MATTHEW PALAVIDIS
VICTOR FATTORETTO
MATTHEW SHIELDS

Proposed Internal Refurbishment Work and Extension of Rooftop Level, InterContinental Hotel

Stage 2, Part 1 -Environmental Noise Impact Assessment

SYDNEY
9 Sarah St
MASCOT NSW 2020
(02) 8339 8000

ABN 11 068 954 343
www.acousticlogic.com.au

Project ID	20191219.4
Document Title	Stage 2, Part 1 -Environmental Noise Impact
Attention To	Mulpha Australia Limited

Revision	Date	Document Reference	Prepared By	Checked By	Approved By
0	8/07/2020	20191219.4/0807A/R0/EC	EC		
1	28/07/2020	20191219.4/2807A/R1/EC	EC		VF
2	30/07/2020	20191219.4/3007A/R2/EC	EC		GW

TABLE OF CONTENTS

1 INTRODUCTION

This report presents an analysis of the noise and vibration impacts associated with the proposed hotel refurbishments and rooftop additions of Stage 2 DA - Part 1 of the InterContinental Hotel located at 115-119 Macquarie Street, Sydney. This report will address the noise and vibration requirements of "Planning Secretary's Environmental Assessment Requirements" Section 4.12(8) for Application Number SSD-10454.

The proposal would increase the GFA of the intercontinental Hotel tower by 250 m^2. The proposal also provides a maximum height of building of RL114.55 (consistent with the envelope approved under the Concept approval).

This report addresses the following acoustic issues:

- Noise impact from the refurbishment work within project site
- Vibration impact from the refurbishment work within project site
- Noise emission from operation of project building after refurbishment work.

This assessment is based on the architectural drawings dated 26/03/2020 and provided by Woods Bagot. For detailed architectural drawings refer to Table 1 below.

Table 1 - Architectural Drawings

Drawing number	Drawing Revision	Drawing Title	Date
ST2-DA-00000	A	Cover Sheet	24/07/2020
ST2-DA-00001	B	Drawing List	
ST2-DA-10000	A	Site Context Plan	
ST2-DA-10001	B	Site Plan	
ST2-DA-11000	B	Staging Plans	
ST2-DA-12000	A	Shadow Diagrams	
ST2-DA-13000	A	GFA Plans	
ST2-DA-14000	A	3D Height Plane Diagram	
ST2-DA-15000	A	Public Domain Plans	
ST2-DA-19050	A	Existing Floor Plan – Level 05	
ST2-DA-19060	A	Existing Floor Plan – Level 06	
ST2-DA-19070	A	Existing Floor Plan – Level 07	
ST2-DA-19320	A	Existing Floor Plan – Level 32	
ST2-DA-19330	A	Existing Floor Plan – Level 33 (Roof)	
ST2-DA-20050	A	Demolition Plan – Level 05	
ST2-DA-20060	A	Demolition Plan – Level 06	
ST2-DA-20070	A	Demolition Plan – Level 07	

Table 1 (Cont.) - Architectural Drawings

Drawing number	Drawing Revision	Drawing Title	Date
ST2-DA-20320	A	Demolition Plan – Level 32	24/07/2020
ST2-DA-20330	A	Demolition Plan – Level 33 (Roof)	
ST2-DA-22050	C	Floor Plan – Level 05	
ST2-DA-22060	C	Floor Plan – Level 06	
ST2-DA-22070	C	Floor Plan – Level 07	
ST2-DA-23020	D	Floor Plan – Level 32	
ST2-DA-23030	C	Floor Plan – Level 33 (Roof)	
ST2-DA-24050	A	RCP – Level 05	
ST2-DA-30001	A	Existing Elevation – South & East	
ST2-DA-30002	A	Existing Elevation – North & West	
ST2-DA-30011	A	Demolition Elevation – South & East	
ST2-DA-30012	A	Demolition Elevation – North & West	
ST2-DA-30021	A	Elevation – South & East	
ST2-DA-30022	A	Elevation – North & West	
ST2-DA-30201	A	Existing Section – Overall	
ST2-DA-30211	A	Demolition Section – Overall	
ST2-DA-30221	A	Section – Overall	
ST2-DA-45001	C	City Corner Entry Elevations/Section	
ST2-DA-45002	A	City Corner Entry Details	
ST2-DA-45101	A	Level 32 Façade Elevations	
ST2-DA-45102	A	Level 32 Façade Elevations	
ST2-DA-45103	A	Level 32 Façade Details	
ST2-DA-46001	A	Cortile Floor Plan	
ST2-DA-46002	A	Cortile Internal Sections	
ST2-DA-46003	A	Cortile Internal Sections	
ST2-DA-46004	A	Cortile Balustrade Detail	
ST2-DA-90000	A	Material Schedule	
ST2-DA-90101	A	Perspective Montage – 01	
ST2-DA-90102	A	Perspective Montage – 02	
ST2-DA-90103	A	Perspective Montage – 03	
ST2-DA-90104	A	Perspective Montage – 04	

2 PLANNING SECRETARY'S ENVIRONMENTAL ASSESSMENT REQUIREMENTS

Below are the noise and vibration requirements of "Planning Secretary's Environmental Assessment Requirements" Section 4.12(8) for Application Number SSD-10454 and Condition of Consent C19 of application number SSD 7693.

5. Amenity

- Assess the environmental and residential amenity impacts associated with the proposal, including solar access, acoustic impacts, visual privacy, overshadowing, servicing requirements (including waste management, loading zones, mechanical plant), lighting impacts, air quality, odour and dust emissions, and wind impacts.
- Demonstrate how the proposal protects solar access to key public open space and the surrounding domain.

8. Noise and Vibration

- Prepare a noise and vibration assessment in accordance with the relevant EPA guidelines. This assessment must detail construction and operational noise impacts on nearby sensitive receivers and outline the proposed management and mitigation measures that would be implemented.

