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WALSH BAY ARTS PRECINCT | STAGE 2 STATE SIGNIFICANT DEVELOPMENT APPLICATION

Peer review of noise and vibration impact assessment

15 February 2017

Dynamic Property Services

TH720-02F01 Review of Noise Impact Assessment (r4)

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Executive summary

Renzo Tonin & Associates is engaged by the owners and tenants of No 13 Hickson Road, Dawes Point NSW 2000 (SP 73989) to provide a peer review of the Noise Impact Assessment, the Precinct Operational Event Noise Management Plan and the Precinct Environmental, Construction and Site Management Plan relating to noise and vibration impacts associated with the construction and operation of the proposed Walsh Bay Arts Precinct (**WBAP**). The occupants of No 13 Hickson Road abut the WBAP and represent the closest potentially affected noise-sensitive receivers.

The WBAP comprises demolition and rebuilding works in Pier 2/3 to accommodate arts uses, events. festivals and functions, a major upgrade of Wharf 4/5 for arts uses, new commercial offices with cafes, restaurants and retail shopping and the construction of a new north facing Waterfront Square over water between Pier 2/3 and Wharf 4/5 supported with new boardwalks for collaborative outdoor performances, events, festivals, markets and public art. If approved, the consent will permit the WBAP to hold events for up to 10,000 people.

The construction of the WBAP will involve use of piling rigs, large delivery and dump trucks, concrete trucks and concrete pumps with booms, front end loaders, cranes and excavators, welders, nailing guns, hand tools, grinders and similar equipment.

The NSW EPA provides guidelines in respect of mitigating noise and vibration from construction activities. However, the noise impact assessment prepared for WBAP neglects to include SP 73989 as a noise-sensitive receiver. Furthermore, the noise impact assessment relies on measured existing ambient noise levels which are inadequate because they do not comply with EPA guidelines. As a consequence, the noise management levels and noise goals recommended in the report are deficient.

The noise impact assessment also fails to consider SP 73989 as a noise-sensitive receiver in evaluating event noise. As a consequence, the occupants of SP 73989 are not protected from adverse noise impacts when WBAP is operating.

We conclude that there are likely to be significant noise impacts for occupants of SP 73989 which have not been addressed. Therefore, the noise impact assessment fails to comply with clauses 7, 9 and 17 of the Secretary's Environmental Assessment Requirements in terms of a) providing a "*high level of environmental amenity*", b) "*outlining measures to minimise and mitigate potential noise and vibration impacts within the precinct and to surrounding occupiers of land*", and c) providing an Environmental and Construction Management Plan to include "*noise and vibration impacts on and off site*". Furthermore, because the noise-sensitive receivers in SP 73989 are overlooked or ignored in the noise impact report, conditions A12, A13, B3, B16 and B12 in SSD 6069 are not complied with.

It is therefore concluded the noise impact assessment is faulty and non-compliant with both the Secretary's Environmental Assessment Requirements and the development consent SSD 6069.

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1 Introduction

Renzo Tonin & Associates is engaged by the owners and tenants of No 13 Hickson Road, Dawes Point NSW 2000 (SP 73989) to provide a peer review of documents relating to noise and vibration impacts associated with the construction and operation of the proposed Walsh Bay Arts Precinct (**WBAP**).

The occupants of No 13 Hickson Road abut the WBAP and represent the closest potentially affected noise-sensitive receivers. A list of occupants is shown in the table below.

Table 1 List of Occupants in Shore 2/3 Studios at 13 Hickson Road Strata Plan 73989

Lot	Studio	Company	Tenant or Owner
1	1	Stephenson Mansell Group	Tenant
2	2	10,000 Hours	Tenant
3	3	Pier Capital / Meers Group	Owner
4-9	4-9	Archer Capital	Owner
10	10	Stewart Investors	Tenant
11	11	Tudor Capital	Owner
12	12	Mail Plus / Jigsaw Capital	Tenant
13	13	WWW.Com (The Dubs)	Tenant
14	14	Xref	Tenant
15	15	Angophora Capital	Owner
16	16	Vittoria Coffee	Owner
17	17	Xref	Tenant
18	18	Munro Lawyers	Tenant
19	19	Simmer on the Bay	Owner
20	20	View By Sydney	Tenant
21-22	21-22	Simmer on the Bay	Owner

The occupants comprise mostly commercial office space, a restaurant (View By Sydney), and an art gallery/private dining room/café (Simmer on the Bay). There is no assessment of noise and vibration impacts upon the sensitive receivers in SP 73989 despite the requirement in the Secretary's Environmental Assessment Requirements (**SEARs**) to "*outline(s) measures to minimise and mitigate potential noise and vibration impacts within the precinct and to surrounding occupiers of land*". [1]

The purpose of this report is therefore to provide a peer review of the Noise Impact Assessment prepared by Arup [9], the Environmental, Construction and Site Management Plan prepared by Cadence [11] and the Operational Event Noise Management Plan prepared by Arup [10] and to present further information to enable an assessment to be made as to the likely noise and vibration impacts generated by the WBAP on the occupants situated at No 13 Hickson Road.

[1] Clause 9, Secretary's Environmental Assessment Requirements, 1 July 2016

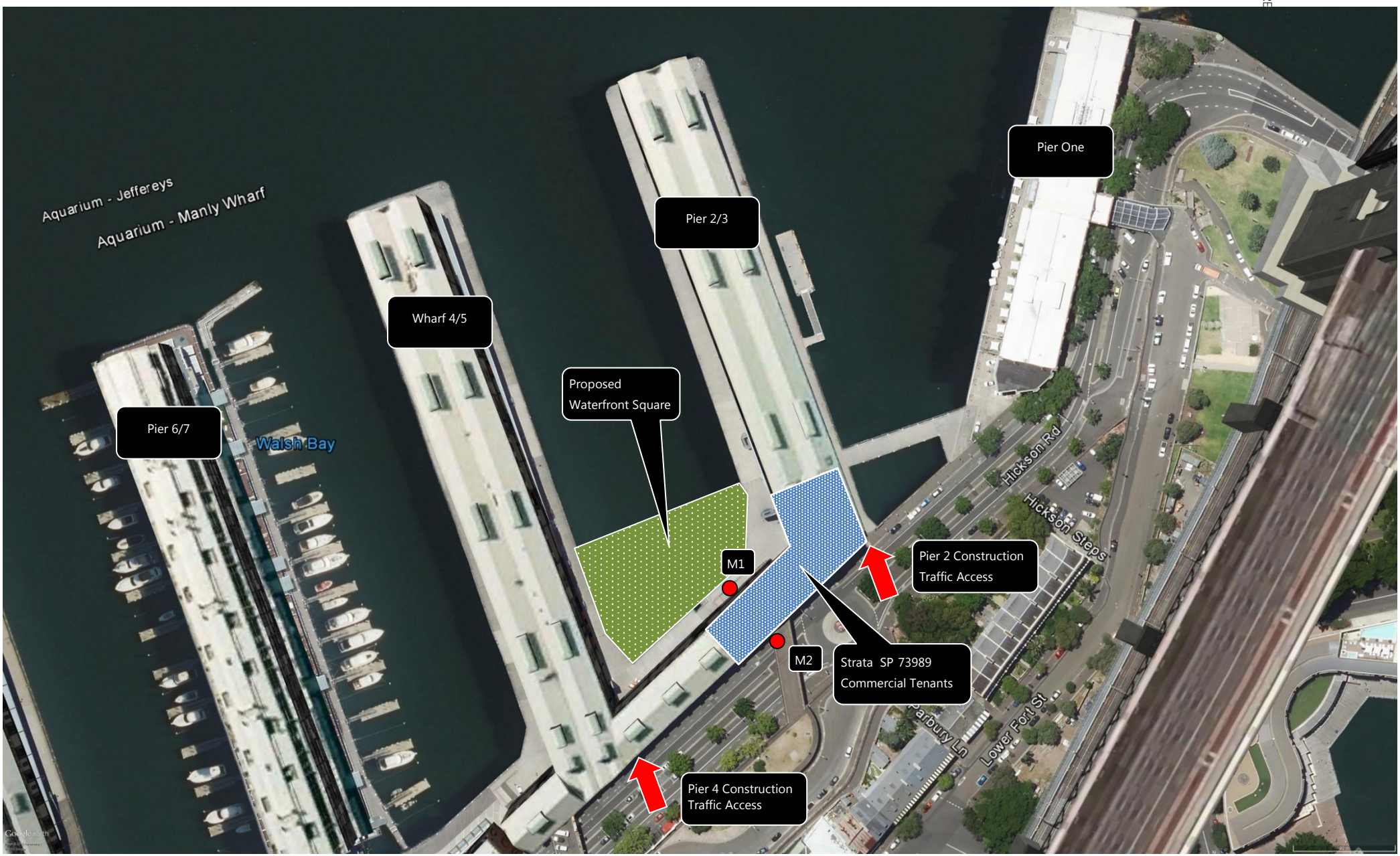
The work documented in this report was carried out in accordance with the Renzo Tonin & Associates Quality Assurance System, which is based on Australian Standard / NZS ISO 9001. Appendix A contains a glossary of acoustic terms used in this report.

2 Description of the Proposal and the Applicant's premises

The existing development at Walsh Bay Wharves comprises the following buildings, some of which are shown in Figure 1 below:

1. Pier One - adapted to contain the Sebel Pier One Sydney Hotel;
2. Pier 2/3 - an undeveloped finger wharf comprising two storeys (and associated shore sheds) with gabled roof which has approval for cultural uses, temporary arts events and some commercial events.
3. Wharf 4/5 - a four storey timber finger wharf structure used by ten arts and cultural organisations (such as Australian Theatre for Young People and the Bangarra Dance Theatre) and comprises a range of performance venues, rehearsal, workshop spaces. a recording studio. cafe/restaurants and office accommodation occupied by the Sydney Theatre Company;
4. Pier 6/7 - redeveloped for residential apartments and associated boat marina;
5. Pier 8/9 - redeveloped for office uses; and,
6. Shore Sheds - containing a range of commercial activities, including restaurants. bars, shops and offices.

Figure 1 Site aerial photograph showing the proposed waterfront square, location of SP 73989 and the location of additional noise monitoring locations M1 and M2



In 2011/12 Arts NSW engaged the NSW Government Architect to prepare a master plan for the WBAP. The WBAP comprises the following elements:

1. Demolition and rebuilding works in Pier 2/3 to accommodate the Australian Chamber Orchestra, Bell Shakespeare and Australian Theatre for Young People with associated foyer and office space on the ground level and a commercial space at the northern end;

2. The construction of a new Australian Chamber Orchestra auditorium in the north end of Pier 2/3 and secondary auditorium for Australian Theatre for Young People in the south end of Pier 2/3. To accommodate the acoustic needs of the auditorium, a section of roof will be demolished and rebuilt with an increased height;

3. The demolition and construction of a large "raw" heritage space in Pier 2/3 for events. festivals and functions;

4. A major upgrade of ground floor facilities at Wharf 4/5 for the Bangarra Dance Theatre (an indigenous performing arts company) including a café/bar at the end of the Wharf on the ground floor and facilities for the Sydney Dance Company (but excluding Sydney Theatre Company which is not a part of the Proposal);

5. The demolition and construction of creative and commercial activities along the shore sheds included an upgraded choirs office accommodation, rehearsal space and new commercial offices with cafes, restaurants and retail shopping;

6. The construction of a new north facing Waterfront Square over water between Pier 2/3 and Wharf 4/5 supported with new boardwalks to significantly increase public open space and create a central platform for activity, collaborative outdoor performances, events, festivals, markets and public art. This work will involve the installation of a large number of piles.

Annexed hereto in Appendix B is a copy of the strata plan SP 73989 [1]. The location of SP 73989 is shown in Figure 1 and comprises a four level brick and timber building otherwise known as "Shore Studios 2/3" as depicted in the strata plan. The street address of SP 73989 is No 13 Hickson Road, Dawes Point NSW 2000 and comprises 22 tenancies of various sizes.

