

**Environmental Noise Directive**

**Action Plan**

**NOISE ACTION PLAN FOR THE  
GLASGOW AGGLOMERATION**

Prepared by the Glasgow Agglomeration Working Group

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# 1 Introduction

## 1.1 The Purpose of This Document

The purpose of this Glasgow Agglomeration Noise Action Plan is to describe how The Scottish Government and its partners propose to deliver their obligations under the Environmental Noise Directive. This action plan for the Glasgow agglomeration was the subject of a consultation exercise between May and July 2008 and has been amended where appropriate as a result of comments received during that consultation.

The European Parliament and Council Directive for Assessment and Management of Environmental Noise [2002/49/EC](#)<sup>(1)</sup> more commonly referred to as the Environmental Noise Directive (END), was published in the [Official Journal of the European Union](#)<sup>(2)</sup> in July 2002. This directive deals with noise from road, rail, and air traffic, and from industrial noise in agglomerations. It focuses on the impact of such noise on individuals, complementing existing EU legislation, which sets standards for noise emissions from specific sources.

The three main objectives of the Directive are as follows:

- To determine the noise exposure of the population through noise mapping.
- To make information available on environmental noise to the public.
- To establish Action Plans based on the mapping results, to reduce noise levels where necessary, and to preserve environmental noise quality where it is good.

To embrace their devolved responsibility to deliver the requirements of the END legislation the Scottish Executive published the [Environmental Noise \(Scotland\) Regulations 2006](#)<sup>(3)</sup>. The Scottish legislation describes a two round process to manage environmental noise. This is now completed as can be seen by reference to Table 1.

**Table 1: Key Tasks in the Scottish Legislation – Round 1**

| Task  | Detail                                                                     | Due Completion Date | Completed                                                                                    |
|-------|----------------------------------------------------------------------------|---------------------|----------------------------------------------------------------------------------------------|
| One   | Produce strategic noise maps for major roads, rail, airports, and industry | June 30 2007        | Yes<br>(see <a href="http://www.scottishnoisemapping.org">www.scottishnoisemapping.org</a> ) |
| Two   | Prepare guidance on the preparation and content of noise Action Plans      | July 18 2007        | Yes<br>(see <a href="http://www.scottishnoisemapping.org">www.scottishnoisemapping.org</a> ) |
| Three | Competent Authorities to draw up Action Plans to manage noise              | July 18 2008        | Yes<br>(see <a href="http://www.scottishnoisemapping.org">www.scottishnoisemapping.org</a> ) |
| Four  | Submit summary of Action Plans to Commission                               | January 18 2009     | Yes<br>(see <a href="http://www.scottishnoisemapping.org">www.scottishnoisemapping.org</a> ) |

The strategic noise maps referred to in Table 1 are the starting point for Action Planning. Their initial analysis, using a prioritisation matrix developed as noted in Section 4 of this document, provided a focus for deriving actions to manage noise where it is deemed there is a need. Where the prioritisation matrix has identified an area as being a possible Noise Management Area that area has been put forward as a Candidate Noise Management Areas (CNMA), as described in Section 4. A methodology has been developed to determine whether or not the CNMA will eventually become a noise Management Area (NMA) and this process is described in Section 4.

A description of the European Directive on Environmental Noise is provided in Section 2 together with a brief outline of the Scottish Legislative framework relative to environmental noise. This section also provides an overview of the strategic noise maps and provides the rationale behind the selection of those areas and sources that have been mapped to date.

Section 3 provides an explanation of the Action Planning process and the infrastructure of the groups set up to assist in the delivery of an Action Plan for Scotland. In reading the Action Plan it is important to bear in mind that Action Plans have been developed to manage noise issues and effects, including noise reduction if necessary. The Action Plans for the agglomerations of Glasgow and Edinburgh also aim to protect quiet areas against an increase in noise.

The methodology for the determination of Quiet Areas has been described in Section 5.

Section 6 sets out the planning framework relevant to the Action Planning process and describes the alignment of existing initiatives that should be incorporated into the Action Planning process.

Finally, Section 7 describes the next steps in the noise mapping process.

## 2 Background and Context

### 2.1 The European Directive on Environmental Noise

The European Union has estimated that around 20 percent of the EU's population, or close to 80 million people, suffer from noise levels that scientists and health experts consider unacceptable. It is suggested that people within this 20 percent of the population may become annoyed, their sleep disturbed and adverse health effects are therefore expected. An additional 170 million people experience noise levels causing serious annoyance during daytime<sup>(4)</sup>. With this background, there is a clear need to manage environmental noise on a national and local scale.

One of the first steps in embarking on a programme of noise management is to quantify the current noise climate. This provides a solid basis for formulating environmental noise management policy. To ensure parity for this across the European Union the European Parliament and Council adopted Directive 2002/49/EC. This Directive has since been transposed into the [Environmental Noise \(Scotland\) Regulations 2006](#)<sup>(3)</sup>.

The Directive requires competent authorities in Member States to draw up "strategic noise maps" for major roads, railways, airports and agglomerations, using harmonised noise indicators  $L_{den}$  (day-evening-night equivalent level) and  $L_{night}$  (night equivalent level).

The Directive requires that the public is informed and consulted about noise exposure, its effects, and measures that are being considered in order to address noise, in line with the principles of the [Aarhus Convention](#)<sup>(5)</sup>. The Aarhus Convention established a number of rights of the public (individuals and their associations) with regard to the environment. The Parties to the Convention are required to make the necessary provisions so that public authorities (at national, regional or local level) will contribute to these rights so that they become effective.

The process of provision of information, consultation, and ultimate decision making that relate to the issues of noise management is known as the Action Planning Process and this document sets out the Action Plan for the Glasgow Agglomeration following the first round of mapping. The Action Plans are intended to manage environmental noise and will provide strategies for the reduction of environmental noise where it is deemed necessary. It is important to note that 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.

## 2.2 The Legal Context

[The Environmental Noise \(Scotland\) Regulations 2006](#) <sup>(3)</sup> came into force on 5 October 2006 and apply to the environmental noise to which humans are exposed to, in particular in built up areas, public parks or other quiet areas in an agglomeration, near schools, hospitals, and other noise sensitive buildings and areas. The regulations apply to noise from road, railway and airport sources, as well as industrial noise. The regulations do not apply to noise that is caused by the person exposed to the noise, 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.

Noise from domestic activities or noise created by neighbours can be dealt with under the [Environmental Protection Act 1990](#) <sup>(6)</sup> and Antisocial Behaviour etc. (Scotland) Act 2004. Part 5 of the [Antisocial Behaviour etc. \(Scotland\) Act 2004](#) <sup>(7)</sup> contains provisions in relation to antisocial noise and, in particular, gives local authorities additional powers to tackle the problems of night noise in dwellings. Noise exposure at work is governed by the [Control of Noise at Work Regulations 2005](#) <sup>(8)</sup> and the noise from construction sites is controlled by the [Control of Pollution Act 1974](#) <sup>(9)</sup>. Further information on the aforementioned legislation can be obtained in the research document [“Noise Level Research Report”](#) <sup>(10)</sup>.

Details of a draft [“Noise Management Guide”](#) <sup>(11)</sup>, which aims to provide guidance on the creation and maintenance of effective noise management policies and practice for local Authorities and their officers in Scotland, can be obtained from the [Scottish Government Website](#).

If a proposed development is likely to be a source of new noise, its location and associated measures regarding the level and/or timing of noise emissions may be controlled through the planning process. Existing sources of noise such as road or rail traffic are not subject to planning control but they may be an issue to be considered in the context of proposed noise sensitive developments which may be affected by such sources.

Noise from lawful use of existing roads and railways cannot be construed as a noise nuisance in terms of the Environmental Protection Act. Noise from new roads can be controlled through the planning process and there is additional legislation in respect of potential compensation and insulation. Noise from new railways may also be controlled by conditions attached as part of the Parliamentary Bill process.

At present where noise from a new or altered road <sup>(1)</sup> exceeds a certain trigger level, and meets other qualifying criteria, the [Land Compensation \(Scotland\) Act 1973](#) <sup>(12)</sup>, through the Noise Insulation (Scotland) Regulations 1975 <sup>(13)</sup> (NISR), provides for insulation work to be carried out, or a grant to be made in respect of that insulation work.. Under the NISR, the Land Compensation (Scotland) Act 1973 also confers a right to compensation for depreciation in the value of land caused by public works. Public works do not include aerodromes.

The railway equivalent of the NISR is the [Noise Insulation \(Railways and other Guided Transport Systems\) Regulations 1996](#) <sup>(14)</sup>. However, the provisions of the 1996 Regulations, which came into force under the Land Compensation Act 1973, do not extend to Scotland.

Noise from aircraft in flight is not treated as nuisance. Ground noise, other than normal aircraft movements, at the airport may be controlled by the local authority.

The Scottish Government also issues planning guidance in respect of various noise related issues in the form of planning advice notes such as [Planning Advice Note 56 "Planning and Noise"](#) <sup>(15)</sup> and [Planning Advice Note 50: "Controlling the Environmental Effects of Surface Mineral Working, Annex A: The Control of Noise at Surface Mineral Working."](#) <sup>(16)</sup> In more general terms [Planning Advice Note 51: "Planning, Environmental Protection and Regulation"](#) <sup>(17)</sup> supports the existing policy on the role of the planning system in relation to the environmental protection regimes. As part of the Action Plan, PAN 56 will be revised to align with the Action Planning process.

An environmental impact assessment is required for a large range of projects which are likely to have significant environmental effects. Noise emissions are one of the impacts which have to be considered and, if relevant, measures to mitigate the effects should be proposed. The implementation of the mitigation measures are a matter for the consenting procedure and the responsible authority.

Industrial noise for Part A processes (as defined within the [Pollution Prevention and Control \(Scotland\) Regulations 2000](#) <sup>(18)</sup>) is controlled through The Pollution Prevention and Control (Scotland) Regulations 2000 (the PPC Regulations). These regulations designate the [Scottish Environment Protection Agency](#) <sup>(19)</sup> (SEPA) as the 'Regulator' responsible for enforcing the regime.

As part of its role as regulator, SEPA produces guidance for use in enforcing the PPC Regulations. SEPA has produced guidance on the control of noise at PPC installations, which will be used when considering applications for, and inspections of PPC installations. For non Part A processes the control of noise is exercised by the relevant local authority.

From the above it is clear that there are existing controls in respect of operational industrial noise sources, but at present controls over operational transportation sources are limited to the [Motor Vehicles \(Construction and Use\) Regulations](#) <sup>(20)</sup> and BS ISO 362:1998 Acoustics - Measurement of noise emitted by accelerating road vehicles. Engineering method, which although they provide a degree of control over excessive exhaust noise they do not provide a very effective solution to the problem. The preparation of noise mapping and action plans affords an opportunity to inform policy on such matters.

It is important that the Action Planning process takes into account the existing legislative and guidance framework that exists within Scotland.

### 2.3 Introduction to Strategic Noise Maps

The maps have, in accordance with the requirements of the Environmental Noise (Scotland) Regulations 2006<sup>(3)</sup>, been produced for the first round mapping for all roads (essentially motorways and A roads) which have more than 6 million passages per year, as well as all roads within the “agglomerations” of Edinburgh and Glasgow which exceed the qualifying flow of 1000 vehicles or more per day. Similarly, for rail, the first round qualifying railways are those which have more than 60,000 train passages per year as well as all railways within the agglomerations of Edinburgh and Glasgow.

A noise map is analogous to a weather map, but instead of showing a temperature or percentage cloud cover it shows noise levels in terms of coloured contour bands. Also the noise levels represent the noise to be experienced within a certain area over a given period of time. Therefore the level may vary throughout the day or even on a daily basis as the noise map will display levels based on annual averages.

It is important to appreciate that the maps produced show an average noise level for an average weekday in the year, calculated on the basis of a 10m grid at a height of 4m above ground level as required by [Directive 2002/49/EC](#)<sup>(1)</sup>. As was stated above, the noise maps are based on predicted noise levels using a 10m grid spacing therefore the value of the "grid" is determined by the centre point of the grid and therefore in reality there may be some variation within the grid. Also, with a receptor point located 4m above ground level compared with the average height above ground of an "ear", at about 1.2-1.5m above ground level, it should be clear that the strategic maps cannot be used to determine the level for any specific property. It would therefore be a mistake to try to categorise any site at ground floor level in terms of the Noise Exposure Categories given in the Scottish Government [Planning Advice Note 56](#)<sup>(15)</sup>. Once again, it is important to remember that the noise maps are strategic and they will be used accordingly, they should not be taken to be fully representative of all local circumstances, for example, localised garden walls and fences are not taken into account in the production of strategic noise maps. It is likely that more detailed examination will be necessary in some of these situations as any required local Action Plans are developed.

The data required for the calculations of noise levels have been determined by consultation with various organisations including Transport Scotland, SEPA, BAA, Network Rail, British Airports Authority, Local Authorities, and others.

The maps are produced using computer based three dimensional noise models. This process requires the acquisition of information about the noise source and the path of noise propagation. The specialised noise modelling software does take account of physical features such as buildings and the ground contours. The noise level for each grid point is then calculated, which can be used to create noise contour bands as shown in the noise maps available at the [Scottish Noise Mapping Internet site](#)<sup>(21)</sup>.

The END and Environmental Noise (Scotland) Regulations 2006 refer to noise descriptors, namely  $L_{den}$ ,  $L_{day}$  and  $L_{night}$ .

