

Thursday, 28 May 2020

Project number: S180585
Reference: S180585LT6 Rev B

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Dear Sarah,

**USYD Electrical Engineering Building ETP Stage 1
Out of Hours (OOH) construction noise assessment – COVID-19 (Social Distancing)**

1 Introduction

This letter contains an assessment of construction noise impacts relating to proposed OOH work to take place on the ETP Stage 1 Electrical Engineering Building in response to Covid-19 measures to facilitate social distancing whilst working on-site, resulting in the site being able to remain operational.

This assessment letter will form part of a Section 4.55 Modification Report to the Department of Planning to allow for a revision of the SEARs approval conditions in relation to construction noise.

On 31 March 2020 the Minister for Planning and Public Spaces, made an Order under Section 10.17 of the *Environmental Planning and Assessment Act 1979*, to allow a relaxation of the current construction site working day restrictions.

The Order allows for Development work to be carried out on a Saturday, Sunday or Public Holiday without the need for approval under the Act providing:

- The work is the subject of a development consent, and
- comply with all conditions of the consent that restrict the hours of work or operation on any other days as if the conditions applied to work or operation on a Saturday, Sunday or public holiday, and
- Not involve the carrying out of rock breaking, rock hammering, sheet piling, pile driving or similar activities during the hours of work or operation that would not be permitted but for this order, and
- Take all feasible and reasonable measures to minimise noise.

However, relaxation of working days to a Saturday, Sunday or public holiday as conveyed by the Order above does not extend to the extension of working hours, which is required by Laing O' Rourke to break up the shifts on-site for social distancing reasons and, keep the existing University building in use for laboratory exercises during the day. Therefore, Laing O' Rourke are proceeding with an OOH modification under Section 4.55 for planning approval.

2 Existing Construction Noise SSDA Approval Conditions

The current approval criteria and conditions allowing for construction works are taken from the, *University of Sydney Engineering & Technology Precinct – SEARs Noise and Vibration Assessment* report Rev D, Dated 30 November 2018. These criteria and conditions are also provided in the *Construction Noise and Vibration Management Plan*: Rev A, dated 1 March 2019.

2.1 Existing Allowable Construction Hours

The Development Approval Conditions state in relation to allowable construction hours:

C4. Construction, including delivery of materials to and from the site, may only be carried out between the following hours:

- Between 7am and 6pm Monday to Fridays inclusive; and
- Between 7:30am and 3.30pm, Saturdays
- No work to be carried on Sunday's or Public holidays.

C5. Activities may be undertaken of the hours in Condition C4 if required:

- By the police or a public authority for the delivery of vehicles, plant or materials: or
- In an emergency to avoid the loss of life, damage to property and/or to prevent environmental harm: or
- Where the works are inaudible at the nearest sensitive receivers: or
- Where a variation is approved in advance writing by the Secretary or her nominee if appropriate justification is provided for the works.

C6. Notification of such activities must be given to affected residents before undertaking the activities or as soon as is practical afterwards.

C7. Rock breaking, rock hammering, sheet piling, pile driving and similar activities may only be carried out between the following hours:

- 9am to 12pm Monday to Friday
- 2pm to 5pm Monday to Friday: and
- 9am to 12pm, Saturday

3 ETP Project Proposed Out of Hours Work

The ETP project is looking to modify the current SSDA conditions to enable a range of works to be undertaken out of hours. The proposed scope of works to extend out of hours is outlined below, with the plant replicating what is currently being used on site, (less the tower crane in the coming months). This has arisen from the unforeseen COVID-19 impacts and Laing O'Rourke's response to ensure they keep the safety of their project personal and surrounding university and residential community at an optimum.

The scope of works for both the new building and the existing building are outlined in Table 1 and Table 2 below.

The justification for each Table of proposed work is as follows:

- Table 1 - New ETP Building under construction - Justification: COVID-19 Social Distancing Initiative.
- Table 2 – Existing Building refurbishment work – Justification: Safety Initiative, to keep existing building in use for student laboratory and ongoing VC sessions.

