MARSHALL DAY Acoustics

LORIMER STREET SLAG GRINDING FACILITY
NOISE ASSESSMENT

Rp 001 20200607 2 July 2021

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Project: **LORIMER STREET SLAG GRINDING FACILITY**

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1.0 INTRODUCTION

Cement Australia proposes to build a Granulated Blast Furnace Slag (GBFS) grinding station at Berth 33, 465 Lorimer Street, Port Melbourne. The facility would include hoppers for receiving material, a storage shed, a vertical roller mill, product storage silo and internal truck loading facilities.

Marshall Day Acoustics Pty Ltd (MDA) has been engaged to provide a noise assessment suitable for submission to the Victorian EPA to assist in obtaining a Works Approval for the project.

This report provides details of relevant environmental noise limits and benchmark targets, an assessment of noise against the relevant criteria and recommended noise control measures to enable the relevant noise limits and targets to be achieved.

A high-level discussion of potential vibration impacts associated with the proposal, based on measured existing vibration levels in the area and measured vibration levels at a comparable operational GBFS grinding facility, has also been included.

A glossary of acoustic terminology is provided in Appendix A.

2.0 DOCUMENTS REVIEWED

The following documents provided by Cement Australia have been reviewed for this project:

Document reference	Revision	Title	Date
PM-146	0	Ground Granular Blast Furnace Slag Grinding Facility User Requirement Statement (URS)	26/11/2019
PM-146	-	Part C – Scope of Works	-
PM-146 D&S	-	Port Melbourne GGBFS Grinding Mill: Advice to Bidders – Addendum 11	01/07/2020
AJ148-00-GA-004	-	CEMENT AUSTRALIA PM SLAG GRINDING STATION ALTERNATIVE WHARF ACCESS	19/08/2019
19131132-002-R-Rev 0	0	Berth 33 Lot 465 Lorimer Street, Port Melbourne – Preliminary Geotechnical Investigation	20/03/2020
A2693185	-	Lease Part 32 – 34 South Wharf, Port Melbourne | Proposed Slag Mill Development	17/09/2020
2002/765	-	Planning Permit (Port of Melbourne Education Centre)	07/01/2003

Additionally, relevant email correspondence with Cement Australia and GTA Traffic Consultants regarding truck movements and equipment details has been reviewed.

3.0 SITE DESCRIPTION

The subject site is located at Berth 33, 465 Lorimer Street, Port Melbourne and is bounded by:

- the Yarra River to the north
- the Port control tower and Port of Melbourne Education Centre to the west
- Lorimer Street to the south with commercial properties beyond
- a concrete batching station (Hy-tec Concrete) to the east.

The nearest identified residential areas considered in the assessment are provided in Table 1.

Table 1: Nearest identified noise sensitive receivers – residential

ID	Location	Description
R1	232 Williamstown Road, Port Melbourne	A single-storey dwelling approximately 1650 m south of the subject site
R2	282 Williamstown Road, Port Melbourne	A single-storey dwelling approximately 1700 m south-east of the subject site
R3	10 Francis Street, Yarraville	A single-storey dwelling approximately 1000 m west of the subject site
R4	6 Frederick Street, Yarraville	A single-storey dwelling approximately 1100 m north-west of the subject site
R5	81 S Wharf Drive, Docklands	A multi-storey residential development approximately 2000 m east of the subject site

The residential locations presented in Table 1 have been identified as the nearest noise sensitive receivers (including other relevant receiver types such as childcare centres).

Further to the residential receivers presented in Table 1, it was considered relevant to consider noise impacts to the adjacent commercial receivers listed in Table 2.

Table 2: Commercial receivers

ID	Location	Description
C1	343-383 Lorimer Street, Port Melbourne	Port of Melbourne Education Centre, a two-storey building directly west of the subject site boundary
C2	506 Lorimer Street, Port Melbourne	Defence Science and Technology Group, a two-storey building approximately 30 m south of the subject site boundary (120 m south-east of the vertical roller mill)
C3	344 Lorimer Street, Port Melbourne	A three-storey commercial/industrial building approximately 50 m south of the subject site boundary (90 m south-west of the vertical roller mill) The building tenants include John Barry Sales, Antec Group Pty Ltd, thussenkrupp Elevator Victoria and RANGER

In relation to receiver C1, Port of Melbourne stated the following (reference: correspondence dated 17 September 2020)

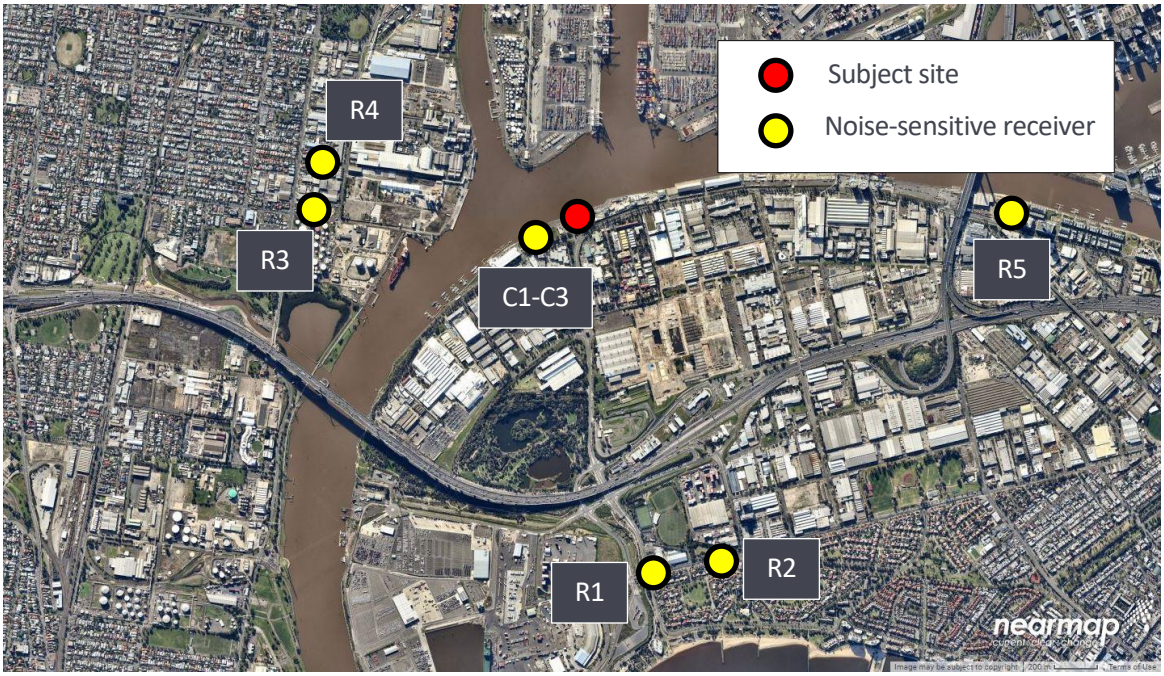
…Planning Permit 2002/765 establishing the Port Education Centre is for a Place of Assembly, not an education centre… The Port Education Centre is a place of assembly used by the Port of Melbourne to conduct meetings and some tours.

The Port of Melbourne support the proposed development of the Slag Mill by Cement Australia

Aerial photographs of the subject site, surrounds area and receiver locations are provided in Figure 1 and Figure 2.

Figure 1: Subject site and surrounds (Source: Nearmap)

Figure 2: Surrounding area and nearest receivers (Source: Nearmap)



The subject site is zoned PZ Port Zone and is surrounded by the following zoning types:

- PZ Port Zone to the north and north-east

- C2Z Commercial 2 Zone, RDZ1 Road 1 Zone and IN1Z Industrial 1 Zone to the east and southeast
- C2Z Commercial 2 Zone, PUZ1 Public Use Zone and IN1Z Industrial 1 Zone to the south
- PZ Port Zone to the south-west, west and northwest

The identified noise-sensitive receivers are zoned as follows:

Table 3: Noise-sensitive receiver zoning types (residential)

ID	Location	Receiver type	Zoning
R1	232 Williamstown Road, Port Melbourne	Dwelling	NRZ3 Neighbourhood Residential Zone
R2	282 Williamstown Road, Port Melbourne	Dwelling	NRZ3 Neighbourhood Residential Zone
R3	10 Francis Street, Yarraville	Dwelling	IN3Z Industrial 3 Zone
R4	6 Frederick Street	Dwelling	IN3Z Industrial 3 Zone
R5	81 S Wharf Drive, Docklands	Multi-storey mixed-use	DZ1 Dockland Zone

Table 4: Noise-sensitive receiver zoning types (commercial)

ID	Location	Receiver type	Zoning
C1	343-383 Lorimer Street, Port Melbourne	Place of assembly	PZ Port Zone
C2	506 Lorimer Street, Port Melbourne	Commercial/office	IN1Z Industrial 1 Zone
C3	344 Lorimer Street, Port Melbourne	Commercial/office	IN1Z Industrial 1 Zone

The relevant planning maps are provided in Appendix B.

4.0 DESCRIPTION OF PROPOSAL

A summary of the proposed activities at the site is as follows.

- Ships would deliver GBFS to the port and unload the material into three separate hoppers located on the berth using the ships' cranes
- The hoppers would distribute the material to a belt conveyor system to transfer the GBFS to a fully enclosed storage shed
- Internal gantry cranes would redistribute the material within the shed and transfer it to a reclaim hopper which transports material to the milling circuit
- The milling circuit would comprise the processes and equipment described below.
  - Vertical roller mill – GBFS would be deposited onto a rotating steel table to shift the material to the grinding rollers, where product is ground
  - Hot gas generator – the hot gas generator dries the GBFS
  - Process fan – the process fan would maintain a negative pressure within the vertical roller mill, providing air circulation for drying and the energy required to convey the ground product into the separator and into the main process bag filter for collection
  - Separator – a separator would separate the product leaving the mill circuit, directing oversize product back to the grinding table for further processing while the finished product is transferred to the process bag filter
  - Process bag filter – the process bag filter separates the product from process air. The cleaned process air is partially recirculated into the mill and the remainder exhausted through the exhaust stack
- Finished product would be transferred via sealed conveyors and bucket elevators from the mill circuit to one steel silo in the first instance, with provisions for a future second silo
- Product would then be loaded from the storage silos into pneumatic road tankers, which are subsequently weighed and depart from site.

As part of the tender documentation provided to bidders for the facility equipment (bidders are referred to in the User Requirement Statement (URS) and herein as 'the contractor') a noise level specification must be achieved by the plant installers.

The site is proposed to operate 24-hours per day, 7 days per week, 365 days per year.

A site map is provided in Appendix C.

5.0 LEGISLATION AND GUIDELINES

5.1 Victorian Legislation and Guidelines

A summary of the relevant Victorian legislation and guidelines is provided in Table 5. Refer to Appendix D for further details.

Table 5: Relevant Victorian noise legislation and guidelines

Document	Overview
Environment Protection Act 2017 (the Act), as amended by the Environment Protection Amendment Act 2018	The Act provides the overarching legislative framework for the protection of the environment in Victoria. It establishes a general environmental duty to minimise the risks of harm to human health or the environment from pollution or waste, including noise, so far as reasonably practicable. The Act does not specify noise limit values, but prohibits the emission of unreasonable or aggravated noise from non-residential premises. The Act provides general definitions of unreasonable and aggravated noise; definitions that are specific to commercial, industrial and trade premises are provided in supporting publications (see below). Section 93 of the Act provides for the creation of an environmental reference standard to be used to assess and report on environmental conditions in the whole or any part of Victoria (see below).
Environment Protection Regulations 2021 (the Regulations)	The objectives of the Regulations are to further the purposes of, and give effect to, the Act. Part 5.3 of the Regulations sets out requirements that are specific to environmental noise. It states that the prediction, measurement, assessment or analysis of noise within a noise sensitive area for the purposes of the Act or the Regulations, must be conducted in accordance with the Noise Protocol (see below). Division 3 of Part 5.3 stipulates requirements that are specific to commercial, industrial and trade premises. In particular, noise from these types of premises is prescribed as unreasonable if it exceeds a noise limit or alternative criterion determined in accordance with the Noise Protocol. Additional matters addressed in this Division include assessment time periods, minimum noise limit values, management of cumulative noise from multiple premises, noise sensitive areas where assessment requirements apply, definition of frequency spectrum as a prescribed factor, and a definition for aggravated noise.
EPA Publication 1826.4 *Noise limit and assessment protocol for the control of noise from commercial, industrial and trade premises and entertainment venues* dated May 2021 (Noise Protocol)	The Noise Protocol defines the method for setting the noise limits for new and existing commercial, industrial and trade premises and entertainment venues in Victoria. It also outlines the steps that must be followed to undertake an assessment (measurement or prediction) of the effective noise level within a noise sensitive area or at an alternative assessment location. A comparison between the effective noise level and the relevant noise limit or the relevant alternative assessment criterion will determine whether the noise that is emitted from the premises is unreasonable under the Regulations. The noise limits for commercial, industrial and trade premises are determined on the basis of land zoning and background noise levels, and are separately designated for day, evening and night periods.

Document	Overview
Environment Reference Standard dated 25 May 2021 (ERS)	The ERS is made under section 93 of the Act. The ERS sets out environmental values for ambient sound that are sought to be achieved and maintained in Victoria and standards to support those values. The indicators and objectives within the standard provide a benchmark for comparing desired outcomes to the actual state of the environment and a basis for assessing actual and potential risks to the environmental values. The ERS is not a compliance standard, and the values listed within the ERS for different land uses are explicitly not noise limits nor design criteria. The primary function of the ERS is to provide assessment and reporting benchmarks for environmental values.

5.2 General Standards and Guidelines

Other standards and guidelines reviewed as part of this noise assessment are provided in Table 6.

Table 6: General standards and guidelines (residential)

Reference	Overview
NSW *Road Noise Policy* 2011 produced by the NSW Environmental Protection Agency (Sleep Disturbance)	Strictly only applies in NSW. However, the provisions of the document are often referred to in Victoria for general guidance on potential sleep disturbance. The NSW policy notes that from the research on sleep disturbance to date it can be concluded that: *maximum internal noise levels below 50–55 dB L_{Amax} are unlikely to awaken people from sleep* *one or two noise events per night, with maximum internal noise levels of 65-70 dB L_{Amax}, are not likely to affect health and wellbeing significantly.* It is generally accepted that a partially open window provides approximately 10 dB noise reduction from outside to inside. Therefore, in accordance with the *NSW Road Noise Policy* sleep disturbance findings, we recommend that maximum noise levels from on-site activities at night should not exceed 65 dB L_{Amax} outside an openable window of existing or future residential dwellings.

The likelihood of sleep disturbance is typically assessed where a proposal is expected to have the potential to noticeably alter the acoustic conditions at residential receivers during times where most residents would be expected to be sleeping.

Sleep disturbance potential has been reviewed at a high level and the proposal is considered to be low risk with regard to sleep disturbance on the following basis:

- The nearest receiver is located over 1 km from the subject site, providing significant noise reduction
- Subsequent sections of this report identify EPA requirements to achieve significantly lower targets than SEPP N-1 noise limits, in recognition of cumulative noise considerations. Achieving these noise targets will provide suitable protection for sleep disturbance purposes.

Therefore, a specific sleep disturbance assessment based on L_{Amax} values has not been undertaken.

