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Proposed Residential Development Flambeau Europlast Site, Manston Road, Ramsgate

Noise Impact Assessment

**For:
Flambeau Europlast Ltd**

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1 Introduction

1.1 Overview

Environmental Noise Solutions Ltd (ENS) has been commissioned by Flambeau Europlast Ltd to undertake a noise impact assessment for a residential new build development on the Flambeau Europlast Site, Manston Road, Ramsgate (hereafter referred to as ‘the site’).

The objectives of the noise impact assessment were to:

- Determine external noise levels at the site
- Assess the potential impact of the external noise climate on the proposed residential development with reference to relevant guidelines
- Provide outline recommendations for noise mitigation measures (be it layout, enhanced building envelope and/or boundary treatments) to avoid any unacceptable loss of amenity due to noise

This report details the methodology and results of the assessment and provides outline recommendations for layout considerations, building envelope (fenestration and ventilation) and boundary treatments. It has been prepared to accompany an application for outline planning permission which is to be submitted Thanet District Council.

The report has been prepared for Flambeau Europlast Ltd for the sole purpose described above and no extended duty of care to any third party is implied or offered. Third parties referring to the report should consult the Flambeau Europlast Ltd and ENS as to the extent to which the findings may be appropriate for their use.

A glossary of acoustic terms used in the main body of the text is contained in Appendix 1.

1.2 Site Description and Development Proposals

The site comprises a vacant factory and existing brownfield land on the western outskirts of Ramsgate, as shown (highlighted in red) in Figure 1.1 overleaf.

The site is bound by:

- The B2050, Manston Road, adjacent to the north eastern boundary, with school playing fields and residential development beyond;
- A dual track railway line adjacent to the southern boundary, with residential development beyond;
- The petrol filling station (PFS) and car park of a Tesco supermarket, together with an area of scrub land, adjacent to the north western boundary; and,
- A commercial unit adjacent to the western boundary.

Figure 1.1: Location of Proposed Development



Development proposals are for a residential development of circa 118 no. dwellings. As outline planning permission is sought for the proposed development, detailed proposals, other than access, are not known at the time of writing and a ‘illustrative’ site layout has been assumed.

Notwithstanding this, the objective of the noise impact assessment is to assess whether the ambient noise climate represents a constraint to the proposed development, and the recommendations contained within this assessment can be refined at reserved matters stage once the layout is finalised.

For reference, outline planning permission (ref: OL/TH/15/0187) for residential development of the site was previously granted by Thanet District Council in November 2017, subject to conditions. Condition 24 relates to the control of noise as follows:

24 Details pursuant to Condition 1 shall include a sound attenuation scheme for dwellings adjacent to Manston Road, on the western boundary of the site adjacent to the superstore access road, and adjacent to the southern boundary of the site next to the railway line. This scheme should include, but not be limited to, mechanical ventilation for properties adjacent Manston Road and the railway line, with 1.8m acoustic timber fencing on the western boundary of the dwellings adjacent to the superstore access road and on to the southern boundary of dwellings adjacent to the railway line, in accordance with the Noise Impact Assessment report received and applicant's email received 8th May 2015.

GROUND:
 In the interest of the living conditions of future occupiers of the development in accordance with Thanet Local Plan Policy D1 and paragraph 17 of the National Planning Policy Framework.

The noise impact assessment (NIA) referenced in the above condition (ENS ref: NIA/5296/14/5022) undertook noise measurements at the site and provided comment on the suitability of the site for residential development, layout considerations and recommendations for the residential building envelope (fenestration and ventilation) and boundary screening.

Whilst the planning permission has now lapsed, this report makes reference to the requirements of Condition 24 and the findings of the aforementioned NIA.

During the course of the daytime noise survey, local road traffic on Manston Road was the dominant noise source in the northern site area (circa. 850 vehicles/hour recorded during a manual traffic count). During the night-time survey, the volume of traffic dropped off significantly, to circa. 60 vehicles/hour at 23:00 hours. At this time, noise emissions from cooling plant at the Tesco PFS were audible at the northern site boundary.

