Seymour Group

58-66 Abbotsford Road - Commercial Development Application

Noise Assessment

AAc/221349/R01

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Contents

Appendices

J:\221000\221349\4_PROJECT_WORK\05_REPORTS\0001ABBOTSFORD RD DA REPORT - COMMERCIAL ISSUE2 240211.DOCX

1 Executive Summary

This report provides a noise assessment for a proposed commercial development on the 58-66 Abbotsford Road site.

The site is located within the Bowen Hills Urban Development Area and is included within the Bowen Hills UDA Development Scheme, under the jurisdiction of the ULDA.

Section 3.9 of the Development Scheme outlines the General Noise Requirements for new development within the ULDA, including:

- The design, siting and location of development must address noise impacts and where necessary, incorporate appropriate noise mitigation measures.
- Development is to achieve acceptable noise levels for noise sensitive uses in affected areas (in accordance with the Environmental Protection (Noise) Policy 2008.

This assessment addressed the proposal in relation to the two points above and considers the Environmental Protection (Noise) Policy 2008.

The site also falls within the Mixed Use Transit Precinct inside the "Bowen Hills Local Plan". This local plan does not recommend any specific requirement regarding noise levels, therefore this assessment has been conducted following the "Brisbane City Plan 2000 Appendix 2 Noise Impact Assessment Planning Scheme Policy" (NIAPSP).

This report provides noise assessment against policy and legislation for the following:

- Existing noise environment affecting the proposed commercial development;
- Operational noise from the development affecting surrounding existing noise sensitive premises;
- Traffic noise affects to the existing road network arising from the proposed development;
- Construction noise affects.

Following assessment of each of these components, mitigation measures are defined as appropriate to provide compliance with governing requirements.

Mitigation requirements for the proposed commercial development are as follows:

- Road traffic movements from the proposed development are unlikely to increase the existing Road Traffic Noise levels.
- Minimum façade acoustic performance of ***Rw35 (e.g. 6mm laminated glass)for commercial***(Level 2 down)
- Minimum façade acoustic performance of ***Rw40 (e.g. 13mm laminated glass)for general office spaces and Rw45 (e.g. 6mm glass/150mm***

J:\221000\221349\4_PROJECT_WORK\05_REPORTS\0001ABBOTSFORD RD DA REPORT - COMMERCIAL ISSUE2 240211.DOCX

airgap/6mm glass double glazing)for private offices and boardroom spaces

- ***Office spaces facade acoustic requirements will be reviewed during detailed design to ascertain whether the acoustic performance can be reduced at higher levels of the building to account for reduced traffic noise at height – typically traffic noise levels at 70 metres above roads are in the order of 7dB(A) lower.***
- Plant noise should be limited to 64 dB(A) during the day, 62 dB(A) during the evening and 58 dB(A) during the night at 3m from the site boundary (ground level) and 65 dB(A) during the day, 65 dB(A) during the evening and 60 dB(A) during the night at 3m of the site boundary (above ground level);

If the acoustic mitigation requirements defined above are incorporated into the development, all acoustic requirements for the development are fulfilled in accordance with planning requirements.

The Mitigation requirements defined above should be reviewed during detailed design of the development to ensure that the intent of the acoustic requirements defined herein are maintained during the detailed design development.

2 Introduction

Arup Acoustics has been commissioned by Seymour Group to provide a noise assessment for a commercial development at 58-66 Abbotsford Road.

The proposed development is a 24 floor building (with 1 roof level) located on a 3199 m^2 site at 58-66 Abbotsford Road in Bowen Hills and will provide a commercial tower with office space aboveand a mix of shop, indoor sport, food premises and offices within the lower levels as well as a parking area over the basement and podium levels.

This report provides an assessment of the acoustic impact of the proposed development as part of the application process and considers:

- How the amenity of the proposed development will be affected by the existing acoustic environment
- How the amenity of existing noise sensitive receivers may be affected by the proposed development

This assessment has been conducted with reference to:

- Environmental Protection (Noise) Policy 2008
- The Brisbane City Plan 2000 Volume 1 Chapter 4 Local Plans – Bowen Hills Local Plan
- Bowen Hills UDA Development Scheme
- The Brisbane City Plan 2000 Volume 2 Noise Impact Assessment Planning Scheme Policy (NIAPSP).

J:\221000\221349\4_PROJECT_WORK\05_REPORTS\0001ABBOTSFORD RD DA REPORT - COMMERCIAL ISSUE2 240211.DOCX

- The Queensland Environmental Protection Agency (EPA) Ecoaccess guidelines for noise control

Should the development application be approved, it is anticipated that further detailed acoustic input will be required in subsequent stages of design to ensure that the acoustic objectives discussed in this assessment are achieved.

Acoustic Terminology are described in Appendix A

3 Site Description

The proposed site is located at 58-66 Abbotsford Rd, Bowen Hills. This site is located within the Bowen Hills UDA and is located within Precinct 1 (Boen Hills Heart). This is a mixed use precinct comprised of commercial and residential uses that focus around the railway station.

Commercial and Residential buildings are currently present in the immediate development surroundings. The commercial spaces are mainly workshops and warehouses predominantly located on the railway side of Abbotsford Road and the same side as the proposed development on Abbotsford Road. On the opposite side of Abbotsford Road there are residential and recreational spaces (Perry Park), which for the purposes of noise assessment shall be considered as the closest noise sensitive receivers.

The following noise sources from the proposed development are considered in this assessment:

- Increased on site and surrounding traffic movements due to the proposed development.
- Mechanical services noise from the proposed development and supplementary building mechanical services equipment.
- Potential entertainment noise from retail space on the ground floor.

J:\221000\221349\4_PROJECT_WORK\05_REPORTS\0001ABBOTSFORD RD DA REPORT - COMMERCIAL ISSUE2 240211.DOCX

Figure 1 below identifies the proposed development limits (red) on the existing site and the Mixed Use Transit Precinct limits (blue) at the Bowen Hills area.

