



Proposed Inclined Chair Lift & Pool Pump  
Noise Emission Assessment  
271 Whale Beach Road, Whale Beach, NSW



Client:  
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Ltd

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## GLOSSARY

### NOISE

Noise is produced through rapid variations in air pressure at audible frequencies (20 Hz – 20 kHz). Most noise sources vary with time. The measurement of a variable noise source requires the ability to describe the sound over a particular duration of time. A series of industry standard statistical descriptors have been developed to describe variable noise, as outlined in Section 2 below.

### NOISE DESCRIPTORS

**dB** – Decibels. The fundamental unit of sound, a Bell is defined as the logarithm of the ratio of the sound pressure squared over the reference pressure squared. A Decibel is one-tenth of a Bell. Probably the most common usage of the Decibel in reference to sound loudness is dB sound pressure level (SPL), referenced to the nominal threshold of human hearing. For sound in air and other gases, dB (SPL) is relative to 20 micropascals ( $\mu\text{Pa}$ ) =  $2 \times 10^{-5}$  Pa, the quietest sound a human can hear.

**L<sub>Aeq</sub>** – The A-weighted sound pressure level averaged over the measurement period. It can be considered as the equivalent continuous steady-state sound pressure level, which would have the same total acoustic energy as the real fluctuating noise over the same time period. Measured in dB.

**L<sub>Amax</sub>** – The maximum or peak A-weighted noise level that occurs over the measurement period. Measured in dB.

**Indoor Design Level** – The recommended maximum level in dB(A) inside a building from external noise sources.

### A-WEIGHTING

"A-weighting" refers to a prescribed amplitude versus frequency curve used to "weight" noise measurements in order to represent the frequency response of the human ear. Simply, the human ear is less sensitive to noise at some frequencies and more sensitive to noise at other frequencies. The A-weighting is a method to present a measurement or calculation result with a number representing how humans subjectively hear different frequencies at different levels.

### NOISE CHARACTER, NOISE LEVEL AND ANNOYANCE

The perception of a given sound to be deemed annoying or acceptable is greatly influenced by the character of the sound and how it contrasts with the character of the background noise. A noise source may be measured to have only a marginal difference to the background noise level, but may be perceived as annoying due to the character of the noise.

Acoustic Dynamics' analysis of noise considers both the noise level and sound character in the assessment of annoyance and impact on amenity.

## 1 INTRODUCTION

### 1.1 SUMMARY

Acoustic Dynamics is engaged by **DMC Building Group Pty Ltd** to assess the noise emission resulting from the operation of the proposed inclined chair lift and pool pump unit, located at 271 Whale Beach Road, Whale Beach NSW.

This document provides an assessment of mechanical noise emission to the nearest residential receivers resulting from the proposed mechanical equipment. This assessment is prepared in accordance with the various acoustic assessment requirements of Northern Beaches Council, the NSW Environment Protection Authority (EPA) and relevant Australian Standards, and provides an assessment of noise emission at nearby receiver locations.

### 1.2 DESCRIPTION OF MECHANICAL EQUIPMENT

The subject development is proposed to contain two items of mechanical plant, being an inclined chair lift and a pool pump. The nearest residential boundary to the inclined chair lift will be 269 Whale Beach Rd to the west, whilst the nearest residential boundary to the pool pump will be 273 Whale Beach Road to the east.

Acoustic Dynamics understands that the proposed inclined chair lift is to operate between the following hours:

- 8:00am and 6:00pm Monday to Sunday.

Acoustic Dynamics understands that the proposed pool pump is to operate between the following hours:

- 8:00am and 6:00pm Monday to Sunday.

The subject site, the location of the subject mechanical equipment and the nearest residential receiver locations are shown in the Location Map, Aerial Photo and Drawings presented within **Appendix A**.

### 1.3 SCOPE

Acoustic Dynamics has been engaged to provide an external mechanical noise emission assessment suitable for submission to the Northern Beaches Council.

