Memo

Project: National Paediatric Hospital

Report Type: Summary of Noise and Vibration Monitoring Results

Period of Monitoring: Sensor data 22nd December 2017 – 29th January 2018

Introduction

Contained within the project documents for the National Paediatric Hospital development are requirements for Environmental Monitoring to be completed during construction works. This monitoring regime includes recording dust deposition, noise at the perimeter of the site, and ground vibration at the perimeter of the site. Permissible limits for each monitoring regime have been set out in the Project EIS which was submitted with the Planning Permission for the Hospital.

The number of Monitoring points will vary throughout the project depending on the construction works being undertaken. Additional monitoring points may be added if particular features of adjacent properties require it.

Vibration Monitoring.

Vibration monitors have been located at the 'closest part of sensitive property' as per the Project Environmental Impact Statement where feasible or alternatively at the site hoarding. The monitors will be located as per the above adjacent to locations where significant works are ongoing on site.

The Project Environmental Impact Statement (EIS) that was part of the project Planning Permission established vibration limit at structures depending on their condition and type. Please see tables below for the limits set.

Table 11.7: Allowable vibration during construction phase for soundly constructed buildings

Allowable vibration (in terms of peak particle velocity) at the closest part of sensitive property to the source of vibration, at a frequency of		
Less than 10Hz	**10 to 50Hz**	**50 to 100Hz (and above)**
15 mm/s	20 mm/s	50 mm/s

Table 11.8: Allowable vibration during construction phase for sensitive buildings

Allowable vibration (in terms of peak particle velocity) at the closest part of sensitive property to the source of vibration, at a frequency of		
Less than 10Hz	**10 to 50Hz**	**50 to 100Hz (and above)**
3 mm/s	3 – 8 mm/s	8 – 10 mm/s

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Site operations are monitored using a traffic light trigger system of Green, Amber and Red trigger levels with the Red trigger level set at a vibration limit of 3mm/s PPV which corresponds to the lowest permissible vibration limit for sensitive structures. Any vibration level recorded below Red levels is acceptable within the limits established in Planning.

Number of Monitors on Site:

During the monitoring period summarised for this report (22nd December 2017 – 29th January 2018) there were up to 17 active vibration monitors installed at the perimeter of the site.

Location of Vibration and Noise Monitors:

The new layout of the monitors is as seen below:

Location of Vibration Monitors

There are concentrations of monitors at the boundaries with Cameron Square and O'Reilly Avenue where works have been ongoing on site in proximity to neighbouring properties.

Sensor 8983 has been replaced by sensor 3468 but has remained in the same location.

Sensor 8939 has been replaced by sensor 3182 but has remained in the same location.

There are 5 new sensors on site during this monitoring period, 3252 Cameron Square, 9005 Luas Comm box, 8939 inside the Pharmacy, 9044 inside the A&E and 8838 which is at the energy centre.

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Location of Vibration Monitors around O'Reilly Avenue

Observations:

Executive Summary:

The majority of vibration readings during the monitoring period recorded readings below the limit specified within the Project EIS. However two number monitors recorded readings above the limit specified within the Project EIS. These triggers were generally caused by residents knocking into the sensors. Vibration monitors have been placed at the 'closest part of the sensitive properties' as per the EIS where this is feasible.

3 number monitors were offline for portions of the monitoring period and are noted below.

Detailed Summary:

Sensor (V3 - 9000) (South Circular Road)

- No data available from 22nd December 2017 to 8th January 2018. It should be noted that the site was closed from 22nd December 2017 to the 2nd January 2018 with no construction activity taking place.
- All vibration readings recorded were below the limit specified within the Project EIS.

Sensor (9244) (O'Reilly Avenue)

- All vibration readings recorded were below the limit specified within the Project EIS.

Sensor (8681) (Mount Brown)

- There were 4 number vibration readings recorded above the limit specified within the Project EIS. The readings were recorded on the 21st & 29th December 2017 and the 22nd & 24th January 2018.

  The reports indicate that there were no works on site in the area of Mount Brown when the triggers occurred.

  On 21st December the site was being shut down for the Christmas break with little or no production.

On 29th December the site was closed with no construction activities taking place.

On 21st December, 22nd & 24th January works on site were concentrated away from the Mount Brown area and the sensors in the areas of these works recorded no vibration triggers. This would suggest the triggers are due to activities not related to the construction works.

On the days of the triggers, excavation and construction works were taking place on site at various locations.