16. Construction Impacts

- Address potential impacts of the construction on surrounding areas with respect to noise and vibration, air quality and odour impacts, dust and particle emissions, water quality, stormwater runoff, groundwater seepage. Soil pollution and construction waste.

C19 - Condition of Consent

- **C19** - Future development application(s) shall include a Noise Impact Assessment that identifies background noise levels, noise impacts, vibration impacts, and affected sensitive receivers and includes appropriate modelling and required mitigation/management measures for construction and operation of the development. The NIA must be undertaken by a suitably qualified acoustic consultant and generally be in accordance with the provisions of the EPA's Noise Policy for Industry, Interim Construction Noise Guideline and Assessing Vibration: A Technical Guideline.

3 NOISE DESCRIPTORS

Traffic noise constantly varies in level, due to fluctuations in traffic speed, vehicle types, road conditions and traffic densities. Accordingly, it is not possible to accurately determine prevailing traffic noise conditions by measuring a single, instantaneous noise level. To accurately determine the effects of traffic noise a 15-20-minute measurement interval is utilised. Over this period, noise levels are monitored on a continuous basis and statistical and integrating techniques are used to determine noise description parameters. These parameters are used to measure how much annoyance would be caused by a particular noise source.

In the case of environmental noise three principle measurement parameters are used, namely L_{10}, L_{90} and L_{eq}.

The L_{10} and L_{90} measurement parameters are statistical levels that represent the average maximum and average minimum noise levels respectively, over the measurement interval.

The L_{10} parameter is commonly used to measure noise produced by a particular intrusive noise source since it represents the average of the loudest noise levels produced by the source.

Conversely, the L_{90} level (which is commonly referred to as the background noise level) represents the noise level heard in the quieter periods during a measurement interval. The L_{90} parameter is used to set the allowable noise level for new, potentially intrusive noise sources since the disturbance caused by the new source will depend on how audible it is above the pre-existing noise environment, particularly during quiet periods, as represented by the L_{90} level.

The L_{eq} parameter represents the average noise energy during a measurement period. This parameter is derived by integrating the noise levels measured over the measurement period. L_{eq} is important in the assessment of traffic noise impact as it closely corresponds with human perception of a changing noise environment; such is the character of traffic noise.

Current practice favours the L_{eq} parameter as a means of measuring traffic noise, whereas the L_{10} parameter has been used in the past and is still incorporated in some codes. For the reasons outlined above, the L_{90} parameter is not used to assess traffic noise intrusion.

4 BACKGROUND NOISE MONITORING

Background noise levels for the site were obtained by installing an unattended noise monitor at the site. The noise logger was installed at the north-eastern boundary corner of the attached site at 95 Macquarie Street on the rooftop. The noise logger location was approximate 9m distance from Macquarie Street. For detailed location refer to Figure 1.

The unattended monitoring was conducted using an Acoustic Research Laboratory noise logger. The logger was programmed to store 15-minute statistical noise levels throughout the monitoring period. The equipment was calibrated at the beginning and the end of the measurement using a Rion NC-73 calibrator; no significant drift was detected. All measurements were taken on A-weighted fast response mode. There were no significant periods of adverse weather conditions during the measurement period.

The measured background noise levels have been processed based on requirements of NSW EPA NPfI and results are summarised below.

Table 2 – Measured Background Noise Levels

Location	**Period/Time**	**Background Noise Level dB(A) L_{90}**
North-eastern boundary corner of 95 Macquarie Street, Sydney @rooftop	Day 1 (7am – 6pm)	62
	Evening (6pm – 10pm)	56
	Night (10pm – 7am)	50

Additional background noise levels based on the proposed work hours are presented in table below.

Table 3 – Measured Background Noise Levels

Location	Period/Time	Background Noise Level dB(A) L_{90}
North-eastern boundary corner of 95 Macquarie Street, Sydney @rooftop	Monday – Friday Early Morning (7am – 8am)	62
	Monday – Friday Early Morning (8am – 9am)	63
	Monday – Friday Day (9am – 5pm)	62
	Saturday Early Morning (7am – 8am)	59
	Saturday Early Morning (8am – 9am)	60
	Saturday Day (9am – 4am)	57

5 SITE DESCRIPTION AND PROPOSAL

5.1 SITE ANALYSIS

The subject site is comprised of two allotments containing the Intercontinental Hotel at 115-119 Macquarie Street. One lot is a 32-storey Hotel tower located on the corner of Phillip and Bridge Streets and the other is the State Heritage listed former NSW Treasury Building located on the corner of Macquarie and Bridge Streets.

The nearest noise sensitive receivers to the subject site are listed below. For detailed site map and closest noise sensitive receivers refer to Figure 1.

- Receiver 1: A 13-storey residential development at approximately 65m to the south of the site at 123-125 Macquarie Street;
- Receiver 2: A commercial building at approximately 30m to the south of the site at 121 Macquarie Street, Sydney;
- Receiver 3: A commercial building at approximately 80m to the south-west of the site, on the corner of Bridge and Phillip Street;
- Receiver 4: The commercial building at approximately 30m to the west of the site at 50 Bridge Street, Sydney;
- Receiver 5: A commercial building attached to the north of the site at 99 Macquarie Street, Sydney; This building is owned by the proponent, Mulpha.
- Receiver 6: The Conservatorium of Music Educational building approximately 180m to the east of the site;
- Receiver 7: The hotel rooms of the subject site;
- Receiver 8: The Café/Restaurant and amenities located in the Heritage building.

