

Environmental Noise Directive

Action Plan

**TRANSPORTATION NOISE ACTION
PLAN**

Prepared by the Transportation Working Group

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1. Introduction

1.1 The Purpose of this Document

The purpose of this Transportation Noise Action Plan is to describe how the Scottish Government and its partners propose to deliver their obligations under the Environmental Noise Directive ⁽¹⁾ with respect to Transportation noise in Scotland outwith the agglomerations of Edinburgh and Glasgow.

The Transportation Noise Action Plan is one of a set of six Noise Action Plans as follows.

- The Transportation Noise Action Plan
- The Edinburgh Agglomeration Noise Action Plan
- The Glasgow Agglomeration Noise Action Plan
- The Aberdeen Airport Noise Action Plan
- The Edinburgh Airport Noise Action Plan
- The Glasgow Airport Noise Action Plan

1.2 Requirement for Noise Action Planning

The [European Parliament and Council Directive for Assessment and Management of Environmental Noise 2002/49/EC](#) ⁽¹⁾, more commonly referred to as the Environmental Noise Directive (END), was published in the [Official Journal of the European Union](#) ⁽²⁾ 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 set 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](#) ⁽³⁾.

The END describes a two stage process to manage environmental noise. The first round relates to major roads with more than six million vehicle passages per year, major railways with more than 60,000 train passages per year, major airports with more than 50,000 air traffic movements per year and transport sources and industry in agglomerations.

1.3 Current Status

The first round is now complete, as described in Table 1 below.

Tasks One and Two are now complete. This document and the related consultation process have been developed to complete Task Three.

The first round Action Planning Process will cover a five year period from 2009 to end 2012. At the end of the four year period, the noise maps and Action plans will be reviewed and revised as part of the second round process required by the Directive.

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

Task	Detail	Due Completion Date	Completion Status
One	Produce strategic noise maps for major roads, rail, airports, and industry	June 30 2007	Complete (www.scottishnoisemapping.org)
Two	Prepare guidance on the preparation and content of noise Action Plans	July 18 2007	Complete (www.scottishnoisemapping.org)
Three	Competent Authorities to draw up Action Plans to manage noise and submit summary to Commission	18 January 2009	Complete (www.scottishnoisemapping.org)

1.4 Noise Action Planning

The strategic noise maps referred to in Task One, of Table 1, above, provided the starting point for Noise Action Planning. Their initial analysis, using the Prioritisation Matrix, described in Appendix 2 and Section 4.3 of this document, provided a focus for deriving actions to reduce noise where it is deemed there is a need to do so. Where the Prioritisation Matrix indicated a possible need to manage noise in an area, the area has been defined as a Candidate Noise Management Area (CNMA), as described in Section 4.4 of this document. The CNMAs from this process are shown graphically and listed in Appendix 3. A methodology has been developed to determine whether a CNMA should move on to Noise Management Area (NMA) status, and this process is described in Section 4.5 of this document. Finally, over the five year period of the Transportation Noise Action Plan, the NMAs will be determined and will also require further analysis, taking account of costs and benefits, to determine whether potential mitigation measures are appropriate.

It is recognised that the key to a successful delivery of the Transportation Noise Action Plan is the partnership and team working of the various organisations concerned. To support this delivery, 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.

1.5 Action Planning Process

The process of provision of information, consultation, and decision making on the issues of noise management is the wider Action Planning Process.

This document sets out the Transportation Noise Action Plan for those areas of Scotland out with the agglomerations of Edinburgh and Glasgow.

However, it is important to note that the Directive does not set limit values, nor does it prescribe the measures to be used in the Action Plans, which remain at the discretion of the relevant competent authority.

1.6 Layout of this Transportation Noise Action Plan

A description of, and background to, the European Directive on Environmental Noise, together with a brief outline of the Scottish Legislative framework in relation to environmental noise is provided in Sections 2.1 and 2.2 of this document. Section 2.3 provides an introduction to the strategic noise maps, Section 2.4 provides details of the data returned to the European commission and Section 2.5 describes the rationale behind the selection of areas and sources that have been mapped to date.

Section 3 explains the Action Plan requirements and describes the structure of the groups established to assist in the delivery of a Transportation Noise Action Plan for Scotland.

Section 4 covers the keys stages of the Action Planning Process, including the determination and further investigation of Candidate Noise Management Areas (CNMA), and Noise Management Areas (NMA).

Section 5 sets out the planning framework relevant to the Action Planning process, and describes the alignment of existing initiatives that are to be incorporated into the Action Planning process.

Finally, Section 6 describes the next steps in the fulfilment of the aforementioned statutory requirements.

2. Background and Context

2.1 The European Directive on Environmental Noise

The European Union, [Future Noise Policy European Commission Green Paper Brussels 1996](#)⁽⁴⁾, has estimated that around 20 percent of the EU's population, or close on 80 million people, suffer from noise levels scientists and health experts consider unacceptable. They are annoyed, their sleep is disturbed, and adverse health effects are expected. An additional 170 million people experience noise levels causing serious annoyance during daytime.

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](#)⁽³⁾.

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 the public be informed and consulted on noise exposure, its effects, and the measures that are being considered in order to address noise, in line with the principles of the [Aarhus Convention](#)⁽⁵⁾. 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 Environmental Noise Directive 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](#)⁽⁶⁾) of 24 September 1996 concerning integrated pollution prevention and control”. Environmental noise can therefore be split into three main categories as follows.

- Industrial noise
- Road and rail transport noise
- Aircraft noise.

2.2 The Legal Context

The [Environmental Noise \(Scotland\) Regulations 2006](#) came into force on 5 October 2006 and apply to environmental noise to which humans are exposed, 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 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](#) ⁽⁷⁾ and the [Antisocial Behaviour etc \(Scotland\) Act 2004](#) ⁽⁸⁾. Part 5 of the [Antisocial Behaviour etc \(Scotland\) Act 2004](#) contains provisions in relation to antisocial noise and in particular gives local authorities additional powers to tackle the problems of noise in dwellings. Noise exposure at work is governed by the [Control of Noise at Work Regulations 2005](#) ⁽⁹⁾ and noise from construction sites is controlled by the [Control of Pollution Act 1974](#) ⁽¹⁰⁾. Further information on the legislation referred to here can be obtained from the [Noise Level Research Report](#) ⁽¹¹⁾ published by the Scottish Executive on 19 October 2004.

In addition to the above, the [Draft Noise Management Guide](#) ⁽¹²⁾ provides guidance on the creation and maintenance of Effective Noise Management Policies and Practice for Local Authorities and their Officers in Scotland. However, notwithstanding the usefulness of this guide, it is important for the reader to understand the correlation and relationship of all of the aforementioned documents.

If a proposed development is likely to be a source of noise, its location and associated measures regarding the level, and/or timing, of noise emissions may be controlled through the planning system. 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 planning context of any proposed noise sensitive development which may be affected by such sources.

