ADP
Consulting : Engineering

28 Yarrunga Street, Prestons

Noise Impact Assessment

Prepared for: Favelle Favco c/o Bureau SRH

Project No: SYD0923
Date: 17 June 2020
Revision: [04]

Creating great environments with great people

Project:	28 Yarrunga Street, Prestons
Location:	28 Yarrunga Street Prestons, NSW, 2107
Prepared by:	ADP Consulting Pty Ltd Level 3, 8 Spring Street Sydney NSW 2000
Project No:	SYD0923
Revision:	[04]
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Rev	Date	Comment	Author	Signature	Technical Review	Signature	Authorisa-tion & QA	Signature
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03	6/12/19	Council issue	JW		TC		MM	
04	17/6/20	Respond to Council RFI	TC		JM		MM	

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1. Introduction

1.1 Document purpose

ADP Consulting Pty Ltd has been retained by Favelle Favco c/o Bureau SRH to undertake acoustics engineering services for the proposed distribution centre to be located at 28 Yarrunga Street, Prestons.

This report is prepared to provide acoustic design advice and addresses the impact on nearby sensitive receivers from the operation of the proposed development, including:

- noise emission from vehicular movements, including:
  - associated with the dropping off and picking up of goods and materials
  - internal movement of vehicles such as forklifts
- noise emission from associated plant and equipment

The design criteria and acoustic treatment concepts in this report demonstrate the pathways by which these shall be addressed by ADP Consulting and the project team through further analysis, recommendations and coordination as the design progresses.

It is the responsibility of the relevant contractor to ensure the implementation of the acoustic design intent of this document; including compliance with criteria, codes, standards, specifications etc.

1.2 Referenced drawings, codes and standards

The followings drawings, guidelines, standards, conditions, regulatory requirements and other project-specific information has been referenced in preparing this report:

- Bureau SRH's Design Development architectural drawings (ref: Design Development, dated 21 November 2019) (Architectural Drawings)
- Ason Group's Traffic Impact Assessment (Ref: P1004r01v03, dated 5 November 2019 (Traffic Impact Assessment)
- AS 1055.2:1997 Acoustics – Description and Measurement of Environmental Noise Part 2: Application to Specific Situations (AS 1055.2)
- AS 2670.2:1990 Evaluation of Human Exposure to Whole-Body Vibration Part 2: Continuous and Shock-Induced Vibration in Buildings (1 to 80 Hz) (AS 2670.2)
- AS/NZS 1668.1:2015 The Use of Ventilation and Air Conditioning in Buildings Part 1: Fire and Smoke Control in Buildings (AS/NZS 1668.1)
- AS/NZS 2107:2016 Acoustics – Recommended Design Sound Levels and Reverberation Times for Building Interiors (AS/NZS 2107)
- Assessing Vibration: A Technical Guideline – NSW Department of Environment and Conservation, dated February 2006 (AVTG)
- BS 6472–1992 – Evaluation of Human Exposure to Whole-Body Vibration in Buildings (1 to 80 Hz) (BS 6472)
- NSW EPA's Noise Policy for Industry, dated October 2017 (NPfI)

1.3 Project summary

The 28 Yarrunga Street development comprises construction of a new distribution centre in two stages. The Architectural Drawings show that the two stages will consist of the following, with the proposed development ultimately consisting of the combination of both stages:

- Stage 1:
  - Ground Floor: Two separate warehouses with loading areas
  - Ground Mezzanine: Office spaces
  - Level 1: Two separate warehouses with loading areas and office spaces
  - Level 1 Mezzanine: Office spaces
  - Level 1 Mezzanine 2: Office space
- Stage 2:
  - Basement: Carparking spaces and services
  - Ground Floor: Two separate warehouses with loading areas
  - Ground Mezzanine: Office spaces
  - Level 1: Two separate warehouses with loading areas and office spaces
  - Level 1 Mezzanine: Office spaces

The delivery vehicles will generally comprise of semi-trailer delivery and distribution vehicles. For both stages, access to the development will be via Yarrunga St from the south-western corner on ground level, with the vehicles along the western edge of the development.

The trucks will then access either the ground level warehouses or the level 1 warehouses via the western up ramp. From Level 1, the trucks will be able to access the first level warehouses before returning to ground level via the eastern down ramp.

Once unloaded, the trucks will leave the proposed development from the south-eastern corner onto Yarrunga St.

A mark-up of this traffic flow has been included in Appendix B.

In total there are eight (8) loading bays, located at:

- Ground floor: four (4) loading bays located in the middle of the building (covered by Level 1)
- Level 1: four (4) loading bays located in the middle of the building (covered by the roof)

At the time of writing, vehicle movement volumes are yet to be determined.