The scope of the assessment is to include the following:

- Review of legislation, Council criteria and Australian Standards relevant to the external and mechanical noise emission at the development;

- Conduct operator-attended noise measurements to establish background noise levels at the subject site; and
- Assessment of noise emission from the proposed mechanical equipment at the site.

## 2 ASSESSMENT CRITERIA AND STANDARDS

Acoustic Dynamics has conducted a review of the local council, state government and federal legislation that is applicable to noise assessment for the subject mechanical equipment. The relevant sections of the legislation are presented below. The most stringent criteria which have been used in the assessment of the proposed development are summarised below.

### 2.1 NORTHERN BEACHES COUNCIL CRITERIA

#### 2.1.1 DEVELOPMENT APPLICATION DA2019/0534

Acoustic Dynamics has reviewed the consent conditions for the subject Development Application DA2019/0534. Reference to mechanical noise emission is reproduced below.

*“2) Under Pittwater 21 DCP, Section C1.19: Incline Passenger Lifts and Stairways an acoustic assessment (prepared by an acoustic engineer) must be submitted demonstrating the noise level from the incline passenger lift will not exceeds 5D(b)A above the background noise when measured from the nearest property boundary, The proposal is to demonstrate by analysis of noise date, the incline passenger lifts and associated stairways will cause minimal visual and acoustic disturbance to environment and neighbours. Such information must be included in the Statement of Environmental Effects.”*

#### 2.1.2 LOCAL ENVIRONMENT PLAN

Acoustic Dynamics understands that the new “Northern Beaches Council” area of Sydney is temporarily being maintained under the LEP conditions of the previous Council areas, being Pittwater Council. Acoustic Dynamics’ review of the *Pittwater Council LEP 2014* did not yield specific acoustic criteria or information relating to noise emission.

#### 2.1.3 DEVELOPMENT CONTROL PLANS

Acoustic Dynamics understands that the new “Northern Beaches Council” area of Sydney is temporarily being maintained under the DCP conditions of the previous Council areas, being Pittwater Council.

A review of the *Pittwater Council Development Control Plan (DCP) 2014* was conducted. Reference to noise emission from inclined passenger lifts is reproduced below:

### **“C1.6 Acoustic Privacy**

#### **Controls**

*...Noise generating plants including pool/spa motors, air conditioning units and the like shall not produce levels that exceed 5dBA above the background noise when measured from the nearest property boundary.”*

...

### **C1.19 Incline Passenger Lifts and Stairways**

#### **Controls**

*...The noise level shall not exceed 60dB(A), when measured one metre from any adjoining premises.*

...

#### **Technical Reports and Supporting Information**

*An acoustic assessment prepared by an acoustic engineer demonstrating that the noise level from the incline passenger lift will not exceeds 5D(b)A above background noise when measured from the nearest property boundary”*

## **2.2 NSW EPA’S ENVIRONMENTAL NOISE CRITERIA**

### **2.2.1 ENVIRONMENTAL PROTECTION (NOISE) POLICY 2008**

The EPA, in its Noise Policy for Industry (NPfI) document published in October 2017, outlines and establishes noise criteria for industrial or other noise sources in various zoning areas.

To establish the acoustic environment at the subject site in accordance with the guidelines of the NSW EPA’s NPfI, operator attended noise measurements were conducted at a location representative of the nearest sensitive residential receivers at 2:30pm on Wednesday 14 August 2019. Acoustic Dynamics advises the selected measurement location is likely to be representative of the existing noise environment at the worst-case time and residential receiver location.

Acoustic Dynamics advises that the assessment of the proposed mechanical equipment has been based on the **lowest** background noise levels in the area. Acoustic Dynamics advises that such an assessment is conservative and will ensure no loss of amenity to the nearby residential receivers.

Acoustic Dynamics advise that the following criteria have been applied for the assessment of the noise emission associated with the operation of the proposed mechanical equipment.

### **Project Intrusiveness Noise Level**

The intrusiveness noise level is determined as follows:

**$L_{Aeq, 15min} = \text{rating background noise level} + 5 \text{ dB}$**

where:

$L_{Aeq, 15min}$  represents the equivalent continuous (energy average) A-weighted sound pressure level of the source over 15 minutes.

and

**Rating background noise level** represents the background level to be used for assessment purposes, as determined by the method outlined in Fact Sheets A and B.