At present where noise from a new or altered¹ road exceeds a certain trigger level, and meets other qualifying criteria, the [Land Compensation \(Scotland\) Act 1973](#) ⁽¹³⁾ provides, through the Noise Insulation (Scotland) Regulations 1975 (NISR) ⁽¹⁴⁾, 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 under certain circumstances. Public works in this context do not include aerodromes.

Noise from new railways may be controlled by conditions attached as part of the Parliamentary Bill process. The railway equivalent of the NISR is the [Noise Insulation \(Railways and Other Guided Transport Systems\) Regulations 1996](#) ⁽¹⁵⁾. However, the provisions of the 1996 Regulations, which came into force under the Land Compensation Act 1973, do not apply to Scotland.

Noise from aircraft in flight is not treated as nuisance. Ground noise at the airport is treated as industrial noise and is controlled by local authorities

The Scottish Government also issues planning guidance on noise related matters in the form of planning advice notes such as [Planning Advice Note 56: “Planning and Noise”](#) ⁽¹⁶⁾, and [Planning Advice Note 50: “Controlling the Environmental Effects of Surface Mineral Workings Annex A: The Control of Noise at Surface Mineral Workings.”](#) ⁽¹⁷⁾

In more general terms [Planning Advice Note 51: Planning, Environmental Protection and Regulation](#) ⁽¹⁸⁾ supports the existing policy on the role of the planning system in relation to the environmental protection regimes. As part of the overall Action Plan process [Scottish Government Planning Advice Note 56 \(PAN 56\)](#) will be revised to align with the Action Planning process.

An Environmental Impact Assessment is required for projects which are likely to have significant environmental effects. Noise emissions are one of the impacts which have to be considered in such assessments and, if relevant, measures to mitigate the effects should be

¹ an “altered” road is defined within the NISR

proposed. The implementation of the mitigation measures are a matter for the consenting procedure and the responsible authority.

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

2.3 Introduction to Strategic Noise Maps

The strategic END noise maps have, in accordance with the requirements of the Scottish Regulations, been produced for round one mapping. The maps can be found at the [Scottish Noise Mapping](#) internet site⁽¹⁹⁾.

The areas and corridors mapped are as follows.

- All major roads (essentially motorways and A roads) which have more than 6 million passages per year.
- All roads within the agglomerations of Edinburgh and Glasgow which exceed the qualifying flow of 1000 vehicles or more per day.
- Railways with more than 60,000 train passages per year (major railways).
- All railways within the agglomerations of Edinburgh and Glasgow.

The areas noted above, out with the agglomerations of Edinburgh and Glasgow, are shown in Appendix 1.

A noise map is analogous to a weather map, but instead of mapping temperature or cloud cover, it maps strategic noise levels in terms of coloured contour bands. The noise levels shown on the noise mapping show the annual average noise level predicted to be experienced within the area. It is important to recognise the actual noise levels may well vary during the day, or on a daily basis.

The distance noise propagates from noise sources, such as major roads and railways, depends on the surrounding topography, and features. To take account of this a buffer area of 2km has been created around the main transport sources in the mapping process. This buffer area was determined from the [Good Practice Guide for Strategic Noise Mapping and the Production of Associated Data on Noise Exposure](#)⁽²⁰⁾ and describes the extents of the noise mapping of corridors outwith the agglomerations.

The noise maps are strategic in nature and purpose. Some of the reasons for this are as follows.

- The noise contours presented in the mapping are based on average noise levels for an average weekday in the year 2005.
- The noise levels used in the mapping are calculated at a height 4m above ground level and thus do not represent noise levels that would be experienced at typical ground, or typical human ear, height.
- The noise levels have been predicted on a grid basis that has a spacing of 10m x 10m.
- Localised features such as garden walls and fences are not included in the noise model.

The bullet points above highlight that the mapping is strategic and therefore cannot be used to determine the noise level for any specific property. It would also be a mistake to use the maps

to categorise any site in terms of the Noise Exposure Categories given in the [Scottish Government's Planning Advice Note 56 \(PAN 56\)](#) ⁽¹⁶⁾.

The input data required for the calculation of noise levels have been determined by consultation with various organisations including Transport Scotland, Scottish Environment Protection Agency (SEPA), Network Rail, BAA, Local Authorities, and others.

The noise maps were produced using computer based three dimensional noise models. This process requires the acquisition of information about the noise source, and the path of propagation. The specialised software takes account of physical features such as buildings and ground contours. The calculated grid noise levels are used to create the series of noise contour bands as shown on the [Scottish Noise Mapping](#) Invalid source specified. website.

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, determined over all the 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.

2.4 Data Reported to the European Commission

All member states were required to produce strategic noise maps for major roads, rail, airports, and industrial noise within agglomerations by June 2007. The Scottish Government met this target and the data flows, as required under [Article 10\(2\) of the Environmental Noise Directive \(2002/49/EC\)](#) ⁽¹⁾, were submitted to the European Commission on 19 December 2007.

As part of the Transportation Noise Action Plan development process the population noise exposure for 'places near' major roads with more than six million vehicle passages a year and places near major railways which have more than sixty thousand train passages per year, outwith the agglomerations of Edinburgh and Glasgow were determined. The Scottish Government has defined 'places near' as areas where the noise mapping indicates the L_{den} exceeds the 55dB noise contour and the L_{night} exceeds the 50 dB noise contour. A summary of this information is presented in Table 2 below.

Table 2: Population Exposure For Noise Sources as Mapped for The Environmental Noise Directive 2002/49/EC (END)

Total Population out with agglomerations of Edinburgh and Glasgow affected with Noise levels as shown						
Noise Level	L _{den} (dB)			L _{night} (dB)		
	> = 55	> = 65	> = 75	> = 50	> = 60	> = 70
Roads	191,000	44,600	1,600	115,900	20,200	100
Rail	20,500	5,700	100	14,300	3,300	0

The formula for L_{den} is described in Section 2.3 above.

Table 2 shows the estimated population affected by road traffic noise is significantly higher than rail noise. It is also clear that the population numbers predicted to be affected by noise levels decrease significantly as the banding level increases.

2.5 Description of the Area

For areas outwith the agglomerations of Edinburgh and Glasgow, round one of the Environmental Noise Directive requires places near major roads with more than six million vehicle passages a year and places near major railways which have more than sixty thousand train passages per year to be included in an Action Plan.

The noise mapping process has identified that sections of the following corridors or parts of the following areas are within round one of the Transportation Action Planning Process.

- A90 Corridor
- A9 and A90 Corridor
- Aberdeen area
- Alford
- Dumfries
- Edinburgh area out with the agglomeration of Edinburgh
- Elgin
- Fort William
- Glasgow area out with the agglomeration of Glasgow
- Huntly
- Inverness
- M8 and A8 Corridor
- M8, M9, A80, M80 Corridor
- M90 and A92 Corridor
- M74 Corridor
- M77 and A77 Corridor
- Oban
- Saltcoats

The spatial extent of these corridors and areas are shown in more detail in Appendix 1.