2. Site investigations and noise measurements

2.1 Site investigations

Based on our site survey and investigations we have identified the following sensitive receivers as being the nearest noise sensitive premises to the proposed development:

- Industrial premises located directly to the north, east and west of the proposed development, including 1 Yarrunga St.
- Industrial premises located across Yarrunga St, approximately 30m south of the proposed development.
- Residential properties located approximately 240 metres northwest of the proposed development, including 56 Coffs Harbour Ave, Hoxton Park.
- Residential properties located approximately 450 metres south of the proposed development, including 25 Huskisson St, Prestons.
- The development itself that includes:
  - Services requiring noise attenuation and vibration isolation to ensure low indoor noise levels in occupied areas and compliance with noise emission regulations
  - An expected standard of amenity compliant with all applicable codes, regulatory requirements, client brief and other standards

Figure 1 provides a site map of the proposed development and its surrounds.

Figure 1 Site plan, prepared by Bureau SRH

2.2 Noise measurement equipment

The following instrumentation was used for noise measurements and analysis:

- Bruel and Kjaer 2250 Integrating Sound Level Meter (S/N: 3011318)
- Bruel and Kjaer type 1 microphone – comprising of:
  - ZC 0032 preamplifier (S/N: 25754)
  - 4189 capsule (S/N: 3087045)
- Bruel and Kjaer Sound Calibrator Type 4231 (S/N: 3018299)
- Infobyte iM4 Integrating-Averaging Sound Level Meter – noise logger (S/N: 101)

All instrument systems are laboratory calibrated using instrumentation traceable to Australian National Standards and certified within the last two years thus conforming to Australian Standards. The measurement system was also field calibrated prior to and after noise surveys. Calibration drift was found to be less than 0.2dB during measurements. No adjustments for instrument drift during the measurement period were warranted.

2.3 Attended noise measurements

Attended noise measurements were conducted on Wednesday 14 August 2019 at location A1, on Thursday 22 August 2019 at location A2, and Friday 23 August 2019 at location A3. These noise measurements were used to qualify and quantify the noise levels for the area.

Table 1 presents the noise levels of the attended measurements at the locations shown in Figure 1.

Table 1 Attended noise measurements, dB(A)

Location	Start Time	Location and Comments	L_{Aeq}	L_{A90}
Wednesday 14 August 2019				
A1	10:58am	**Behind 68 Coffs Harbour Ave** – 15m from fence. The character of noise comprised of: > Reverse beepers (both tonal and broadband), truck engines, gas brakes, forklifts revving, and dropping of materials from 1 Yarrunga St at approximately 60m away > Distant traffic noise from M7 Motorway, at approximately 850m away > Birds chirping > Propeller planes overhead	50	40
Thursday 22 August 2019				
A2	1:08pm	**28 Yarrunga Street** – 5m from Yarrunga Street. The character of noise comprised of: > Frequent heavy truck traffic along Yarrunga St > Local traffic > Excavator working at approximately 70m away, including reversing tonal beepers, which did not impact the L_{A90} measurement > Dropping of materials at various locations, including within a warehouse across Yarrunga St from the proposed site, at approximately 20m away > Propeller planes overhead	66	53
Friday 23 August 2019				
A3	2:04pm	**Behind 22 Bergalia Cl** – 3m from Kurrajong Rd. The character of noise comprised of: > Dominant traffic noise along Kurrajong Rd > Occasional buses and articulated trucks > Some car traffic > Propeller planes overhead	70	56

2.4 Unattended noise measurements

Unattended noise measurements were conducted at the following locations (shown in Figure 1):

- **Location L1:** between Wednesday 14 August 2019 and Thursday 22 August 2019
- **Location L2:** between Friday 23 August 2019 and Friday 30 August 2019

The long-term loggers were chosen to collect background noise in the area at locations L1 and L2 to set noise emission criteria for the development.

Background and equivalent continuous sound levels at location L1 are summarised in Table 2.

Table 2 Unattended noise measurements, dB(A)

Noise Measurement	**Daytime** (07:00-18:00)	**Evening** (18:00-22:00)	**Night-time** (22:00-07:00)
Location L1 (ZONE 1)			
Repeatable – L_{Aeq}	54	48	47
Rating Background Level (RBL) – L_{A90}	41	41	36
Location L2 (ZONE 2)			
Repeatable – L_{Aeq}	57	57	52
Rating Background Level (RBL) – L_{A90}	47	46	34

The Location L1 and Location L2 RBLs have been be used for the noise emission criteria for Zone 1 and Zone 2, respectively. These criteria have been presented in Section 3.1 of this report.

3. Noise emission criteria

3.1 Noise emission criteria - NPfI

Noise emission restrictions apply to future tenant activity and mechanical plant and equipment systems. These must be planned, designed and installed to include suitable sound attenuation, vibration isolation, and other necessary acoustic treatments.

The NPfI requires that trigger levels be calculated from the intrusiveness and amenity criteria. The NPfI also includes the application of modifying factors for undesirable noise characteristics, up to a maximum of 10dB.

3.1.1 Noise intrusiveness

The NPfI states that the intrusiveness of an industrial noise source may generally be considered acceptable if the equivalent continuous (energy-average) A-weighted level of noise from the source (represented by the L_{Aeq} descriptor), measured over a 15-minute period, does not exceed the background noise level measured in the absence of the source by more than 5dB.