The vibration readings either side of the peak / trigger are within the limit specified in the Project EIS. This would suggest the triggers are due to isolated incidents – rather than a prolonged activity on site.

Sensor (9141) (Hospital A&E)

- All vibration readings recorded below the limit specified within the Project EIS.

Sensor (9028) (Cameron Square)

- All vibration readings recorded below the limit specified within the Project EIS.

Sensor (8898) (O'Reilly Avenue)

- All vibration readings recorded below the limit specified within the Project EIS.

Sensor (3182) (Cameron Square) (Previously Numbered 8939)

- One number trigger was recorded on 9th January 2018. This trigger has been noted as occurring when the batteries were being changed on the monitor.
- The monitoring data is not available from the 21st – 26th of December 2017. Note that the site was closed from 22nd December to 2nd January with no construction activities taking place.
- All remaining recorded vibration readings recorded below the limit specified within the Project EIS.

Sensor (8995) (O'Reilly Avenue)

- All vibration readings recorded below the limit specified within the Project EIS.

Sensor (V12 - 3468) (O'Reilly Avenue)

- The sensor was previously number 8983.
- No data available from 22nd December 2017 to 8th January 2018. Note that the site was closed from 22nd December to 2nd January with no construction activities taking place. Monitor V12 is located between Sensor 3468 and 8898 and in close proximity to both. Neither of these monitors recorded readings over the lowest limit in the Project EIS during this monitoring period.
- All available vibration readings recorded below the limit specified within the Project EIS.

Sensor (9737) (4 Mount Shannon Road)

- All vibration readings recorded below the limit specified within the Project EIS.

Sensor (9750) (Rialto Luas)

- All vibration readings recorded below the limit specified within the Project EIS.

Sensor (9734) (Hospital Entrance)

- All vibration readings recorded below the limit specified within the Project EIS.

Sensor (9736) (Cameron Square)

- All vibration readings recorded below the limit specified within the Project EIS.

Sensor (Temp - 9005) (Luas Comm Box)

- This is a new sensor which started recording on the 10th January 2018 and is located between the site and the Luas line rather than at a residential property.
- There were 4 number vibration readings recorded above the limit specified within the Project EIS. The readings were recorded on the 10th, 16th, 17th, and 19th January 2018. The reports indicate that the trigger on the 10th *"was caused by the installation of the protective wooden box surrounding the unit"*, the trigger on the 16th and 17th *"[were] caused by a knock by a pedestrian walking past"*.
  Works on site on 10th, 16th, 17th, and 19th January included excavation and construction at O'Reilly Avenue, Piling preparation at Cameron Square, Excavation at Hospital / South Circular Road, Demolition Works at the old Clinic Building, and Construction of the new Diversion Road.
  The trigger readings appear to be isolated incidents rather than sustained construction activities with the readings either side of the peak within the specified limit.

Sensor (3252) (Cameron Square)

- New sensor which started recording on the 8th January 2018.
- All vibration readings recorded below the limit specified within the Project EIS.

Sensor (A2 - 8939) (Pharmacy (inside))

- New sensor which started recording on the 15th January 2018.
- All vibration readings recorded below the limit specified within the Project EIS.

Sensor (A1 - 9044) (A&E (inside))

- New sensor which started recording on the 15th January 2018.
- All vibration readings recorded below the limit specified within the Project EIS.

Sensor (V18 - 8838) (Energy Centre)

- New sensor which started recording on the 15th January 2018.
- All vibration readings recorded below the limit specified within the Project EIS.

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Noise Monitoring.

During the report period noise monitors have been placed at the 'closest part of sensitive property' as per the Project EIS where this has been feasible, or alternatively to the outside face of the site hoarding. When works are ongoing the noise monitor sensors run continuously and readings are recorded in decibels (dB) LA_{eq1hr}. Decibels is the standard unit of measurement of sound energy and 'LA_{eq1hr}' means that sensors record all levels of sound over a 1 hour period and then calculate an average equivalent decibel level as if the sound was continuous. Isolated instantaneous loud noises are thus averaged out.

The Project Environmental Impact Statement (EIS) that was part of the project Planning Permission established a noise limit at residential dwellings of 70dB LA_{eq1hr}. Site operations are monitored using a traffic light trigger system of Green, Amber and Red trigger levels with the Red trigger level set at the noise limit set out in the project EIS (70 dB LA_{eq1hr}.). Any noise level recorded below Red levels is acceptable within the limits established in Planning.