Noise levels at the southern site boundary were dominated by passenger train movements during the daytime, which were regular and noted to be slow moving (Ramsgate station is approximately 500 metres to the east of the site). During the night-time monitoring, train movements were limited, with seven train passes recorded between 23:00 and 00:27 hours. No significant noise emissions were noted from the commercial unit to the west of the subject site.

Consultation with the online resource 'Realtime Trains' has determined that the line is currently used by circa 115 no. passenger trains and 1–2 no. freight trains during the daytime (0700–2300 hrs). At night (2300–0700 hours), the rail line is used less frequently with circa 24 no. passenger trains and 1–2 no. freight trains.

2 Policy Context and Assessment Guidance

2.1 National Planning Policy Framework

The National Planning Policy Framework (NPPF)¹ was updated in 2021 and sets out the Government's planning policies for England and how these are expected to be applied.

Where issues of noise impact are concerned the NPPF provides brief guidance in paragraph 174 where it states that planning policies and decisions should contribute to and enhance the natural and local environment by:

'preventing new and existing development from contributing to, being put at unacceptable risk from, or being adversely affected by, unacceptable levels of.....noise pollution'.

Paragraph 185 advises that:

'Planning policies and decisions should also ensure that new development is appropriate for its location taking into account the likely effects (including cumulative effects) of pollution on health, living conditions and the natural environment, as well as the potential sensitivity of the site or the wider area to impacts that could arise from the development. In doing so they should.....mitigate and reduce to a minimum potential adverse impacts resulting from noise from new development – and avoid noise giving rise to significant adverse impacts on health and the quality of life'.

The NPPF also refers to the 2010 DEFRA publication, the Noise Policy Statement for England (NPSE) which reinforces and supplements the NPPF.

2.2 Noise Policy Statement for England

The Noise Policy Statement for England² (NPSE) sets out the long-term vision of promoting good health and a good quality of life through the effective management of noise within the context of Government policy on sustainable development. This long-term vision is supported by the following aims:

- Avoid significant adverse impacts on health and quality of life
- Mitigate and minimise adverse impacts on health and quality of life
- Where possible, contribute to the improvement of health and quality of life

The NPSE describes the following levels at which noise impacts may be identified:

- NOEL – No Observed Effect Level. This is the level below which no effect can be detected. In simple terms, below this level, there is no detectable effect on health and quality of life due to the noise
- LOAEL – Lowest Observed Adverse Effect Level. This is the level above which adverse effects on health and quality of life can be detected
- SOAEL – Significant Observed Adverse Effect Level. This is the level above which significant adverse effects on health and quality of life occur

According to the explanatory notes in the statement, where a noise level falls between the lowest observable adverse effect level (LOAEL) and a level which represents a significant observable adverse effect level (SOAEL):

'...all reasonable steps should be taken to mitigate and minimise adverse effects on health and quality of life whilst also taking into consideration the guiding principles of sustainable development. This does not mean that such effects cannot occur.'

1 National Planning Policy Framework. Ministry of Housing, Communities and Local Government (2021)

2 Government Department for Environment, Food and Rural Affairs. Noise Policy Statement for England. March 2010.

2.3 Planning Practice Guidance on Noise

Planning Practice Guidance³ (PPG) is an online resource which provides additional guidance and elaboration on the NPPF. It advises that the Local Planning Authority should consider the acoustic environment in relation to:

- Whether or not a significant adverse effect is occurring or likely to occur
- Whether or not an adverse effect is occurring or likely to occur
- Whether or not a good standard of amenity can be achieved

In line with the Explanatory Note of the NPSE, the PPG references the LOAEL and SOAEL in relation to noise impact. It also provides examples of outcomes that could be expected for a given perception level of noise, plus actions that may be required to bring about a desired outcome. However, in line with the NPSE, no objective noise levels are provided for LOAEL or SOAEL although the PPG acknowledges that:

‘...the subjective nature of noise means that there is not a simple relationship between noise levels and the impact on those affected. This will depend on how various factors combine in any particular situation’.

The PPG also provides general advice on the typical options available for mitigating noise, suggesting that Local Plans may include noise standards applicable to proposed developments within the Local Authority’s administrative boundary, although it states that:

‘Care should be taken, however, to avoid these being implemented as fixed thresholds as specific circumstances may justify some variation being allowed’.