The nature of the road and rail network out with the agglomerations results in the areas under consideration consisting of parts of the major arterial routes leading to the cities and larger towns within Scotland. These routes consist of both trunk and local roads, and major

railways. The corridors included in round one are listed in tabular form, and are illustrated in a map, in Appendix 1 of this document.

The Scottish Government works with others to deliver transport policy objectives, and responsibility for road and rail transportation in Scotland is split between a range of organisations including the Scottish Government, Transport Scotland, the Local Authorities, and the Regional Transport Partnerships.

Transport Scotland works in partnership with private sector transport operators, local authorities, the Scottish Government, and the Regional Transport Partnerships (RTPs). Its remit includes overseeing delivery of the Scottish Government's major transport projects, management of the trunk road network and implementing parts of the National Transport Strategy.

Scotland's trunk road network covers about 3,500 kilometres of motorways and main roads, 1,900 bridges and 3,700 other structures. The asset is valued at £13.2 billion with an annual upkeep cost of approximately £160 million. The plan land area of trunk roads in Scotland is over 70 square kilometres, of which more than half, the verges and earthworks, is vegetated. This land area is spread over a wide network, passing through many different landscape character areas and habitat types. The soft verges and earthworks can be relatively wide in places, being over 100 m wide at some junctions on motorways.

Local authorities have a duty under the [Roads \(Scotland\) Act 1984](#)⁽²¹⁾ to manage and maintain local roads in their area and duties under the [Road Traffic Regulation Act 1984](#)⁽²²⁾ to secure expeditious, convenient and safe movement of traffic. Approximately 94% of Scotland's roads, around 56,000 km, are the responsibility of local authorities to manage and maintain.

The rail network in Scotland comprises 2,729 kilometres of railway, 23% of which is electrified. There are 344 stations leased by First ScotRail and 4 others operated by Network Rail (Glasgow Central and Edinburgh Waverley), GNER (Dunbar), or a private company (Prestwick International Airport). Two thirds of rail passenger journeys were supported by the west of Scotland commuter network, and one third were elsewhere in Scotland. The rail network in the west of Scotland is the most heavily used commuter network in the UK outside London.

Whilst Transport Scotland are funders of the rail network, the infrastructure is owned by Network Rail, a not for profit organisation. Passenger trains are operated by First ScotRail under a franchise agreement specified and let by Transport Scotland.

Freight plays an important part in Scotland's railways with 13.99 million tonnes of freight being moved in Scotland in 2005/2006, 9.5 million tonnes going to destinations outside Scotland whilst 2.56 million tonnes came into Scotland by rail.

Rail transport can reduce overall carbon emissions by encouraging modal shift from road to rail transport, however this modal shift may have an influence on future rail noise. This influence will require consideration.

It will be important, in delivering this Transportation Noise Action Plan, to ensure coordination and close working between the various organisations and professionals who have responsibility for transportation delivery within the areas covered by the plan.

2.6 Requirement for Noise Action Plans

The purpose of this Transportation Noise Action Plan is to describe how those organisations responsible for transportation delivery, and their strategic partners, should deliver their obligations under the Environmental Noise Directive.

The Directive was implemented in Scotland by the Environmental Noise (Scotland) Regulations 2006.

Action Planning is the process whereby environmental noise, as described in the Regulations, will be managed. Action Plans must be developed for places near the designated major sources. The Scottish Government has defined the term "places near" in terms of those areas receiving exposure levels as reported to the Commission, above L_{den} 55dB and L_{night} 50dB contour bands. These bands are shown on the Noise Maps noted earlier in Section 2.3 and are described in [Annex VI](#)⁽¹⁾ of the END.

2.7 Health Effects

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 about 70dB. Hence, it is normal to consider only "non-auditory" 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 the following:

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

Over the years, many reviews of the effects of noise on health have been conducted and published. Some examples are included in the Bibliography in Appendix 7^(23; 24; 25; 26; 27; 28; 29; 30; 31; 32)

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 for Research on Cancer](#)⁽³³⁾ (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, chance, where 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 the overall picture provided by these various reviews is considered, and the issue of availability of reliable quantitative relationships between noise exposure and effects (also called Dose-effect relationships), then three health effects remain for consideration in the Action Planning process, as follows.

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

Following consideration and review the Scottish Government, have at this stage in the Action Planning process, included the “Annoyance” health effect in the development of the Prioritisation Matrix described in Section 4. 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.

3. Action Plan Requirements

3.1 Noise Action Planning

The END requires the Competent Authority, in this instance the Scottish Government, to be responsible for the development of noise Action Plans. The END (Annex 5) lists the minimum requirements for each Action Plan. The Transportation Noise Action Plan must address priorities in 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 Table 3 below.

Table 3 Environmental Noise Directive minimum Action Plan contents and location in this document

No	Description	Location in this document
1	A description of the area out with the agglomerations, the major roads and major railways taken into account.	Section 2.5 Appendix 1
2	The authority responsible.	Section 3.1
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).	Ongoing
9	Any noise-reduction measures already in force and any projects in preparation.	Section 5
10	Actions which the competent authorities intend to take in the next five years, including any measures to preserve quiet areas.	Section 4.6 Section 5 Appendix 4
11	Long-term strategy.	Appendix 4
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 4.4
14	Provisions envisaged for evaluating the implementation and the results of the action plan.	Section 4.6 Section 5 Appendix 4

To take forward the development of the six Noise Action Plans the Scottish Government established a Steering Group to support Working Groups preparing each Action Plan. This process, its relationship to the development of the Transportation Noise Action Plan, and the working with key partners is described in Sections 3.2 to 3.4.

3.2 Competent Authorities and Key Partners

The Scottish Government is the Competent Authority for END and is responsible for drawing up this Transportation Noise Action Plan. In the development and preparation of this Action Plan, the Scottish Government has worked with key partners and stakeholders involved in END, and these are as follows.

- BAA Glasgow, Edinburgh and Aberdeen
- EWS
- First ScotRail
- Glasgow Prestwick Airport
- Hamilton and McGregor
- Relevant Local Authorities out with the agglomerations
- Network Rail
- Regional Transport Partnerships
- Transport Scotland

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 Transportation Action Plan process.

3.3 Noise Action Planning Steering Group

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, Local Authorities, SEPA, BAA, Transport Scotland, and Network Rail. SENSG has provided a forum for all key partners to review the development and progress of the six Noise Action Plans and to determine the prioritisation of intervention measures.

3.4 Noise Action Planning Working Groups

SENSG established and coordinated three working groups (Edinburgh agglomeration, Glasgow agglomeration, and Transportation) to prepare appropriate Action Plans. SENSG also works closely with the Airport Working Group who developed the Airport Action Plan. All four groups feedback on a regular basis to SENSG. This process will continue through the Action Planning consultation and implementation.

