THE MERSEYSIDE NOISE STUDY

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1 INTRODUCTION

The key aim of this project has been to ascertain the extent to which people on Merseyside perceive noise to be a problem and to identify which types of noise and noise sources are perceived to have the greatest impact. The study was commissioned by the Merseyside Transport, Health and Environment Forum. The Forum is comprised of representatives from the five Merseyside councils (Sefton, Liverpool, Knowsley, St Helens, Wirral) and the passenger transport authority, Merseytravel. The information has been obtained to provide base data to assist the Forum in developing an Environmental Noise Strategy for Merseyside, and subsequently to formulate, adopt and implement a Noise Action Plan for the region. This paper describes briefly the results of the surveys but also considers the likely programme required to develop a Noise Action Plan and some of the obstacles that will have to be overcome.

Approximately 1.4 million people live in the Merseyside region. Merseyside exhibits a wide range of environments, land use patterns, socio-economy and demographics. The project was primarily concerned with the impact of transportation noise. The region has a well developed transport infrastructure including a number of motorways (M57, M62, M58, M53); railways; an international shipping port; and an international airport.

In order to be in a position to formulate a framework in which an environmental noise policy can be developed for the Merseyside Region, it is first necessary to understand the current impact of noise on the resident population. Therefore, in accordance with the project brief, the following work items were carried out:

i) Review of available research and information about the contribution and significance of transport noise to overall background noise levels.
ii) Review of current thinking and research on the effects of noise, specifically transport-related noise, on quality of life and interpretation of its relevance for Merseyside.
iii) Identification and assessment of the perception of the noise environment experienced by people in Merseyside and, in particular, the sources that are most prevalent and most likely to cause annoyance, with specific reference to the perception of transport sources.
iv) Characterisation of the range of ambient noise conditions occurring on Merseyside, particularly in relation to transport noise.
v) Recommendation of a framework within which a possible future Merseyside environmental noise strategy could be developed that will address key noise related issues and the possible role of the transport sector.
vi) Identification of the requirements for further research and information as a basis for better describing the key factors affecting people's experience of noise.

2 SURVEYS

2.1 Noise Surveys

In accordance with the project brief a survey of noise levels was carried out over 24 hour periods at 90 locations throughout Merseyside. The survey locations covered ten examples in each of nine different noise environments.

The noise survey work was carried out in the Spring and Autumn of 2003 i.e. avoiding the school holiday period. Automatic data logging sound level meters were used fitted with 'all weather kits', although surveys were not carried out during periods of heavy rain or strong winds. As the survey was to be unattended, safe and secure locations had to be found. The local Environmental Health Officers suggested possible survey areas and it was then a case of our staff 'door knocking' to gain access to suitable sites. These were mainly residential properties with some public buildings, offices, etc. Where possible the microphone was located at a height of 1.5 metres above the ground. However in some inner city areas, microphones had to be extended from first floor windows.

The nine different types of environment where noise measurements were carried out are shown below:

i) Adjacent to a busy urban road.
ii) Adjacent to a motorway.
iii) Adjacent to a railway line.
iv) Adjacent to a transport interchange.
v) In a suburban residential street.
vi) In a city/town centre.
vii) Near the airport.
viii) In a city park.
ix) In a rural area.

In addition, noise contour mapping of 15 different locations was undertaken, and 15 further 24 hour noise surveys carried out at the same locations, to investigate the correlation of noise mapping results with actual measured values.

2.2 Attitude Surveys

A public perception survey on noise sources and attitudes to noise was carried out at a random sample of 10 households in each of the 117 wards on Merseyside. The survey methodology is described by Stuart Smith of Woodholmes in the following paper so is not repeated here.

3 FINDINGS

3.1 Noise Surveys

The study has resulted in a considerable amount of noise data but it is only possible to summarise some of the findings in this paper. Table 1 shows a summary of the daytime and night-time L_{Aeq} results for the nine different types of environment. The table shows the mean values and the range of values.

There is a 15 dB L_{Aeq} range in the mean results for the 9 types of environment both during day and night. For each type of environment there is a range of levels of between 10 and 22 dB L_{Aeq} during the day and 8 and 21 dB L_{Aeq} at night, with the greater range of levels generally at those locations

with the highest mean values. This illustrates that there are a wide range of noise levels associated with nominally similar types of area.