J:\221000\221349\4_PROJECT_WORK\05_REPORTS\0001ABBOTSFORD RD DA REPORT - COMMERCIAL ISSUE2 240211.DOCX

4 Existing Noise Environment

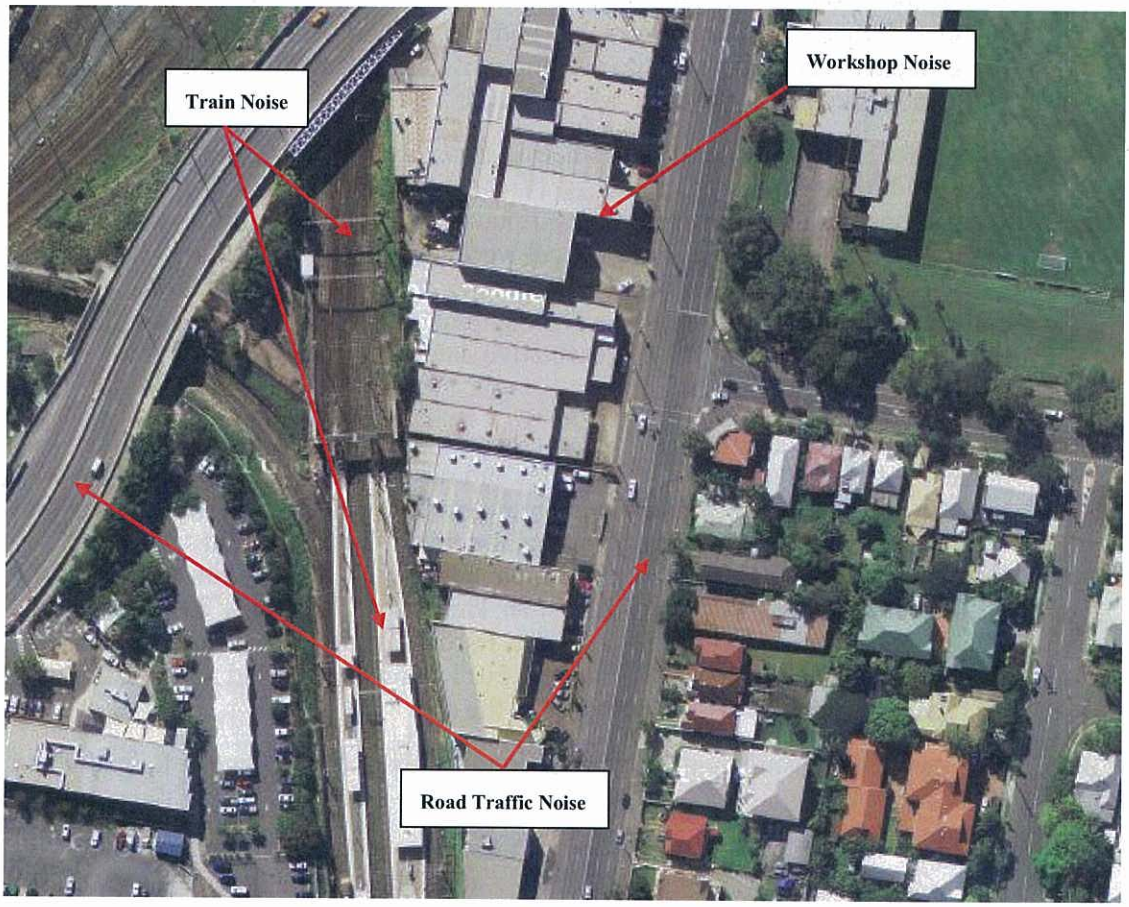
4.1 Description

The major existing noise sources identified in the vicinity of the site during attended measurements and site visits include:

- Railway and train station noise; this includes train movements along the main railway corridor, noise associated with the station (ie. Train horns, train door warning signals, released pressurised air noise and Public Address system).
- Road traffic noise, mainly from Abbotsford Road and from the Inner City Bypass.
- Mechanical Services and Workshop noise from surrounding commercial premises
- Pedestrian noise.

Vibration from train operation was perceptible during the attended measurements on site. These vibrations may propagate through the intervening soil and rock and into buildings in the railway proximity. The vibration may be radiated into the rooms of the building and heard as a low-frequency rumble. Further investigation and study should be considered during the detailed design of the building.

Figure 2 shows the existing site and the associated noise sources of relevance



J:\221000\221349\4_PROJECT_WORK\05_REPORTS\0001ABBOTSFORD RD DA REPORT - COMMERCIAL ISSUE2 240211.DOCX

At night the noise landscape in the environment could be described as quiet. The dominant source is the traffic noise from the Inner City Bypass and some vehicle movements on Abbotsford Road. The train movements are reduced after peak hours and public service stop as follows:

Monday to Thursday from 12:30am to 4:00am;

Friday-Saturday from 2:15am to 3:30am;

Saturday-Sunday from 2:00am to 3:30am;

Sunday-Monday from 12:15am to 4:00am

During the day some aircraft noise events were noticeable. This comes from the fact that the site is located on the arrival flight path of the Brisbane airport. Although, the dominant noise source was the traffic on Abbotsford Rd which creates a masking effect for the aircraft noise events. The development site falls outside of the airport noise contour zone, therefore aircraft noise is considered negligible in this assessment.

4.2 Noise measurements

4.2.1 Methodology

Unattended (logging) and attended measurements were conducted at key locations in the vicinity of the site between 27th and 31st January 2011 to obtain a representative set of data for the existing noise environment. These measurements were undertaken in accordance with AS 1055.1-1997

Long term noise monitoring equipment was set up to log measurements of 15 minutes duration and logged the L_{Aeq} , L_{A10} , L_{A90} , L_{Amin} and L_{Amax} parameters. This equipment recorded 4days of continuous noise data. The measurement period was selected to cover the typical weekday environment which maybe expected to consist predominantly of daytime commercial activities and associated weekday traffic noise. The equipment was left logging noise data over the weekend to ensure that a representative dataset of peak weekend noise was obtained.

