on collector roads	$L_{Aeq(1hour)}$ 60 dBA	$L_{Aeq(1hour)}$ 55 dBA	Where feasible and reasonable, existing noise levels should be mitigated to meet the noise criteria via judicious design construction of the development. In all cases, traffic arising from the development should not lead to an increase in existing noise levels by more than 2 dB.

Definitions: Land use developments with potential to create additional traffic – addresses the acceptable level of traffic noise impact for existing residences.

In circumstances where ambient L_{Aeq} noise levels are *already* being exceeded (as is the case in this area), application of the ECRTN criteria would then be to ensure that, at a minimum, traffic arising from the proposed development should not lead to an increase in existing noise levels of more than 2 dB.

It is noted that the noise criteria presented within the ECRTN noise policy document are guidelines and non-mandatory.

6.4 Sleep Disturbance

In order to minimise the risk of sleep disturbance from the industrial operations during night-time operation, the DECC's ENCM recommends that:

- The $L_{A1\ (60second)}$ noise level outside a bedroom window should not exceed the L_{A90} background noise level by more than 15 dBA during night-time period (10.00 pm to 7.00 am). The $L_{A1\ (60second)}$ noise level may conservatively be estimated by the typical maximum level of noise emission.

Based on the measured background noise levels, the sleep disturbance criteria for the nearest and potentially most affected residential receivers are presented in **Table 10**.

Table 10 Night-time Sleep Disturbance Criteria

Location	Sleep Disturbance Criteria	
	Measured RBL	Criteria $L_{A1(60second)}$
Residential Premises Manning & Bull/Priddle Streets	37 dBA	52 dBA

The DECC's ECRTN provides additional guidance as to the likelihood of sleep disturbance and points out the following:

> *"There is no universally accepted criterion governing the likelihood of sleep disturbance. In other words, 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 (for all or even a majority of people)."*

The RTA *"Environmental Noise Management Manual"* (ENMM, January 2002), addresses sleep disturbance in a similar fashion:

- With respect to road traffic noise, it is required to assess the characteristics of so-called "maximum noise events" at nearest residential receivers, namely their occurrence throughout the night-time period (ie how many on an hourly basis) and their magnitudes. A "maximum noise event" is defined as any single event where the L_{Amax} level exceeds the $L_{Aeq(1hr)}$ level by more than 15 dBA.

6.5 Construction Noise

When dealing with construction noise, the DECC recognises that higher levels of noise than would apply to the long-term operational emissions for a development are likely to be more tolerable to receptors in view of the relatively short duration of construction works.

As a result of this and in consideration of the inherently noisy nature of construction works and the practical difficulties in controlling construction noise emissions, guidelines have been published by the former EPA in Chapter 171 of the Environmental Noise Control Manual (ENCM) for the assessment and minimisation of construction noise impacts. In addition to the published guidelines, standard practices have evolved which are applicable to construction noise and vibration relating to normal contact with affected communities (eg liaison protocols, appropriate notification to affected residents, etc).

In summary, the recommended general approach to the control of construction noise involves the following:

a. Level Restrictions

- For a cumulative period of exposure to construction activity noise of up to 4 weeks, the $L_{A10(15minute)}$ emitted by the works to specific residences should not exceed the $L_{A90(15minute)}$ background level by more than 20 dBA.
- For a cumulative construction noise exposure period of between 4 weeks and 26 weeks, the emitted $L_{A10(15minute)}$ noise level should not exceed the L_{A90} background level by more than 10 dBA.
- For a cumulative construction noise exposure period of greater than 26 weeks, the emitted $L_{A10(15minute)}$ noise level should not exceed the L_{A90} background level by more than 5 dBA.

In relation to the above, the $L_{A90(15minute)}$ background noise level is the background noise at affected premises prior to the commencement of construction. Further, a 5 dBA penalty must be added to the $L_{A10(15minute)}$ noise level if the noise is substantially tonal or impulsive in character.

b. Time Restrictions

Construction hours specified in the ENCM:

Monday to Friday	7 am to 6 pm
Saturday	7 am to 1 pm (if inaudible at residential premises) 8 am to 1 pm (if audible at residential premises)
Sundays, Public Holidays	No work permitted

c. Silencing

All practical measures should be used to silence excavation and/or construction equipment, particularly in instances where extended hours of operation are required.

d. Works Undertaken Outside of Preferred Construction Hours

The ENCM guidelines do not provide criteria for work outside the Time Restrictions specified. Where it is necessary for construction works to be undertaken outside the preferred daytime construction hours, the $L_{A10(15minute)}$ noise level emitted by the works should not exceed the $L_{A90(15minute)}$ noise level during the relevant evening or night-time period by a margin of more than 5 dBA.