Table 1 – Summary of L_{Aeq} Results in Different Environments

Survey Location Type	Mean Daytime Noise Level in dB $L_{Aeq, 16hr}$	Range of Daytime Noise Levels in dB $L_{Aeq, 16hr}$	Mean Night-time Noise Level in dB $L_{Aeq, 8hr}$	Range of Night-time Noise Levels in dB $L_{Aeq, 8hr}$
Urban Road	65	52-73	58	44-64
Motorway	61	52-67	55	46-60
Transportation Interchange	60	48-70	55	42-63
Town Centre	58	52-68	51	44-62
Park	57	44-72	47	38-56
Railway	56	50-66	52	44-62
Airport	54	47-60	48	40-55
Rural	51	47-58	45	39-51
Suburban	50	46-56	43	40-48

The table shows that locations adjacent to busy roads are the noisiest of the locations monitored. Parks, particularly during the daytime are shown as not being particularly quiet areas. This is probably due to many of the park areas being located in urban areas close to main roads, and also the fact that, for reasons of security of the monitoring instrumentation, the noise measurements were generally carried out at residential properties on the edge of parks. Noise levels may well be lower in the middle of the parks. The table also demonstrates that suburban residential areas are slightly quieter than rural areas.

In Merseyside, there is a network of motorways and main roads that pass through most of the rural areas. The open nature of the rural areas means that the traffic noise can propagate over a considerable distance, whereas in suburban areas, the density of housing acts as a noise barrier to minimise the spread of the noise. Therefore, some suburban areas can be quieter than some types of rural areas.

3.2 Public Attitude Surveys

The results of the public attitude survey demonstrate that noise is an important issue for people living in Merseyside. When asked about the factors that have a negative impact on quality of life the residents placed noise as the fourth most important factor.

Road traffic noise was found to be the most common type of noise heard by the interviewees (79%) and was also the type of noise source that bothered the highest percentage of interviewees (44%). Interestingly 30% of those that reported hearing traffic noise consider that it has become ‘definitely worse’ over the last 5 years.

The conclusions are 340,500 residents across Merseyside have their home lives either 'totally spoilt' or 'spoilt quite a lot' by noise. It is estimated that some 354,000 Merseyside residents have their sleep affected by road traffic noise.

These findings are discussed in more detail in the paper by Stuart Smith of Woodholmes.

3.3 Comparison with National Studies

National noise and attitude surveys have been carried out recently in England, with the National Noise Attitude Survey[1] (NAS) being carried out in 1999/2000 and the National Noise Incidence Study[2] (NIS) in 2000/2001. However, the only NAS sites on Merseyside were 10 addresses from each of 5 wards in Liverpool. Similarly in the NIS, noise measurements were only carried out at twenty sites in Merseyside, all in Liverpool. Therefore data from the national studies are not sufficient to provide the necessary information on the response to different types of noise on Merseyside that is required to develop a Noise Action Plan.

In accordance with the project brief, the noise survey locations for the Merseyside Study were chosen to provide a representation of the noise levels experienced in a number of land use categories across Merseyside. The locations were not chosen to make the noise measurements statistically representative of the population of Merseyside. However, the measurement locations for the NIS were chosen to be statistically representative of the population of England and Wales so that figures could be derived for percentage of the population exposed to different noise levels. Therefore, the results obtained from the Merseyside measurements and the NIS are not directly comparable.

The results of the Merseyside noise monitoring show that 47% of the locations had noise levels above a daytime level of 55 dB $L_{Aeq,16hr}$ and 67% of the locations exceeded the night time level of 45 dB $L_{Aeq,8hr}$. To put this into a national context, the NIS 2000 found that 55% +/- 3% of the population of England and Wales was exposed to daytime noise levels above 55 dB $L_{Aeq,16hr}$ and 68% +/- 3% of the population was exposed to night time noise levels above 45 dB $_{LAeq,8hr}$.

3.4 Noise Mapping

Some initial noise mapping was carried out in 15 locations using 'LIMA' noise modelling software. The Forum had hoped that it may be possible to adopt a 'broad brush' noise mapping approach in order to quantify the percentage of population in Merseyside exposed to different levels of transportation noise based solely on propagation distance from the source. However, in order to obtain the required level of accuracy, it was found that fully detailed noise mapping is necessary taking into account noise shielding by barriers/buildings, ground type, and relative ground heights.

The opportunity was taken to carry out 24-hour noise monitoring at 15 locations in order to check the accuracy of the detailed noise mapping. A very good correlation was found with a mean difference between calculated and measured values of 1.5 dB(A) for the daytime and 0.8 dB(A) at night.

In order to quantify population exposure to noise in Merseyside a full noise mapping exercise will be necessary to cover the whole region. The fact that a total of 105 24-hour surveys have been carried out will assist with checking of the model. Once completed it would then be straightforward to investigate the potential effect of possible noise mitigation measures such as acoustic barriers, traffic re-routing, etc.