With regard to the mitigation of extant environmental noise at a proposed residential development, the guidance states that:

‘... consideration should also be given to whether adverse internal effects can be completely removed by closing windows and, in the case of new residential development, if the proposed mitigation relies on windows being kept closed most of the time. In both cases a suitable alternative means of ventilation is likely to be necessary. Further information on ventilation can be found in the Building Regulations’.

The subjective nature of noise means that there is not a simple relationship between noise levels and the impact on those affected. This will depend on how various factors combine in any particular situation. The following guidance documents provide some meaningful context.

2.4 ProPG Planning and Noise: New Residential Development

ProPG Planning and Noise: New Residential Development (ProPG)⁴ was published in 2017 by the Association of Noise Consultants, Institute of Acoustics and the Chartered Institute of Environmental Health.

3 Planning Practice Guidance on Noise: <http://planningguidance.planningportal.gov.uk/blog/guidance/noise/>

4 ‘ProPG Planning and Noise: New Residential Development (ProPG)’, 2017. Association of Noise Consultants (ANC), Institute of Acoustics (IOA) and the Chartered Institute of Environmental Health (CIEH)

Stage 2: Element 2 of ProPG sets indoor ambient noise levels for residential dwellings based on the guidance contained in British Standard 8233:2014 ‘Guidance on Sound Insulation and Noise Reduction for Buildings’⁵ (BS 8233), see Table 2.1.

Table 2.1: Indoor Ambient Noise Levels in Dwellings

Activity	Location	Good Indoor Ambient Noise Levels	
Resting	Living Room	35 dB L_{Aeq} (0700-2300)	-
Dining	Dining Room/Area	40 dB L_{Aeq} (0700-2300)	-
Sleeping (daytime resting)	Bedroom	35 dB L_{Aeq} (0700-2300)	30 dB L_{Aeq} (2300-0700) 45 dB L_{AFMax} (2300-0700)

Note 4 to the above table states:

‘A guideline value may be set in terms of SEL or $L_{Amax,F}$, depending on the character and number of events per night. Sporadic noise events could require separate values. In most circumstances in noise sensitive rooms at night (e.g. bedrooms) good acoustic design can be used so that individual noise events do not normally exceed 45dB $L_{Amax,F}$ more than 10 times a night.’

Note 5 to the above table states:

‘Where it is not possible to meet internal target levels with windows open, internal noise levels can be assessed with windows closed, however any façade openings used to provide whole dwelling ventilation (e.g. trickle ventilators) should be assessed in the “open” position and, in this scenario, the internal L_{Aeq} target levels should not normally be exceeded, subject to the further advice in Note 7’.

This is consistent with the guidance contained within the PPG, which states that:

‘... consideration should also be given to whether adverse internal effects can be completely removed by closing windows and, in the case of new residential development, if the proposed mitigation relies on windows being kept closed most of the time. In both cases a suitable alternative means of ventilation is likely to be necessary. Further information on ventilation can be found in the Building Regulations’.

On the basis of the above, the following criteria (with windows closed and an alternative means of ventilation provided) are considered appropriate for the proposed residential development and considered to represent good resting and sleeping conditions:

- ≤ 35 dB L_{Aeq} (0700-2300) during the daytime
- ≤ 30 dB L_{Aeq} (2300-0700) and 45 dB L_{AFMax} not regularly exceeded during the night-time

With regard to external amenity, ProPG reflects the advice given in BS 8233 as follows:

‘The acoustic environment of external amenity areas that are an intrinsic part of the overall design should always be assessed and noise levels should ideally not be above the range 50–55 dB $L_{Aeq,16hr}$.’

‘These guideline values may not be achievable in all circumstances where development might be desirable. In such a situation, development should be designed to achieve the lowest practicable noise levels in these external amenity spaces.’

5 British Standards Institution (2014). *British Standard 8233:2014 Guidance on Sound Insulation and Noise Reduction for Buildings*.

3 Noise Survey

3.1 Overview

In order to determine the level of external noise affecting the proposed development, noise monitoring was carried out on Tuesday 3rd June through to Wednesday 4th June 2014.

