

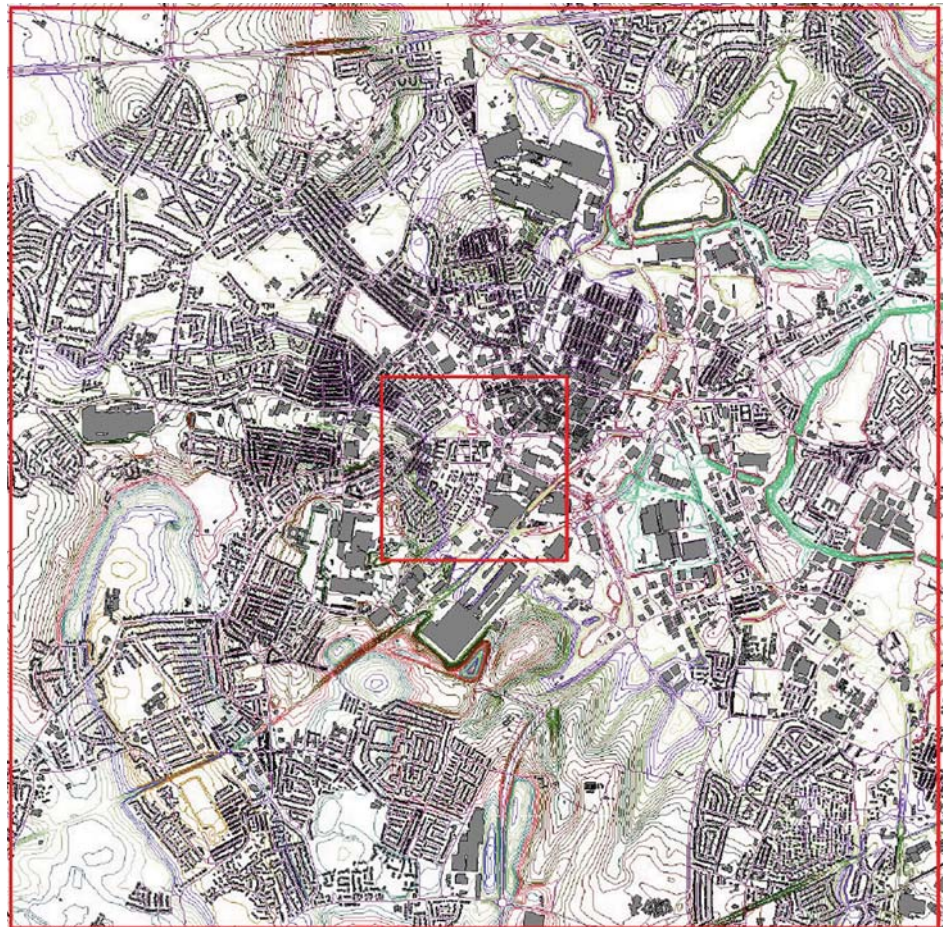
UK Research Reveals Lima as Fastest Noise Mapping Package

In June 2006, Hepworth Acoustics Limited presented two papers at Euronoise 2006 in Tampere, Finland (see www.bksv.com/4112.asp) on research carried out for the United Kingdom government into noise mapping calculation time. The research was carried out in support of Defra's Noise Research Advisory Service (NRAS) contract and studied the effect of calculation efficiency settings on both calculation time and accuracy of results for five commercially available noise mapping software including Brüel & Kjær's Lima™ Environmental Noise Calculation and Mapping Software Type 7812. The research focused on calculations made according to the UK's national road traffic noise calculation standard, the Calculation of Road Traffic Noise 1988 (CRTN).

The research was carried out in two stages. The first stage involved the project team obtaining a detailed understanding of each software package in order to formulate calculation settings that would yield the most accurate calculation possible from the software. These settings were called "benchmark" settings. An identical noise model was imported into each of the noise mapping packages and calculations run using the benchmark settings with calculation times recorded.

During initial testing, it was found that only Lima and software package C were capable of calculating the 1 km² calculation area at a 10m resolution within 48 hours at benchmark settings. For the other software, lower numbers of calculation points were used in order to guarantee calculations were completed within the allowed 48 hours.