### **Project Amenity Noise Level**

The recommended amenity noise levels represent the objective for **total** industrial noise at a receiver location, whereas the **project amenity noise level** represents the objective for a noise from a **single** industrial development at a receiver location.

To ensure that industrial noise levels (existing plus new) remain within the recommended amenity noise levels for an area, a project amenity noise level applies for each new source of industrial noise as follows:

**Project amenity noise level for industrial developments = recommended amenity noise level (Table 2.2) minus 5 dB(A)**

The following exception to the above method to derive the project amenity noise level apply:

4. Where cumulative industrial noise is not a necessary consideration because no other industries are present in the area, or likely to be introduced into the area in the future. In such cases the relevant amenity noise level is assigned as the project amenity noise level for the development.

Following the general procedures outlined in the EPA’s NPfI, a summary of the established noise environment, and relevant environmental noise criteria is presented in **Table 2.1**.

**Table 2.1 External Measured Noise Levels & Most Stringent Criteria**

Location	Time of Day	L <sub>A90</sub> Rating Background Noise Level (RBL) [dB]	Measured L <sub>Aeq</sub> [dB]	Project Intrusive Noise Level [dB]	Project Amenity Noise Level L <sub>Aeq</sub> [dB]	Project Noise Trigger Level L <sub>Aeq</sub> [dB]
Nearest residential receiver(s)	Day time (7am to 6pm)	53	56	58	58 <sup>1</sup>	58

Note: 1) Amenity adjustment based on day-time “Suburban” receiver type. The noise emission objective has been modified in accordance with the recommendations detailed within the NPfl Section 2.2, for time period standardising of the intrusiveness and amenity noise levels (L<sub>Aeq,15min</sub> will be taken to be equal to the L<sub>Aeq,period</sub> + 3 decibels (dB)).

### 2.3 RELEVANT AUSTRALIAN STANDARDS

#### 2.3.1 AS 2107:2016 – “ACOUSTICS – RECOMMENDED DESIGN SOUND LEVELS ...FOR BUILDINGS”

Australian Standard 2107:2016 recommends satisfactory and maximum design sound levels for various types of occupancy within buildings. AS 2107:2016 recommends the following satisfactory and maximum design sound levels for the relevant types of occupancies and areas which are likely to be located adjacent to the premises:

**Table 2.4 – Recommended Design Sound Levels for Different Areas of Occupancy in Buildings (Extract from Australian Standard 2107:2016 Table 1)**

Type of Occupancy / Activity	Recommended Design Sound Level, L <sub>Aeq</sub> dB (A) range
7 RESIDENTIAL BUILDINGS	
Houses and apartments in suburban areas or near minor roads-	
Living areas	30 to 40
Work areas	35 to 40

Acoustic Dynamics advises that any levels of airborne noise or regenerated noise transmitted into the nearby residential receivers should not exceed the relevant maximum design sound levels presented within **Table 2.4** above. By ensuring the noise levels from the premises received within the adjacent tenancies do not exceed the above recommended maximum internal design level, it is likely to ensure occupants of the adjacent tenancies are not adversely affected by the use and operation of the proposed mechanical equipment.

### 3 MEASUREMENT STANDARDS AND PROCEDURES

All measurements were conducted in general accordance with Australian Standard 1055.1 1997, “Acoustics - Description and Measurement of Environmental Noise Part 1: General Procedures”. Acoustic Dynamics’ sound measurements were carried out using precision sound level meters conforming to the requirements of IEC 61672-2002 "Electroacoustics: Sound Level Meters – Part 1: Specifications". The survey instrumentation used during the survey is set out in **Table 3.1**.

**Table 3.1 Noise Survey Instrumentation**

Type	Serial Number	Instrument Description
2270	2664115	Brüel & Kjaer Modular Precision Sound Level Meter
4189	2670479	Brüel & Kjaer 12.5 mm Prepolarised Condenser Microphone
4231	1730737	Brüel & Kjaer Acoustic Calibrator

The reference sound pressure level was checked prior to and after the measurements using the acoustic calibrator and remained within acceptable limits.