Table 7: General standards and guidelines (commercial)

Reference	Overview
NSW EPA *Noise Policy for Industry* 2017	Strictly only applies in NSW The NSW Noise Policy for Industry (NPfI) is not a statutory document but is used in NSW to inform decision making. The Policy provides recommended "Amenity Noise Levels". These levels are not mandatory limits but rather an objective level for assessing potential noise impact and trigger the investigation of feasible and reasonable noise mitigation. The Amenity Noise Level or trigger level for noise from one industrial use to another industrial use is 70 dB L_{Aeq} at an outdoor location. The Amenity Noise Level from one industrial use to a commercial premise is 65 dB L_{Aeq} at an outdoor location. The policy states that the assessment point should be "at the reasonably most-affected point on or within the property boundary". **Justification for use** There have been previous occasions in Victorian planning decisions where NSW documents have been used to assess and manage noise in the absence of suitable current Victorian legislation and guidelines. This has most recently been adopted in the North East Link Project Environmental Management Framework January 2020 where the Environmental Performance Requirements for Noise and Vibration reference three (3) NSW documents: NSW Interim Construction Noise Guideline (2009), NSW Roads and Maritime Services Construction Noise and Vibration Guideline 2016 and NSW Roads and Maritime Services Noise Mitigation Guideline (2015)
AS 2107:2016 *Acoustics – Recommended design sound levels and reverberation times for building interiors* (AS 2107)	Provides recommendations for internal noise levels for various spaces. Table 1 of AS 2107 presents recommended internal noise levels for "Office Buildings – meeting rooms (small)", which has been used for consideration in the assessment
BS 6472-1:2008 – Guide to evaluation of human exposure to vibration in buildings Part 1: Vibration sources other than blasting (BS 6472)	Provides guidance on predicting human response to vibration in buildings over the frequency range 0.5 Hz to 80 Hz. Describes how to determine the vibration dose value, VDV, from frequency-weighted vibration measurements. The VDV is used to estimate the probability of adverse comment which might be expected from human beings experiencing vibration in buildings.

5.3 Vibration guidelines

Vibration guidelines are available for assessing human response to vibration and impacts on vibration-sensitive equipment. Guidelines such as those summarised in Table 8 and Figure 3 below are relevant to considering potential vibration impacts.

BS 6472 provides guidance on predicting human response to vibration in buildings and provides criteria as summarised in Table 8 below. The criteria are expressed in terms of an exposure metric referred to as the vibration dose value (VDV).

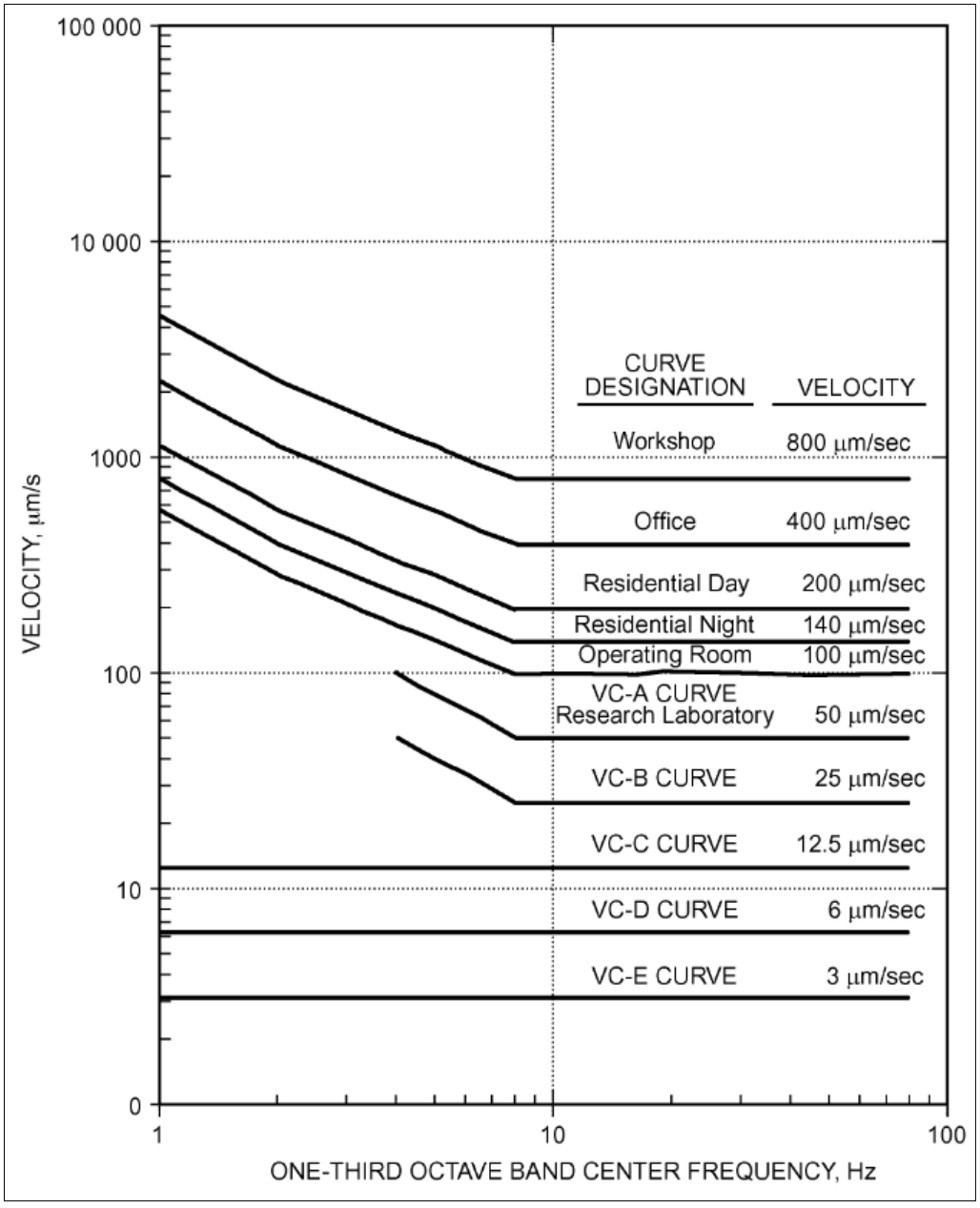
Table 8: Vibration dose value ranges per BS 6472, VDV

Place and time	Low probability of adverse comment $ms^{-1.75}$
Residential buildings 16 h day	0.2 to 0.4
Offices 16 h day*	0.4 to 0.8

**Note; for offices, BS6472 recommends a multiplying factor of 2 should be applied to residential vibration ratings for a 16 h day*

Depending on the specific sensitivity of the receiver building and any at-receiver vibration isolation, criteria provided in the ASHRAE noise and vibration handbook such as that reproduced in Figure 3 below may be selected, subject to specific criteria provided by the identified vibration sensitive receiver. The criteria curves are expressed in terms of the root-mean-squared (rms) vibration velocity.

Figure 3: ASHRAE building vibration criteria



5.4 Identification of noise sources and assessment method

The noise sources associated with the operation of the proposed development have been identified in consultation with Cement Australia. Table 9 details the relevant legislation and/or guideline applicable for the assessment of each of the identified noise sources.

The assessment considers the following:

- Noise associated with ancillary equipment e.g. cranes, grinding equipment etc
- Noise associated with the vertical roller mill and associated equipment
- Noise breakout from the storage building
- Truck movements and truck loading
- Vessel engine noise once docked at the facility.

Table 9: Potential noise impacts

Potential noise impact	Source of assessment criteria	Status
Mechanical services noise (noise from all processing equipment on site as well as heating and ventilation equipment associated with office areas)	Noise Protocol	Legislation - mandatory
Noise from the vertical roller mill and associated equipment	Noise Protocol	Legislation - mandatory
Truck movements	Noise Protocol	Legislation - mandatory
	EPA Publication 1254	Vic EPA Guidelines - best practice
Vessel engine noise (once docked)	Noise Protocol	Legislation - mandatory
Truck movements at night	Noise Protocol	Legislation - mandatory
Noise to other commercial/industrial properties	NSW NPfI AS 2107:2016	Used in Victoria as a guideline

6.0 EXISTING NOISE ENVIRONMENT

The assessment criteria applicable to the proposed development includes noise limits that are defined on the basis of background noise levels, in the absence of noise associated with the operation of the subject site. Therefore, it is necessary to establish background noise levels in the vicinity of the site.

At the time when the acoustic assessment work was initiated, Metropolitan Melbourne was subject to the global COVID-19 pandemic resulting in '*stay-at-home*' and movement restriction measures being imposed on occupants of the city. Due to this, it was not possible to deploy unattended noise monitors or undertake attended noise measurements. Further, it is expected that current background noise levels may not be representative of typical background noise levels due to the altered commercial, industrial and road traffic activity occurring during this time.

Notwithstanding, daytime noise measurements were conducted on the morning of 11th June 2021 in order to characterise the existing noise and vibration levels at surrounding commercial and industrial premises, and to contextualise the predicted noise levels from the proposal at these locations. Details of the survey and the measured daytime noise and vibration levels are provided in Appendix E.

MDA has previously undertaken daytime, evening and night-time noise measurements in the vicinity of several noise-sensitive receivers at the locations presented in Figure 4 below, which give some insight into the prevailing acoustic conditions surrounding the site.

Figure 4: Previous noise measurement locations

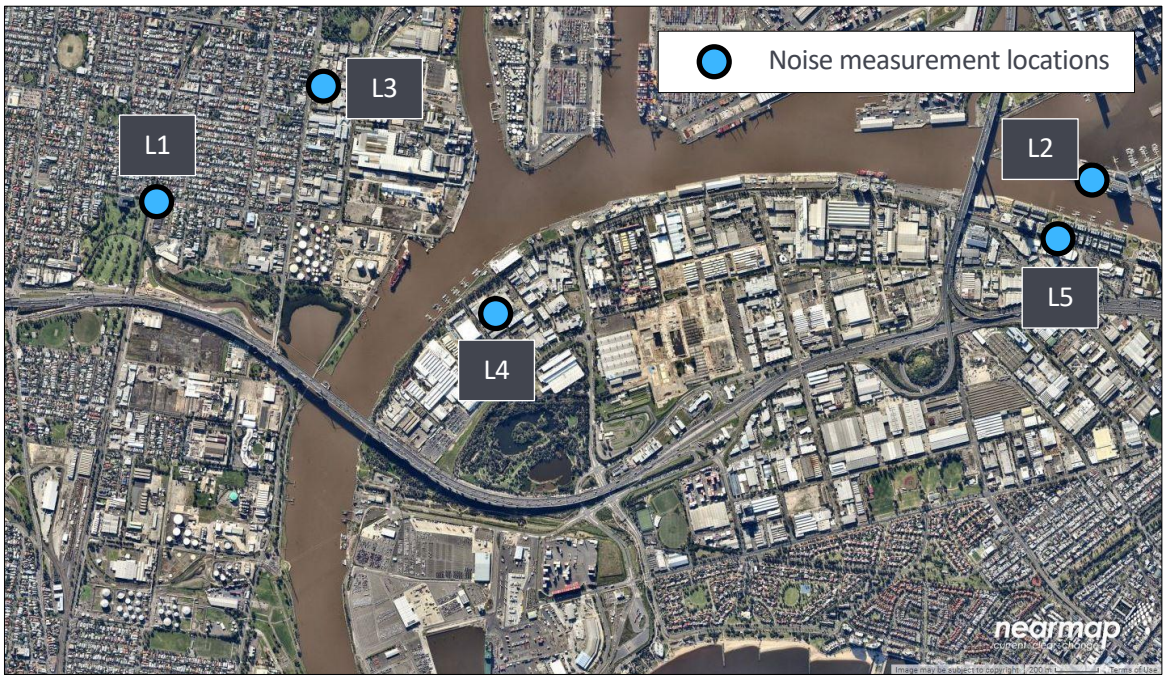


Table 10: Previous noise measurement locations

Location	Period	Description
L1	22/11/2017 to 29/11/2017	Banool Avenue, Yarraville Noise monitor was placed on the roof of an existing small brick building under free-field conditions, approximately 1.5 m above roof level
L2	22/02/2018 to 25/02/2018	Collins Wharf, Docklands The noise monitor was affected by construction noise during the daytime, however outside construction hours the ambient noise environment is taken to be an accurate representation of the prevailing acoustic conditions Notwithstanding, measurement results affected by construction noise were excluded from consideration
L3	16/06/2015 to 23/06/2015	Hyde Street, Yarraville Noise monitor was placed on the roof of an existing building under free-field conditions, approximately 1.5 m above roof level
L4	12/04/2018 to 19/04/2018	Lorimer Street, Port Melbourne Noise monitor was placed at the rear boundary of the existing commercial/industrial premises under free-field conditions, approximately 1.5 m above ground level
L5	27/10/2015 and 29/10/2020	Corner of Foundry Way and South Wharf Drive Short-term attended noise measurements were conducted at the corner of Foundry Way and South Wharf Drive with the sound level meter positioned under free-field conditions, approximately 1.5 m above ground level No daytime noise level was measured during this campaign

Table 11 below presents a summary of the previously measured, background noise levels. For those locations where multiple noise monitors were deployed, noise monitor results from the location with lower noise levels have been presented. The results are representative of the lowest period averaged background noise levels.

Table 11: Previously measured background noise levels

Location	Measured noise levels, L_{A90}		
	Day	Evening	Night
L1	52	54	47
L2	56	51	45
L3	46	47	47
L4	51	50	49
L5	-	46	44

7.0 SUMMARY OF APPLICABLE NOISE LIMITS/DESIGN TARGETS

7.1 Noise Protocol

The Noise Protocol limits applicable at the nearest residential areas are shown in Table 12.

The noise limits consider the previous noise measurement data provided in Table 11. Where background noise data was not available neutral background noise conditions are presumed. Given the urban nature of the local environment that each of the receiver locations are within, the application of neutral background noise conditions is considered to be a conservative approach. It is likely that these areas will be subject to higher background noise levels. It is recommended that background noise conditions at the site and surrounds are suitably confirmed via noise measurements during the detailed design and assessment phase of the project.

The full derivation of noise limits is provided in Appendix F.

Table 12: Noise Protocol limits, dB L_{eff}

ID	Location	Limits		
		Day	Evening	Night
R1	232 Williamstown Road, Port Melbourne	57	50	45
R2	282 Williamstown Road, Port Melbourne	55	48	43
R3	10 Francis Street, Yarraville	63	57	51
R4	6 Frederick Street, Yarraville	57	53	50
R5	81 S Wharf Drive, Docklands	56	54	48

Day: 0700 to 1800 hrs Monday to Saturday
Evening: 1800 to 2200 hrs Monday to Saturday, 0700 to 2200 hrs Sunday and Public holidays
Night: 2200 to 0700 hrs 7 days

The EPA has advised, in considering cumulative noise impacts, that a limit of the SEPP N-1 (now superseded by the Noise Protocol) limits less 10 dB should be adopted so that noise from the proposal does not add to noise from existing industry.

7.2 Environment Reference Standard

The ERS seeks to protect the following environmental values listed in Table 13.