Table 1 Scope of Works – New Building

Currently allowed hours	• Mon to Fri 7am and 6pm • Sat 7:30am and 3:30pm • Sun - No work	• Mon to Fri 7am and 6pm • Sat 7:30am and 3:30pm • Sun – No work
Requested OOH extension	• Mon to Fri 6am – 7am¹ (1 hour before 7am) • Sat - No extension required • Sun – No extension required	• Mon to Fri 6pm – 10pm (4-hour evening extension) • Sat - No extension required • Sun – No extension required
Monday – Friday	Service installation • Wet and dry fire services • Hydraulics services • Electrical services • Duct services Internal Fit out Works • Ceilings & partitions (Inc. doors) • Painting, tiling, floor finishes • Balustrades & handrails • Service fit off • Signage & wayfinding • Flooring Façade Installation • Install façade panels	Façade Installation • Install façade panels (No extension required) Service installation • Wet and dry fire services • Hydraulics services • Electrical services • Duct services Internal Fit out Works • Ceilings & partitions (Inc. doors) • Painting, tiling, floor finishes • Balustrades & handrails • Service fit off • Signage & wayfinding • Flooring
Saturday	As above	As above
Sunday	No works proposed	

Table 2: Scope of Works – Existing Building

Currently allowed hours	• Mon to Fri 7am and 6pm • Sat 7:30am and 3pm • Sun - No work	• Mon to Fri 7am and 6pm • Sat 7:30am and 3pm • Sun – No work
Requested OOH extension	• Mon to Fri 6am – 7am (1 hour before 7am) • Sat – No extension required • Sun – No extension required	• Mon to Fri 6pm – 10pm (4-hour evening extension) • Sat – No extension required • Sun – No extension required
Monday – Saturday	Internal Fit out Works • Ceilings & partitions (Inc. doors) • Painting, tiling, floor finishes • Balustrades & handrails • Service fit off • Signage & wayfinding • Flooring Service installation: • Wet and dry mechanical installation • Hydraulics installation • Electrical services • Duct installation	Internal Fit out Works • Ceilings & partitions (Inc. doors), plastering • Painting, tiling, floor finishes • Balustrades & handrails • Service fit off • Wayfinding installation • Flooring
Saturday	As above	As above
Sunday	No works proposed	

4 Construction Noise Assessment

This OOH construction noise assessment has considered vibration in that, the risk of an adverse vibration impact to sensitive receivers is considered insignificant due to the proposed OOH construction activities generating low levels of vibration, and the distances between sensitive receivers and any sources of construction vibration are large enough that any vibration impact is considered highly unlikely and negligible. Therefore, vibration is not considered further in this assessment.

The nature of the proposed OOH work is such that the majority of proposed work will be carried out inside the building, behind the façade, except for the façade installation itself and landscaping and civil work. Laing O'Rourke have stated that no service installation or fitout works will be carried out without the façade for that floor being installed. The façade installation will be carried out during currently approved daytime hours as usual, and only carry out this work OOH when deliveries have been delayed. The ETP project is now at a place where the majority of noisy works are complete and the work now largely consists of activities taking place inside behind the external façade, which provides an effective barrier to noise from those activities.

A construction noise assessment was undertaken as part of the SEARs noise and vibration assessment report. The proposed construction activities for this OOH work assessment were considered in the SEARs report. The outcomes of the noise assessment are summarised in to following sections.

4.1 Noise Sensitive Receivers

The ETP is being constructed on the Darlington campus. The site is bounded by the Mechanical Engineering Building and Seymour Centre to the north, the Peter Nicol Russell (PNR) Building to the south and the Engineering Link Building to the east. Figure 1 shows the site location.

A number of noise and vibration-sensitive land uses are located in the immediate vicinity of the Stage 1 site as shown in Figure 1 ETP site location, with the most significant being existing University buildings. The nearest residential land uses are the Urbanest Darlington Student Accommodation to the west (represented by R1), the residences on the eastern side of Shepherd Street (represented by R4, R5 and R6) and the residences on the northern side of Cleveland Street (represented by R3).

The sensitive land uses are summarised in Table 3 alongside a description of the land use.