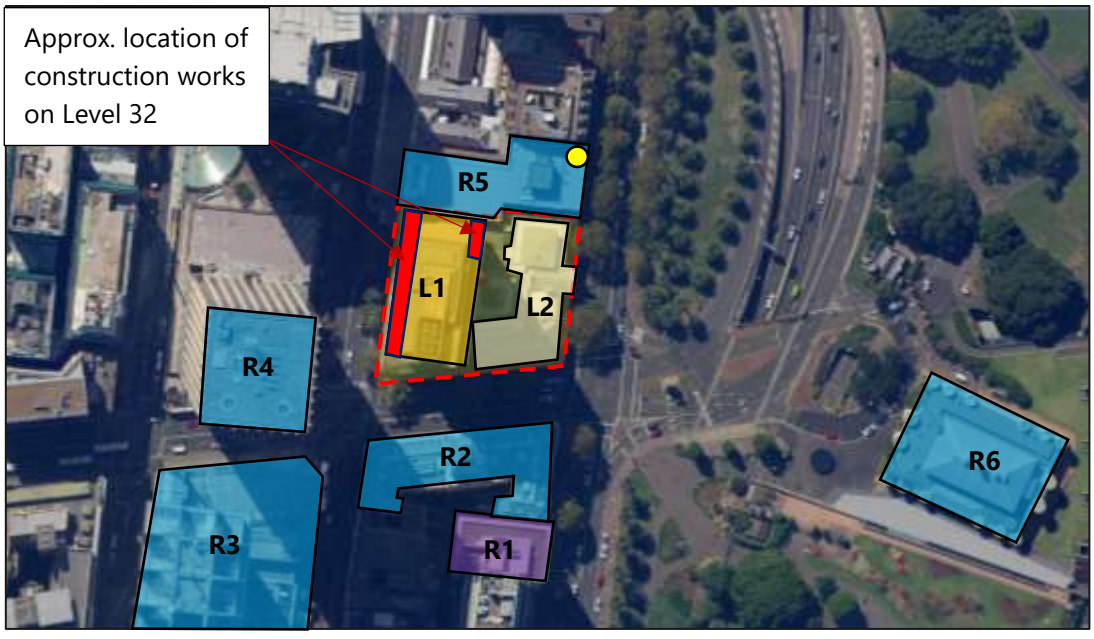

Figure 4 – Site Map and Nearest Noise Sensitive Receivers (Resource: SIX Maps)

Project Site
Lot 1 – 32-storey Hotel tower
Lot 2 – Heritage Building
Closest Commercial receivers
Closest Residential receivers
Unattended noise monitoring location

6 CONSTRUCTION NOISE EMISSION ASSESSMENT

6.1 CONSTRUCTION NOISE MANAGEMENT TRIGGER LEVEL

6.1.1 City of Sydney Council – Code of Practice for Construction Hours/Noise within the Central Business District 1992

The City of Sydney code of practice establishes various categories for construction works based on the time of day they are undertaken, as detailed below.

Table 5 – Categories of Working Hours and Noise Levels

Day	Time Zone	Category	Noise Management Trigger Level dB(A) $L_{Av, Max(15min)}$
Monday to Friday	00.00 – 07.00	4	Background + 0 dB(A)
	07.00 – 08.00	1	Background + 5dB(A)
	08.00 – 19.00	1	Background + 5dB(A) + 5 dB(A) (to be determined on a site basis)
Saturday	00.00 – 07.00	4	Background + 0dB(A)
	07.00 – 08.00	1	Background + 5dB(A)
	08.00 – 17.00	1	Background + 5dB(A) + 5 dB(A) (to be determined on a site basis)
Sundays and Public Holidays	00.00 – 07.00	4	Background + 0 dB(A)
	07.00 – 17.00	3	Background + 3 dB(A)

6.1.2 EPA Interim Construction Noise Guidelines

6.1.2.1 Residential Receivers at 123-125 Macquarie Street (R1)

The construction noise management trigger level has been determined based on requirements of City of Sydney Council – Code of Practice for Construction Hours/Noise within the Central Business District 1992.

If noise emissions are likely to exceed 75dB(A)$L_{eq(15min)}$, the receiver is deemed to be "highly noise affected". Introduction of management controls such as scheduling of noise periods, or respite periods is recommended.

Table 6 – Noise Goals for Residential Receivers

Time of Day	Measured Background Levels – dB(A)L_{90}	Noise Management Trigger Level dB(A)$L_{average\ Max}$	Highly Noise Affected Management Level – dB(A)$L_{eq(15min)}$
Monday – Friday Early Morning (7am – 8am)	62	67	75
Monday – Friday Early Morning (8am – 9am)	63	73	75
Monday – Friday Day (9am – 5pm)	62	72	75
Saturday Early Morning (7am – 8am)	59	64	75
Saturday Early Morning (8am – 9am)	60	70	75
Saturday Day (9am – 4pm)	57	67	75

6.1.2.2 Commercial Receivers (R2 to R6)

The Council guideline does not specifically address non-residential receivers which, in most cases will be less sensitive to noise, either because the use is less noise sensitive, or the buildings have noise attenuating facades and sealed (or normally closed) windows.

For other sensitive land users, such as commercial buildings, typically consider noise from construction to be disruptive when the properties are being used. The following table presents management levels for noise at other sensitive land uses based on NSW EPA Interim Construction Noise Guideline.

Table 7 – Noise Management Trigger Level for Commercial Receivers

Land Use	Management Level – dB(A)$L_{eq(15min)}$
Commercial Receivers, Offices, retail outlets (R2-R5)	70
Classrooms at schools and other educational institutions (R6)	Internal Noise Level 45 dB(A)

6.1.3 Summarised Construction Noise Management Levels

A summary of all relevant construction noise emission levels is presented in the following table.

