

# Noise Management Plan

**'Rivermark' Area 3 Subdivision**

Reference: 20085657-14a Area 3

**Prepared for:**  
Hesperia

## Report: 20085657-14a Area 3

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# 1 INTRODUCTION

Hesperia Pty Ltd is the Development Manager for the owners of the land (Capitary No.2) east of Cranwood Crescent in Viveash, previously occupied by the Midland Brick Industrial site. This report forms the Noise Management Plan (NMP) for Area 3 of the project as located in *Figure 1-1*. The subdivision plan is shown in *Figure 1-2*.



*Figure 1-1 Project Locality*

Specifically, this report considers:

- Midland Brick noise against the prescribed standards of the *Environmental Protection (Noise) Regulations 1997*.
- Aircraft noise against *State Planning Policy 5.1 Land Use Planning in the Vicinity of Perth Airport* and *Australian Standard 2021:2015 Acoustics – Aircraft Noise Intrusion – Building Siting and Construction*.

It is relevant to note that the new owners of the Midland Brick site have a vision to progress the orderly staged contraction of the brickworks footprint to an area north of Bassett Road. This consolidation has commenced with the removal of Kilns 7 and 8 from Part V License, brick storage has now been removed from south of Bassett Road and Kiln 11 has been decommissioned as per the amended license issued 26 June 2023.

*Appendix B* contains a description of some of the terminology used throughout this report.





Figure 1-2 Subdivision Plan

## 2 CRITERIA

### 2.1 Industrial Noise

Noise from the Midland Brick site to the proposed urban development is governed by the *Environmental Protection Act 1986*, through the *Environmental Protection (Noise) Regulations 1997* (the Regulations). Work associated with this assessment was undertaken by Herring Storer Acoustics (HSA) with their report provided in *Appendix A*<sup>1</sup>.

Regulation 7 defines the prescribed standard for noise emissions as follows:

- “7. (1) Noise emitted from any premises or public place when received at other premises –
- (a) Must not cause or significantly contribute to, a level of noise which exceeds the assigned level in respect of noise received at premises of that kind; and
  - (b) Must be free of –
    - i. tonality;
    - ii. impulsiveness; and
    - iii. modulation,
 when assessed under regulation 9”

A “...noise emission is taken to significantly contribute to a level of noise if the noise emission ... exceeds a value which is 5 dB below the assigned level...”

Tonality, impulsiveness and modulation are defined in Regulation 9. Noise is to be taken to be free of these characteristics if:

- (a) The characteristics cannot be reasonably and practicably removed by techniques other than attenuating the overall level of noise emission; and
- (b) The noise emission complies with the standard prescribed under regulation 7 after the adjustments of *Table 2-1* are made to the noise emission as measured at the point of reception.

**Table 2-1 Adjustments Where Characteristics Cannot Be Removed**

| Where Noise Emission is Not Music |            |               | Where Noise Emission is Music |               |
|-----------------------------------|------------|---------------|-------------------------------|---------------|
| Tonality                          | Modulation | Impulsiveness | No Impulsiveness              | Impulsiveness |
| + 5 dB                            | + 5 dB     | + 10 dB       | + 10 dB                       | + 15 dB       |

Note: The above are cumulative to a maximum of 15dB.

The baseline assigned levels (prescribed standards) are specified in Regulation 8 and are shown in *Table 2-2*.

<sup>1</sup> *Acoustic Assessment, Midland Brick Site Redevelopment; July 2021, Reference: 27982-2-20355-02*

Table 2-2 Baseline Assigned Noise Levels

| Premises Receiving Noise                                     | Time Of Day  | Assigned Level (dB)     |                         |                         |
|--|--|-------------------------|-------------------------|-------------------------|
|  |  | L <sub>A10</sub>        | L <sub>A1</sub>         | L <sub>Amax</sub>       |
| Noise sensitive premises: highly sensitive area <sup>1</sup> | 0700 to 1900 hours Monday to Saturday (Day)  | 45 + influencing factor | 55 + influencing factor | 65 + influencing factor |
|  | 0900 to 1900 hours Sunday and public holidays (Sunday)   | 40 + influencing factor | 50 + influencing factor | 65 + influencing factor |
|  | 1900 to 2200 hours all days (Evening)  | 40 + influencing factor | 50 + influencing factor | 55 + influencing factor |
|  | 2200 hours on any day to 0700 hours Monday to Saturday and 0900 hours Sunday and public holidays (Night) | 35 + influencing factor | 45 + influencing factor | 55 + influencing factor |

1. **highly sensitive area** means that area (if any) of noise sensitive premises comprising —
- (a) a building, or a part of a building, on the premises that is used for a noise sensitive purpose; and
  - (b) any other part of the premises within 15 metres of that building or that part of the building.

The influencing factor, applicable at noise sensitive premises varies depending upon their proximity to commercial and industrial zoned land within a 450 metre radius. As such, the assigned noise level varies at different future residences within the existing and proposed urban zoned land and becomes a complex analysis. HSA has discussed the assigned noise levels in their report in Section 4.0, providing Map C, shown as *Figure 2-1*, demonstrating the various assigned levels based on the ultimate scenario (Masonry Facility only). The influencing factor across Area 3 is shown to be 0 dB and thus the assigned night-time level is 35 dB L<sub>A10</sub>.



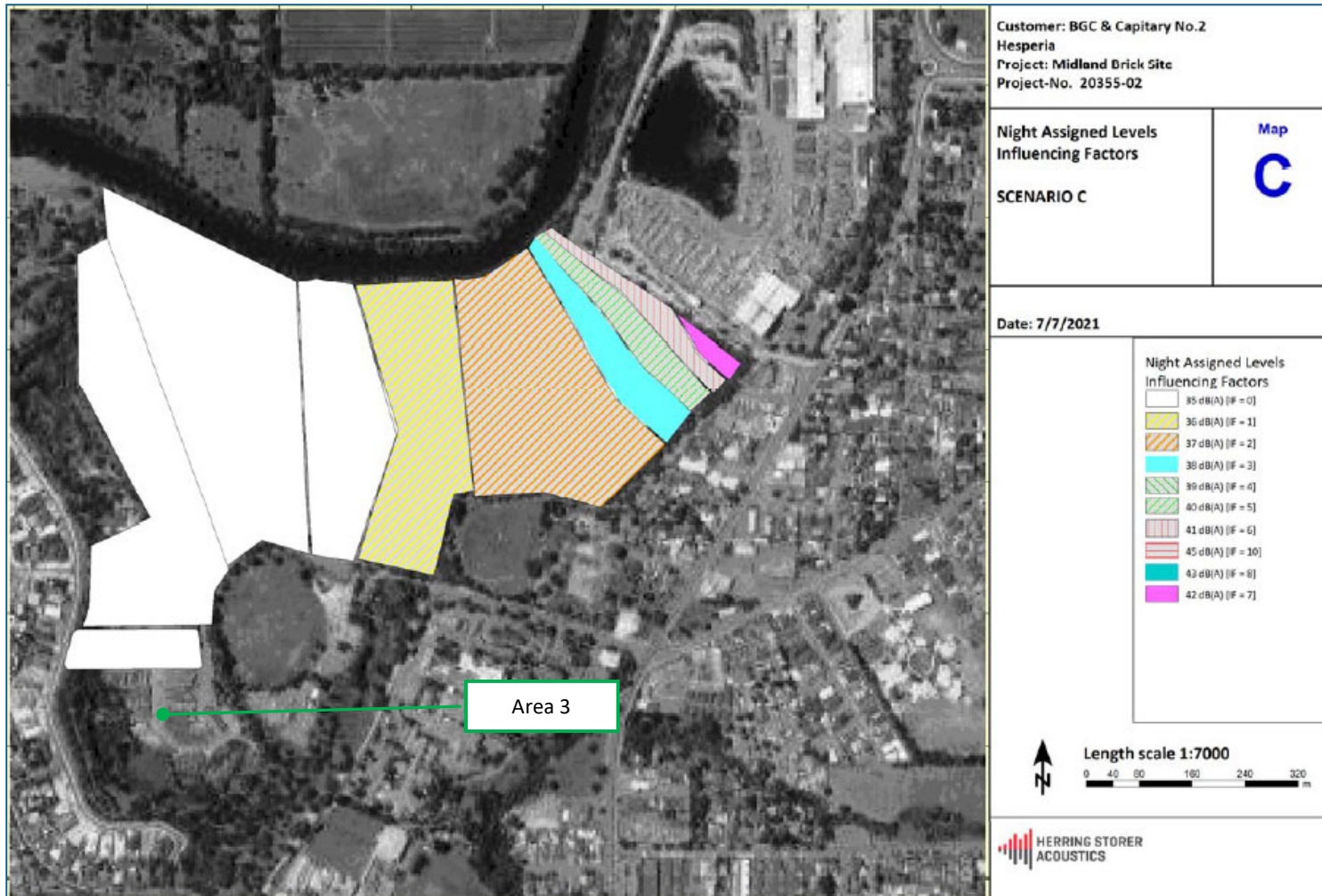


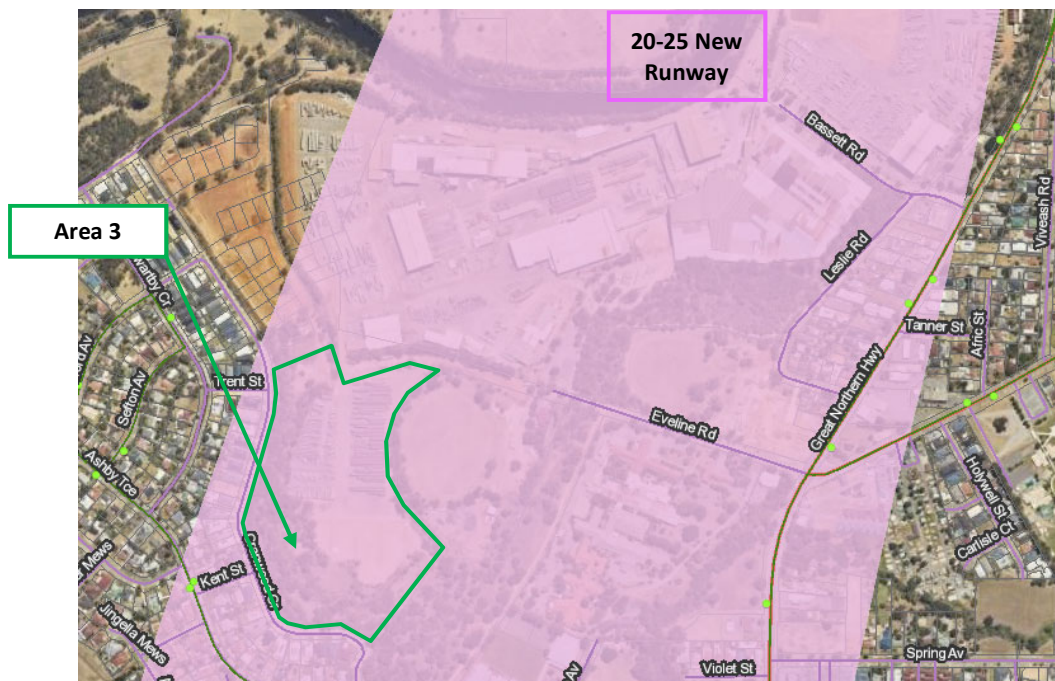
Figure 2-1 Night-time Assigned Noise Levels (HSA)

## 2.2 Aircraft Noise

The relevant planning policy in Western Australia in relation to aircraft noise is *State Planning Policy 5.1 Land Use Planning in the Vicinity of Perth Airport*; July 2015, Western Australian Planning Commission (SPP 5.1). SPP 5.1 applies to any land within ANEF 20 and separates land into three zones:

- Areas below 20 ANEF;
- Areas between 20 ANEF and 25 ANEF; and
- Areas above 25 ANEF.

The entirety of Area 3 falls within 20 ANEF (refer *Figure 2-2* where the pink shading is the 20-25 ANEF zone). Note that the ANEF contours are associated with the future parallel runway.



**Figure 2-2 ANEF Contour Over Site**

For areas within the 20-25 ANEF contour, SPP 5.1 states the following:

- Maximum residential density should be limited to R20;
- Noise insulation is not mandatory for residential development. Some areas however, may experience peak aircraft noise levels in excess of the Indoor Design Levels specified in AS2021, and noise insulation is recommended in such cases.
- Closure of windows and other openings to habitable rooms can significantly reduce the intrusion of aircraft noise. This will normally require forced ventilation, and may also necessitate some form of active cooling, such as refrigerative air conditioning. The operational management of buildings however, is outside the ambit of this policy, and will therefore be subject only to advice.
- A 'notice on title' advising of the potential for noise nuisance is to be required as a condition of any subdivision or planning approval within this noise exposure zone.

## 3 METHODOLOGY

### 3.1 Industrial Noise

As described, Herring Storer Acoustics (HSA) was engaged to undertake noise modelling from the Midland Brick site. HSA has used the noise modelling package *SoundPLAN 8.2* along with the *CONCAWE* algorithms and worst-case meteorological conditions as part of the assessment – refer *Appendix A* for full report and methodology.

### 3.2 Aircraft Noise

*Figure 2-2* showed Area 3 will be within the 20-25 ANEF contour. SPP 5.1 states that whilst noise insulation is not mandatory, some areas may experience maximum aircraft noise levels in excess of the Indoor Design Sound Levels specified in AS2021<sup>2</sup>, and noise insulation is recommended in such cases. Guidance on noise insulation measures is contained within the Western Australian Planning Commission report, *Aircraft Noise Insulation for Residential Development in the Vicinity of Perth Airport* (Noise Insulation report).

The ANEF contours are a planning tool and do not represent actual noise levels. As such, Perth Airport also produce N65 Contours, which represent the average number of daily aircraft above a noise level of 65 dB  $L_{Amax}$ , considered to represent a point at which normal conversation may be disturbed. An extract of these contours taken from *Perth Airport Master Plan 2020 Summary* is provided in *Figure 3-1* with the approximate location of Area 3. This shows that the area is expected to be subjected to 100-200 events per day above a noise level of 65 dB  $L_{Amax}$ .

Aircraft noise levels can be further explored by using the AS2021:2015 look-up tables. For this runway and area, the departing Airbus 330 is likely to result in the worst-case maximum noise levels. An extract of the noise level table for this aircraft is provided in *Figure 3-2* noting the noise level varies with distance from the far end of the runway (DT) and the offset (DS) distance (refer *Figure 3-3*). The relevant noise levels are within the red area in *Figure 3-2*.

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<sup>2</sup> Indoor design sound levels for residences are 50 dB  $L_{Amax}$  in bedrooms and 55 dB  $L_{Amax}$  in living areas.

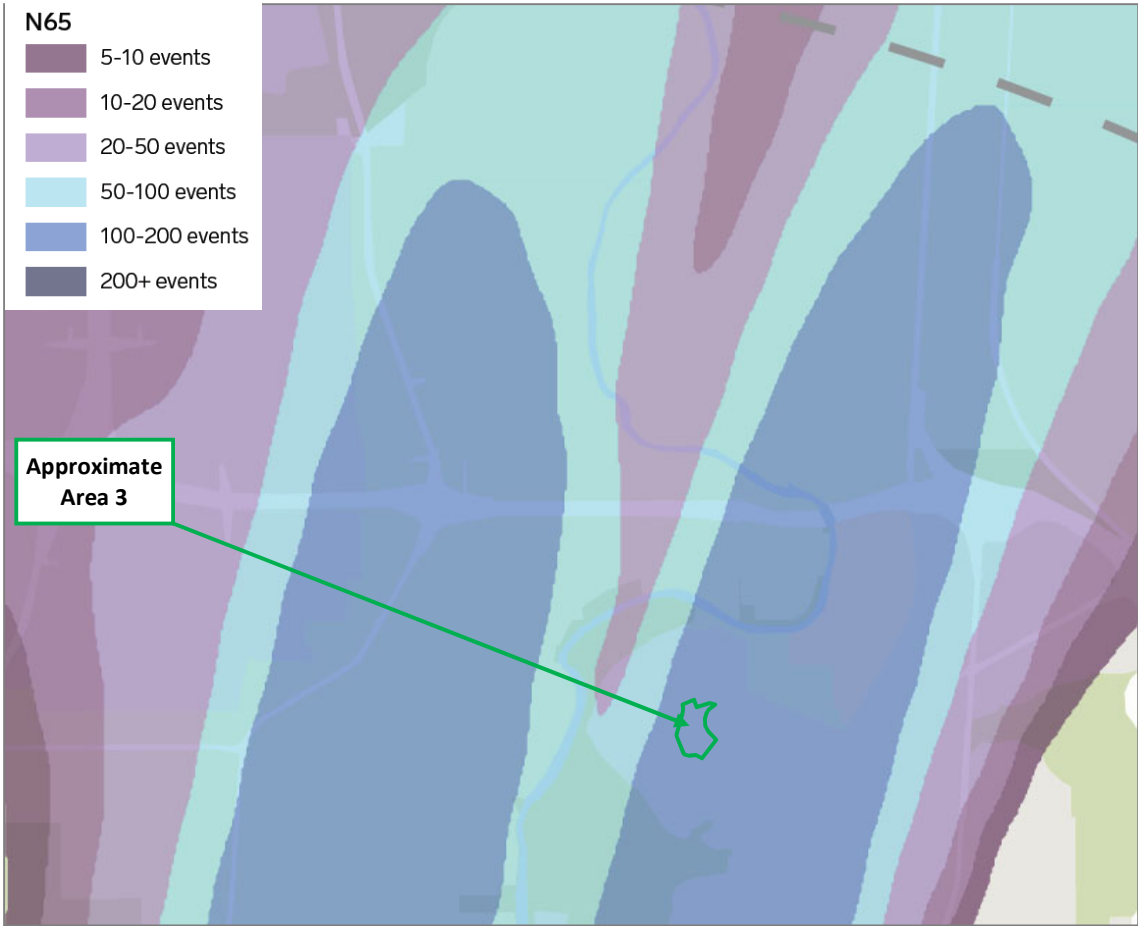


Figure 3-1 Site Locality in Relation to Ultimate N65 Contours

**NOISE LEVELS FOR AIRBUS A330-301 DEPARTURES**

| Centre-line distance (DT), m | Noise levels, dB(A)       |     |     |     |     |     |     |     |     |     |      |      |      |      |      |      |      |      |      |
|------------------------------|---------------------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|------|------|------|------|------|
|                              | Sideline distance (DS), m |     |     |     |     |     |     |     |     |     |      |      |      |      |      |      |      |      |      |
|                              | 0                         | 100 | 200 | 300 | 400 | 500 | 600 | 700 | 800 | 900 | 1000 | 1200 | 1400 | 1600 | 1800 | 2000 | 2200 | 2400 | 2600 |
| 10 000                       | 77                        | 77  | 76  | 76  | 76  | 75  | 74  | 73  | 72  | 72  | 71   | 69   | 67   | 65   | 63   | 62   | 60   | 59   | 57   |
| 10 500                       | 76                        | 76  | 76  | 75  | 75  | 74  | 74  | 73  | 72  | 71  | 70   | 68   | 67   | 65   | 63   | 62   | 60   | 59   | 58   |
| 11 000                       | 75                        | 75  | 75  | 75  | 74  | 74  | 73  | 73  | 72  | 71  | 70   | 68   | 67   | 65   | 63   | 62   | 60   | 59   | 58   |
| 11 500                       | 75                        | 75  | 75  | 74  | 74  | 74  | 73  | 72  | 72  | 71  | 70   | 68   | 67   | 65   | 63   | 62   | 60   | 59   | 58   |
| 12 000                       | 75                        | 75  | 74  | 74  | 74  | 73  | 73  | 72  | 72  | 71  | 70   | 68   | 67   | 65   | 63   | 62   | 61   | 59   | 58   |
| 12 500                       | 74                        | 74  | 74  | 74  | 74  | 73  | 73  | 72  | 72  | 71  | 70   | 68   | 67   | 65   | 64   | 62   | 61   | 59   | 58   |
| 13 000                       | 74                        | 74  | 74  | 74  | 74  | 73  | 73  | 72  | 71  | 71  | 70   | 68   | 67   | 65   | 64   | 62   | 61   | 59   | 58   |
| 13 500                       | 74                        | 74  | 74  | 74  | 73  | 73  | 73  | 72  | 71  | 71  | 70   | 68   | 67   | 65   | 64   | 62   | 61   | 59   | 58   |
| 14 000                       | 74                        | 74  | 74  | 73  | 73  | 73  | 72  | 72  | 71  | 70  | 70   | 68   | 67   | 65   | 64   | 62   | 61   | 59   | 58   |