Number of Noise Monitors on Site:

During the monitoring period (22th December 2017 – 29th January 2018) summarised for this report there were up to 15 active monitors at the site boundaries.

Observations:

Executive Summary:

Fourteen of the fifteen monitors recorded noise levels above the limits set out in the Project EIS, these are 01, 02, 03, 04, 05, 06, 07, 08, 09, 10, 11, 12, 13 and 16.

Detailed Summary:

The monitoring results for noise for this period were within the limits set out in the Project EIS with the following exceptions:

Monitor 01 (Cameron Square)

- Noise Monitor 01 recorded levels above those set out in the Project EIS on 5 separate days (4th, 18th, 19th, 23rd & 24th January 2018) with all values between 70-74 dB LA_{eq1hr}.
- No details were provided for the cause of the triggers on these dates.

Monitor 02 (O'Reilly Avenue)

- Monitor was offline from 19th-22nd January 2018
- Noise Monitor 02 recorded levels above those set out in the Project EIS on 2 separate days (23rd December 2017 & 2nd January 2018) with both values between 70-74 dB LA_{eq1hr}. Note the site was closed from 22nd December to 2nd January inclusive with no construction works taking place – therefore both triggers are unrelated to construction works.

Monitor 03 (South Circular Road)

- Monitor was offline on the 9th January 2018.
- Noise Monitor 03 recorded levels above those set out in the Project EIS on 9 separate days (3rd, 13th, 17th, 19th, 22nd, 23rd, 24th , 25th & 26th January 2018) with typical values between 70-80 dB LA_{eq1hr}.
- Works on site on these dates include excavation works from various locations on site and construction work for the utility tunnel at the O'Reilly Avenue entrance.

Monitor 04 (Mount Brown Road)

- The sensor was intermittently offline from 8th to the 15th January 2018, and was offline throughout the whole of the 9th and 13th January 2018.
- Noise Monitor 04 recorded levels above those set out in the Project EIS on 1 day (27th December 2017) with a value of approximately 81 dB LA_{eq1hr}. The report indicates that the trigger "*was caused due to ambient traffic noise off site, most likely traffic from the road*". The remaining readings didn't exceed the limit (80 dB LA_{eq1hr}, revised at this location as ambient noise readings at all times are above 70 dB LA_{eq1hr}) in the timeframe covered in this report. Note the site was closed from 22nd December to 2nd January inclusive with no construction works taking place – therefore the trigger on 27th December would be assumed to be unrelated to construction works.

Monitor 05 (O'Reilly Avenue)

- Noise Monitor 05 recorded levels above those set out in the Project EIS on 1 day (3rd January 2018) with a value of approximately 81 dB LA_{eq1hr}. Works on site on this day included excavation works for the piling mat on Brookfield Road and construction work to new sewer and water main.

Monitor 06 (O'Reilly Avenue)

- Sensor was offline for the following dates: 25th December 2017 to 7th January 2018 inclusive, 12-16th January 2018 inclusive and the 22nd January 2018.
- Noise Monitor 06 recorded levels above those set out in the Project EIS on 1 day (24th December 2017) with a value of approximately 71 dB LA_{eq1hr}. Note the site was closed from 22nd December to 2nd January inclusive with no construction works taking place – the trigger on 24th December is assumed to be unrelated to construction works.

Monitor 07 (Hospital A&E)

- Sensor was offline for the following dates: 22th December 2017 to 3rd January 2018 inclusive, 5th, 6th, 7th, 8th, 14th & 17th January 2018.
  Noise Monitor 07 recorded levels above those set out in the Project EIS on 1 day (4th January 2018) with a value of approximately 71 dB LA_{eq1hr}. Works on site when the trigger occurred include: *"Piling at South Circular Road, construction works for new diversion road, Excavation works for piling mat at private clinic, construction works on existing water main and sewer at linear park [and] construction works for new utility tunnel at O'Reilly Avenue".* Note the site was closed from 22nd December to 2nd January inclusive with no construction works taking place.

Monitor 08 (Pharmacy)

- Sensor was offline between 22nd December 2017 and 7th January 2018 inclusive, 11th, 15th, 16th & 25th January 2018.
- Noise Monitor 08 is adjacent to the St James Hospital site and recorded levels above those set out in the Project EIS on the following dates: January 2018 4th, 8th, 9th, 10th, 12th, 13th, 17th,

18th, 19th & 20th, 23rd, 24th, 26th, & 27th 2018. The peak reading, on 26th January 2018 was 80 dB LA_{eq1hr}.
The monitoring report indicates that the triggers were caused by *"the construction work on the sewer/water main at Linear park and deliveries to the hospital"*.