Lots 1-18 are used as commercial offices. On Level 1 (the ground floor level) is a restaurant in Lot 20 and a single tenancy known as Simmer on the Bay in Lots 19, 21 and 22 which is used as an art gallery/private dining room/café.

Simmer on the Bay has a café on the eastern portion of the tenancy accommodating approximately 20 patrons. The remainder of the tenancy is used for art gallery/dining room use including an outdoor area. The art gallery/dining room is air-conditioned with 12mm thick glass windows and two 12mm thick double glass doors on the northern façade and large fixed windows and a main entrance incorporating a 12mm thick double glass door on the southern façade.

Abutting the tenancy immediately to the east is the Pier 3 promenade entrance roadway. Abutting the tenancy immediately to the west is a space associated with arts use.

The approved hours of operation for the art gallery are 9:00am to 9:00pm 7 days a week. The private dining room is approved for use from 6pm to 1am Monday to Saturday 3 times a week in the inside areas and up to 10:30pm 3 times a week in the outside areas. On Sundays and public holidays, the inside areas are restricted to 11:00pm and the outside areas to 10:00pm. The operating hours of the Café are unrestricted.

3 Minister's consent and conditions imposed

Development Application SSD 6069 submitted by Arts NSW to the Minister for Planning was approved on 21 May 2015 [5]. Of relevance is that, because the noise-sensitive receivers in SP 73989 are overlooked or ignored in the noise impact report, conditions A12, A13, B3, B16 and B12 in SSD 6069 are not complied with.

The following relevant conditions were imposed in SSD 6069.

3.1 Approved development

A1 DEVELOPMENT DESCRIPTION

a. Except as amended by this approval, concept approval is granted for the Walsh Bay Arts Precinct, an integrated performing arts and cultural precinct, which includes the following key elements:

• a new waterfront public square between Pier 2/3 and Wharfs 4/5;

• a series of new stairs and balconies on Pier 2/3 and Wharf 4/5 and modification to the roof of Pier 2/3;

• the inclusion of flexible and adaptive spaces in Pier 2/3 and Wharf 4/5 for arts and cultural activities; and

• the use of the precinct for arts festivals, events and pop-ups and associated uses, including restaurants, cafes and bars

subject to compliance with the modification in Part B of this approval.

3.2 Restrictions on use

Condition A7 specified the restrictions on use as follows:

A7 RESTRICTIONS ON USE

The future use of the Waterfront Square and associated outdoor spaces for events is to be generally consistent with the scope and frequency provided in the Table below.

Category	*Scope of Events*
Major Events	• *up to 10,000 people* • *max 4 times per year* • *must not occur over more than one day* • *use must not occur before 7 am or after midnight on any day, except New Year's Eve (when the use may occur until 2 am the following day)* • *music to be ceased by 11 pm in all cases (with the exception of New Year's Eve)*

	• *set-up/dismantle time for the use must not start earlier than 6 am, or end later than 1 am, on any day, except New Year's Eve when dismantle may occur until 2 am the following day* • *clean up time for the use must end no later than 2 hours after the use was to stop occurring or may be undertaken the following day*
Arts and Cultural Festivals	• *up to 7,500 people moving through the site at any one time* • *can occur over consecutive days* • *max 6 times per year* • *use must not occur before 7 am or after 12 midnight on any day (including set up/dismantle and clean up time) music to be ceased by 11 pm in all cases*
Community Events	• *up to 5,000 people* • *no limit on number of community events held in a year* • *can occur over consecutive days* • *use must not occur before 7 am or after midnight on any day, including set up/ dismantle time and clean up* • *music to be ceased by 11 pm in all cases* • *use of localised low output amplified sound system for announcements or for live intimate entertainment only*
Private Events	• *up to 1,000 people* • *no limit on number of private events* • *use must not occur before 7 am or after midnight, including set up/dismantle and clean up time* • *music to be ceased by 11 pm in all cases* • *private event should not restrict or impede public* • *access to public outdoor areas* • *use of localised low output amplified sound system for live intimate entertainment only*

3.3 Operational management plans

An operational plan of management and operational event noise management plan are to be prepared:

A12 OPERATIONAL PLAN OF MANAGEMENT

The applicant is to review and finalise the draft Operational Plan of Management (OPM) for WBAP in consultation with the Walsh Bay Arts Precinct Working Group. A copy of the final OPM is to be submitted to the Secretary and Council prior to the lodgement of the first development application.

A13 OPERATIONAL EVENT NOISE MANAGEMENT PLAN

The applicant is to finalise the draft Operational Event Noise Management Plan (OENMP) for WBAP in consultation with the EPA and Council. Specifically, the EPA and Council are to be consulted in relation to the following:

(a) relevant event noise control targets for each specific category of event;

(b) the methodology for noise monitoring;

(c) reasonable and feasible noise mitigation techniques specific to each category of event; and

(d) required community consultation techniques specific to each category of event.

The Plan is to include the management strategies and mitigation measures included in Sections 7 and 8 of the Noise and Vibration Management Plan prepared by WSP dated June 2014.

A copy of the final OENMP is to be submitted to the Secretary and Council prior to the lodgement of the first development application.

3.4 Conditions to be met in Stage 2

The conditions to be complied with in future stages (including Stage 2, the current proposal) are:

B3 OPERATIONAL MANAGEMENT PLANS

All future applications for the fitout and adaptive reuse of the WBAP are to demonstrate compliance with the following:

a) The final Operational Plan of Management prepared in accordance with Condition Al2; and

b) The final Operational Event Noise Management Plan in accordance with Condition A13.

Where future application/s require amendments to these Plans they are to be endorsed by the respective agencies/groups referred to in the respective Condition.

B16 NOISE IMPACT ASSESSMENT

Where relevant, future applications are to be include a Noise Impact Assessment (NIA) which includes performance based modelling. The NIA is to demonstrate how the recommendations in sections 7.0 and 8.0 of the Noise and Vibration Plan prepared by WSP dated June 2014 have been addressed, as relevant. The NIA is also to demonstrate how compliance can be achieved with the Operational Event Noise Management Plan prepared in accordance with Condition A13 of this consent.

B20 EVENT MANAGEMENT PLAN

All future event development applications are to be accompanied by a detailed event management plan prepared in accordance with approved Operational Plan of Management required under Condition Al2. The Plan is to be prepared in consultation with the NSW Police, the RMS, Transport for NSW and the City of Sydney and is to comprehensively address the following matters:

…

(c) Noise management, including reactive noise management measures and noise monitoring

...

4 Secretary's Environmental Assessment Requirements (SEARs)

The SEARs for the Stage 2 development were issued on 1 July 2016 [6]. Of relevance is that requirements 7,9 and 17 are not considered in the Stage 2 development application in respect of the sensitive receivers in SP 73989 and therefore those requirements are not complied with.

The relevant SEARs requirements are as follows:

7. Amenity

- *Address and demonstrate a high level of environmental amenity in respect of … acoustic … privacy, particularly regarding the impacts of the outdoor waterfront square; and, …*

9. Noise and Vibration

- *The EIS shall include a noise and vibration assessment prepared by a suitably qualified acoustic consultant that:*
    - *assesses construction noise and vibration impacts. The assessment must consider cumulative noise and vibration impacts from all concurrent construction activities;*
    - *assesses operational noise from the use of the buildings and the public domain, associated events and any food and drink premises;*
    - *assesses operational vibration from the use of the premises;*
    - *outlines measures to minimise and mitigate potential noise and vibration impacts within the precinct and to surrounding occupiers of land.*

Relevant Policies and Guidelines:

- *NSW Industrial Noise Policy (EPA)*

17. Environmental, Construction and Site Management Plan

- *The EIS shall provide an Environmental and Construction Management Plan for the proposed works, and is to include:*
    - *community consultation, notification and complaints handling;*
    - *impacts of construction on adjoining development and proposed measures to mitigate construction impacts;*
    - *noise and vibration impacts on and off site; …*

5 Description of proposed construction works

The Proposal is described in the architectural drawings prepared by Tonkin Zulaikha Greer Architects [14]. An explanation of the Proposal is provided in the table below. [2]

Table 2 Proposed construction works

Location	Description
Pier 2/3 internal alterations	Performance venues for ACO, Bell Shakespeare and ATYP; Rehearsal rooms, production workshops, back of house facilities and offices for ACO, ATYP and Bell Shakespeare; Function/commercial spaces and foyer spaces, some of which extend out onto external gantry platforms (balconies) providing breakout space for internal foyers and allowing views of outdoor performances; Mezzanine spaces for offices and back of house facilities; Upgrades to meet compliance with current BCA, DDA and fire codes; New lifts and stairs; Public toilets; Removal of some storey posts and beams to facilitate internal reconfiguration and new uses; Retention of a large proportion of the ground floor in its existing 'raw' heritage state for events and festivals including Sydney Writers' Festival and Biennale including venue and commercial hire.
Pier 2/3 external alterations	Three new balconies on the western elevation and one balcony on the eastern elevation to provide breakout space from the internal public areas. The balconies have been designed to echo the form and detailing of the original gantries; Three new external stairs on the western elevation and one new set of stairs on the eastern elevation to provide fire escape from the upper level; New external lift for access at the north end of the western facade to provide accessible travel to ACO offices and the function space on Level 1; Installation of glazing in existing cargo sliding door openings and other solid panels on the eastern and western elevations to allow for views into and out of the building. The new glazing has been located to respect the chequerboard rhythm of the building. Other than those in front of the balconies, new openings are screened with louvres adapted from the existing sidings to mimic the solidity of the existing façade; Installation of three new openings on the northern elevation. At the upper level, the central two bays will be replaced with glazing, providing Harbour views from the independent function space. At the lower level, the north eastern corner is opened up and replaced with glazing, reinterpreting the original building which was open in this corner; Roof penetrations within the central valley at the southern and northern end to accommodate mechanical plant and associated structural modifications including truss strengthening; Raising of the external floor level on the eastern side by introducing a new raised deck and continuous set of stairs beyond the existing column line; A new canopy on the east facade above the loading area in order to provide shelter for the safe movement of goods. The canopy will be a contemporary element that interprets historical loading platforms that were present.

[2] extracted from Section 6 reference 12

Location	Description
Wharf 4/5 internal alterations	Internal alterations and reconfiguration to the BDT tenancy to provide for: - Upgrade of the main rehearsal and performance space to provide improved daylight and natural ventilation; - Upgraded foyer and exhibition space along the eastern frontage; - Improved office space at mezzanine level including a new lift; - Provision of function space and kitchen at ground level of northern end of wharf; - New entrance to BDT and new glazing in bays of sliding cargo doors, opening up the foyer and main studio to Wharf 4 apron; - Improved staff amenities. Minor internal alterations to the SDC tenancy including: - Reducing the existing workshop space to create a fifth dance studio; - Upgrading office and reception areas; - Improved staff amenities. Provision of two new commercial tenancies at ground and mezzanine levels, one at the southern end and one in the centre of the ground level. Future use of these tenancies will be subject to separate development applications; Removal of some storey posts and beams to facilitate internal reconfiguration and new uses; Provision of public toilets.
Wharf 4/5 external alterations	Three new external stairs on the eastern elevation and one new set of stairs on the western elevation to provide fire escape from the upper level; Two external lifts on the eastern elevation to provide for accessible travel and one external goods lift on the western elevation; Two roof penetrations within the central valley, one above the STC workshop to allow theatre sets to be built at full height and one above STC Theatre 1 to improve sight lines, allow for clear head height to technical zones and enable flexible seating configurations; Raising of timber wharf deck adjoining the SDC café and opening of facade with new glazing to activate the waterfront square; Improved street entry at Hickson Road involving relocation of the stairs to allow for an improved landing and point of arrival to the STC; New entries along the wharf located to respect the chequerboard rhythm of the building
Shore Sheds 4/5	Internal alterations to reconfigure choir spaces, including provision of a large rehearsal space on the ground floor and creation of a mezzanine for choir administration; Creation of two new commercial tenancies at ground and mezzanine levels. Future use of these tenancies will be subject to separate development applications; Provision of office space at ground level, including an office in the western Shore Shed for use by the Precinct Manager; Provision of a waste room for Pier 2/3
Waterfront Square	New waterfront square between Pier 2/3 and Wharf 4/5 by extending the promenade into the water space between the two wharves. The majority of the Square is set at RL2.1, matching the key entry at Pier 4/5. At either side, raised areas resolve the changes in level to the main Wharf Aprons at RL 3.4 .
Structural Engineering	The proposed upgrade and alterations involve removal of additional internal columns, replacement of some columns previously removed, additional stairs, lifts and mezzanine floors throughout, raised roof profile in parts, and some additional roof plant platforms. The new waterfront square is supported on new piles.
Construction Staging	The project is to be carried out in two main stages; demolition and construction. The indicative duration of each stage is as follows. Demolition – 4 months (approximately 17 weeks) Construction – 18 months (approximately 74 weeks). The project would include the demolition and redevelopment of the internal building fabric, with the external structure to be maintained and improved. The construction works scheduled to be carried out in 22 to 23 months between mid 2017 and mid 2019.