Table 13: Environmental values

Environmental value	Description of environmental value
Sleep during the night	An ambient sound environment that supports sleep at night
Domestic and recreational activities	An ambient sound environment that supports recreational and domestic activities in a residential setting
Normal conversation	An ambient sound environment that allows for a normal conversation indoors without the need to raise voices
Child learning and development	An ambient sound environment that supports cognitive development and learning in children

Environmental value	Description of environmental value
Human tranquillity and enjoyment outdoors in natural areas	An ambient sound environment that allows for the appreciation and enjoyment of the environment for its natural condition and the restorative benefits of tranquil soundscapes in natural areas
Musical entertainment	An ambient sound environment that recognises the community's demand for a wide range of musical entertainment

Per Table 3.2 of the ERS, the land relevant to the current study is Category 1, and therefore the following indicators and objectives listed in Table 14 apply.

Table 14: Ambient sound environment indicators and objectives, dB

Land use category	Indicators	Objective
Category 1	Outdoor $L_{Aeq,8h}$ from 2200 to 0600	55
	Outdoor $L_{Aeq,16h}$ from 0600 to 2200	60

EPA Publication 1992 *Guide to the Environment Reference Standard* (the Guide) states that direct regulation (in this case the Noise Protocol) takes precedence over the ERS.

7.3 NSW Noise Policy for Industry

While the NPfI is not a Victorian statutory policy, the NPfI has been applied to provide a guideline external noise target for the adjacent Port of Melbourne Education Centre. The NPfI contains detailed methods to derive project-specific noise trigger levels however for the purpose of the current assessment such detailed methods are inappropriate. The NPfI has therefore been referred to in order to provide a simple guideline external noise target at the surrounding boundaries with the identified commercial receiver as presented in Table 15.

Table 15: NPfI noise target, dB L_{Aeq}

ID	Location	Noise target
C1	343-383 Lorimer Street, Port Melbourne (external)	65-70
C2	506 Lorimer Street, Port Melbourne (external)	65-70
C3	344 Lorimer Street, Port Melbourne (external)	65-70

Although the NPfI provides for a 15-minute assessment period, a 30-minute assessment period has been applied for the current project to allow for comparison to the Noise Protocol residential noise limits. The noise target applies when the premises is in use (i.e. not overnight when the premises are closed).

7.4 AS 2107

While AS 2107 is technically a design guide, the standard has been considered to provide a guideline internal noise target for the adjacent commercial receivers as presented in Table 16.

Table 16: AS 2107 noise target, dB L_{Aeq}

ID	Location	AS 2107 classification	Noise target
C1	343-383 Lorimer Street, Port Melbourne (internal)	Office Buildings – meeting rooms (small)	40-45*

ID	Location	AS 2107 classification	Noise target
C2	506 Lorimer Street, Port Melbourne (internal)	Office Buildings – open plan office (small)	40-45
C3	344 Lorimer Street, Port Melbourne (internal)	Office Buildings – open plan office (small)	40-45

**Note; C1 has been characterised as similar in use to a small meeting room with reference to the comments provided in the Port of Melbourne Letter (see Section 3.0). The upper target for typical teaching classrooms within schools is 45 dB L_{Aeq}.*

AS 2107 recommends an assessment period of sufficient length to characterise the noise source and therefore a 30-minute assessment period is considered appropriate for the current assessment.

8.0 VIBRATION DISCUSSION

It is understood that vibration-sensitive equipment may be installed at the adjacent non-residential receiver at 506 Lorimer Street, located approximately 120 m away from the proposal.

Depending on the sensitive equipment, the relevant vibration criteria can range from 100 µm/s (equivalent to 0.1 mm/s) for microscopes up to 100X magnification, down to fractions of a micron (for example VC-G which goes down to 0.78 µm/s for extremely quiet research spaces). Considering the extremely low magnitude of the criteria which apply to vibration sensitive instruments, environmental ground vibration is usually an important consideration for such facilities, and their design usually includes dedicated isolation measures for the control of typical ambient vibration levels.

Specific details regarding the location and sensitivity of the equipment, and any existing installed mitigation measures (including isolation tables, room/building isolation, etc.) is not currently available. To assess the potential impacts in detail would require an understanding of the vibration generating processes associated with the GBFS, in addition to the level of isolation provided by the existing building structure. This is normally quantified through site-specific testing and analysis, requiring significant engagement with the operator to coordinate site access, specific details regarding the equipment's location and any performance characteristics as provided in the manufacturer data.

Such a process is outside the scope of a town planning stage assessment however MDA has conducted indicative vibration measurements at representative receiver boundary locations and at Cement Australia's existing comparable facility to enable a high-level comparison of vibration levels and provide insight into the likelihood of vibration-related impacts.

Table 17 below presents a comparison of the measured maximum vibration levels. Further detail of the measurements is provided in Appendix G.

VDV values as discussed in Section 5.3 are a weighted, time-integrated value which may not account for brief periods of high vibration, which may have the potential to effect vibration sensitive equipment. Therefore, PCPV (peak component particle velocity) values are provided in Table 17 to provide a comparison of maximum vibration events measured during the surveys.

Table 17: Comparison of measured vibration levels, mm/s

Measurement location	Measured vibration levels, PCPV	Comment
Lorimer Street, existing		
Southern boundary of 465 Lorimer Street, Port Melbourne	0.507	Approximately 45 m from nearest proposed vibration-generating plant The vibration levels at this location were dominated by heavy vehicle pass-by events on Lorimer Street
Northern Boundary of 506 Lorimer Street, Port Melbourne	0.621	Approximately 135 m from nearest proposed vibration-generating plant The vibration levels at this location were dominated by heavy vehicle pass-by events on Lorimer Street
Representative existing Cement Australia facility		
Roller mill base	1.391	Accelerometer attached to roller mill platform

Measurement location	Measured vibration levels, PCPV	Comment
Roller mill motor base	1.919	Accelerometer attached to roller mill motor base
Base of roller mill	3.619	Accelerometer attached to base of roller mill
2 m from roller mill platform	0.850	Accelerometer attached to local ground level (concrete)
4 m from roller mill platform	0.865	Accelerometer attached to local ground level (concrete)
6 m from roller mill platform	0.826	Accelerometer attached to local ground level (concrete)
12 m from roller mill platform	0.728	Accelerometer attached to local ground level (concrete)
24 m from roller mill platform	0.081	Accelerometer attached to local ground level (concrete footpath), which appeared to be decoupled from the nearby ground due to a strip of grass and soft dirt

Vibration measurements beyond 26 m were not possible at the existing Cement Australia facility due to practical constraints (extraneous sources of vibration, safe-access constraints).

Based on the vibration measurement results provided in Table 17 the measured background vibration levels at street level outside of 506 Lorimer Street were found to range from 0.2 to 0.6 mm/s due to local traffic. A time-trace of the measured vibration levels at Lorimer Street is provided as Figure 8 in Appendix E.

It is understood that the dominant source of vibration from the GBFS is associated with the roller mill. For reference, the measured vibration was measured at the site office approximately 26 m from the roller mill platform at 0.1 mm/s, which is generally comparable to the background results measured above. Further, the processing plant at the existing Cement Australia facility is approximately three times larger than the proposed plant at Lorimer Street and therefore the measured vibration levels are likely to be conservative.

Considering the above and assuming that any sensitive equipment at the receiver is already vibration-isolated, it is unlikely that the roller mill would adversely affect its ongoing use.

9.0 NOISE DATA

The noise considerations associated with the operation of the proposed development include:

- Noise associated with removing the product from the incoming vessels via crane (including noise from idling vessel engines)
- Grinding and processing noise
- Truck movements including loading (note: truck engines are turned off during loading, which occurs in the truck loading enclosure).

This section presents information used primarily as the basis for assessing the feasibility of the proposed facility for town planning purposes. Prior to the construction of the facility, revised and updated information for the final equipment selections would need to be used to develop a revised noise model to verify any necessary mitigation measures and compliance with the applicable Victorian noise policy requirements.

9.1 Building fabric noise reduction

Detailed building construction design has not yet been undertaken at this planning stage of the project. In order to progress the acoustic assessment, nominal building fabric noise reduction values, see Table 18, have been used to predict noise breakout from the storage shed and truck filling area. The estimated noise reductions are based on calculated information using proprietary acoustic software, INSUL 9.0. The sound reductions have been provided for information/example at this stage in order to demonstrate feasibility for planning purposes and should be confirmed as the design progresses.

Table 18: Building fabric noise reduction, dB

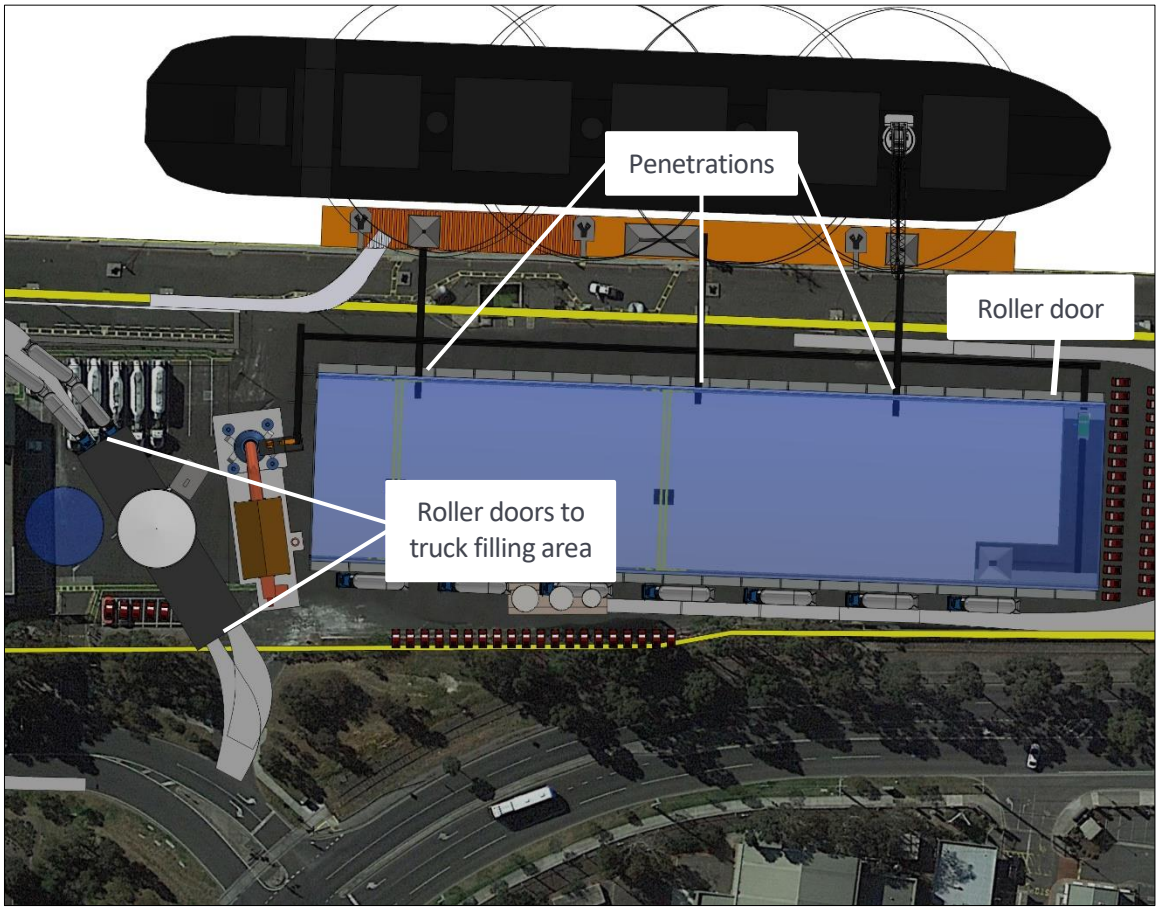
		Octave band centre frequency (Hz) transmission loss						
Building element	**Nominal construction**	**63**	**125**	**250**	**500**	**1k**	**2k**	**4k**
Storage shed walls	100 mm thick precast concrete	37	38	35	41	50	58	67
Storage shed roof	0.55 metal (e.g. Colorbond)	8	11	15	19	23	20	21
Storage shed operable elements	Single roller door for vehicles at the north-east of the shed (closed)	2	2	8	12	12	14	13
Truck filling shed walls and roof	0.55 metal (e.g. Colorbond)	8	11	15	19	23	20	21
Truck filling shed operable elements	Roller door at each end of filling shed as indicated in Figure 5	2	2	8	12	12	14	13

The assessment has included three (3) openings at the northern side of the storage shed for conveyors, with an allowance of 1 m^2 per penetration.

The assessment has also included one (1) opening at each end of the truck filling area, with an allowance of 52 m^2 per opening.

Penetrations and operable elements included in the assessment are shown in Figure 5 below.

Figure 5: Location of penetrations and roller doors



No penetrations or operable elements additional to those described above have been included at this stage.

9.2 Grinding equipment and shed noise levels

Section *4.1.6 Noise* of the URS states the following with regard to noise:

> *All items of equipment shall be attenuated such that noise is no greater than 85dBA at the source, and less than 75dBA when measured at a distance of 1m from the source in a horizontal plane.*
>
> *Noise emissions are to be kept to a minimum. State Environment Protection Policy (Control of Noise from Commerce, Industry and Trade) No. S183 and international limits shall not be exceeded. The following applies:*
>
> - *At the work place the maximum level shall not exceed 85 dB(A) at one metre from the emitting machine*
> - *In any event, the mill will be designed to meet the Development Approval conditions applied by the Victorian Department of Planning*

Section *4.2.3.1 Noise* of the URS states the following restriction:

> *Maximum of 70 dBA at any given point of the plant's perimeter, with the entire plant running. (This does not include background noise or current operations, where significant).*

The restriction stated in Section 4.1.6 of the URS concerns noise on-site from a health and safety perspective, which is beyond the scope of this town planning acoustic report and therefore has not been considered for the current assessment.

The statement in Section 4.2.3.1 does not appear to have been based on any relevant acoustic planning provision. MDA has assessed noise at the site based on noise limits at the surrounding residential receivers determined in accordance with the Noise Protocol and guideline noise levels determined with reference to the NPfI, based on noise level data determined via;

- Manufacturers' data, where available
- Attended noise measurements of an existing comparable Cement Australia facility at Port Kembla (more information provided in Appendix G)
- Measured noise levels of similar equipment from the MDA noise measurement database
- Empirical estimation methods based on equipment type and duty (where manufacturers' data, attended noise measurement data or appropriate database noise levels were not available).

The assessment has been based on the proposed equipment at the site identified by Cement Australia, and the current proposed site layouts.

Given that the relevant policies require that noise levels be assessed at the receiver locations, and given the variability of noise propagation based on noise source location, height and overall noise level the provision of a boundary noise level for equipment design (as referenced in the URS) is not considered a robust method for determining appropriate equipment noise levels. Therefore, it is considered more appropriate that the contractor refers to the assessed sound power levels for the equipment provided in Table 19 as a design guide. Note that the assessment is based on the equipment locations and elevations shown in Figure 6 and variation to these locations and/or elevations would require a revised assessment.

Detailed design and equipment selection for the development has not progressed to a stage where specific manufacturers' noise levels for all equipment are available. These items would be subject to further design development and a commercial procurement process following approval for the project. Attended noise measurements have been undertaken at an existing facility to determine appropriate sound power data as discussed in Appendix G.

Table 19 below provides the noise levels used for the assessment. Further detail regarding the basis of the noise levels is provided in Appendix H.