Table 8 – Summarised Construction Noise Requirements During Proposed Hours (Receivers 1-6)

Receiver	Period/Time	Background Noise Level dB(A)	Construction Noise Management Levels dB(A) $L_{10(15min)}$
Residential receivers (R1)	Monday – Friday 7.00am – 8.00am	62	67 dB(A) $L_{10(15min)}$
	Monday – Friday 8.00am – 9.00am	63	73 dB(A) $L_{10(15min)}$
	Monday – Friday 9.00am – 5.00pm	62	72 dB(A) $L_{10(15min)}$
	Saturday 7.00am – 8.00am	59	64 dB(A) $L_{10(15min)}$
	Saturday 8.00am – 9.00am	60	70 dB(A) $L_{10(15min)}$
	Saturday 9.00am – 4.00pm	57	67 dB(A) $L_{10(15min)}$
Commercial Receivers (R2-R5)	Monday – Friday 7.00am – 8.00am	62	70 dB(A) $L_{eq(15min)}$ when in use
	Monday – Friday 8.00am – 9.00am	63	
	Monday – Friday 9.00am – 5.00pm	62	
	Saturday 7.00am – 8.00am	59	
	Saturday 8.00am – 9.00am	60	
	Saturday 9.00am – 4.00pm	57	
Receiver 6	When in use		45 dB(A)$L_{eq\ 15\ min}$ (internal)

6.2 REFURBISHMENT WORK NOISE EMISSION ASSESSMENT

6.2.1 ACTIVITIES

Demolition and construction works will take place on Levels 5 and 32. Works on all other levels of the proposal will be associated with refurbishment or light construction works which will not require heavy tools or equipment.

Details of the proposed development are presented below.

6.2.2 Proposed Works and Duration

- Demolition works
    - Duration: 8 days
    - Demolition works will take place on levels 5, 6, 7 and 32.

- Construction works
    - Duration: 70-80 days

- Crane will not be required.

- Construction hours

    - Proposed construction hours for City Centre are as below:
        - Monday to Friday: 7am – 7pm
        - Saturday 7am – 5pm

Based on information give to this office by construction management, different hours are proposed for noisy and not-noisy works as listed below.

    - Monday to Friday
        - For noisy works: 9:00am to 5:00pm
        - For not noisy works: 7:00am to 7:00pm

    - Saturday
        - For noisy works: 9:00am – 4:00pm
        - For not noisy works: 7:00am – 5:00pm

The proposed works on each level, associated tools and nearest noise sensitive receivers are listed below.

- **<u>Source 1: Level 5</u>**

    - Demolition period: 15 days

    - Construction period: 97 days

    - Proposed works

        - Architectural upgrade of façade entry of Bridge and Phillip Street corner.

        - Finishes upgrade to Porte Cochere entrance.

        - Finishes upgrade to lift lobby, Cortile, bathrooms.

        - Refurbishment to Bridge Street corner arcade entry, Porte Cochere drop off and Macquarie Street entry including concierge, baggage storage and lounge seating.

    - Most likely required tools: powered hand tools, jack hammers, drill, hammers, angle grinder, trucks.

    - Nearest noise sensitive receivers: Level 4 (offices and staff kitchen), Level 6 (Cafés, Main Kitchen, Private Dining, Heritage Function Room and Treasury Restaurant). Also, commercial receivers R2, R3 & R4 (refer to Figure 1).

- **Source 2: Level 6**

    - No demolition or construction of building structure proposed.

    - Proposed works

        - Refurbishment to restaurant and commercial kitchen.

        - Upgrade to toilets, cortile balustrade, façade entry of Bridge and Phillip Street corner and cortile arcade and lift lobby.

    - Most likely required tools: powered hand tools only.

    - Nearest noise sensitive receivers: Level 5 (Cortile Café/Restaurant, Concierge), Level 7 (Kitchen, Main Reception Room).

- **Source 3: Level 7**

    - No demolition or construction of building structure proposed.

    - Proposed works

        - Upgrade to Cortile balustrade, commercial kitchen, toilets and façade entry of Bridge and Phillip Street corner.

    - Most likely required tools: powered hand tools.

    - Nearest noise sensitive receivers: Level 6 (Café and Kitchen. The Treasury Restaurant, Heritage Function and Dining Room are not expected to operate during day-time when the proposed demolition and construction works will take place). Level 8 is not considered a sensitive receiver the plant room is located there.

- **Source 4: Level 32**

    - Demolition period: 39 days

    - Construction period: 160 days

    - Proposed works

        - Refurbishment of existing club lounge.

        - Western extension of club lounge

        - Extension of eastern club lounge to build new deck and enclosed space over existing roof slab.

- New façade to club lounge.

- Most likely required tools: powered hand tools, jack hammers, drill, hammers, angle grinder.
- Nearest noise sensitive receivers: Level 31 (Spa and Gym), Level 30 (Hotel Rooms), residential receiver (R1), commercial receivers (R2-R6).

6.3 AIRBORNE NOISE IMPACT ASSESSMENT

The predicted noise levels during construction will depend on:

- The activity undertaken.
- The distance between the work site and the receiver. For many of the work areas, the distance between the noise source and the receiver will vary depending on which end or floor of the site the work is undertaken. For this reason, the predicted noise levels will be presented as a range.
- Whether the activity is enclosed or partially enclosed.

Predicted noise levels are presented below. Predictions take into account the following (where applicable):

- Noise reduction as a result of distance;
- Transmission loss through the retained building façade (assumed for internal works) or other barrier effects.

A summary of sound power levels of major demolition and construction works required for the proposed development is presented below.

Table 9 – Sound Power Levels of the Proposed Equipment

Equipment/ Process	Sound Power Level
Drill	95
Powered Hand Tools	95-100
Trucks(L5)	100
Electric Saw	102
Angle Grinder	105
Hammering	110

Following are predicted noise generation from demolition and construction works on Levels 5 and 32. All other proposed works of the development on Levels 6 and 7 are associated with internal refurbishment works which generally produce minimum noise levels. These noise levels will be limited by the building's structure and masked by the rest of construction works.