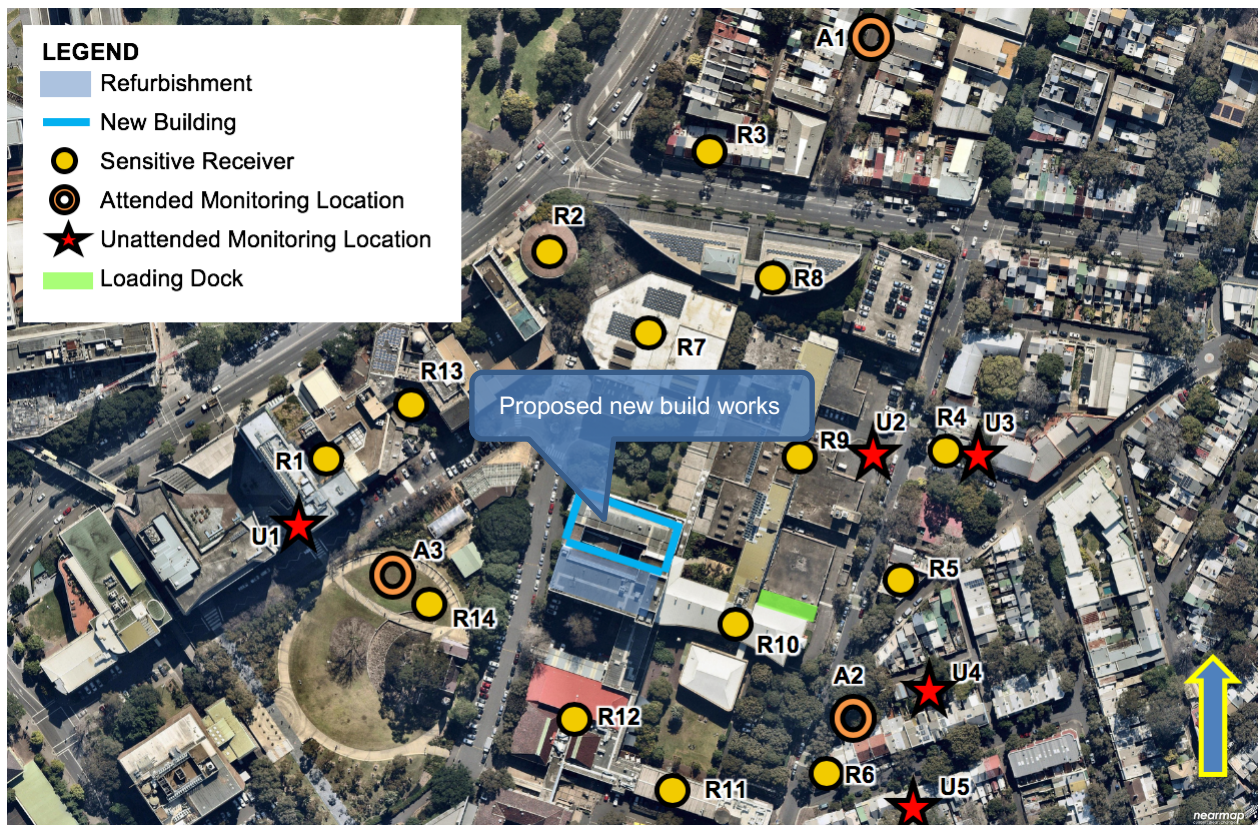


Figure 1 ETP site location

4.1.1 Noise Catchment Areas

Based on the results of the noise monitoring conducted around the site, four noise catchment areas (NCAs) have been defined for the different residential land use areas around the University of Sydney. This includes the student accommodation uses at International House and Urbanest Darlington.

The NCAs have been defined as shown on Figure 2 and are broadly described as follows:

- NCA1: Student accommodation areas to west and northwest of site. Background noise environment established based on monitoring results from U1.
- NCA2: Residential areas to the north of the site and on the northern side of Cleveland Street. Background noise environment established based on monitoring results from U3.

- NCA3: Residential areas to the northeast of the site and on the eastern side of Shepherd Street and north of Ivy Street. Background noise environment established based on monitoring results from U3.
- NCA4: Residential areas to the east and southeast of the site, on the eastern side of Shepherd Street and south of Ivy Street. Background noise environment established based on monitoring results from U4.



