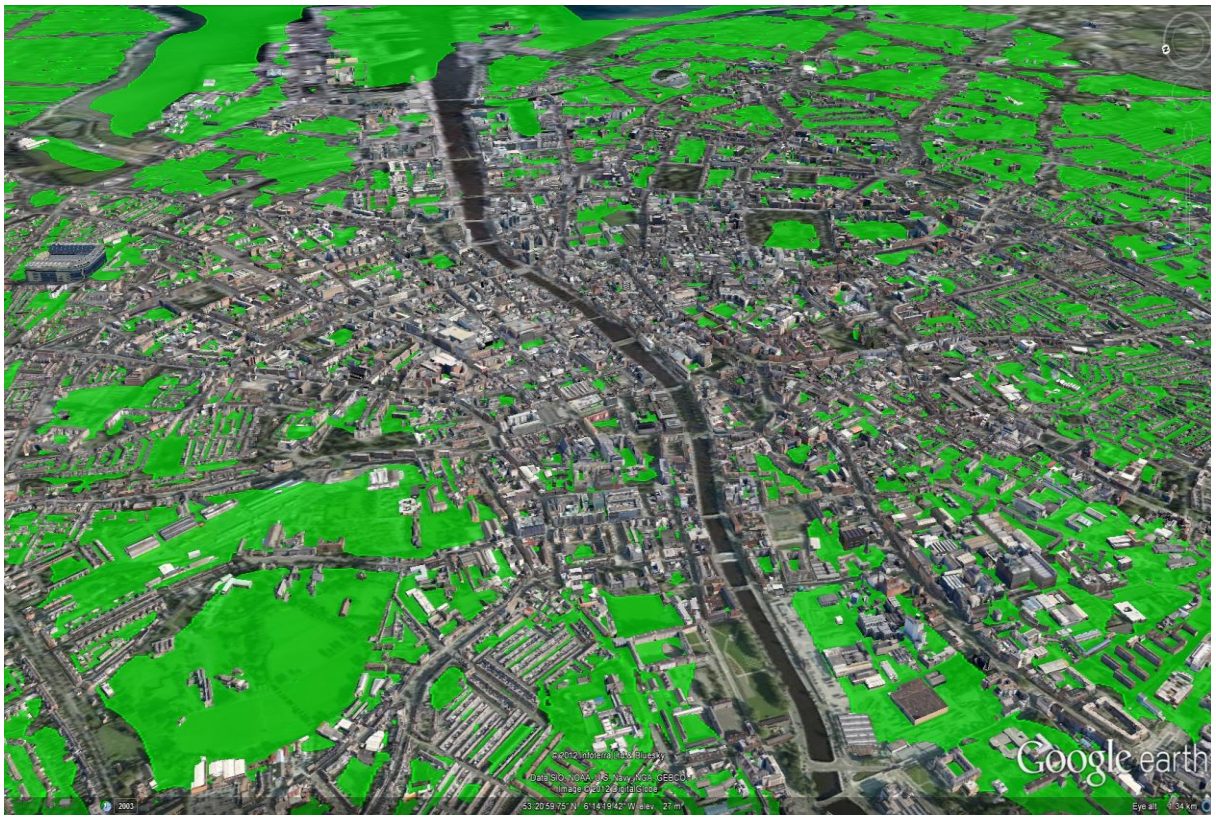
Noise Maps, Report & Statistics, Dublin City Council Noise Mapping Project Roads & Traffic Department



Quiet Areas Within Dublin

Produced by
The Traffic Noise & Air Quality Unit
June 2012

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Executive Summary

Under EU Directive 2002/49/EC relating to The Assessment and Management of Environmental Noise (known as the END), Dublin City Council, is required to review and revise, if necessary, 'Strategic Noise Maps' every 5 years. The first set of maps were produced in June 2007. A review was carried out by Dublin City Council and a decision was made to revise the 2007 road source noise maps in order to produce maps for June 2012. It was agreed with the EPA, as in 2007, that major industrial sources would not be mapped. During the review phase it was found that they did not have any strategic impact on the overall sound environment in the Dublin City Council area and produce sound emissions which are below the reporting threshold.

Irish Rail and the Rail Procurement Agency are required to produce noise maps for rail sources within the Dublin City Council area.

One could conclude, based on comparisons of the 'Noise Maps' and population exposure between the 1st round of mapping in 2007 and 2012, that there has been substantial reduction in the number of people being exposed to undesirable sound levels, especially at night time. It has been calculated that the number of people being exposed to levels below the night time desirable level has risen from 1% to 69% of the population. The number of people being exposed to undesirable night time levels has reduced by approximately 60% - from 58% to 23% of the population. One has to be cautious in drawing conclusions in relation to how these decreases occurred. There are a number of factors which give rise to the various changes in the maps and statistics, including a decrease in traffic volumes, availability of more robust data sets than those used in 2007, the use of amended calculation methods and the use of improved software

The full statistics on population exposure to sound from road sources for the Dublin City Council functional area are presented in Table 1 on page 13. The modelled sound levels are displayed as 'noisemaps' on pages 14 -20. Areas displaying 'desirable' and 'undesirable' sound contours as defined in the Dublin Agglomeration Noise Action Plan can be found on pages 21-22.

The situation where 24% of the population in the region are being exposed to undesirable night time sound levels and where 5% are being exposed to day time sound levels above 70dB(A), needs to be addressed. This could be one area to address in the next review of the Dublin Agglomeration Noise Action Plan Oct 2008 – Nov. 2013, which is due to be revised, in draft format, before July 2013.

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1 Introduction

1.1 Background

Under EU Directive 2002/49/EC relating to The Assessment and Management of Environmental Noise, (known as the END) which was transposed by SI. number 140 of 2006, the relevant noise mapping bodies, are required to produce 'Maps' for noise emanating from Major Industry and Roads, including Major Roads, and for rail sources within the Dublin City Council area. The production of these maps is through the use of computer software in which a model of the entire Dublin City area is developed. The software then calculates the sound levels at 20m spacing's across Dublin. These calculated sound levels can then be colour coded to produce 'thematic noisemaps'. There are no measurements of sound involved in the process. The outputs are all related to calculations produced by the computer model. The 'END' emphasises that Strategic maps are not to be used to address local noise nuisances such as neighbourhood or domestic noise nuisance.

The noise mapping bodies are required to review and revise, if necessary, 'Strategic Noise Maps' every 5 years. The first set of maps was produced in June 2007 (see web link: *http://www.dublincity.ie/WaterWasteEnvironment/NoiseMapsandActionPlans/Pages/default.aspx*). As the next round of noise maps are required to be produced by June 2012, Dublin City Council carried out a review of their strategic noise maps in relation to road traffic. This review indicated that overall traffic volumes had decreased on 2007, but not substantially enough to produce any significant changes in the 2007 maps. However, due to the re-designation of the 'Major Road' category from 'roads with more than 6 million vehicle passages per year' to roads with '3 million vehicle passages per year' it was decided that this would alter substantially this particular sub set of the 2007 road source noise maps. Therefore it was decided that the 2007 noise maps would have to be revised.

1.2 Sound and Effects of Noise

Environmental noise, commonly called noise pollution, is among the most frequent sources of complaint regarding environmental issues in Europe, especially in densely populated urban areas and residential areas near highways, railways and airports, (WHO, European office). Noise contributes greatly to diminishing people's quality of life. Unwanted sound (noise) of sufficient intensity and duration can cause temporary and\or permanent hearing loss. It can also interfere with speech communication, the transmission of other auditory signals, can disturb sleep and act as a general source of annoyance or disturbance and interfere with the performance of complicated tasks and the opportunity for privacy. In particular, exposure of people to day time noise levels above 65 dB(A) can cause severe health problems. It is accepted that sound levels in cities range between 60-70 dB(A), with suburban levels between 50-60 dB(A). The World Health Organisation has set guideline levels for annoyance at 55 dB(A) representing daytime levels below which a majority of the adult population will be protected from becoming moderately or seriously annoyed.

In 2009, the WHO European Regional Office published the '*Night Noise Guidelines for Europe'.* It presents new evidence on the health damage of night time sound exposure and recommended threshold values that, if breached at night, would threaten health. An annual average night exposure not exceeding 40 dB(A) outdoors is recommended in the guidelines. It is recommended that that this level should be the target for night noise guidelines to protect the public, including the most vulnerable groups such as children, the chronically ill and the elderly. A night time level of 55 dB(A) is recommended as an interim target for countries that cannot meet these night noise guidelines in the short term for various reasons and where policy-makers choose to adopt a stepwise approach. The publication indicates that these guidelines can be considered an extension to the previous WHO '*Guidelines for Community Noise',* which are mentioned above.

In 2011 the European Regional Office of the World Health Organisation published a document entitled 'Burden of Disease from Environmental Noise'. It suggests that there is overwhelming evidence that exposure to environmental noise has adverse effects on the health of the population. The publication provides an evidence base for the future development of suitable guidelines on noise by WHO. It supports the recommendations as set out in the 'Night Noise Guidelines for Europe' publication and supports this view based on a review of evidence based assessments of the impact of noise on health.

1.3 Purpose and Scope of the END Directive

The over arching aim of this Directive is to provide a common framework to avoid, prevent or reduce, on a prioritised basis, the harmful effects of exposure to environmental noise. It aims to do this by:-

- Monitoring environmental noise problems by requiring competent authorities in Member States to draw up "strategic noise maps" for major roads, railways, airports and agglomerations, using harmonised noise indicators Lden (day-evening-night equivalent level) and Lnight (night equivalent level). These maps are to be used to assess the number of people annoyed and sleep-disturbed respectively throughout each member state in the European Union.