To Receiver 1

Table 10 – Predicted Construction Noise Impact

Activity	Receiver	Management Level dB(A) L10 (15min)	Predicted Level at Receiver dB(A)L10(15min)	Comment
Drill	Residential Receiver R1	M-F 7am-8am 62* M-F 8am-9am 63* **M-F 9am-5pm** **62** Sat 7am-8am 59* Sat 8am-9am 60* **Sat 9am-4pm** **57**	45-47 construction of façade 25-27 all other internal/screened works	All proposed works have shown compliance with management levels
Powered Hand Tools			50-52 construction of façade 30-32 all other internal/screened works	
Trucks			50-52 construction of façade 30-32 all other internal/screened works	
Electric Saw			52-54 construction of façade 32-34 all other internal/screened works	
Angle Grinder			55-57 construction of façade 35-37 all other internal/screened works	
Hammering			60-62 construction of façade 40-42 all other internal/screened works	Predictions indicate a marginal exceedance of management levels for Saturday only as worst case. However, the actual noise levels are expected to be at least 5dB lower than the predicted noise levels, as the predictions did not take into account the shielding of the buildings between the subject site and the residential receiver.

*to manage noise impacts to the InterContinental Hotel, it is proposed to avoid noisy works prior to 9:00am

To Receiver 2

Table 11 – Predicted Construction Noise Impact

Activity	Receiver	Management Level dB(A) $L_{eq\ (15min)}$	Predicted Level at Receiver dB(A)$Leq_{(15min)}$	Comment
Drill	Commercial Receiver R2	70	47-59 construction of façade 27-39 all other internal/screened works	All proposed works have shown compliance with management levels
Powered Hand Tools			52-64 construction of façade 32-44 all other internal/screened works	
Trucks			52-64 construction of façade 32-44 all other internal/screened works	
Electric Saw			54-66 construction of façade 34-46 all other internal/screened works	
Angle Grinder			57-69 construction of façade 37-49 all other internal/screened works	
Hammering			62-74 construction of façade 42-54 all other internal/screened works	Marginal exceedance for construction works on facade. Refer to Section 9.1 for recommendations

To Receiver 3

Table 12 – Predicted Construction Noise Impact

Activity	Receiver	Management Level dB(A) $L_{eq\ (15min)}$	Predicted Level at Receiver dB(A)$L_{eq(15min)}$	Comment
Drill	Commercial Receiver R3	70	45-51 construction of façade 25-31 all other internal/screened works	All proposed works show compliance with management levels
Powered Hand Tools			50-56 construction of façade 30-36 all other internal/screened works	
Trucks			50-56 construction of façade 30-36 all other internal/screened works	
Electric Saw			52-58 construction of façade 32-38 all other internal/screened works	
Angle Grinder			55-61 construction of façade 35-41 all other internal/screened works	
Hammering			60-66 construction of façade 40-46 all other internal/screened works	

To Receiver 4

Table 13 – Predicted Construction Noise Impact

Activity	Receiver	Management Level dB(A) $L_{eq\ (15min)}$	Predicted Level at Receiver dB(A)$L_{eq(15min)}$	Comment
Drill	Commercial Receiver R4	70	47-57 construction of façade 27-37 all other internal/screened works	All proposed works show compliance with management levels
Powered Hand Tools			52-62 construction of façade 32-42 all other internal/screened works	
Trucks			52-62 construction of façade 32-42 all other internal/screened works	
Electric Saw			54-64 construction of façade 34-44 all other internal/screened works	
Angle Grinder			57-67 construction of façade 37-47 all other internal/screened works	
Hammering			62-72 construction of façade 42-52 all other internal/screened works	Slight exceedance for construction works on facade. Refer to Section 9.1 for recommendations

To Receiver 5

Table 14 – Predicted Construction Noise Impact

Activity	Receiver	Management Level dB(A) $L_{eq\ (15min)}$	Predicted Level at Receiver dB(A)$L_{eq(15min)}$	Comment
Drill	Commercial Receiver R5	70	45-67 construction of façade 25-47 all other internal/screened works	Compliant with management levels
Powered Hand Tools			50-72 construction of façade 30-52 all other internal/screened works	Slight exceedance for construction works on facade. Refer to Section 9.1 for recommendations.
Trucks			50-72 construction of façade 30-52 all other internal/screened works	
Electric Saw			52-74 construction of façade 32-54 all other internal/screened works	
Angle Grinder			55-77 construction of façade 35-57 all other internal/screened works	Exceedance for construction works on facade. Refer to Section 9.1 for recommendations.
Hammering			60-82 construction of façade 40-62 all other internal/screened works	

To Receiver 6

Table 15 – Predicted Construction Noise Impact

Activity	Receiver	Management Level dB(A) $L_{eq\ (15min)}$	Predicted Level at Receiver dB(A)$L_{eq(15min)}$	Comment
Drill	Educational Receiver R6	45 internally	<45	All proposed works have shown compliance with the management levels
Powered Hand Tools				
Trucks				
Electric Saw				
Angle Grinder				
Hammering				

It is further noted that:

- Noise sensitive spaces within the Conservatorium are enclosed within acoustically isolated rooms which would prevent any noise impact from the proposed construction activities.

7 CONSTRUCTION VIBRATION

7.1 CRITERIA

Vibration caused by construction at any residence or structure outside the subject site must be limited to:

- For structural damage vibration, German Standard DIN 4150-3 *Structural Vibration: Effects of Vibration on Structures; and*
- For human exposure to vibration, the evaluation criteria presented in the British Standard BS 6472:1992 *Guide to Evaluate Human Exposure to Vibration in Buildings (1Hz to 80Hz)* for low probability of adverse comment.