Figure 2 Noise catchment areas

Table 3 Noise and vibration sensitive land uses

Reference (Figure 1)	Noise Catchment Area (NCA) (Figure 2)	Description
	Residential buildings	
R1 – Urbanest Darlington (student accommodation)	NCA 1	Residential land uses 80 m away or more from new building. Cleveland Street and Shepherd Street residences shielded by intervening buildings.
R2 – International House (student accommodation)	NCA 1	
R3 – Cleveland Street residences	NCA 2	
R4 – Shepherd Street residences north	NCA 3	
R5 – Shepherd Street residences south	NCA 4	
R6 – Calder Road residences	NCA 4	
	University of Sydney buildings	
R7 – Seymour Centre	Non-residential	Performing Arts Centre within the University of Sydney, approximately 45 m north of the new building.
R8 – Warren Centre	Non-residential	Various University buildings associated with Engineering Faculty that surround the project site.
R9 – Mechanical Engineering	Non-residential	
R10 – Engineering Link Building	Non-residential	
R11 – Civil Engineering	Non-residential	
R12 – PNR Building	Non-residential	
R13 – Wentworth Building	Non-residential	Faculty of Architecture, Design and Planning
	Recreational land uses	
R14 – Cadigal Green	Non-residential	Public recreation area. Includes heritage-listed Old School building on Maze Crescent.

4.2 Construction Noise Criteria

Construction noise in New South Wales is assessed using the Department of Environment & Climate Change (now Environment Protection Authority) *Interim Construction Noise Guideline* (ICNG). The ICNG is also defined as the relevant guideline for construction noise by the SEARs issued by DPIE.

Table 4 provides the ICNG recommended criteria for construction work outside recommended Standard Working Hours.

Table 4 Noise Management Levels for residential land uses for work outside of recommended Standard Working Hours

Time of day	NML, $L_{eq,15min}$	Application notes
Outside recommended Standard Working Hours	Noise affected: RBL + 5 dB(A)	- A strong justification would typically be required for works outside the recommended standard hours. - The proponent should apply all feasible and reasonable work practices to meet the affected noise level. - Where all feasible and reasonable practices have been applied and noise is more than 5 dB(A) above the affected noise level, the proponent should negotiate with the affected community.

4.2.1 Noise Management Levels

Table 5 summarises the NMLs applicable to sensitive land uses around the ETP site during the construction phase. The NMLs are based on the background noise levels from unattended monitoring, which can be found detailed in the *University of Sydney Engineering & Technology Precinct – SEARs Noise and Vibration Assessment* report Rev D, Dated 30 November 2018.

Table 5 Noise Management Levels applicable to ETP

Land use	NML for time period, dB(A)			
	Standard Working Hours	Out of Hours Day ¹ (Saturday afternoon & Sundays)	Out of Hours Evening ²	Out of Hours Night ³
NCA1 – student accommodation uses (R1, R2, R13)	64 (NML) 75 (Highly noise affected)	59	55	51
NCA2 (R3)	58 (NML) 75 (Highly noise affected)	53	50	45
NCA3 (R4)				
NCA4 (R5, R6)	53 (NML) 75 (Highly noise affected)	48	47	42
University of Sydney uses (R7-13)	70	70	70	70
Cadigal Green (R14)	60	60	60	60

- (1) Any out of hours work occurring between 7 am and 6 pm.
 (2) Any out of hours work occurring between 6 pm and 10 pm.
 (3) Any out of hours work occurring between 10 pm and 7 am.

4.3 OOH work noise predictions

4.3.1 Construction noise sources

Table 6 summarises the assumed sound power levels (L_W) for the major construction noise sources which we expect would be on site during each phase. The sound power levels have been based on data obtained from previous measurements conducted by Resonate and those within the UK Department for Environment, Food and Rural Affairs (DEFRA) *Update of noise database for prediction of noise on construction and open sites*. An overall sound power level for each phase has also been assumed based on the loudest typical source(s) operating for each works phase. acknowledging that not all plant and equipment will be used for 100% of the time.