Figure 3-2 AS2021 Look-up Table for Departing Airbus 330

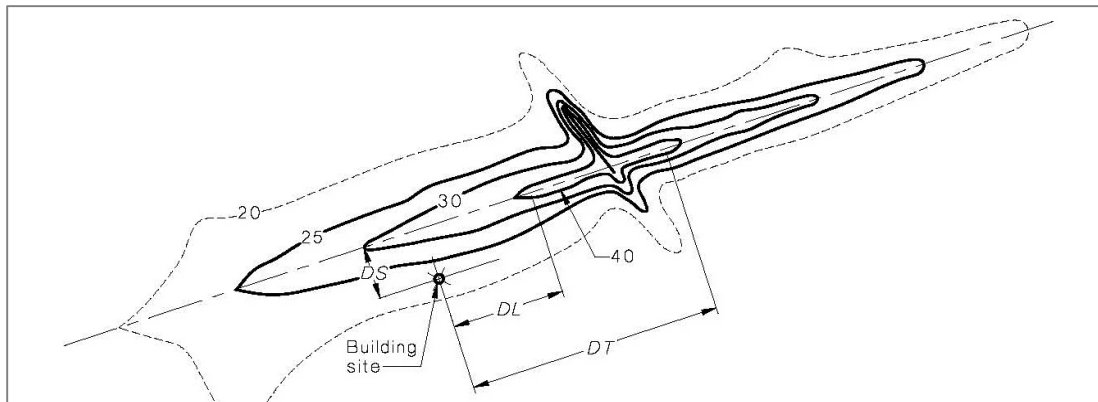


Figure 3-3 AS2021 Determination of Distances

## 4 RESULTS

### 4.1 Industry Noise

Herring Storer Acoustics (HSA) considered three scenarios of noise emissions from the Midland Brick site as follows:

- A. Full brickwork operations north of Bassett Road (i.e. Kilns 9 and 10 and Masonry Facilities) plus the Clay Shed operations south of Bassett Road;
- B. Full operations north of Bassett Road only (i.e. Kilns 9 and 10 and Masonry Facilities and no Clay Shed operations); and
- C. Masonry Facility only, located immediately north of Bassett Road.

#### 4.1.1 Scenario A

In this scenario, everything on the north side of Bassett Road is operational, consisting mostly of Kilns 9 and 10 and the Masonry Facility. The Clay Shed will operate only during the day and evening, with the exception of conveyor transfer of materials from the Clay Shed (bins) to Kilns 9 and 10. This scenario is relevant for between the next 5 and 10 years. Two noise contour plots are provided:

- *Figure 4-1* representing the day/evening scenario, at which time the assigned noise levels are at least 5 dB higher than those during the night, and
- *Figure 4-2* representing the night scenario.

Triple stacked shipping containers are included on the west side of the Clay Shed and double stacked shipping containers at the nearest future residences to act as noise barriers.

The thick red line on these plots indicates the point at which residential development is compliant with the Noise Regulations. Area 3 is outside of this line and therefore considered compliant.



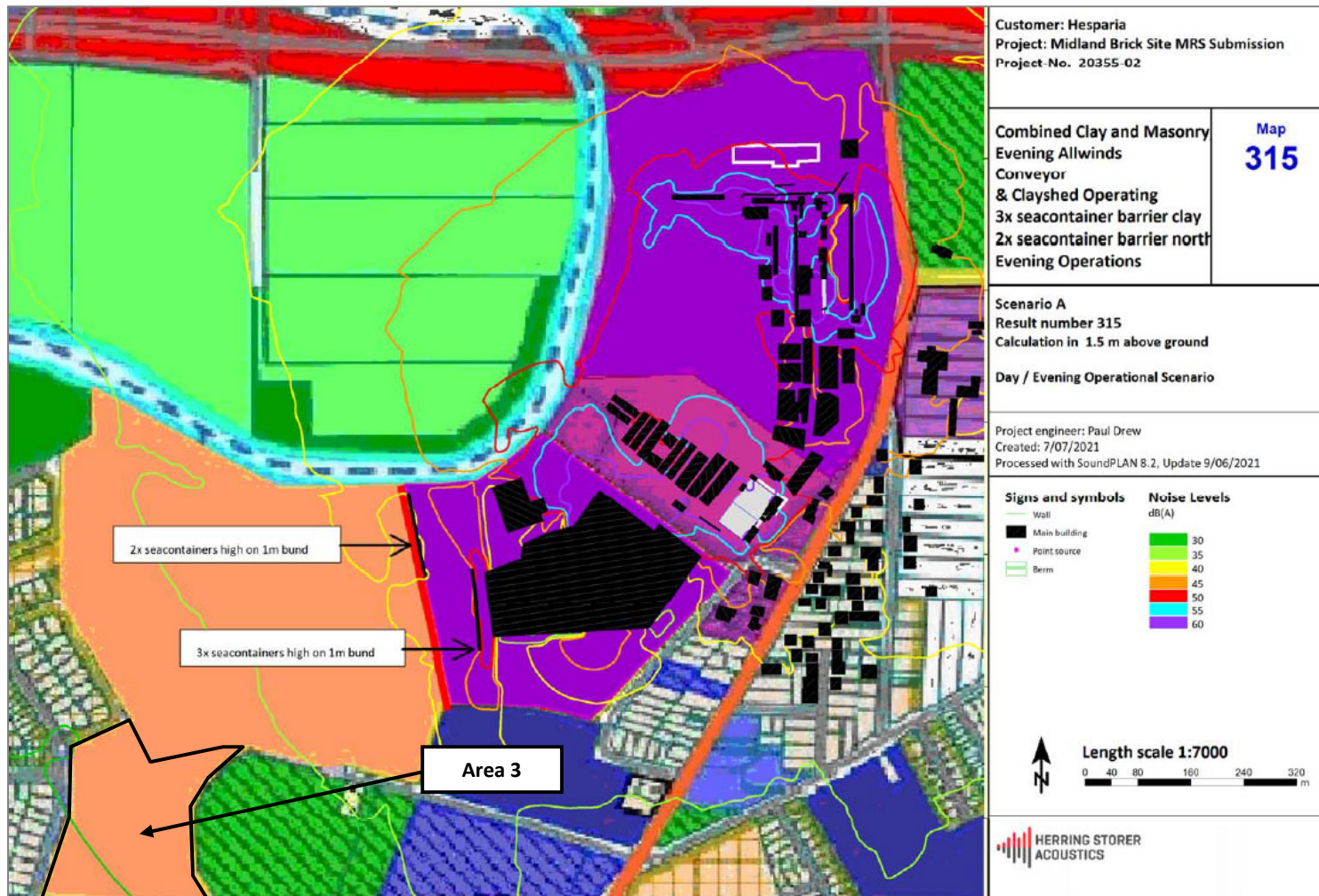


Figure 4-1 Noise Contour Plot: Scenario A Day/Evening Period



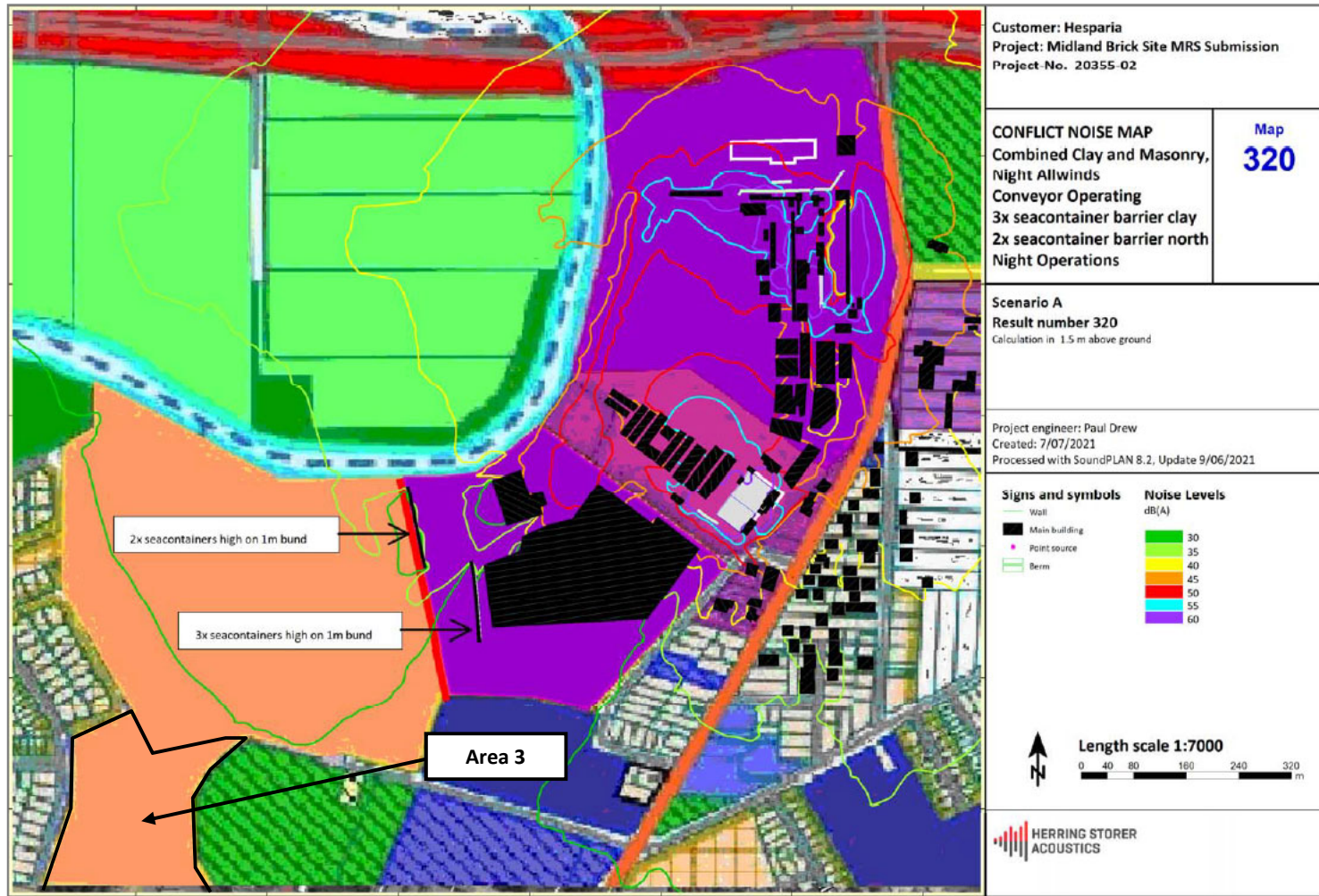


Figure 4-2 Noise Contour Plot: Scenario A Night Period

#### 4.1.2 Scenario B

Scenario B is the same as Scenario A, with the exception that the Clay Shed on the south side of Bassett Road and associated conveyor are no longer in use. Before the Clay Shed is demolished, a 5-metre high wall will be constructed abutting the south side of the masonry lot to act as a noise barrier.

The noise contour plot associated with this scenario is provided in *Figure 4-3*. Also shown is the line indicating the point where compliance is achieved. Area 3 is outside of this line and therefore considered compliant.

#### 4.1.3 Scenario C

Scenario C represents the long term scenario where the only remaining plant operating at the Midland Brick site is the Masonry Facility. This is to be assumed to be operating indefinitely and represents the scenario that will exist in 10-15 years time, depending on whether BGC take up an additional 5 year option for the clay operations.

The noise contour plot associated with this scenario is provided in *Figure 4-4*. Compliance is achieved at all proposed residential land including the proposed Area 3.

#### 4.1.4 Summary

The outcome of the industrial noise assessment by HSA is that noise to Area 3 will comply with the *Environmental Protection (Noise) Regulations 1997* at all times. This is on the basis of:

- the only operations existing south of Bassett Road is the Clay Shed;
- the Clay Shed does not operate during the night, with the exception of the conveyor transfer of materials from the Clay Shed (bins) to kilns 9 and 10;
- Triple stacked shipping containers are included on the west side of the Clay Shed and double stacked shipping containers at the nearest future residences to act as noise barriers.

The above relates to Scenario A. Before the Clay Shed is demolished, a 5-metre high wall will be constructed abutting the south side of the masonry lot to act as a noise barrier.

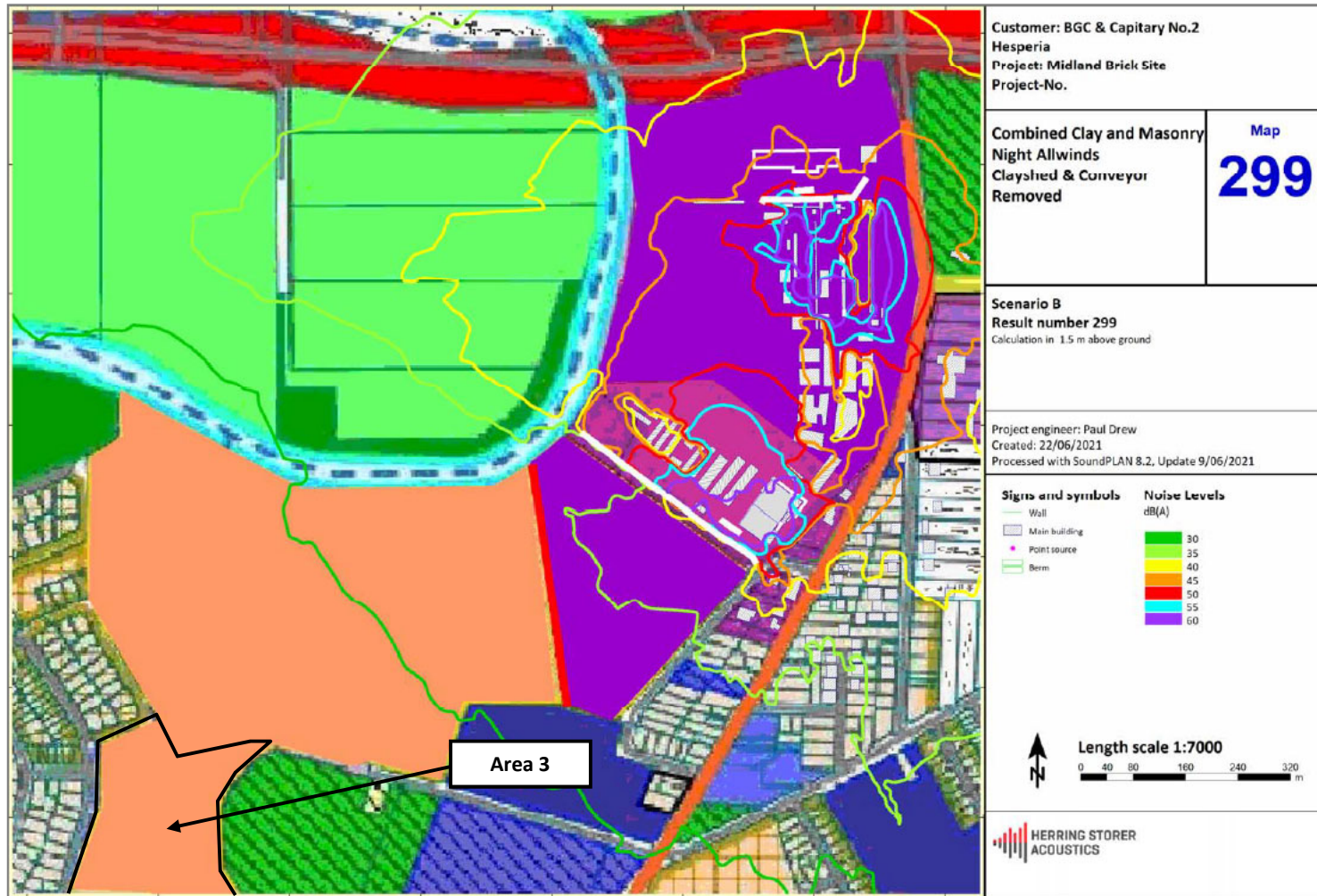


Figure 4-3 Noise Contour Plot: Scenario B



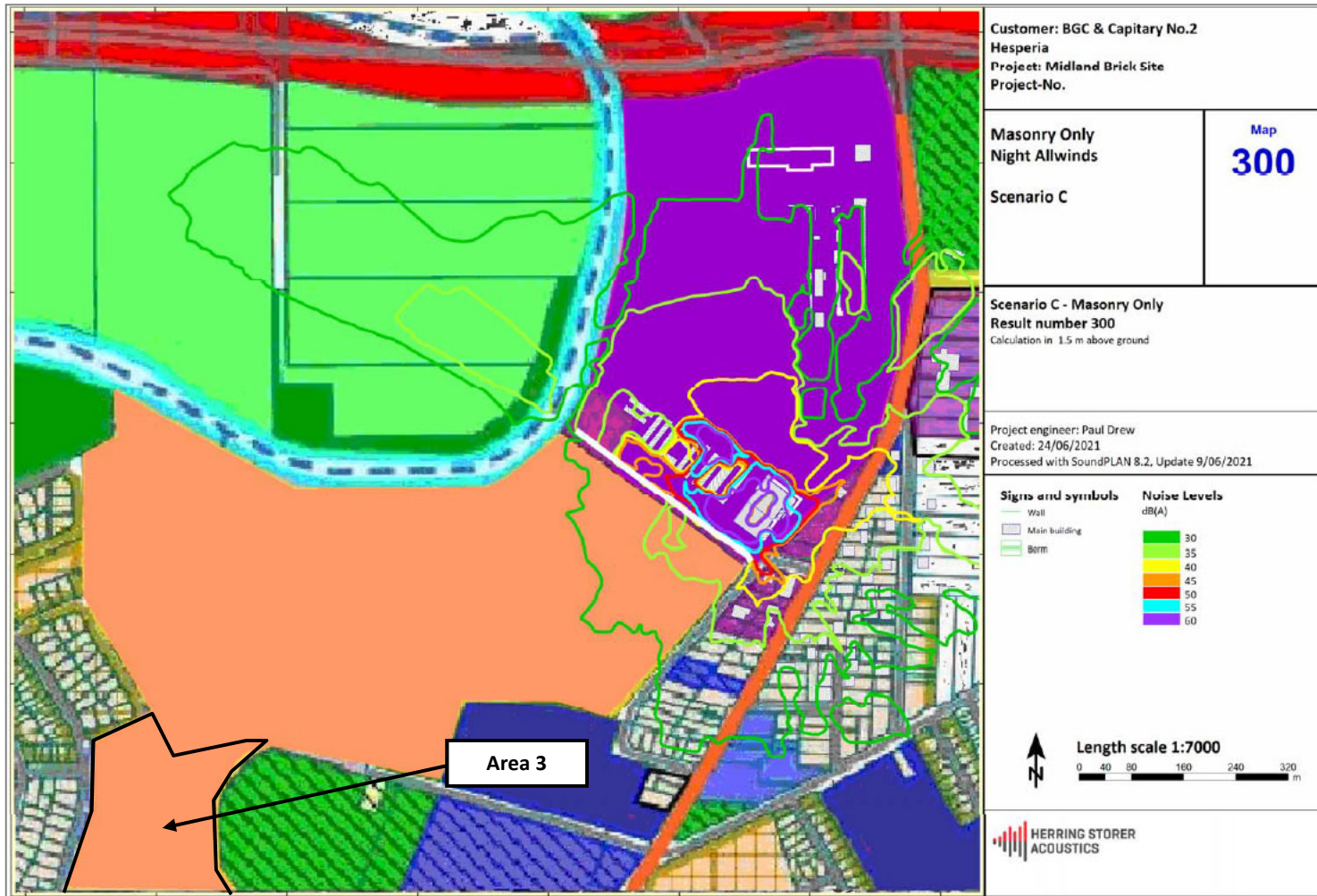


Figure 4-4 Noise Contour Plot: Scenario C

## 4.2 Aircraft Noise

As described in *Section 3.2*, Area 3 is expected to be subjected to 100-200 aircraft events per day above 65 dB  $L_{Amax}$ . The Airbus A330 on departure is expected to align with the typical aircraft maximum noise levels and these have been shown across the site on *Figure 4-5*.