7.1.1 Structure Borne Vibrations (Building Damage Criteria)

German Standard DIN 4150-3 (1999-02) provides vibration velocity guideline levels for use in evaluating the effects of vibration on structures. The criteria presented in DIN 4150-3 (1999-02) are presented in Table 4.

It is noted that the peak velocity is the value of the maximum of any of the three orthogonal component particle velocities as measured at the foundation, and the maximum levels measured in the x- and y-horizontal directions in the plane of the floor of the uppermost storey.

Table 16 – DIN 4150-3 (1999-02) Safe Limits for Building Vibration

TYPE OF STRUCTURE		PEAK PARTICLE VELOCITY (mms^{-1})			
		At Foundation at a Frequency of			**Plane of Floor of Uppermost Storey**
		< 10Hz	**10Hz to 50Hz**	**50Hz to 100Hz**	**All Frequencies**
1	Buildings used in commercial purposes, industrial buildings and buildings of similar design	20	20 to 40	40 to 50	40
2	Dwellings and buildings of similar design and/or use	5	5 to 15	15 to 20	15
3	Structures that because of their particular sensitivity to vibration, do not correspond to those listed in Lines 1 or 2 and have intrinsic value (e.g. buildings that are under a preservation order)	3	3 to 8	8 to 10	8

It is noted that part of one of the two buildings of the development is Heritage listed. Category 3 vibration criteria will be adopted for this part of the building, as well as other heritage listed buildings on adjacent sites. Category 1 vibration criteria will be adopted for the other commercial buildings around the site, and Category 2 for the residential building.

7.1.2 Assessing Amenity

The NSW EPA document "*Assessing Vibration: A Technical Guideline*" provides procedures for assessing tactile vibration and regenerated noise within potentially affected buildings and is used in the assessment of vibration impact on amenity.

Relevant criteria are presented below.

Table 17 – EPA Recommended Vibration Criteria

		RMS acceleration (m/s^2)		RMS velocity (mm/s)		Peak velocity (mm/s)	
Place	Time	Preferred	Maximum	Preferred	Maximum	Preferred	Maximum
Continuous Vibration							
Residences	Daytime	0.01	0.02	0.2	0.4	0.28	0.56
Offices, schools, educational institutions and places of worship		0.02	0.04	0.4	0.8	0.56	1.1
Workshops		0.04	0.08	0.8	1.6	1.1	2.2
Impulsive Vibration							
Residences	Daytime	0.3	0.6	6.0	12.0	8.6	17.0
Offices, schools, educational institutions and places of worship		0.64	1.28	13.0	26.0	18.0	36.0
Workshops		0.64	1.28	13.0	26.0	18.0	36.0

7.2 VIBRATION IMPACTS

Of the proposed activities, the only activity likely to generate any significant vibration is the use of handheld jack hammers. This will not be perceptible in any of the surrounding structures.

Potential impacts would be limited to protection of the heritage features within the Intercontinental site should this activity occur within 10m of these. Additional measures are recommended to occur to manage vibration from this activity should this occur.

8 SITE SPECIFIC AMELIORATIVE MEASURES FOR CONTRUCTION NOISE AND VIBRATION

Site specific recommendations as follows:

8.1 RESPITE PERIODS

As a worst case, all activities will either comply with the noise management levels or only marginally exceed them for short periods. No exceedances of the highly noise affected management level is predicted. Therefore, respite periods are not proposed.

8.2 VEHICLE NOISE

Vehicle noise will be generally low impact in this instance. Notwithstanding, best practice techniques which will minimise noise include the following:

- Any trucks associated with the proposed development must turn off their engines when on site to reduce impacts on adjacent land use (unless truck ignition needs to remain on during concrete pumping).

8.3 VIBRATION ASSESSMENT AND MONITORING IN HERITAGE BUILDINGS

The activities proposed will not impact any surrounding buildings. However, hammering in or close to heritage listed structures or items on the subject site should be assessed on a case by case basis. Where possible the use of percussive demolition techniques should be avoided where possible, and where required should be undertaken using the smallest practical equipment. Vibration monitoring should be undertaken at heritage items during the works to confirm there is a low risk of damage from the activities occurring nearby.

8.4 COMMUNITY CONSULTATION/ NOTIFICATION

- Notification (leaflet or similar) to the residential receiver prior to any major works on Level 32 façade.
- Any notification advice should advise estimated start and finish dates of the construction activities identified above.
- In the event of complaint, noise management techniques identified in this report should be employed to minimise the level of noise impact. This may include community consultation and scheduling of loud construction processes.
- Notwithstanding above, general management techniques and acoustic treatments are included below which may be implemented on a case-by-case basis to reduce noise emissions to surrounding receivers.

8.5 CONTROL OF CONSTRUCTION NOISE AND VIBRATION GENERALLY

The execution of this work will facilitate the formulation of noise control strategies for this project. The flow chart presented in Figure 2 illustrates the process that will be followed in assessing construction activities.