The day-evening-night level  $L_{den}$  in decibels (dB) is defined by the following formula:

$$L_{den} = 10 \times \log_{10} \left( \frac{1}{24} \left[ 12 \times 10^{\frac{L_{day}}{10}} + 4 \times 10^{\frac{L_{evening} + 5}{10}} + 8 \times 10^{\frac{L_{night} + 10}{10}} \right] \right)$$

in which:

- $L_{day}$  is the A-weighted long-term average sound level as defined in ISO 1996-2: 1987, determined over all the day periods of a year,
- $L_{evening}$  is the A-weighted long-term average sound level as defined in ISO 1996-2: 1987, averaged over all the weekday evening periods of a year,
- $L_{night}$  is the A-weighted long-term average sound level as defined in ISO 1996-2: 1987, determined over all the night periods of a year;

The default values for the day, evening and night time periods are 07:00 to 19:00, 19:00 to 23:00 and 23:00 to 07:00, respectively.

#### Airport Maps

There is sometimes confusion with the END airport noise contours and the noise contours presently produced by the airport operators for use in the planning process. The END requires the maps to represent the annual average values. This contrasts with the common UK practice, required under the [Aviation White Paper](#) <sup>(22)</sup>, that requires the production of aircraft noise contours for the average summer's day, using  $L_{eq,(16hr)}$ , whilst END uses an annual average  $L_{den}$ . It must be remembered that the annual average  $L_{den}$  indicator is different from the summer average 16 hour  $L_{Aeq,16hr}$  indicator that has traditionally been used to describe the noise exposure from the airport. Thus the two sets of results are not comparable and should not be confused. Instead they should simply be seen as two methods of describing average noise exposure around the airport. Airports will have to continue to provide both types of contours.

BAA has produced for Glasgow airport an Action Plan that is based on the maps produced. This demonstrates the impact on domestic households within the Glasgow agglomeration who reside under the flight paths in and out of the airport. It is the responsibility of the relevant local authorities within the agglomeration to undertake a post code check of residential areas within the flight paths to establish whether they have received sound insulation support, or if new properties have been adequately noise insulated from noise aircraft by the property developer, which may include double or secondary glazing. This will be undertaken as part of the first phase of the CNMA analysis.

## 2.4 Data Reported to the European Commission

To reiterate this Action Plan explains how the noise maps have been presented to the public and it also provides advice on understanding the maps. All member states were required to produce strategic noise maps for major roads, rail, airports, and industry by the end of June 2007. The Scottish Government met this target and the data, as required under Article 10(2) of the [Environmental Noise Directive \(2002/49/EC\)](#) <sup>(1)</sup>, was submitted by the Scottish Government on the 19th December 2007 to the European Commission.

As part of the Action Plan an analysis of the population exposure with respect to noise from both individual and, where appropriate, combined noise sources, as covered by the Environmental Noise Directive, is presented below for the Glasgow Agglomeration.

**Table 2: Population Exposure for Noise Sources Mapped per the Environmental Noise Directive 2002/49/EC (END)**

| Noise Source / Noise Level | L <sub>den</sub> ≥ 55 (dB) | L <sub>den</sub> ≥ 55 (dB) | L <sub>den</sub> ≥ 55 (dB) | L <sub>night</sub> ≥ 50 (dB) | L <sub>night</sub> ≥ 60 (dB) | L <sub>night</sub> ≥ 70 (dB) |
|----------------------------|----------------------------|----------------------------|----------------------------|------------------------------|------------------------------|------------------------------|
| <b>All Mapped Roads</b>    | 533800                     | 171,100                    | 3,900                      | 374,100                      | 43,300                       | 1,000                        |
| <b>Major Roads</b>         | 261,200                    | 65,800                     | 3,300                      | 158,400                      | 27,900                       | 1100                         |
| <b>All Mapped Railways</b> | 123,400                    | 30,000                     | 2,300                      | 89,800                       | 19600                        | 1,500                        |
| <b>Major Railways</b>      | 44200                      | 10700                      | 200                        | 33,100                       | 6800                         | 0                            |
| <b>Industrial Glasgow</b>  | 316,100                    | 64,700                     | 700                        | 113,800                      | 6,900                        | 0                            |
| <b>Glasgow Airport</b>     | 63,500                     | 400                        | 0                          | 24,700                       | 0                            | 0                            |

## 2.5 Description of the Agglomeration

Glasgow and the Clyde Valley (GCV) has a population of 1.75 million and covers an area of 3,376km<sup>2</sup>, encompassing the whole of the River Clyde catchment. 48% of Scotland's exports are produced within the area, making it critically important to the national economy.

Glasgow and the Clyde Valley is predominantly a lowland area surrounded by hill ranges and in recent times the area has experienced the same trends as the rest of Scotland where urban development has had the biggest impact on the environment. This urban growth is projected to continue.

The GCV Area includes several landscapes that are recognised as being of national and regional importance including parts of the Loch Lomond National Park, the Campsie Fells, the Clyde Muirshiel Regional Park and the Southern Uplands.

Glasgow's network of greenspaces (3,870ha) accounts for over 20% of the City's total area. The network consists of public parks, amenity open spaces, countryside areas,

two local nature reserves, over 30 sites of City-wide importance for nature conservation and around 40 sites of local importance. The 1,790 listed buildings in the City represent the principal elements of Glasgow's architectural heritage. The City also has 19 conservation areas, which extend over 1,423 ha, each containing its own distinctive character.

Trips between Glasgow and the Clyde Valley corridors account for 26 per cent of the total trips, with the largest proportion, 69 per cent, made up of trips within the city itself. The remaining five percent consists of trips between corridors across Glasgow.

The Glasgow and Clyde Valley Joint Structure Plan 2000, as amended in 2006, and detailed in Section 6, has the aim of delivering sustained growth as its primary aim, with shared targets for integrating land use and transportation as a key indicator. It is only by integrating the END Noise Action Plan in with local and regional structural and transport plans will noise control be afforded similar priorities to air quality management.

## 2.6 Requirement for and of Action Plans

The purpose of this Glasgow Noise Action Plan is to describe how the Scottish Government and its key partners propose to deliver their obligations under the Environmental Noise Directive. This directive deals with noise from road, rail, and air traffic, and from industrial noise within agglomerations. It focuses on the impact of such noise on individuals, complementing existing EU legislation, which sets standards for noise emissions from specific noise generating sources.

The three main objectives of the Directive are as follows:

- To determine the noise exposure of the population through noise mapping.
- To make information available on environmental noise to the public.
- To establish Action Plans based on the mapping results, to reduce noise levels where necessary, and to preserve environmental noise quality where it is good.

As has been previously stated, Action Planning is the process whereby environmental noise, as described in the Regulations, will be managed. Clearly the agglomeration Action Plans must cover the agglomeration area; whether that is for Edinburgh or Glasgow. Outside agglomerations, Action Plans must be developed for places 'near' the qualifying major transport noise sources. The Scottish Government has defined the term "places near" in terms of levels of exposure that were reported to the Commission: *i.e.* out to the  $L_{den}$  55 dB and  $L_{night}$  50 dB contour bands in a noise map (see [Annex VI](#) of the END<sup>(1)</sup>). The distance noise propagates from noise sources such as major roads and railways will depend on the source to receiver propagation path. . To take account of this a buffer area of 2km has been created around each agglomeration and for each of the qualifying transportation links. These 2km buffered areas defined the areas for which noise maps have been produced. However, in the case of relevant airports the distance to the  $L_{den}$  55 dB and  $L_{night}$  50 dB noise contour

lines may be greater than 2km from the airport itself and, as such, the airport noise maps extended out to  $L_{den}$  55 dB and  $L_{night}$  50 dB contour lines, respectively.

The need to manage noise implies a potential adverse impact on health. The relationship between exposure to noise and health effects at noise levels experienced in everyday environments is a complex one. Hearing loss does not occur in normal environmental noise situations below a  $L_{Aeq,24hr}$  noise level of approximately 70 dB. Hence it is normal to consider only “non-auditory” health effects.

## 2.7 Health Effects

There are a wide range of non-auditory health effects that may be associated with exposure to environmental noise. Examples of non auditory health effects include:

- Annoyance;
- Sleep disturbance;
- Mental health;
- Cardiovascular effects, hypertension, heart disease etc;
- Cognitive performance of children.

Over the years, many reviews of the effects of noise on health have been conducted and published, examples of which are provided in the Bibliography (Appendix 5).

Such reviews have considered the “strength of evidence” for each of the main areas of potential effect, in terms of the categories proposed by the International Agency of the Research on Cancer<sup>(23)</sup> (IARC) as ‘sufficient’, ‘limited’, ‘inadequate’ or ‘lacking’. The categories are defined as follows:

- Sufficient: a relationship has been observed between noise exposure and a specific health effect, where chance, bias, and confounding factors can be ruled out with reasonable confidence;
- Limited: an association has been observed between noise exposure and a specific health effect, where chance, bias, and confounding factors cannot be ruled out with reasonable confidence;
- Inadequate: the available studies are of insufficient quality, lack the consistency or statistical power to permit a conclusion regarding the presence of absence of a causal relationship;
- Lacking: several adequate studies are mutually consistent in not showing a positive association between exposure and health effect.

When one considers the overall picture provided by these various reviews, and the issue of availability of reliable quantitative relationships between noise exposure and effects (also sometimes called Dose-effect relationships), then three health effects remain for consideration in Action Planning:

- Annoyance;
- Sleep disturbance; and
- Cognitive effects on schoolchildren.

Following some lengthy consideration the Scottish Government, have at this stage in the work included the “Annoyance” health effect in the development of the prioritisation matrix. However, as research work progresses and further information becomes available from authoritative sources on the remaining two health effects the input data to the prioritisation matrix can be augmented over time. The development of the prioritisation matrix is explained in Section 4.

## 2.8 Public Consultations

Keeping the public aware of all noise maps and resulting Action Planning phases is a key principle of the END. Therefore the Scottish Government, as the competent authority, along with BAA for the airports, published full consultations on all Noise Action Plans including a Strategic Environmental Assessment.

The Glasgow Agglomeration Action Plan is one of 6 plans which have all been the subject of consultation under the Environmental Noise Directive. The Transportation Action Plan, the Edinburgh Agglomeration Plan and the Plans for Edinburgh Aberdeen and Glasgow Airports are also published on the Scottish Noise mapping website.

Consultations relating to the Directive are summarised below:

**16 November 2005** Publication of research by Consultants Hamilton &McGregor Acoustics Division to inform the strategic noise mapping process required under the terms of the Directive. This research identified where the process of data handling can be automated with minimal manual intervention.

**9 March - 1 June 2005** A consultation, supported by a partial Regulatory Impact Assessment, sought views from all stakeholders with an interest in environmental noise issues on proposals to transpose and implement Directive 2002/49/EC on the assessment and management of environmental noise.

**September 2006** Series of workshops and brainstorming sessions held, with interested stakeholders, to inform Action Planning process.

**24 August -12 October 2007** Consultation on Noise Action Planning Guidance, sought views from all stakeholders on our approach to Noise Action planning and responses to this document were generally supportive. It is considered that the Action Plans follow the Guidance issued.

**September 2007** Noise Conference held to discuss noise maps and Action Planning process.

**25 May - 21 July 2008** draft plans were the subject of a public consultation.

**22 October - 19 December 2008** The plans were subject to a Strategic Environmental Assessment which also covered the airport plans.

Consultation exercises have been accompanied by press releases and media interviews by the Scottish Government, its partners and its consultants in order to raise awareness of the issues.

### 3 Noise Action Planning – Glasgow

#### 3.1 Noise Action Planning

The END<sup>(1)</sup> requires the designation of a competent authority to be responsible for the development of noise Action Plans. The END (Annex 5) lists the minimum requirements for the content of each Action Plan. The Glasgow Action Plan must address these areas of interest and the plans should be drawn up in consultation with the public. It must include at least the points detailed in the following table:

**Table 4: Environmental Noise Directive Minimum Action Plan Contents and Location in this Document**

|    |                                                                                                                                |                                        |
|----|--------------------------------------------------------------------------------------------------------------------------------|----------------------------------------|
| 1  | A description of the agglomerations, the major roads and major railways taken into account.                                    | Section 2.5<br>Appendix 1              |
| 2  | The authority responsible                                                                                                      | Section 3.2                            |
| 3  | The legal context                                                                                                              | Section 2.2                            |
| 4  | Any limit values in place in accordance with Article 5                                                                         | None                                   |
| 5  | A summary of the results of the noise mapping.                                                                                 | Section 2.4                            |
| 6  | An evaluation of the estimated number of people exposed to noise                                                               | Section 2.4                            |
| 7  | Identification of problems and situations that need to be improved.                                                            | Section 4                              |
| 8  | A record of the public consultations organised in accordance with Article 8(7).                                                | Section 2.8                            |
| 9  | Any noise-reduction measures already in force and any projects in preparation.                                                 | Section 6                              |
| 10 | Actions which the competent authorities intend to take in the next five years, including any measures to preserve quiet areas. | Section 4.6<br>Section 5<br>Appendix 3 |
| 11 | Long-term strategy.                                                                                                            | Appendix 3                             |
| 12 | Financial information (if available): budgets, cost-effectiveness assessment, cost-benefit assessment                          | Section 4.6                            |
| 13 | Estimates in terms of the reduction of the number of people affected (annoyed, sleep, disturbed, or other)                     | Section 2.6                            |

However, it must be borne in mind that just as the published noise contours are strategic (see Section 2.3 for further explanation) the resulting Action Plans must also be strategic in nature.

### 3.2 Competent Authorities, Key Partners and Key Stages

The Scottish Government is the Competent Authority for END and is responsible for drawing up Noise Action Plans. Whilst for Airports it is the Airport operator who is the Competent Authority. In the development and preparation of the Noise Action Plans, the Scottish Government has worked with key partners involved in END.

