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NV/09/3857NL01
13 August 2009

Declan Burke
Project Manager
Bord Gais Networks
Gasworks Road
Cork

Dear Declan,

RE: BORD GAIS DOCK ROAD SITE PRELIMINARY VIBRATION MONITORING – 18th MAY to 24th JUNE 2009

We are pleased to forward our comments in relation to the preliminary vibration monitoring carried out on the Bord Gais Dock Road development project in Limerick

1.0 BACKGROUND

AWN Consulting Limited was commissioned by Bord Gais to carry out preliminary vibration monitoring at two locations on their site on the Dock Road, Limerick. The vibration monitoring was carried out to ascertain the current ambient levels of vibration that are experienced at the site in advance of construction work that is due to take place on this site.

This survey has been conducted with a view to logging typical vibration levels at sensitive locations. The results of the vibration monitoring are reviewed and commented on in the following sections.

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2.0 VIBRATION SURVEY DETAILS

Specific details of the vibration monitoring are set out below.

2.1 Measurement Locations

Location 1

Location 1 is at the entrance to the site from the Dock Road (N69). The Dock Road is a national primary route which experiences a high volume of daily traffic. This location is also in close proximity to Limerick Port which caters for a large volume of HGV traffic. The geophone was hard mounted to the entrance wall. This wall is connected to an adjacent public house.

Location 2

Location 2 is the now redundant Bord Gais administration office. This building is located approximately 30m south east of the Dock Road entrance. The geophone was hard mounted onto the gable wall on the east side of the building.

2.2 Survey Period

Continual monitoring was carried out from 18th May to 24th June 2009.

2.3 Personnel and Instrumentation

Niall Vaughan (AWN) conducted the vibration survey.

The vibration measurements were conducted using an Instantel Blastmate Type III Vibration Analyser with attached tri-axial geophone. This unit performs the measurement of vibration velocity in the three orthogonal axes (vertical, longitudinal and transverse). The unit stores the greatest peak particle velocity (ppv) measured in each axis during each measurement period. The period selected here was 5 minutes. As well as storing the greatest peak particle velocity during each measurement period, the unit also stores the frequency (in hertz) at which the greatest velocity occurred.

3.0 RESULTS / DISCUSSION

Tables 1 & 2 below review the measured levels at Locations 1 & 2 respectively and summarise the maximum vibration levels monitored during the current survey period in various frequency bands.

Frequency of vibration	Tran PPV mm/s	Vert PPV mm/s	Long PPV mm/s
Threshold Vibration Values	*0.127 – 0.254*	*0.127 – 0.254*	*0.127 – 0.254*
Less than 10Hz	0.127	0.127	0.127
10 to 50Hz	0.762	0.254	0.127
50 to 100Hz (and above)	0.889	0.762	0.762

Table 1 Maximum Levels Monitored in Frequency Bands at Location 1

Frequency of vibration	Tran PPV mm/s	Vert PPV mm/s	Long PPV mm/s
Threshold Vibration Values	*0.127 – 0.254*	*0.127 – 0.254*	*0.127 – 0.254*
Less than 10Hz	0.254	0.254	0.254
10 to 50Hz	28.4	0.254	0.254
50 to 100Hz (and above)	0.381	43.1	37.2

Table 2 Maximum Levels Monitored in Frequency Bands at Location 2

Vibration standards come in two varieties: those dealing with human comfort and those dealing with cosmetic or structural damage to buildings. In both instances, it is appropriate to consider the magnitude of vibration in terms of Peak Particle Velocity (PPV).

Guidance relevant to acceptable vibration within buildings is contained in the following documents:

- British Standard BS 7385-2 (1993): *Evaluation and measurement vibration in buildings Part 2: Guide to damage levels from ground borne vibration*;
- British Standard BS 5228-2 (2009): *Code of practice for noise and vibration control on construction and open sites Part 2:Vibration*;
- BRE – 403 (1995) – Damage to structures from ground-borne vibration 1995.

BS 7385 states there should typically be no cosmetic damage if transient vibration does not exceed 15mm/s at low frequencies rising to 20mm/s at 15Hz and 50mm/s at 40Hz and above. These guidelines relate to relatively modern buildings and should be reduced to 50% or less for more critical buildings or structures that are regarded to be compromised..

BS 5228 recommends that, for soundly constructed residential property, light commercial buildings and similar structures that are generally in good repair, a threshold for minor or cosmetic (i.e. non-structural) damage should be taken as a peak particle velocity of 15mm/s at 4Hz increasing to 20mm/s at 15Hz and increasing to 50mm/s at 40Hz and above for intermittent vibration. For reinforced or framed structures or industrial and heavy commercial buildings and similar structures that are generally in good repair, a threshold for minor or cosmetic (i.e. non-structural) damage should be taken as a peak particle velocity of 50mm/s at 40Hz and above again for intermittent vibration. In the case of continuous vibration it states that these figures may need to be reduced by up to 50%. Below these vibration magnitudes minor damage is unlikely, although where there is existing damage these limits may be reduced by up to 50%.

The BRE403 document references guidance limits from the previous BS 5228: Part 4 (1992) which has been superseded by BS 5228: Part 2 (2009). It is understood that BRE403 is due to be revised.

The guidance limits from BS 7385 and BS 5228 are set out in Table 3 below.

Type of structure	Frequency of vibration	
	4 to 15Hz	15Hz (and above)
Reinforced or framed structures Industrial and heavy commercial buildings	50mm/s	50mm/s
Unreinforced and light framed structures Residential or light commercial buildings	15mm/s at 4Hz increasing to 20mm/s at 15Hz	20mm/s at 15Hz increasing to 50mm/s at 40Hz and above

Table 3 Peak Particle Velocities (ppv in mm/s) Below Which Transient Vibration Should Not Cause Cosmetic Building Damage

4.0 CONCLUSION

It is evident that the levels monitored from both locations during this period do not exceed the levels prescribed in Table 3.

The vibration levels recorded from Location 1 are regarded as being consistent as to what would be expected from vibration associated with traffic movements. These levels would be considered as "slight" and would reflect the levels of vibration emanating from traffic movements at a location such as this.

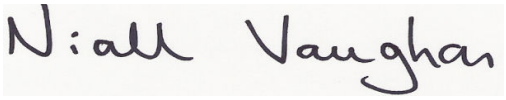
The vibration levels from Location 2 were generally consistent for this location. There was one occurrence on the 5th June at 13:19hrs when the recorded vibration levels experienced a rise relative to the former and latter readings. The levels and frequencies recorded in the transverse, vertical and longitudinal components were 28.4mm/s at 43Hz, 43.1mm/s above 100Hz and 37.2mm/s above 100Hz respectively. It is understood that there is a dancing and band practice studio to the rear of this location. It is possible that the source of this vibration may have emanated from this facility however it could also be attributed to a different source.

Notwithstanding the levels recorded on 5th June at Location 2, there were no noticeable sources of vibration which is borne out by the values recorded. These values were generally at threshold levels.

It would be expected that vibration levels from demolition events or similar occurrences and similar distances from the structures of interest would result in similar levels of vibration assuming similar ground composition.

Please do not hesitate to contact this office if you have any comments in relation to the content of this document.

Yours sincerely,



NIALL VAUGHAN
Senior Acoustic Consultant

encl. raw measurement data (Excel spreadsheet)