Diagram 1, below, illustrates the reporting structure for the Action Planning Process and also clarifies the responsibilities for delivering the Action Plans.

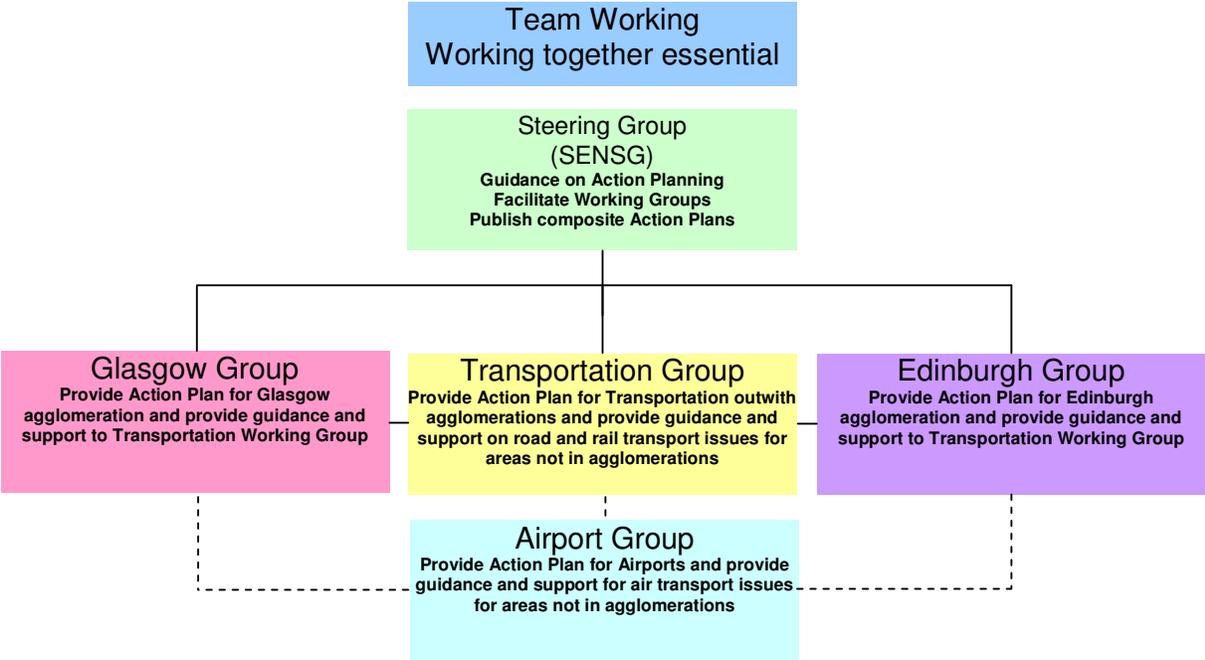


Diagram 1 – Steering Groups and Working Groups

4. Action Planning Process

4.1 Key Stages

The Action Planning process comprises five key stages as shown in the Table 4, below.

Table 4: Key stages of the Action Planning process

Stage	Description	Described in this document
Completed to Date		
1	Analysis of the strategic noise maps.	Section 4
2	Evaluation of existing UK, Scottish and Local Policies, Plans and Programmes.	Section 2.2 Appendix 6
3	Prioritisation and identification of Candidate Noise Management Areas (CNMA).	Section 4.2 to 4.4 Appendix 2
Actions to be carried out		
4	Identification of Noise Management Areas (NMA).	Section 4.5 Appendix 4
5	Evaluation of potential mitigation measures.	Section 4.6

Stages 1 and 2 of the Action Planning Process (Table 4 above) are complete and are described in earlier sections of this document. Stage 3, is also complete, and is the Prioritisation Process described in sections 4.2 to 4.4, below. Stages 4 and 5, which are described in this section of the document will be conducted as part of the first round Action Planning process.

4.2 Prioritisation

Whilst noise maps presented in the Scottish Government [Scottish Noise Mapping](#) Internet site ⁽¹⁹⁾ present the information from the first round noise mapping exercise in terms of 5 dB noise contours, it is not practical to use these contour maps alone to determine where the highest noise levels correlate with exposure of residential buildings. Furthermore, an examination of the consolidated maps does not reveal sufficient information regarding the specific noise source (road, rail, or industrial) affecting noise sensitive properties.

Article 1 of the END states:

“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.”

A process for complying with Article 1 of the END was therefore required. This process is the prioritisation process described in Section 4.3, below. The process is a method of determining areas where the predicted road and rail noise levels are likely to cause most annoyance to people potentially affected.

4.3 Development of the Prioritisation Process

The purpose of prioritisation is to establish those locations within the areas described in Section 2.5 where people are most likely to be annoyed by noise and that may require noise intervention or management, and to determine the order and process of this intervention or management in line with the aim of Article 1 of the END as reproduced in Section 4.2, above.

The prioritisation evaluates strategic noise levels determined from the first round noise maps, in terms of the road, railway, and aircraft source areas most likely to cause annoyance to people potentially affected. This will enable appropriate actions to be taken at locations selected on the basis of noise levels, the number of people potentially affected, and the annoyance response to the particular noise source; road, railway, and aircraft.

The prioritisation process has been undertaken through a noise assessment process known as a Prioritisation Matrix. The matrix has been developed in a transparent and consistent manner to inform all of the action plans being progressed and uses Geographical Information System (GIS) software to analyse the data. Although the matrix provides a focus for action planning, due to the strategic nature of the mapping, a check on the strategic noise levels, the matrix input data and any proposed interventions will be essential prior to the implementation of any suggested actions. This check will be undertaken as an early measure in the action planning process (see Section 4.5).

The Prioritisation Matrix for the transportation plan has involved the segmentation of the road and rail networks identified from the round one noise mapping (Appendix 1) into 100m sections. Using the noise mapping information, each building was assigned a score based on the predicted noise level and the number of people living in that building that are predicted to be annoyed by the source of noise. These scores are known as the Building Prioritisation Scores (BPSs). Each building (with its associated BPS) is then assigned the ID of the 100m segment closest to it. The BPS values for all buildings with same 100m segment ID are then logarithmically summed. This summation value is then assigned to the 100m segment to give the resultant Source Prioritisation Score (SPS) for that segment.

All of the SPS values are then prioritised in a manageable list for consideration in the action planning process. Whilst it is clearly desirable to start with the areas with 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. Following consultation with all END working groups it was decided to identify the top three percent of the road and railway network assessed in terms of the highest three one percent bands of the SPS scores. The top one percent were then colour coded red, the next one percent colour coded amber, the next one percent colour coded green, and the remainder colour coded as grey/black.

The Prioritisation Matrix is explained in more detail in Appendix 2.