The key stakeholders/partners who were involved in (END round one) Action Planning are as follows:

- The Scottish Environment Protection Agency ( SEPA)
- Local Authorities within agglomerations

Glasgow agglomeration:

- East Dunbartonshire Council
- East Renfrewshire Council
- Glasgow City Council
- North Lanarkshire Council
- Renfrewshire Council
- South Lanarkshire Council
- West Dunbartonshire Council

Edinburgh agglomeration:

- City of Edinburgh Council
- East Lothian Council
- Midlothian Council

In addition:

- Local Authorities not in agglomerations for local road issues
- Regional Transport Partnerships
- BAA Glasgow, Edinburgh and Aberdeen
- Glasgow Prestwick Airport
- Transport Scotland
- Network Rail
- For qualifying Airports, the airport operators are responsible for drawing up their own Noise Action Plans.

The airport operators in Scotland have worked very closely with the Scottish Government's consultants to produce the required noise maps and have been fully involved in the Action Planning process in terms of both producing Action Plans for individual Airports and Action Plans for the agglomerations.

### 3.3 Steering and Working Groups for Action Planning

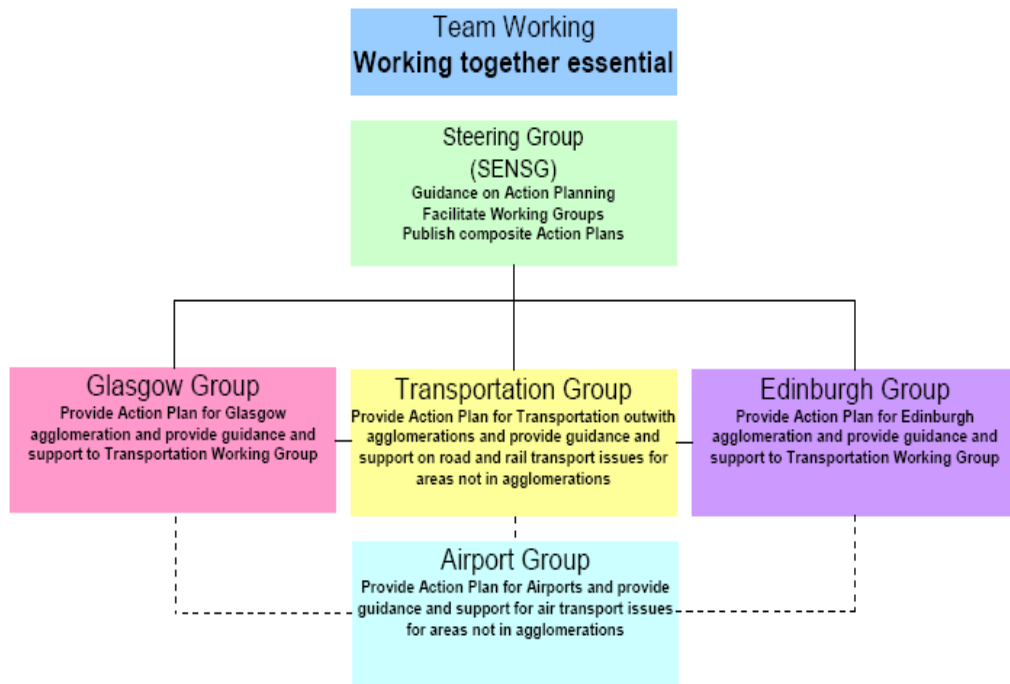
The Scottish Environmental Noise Steering Group (SENSG) is a group with representation from all parties involved in environmental noise. The group comprises representatives from the Scottish Government, Hamilton & McGregor, Acoustic Consultants, local authorities, SEPA, BAA, Transport Scotland and Network Rail. The primary aim of SENSG has been to provide a forum for all key partners to review the development and progress of Action Plans and to determine the prioritisation of management measures.

SENSG acts as the core group to oversee the consistent development and implementation of all Action Plans. SENSG established three working groups to assist in the preparation of Action Plans and these groups feedback on a regular basis to the core group and this process will continue through the Action Planning process. There is a Glasgow agglomeration working group, an Edinburgh agglomeration working group and a Transportation Action Planning working group. All three groups have representation on the core steering group.

Airport operators have a key role to play in Action Planning and have been able to input to all working groups. The airport operators have also been represented on the Transportation working group. The Scottish Government's nominated noise mapping consultants, Hamilton & McGregor, assisted in the development of noise maps for the four major airports in Scotland with the raw noise data prepared by the Civil Aviation Authority (CAA) for Glasgow, Edinburgh and Aberdeen Airports. It was later decided that Glasgow Prestwick airport need not participate in this first round of action planning as annual passenger numbers still do not breach the 50,000 per annum requirement. The airport operators are as follows:

British Airports Authority (BAA) who operate and represent Glasgow, Edinburgh and Aberdeen airports.

The following diagram illustrates the reporting structure for Action Planning and also clarifies the responsibilities for delivering the Action Plans.



The Action Plan process comprises four key stages which are detailed below:

1. Analysis of the strategic noise maps;
2. Further investigation and analysis;
3. An evaluation of existing UK, Scottish and Local Policies, Plans and Programmes;
4. An evaluation of potential mitigation measures.

## 4 Prioritisation Methodology and Matrix

### 4.1 Need for and Development of Prioritisation Matrix

Whilst Scottish END noise maps at the [Scottish Noise Mapping Internet site](#) <sup>(21)</sup> present the noise data in terms of 5dB noise contours it is a resource intensive process to examine the contour maps to determine where the highest noise levels actually correlate with noise exposure at residential buildings. Furthermore, an examination of the consolidated maps does not reveal sufficient information in relation to where the noise contours result from road, rail aircraft or industrial noise sources. Article 1 of the END <sup>(1)</sup> states that “*The aim of this Directive shall be to define a common approach intended to avoid, prevent or reduce on a prioritised basis the harmful effects, including annoyance, due to exposure to environmental noise.*”, and END defines ‘environmental noise’ as 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 such as those defined in Annex I to Council Directive 96/61/EC (recently codified as [Directive 2008/1/EC](#) <sup>(27)</sup>) of 24 September 1996 concerning integrated pollution prevention and control. Environmental noise can therefore be split into three main categories; 1) industrial noise, 2) road and rail transportation noise sources and 3) aircraft noise.

As a first step in applying the information obtained by mapping the agglomeration and major road and rail links out with the agglomerations, it was decided that in order to select appropriate Candidate Noise Management Areas it would be necessary to introduce a prioritisation methodology. It was recognised that analysing the noise contours alone would not necessarily achieve this. In order to gain a better understanding of the potential noise impacts it is helpful to identify in which parts of the agglomeration high population density come together with high levels of noise, as indicated by the END noise maps. This need for prioritisation resulted in the development of the Source Prioritisation Score (SPS) which is described in Appendix 2. This prioritisation methodology is seen as making the cost benefit analysis an integral part of the Action Planning process.

### 4.2 Industrial Noise

The approach to the calculation of industrial noise was based on the [Good Practice Guide](#) <sup>(28)</sup>. The computational method used is that detailed in ISO 9613-2 “Acoustics - Attenuation of Sound During Propagation Outdoors - Part 2: General Method of Calculation (1996)”. As has been explained in Section 2.2 there are at present adequate provisions in the Scottish legislative framework for the control of noise from industrial sources. In view of this and following consultation with SEPA and the local authorities it was agreed that industrial sources or areas would not be included in the prioritisation matrix and that any prioritisation of such areas/source would be at the request of the regulatory authority.

No attempt has been made to identify Candidate Noise Management Areas in relation to industrial noise. This is because this type of noise is, as previously mentioned, dealt with through an existing enforcement regime. Enforcement offers a faster and more specific response to noise problems than is possible through noise mapping. The enforcement service is available through each of the local authorities that form part of the agglomeration. The service will investigate complaints against most commercial premises that operate within their boundaries. However, there are some for whom the enforcement authority is the Scottish Environmental Protection Agency (SEPA). It would improve access to the relevant services if this distinction was made clearer to the public. It is a recommended action of this report that the Scottish Noise Mapping Internet site be expanded to include clear guidance as to when members of the public affected by noise should contact their Local Authority and when they should contact SEPA.

### 4.3 Airports

BAA, the operator of Glasgow Airport is the competent authority under the Environmental Noise (Scotland) Regulations 2006 <sup>(3)</sup> for the production of the relevant Glasgow airport noise maps and Action Plan.

The Airport Action plan addresses the issue of noise from aircraft affecting residents in the agglomeration. It identifies Clydebank, and the Johnstone areas of Renfrewshire, within the agglomeration as higher priority compared to elsewhere. Among the issues raised by local residents were concerns about low flying aircraft, aircraft engine testing and requests for noise insulation. However, any measures taken to reduce aircraft noise will impact the total area within the noise contours, benefiting a wider audience than any targeted priorities. Therefore, Glasgow Airport will adopt a generic approach in aiming to reduce aircraft noise.

In addition, the close working relationship developed as part of the Glasgow Action Planning working group, between the Airport operator, Environmental Health officers and Planning Officers within the local Authorities has resulted in mechanisms having been put in place to allow all parties to work together to address noise issues from the airport. It is recommended that these mechanisms be continued and these closer working relationships be continued.

### 4.4 Development of Prioritisation Matrix

The purpose of the matrix is to establish areas that may require noise intervention or management, and in what order, and by what process. In line with the aim of Article 1 of the END, as reproduced in Section 4.1, above, the prioritisation matrix has been developed to evaluate strategic noise levels determined from the first round noise maps for the road, railway and aircraft noise sources in areas most likely to cause annoyance to people potentially affected. The prioritisation will enable appropriate actions to be taken at locations selected on the basis of noise level, the number of people potentially affected and the annoyance response to the particular noise source: road, railway or aircraft.

The developed prioritisation matrix is straightforward, transparent, and consistent. Although the matrix provides a focus for action planning, a reality check on the strategic noise levels, all matrix input data and any proposed interventions prior to the implementation of any suggested actions is essential and, in fact, this reality check will in essence be the first step in the action planning process.

The derivation of the Prioritisation Matrix is fully explained in Appendix 2. However, in summary, each building is assigned a Building Prioritisation Score (BPS), which takes into account the predicted noise level at the building, the number of people assumed to live in the building and the annoyance response of that exposed population relative to the transportation noise source in question. The Source Prioritisation

Scores (SPS) is then determined by first segmenting the road or rail network into 100m sections; for aircraft noise the SPS are based on postcode areas. Each road/rail segment is then given a unique ID and for each building with a noise level greater than or equal to  $L_{den}$  55dB the ID of the road/rail segment that is closest to it is assigned to that building. The logarithmic sum of BPS values for all buildings with the same nearest road/rail segment ID is then assigned to the relevant road segment to give the Source Prioritisation Score for that road/rail segment.

All of the SPSs then require to be prioritised in a manageable list for consideration in the action planning process. Whilst it is clearly desirable to start with the sources areas which have the highest SPS the question of “*how high does the SPS have to be before consideration is given in the first round of actions?*” arose. Therefore a basic statistical analysis of the SPSs was undertaken and it was found that the top one percent of SPSs (normally distributed) corresponded to the mean SPS plus two standard deviations. Consequently, following a statistical analysis and consultation with END working groups it was decided to identify the top 3% of road and railway network together with the aircraft postcodes areas in terms of the top three one percent bands with the top one percent being colour coded red, the next one percent colour coded amber, the next one percent colour coded green and the rest colour coded as grey/black.

#### 4.5 Process of Determining Candidate Noise Management Areas

The noise maps were used to identify possible locations for Candidate Noise Management Areas. Emphasis was placed on locations which were noted to have the highest scores from noise sources and the highest scores in relation to building exposure

It is important to appreciate that the determination of a CNMA is simply a means of highlighting that a geographical area should be considered further in terms of a potential need for noise management. It does not mean that the potential CNMA necessarily corresponds to the start and end of any distinct 100m section of road. Using the procedure as detailed in Appendix 2 the top one percent of each of the road rail segments within each of the agglomeration have been identified as CNMAs. Out with the agglomerations the top one percent of each of the major road and rail segments have been assigned as CNMA's. The identified CNMA's are presented at section 4.6.

#### 4.6 Identification of Candidate Noise Management Areas

The initial consultation responses indicated a need for clear guidance on the process of CNMA assignment. The SENSG group is to produce detailed Technical Guidance to assist local authorities in the process of assigning candidate and noise management areas.

Following the process previously described, 53 Candidate Noise Management Areas (CNMAs) were identified within the Glasgow agglomeration. 42 of these are

associated with road traffic and 11 with railway noise. A list of these 53 CNMA locations is provided below (in addition The Candidate Noise Management Areas can be seen on the accompanying maps).