## 4 ASSESSMENT

The following subsections provide an assessment of the proposed inclined chair lift and pool pump against the various noise emission criteria and objectives outlined in **Section 2** above.

### 4.1 OPERATIONAL NOISE EMISSION TO RECEIVERS

Based on previous experience and the drawings and information provided by the proponent, Acoustic Dynamics has conservatively undertaken modelling and calculations to predict the likely **maximum**  $L_{Aeq,15min}$  noise emission levels at the nearest receiver locations during the **quietest** background noise level period (day time), resulting from the following assumed noise sources and activities:

- ❑ Acoustic Dynamics understands that the development will have an Astral Viron P320XT pool pump installed, with a reported sound power level (SWL) of 63 dB(A);
- ❑ Acoustic Dynamics understands that the development will have an inclined chair lift installed, with a determined sound power level (SWL) of 79 dB(A); and
- ❑ A conservative assumption of a maximum of 3 uses/cycles of the inclined chair lift within any 15-minute assessment period;

The calculated maximum noise emission levels at the nearest residential receiver locations and the relevant noise emission criteria are presented in **Table 4.2** below. It is advised that by achieving compliance at the nearest residential receiver locations, compliance will also be achieved at all other receiver locations further away.

**Table 4.2 Maximum External Noise Emission Levels & Relevant Criteria – Nearest Receivers**

Receiver Location	Assessment Description & Period	Noise Source	Maximum $L_{Aeq(15min)}$ Noise Emission Level [dB]	Overall $L_{Aeq(15min)}$ Noise Emission Level [dB]	Project Trigger Level $L_{Aeq(15min)}$ [dB]	Complies
269 Whale Beach Rd (to the west)	Daytime	Inclined Chair Lift	61	61	58	<b>No</b>
		Pool Pump	31			
273 Whale Beach Rd (to the east)	Daytime	Inclined Chair Lift	33	61	58	<b>No</b>
		Pool Pump	61			

Acoustic Dynamics advises that the above calculated noise emission levels are conservatively based on the maximum source noise levels and maximum capacity operations (i.e. worst-case scenario). Acoustic Dynamics advises that such a scenario is unlikely to occur for the majority of the time.

#### 4.2 RECOMMENDED ACOUSTIC MITIGATION

Acoustic Dynamics' calculations and analysis indicate that acoustic mitigation is required to ensure the noise emission from the proposed inclined chair lift and proposed pool pump achieve compliance with the relevant criteria.

Acoustic Dynamics provides the following recommendations that should be incorporated to ensure noise emission is adequately managed and minimised during operation of the mechanical equipment:

- 1) Lining the inside surfaces of the inclined chair lift's undercarriage with a suitable absorptive acoustic foam. The acoustic foam should have an absorption coefficient of at least 0.7 at 250Hz and preferably not be foil faced unless necessary. The inclined chair lift is required to have a sound power of  $L_{Aeq}$  76 dB following installation of the acoustic foam;
- 2) Fitting a cover to the pool pump system as detailed in **Section 4.3** below; and
- 3) Ensuring mechanical equipment is regularly maintained and serviced to maintain low mechanical noise emission levels.

Acoustic Dynamics advises that following incorporation of the above recommendations that noise emission associated from the use and operation of the proposed inclined chair lift and pool pump **will achieve compliance** with the relevant noise emission criteria and not adversely impact nearby receivers.