4.4 Assigning Candidate Noise Management Areas

The colour coding of the SPS described in Section 4.3, above, was the basis for determining Candidate Noise Management Areas (CNMAs). Those areas with a red banding (the highest 1% of SPS scores) have been allocated CNMA status. The prioritisation process is described in further detail in Appendix 2 and the areas with CNMA status are described and mapped in Appendix 3.

An initial analysis of the total number of Candidate Noise Management Areas, using the bandings within Table 2, indicates 14,542 people in total are affected by road noise and 366 people in total are affected by railway noise in the CNMAs.

4.5 Assigning Noise Management Areas

The areas with CNMA status are shown in Appendix 3. During the implementation of the Action Plan, a review process will be applied to each CNMA to determine whether it should become a Noise Management Area (NMA). 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 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.

The CNMA to NMA review process will, amongst other steps, seek to verify the findings of the noise model. This will involve checking, and updating where necessary, the data used in the Prioritisation Matrix. It will also involve a comparison of noise model assumptions regarding physical features with actual conditions on the ground (for example, presence of roadside noise barriers). The stages of the proposed CNMA to NMA review process are presented in Table 5 below.

Table 5: CNMA to NMA Checking Process

Stage	Item	Data to be reviewed
1	Assess Model input data	Traffic flow Traffic composition Traffic Speed Surface type Gradient Topography
2	Existing mitigation measures	Existing sound insulation Existing noise barriers Building orientation

The assignment of Noise Management Areas and subsequent appraisal, planning, and implementation of mitigation measures in the NMAs form the core part of the Action Planning Process. The process of identification and prioritisation of actions to tackle noise in the NMAs is described further in Section 4.6, below.

When Noise Management Areas have been identified they will be annexed to this plan at Appendix 8

4.6 Core Elements

In 1996, the [European Commission Green Paper on Noise \(1996\)](#) ⁽⁴⁾ noted the financial impact of noise on society, with respect to the European Union, this has been estimated to range between 0.2% to 2% of GDP. In addition, the Paper noted noise contributes greatly to reducing city dwellers' quality of life and may lead to health problems. There is a clear benefit to society to reducing environmental noise. At the same time however, reducing noise levels in identified NMA locations will often involve interventions requiring potentially significant expenditure and cost.

As part of assessing and identifying potential noise reduction measures in NMAs, it will be necessary to develop criteria to determine whether practical and cost effective noise mitigation measures can be implemented. In this way the available resources can be allocated to permit such measures to be implemented where benefit is justified and where the noise reduction potential is greatest.

The criteria for consideration when developing the prioritisation of actions in NMAs may include the following.

- Identifying the noisiest locations that affect the most people.
- Identifying the location of nearby sensitive buildings.
- Achieving effective noise reduction for the affected population.
- Minimising whole life cost.
- Reviewing existing maintenance and improvement programmes to identify when and how interventions can be implemented.
- Minimising disruption.
- Identifying appropriate and balanced Value for Money criteria.

Technical Guidance will be provided to assist in this prioritisation process however it is envisaged that this will be developed further by the Scottish Environmental Noise Steering Group. Thereafter a timetable and programme for a series of interventions, within the limits of available resources and alignment with planned maintenance, would be developed through the period of the first round Action Plan process (to 2012). The later stages of this planning period will also involve preparation for the second round of noise action planning required by the Environmental Noise Directive.

These core processes will be supported, as appropriate, by other activities including participation in, and drawing on, relevant research and development in noise assessment and management. A description of the generic nature that such supporting measures may involve is provided in Appendix 4.

5. Aligning Noise Action Planning

5.1 Planning and Noise

The relationship between the planning system and noise was highlighted in Section 2.2. [Planning and Advice Note 56 \(PAN 56\)](#)⁽¹⁶⁾, builds on principles set out in [SDD Circular 10/1999 Planning and Noise](#)⁽³⁴⁾.

In broad general terms, PAN 56 provides the following advice:

- How noise issues should be handled in development plans and development management.
- Ways of mitigating the adverse impact of noise.
- Specific guidance on noisy and noise-sensitive development.
- Guidance on the use of planning conditions relating to noise.

The transposition of the END into the Environmental Noise (Scotland) Regulations 2006 alters the backdrop on which noise should be considered in terms of planning. NMAs may be shown in development plans, however the 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 noted earlier in Section 2.3 it is important to appreciate the contour maps illustrate average noise levels, for an average weekday, in the year of calculation, on the basis of a 10m grid, at a height of 4m above ground level, and therefore cannot be used to determine noise levels for any specific property. Consequently, it would not be appropriate to use the noise contours to categorise any site at ground floor level in terms of the Noise Exposure Categories given in PAN 56.

5.2 Aligning with Policy

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 impacts on transportation noise. There is also a range of international initiatives providing direction to the strategy of noise reduction. It is important the Transportation Noise Action Plan is delivered in a joined up way that takes account of these other policies so as to optimise outcomes. Relevant policy initiatives are highlighted in this section and some current technical and research developments are presented in Section 5.3.

At a national level, [Scotland's National Transport Strategy](#) (SNTS)⁽³⁵⁾, published in December 2006 by the Scottish Government, recognises transport provides a significant and positive contribution to economic growth, and to the prosperity and quality of life of Scottish people. The document built on the background of a range of documents including [Scotland's Transport Future – Transport White Paper 2004](#)⁽³⁶⁾ and [Choosing our future: Scotland's sustainable development strategy](#)⁽³⁷⁾, which recognised a need to work in partnership with local authorities, regional transport partnerships and transport operators to achieve the objectives.

The SNTS document recognised 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.

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

Transport Scotland has begun the Strategic Transport Projects Review⁽³⁸⁾ (STPR), 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 later in 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. Strategic Environmental Assessment, including assessment of the potential for transport noise emissions, will be a significant component of this review.

To provide clarity on nationally significant transport priorities two major elements of the Strategic Projects Review, 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⁽³⁹⁾ 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)⁽⁴⁰⁾ 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 Transportation Noise Action Plan has a clear cross cutting role with this aspiration.

With respect to road networks, the Road Asset Management Plan for Scottish Trunk

Roads April 2007 to March 2009 ⁽⁴¹⁾ 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 ⁽⁴²⁾ 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.

At a local level, Local Transport Strategies have an important role to play in reducing noise. The strategies will help, for example, secure, or support modal shift to sustainable modes such as walking, cycling, and public transport. 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.

5.3 Relevant Current Initiatives

As part of the design of all new trunk road projects, the Design Manual for Roads and Bridges (DMRB) ⁽⁴³⁾ contains guidance on how to assess and mitigate noise. Revised guidance on the assessment of noise and vibration in DMRB Volume 11 (Environmental Assessment) is expected later in 2008. Further mitigation measures such as the use of low noise road surfacing and noise barriers, where appropriate, will be taken forward as part of new schemes, to reduce the impacts of traffic noise on sensitive receptors. Wherever possible, however, the principle of environmental assessment for new road projects is to ensure that adverse noise and other environmental effects are avoided or reduced as far as possible through good project design.