Table 3 schedules the noise intrusion level criteria in accordance with the NPfI, calculated with the background noise levels presented in Section 2.3 and Section 2.4.

3.1.2 Noise amenity

The NPfI describes methodology to limit the increases in noise levels from the introduction of new noise sources in an area. The NPfI recommends that the maximum ambient noise should not exceed the levels in Table 2.2 of the NPfI.

Table 3 summarises the project amenity noise levels (as described in Table 2.2 of the NPfI).

3.1.3 Modifying factors

For noise emissions from the proposed development with undesirable characteristics such as; tonality, low frequency, impulsiveness and intermittency, adjustments (as per Fact Sheet C of the NPfI) need to be included. These modifying factors include a 5dB penalty for each undesirable characteristic. A maximum of 10dB penalty for 2 or more undesirable characteristics is to be applied.

It should be noted that during the D&C phase of the project, if the contractor makes selections of equipment which include one or more of these undesirable noise characteristics, a modifying factor will be applied.

3.1.4 Noise emission criteria (NPfI)

The project specific trigger levels have been derived using the methodology presented in the NPfI and are scheduled in Table 3 and Table 4. We note that these trigger levels have been derived from the background noise levels measured at Location L1 and Location L2.

Table 3 Noise emission criteria – Residential

Time of operation	Site specific noise limits				
	Intrusive, $L_{Aeq,15min}$	**Recommended amenity, $L_{Aeq, Period}$**	**Project amenity, $L_{Aeq, Period}$**	**Project amenity, $L_{Aeq, 15min}$**	**Project trigger levels, $L_{Aeq, 15min}$**
Zone 1					
Day (7am to 6pm)	46	60	55	58	**46**
Evening (6pm to 10pm)	46	50	45	48	**46**
Night (10pm to 7am)	41	45	40	43	**41**
Zone 2					
Day (7am to 6pm)	52	60	55	58	**52**
Evening (6pm to 10pm)	51	50	45	48	**48**
Night (10pm to 7am)	39	45	40	43	**39**

Table 4 Noise emission criteria – Industrial

Time of operation	Site specific noise limits			
	Recommended amenity, $L_{Aeq, Period}$	**Project amenity, $L_{Aeq, Period}$**	**Project amenity, $L_{Aeq, 15min}$**	**Project trigger levels, $L_{Aeq, 15min}$**
When in use	70	65	68	**68**

It should be noted that the cumulative noise emission from the operations of the proposed development are to meet the project trigger levels presented in Table 3 and Table 4. Careful planning and coordination with the project design team should be undertaken so that these criteria are complied with.

3.2 Transient noise events - Sleep disturbance

Night-time noises, which occur infrequently and for short durations of time, have a potential to cause sleep disturbances. Such noise sources may include delivery/distribution trucks and other warehouse activities.

Table 5 presents recommended sleep disturbance criteria based on the NPfI and the background noise measurements schedule in Section 2.4. Noise emission from such short duration noise events should be controlled to meet these criteria to reduce the risk of sleep disturbance to adjacent residences at night.

Table 5 Noise emission criteria – Transient noise events

Activity	**Noise descriptor**	**Internal noise criterion L_{Amax}, dB(A)**	
		Zone 1	**Zone 2**
Reverse beepers Loading / unloading of trucks Trucks travelling up access ramps	$L_{Aeq, 15min}$ L_{AFmax}	41 52	40 52

4. Operating noise environment

4.1 Operational noise levels

The proposed development site is bounded by Yarrunga Street to the south, and industrial receivers to the north, east and west.

The closest sensitive residential receivers are located approximately 240 metres to the west.

We understand that the following activities will contribute to the environmental noise emission for the operation (detailed description provided in Section 1.3) from the development:

- Mechanical plant and equipment noise levels
- Truck movements:
  - Along access road
  - Up and down access ramps
  - Within warehouse spaces and in loading dock areas
- Truck reverse beepers within warehouse spaces and loading dock areas
- Forklift movements within warehouse spaces
- Forklift reverse beepers within warehouse spaces
- Unloading and loading of goods

Based on noise measured on other similar projects, typical sound power levels for each noisy activity has been scheduled in Table 6.

Table 6 Operational activity sound power levels

Operational activity	**Sound Power Level, dB(A)**		**Typical duration in a single 15-minute period (L_{Aeq})**
	L_{Aeq}	**L_{Amax}**	
Mechanical plant and equipment	To be determined (will be controlled by careful selection and acoustic measures, such as silencers, barriers, etc.)		15 min
Truck travelling up ramp	108	110	20 seconds
Truck reversing beeper	101	107	10 to 30 seconds
Truck being unloaded	90	99	10 minutes
Forklift	93	96	15 min

4.2 Operational noise assessment

Based on the assumptions presented in Section 4.1 and the barrier recommendations in Section 5.2 of this report, we have calculated the noise emission levels at each residence for each assessment period and presented a summary in Table 7**Error! Reference source not found.**.

Our assessment factors in that the Favelle Favco warehouse will not be operational once Stage 2 is complete. As such, the removal of the Favelle Favco facility to make way for the Stage 2 development will not allow for a significant increase in permissible noise emission levels for the proposed site.