### 4.3 POOL PUMP

Acoustic treatment of the pool pump appropriate for this context is an enclosure surrounding the pool pump system, with the following characteristics:

- The subject enclosure should be of a solid construction with material density of **minimum 15kg/m<sup>2</sup>**, which could be achieved with 2x layers of Colourbond, 1x layer of 12mm Ceminsal FC sheeting or 2x layers of 12mm marine-grade plywood;
- All edges should be tightly-fitting and sealed with a flexible mastic sealant;
- The subject enclosure should be internally lined with suitable acoustic absorptive material, of a minimum performance coefficient of **0.7 at 250Hz**, such as those provided by Pyrotek and Megasorber;
- The maintenance hatch should be of the same solid construction, and should have a backing frame with rubber seals along all edges (see detail B.1 in **Appendix B**);
- The openings for ventilation should be weatherproof louvre-type vents (see detail B.1 in **Appendix B**) which are not directed towards the nearest neighbouring property; and
- The enclosure should have baffles installed behind the vents which are lined with acoustic absorption material (see detail B.2 in **Appendix B**).

**NB:** Should a proprietary pool equipment enclosure/box be preferred, Acoustic Dynamics recommends consultation with a suitable supplier/manufacturer, such as “The Acoustic Box”.

**The pool pump system should be equipped with an electrical timer which ensures that it does not operate between the hours of 6:00pm and 8:00am.**

## 5 CONCLUSION

Acoustic Dynamics has determined the mechanical noise emission associated with the use and operation of the proposed inclined chair lift and pool pump located at 271 Whale Beach Road, Whale Beach NSW.

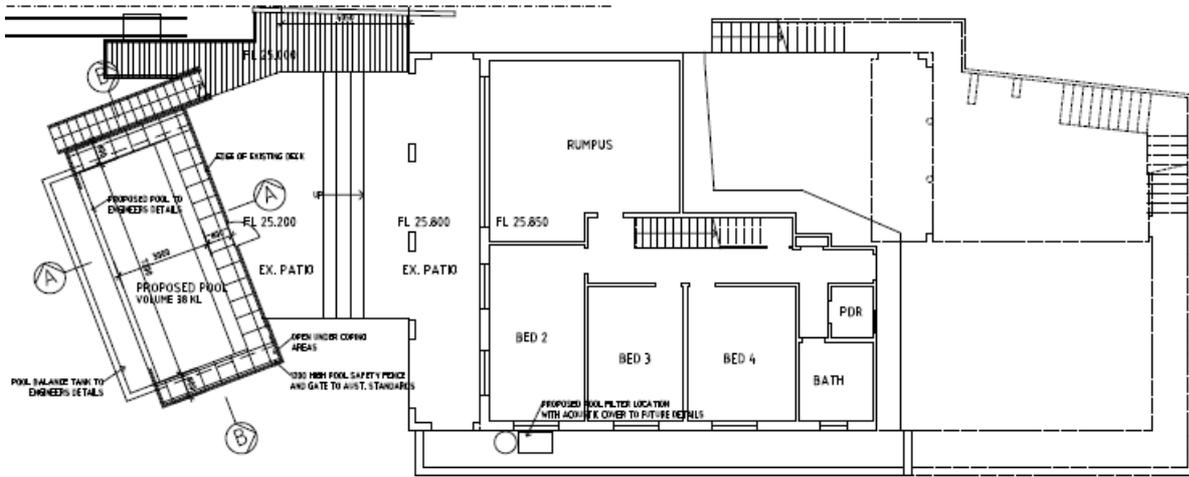
### *Acoustic Opinion*

**Further to the noise measurements conducted, our review of the relevant acoustic criteria and requirements and our calculations, Acoustic Dynamics advises that the predicted noise emission associated with the use and operation of the proposed inclined chair lift and proposed pool pump will comply with the relevant noise emission criteria of Northern Beaches Council, NSW EPA and relevant Australian Standards subsequent to the incorporation of the recommendations outlined within Section 4.**