The noise level on the subject site will range 74-75 dB  $L_{Amax}$  from a departing Airbus A330 with arrivals being a similar noise level (within 1 dB) to departures. Other aircraft (Airbus A380 and Boeing 737-700 and 737-800) are also expected to be around the 73-74 dB  $L_{Amax}$  level. The indoor design sound levels from AS2021 for a residential building are 50 dB  $L_{Amax}$  inside bedrooms and 55 dB  $L_{Amax}$  inside living areas, meaning an aircraft noise reduction from outside to inside of 25 dB and 20 dB respectively is required.

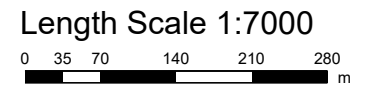
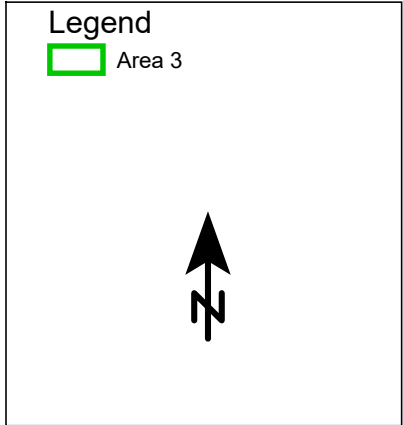
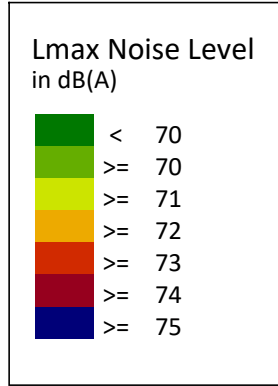
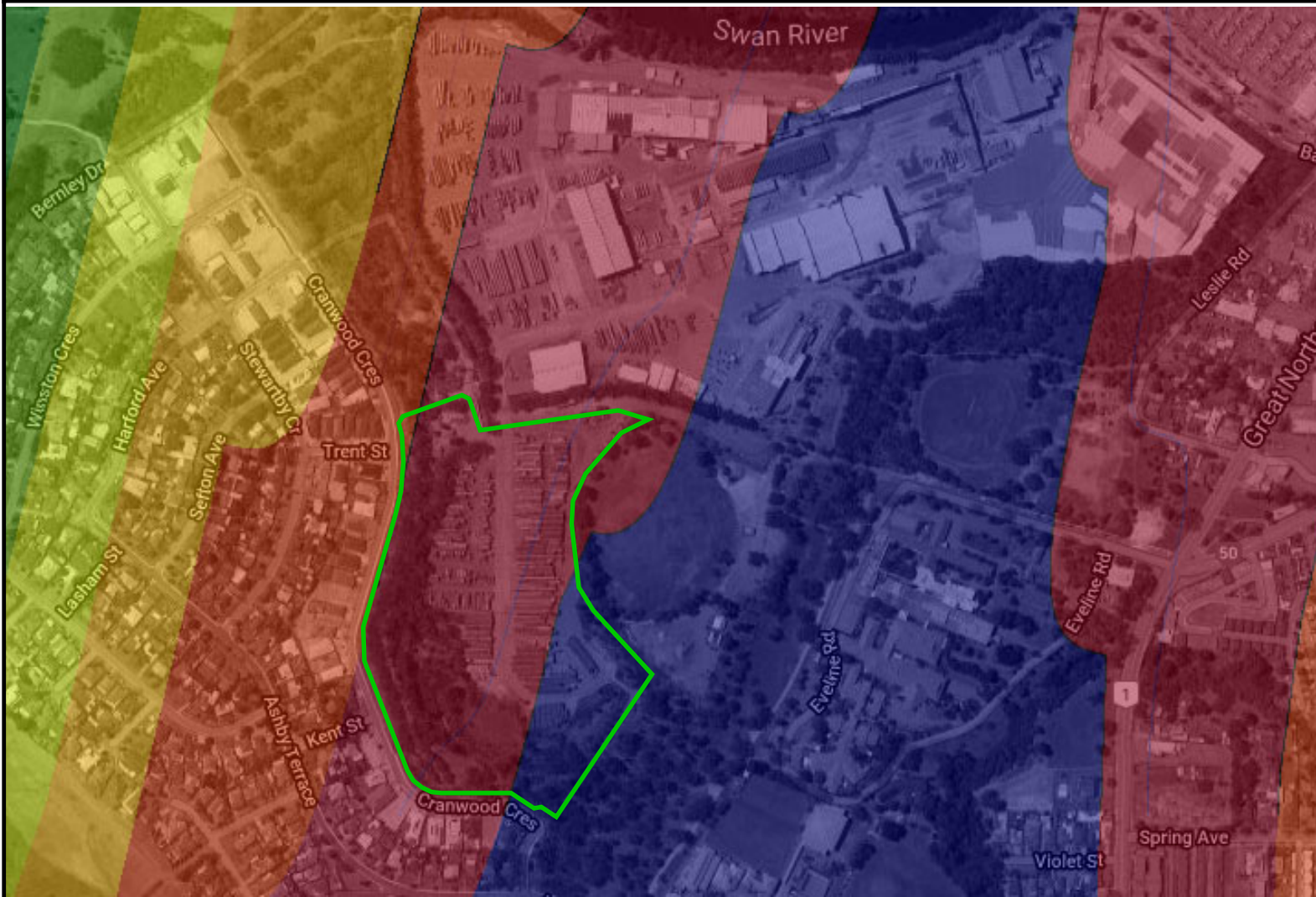
A noise reduction of 20 dB(A) is generally readily achievable with standard construction, provided windows and doors are closed and of a standard size (that is, the larger the glazing the more noise entering via this element). For instance, 4mm thick glass in a sliding window frame is expected to achieve  $R_w + C_{tr}$  20 performance.

SPP 5.1 does not mandate any noise insulation where residences are located within the 20-25 ANEF contour but does require notifications on lot title. Given the expected number of aircraft movements above 65 dB  $L_{Amax}$ , it is suggested that the following be considered:

- Walls to achieve  $R_w + C_{tr}$  45 construction. Appropriate constructions may be:
  - double leaf cavity brickwork; or
  - brick veneer being 90mm brick, 50mm cavity stud with 90mm thick, 11kg/m<sup>3</sup> fibrous insulation and 13mm plasterboard/6mm fibre cement sheet; or
  - 6mm fibre cement sheet to 140mm timber stud with 70mm thick *Soundscreen 2.0* fibrous insulation and 13mm thick sound-rated plasterboard to furring channels and resilient mounts.
- Roof/ceiling to achieve  $R_w + C_{tr}$  35 construction (e.g. 24° metal deck or tiled roof, 10mm thick plasterboard with R4.0 fibrous insulation above). Where a raked ceiling is proposed, plasterboard to be 13mm thick fire/sound-rated;
- All external glazing to habitable rooms be minimum 6mm thick;
- External windows to habitable rooms be fixed or awning style with acoustic seals;
- External sliding doors, bi-fold doors or similar to be fitted with acoustic seals;
- Entry door to be minimum 35mm thick, solid timber core with full perimeter acoustic seals;
- Air-conditioning recommended with fresh air intakes to allow windows to be closed.

The upgraded construction listed above is expected to achieve a 25-28 dB noise reduction (depending on glazing size). Alternative constructions can be assessed by a suitably qualified acoustical consultant (member firm of the Association of Australasian Acoustic Consultants).

# Figure 4-5



Typical Maximum Aircraft Noise Level -  
 Airbus A330 Departure on Future Parallel Runway

**L<sub>Amax</sub> Noise Level Contours Future Runway**

25 August 2021



## 5 CONCLUSION

To manage noise impacts to the proposed urban area of Area 3, the following is proposed to be implemented:

- All residential lots are to incorporate the following notifications:
  - “This lot is in close proximity to an existing bricks works and may be adversely affected by virtue of gaseous, odour, noise and/or dust emissions from that facility.”*
  - “This lot is situated in the vicinity of Perth Airport, and is currently affected, or may in the future, be affected by aircraft noise. Noise exposure levels are likely to increase in the future as a result of increases in numbers of aircraft using the airport, changes in aircraft type or other operational changes. Further information about aircraft noise, including development restrictions and noise insulation requirements for noise affected properties, are available on request from the relevant local government offices.”*
- Section 4.2 provides recommended (not mandatory) construction of dwellings. Incentives will be offered by the developer to purchaser to encourage quite house designs including:
  - All external glazing to be minimum 6mm thick;
  - External operable windows to habitable rooms be fixed or awning style;
  - External sliding doors, bi-fold doors or similar to be fitted with acoustic seals;
  - Timber doors to be minimum 35mm thick, solid timber core with full perimeter acoustic seals.
- No brick work operations shall occur south of Bassett Road other than the Clay Shed. Whilst the Clay Shed remains in operation, all but the conveyor transfer of materials from the Clay Shed (bins) to kilns 9 and 10, shall be during the day and evening only. Triple stacked shipping containers are included on the west side of the Clay Shed and double stacked shipping containers at the nearest future residences to act as noise barriers. Before the Clay Shed is demolished, a 5-metre high wall will be constructed abutting the south side of the masonry lot to act as a noise barrier.

**Appendix A**

**Herring Storer Acoustics Report**

## **ACOUSTIC ASSESSMENT**

### **MIDLAND BRICK SITE REDEVELOPMENT**

FOR

### **CAPITARY NO. 2**

JUNE 2021

REFERENCE: 27982-2-20355-02

DOCUMENT CONTROL PAGE

**ACOUSTIC ASSESSMENT**

**MIDLAND BRICK SITE REDEVELOPMENT**

Job No: 20355-02

Document Reference: 27982-2-20355-02

FOR

**CAPITARY NO. 2**

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## APPENDIX

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## 1.0 INTRODUCTION

Capitary No. 2 commissioned Herring Storer Acoustics to carry out an acoustic assessment of a proposed rezoning to the Metropolitan Region Scheme (MRS) of part of the existing Midland Brick site from 'Industrial and Rural' land use to 'Urban'. The assessment addresses the potential acoustic impact of the remaining Midland Brickworks operations on the proposed residential subdivision, through a number of phases, as the brickwork operations contract in an orderly manner over time.

An acoustic model of the Midland Brickworks Clay (Kilns 9 & 10 and materials feed bins), Clayshed and the Masonry Plant has been used in the assessment. The acoustic model was jointly prepared by Herring Storer Acoustics for Capitary No. 2 and BGC (the Parties) as part of the transfer of the operational business from capitary No. 2 to BGC, and is subject to confidentiality restrictions. The Parties have agreed that the modelling predictions may be used by Capitary No.2 for the purpose of assessing potential impact of the brickwork operations on the proposed residential subdivision. The agreement between the Parties identifies that there needs to be adequate separation between the proposed residential development and the brickwork operations. This separation will reduce as the brickwork operations contract over time.

The acoustic criteria for the proposed residential subdivision is that any proposed residential redevelopment is to only be considered if the predicted noise emissions from the residual brickworks operations are compliant with the 'assigned levels' of the *Environmental Protection (Noise) Regulations 1997* at the proposed redevelopment areas. By reducing the amount of industrial land, the 'assigned levels' at existing residences (external to the proposed residential redevelopment area) may also be reduced. This has been considered within this assessment to ensure there are no exceedances at these locations.

A graphic of the site is shown in Figure 1. Proposed Lot 11 is the Masonry plant site. Area B is the Clay operations site. Area C is a BGC lease area for the existing clay shed.

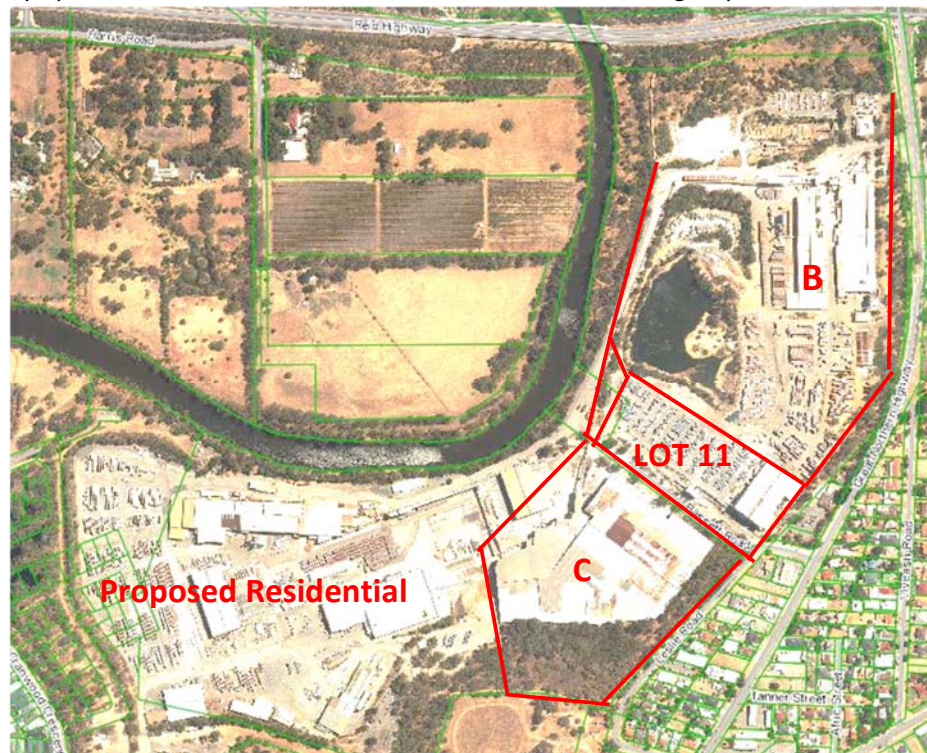


FIGURE 1 – AREA PLAN – MIDLAND BRICK SITE



## 2.0 METHODOLOGY

An acoustic model has been developed for the Midland Brick site on behalf of BGC and Capitary No.2 (Hesperia). While there are contractual and confidentiality aspects to this modelling, modelling outputs have been permitted to be used for assessment of noise emissions to the proposed MRS rezoning area.

The acoustic model was developed for operational noise emissions north of Bassett Road (the typical night time noise emissions from the brickworks) and verified through a process of measurement of existing noise levels throughout and around the site. A 'measurement map' of the measured noise emissions was generated, and compared to the model predicted emissions to assist in verification of the acoustic model. The clayshed operations were subsequently measured and added to the model.

The basic model development steps were:

- Measure baseline noise emissions of clay and masonry operations operating at an agreed production condition, selected to be representative of historically 'normal' maximum production operating condition.
- Develop an acoustic model to represent the baseline noise emissions.
- Establish the basis for determining the 'assigned levels'.
- Determine influencing factors and 'assigned levels' for the nominated land use scenarios.
- Assessment of compliance with the 'assigned levels' under the regulations.

To assist in the process, tools available in the SoundPlan software were utilized, as due to the large areas and multiple receptor locations involved, a graphics based presentation of noise emission exceedance was considered easier to interpret than a table based approach. Therefore, compliance was assessed on the basis of conflict maps, reflecting interpolated assigned levels from manually determined influencing factors at a number of receptor points.

The baseline measurements from the 23<sup>rd</sup> November 2020 – 17<sup>th</sup> December 2020 were used to develop the combined plant ‘measurement map’, plot 65 (Figure 2). The clayshed and conveyer operations were later measured and added to the acoustic model.

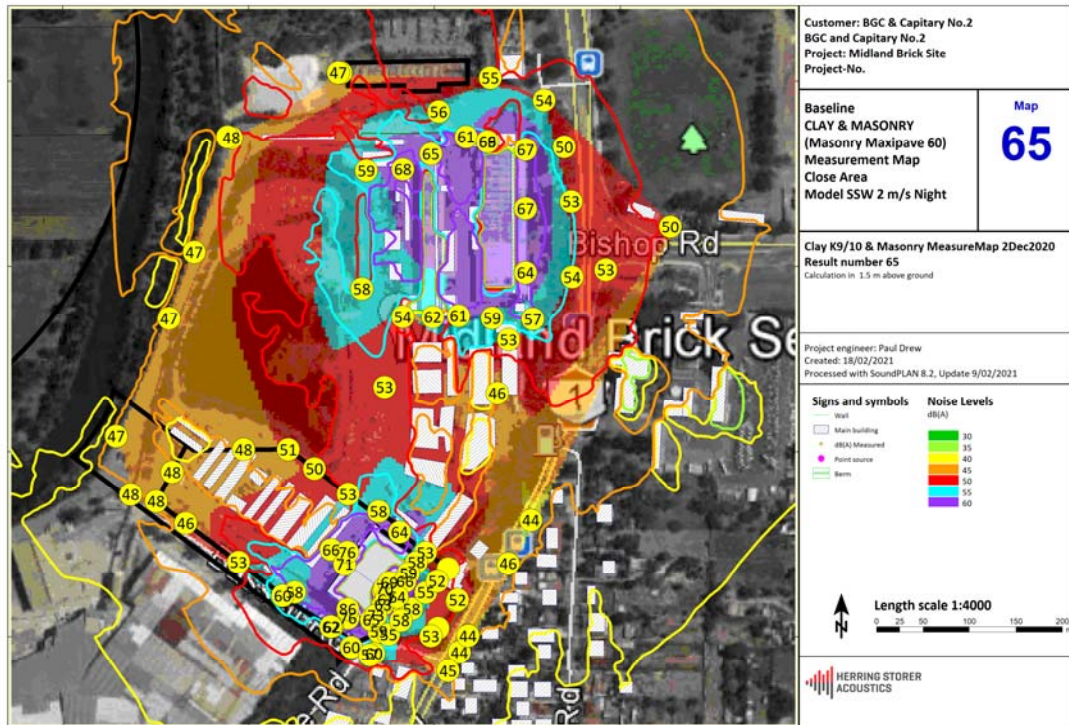


FIGURE 2 - MEASUREMENT MAP AND PREDICTED EMISSIONS FOR COMBINED PLANTS

There is close alignment of the modelled noise emissions (solid contour lines) with the shaded noise contours derived from the baseline noise measurements.