### **Roads (42)**

1. Between Renfrew Road and Arkleston Road (M8) in the vicinity of Abbotsinch Retail Park, Paisley.
2. At Causeyside St / Canal St Junction and Glasgow Road , Paisley.
3. a) Between Glasgow Road and Dumbarton Road, Anniesland ,  
b) Victoria Park South, Whiteinch, Glasgow
4. Between Great Western Road and Bearsden Road, Anniesland, Glasgow
5. Crow Road, Jordan hill, Glasgow
6. Dumbarton Road, Near Incholm Street and Ferryden Street, Glasgow
7. Berryknowes Road, Near M8, Glasgow
8. Maryland Drive, Paisley Road West and M8, Govan, Glasgow
9. Broomloan Road and Paisley Road West, Rhynde Drive, Glasgow
10. M8, Near Clifford Street and M77, Glasgow
11. Paisley Road West, Near Cessnock Subway, Glasgow
12. M8, Near Vermont Street, Pollokshields, Glasgow
13. Seaward Street and Paisley Road West, Glasgow
14. Wallace Street, Morrison Street and Paisley Road, Near M8, Glasgow
15. Finnieston Street and Lancefield Quay, Glasgow
16. Argyle Street, Near M8 and Anderston SPT, Glasgow
17. Blythswood Street, Near St. Vincent Lane, Glasgow
18. Between St. Vincent Street, M8 and Berkley Street, Glasgow
19. Woodlands Road, Near St. Georges Street and M8, Glasgow
20. Between Great Western Road, St. Georges Street, M8 and West Graham Street, Glasgow
21. Craighall Road, Near Port Dundas Business Park, Glasgow
22. Baird Street (A804), Near M8, Glasgow
23. Springburn Road, Near Charies Street, Glasgow
24. High Street, Ingram Street and Albion Street, Glasgow
25. Clyde Street, Near Dunlop Street, Glasgow
26. Hospital Street, Near Sandifield Road, Glasgow
27. Caledonia Street and Silverfir Street, Glasgow
28. Alexandra Park Street, Near Harcourt Drive and M8, Glasgow
29. M8, Near Gala Street, Glasgow
30. M8, Near Longston Road, Glasgow
31. M8, Near Kildermorie Road, Glasgow
32. Duke Street, Near Cumbernauld Road, Glasgow
33. Maryhill Road, Near Sandbank Street, Glasgow
34. Beith Street, Near Hayburn Street, Glasgow
35. Byres Road, Near Observatory Lane, Glasgow
36. Garscube Road, Near Northpark Street, Glasgow
37. Fenwick Road, Near Fenwick lace, Glasgow

38. Busby Road, Near Arthur Street, Glasgow
39. East Kilbride Road, Near Glenville Gate, Glasgow
40. Main Street, Near Jackson Court, Glasgow
41. Calder Street, Near Whifflet Street, Glasgow
42. Deedes Street, Near Kennedy Drive, Glasgow

#### **Rail (11)**

1. Near Clyde Bank Public Park and Dumbarton Road, Dalmuir
2. Greenend Avenue , Milliken Park , Johnstone.
3. Between Brown Street and St. James Street, Millarston Drive, Glasgow
4. Peel Lane, Near Crow road, Partick
5. Between Paisley Road West and B768, Govan
6. Near Jamaica Street and Argyle Street, Glasgow Central Station
7. a. Near Victoria Road, A77 and b. Dixon Street, Queens Park
8. Near Main Street, A724, Cambuslang
9. Areas between Gartsherrie Road and Stobcross Street, Coatbridge
10. Near Carfin Street and Clydesdale Road, New Stevenson
11. Near Alexander Street and A721, Wishaw

It should be noted that each CNMA is deliberately imprecisely defined. This is because the manner in which CNMAs have been identified is based upon the strategic noise contours and other data, such as population figures, which is less certain at a local level. Additionally, some data can only be gathered from an on site investigation. Any actions that may be taken, in the event that a CNMA is promoted to a Noise Management Area, may extend beyond a specific proposed CNMA.

It should also be remembered that these areas are based on strategic noise maps which show an average weekday noise level. It is anticipated that certain areas will not become Noise Management Areas for various reasons. It was however decided to include all the areas identified at this stage for the sake of completeness and transparency.

Representatives of each local authority explored the noise maps and, as a desk top exercise, were able to confirm the probability or otherwise of the maps accurately predicting the correct location for each Candidate Noise Management Area.

In addition, each CNMA was visited by representatives of the relevant local authority, and a proforma completed as an initial analysis of CNMA status. The proforma is included in Appendix 3 and, again, the maps are detailed in Appendix 2.

Further detailed examination of each CNMA will occur prior to any decision as to whether or not a particular CNMA will be promoted to a Noise Management Area (NMA). Regulation 18 of the Environmental Noise (Scotland) Regulations 2006 states inter alia that the competent authority, in this case the Scottish Government, shall ensure that the public is consulted in the preparation of action plans. Part of the process in preparing the action plans for the agglomerations and the transport network

in Scotland has therefore involved consulting the public in line with Regulation 18. Beyond this, the public should be informed of any conclusions that an area, included in any of the noise action plans, is a NMA or not, after following the assessment outlined in the technical guidance, in line with regulation 18 (d) of the 2006 Regulations. This will be done by updating the relevant action plans on the web which can be found at [scottishnoisemapping.org](http://scottishnoisemapping.org)

Consideration will be given to a number of factors that may affect these candidate areas including, but not necessarily limited to, the following:

- An evaluation of the data input into the model, e.g., traffic volumes, traffic types, road gradient.
- The road surface.
- The condition of the road surface
- Any noise reduction mechanisms already in place and that have not been taken into account in the calculation methodology, e.g., local barriers, acoustic double glazing, single aspect construction.
- Building profile.
- Traffic calming measures, e.g., recently reduced speed limits, speed bumps.
- Rail corrugation.

#### 4.7 Process of Assigning Noise Management Areas CNMA to NMA

Prior to any CNMA being promoted to a NMA it will be subject to detailed scrutiny. In so far as is reasonably practical efforts will be made to ensure that noise contours are accurate and the numbers of people believed to be affected are correct. Where the CNMA status appears to be inaccurate either as a result of erroneous data or where local topography and design have reduced the number of people affected then the area will not be promoted to a NMA. Where the CNMA status is considered to be warranted the area will only be promoted if there are remedial actions that are likely to be effective. The potential remedial actions will be the subject of a cost benefit analysis. Consideration will also be given to who would be responsible for any proposed actions and whether or not they are affordable or desirable. A list of possible considerations is listed below.

- Evaluation of the data input into the Noise Mapping Model
- Local circumstances not reflected in the noise contours
- The noise affects people in significant numbers
- The noise is significant
- The noise can be reduced e.g. quieter vehicles
- The noise can be blocked e.g. barrier
- The source can be reduced e.g. fewer cars - action possible
- The source can be redirected / removed e.g. ban vehicles
- The receiver can be protected e.g. sound insulation
- The receiver can be removed e.g. change of use from residential)

- The actions are achievable
- The impact of any action(s) is(are) significant / measurable
- The possible action is affordable
- The longevity of any action
- The maintenance requirements & costs of any action
- The actions are not themselves undesirable
- The actions do not hinder other policy objectives
- The actions complement other policy objectives
- There are no undesirable side effects

These considerations are not to be considered as absolute, but should be used with appropriate care

## 5 Quiet Areas

### 5.1 Introduction to Agglomeration Quiet Areas

The Environmental Noise (Scotland) Regulations 2006 (3) regulations require that Quiet Areas within agglomerations are included in maps. But what does quiet mean? The Transport Research Laboratories (TRL) undertook research for Defra into the subject [Quiet Areas](#) <sup>(29)</sup>. The research reported that defining, identifying and appreciating the benefits of preserving quiet or relatively Quiet Areas in urban conurbations cuts across many different fields including health, physical and psycho-acoustics, and environmental psychology. An important aspect of the research carried out into Quiet Areas has been to establish the positive effect natural sounds have on health and well-being.

### 5.2 Current Research into Quiet Areas

Research carried out in Sweden <sup>(30)</sup> has examined how the adverse health effects of noise are related to individual exposure and perceived soundscapes in residential areas with and without access to Quiet Areas. Their results show that access to a quiet façade of a dwelling reduces annoyance to noise by 10-20 percent, depending on the road traffic sound level at the most exposed side. Results suggest <sup>(31)</sup> that a good urban outdoor soundscape should (a) be dominated by positive sounds from nature, and (b) have an overall equivalent sound level below 50dB (A) during the daytime.

Research carried out in Norway has examined the relationship between localised areas of noise and quiet within a neighbourhood on residential noise annoyance in Oslo <sup>(32)</sup>. Results indicate that noisy neighbourhoods have the potential to increase residential noise annoyance primarily for apartments exposed to low residential noise levels whereas quiet neighbourhood areas have the potential to reduce residential noise annoyance the most at intermediate and high residential noise levels.

In the Netherlands, reviews of current research has concluded that the percentage of time during which a disturbance is present (or the length of time during which a 'level of quiet' is regarded as acceptable) is generally more important than the actual noise level <sup>(33)</sup>. Alongside these acoustic criteria additional criteria about the sounds heard which convey positive or negative feelings, with regard to appropriateness for a given context, are also important.

Research carried out in Italy to identify indicators to describe perceived soundscapes is following a similar approach to that found in the Netherlands in that it is related to temporal variations in noise although the method is more complex <sup>(34)</sup>.

Research in the UK into Quiet Areas has primarily been carried out to assist in the implementation of END <sup>(35)</sup> <sup>(35)</sup>. The TRL research recommended that public and open spaces in the UK, should fall within the noise band < 55 dB L<sub>day</sub>, as determined from the first round of noise mapping and a minimum area (the candidate area must be at least 9 hectares). The specifications for the filter definitions and the candidate list of

Quiet Areas should be reviewed and, where necessary, revised by the relevant authorities before the list is finalised.

The following filter specifications have been used:

- Noise Level filter: The specification of a  $L_{day}$  55 dB limit is seen as an appropriate compromise, based on the mapping requirements of the END and definitions for Quiet Areas used elsewhere in Europe;
- Minimum Area filter: The specification of a minimum area of 9 hectares is based upon consideration of both the minimum area that should lie within the defined noise limit to warrant preservation (50%) and the minimum area required to achieve  $L_{day}$  55dB, based on the presence of at least one major road at the boundary.
- Minimum Area 'of Quiet' filter: This required that at least 75% of a candidate area be quiet, i.e., have a noise level less than  $L_{day}$  55 dB.

The Candidate Quiet Areas within the agglomeration of Glasgow are presented in Appendix 1. It will be noted that the candidate quiet areas have changed following responses to the first consultation. The quiet areas are now based on a source data set that is consistent across all the local authorities involved and consistent with the Edinburgh Agglomeration. The source data set comprises Historic Parks and Gardens, Metropolitan Open Land taken from the Land Use constraints dataset as well as relevant Scottish Natural Heritage designations. The TRL filters described above were then applied to these data sources.

### 5.3 Candidate Quiet Areas (CQA) to Quiet Areas (QA)

As with Candidate Noise Management Areas, during implementation of the Action Plan, a review process will be applied to each CQA to determine whether it should become a Quiet Area (QA). To support this review process, separate Technical Guidance will be provided. The Technical Guidance will also assist the key organisations and their stakeholders in addressing the technical detail of the Noise Action Planning process.

Regulation 18 of the Environmental Noise (Scotland) Regulations 2006 states inter alia that the competent authority, in this case the Scottish Government, shall ensure that the public is consulted in the preparation of action plans. Part of the process in preparing the action plans for the agglomerations and the transport network in Scotland has therefore involved consulting the public in line with Regulation 18. Beyond this, the public should be informed of any conclusions that an area, included in any of the noise action plans, is a QA or not, after following the assessment outlined in the technical guidance, in line with regulation 18 (d) of the 2006 Regulations. This will be done by updating the relevant action plans on the web which can be found at [scottishnoisemapping.org](http://scottishnoisemapping.org)

Prior to any CQA being promoted to a QA it will be subject to detailed scrutiny. In so far as is reasonably practical efforts will be made to ensure that noise contours are

accurate. Where the CQA status appears to be inaccurate either as a result of erroneous data or some other identified reason then the area will not be promoted to a QA. Where the CQA status is considered to be warranted the area will only be promoted if there are no conflicts with existing local development plans. Consideration will also be given to the likely impacts of protecting an area and whether or not they are affordable or desirable. A list of possible considerations is listed below. These considerations are not to be considered as absolute, but should be used with appropriate care:

- Is the area already identified for an alternate use within the local plan?
- Are alternate uses for the area currently being developed for a future local plan?
- Are there any developments planned in close proximity to the area that would be compromised?
- Are any significant changes to nearby roads proposed which would impact upon the area.

#### 5.4 Protection of Quiet Areas

The designation and protection of quiet areas is a proactive measure. It aims to ensure that changes do not happen within, and to a certain extent out with, the quiet area that will result in an increase of the noise level or a reduction in the size of the quiet area. However, although quiet areas are significant because they are quiet, they remain an integral part of an agglomeration and should not necessarily be viewed in isolation. For this reason it is considered that once identified, through a noise action plan, quiet areas should only be incorporated into the local authority's local plan where appropriate. Thereafter, they should be protected via the development control process with the assistance and advice of Environmental Health.

## 6 Aligning Noise Action Planning

### 6.1 Aligning Road and Rail Noise Initiatives

The Scottish Government and other organisations responsible for delivering transportation in Scotland have developed a range of policy and strategy documents with direct or cross cutting impact on transportation noise. These documents are directed at either Central, Regional and Local level. There is also a range of international initiatives providing direction to the strategy of noise reduction. Moreover, in order to optimise outcomes, it is important the Glasgow Noise Action Plan is delivered in a joined up way with these other policies,

At a national level “[Scotland’s National Transport Strategy](#)”<sup>(36)</sup>, published in December 2006 by the Scottish Government, stated that transport provides a significant and positive contribution to economic growth, and to the prosperity and quality of life of Scottish people. This document was developed on the background of a range of documents including “[Scotland’s Transport Future – Transport White Paper](#)” 2004<sup>(37)</sup> and “[Choosing our future: Scotland’s sustainable development strategy](#)”<sup>(38)</sup>, which recognised the need to work in partnership with local authorities, regional transport partnerships and transport operators to achieve the objectives.

The [Scotland’s National Transport Strategy](#) (SNTS)<sup>(36)</sup> document pointed out three key issues that will make a fundamental difference towards delivering a world class public transport system. These are as follows.

- Improved journey times and connections - making it quicker, easier and more reliable for passengers to travel between our towns and cities and across our global markets.
- Reduced emissions - making sure that Scotland takes a lead in the future of sustainable transport.
- Improved quality, accessibility and affordability - ensuring everyone across Scotland has high quality public transport choices.