At a national level Transport Scotland will look to influence technology choices when railway 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 ⁽⁴⁴⁾ and conventional rolling stock (2001/16/EC) ⁽⁴⁵⁾ 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 (resin based) materials, rather than cast iron tread brakes. This leads to much smoother wheel running surfaces and a subjective 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⁽⁴⁶⁾.

At a UK research level the Construction Industry Research and Information Association (CIRIA) are currently taking forward a Noise and Vibration Issues in Urban Development⁽⁴⁷⁾ 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 derive practical solutions.

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⁽⁴⁸⁾ and an Examination of Vehicle Noise Test Procedures⁽⁴⁹⁾, two areas where a reduction in transport noise could be achieved.

Further discussion on areas of research and development, which may be pursued in support of the Transportation Noise action planning process, are discussed in Appendix 4.

6. Next Steps

6.1 Preparing for Round Two Mapping and Action Planning

The current working group system has proved to be effective in developing this Transportation Noise Action Plan. Consideration will be given to the form in which the group will continue in order to facilitate ongoing planning work (including identification of NMAs), implementation of actions, and the development of future plans following the required five yearly review of the noise maps.

Appendix 1 – Areas Outwith the Agglomeration in Round One Mapping

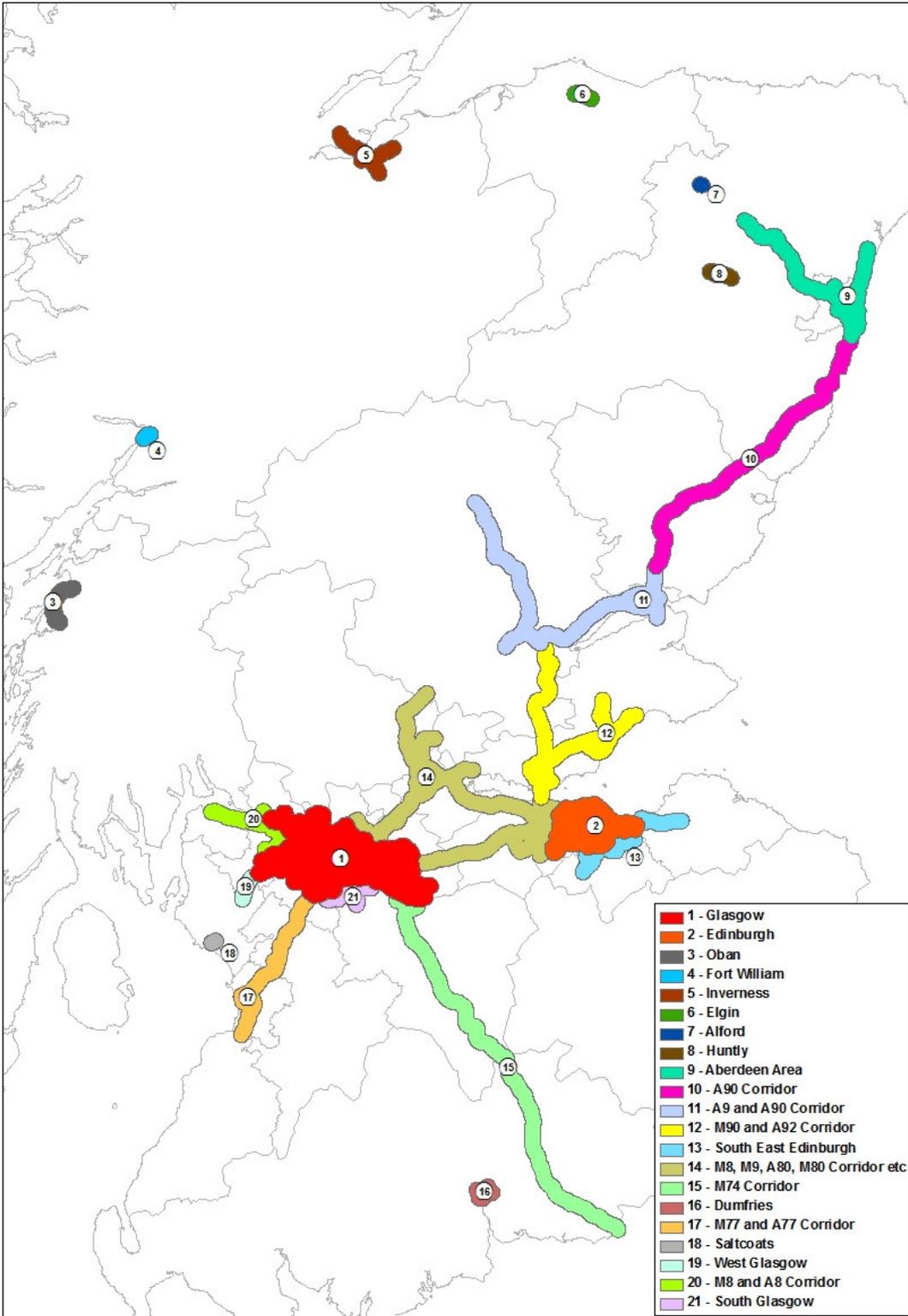


Figure A1.1 All Noise Mapped Areas Within Round One of the END (Glasgow and Edinburgh Agglomerations shown for reference only)

Table A1.1 : List of areas in Round One Noise Mapping

No	General Area	Main Routes	Approximate Length (km)
1	Oban	George Street, Dunollie Road	14
2	Fort William	A82	2
3	Inverness	A9, A96	24
4	Elgin	East Road, Alexandra Road A96	5
5	Alford	A96	<1km
6	Huntly	Parkhill Road	6
7	Aberdeen Area	A96, A90, Great Northern Road	84
8	A90 Corridor	A90, B966, A926	88
9	A9 and A90 Corridor (Dundee)	A90, A9, M90, A92	113
10	M90 and A92 Corridor	M90, A92, A915, A907, A921, B981, A90, A823	107
11	South East Edinburgh	A1, A701, A7	43
12	M8, M9, A80, M80 Corridor	M9, M8, M876, M80, A71, A9, A91	215
	M74 Corridor	A74 (M), M74, A71	137
14	Dumfries	A701, A75, A76	7
15	M77 and A77 Corridor	A77, M77, A79, A70, A713	57
16	Saltcoats	A738, Kilwinning Road	1
17	West Glasgow (Lochwinnoch)	A737, Belltrees Roads	14
18	M8 and A8 Corridor (West Glasgow)	Greenock Road, Ferry Road, M8, Glasgow Road	41
19	South Glasgow	A726, A725	54
Total		All Rail	120
Total		All Roads	1020
Total		Overall	1140

Please note the length of road (km) shown in the table above is approximate and is provided to give an indication of the general scale of area. Similarly, road numbers and names have been assigned using the original input road traffic data, to give an indication of the roads being considered. Other smaller roads may also be included in the areas.