Table 6 Construction noise source sound power levels

Stage	Typical plant items	Assumed sound power level, dB(A)
Facade works	Crane	106
	Electric pallet jack	96
	General hand tools	98
	Large truck	108
	Day maker / temporary lighting	93
	Typical overall sound power level	107
Service installation, Internal works and fitout ¹	General hand tools	98
	Compressor	94
	Portable generator	95
	Electric Scissor lift	96
	Typical overall sound power level	85

(1) Includes a 15 dB(A) indoor-to-outdoor reduction in noise levels for internal works.

Predictions of noise at the noise sensitive receivers were made for the SEAR's noise assessment report. The receiver locations and noise propagation pathways remain the same. The methodology for prediction can be found in the SEARs report. The noise predictions in Table 7 are taken from the SEAR's assessment but augmented for the specific activities associated with this OOH work assessment.

It is important to note that these predictions are typical worst-case predictions as they assume that:

- The construction works are occurring at the nearest point to each receiver and that the receiver is located at the most exposed position (e.g. the nearest windows of Urbanest Darlington and International House).
- The noisiest construction sources are operating continuously for the entire 15-minute period. This will not occur at all times as equipment will regularly be stood down or idled while other activities are undertaken.

Typical worst-case predicted noise levels are shown in Table 7 for each sensitive-receiver location and each phase of works. Predicted noise levels that exceed the relevant OOH work NML are highlighted in **RED BOLD** type.

Table 7 Typical worst-case external construction noise levels for OOH working hours

Noise Sensitive Receiver	NCA Category	OOH work NMLs			Typical worst-case external construction noise level for phase during OOH Working Hours, dB(A) L _{eq}	
		Out of Hours Day ¹ (Saturday afternoon & Sundays)	Out of Hours Evening ²	Out of Hours Night ³	Facade works (F)	Service Installation and Internal works and fitout (SI&F)
R1 – Urbanest Darlington	NCA 1	59	55	51	58 (Eve)	36
R2 – International House	NCA 1	59	55	51	61	39
R3 – Cleveland Street residences	NCA 2	53	50	45	45	21
R4 – Shepherd Street residences north (NCA3)	NCA 3	53	50	45	48	25
R5 – Shepherd Street residences south	NCA 4	48	47	42	50	28
R6 – Calder Road residences	NCA 4	48	47	42	46	23
R7 – Seymour Centre	Non-residential	70	70	70	67	45
R8 – Warren Centre	Non-residential	70	70	70	57	35
R9 – Mechanical Engineering	Non-residential	70	70	70	73	51
R10 – Engineering Link Building	Non-residential	70	70	70	75	53
R11 – Civil Engineering	Non-residential	70	70	70	56	34
R12 – PNR Building	Non-residential	70	70	70	64	42
R13 – Wentworth Building	NCA 1	70	70	70	60	38
R14 – Cadigal Green	Non-residential	60	60	60	61	39

(1) Any out of hours work occurring between 7 am and 6 pm.

(2) Any out of hours work occurring between 6 pm and 10 pm.

(3) Any out of hours work occurring between 10 pm and 7 am.

Based on the predictions, it can be seen that the noise generated by the proposed OOH construction activities are predicted to exceed the relevant OOH Working Hours for relevant times of the day NMLs at:

- Urbanest student accommodation and International house in NCA 1 for the façade works. It should be noted that only during the evening time does the façade works exceed the NML.

- There are no exceedances at receivers in NCA 2 and 3.
- The façade installation works exceed the OOH NML's for daytime and evening at the Shepherd Street residences in NCA 4.
- There are some other exceedances from the façade installation works at nearby University buildings. However, the OOH work is only proposed to occur outside of normal university opening hours, when these buildings are typically less sensitive (and largely unoccupied) at these times.
- No residential or University land uses are predicted to be highly noise affected by the OOH construction works.
- All internal works are predicted to meet the OOH work noise NML's at all times.

4.4 Noise Mitigation and Management

The ETP Stage 1 project is at an advanced stage of construction, with the noisiest works including demolition, bulk excavation (including rock breaking) and construction of the sub and super structures are being complete. The majority of work remaining is either inside the building which are benefiting from noise attenuation from the building envelope, or less noisy in comparison to other previous project stages. This results in no receivers approaching the Highly Noise Affected impact of 75 dB(A).