7 PREDICTED NOISE EMISSIONS

7.1 Proposed Operations

Calculations have been conducted to assess the impact of the following noise sources or operations associated with the proposed IPMG facility:

- Production plant and equipment;
- Mechanical ventilation plant & equipment;
- Production-related mobile equipment (eg 3-tonne and 10-tonne capacity forklifts);
- Vehicle movements within the facility including trucks and forklifts (including reversing alarms);
- People-related noise emissions (especially at night-time and in the carpark); and
- Truck and car movements external to the site.

7.2 Production Plant

7.2.1 Plant Noise Levels

The major sources of noise generating plant associated with the facility are the printing presses and the forklifts which will operate within the building. Noise level data associated with each of the production processes was obtained and the levels are presented in **Table 11**.

Table 11 Production Plant Noise Levels

Area	Process/Plant Item	Noise Level
A	Bulk Roll Paper Store	Lw 115 dBA
	10 tonne CNG Forklift (2 off)	
B	Cylinder Production	Maximum Lp 75 dBA
C	Rotogravure Press (3 off)	Lw 118 dBA
D	Vapour Recovery Plant (External)	Lp 70 dBA @ 1 m
E	Stacking and Palletising	Lp 85 dBA outside press enclosure
F	Racked Storage	Lw 106 dBA
	3 tonne CNG Forklift[1]	
G	Bindery	Lp 87 dBA
	3 tonne CNG Forklift	Lw 106 dBA
H	Finished goods dispatch	Lw 106 dBA
	3 tonne CNG Forklift	
I	Waste paper collection	
	Tennant Floor sweeper	Lw 106 dBA
	3 tonne CNG Forklift	
J	Finished goods storage and packing	Lw 106 dBA
	3 tonne CNG Forklift	
K	Warehouse and dispatch	Lw 106 dBA
	3 tonne CNG Forklift	
L	Proposed new warehouse	Lw 106 dBA
	3 tonne CNG Forklift	

1 There will be 6 off 3-tonne forklifts operating within the building and associated with loading and unloading. Calculations assume the 6 forklifts operating throughout all areas E-L.

7.2.2 Building Construction

The existing building is of concrete and masonry construction. There are three large roller shutter openings to loading docks on the northern facade and one large roller shutter opening on the western facade. The southern side of the future warehouse Areas J and K are also largely open. It is assumed that the new warehouse Area L will have a similar large roller shutter opening on the southern side.

The existing roof construction was reported to comprise:

- outer skin of sheet metal
- minimum100 mm width airspace
- insulating layer
- internal skin of sheet metal.

For the purposes of calculation we have assumed a BMT of 0.48 mm for the metal roofing and an internal layer of 50 mm glasswool (12 kg/m^3).

Details of the raised roof construction in Area C were unavailable at the time of this assessment. Any vertical (wall) sections between the existing (8 m) roof level and the new elevated roof line must be of an equivalent construction to that of the existing roof as detailed above.

7.2.3 Noise Level Emissions

Calculations of the total noise emissions during the typical operational phase of the facility have been conducted to the nearest residential receiver locations to the north, to the nearest Liverpool Hospital and Liverpool High School buildings to the west, to the nearest industrial boundary to the south and/or east and the ancillary hospital buildings to the south.

A conservative approach was adopted whereby all equipment was assumed to be operating concurrently. Nominal allowances have been allowed for directional and shielding losses where applicable. A 5 dBA penalty has been applied for the tonality associated with the emissions from the printing presses.

The noise level predictions to each receiver location considered are shown in **Table 12**.

Table 12 Predicted Operational Noise Emissions

Receiver Location	Predicted Noise Level
Residential Premises Manning/Bull/Priddle Streets	42 dBA
Liverpool Hospital	37 dBA
Liverpool Boy' & Girls' High School	36 dBA
Hospital ancillary buildings to south	35 dBA
Industrial boundary east/south	52 dBA

7.3 Mechanical Noise

The existing mechanical ventilation system serving the building will be retained with some modifications to take into account the new and refurbished areas of the building. The precise selection of any additional mechanical plant is unknown at this stage, as plant selection will take place during the detailed design phase of the project.