Location	Description

NOTE:
ACO – Australian Chamber Orchestra
ATYP- Australian Theatre for Young People

There is no information provided in the EIS document [12] relating to building quantities expected in the project. However, in the previous application SSD 6069, a detailed description of construction works was provided in the MBM Report [2]. The following key details are extracted from that report:

Table 3 Key project construction details

Location	Description
Pier 2/3 Refurbishment	Removal of 180 piles to be replaced with new steel jack-up piles. ACO Fitout – 1,420sqm of reinforced concrete slabs Replace existing roof 336sqm with associated bracing Bell Shakespeare Fitout – 573sqm of reinforced concrete slab ATYP Fitout – 1,405sqm of reinforced concrete slabs
Wharf 4/5 Refurbishment	Demolish 2,416sqm of ground and first floor areas Demolish 904sqm of retail space in shore sheds
Waterfront Square	634sqm of upgrade to eastern approaches to Pier 2/3 2,175sqm of piling 1,013sqm of timber decking including framing fixed to piling 840sqm of unspecified decking to The Wings 246sqm performance stage 317sqm of Roof over stage 157sqm new raised deck area in front of Wharf ¾ Café externally

NOTE:
ACO – Australian Chamber Orchestra
ATYP- Australian Theatre for Young People

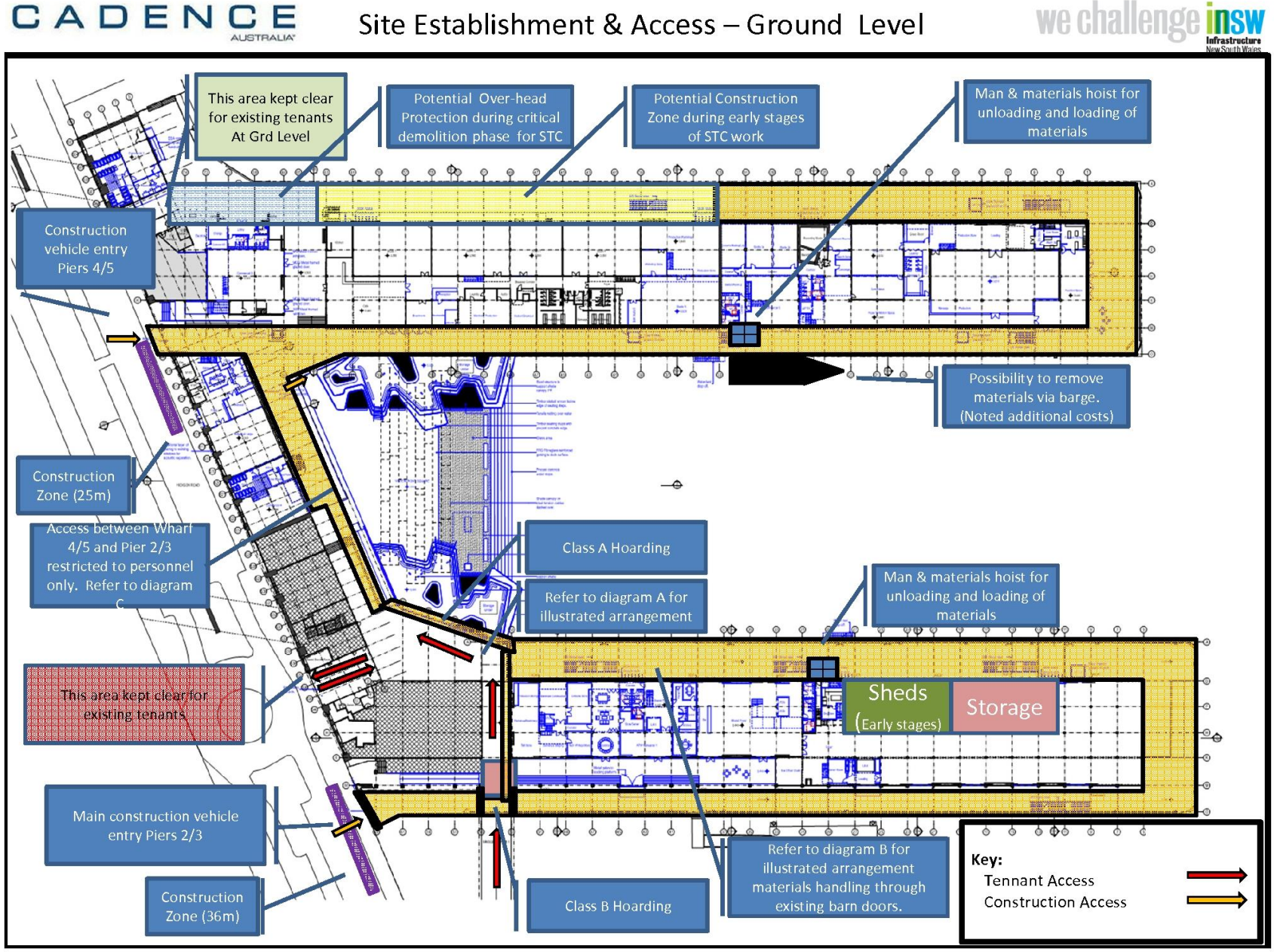
The work described above would most likely involve the use of construction equipment such as:

- Piling rigs
- Large delivery and dump trucks
- Concrete trucks and concrete pumps with booms
- Barge crane
- Fork lifts and mobile cranes
- Welders, nailing guns, hand tools, grinders etc.

Whilst a large proportion of the construction works will occur indoors, the construction of the Waterfront Square will occur outdoors in front of SP 73989.

Figure 2 shows the proposed construction access arrangements. The two key construction entry and exit portals are via Pier2 and Wharf 4. The access from Hickson Road via Pier 3 is to be kept free for existing tenants (including SP 73989).

Figure 2: Proposed construction vehicle entry and exit points and access for existing tenants



According to Section 6.4.7 of the Arup Report, there will be 40-80 vehicles per day (i.e. 80-160 vehicular movements per day) associated with deliveries and debris removal from the site. It is noted that the construction traffic corridor extends across both the north-west and the eastern facades of SP 73989. Noise impacts from truck traffic entering and leaving the site would therefore be a relevant matter to be addressed.

6 Ambient noise measurements

Ambient noise levels were measured at the Simmer on the Bay premises in 2015 for the purpose of adducing evidence in relation to an appeal against development application SD 6069 (a matter which is now concluded).

A limited sample of noise measurements were taken inside and outside the premises on the morning of Thursday 26th November 2015 from 10:19am to 11:33am.

The equipment used for noise measurements was an NTi Audio Type XL2 precision sound level analyser which is a class 1 instrument having accuracy suitable for field and laboratory use. The instrument was calibrated prior and subsequent to measurements using a Bruel & Kjaer Type 4231 calibrator. No significant drift in calibration was observed. All instrumentation complies with IEC 61672 (parts 1-3) '*Electroacoustics - Sound Level Meters*' and IEC 60942 '*Electroacoustics - Sound calibrators*' and carries current NATA certification.

Weather conditions were fine with wind gusts less than 5m/sec, temperature 34.4degC, 35%RH and 1/8oct cloud cover.

Noise levels were measured in the free field outside the premises on the northern and southern facades (denoted as M1 and M2 in Figure 1). Existing noise sources include traffic, wave noise, helicopters, people chatting in the distance and train passbys on the bridge approach. Noise levels were also measured inside the kitchen and in the gallery/dining space. The following results were obtained:

Table 4 Measured ambient noise levels Thursday 26 November 2015

File	Location	Start Time	Stop Time	Duration	LA10%	LAeq	LA90%
		[hh:mm:ss]	[hh:mm:ss]	[mm:ss]	[dB]	[dB]	[dB]
SLM_000	M1 - North entrance to Simmer 4m from façade	10:19:44 AM	10:34:46 AM	15:02	60.0	56.7	51.5
SLM_001	M1 - North entrance to Simmer 4m from façade	10:35:18 AM	10:50:36 AM	15:18	61.0	58.1	51.3
SLM_002	M2 - Hickson Road main entrance 3.5m from façade	10:51:48 AM	11:08:12 AM	16:24	71.9	68.7	58.3
SLM_003	Inside kitchen - 3 staff, no airconditioning	11:09:30 AM	11:14:38 AM	05:08	70.0	67.2	60.1
SLM_004	Lower gallery/dining space no airconditioning	11:15:44 AM	11:22:43 AM	06:59	49.3	47.3	43.0
SLM_005	Lower gallery/dining space with airconditioning on	11:26:24 AM	11:32:56 AM	06:32	48.8	46.9	44.9

In respect of the gallery/dining space, ambient noise was predominantly due to traffic on Hickson Road transmitted via the main entry door and fixed windows. Whilst the entry door glass is 12mm thick, there are large gaps in the perimeter of the door which allow the transfer of sound. Comparing the outside noise level on Hickson road with the internal noise level, there is only about a 22dB(A) noise reduction in the LAeq noise level. This is relevant because this would be the noise reduction that would also be

expected from outside to inside from future construction noise transmitted through the northern façade.

For the office areas on Level 2 and above, the glass in the windows and balcony doors is unlikely to be as thick, we assume in the order of 6-10mm, however the acoustic sealing at the frame periphery would be better. Therefore, taking both matters into consideration, we expect the internal noise levels in the office spaces to be about the same as in the gallery/dining spaces in Simmer on the Bay, i.e. 47 LAeq and the noise reduction of the external façade to be about 22dB(A).

It is not necessary to be precise about these noise levels at this point in time because they can be quantified accurately prior to construction works commencing.

7 Applicable noise and vibration criteria for construction works

There are no standards recommended in the SEARs for assessment of noise and vibration during construction of the WBAP. The EPA's NSW Industrial Noise Policy referred to in condition 9 of the SEARs does not apply to construction works. Instead, the EPA recommends the following guideline documents:

- Interim Construction Noise Guideline (2009) [16]; and
- Assessing Vibration: a technical guideline (2006) [17].

7.1 Applicable noise criteria

The NSW EPA *Interim Construction Noise Guideline(2009)* (**ICNG**) provides guidelines for assessing noise generated during the construction phase of developments. The key components of the guideline relevant to this assessment include:

- Use of LAeq(15min) as the descriptor for measuring and assessing construction noise.
- Application of feasible and reasonable noise mitigation measures.
- A noise mitigation measure is feasible if it is capable of being put into practice, and is practical to build given the project constraints.
- Selecting reasonable mitigation measures from those that are feasible involves making a judgement to determine whether the overall noise benefit outweighs the overall social, economic and environmental effects.

The standard hours for construction work recommended in the ING are as follows:

- Monday to Friday 7 am to 6 pm
- Saturday 8 am to 1 pm
- No work on Sundays or public holidays

It is assumed in this report those standard hours will be applied to the WBAP.