- Informing and consulting the public about noise exposure, its effects, and the measures to be considered to address noise problems.

- Addressing local noise issues by requiring competent authorities to draw up action plans to reduce noise where necessary and maintain the environmental acoustic quality where it is good. The directive does not set any limit value, nor does it prescribe the measures to be used in the action plans, which remain at the discretion of the competent authorities.

- Developing a long-term EU strategy, which includes objectives to reduce the number of people affected by noise in the longer term, and provides a framework for developing existing Community policy on noise reduction from source.

The Directive is also aimed at providing a basis for developing EU wide measures to reduce noise emitted by the major sources, in particular road and rail vehicles and infrastructure, aircraft, outdoor and industrial equipment. The Directive applies to environmental noise to which humans are exposed, in particular in built-up areas, in public parks or other quiet areas in an agglomeration, in quiet areas in open country, near schools, hospitals and other noise sensitive buildings and areas. It does not apply to noise that is caused by the exposed person himself\herself, noise from domestic activities, noise created by neighbours, noise at work places or noise inside means of transport or due to military activities in military areas. As these maps are Strategic Noise Maps they should not be used for the assessment of local noise nuisances.

1.4 Purpose and Scope of the Regulations

The purpose and scope of the regulations are set out to the rear of the statutory instrument S.I No. 140 of 2006, which transposes EU Directive 2002/49/EC relating to the assessment and management of environmental noise. It states that for the purposes of these Regulations, environmental noise means unwanted or harmful outdoor sound created by human activities, including noise emitted by means of transport, road traffic, rail traffic, air traffic, and from sites of industrial activity.

The Regulations set out a two-stage process for addressing environmental noise. Firstly, noise must be assessed through the preparation of strategic noise maps for areas and infrastructure falling within defined criteria, e.g. large agglomerations, major roads, railways and airports. Secondly, based on the results of the mapping process, the Regulations require the preparation of noise action plans for each area concerned. The fundamental objective of action plans is the prevention and reduction of environmental noise.

The Regulations designate noise-mapping bodies and action planning authorities for the making of strategic noise maps and action plans. Primary responsibility for both noise mapping and action planning is assigned to local authorities. While a number of other bodies also have noise mapping functions, these bodies will carry out their functions on behalf of the local authorities concerned.

The Regulations designate the Environmental Protection Agency as the National Authority for the purposes of the Regulations. The Agency's role includes supervisory, advisory and coordination functions in relation to both noise mapping and action planning, as well as reporting requirements for the purpose of the Directive.

The Regulations provide for strategic noise maps and action plans to be made available to the general public. They also provide for public consultation on proposed action plans, and for the results of public consultation to be taken into account in finalising action plans or reviews of action plans.

1.5 Roles and Responsibilities of designated bodies

The roles of the noise mapping bodies are set out in the Environmental Noise Regulations 2006. The relevant noise mapping bodies for the Dublin City Council area are Dublin City Council (road and industry noise maps), the RPA (Luas noise maps) and Irish Rail (rail noise maps). There is a requirement to produce 'Maps' for noise emanating from Major Industry and Roads, including Major Roads. Irish Rail and the Rail Procurement Agency are required to produce noise maps for rail sources within Dublin.

2. Review of 1st round of Noise Maps

2.1 Developments since the first round of Noise Mapping (2007)

Noise Maps for the first round of mapping were completed and produced for the Dublin area in July 2007. They are still currently available as part of the Noise Action Plan for the Agglomeration, on the Dublin City Council website.

As previously indicated, a review of the strategic noise maps in relation to road traffic, rail and industrial processes was carried out. This review indicated that for roads, overall traffic volumes had decreased on 2007, but not substantially enough to produce any significant changes in the 2007 maps. However, due to the re-designation of the 'Major Road' category from 'roads with more than 6 million vehicle passages per year' to roads with '3 million vehicle passages per year' it was decided that this would alter substantially this particular sub set of the 2007 road source noise maps and a revision of the maps was required. On reviewing the Rail maps (including the LUAS) it was found that there was no significant increase or decrease in rail volumes within the Dublin City Council area except for the extension of the LUAS from Connolly Station to the O2 Arena. Therefore it was decided that there was no need to revise the Rail maps. It was also found that there were no significant changes in relation to major industry that would require these noise maps to be produced or revised.

The EPA was advised of the outcome of these reviews and was provided with a report supporting these conclusions. The EPA subsequently advised the Dublin City Council that the proposed approach to the second round of 'noise mapping' was acceptable to them.

3. Areas to be Mapped

3.1 Requirements of Directive

The Directive applies to environmental noise to which humans are exposed and in particular in built-up areas, in public parks or other quiet areas in an agglomeration, in quiet areas in open country, near schools, hospitals and other noise sensitive buildings and areas. The Directive defines an agglomeration as meaning '*part of a territory, delimited by the Member State, having a population in excess of 100,000 persons and a population density such that the Member State considers it to be an urbanised area*'. It also defines Major Roads as meaning '*a regional, national or international road, designated by the Member State, which has more than three million vehicle passages a year*.'

3.2 Description of Area to be Mapped and Modelled

The Dublin City Council region comprises an area of approximately 127Km2 and is populated by 527,612 people, an increase on 2007 from 506,21. Within its boundaries there are just over 31Km of Irish Rail track and just under 13Km of LUAS track. The entire rail track within the Dublin City Council area is designated as major rail. Approximately 1280Km of road was inputted into the noise model, 17% of which was designated as Major Road i.e. carrying more than 8,219 vehicles per 24 hours. This was an increase of 1% on 2007. Also, for this round of mapping, along with the change in traffic volumes associated with major roads, the definition was also altered to exclude all roads other than national regional roads and motorways. The area to be modelled was slightly larger than the area to be mapped as a two kilometre buffer outside the Dublin City area boundary was included in the model in order to take into consideration the influence of traffic outside of the area to be mapped.

4 Sound Calculation Method

4.1 Requirements of Directive

The Environmental Noise Directive allows 'National Methods' to be used in the place of the prescribed 'Interim Method'. Although CRTN is not 'officially' a national method it is the most common method used in Ireland for the assessment of noise from road sources and is considered a 'de facto' national method.

4.2 Requirements of Regulations

The Environmental Noise Regulations prescribes two methods that can be used for the assessment of sound emissions from road sources. These are CRTN and the 'Interim Method' as described in the END. As with the previous round it was decided to use CRTN as no common assessment method for Europe has as yet been produced.

4.3 Method of Assessment & Factors influencing its selection

In the interest of consistency with the Round 1 noise mapping, it was decided to use the adapted version of the UK CRTN methodology for the assessment of road traffic sound levels. This is one of the designated methods under the Environmental Noise Regulations.

Within this assessment procedure, Method 2 was used in the Dublin City Council region, as Method 1 for conversion of L10, 18Hr to Lden and L night,(outlined in the TRL Project report PR/SE/451/02), in relation to low flow roads at night, was found to be unsuitable.

5. Input Data Requirements of CRTN – Road Source Noise Model

The information required for the source emission model for the road traffic is specific to each method of assessment. The CRTN inputs are listed below. The information is required for each road section for an assessment using the adapted UK CRTN method:-

Road centreline locations, along with data for:

- Traffic volume, %HGVs, and mean vehicle speed; expressed as an annual average day, evening and night traffic flow;
- Direction of vehicle flow;
- Road width;
- Road surface type;
- Texture depth;
- Road gradient;
- Road classification;

6. Data Sources

The Environmental Noise Directive requires that data should not be more than 3 years old. All data sets used in the model were less than a year old with the most up-to-date dataset being the 'Geodirectory' containing address point and building use information. The release version for period 2 of 2011 was used for the 2nd round of mapping. The model infrastructure datasets for Buildings, Road Centre lines, Contours and Green areas were supplied by OSI under licence and dated from the last half of 2010. Traffic counts were based on an annual average for the year 2011. Dublin City Council used their SCATS system to produce annual hourly traffic volumes. The percentage of heavy goods vehicles (HGV) was estimated for those roads that did not have manual HGV counts. This estimation was based on comparing roads with similar profiles which had the information required.

7. Calculation Results

7.1 Results of Calculations

Table 1 sets out the population exposures to sound from traffic sources both from all the roads and the major roads in the Dublin City Council area. Figures 1- 7 are colour coded 'Noise Maps' indicating the various sound bands throughout the various areas within Dublin.

For the purpose of the Noise Action Plan for the Agglomeration of Dublin, which is to be revised in 2013, limits are set out as to what sound emissions are desirable and undesirable. It indicates that a night time level greater than 55 decibels and a daytime level greater than 70 decibels is undesirable. It identifies areas with desirable low sound levels as those areas with a with a night time level less than 50 decibels and\or a daytime level less than 55 decibels. Maps displaying areas exposed to these levels can be found in Figures 8-9.

As can be deduced from Chart*1* just over 53% of the population are exposed to sound levels from traffic sources below a day time level of 55dB(A). Just over 69% of the population are being exposed to night time levels below 50dB(A). Approximately 24% of the population are being exposed to undesirable night time sound levels of greater than 55dB(A) and just under 5% are being exposed to day time sound levels above 70dB(A).