The adopted noise monitoring positions (shown in Appendix 2) were as follows:

- MP1 was located in a free field environment, at 1.5 metres height, approximately 10 metres from the near-side railway line in the south western corner of the site.
- MP2 was located in a free field environment, at 3.0 height, mid-way along the northern site boundary with the Tesco car park (*note: supermarket was noted to open from 06:00 to 00:00 hours*).
- MP3 was located in a free field environment, at 1.5 height, on the north eastern site boundary, 10 metres from the kerb of Manson Road and in the vicinity of the Tesco PFS. *Note: MP3A was located in the same vicinity, at 20 metres from the kerb of Manston Road.*
- MP4 was located in a free field environment, at 1.5 height, in the Tesco car park at 15 metres from the main car park access road (*note: this position is equivalent to a location 5 metres into the site from the main car park access road*).

Noise measurements were undertaken using Bruel & Kjaer 2260 and 2250 Type 1 integrating sound level meters. Measurements consisted of A-weighted broadband parameters, together with linear, octave band L_{eq} levels.

The measurement systems calibration was verified immediately before the commencement of the measurement sessions and again at the end, using a Bruel & Kjaer Type 4231 calibrator. No drift in calibration level was noted. Weather conditions throughout the survey were appropriate for monitoring. A windshield was fitted for all measurements.

3.2 Summary

During the course of the noise survey, rail movements together with local and distant road traffic noise were noted to be the most significant contributions to the ambient noise climate across the site. No significant commercial noise emissions were noted, albeit noise from a Tesco PFS external chiller unit was locally audible in the vicinity of MP3/3A.

The following table contains a summary of the measurement data for each measurement session, at each measurement position, rounded to the nearest decibel. Noise emissions from the subject site were excluded using B&K Evaluator software.

Table 3.1: Summary of Noise Measurement Data

Position	Date	Time	L _{Aeq} (dB)	L _{AFmax} (dB)	L _{A10} (dB)	L _{A90} (dB)	Comment
MP1	03/06/14	1030-1420	54	80	49	41	Local rail traffic main noise source, with occasional aircraft fly over, distant road traffic and birdsong. No significant noise emissions audible from commercial premises to west. Typical L _{AFmax} of train pass <78 dB.
MP1	03/06/14	2300-0027	49	76	41	37	Local rail traffic and distant road traffic main noise sources. 7 trains recorded during measurement session.
MP2	03/06/14	1028-1058	46	60	48	43	Noise climate consisting of distant traffic, train passes and birdsong, with car park activity barely audible (note: earth bund between site and car park).
MP3	03/06/14	1111-1411	65	82	68	53	10 metres to road kerb. Noise climate consisting of local road traffic on Manston Road. Typical L _{AFmax} of vehicle pass <72 dB.
MP3	03/06/14	2307-0007	54	74	57	37	10 metres to road kerb. Noise climate consisting of local road traffic on Manston Road. Typical L _{AFmax} of vehicle pass <72 dB.
MP3A	03/06/14	1424-1454	60	81	63	49	20 metres to road kerb. Noise climate consisting of local road traffic on Manston Road.
MP3A	04/06/14	0017-0032	49	67	49	34	20 metres to road kerb. Noise climate consisting of local road traffic on Manston Road. L _{AF90,T} 46 dB with Tesco PFS cooling plant operating. L _{AF90,T} 34 dB with Tesco PFS cooling plant off.
MP4	03/06/14	1521-1536	60	73	64	51	Measurement at 15 metres to Tesco car park access road, equivalent to 5 metres into subject site from access road.

3.3 Analysis

Railway Noise

Ambient noise levels at the southern site boundary (MP1) were attributable to train passes on the adjacent railway line.

In order to assess the impact of rail movements, the Sound Exposure Level (SEL) is used. The SEL of a single discrete noise event is the level which if maintained constant for a period of one second would contain as much A-weighted sound energy as is contained in the actual noise event.

The typical SEL of a train pass at MP1 was measured 80 dB(A).

Current timetable information indicates circa 117 no. train passes during the daytime (0700–2300 hrs) and circa 26 no. train passes at night.