Section 4.1.3 of the ICNG sets out the following guideline for commercial premises.

4.1.3 Commercial and industrial premises

Due to the broad range of sensitivities that commercial or industrial land can have to noise from construction, the process of defining management levels is separated into three categories. The external noise levels should be assessed at the most-affected occupied point of the premises:

industrial premises: external LAeq (15 min) 75 dB(A)

offices, retail outlets: external LAeq (15 min) 70 dB(A)

other businesses that may be very sensitive to noise, where the noise level is project specific as discussed below.

Examples of other noise-sensitive businesses are theatres and child care centres. The proponent should undertake a special investigation to determine suitable noise levels on a project-by-project basis; the recommended 'maximum' internal noise levels in AS 2107 Acoustics – Recommended design sound levels and reverberation times for building interiors may assist in determining relevant noise levels (Standards Australia 2000).

The proponent should assess construction noise levels for the project, and consult with occupants of commercial and industrial premises prior to lodging an application where required.

During construction, the proponent should regularly update the occupants of the commercial and industrial premises regarding noise levels and hours of work.

If the external noise level at the façade of SP 73989 is limited to 70 LAeq(15min) then, according to the information in the previous section, this will result in a noise level below 50LAeq(15min) which should be acceptable for a commercial premises. A management level of 70 LAeq(15min) is therefore recommended.

In respect of the outside café, the management noise levels for residential receivers of *"RBL+10dB"* should apply. From Table 4 above, the LA90(15min) (taken to be the RBL) at the northern entrance is 51dB(A) and the appropriate management construction noise level is therefore (51+10=) 61LAeq(15min).

The following table therefore summarises the applicable noise management levels for the commercial premises SP 73989:

Table 5: Construction noise management levels for the commercial premises SP 73989

Assessment Location	Indoors/outdoors	LAeq(15min)
Commercial tenancies	Outdoors	70
Café	Outdoors	61

As the café and the nearest façade of the building are at approximately the same location with respect to most of the construction works, complying with the café management level will be more onerous than for the office spaces. Whilst the use of acoustic screens around the café boundary may assist in reducing noise levels, there will no doubt be some negotiation required with the café operator in respect of achieving times of respite.

7.2 Applicable vibration criteria

Vibration disturbance from piling operations contemplated for the Proposal is a potential issue.

Assessment of disturbance from vibration on human occupants of buildings is made in accordance with the NSW DECC '*Assessing Vibration; a technical guideline*' (DECC, 2006) [17]. Sources of vibration are

defined as either 'Continuous', 'Impulsive' or 'Intermittent'. In the case of piling operations, these are defined in the guideline as 'Intermittent' and the following vibration criteria apply:

Table 6: Acceptable vibration dose values for intermittent vibration (m/s$^{1.75}$)

Location	Daytime[1]		Night-time[1]	
	Preferred value	Maximum value	Preferred value	Maximum value
Critical areas[2]	0.10	0.20	0.10	0.20
Residences	0.20	0.40	0.13	0.26
Offices, schools, educational institutions and places of worship	0.40	0.80	0.40	0.80
Workshops	0.80	1.60	0.80	1.60

Notes:
1. Daytime is 7:00am to 10:00pm and night-time is 10:00pm to 7:00am
2. Examples include hospital operating theatres and precision laboratories where sensitive operations are occurring. These criteria are only indicative, and there may be a need to assess intermittent values against the continuous of impulsive criteria for critical areas.

Source: BS 6472-1992

By way of explanation, the "*vibration dose values*" or VDV account for both the magnitude of vibration and the number of vibration occurrences.

Activities should be designed to meet the preferred values where an area is not already exposed to vibration. Where all feasible and reasonable measures have been applied, values up to the maximum value may be used if they can be justified. For values beyond the maximum value, the operator should negotiate directly with the affected community.

As there are no specific categories for art gallery use, café use or catering service use, we shall adopt the third row category in this table "*Offices, schools, educational institutes and places of worship*" as being the most relevant for the whole of SP 73989.

8 Predicted construction noise levels and assessment of impact

There is some information provided in the WBAP documents as to the type of construction equipment to be deployed (e.g. Section 4 ECSMP [11]) but not the number of equipment and therefore a generic assessment must be made in order to estimate noise levels.

The sound levels in British Standard BS 5228-1-2009 plus A1-2014 *Noise and Vibration Control on Construction Sites* are used for the purpose of estimating construction noise levels taking into consideration the information provided in the architectural drawings, the MBM Report and the noise sources identified in Section 5 above.

Three construction scenarios are assumed as depicted in the following table – Site Preparation, Piling and Superstructure Works. Activities which might occur inside the pier and wharf are ignored as these would not add significantly to the external noise levels. The numbers and type of equipment for each stage depicted in the table are based on an assumption as to what might be required to construct the WBAP. These assumptions are based on our observations of equipment used on other construction sites.

Columns 1 and 2 "Table" and "Ref No" are a reference to the data tables in BS 5228. Columns 3-5 describe the equipment. Column 6 is the noise level at 10m. On the assumption that the acoustic centre of the external works (particularly the Waterfront Square) is 30m from the façade of SP 73989 then columns 7-8, 9-10 and 11-12 show the numbers of equipment by type and the respective sound levels at the northern façade of SP 73989.

The total cumulative noise level at the northern façade of SP 73989 is shown in the last row.

Note that the equipment selection is conceptual. If there is a criticism, for example, that there will be no dozers used on site, then that item of equipment would be indicative of another similar item of equipment.

Table 7 Predicted construction noise levels at the northern façade of SP 73989

1	2	3	4	5	6	7	8	9	10	11	12
						Site Preparation		Piling		Superstructure Works	
Table	Ref no.	Equipment	Power rating, kW	Equipment size, weight (mass), capacity	LAeq,T		LAeq,T		LAeq,T		LAeq,T
					dB at 10 m	No	Receiver	No	Receiver	No	Receiver
C.2	13	Barge Crane	82	11t	78	1	68	1	68	1	68
C.2	32	Articulated dump truck	187	23t	74	2	67	2	67	2	67
C.3	2	Hydraulic hammer rig	186	4t hammer	87			1	77		
C.3	28	Tracked mobile crane	184	110t	67	1	57	1	57	1	57
C.3	31	Hand-held welder			73			2	66	1	63
C.3	33	Generator for welding	6	508kg	57			2	50	1	47
C.4	18	Concrete mixer truck (discharing)			75					1	65
C.4	29	Truck mounted concrete pump + boom arm		26t	80					1	70
C.4	43	Wheeled mobile crane	275	35t	70	1	60	1	60	1	60
C.4	67	Fork lift		5t	74	1	64	1	64	1	64
C.4	73	Hand-held circular saw (cutting paving slabs/tiles)	1.5	7.6kg/235mm diameter	84					4	80
C.4	76	Diesel generator (hand tools, lighting)	6.5		61	4	57			4	57
C.4	93	Angle grinder (grinding steel)	2.3	4.7kg	80					1	70
C.4	95	Handheld cordless nail gun		15 to 50mm nails	73					1	63
				Total Receiver LAeq,T			72		79		82

The "Total Receiver LAeq,T" shown in the last row is the external noise level at the northern façade of the Simmer on the Bay premises.

The predicted external construction noise levels may then be compared with the noise management levels determined in the previous section. The following table shows the predicted noise levels and assessment and compliance with the goals.

Table 8: Assessment of construction noise impact at the premises SP 73989

Assessment Location	Outside LAeq(15min)	Construction Noise Management Level LAeq(15min)	Exceedence dB
Commercial tenancies	72-82	70	2-12
Outside Café	72-82	61	11-21

This table shows there are significant exceedences of the construction noise management level for all assessment locations which require mitigation.

The calculation does not take into account noise produced by construction vehicles entering and leaving the construction site which would add cumulatively to the noise levels indicated in the table above.

9 Predicted construction vibration levels and assessment of impact

It is stated in section 6.4.9 of the Arup Report that no significant issues are expected in respect of construction vibration. Irrespective of whether or not the proposed hydraulic piling method will result in ground vibration potentially affecting the commercial tenancies in SP 73989, construction activity conducted on the existing wharf structure (such as dropping of materials) may generate vibration.

Therefore, vibration monitors should be installed at selected locations in SP 73989 for the period of the construction works.

10 Noise and vibration mitigation measures associated with construction

Where the noise or vibration management targets are exceeded, it would be reasonable to recommend work practices to mitigate those exceedences based on best practice techniques. For example, Section 6 of the ICNG discusses various reasonable and feasible measures including:

i. reduce the line-of-sight noise transmission using temporary barriers.

ii. temporary noise barriers can be constructed from hoarding (plywood boards, panels of steel sheeting or compressed fibre cement board) with no gaps between the panels at the site boundary. Stockpiles, shipping containers and site office transportables can be effective barriers. Erect temporary noise barriers before work commences to reduce noise from works as soon as possible.

iii. provide acoustical treatment for the kitchen, for example, acoustically sealed doors and windows and install air-conditioning to enable the doors and windows to be kept closed.

iv. using a lower noise and vibration generating form of piling, such as bored or vibratory piling instead of impact piling.

v. limiting noisy activities – piling and demolishing – to one or two hours in a day to provide respite.

vi. selecting low noise equipment for the site.

vii. liaising with stakeholders and informing them when noisy work will occur and what is being done to minimise the noise.

viii. using smart reversing alarms rather than beeping annoying alternatives.

ix. use alternatives to diesel and petrol engines and pneumatic units, such as hydraulic or electric driven units.

x. locate electrical generators away from noise sensitive receivers and/or use noise barriers.

xi. examine and specify different types of machines that perform the same function and compare the noise level data.

xii. select the least noisy machine for the job, for example, rubber wheeled tractors can be less noisy than steel tracked tractors.

xiii. pneumatic equipment is traditionally a problem – select super-silenced compressors, silenced jackhammers and damped bits where possible.

xiv. reduce throttle setting and turn off equipment when not being used.

xv. reducing noise from metal chutes and bins by placing damping material in the bin.

xvi. regularly inspect and maintain equipment to ensure it is in good working order. Also check the condition of mufflers.

xvii. place as much distance as possible between the plant or equipment and sensitive receivers.

xviii. restrict areas in which mobile plant can operate so that it is away from sensitive receivers.

xix. schedule site vehicle entrances away from sensitive land uses.

xx. carry out noisy fabrication work at another site (for example, within enclosed factory premises) and then transport to site.

Identifying work practices that are reasonable involves an evaluation of the costs involved in implementing the solution in comparison with the overall project costs and taking into account the expected reduction in noise levels and the benefit to the sensitive receiver.

11 Evaluation of the Arup report, the Environmental, Construction and Site Management Plan and the Operational Event Noise Management Plan

We now turn to the Arup Report [9], the Environmental, Construction and Site Management Plan prepared by Cadence [11] and the Operational Event Noise Management Plan prepared by Arup [10] in terms of evaluating compliance with conditions B16, B3 and B20 respectively as described in Section 3.4 above.

11.1 Arup Report

11.1.1 Identification of noise-sensitive receivers

In Section 4.2 of the Arup Report, the terminology "key receptors" is used instead of "noise-sensitive land uses" or "noise-sensitive receivers" which are the preferred terms in the NSW Industrial Noise Policy (**INP**) [15]. As previously stated in this report, SP 73989 is a noise-sensitive receiver which is neglected or overlooked in the Arup Report.

11.1.2 Measurement of ambient noise levels

In Section 4.3 of the Arup Report, it states that it relies on ambient noise levels in the WSP Report submitted as part of the Stage 1 SSDA [5]. However, in the WSP Report, it is stated that noise logging was undertaken at seven days for Locations 1 and 5 in Figure 5 of the WSP Report (also annexed in Appendix A of the Arup Report). In the INP, seven days' valid data is recommended for high risk projects (which we believe is a suitable category for the WBAP).[3] However, in Figure 7 of the WSP Report, there is only 5 1/2 days data reported for Location 1 and in Figure 8 only 4 1/2 days for Location 2. Furthermore, it is not evident in these figures that data for days with adverse meteorology are excluded from the analysis as required in the INP.[4] Therefore, the validity of the data is questioned.