Rounding up or down to the nearest '100' of population in each decibel band, causes an over or under estimation of the total true population. However this 'rounding' is a requirement of the END and the 'error' is not considered significant.

Table 1

Total Sound Emissions from All Road Sources									
All Roads dB(A)	LDEN	LDAY	LEVE	LNIGHT	No. Of QF	No Of People with QF(Lden)	No Of People with QF (Ln)	Area Exposed (Lden)Km2	No. of Dwellings Exposed (LDEN)
0-44	1600	2800	5100	306500	0	0	2700		700
45-49	15500	21600	24900	58000	200	1200	100		7100
50-54	206700	255900	267800	38800	0	1700	2700		90500
55-59	141800	98600	89400	69000	0	100	30800		67600
60-64	38700	48600	61800	47500	200	2200	34100		18000
65-69	72800	74000	63400	7600	6100	28500	5500		34900
70-74	48400	25400	14900	200	4700	33100	100		24300
>55	302800	246800	229100	124300	11200	65400	70600	43.35	145500
>65	123100	100000	78400	7700	11000	62900	5600	13.37	60300
>=70	50400	26000	15200	200	4800	34500	100		25400
>=75	2100	700	300	0	100	1500	0	1.22	1100
Total	527600	527600	527600	527600	11300	68300	76000		244200

Total Sound Emissions from Major Road Sources									
Major Roads dB(A)	LDEN	LDAY	LEVE	LNIGHT	No. Of QF	No Of People with QF(Lden)	No Of People with QF (Ln)	Area Exposed (Lden)Km2	No. of Dwellings Exposed (LDEN)
0-44	196100	257500	290800	394300	0	0	3700		85200
45-49	131600	101800	83500	35700	100	800	1800		62100
50-54	65300	51400	45800	22100	200	3100	2800		31300
55-59	35700	26500	21700	39900	100	1900	10300		17100
60-64	20000	23400	29900	31300	300	2800	11600		9400
65-69	42100	46400	42800	4100	2600	11700	1400		20400
70-74	35200	19900	12700	100	1900	12000	100		17900
>55	134400	116700	107500	75300	5000	28900	23400	22.13	65600
>65	78900	66800	55800	4200	4600	24300	1600	9.1	39100
>=70	36800	20500	13000	100	2000	12600	100		18700
>=75	1600	500	300	0	100	500	0	1.04	800
Total	527600	527400	527500	527500	5300	32800	31700		244200

Fig.1

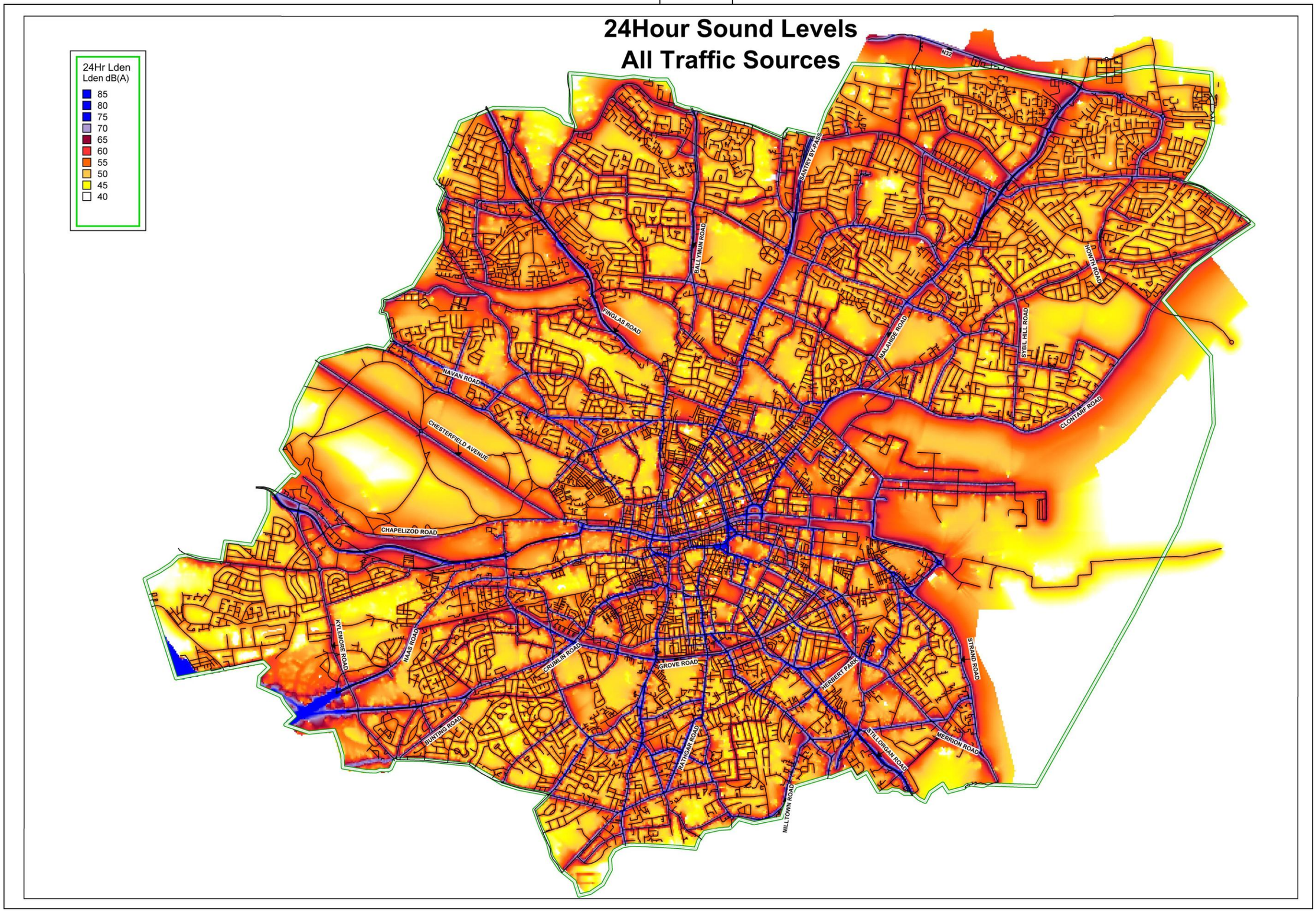

24Hour Sound Levels
All Traffic Sources
24Hr Lden
Lden dB(A)
85
80
75
70
65
60
55
50
45
40
N32
SAINTS BY PASS
BALLYMUN ROAD
FINGLAS ROAD
NAVAN ROAD
CHESTERFIELD AVENUE
CHAPELIZOD ROAD
HOWTH ROAD
MALAHIDE ROAD
SYBIL HILL ROAD
CLONTARF ROAD
KYLEMORE ROAD
NAAS ROAD
CRUMLIN ROAD
GROVE ROAD
BUNTING ROAD
RATHGAR ROAD
MILLTOWN ROAD
HERBERT PARK
STILLORGAN ROAD
MERRION ROAD
STRAND ROAD