The following formula may be used for calculating the daytime and night time L_{Aeq} level from the SEL:

$L_{Aeq,T} = 10 * \log_{10} [(n \times 10^{SEL/10}) / T]$ where:

- SEL is the measured Single Event Level (dB (A))
- n is the number of occurrences
- T is the time period in seconds

Based on the SEL and usage as detailed above, the overall daytime and night-time ambient noise levels are calculated at **53 dB L_{Aeq} (0700-2300)** and **50 dB L_{Aeq} (2300-0700)** respectively at MP1. This correlates well with the measured data at this position.

The typical maximum noise level event associated with train passes was **78 dB L_{AFMax}** at MP1.

Road Traffic Noise

Ambient noise levels at the north-eastern site boundary (MP3) were attributable to road traffic on Manston Road.

For the prediction of daytime road traffic noise, the Department of Transport's Memorandum on the Calculation of Road Traffic Noise (CRTN) explains that the following shortened measurement procedure may be used. Measurements of L_{A10} are made over any three consecutive hours between 10:00 and 17:00 hours. Using L_{A10} (3 hour) as the arithmetic mean of the three consecutive values of hourly L_{A10} , the L_{A10} (18 hour) can be calculated from the equation:

$$L_{A10} (18 \text{ hour}) = L_{A10} (3 \text{ hour}) - 1 \text{ dB}$$

A study prepared by TRL Limited on behalf of the Department for Environment, Food and Rural Affairs (DEFRA) entitled 'Converting the UK Traffic Noise Index L_{A10} (18 hour) to EU Noise Indices for Noise Mapping' presents a methodology for calculating daytime L_{Aeq} (0700-2300) and night time L_{Aeq} (2300-0700) ambient noise levels based on the L_{A10} (18 hour) noise levels, as follows:

$$L_{Aeq} (0700-2300) = \frac{10 * \log ([(10^{((0.95 * L_{A10} (18 \text{ hour}) + 1.44)/10)^{12}}] + [10^{((0.97 * L_{A10} (18 \text{ hour}) - 2.87)/10)^{4}}])}{16}$$

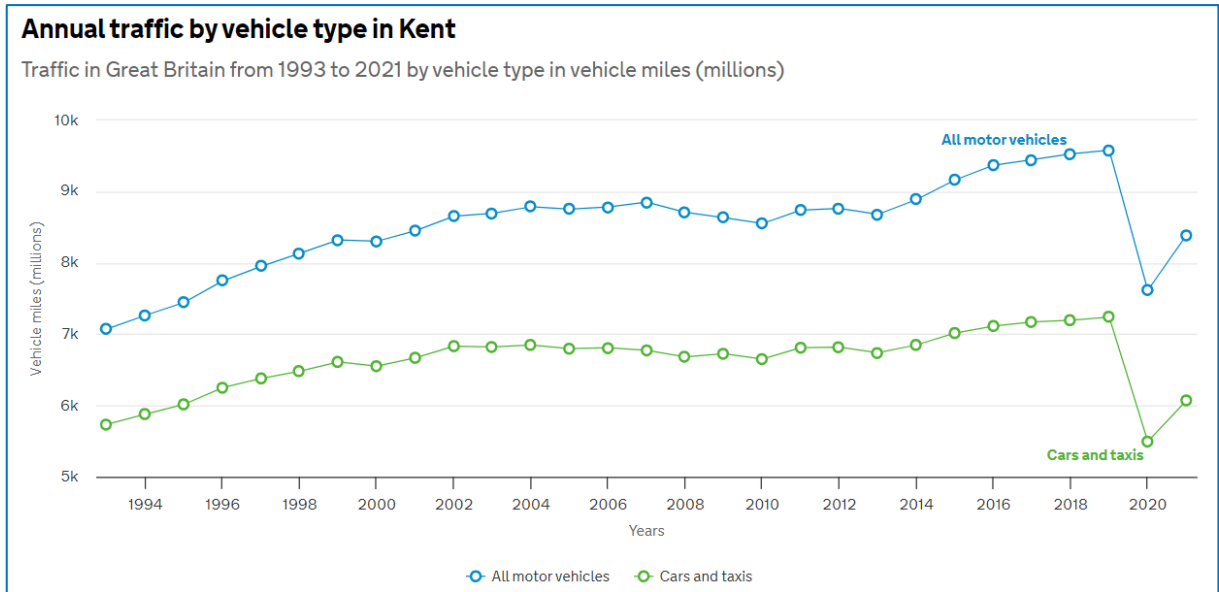
$$L_{Aeq} (2300-0700) = 0.90 * L_{A10, 18 \text{ hour}} - 3.77$$