Furthermore, with the possible exception of sites R4 and R5, the applicable background noise levels for all the locations in Figure 3 of the WSP Report are calculated from a combination of the noise logging referred to in the previous paragraph and short term noise measurements. This is completely unacceptable because, for a project of this importance, Arup should have deployed a sufficient number of noise loggers in the study area to define the background noise levels with appropriate precision in accordance with the INP.

Whilst this criticism could equally apply to the short-term measurements we took at SP 73989 as reported in Section 6 above, those measurements were taken to illustrate the potential noise impacts at SP 73989 are were not intended to support a large-scale project such as WBAP. Furthermore, it is

[3] Table 3.2 INP

[4] Section 3.4 INP

recommended that Arup redo those noise measurements over a period of 7 days in compliance with the INP guidelines.

We also refer to the EPA's submission which also criticised the lack of valid environmental noise monitoring {12].

Section 5.1 of the Arup Report in which Project Specific Noise Criteria are derived should therefore be updated following a more extensive assessment of ambient noise levels.

11.1.3 Acoustic criteria

In Section 5.1 of the Arup Report there is a derivation in Table 3 of the Project Specific Noise Criteria based on the principles in the INP. However, there is no explanation of how those levels were derived nor of what amenity noise category was used. Furthermore, there is no explanation of how cumulative noise impact from mechanical plant and other event noise occurring contemporaneously will comply with the recommended noise limits.

In any event, Table 3 should be updated to include SP 73989 as a sensitive receiver and, for the reasons explained in Section 11.1.2 above, should also be revised once new background noise levels are obtained.

11.1.4 Event noise

In Section 5.3 of the Arup Report, criteria are developed for major events and arts and cultural events to be held at the WBAP. The report states that these are "based on common practice in Sydney". However, it is our submission that this statement is incorrect.

The noise limits in Tables 4 and 5 use the LAeq,15min and LCeq,15min descriptors. The use of these descriptors is not common practice in Sydney. Reference is made to the following documents:

1. Noise Guide for Local Government, NSW EPA, May 2013: In "Case study 1: open-air concerts and public address systems" in Section 3.6 of that document, the noise limits are:

    a) For a crowd capacity less than 1,500 the LA10,T must not exceed the ambient background LA90,T.

    b) For a crowd capacity of between 1,500 and 5,000, the LA10,T must not exceed LA90 plus 5dB up to 11pm and must not exceed LA90,T after 11pm.

    c) For a crowd capacity exceeding 5,000 the LA,Max must not exceed 65dB(A) and the LC,Max must not exceed 85dB(C) with a time limit up to 10:30pm and a maximum of 8 concerts per year.

    These are the same limits applied in the prevention notice issued by the NSW EPA to the Centennial park and Moore Park Trust dated 26 Feb 2001 in respect of events held at Moore Park, Centennial Park and Queens Park.

2. Royal Botanic Gardens and Domain Trust. Prevention Notice issued by the NSW EPA, 24 June 2003: This document regulates outdoor events held at the Fleet Steps and on the Domain Lawn and the noise limits are:

    a) Category 1 - for a crowd capacity up to 2,000, an LA,Max not to exceed the LA90,T by more than 5dB or 55dB(A) whichever is the lesser, and must finish at midnight.

    b) Category 2 - for a crowd capacity between 2,000 and 10,000, an LA,Max not exceeding 55dB(A) and an LC,Max not exceeding 70dB(C) and must finish at 11pm.

    c) Category 3 - for a crowd capacity over 10,000 not relevant to this study.

3. City of Sydney Event Guidelines, April 2015. Noise from any amplified music or notification system used at the event must not exceed an LAeq,15min greater than 65 dB(A) when measured at the nearest affected receiver.

Firstly, it is clear from the above that, with the single exception of the City of Sydney Event Guidelines (which impose a much lower noise limit than the other event categories listed), the preferred noise descriptors commonly used in Sydney are LA,Max and LC,Max and not LAeq,15min and LCeq,15min as proposed in the Arup Report. The effect of measuring in terms of the equivalent noise level indicated by the subscript "eq" is that the noise level is averaged over 15 minutes. It is estimated that the averaging process dilutes the "Max" noise level by as much as 5-10dB. Therefore, the noise limits proposed in Table 4 and 5 of the Arup Report could be 5-10dB higher than if they were to be measured using the "Max" descriptor.

For example, in Table 4, the level of LAeq,15min of 65dB(A) could be equivalent to an LA,Max of 70-75dB(A) which would far exceed the limit range of 55-65dB(A) historically used for major events in Sydney as evident in the examples above. Similarly, an LCeq,15min of 80dB(A) could be equivalent to an LC,Max of 85-90dB(A) which is to be compared with the limits of 70-85dB(C) above.

Secondly, in the examples above, the larger events must finish by 10:30pm-11pm whereas it is proposed that events (with the exception of New Years Eve) would finish at midnight with a 10dB reduced level between 10pm and midnight.

We refer to the EPA's submission which also criticised the derivation of noise criteria for events {12].

11.1.5 Construction noise and vibration

Section 6.4 of the Arup Report deals with noise impacts from construction activity. Reference is made to the NSW EPA's Interim Construction Noise Guideline, 2009 (**ICNG**) which is the applicable document for assessing noise impacts.

Firstly, the applicable construction noise management levels shown in Table 6 of the Arup Report should be updated to include SP 73989 and, for the reasons explained in Section 11.1.2 above, should also be revised once new background noise levels are obtained.

The assessment of construction noise is unacceptable for two reasons. Firstly, there is no assessment of construction noise at SP 73989 which is the closest noise-sensitive receptor to the WBAP works.

Secondly, the only construction activities discussed in the Arup Report are screw piling, concrete pumps, vibratory pokers and truck noise. It is noted that set-building work is addressed, however, this work is internal to the buildings and unlikely to be an issue at SP 73989. Given the range of works to be carried out at WBAP as described above in Section 5, it seems unlikely these four types of equipment will be the only construction equipment to be deployed on site. We refer to Section 8 above which outlines a more comprehensive list of construction equipment.

Thirdly, in respect of assessing construction noise at SP 73989, it should be done on the basis of the cumulative contribution from all sources and not one source at a time (as required in the SEARs condition 9).

In Section 6.4.8 of the Arup Report, it is stated that the construction contractor "*will be required to liaise with the users so that noise from construction does not impact on any critical events taking place within the existing accommodation*". It is not clear whether this is a reference to SP 73989. If it is, then the Arup Report is clearly misleading in not quantifying potential noise impacts at SP 73989.

In Section 6.4.9 of the Arup Report, it is stated that "*no significant issues are expected with construction vibration affecting residential or commercial properties of the users of the existing venues at site*". It is not clear whether the "*existing venues at site*" is a reference to SP 73989. Given that some of the work will be undertaken on or abutting the existing wharf superstructure, it does not seem reasonable to assume there will be "*no significant issues*". For example, the possibility of materials being dropped on the existing wharf superstructure and the construction of new work abutting the existing structure have the capacity to cause vibration potentially affecting SP 73989. Therefore, it would be appropriate to conduct vibration monitoring in SP 73989 during the period of construction.

11.2 Environmental, Construction and Site Management Plan (ECSMP)

Our review of the ECSMP [11] concludes that it provides no further information in respect of construction noise impacts than that in the Arup Report and therefore the criticisms contained in the previous section equally apply to that report. In respect of vibration impacts, it is noted that in Section 6.2.1 of the ECSMP, there is a requirement to undertake vibration monitoring "*if deemed appropriate and/or necessary by the Acoustic Consultant*" which we agree with, however, it is our recommendation that vibration monitoring should be required as a condition of consent.

11.3 Operational Event Noise Management Plan (OENMP)

As in the Arup Report, the OENMP omits reference to SP 73989 as a noise-sensitive receiver. SP 73989 will be the most affected receiver in respect of event noise.

In Section 6.1 of the OENMP, it states that it is currently proposed that the public domain will not include uses involving music in a concert format. The only scenarios considered in the noise impact

analysis are outdoor cinema and large gatherings without music. If this is in fact the case, then the development consent should impose this restriction as a condition.

In respect of noise from the cinema, it is reported in Section 6.4.2 of the OENMP that the sound level at the "*back of the cinema*" viewing area (presumably close to the northern façade of SP 73989) will be 88 LAeq,15min. However, this far exceeds the 60-65 LAeq,15min criterion proposed in Tables 1 and 2 of the OENMP for the hours up to 10:00pm and there will be a far greater exceedence up to midnight.

Even if the "*back of the cinema*" is separated by some further distance from the northern façade of SP 73989, the emitted noise level should be nevertheless quantified and the impacts addressed.

12 Conclusion

Renzo Tonin & Associates is engaged by the owners and tenants of No 13 Hickson Road, Dawes Point NSW 2000 (SP 73989) to provide a peer review of the Noise Impact Assessment, the Precinct Operational Event Noise Management Plan and the Precinct Environmental, Construction and Site Management Plan relating to noise and vibration impacts associated with the construction and operation of the proposed Walsh Bay Arts Precinct (**WBAP**). The occupants of No 13 Hickson Road abut the WBAP and represent the closest potentially affected noise-sensitive receivers.

The WBAP comprises demolition and rebuilding works in Pier 2/3 to accommodate arts uses, events. festivals and functions, a major upgrade of Wharf 4/5 for arts uses, new commercial offices with cafes, restaurants and retail shopping and the construction of a new north facing Waterfront Square over water between Pier 2/3 and Wharf 4/5 supported with new boardwalks for collaborative outdoor performances, events, festivals, markets and public art. If approved, the consent will permit the WBAP to hold events for up to 10,000 people.

The construction of the WBAP will involve use of piling rigs, large delivery and dump trucks, concrete trucks and concrete pumps with booms, front end loaders, cranes and excavators, welders, nailing guns, hand tools, grinders and similar equipment.

The NSW EPA provides guidelines in respect of mitigating noise and vibration from construction activities. However, the noise impact assessment prepared for WBAP neglects to include SP 73989 as a noise-sensitive receiver. Furthermore, the noise impact assessment relies on measured existing ambient noise levels which are inadequate because they do not comply with EPA guidelines. As a consequence, the noise management levels and noise goals recommended in the report are deficient.

The noise impact assessment also fails to consider SP 73989 as a noise-sensitive receiver in evaluating event noise. As a consequence, the occupants of SP 73989 are not protected from adverse noise impacts when WBAP is operating.

We conclude that there are likely to be significant noise impacts for occupants of SP 73989 which have not been addressed. Therefore, the noise impact assessment fails to comply with clauses 7, 9 and 17 of the Secretary's environmental Assessment Requirements in terms of a) providing a "*high level of environmental amenity*", b) "*outlining measures to minimise and mitigate potential noise and vibration impacts within the precinct and to surrounding occupiers of land*", and c) providing an Environmental and Construction Management Plan to include "*noise and vibration impacts on and off site*". Furthermore, because the noise-sensitive receivers in SP 73989 are overlooked or ignored in the noise impact report, conditions A12, A13, B3, B16 and B12 in SSD 6069 are not complied with.

It is therefore concluded the noise impact assessment is faulty and non-compliant with both the Secretary's Environmental Assessment Requirements and the development consent SSD 6069.