Table 19: Grinding equipment assessed noise levels, dB

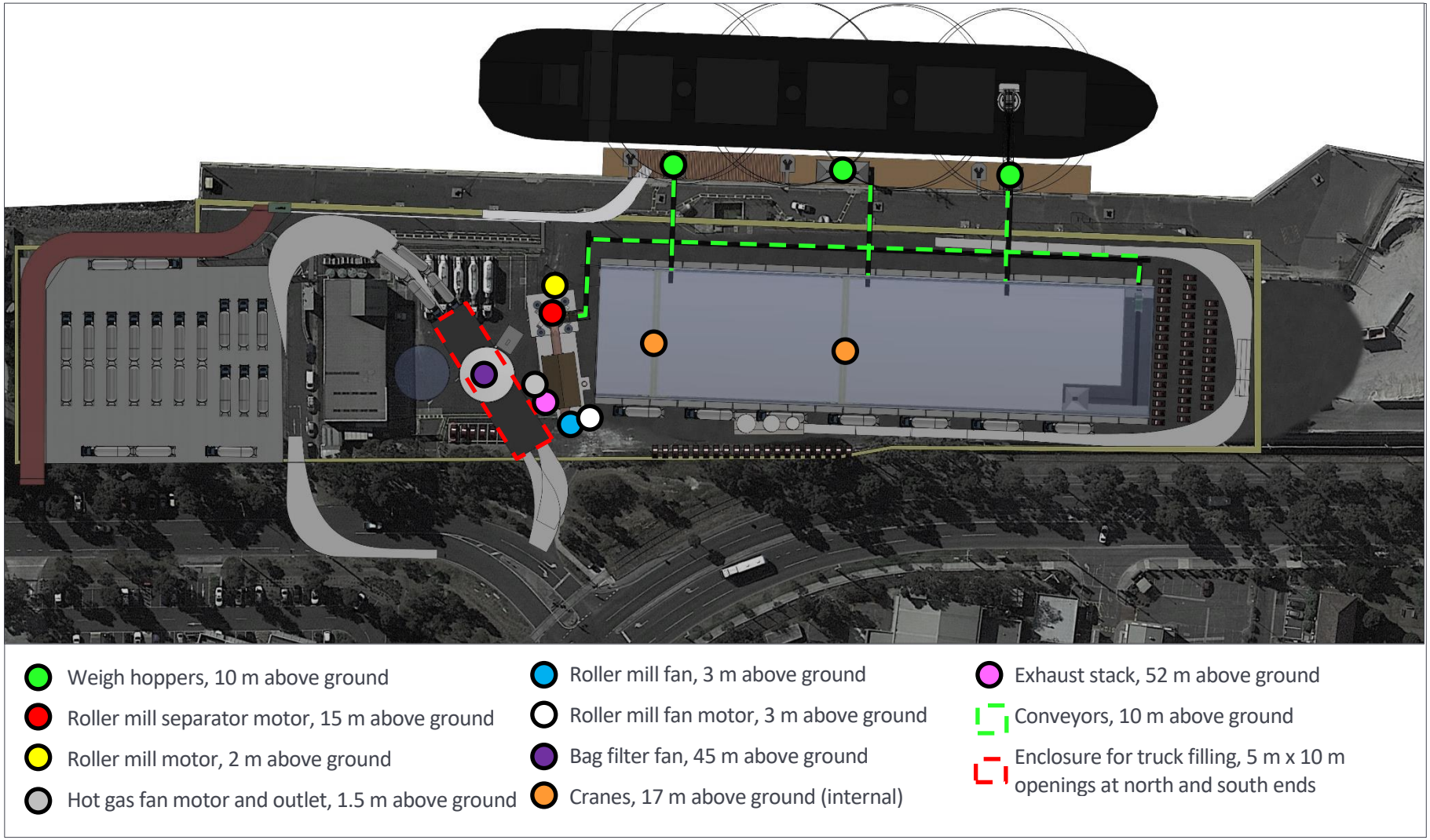
		Octave Band Centre Frequency (Hz)							
Description	**Descriptor**	**A**	**63**	**125**	**250**	**500**	**1k**	**2k**	**4k**
Receival hoppers	L_{eq}, L_w	82	88	80	79	77	77	75	73
Roller mill separator motor	L_{eq}, L_w	97	84	87	89	92	92	91	86
Roller mill motor	L_{eq}, L_w	102	102	99	99	96	100	93	85
Roller mill fan casing	L_{eq}, L_w	103	103	99	106	103	93	87	81
Roller mill fan outlet	L_{eq}, L_w	109	115	110	112	108	102	98	94
Roller mill fan motor	L_{eq}, L_w	104	98	93	90	86	99	101	87
Bag filter fan	L_{eq}, L_w	95	98	97	98	93	88	83	78
Hot gas fan motor	L_{eq}, L_w	88	96	90	87	87	80	80	76

		Octave Band Centre Frequency (Hz)							
Description	**Descriptor**	**A**	**63**	**125**	**250**	**500**	**1k**	**2k**	**4k**
Hot gas fan exhaust	L_{eq}, L_w	92	97	93	92	84	86	86	84
Conveyors	L_{eq}, L_w / m	72	80	75	75	69	65	61	59
Storage shed, internal noise level	L_{eq}, L_p	75	83	82	72	72	70	67	60

Noise from the roller mill fan outlet is expected to discharge via ductwork and the exhaust stack at a height of approximately 52 m above local ground level.

It is noted that the storage shed includes 2 internal gantry cranes. It is likely that resilient isolation will be required to prevent noise and vibration transfer to the environment via the building structure and should be considered during detailed design phase.

Figure 6: Grinding equipment locations



The final noise levels will be dictated by a variety of factors, including the following:

- Noise levels of the selected machinery
- The number and type of simultaneous activities at the site
- The arrangement and location of equipment relative to the building structure and the identified receiver
- Internal surface finishes and reverberation time of the internal spaces

Duration corrections have not been applied to the grinding plant, crane or internal noise levels based on continuous operation of the noise sources for a full 30-minute assessment period.

9.3 Trucks on site

Noise from truck movements on site will be dictated by the following key variables:

- Number and variety of trucks visiting the site during any given 30-minute assessment period
- Layout of entry and exit and layout of internal roadways
- The time taken per truck to enter, drive through the site, be filled and weighed and exit the site.

At this stage of the project, much of this relevant detail is yet to be finalised and therefore the following variables have been provided as inputs to the preliminary model to present worst-case expected noise levels.

Table 20: Truck movement inputs

Variable	Input	Basis
Truck type	50/50 split B-double and semi-trailer Acoustically comparable to semi-trailer/articulated vehicle	Consultation with GTA traffic consultants
Number of trucks per 30-minute period attending site for loading	Worst-case 4 trucks per half hour	As discussed with Cement Australia, based on future output of 400,000 tonnes per annum and truck capacity of 27.5 tonnes
Number of trucks per 30-minute period attending site for parking	14 truck arrivals	Consultation with GTA traffic consultants and Cement Australia, based on 25 trucks arriving on site over the course of one hour
Layout of internal roadways, entry and exit	Per site map AJ148-00-GA-004	
Time taken to fill and weigh individual truck	15-minutes	As discussed with Cement Australia

Further assessment iterations may be required as the roadway design and truck volumes are refined as appropriate. The noise levels presented in this report are considered to be representative of worst-case scenario noise levels at an appropriate level of detail for a town planning acoustic report.

Given the capacity for the site to operate 24-hours per day, worst-case scenario noise levels have been predicted based on the presumption that the worst-affected half-hour period may occur at any time during the day, evening or night.

Noise level data of trucks and filling operations has been sourced from the MDA database and measurements at the existing Cement Australia facility. The MDA database is a collection of noise measurements performed by staff at MDA, including noise levels (L_{Aeq} and L_{Amax}) of truck movements, loading activity and waste collections at similar sites. Typical noise levels based on the MDA database and measured noise levels are provided in Table 21.

Table 21: Trucks, dB

		Octave band centre frequency								
Description	**Descriptor**	**A**	**63**	**125**	**250**	**500**	**1k**	**2k**	**4k**	**Hz**
Semi trailer/ Articulated Vehicle AV moving through site	L_{eq}, L_w	106	109	111	106	101	99	98	97	dB
Truck filling enclosure, internal noise level	L_{eq}, L_p	75	80	77	75	74	70	67	61	75

9.4 Grabber/crane and vessel noise

Vessel noise is highly variable based on the size and type of vessel under consideration and therefore it is impractical to provide a comparable noise level based on database measurements alone.

Overall noise levels for vessels idling at port used for the assessment are based on an empirical estimation method[1] for ship noise, considering the relevant vessel type and size (bulk carriers up to 50,000 DWT) for the proposal. Spectral information was based on previous measurements conducted by MDA.

The reviewed information demonstrated a high variability of vessel engine noise, including noise levels in excess of those assessed in the current report and therefore it is recommended that noise measurements are conducted in order to validate that the noise levels are appropriate for the current proposal. While the data reviewed indicates that vessels can result in significantly higher emissions than those documented herein (consistent with noise levels previously measured by MDA), the information reviewed also indicates a distinct difference in the upper range noise levels for different vessel types. Notably, the upper range of noise levels associated with bulk carriers were lower than those of other vessels, peaking at 110 L_{WA} for a bulk carrier over 100,000 DWT.

Noise levels are provided in Table 22.

Table 22: Grabber/crane and vessels, dB L_w

Description	Octave band centre frequency								
	A	**63**	**125**	**250**	**500**	**1k**	**2k**	**4k**	**Hz**
Vessel idling	108	115	109	107	105	103	100	94	dB
Grabber/crane noise level, per crane	104	112	111	101	101	99	96	89	dB

[1] Methodology provided in *Noise from moored ships*, Rob Witte, published in *Internoise,* 2010

10.0 ASSESSMENT METHOD – NOISE

To predict noise levels to nearby neighbouring residences, the following factors have been considered:

- The amount of noise being generated within the subject site
- The distance between the sources and receivers
- The presence of obstacles such as buildings or screens that obstruct the noise path
- The ground between the source and receiver
- The presence of hard reflective surfaces that may enable additional noise paths.

A 3-dimensional digital model of the proposal and surrounding built environment has been created using SoundPLAN proprietary modelling software (version 8.2). This model has been used to predict noise from the site to the nearest noise sensitive receivers.

Geometry data for the model has been sourced from public aerial photography, visual inspections of the area, and building heights determined from the town planning drawings.

Terrain data for the surrounding area have been sourced from the Victoria State Government Department of Environment, Land, Water and Planning Spatial Datamart[2].

The geometries in the model are simplified representations of the built environment that have been configured to a level of detail that is appropriate for noise calculation purposes.

The SoundPLAN digital model has been used to calculate noise levels using the International Standard *ISO 9613-2: 1996 Acoustics – Attenuation of sound during propagation outdoors – Part 2: General method of calculation* (ISO 9613). ISO 9613 is a general environmental noise calculation standard that has been used extensively throughout Australia, New Zealand, and Europe since its publication in 1996.

The implementation of ISO 9613 within proprietary noise modelling software enables multiple sound transmission paths, including reflected and screened paths, to be accounted for in the calculated noise levels. ISO 9613 predicts noise levels for meteorological conditions which favour the propagation of noise.

[2] https://services.land.vic.gov.au/SpatialDatamart/

11.0 NOISE PROTOCOL (RESIDENTIAL) AND NPFI (NON-RESIDENTIAL) ASSESSMENT

In order to account for potential cumulative noise impact to the surrounding receivers, the Victorian EPA has advised that compliance 10 dB below Noise Protocol noise limits is preferred and therefore the assessment considers noise limits 10 dB below the Noise Protocol noise limits presented in Section 7.1.

The assessment is inherently conservative on the basis that it presumes a "worst-case-scenario" whereby each identified noise generating activity at the subject site is operating at its loudest concurrently at least once during the day, evening and night. In practice it may be unlikely that all activities will operate at their loudest level at the same time.

Adjustments for tonality and impulsiveness have not been applied due to the preliminary nature of the information on which the assessment is based and the distances between the site and the identified residential receivers. Should the noise sources and activities at the site include tonal or impulsive components additional noise control measures may be required. Additional noise control measures would depend on the magnitude, frequency and source.

The following sections provide the noise level assessment based on the noise levels, building fabric information and noise reductions stated in Section 9.0, 9.1, 9.2 9.3 and 9.4.

Table 23 below presents predicted total noise levels from the identified activities associated with the site.

Table 23: Total noise level assessment, residential, dB L_{eff}

Receiver	Predicted noise from vehicles	Predicted noise from vessel engines, cranes, storage shed and grinding	Total noise level from site activity	EPA noise limit (Noise Protocol less 10 dB) D / E / N	Complies? D / E / N
R1 – 232 Williamstown Road, Port Melbourne	16	28	28	47 / 40 / 35	✓ / ✓ / ✓
R2 – 282 Williamstown Road, Port Melbourne	16	28	28	45 / 38 / 33	✓ / ✓ / ✓
R3 – 10 Francis Street, Yarraville	27	39	39	53 / 47 / 41	✓ / ✓ / ✓
R4 – 6 Frederick Street, Yarraville	27	39	39	47 / 43 / 40	✓ / ✓ / ✓
R5 – 81 S Wharf Drive, Docklands	15	34	34	46 / 44 / 38	✓ / ✓ / ✓

The predicted noise levels at the surrounding residential receivers comply with the EPA noise limit 10 dB below Noise Protocol noise limits.

Table 24 below presents the predicted noise level at the identified commercial receivers against MDA's proposed external noise targets based on the NPfI, and internal targets based on AS 2017. Internal noise levels have been calculated based on nominal noise reduction through a building façade with 6 mm standard fixed glazing.

Table 24: Total noise level assessment, commercial, dB L_{eff}

Receiver	Predicted noise from vehicles	Predicted noise from ships, cranes, storage shed and grinding	Total noise level from site activity	Proposed noise target When in use	Complies?
C1 – 343-383 Lorimer Street, Port Melbourne (external)	65	53	65	65-70	✓
C1 – 343-383 Lorimer Street, Port Melbourne (internal)	43	31	44	40-45	✓
C2 – 506 Lorimer Street, Port Melbourne (external)	43	63	63	65-70	✓
C2 – 506 Lorimer Street, Port Melbourne (internal)	22	40	40	40-45	✓
C3 – 344 Lorimer Street, Port Melbourne (external)	56	64	65	65-70	✓
C3 – 344 Lorimer Street, Port Melbourne (internal)	32	39	40	40-45	✓

The predicted external and internal noise levels at the commercial receivers are anticipated to comply with the proposed criteria.

The predicted external worst-case 30-minute noise levels are within 5 dB of the relevant daytime ERS objective (60 dB $L_{Aeq,16h}$). Given the predicted noise levels are provided for the worst-case 30-minute level and the ERS provides for daytime noise levels occurring over a 16-hour period, it is anticipated that noise associated with the proposal will be generally consistent with the daytime ERS objective.

External noise levels are within the guideline values determined with reference to the NPfI, however the predicted noise levels are relatively high. In order to contextualize the predicted worst-case 30-minute predicted noise levels attended measurements were conducted at representative commercial receiver locations during the morning of Friday 11th June 2021. A comparison of the predicted noise levels and the measured noise levels is presented in Table 25 below. Detail regarding the attended noise measurements is provided in Appendix E.