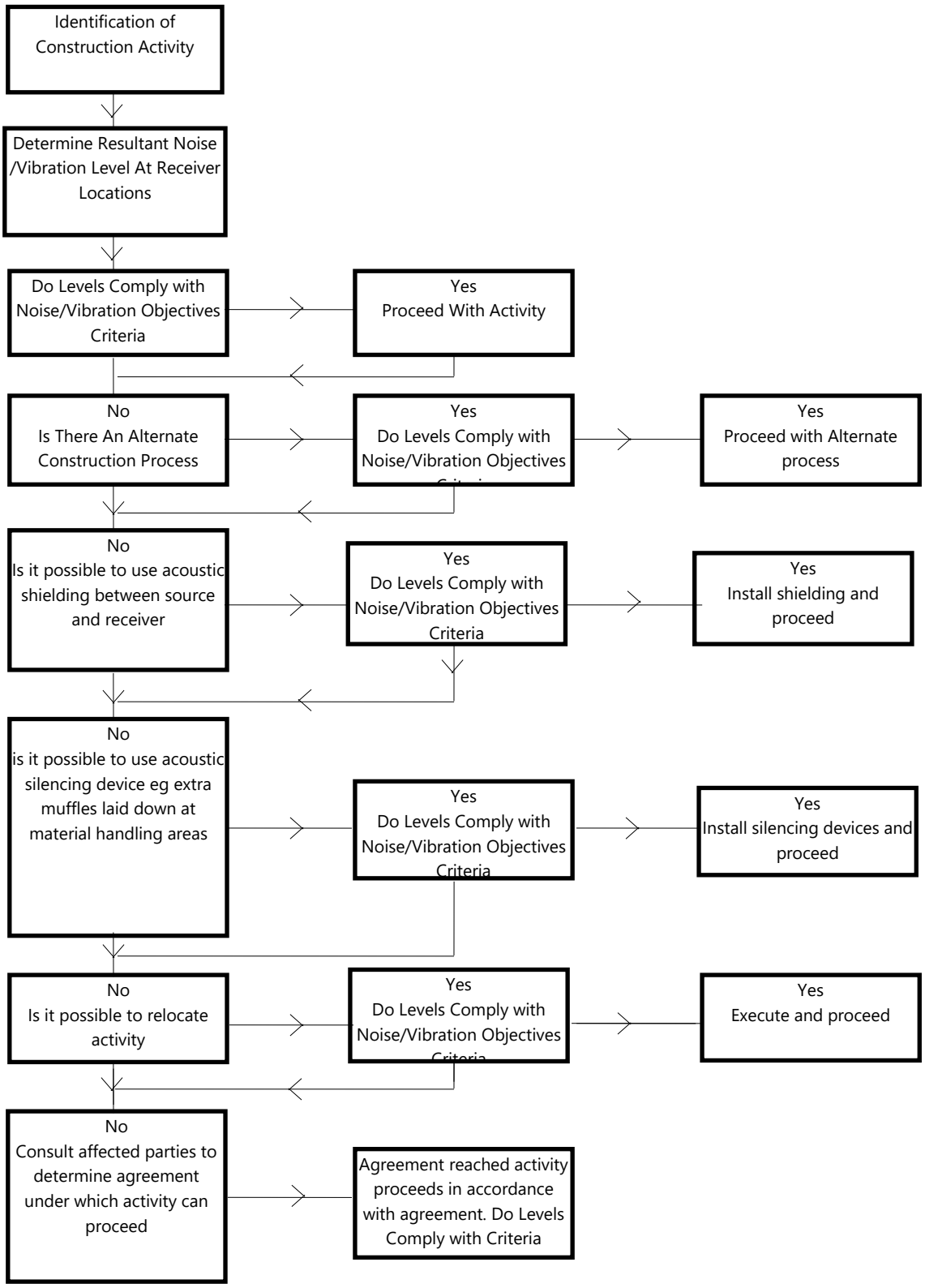

Figure 1 – Process Flowchart

8.6 NOISE AND VIBRATION CONTROL METHODS

The determination of appropriate noise control measures will be dependent on the particular activities and construction appliances. This section provides an outline of general available methods.

8.6.1 Silencing devices

Where construction process or appliances are noisy, the use of silencing devices may be possible. These may take the form of engine shrouding, or special industrial silencers fitted to exhausts.

8.6.2 Material handling

The installation of rubber matting over material handling areas can reduce the sound of impacts due to material being dropped by up to 20dB(A).

8.6.3 Treatment of specific equipment

In certain cases, it may be possible to specially treat a piece of equipment to dramatically reduce the sound levels emitted.

8.6.4 Establishment of Site Practices

This involves the formulation of work practices to reduce noise generation. It is recommended that all available and reasonable treatments and mitigation strategies presented in this report be adopted to minimise noise emissions from the excavation and construction activities on site.

8.6.5 Regular Noise Checks of Equipment

To determine the requirement for silencing devices on machinery it is proposed to undertake fortnightly noise check. Noise levels of all machines on site will be measured and if they are found to be higher than nominated for that equipment type, items such as mufflers and engine shrouds will be examined to ensure they are in good working order.

A record of these measurements will be kept on a form similar to that shown below.

This measure is expected to maintain noise at constant levels and prevent any increases.

8.6.6 vibration monitoring

Specific assessment and monitoring of vibration levels in heritage structures should occur as described In Section 7.1.

8.6.7 Combination of methods

In some cases, it may be necessary that two or more control measures be implemented to minimise noise and vibration impacts to surrounding receivers.

8.7 COMMUNITY INTERACTION AND COMPLAINTS HANDLING

8.7.1 ESTABLISHMENT of direct communication with affected parties

In order for any construction noise management programme to work effectively, continuous communication may be required between all parties, which may be potentially impacted upon, the builder and the regulatory authority. This establishes a dynamic response process which allows for the adjustment of control methods and criteria for the benefit of all parties.

The objective in undertaking consultation processes is to:

- Inform and educate the groups about the project and the noise controls being implemented;
- Increase understanding of all acoustic issues related to the project and options available;
- Identify group concerns generated by the project, so that they can be addressed; and
- Ensure that concerned individuals or groups are aware of and have access to a Constructions Complaints Register which will be used to address any construction noise related problems should they arise.

Consultation should be undertaken prior to works through the builder. This includes correspondence with all affected parties (Sensitive Receivers 1-5).

8.7.2 Dealing with Complaints

Should ongoing complaints of excessive noise or vibration criteria occur immediate measures shall be undertaken to investigate the complaint, the cause of the exceedances and identify the required changes to work practices. In the case of exceedances of the vibration limits all work potentially producing vibration shall cease until the exceedance is investigated.

The effectiveness of any changes shall be verified before continuing. Documentation and training of site staff shall occur to ensure the practices that produced the exceedances are not repeated.