Based on the above formulae, the daytime and night-time ambient noise levels at MP3 are measured / calculated at **65 dB L_{Aeq} (0700-2300)** and **57 dB L_{Aeq} (2300-0700)** respectively. The typical maximum noise level event associated with vehicle passes was **72 dB L_{AFMax}** at MP3.

The ambient noise level from road traffic is proportionate to the number of vehicle movements on the road.

As evidenced in Figure 3.1, Department for Transport (DfT) data for the Kent area indicates a steady rise (circa 7 %) in annual road traffic between 2014 and 2019, followed by a sharp decline in 2020 due to the Covid-19 pandemic.

Figure 3.1: Annual Traffic Summary for Kent



Further data produced by the DFT⁶ indicates that traffic volumes in 2023 have recovered to pre-pandemic (2019) flows.

Therefore, it is robustly assumed that road traffic volumes have increased overall by 7 % since 2014 (the year of the noise survey).

Using the methodology in the CRTN, a 7 % increase in traffic volumes equates to a negligible noise level change of 0.3 dB. Therefore, the road traffic noise levels measured are considered to be representative.

6

<https://www.gov.uk/government/statistics/transport-use-during-the-coronavirus-covid-19-pandemic>

4 Design Considerations

4.1 Overview

As stated previously, the most significant contributions to the ambient noise climate across the site are rail traffic together with local and distant road traffic noise.

On the basis of the survey results detailed in Section 3 and the design criteria referenced in Section 2, in principle, the site is considered suitable for residential development. Advice, in terms of controlling/limiting exposure to the ambient noise climate, is contained in the following paragraphs.

4.2 Southern Site Area

For the southern site area adjacent to the railway line, the daytime ambient noise level is relatively low, at 53 dB $L_{Aeq(0700-2300)}$ with no existing screening. In this area, gardens can be located directly up to the rail boundary (as occurs for existing dwellings on the opposite side of the track). It is probable that a trespass proof barrier will be required at the rear curtilage of the gardens. If this barrier is a 1.8-metre-high close boarded timber fence of mass per unit area of 10 kg/m², with panels rigidly mounted and no gaps between adjacent panels, or the barrier and the ground, it will provide a good level of amenity to garden areas.

The barrier should also be designed (e.g. through the use of cover strips) so that gaps do not develop between abutting panels through warping or shrinking. Consideration should be given to extending the barrier around the boundary with the commercial unit to the west as a precautionary measure, albeit no significant noise emissions were noted during the survey.

Night-time internal noise criteria at the southern boundary will be driven by L_{AFmax} levels. In this regard, locating gardens adjacent to the railway line will be beneficial as it will increase the separation distance to the dwelling facades. Enhanced glazing and a mechanical ventilation strategy (to avoid the need to open windows) will be required for bedrooms on the railway frontage façade.

On the basis of the measured L_{AFmax} levels, a 10-16-6 double glazing specification would be appropriate. Mechanical ventilation may be either an individual room system (e.g. Titon Sonair), or a System 3 MEV system (with make-up air provided by high performance over-frame vents or through-wall ventilation). Standard glazing and trickle ventilation are considered appropriate for living rooms.

4.3 North-Eastern Site Area Adjacent to Manston Road

For the north-eastern site area adjacent to Manston Road, the ambient noise climate is dominated by local road traffic, with a daytime and night-time levels of 65 dB $L_{Aeq(0700-2300)}$ and 57 dB $L_{Aeq(2300-0700)}$ respectively, and typical vehicle pass L_{AFmax} of 72 dB at 10 metres to the kerb. On this frontage it is recommended that gardens are located to the rear of dwellings, such that the dwellings themselves screen gardens from local traffic.