The mechanical plant and equipment will operate on a 24 hours per day, 7 days per week basis.

It is likely that the criteria set out in **Section 6.2** will be met through the use of conventional noise control methods (e.g.: selection of equipment on the basis of quiet operation and, where necessary, providing full enclosures, localised barriers, silencers and lined ductwork).

7.4 Loading Dock Noise Emissions

The operations involved in both the inbound and outbound handling of goods at each dispatch dock would involve 3-tonne capacity forklifts loading and unloading pallets from trucks. The forklifts would also be used to relocate goods within the production and warehouse areas of the facility. The noise emissions associated with the movement of forklifts within the building are included in operational noise emission calculations discussed in **Section 7.2.3**.

Heggies has made numerous measurements of forklift operations at large scale handling facilities. Typical noise emissions involved expressed as sound pressure levels are:

- L_{Aeq} of 72 dBA at 10 m from a gas forklift unloading a truck and driving.
- L_{Aeq} of 84 dBA at 10 m from a Clark forklift lifting and re-arranging a container.
- L_{Aeq} of 82 dBA at 10 m from an Omega forklift lifting and re-arranging a container.

Resulting noise levels at the nearest residences would depend upon the number of forklifts operating at any one time, their location and their type. A conservative estimate has been made of the resulting noise levels at the nearest residences, based upon a 3-tonne capacity forklift operating in the most exposed area of the external loading dock in closest proximity relative to the residential receiver.

For the residence on Manning Street, adjacent the northern site (carpark) boundary, a nominal barrier effect of 5 dBA has been included in the calculations. No shielding has been included for the residential premises near the corner of Manning and Priddle Streets or the premises at the southern end of Bull Street (adjacent to Priddle Street).

Trucks and forklifts operating during the 10.00 pm to 7.00 am night-time period would require the use of reversing alarms. A wide range of such alarms exist with varying sound output levels and varying tonal qualities.

The predicted levels of noise emissions to nearby residential premises due to loading dock activities are presented in **Table 13**.

Table 13 Loading Dock Noise Emissions

Noise Source	Typical Maximum Sound Power Level (dBA)	Received Noise Level (dBA)		
		Residence Manning St adjacent north carpark	Residence Manning St near corner of Priddle St	Residence southern end of Bull St near Priddle St
Reversing Alarm	100 to 110	50 to 60	54 to 64	58 to 68
Truck Engine	100	50	54	58
Roller Door	94	44	48	52
Trolley	93	43	47	51
Raised Voices	83	33	37	41
People Talking	78	28	32	36

7.5 Carpark Noise Emissions

There is potential for the noise generated by staff and their vehicles within the carpark during change of shift, to impact on night-time noise levels at nearby residences.

The noise level generated by carpark activities is variable. Heggies has conducted studies of customer and vehicle noise levels in the context of low speed vehicle activities in suburban fast food outlets. The calculated noise emissions to residences due to carpark activities are based upon the sound power levels derived from this study and are included in **Table 14**.

Table 14 Carpark Noise Emissions

Noise Source	Typical Maximum Sound Power Level (dBA)	Received Noise Level (dBA)	
		Residence Manning St adjacent to the north carpark	Residence Manning St near corner of Priddle St opposite the carpark
Car Accelerating	93 to 98	56 to 61	56 to 61
Car Starting	91 to 97	54 to 60	54 to 60
Car Door Closing	88 to 93	51 to 56	51 to 56
Car Moving	83 to 90	46 to 53	46 to 53
Raised Voices	83	46	46
People Talking	78	41	41

7.6 Road Traffic Noise

The proposed IPMG facility will generate in the order of 54 fewer heavy vehicle movements per day compared with the heavy vehicle volume generated by the former Kimberley Clark operation.

The former Kimberley Clark operation employed in excess of 300 staff during its peak operations. In contrast, the proposed IPMG development will generate as many as 60 to 80 fewer vehicle trips in the morning and afternoon peak periods.

A direct comparison between the numbers of heavy vehicles generated by Kimberley Clark compared with the number projected due to IPMG operations (ie 54 fewer movements) would result in a reduction in the site heavy vehicle noise contribution of 3 dBA. Similarly, the contributed level of road traffic noise generated by light vehicles movements to and from the site would result in reductions of between 1 dBA and 2 dBA in morning and peak periods due to the IPMG operations.