If a noise complaint is received the complaint should be recorded on a Noise Complaint Form. The complaint form should list:

- The name and address of the complainant (if provided);
- The time and date the complaint was received;
- The nature of the complaint and the time and date the noise was heard;
- The name of the employee who received the complaint;
- Actions taken to investigate the complaint, and a summary of the results of the investigation;
- Required remedial action, if required;
- Validation of the remedial action; and
- Summary of feedback to the complainant.

A permanent register of complaints should be held. All complaints received should be fully investigated and reported to management. The complainant should also be notified of the results and actions arising from the investigation.

Where an item of plant is found to be emitting excessive noise, the cause is to be rectified as soon as possible. Where work practices within established guidelines are found to result in excessive noise being

generated then the guidelines should be modified so as to reduce noise emissions to acceptable levels. Where guidelines are not being followed, the additional training and counselling of employees should be carried out.

Measurement or other methods shall validate the results of any corrective actions arising from a complaint where applicable.

8.7.3 Reporting Requirements

The following shall be kept on site:

1. A register of complaints received/communication with the local community shall be maintained and kept on site with information as detailed in this report.
2. Where noise/vibration complaints require noise/vibration monitoring, results from monitoring shall be retained on site at all times.
3. Any noise exceedances occurring including, the actions taken and results of follow up monitoring.
4. A report detailing complaints received and actions taken shall be presented to the construction liaison committee.

8.7.4 Contingency plans

Where non-compliances or noise complaints are raised the following methodology will be implemented.

1. Determine the offending plant/equipment/process
2. Locate the plant/equipment/process further away from the affected receiver(s) if possible.
3. Implement additional acoustic treatment in the form of localised barriers, silencers etc where practical.
4. Selecting alternative equipment/processes where practical.

9 OPERATIONAL NOISE EMISSION

Noise emission criteria from the proposed development has been presented in the acoustic report with reference number 20191219.1/0412A/R0/EC dated 4th December 2019. Project's intrusiveness and amenity criteria for noise emissions to the closest noise sensitive receivers, as well as noise emission criteria for the hotel rooms within the development are listed below.

9.1 INTRUSIVENESS CRITERION

Intrusiveness criteria requires that noise from the site not exceed background noise level by more than 5dB(A)$L_{Aeq(15min)}$.

For the closest sensitive noise receivers, the following goals will apply:

Table 18 – Intrusiveness Criteria

Time of Day	Background Noise Level (Measured) dB(A)L_{90}	Intrusiveness Noise Emission Objective dB(A)$L_{Aeq(15min)}$
Day (7am-6pm)	62	67
Evening (6pm-10pm)	56	61
Night (10pm-7am)	50	55

For future residential development:

- As per section 2.4.3 of the Npfl, for sites where changing land use is expected to change the existing acoustic environment, it is appropriate to use the Amenity Criteria (based on the zoned use/density) as opposed to the Intrusiveness Criteria.
- The applicable Amenity Criteria are detailed in the following section.

9.2 PROJECT AMENITY CRITERIA

Project amenity criteria are determined based on the land use in the area (residential/commercial/industrial). The residential land use is then further categorised into rural, sub-urban and urban areas.

For the purpose of this assessment, the proposed residential dwellings will be considered urban.

Table 19 – Project Amenity Criteria

Noise Receiver	Amenity Noise Level – dB(A)$L_{Aeq(15min)}$		
	Daytime (7am – 6pm)	**Evening (6pm – 10pm)**	**Night (10pm – 7am)**
Closest Residential Receivers	58	48	43
Closest Commercial Receivers	65 (when in use)		
Passive Recreation	50 (when in use)		

9.3 SUMMARISED OPERATIONAL MANAGEMENT NOISE EMISSION TRIGGER LEVEL

Summarised project noise emission management trigger levels are presented in Table 20 below.

Table 20 – Project Noise Emission Limit

Noise Receiver	Noise Limit – dB(A)$L_{Aeq(15min)}$		
	Daytime (7am – 6pm)	**Evening (6pm – 10pm)**	**Night (10pm – 7am)**
Closest Residential Receivers	58	48	43
Closest Commercial Receivers	65 (when in use)		
Passive Recreation	50 (when in use)		

9.4 OPERATIONAL NOISE EMISSION ASSESSMENT FROM PROPOSED ALTERATIONS AND ADDITIONS

9.4.1 Level 5 and Level 32 Cafes

There are no proposed changes in the number of patrons or activities carried out in the food and beverage spaces on Levels 5 and 32. Therefore, the proposal will have no impact on the existing level of noise emissions. It is noted that these spaces are significantly separated from any residential receivers by distance and screening and noise emissions from dining activities would be inaudible at these receivers (as they would be within the surrounding commercial spaces and public domain).

9.4.2 Mechanical Plant

The selection of equipment isn't finalised and will be in CC. Based on the preliminary review of mechanical information the plant will satisfy the noise emission criteria detailed in Section 9.1. However, any new plant will be contained within the building will be assessed at CC stage and is not expected to emit significant levels of noise.

10 CONCLUSION

This report presents an analysis of the noise and vibration impacts associated with the construction work and operation of the proposed hotel refurbishments and rooftop additions of Stage 2 DA - Part 1 of the InterContinental Hotel located at 115-119 Macquarie Street, Sydney. This report addressed the noise and vibration requirements of "Planning Secretary's Environmental Assessment Requirements" Section 4.12(8) for Application Number SSD-10454 and Condition of Consent C19.

Provided that the recommendations, management controls and procedures outlined in this report are implemented, noise and vibration impact from the proposed works will be minimised in accordance with the relevant guidelines.

Yours faithfully,

Acoustic Logic Consultancy Pty Ltd
Eleni Chrysafis
M. Arch. Sci. (Audio & Acoustics) *University of Sydney*