The SNTS document also recognised transport users do not pay the full costs they impose on society in terms of emissions, noise and air quality, and committed to working closely with the UK Government on this issue.

The SNTS is a key document, setting the context for transport policy making and informing decision making for the next 20 years for the Scottish Executive and key partners, has provided direction to a series of related policies and strategies.

Transport Scotland has begun the [Strategic Transport Projects Review \(STPR\)](#)<sup>(39)</sup>, a nationwide study for Scotland, which will recommend a programme of interventions for implementation between 2012 and 2022. The STPR will focus on identifying those

interventions that most effectively contribute towards the Government's Purpose of promoting sustainable economic growth. Work on the STPR started in summer 2006 and the study will report to Ministers in the summer of 2008. The STPR will make recommendations on a portfolio of land-based transport interventions to be taken forward between 2012 and 2022. This will establish the basis for the ongoing development of Scotland's transport infrastructure to meet the demands of the 21st Century. Environmental Assessment, including assessment of transport noise emissions, will be a significant component of this review.

To provide clarity on nationally significant transport priorities two major projects, the Forth Replacement Crossing and the Edinburgh Glasgow Rail Improvements Study have been fast tracked. The Edinburgh Glasgow Improvement Project will electrify over 350 track kilometres of railway, covering the core Edinburgh to Glasgow route, the Cumbernauld Line and the Dunblane/Stirling line to Edinburgh and Glasgow. The project will also assess the benefit in electrifying the remainder of the Shotts Line.

.In December 2006, "[Scotland's Railways](#)" <sup>(40)</sup> was published, setting out Scottish Ministers vision for the rail network over the next 20 years. Scotland's Railways accompanies the National Transport Strategy, showing how rail can contribute to achieving the three strategic outcomes for transport of improving journey times and connections, reducing emissions and improving quality, accessibility and affordability. Leading on from this, the [High Level Output Specification \(HLOS\)](#) <sup>(41)</sup> is the next step in firming up medium-term requirements, setting out the detail of what Scottish Ministers want the rail industry to deliver between 2009 and 2014 on behalf of Scottish rail passengers and freight users. The HLOS confirmed the Scottish Ministers' aspiration for the rail network to include the delivery of services that minimise the impact on the environment and ensure that rail is a real alternative to road and air travel for passenger and freight travel and environmentally superior both within Scotland and for cross-border journeys. Therefore the Noise Action Plans have a clear cross cutting role with this aspiration.

With respect to roads, the [Road Asset Management Plan for Scottish Trunk Roads April 2007 to March 2009](#) <sup>(42)</sup> sets out how Transport Scotland currently manages, or intends to manage, the trunk road network and the service this will deliver for road users. In addition the "[Transport Scotland Development Management Guidance](#)" <sup>(43)</sup> sets out the approach to be adopted by Transport Scotland in regard to their Development Management and Development Plan responsibilities when engaging with the development community in Scotland. This guidance is intended to assist everyone involved in the planning/development process in Scotland but particularly Local Authorities, Consultants and major developers.

At a regional level the Seven Regional Transport Partnerships have, or are in the process of developing their Regional Transport Strategies. These will address environmental issues including noise.

This should result in reduced traffic levels, cutting air pollution and traffic noise.

The Transportation Noise Action Plan forms policy which can be taken account of for the next round of Local and Regional transport strategies, in approximately 3 to 5 years.

At a UK level CIRIA are currently taking forward a “[Noise and Vibration Issues in Urban Development](#)”<sup>(44)</sup> project”. This project will aim to provide practical advice on noise and Vibration issues for those involved in undertaking developments next to infrastructure. It will look at how to address these issues and come to sensible decisions.

The Department for Transport (DFT) is leading on reserved transport matters for the UK. They are committed to a transport system which balances the needs of the economy, the environment and society. They have conducted research on the [Assessment of the existing and proposed tyre noise limits](#)<sup>(45)</sup> and an [Examination of Vehicle Noise Test Procedures](#)<sup>(46)</sup>, two areas where a reduction in transport noise could be achieved.

All of the above organisations and their respective policies and strategies have a role to play in reducing transport noise. At present, there are a range of areas where noise reduction is taking place and these are described in Section 5.2 and 5.3.

## 6.2 Some Current Road Initiatives

With regard to future road projects, the M74, for example, will include low noise road surfacing, suitable noise barriers, and appropriate landscaping. With these measures, overall, the indications are that more properties and a larger population would experience decreases in noise levels than increases, and there would be an overall net benefit from the scheme

The full noise impacts from the new road have been fully assessed and reported in the Environmental Statement. As traffic transfers from local roads to the new motorway, local communities will experience a decrease in road traffic noise. A number of local communities, including Govanhill and parts of Rutherglen, will experience slight decreases in noise levels due to the reduction in traffic volumes on local roads.

## 6.3 Some Current Rail Initiatives

At a national level Transport Scotland have stated they will look to influence technology choices when rolling stock replacements are being considered, encouraging increasing use of electric passenger rolling stock and haulage of freight by electrical locomotives where it is both cost effective and feasible. This will assist in delivering lower noise emissions as well as better air quality.

At a European level, [Council Directive 96/48/EC on the interoperability of the trans-European high speed rail system](#)<sup>(47;27)</sup> and [conventional rolling stock \(2001/16/EC\)](#)<sup>(48)</sup> specify maximum noise emission from trains. Implementation of these EU TSIs will lead to overall reductions in railway noise impact as the train fleet is renewed.

A significant proportion of the UK freight wagon fleet is fitted with disc brakes or tread brakes made of composite (resins based) materials, rather than cast iron tread brakes. This leads to much smoother wheel running surfaces and a noise reduction equivalent to a halving of the rail traffic volume. The latest diesel freight locomotives are fitted with composite tread brakes and efficient engine silencing.

In relation to reducing noise from track, rail roughness is routinely measured. The industry is evaluating the benefits of moving to a targeted rail grinding strategy.

Advanced noise control technology, in the form of tuned absorbers on rails is also being developed. The industry will follow the development of tuned absorbers on rails for potential future application.

The UK rail industry is at the forefront of international railway noise and research and maintains close involvement with European developments such as [Silent Freight](#) and [Silent Track](#)<sup>(49)</sup>.

#### 6.4 Planning and Noise

The relationship between the planning system and noise was highlighted in section 2.2. Planning [Advice Note 56 “Planning and Noise” \(PAN 56\)](#)<sup>(15)</sup> builds on principles set out in [SODD Circular 10/1999](#)<sup>(50)</sup> Planning and Noise. In broad general terms PAN 56:

- indicates how noise issues should be handled in development plans and development control;
- outlines ways of mitigating the adverse impact of noise;
- provides specific guidance on noisy and noise-sensitive development; and
- gives guidance on the use of planning conditions relating to noise.

The transposition of the END into the Environmental Noise (Scotland) Regulations 2006 clearly alters the backdrop on which noise should be considered in terms of planning. NMAs and Quiet Areas may be required to be of material consideration in development plans. Furthermore the very strategic nature of the published noise contour maps and their potential use for land use planning must be clarified in any future planning guidance. As has been previously stated (see Section 2.3) it is important to appreciate that the maps produced show an average noise level for an average day in the year calculated on the basis of a 10m grid at a height of 4m above ground level. Therefore they cannot be used to determine the noise level for any specific property. It would therefore be a mistake to try to categorise any site at ground floor level in terms of the Noise Exposure Categories given in the Scottish Executive Planning Advice Note 56 (PAN56) using the END noise contour maps.

The main links between Planning Authorities and Environmental Health, in terms of noise, relate to the consultation process for specific planning applications. Planning Departments use Environmental Health colleagues as consultees for many applications received for development. Environmental Health Officers may comment

on a variety of relevant issues, including air quality, refuse facilities, odours, nuisance, and of course, noise. The decision on whether to consult with environmental Health lies with individual Planning Officer. On most occasions that comment is sought or provided depending on whether the development is likely to add to the noise burden of the area. Also, routinely comment is sought on whether existing noise is likely to adversely impact upon the development. Either way, conditions may be attached to planning consent to control noise or introduce noise mitigation measures in a development proposal. Planning conditions may also be applied that introduce measures to protect a development, usually residential, from existing noise. In theory, a proposal for development may be refused consent on the grounds of being predicted to experience too high a noise exposure.

The system as it currently is applied leads to inconsistencies not only between different local authorities but even within local authorities where the approach taken is often dependent upon the level of knowledge or attitude of an individual Planning Officer or Environmental Health Officer. Future guidance requires to address the need for a consistent approach when dealing with planning applications throughout local authorities.

There is also a need to ensure that Planning Authorities adequately protect areas deemed to be Quiet Areas and again suitable guidance to ensure consistency will be necessary.

#### 6.5 Noise Reduction Measures in Force and Projects in Preparation

The City of Glasgow Council and the adjoining local authorities have been proactive in managing noise for many years and current good practice has been established over the past 30 to 40 years. In particular, Environmental Health Officers responsible for the enforcement of noise and nuisance legislation have developed good working relationships with both planning, and transport professions within the local authorities in order that Environmental Noise issues are addressed through:

- the Planning and Development Management process;
- the design and maintenance of transport infrastructure, road and rail;
- Air Quality Action Plans; and
- Regional Transport Strategies and Local Plans

#### 6.6 Existing Initiatives Aimed at Reducing Noise

There are obvious links between traffic and noise pollution. At a national level legislation places a responsibility on the highway authority to provide a compensation package, normally sound insulation, to residents who are adversely affected by a newly constructed road, or by significant changes to an existing road, e.g., the addition of a carriageway. This is taken into account at the design stage.

The Council's planning framework for reinforcing Glasgow's place in the national and regional economy is delivered through the Development Plan, comprising the Glasgow and the Clyde Valley Joint Structure Plan (the Joint Structure Plan) and the City Plan (Figure 1). The Joint Structure Plan sets out the strategic framework for development in eight contiguous local authorities. More detailed guidance on the shape, form and direction of development in Glasgow is delivered through the adopted City Plan 1. The emerging City Plan 2 will also provide the context for protecting and enhancing the built and natural environment, identifying planning action in the first five years and specifying appropriate locations for development, over 20 years, to 2021.



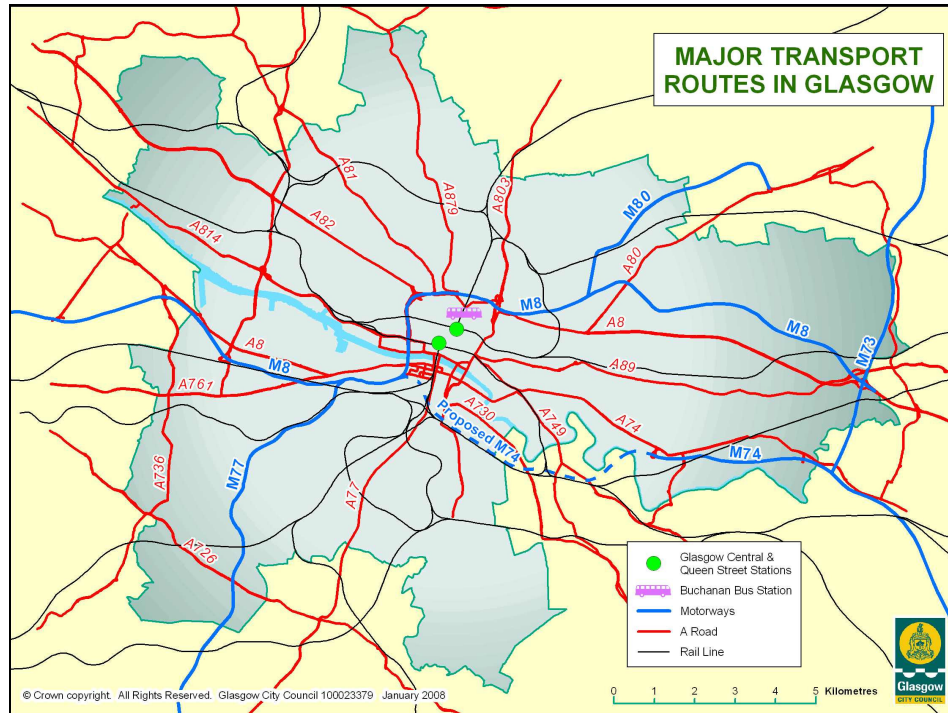
**Figure 1: Glasgow and the Joint Structure Plan Area**

In common with other large cities, Glasgow has a requirement to transport people in and out of the city quickly and effectively, whilst also functioning as a major modal point of the Scottish modal transport system. Consequently, Glasgow has experienced a continuous increase in road traffic. The city has an extensive road network consisting of some 40 km of motorway and 1700 km of other public roads.

The backbone of the road system is the M8 motorway that runs through the city and continues to Edinburgh (A8/M8) (Figure 2). At the Baillieston Interchange, on the

eastern outskirts of the city, the M8 links, via the M73, with the M74/A74 route to Carlisle and the south, and with the M73/A80 route to Stirling and the north.

The M77 (Ayr road route) was completed in November 1996 and runs through the south west of the city.



**Figure 2 Major Transport Routes in Glasgow**

Several other major routes radiate from the city centre. These include the Clydeside Expressway, Great Western Road, Springburn Road, Cumbernauld Road, Edinburgh Road, London Road, Paisley Road West and the M80 Stepps bypass. A large proportion of journeys along these routes are by private cars commuting to the city often from areas out with the city boundary. As a result there is frequent congestion on routes leading to the city during peak periods.