References

1. Strata Plan SP73989, 13 Hickson Road, 21 Nov 2013
2. Walsh Bay Arts Precinct. Concept CP03 - Final, prepared by MBM, 10 June 2014 (**MBM Report**)
3. Noise & Vibration Report prepared by WSP, 24 June 2014 (**WSP Report**)
4. Secretary's Environmental Assessment Report SSD 6069. May 2015
5. Development Consent SSD 6069 issued by the Minister for Planning, 21 May 2015
6. Secretary's Environmental Assessment Requirements SSD 7689. Walsh Bay Arts Precinct - Stage 2,1 July 2016 (**SEARs**)
7. Wash Bay Arts Precinct. Events Management Plan 2016 v2.1 prepared by MI Associates, 10 Nov 2016 (**EMP**)
8. Wash Bay Arts Precinct. Operational Plan of Management 2016 v2.1 prepared by MI Associates, 10 Nov 2016 (**POM**)
9. Infrastructure NSW. Walsh Bay Arts Precinct. SSD 16_7689 SEARs - Noise Impact Assessment. Issue 3 prepared by Arup, 14 Nov 2016 (**Arup Report**)
10. Infrastructure NSW. Walsh Bay Arts Precinct. Operational Event Noise Management Plan. R04 prepared by Arup, 14 Nov 2016 (**OENMP**)
11. Walsh Bay Arts Precinct. Environmental, Construction and Site Management Plan. Revision C prepared by Cadence Australia, 14 Nov 2016 (**ECSMP**)
12. Walsh Bay Arts Precinct. Environmental Impact Statement. Main Report. Stage 2 State Significant Development Application (SSD 7689) prepared by Arup, 15 Nov 2016 (**EIS**)
13. SSD 7689 8126 - Walsh Bay Arts Precinct Stage 2 EIS. NSW EPA. 16 Dec 2016
14. Set of drawings SSDA Issue A-001 to A-402 prepared by Tonkin Zulaikha Greer Architects, 14 Nov 2016 (downloaded from DoP web portal)
15. NSW Industrial Noise Policy issued by the NSW Environment Protection Authority, Jan 2000 (**INP**)
16. NSW EPA Interim Construction Noise Guideline, 2009 (**ICNG**)
17. NSW DECC Assessing Vibration; a technical guideline, 2006.

APPENDIX A Glossary of terminology

The following is a brief description of the technical terms used to describe noise to assist in understanding the technical issues presented.

Adverse weather	Weather effects that enhance noise (that is, wind and temperature inversions) that occur at a site for a significant period of time (that is, wind occurring more than 30% of the time in any assessment period in any season and/or temperature inversions occurring more than 30% of the nights in winter).
Ambient noise	The all-encompassing noise associated within a given environment at a given time, usually composed of sound from all sources near and far.
Assessment period	The period in a day over which assessments are made.
Assessment point	A point at which noise measurements are taken or estimated. A point at which noise measurements are taken or estimated.
Background noise	Background noise is the term used to describe the underlying level of noise present in the ambient noise, measured in the absence of the noise under investigation, when extraneous noise is removed. It is described as the average of the minimum noise levels measured on a sound level meter and is measured statistically as the A-weighted noise level exceeded for ninety percent of a sample period. This is represented as the L90 noise level (see below).
Decibel [dB]	The units that sound is measured in. The following are examples of the decibel readings of every day sounds: 0dB The faintest sound we can hear 30dB A quiet library or in a quiet location in the country 45dB Typical office space. Ambience in the city at night 60dB CBD mall at lunch time 70dB The sound of a car passing on the street 80dB Loud music played at home 90dB The sound of a truck passing on the street 100dB The sound of a rock band 115dB Limit of sound permitted in industry 120dB Deafening
dB(A)	A-weighted decibels. The A- weighting noise filter simulates the response of the human ear at relatively low levels, where the ear is not as effective in hearing low frequency sounds as it is in hearing high frequency sounds. That is, low frequency sounds of the same dB level are not heard as loud as high frequency sounds. The sound level meter replicates the human response of the ear by using an electronic filter which is called the "A" filter. A sound level measured with this filter switched on is denoted as dB(A). Practically all noise is measured using the A filter.
dB(C)	C-weighted decibels. The C-weighting noise filter simulates the response of the human ear at relatively high levels, where the human ear is nearly equally effective at hearing from mid-low frequency (63Hz) to mid-high frequency (4kHz), but is less effective outside these frequencies.
Frequency	Frequency is synonymous to pitch. Sounds have a pitch which is peculiar to the nature of the sound generator. For example, the sound of a tiny bell has a high pitch and the sound of a bass drum has a low pitch. Frequency or pitch can be measured on a scale in units of Hertz or Hz.
Impulsive noise	Having a high peak of short duration or a sequence of such peaks. A sequence of impulses in rapid succession is termed repetitive impulsive noise.
Intermittent noise	The level suddenly drops to that of the background noise several times during the period of observation. The time during which the noise remains at levels different from that of the ambient is one second or more.
L_{Max}	The maximum sound pressure level measured over a given period.
L_{Min}	The minimum sound pressure level measured over a given period.

L_1	The sound pressure level that is exceeded for 1% of the time for which the given sound is measured.
L_{10}	The sound pressure level that is exceeded for 10% of the time for which the given sound is measured.
L_{90}	The level of noise exceeded for 90% of the time. The bottom 10% of the sample is the L90 noise level expressed in units of dB(A).
L_{eq}	The "equivalent noise level" is the summation of noise events and integrated over a selected period of time.
Reflection	Sound wave changed in direction of propagation due to a solid object obscuring its path.
SEL	Sound Exposure Level (SEL) is the constant sound level which, if maintained for a period of 1 second would have the same acoustic energy as the measured noise event. SEL noise measurements are useful as they can be converted to obtain Leq sound levels over any period of time and can be used for predicting noise at various locations.
Sound	A fluctuation of air pressure which is propagated as a wave through air.
Sound absorption	The ability of a material to absorb sound energy through its conversion into thermal energy.
Sound level meter	An instrument consisting of a microphone, amplifier and indicating device, having a declared performance and designed to measure sound pressure levels.
Sound pressure level	The level of noise, usually expressed in decibels, as measured by a standard sound level meter with a microphone.
Sound power level	Ten times the logarithm to the base 10 of the ratio of the sound power of the source to the reference sound power.
Tonal noise	Containing a prominent frequency and characterised by a definite pitch.

APPENDIX B Strata Plan SP 73989

STRATA PLAN FORM 2

WA G: CREASING OR FOLDING WILL LEAD TO ECTION

LOCATION PLAN

SP73989

NOTE 1 THESE PARTS OF THE SUBJECT LAND EXIST AT LEVEL 2 AND ABOVE ONLY & ARE LIMITED IN DEPTH BY LOT 23 IN DP 1071597.

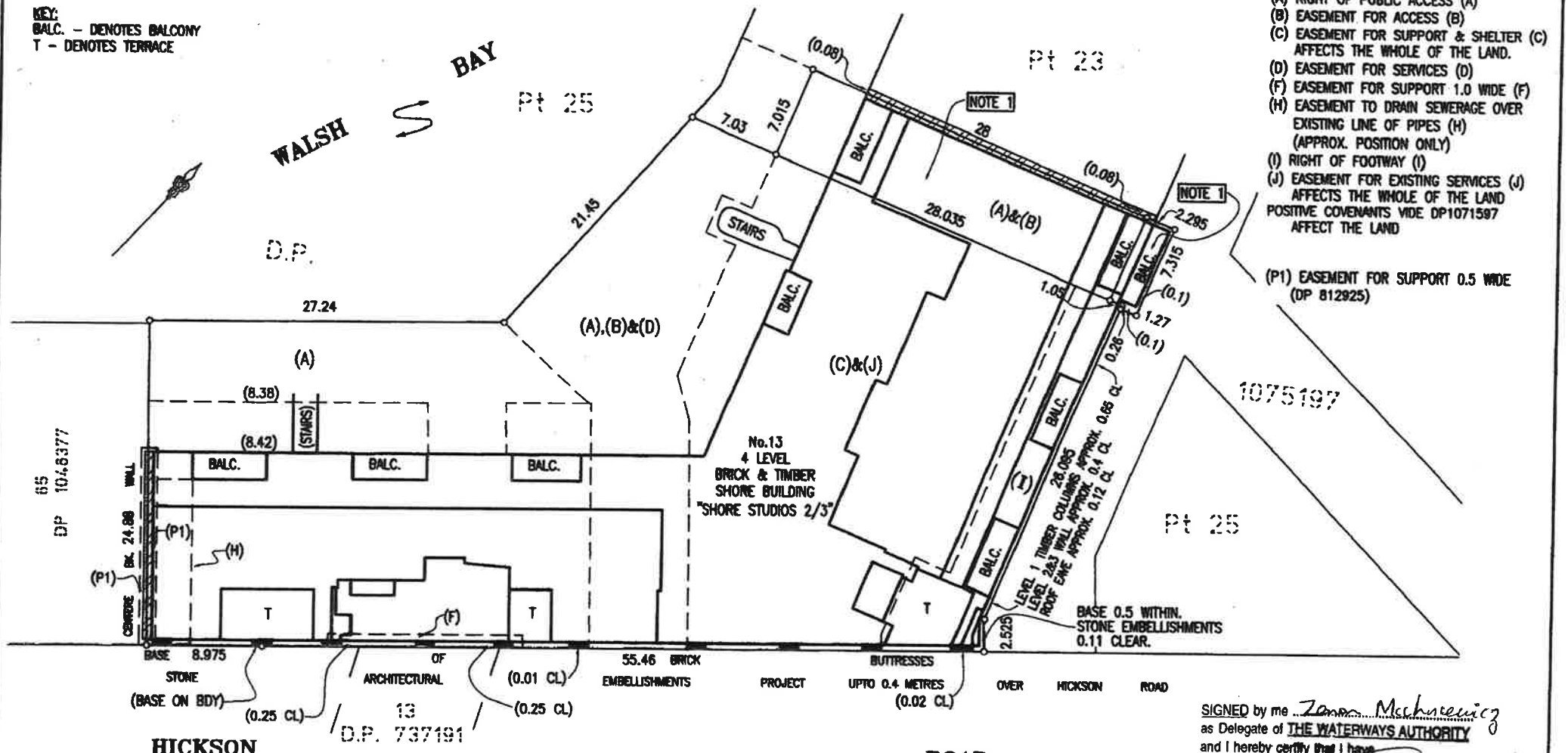
THE SUBJECT LAND, LOT 24 IN DP 1071597, IS A STRATUM PARCEL, PARTLY LIMITED IN HEIGHT & DEPTH AS SHOWN IN DP 1071597.

KEY:
BALC. – DENOTES BALCONY
T – DENOTES TERRACE

EXISTING EASEMENTS VIDE DP 1071597
(SEE DP 1071597 FOR FULL DETAILS).

(A) RIGHT OF PUBLIC ACCESS (A)
(B) EASEMENT FOR ACCESS (B)
(C) EASEMENT FOR SUPPORT & SHELTER (C) AFFECTS THE WHOLE OF THE LAND.
(D) EASEMENT FOR SERVICES (D)
(F) EASEMENT FOR SUPPORT 1.0 WIDE (F)
(H) EASEMENT TO DRAIN SEWERAGE OVER EXISTING LINE OF PIPES (H) (APPROX. POSITION ONLY)
(I) RIGHT OF FOOTWAY (I)
(J) EASEMENT FOR EXISTING SERVICES (J) AFFECTS THE WHOLE OF THE LAND
POSITIVE COVENANTS VIDE DP1071597 AFFECT THE LAND

(P1) EASEMENT FOR SUPPORT 0.5 WIDE (DP 812925)



SIGNED by me Zanna Machniewicz
as Delegate of THE WATERWAYS AUTHORITY
and I hereby certify that I have no notice as to revocation of such delegation

Reduction Ratio 1 : 300 (A3)

Lengths are in metres

Registered Surveyor

Authorised Person/General Manager/Accredited Certifier

SURVEYOR'S REFERENCE : 031210 SP

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LEVEL 1

SP73989

EXCLUSIVE USE AREA WITHIN COMMON PROPERTY

(a1) to (a3) – DENOTE EXCLUSIVE USE AREA LIMITED IN HEIGHT TO THE LEVEL OF THE UPPER SURFACE ADJOINING LEVEL 2 FLOOR.
(b) – DENOTES EXCLUSIVE USE AREA LIMITED IN HEIGHT TO THE LEVEL OF THE UPPER SURFACE OF THE ADJOINING LEVEL 2 FLOOR, EXCEPT FOR THAT PART BELOW THE COMMON PROPERTY STAIRS.
(c) – DENOTES EXCLUSIVE USE AREA
(f) – DENOTES EXCLUSIVE USE AREA
(j) – DENOTES EXCLUSIVE USE AREA LIMITED IN STRATUM TO BETWEEN 1.45 METRES BELOW THE UNDERSIDE OF THE LEVEL 2 TIMBER FLOOR BOARDS ABOVE & THE UPPER SURFACE OF THE CONCRETE CEILING SLAB OF THE SPRINKLER/HYDRANT PUMP ROOM BELOW.
(k) – DENOTES EXCLUSIVE USE AREA LIMITED IN STRATUM TO BETWEEN THE UNDERSIDE OF THE LEVEL 2 TIMBER FLOOR BOARDS & THE UPPER SURFACE OF THE CONCRETE CEILING SLAB OF THE SWITCH ROOM BELOW.