Attended noise measurements recorded octave band and the one-third octave band noise levels for a duration of 15 minutes and recorded the L_{Aeq} , L_{A10} , L_{A90} , L_{Amin} and L_{Amax} parameters. Subjective assessments of the existing noise environment were noted by the equipment operator at the time of measurement. Attended measurements were conducted for discrete periods at each location during the evening and night time (5pm to 12am) on Thursday 27th January 2011 to ensure detailed noise information was gathered. Further attended noise measurements were undertaken on Friday 28th January, 2011 to obtain detailed noise information for typical weekday daytime activities in the area.

The attended measurements are also used to validate the unattended logged noise measurements.

J:\221000\221349\4_PROJECT_WORK\05_REPORTS\0001ABBOTSFORD RD DA REPORT - COMMERCIAL ISSUE2 240211.DOCX

Meteorological conditions during the survey periods were suitable for robust noise measurements with no significant periods of rainfall and wind speeds below 5m/s.

4.2.2 Equipment

The equipment used to measure the baseline noise levels is detailed in Table 1 below. All equipment holds a current NATA calibration certificate and was checked for calibration before and after each set of measurements.

Equipment manufacturer and type	Description of Equipment	Serial No.
RTA Technology 02	Sound logging meter	RTA-02 #016
RTA Technology 02	Sound logging meter	RTA-02 #049
Brüel and Kjær 2250	Type 1 sound level meter	2630368
Brüel and Kjær 4231	Sound level meter calibrator	2637410

Table 1 Equipment used to conduct the noise survey

4.2.3 Measurements Locations

Long term sound logging equipment was installed at the following locations:

1. 62 Abbotsford Road Warehouse – Front. Next to the site access on Abbotsford road.
2. 62 Abbotsford Road Warehouse – Rear. In the backyard close to the railway.

Attended noise measurements were undertaken during daytime, evening and night period at various locations around the site, including the logger position. The locations are as follows and detailed in Figure 3:

a. Abbotsford Road – next to the train station access lane.

b. Logger location position 2 – rear of the 62 Abbotsford Road warehouse.

c. Walking bridge over the railway – train station location.

d. 68 Abbotsford Road – facing the JAX Quickfit Tyres workshop.

J:\221000\221349\4_PROJECT_WORK\05_REPORTS\0001ABBOTSFORD RD DA REPORT - COMMERCIAL ISSUE2 240211.DOCX

Figure 3 Unattended and attended noise monitoring locations and noise sensitive receivers

J:\221000\221349\4_PROJECT_WORK\05_REPORTS\0001ABBOTSFORD RD DA REPORT - COMMERCIAL ISSUE2 240211.DOCX

4.2.4 Noise Data

For the purposes of comparison with the road traffic noise, the measured daily $L_{A10,18h}$ noise level has been provided for relevant measurement locations in Table 2 and Table 3 below. Data has been averaged in weekdays and weekend for comparison.

Location	Measured Traffic Noise Level, $dBL_{A10,18\ hr}$		
	Friday 28 January	Monday 31 January	Average
1	78	78	78

Table 2 – Weekday Measured Traffic Noise Level, $dBL_{A10,\ 18\ hr}$

Location	Measured Traffic Noise Level, $dBL_{A10,18\ hr}$		
	Saturday 29 January	Sunday 30 January	Average
1	77	76	77

Table 3 – Weekend Measured Traffic Noise Level, $dBL_{A10,\ 18\ hr}$

For the purpose of comparison with mechanical and site specific noise criteria used in this assessment, the minimum background noise levels obtained from the unattended measurements for each time period in weekdays and at the weekend are summarised in Table 4 and Table 5. Time periods are defined as follows: Day between 0700 and 1800 hours; Evening between 1800 and 2200; Night between 2200 and 0700. On Sundays and public holidays, daytime is defined as from 0900 to 1800.

Location	Background Noise ($mindBL_{A90}$)		
	Day	Evening	Night
1	62	57	50
2	43	44	41

Table 4 - Weekday Measured Background Noise Levels, $mindBL_{A90}$

Location	Background Noise ($mindBL_{A90}$)		
	Day	Evening	Night
1	57	55	51
2	43	43	41

Table 5 - Weekend Measured Background Noise Levels, $mindBL_{A90}$

J:\221000\221349\4_PROJECT_WORK\05_REPORTS\0001ABBOTSFORD RD DA REPORT - COMMERCIAL ISSUE2 240211.DOCX

Average Ambient Noise Levels from unattended measurements for different time periods in weekdays and weekends are provided in Table 6 and Table 7 below.

Location	Measured Average Ambient Noise Levels $L_{Aeq,ave}$		
	Day	Evening	Night
1	76	74	70
2	67	63	52

Table 6 – Weekday Average Ambient Noise Levels $L_{Aeq,ave}$

Location	Measured Average Ambient Noise Levels $L_{Aeq,ave}$		
	Day	Evening	Night
1	74	71	70
2	64	59	51

Table 7 - Weekend Average Ambient Noise Levels $L_{Aeq,ave}$

Average Background Noise Levels from unattended measurements for different time periods during the week are provided in Table 8 below. These levels will be referenced to establish the NIAPSP Background Creep criteria.

Location	Background Noise (dBL_{A90})		
	Day	Evening	Night
1	62	59	54
2	51	49	42

Table 8 – Weekday Average Background Noise Levels dBL_{A90}

Full results of the unattended noise measurements are in Appendix B

Attended measurements results and subjective descriptions are provided in Table 9 below. Attended measurements recorded L_{A10}, L_{A90} and L_{Aeq} noise parameters for 15-minute periods at the logger position and strategic points around the site. Noise event measurements (e.g. mechanical noise equipment, workshop equipment, etc) have been undertaken in shorter time periods representative of the source noise.