Table 25: Predicted total noise level and measured existing noise level, dB $L_{Aeq,30\ minute}$

Receiver	Predicted total noise level from site activity	Measured noise level (representative location)	Comment
C1	65	65	Existing L_{Aeq} noise level was dominated by traffic noise from vehicles passing on Lorimer Street and Todd Road, particularly heavy vehicle movements
C2	63	69	Existing L_{Aeq} noise level was dominated by traffic noise from vehicles passing on Lorimer Street, particularly heavy vehicle movements
C3	65	61	Existing L_{Aeq} noise level was dominated by traffic noise from vehicles passing on Lorimer Street and Todd Road, particularly heavy vehicle movements

The predicted noise level is comparable to the existing ambient noise environment and is considered typical of the range of noise levels expected in a commercial/industrial environment.

Further, consideration should be given to the context during which the attended noise measurements of the existing noise environment were undertaken, being the day following the two-week 'circuit-breaker' lockdown in metropolitan Melbourne, and whilst work-from-home requirements were still in effect (i.e. activity and traffic levels in the area may be increased during normal activities).

It should be noted that the predicted total noise levels represent a conservative worst-case scenario whereby all noise-generating activities occur at their noisiest anticipated level simultaneously including:

- A vessel idling at port unloading raw material for a full 30-minute period
- Gantry cranes operating within the storage shed for a full 30-minute period
- All processing equipment operating for a full 30-minute period
- Trucks being filled within the internal truck-filling area for a full 30-minute period
- The truck parking area filling from empty (no trucks) to capacity (15 trucks) within a 30-minute period.

While the worst-case 30-minute period assessed herein represents a feasible scenario, it is considered unlikely that all noise-generating activities would occur at their noisiest anticipated level simultaneously and therefore, in practice, noise levels at the surrounding receivers would be expected to be generally lower than the predicted levels assessed herein.

Should noise levels be required to be reduced based on the detailed design phase assessment, noise control strategies such as relocation, acoustic screening or enclosures for specific noisy plant items may be effective and should be assessed as appropriate.

12.0 SUMMARY

MDA have conducted a town planning acoustic assessment of the proposed GBFS grinding station at Berth 33, 465 Lorimer Street in Port Melbourne.

The assessment has determined noise limits in accordance with the Noise Protocol accounting for background noise conditions in the area.

As per the request from the Victorian EPA to consider cumulative noise impacts, the assessment has been based on noise limits set at a value 10 dB lower than the Noise Protocol. Predicted noise levels based on the assessment input data demonstrate that this reduced noise limit is achievable.

In order to screen for potential disturbance at the adjacent commercial receivers additional noise targets have been proposed based on the NSW NPfI as the Noise Protocol does not currently provide noise limits for non-residential receivers. Predicted noise levels at the commercial receivers have been contextualised with representative noise measurements in the area, and values provided in the ERS.

Noise associated with on-site truck and vehicle movements, including trucks being filled with material and being weighed, have been assessed based on the anticipated worst-case truck movement information.

MDA has further assessed noise associated with reception of raw material, grinding and processing activity and activity within the storage shed. Equipment noise levels have been based on manufacturers' data, measurement data from an existing facility, relevant standards, database noise levels and, where necessary, empirical estimation methods.

Noise associated with vessel engines has been predicted based on an empirical estimation method for bulk carriers up to 50,000 DWT. Due to the variability of vessel noise it is recommended that noise measurements are conducted in order to validate that the noise levels are appropriate for the current proposal.

Vibration levels have been measured at an existing Cement Australia facility and compared with representative vibration measurements undertaken at the surrounding area to the proposal. Based on the measurement data, and a high-level review, the total vibration levels associated with the proposal at surrounding receivers are expected to be comparable or lower than those of existing sources of vibration in the area.

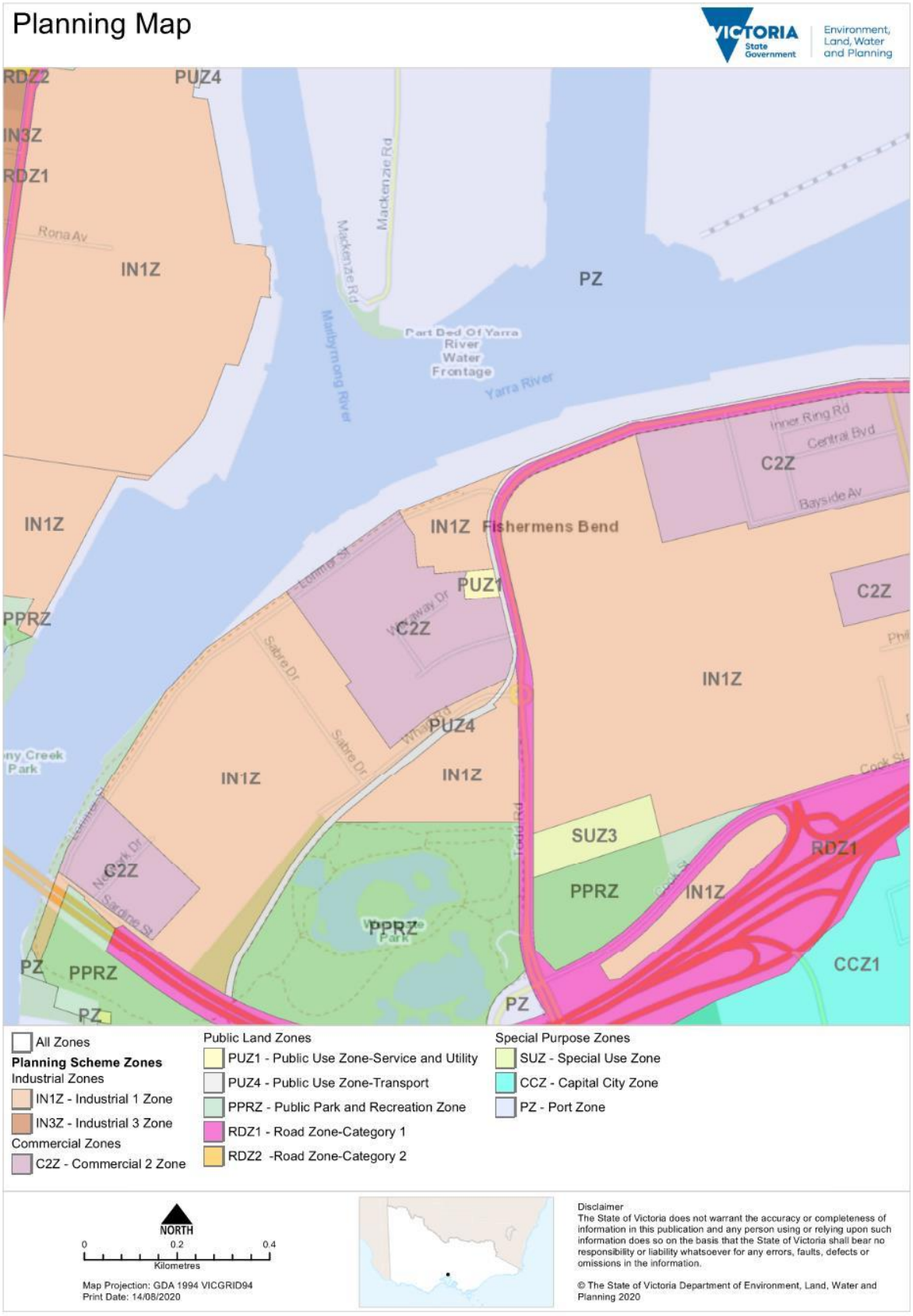
Noise levels should be reviewed and verified during the detailed design phase of the project. However, based on the noise levels, operational parameters and the noise limits and targets presented herein, the proposed GBFS grinding station can be designed to operate for the proposed 24-hours, 7 days per week while meeting the required noise levels at the identified noise-sensitive receivers.

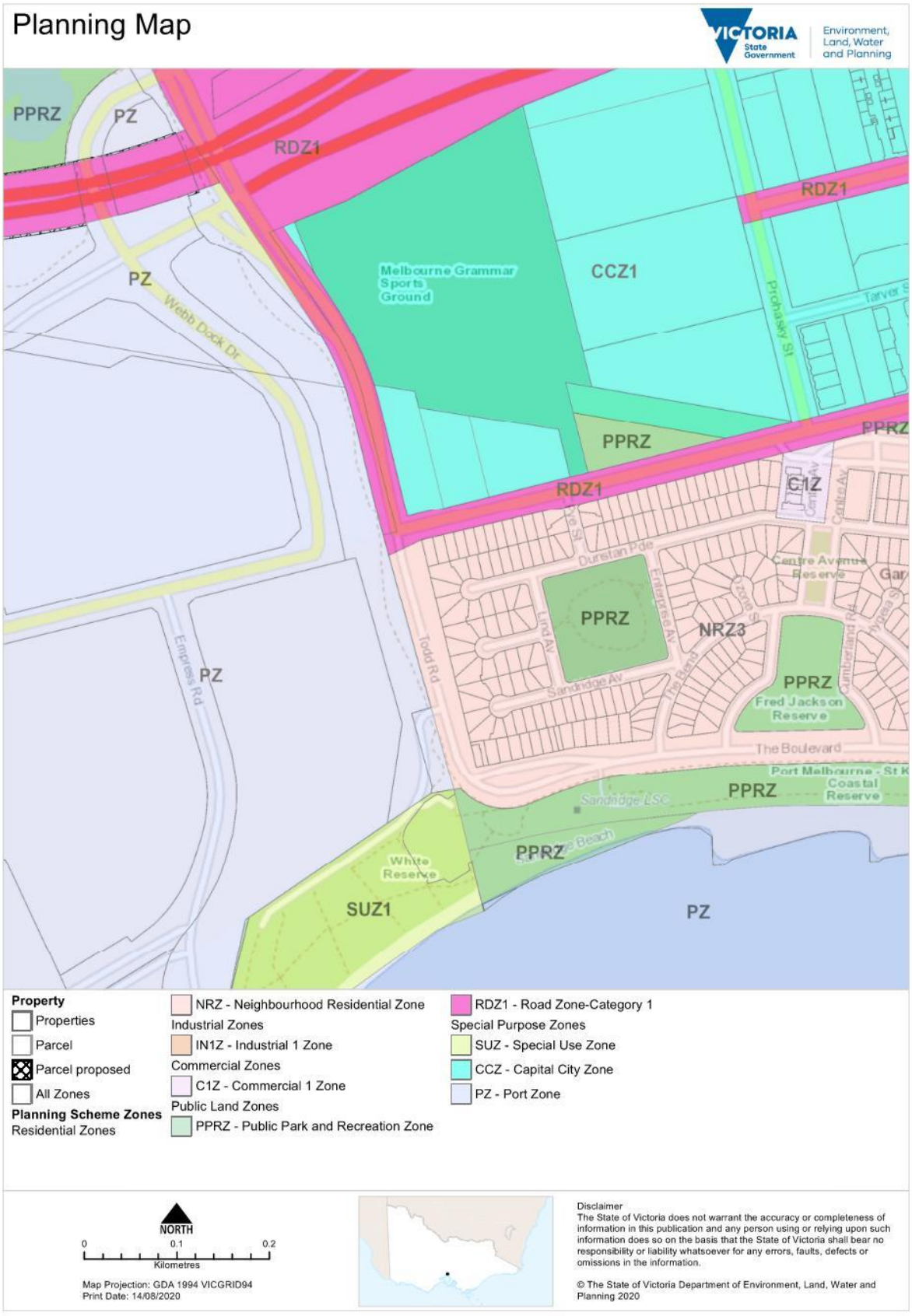
APPENDIX A GLOSSARY OF TERMINOLOGY

The following acoustic terminology has been used throughout this report.

dB	Decibel The unit of sound level.
A-weighting	The process by which noise levels are corrected to account for the non-linear frequency response of the human ear.
L_{Aeq}	The equivalent continuous (time-averaged) A-weighted sound level. This is commonly referred to as the average noise level.
L_{Amax}	The A-weighted maximum noise level. The highest noise level which occurs during the measurement period.
L_{A90}	The A-weighted noise level equalled or exceeded for 90% of the measurement period. This is commonly referred to as the background noise level.
L_{eff}	The effective noise level of commercial or industrial noise determined in accordance with EPA Publication 1826.4 *Noise limit and assessment protocol for the control of noise from commercial, industrial and trade premises and entertainment venues* (Noise Protocol) This is the L_{Aeq} noise level over a half-hour period, adjusted for the character of the noise. Adjustments are made for tonality, intermittency and impulsiveness.
SWL or L_W	Sound Power Level A logarithmic ratio of the acoustic power output of a source relative to 10^{-12} watts and expressed in decibels. Sound power level is calculated from measured sound pressure levels and represents the level of total sound power radiated by a sound source.