SPECIAL PRIVILAGE ZONES WITHIN COMMON PROPERTY

(g) – DENOTES SPECIAL PRIVILAGE ZONES WITHIN THE CEILING ZONE. THE CEILING ZONE IS THE COMMON PROPERTY BETWEEN THE UPPER STRATUM OF LOTS 19,21 & 22 AND THE UNDERSIDE OF LEVEL 2 TIMBER FLOOR BOARDS ABOVE.
(h) – DENOTES SPECIAL PRIVILAGE ZONES BELOW THE UPPER SURFACE OF THE LEVEL 1 FLOOR.
(i) – DENOTES SPECIAL PRIVILAGE ZONES BELOW THE UNDERSIDE OF THE LEVEL 1 FLOOR.
(ℓ1) to (ℓ3) – DENOTES SPECIAL PRIVILAGE ZONES WITHIN THE CEILING ZONE.

STRATUM NOTES.

THE STRATUM OF LOT 21 IS LIMITED TO 1.55 METRES BELOW THE UNDERSIDE OF THE LEVEL 2 TIMBER FLOOR BOARDS ABOVE.

THE STRATUM OF LOT 19 IS LIMITED TO 1.7 METRES BELOW THE UNDERSIDE OF THE LEVEL 2 TIMBER FLOOR BOARDS ABOVE.

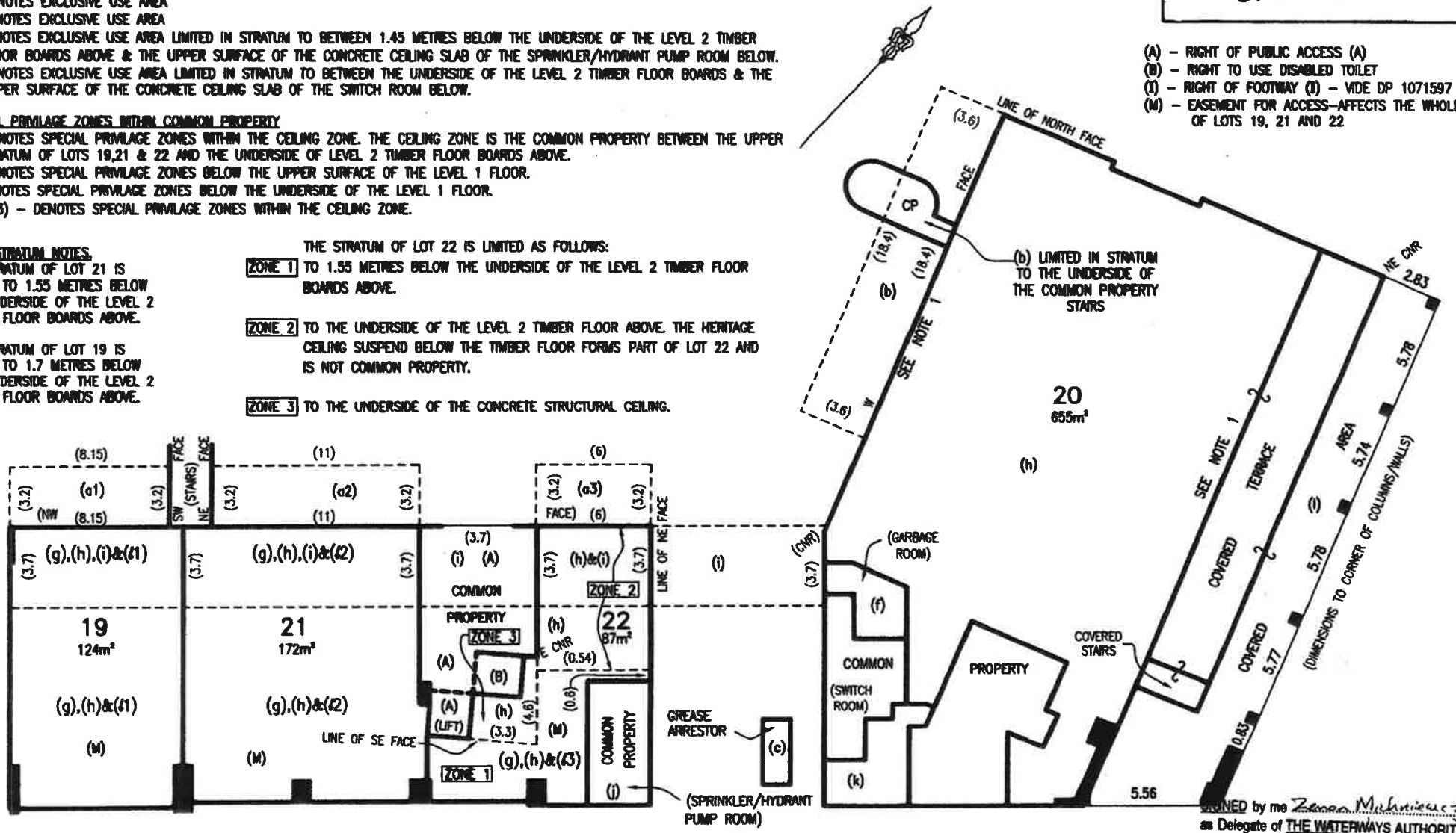
THE STRATUM OF LOT 22 IS LIMITED AS FOLLOWS:

ZONE 1 TO 1.55 METRES BELOW THE UNDERSIDE OF THE LEVEL 2 TIMBER FLOOR BOARDS ABOVE.

ZONE 2 TO THE UNDERSIDE OF THE LEVEL 2 TIMBER FLOOR ABOVE. THE HERITAGE CEILING SUSPEND BELOW THE TIMBER FLOOR FORMS PART OF LOT 22 AND IS NOT COMMON PROPERTY.

ZONE 3 TO THE UNDERSIDE OF THE CONCRETE STRUCTURAL CEILING.

(A) – RIGHT OF PUBLIC ACCESS (A)
(B) – RIGHT TO USE DISABLED TOILET
(I) – RIGHT OF FOOTWAY (I) – VIDE DP 1071597
(M) – EASEMENT FOR ACCESS–AFFECTS THE WHOLE OF LOTS 19, 21 AND 22



AREAS SHOWN ON THE FLOOR PLAN HAVE BEEN CALCULATED FOR THE PURPOSE OF THE STRATA SCHEMES (LEASEHOLD DEVELOPMENT) ACT 1986 ONLY. THEY MAY DIFFER FROM MEASUREMENTS OF THE FLOOR AREAS FOR OTHER PURPOSES.

FOR CLARITY NOT ALL COMMON PROPERTY STRUCTURES ARE SHOWN.

NOTE 1:
THE EASTERN & WESTERN BOUNDARY OF PART LOT 20 IS TO THE INTERIOR FACE OF THE HERITAGE WALLS. THE HERITAGE CARGO DOORS & THE GLASS DOORS FORM PART OF THE LOT & ARE NOT COMMON PROPERTY.

SIGNED by me Zenon Michniewicz as Delegate of THE WATERWAYS AUTHORITY and I hereby certify that I have no notice as to revocation of such delegation

Reduction Ratio 1 : 200 (A3) Lengths are in metres

Registered Surveyor

Authorised Person/Chartered Manager/Accredited Certifier

SURVEYOR'S REFERENCE : 031210 SP

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SP73989

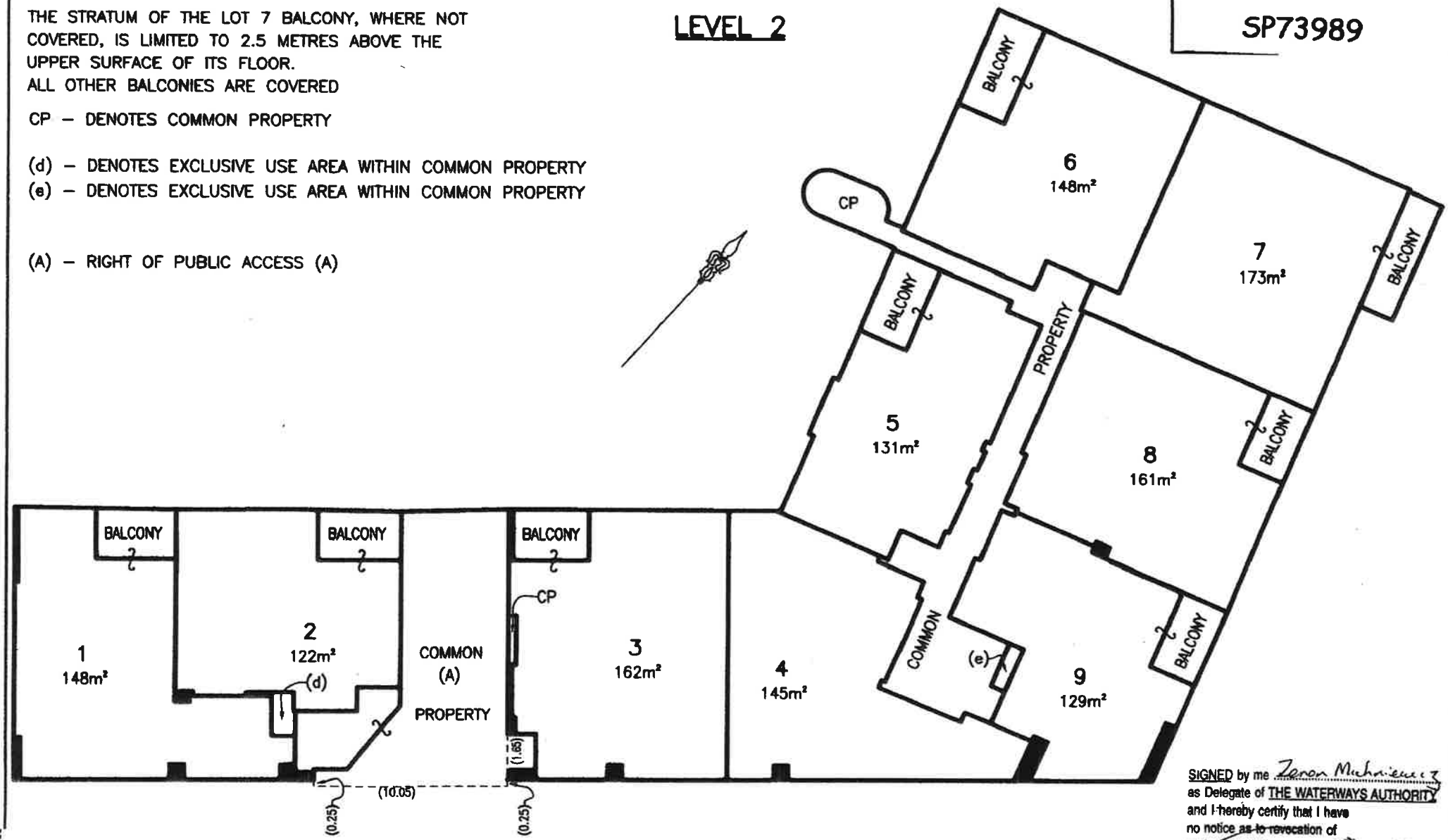
LEVEL 2

THE STRATUM OF THE LOT 7 BALCONY, WHERE NOT COVERED, IS LIMITED TO 2.5 METRES ABOVE THE UPPER SURFACE OF ITS FLOOR.
ALL OTHER BALCONIES ARE COVERED

CP – DENOTES COMMON PROPERTY

(d) – DENOTES EXCLUSIVE USE AREA WITHIN COMMON PROPERTY
(e) – DENOTES EXCLUSIVE USE AREA WITHIN COMMON PROPERTY

(A) – RIGHT OF PUBLIC ACCESS (A)



AREAS SHOWN ON THE FLOOR PLAN HAVE BEEN CALCULATED FOR THE PURPOSE OF THE STRATA SCHEMES (LEASEHOLD DEVELOPMENT) ACT 1986 ONLY. THEY MAY DIFFER FROM MEASUREMENTS OF THE FLOOR AREAS FOR OTHER PURPOSES.