Fig.2

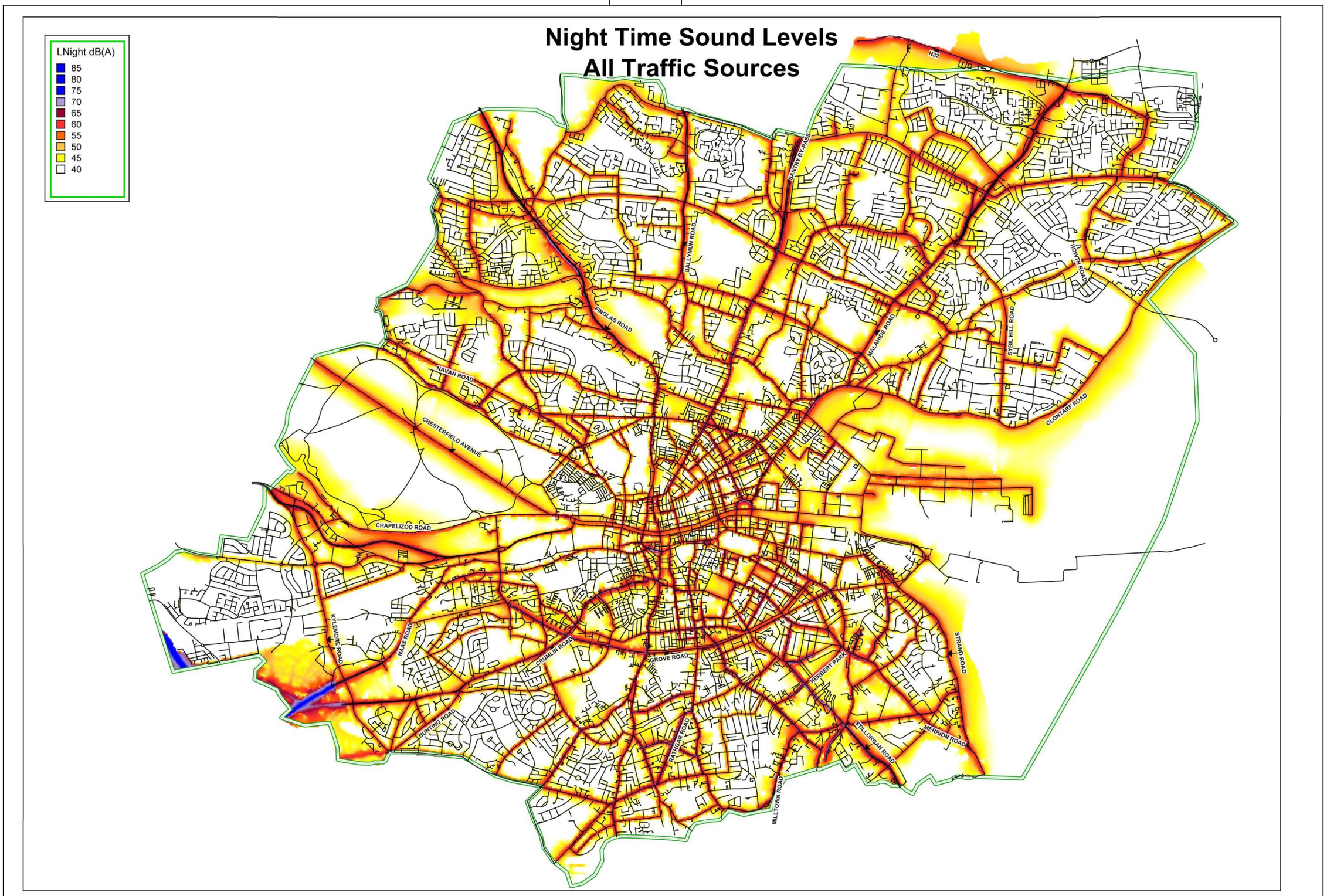

Night Time Sound Levels
All Traffic Sources
LNight dB(A)
85
80
75
70
65
60
55
50
45
40
N32
SANTRY BY-PASS
BALLYMUN ROAD
FINGLAS ROAD
NAVAN ROAD
CHESTERFIELD AVENUE
CHAPELIZOD ROAD
MALAHIDE ROAD
HOWTH ROAD
SYBIL HILL ROAD
CLONTARF ROAD
KYLEMORE ROAD
NAAS ROAD
CRUMLIN ROAD
GROVE ROAD
BUNTING ROAD
RATHGAR ROAD
HERBERT PARK
STILLORGAN ROAD
MERRION ROAD
STRAND ROAD
MILLTOWN ROAD

Fig.3

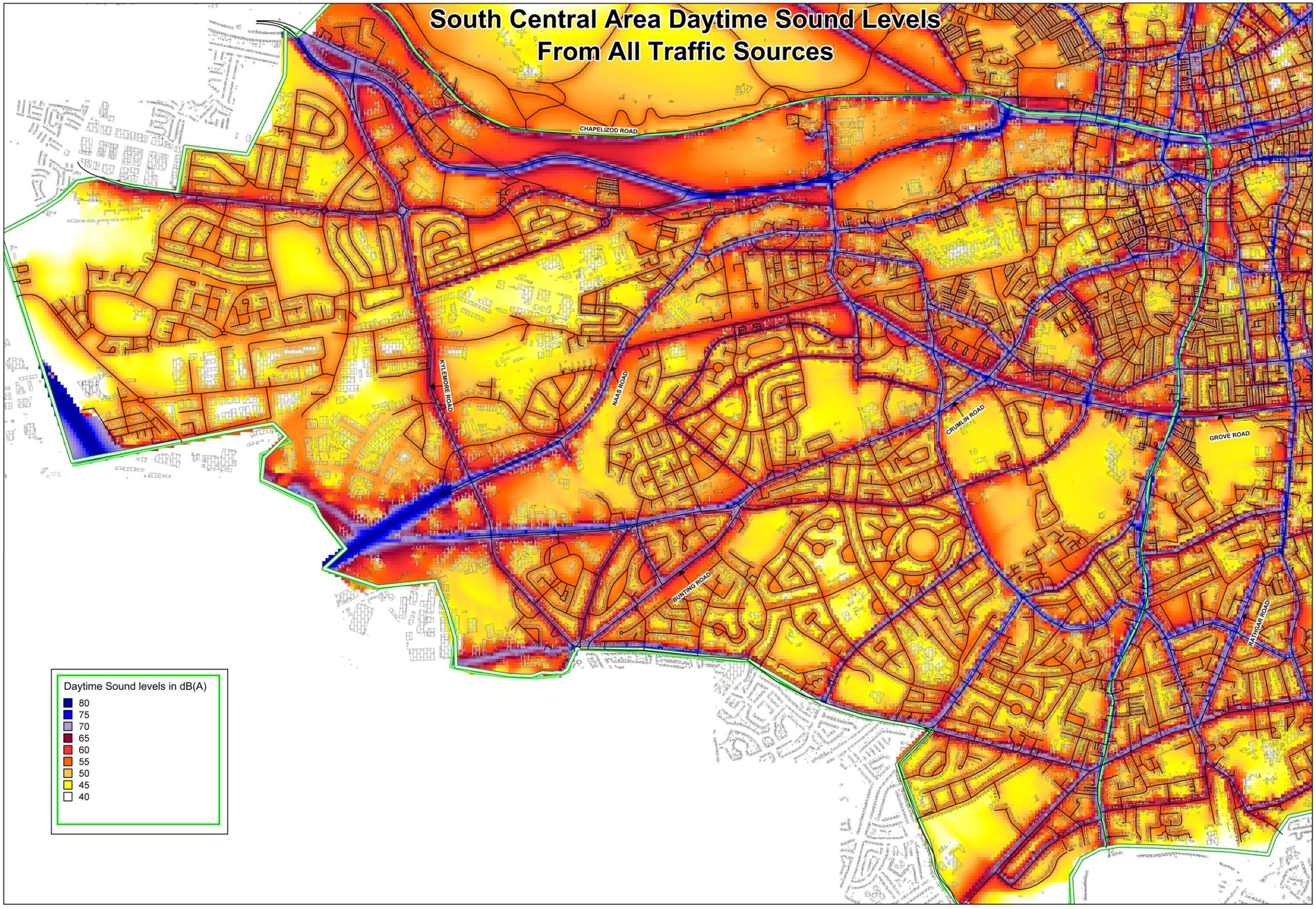

South Central Area Daytime Sound Levels
From All Traffic Sources
CHAPELIZOD ROAD
KYLEMORE ROAD
NAAS ROAD
CRUMLIN ROAD
GROVE ROAD
BUNTING ROAD
RATHGAR ROAD
Daytime Sound levels in dB(A)
80
75
70
65
60
55
50
45
40

Fig.4

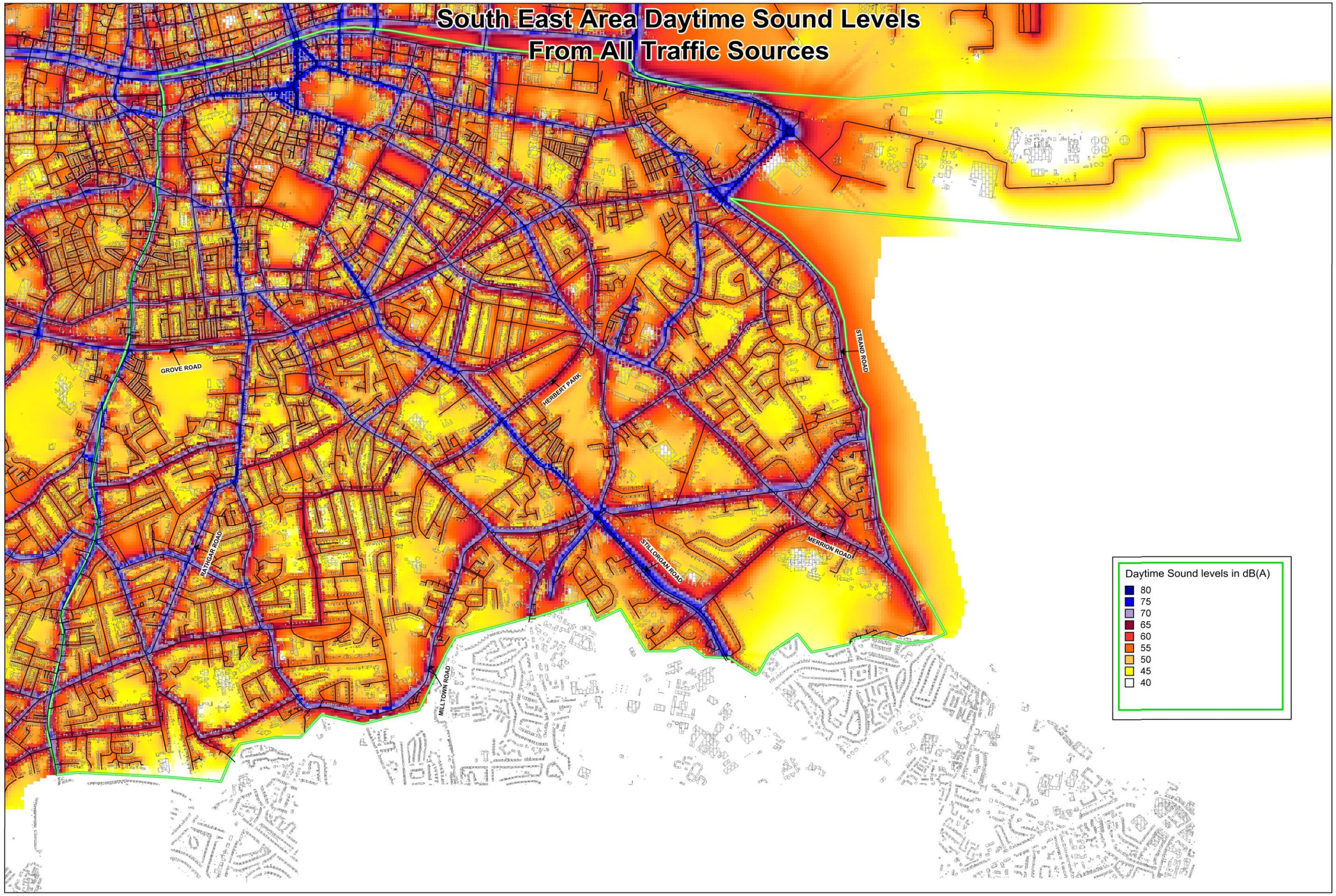

South East Area Daytime Sound Levels
From All Traffic Sources
GROVE ROAD
HERBERT PARK
STRAND ROAD
RATHGAR ROAD
MILLTOWN ROAD
STILLORGAN ROAD
MERRION ROAD
Daytime Sound levels in dB(A)
80
75
70
65
60
55
50
45
40