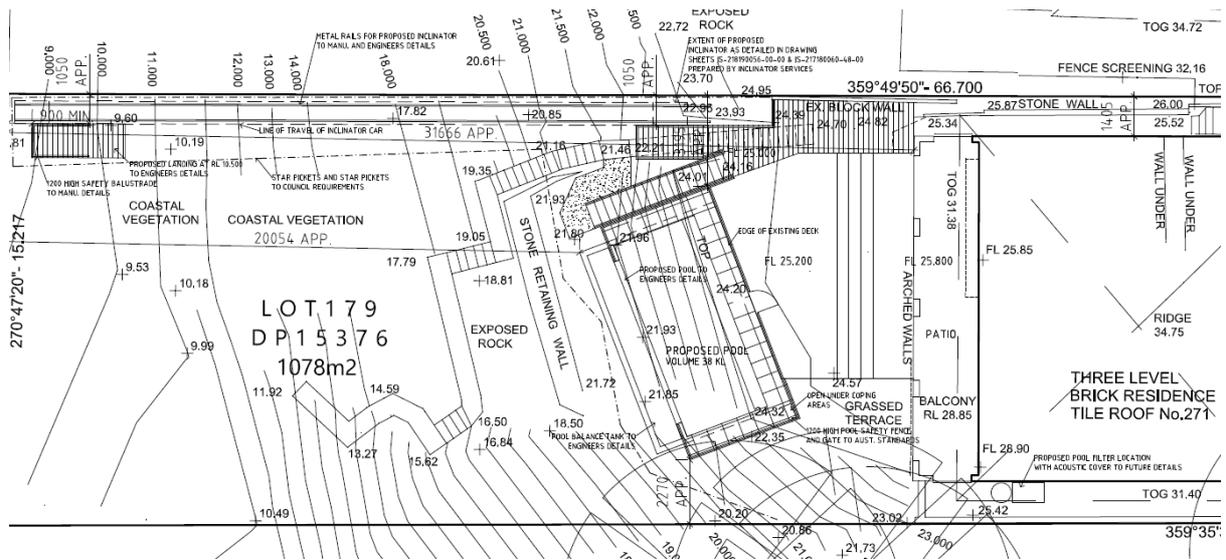
We trust that the above information meets with your requirements and expectations. Please do not hesitate to contact us on 02 9908 1270 should you require more information.