The acoustic model was then used to predict noise emissions for the various stages of transition from existing operations to future ‘masonry plant only’ operations.

### 3.0 STAGES OF PHASED REDEVELOPMENT

The proposal is to stage the redevelopment of the existing industrial land to the south/west of Bassett Road to residential. There is a planned phased contraction of the existing brickworks operations, based on contractual agreements with Capitary No.2 (the owner) and brickwork operators / owner BGC.

The arrangements are summarised below;

- Kiln 11 and all surrounding industrial areas south of the clayshed – BGC have use of these areas until April 2022. Capitary No. 2 will commence demolition of existing industrial infrastructure south of Bassett Road in May 2022.
- Clayshed – Lease Area C. Capitary No. 2 will commence demolition soon after BGC vacate.
- Kilns 9 and 10 and Associated hardstand – Lease Area B. Capitary No. 2 will commence demolition soon after BGC vacate.

- Masonry plant (proposed Lot 11)– BGC will acquire this 3.5ha site and propose to continue operating as a masonry brickworks.

The extent of each stage of proposed residential redevelopment has been based on maintaining compliance of brickworks noise emissions to all residential development. The remaining industrial zoned land (as shown on Local Planning Scheme (LPS) No. 17) contributes to maintaining the relevant 'assigned levels' under the noise regulations.

These phases and the relevant operations affecting noise emissions are:

**Scenario A** – Continued operation of brickworks Kilns 9 and 10, brick yards, masonry plant and clayshed but all other brickwork operations south of Bassett Road have ceased. Land west of this to be potentially redeveloped as residential, with an appropriate buffer as shown in Figure 3. This proposal includes for the operation of the existing clayshed during the weekday and evening periods as defined by the *Environmental Protection (Noise) Regulations 1997*. During the night period the clayshed operations are to cease, with the exception of conveyor transfer of materials from the clayshed (bins) to Kilns 9 and 10.

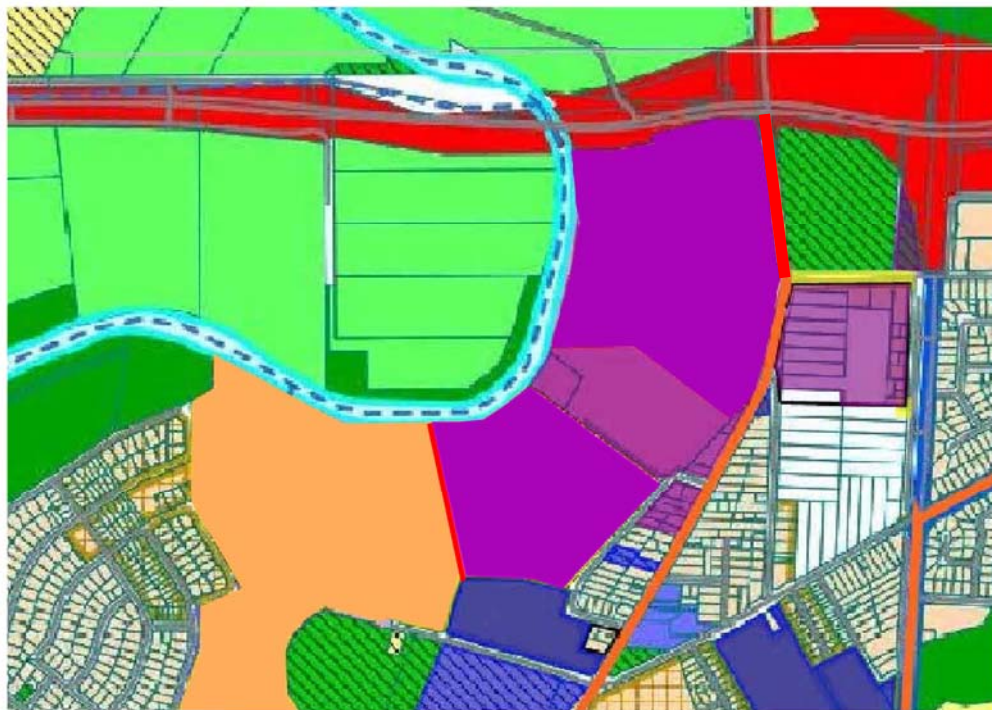
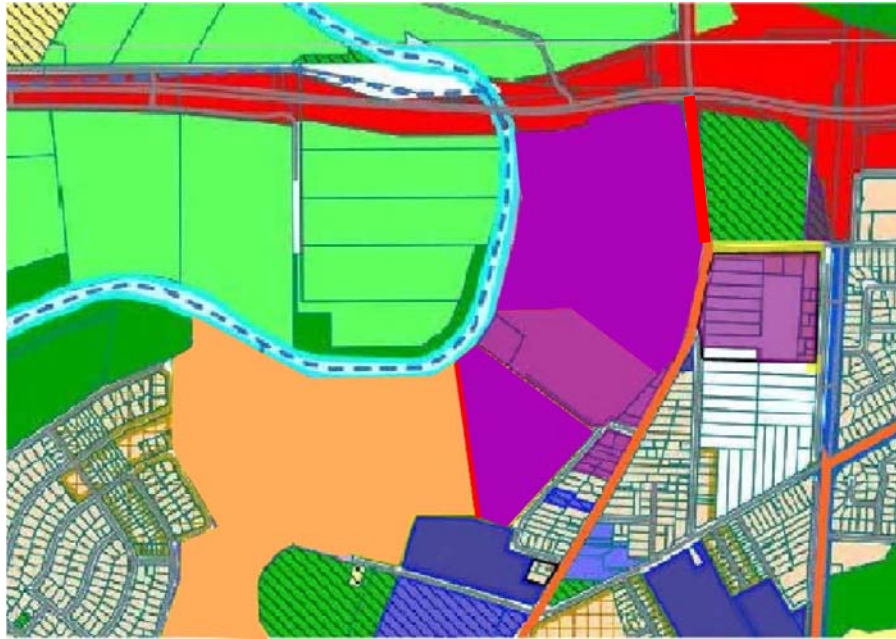


FIGURE 3 – SCENARIO A LAND USE



**Scenario B** – Continued operation of brickworks Kilns 9 and 10, brick yards, masonry plant, with the clayshed removed and conveyor not in operation. Additional land west of Bassett Road to be potentially redeveloped as residential, with a buffer as shown in Figure 4.



**FIGURE 4 – SCENARIO B LAND USE**

**Scenario C** – Continued operation of masonry plant, with a 5m acoustic barrier wall constructed along the Bassett Road alignment. The clayshed and clay brickworks including kilns 9 and 10 to have ceased operation (removed). Additional land south-west of Bassett Road to be potentially redeveloped as residential, up to Bassett Road, as shown in Figure 5.



**FIGURE 5 – SCENARIO C – FINAL LAND USE**

## 4.0 ACOUSTIC CRITERIA

### 4.1 ENVIRONMENTAL NOISE REGULATIONS

The criteria used is in accordance with the *Environmental Protection (Noise) Regulations 1997 (as amended)*. These regulations stipulate maximum allowable external noise levels determined by the calculation of an influencing factor. The influencing factor is calculated for the usage of land within the two circles, having radii of 100m and 450m from the premises of concern. For commercial and industrial premises, the allowable assigned noise levels are fixed, as listed in Table 4.1.

**TABLE 4.1 – ASSIGNED OUTDOOR NOISE LEVELS**

| Type of premises receiving noise   | Time of day  | Assigned level (dB) |                 |                   |
|--|--|---------------------|-----------------|-------------------|
|  |  | L <sub>A10</sub>    | L <sub>A1</sub> | L <sub>Amax</sub> |
| Noise sensitive premises: highly sensitive area (i.e within 15m of a dwelling) | 0700 to 1900 hours Monday to Saturday  | 45 + IF             | 55 + IF         | 65 + IF           |
|  | 0900 to 1900 hours Sunday and public holidays  | 40 + IF             | 50 + IF         | 65 + IF           |
|  | 1900 to 2200 hours all days  | 40 + IF             | 50 + IF         | 55 + IF           |
|  | 2200 hours on any day to 0700 hours Monday to Saturday and 0900 hours Sunday and public holidays | 35 + IF             | 45 + IF         | 55 + IF           |
| Noise sensitive premises: any area other than highly sensitive area            | All hours  | 60                  | 75              | 80                |
| Commercial premises  | All hours  | 60                  | 75              | 80                |
| Industrial Premises  | All hours  | 65                  | 80              | 90                |

Note: The L<sub>A10</sub> noise level is the noise that is exceeded for 10% of the time.  
 The L<sub>A1</sub> noise level is the noise that is exceeded for 1% of the time.  
 The L<sub>Amax</sub> noise level is the maximum noise level recorded.  
 IF = Influencing Factor

It is a requirement that noise from the site be free of annoying characteristics (tonality, modulation and impulsiveness) at other premises, defined below as per Regulation 9.

Where the above characteristics are present and cannot be practicably removed, the following adjustments are made to the measured or predicted level at other premises.

**TABLE 4.2 – ADJUSTMENTS FOR ANNOYING CHARACTERISTICS WHEN MUSIC IS NOT PRESENT**

| Where tonality is present | Where modulation is present | Where impulsiveness is present |
|---------------------------|-----------------------------|--------------------------------|
| + 5 dB                    | + 5 dB                      | + 10 dB                        |

The influencing factors and associated 'assigned levels' are described in following sections of this report.

The most critical assessment parameter is the L<sub>A10</sub> 'assigned level' at the respective receptor locations. Noise sources / operations that contribute to short duration noise emissions that occur less than 10% of the representative assessment period have not been described in detail.

#### 4.2 LAND USE MAPS

The City of Swan Local Planning Scheme No. 17 (LSP-17) has been accepted as being the relevant land use planning map for determination of influencing factors and ‘assigned levels’ under the *Environmental Protection (Noise) Regulations 1997*. The most current revision of LSP17 can be viewed on the City of Swan Intramaps portal. It is noted this differs from the MRS zoning.

#### 4.3 ROAD SYSTEMS

Main Roads Department of Western Australia provides access to the ‘Traffic Map’ web accessed portal. This provides detail of publicly available traffic monitoring data for selected road systems.

The determination of the more significant road systems status in terms of average weekday traffic counts (vehicles per day) to determine whether road systems are classified as ‘secondary’ or ‘major’ roads under Schedule 3 of the Noise Regulations.

Roads are classified as ‘secondary’ where the daily average traffic count is between 6,000 – 15,000 vehicles.

Roads are classified as ‘major’ where the daily average traffic count is greater than 15,000 vehicles.

Schedule 3, section 1 (2) and (3) outline the acceptable methods of determining the traffic count. Clause (3) directs that if the count is unknown, the road is not to be taken as a secondary or major road for the determination of the ‘influencing factor’.

There is one available count for Lloyd Street, south of Toodyay Road for 2020, which indicates that section of road has a count of less than 15,000 vpd. Reid Highway and Roe Highway have counts greater than 15,000 vpd. The road system classifications used in the assessment are shown on the Figures included in this report (colour coded). The traffic counts are listed in Table 4.3.

The section of Great Northern Highway south of Roe/Reid intersection to Bishop Road has been interpreted as a major road due to the available traffic count (2015/2016) of 19,451 vpd. A review of traffic flows in the area implies that around 2017, some traffic moved from GNHwy (south of Toodyay Road) to Lloyd Street, around 2,500vpd. This change may not have affected the northern section of GNHwy next to Midland Brick. However, recent introduction of the North Link system may have, although there are no recent traffic counts available and a decrease from 19,451 vpd to below 15,000 vpd (required to change status from major road to secondary road) is a significant change.

**TABLE 4.3 –ROAD TRAFFIC COUNTS SURROUNDING SITE (MRWA TRAFFIC MAP)**

| Road  | vpd    | year      | Designation     |
|---|--------|-----------|-----------------|
| Reid Highway                                  | 38,752 | 2017/2018 | Major           |
| Roe Highway                                   | 31,443 | 2015/2016 | Major           |
| GNHwy (south of Toodyay Road)                 | 14,694 | 2017/2018 | Secondary       |
| GNHwy (south of Reid/Roe Hwy) to Bishop Road. | 19,451 | 2015/2016 | Major           |
| GNHwy north of Reid/Roe                       | 26,603 | 2017/2018 | Major           |
| Toodyay Road                                  | 4,229  | 2017/2018 | Not significant |
| Lloyd Street                                  | 14,107 | 2020/2021 | Secondary       |



As there is no official traffic count for Bishop Road, it has not been included as either a secondary or major road.

#### 4.4 NOISE CHARACTERISTICS & SIGNIFICANTLY CONTRIBUTING ASPECTS

Noise characteristic can require an adjustment to the measured noise emission, reference (regulation 7 (1) (a), and (9)).

Noise emissions from industrial plants typically demonstrate 'tonality' noise characteristic for locations strongly affected by the industrial noise emission. This requires an adjustment of +5 dB(A) where present as defined under regulation 9.

At further distance, the merging of the noise emission and local background noise can 'mask' noise characteristic, and the adjustment is no longer applicable.

For the acoustic assessment, it has been assumed that noise emissions greater than 35 dB(A) may exhibit tonal characteristic, with adjustment of emitted levels by + 5 dB(A) for the compliance assessment. Noise emissions of 35 dB(A) and lower have been assessed as not exhibiting 'tonal characteristic'. There is background noise surrounding the site associated with the high traffic flow Reid Highway and other significant roads. Background noise monitoring undertaken in the early morning on various occasions has consistently resulted in measured levels above 35 dB(A), consistent with this assumption.

There are no other major noise emitting industries close to the proposed residential subdivision areas, therefore significantly contributing noise emissions are not expected to be applicable.

#### 4.5 EXISTING ASSIGNED LEVELS

The noise sensitive premises surrounding the Midland Brick site, particularly those sections under consideration of development, could potentially have their 'influencing factor' and associated 'assigned levels' reduced by rezoning of industrial classified land to residential. This has been considered and a comparison made between the predicted noise levels and the future assigned levels.

In undertaking this assessment, a number of assumptions and interpretations have been made. The assumptions regarding traffic flows have been discussed in Section 4.3. Other assumptions include:

- The existing City of Swan works depot has been assessed as 'industrial' classification, as this area is zoned for 'residential redevelopment', but the current use is permitted until such development occurs.
- The former school site at Eveline Road / Leslie Street corner is zoned 'Private Clubs and Institutions'. Zoning includes clubs, which are commercial classification, therefore as highest classification presides in determining influencing factor, zoning will be treated as commercial for determination of influencing factor. However, usage is Aged Care, so will be a 'highly noise sensitive' premises on the site. Developer DA plans show future residential on section of land to the west (north edge of former school oval).

- Swan Hospital site: Zoned public purposes, which has no direct classification. Last use was Hospital of 192 beds, which is classified as 'commercial', however hospital has been closed for some time and LSP17-179 Rezoning Amendment being considered by City of Swan would change usage to predominantly 'Aged Care' use, which is 'noise sensitive'. Interpretation is 'commercial classification for determination of influencing factor, unoccupied noise sensitive land for receptor (at present).

Figure 6 shows the base land use classifications (under the Regulations) used.

Table 4.3 shows the determined influencing factors under the existing LSP17.