Fig.5

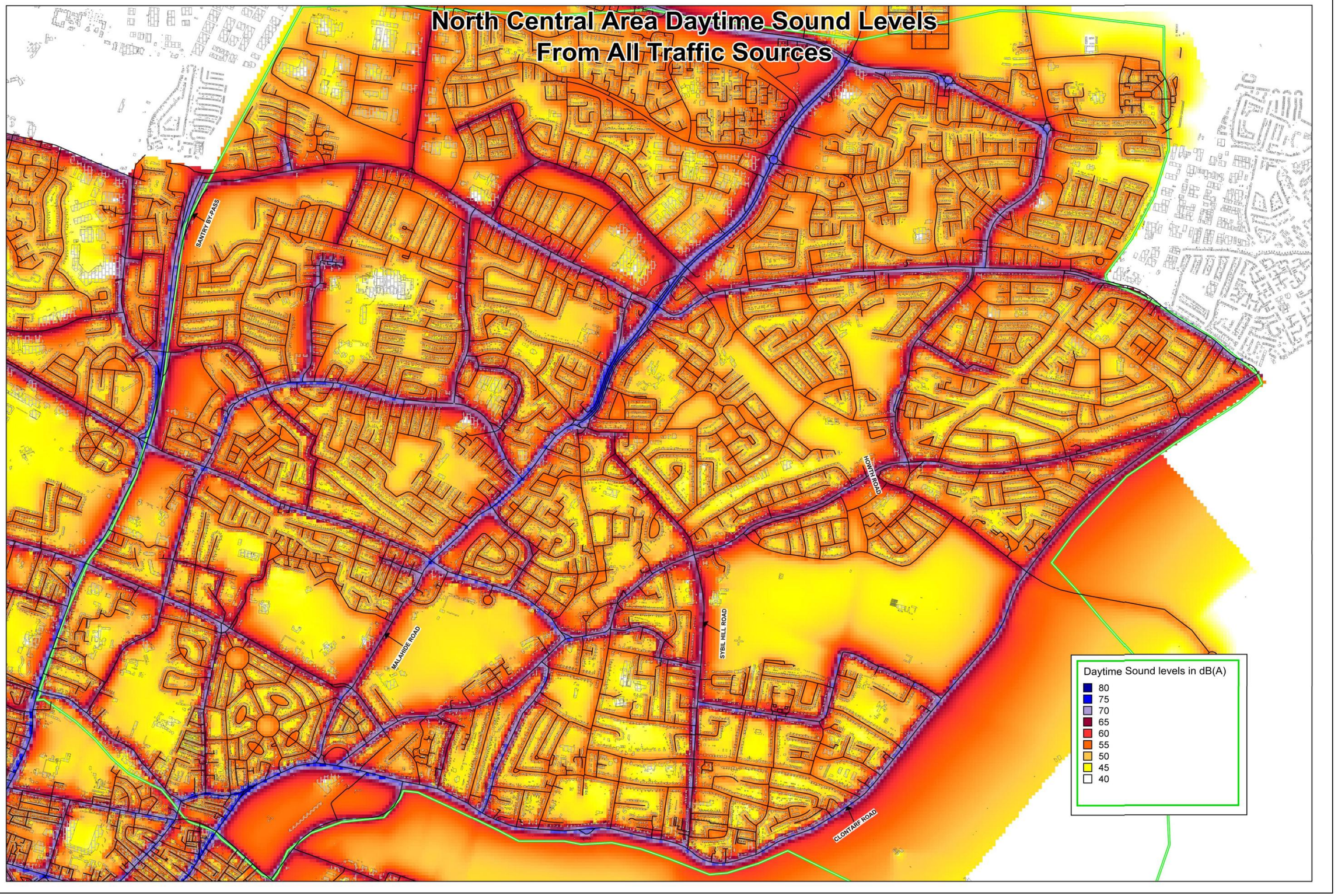

North Central Area Daytime Sound Levels
From All Traffic Sources
SANTRY BY-PASS
MALAHIDE ROAD
SYBIL HILL ROAD
NORTH ROAD
CLONTARF ROAD
Daytime Sound levels in dB(A)
80
75
70
65
60
55
50
45
40

Fig.6

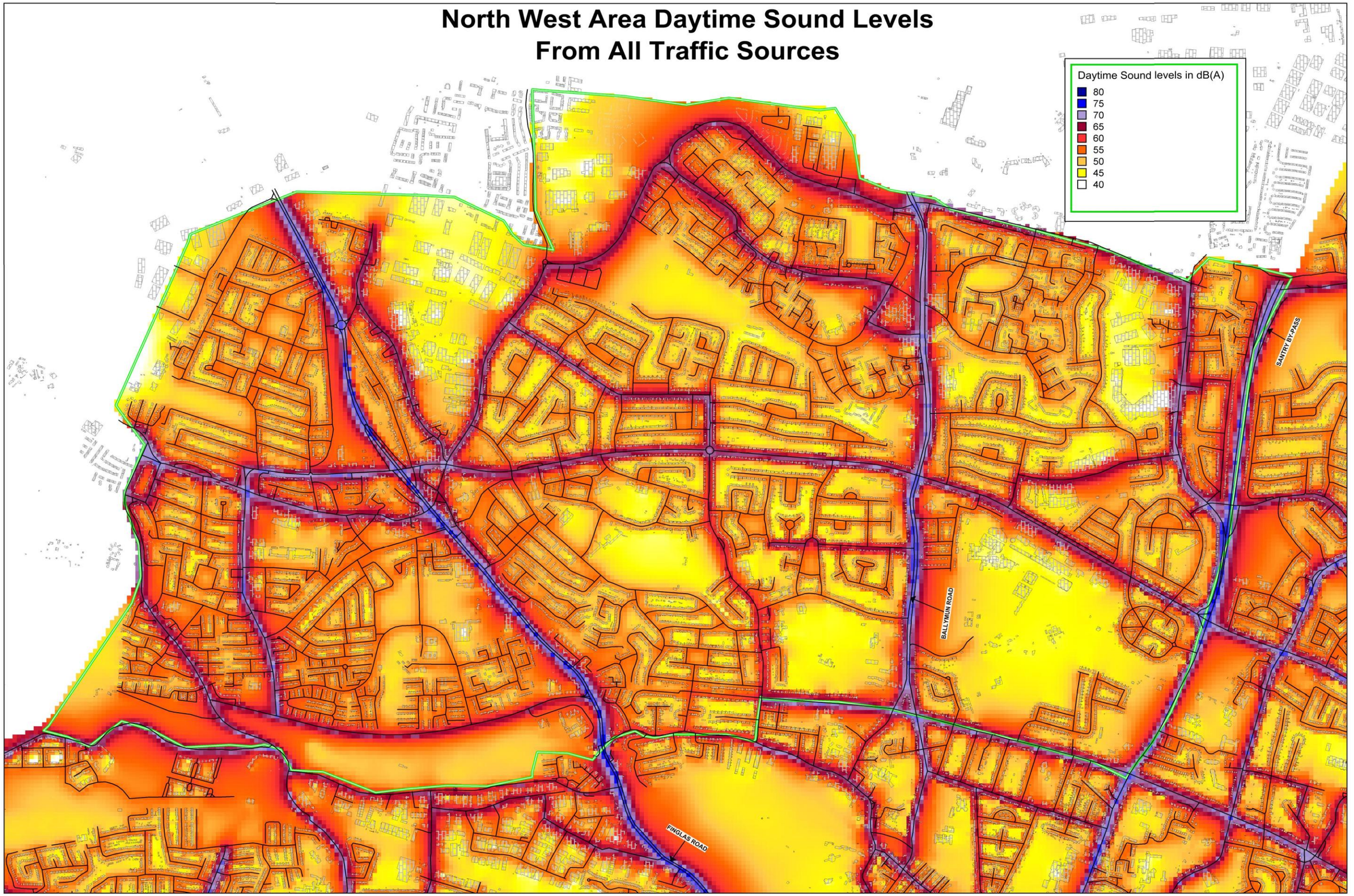

North West Area Daytime Sound Levels
From All Traffic Sources
Daytime Sound levels in dB(A)
80
75
70
65
60
55
50
45
40
SANTRY BY-PASS
BALLYMUN ROAD
FINGLAS ROAD