APPENDIX B PLANNING MAPS




Planning Map
VICTORIA State Government
Environment, Land, Water and Planning
PPRZ
PZ
RDZ1
Melbourne Grammar Sports Ground
CCZ1
Webb Dock Dr
Empress Rd
Todd Rd
Duretan Pde
Centre Avenue Reserve
Sandridge Av
Fred Jackson Reserve
NRZ3
C1Z
The Boulevard
Port Melbourne - St K
Coastal Reserve
Sandridge LSC
White Reserve
SUZ1
Property
Properties
Parcel
Parcel proposed
All Zones
Planning Scheme Zones
Residential Zones
NRZ - Neighbourhood Residential Zone
Industrial Zones
IN1Z - Industrial 1 Zone
Commercial Zones
C1Z - Commercial 1 Zone
Public Land Zones
PPRZ - Public Park and Recreation Zone
RDZ1 - Road Zone-Category 1
Special Purpose Zones
SUZ - Special Use Zone
CCZ - Capital City Zone
PZ - Port Zone
NORTH
0
0.1
0.2
Kilometres
Map Projection: GDA 1994 VICGRID94
Print Date: 14/08/2020
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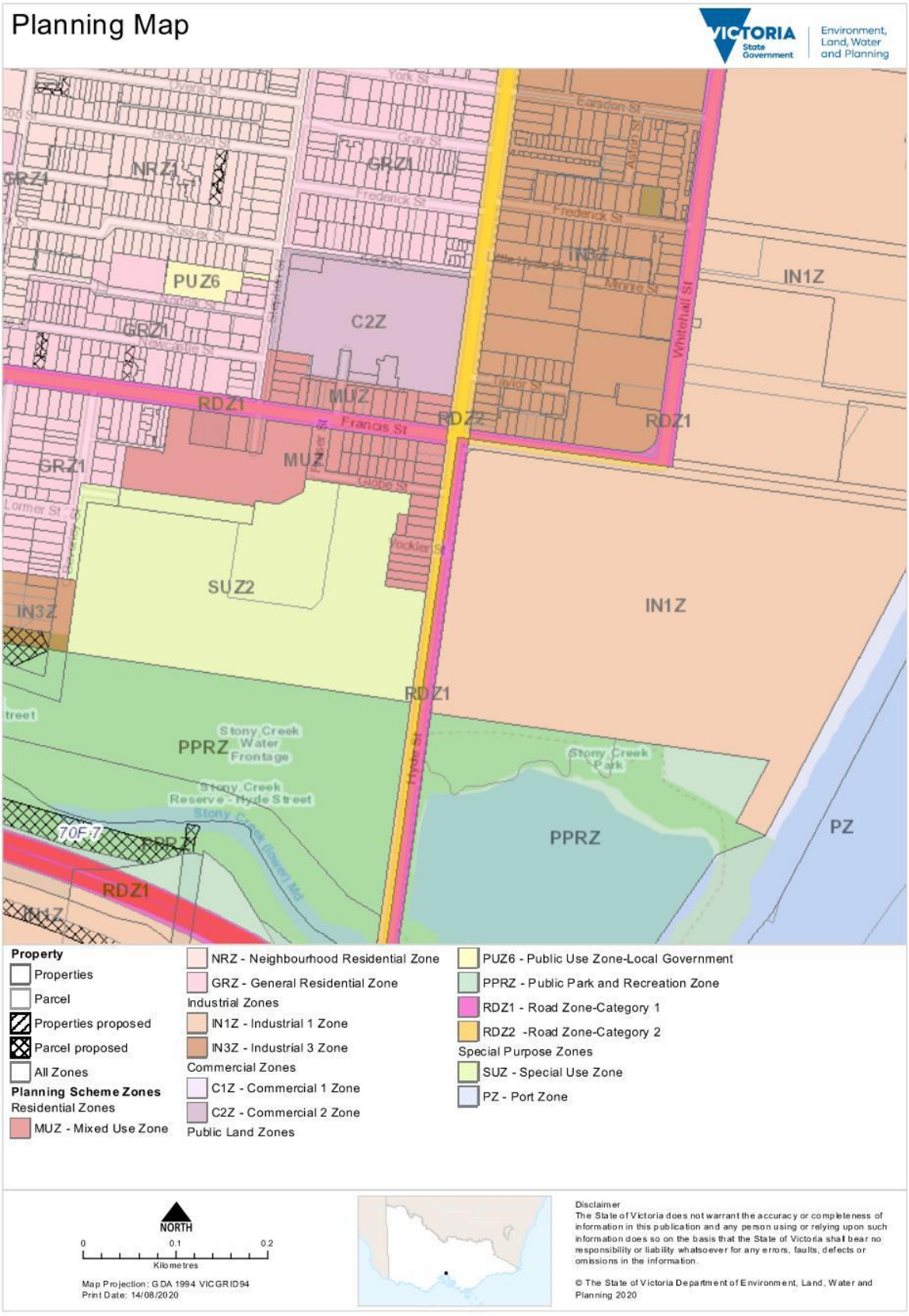
Planning Map
VICTORIA State Government
Environment, Land, Water and Planning
NRZ1
GRZ1
PUZ6
C2Z
MUZ
RDZ1
RDZ2
IN3Z
IN1Z
SUZ2
PPRZ
PZ
Stony Creek Water Frontage
Stony Creek Reserve - Hyde Street
Stony Creek Park
Hyde St
Whitehall St
Francis St
Property
Properties
Parcel
Properties proposed
Parcel proposed
All Zones
Planning Scheme Zones
Residential Zones
MUZ - Mixed Use Zone
NRZ - Neighbourhood Residential Zone
GRZ - General Residential Zone
Industrial Zones
IN1Z - Industrial 1 Zone
IN3Z - Industrial 3 Zone
Commercial Zones
C1Z - Commercial 1 Zone
C2Z - Commercial 2 Zone
Public Land Zones
PUZ6 - Public Use Zone-Local Government
PPRZ - Public Park and Recreation Zone
RDZ1 - Road Zone-Category 1
RDZ2 -Road Zone-Category 2
Special Purpose Zones
SUZ - Special Use Zone
PZ - Port Zone
NORTH
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0.1
0.2
Kilometres
Map Projection: GDA 1994 VICGRID94
Print Date: 14/08/2020
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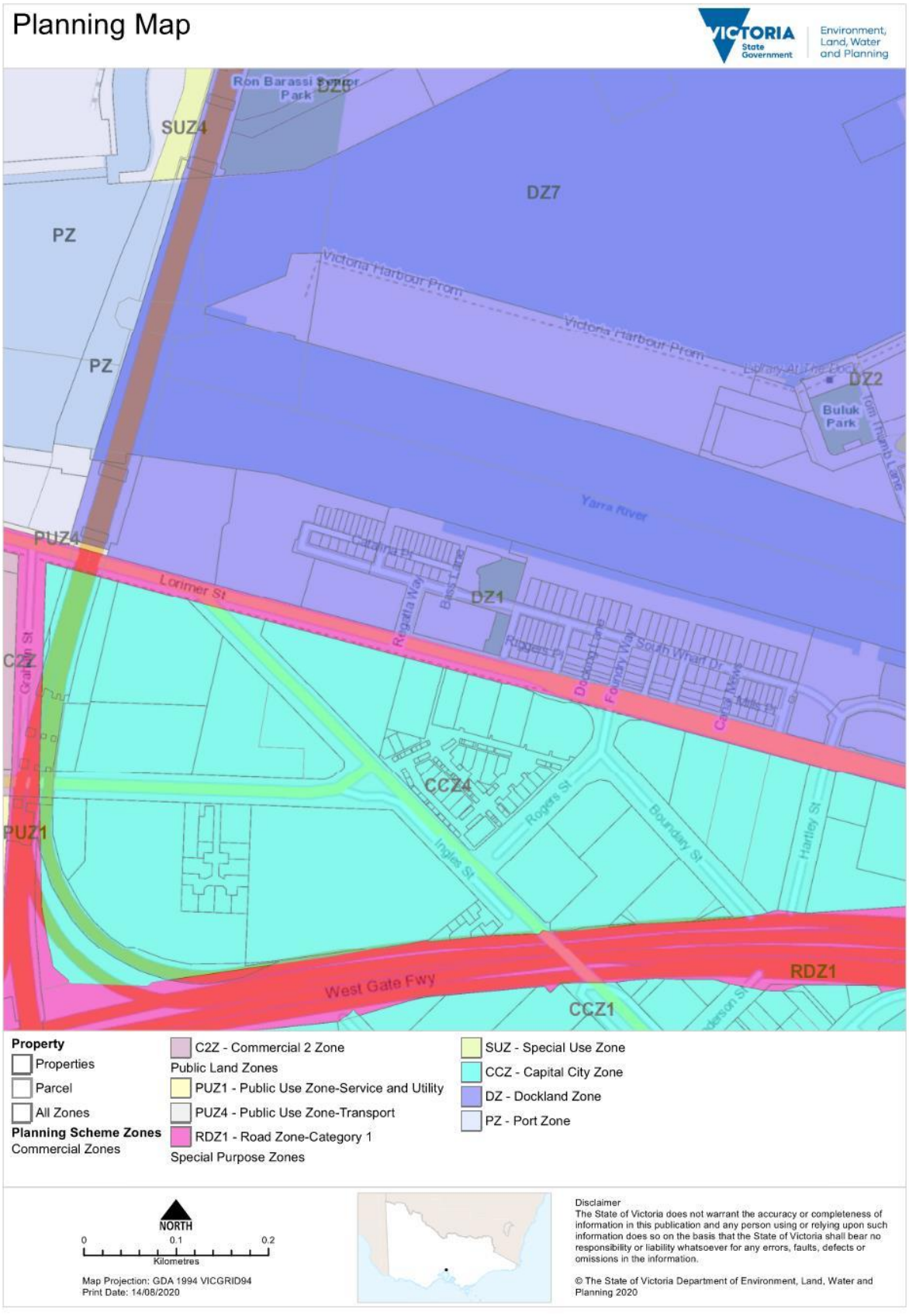
Planning Map
VICTORIA State Government
Environment, Land, Water and Planning
Ron Barassi Snr Park
DZ6
SUZ4
DZ7
PZ
Victoria Harbour Prom
PZ
DZ2
Buluk Park
Yarra River
PUZ4
Lorimer St
DZ1
C2Z
CCZ4
PUZ1
Ingles St
Rogers St
Boundary St
Harbour St
West Gate Fwy
RDZ1
CCZ1
Property
Properties
Parcel
All Zones
Planning Scheme Zones
Commercial Zones
C2Z - Commercial 2 Zone
Public Land Zones
PUZ1 - Public Use Zone-Service and Utility
PUZ4 - Public Use Zone-Transport
RDZ1 - Road Zone-Category 1
Special Purpose Zones
SUZ - Special Use Zone
CCZ - Capital City Zone
DZ - Dockland Zone
PZ - Port Zone
NORTH
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Kilometres
Map Projection: GDA 1994 VICGRID94
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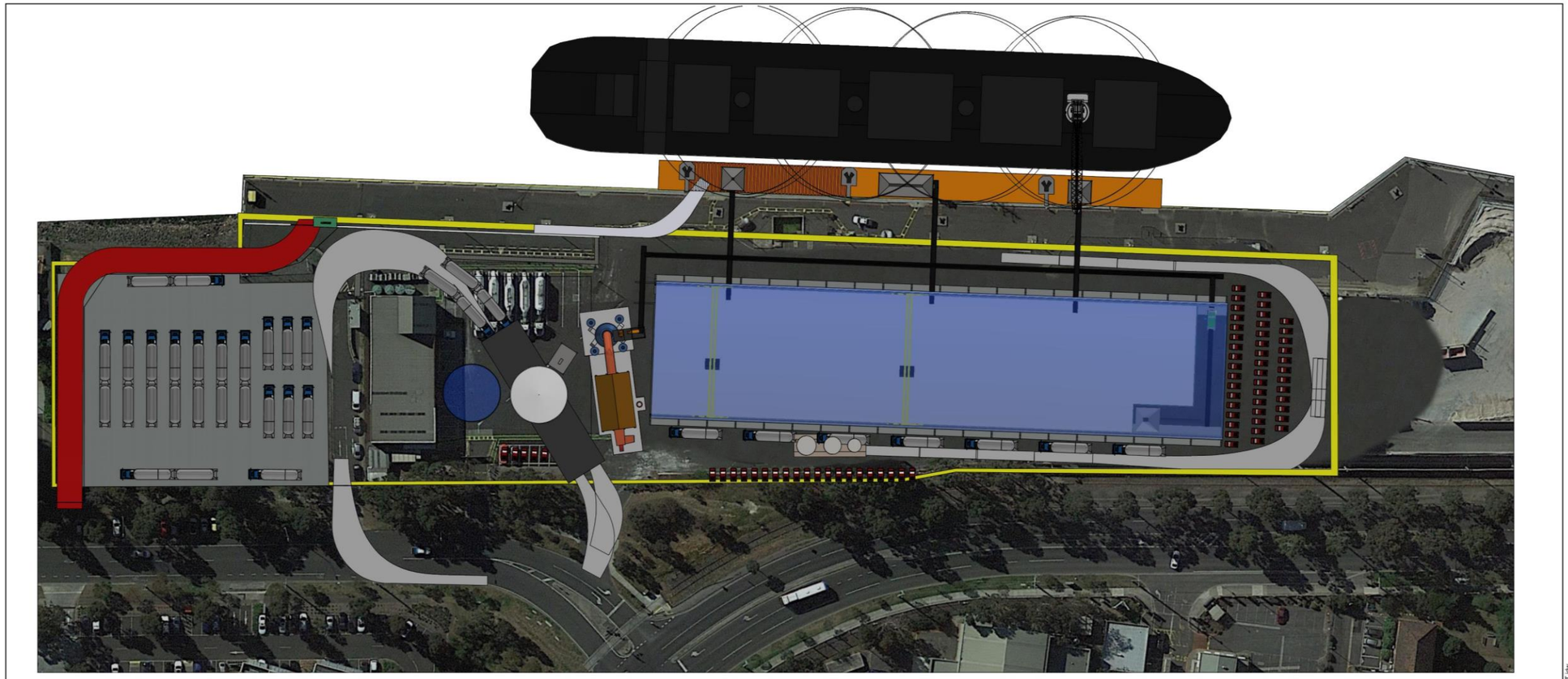
APPENDIX C SITE PLAN



FRONT VIEW
AJ148-00-GA-0000-000
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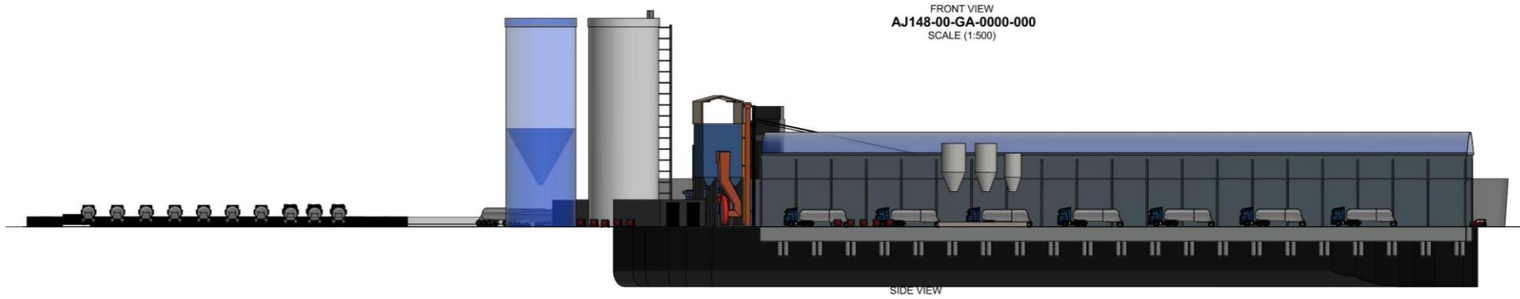

SIDE VIEW

-	-	-	-	-	-
0	ISSUED FOR TENDER	TNM	WJP	BAW	06/12/2019
REV	DESCRIPTION OF CURRENT REVISION	DRAWN:	APPROVED:	REVIEWED:	DATE:
REVISION HISTORY					

PoM Wharf Access
CA Truck Parking
CA Truck Turning Path
Lease Boundary

SCALE:	AS NOTED	DATE
DRAWN	JMack	19/08/2019
CHECKED	BW	19/08/2019
DESIGNED	JMack	19/08/2019
PM APPVD		

ammjohn Project Engineering

FOR TENDER

CEMENT AUSTRALIA
PM SLAG GRINDING STATION
ALTERNATIVE WHARF ACCESS

3rd Angle
A1

Job Number	Area	Type	Drawing	Sheet	Revision
AJ148	00	GA	004	4	-

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APPENDIX D LEGISLATION AND GUIDELINES

D1 Noise Protocol

D1.1 Application

Publication 1826.4 *Noise limit and assessment protocol for the control of noise from commercial, industrial and trade premises and entertainment venues* (Noise Protocol) sets noise limits that apply to commercial, industrial and trade premises within the Melbourne metropolitan region.

The Act defines a 'commercial, industrial and trade premises' as:

Any premises except the following –

(a) residential premises (other than common plant under the control of an owners corporation);

(b) a street or road, including every carriageway, footpath, reservation and traffic island on any street or road;

(c) a railway track used by rolling stock in connection with the provision of a freight service or passenger service—

(i) while travelling on a railway track or tramway track; or

(ii) while entering or exiting a siding, yard, depot or workshop;

(d) a railway track used by rolling stock in connection with the provision of a passenger service, while in a siding, yard, depot or workshop and is—

(i) powering up to commence to be used in connection with the provision of a passenger service; or

(ii) shutting down after being used in connection with the provision of a passenger service;

(e) the premises situated at Lower Esplanade, St Kilda and known as "Luna Park" and being the whole of the land more particularly described in Certificate of Title Volume 1204 Folio 109;

D1.2 Assessment method

The Noise Protocol prescribes the method and measurement procedure used to determine applicable noise limits and assessment of compliance.