Table 7 Noise emission assessment

Sensitive receivers / Time of day	Noise levels, dB(A)		Compliance	
	L_{Aeq}	L_{Amax}	L_{Aeq}	L_{Amax}
56 Coffs Harbour Ave, Hoxton Park				
Day: 7am to 6pm	46	–	Y	–
Evening: 6pm to 10pm	46	–	Y	–
Night: 10pm to 7am	41	51	Y	Y
25 Huskisson St, Prestons				
Day: 7am to 6pm	43	–	Y	–
Evening: 6pm to 10pm	43	–	Y	–
Night: 10pm to 7am	37	45	Y	Y
1 Yarrunga St, Prestons				
When in use	62	–	Y	–

4.3 Impact of increased truck traffic flow on surrounding roads

It is understood that most of the delivery trucks will be travelling to the proposed site from the Westlink M7. The roads that connect the M7 to the proposed site are Bernera Rd and Yarrunga St, which are not adjacent to or near any residences.

The noise increase to residences of the increased truck traffic flow along the Westlink M7 road will be negligible (less than 1dB). This is based on the following Westlink M7 assumptions:

> 50,000 vehicles per day
> 5% being trucks (2,500 movements)
> Additional truck movements for 28 Yarrunga Street being 112

5. Recommendations

5.1 Mechanical plant and equipment – general recommendations

The mechanical contractor is to ensure compliance with the noise emission criteria presented in Section 3.

At time of writing, final plant and equipment selection and design is yet to be finalised. It is anticipated that provision has been included in the current scheme to incorporate standard acoustic treatment, such as silencers, barriers, acoustically lined ductwork, acoustic louvres, etc. to comply with the aforementioned criteria.

Generally, the following allowances should be made for in the design:

- Support points for major plant items should be structurally rigid. Mid span areas of floor slab should be avoided where practical. Ideally columns, thick structural slabs or very strong beams should be provided in such cases
- 200mm concrete slabs and precast/in-situ concrete walls surrounding plant rooms
- Vibration isolators for equipment rotating plant and machinery located in plant rooms with >90% isolation efficiency
- Plant complete with associated motor and drive assemblies should be mounted on rigid integral steel chassis or concrete inertia blocks
- All penetrations to plant rooms should be properly dimensioned, packed and sealed
- Main services ducts and pipes to have their own individual penetrations, with suitable spacing to allow good sealing
- Allowance for acoustic attenuation treatments e.g. internal lining to air inlets and discharges to meet external noise emission criteria
- For major equipment such as chillers and cooling towers, allow for local stiffening of the plant room floor
- Speed controllers, if used, should be of good quality and compatible with the motor model. Poor quality controllers can result in significant increase in motor noise, as much as 10dB(A), with an offensive characteristic such as high frequency tone
- Selection of low noise fans, allowance for smooth airflow conditions in ductwork, use of attenuators and lined duct work while minimising regenerated noise at bends, take-offs and transitions
- Selection of plant and acoustic measures such as lined ductwork, silencers and enclosures, that will ensure that noise emission levels presented in Section 3 are complied with

It is understood that rooftop plant items will accompany the proposed development and may require attenuation measures. Future comparison between the L_{eq} external noise levels at the nearby residential receivers and the NPfI noise limits presented in Section 3 will be required to ensure compliance.

5.2 Barrier fence

Due to the high noise levels of the trucks travelling up the access ramps to levels 1 and 2, we recommend that the barriers along the side of the ramps be built to the following specifications:

- 4.0m in height
- Gap free along its entire length and solid along its entire length (colourbond or similar)
- Lined with acoustically absorptive material. The acoustic absorption may comprise of either (minimum absorption at 125Hz of 0.5 and NRC 0.85):
  - 75mm thick glasswool (24-32kg/m^3) faced with perforated metal/sisalation
  - 100mm thick polyester (24-32kg/m^3) faced with perforated metal/sisalation

5.3 Operational recommendations

To ensure compliance with the NPfI limits presented in Section 3 and the noise levels of our assessment scheduled in Section 4.2, we recommend several operational restrictions. These restrictions have been scheduled in Table 8, both for during Stage 1 and upon completion of Stage 2.

Table 8 Operational restrictions for Stage 1 and Stage 2

Time of day	During Stage 1	Upon completion of Stage 2
Day (7am to 6pm)	> Up to fourteen (14) trucks entering and leaving in any one 15min period > Up to fifty (50) forklifts total to be operating within warehouses	> Up to fourteen (14) trucks entering and leaving in any one 15min period > Up to fifty (50) forklifts total to be operating within warehouses
Evening (6pm to 10pm)	> Up to fourteen (14) trucks entering and leaving in any one 15min period > Up to fifty (50) forklifts total to be operating within warehouses	> Up to fourteen (14) trucks entering and leaving in any one 15min period > Up to fifty (50) forklifts total to be operating within warehouses
Night (10pm to 7am)	> Up to six (6) trucks entering and leaving in any one 15min period > Up to forty (40) forklifts total to be operating within warehouses > Forklifts and trucks to use broadband reverse alarms > Truck motors to be turned off when in warehouse areas	> Up to six (6) trucks entering and leaving in any one 15min period > Up to forty (40) forklifts total to be operating within warehouses > Forklifts and trucks to use broadband reverse alarms > Truck motors to be turned off when in warehouse areas

6. Conclusion

Current regulations and standards associated with the development have been reviewed and assessed in accordance with existing site constraints. The construction standards have been provided to satisfy the local council and other relevant standards.