J:\221000\221349\4_PROJECT_WORK\05_REPORTS\0001ABBOTSFORD RD DA REPORT - COMMERCIAL ISSUE2 240211.DOCX

Location	Time Period	Noise Levels dB(A)			Subjective Noise Environment Description
		L_{A10}	L_{A90}	L_{Acq}	
a	Day	77	62	74	15min measurement. Dominant noise is traffic from Abbotsford Road. Pedestrian noise. Pedestrian Crossing Light Sounder is noticeable. Train noise is audible.
b	Evening	74	51	68	Train operations noise is dominant. Noise from Inner City Bypass is dominant when trains are not on the railway. Train horn level: 61dBA / Train operation max level: 78dBA.
c	Evening	74	56	72	Train operations noise is dominant. Noise from Inner City Bypass is dominant when trains are not on the railway. PA announcements are audible. PA announcement: 65dBA / Train operation max level: 83dBA / Train horn max level: 105 dBA
d	Evening	74	56	71	Traffic on Abbotsford is dominant.
a	Evening	73	55	69	Light traffic on Abbotsford Rd. mechanical equipment noise was noticeable.
d	Evening	71	51	67	Light traffic on Abbotsford Rd. Aircraft noise was noticeable.
b	Night	62	45	63	Dominant noise from train operations and Inner City Bypass. 4 trains passed during the measurement and 1 train horn event
c	Night	60	51	62	Train operations noise is dominant. Noise from Inner City Bypass is dominant when trains are not on the railway. PA announcements are audible
a	Day	77	58	74	Heavy traffic on Abbotsford Rd. Noise from railways is audible. Pedestrian Crossing Light Sounder is noticeable. Aircraft noise is audible.
b	Day	72	51	66	Train operations noise is dominant. Noise from Inner City Bypass is dominant when trains are not on the railway. PA

J:\221000\221349\4_PROJECT_WORK\05_REPORTS\0001ABBOTSFORD RD DA REPORT - COMMERCIAL ISSUE2 240211.DOCX

Location	Time Period	Noise Levels dB(A)			Subjective Noise Environment Description
		L_{A10}	L_{A90}	L_{Aeq}	
					announcements.
c	Day	70	55	65	Train operations noise is dominant. Noise from Inner City Bypass is dominant when trains are not on the railway. PA announcements
d	Day	76	61	73	Heavy traffic on Abbotsford Rd. Traffic noise is dominant. Noise from workshops is audible. Pressurised air – car engines – drills ≈ 58dBA
a	Day	-	-	74	1m24sec event: workshop noise from 58 Abbotsford Rd. Accident Repair Centre workshops. Peak coming from pressurised air at 80dBA. Constant noise from a compressor.

Table 9 - Attended Measurement Results and Subjective Noise Environment Description

5 Impact Assessment

5.1 Noise Criteria

5.1.1 Aircraft noise

The site is located outside of the 20 ANEF contour from the nearest airport (Brisbane Airport). As specified in the Aircraft Noise document from the Brisbane Airport Master Plan Chapter 11, no special treatment regarding aircraft noise is required.

5.1.2 Road Traffic Noise

Road traffic noise has been assessed using the objectives set out in the Queensland Government EPA State Interest Planning Policy for Noise Management in Planning Schemes; and criteria given in the NIAPSP. The road traffic noise criteria for a noise sensitive place affected by a public road used for this assessment are as follows:

- 63 $dBL_{A10,\ 18hrs}$ assessed 1m in front of the most exposed part
- As per NIAPSP: *the maximum recommended design sound levels stated in Table1 of AS2107.*

Table 10 below shows the recommended internal noise levels defined in AS2107:

J:\221000\221349\4_PROJECT_WORK\05_REPORTS\0001ABBOTSFORD RD DA REPORT - COMMERCIAL ISSUE2 240211.DOCX

Type of occupancy / activity	Maximum, dB L_{Acq}
OFFICE BUILDINGS Private Offices / Board and conference rooms	40
OFFICE BUILDINGS General office area	45
PUBLIC BUILDINGS Restaurants	50
SHOP BUILDINGS Small retail stores (general)	50

Table 10– Recommended internal noise levels stated in AS2107

5.1.3 Mechanical Services and Site Activity Noise

Environmental noise criteria for the 58-66 Abbotsford Rd development have been established for compliance with the Environmental Protection (Noise Policy (20088) and are also based on the requirements of the Brisbane City Council Noise Impact Assessment Planning Scheme Policy (NIAPSP) and the advice of the Queensland Environmental Protection Agency (EPA) ECOACCESS Planning for Noise Control Guideline (PNCG).

Four noise criteria are given between the NIAPSP and the PNCG. The NIAPSP sets an environmental noise criterion based on the noise area categories and recommended background noise levels in Australian Standard AS2107[1] and AS1055.2[2]. These criteria determine the limiting noise levels for any development application including commercial. The PNCG sets three criteria based on preventing background creep, restricting the intrusiveness of a noise source from industrial premises, commercial premises and mining operations, and limiting the overall industrial noise levels in an area. While NIAPSP criterion will be applied to establish the noise insulation required to insulate the project from the existing noise environment, the most stringent of the four noise criteria (NIAPSP and PNCG) will be adopted for the commercial application emission levels.

The nearest noise-sensitive receivers are the houses and coffee shop on the opposite side of Abbotsford Road with the nearest facade approximately at 20m from the development boundary. These receivers are categorised as residential and commercial receivers in a residential area near a commercial area with very dense transportation. This land use category has been used to set noise criteria for the 58-66 Abbotsford Rd development.

Noise criteria are set for 'Day', 'Evening' and 'Night' time periods, based on the existing noise levels measured in that time period and guidance on acceptable noise levels given in the documentation.