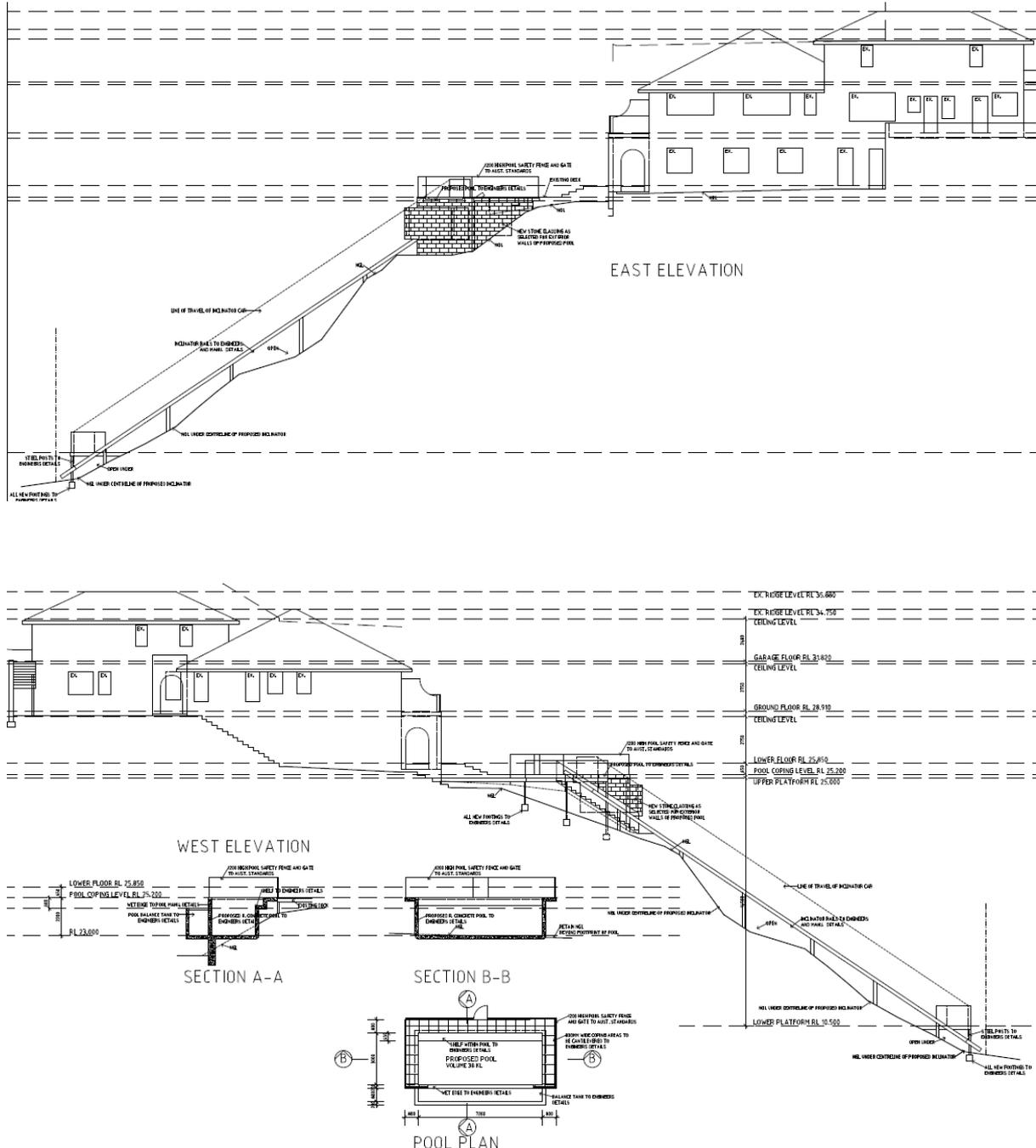


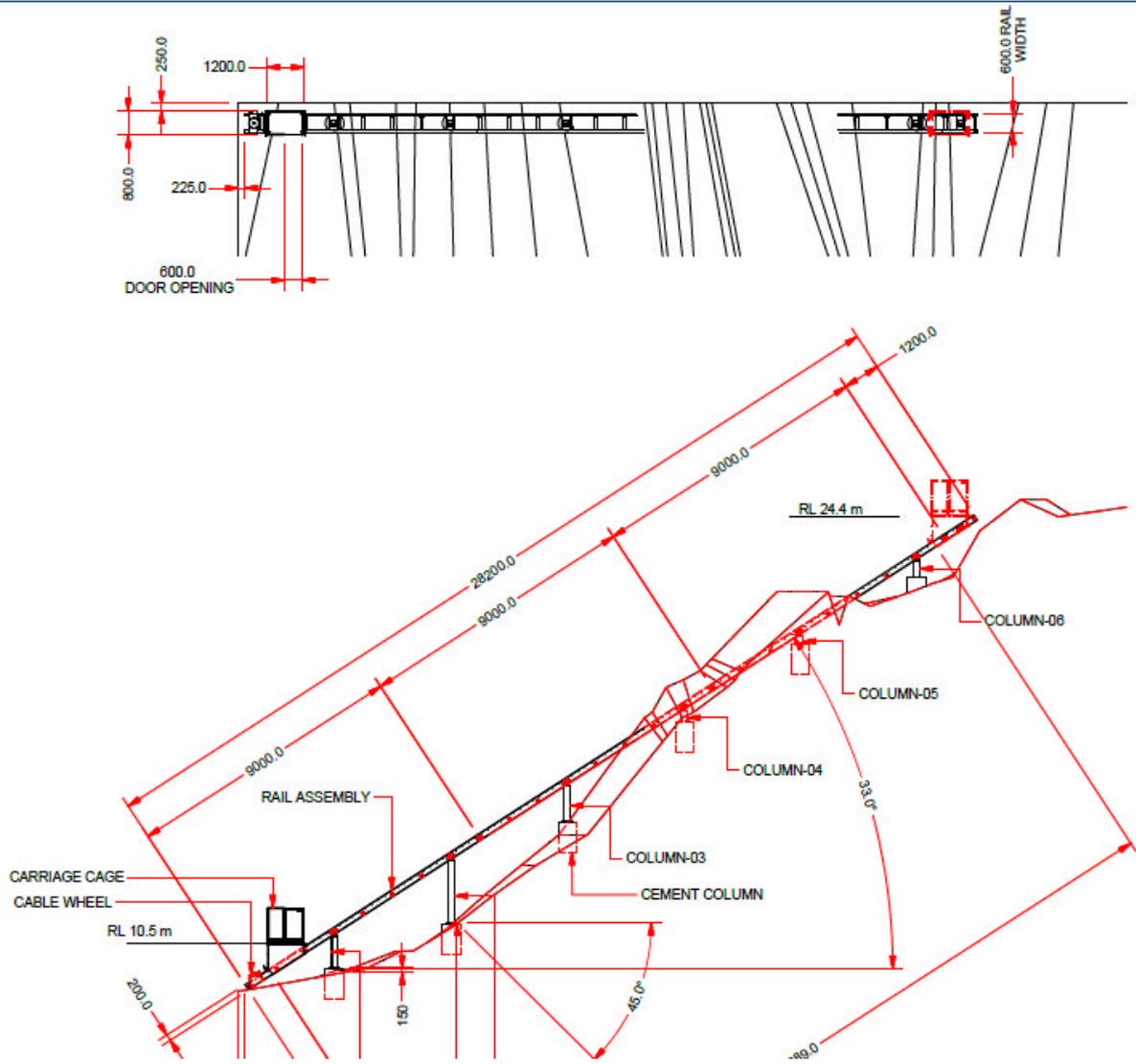
## A.3 DRAWINGS



LOWER FLOOR PLAN







## APPENDIX B – DETAIL OF ACOUSTIC ENCLOSURE FOR POOL PUMP

### B.1 EXAMPLES OF LOUVRE-TYPE VENT AND TIMBER BACKING FRAME



Figure B.1.1 Example of Louvre-Type Vent