ADP Consulting believes there are no site conditions, statutory or other requirements that would preclude this development from complying with the criteria defined in this report.

The design criteria and acoustic treatment concepts in this report demonstrate the pathways by which these shall be addressed by ADP Consulting and the project team through further analysis, recommendations and coordination as the design progresses.

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Appendix A
Glossary of acoustic terms

Air-borne sound

The sound emitted directly from a source into the surrounding air, such as speech, television or music.

Ambient sound

Of an environment: the all-encompassing sound associated with that environment, being a composite of sounds from many sources, near and far. This is normally taken to be the L_{Aeq} value.

Background noise level

The average of the lowest levels of the noise levels measured in an affected area in the absence of noise from occupants and from unwanted external ambient noise sources. Usually the L_{A90} value represents the background noise level.

dB(A)

Unit of acoustic measurement weighted to approximate the sensitivity of human hearing to sound frequency.

Decibel scale

The decibel scale is logarithmic in order to produce a better representation of the response of the human ear. Therefore, a 3 dB increase in the sound pressure level corresponds to a doubling in the sound energy. It is generally accepted that a 10 dB increase in the sound pressure level corresponds to a perceived doubling in loudness.

Examples of decibel levels of common sounds are as follows:

- 0 dB(A) Threshold of human hearing
- 30 dB(A) A quiet country park
- 40 dB(A) Whisper in a library
- 50 dB(A) Open office space
- 70 dB(A) Inside a car on a freeway
- 80 dB(A) Outboard motor
- 90 dB(A) Heavy truck pass-by
- 100 dB(A) Jackhammer / Subway train
- 110 dB(A) Rock Concert
- 115 dB(A) Limit of sound permitted in industry
- 120 dB(A) 747 take off at 250 metres

Frequency

The repetition rate of the cycle measured in Hertz (Hz). The frequency corresponds to the pitch of the sound. A high frequency corresponds to a high-pitched sound and a low frequency to a low-pitched sound.

L_{90}, L_{10}, etc

A statistical measurement giving the sound pressure level which is exceeded for the given percentile of a measurement period (i.e. L_{90} is the level which is exceeded for 90 percent of a measurement period). L_{90} is commonly referred to as a basis for measuring the background sound level.

$L_{Aeq,T}$

The equivalent continuous A-weighted sound pressure level. The value of the A-weighted sound pressure level of a continuous steady sound that, within a measurement time interval T, has the same A-weighted sound energy as the actual time-varying sound.

L_{Amax}

The maximum sound pressure level measured over the measurement period.

L_{Amin}

The minimum sound pressure level measured over the measurement period.

Day

Referred to as the period between 7am and 6pm for Monday to Saturday and 8am to 6pm for Sundays and Public Holidays.

Evening

Referred to as the period between 6pm and 10pm for Monday to Sunday and Public Holidays.

Night

Referred to as the period between 10pm and 7am for Monday to Saturday and 10pm to 8am for Sundays and Public Holidays.

Assessment background level (ABL)

The overall background noise level on each day, evening and night periods for each day of the noise monitoring.

Rating background level (RBL)

The overall background level on each day, evening and night periods for the entire length of noise monitoring.

Reverberation

The persistence, after emission by the source has stopped, of a sound field in an enclosure.

Sound isolation

A reference to the degree of acoustical separation between two spaces. Sound isolation may refer to sound transmission loss of a partition or to noise reduction from any unwanted noise source. The term 'sound isolation' does not specify any grade or performance quality and requires the units to be specified for any contractual condition.

Sound pressure level, L_p, dB of a sound

A measurement obtained directly obtained using a microphone and sound level meter. Sound pressure level varies with distance from a source and with changes to the measuring environment. Sound pressure level equals 20 times the logarithm to the base 10 of the ratio of the R.M.S. sound pressure to the reference sound pressure of 20 micro Pascals.