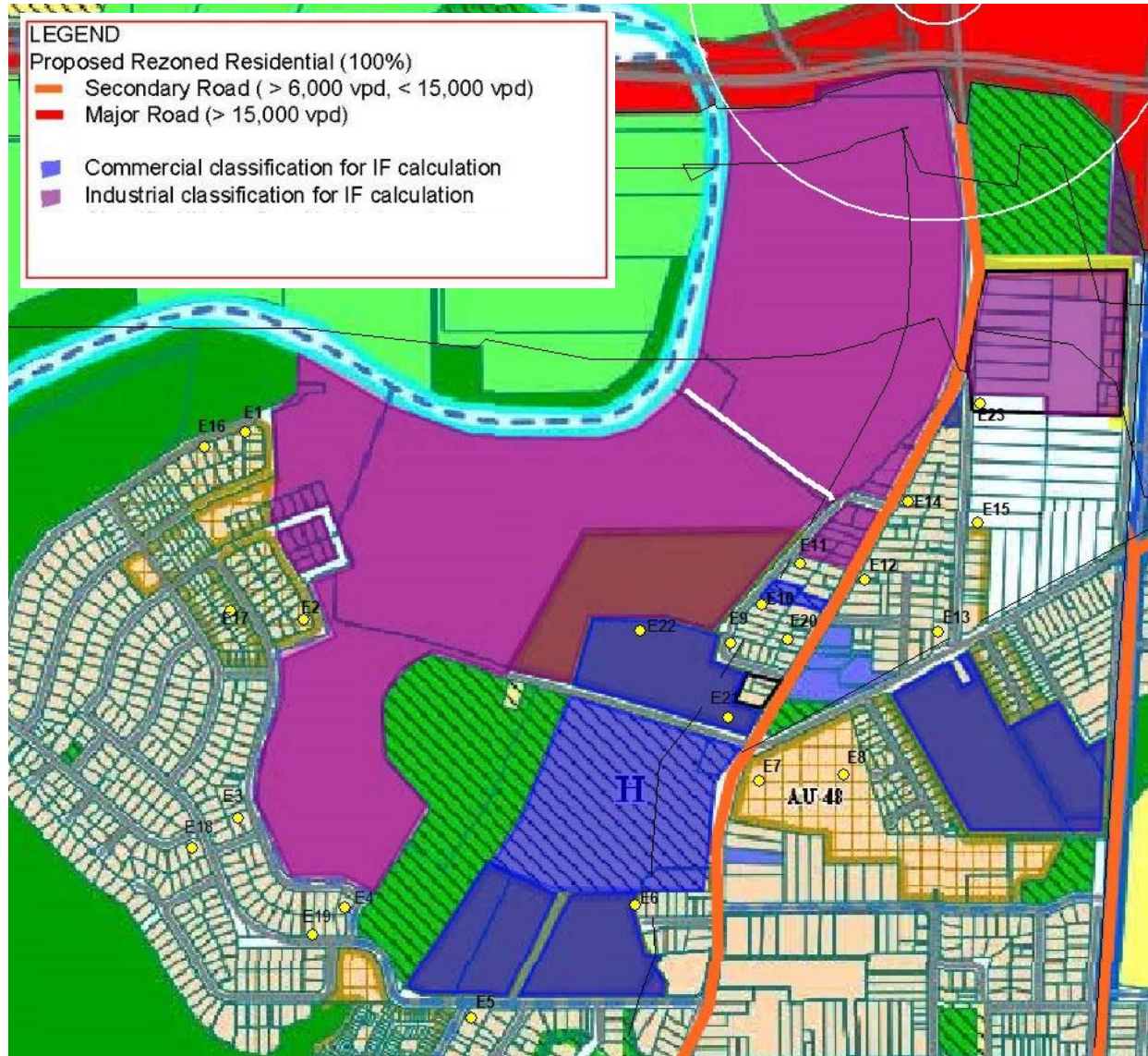


FIGURE 6 - EXISTING INFLUENCING FACTORS – ASSESSMENT MAP AND CALCULATION LOCATIONS

**TABLE 4.3 – CALCULATED INFLUENCING FACTORS FOR EXISTING LSP-17**

| Ref  | Industrial     |                | Commercial     |                | Industrial |         | Commercial |         | Circle IF | TF | IF |
|------|----------------|----------------|----------------|----------------|------------|---------|------------|---------|-----------|----|----|
|      | Inner Area, m2 | Outer Area, m2 | Inner Area, m2 | Outer Area, m2 | Inner %    | Outer % | Inner %    | Outer % |           |    |    |
| E-1  | 6095           | 136315         | 0              | 0              | 19         | 21      | 0          | 0       | 4.1       | 0  | 4  |
| E-2  | 12886          | 284449         | 0              | 0              | 41         | 45      | 0          | 0       | 8.6       | 0  | 9  |
| E-3  | 7687           | 110429         | 0              | 6590           | 24         | 17      | 0          | 1       | 4.2       | 0  | 4  |
| E-4  | 6025           | 91744          | 0              | 78635          | 19         | 14      | 0          | 12      | 4.0       | 0  | 4  |
| E-5  | 0              | 27330          | 8031           | 116045         | 0          | 4       | 26         | 18      | 2.6       | 0  | 3  |
| E-6  | 0              | 3652           | 20760          | 211231         | 0          | 1       | 66         | 33      | 5.0       | 0  | 5  |
| E-7  | 0              | 45333          |                | 122849         | 0          | 7       | 0          | 19      | 1.7       | 2  | 4  |
| E-8  | 0              | 25697          | 0              | 225877         | 0          | 4       | 0          | 36      | 2.2       | 0  | 2  |
| E-9  | 5451           | 228150         | 8073           | 156675         | 17         | 36      | 26         | 25      | 7.8       | 0  | 8  |
| E-10 | 9093           | 251744         | 3175           | 130292         | 29         | 40      | 10         | 20      | 8.4       | 2  | 10 |
| E-11 | 15169          | 262373         | 3770           | 96928          | 48         | 41      | 12         | 15      | 10.3      | 2  | 12 |
| E-12 | 4677           | 102451         | 298            | 95787          | 15         | 16      | 1          | 15      | 3.9       | 2  | 6  |
| E-13 | 0              | 48204          | 2568           | 105874         | 0          | 8       | 8          | 17      | 2.0       | 0  | 2  |
| E-14 | 6823           | 273252         | 0              | 37859          | 22         | 43      | 0          | 6       | 6.8       | 2  | 9  |
| E-15 | 0              | 189619         | 0              | 53819          | 0          | 30      | 0          | 8       | 3.4       | 0  | 3  |
| E-16 | 0              | 119556         | 0              | 0              | 0          | 19      | 0          | 0       | 1.9       | 0  | 2  |
| E-17 | 0              | 205070         | 0              | 0              | 0          | 32      | 0          | 0       | 3.2       | 0  | 3  |
| E-18 | 0              | 92227          | 0              | 0              | 0          | 14      | 0          | 0       | 1.4       | 0  | 1  |
| E-19 | 0              | 79875          | 0              | 50852          | 0          | 13      | 0          | 8       | 1.7       | 0  | 2  |
| E-20 | 0              | 190840         | 3608           | 151970         | 0          | 30      | 11         | 24      | 4.8       | 2  | 7  |
| E-21 | 0              | 133188         | 12907          | 196287         | 0          | 21      | 41         | 31      | 5.7       | 2  | 8  |
| E-22 | 11723          | 277943         | 17353          | 171018         | 37         | 44      | 55         | 27      | 12.2      | 0  | 12 |
| E-23 | 9824           | 278172         | 1343           | 1343           | 31         | 44      | 4          | 0       | 7.7       | 4  | 12 |

#### 4.6 PROPOSED FINAL REZONED ASSIGNED LEVELS

The assigned levels following the proposed rezoning of the south-western part of the brickworks land to residential have been determined.

The interim phases of development (Scenarios A and B) 'assigned levels' have not been detailed in this report, although these have been assessed, and the 'conflict maps' are provided in Appendix A, with assessment of compliance in Appendix C.

The process is to first identify the surrounding land classification and minor/major roads surrounding the area of interest. Using this base, the influencing factors for key surrounding land can be determined, including the potential rezoned site land. Once this is completed, predicted noise emissions can be compared to the assigned levels at the critical time period (night time in this case), to determine the compliance status.

Figure 7 shows the base land use classifications (under the Regulations).



**FIGURE 7 – LAND CLASSIFICATIONS AND ROAD SYSTEMS USED FOR ASSIGNED LEVEL DETERMINATION**

Figure 8 shows the determined influencing factors and night-time 'assigned levels' based on all redeveloped land south of Bassett Road being residential. Detail on how these were derived are provided in Table 4.4. Figure 9, show the potential residences south of Bassett Road for which the Influencing Factor has been calculated.



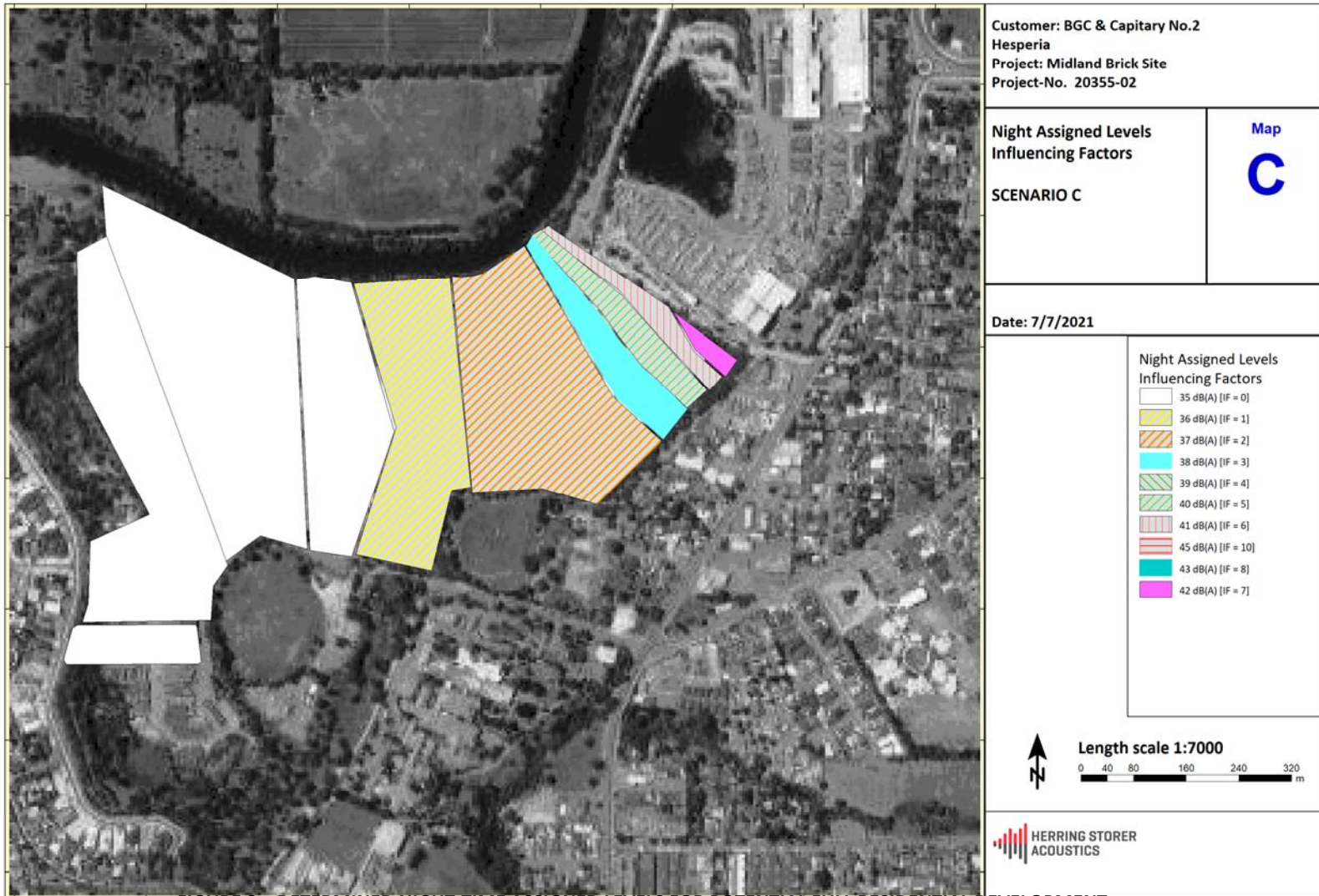


FIGURE 8 – DETERMINED NIGHT-TIME ASSIGNED LEVELS FOR POTENTIAL FULL RESIDENTIAL DEVELOPMENT

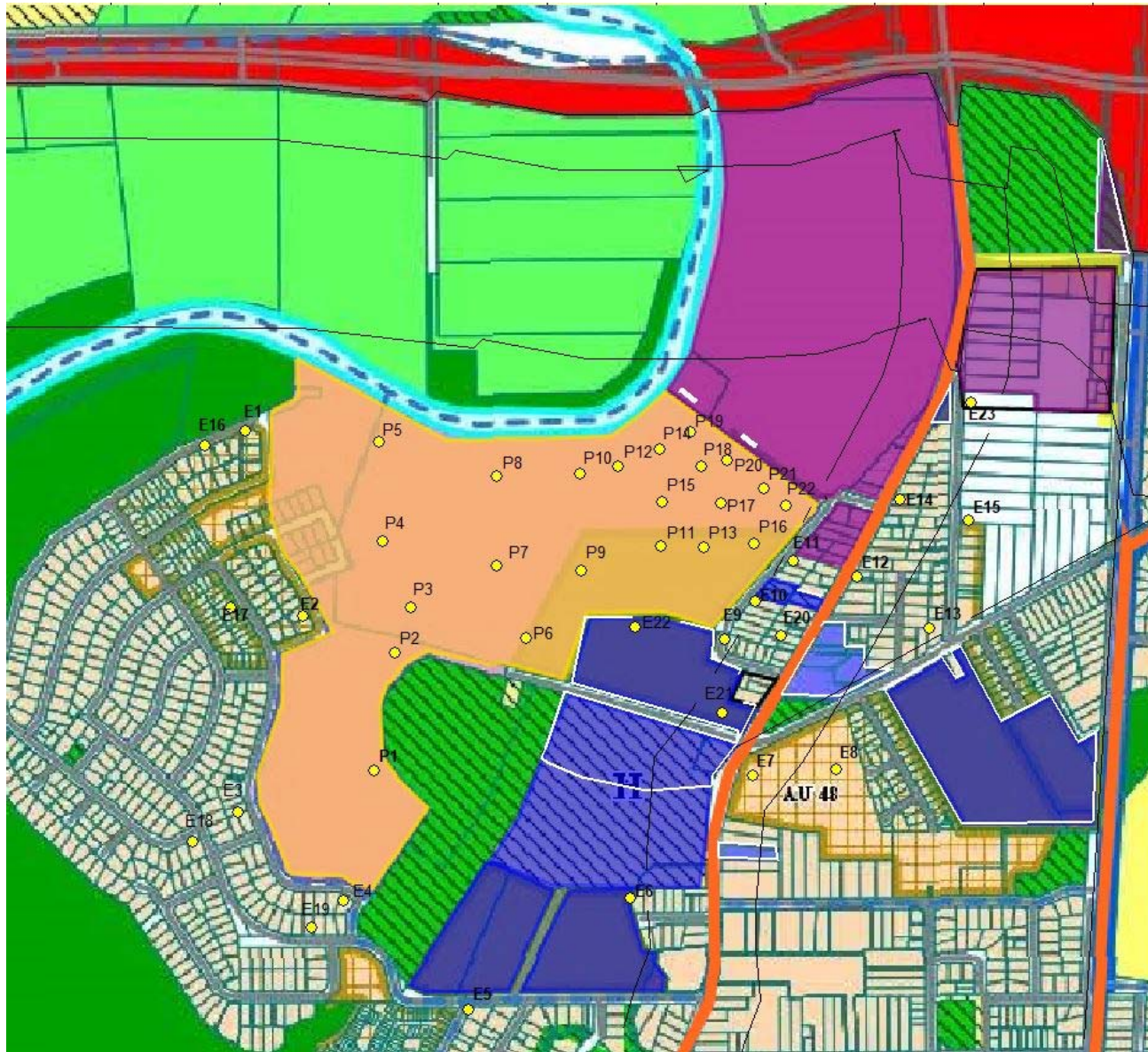


FIGURE 9 - POTENTIAL RESIDENTIAL SOUTH OF BASSETT ROAD INFLUENCING FACTORS – ASSESSMENT MAP AND CALCULATION LOCATIONS



**TABLE 4.4 – CALCULATED INFLUENCING FACTORS FOR POTENTIAL REZONE ALL SOUTH OF BASSETT ROAD TO RESIDENTIAL**

| Ref  | Industrial     |                | Commercial     |                | Industrial |         | Commercial |         | Circle IF | TF | IF |
|------|----------------|----------------|----------------|----------------|------------|---------|------------|---------|-----------|----|----|
|      | Inner Area, m2 | Outer Area, m2 | Inner Area, m2 | Outer Area, m2 | Inner %    | Outer % | Inner %    | Outer % |           |    |    |
| E-1  | 0              | 0              | 0              | 0              | 0          | 0       | 0          | 0       | 0.0       | 0  | 0  |
| E-2  | 0              | 0              | 0              | 0              | 0          | 0       | 0          | 0       | 0.0       | 0  | 0  |
| E-3  | 0              | 0              | 0              | 6590           | 0          | 0       | 0          | 1       | 0.1       | 0  | 0  |
| E-4  | 0              | 0              | 0              | 78635          | 0          | 0       | 0          | 12      | 0.6       | 0  | 1  |
| E-5  | 0              | 0              | 8031           | 116045         | 0          | 0       | 26         | 18      | 2.2       | 0  | 2  |
| E-6  | 0              | 0              | 20760          | 211231         | 0          | 0       | 66         | 33      | 5.0       | 0  | 5  |
| E-7  | 0              | 2847           | 1649           | 235561         | 0          | 0       | 5          | 37      | 2.2       | 2  | 4  |
| E-8  | 0              | 5000           | 0              | 225877         | 0          | 1       | 0          | 36      | 1.9       | 0  | 2  |
| E-9  | 0              | 45121          | 8073           | 156675         | 0          | 7       | 26         | 25      | 3.2       | 0  | 3  |
| E-10 | 0              | 81917          | 3175           | 83995          | 0          | 13      | 10         | 13      | 2.5       | 2  | 4  |
| E-11 | 4389           | 119171         | 3763           | 95700          | 14         | 19      | 12         | 15      | 4.6       | 2  | 7  |
| E-12 | 4677           | 102451         | 298            | 95787          | 15         | 16      | 1          | 15      | 3.9       | 2  | 6  |
| E-13 | 0              | 48204          | 2568           | 105874         | 0          | 8       | 8          | 17      | 2.0       | 0  | 2  |
| E-14 | 6828           | 207559         | 0              | 37859          | 22         | 33      | 0          | 6       | 5.7       | 2  | 8  |
| E-15 | 0              | 163758         | 0              | 53819          | 0          | 26      | 0          | 8       | 3.0       | 0  | 3  |
| E-16 | 0              | 0              | 0              | 0              | 0          | 0       | 0          | 0       | 0.0       | 0  | 0  |
| E-17 | 0              | 0              | 0              | 0              | 0          | 0       | 0          | 0       | 0.0       | 0  | 0  |
| E-18 | 0              | 0              | 0              | 0              | 0          | 0       | 0          | 0       | 0.0       | 0  | 0  |
| E-19 | 0              | 0              | 0              | 50852          | 0          | 0       | 0          | 8       | 0.4       | 0  | 0  |
| E-20 | 0              | 56588          | 3608           | 151970         | 0          | 9       | 11         | 24      | 2.7       | 2  | 5  |
| E-21 | 0              | 9677           | 12907          | 196287         | 0          | 2       | 41         | 31      | 3.8       | 2  | 6  |
| E-22 | 0              | 25264          | 17353          | 171018         | 0          | 4       | 55         | 27      | 4.5       | 0  | 5  |
| E-23 | 9824           | 264048         | 1343           | 1343           | 31         | 42      | 4          | 0       | 7.5       | 4  | 12 |
| P1   | 0              | 0              | 0              | 97063          | 0          | 0       | 0          | 15      | 0.8       | 0  | 1  |
| P2   | 0              | 0              | 0              | 52279          | 0          | 0       | 0          | 8       | 0.4       | 0  | 0  |
| P3   | 0              | 0              | 0              | 38463          | 0          | 0       | 0          | 6       | 0.3       | 0  | 0  |
| P4   | 0              | 0              | 0              | 5277           | 0          | 0       | 0          | 1       | 0.0       | 0  | 0  |
| P5   | 0              | 0              | 0              | 0              | 0          | 0       | 0          | 0       | 0.0       | 0  | 0  |
| P6   | 0              | 0              | 0              | 134678         | 0          | 0       | 0          | 21      | 1.1       | 0  | 1  |

| Ref | Industrial     |                | Commercial     |                | Industrial |         | Commercial |         | Circle IF | TF | IF |
|-----|----------------|----------------|----------------|----------------|------------|---------|------------|---------|-----------|----|----|
|     | Inner Area, m2 | Outer Area, m2 | Inner Area, m2 | Outer Area, m2 | Inner %    | Outer % | Inner %    | Outer % |           |    |    |
| P7  | 0              | 0              | 0              | 67512          | 0          | 0       | 0          | 11      | 0.5       | 0  | 1  |
| P8  | 0              | 10729          | 0              | 20174          | 0          | 2       | 0          | 3       | 0.3       | 0  | 0  |
| P9  | 0              | 25554          | 555            | 101383         | 0          | 4       | 2          | 16      | 1.3       | 0  | 1  |
| P10 | 0              | 62340          | 0              | 39605          | 0          | 10      | 0          | 6       | 1.3       | 0  | 1  |
| P11 | 0              | 88838          | 0              | 101636         | 0          | 14      | 0          | 16      | 2.2       | 0  | 2  |
| P12 | 0              | 102720         | 0              | 42307          | 0          | 16      | 0          | 7       | 1.9       | 0  | 2  |
| P13 | 0              | 108703         | 0              | 95388          | 0          | 17      | 0          | 15      | 2.5       | 0  | 2  |
| P14 | 0              | 146273         | 0              | 37381          | 0          | 23      | 0          | 6       | 2.6       | 0  | 3  |
| P15 | 0              | 118700         | 0              | 71867          | 0          | 19      | 0          | 11      | 2.4       | 0  | 2  |
| P16 | 609            | 127578         | 1400           | 101286         | 2          | 20      | 4          | 16      | 3.2       | 0  | 3  |
| P17 | 0              | 146434         | 0              | 70885          | 0          | 23      | 0          | 11      | 2.9       | 0  | 3  |
| P18 | 2346           | 164667         | 0              | 53454          | 7          | 26      | 0          | 8       | 3.8       | 0  | 4  |
| P19 | 8501           | 184243         | 0              | 27685          | 27         | 29      | 0          | 4       | 5.8       | 0  | 6  |
| P20 | 7511           | 180324         | 0              | 48044          | 24         | 28      | 0          | 8       | 5.6       | 0  | 6  |
| P21 | 7403           | 177135         | 0              | 61707          | 24         | 28      | 0          | 10      | 5.6       | 0  | 6  |
| P22 | 10017          | 169659         | 0              | 66508          | 32         | 27      | 0          | 10      | 6.4       | 0  | 6  |

The potential impact of re-zoning industrial land to residential is shown in Table 4.5, based on predicted noise emissions for Scenario C 'masonry only' operating under 'worst case' night conditions.