A 'noise sensitive area' is defined in the Environment Protection Regulations 2021 (the Regulations) as:

(a) that part of the land within the boundary of a parcel of land that is—

(i) within 10 metres of the outside of the external walls of any of the following buildings—

(A) a dwelling (including a residential care facility but not including a caretaker's house);

(B) a residential building;

(C) a noise sensitive residential use; or

(ii) within 10 metres of the outside of the external walls of any dormitory, ward, bedroom or living room of one or more of the following buildings—

(A) a caretaker's house;

(B) a hospital;

(C) a hotel;

(D) a residential hotel;

(E) a motel;

(F) a specialist disability accommodation;

(G) a corrective institution;

(H) a tourist establishment;

(I) a retirement village;

(J) a residential village; or

(iii) within 10 metres of the outside of the external walls of a classroom or any room in which learning occurs in the following buildings (during their operating hours)—

(A) a child care centre;

(B) a kindergarten;

(C) a primary school;

(D) a secondary school; or

(b) subject to paragraph (c), in the case of a rural area only, that part of the land within the boundary of—

(i) a tourist establishment; or

(ii) a campground; or

(iii) a caravan park; or

(c) despite paragraph (b), in the case of a rural area only, where an outdoor entertainment event or outdoor entertainment venue is being operated, that part of the land within the boundary of the following are not noise sensitive areas for the purposes of that event or venue—

(i) a tourist establishment;

(ii) a campground;

(iii) a caravan park;

The assessment of noise from the subject site under the Noise Protocol is based on the calculation of a noise limit at a receiver position, taking into account a zoning noise level derived from the land zoning types in the surrounding area and the background noise level.

Once a noise limit is established, the noise level (L_{Aeq}) due to the commercial premises is measured or predicted. If necessary, the L_{Aeq} noise level is adjusted for noise character and duration to give the effective noise level (L_{eff}). If the L_{eff} level exceeds the noise limit, then remedial action is required.

D1.3 Calculation of noise limits

The Noise Protocol provides two methods for deriving the relevant noise limits, the Urban area method and the Rural area method. The Urban area method is applicable to the current study.

Using the Urban area method, noise limits are calculated taking into account land 'zoning types' within a 70 m and 200 m radius of a noise sensitive building. Zoning types are categorised as type 1, 2 or 3 as defined in Annex A of the noise protocol. A prescribed formula is used to calculate a corresponding Zoning Level. In general, zone type designations are as follows.

- Type 1 for residential, rural, open space or similar zones;
- Type 2 for commercial, business, office and industrial 3 [light industry] zones; or
- Type 3 for industrial 1 and 2 [general industry] and similar zones.

Greater areas of type 2 and 3 land within a 200 m radius of a noise sensitive site result in higher Zoning Levels than a site with respectively larger areas of type 1 land.

The Noise Limit is equal to the 'zoning level' unless the background level at the noise sensitive site is categorised as low or high according to the Noise Protocol. If the background level is low or high, the Noise Limit is calculated from a formula taking into account the Zoning Level and the Background Level.

The limits are separately defined for the day, evening and night periods. The time periods are defined in the Regulations and shown in Table 26.

Table 26: Noise Protocol time periods

Period	Day of week	Start time	End time
Day	Monday-Saturday	0700 hrs	1800 hrs
Evening	Monday-Saturday	1800 hrs	2200 hrs
	Sunday, Public holidays	0700 hrs	2200 hrs
Night	Monday-Sunday	2200 hrs	0700 hrs

The relevant noise limits applicable to this development are shown with their derivation in Appendix F

D2 NPfI

In NSW, the NPfI is the guideline for assessing noise emissions from industrial facilities. The NPfI has been applied in the current project in order to provide guideline noise limits for assessing the likelihood of impact to the neighbouring Port of Melbourne Education Centre as the Noise Protocol does not provide noise criteria for the assessment of noise to non-residential premises.

The NPfI sets out a procedure where an industrial facility can be assessed against a series of noise levels. In the NPfI, these project specific noise levels are derived from an analysis of the background noise environment (for residential premises) and zoning information (for non-residential premises).

D2.1 Amenity noise levels

The Amenity Noise Levels are designed to prevent industrial noise continually increasing above an acceptable level.

The NPfI contains detailed methods to derive project-specific noise trigger levels however for the purpose of the current assessment such detailed methods are inappropriate and therefore the NPfI has been referred to in order to provide a simple guideline noise limit at the surrounding boundaries with commercial receivers as presented in

The relevant receiver characterisations and relevant noise limit are presented in Table 27 below.

Table 27: Derived Amenity Noise Levels, dB $L_{Aeq, period}$

Receiver	Period	Recommended Amenity Noise Level
Commercial premises	When in use	65
Industrial premises	When in use	70

Given the use of the neighbouring Port of Melbourne Education Centre and its location in an industrial area, MDA have deemed it appropriate to adopt a noise limit of 65-70 dBA at the site boundary.

APPENDIX E EXISTING DAYTIME NOISE AND VIBRATION LEVELS

Attended noise and vibration surveys were conducted during the daytime period on Friday 11 June 2021 to characterise the existing noise and vibration environment, and to contextualise the predicted noise levels from the proposal at these locations.

Details of the noise and vibration measurement equipment used for the survey are provided below:

- 01dB DUO smart noise monitor (s/n: 10197), fitted with proprietary windshield and mounted on a tripod at a height of approximately 1.5 m above ground level in the free field. Measurements were conducted using the 'F' response time and A-weighted frequency network. The noise monitor was calibrated before and after testing using a 01dB Cal31 calibrator (s/n: 83391) and no significant drift was observed
- 01dB ORION vibration monitor (s/n 10155) with internal accelerometer. The monitor was securely coupled to the ground in a horizontal position. The monitor was configured to measure Peak Component Particle Velocity (PCPV) in three orthogonal directions (X, Y, Z) in 1 second elementary intervals with full waveform recordings of the raw acceleration signal.

The equipment used for the survey carry current NATA certification and comply with applicable calibration requirements.

Weather conditions during the survey were suitably calm and dry as to be conducive to noise and vibration measurements.

Noise and vibration measurement locations are described in Table 28 and presented in Figure 7.

Table 28: Noise and vibration measurement locations

ID	Description
Noise measurements	
M1	Southern boundary of 343-383 Lorimer Street, Port Melbourne This noise measurement location was considered representative of the prevailing acoustic conditions at C1 – Port of Melbourne Education Centre
M2	Northern Boundary of 506 Lorimer Street, Port Melbourne This noise measurement location was considered representative of the prevailing acoustic conditions at C2 – Defence Science and Technology Group This noise measurement location corresponds with vibration measurement location V2
M3	North-eastern boundary of 344 Lorimer Street, Port Melbourne This noise measurement location was considered representative of the prevailing acoustic conditions at C3 – mixed commercial/industrial building
M4	Southern boundary of 465 Lorimer Street, Port Melbourne This noise measurement location was considered representative of existing noise levels at the subject site This noise measurement location corresponds with vibration measurement location V1 (note that the noise measurement location was not located directly adjacent the vibration measurement in order to avoid nearfield acoustic effects on the noise measurement)
Vibration measurements	
V1	Roadside beyond southern boundary of 465 Lorimer Street, Port Melbourne This vibration measurement location was considered representative of existing vibration levels at the subject site This vibration measurement location corresponds with noise measurement location M4
V2	Northern Boundary of 506 Lorimer Street, Port Melbourne This vibration measurement location was considered representative of the prevailing acoustic conditions at C2 – Defence Science and Technology Group This vibration measurement location corresponds with noise measurement location M2

Figure 7: Noise and vibration measurement locations

The measured noise levels are provided in Table 29 below.

Table 29: Measured noise levels, pass-by

Measurement location	Measurement time	Measured noise levels		Comment
		L_{A90}	L_{Aeq}	
M1	0745 – 0815 hrs	58	65	L_{A90} was dominated by engine noise from a container ship passing on the Yarra River L_{Aeq} was dominated by traffic noise from vehicles passing on Lorimer Street and Todd Road, and noise from highly active birds in the nearby trees A high proportion of heavy vehicle activity was observed
M1	1030 – 1100 hrs	53	65	A secondary noise measurement at M1 was undertaken in order to account for the potential extraneous influence from the passing container ship and bird noise during the first measurement L_{A90} was dominated by traffic noise from the West Gate Bridge located to the south-west L_{Aeq} was dominated by traffic noise from vehicles passing on Lorimer Street and Todd Road A high proportion of heavy vehicle activity was observed During the noise measurement, additional intermittent workshop noise was detected originating from the boat servicing premises located at 263-329 Lorimer Street

Measurement location	Measurement time	Measured noise levels		Comment
		L_{A90}	L_{Aeq}	
M2	0918 – 0950 hrs	57	69	L_{A90} was dominated by a steady-state noise that appeared to originate from within the Defence Science and Technology property, the noise was consistent with some type of mechanical services L_{Aeq} was dominated by traffic noise from vehicles passing on Lorimer Street A high proportion of heavy vehicle activity was observed An interruption from a Defence Science and Technology staff member was manually excluded from the measurement
M3	0957 – 1027 hrs	55	61	L_{A90} was dominated by traffic noise from the West Gate Bridge located to the south-west and mechanical services noise originating from a location towards the north-west which appeared to be associated with the Port of Melbourne Education Centre A high proportion of heavy vehicle activity was observed L_{Aeq} was dominated by traffic noise from vehicles passing on Lorimer Street and Todd Road
M4	0837 – 0907 hrs	58	66	L_{A90} was dominated by a distant steady-state noise source originating from the north beyond the subject site. It was not possible to identify the exact source of the noise due to visual obstructions from buildings on-site L_{Aeq} was dominated by traffic noise from vehicles passing on Lorimer Street and Todd Road A high proportion of heavy vehicle activity was observed

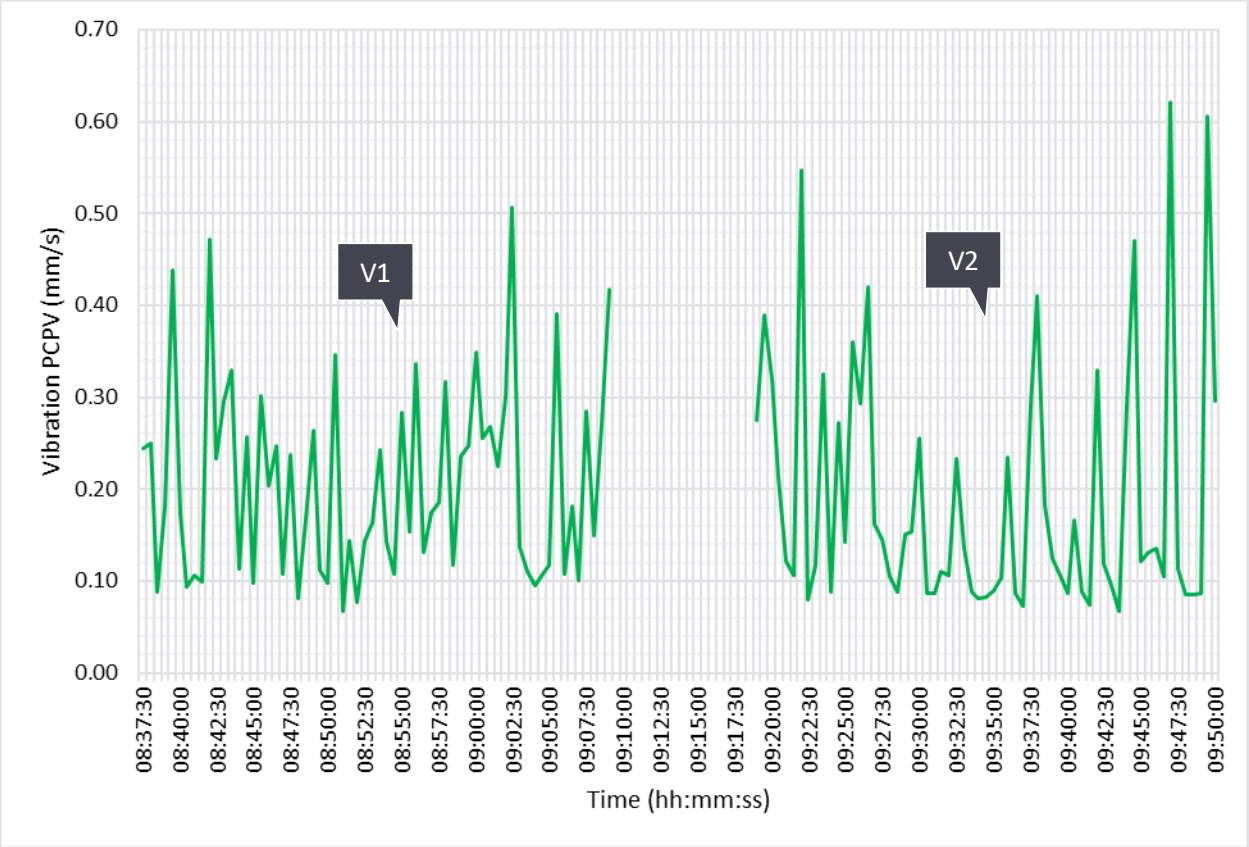
The measured noise levels were consistent with typical noise levels in an areas of similar use, being industrial and commercial areas with a high proportion of heavy vehicle activity.

The measured vibration levels are presented in Table 30 and Figure 8 below.

Table 30: Measured maximum vibration levels, mm/s

Measurement location	Measurement time	Measured vibration levels, PCPV	Comment
V1	0837 – 0907 hrs	0.507	Maximum vibration levels were associated with heavy vehicle pass-by
V2	0918 – 0950 hrs	0.621	Maximum vibration levels were associated with heavy vehicle pass-by

Figure 8: Measured vibration level time trace, mm/s



APPENDIX F DERIVATION OF NOISE PROTOCOL LIMITS

The assessment of noise from the subject site under the Noise Protocol is based on the calculation of a noise limit at a receiver position, taking into account a zoning level derived from the land zoning types in the surrounding area and the background noise level.

At the time when the acoustic assessment work was initiated, Metropolitan Melbourne was subject to the global COVID-19 pandemic resulting in '*stay-at-home*' and movement restriction measures being imposed on occupants of the city. Due to this, it was not possible to deploy unattended noise monitors or undertake attended noise measurements. Further, it is expected that current background noise levels may not be representative of typical background noise levels due to the altered commercial, industrial and road traffic activity occurring during this time.

As such, it has been deemed appropriate to classify background conditions at the noise-sensitive receiver locations as neutral, based on previous noise measurements conducted in the area indicating that the surrounding noise sensitive receivers are subject to neutral or high background noise levels.