From the results of traffic counts conducted in Warwick and Munday Streets, the AADT volumes (measured over 5 consecutive weekdays) were 1620 and 3631 vehicles, respectively. The breakdown of the traffic between Manning Street and each of these streets is not known. However, for the purposes of calculation we have assumed the total traffic volume from both Warwick and Munday Streets travels along Manning Street, ie an AADT (5 consecutive weekday) of 5251 vehicles.

Calculations of the daily traffic noise level have been conducted to compare the overall level generated due to existing traffic flows on Manning Street with the level generated by the projected traffic flows from the IPMG operation. The results of calculations show an insignificant reduction (in the order of 0.1 dBA) in the existing levels of road traffic noise. This is due to the relatively small reduction in the overall high volume of heavy vehicles movements currently operating on the local roads accessing the industrial estate and the stables and training facilities. The effect of the reduction in light vehicle movements is not significant since the received noise level is dominated by the contributions from heavy vehicle movements

Overall, therefore, the proposed development will not cause any significant change to existing traffic volumes and as such, the current levels of road traffic noise will remain similarly unchanged.

7.7 Construction Noise

Construction activities associated with the modifications and additions to the existing building will not involve extensive excavation or demolition works. As such, noise generated during the construction phase will be due to typical building-type activities such as drilling, sawing, hammering and the like. Construction noise emissions are therefore likely to be similar to any typical domestic, commercial or industrial building project.

8 ASSESSMENT OF NOISE EMISSIONS

8.1 Operational Noise Emissions

The predicted $L_{Aeq(15minute)}$ operational noise levels contained in **Section 7.2.3** are shown, together with the relevant assessment criteria for each of the receiver location considered, in **Table 15**. Since the plant will operate on a 24 hour per day basis, the night-time criterion will determine compliance.

Table 15 Comparison of Predicted Operational Noise Emissions with Environmental Criteria

Receiver	Received Noise Level (dBA)	Criterion (dBA)	Compliance
Northern residences	42	42	yes
Liverpool Hospital	37	50	yes
Liverpool Boys' & Girls' High Schools	36	50	yes
Hospital ancillary buildings to south	35	65	yes
Industrial boundary east/south	52	70	yes

The above comparison of predicted noise level with the relevant project specific noise goal indicates that compliance can be achieved at the nearest potentially sensitive receiver locations considered with no additional noise controls beyond those already examined.

8.2 Mechanical Noise Emissions

Precise details of the mechanical plant selection are unknown at this stage, as this will take place during the detailed design phase of the project. The noise emission of mechanical plant associated with the development should be controlled so that the operation of such plant does not adversely impact upon nearby potentially sensitive receivers.

It is envisaged that compliance with the limiting noise criterion of 42 dBA during the night-time period will be achieved through the use of common engineering methods such as:

- Judicious location;
- Barriers/enclosures;
- Silencers; and,
- Acoustically lined ductwork.

The mechanical equipment associated with the development must be reviewed by an appropriately qualified acoustic consultant at the detailed design stage when preliminary, and final plant selections have been made.

8.3 Loading Dock Noise Emissions

Noise emissions from trucks and forklifts associated with the delivery of materials to the site and the dispatch of finished products have the potential to cause adverse impact to surrounding residential receivers, particularly if they occur during the night-time period when sleep disturbance becomes an issue.

The predicted noise levels due to typical loading dock activities are shown, together with the sleep disturbance criterion, in **Table 16**.

Table 16 Comparison of Predicted Loading Dock Noise Emissions with Sleep Disturbance Criteria

Noise Source	Received Noise Level (dBA)			Sleep Disturbance Criterion (dBA)
	Residence Manning St adjacent north carpark	Residence Manning St near corner of Priddle St	Residence southern end of Bull St near Priddle St	
Reversing Alarm	50 to 60	54 to 64	58 to 68	52
Truck Engine	50	54	58	52
Roller Door	44	48	52	52
Trolley	43	47	51	52
Raised Voices	33	37	41	52
People Talking	28	32	36	52

From the predicted noise levels at the residences in closest proximity to the loading dock locations it is apparent that the operation of reversing alarms and truck engines may at times result in an exceedance of the sleep disturbance criterion. It is therefore recommended that the operation of all loading docks located on the northern side of the facility be restricted to between 7:00 am and 9:00 pm. We understand a 9:00 pm to 6:00 am curfew currently applies successfully to the north-western dock. Loading and unloading operations can be conducted without adverse acoustical impact at the rear (southern side) of the building.