As well as the road system, a modernised underground railway system and the largest suburban commuter rail network in the United Kingdom outside London also operate in Glasgow. The rail network is used to make 100,000 daily passenger trips in or out of the six central area stations, with almost 20% of this figure accounted for by morning peak hour movements alone. Two major railway stations (Queen Street and Glasgow Central) are sited within Glasgow city centre and link to a further 60 railway stations throughout the city, five of which have park and ride facilities. The SPT Subway (Glasgow Underground) operates on 10.4 km of double track and handles more than 40,000 passengers a day and is estimated to be used by about 10% of city centre travellers.

In addition, a main bus station (Buchanan Bus Station) is also situated within the city centre (See Figure 1.2, above). The scale of equivalent bus movements is such that about 16,000 bus trips are made into or across the central area during the morning peak hour period. Buchanan Bus Station is used by an estimated 35,000 passengers per day. It offers a significant terminal resource for both coach and local bus operators. Glasgow International Airport lies some 10 km west of the city centre, out with the city boundary.

Glasgow is currently undertaking a review and update of the City Centre Traffic Management Strategy and opportunities for further enhancing the public realm, including pedestrian priority areas, improved public transport and reducing traffic volumes and thereby pollution in the city centre and its gateways. The strategy is focussing on enhancing the priority and reliability for public transport, walking and cycling within the city centre and discouraging unnecessary private car access. At the same time, the strategy will accommodate city centre residents, blue badge holders and traffic essential to sustain the economic functions. The strategy is also looking at ways of enhancing the physical public realm, particularly the quality and legibility of main pedestrian spaces not yet treated, key development areas and main access routes and will work to reduce harmful traffic emissions and enhance road safety and personal security for all city centre users.



**Figure 3 M74 Completion Route** (Transport Scotland, © Crown Copyright)

### 6.7 Glasgow City Council’s Regional Transport Strategy on Noise Impact

Like Air Quality, noise impacts are considered as part of the process during planning consultation, which may involve the planning officer including Environmental Health in consultations on application. If Environmental Health Officer thinks a proposed development could be adversely affected by noise, - whatever the source - he/she would recommend attaching a condition for a noise exposure assessment and would

ask for suggested mitigation measures, if necessary. In extreme cases the Environmental Health Officer could recommend that the application is not granted on the grounds of adverse noise impacts. Cases for objection would usually be because the development would be likely to make noise rather than be affected by noise.

Current practice in dealing with road traffic noise by local authorities in Scotland is in response to the duty placed on them by the Noise Insulation (Scotland) Regulations 1975. This requires authorities to make initial assessments of traffic noise for both new and altered roads at opening and after 5, 10 and 15 years after opening. These assessments are carried out in accordance with procedures set by central government. Where noise levels are exceeded the local authority has a duty to carry out insulation works to qualifying properties or make grants to have the work carried out.

The Glasgow and Clyde Valley Joint Structure Plan 2000 as amended in 2006 can potentially significantly affect levels of traffic related ambient noise. Within this document the section entitled, “Delivering Sustained Growth- the Action Plan”, there are shared targets for integrating land use and transportation. The Strategic Environmental Assessment process within the Plan addresses noise as follows.

**Table 5: SEA and Noise**

| SEA issue; Noise                                                                    | Potential Performance Indicators                                                                                                         |
|-------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------|
| To reduce the negative impact of noise associated with the transport infrastructure | a) Number of transport-related noise complaints<br>b) Proportion of Council area where transport related noise levels exceed WHO limits. |

All seven local plans include policies that either directly or indirectly impact on Environmental Noise for example:

- Policies designed to ensure that new development will be permitted where there will be no significant adverse effects for health, the environment and amenity or where appropriate mitigation to minimise any adverse effects can be provided.
- Developments, including changes of use, which would have a materially detrimental effect on the living conditions of nearby residents will not be permitted.
- Policies that provide a framework to put in place conditions of development that would mitigate adverse environmental effects of traffic generation.
- Policies which seek to protect areas from adverse affects of Surface Mineral Extraction
- Development will not be permitted in built-up areas which detracts materially from amenity of area (noise could be such a factor)

- Policy indirectly relates to noise – seeks to ensure that no community is adversely affected by volumes of traffic generated from storage and distribution.

Policy on Renewable Energy Projects contains a criterion to ensure consideration of noise impact on wider environment.

The links to the Glasgow Clyde Valley Structure Plan which covers strategic land use planning policies for all of the authorities in the agglomeration and the 7 Local Authority local plans are detailed below.

Information on the Glasgow and the Clyde Valley Structure Plan can be viewed at:  
[http://www.gcvcore.gov.uk/structure\\_plan/structure\\_plan.htm](http://www.gcvcore.gov.uk/structure_plan/structure_plan.htm)

Information on the North Lanarkshire Local Plan can be viewed at;  
<http://www.lanarkshire.com/nllocalplan/>

Information on the Glasgow City Plan can be viewed at:  
<http://www.glasgow.gov.uk/en/business/city+plan/index.htm>

Information on the East Dumbartonshire Local Plan can be viewed at:  
<http://www.eastdunbarton.gov.uk/Web%20Site/Live/EDWebLive.nsf/LU-AllContent/MMAN-5SXLBB?OpenDocument>

Information on the West Dumbartonshire Local Plan can be viewed at:  
<http://www.wdcweb.info/building-and-planning/wd-local-plan/>

Information on the Renfrewshire Local Plan can be viewed at:  
<http://www.renfrewshire.gov.uk/ilwwcm/publishing.nsf/Content/Navigation-pt-LocalPlanandStructurePlanHomePage>

Information on the South Lanarkshire Local Plan can be viewed at:  
[http://www.southlanarkshire.gov.uk/portal/page/portal/EXTERNAL\\_WEBSITE\\_DEVELOPMENT/SLC\\_ONLINE\\_HOME/PLANNING/STRUCTURE\\_LOCAL\\_PLAN\\_S?CONTENT\\_ID=1958](http://www.southlanarkshire.gov.uk/portal/page/portal/EXTERNAL_WEBSITE_DEVELOPMENT/SLC_ONLINE_HOME/PLANNING/STRUCTURE_LOCAL_PLAN_S?CONTENT_ID=1958)

Information on the East Renfrewshire Local Plan can be viewed at:  
[www.eastrenfrewshire.gov.uk/environment/planning/localplan.htm](http://www.eastrenfrewshire.gov.uk/environment/planning/localplan.htm)

Finally, the East Renfrewshire Local Transport Plan can be viewed at:  
[www.eastrenfrewshire.gov.uk/transport/lts.htm](http://www.eastrenfrewshire.gov.uk/transport/lts.htm)

It must be noted that all the plans are at different stages of development within their respective lifespans and therefore there will be a staged influence of the END (and its resulting Action Plans) on these plans. The aim is that these local and regional plans will take into account noise control, along with other environmental controls, such as air quality management, when developing their plans.

As an example of the many and various plans that local authorities work to and review, West Dunbartonshire local authority plans are:

Adopted Plans - Clydebank Local Plan (Sept.2004); Dumbarton District Wide Local Plan (1999); Loch Lomond Local Plan (1986) (subject plan)

Emerging Local Plan: West Dunbartonshire Local Plan- Finalised published August 2007; PLI expected late 2008 and adoption in 2009.

Finally, Countryside and Natural Heritage Policies prevent development that would have adverse impacts on important natural areas.

## 6.8 Glasgow Analysis - Transport

Glasgow is the largest and most densely populated city in Scotland. The city has a population of approximately 575,000, and the SPT area, which largely correlates with the functioning of the Glasgow labour market, has a population of approximately 2.1 million.

The city's economy has changed from being largely manufacturing based to one based on the service sector, with a strong performing financial services sector and a significant number of public sector employees. The economy of the city and the region has been growing in recent years and Glasgow is now recognised as one of the fastest growing cities in the UK. This is reflected in the 18 per cent increase in employment levels between 1996 and 2004, which raised the employment rate from 57 per cent to 65 per cent.

These improvements in economic performance have resulted in rising land and property prices and demand for further development in and around the city. Average house prices increased by around 145 per cent over the last ten years compared with an average of 110 per cent in Scotland as a whole. One of the consequences of this is the increase in the number of those working in Glasgow but residing outside the city, increasing the demand to travel into and out of the city at peak times.

Glasgow accounts for 27 per cent of the total jobs in Scotland and a similar proportion of the population in the SPT area.

The level of both employment and population within Glasgow are projected to decrease between 2005 and 2022, although employment is expected to only decrease by around two per cent compared with a decrease of 10 per cent in population. Conversely, employment levels in the SPT area are projected to increase from 994,000 to 1,031,000 between 2005 and 2022.

Inactivity rates are projected to decline in Glasgow from 240,400 in 2005 to 171,200 in 2022. Gross Value Added per head in Glasgow is lower than Edinburgh but higher than Aberdeen and Dundee. Median gross weekly earnings in Glasgow are £396, four per cent below the national average for Scotland of £412.

Trips between Glasgow and the corridors account for 26 per cent of the total trips, with the largest proportion, 69 per cent, made up of trips within the city itself. The remaining five per cent consists of trips between corridors across Glasgow.

By 2022, there is an overall growth of nine per cent in trips. This overall figure, however, masks a significant variation. Within Glasgow, trips are projected to grow by only three per cent and although trips within Glasgow remain by far the largest proportion of overall trips, this does reduce by four per cent to 65 per cent. There is a consequent rise in the proportion of the overall trips that take place between Glasgow and the corridors to 30 per cent. The growth in demand on individual corridors varies from seven per cent (Corridor 15– Ayrshire) to 36 per cent (Corridor 13 – Edinburgh). The proportion of overall trips that route across Glasgow remains at five per cent with a growth in these movements compared with 2005 of 27 per cent. The percentage of HGV traffic on the M8 in Glasgow is approximately six per cent by TMfS (Transport Model for Scotland).

Analysis of inter-Glasgow movements shows that in general, movements are localised within ‘sectors’ of the city and between neighbouring sectors. There are three movements that are substantive, which do not fit with this general situation and involve longer journeys across the city. These are between:

- The inner west area (Partick/Hyndland) and Paisley / Renfrew / Braehead;
- The inner west area (Partick/Hyndland) and the inner south area (Cathcart/Shawlands); and
- Clydebank / Whiteinch and Paisley / Renfrew / Braehead.

An important feature of each of these is that they involve crossing the River Clyde, and while trips between the inner west and inner south areas have access to high frequency rail connections via Glasgow Central railway station, the other two movements have no viable rail connection options and few competitive bus opportunities.

Journeys across Glasgow account for only five per cent of total trips although these are likely to have a disproportionate impact on the operation of the M8 due to its function in linking the corridors. Cross Glasgow trips have the lowest public transport modal share of all the movements, at only three per cent.

From the totals, trips to and from Glasgow account for between 57 per cent and 82 per cent of trips for the surrounding corridors.

About 69 per cent of all trips are fully within Glasgow and of these trips approximately 24 per cent are by public transport. This is higher than the proportion of trips into and out of Glasgow made by public transport at 16 per cent. This is likely to be because of the better availability of public transport within the city due to the denser network and higher frequency of services. For travel to / from Glasgow city centre, public transport trips make up a far higher percentage, but the lower use of public transport further out of the city centre decreases the city wide average.

Considering travel to work, approximately 32 per cent of journeys by Glasgow residents are made by public transport. This is considerably above the Scottish average of 15 per cent.

Approximately 41 per cent of the trips to the city centre area in 2005 are made by public transport. However, when reviewing the patterns of trips to the non-centre areas, the public transport share is projected to be lower with only seven per cent of trips to Glasgow Airport Corridor and eight per cent to the Clyde Gateway area made by public transport in the morning peak period. Glasgow Waterfront performs slightly better with around 14 per cent of trips made by public transport in the morning peak period, but this is still significantly below the current level for the city centre.

Considering these journey times in the context of the city's labour market, it is estimated that approximately 1.6 million of Scotland's population live within a one hour commute of the city centre, with slightly less within one hour of the Glasgow Airport Corridor.

It is predicted that due to the increased levels of congestion projected in the future, the population within a one hour commute of the city centre will fall slightly. The reduction is not considered to be of a significant level, but that there is a reduction at all is an indication of the impact of transport network constraints. The economic area adjacent to Glasgow Airport benefits from the Glasgow Airport Rail Link, which acts to offset the reduction due to effects on congestion. One issue that is a highlight is the poor level of public transport competitiveness for journeys between Glasgow Airport and points east of Glasgow, compared with the city centre.

Despite the high level of journeys to work by public transport, much of the city's road network experiences congestion during peak periods. It is estimated that in 2005 approximately five to six per cent of the road network in Glasgow was operating at or above capacity during the peak periods. Due to the projected increase in travel over the next 15 years, congestion in these periods is projected to increase, with eight to eleven per cent of the network predicted to be operating over capacity in 2022. The off peak period is predicted to remain uncongested during this time.

Emissions of CO<sub>2</sub> per person kilometre are forecast to rise from 133 tonnes / million person kilometres to 135 tonnes / million person kilometres between 2005 and 2022.

The road based transport network produced 983,500 tonnes of CO<sub>2</sub> in Glasgow in 2005. This equates to approximately 15 per cent of the total road based transport related CO<sub>2</sub> emissions in Scotland.

By 2022, it is forecast that CO<sub>2</sub> emissions in Glasgow will increase to around 1,061,000 tonnes, approximately 13 per cent of Scotland's road based transport related CO<sub>2</sub> emissions in 2022.

The rail network produced 1,000 tonnes of CO<sub>2</sub> in Glasgow in 2007. This equates to approximately one per cent of the total rail based CO<sub>2</sub> emissions in Scotland.

Therefore, it is estimated that the road and rail based transport network produced 984,500 tonnes of CO<sub>2</sub> in Glasgow in 2005. This equates to approximately fifteen per cent of the total road and rail based transport related CO<sub>2</sub> emissions in Scotland.