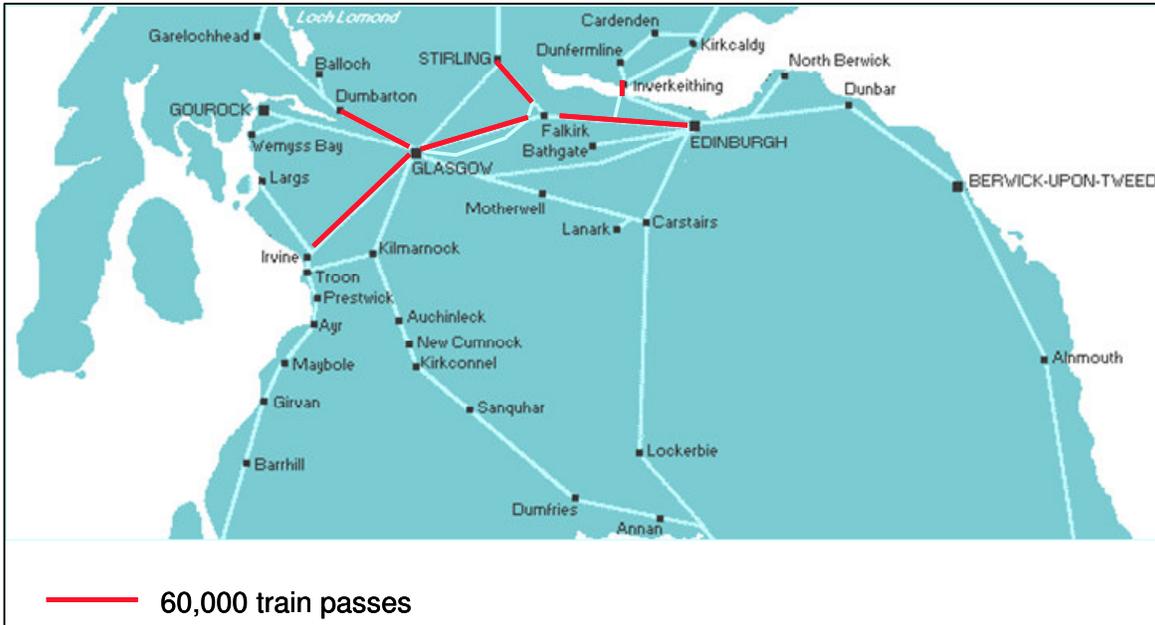


Figure A1.2 Rail routes within Round One of the END (Routes within Glasgow and Edinburgh Agglomerations shown for reference only)

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 building²
- The population density³
- The Annoyance response⁴

The BPS for each building is then calculated as follows:

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

² All address points that lie within a building are used

³ using a multiplication factor of 2.36 for each Address Point. From Scot-Tag

⁴ 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

Where:

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.

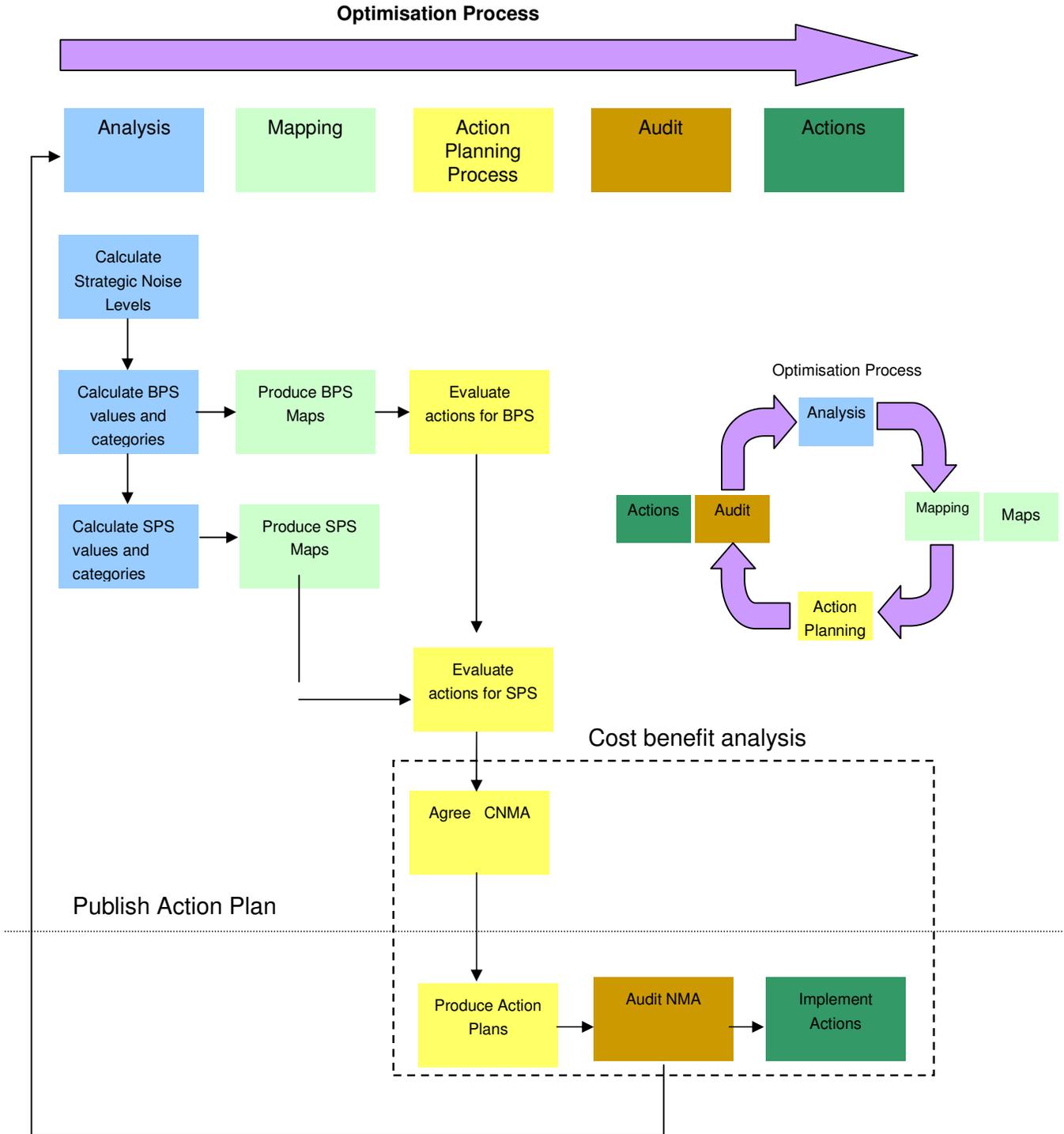
Once calculated, the road and rail network with assigned SPS values are ranked into four categories, based on each section's SPS. To initiate the prioritisation process for each noise source the initial categorisation used is as follows: 1%, 1%, 1%, 97%, from highest to lowest.