Table 31: Noise Protocol noise limits, 232 Williamstown Road, Port Melbourne (R1), dB L_{eff}

Period	Day	Time	Zoning level	Background classification	Limit
Day	Monday-Saturday	0700-1800 hrs	57	Neutral	57
Evening	Monday-Saturday	1800-2200 hrs	50	Neutral	50
	Sunday/Public Holidays	0700-2200 hrs			
Night	Monday-Sunday/Public Holidays	2200-0700 hrs	45	Neutral	45

Table 32: Noise Protocol noise limits, 282 Williamstown Road, Port Melbourne (R2) , dB L_{eff}

Period	Day	Time	Zoning level	Background classification	Limit
Day	Monday-Saturday	0700-1800 hrs	55	Neutral	55
Evening	Monday-Saturday	1800-2200 hrs	48	Neutral	48
	Sunday/Public Holidays	0700-2200 hrs			
Night	Monday-Sunday/Public Holidays	2200-0700 hrs	43	Neutral	43

Table 33: Noise Protocol noise limits, 10 Francis Street, Yarraville (R3) , dB L_{eff}

Period	Day	Time	Zoning level	Background classification	Limit
Day	Monday-Saturday	0700-1800 hrs	63	Neutral	63
Evening	Monday-Saturday	1800-2200 hrs	56	High	57
	Sunday/Public Holidays	0700-2200 hrs			
Night	Monday-Sunday/Public Holidays	2200-0700 hrs	51	Neutral	51

Table 34: Noise Protocol noise limits, 6 Frederick Street, Yarraville (R4) , dB L_{eff}

Period	Day	Time	Zoning level	Background classification	Limit
Day	Monday-Saturday	0700-1800 hrs	59	Low	57
Evening	Monday-Saturday	1800-2200 hrs	53	Neutral	53
	Sunday/Public Holidays	0700-2200 hrs			
Night	Monday-Sunday/Public Holidays	2200-0700 hrs	48	High	50

Table 35: Noise Protocol noise limits, 81 S Wharf Drive, Docklands (R5) , dB L_{eff}

Period	Day	Time	Zoning level	Background classification	Limit
Day	Monday-Saturday	0700-1800 hrs	56	Neutral	56
Evening	Monday-Saturday	1800-2200 hrs	49	High	54
	Sunday/Public Holidays	0700-2200 hrs			
Night	Monday-Sunday/Public Holidays	2200-0700 hrs	44	High	48

APPENDIX G NOISE AND VIBRATION MEASUREMENTS OF EXISTING EQUIPMENT

Attended noise measurements were conducted on Wednesday 9th June 2021 at Cement Australia's Port Kembla Milling facility (PKM) to determine representative equipment noise levels to inform the current assessment.

It should be noted that the PKM facility is approximately three times larger than the proposal and includes larger plant items than many of those proposed for the Lorimer Street site. Therefore, the noise and vibration levels measured at the PKM facility are considered conservative.

Details of the noise and vibration measurement equipment used for the survey are provided below:

- Brüel and Kjær type 2250 sound level meter (s/n: 3010265), fitted with proprietary windshield and mounted on a tripod at a height of approximately 1.5 m above ground level in the free field. Measurements were conducted using the 'F' response time and A-weighted frequency network. The sound level meter was calibrated before and after testing using a 01dB Cal31 calibrator (s/n: 34164983) and no significant drift was observed
- Brüel and Kjær type 2250 sound level meter (s/n: 3010249), fitted with a Brüel and Kjær type 4507 external accelerometer (s/n: 12187) mounted as indicated in Table 37

The equipment used for the survey carry current NATA certification and comply with applicable calibration requirements.

Weather conditions during the survey were suitably calm and dry as to be conducive to noise and vibration measurements.

Table 36 below presents a summary of the measured noise levels. Noise measurements were conducted in octave band resolution, however overall A-weighted noise levels are presented for readability.

Table 36: Measured equipment noise levels, dB

Description, distance	Measurement time	Measured/estimated noise level, L_{Aeq}	Comment
Receival hopper/in-load hopper, 5 m	0908 hrs	< 77	Hopper noise level was observed to be lower than extraneous noise (trucks, roller mill equipment) therefore clear measurement of the hoppers' contribution was not possible Main noise from hopper included noise from the raw GBFS material (sand-like consistency) moving through the hopper chute Based on the on-site observations, the hopper is not expected to be a dominant noise source
Roller mill motor, 3 m	0919 hrs	< 88	Roller mill motor noise measurement included some contribution from a nearby vibrating plate equipment Cement Australia have confirmed that the identified extraneous noise source will not be included at the Lorimer Street facility and therefore influence from this source was excluded as far as practicable
Hot gas fan, 0.5 m (motor)	1238 hrs	86	Measurement included some influence from an additional nearby fan that was unrelated to the hot gas fan motor

Description, distance	Measurement time	Measured/estimated noise level, L_{Aeq}	Comment
Hot gas fan, 0.5 m (intake)	1242 hrs	90	Measurement included some influence from nearby noise source unrelated to the hot gas fan intake
Roller mill fan, 2 m (motor)	1015 hrs	93	Measurement included minor contribution from trucks idling nearby
Roller mill fan, 0.5 m (casing)	1022 hrs	79	Measurement included minor contribution from trucks idling nearby
Truck loading area (internal spatial L_p)	1401 hrs	75	The truck loading area measurement included influence from a full cycle of truck-loading, whereby a truck enters the shed and is filled with product via a loading chute The main noise sources within the truck enclosure included noise from idling trucks with some contribution from ancillary equipment (i.e. loading equipment)
Storage shed	-	-	The storage shed was at-capacity with stored product and therefore safe entry was not possible Based on the operators' observation, there were no significant noise sources within the storage shed
Bag filter fan	-	-	The bag filer fan could not be measured due to safe-access restrictions

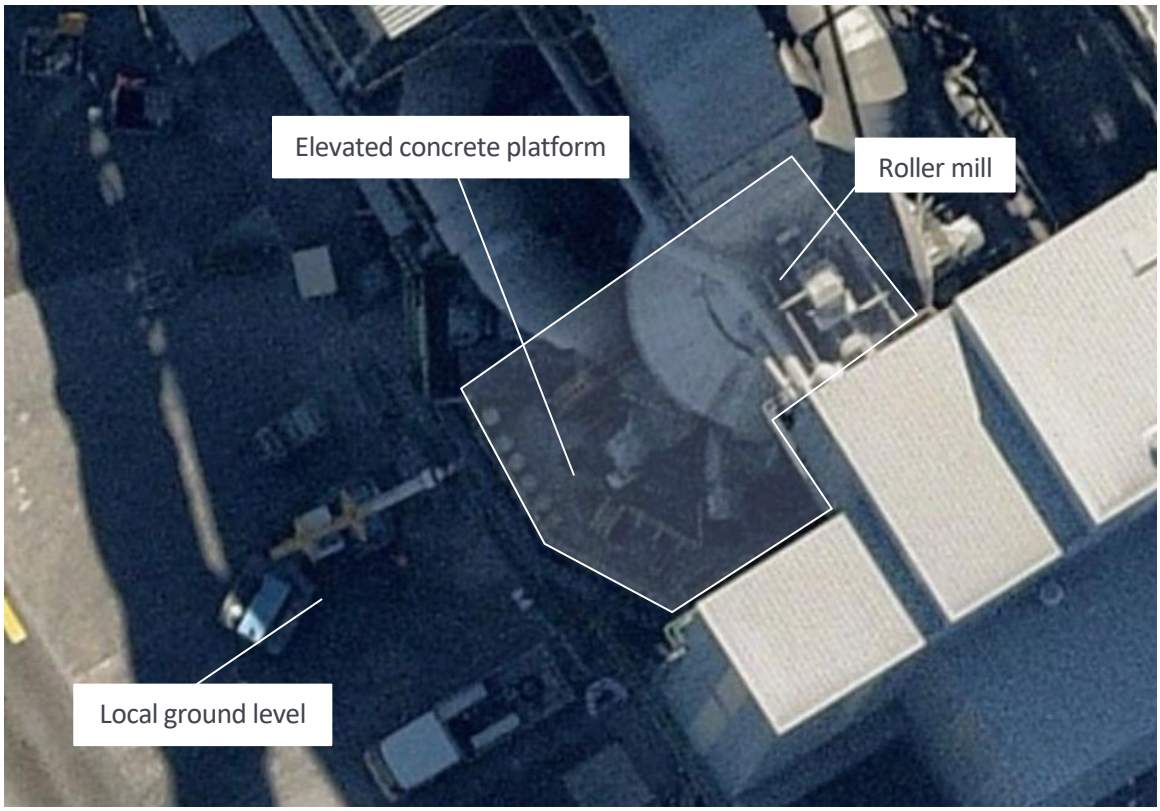
Table 37 below presents a summary of the measured vibration levels near the roller mill. Note that the plant is located on a concrete platform elevated from the local ground level as indicated in Figure 9. No resilient or spring-type mounts appeared to be present between the measured equipment and the concrete platform. Note that vibration propagation is highly dependent on site-specific ground conditions and therefore the vibration levels indicated in Table 37 should be considered indicative only.

Table 37: Measured vibration levels, mm/s

Description, distance	Measurement time	Measured vibration levels, PCPV	Comment
Roller mill base	1125 hrs	1.391	Accelerometer attached to concrete roller mill platform
Roller mill motor base	1134 hrs	1.919	Accelerometer attached to roller mill motor base
Roller mill	1137 hrs	3.619	Accelerometer attached to base of roller mill
2 m from roller mill platform	1157 hrs	0.850	Accelerometer attached to local ground level (concrete)
4 m from roller mill platform	1202 hrs	0.865	Accelerometer attached to local ground level (concrete)
6 m from roller mill platform	1210 hrs	0.826	Accelerometer attached to local ground level (concrete)

Description, distance	Measurement time	Measured vibration levels, PCPV	Comment
12 m from roller mill platform	1216 hrs	0.728	Accelerometer attached to local ground level (concrete)
24 m from roller mill platform	1225 hrs	0.081	Accelerometer attached to local ground level (concrete footpath), which appeared to be decoupled from the nearby ground due to a strip of grass and soft dirt

Figure 9: Elevated roller mill platform



APPENDIX H NOISE MODEL INPUT DATA AND ASSUMPTIONS

Feature	Description
Site terrain data	Sourced from Victoria State Government department of Environment, Land, Water and Planning Spatial Datamart
Surrounds terrain data	Sourced from Victoria State Government department of Environment, Land, Water and Planning Spatial Datamart
Environmental ground conditions	Site and surrounding ground is assumed to be 100 % 'hard ground', accounting for paved areas
Site plan	Supplied by Cement Australia
Equipment schedules	Supplied by Cement Australia
Building heights on site	Supplied by Cement Australia in site plan
Dwelling and surrounding building heights	Assumed to be single storey for a conservative assessment
Receiver heights	1.5 m above ground (residential); worst affected based on observed building heights and nominal 3 m per storey (commercial)
Noise calculation method	Noise propagation calculated according to ISO 9613-2:1996
Description of proposed activities on site	Supplied by Cement Australia
Noise data for ancillary equipment	Sourced from manufacturers' data, measurement data, AS 2436:2010 and BS 5228-1:2009 and empirical estimation methods as necessary. See Table 38
Noise data for trucks	Sourced from measurement data
Noise data for internal shed areas	Calculated based on database measurement data for gantry cranes
Noise data for fans and motors	Per Table 38
Noise data for vessels	Estimated based on empirical method as discussed in Table 38
Truck speed	10 km/h, discussed with Traffic Consultant
Truck schedules	Supplied by Traffic Consultant, note that volumes may be refined as clearer detail becomes available
Plant operating height	Per Table 38
Operating durations	Truck durations based on truck volumes, and speed on site All other noise sources presumed to operate for full 30-minute assessment period

Table 38: Indicative equipment noise level data – for feasibility assessment purposes, dB

Source	Noise source height	Octave Band Centre Frequency (Hz)								Basis of noise level
		A	63	125	250	500	1k	2k	4k	
Receival hoppers, L_{eq} L_w	10 m	82	88	80	79	77	77	75	73	Measurements at existing Cement Australia facility (see Table 36)
Roller mill separator motor, L_{eq} L_w	15 m	97	84	87	89	92	92	91	86	Estimated[1] based on the following: Rating – 152 kW Speed – 600 – 1500 RPM *Note: noise measurement of roller mill separator motor was not possible at the existing Cement Australia facility due to access restraints and extraneous noise*
Roller mill motor, L_{eq} L_w	2 m	102	102	99	99	96	100	93	85	Measurements at existing Cement Australia facility (see Table 36)
Roller mill fan (casing), L_{eq} L_w	3 m	103	103	99	106	103	93	87	81	Based on manufacturers' data
Roller mill fan (outlet), L_{eq} L_w	52 m	109	115	110	112	108	102	98	94	Based on manufacturers' data
Roller mill fan motor, L_{eq} L_w	3 m	104	98	93	90	86	99	101	87	Measurements at existing Cement Australia facility (see Table 36)

Source	Noise source height	Octave Band Centre Frequency (Hz)								Basis of noise level
		A	63	125	250	500	1k	2k	4k	
Bag filter fan, L_{eq} L_w	45 m	95	98	97	98	93	88	83	78	Estimated[3] based on the following: Airflow – 1 m^3/s Static pressure – 2500 Pa Spectral values based on empirical spectral adjustment for centrifugal fans[2] *Note: noise measurement of bag filter fan was not possible at the existing Cement Australia facility due to access restraints and extraneous noise*
Hot gas fan motor	1.5 m	88	96	90	87	87	80	80	76	Measurements at existing Cement Australia facility (see Table 36)
Hot gas fan exhaust	1.5 m	92	97	93	92	84	86	86	84	Measurements at existing Cement Australia facility (see Table 36)
Conveyors, L_{eq} L_w/m	10 m	72	80	75	75	69	65	61	59	MDA database noise level
Storage shed, internal L_{eq} L_p	15 m	75	83	82	72	72	70	67	60	Calculated based on MDA database noise level for gantry cranes Accounts for two cranes operating at steady state for a full 30-minute period *Note: during the site inspection at the existing Cement Australia facility, no significant noise was observed inside the storage shed*
Truck filling enclosure, internal L_{eq} L_p	6 m	75	80	77	75	74	70	67	61	Measurements at existing Cement Australia facility (see Table 36)

Source	Noise source height	Octave Band Centre Frequency (Hz)								Basis of noise level
		A	63	125	250	500	1k	2k	4k	
Grabber/crane , L_{eq} L_w	14 m	104	112	111	101	101	99	96	89	MDA database spectrum and midpoint of typical sound power level for cranes provided in *AS 2436: 2010 – Guide to noise and vibration control on construction, demolition and maintenance sites*
Vessel idling, , L_{eq} L_w	30 m	108	115	109	107	105	103	100	94	Overall noise level for relevant vessel size for site (up to 50,000 DWT) calculated via empirical method[4] Spectral values based on MDA database levels Note, noise associated with vessels is highly variable and it is recommended that validation noise measurements are conducted at the specific site once operations have commenced
Semi trailer/ Articulated Vehicle AV moving through site, L_{eq} L_w	2 m	106	109	111	106	101	99	98	97	MDA database noise level

[1] Method provided in *Engineering Noise Control – Theory and Practice*, David A. Bies and Colin H. Hansen, 3rd edition

[2] Method provided in *Noise Control of Building Services*, SRL, 1st edition

[3] Method provided in *Flakt Woods Practical Guide to Noise Control*, Ian Sharland, 9th edition and refined in MDA noise calculation methodology database

[4] Methodology provided in *Noise from moored ships*, Rob Witte, published in *Internoise,* 2010