Fig.7

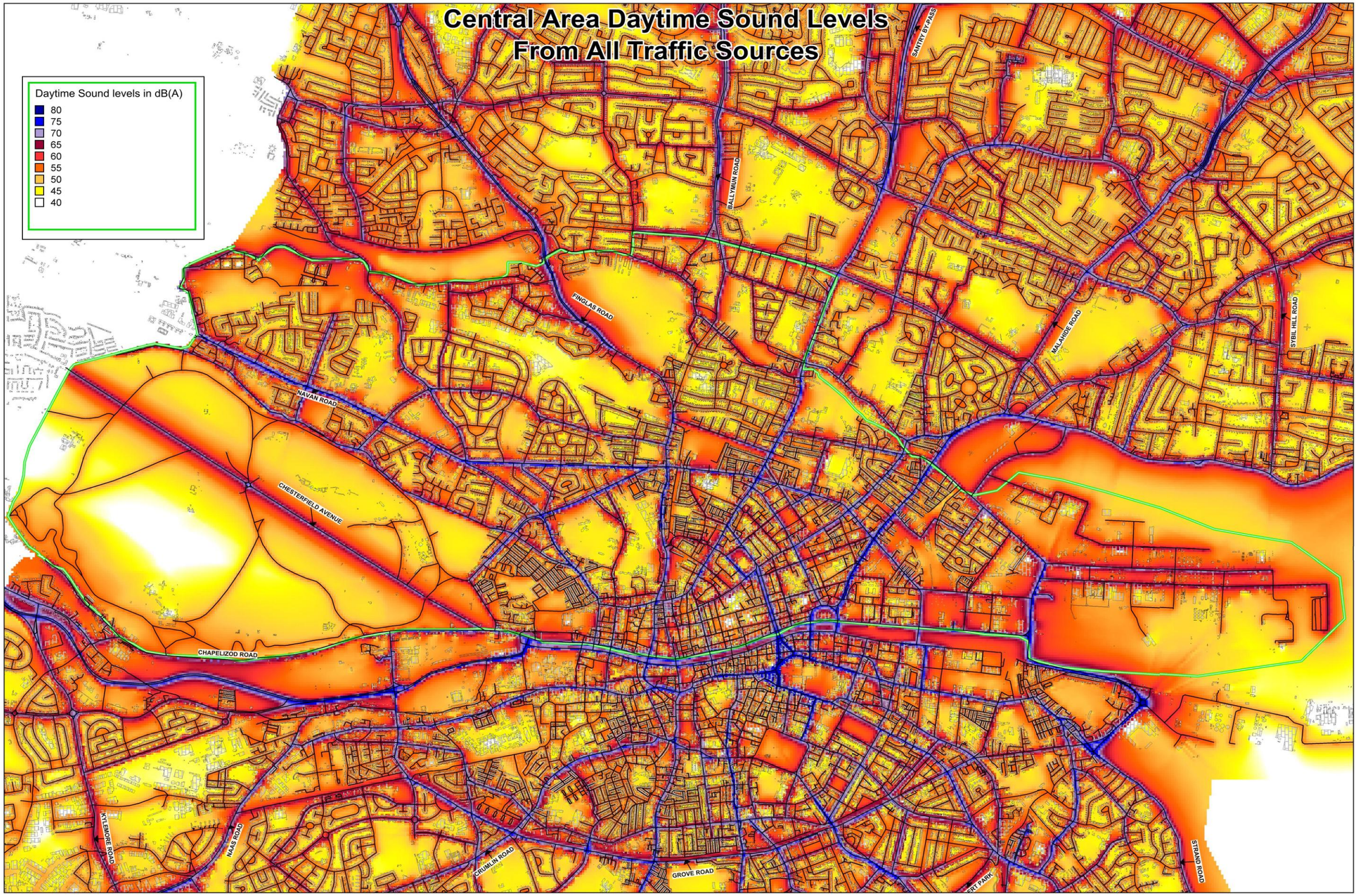

Central Area Daytime Sound Levels
From All Traffic Sources
Daytime Sound levels in dB(A)
80
75
70
65
60
55
50
45
40
SANTRY BY-PASS
BALLYMUN ROAD
FINGLAS ROAD
NAVAN ROAD
CHESTERFIELD AVENUE
CHAPELIZOD ROAD
MALAHIDE ROAD
SYBIL HILL ROAD
KYLEMORE ROAD
NAAS ROAD
CRUMLIN ROAD
GROVE ROAD
STRAND ROAD

Fig.8

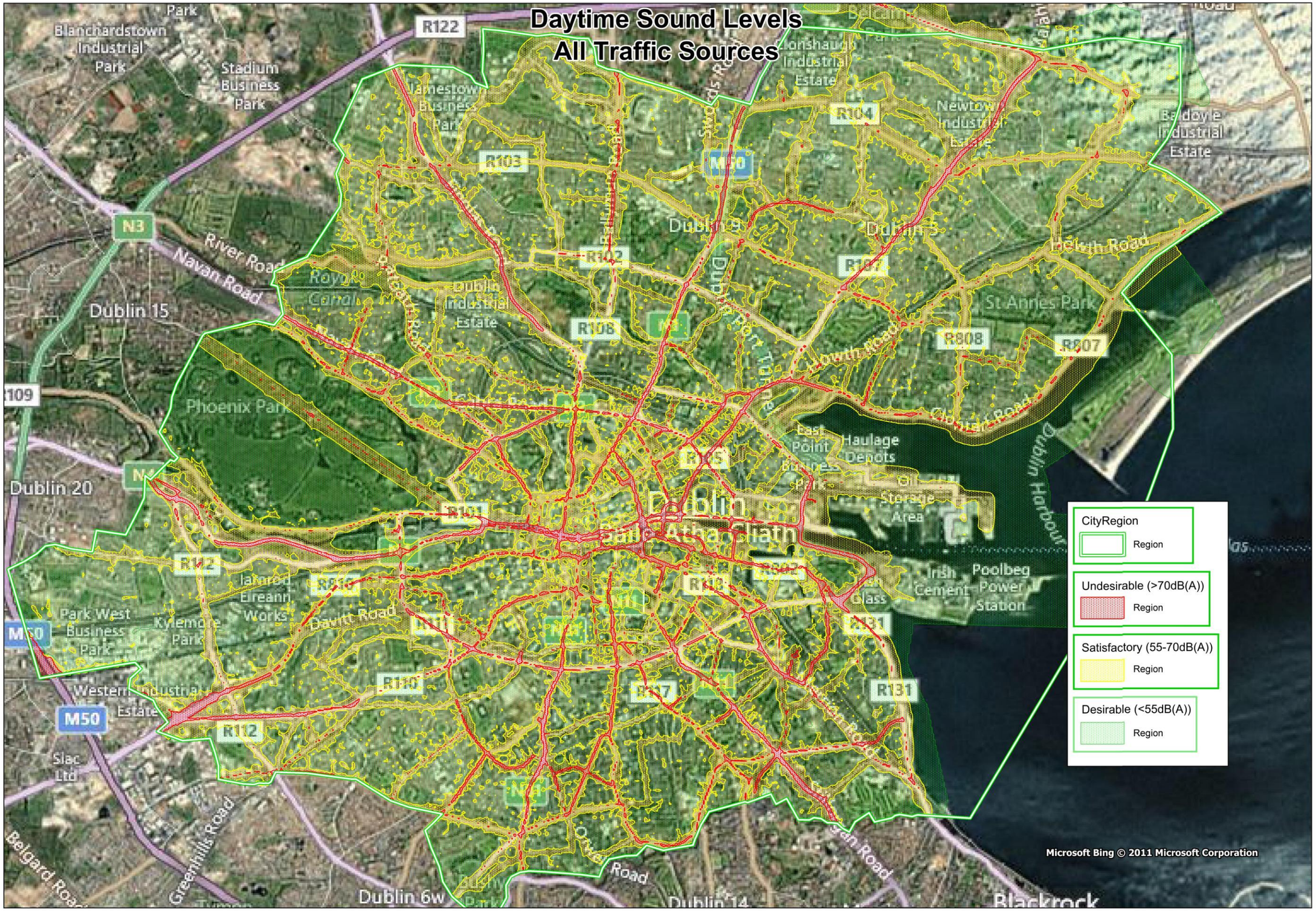
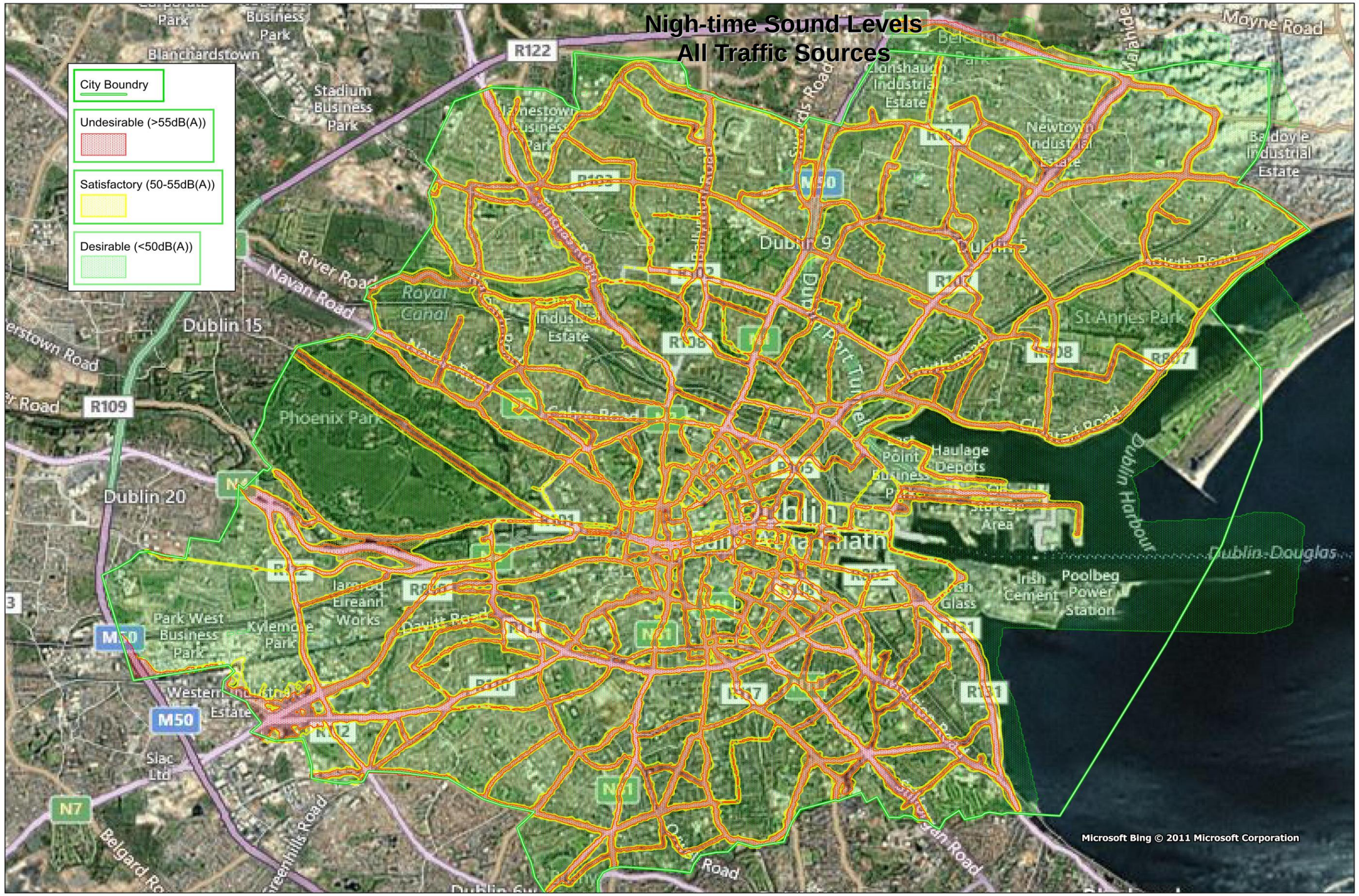