- It has been advised that the location of Monitor 08 is currently under review in terms of its value as it is impossible to separate background noise from construction noise.

Monitor 09 (Rialto LUAS)

- Sensor was offline on 26th, 27th, 28th, 29th, 30th and 31st December 2017 and 1st, 2nd, 3rd, 4th, 13th & 14th January 2018. Note that the site was closed from 22nd December to 2nd January inclusive with no construction activities taking place.
- Noise Monitor 09 recorded levels above those set out in the Project EIS on 20 separate days (23rd and 25th December 2017 and 5th, 8th, 9th, 10th, 11th, 12th, 15th, 16th, 17th, 18th, 19th, 20th, 21st, 22nd, 23rd, 24th, 25th and 28th January 2018) with typical values between 70-76 dB LA_{eq1hr}. It is reported that the triggers can be attributed to *"piling operations at Linear Park and ambient noise levels from the LRT"*.
- It has been advised that the location of Monitor 09 is currently under review in terms of its value as it is impossible to separate background noise from construction noise.

Monitor 10 (Brookfield Clinic)

- Noise Monitor 10 recorded levels above those set out in the Project EIS on 8 separate days (31st December 2017 and 4th 5th, 8th, 9th, 10th, 12th, and 26th January 2018) with all values between 70-75 dB LA_{eq1h}. The report indicates that the triggers were caused *"by the construction of the piling pod"*. There were no works on site on the 31st December 2017.

Monitor 11 (Cameron Square)

- Sensor was offline intermittently between 22nd December 2017 and 7th January 2018 and recorded no readings from the 23rd to the 26th December 2017 or 12th to the 23rd January 2018. Note the site was closed from 22nd December to 2nd January inclusive with no construction works taking place.
- Noise Monitor 11 recorded levels above those set out in the Project EIS on 3 separate days (24th, 25th, and 26th January 2018) with typical values between 73-77 dB LA_{eq1h}. Works on site at the time of the triggers included "*Excavating material from site and form work construction for utility tunnel at O'Reilly Avenue. Excavation works and piling at Cameron Square. Excavating material from site at Hospital/South Circular Road. Excavation works at Private Clinic*".

Monitor 12 (Cameron Square)

- No recorded readings from 22nd December 2017 to 7th January 2018 inclusive and 9th to 13th January 2018 inclusive. Note the site was closed from 22nd December to 2nd January inclusive with no construction works taking place.

- Noise Monitor 12 recorded levels above those set out in the Project EIS on 3 separate days (8th, 24th, and 26th January 2018) with typical values between 70-75 dB LA_{eq1h}. These triggers were reportedly the result of *"piling operations at Cameron square*".

Monitor 13 (O'Reilly Avenue)

- Noise Monitor 13 recorded levels above those set out in the Project EIS on 9 separate days (27th and 31st December 2017 and 1st, 8th, 9th, 10th, 11th, 12th, 13th January 2018) with typical values between 70-76 dB LA_{eq1h}. Works on site at the time of the triggers included "*Excavating material from site and form work construction for utility tunnel at O'Reilly Avenue. Excavation works and piling pad preparation at Cameron Square. Excavating material from site at Hospital/South Circular Road. Excavation works at old office/compound*". There were no construction works on site between 22nd December 2017 and 2nd of January 2018 inclusive so three of the triggers noted above were due to other causes.

Monitor 15 (A&E Office)

- New Noise Monitor 15 recorded levels below those set out in the Project EIS for the duration of the timeframe covered in this report.

Monitor 16 (Cardiac Ward)

- New Noise Monitor 16 recorded levels above those set out in the Project EIS on 2 separate days (30st December 2017 and 25th January 2018) with trigger values between 70-76 dB LA_{eq1h}. Works on site at the time of the triggers included "*Excavating material from site and form work construction for utility tunnel at O'Reilly Avenue. Excavation works and piling at Cameron Square. Excavating material from site at Hospital/South Circular Road. Excavation works at Private Clinic*". There were no construction works on site between 22nd December 2017 and 2nd of January 2018 inclusive so one of the triggers noted above were due to other causes.