4 TOWARDS AN ENVIRONMENTAL NOISE STRATEGY

It is considered that the evidence produced by the study on the level of importance attached to ambient noise by residents has proved the need for a Merseyside Environmental Noise Strategy (MENS).

Within the United Kingdom, no detailed Environmental Noise Strategies have yet been implemented at a regional or local level. Therefore, there is a not a readily available 'road map' that could be adapted for Merseyside. The London Ambient Noise Strategy has been finalised recently by the Mayor of London, but this has not, as yet, been linked to the results of a detailed attitude survey within London. However, some comments on the steps required to develop an ENS and Noise Action Plan for Merseyside are set out below.

It is recommended that a four year plan is devised to develop a Merseyside Environmental Noise Strategy. As transportation noise, particularly road traffic noise is the key noise source on Merseyside, the plan could be developed in conjunction with the Local Transport Plan, albeit with input from a range of other departments. The suggested timescale is provided below

2004-2006 develop the groundwork for a successful ENS,
2006-2007 implement trial noise mitigation schemes,
2007-2008 assess impact of trial schemes and finalise action plan.

The first two years would be taken up in setting up the framework for the ENS.

Firstly, to assist with the successful formulation of the ENS, it is essential that a Merseyside Noise Map is produced that provides information on the number and location of residents exposed to different bands of noise levels.

The development of a successful noise action plan will require the implementation of joined up government and the involvement of many local authority departments into the development of the plan. It will be necessary to assemble a project board from various departments across the local authorities, and other transportation organisations, to determine the feasibility of various options for noise control, and the associated costs. This is likely to involve staff from Transportation, Environmental Health, Planning departments within local authorities and Merseytravel, Liverpool John Lennon Airport and Network Rail.

One fundamental role of the project board would be to develop clear project deliverables taking into account the end user preferences. This would include choosing noise criteria, developing measurable targets, and developing policies to ensure that the targets are met.

In addition to assessing the technical implications, there will be a wide range of policy decisions to be made on how the noise mitigation works should be targeted. For example, is it better to reduce noise levels by 10 dB(A) at one house or 1 dB(A) at 10 houses? To aid these decisions, it is recommended that public participation is developed e.g. by the use of Citizens Panels or a further attitude survey.

It is recommended that in 2006-2007, a number of trial noise mitigation schemes are carried out. These would be most likely to be those involving physical works such as installation of noise barriers, noise insulation and quieter road surfaces, although it may be possible to investigate traffic planning schemes as well. Noise mapping should be used to help choose the trial areas by modelling 'before' and 'after' scenarios prior to the works being carried out. It would also be possible to carry out before and after social surveys to assess the public perception of the effect of these measures.

Finally, in 2007-2008, it would be necessary to evaluate the results of the trial noise mitigation schemes, and from that finalise the noise action plan.

5 CONCLUSIONS

The European Environmental Noise Directive (END) requires that a Noise Action Plan shall be drawn up no later than 18th July 2008 for agglomerations of more than 250,000 inhabitants. This requirement will apply to Merseyside. Therefore the timescale for the implementation of regional Noise Action Plans has been fixed. 'Do nothing' is not an option. In order to achieve the timescale, authorities throughout the UK must take steps now to develop appropriate Environmental Noise Strategies for their regions.

The Merseyside Transport, Health and Environment Forum have taken a lead in commissioning a noise measurement and attitude survey throughout the Merseyside Region as a first step towards a Noise Action Plan. The noise survey results have indicated the range of noise levels that are experienced in different types of environment and the results of the public attitude survey demonstrate that noise is an important issue for people living in Merseyside.

The next step required is a full noise mapping exercise of the Merseyside Region in order to quantify population exposure to noise in Merseyside. Once completed the noise map can be used as a basis for identifying problem areas, prioritising noise reduction and investigating potential effects of implementing noise mitigation measures.

The Merseyside Noise Study has produced a vast amount of data which will help the Forum to develop a cohesive and focussed Environmental Noise Strategy for the Merseyside region. There will be many obstacles to overcome. In particular, for this regional approach to be successful it is critical that effective multi-agency working takes place between the officers and members of the various Councils and transport organisations in Merseyside. It must be said, that generally there is little precedence for this type of working in the UK.

Nevertheless, having commissioned the Merseyside Noise Study in 2003, Merseyside is well placed to take a leading role in the UK towards implementing a regional Noise Action Plan and the Forum hope to be able to pass on the experience gained to other authorities.

6 REFERENCES

1. DEFRA, 'The UK National Noise Attitude Survey (NAS) 1999/2000'.
2. DEFRA, 'The UK National Noise Incidence Study (NIS) 2000/2001'.