## 6.9 Local Air Quality Action Plans

All seven local authorities have Air Quality Action Plans and the links between air quality and noise from traffic sources are strong. A study carried out in 2001<sup>(51)</sup> <sup>(49)</sup> identified a wide range of local mitigation measures that can be used to reduce the air pollution and noise from traffic and industrial sources, many of which can be effectively implemented by local authorities. The study concluded that the overwhelming majority of potential mitigation measures are unlikely to cause conflicts between the objectives of reducing air pollution and noise. Some measures, particularly those concerned with managing levels of activity, such as reducing local traffic flows, benefit air quality and noise.

Any proposed noise mitigation measures should be cross referenced to the Local Air Quality Management Plan as part of the Strategic Environmental Assessment. It is also proposed that the Local Air Quality Management Plan should be examined for any measures that affect the noise climate.

## **7 Next Steps**

### **7.1 Preparing for Round Two Mapping and Action Planning**

Following the SEA consultation this Action Plan, once approved by Scottish Ministers will be published on the Scottish Government and the Scottish Noise Mapping Internet sites. The plans will also be forwarded to the relevant local authorities and other key partners.

The current working group system has proved effective in developing this action plan. Consideration will be given to the form in which the group will continue in order to facilitate implementation and the development of future plans following the required 5 yearly review of the noise maps.

## Appendix 1 Maps

1. **CNMA Map for Glasgow Agglomeration Roads**  
[http://www.scottishnoisemapping.org/downloads/sea/Glasgow\\_Action\\_Plan\\_Maps\\_Roads.pdf](http://www.scottishnoisemapping.org/downloads/sea/Glasgow_Action_Plan_Maps_Roads.pdf)
2. **Key for Glasgow Agglomeration Road CNMA**  
[http://www.scottishnoisemapping.org/downloads/sea/Glasgow\\_Action\\_Plan\\_Maps\\_Roads\\_Legend.pdf](http://www.scottishnoisemapping.org/downloads/sea/Glasgow_Action_Plan_Maps_Roads_Legend.pdf)
3. **CNMA Map for Glasgow Agglomeration Railways**  
[http://www.scottishnoisemapping.org/downloads/sea/Glasgow\\_Action\\_Plan\\_Maps\\_Rail.pdf](http://www.scottishnoisemapping.org/downloads/sea/Glasgow_Action_Plan_Maps_Rail.pdf)
4. **Key for Glasgow Agglomeration Railway CNMA**  
[http://www.scottishnoisemapping.org/downloads/sea/Glasgow\\_Action\\_Plan\\_Maps\\_Rail\\_Legend.pdf](http://www.scottishnoisemapping.org/downloads/sea/Glasgow_Action_Plan_Maps_Rail_Legend.pdf)
5. **CQA Map for Glasgow Agglomeration**  
[http://www.scottishnoisemapping.org/downloads/sea/CQA\\_Gla\\_TRL\\_75\\_SNH\\_V3\\_Maps\\_All.pdf](http://www.scottishnoisemapping.org/downloads/sea/CQA_Gla_TRL_75_SNH_V3_Maps_All.pdf)
6. **Key for Glasgow Agglomeration CQA**  
[http://www.scottishnoisemapping.org/downloads/sea/CQA\\_Gla\\_TRL\\_75\\_SNH\\_V3\\_Text.pdf](http://www.scottishnoisemapping.org/downloads/sea/CQA_Gla_TRL_75_SNH_V3_Text.pdf)

## **Appendix 2 – Prioritisation Matrix**

### **A2.1 Purpose**

The purpose of the prioritisation matrix is to evaluate strategic noise levels within the first round noise maps in terms of the road, rail and air noise sources most likely to cause annoyance to people potentially affected. The prioritisation will enable appropriate actions, required to be determined, based on a consideration of noise levels, the number of people potentially affected and the annoyance response to the noise source.

It is important, in broad terms, to ensure the developed methodology can be used consistently for all three action planning working groups (Edinburgh, Glasgow, and Transportation). It is also, however, important to bear in mind organisational needs and responsibilities.

The matrix must be straightforward, transparent, and consistent. Although the matrix will provide a strategic focus for action planning, a check on the strategic noise levels, all matrix input data and any proposed interventions, will be required prior to the implementation of any suggested actions. In this regard, the matrix will be subject to regular review during the Action Planning process.

The prioritisation matrix, and the related graphics, will be based on Building and Noise Source evaluations as described below. The Source Prioritisation Score being derived from the Building Prioritisation Score.

### **A2.2 The Building Prioritisation Score (BPS)**

The Building Prioritisation Score (BPS) is an individual value assigned to each building. The input factors for the BPS are as follows:

- Building use (only residential considered at this stage, although other building types may be considered in later phases)
- Appropriate strategic noise level at building (for the particular noise metric being assessed).
- The number of properties within each building<sup>1</sup>
- The population density<sup>2</sup>
- The Annoyance response<sup>3</sup>

The BPS for each building is then calculated as follows:

$BPS = (\text{Noise level at building} + 10 \times \log_{10}(\text{number of people annoyed}))$

Where:

---

<sup>1</sup> All address points that lie within a building are used

<sup>2</sup> Using a multiplication factor of 2.36 for each Address Point. From Scot-Tag

<sup>3</sup> Miedema and Oudshoorn "Annoyance from Transportation Noise: Relationship with Exposure Metric DNL and DENL and Their Confidence Intervals. Environmental Health Perspectives Vol 109 No 4 April 2001

Noise Level at building =  $L_{den}$

Number of people annoyed =  $(N_A \times P_A \times A) / 100$

where

$N_A$  = Number of address points within building

$P_A$  = Population per address

A = % people annoyed

For Example:

Property 1 Berkeley Street (Adjacent to M8 in Glasgow)

Noise level at building .....  $L_{den}$  80.9 dB

No. of Address Points within building ( $N_A$ ) ..... 16

Population per Address ( $P_A$ ) ..... 2.36

% people likely to be annoyed by road traffic noise (A) ..... 79.7

BPS .....  $80.9 + (10 \times \log_{10}((16 \times 2.36 \times 79.7)/100)) = 95.7$

Property 2 309 Great Western Road, Glasgow

Noise level at building .....  $L_{den}$  72.1 dB

No. of Address Points within building ( $N_A$ ) ..... 6

Population per Address ( $P_A$ ) ..... 2.36

% people likely to be annoyed by road traffic noise (A) ..... 52.3

BPS .....  $72.1 + (10 \times \log_{10}((6 \times 2.36 \times 52.3)/100)) = 80.7$

### **A2.3 BPS Maps**

To facilitate an understanding of the distribution of BPS values for a particular noise source these have been represented visually in map format. The BPS maps were prepared by assigning each building a score as calculated above. The resultant scores were then divided into 5 point bands, each represented by a different coloured circle. The diameter of each circle is a function of the BPS (the bigger the coloured circle the greater the BPS). The resultant mapped pattern of coloured circles provides a visual representation of where the greatest noise annoyance is likely to occur. As part of the action planning process the maps can, if required, be cross referenced with received noise complaints for particular noise sources. In this way the maps can, if required, be developed for future action planning.

It should be noted that the BPS is an absolute value, and individual properties in Glasgow, Edinburgh, and elsewhere can be directly compared. The colours used in the BPS maps are also absolute, and identify the same BPS values in all areas.

#### A2.4 Source Prioritisation Score (SPS) for Roads and Rail

Once the BPS is calculated for each building the Source Prioritisation Score (SPS), for sections of source line, is calculated as follows.

- Firstly the road network is rationalised so that there is a single centreline to represent motorways, and dual carriageways. Previously these were represented by two separate lines representing opposing carriageways. In addition, junctions are simplified in a similar manner. Similarly, the rail network is reduced to a series of single centrelines that represent railway lines that consist of multiple tracks.
- Road and rail source lines are split into 100m sections (some will necessarily be less than 100m, and these sections have a weighting applied to compensate for the decreased segment length. These shorter sections, in general, occur at junctions and the ends of road/rail sections).
- Each road/rail segment is then given a unique ID.
- For each building with a noise level greater than or equal to  $L_{den}$  55dB the ID of the road/rail segment that is closest to it is assigned to that building.
- The logarithmic sum of BPS values for all buildings with the same nearest road/rail segment ID is then assigned to the relevant road segment. For  $n$  Building Prioritisation Scores the logarithmic sum is given by the follow equation:

$$SPS = 10 \log_{10} \left( \sum_{i=1}^n 10^{\left(\frac{x_i}{10}\right)} \right)$$

Where  $x_i$  is the  $i^{th}$  Building Prioritisation Score.

- Since some segments are shorter than 100m, a weighting has been applied to each segment that has a length between 50m and 100m. The following weighting was applied,  $SPS \times 10 \times \log_{10} (100 \div (\text{segment length}))$ . Hence the maximum correction is 3 and, basically, assumes that if the section was in fact 100m long the distribution of buildings and BPS values would remain constant along the additional length. For lengths less than 50m the correction is not applied due to the large error in summed BPS for such short lengths. However, since these shorter lengths occur at road ends, lengths of less than 50m are deemed insignificant. Furthermore, in general, they represent less than 0.5% of all source segments. For example, there are 12664 major road sections of which 51 are less than 50m in length. The total length of major roads is approx 1,267km of which the sections with lengths less than 50m sum to approximately 1.5km.

An example of the SPS calculation methodology is presented in Section A2.7 of this Appendix.

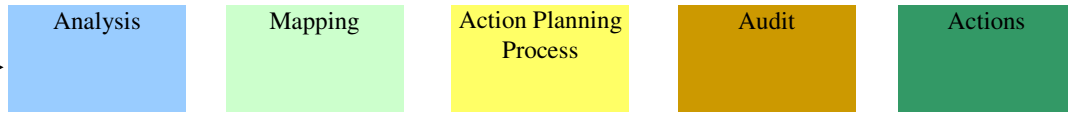
Once calculated, the road and rail network with assigned SPS values are ranked into four categories, based on each section's SPS. To initiate the prioritisation process for each noise source the initial categorisation used is as follows: 1%, 1%, 1%, 97%, from highest to lowest.

### **A2.5 Airport SPS Maps**

The airport source prioritisation maps are based on areas rather than line segments (road and rail). The area SPS values are determined by the logarithmic summation of the building prioritisation scores for all residential buildings that lie within postcode area boundaries. The airport area SPS values are then categorised into four bands as follows: 1%, 1% 1%, 97%. If deemed necessary, the size of the top three airport area SPS bands can be increased.

## A2.6 Prioritisation Matrix

### Optimisation Process



Calculate Strategic Noise Levels

Calculate BPS values and categories

Calculate SPS values and categories

Produce BPS Maps

Produce SPS Maps

Evaluate actions for BPS

Evaluate actions for SPS

Agree CNMA

Produce Action Plans

Audit NMA

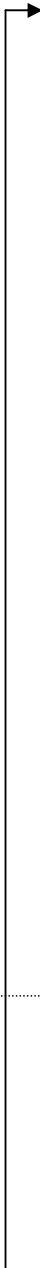
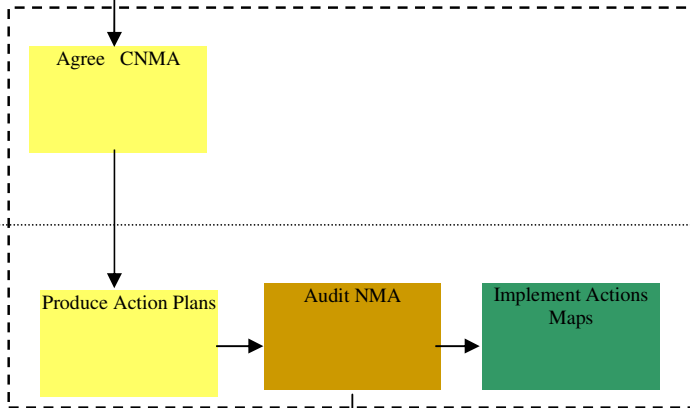
Implement Actions Maps

### Optimisation Process



### Cost benefit analysis

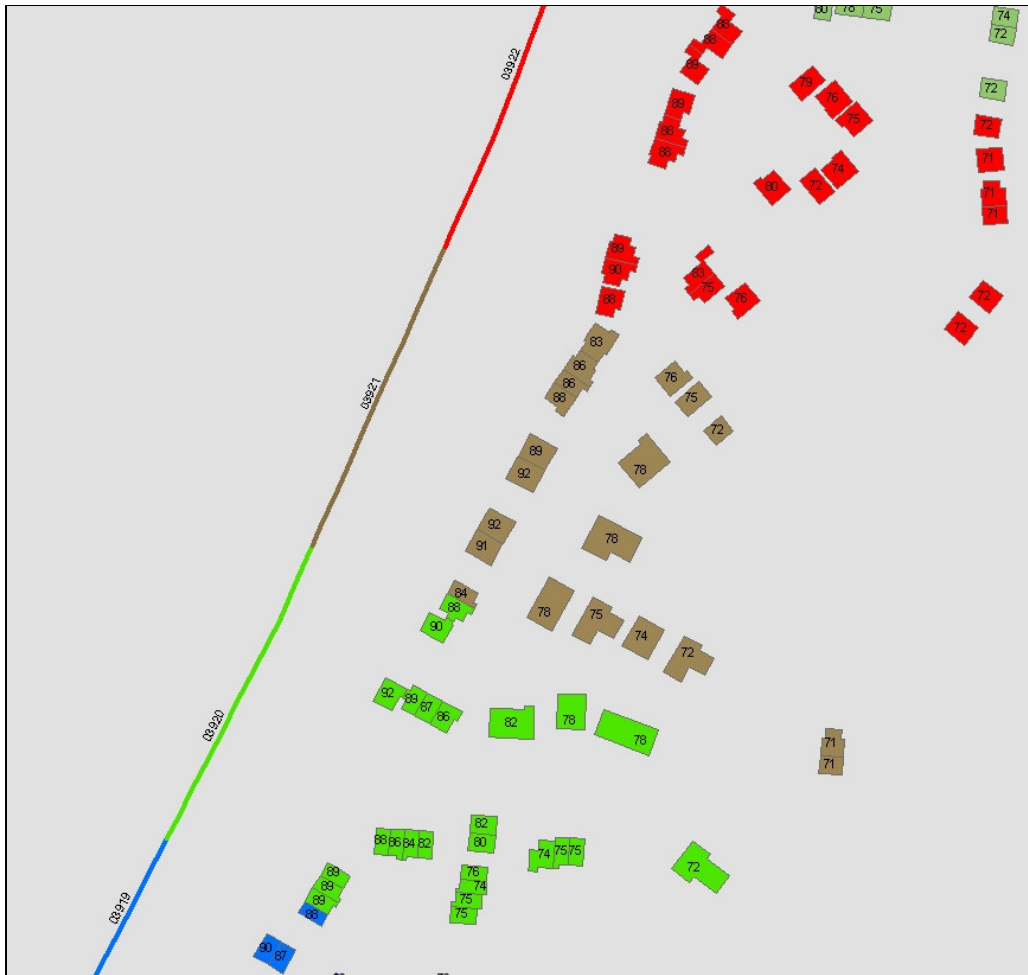
Publish Action Plan



## A2.7 Source Prioritisation Score Example

The following graphic shows a section of the major road network with buildings that have had their Building Prioritisation Scores (BPS) determined. Each of the road sections shown in the graphic equates to a 100 metre length of the major road network, each with a unique ID. In the graphic the road section ID is shown (03919 to 03922) for each road segment. Each line segment and their nearest buildings have been uniquely coloured.