Figure B.1.2 Example of Timber Backing-Frame with Rubber Seals

### B.2 DETAIL OF ENCLOSURE Baffles AND ACOUSTIC LINING

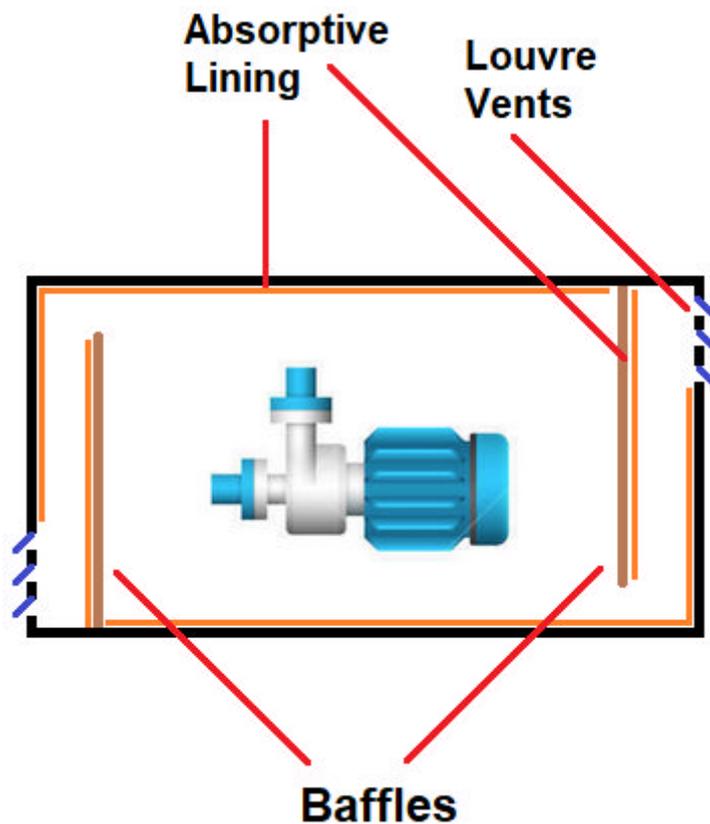


Figure B.2.1 Detail of Enclosure Illustrating Baffles, Acoustic Lining and Louvre Vents (Not to Scale)