8.4 Carpark Noise Emissions

Noise generated by activities within the staff carpark at the northern end of the site has the potential to impact on night-time noise levels at nearby residences.

The predicted noise levels due to typical carpark activities are shown, together with the sleep disturbance criterion, in **Table 17**.

Table 17 Comparison of Predicted Carpark Noise Emissions with Sleep Disturbance Criteria

Noise Source	Received Noise Level (dBA)		Sleep Disturbance Criterion (dBA)
	Residence Manning St adjacent to the north carpark	Residence Manning St near corner of Priddle St opposite the carpark	
Car Accelerating	56 to 61	56 to 61	52
Car Starting	54 to 60	54 to 60	52
Car Door Closing	51 to 56	51 to 56	52
Car Moving	46 to 53	46 to 53	52
Raised Voices	46	46	52
People Talking	41	41	52

From the predicted noise levels at the residences in closest proximity to the northern staff carpark location it is apparent that activities such as car doors closing, cars starting and accelerating may at times result in an exceedance of the sleep disturbance criterion. We are unaware of any previous complaints in regard to noise emissions from the existing use of this carpark. It is therefore likely that the carpark may continue to operate without generating any adverse comment from surrounding residents. It is recommended that security personnel monitor the activities within this carpark to ensure that staff enter and exit with minimum noise generation and that consideration is given at all times to the acoustical amenity of surrounding residents.

8.5 Road Traffic Noise

The commercial vehicle activity predicted for the proposed IPMG operations results in fewer movements than that of the former Kimberley Clark operations. Therefore the proposed development will not result in any significant change to the existing levels of road traffic noise generated by heavy vehicles.

The reduction in staff numbers between the former Kimberley Clark operation and the proposed IPMG development will result in between 60 to 80 less vehicle trips each day during the morning and evening peak periods. In this regard, the proposed development will positively impact upon road traffic noise due to the decrease in vehicle volume.

The overall development does not result in any significant change in the existing levels of road traffic noise and will therefore comply with the DECC's guidelines that, at a minimum, traffic arising from the proposed development should not lead to an increase in existing noise levels of more than 2 dB.

8.6 Construction Noise

There are no demolition or excavation works of significance associated with the development. Construction noise will be confined to general building works and will therefore be adequately controlled by the time restrictions generally imposed on such activities.

9 CONCLUSIONS AND RECOMMENDATIONS

Heggies has conducted an assessment of the noise impact associated with the proposed IPMG facility to be located at the former Kimberley Clark premises at 23 Scrivener Street, Warwick Farm. The new development will house a print production, warehousing and distribution facility. This assessment has been carried out in accordance with NSW regulatory requirements and this report is to form part of a Development Application in support of the proposed development.

The scope of the assessment involved a survey of the existing noise environment; derivation and establishment of assessment criteria for noise emissions; a noise impact assessment relative to appropriate criteria; and, where required, recommendations for noise control measures. The findings are as follows:

Industrial Noise Sources

- Compliance with project specific INP noise goals can be achieved at the nearest potentially sensitive receiver locations surrounding the site under “worst-case” scenario conditions, involving all equipment operating concurrently.

Road Traffic Related Noise Sources

- Road traffic generated by the development is comparable with existing traffic conditions and employee vehicle movements will be considerably less than those generated by the former Kimberley Clark operations. The development will therefore comply with the DECC Environmental Criteria for Road Traffic Noise (ECRTN) guidelines.

Sleep Disturbance

- Noise emissions from loading dock operations on the northern side of the premises may exceed the environmental criterion for sleep disturbance at nearby residences. Accordingly it is recommended that the operation of these loading docks be restricted to between the hours of 7:00 am to 9:00 pm. A curfew between the hours of 9:00 pm and 6:00 am has been successfully applied to the former Kimberley Clark operations. Loading areas at the rear (southern side) of the premises can be operated without adverse impact upon residential receivers.
- Vehicle activity within the northern staff carpark may also exceed the environmental criterion for sleep disturbance at nearby residences. Whilst this carpark appears to have previously operated without incident it is recommended that security personnel monitor its use at shift change to ensure that staff arrive and depart with minimum noise generation and that consideration is given at all times to the acoustical amenity of surrounding residents.