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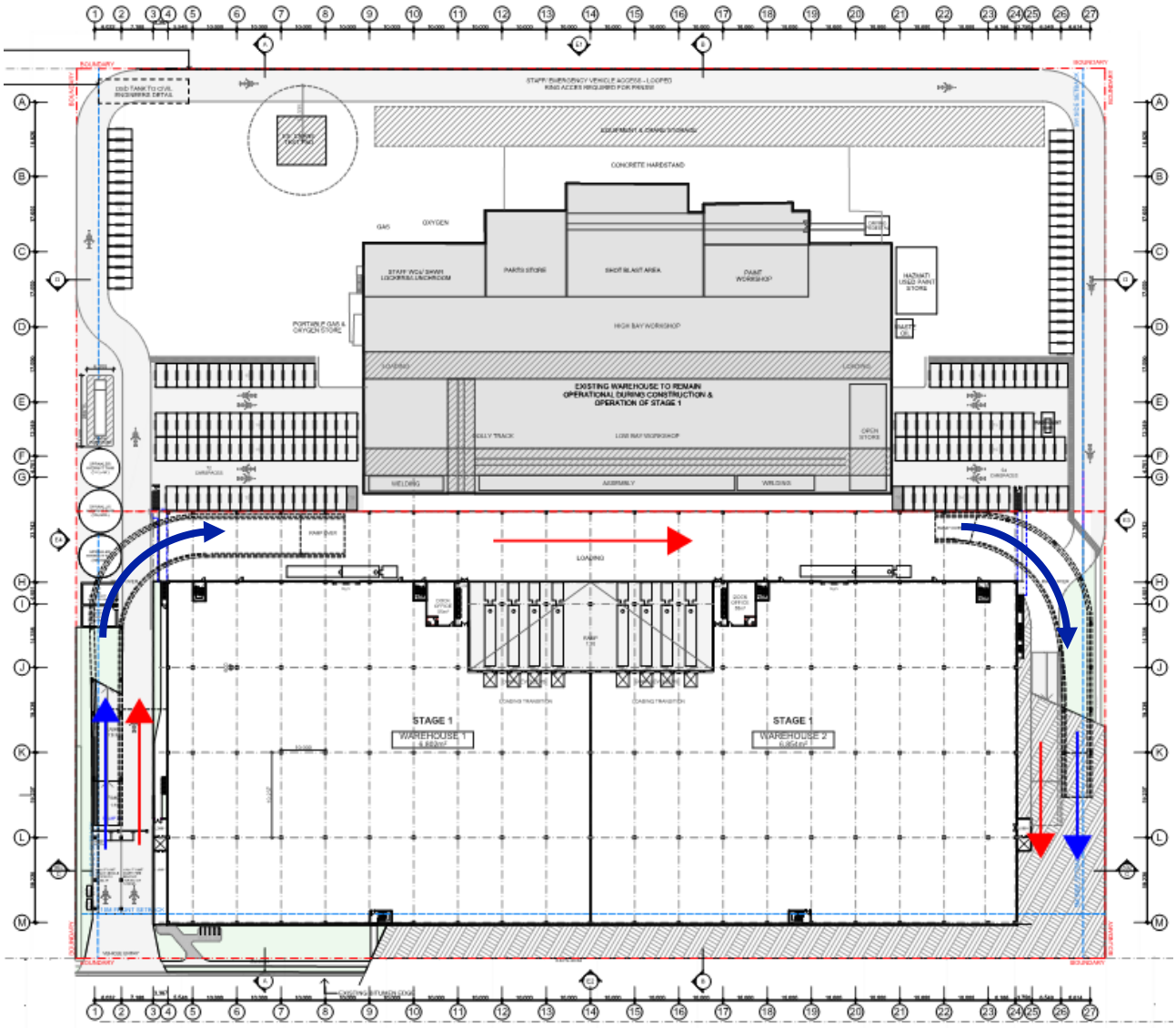
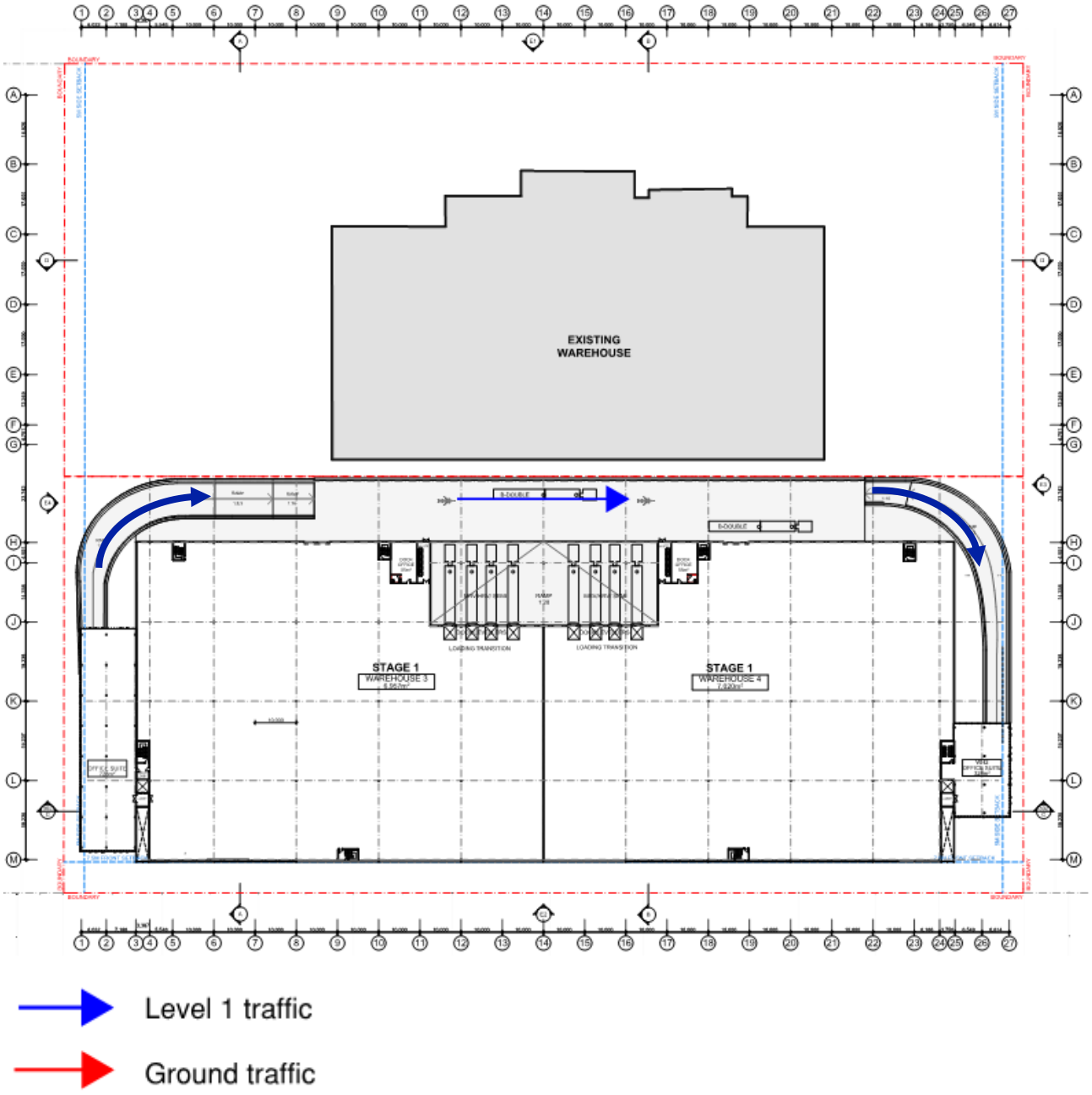
Appendix B
Traffic flow mark-up