The assessment shows that the proposed rezoning will not have an adverse impact on existing residential receptors in relation to the Midland Brick noise emissions.

**TABLE 4.5 – CHANGE IN INFLUENCING FACTOR DUE TO REZONING TO 100% RESIDENTIAL**

| Loc  | IF Exist | IF | Decrease in IF | Night AL | Predicted Level | Exceedance | Impact |
|------|----------|----|----------------|----------|-----------------|------------|--------|
| E-1  | 4        | 0  | 4              | 35       | 20              | -15        | No     |
| E-2  | 9        | 0  | 9              | 35       | 20              | -15        | No     |
| E-3  | 4        | 0  | 4              | 35       | 16              | -19        | No     |
| E-4  | 4        | 1  | 3              | 36       | 17              | -19        | No     |
| E-5  | 3        | 2  | 1              | 37       | 18              | -19        | No     |
| E-6  | 5        | 5  | 0              | 40       | 20              | -20        | No     |
| E-7  | 4        | 4  | 0              | 39       | 25              | -14        | No     |
| E-8  | 2        | 2  | 0              | 37       | 26              | -11        | No     |
| E-9  | 8        | 3  | 5              | 38       | 28              | -9         | No     |
| E-10 | 10       | 4  | 6              | 39       | 30              | -7         | No     |
| E-11 | 12       | 7  | 5              | 42       | 35              | -6         | No     |
| E-12 | 6        | 6  | 0              | 41       | 33              | -8         | No     |
| E-13 | 2        | 2  | 0              | 37       | 31              | -6         | No     |
| E-14 | 9        | 8  | 1              | 43       | 37              | -6 (-1)    | No     |
| E-15 | 3        | 3  | 0              | 38       | 33              | -5 (0)     | No     |
| E-16 | 2        | 0  | 2              | 35       | 20              | -15        | No     |
| E-17 | 3        | 0  | 3              | 35       | 19              | -16        | No     |
| E-18 | 1        | 0  | 1              | 35       | 15              | -20        | No     |
| E-19 | 2        | 0  | 2              | 35       | 17              | -18        | No     |
| E-20 | 7        | 5  | 2              | 40       | 31              | -9         | No     |
| E-21 | 8        | 6  | 2              | 41       | 27              | -14        | No     |
| E-22 | 12       | 5  | 7              | 40       | 27              | -13        | No     |
| E-23 | 12       | 12 | 0              | 47       | 37              | -10        | No     |
| E-24 | 7        | 7  | 0              | 42       | 23              | -19        | No     |

Note: Where noise emissions are known or expected to exhibit tonal characteristic, this is shown by (xx) as the exceedance (adjusted). The exceedance shown includes the adjustment for tonal characteristic in accordance with the regulations.

## 5.0 REDEVELOPMENT - BRICKWORKS NOISE INGRESS ASSESSMENT

Brickworks operations noise emissions are predicted to comply with the 'assigned levels' of the *Environmental Protection (Noise) Regulations 1997* at the proposed residential areas for the various phases of redevelopment.

The phased development proposals outlined in this assessment have been developed on the basis that the predicted operational noise emissions from the brickworks operations will comply with the *Environmental Protection (Noise) Regulation 1997* 'assigned levels'.

Scenario A, the initial phase of residential development allows for the operation of the existing brickworks Kilns 9 and 10, the masonry plant and the clayshed conveyer system. During the weekday and evening period the clayshed operations including truck deliveries, crushing and screening and loader operations have been modelled. Included in the acoustic modelling are the proposed final topography, with inclusion of acoustic barriers formed with stacked seacontainers. The seacontainers are currently located on site, having been used for this purpose in other locations. The proposed brickworks operations are expected to generate compliant noise emissions at the Scenario A residential development areas (plot 320, Appendix B).

Scenario B, an interim phase of residential development allows for the decommissioning of the clayshed and conveyor operations. Upon removal of the clayshed building, a 5m acoustic barrier wall is to be constructed on the southern side of the Bassett Road extension into the site. This will assist in the mitigation of noise emissions from the masonry plant and clay operations. The proposed brickworks operations are expected to generate compliant noise emissions at the Scenario B residential development areas (plot 299, Appendix B).

Scenario C, allows for residential development up to the western side of Bassett Road, and the extension of Bassett Road into the site to the river. This scenario is based on cessation of the clay operations (kilns 9 and 10, clayshed), with the existing masonry plant continuing to operate. The 5m high acoustic barrier wall is to remain along the southern side of Bassett Road, providing acoustic attenuation from the masonry plant operations. The proposed masonry plant operations are expected to generate compliant noise emissions at the Scenario C residential development areas (plot 300, Appendix B).

The Clay and Masonry plant operations have a number of processes that occur within the different time periods as defined under the Noise Regulations. Some of the operating scenarios have less equipment operating than others in the same regulation time period. Therefore, not every scenario needs to be modelled in order to identify the most significant noise emissions for that time period. The significant operating scenarios have been modelled. Scenario A includes separate modelling contour plots (Appendix B) for the weekday / evening scenario, and the night-time scenario operations.

The assessment of compliance with the regulation 'assigned levels' for the surrounding area has been undertaken using graphic 'conflict maps', which are contained in Appendix C. These show that the predicted noise emissions are compliant at the proposed residential development areas.

It is noted that the whole of this site is and will be subject to aircraft noise and significant traffic noise. The residential dwellings are required to be constructed to reduce noise ingress in accordance with *State Planning Policy 5.1 Land Use Planning in the Vicinity of Perth Airport*.

## 6.0 CONCLUSION

Capitary No. 2 commissioned Herring Storer Acoustics to carry out an acoustic assessment of a proposed rezoning to the Metropolitan Region Scheme (MRS) of part of the existing Midland Brick site from 'Industrial and Rural' land use to 'Urban'. The assessment addresses the potential acoustic impact of the remaining Midland Brickworks operations on the proposed residential subdivision, through a number of phases, as the brickwork operations contract in an orderly manner over time.

An acoustic model of the Midland Brickworks Clay (Kilns 9 & 10 and materials feed bins, clayshed and conveyer) and the Masonry Plant has been used in the assessment.

The acoustic criteria for the proposed residential subdivision is that any proposed redevelopment is to only be considered if the predicted noise emissions from the residual brickworks operations are compliant with the 'assigned levels' of the *Environmental Protection (Noise) Regulations 1997* at the proposed redevelopment areas and existing residences.

The proposal is to stage the redevelopment of the existing industrial land to the south/west of Bassett Road to residential. There is a planned phased movement of existing brickworks operations, based on contractual agreements with Capitary No.2 (the owner) and brickwork operators / owner BGC.

Brickworks operations noise emissions are predicted to comply with the 'assigned levels' of the *Environmental Protection (Noise) Regulations 1997* at the proposed residential areas for the various phases of redevelopment.

Scenario A, the initial phase of residential development allows for the operation of the existing brickworks Kilns 9 and 10, the masonry plant and the clayshed conveyer system. During the weekday and evening period the clayshed operations including truck deliveries, crushing and screening and loader operations have been modelled. Included in the acoustic modelling are the proposed final topography, with inclusion of acoustic barriers formed with stacked seacontainers. The seacontainers are currently located on site, having been used for this purpose in other locations.

Scenario B, an interim phase of residential development allows for the decommissioning of the clayshed and conveyer operations. Upon removal of the clayshed building, a 5m high acoustic barrier wall is to be constructed on the southern side of the Bassett Road extension into the site. This will assist in the mitigation of noise emissions from the masonry plant and clay operations.

Scenario C allows for the proposed ultimate residential development up to the southern side of Bassett Road. This scenario is based on cessation of the clay operations (kilns 9 and 10, clayshed), with the existing masonry plant continuing to operate. The 5m high acoustic barrier wall is to remain along the southern side of the Bassett Road extension into the site, providing acoustic mitigation from the masonry plant operations.

The assessment of compliance with the regulation 'assigned levels' for the surrounding area show that the predicted noise emissions are compliant at the proposed and existing residential - areas.



## **APPENDIX A**

INFLUENCING FACTOR CALCULATION ASSUMPTIONS

SCENARIO 'ASSIGNED LEVEL' MAPS

NOTES: INTERPRETATION OF NOISE REGULATION CLASSIFICATIONS  
EXISTING LOCAL STRUCTURE PLAN

1. Shire of Swan Depot. Located on "Residential Redevelopment" zoned land, but existing use is not residential, so receptor is interpreted as 'industrial' user as a permitted use prior to urban redevelopment includes the City of Swan Depot workshops for repair / maintenance.
2. Private Clubs and Institutions – formerly a school and now being developed for Aged Care facility. Zoning includes clubs, which are commercial classification, therefore as highest classification presides in determining influencing factor, zoning will be treated as commercial for determination of influencing factor. However, usage is Aged Care, so will be a 'highly noise sensitive' premises on the site. Developer DA plans show future residential on section of land to the west (north edge of former school oval).
3. Swan Hospital site: Zoned public purposes, which has no direct classification. Last use was Hospital of 192 beds, which is classified as 'commercial', however hospital has been closed from some time and LSP17-179 Rezoning Amendment being considered by City of Swan would change usage to predominantly 'Aged Care' use, which is 'noise sensitive'. Interpretation is 'commercial' classification for determination of influencing factor, unoccupied noise sensitive land for receptor (at present).
4. In determining existing assigned levels, there are some locations which are zoned residential, but which are currently not developed as such (no residence). Example is small lot at NE corner of the Eveline / Leslie St Aged Care. Classification is noise sensitive for determination of influencing factor, but there is no dwelling, so criteria is  $L_{A10}$  of 60 dB(A).
5. Road systems to east of Midland Brick site have all appeared to have had a decline in vehicles per day since 2015/16, although traffic counts are not comprehensive. In accordance with regulations, roads with traffic counts are classified based on the latest traffic count. Roads with no traffic count are not included as affecting the Traffic Factor.
6. For calculation of proportion of area classification to determine influencing factors, areas were measured. The 100% area for the 100m radius and 450m radius circles used to determine influencing factor are 31,389 m<sup>2</sup> for 100m radius and 636,054 m<sup>2</sup> for 450m radius.



Customer: BGC & Capitory No.2  
 Hesperia  
 Project: Midland Brick Site  
 Project-No. 20355-02

Night Assigned Levels  
 Influencing Factors











SCENARIO A

Map

**A**

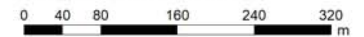
Date: 7/7/2021

Night Assigned Levels  
 Influencing Factors

-  35 dB(A) [IF = 0]
-  36 dB(A) [IF = 1]
-  37 dB(A) [IF = 2]
-  38 dB(A) [IF = 3]
-  39 dB(A) [IF = 4]
-  40 dB(A) [IF = 5]
-  41 dB(A) [IF = 6]
-  45 dB(A) [IF = 10]
-  43 dB(A) [IF = 8]
-  42 dB(A) [IF = 7]



Length scale 1:7000





Customer: BGC & Capitory No.2  
 Hesperia  
 Project: Midland Brick Site  
 Project-No.

Night Assigned Levels  
 Influencing Factors

SCENARIO B

Map

**B**

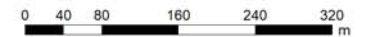
Date: 7/7/2021

Night Assigned Levels  
 Influencing Factors

- 35 dB(A) [IF = 0]
- 36 dB(A) [IF = 1]
- 37 dB(A) [IF = 2]
- 38 dB(A) [IF = 3]
- 39 dB(A) [IF = 4]
- 40 dB(A) [IF = 5]
- 41 dB(A) [IF = 6]
- 45 dB(A) [IF = 10]
- 43 dB(A) [IF = 8]
- 42 dB(A) [IF = 7]



Length scale 1:7000







Customer: BGC & Capitary No.2  
 Hesperia  
 Project: Midland Brick Site  
 Project-No. 20355-02

Night Assigned Levels  
 Influencing Factors

SCENARIO C

Map  
**C**

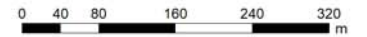
Date: 7/7/2021

Night Assigned Levels  
 Influencing Factors

- 35 dB(A) [IF = 0]
- 36 dB(A) [IF = 1]
- 37 dB(A) [IF = 2]
- 38 dB(A) [IF = 3]
- 39 dB(A) [IF = 4]
- 40 dB(A) [IF = 5]
- 41 dB(A) [IF = 6]
- 45 dB(A) [IF = 10]
- 43 dB(A) [IF = 8]
- 42 dB(A) [IF = 7]



Length scale 1:7000





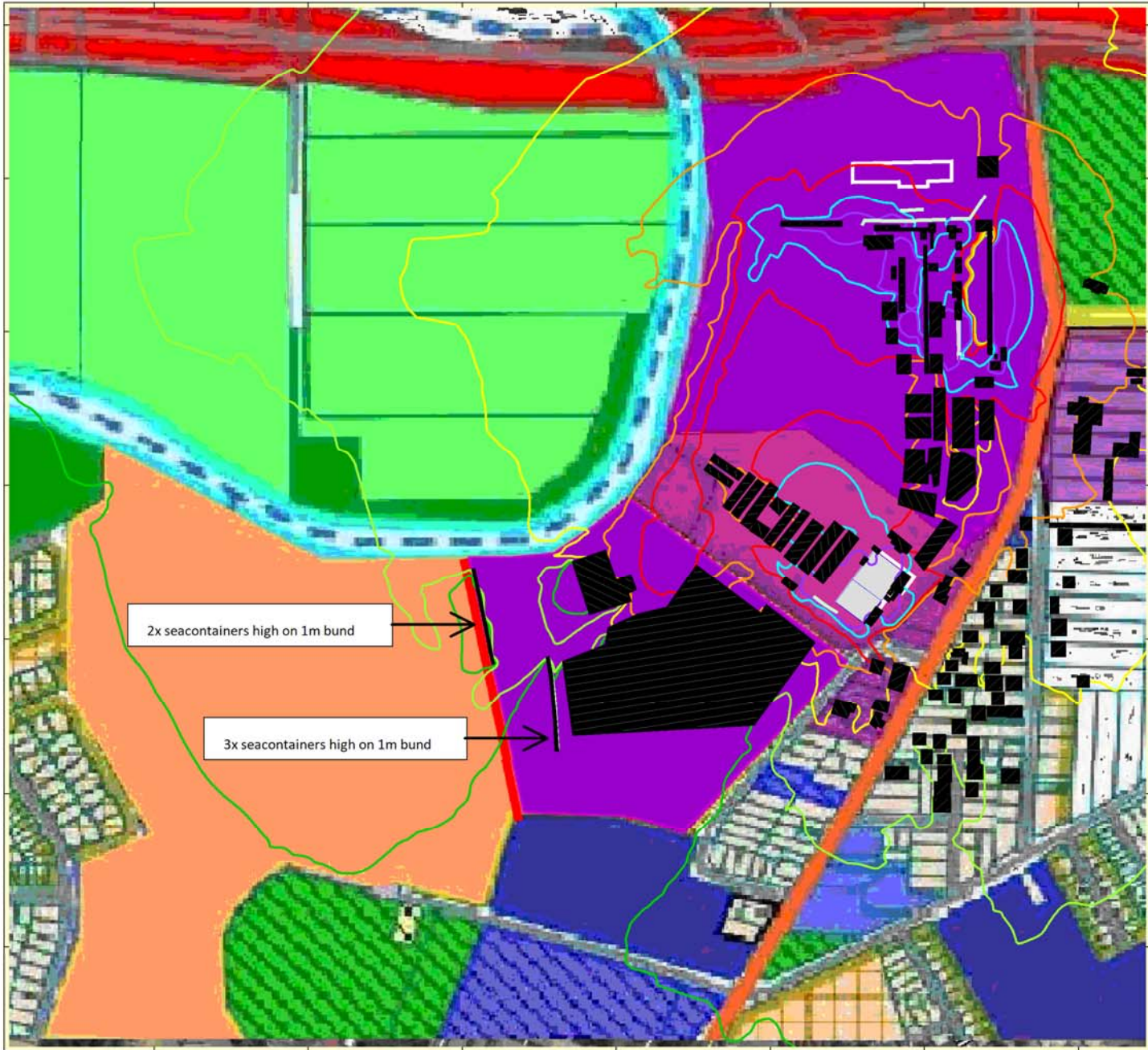
## **APPENDIX B**

### **NOISE EMISSION NOISE CONTOUR PLOTS**

Scenario A: CLAY & MASONRY – INCLUDING OPERATING CLAY BUILDINGS

Scenario B: CLAY & MASONRY –CLAY BUILDINGS REMOVED

Scenario C: MASONRY ONLY



Customer: Hesperia  
 Project: Midland Brick Site MRS Submission  
 Project-No. 20355-02

**CONFLICT NOISE MAP**  
 Combined Clay and Masonry,  
 Night Allwinds  
 Conveyor Operating  
 3x seacontainer barrier clay  
 2x seacontainer barrier north  
 Night Operations