A summary of the resulting noise criteria is presented below in Table 11

[1] Australian Standard AS2107 (2000) *Acoustics – Recommended design sound levels and reverberation times for buildings*
[2] Australian Standard AS1055.2 (1997) *Acoustics – Description and measurement of environmental noise*

J:\221000\221349\4_PROJECT_WORK\05_REPORTS\0001ABBOTSFORD RD DA REPORT - COMMERCIAL ISSUE2 240211.DOCX

Criterion	Criterion Value		
	Day	Evening	Night
NIAPSP Background Creep	60 dB $L_{A90,1hour}$	55 dB $L_{A90,1hour}$	50 dB $L_{A90,1hour}$
PNCG Maximum Planning Level	47 dB $L_{A90,1hour}$	45 dB $L_{A90,1hour}$	40 dB $L_{A90,1hour}$
PNCG Specific Noise Level	60 dB $L_{A90,1hour}$	58 dB $L_{A90,1hour}$	53 dB $L_{A90,1hour}$
PNCG Planning Noise Level	64 dB $L_{A90,1hour}$	61 dB $L_{A90,1hour}$	60 dB $L_{A90,1hour}$

Table 11 - Noise criteria summary

The most stringent noise criterion is the PNCG Maximum Planning Level. The resulting environmental noise criteria for noise emission from the development is presented in Table 12 below

	Time Period		
	Day	Evening	Night
Limiting Criterion	47 dB $L_{A90,1hour}$	45 dB $L_{A90,1hour}$	40 dB $L_{A90,1hour}$

Table 12 - Limiting criteria for noise emission from the development

This criteria is 10dB(A) below the measured background noise levels and should result in noise from the mechanical services and site activities not contributing to the existing background noise levels in the vicinity, thereby avoiding background noise creep.

5.1.4 Construction Noise

The only legislation / guidance relevant to construction noise within Queensland is the Environmental Protection Act, 1994 (EPA). Even within the EPA controls of construction noise are limited and related to hours of work only as follows:

440R Building work

(1) A person must not carry out building work in a way that

makes an audible noise—

(a) on a business day or Saturday, before 6.30a.m. or after 6.30p.m; or

(b) on any other day, at any time.

5.2 Assessment

5.2.1 Road Traffic Noise from the Proposed Development to Neighbourhood.

Road traffic volumes on the streets surrounding the development are currently high, particularly on Abbotsford Rd. Additional traffic volumes associated with the proposed development are 200 to 300 vehicles (based on the design parking capacity) / during the peak period which compared with the existing traffic volumes is insufficient to affect existing traffic noise levels on the surrounding road network.

J:\221000\221349\4_PROJECT_WORK\05_REPORTS\0001ABBOTSFORD RD DA REPORT - COMMERCIAL ISSUE2 240211.DOCX

Movements of these vehicles on the site will be from the road network, directly into the parking zones within the building. Once on the site vehicles are rapidly screened by the development building as they access the parking ramp to the basement levels, therefore on site traffic movements are considered to have negligible affect on the existing noise environment surrounding the development.

5.2.2 Existing background noise level affecting the Proposed Development

Measured road traffic noise exceeds the limiting noise criteria specified in section 5.1.2. In this case, the sound insulation of the development façade shall provide enough attenuation in order to comply with the AS2107 criteria specified in Table 10 above.

The noise levels measured around the site (Table 6 and Table 7) show maximum average ambient noise level of 76 dB L_{Aeq}. The noise environment around the site is dominated by train and road traffic noise, both day and night. Since it has been demonstrated that the increase on the traffic volume doesn't impact on the noise prediction, the development façade requirements will take into account the existing ambient noise level L_{Aeq} measured on site from train and road traffic noise as measured during the survey.

In order to achieve the recommended internal noise levels stated in AS2107 for Public and Shop Buildings (Restaurants and Small retail stores) the following ***minimum sound reduction index of Rw35 (e.g. 6mm laminated glass)*** would be required for the lowest level commercial spaces.

A minimum facade acoustic performance of Rw40 (e.g. 13mm laminated glass) for general office spaces and ***Rw45 (e.g. 6mm glass/150mm airgap/6mm glass double glazing)for private offices and boardroom spaces*** is required to achieve internal levels specified in AS2107 for Office Buildings (see Table 10 above). This façade will need to be well sealed to achieve this acoustic performance, openable windows are unlikely to be provided with this level of acoustic performance. An Air Conditioning system should be considered for this development for ventilation and temperature control.

The development facade acoustic requirements will be reviewed during detailed design to determine whether the acoustic performance at higher levels of the building can be reduced. Typically, traffic noise levels at 70 metres above roads are in the order of 7dBA lower.

5.2.3 Proposed Development Mechanical Services and External Equipment

At present, details of mechanical services associated with the development are not known as they will be developed through the detailed design stage of the development. It is reasonable to assume that the development is likely to have an element of rooftop plant such as air-handling units or chillers. There may also be car park ventilation fans for subterranean parking.

In the absence of detailed information a limiting noise criterion has been determined at the site boundary, this criterion is the target noise level that all plant

J:\221000\221349\4_PROJECT_WORK\05_REPORTS\0001ABBOTSFORD RD DA REPORT - COMMERCIAL ISSUE2 240211.DOCX

on the development must cumulatively comply with in order to meet noise criterion at the nearest noise sensitive properties.

In addition to this, noise emissions will need to be limited to control noise ingress to the development itself such that the maximum recommended internal noise levels stated in AS2107 are achieved.

Table 13 below shows the noise emissions limits for the mechanical plant and external equipment at the site boundary.

Location	Maximum permissible cumulative plant noise at the site boundary, dB(A)		
	Day	Evening	Night
3m from any equipment or external duct termination at ground level	64 dB(A)	62 dB(A)	58 dB(A)
3m from any equipment or external duct termination above ground level	65 dB(A)	65 dB(A)	60 dB(A)

Table 13 – Noise emission limits at site boundary

5.2.4 Construction

At this stage in the design development the construction method is not known, it maybe expected that information about construction methodology will eventuate as the building design develops.

Typically and based on experience, constructions of this nature implies significant activities in terms of noise as piling, excavation, external craning and fixing of the steel structure and façade system.