Laing O'Rourke should continue to apply the noise and vibration management and mitigation measures and compliance management presented in Sections 6 and 7 to of the Construction Noise and Vibration Management Plan (Rev A, dated 1 March 2019).

4.4.1 Service Installation and Internal Fitout Works

Service installation and fit-out works will be undertaken behind an installed façade, thereby benefiting from additional sound attenuation compared with activities undertake outside. Laing O'Rourke has stated that they will not carry out these works on building levels where facades are not installed and sealed. This means these works do not exceed any of the OOH NMLs. There is expected to be a negligible noise impact to the nearby residents and the University buildings.

For the existing building refurbishment, the OOH works are proposed to take place at times when the laboratories and ancillary areas are unlikely to be occupied i.e. early weekday mornings and evenings. No OOH work is proposed after 10pm from Monday – Friday and no OOH work is proposed on Saturday or Sunday.

The noise impact of these works during the proposed OOH times is considered to be negligible and manageable by applying the mitigation and management measures below in Section 4.4.3.

4.4.2 Façade Installation

The application for permission to allow for façade installation in the weekday mornings from 6am to 7am and evenings only, from 6pm - 10pm is made with the intention that it will only be used if necessary to continue with work where, delays in deliveries of façade sections and materials occur due to the unpredictability caused by the COVID-19 pandemic. Otherwise façade installation works will be carried out during currently approved hours.

The noise predictions show relatively minor exceedances of the OOH NMLs of up to 6 dB(A) (61 dB(A)) but all significantly below the Highly Noise Affected level of 75 dB(A).

The noise impact of these works during the proposed OOH times is considered to be minor and manageable by applying the mitigation and management measures below in Section 4.4.3:

4.4.3 Mitigation and Management Measures

Site management

Site management procedures should include the following:

- processes that generate lower noise levels should be selected where feasible
- noisy plant should be located as far away from residences as is practical to allow efficient and safe completion of the task
- the potential shielding provided by site topography and intervening buildings should be considered in locating equipment
- site compounds should be located as far away as possible from residences
- equipment that is used intermittently should be shut down or throttled down to a minimum during periods where it is not in use
- works should be planned to minimise the reduce the noise from reversing signals
- warning horns should not be used as signalling devices
- two way radios should be set to the minimum effective volume
- noise associated with packing up plant and equipment at the end of works should be minimised.

Equipment management

Equipment management should include the following:

- selection of low-noise plant and equipment where possible
- equipment should be well maintained
- equipment should have quality mufflers and silencers installed where relevant
- equipment not in use on site should be shut down
- tasks should be completed using the minimum feasible power and equipment.

5 Conclusion

This is to facilitate social distancing as a result of the COVID-19 pandemic the Minister for Planning and Public Spaces, made an Order under, section 10.17 of the *Environmental Planning and Assessment Act 1979*, to allow a relaxation of the current construction site working day restrictions. This Order does not cover the OOH work proposed by Laing O'Rourke. Therefore, Laing O'Rourke is applying for an OOH work extension under a Section 4.55 modification to their development approval conditions for the construction of the new electrical engineering building and refurbishment of the existing building, as part of the ETP Stage 1 development.

Resonate has assessed the noise impact and predicted noise levels at noise sensitive receivers resulting from the proposed OOH work, which will only occur on weekdays (Monday – Friday) from 6am up until 10pm. The proposed activities relate to service installation and internal fitout works, and façade installation. These activities are among the quieter of the construction stages for this project, the noisiest of which have passed, such as demolition and bulk excavation.

The predicted noise levels show some minor exceedances of the relevant Noise Management Levels (NMLs) for OOH times and Noise Catchment Areas (NCAs). However, the exceedances are all significantly below the highly Noise Affected level of 75 dB(A) and considered relatively minor compared to previous construction stages.

Good practice noise mitigation and management measures have been provided to minimise unnecessary noise impact on the local community and operation of the University.

Please let me know if you have any queries or wish to discuss the above.

Yours sincerely,



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