Map  
**320**

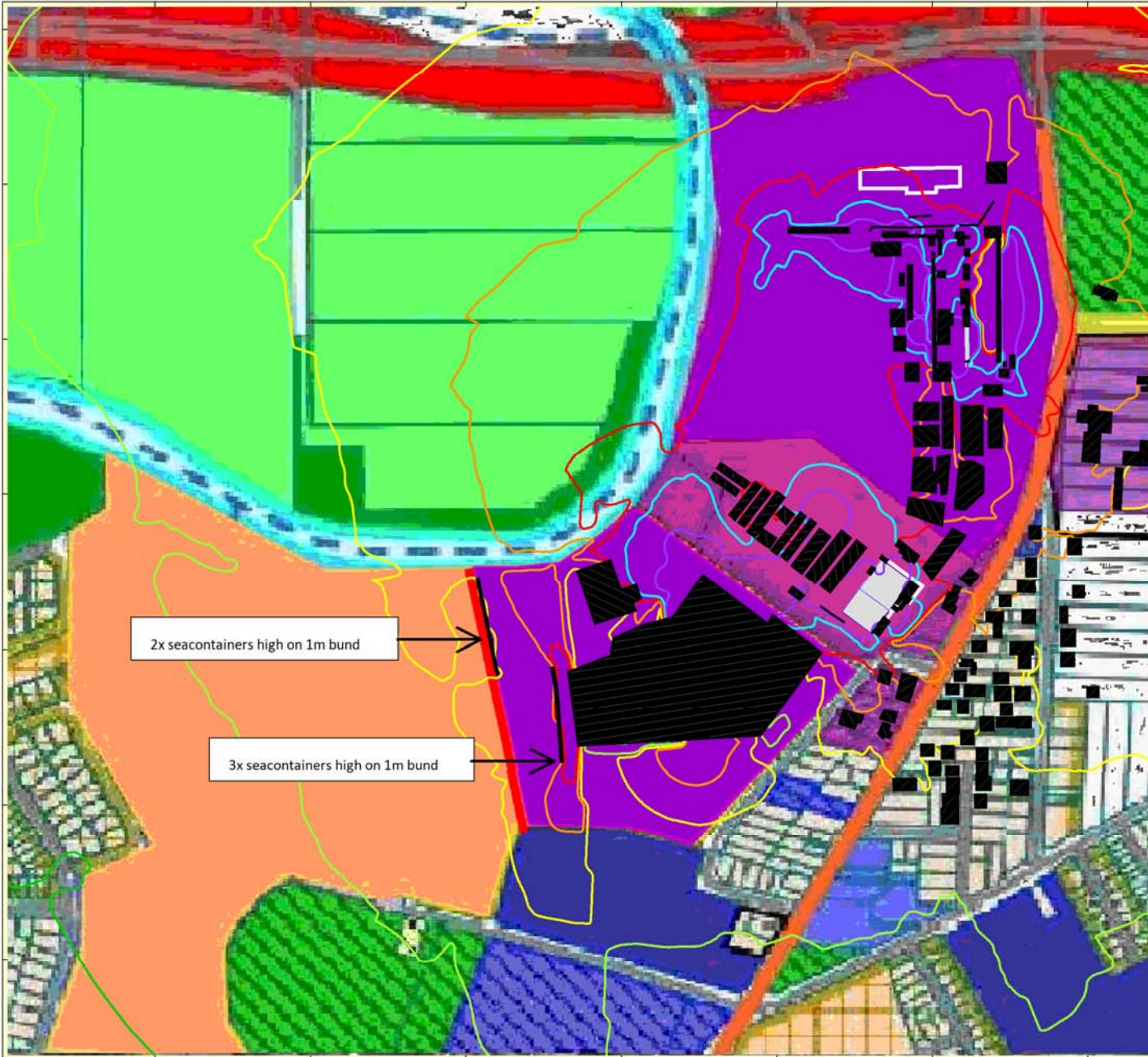
**Scenario A**  
 Result number 320  
 Calculation in 1.5 m above ground

Project engineer: Paul Drew  
 Created: 7/07/2021  
 Processed with SoundPLAN 8.2, Update 9/06/2021

|                          |                              |
|--------------------------|------------------------------|
| <b>Signs and symbols</b> | <b>Noise Levels</b><br>dB(A) |
| — Wall                   | 30                           |
| ■ Main building          | 35                           |
| ● Point source           | 40                           |
| ▭ Berm                   | 45                           |
|                          | 50                           |
|                          | 55                           |
|                          | 60                           |







Customer: Hesperia  
 Project: Midland Brick Site MRS Submission  
 Project-No. 20355-02

Combined Clay and Masonry  
 Evening Allwinds  
 Conveyor  
 & Clayshed Operating  
 3x seacontainer barrier clay  
 2x seacontainer barrier north  
 Evening Operations

Map  
**315**

Scenario A  
 Result number 315  
 Calculation in 1.5 m above ground  
 Day / Evening Operational Scenario

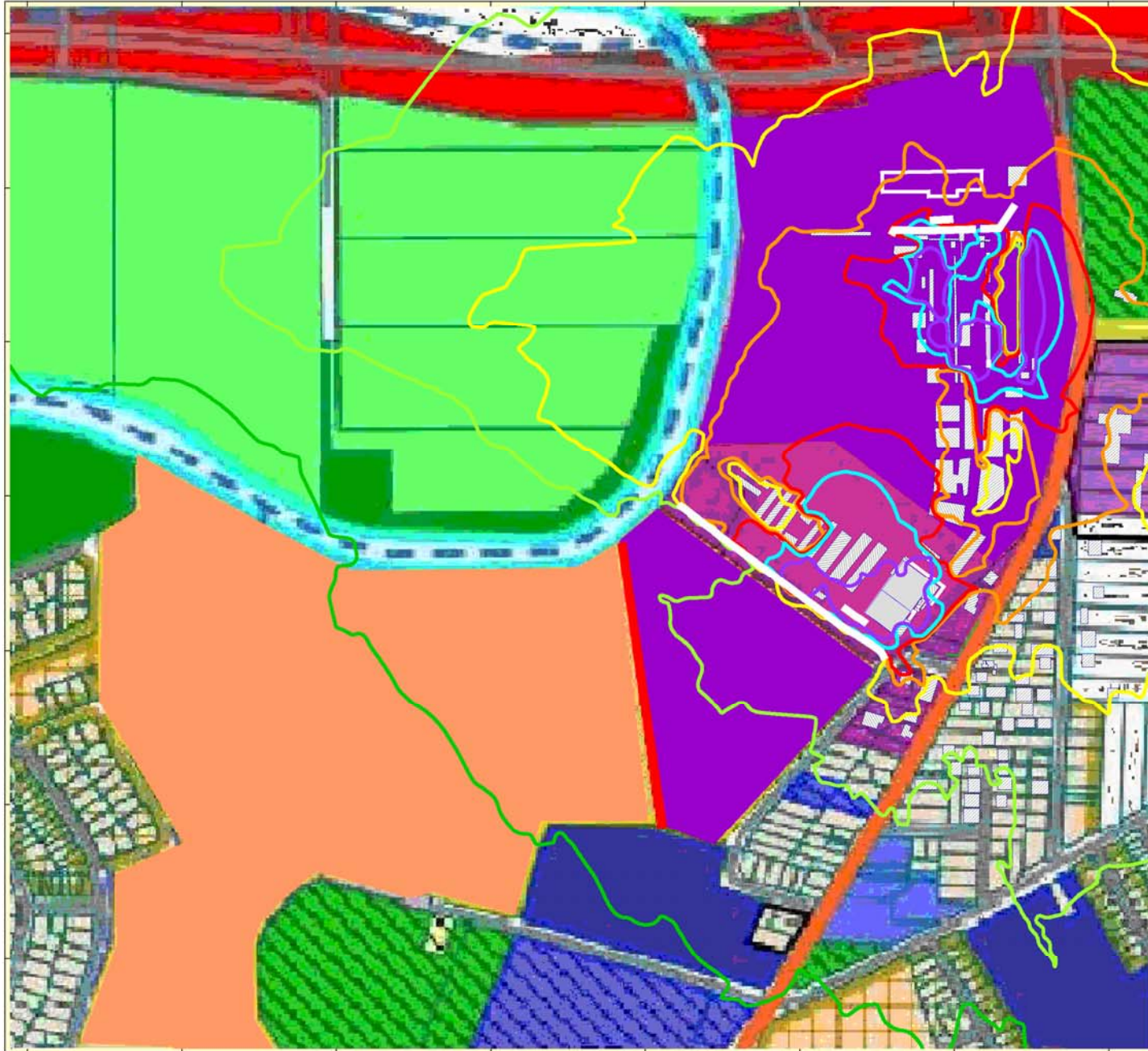
Project engineer: Paul Drew  
 Created: 7/07/2021  
 Processed with SoundPLAN 8.2, Update 9/06/2021

| Signs and symbols | Noise Levels<br>dB(A) |
|-------------------|-----------------------|
| Wall              | 30                    |
| Main building     | 35                    |
| Point source      | 40                    |
| Berm              | 45                    |
|                   | 50                    |
|                   | 55                    |
|                   | 60                    |



HERRING STORER  
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Customer: BGC & Capitory No.2  
 Hesperia  
 Project: Midland Brick Site  
 Project-No.

Combined Clay and Masonry  
 Night Allwinds  
 Clayshed & Conveyor  
 Removed

Map  
**299**

Scenario B  
 Result number 299  
 Calculation in 1.5 m above ground

Project engineer: Paul Drew  
 Created: 22/06/2021  
 Processed with SoundPLAN 8.2, Update 9/06/2021

**Signs and symbols**

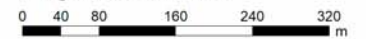
- Wall
- Main building
- Point source
- Berm

**Noise Levels**

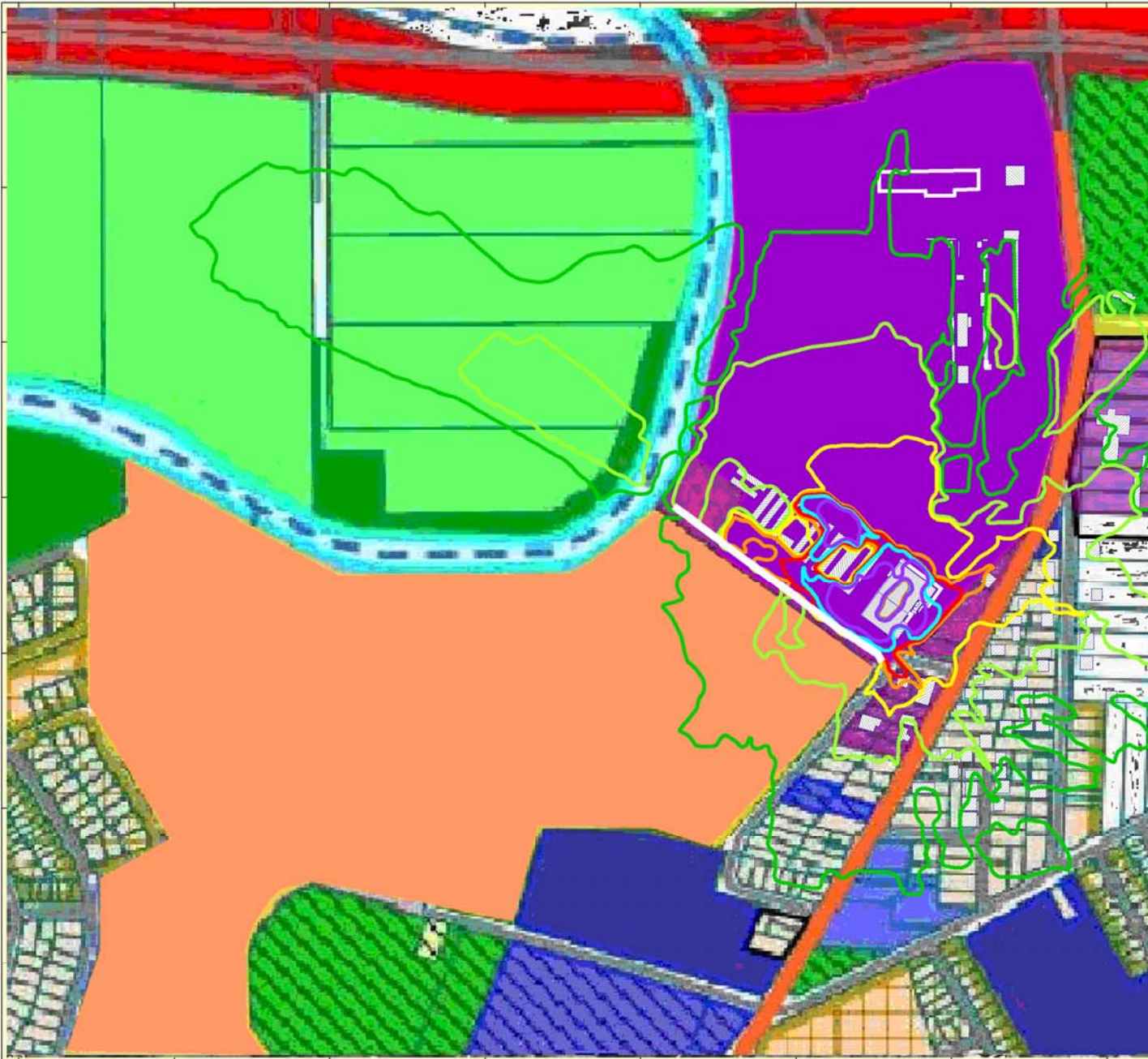
- dB(A)
- 30
  - 35
  - 40
  - 45
  - 50
  - 55
  - 60



Length scale 1:7000







Customer: BGC & Capitary No.2  
 Hesperia  
 Project: Midland Brick Site  
 Project-No.

Masonry Only  
 Night Allwinds  
 Scenario C

Map  
**300**

Scenario C - Masonry Only  
 Result number 300  
 Calculation in 1.5 m above ground

Project engineer: Paul Drew  
 Created: 24/06/2021  
 Processed with SoundPLAN 8.2, Update 9/06/2021

|  |   |
|--|---|
| <b>Signs and symbols</b>   | <b>Noise Levels</b><br>dB(A)  |
| <ul style="list-style-type: none"> <li> Wall</li> <li> Main building</li> <li> Berm</li> </ul> | <ul style="list-style-type: none"> <li> 30</li> <li> 35</li> <li> 40</li> <li> 45</li> <li> 50</li> <li> 55</li> <li> 60</li> </ul> |

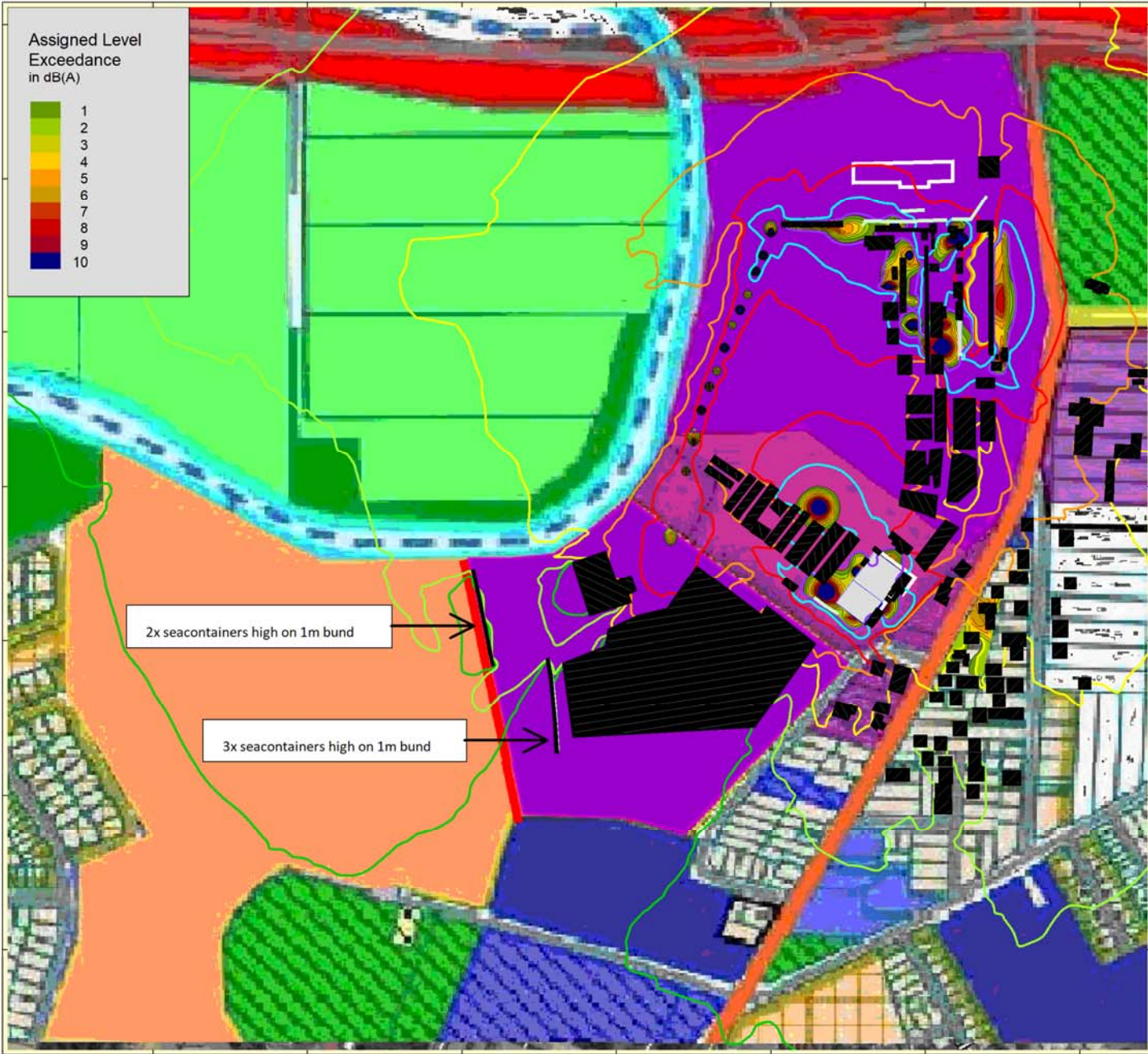
Length scale 1:7000



## **APPENDIX C**

NOISE EMISSION CONFLICT MAPS

(ASSIGNED LEVEL EXCEEDANCE MAPS)



Customer: Hesperia  
 Project: Midland Brick Site MRS Submission  
 Project-No. 20355-02

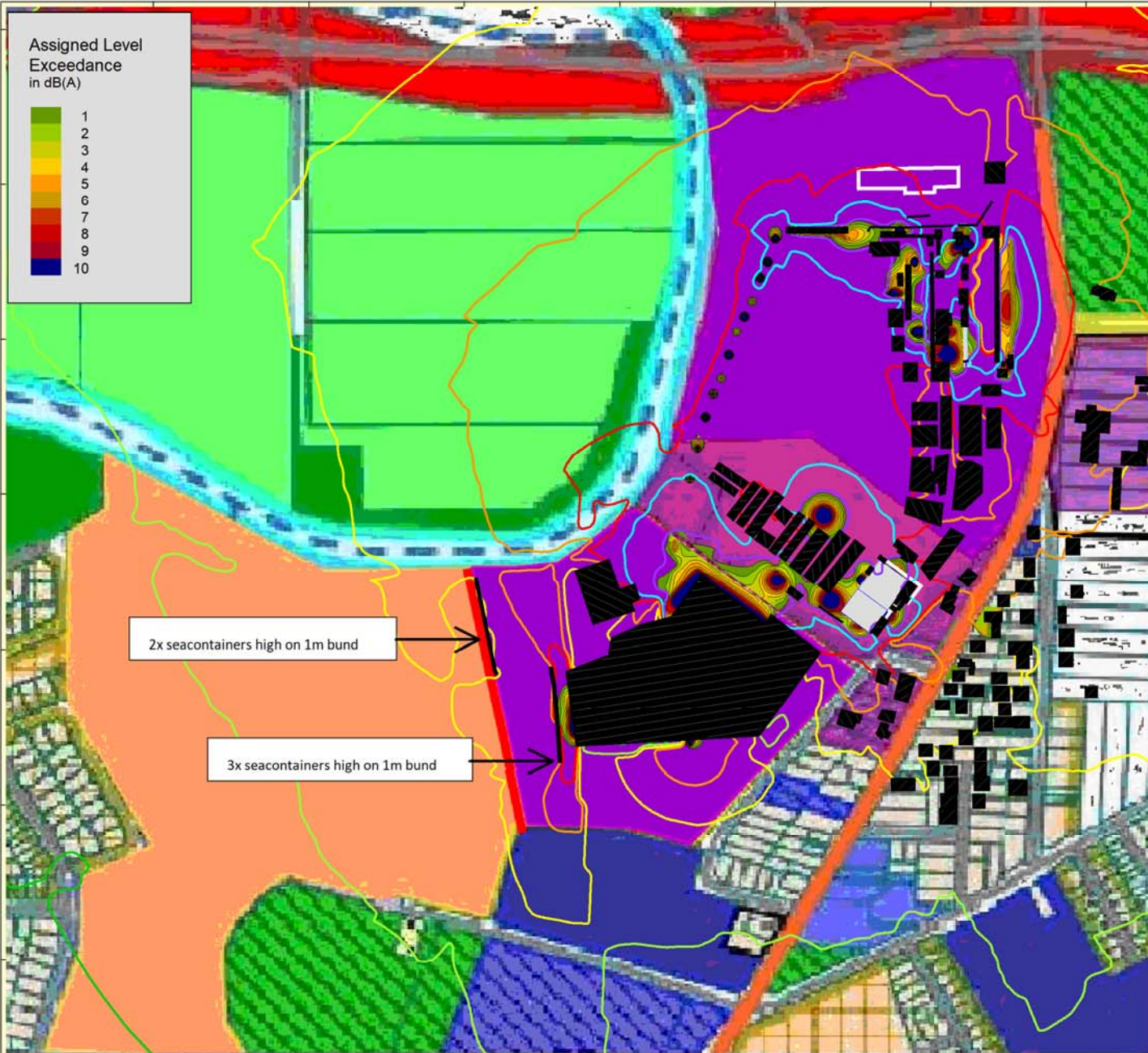
**CONFLICT NOISE MAP**  
 Combined Clay and Masonry,  
 Night Allwinds  
 Conveyor Operating  
 3x seacontainer barrier clay  
 2x seacontainer barrier north  
 Night Operations