Largely, once the façade is in place, the internal fit-out activities can be considered to be of a relatively low noise level and unlikely to give rise to nuisance as they are generally contained within the building.

For construction activities undertaken at high levels i.e. more than 3 metres above ground level there is little that can be done to provide acoustic screening of construction noise. Construction works at this height will predominantly consist of steel frame construction, concrete slab pours and cladding installation.

Given the lack of distinct construction guidance / regulation, it is recommended that Best Practice is applied to the construction activities as follows:

- Undertake construction activities only within the working hours defined in section 5.1.4;
- Install Solid site hoarding / noise screens around the site boundary to limit noise egress;
- Select quiet construction techniques i.e. augured piling in preference to driven piling if practicable in the ground conditions;
- Select silenced construction plant;
- Install static plant in locations furthest from noise sensitive premises;

J:\221000\221349\4_PROJECT_WORK\05_REPORTS\0001ABBOTSFORD RD DA REPORT - COMMERCIAL ISSUE2 240211.DOCX

- Provide regular updates to surrounding premises on upcoming construction activities, in particularly activities of a noisy nature or those that may affect access to their properties.

6 Summary

A noise survey on the site of the future commercial development at 58-66 Abbotsford Road and surrounding areas potentially affected by the development has been conducted. The primary noise sources within the area are train and road traffic noise from Abbotsford Rd.

Noise from the existing environment to the proposed building has been assessed. It is predicted that:

- Minimum façade acoustic performance of *Rw35 (e.g. 6mm laminated glass)for commercial(*Level 2 down)
- Minimum façade acoustic performance of *Rw40 (e.g. 13mm laminated glass)for general office spaces and Rw45 (e.g. 6mm glass/150mm airgap/6mm glass double glazing)for private offices and boardroom spaces*
- *Office spaces facade acoustic requirements will be reviewed during detailed design to ascertain whether the acoustic performance can be reduced at higher levels of the building to account for reduced traffic noise at height – typically traffic noise levels at 70 metres above roads are in the order of 7dB(A) lower.*
- Road traffic noise increase with the new development will be negligible. Accordingly façade acoustic requirements have been determined in accordance the existing environmental noise conditions.

Noise from the proposed development to the surrounding environment has been assessed. It is predicted that:

- A cumulative noise limit of 64 dB(A) (Day), 62 dB(A) (Evening) and 58 dB(A) (Night) at 3m of the site boundary (ground level) and 65 dB(A) (Day), 65 dB(A) (Evening) and 60 dB(A) (Night) at 3m of the site boundary (above ground level) is recommended for mechanical services and equipment noise from the proposed development.
- The additional car movements on the proposed site result in a negligible increase in noise levels at receptors outside of the site boundary.

Further recommendations towards improving the noise environment have been provided in the report. It should be noted that the assessments are based on the best available information at this stage of the design development. All specific noise attenuation requirements must be reassessed during detailed design, should the development application be approved.

J:\221000\221349\4_PROJECT_WORK\05_REPORTS\0001ABBOTSFORD RD DA REPORT - COMMERCIAL ISSUE2 240211.DOCX

Appendix A

Acoustic Terminology

A1 Acoustic Terminology

'A'-WEIGHTED SOUND LEVEL dB(A)

The unit generally used for measuring environmental, traffic or industrial noise is the A-weighted sound pressure level in decibels, denoted dB(A). An A-weighting network can be built into a sound level measuring instrument such that sound levels in dB(A) can be read directly from a meter. The weighting is based on the frequency response of the human ear and has been found to correlate well with human subjective reactions to various sounds. An increase or decrease of approximately 10 dB corresponds to a subjective doubling or halving of the loudness of a noise. A change of 2 to 3 dB is subjectively barely perceptible.

DECIBEL

The ratio of sound pressures which we can hear is a ratio of 10^6:1 (one million : one). For convenience, therefore, a logarithmic measurement scale is used. The resulting parameter is called the 'sound level' (L) and the associated measurement unit is the decibel (dB). As the decibel is a logarithmic ratio, the laws of logarithmic addition and subtraction apply.

Some typical noise levels are given below:

Noise Level dB(A)	Example
130	Threshold of pain
120	Jet aircraft take-off at 100 m
110	Chain saw at 1 m
100	Inside disco
90	Heavy lorries at 5 m
80	Kerbside of busy street
70	Loud radio (in typical domestic room)
60	Office or restaurant
50	Domestic fan heater at 1m
40	Living room
30	Theatre
20	Remote countryside on still night
10	Sound insulated test chamber
0	Threshold of hearing

EQUIVALENT CONTINUOUS SOUND LEVEL (L_{Aeq})

Another index for assessment for overall noise exposure is the equivalent continuous sound level, L_{eq}. This is a notional steady level, which would, over a given period of time, deliver the same sound energy as the actual time-varying sound over the same period. Hence fluctuating levels can be described in terms of a single figure level.

FREQUENCY

The rate of repetition of a sound wave. The subjective equivalent in music is pitch. The unit of frequency is the Hertz (Hz), which is identical to cycles per second. A thousand hertz is often denoted kilohertz (kHz), eg 2 kHz = 2000 Hz. Human hearing ranges from approximately 20 Hz to 20 kHz. The most commonly used frequency bands are octave bands, in which the mid frequency of each band is twice that of the band below it. For design purposes, the octave bands between 63 Hz to 8 kHz are generally used. For more detailed analysis, each octave band may be split into three one-third octave bands or, in some cases, narrow frequency bands.

SOUND EXPOSURE LEVEL (SEL)

The Sound Exposure Level or Single Event Noise Exposure Level, denoted SEL or L_{AE}, is a measure of the total amount of acoustic energy contained in an acoustic event. The SEL is the constant sound pressure level that would produce in a period of one second the same amount of acoustic energy contained in the acoustic event.