**Figure A2.1: Noise Source Segments (With IDs) and Buildings with Associated BPS. The source segments have been uniquely coloured. All buildings have been assigned the ID of the road segment closest to it and then coloured using the same colour as the road segment.**



The sequence of events for determining SPS values for segments of source line is as follows.

- Segment line source into 100m lengths.
- Assign Unique ID to each line source segment.
- Assign to each building the ID of the nearest source line segment.
- Logarithmically sum all the building prioritisation scores that have the same

unique source segment ID.

- Each unique line source segment is then assigned the logarithmically summed BPS for that particular segment.

For Example:

In Figure A2.1, above, each 100m source segment has a unique ID. For illustrative purposes, each segment has been uniquely coloured. The ID of the nearest source segment to each building is then assigned to each building and, for illustration purposes, each building has been assigned the same colour as its nearest source segment.

Taking road segment 03921 (Brown) as an example, the Source Prioritisation Score for this segment is equal to the logarithmic sum of the BPS scores for all properties for which this segment is the closest (i.e. all of the brown coloured buildings). These buildings have the following BPS: 83, 86, 86, 88, 89, 92, 92, 91, 84, 76, 75, 78, 78, 78, 75, 72, 75, 74, 72, 71, 71 and, as such, the Source Prioritisation Score is given by:

$$\begin{aligned} SPS &= 10 \log_{10} \left( \sum_{i=1}^n 10^{\left(\frac{x_i}{10}\right)} \right) \\ &= 10 \log_{10} \left( 10^{\left(\frac{83}{10}\right)} + 10^{\left(\frac{86}{10}\right)} + 10^{\left(\frac{86}{10}\right)} + 10^{\left(\frac{88}{10}\right)} + 10^{\left(\frac{89}{10}\right)} \right. \\ &\quad \left. + 10^{\left(\frac{92}{10}\right)} + 10^{\left(\frac{91}{10}\right)} + 10^{\left(\frac{84}{10}\right)} + 10^{\left(\frac{76}{10}\right)} + 10^{\left(\frac{75}{10}\right)} + 10^{\left(\frac{78}{10}\right)} \right. \\ &\quad \left. + 10^{\left(\frac{78}{10}\right)} + 10^{\left(\frac{75}{10}\right)} + 10^{\left(\frac{72}{10}\right)} + 10^{\left(\frac{75}{10}\right)} + 10^{\left(\frac{74}{10}\right)} + 10^{\left(\frac{72}{10}\right)} \right. \\ &\quad \left. + 10^{\left(\frac{71}{10}\right)} + 10^{\left(\frac{71}{10}\right)} \right) \\ &= 98.8 \end{aligned}$$

Please note that in this example integer BPS values have been used. However, when determining SPS values for all source segments BPS values to one decimal place have been used.

## Appendix 3 – Glasgow Actions

### A3.1 Actions from Glasgow Agglomeration Noise Action Planning Group

The main action is to validate each of the 53 CNMAs by desk review and a visit to each site to describe parameters, existing and future abatement measures. The CNMA Proforma detailed below is a starting point and can be modified in the light of experience :

#### **Proforma for Glasgow Agglomeration Noise Action Planning Group**

**Name :**

**Local Authority :**

**Location of SPS :**

**Key Questions-Roads (but can apply same criteria for rail)**

1. Is the road busy / does local knowledge tell us it is or not at alternate times?
2. Traffic calming measures present?
3. What type of vehicles are using the road.
4. Is the road steep, very steep or flat?
5. Is the housing single aspect?
6. Can we see any other mitigation measures e.g. double glazing on all windows.
7. The number of storeys.
8. Does the traffic model take into account parking provision? As the lack of it might slow down traffic when people park badly

#### **Actions**

- Take a photograph
- look at road surface,
- road width, (approx)
- one way/ two way street,
- parking provisions,
- housing type,
- housing tenure (if you can tell)
- can you hear yourself speak,

any development /traffic management proposals. (some of this may need to be followed up at a later date)

#### **CNMA**

1. Is there any abatement measures in place?
2. Has a CBA been undertaken?
3. Has Transport Scotland got any plans to abate this area?

4. Has BAA got any plans to abate this area?

The following table presents the Actions for the Glasgow Noise Action Planning Group

**Table of Actions for Glasgow Noise Action Planning Group**

| <b>Proposed Action</b>                                                                                                          | <b>Timescales</b>                                   | <b>Responsibility</b>                                                                             |
|---------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------|---------------------------------------------------------------------------------------------------|
| Set up Steering Group to oversee process – local Groups as necessary                                                            | Early 2008 for 4 years                              | Scottish Government, local authorities, SEPA, Transport Scotland, SPT, BAA, others as appropriate |
| Validate the 53 CNMAs by completing proforma                                                                                    | by 2010 (as decided by each group)                  | All trunk roads- TS<br>All other roads- LAs<br>All railways- TS<br>Glasgow airport- BAA           |
| Validate the 59 CQAs by completing proforma                                                                                     | By 2010 as decided by Group                         | LAs                                                                                               |
| Create auditable trail to validate NMAs and other relevant locations and issue Guidance                                         | by 2010                                             | Scottish Government/Steering Group                                                                |
| Update and improve data input to the model – further validation – include Quiet Areas                                           | On-going                                            | Steering Group and Local Groups                                                                   |
| Explore options for mitigation measures and other forms of control – include development control and common planning conditions | by 2013 as decided by TS and local strategies/plans | Steering Group and Local Groups                                                                   |
| Information sharing of options and application of these                                                                         | On-going                                            | Steering Group                                                                                    |
| Raise awareness of ambient noise issues                                                                                         | On-going                                            | Steering Group and Local Groups – others as appropriate                                           |

### A3.2 Potential Actions

The Transportation Noise Action Plan provides details on actions to establish priorities for reducing noise from trunk roads and railways within the Glasgow agglomeration

Consideration should be given to the benefits of replacing the road surface with a low noise surface when the road is next due for resurfacing. Further research should be encouraged into the comparative benefits of different surfaces.

Consideration should be given to the possibility of reducing the number of vehicles / HGVs using this stretch of road.

Consideration should be given to the possibility of reducing the speed limit on this stretch of road.

Consideration should be given to the construction of a barrier along this stretch of road.

Any further construction of noise sensitive developments in this area / along this stretch of road should be afforded protection from noise using a noise reduction technique appropriate to the design.

Consideration should be given to updating the Local Transport Policy to include transport noise and noise reduction as explicit and integral objectives in the design and development of the transport strategy

Consideration should be given to updating the Local Planning Policy to include noise protection and noise control as explicit and integral objectives in the development control process.

Consideration should be given to expanding the Scottish Noise Mapping Internet site to include clear guidance as to when members of the Public affected by noise should contact their Local Authority and when they should contact SEPA .

### **The Noise Model**

The following recommendations concern possible improvements to the noise model. Any potential improvements to the model will have to be evaluated in conjunction with the Scottish Government's noise mapping contractors to establish if they are practical, feasible and worthwhile. For example some data requirements can push the limits of available technology and have implications for processing time.

Consideration should be given to how the data used in the model can be improved in ways that will increase the accuracy of the maps in future years.

Consideration should be given to improving the data available on road surfaces within the agglomeration in order to improve the accuracy of the model.

Consideration should be given to improving the data available on night time noise in order to give a more accurate  $L_{\text{night}}$  and therefore  $L_{\text{den}}$ .

### **Intervention Types**

Reduce speed limits

Limit numbers of vehicles

Limit time of day vehicles have access  
Restrict certain types of vehicles  
Redirect vehicles  
Use low noise road surface  
Introduce speed control measures, e.g., chicanes, narrow roads, road markings, bends,  
Changing vehicle priority  
Introduce a barrier  
Require the use of low noise tyres (national / international support & research needed)

Through the EC press for quieter vehicle requirements e.g. exhaust noise limits,  
quieter tyres, further research into low noise road surface

Consider locating taxi ranks / bus stops away from residential property

Consider location of pedestrian crossings, with due regard to road safety

### **Quiet Areas**

Validate Candidate Quiet Areas by completing adapted proforma to establish each of the 59 candidate areas is considered worthy and viable of preserving present perceived quiet area status.

Ensure local planners are aware of the resulting QAs list, when considering all new developments.

## **Appendix 4 - Strategic Environmental Assessment**

A Strategic Environmental Assessment (SEA) is a systematic process for identifying, predicting and where possible avoiding significant adverse environmental impacts of implementing public strategies, plans and programmes. In Scotland, the Environmental Assessment (Scotland) Act 2005 ensures that all public strategies, plans and programmes that are likely to result in significant environmental effects, adverse or positive, are assessed.

Section 15 of the Environmental Assessment (Scotland) Act 2005 ('the Act') requires a Responsible Authority to consider, in conjunction with the Consultation Authorities, the scope and level of detail of the environmental assessment. The purpose of this scoping report is to identify the environmental issues to be taken into consideration during decision-making. The scope of the SEA depends on:

- what is being proposed, i.e. the remit of the plan, programme or strategy (PPS);
- the geographical and temporal coverage of the PPS; and
- the nature of the receiving environment.

The END Action Plans fall within the scope of Section 5(3) the Environmental Assessment (Scotland) Act 2005 given their potential for significant environmental effects and therefore require an SEA. Accordingly a full SEA consultation of the overall noise action plan, as is required by the Act, will be undertaken in the autumn of 2008 with the full Environmental Report.

The SEA Act requires that the Noise Action Plan (NAP) is assessed against a range of criteria as set out in Schedule 3. Table A4.1 below explains what has been scoped in/out and provided a brief justification for that scoping. A full Scoping Report covering each of the Edinburgh, Glasgow and Transportation Working Groups together with that for the airports is available on the Scottish Noise Mapping web site<sup>(20)</sup>. This report will provide full details of the methods to be used, the organisations and/or individuals to be consulted during the assessment, and the timing and length of the consultation period.

**Table A4.1: Scoping in/out for NAP SEA**

| <b>Environmental Characteristic</b>       | <b>Key Potential Environmental Effect of NAP</b>                                                                                                                                                        | <b>Scoped In/Scoped Out</b> | <b>Justification</b>                                                                                                                                                                   |
|-------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Population &amp; Human Health</b>      | Changes to the environment can influence this category. Such changes may include: air quality; accessibility of open space, services and facilities; noise levels; accident levels.                     | In                          | Management of noise may lead to reduction in noise levels with consequent reduction in the number of people annoyed, or extent of any annoyance and therefore may have health benefits |
| <b>Biodiversity, Flora, Fauna</b>         | Changes to levels of biodiversity; wildlife corridors; stepping stones; valuable habitats and species; levels of fragmentation of habitats.                                                             | In                          | Designation of Quiet Areas may lead to enhancement of habitats                                                                                                                         |
| <b>Soil</b>                               | Changes to quality of soil; quantity of soil; amount of contaminated land; amount of prime quality agricultural land.                                                                                   | Out                         | Changes in noise levels have no impact on soil quality                                                                                                                                 |
| <b>Water</b>                              | Changes to water quality from construction or other access; changes to the water environment; areas of flood risk.                                                                                      | Out                         | Changes in noise levels have no impact on water quality                                                                                                                                |
| <b>Air, Climatic Factors</b>              | Changes in air quality; greenhouse gas emissions; dust levels; flooding; prevalent modes of transport.                                                                                                  | In                          | Possible traffic management may result in decrease/increase in emissions such as PM10, No2 etc                                                                                         |
| <b>Cultural Heritage, Material Assets</b> | Changes to the settings of and access to listed buildings, scheduled ancient monuments, archaeological sites; conservation areas; townscape protection areas; historic gardens and designed landscapes. | In                          | Designation of Quiet Areas may enhance existing designated landscapes etc                                                                                                              |
| <b>Landscape</b>                          | Changes to landscape character; landscape quality; landscape features; Regional Scenic Area.                                                                                                            | In                          | Designation of Quiet Areas may enhance landscape quality                                                                                                                               |

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