FOR CLARITY NOT ALL COMMON PROPERTY STRUCTURES ARE SHOWN.

SIGNED by me Zaron Michniewicz
as Delegate of THE WATERWAYS AUTHORITY
and I hereby certify that I have
no notice as to revocation of
such delegation

Reduction Ratio 1 : 200 (A3)

Lengths are in metres

Registered Surveyor

Authorised Person/General Manager/Accredited Certifier

SURVEYOR'S REFERENCE : 031210 SP

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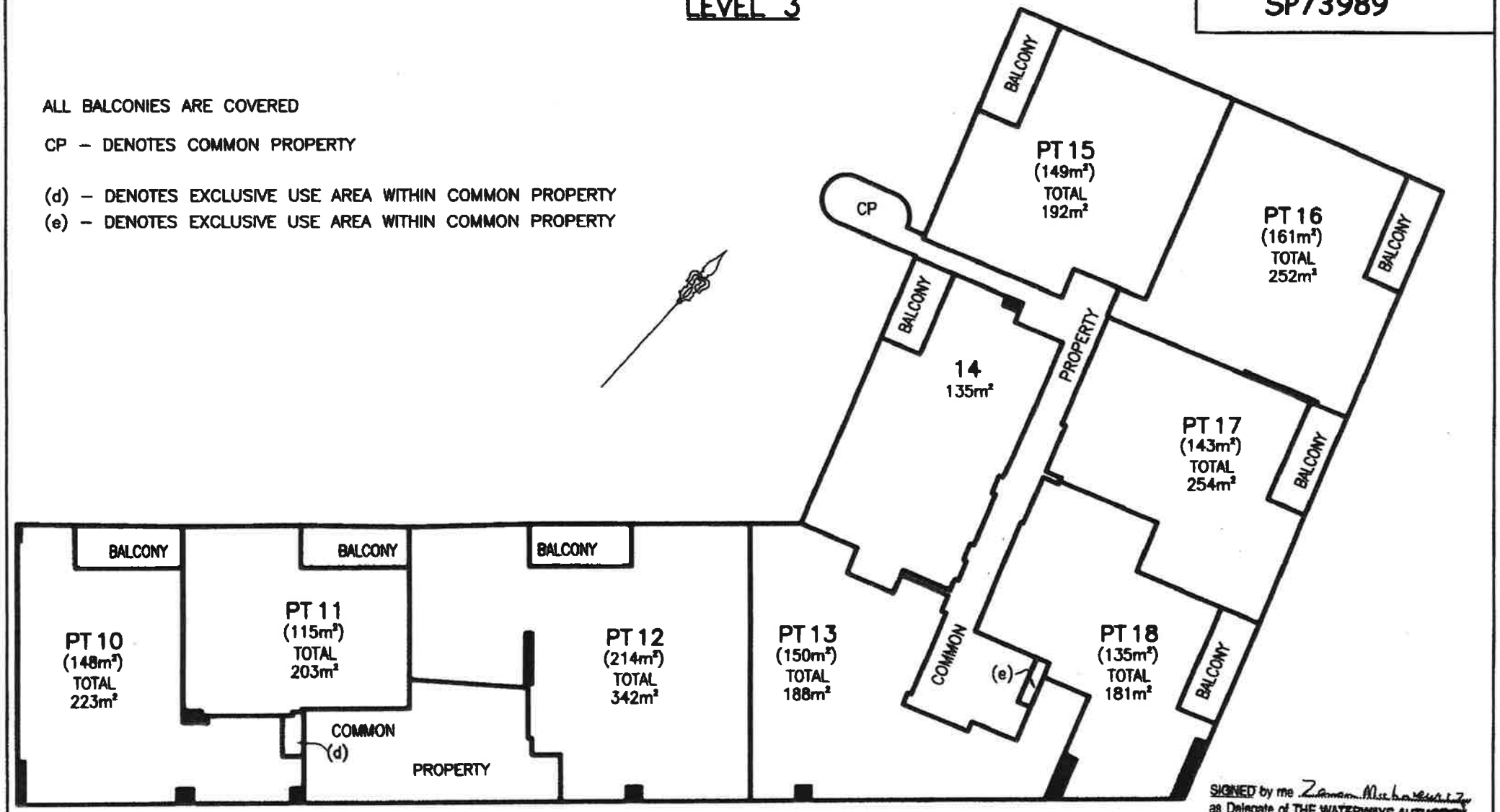
SP73989

LEVEL 3

ALL BALCONIES ARE COVERED

CP – DENOTES COMMON PROPERTY

(d) – DENOTES EXCLUSIVE USE AREA WITHIN COMMON PROPERTY
(e) – DENOTES EXCLUSIVE USE AREA WITHIN COMMON PROPERTY



AREAS SHOWN ON THE FLOOR PLAN HAVE BEEN CALCULATED FOR THE PURPOSE OF THE STRATA SCHEMES (LEASEHOLD DEVELOPMENT) ACT 1986 ONLY. THEY MAY DIFFER FROM MEASUREMENTS OF THE FLOOR AREAS FOR OTHER PURPOSES.

FOR CLARITY NOT ALL COMMON PROPERTY STRUCTURES ARE SHOWN.

SIGNED by me [illegible] as Delegate of THE WATERWAYS AUTHORITY and I hereby certify that I have no notice as to revocation of such delegation

Reduction Ratio 1 : 200 (A3) Lengths are in metres

Registered Surveyor

Authorised Person/General Manager/Accredited Certifier

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SURVEYOR'S REFERENCE : 031210 SP

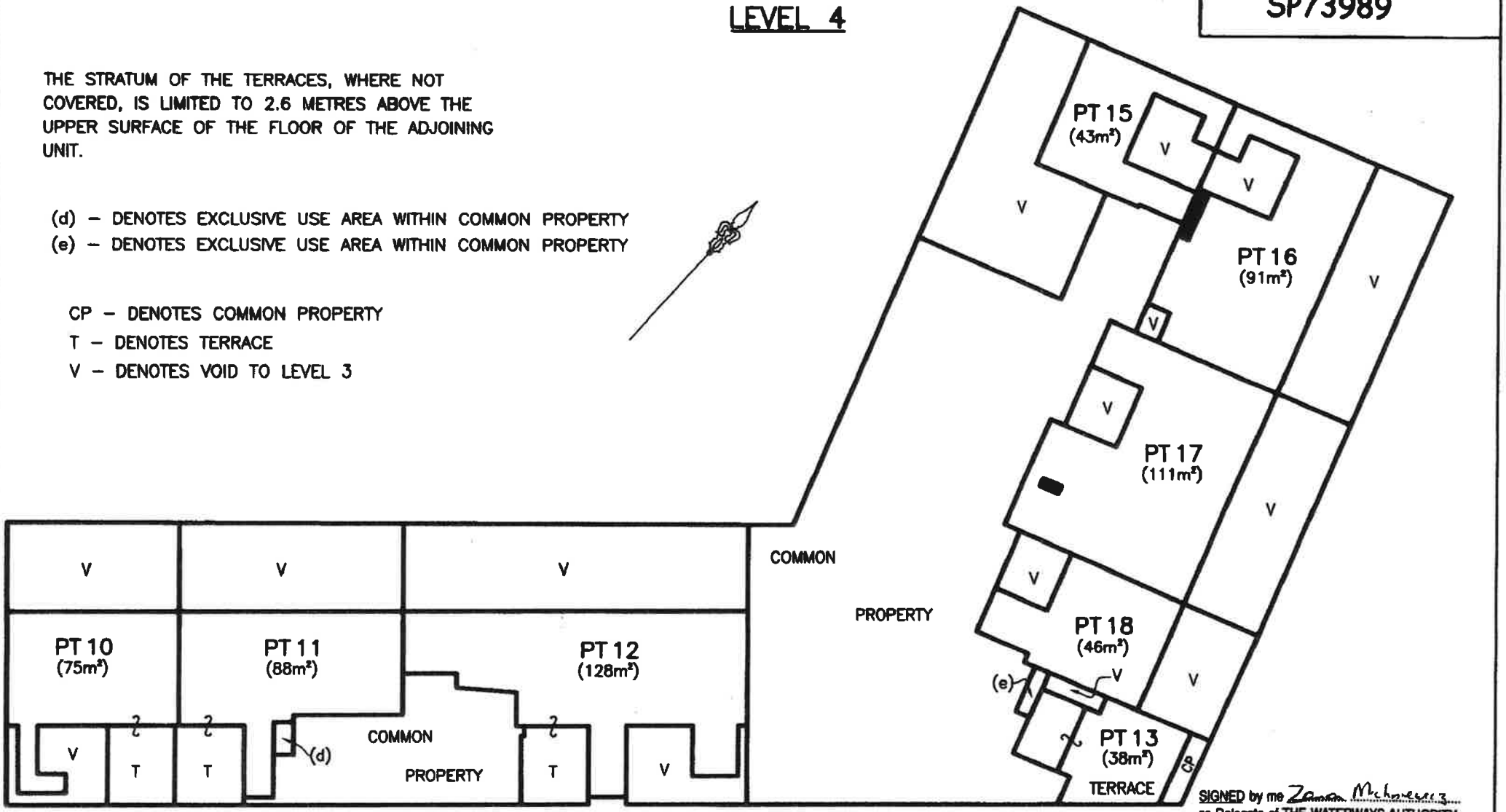
SP73989

LEVEL 4

THE STRATUM OF THE TERRACES, WHERE NOT COVERED, IS LIMITED TO 2.6 METRES ABOVE THE UPPER SURFACE OF THE FLOOR OF THE ADJOINING UNIT.

(d) – DENOTES EXCLUSIVE USE AREA WITHIN COMMON PROPERTY
(e) – DENOTES EXCLUSIVE USE AREA WITHIN COMMON PROPERTY

CP – DENOTES COMMON PROPERTY
T – DENOTES TERRACE
V – DENOTES VOID TO LEVEL 3



SIGNED by me Zoran Michaelis
as Delegate of THE WATERWAYS AUTHORITY
and I hereby certify that I have
no notice as to revocation of
such delegation

AREAS SHOWN ON THE FLOOR PLAN HAVE BEEN CALCULATED FOR THE PURPOSE OF THE STRATA SCHEMES (LEASEHOLD DEVELOPMENT) ACT 1986 ONLY. THEY MAY DIFFER FROM MEASUREMENTS OF THE FLOOR AREAS FOR OTHER PURPOSES.

FOR CLARITY NOT ALL COMMON PROPERTY STRUCTURES ARE SHOWN.

Reduction Ratio 1 : 200 (A3) Lengths are in metres

Registered Surveyor

Authorised Person/General Manager/Accredited Certifier

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SURVEYOR'S REFERENCE : 031210 SP