SOUND POWER AND SOUND PRESSURE

The sound power level (L_w) of a source is a measure of the total acoustic power radiated by a source. The sound pressure level (L_p) varies as a function of distance from a source. However, the sound power level is an intrinsic characteristic of a source (analogous to its mass), which is not affected by the environment within which the source is located.

SOUND REDUCTION INDEX (R)

The sound reduction index (or transmission loss) of a building element is a measure of the loss of sound through the material, i.e. its sound attenuation properties. It is a property of the component, unlike the sound level difference, which is affected by the common area between the rooms and the acoustics of the receiving room. The weighted sound reduction index, R_w, is a single figure description of sound reduction index and is defined in BS EN ISO 717-1: 1997. R_w values are calculated from measurements in an acoustic laboratory. Sound insulation ratings derived from site (which are invariably lower than the laboratory figures) are referred to as apparent sound reduction index (R'_w) ratings.

STATISTICAL NOISE LEVELS

For levels of noise that vary widely with time, for example road traffic noise, it is necessary to employ an index that allows for this variation. 'A'-weighted statistical noise levels are denoted L_{A10}, dBL_{A90} etc. The reference time period (T) is normally included, eg. $dBL_{A10,\ 5min}$ or $dBL_{A90,\ 8hr}$.

$L_{A90(T)}$

Refers to the sound pressure level measured in dB(A), exceeded for 90% of the time interval (T) –i.e. measured noise levels were greater than this value for 90% of the time interval. This is also often referred to the background noise level.

$L_{A10(T)}$

Refers to the sound pressure level measured in dB(A), exceeded for 10% of the time interval (T). This is often referred to as the average maximum noise level and is frequently used to describe traffic noise.

$L_{A10(1hr)}$

For traffic noise, $L_{A10(1hr)}$ is the highest hourly L_{A10} noise level measured over each day of a measurement period. $L_{A10(1hr)}$ is the average maximum noise level resulting from the "worst hour" of the traffic flow.

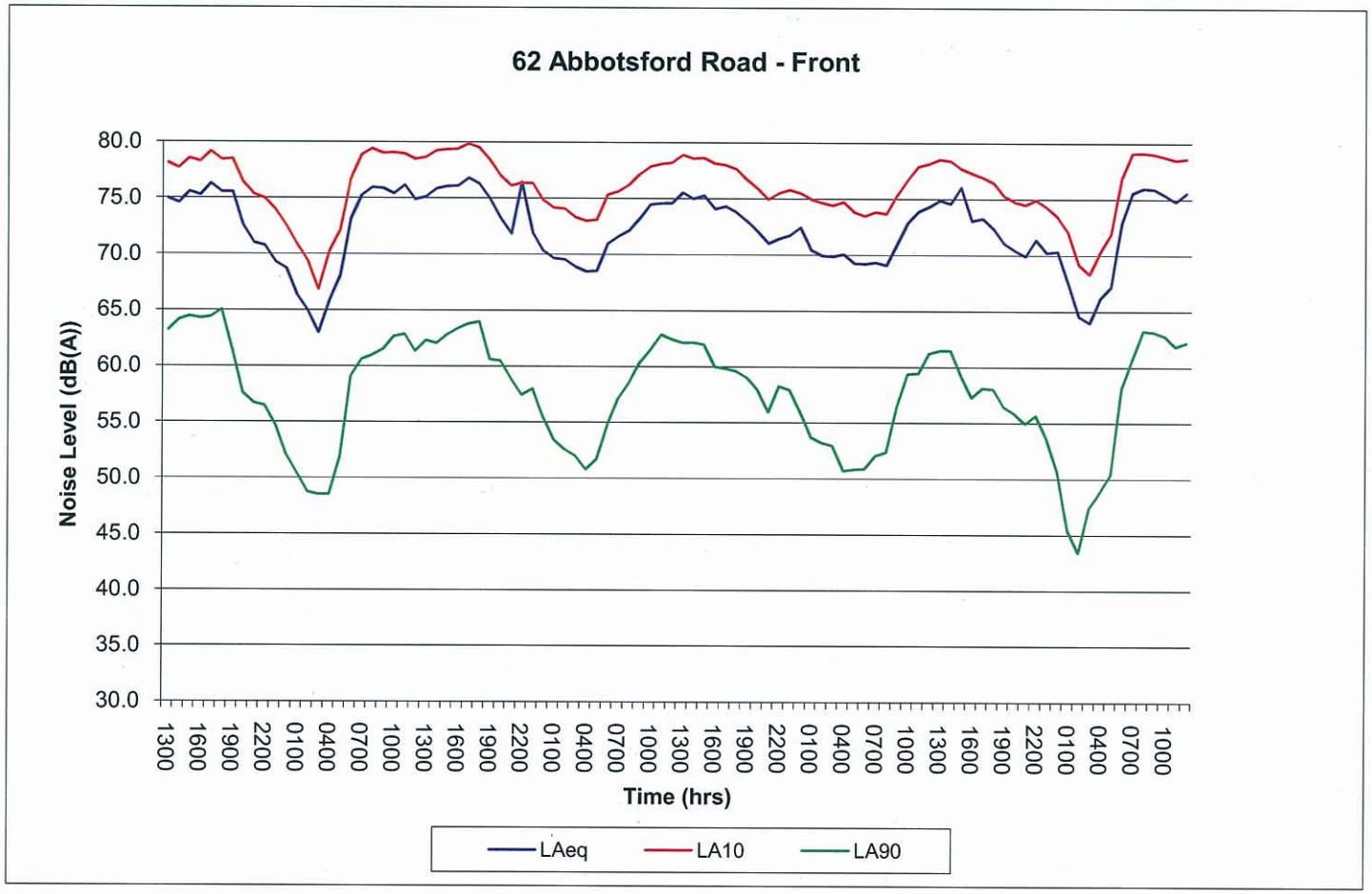
$L_{A10(18hr)}$

$L_{A10(18hr)}$ refers to the arithmetic average of the eighteen 1-hour L_{A10} traffic noise levels over the time period from 6:00 am to midnight. $L_{A10(18hr)}$ is representative of the average maximum traffic noise level from each day of measurements.