The benchmark calculations showed that Lima was the fastest noise-mapping package with an average calculation time 11.4 seconds per calculation point.



	Lima	B	C	D	E
Total Calculation Time (hours)	31.7	48.7	36.9	39.9	25.7
Number of Calculation Points	10000	40	9050	40	1200
Calculation Time per Point (seconds)	11.4	4383.0	14.7	3600.0	77.0

Lima Calculation Times Best in Class

It is widely recognised that the use of efficiency settings in noise mapping software is vital to obtain more realistic calculation times compared with those observed for the benchmark calculations. The second part of the research investigated the effect of efficiency settings on calculation time and accuracy of predictions. The aim was to reduce calculation times as much as possible without introducing an error of more than 1 dB as a result of applying the settings. Efficiency settings were tested individually initially and then simultaneously to establish any combined effects. Following extensive testing, recommended settings were derived and the calculations made for the entire 1 km² calculation area in order to identify calculation time and the overall impact on accuracy of the calculation settings.

	Lima	B	C	D	E
Total Calculation Time (hours)	3.9	22.2	36.9	400.8	86.4
Number of Calculation Points	10000	10201	9050	10201	10000
Calculation Time per Point (seconds)	1.4	7.8	14.7	144.3	31.1

For Lima, it was identified that effective use of efficiency settings can reduce calculation time by 88% whilst keeping results within a 1 dB 95% confidence interval. This resulted in an average calculation time per point of 1.4 seconds. When comparing calculation times

with the other software packages tested, Lima was found to be over 5 times faster than the next quickest software.*

** Predictor 7810 also uses the Lima CTRN Calculation core, giving the same high calculation speed*

Manchester and Merseyside Noise Mapping with Lima

One of the latest developments in noise mapping within the UK has been the Noise Mapping England project. In total, 15 contracts were awarded by the UK government, covering 20 major towns, cities, and regions in England. Two contracts for the Manchester and Liverpool/Birkenhead areas were awarded to a partnership of Hepworth Acoustics Limited and environmental consultancy Entec UK Limited.

The Manchester and Liverpool/Birkenhead contract areas were two of the largest awarded by the government. In total, both areas covered approximately 2000 km² with calculations carried out over a 832 km² footprint. Due to the extent of the two contract areas, the project team was split into specialist noise and GIS teams with the Lima Type 7812 noise mapping software placed as the central focus of the project.

An iterative process was developed with the noise team providing detailed information and guidance to the GIS team on designing model



inputs for Lima from the CDS (Central Data Service) noise mapping data provided by the government. This was achieved mainly due to the data exchange features within the Lima software allowing direct one to one conversion to and from a GIS environment.

In addition to optimising the data in GIS for Lima, the project team also ran a series of tests assessing the effects of simplifying modelling data on accuracy and calculation time. Similar investigations were also made for the efficiency settings available in Lima with testing made



simultaneously with the model testing to ensure that the error introduced by simplification and calculation settings did not exceed the 1 dB criterion set by the government. These tests formed the basis for the data specification of all modelling data created by the GIS team.

The calculation of the noise models was made on a 12-core Lima calculation server comprising 6 Dual 3.2 GHz Intel® Xeon® workstations. To distribute the calculations, Lima's 'tiling mode' feature was utilised. This feature splits the large noise model into a series of smaller models or

files. Each tile is calculated separately on its own calculation core, thereby, distributing the calculation. This feature allows a high level of redundancy and also reduces calculation times and is essential for large area noise mapping.

In total, over 8.5 million calculation points were calculated with all calculations completed within one month. All results were exported

from Lima into a native GIS format using Lima's data converters and supplied back to the GIS team to create noise maps and statistics.

As a result of the organisation and management of the project, and Lima's calculation speed and data conversion tools, the Manchester and Liverpool/Birkenhead contract areas were the first to be completed for the government.

For further information about the project, contact Peter Hepworth at peter.hepworth@hepworth-acoustics.co.uk or visit the website www.hepworth-acoustics.co.uk