Daytime Sound Levels
All Traffic Sources
R122
N3
River Road
Navan Road
Dublin 15
Phoenix Park
Dublin 20
M50
R12
R104
R103
R108
R808
R807
R131
St Annes Park
Haulage Depots
Poolbeg Power Station
Irish Cement
Dublin 6w
Dublin 14
Blackrock
CityRegion
Region
Undesirable (>70dB(A))
Region
Satisfactory (55-70dB(A))
Region
Desirable (<55dB(A))
Region
Microsoft Bing © 2011 Microsoft Corporation

Fig. 9


Nigh-time Sound Levels
All Traffic Sources
City Boundry
Undesirable (>55dB(A))
Satisfactory (50-55dB(A))
Desirable (<50dB(A))
R122
Blanchardstown Business Park
Stadium Business Park
River Road
Navan Road
Dublin 15
R109
Phoenix Park
Dublin 20
Royal Canal
Mayne Road
Clonshaugh Industrial Estate
Newtown Industrial Estate
Baldoyle Industrial Estate
St Annes Park
Haulage Depots
Dublin Harbour
Dublin-Douglas
Irish Cement
Poolbeg Power Station
Park West Business Park
Kylemore Park
Western Industrial Estate
M50
N7
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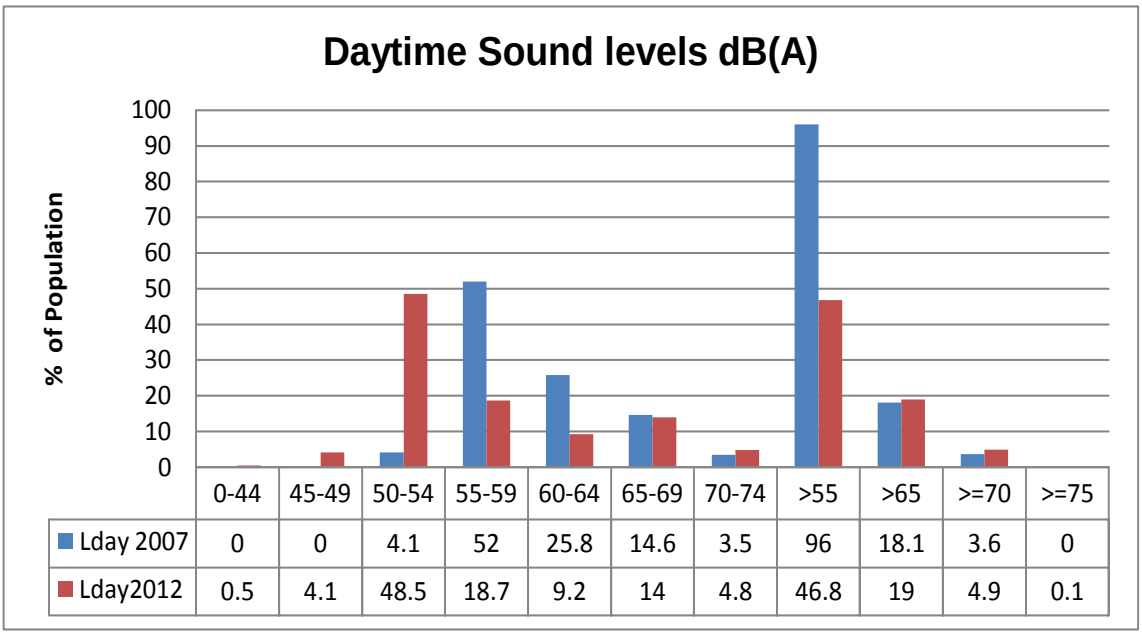
7.2 Comparison with 2007 Noisemaps

It is only natural to compare the 1st round of noise maps in 2007 with the current 2012 Maps. However caution should be exercised in doing so. There are a number of factors which give rise to the various changes in the maps and statistics, including a decrease in traffic volumes, availability of more robust datasets than those used in 2007, the use of amended calculation methods and the use of improved software. It is considered that the impact of the latter two factors influenced the current calculations to a greater degree than the other factors mentioned. It is not possible to compare the Major Roads data set with the 2007 dataset due to the change in definition as has been previously explained.

7.3 Daytime Sound levels

Chart 1

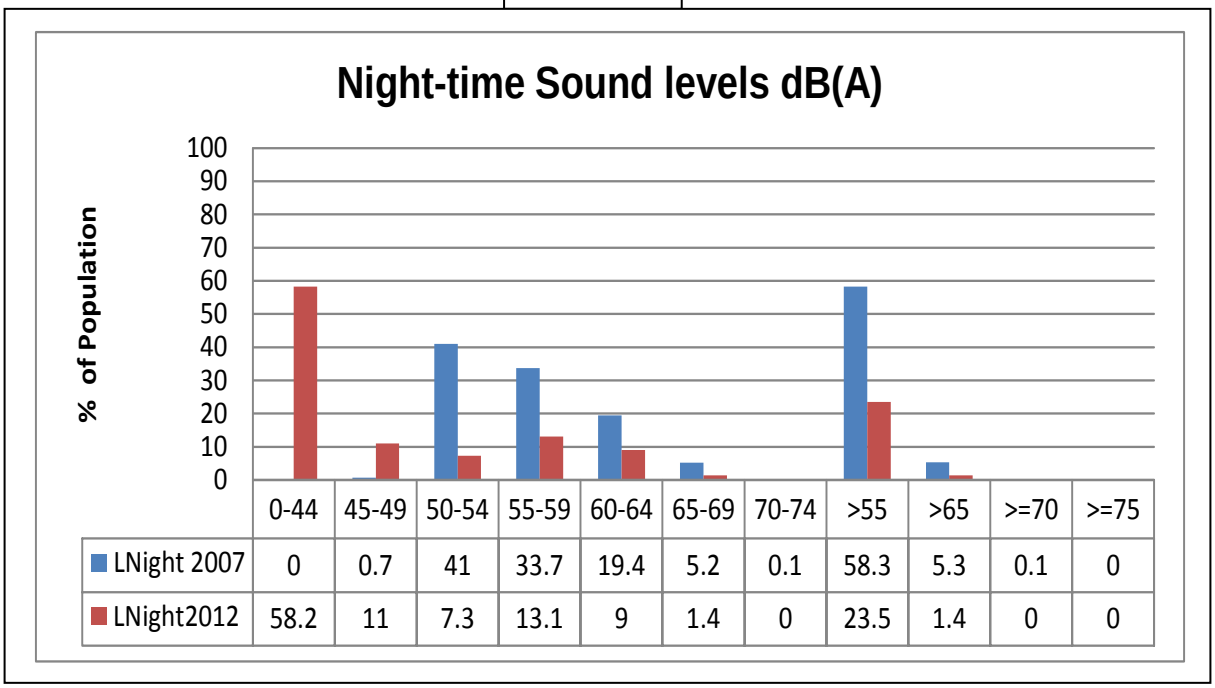


	0-44	45-49	50-54	55-59	60-64	65-69	70-74	>55	>65	>=70	>=75
Lday 2007	0	0	4.1	52	25.8	14.6	3.5	96	18.1	3.6	0
Lday2012	0.5	4.1	48.5	18.7	9.2	14	4.8	46.8	19	4.9	0.1

In 2007 most of the of the population in Dublin (96%) was exposed to sound levels from traffic above 55 dB(A). In 2012 this dropped to 46.8% a reduction of 49.2%. Also just over 53% of the population are below the desirable levels set by the Noise Action Plan, an improvement of 49% on 2007.The number of people above the undesirable daytime level of 70dB(A) increased by just over 1% in 2012.