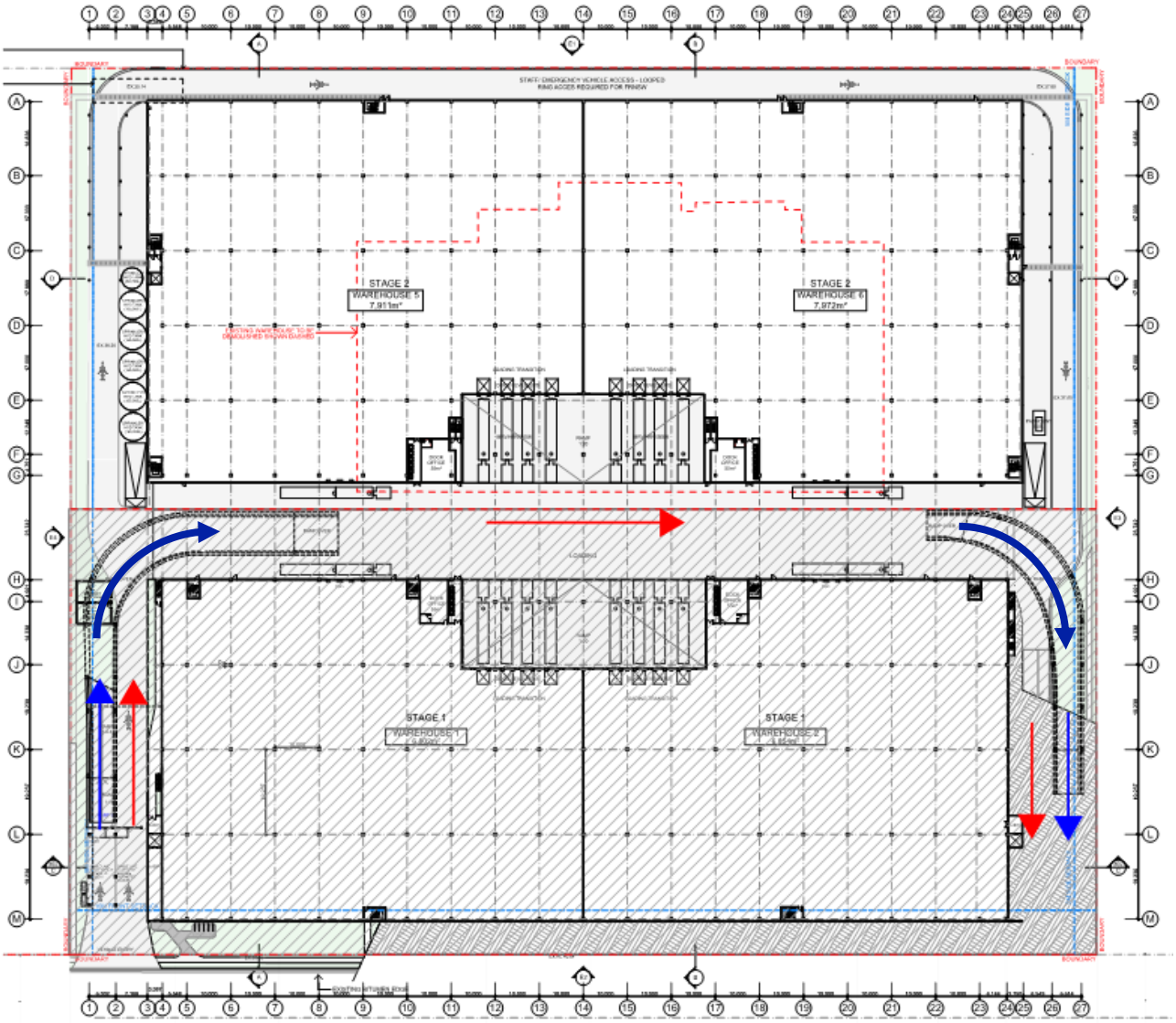
Stage 1: Ground floor plan



Stage 1: Level 1 floor plan



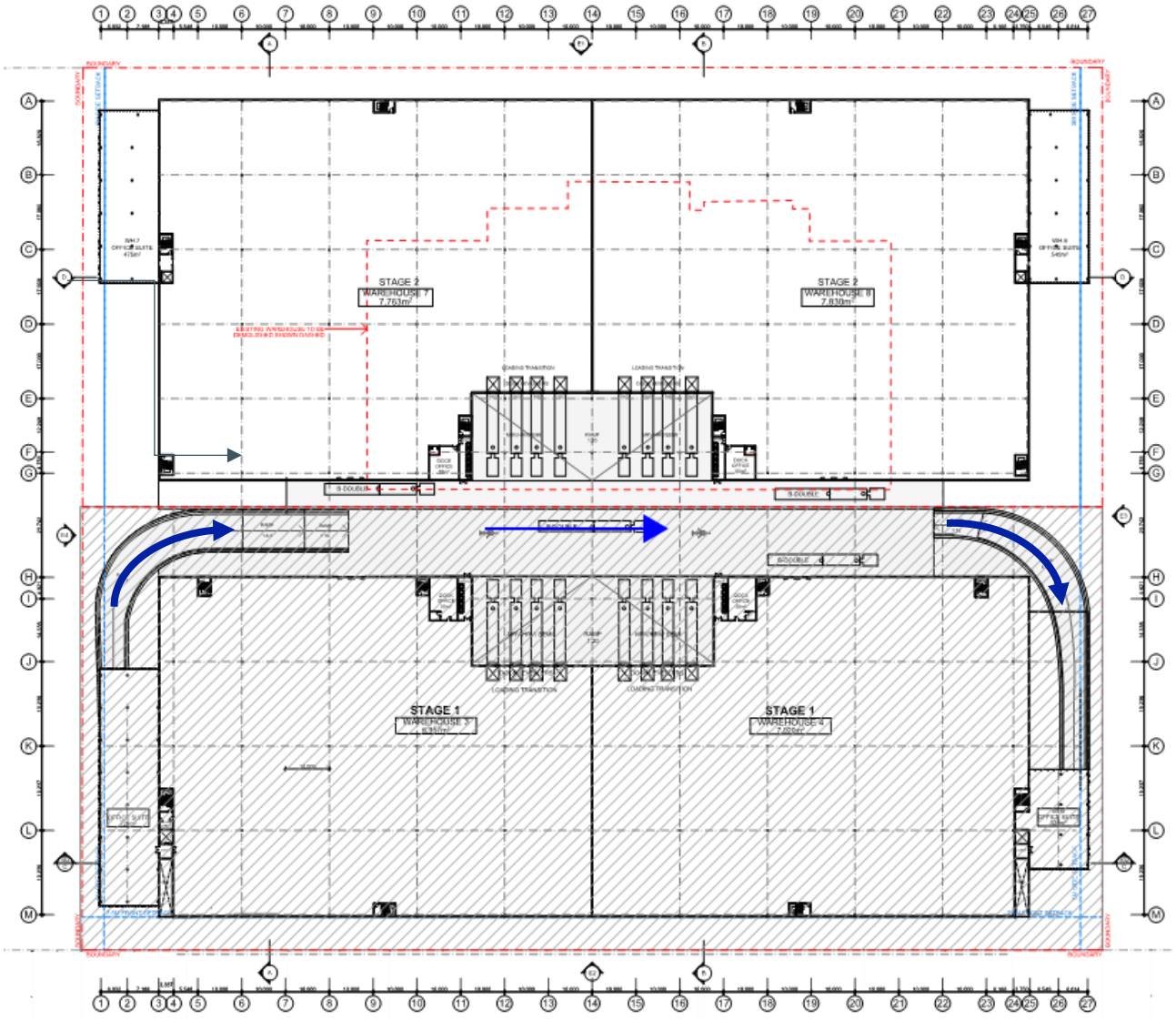
Stages 1&2: Ground floor plan



Level 1 traffic

Ground traffic

Stages 1&2: Level 1 floor plan



Level 1 traffic

Ground traffic

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