On the basis of the measured levels, a 10-16-4 double glazing specification would be appropriate for habitable rooms fronting onto the road. A mechanical ventilation system may also be required, subject to the requirements of the local planning authority. Screening and orientation of the end dwellings in the vicinity of MP3 will also be required to control noise emissions from the Tesco PFS chiller plant (e.g. gable ends with no habitable room glazing oriented towards the noise source).

4.4 Site Boundary with Tesco Car Park

For the site boundary with the Tesco car park and car park access road, appropriate screening can again be provided using a 1.8-metre-high timber acoustic barrier (to the specification above) with gardens backing onto the boundary.

Note: the existing bund at the northern site boundary with the car park can be retained or replaced with a timber barrier. Standard glazing and trickle ventilation is appropriate in these areas.

4.5 Design Summary

For reference, the measures outlined above are consistent with Condition 24 of Planning Permission ref: OL/TH/15/0187, which required details of 1.8m acoustic timber fencing to the southern and western boundaries, and a scheme of mechanical ventilation for plots adjacent to the railway line and Manston Road.

A detailed building envelope specification can be provided when the detailed layout is determined (as part of a Reserved Matters application). The ambient noise climate does not pose a constraint to the proposed residential development.

5 Summary and Conclusions

A noise impact assessment has been undertaken for the proposed residential development at the Flambeau Europlast Site, Manston Road, Ramsgate.

The noise environment at the site is due to rail movements together with local and distant road traffic noise, with no other significant noise sources.

Based on available traffic data, noise associated with road traffic on Manston Road is unlikely to have increased significantly. The assessment of rail noise has been undertaken using current timetable information.

On the basis of the survey results, in principle, the site is considered suitable for residential development subject to judicious layout and appropriate sound insulation of the building façade.

Appendix 1 – Abbreviations and Definitions

Sound Pressure Level (L_p)

The basic unit of sound measurement is the sound pressure level. As the pressures to which the human ear responds can range from 20 μ Pa to 200 Pa, a linear measurement of sound levels would involve many orders of magnitude. Consequently, the pressures are converted to a logarithmic scale and expressed in decibels (dB) as follows:

$$L_p = 20 \log_{10}(p/p_0)$$

Where L_p = sound pressure level in dB; p = rms sound pressure in Pa; and p_0 = reference sound pressure (20 μ Pa).

A-weighting

A frequency filtering system in a sound level meter, which approximates under defined conditions the frequency response of the human ear. The A-weighted sound pressure level, expressed in dB(A), has been shown to correlate well with subjective response to noise.

Equivalent continuous A-weighted sound pressure level, $L_{Aeq, T}$

The value of the A-weighted sound pressure level in decibels of continuous steady sound that within a specified time interval, T, has the same mean-square sound pressure as a sound that varies with time. $L_{Aeq, 16h}$ (07:00 to 23:00 hours) and $L_{Aeq, 8h}$ (23:00 to 07:00 hours) are used to qualify daytime and night time noise levels.

$L_{A10, T}$

The A-weighted sound pressure level in decibels exceeded for 10% of the measurement period, T. $L_{A10, 18h}$ is the arithmetic mean of the 18 hourly values from 06:00 to 24:00 hours.

$L_{A90, T}$

The A-weighted sound pressure level of the residual noise in decibels exceeded 90% of a given time interval, T. L_{A90} is typically taken as representative of background noise.

$L_{AF \max}$

The maximum A-weighted noise level recorded during the measurement period. The subscript 'F' denotes fast time weighting, slow time weighting 'S' is also used.

Single Event Level / Sound Exposure Level (SEL or L_{AE})

The energy produced by a discrete noise event averaged over one second, regardless of the event duration. This allows for comparison between different noise events which occur over different lengths of time.

Weighted Sound Reduction Index (R_w)

Single number quantity which characterises the airborne sound insulation properties of a material or building element over a defined range of frequencies (R_w is used to characterise the insulation of a material or product that has been measured in a laboratory).

Appendix 2 – Noise Measurement Positions



Appendix 3 – Indicative Site Layout