7.4 Night-time Sound Levels

Chart 2

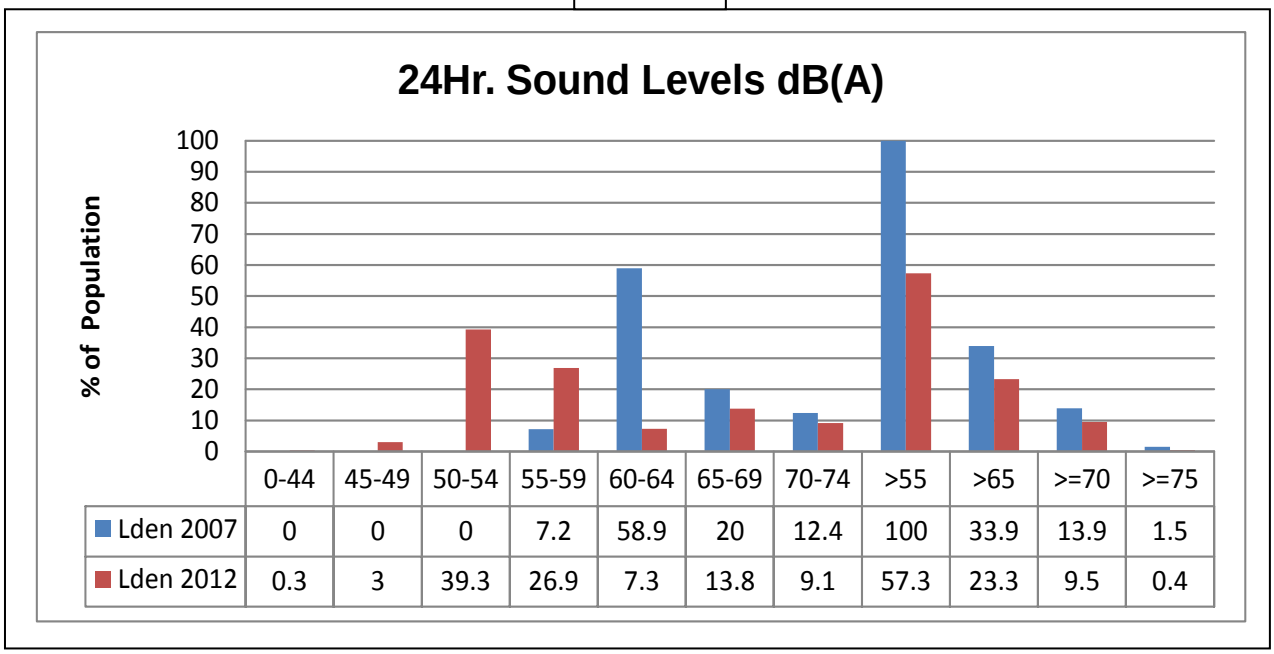


	0-44	45-49	50-54	55-59	60-64	65-69	70-74	>55	>65	>=70	>=75
LNight 2007	0	0.7	41	33.7	19.4	5.2	0.1	58.3	5.3	0.1	0
LNight2012	58.2	11	7.3	13.1	9	1.4	0	23.5	1.4	0	0

Chart 2 indicates that the major positive changes between 2007 and 2012 appear in the 'below **44dB(A) band', where in 2007 there was no person in this band. Currently it has been calculated that** there is now just over 58% of the population in this band. Overall 69.2% of the population meet the desirable criteria for being exposed to night-time sound levels below 50dB(A) as opposed to less than 1% in 2007. There have been improvements in all the night-time decibel bands in 2012 compared to 2007.

7.5 24Hour Sound Levels

Chart 3



	0-44	45-49	50-54	55-59	60-64	65-69	70-74	>55	>65	>=70	>=75
Lden 2007	0	0	0	7.2	58.9	20	12.4	100	33.9	13.9	1.5
Lden 2012	0.3	3	39.3	26.9	7.3	13.8	9.1	57.3	23.3	9.5	0.4

The 24 hour calculations indicate that that there have been significant reductions in population exposure to sound levels at the higher decibel band ranges. A drop can be observed in the number of people in the '> than 75dB (A)' band from 15% to close to zero. There has been close to an 11% reduction in the '>65dB (A)' band and a very significant reduction of just under 43% in the '>55dB (A)' band. The figures indicate that over the average 24 hour period, sound levels have reduced significantly on 2007.

8. Summary and Conclusions

The data on noise maps is required to be forwarded to the European Commission before the end of December 2012. The 'Noise Maps' show colour coded areas in Dublin based on sound levels, in 5 bands. These increment in 5 decibels. The official Night time band starts at 50 decibels and the 24 Hour band starts at 55 decibels. The EU Directive does not give an indication as to what level of sound is acceptable. This is left to each member state. At this point in time, Ireland does not have any statutory limit values, as is the case for air pollution. In the absence of guidance, one could assume that the closer the calculated sound level is to the highest band of sound set out in the Directive, the more unacceptable it is. And conversely, the closer the calculated sound level is to the lowest sound level band, set out in the Directive, the more acceptable it is.

For the purpose of the Noise Action Plan for the Agglomeration of Dublin, which is to be revised in 2013, limits are set out as to what sound emissions are desirable and undesirable. It indicates that a night time level greater than 55 decibels and a daytime level greater than 70 decibels is undesirable. It identifies areas with desirable low sound levels as those area with a night time level less than 50 decibels and\or a daytime level less than 55 decibels.

There are two categories of sound sources to be mapped - 'All Roads' and 'Major Roads'. Dublin City Council is the designated body for producing 'noise maps' for these sources. The production of maps for Rail source sound emissions falls to Irish Rail and the RPA, being the designated noise mapping bodies for these sources. The Irish Rail maps have not been revised although the population exposure statistics have been amended to take into account the change in population identified by the 2011 Census. The RPA has revised the' LUAS' maps due to the additional extension added to both the Red and Green lines since the last round of mapping in 2007. No maps were produced for Industrial point sources as this category has been found to have no strategic impact on overall sound levels within the Dublin City Council region.

Full details of population exposure to sound from traffic sources are given in *Table 1*. Overall there has been a significant reduction in the number of people being exposed to undesirable sound levels, particularly at night. One has to be cautious in drawing conclusions in relation to how these decreases occurred. There are a number of factors to consider, including a decrease in traffic volumes, availability of more robust datasets than those used in 2007, the use of amended calculation methods and the use of improved software. However there is still a tranche of people (23.5%) who are being exposed to undesirable night-time sound levels. These maps and statistics will guide the revision of the Dublin Agglomeration Noise Action Plan Oct 2008 - Nov. 2013.

Appendix A:

Glossary of acoustic and technical terms

Term\Definition

- **Agglomeration**- Major Continuous Urban Area as set out within the Regulations
- **CRTN** - The Calculation of Road Traffic Noise 1988. The road traffic prediction methodology published by the UK, Department of Transport.
- **dB** - Decibel
- **EC** - European Commission
- **END** - Environmental Noise Directive (2002/49/EC)
- **GIS**- Geographic Information System
- **LEQ** – Average sound level measured\calculated over a specified duration, outputted in decibels (dB).
- **QF** – Quiet Facade
- **Sound Bands** - Areas lying between contours of the following levels (dB):-

  Lden <55, 55 – 59, 60 – 64, 65 – 69, 70 – 74, 75

  Ld <55, 55 – 59, 60 – 64, 65 – 69, 70 – 74, 75

  Le <55, 55 – 59, 60 – 64, 65 – 69, 70 – 74, 75

  Ln <45, 45-49, 50 – 54, 55 – 59, 60 – 64, 65 – 69, 70

  The assessment and reporting of the 45 – 49dB band for Lnight is optional under the Regulations
- **Sound Levels** - Free-field values of Lden, Ld, Le, Ln, and LA10,18h at a height of 4m above local ground level
- **Sound Level, Ld** - Ld (or Lday) = LAeq,12h (07:00 to 19:00)
- **Sound Level (Le),** - Evening = LAeq,4h (19:00 to 23:00)
- **Sound Level (Ln),** - Night = LAeq,8h (23:00 to 07:00)
- **Sound Level (Lden), Day/Evening/Night** - A combination of Ld. Le and Ln as follows:

  Lden = 10 * log 1/24 {12 * 10^((Lday)/10) + 4 * 10^((Levening+5)/10) + 8 * 10^((Lnight+10)/10)}
- **Sound Level, LA10,18h** - L A10,18h = LA10,18h (06:00 to 24:00)
- **WHO** – World Health Organisation