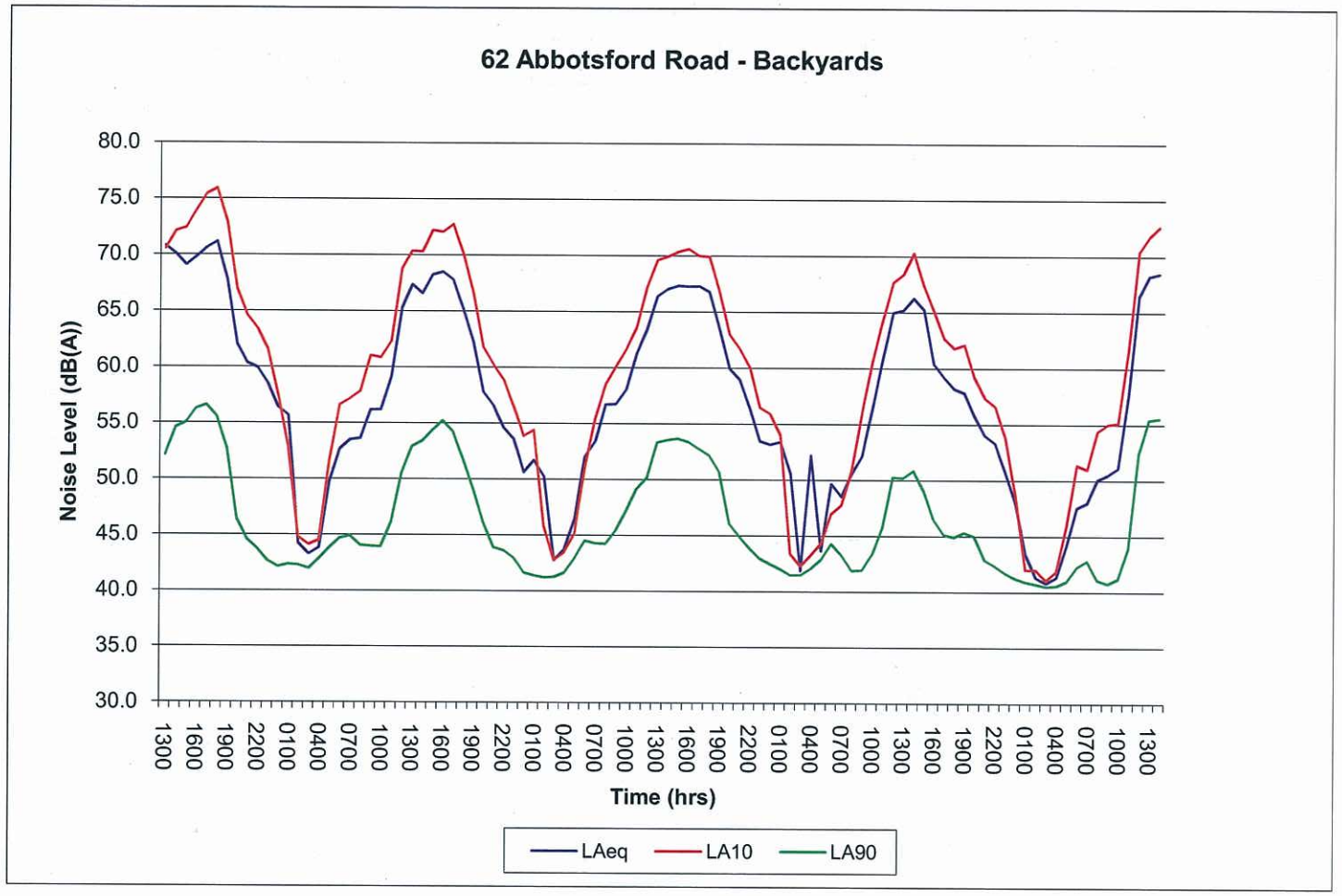
Appendix B

Unattended measurements data

B1 Logger position 1: 62 Abbotsford Road – Front Access



B2 Logger position 2: 62 Abbotsford Road – Backyards



Norman Disney & Young

20 May 2011

PLANS AND DOCUMENTS referred to in the ULDA APPROVAL dated 2 /10 /2012

Nettleton Tribe Architects
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Attention: Mr Bernhard Hoessler

58-66 Abbotsford Rd Proposed Mixed Use Development- Energy Efficiency Statement

The new commercial office building at Abbotsford Rd will be designed to achieve a 4.5 Star NABERS Energy Rating, 5 Star GreenStar Rating and meet PCA A-Grade office standards.

With reference to the Energy Efficiency Code contained within the City Plan we confirm that the proposed development will be designed in accordance with the BCA to meet the three Performance Criteria for office buildings (P1 to P3) as follows:

- The building will be designed to achieve compliance with the overall Building Space Load target of 147 kWh/a.m², as set out in Performance Criteria P1.
- The air conditioning plant will meet the performance requirements as set out in Performance Criteria P2.
- The building design will incorporate high efficiency lighting systems with an average lighting power density of less than 18 W/m², as set out in Performance Criteria P3.

The Energy Efficiency Code also makes reference to 'Shops' as detailed in Performance Criteria P7, P8 and P9. The proposed development includes two small Retail Shop areas, but these are not being fitted out as part of the building works. Base building provisions will be made for the façade (P7), air conditioning (P8) and lighting services (P9) which will be in accordance with minimum BCA requirements. The tenants will be required to ensure compliance over and above this to suit their requirements.

In order to achieve the desired NABERS and GreenStar ratings, it is anticipated that the building will incorporate numerous measures aimed at reducing overall energy consumption. This will allow the project to reach its targeted performance levels, and will enhance its community standing as a leading example of best-practice sustainable design.

Regards,

NORMAN DISNEY & YOUNG

Barbara Lydon
Mechanical/ESD Engineer

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