Map  
**320**  
**CNMT**

**Scenario A**  
 Result number 320  
 Calculation in 1.5 m above ground

Project engineer: Paul Drew  
 Created: 7/07/2021  
 Processed with SoundPLAN 8.2, Update 9/06/2021





Assigned Level Exceedance in dB(A)

- 1
- 2
- 3
- 4
- 5
- 6
- 7
- 8
- 9
- 10

Customer: Hesperia  
 Project: Midland Brick Site MRS Submission  
 Project-No. 20355-02

Combined Clay and Masonry Evening Allwinds Conveyor & Clayshed Operating  
 3x seacontainer barrier clay  
 2x seacontainer barrier north Evening Operations

Map  
**315**  
**CMET**

Scenario A  
 Result number 315  
 Calculation in 1.5 m above ground  
 Day / Evening Operational Scenario

Project engineer: Paul Drew  
 Created: 7/07/2021  
 Processed with SoundPLAN 8.2, Update 9/06/2021

Signs and symbols

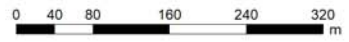
- Wall
- Main building
- Point source
- Berm

Noise Levels dB(A)

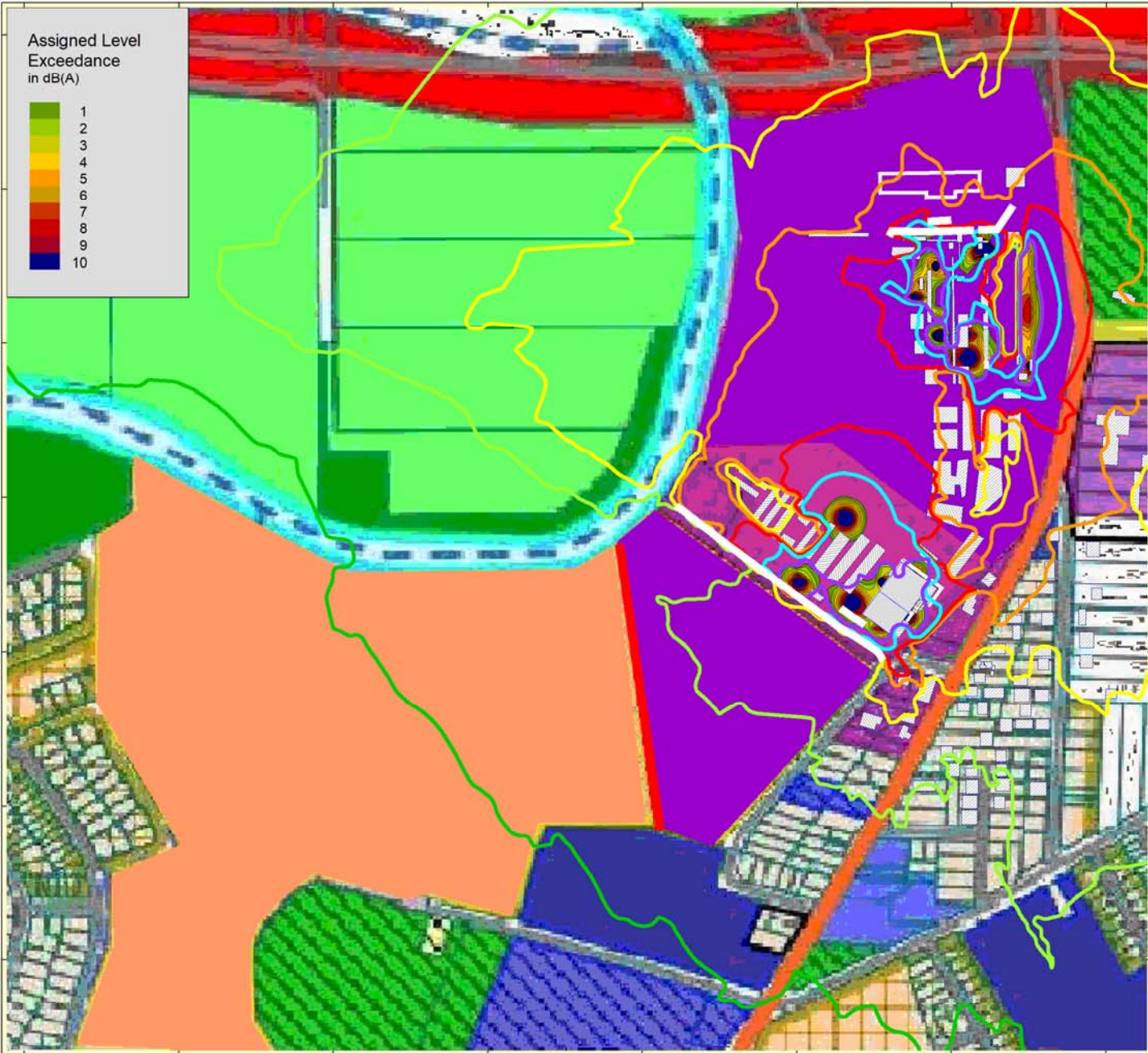
- 30
- 35
- 40
- 45
- 50
- 55
- 60



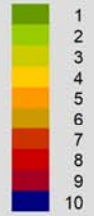
Length scale 1:7000







Assigned Level Exceedance in dB(A)



Customer: BGC & Capitary No.2  
 Hesperia  
 Project: Midland Brick Site  
 Project-No. 20355-02

CONFLICT NOISE MAP  
 Combined Clay and Masonry  
 Night Allwinds  
 Clayshed & Conveyor  
 Removed

Map  
**299**  
**CNMT**

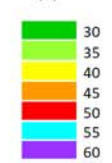
Scenario B  
 Result number 299  
 Calculation in 1.5 m above ground

Project engineer: Paul Drew  
 Created: 7/07/2021  
 Processed with SoundPLAN 8.2, Update 9/06/2021

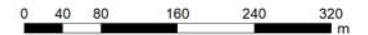
Signs and symbols

- Wall
- Main building
- Point source
- Berm

Noise Levels  
 dB(A)

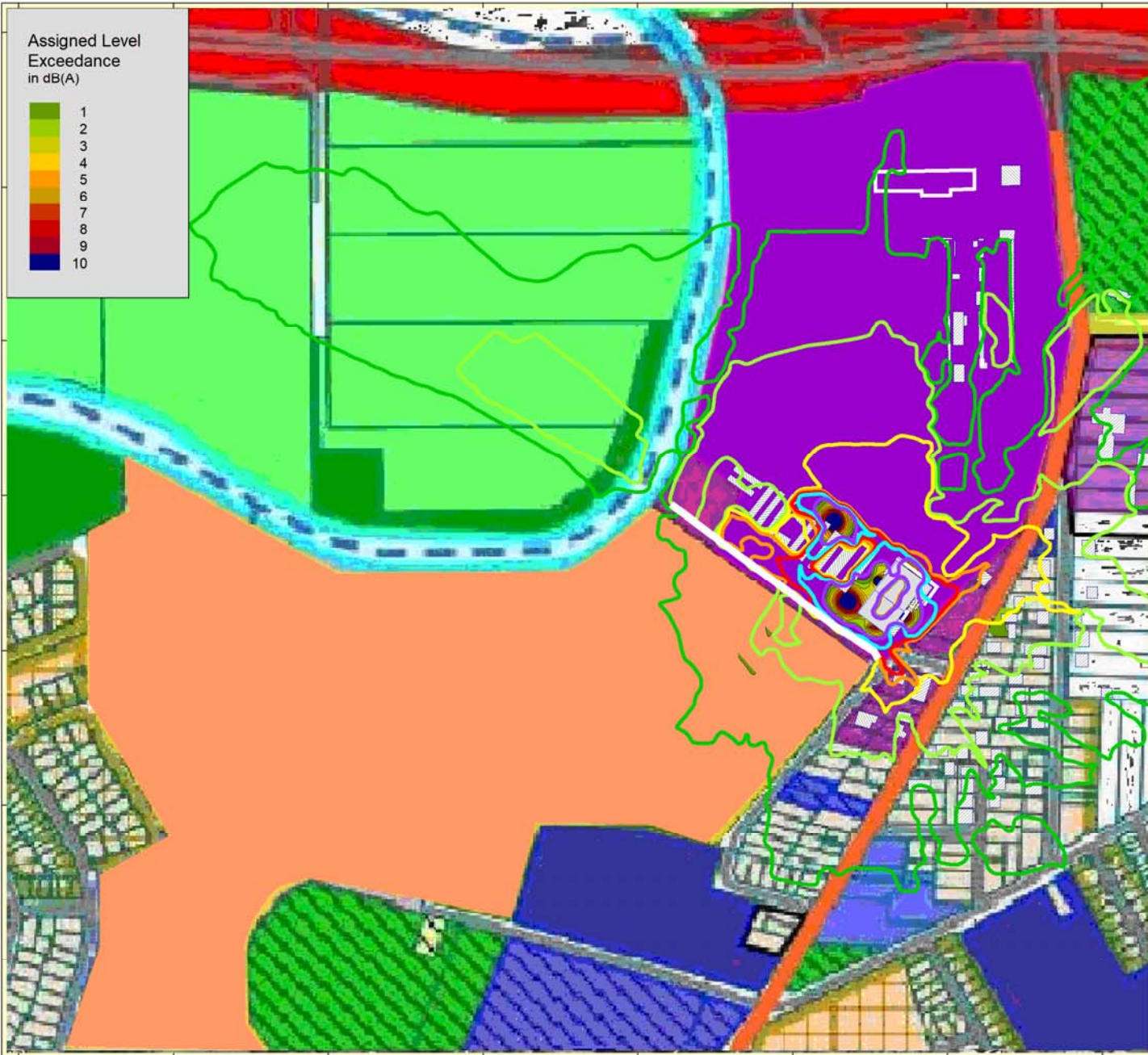


Length scale 1:7000

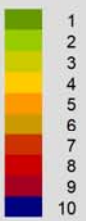


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 ACOUSTICS





Assigned Level Exceedance in dB(A)



Customer: BGC & Capitory No.2  
 Hesperia  
 Project: Midland Brick Site  
 Project-No.

**CONFLICT MAP - NIGHT**  
**Masonry Only**  
**Night Allwinds**

Map  
**300**  
**CMNT**

Scenario C

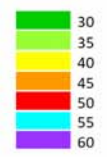
Scenario C - Masonry Only  
**Result number 300**  
 Calculation in 1.5 m above ground

Project engineer: Paul Drew  
 Created: 24/06/2021  
 Processed with SoundPLAN 8.2, Update 9/06/2021

**Signs and symbols**

- Wall
- Main building
- Berm

**Noise Levels**  
 dB(A)



**Length scale 1:7000**



**HERRING STORER**  
**ACOUSTICS**



**Appendix B**

**Terminology**

The following is an explanation of the terminology used throughout this report.

**Decibel (dB)**

The decibel is the unit that describes the sound pressure and sound power levels of a noise source. It is a logarithmic scale referenced to the threshold of hearing.

**A-Weighting**

An A-weighted noise level has been filtered in such a way as to represent the way in which the human ear perceives sound. This weighting reflects the fact that the human ear is not as sensitive to lower frequencies as it is to higher frequencies. An A-weighted sound level is described as  $L_A$  dB.

**$L_1$**

An  $L_1$  level is the noise level which is exceeded for 1 per cent of the measurement period and is considered to represent the average of the maximum noise levels measured.

**$L_{10}$**

An  $L_{10}$  level is the noise level which is exceeded for 10 per cent of the measurement period and is considered to represent the “intrusive” noise level.

**$L_{90}$**

An  $L_{90}$  level is the noise level which is exceeded for 90 per cent of the measurement period and is considered to represent the “background” noise level.

**$L_{eq}$**

The  $L_{eq}$  level represents the average noise energy during a measurement period.

**$L_{A10,18hour}$**

The  $L_{A10,18hour}$  level is the arithmetic average of the hourly  $L_{A10}$  levels between 6.00 am and midnight. The *CoRTN* algorithms were developed to calculate this parameter.

**$L_{Aeq,24hour}$**

The  $L_{Aeq,24hour}$  level is the logarithmic average of the hourly  $L_{Aeq}$  levels for a full day (from midnight to midnight).

**$L_{Aeq,8hour} / L_{Aeq} (Night)$**

The  $L_{Aeq} (Night)$  level is the logarithmic average of the hourly  $L_{Aeq}$  levels from 10.00 pm to 6.00 am on the same day.

**$L_{Aeq,16hour} / L_{Aeq} (Day)$**

The  $L_{Aeq} (Day)$  level is the logarithmic average of the hourly  $L_{Aeq}$  levels from 6.00 am to 10.00 pm on the same day. This value is typically 1-3 dB less than the  $L_{A10,18hour}$ .

**Noise-sensitive land use and/or development**

Land-uses or development occupied or designed for occupation or use for residential purposes (including dwellings, residential buildings or short-stay accommodation), caravan park, camping ground, educational establishment, child care premises, hospital, nursing home, corrective institution or place of worship.

**About the Term 'Reasonable'**

An assessment of reasonableness should demonstrate that efforts have been made to resolve conflicts without comprising on the need to protect noise-sensitive land-use activities. For example, have reasonable efforts been made to design, relocate or vegetate a proposed noise barrier to address community concerns about the noise barrier height? Whether a noise mitigation measure is reasonable might include consideration of:

- The noise reduction benefit provided;
- The number of people protected;
- The relative cost vs benefit of mitigation;
- Road conditions (speed and road surface) significantly differ from noise forecast table assumptions;
- Existing and future noise levels, including changes in noise levels;
- Aesthetic amenity and visual impacts;
- Compatibility with other planning policies;
- Differences between metropolitan and regional situations and whether noise modelling requirements reflect the true nature of transport movements;
- Ability and cost for mobilisation and retrieval of noise monitoring equipment in regional areas;
- Differences between Greenfield and infill development;
- Differences between freight routes and public transport routes and urban corridors;
- The impact on the operational capacity of freight routes;
- The benefits arising from the proposed development;
- Existing or planned strategies to mitigate the noise at source.

**About the Term 'Practicable'**

'Practicable' considerations for the purposes of the policy normally relate to the engineering aspects of the noise mitigation measures under evaluation. It is defined as "reasonably practicable having regard to, among other things, local conditions and circumstances (including costs) and to the current state of technical knowledge" (*Environmental Protection Act 1986*). These may include:

- Limitations of the different mitigation measures to reduce transport noise;
- Competing planning policies and strategies;
- Safety issues (such as impact on crash zones or restrictions on road vision);
- Topography and site constraints (such as space limitations);
- Engineering and drainage requirements;
- Access requirements (for driveways, pedestrian access and the like);
- Maintenance requirements;
- Bushfire resistance or BAL ratings;
- Suitability of the building for acoustic treatments.

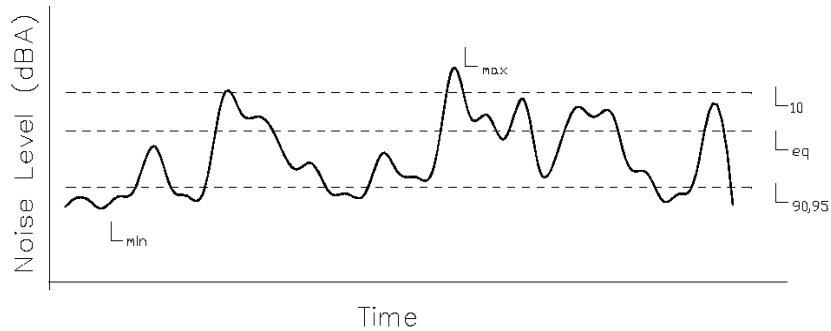
**$R_w$**

This is the weighted sound reduction index and is similar to the previously used STC (Sound Transmission Class) value. It is a single number rating determined by moving a grading curve in integral steps against the laboratory measured transmission loss until the sum of the deficiencies at each one-third-octave band, between 100 Hz and 3.15 kHz, does not exceed 32 dB. The higher the  $R_w$  value, the better the acoustic performance.

**$C_{tr}$**

This is a spectrum adaptation term for airborne noise and provides a correction to the  $R_w$  value to suit source sounds with significant low frequency content such as road traffic or home theatre systems. A wall that provides a relatively high level of low frequency attenuation (i.e. masonry) may have a value in the order of  $-4$  dB, whilst a wall with relatively poor attenuation at low frequencies (i.e. stud wall) may have a value in the order of  $-14$  dB.

**Chart of Noise Level Descriptors**



**Austrroads Vehicle Class**

| VEHICLE CLASSIFICATION SYSTEM |   |
|-------------------------------|---|
| AUSTRADS                      |   |
| LIGHT VEHICLES                |   |
| 1                             | SHORT<br>Car, Van, Wagon, 4WD, Utility, Bicycle, Motorcycle                 |
| 2                             | SHORT - TOWING<br>Trailer, Caravan, Boat                                    |
| HEAVY VEHICLES                |   |
| 3                             | TWO AXLE TRUCK OR BUS<br>*2 axles   |
| 4                             | THREE AXLE TRUCK OR BUS<br>*3 axles, 2 axle groups                          |
| 5                             | FOUR (or FIVE) AXLE TRUCK<br>*4 (5) axles, 2 axle groups                    |
| 6                             | THREE AXLE ARTICULATED<br>*3 axles, 3 axle groups                           |
| 7                             | FOUR AXLE ARTICULATED<br>*4 axles, 3 or 4 axle groups                       |
| 8                             | FIVE AXLE ARTICULATED<br>*5 axles, 3+ axle groups                           |
| 9                             | SIX AXLE ARTICULATED<br>*6 axles, 3+ axle groups or 7+ axles, 3 axle groups |
| LONG VEHICLES AND ROAD TRAINS |   |
| 10                            | B DOUBLE or HEAVY TRUCK and TRAILER<br>*7+ axles, 4 axle groups             |
| 11                            | DOUBLE ROAD TRAIN<br>*7+ axles, 5 or 6 axle groups                          |
| 12                            | TRIPLE ROAD TRAIN<br>*7+ axles, 7+ axle groups                              |

**Typical Noise Levels**