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.

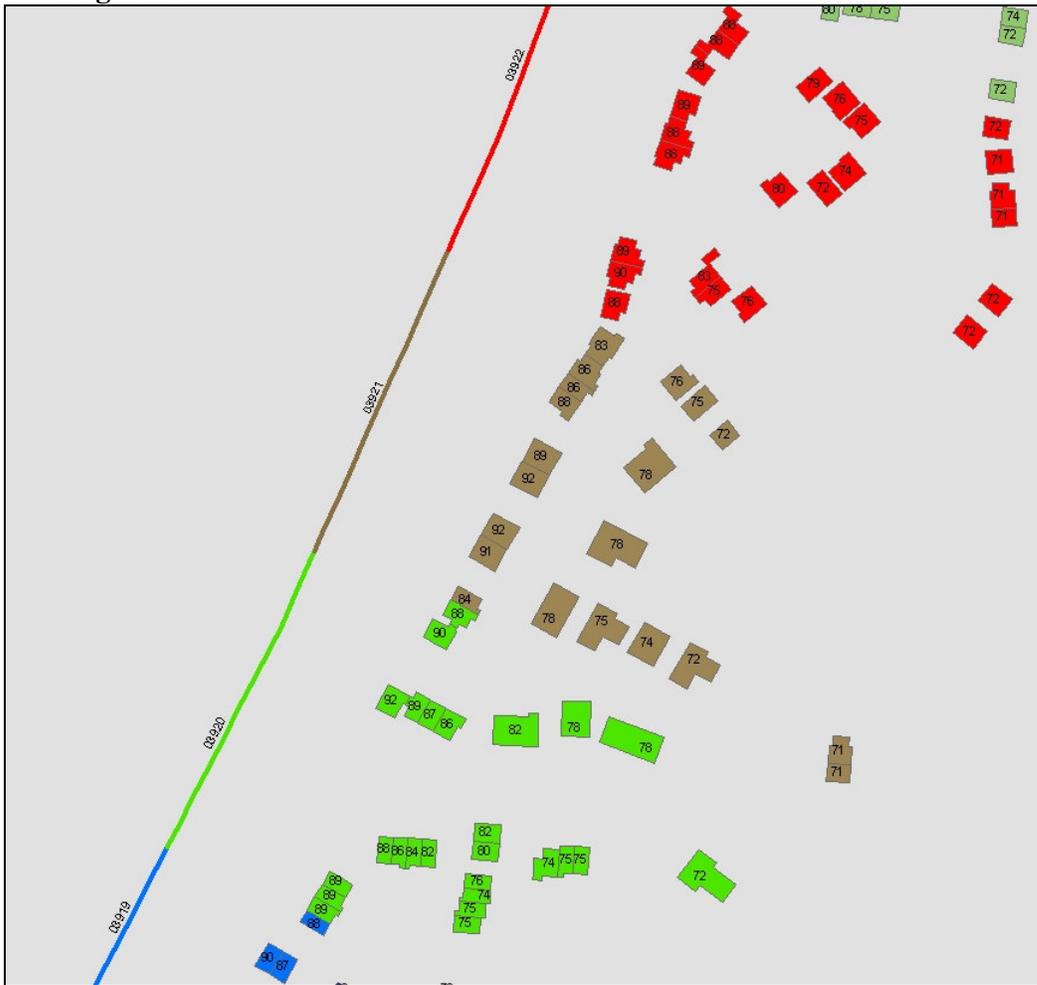
A2.6 Prioritisation Matrix



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 – Candidate Noise Management Areas

Table A3.1 : List of Road Candidate Noise Management Areas Illustrated in Figure A3.1 Below

Road CNMA Areas: Top 1% Red Areas			
Map	Road	Area	Approximate Location (see maps)
1	M74	Clydesdale	Near Strathaven Road, Rogerhill Gait, Turnpike Road and Ramsey Gardens
2	M74	Larkhall	Near Laurel Drive and Donaldson Road
3	A721	Motherwell	Craigneuk Street, Meadowhead Road
4	A723	Hamilton	Motherwell Road , Near Blackswell Lane
5	A725	Blantyre	Near Kirkton Avenue
6	A725	East Kilbride	Kingsway Road, and Hamilton Road
7	A726	East Kilbride	Queensway Road, Rothesay Street, Sinclair Place, and Strathaven Road
8	B761	East Kilbride	West Mains Road, Near Inchcolm Place and Beaully Place
9	B764	East Kilbride	Eaglesham Road, Near Westport Street
10	A727	Thornliebank	Nitshill Road, Near Kylerhea Road
11	A77	Kilmarnock	Near Graham Place and Macbeth Drive
12	A77	Kilmarnock	Near Osprey Drive
13	A737	Linwood	Near Kintyre Avenue
14	M8	Bishopton	Near Queens Drive
15	A82	Dumbarton	Dumbarton Road Near Crannog Road
16	A814	Dumbarton	Glasgow Road, Near Park Street,
17	A8	Inverclyde	Greenock Road, Near Belhaven Street and Bay Street
18	A78	Inverclyde	High Street, Greenock
19	M80	Springburn	Near Sheila Street
20	M8	Baillieston	Near Crossview Place (Baillieston Roundabout), Baillieston
21	M8	Kirk of Shotts	Near Forrest Road, Salsburgh
22	M74	Clydesdale	Near Leadhills Road, Abington
23	A74(M)	Clydesdale	Near Carlisle Road, Crawford
24	A701	Penicuik	Edinburgh Road and John Street, Near Carnethy Avenue,
25	A701	Midlothian	Near Belwood Crescent
26	A701	Midlothian	Straiton Road, Near Straiton Mains Street
27	A90	Almond	Near Cramond Brig Toll Street) and Maybury Road (Near Barntongate Avenue)
28	A991	Maryfield	Marketgait, West Marketgait Road, and South Marketgait (Near Gellatly Street)
29	A92	Dundee	Broughty Ferry Road, Near Carolina Court Street

Road CNMA Areas: Top 1% Red Areas			
Map	Road	Area	Approximate Location (see maps)
30	A90	Dundee	Kingsway, Near Myrekirk Terrace, Balgarthno Terrace and Brownhill Place
31	A90	Dundee	Forfar Road Hebrides Drive
32	A90	Stracathro	North-East of Northwaterbridge
33	A9013	Aberdeen	Union Street, King Street, and St Clair Street
34	A956	Aberdeen	King Street, Near Seaton Place East
35	A96	Elgin	Alexandra Road, South College Street, and East Road
36	A9	Inverness	Near Mackintosh Road at Raigmore Interchange
37	A82	Inverness	Near Wells Street) and Longman Road near George Street and Harbour Road
38	A82	Fort William	Near High Street and Croft Road

Figure A3.1 - Map of Road Candidate Noise Management Areas Shown Over the Backdrop of Routes Shown in Figure A1.1 of Appendix 1

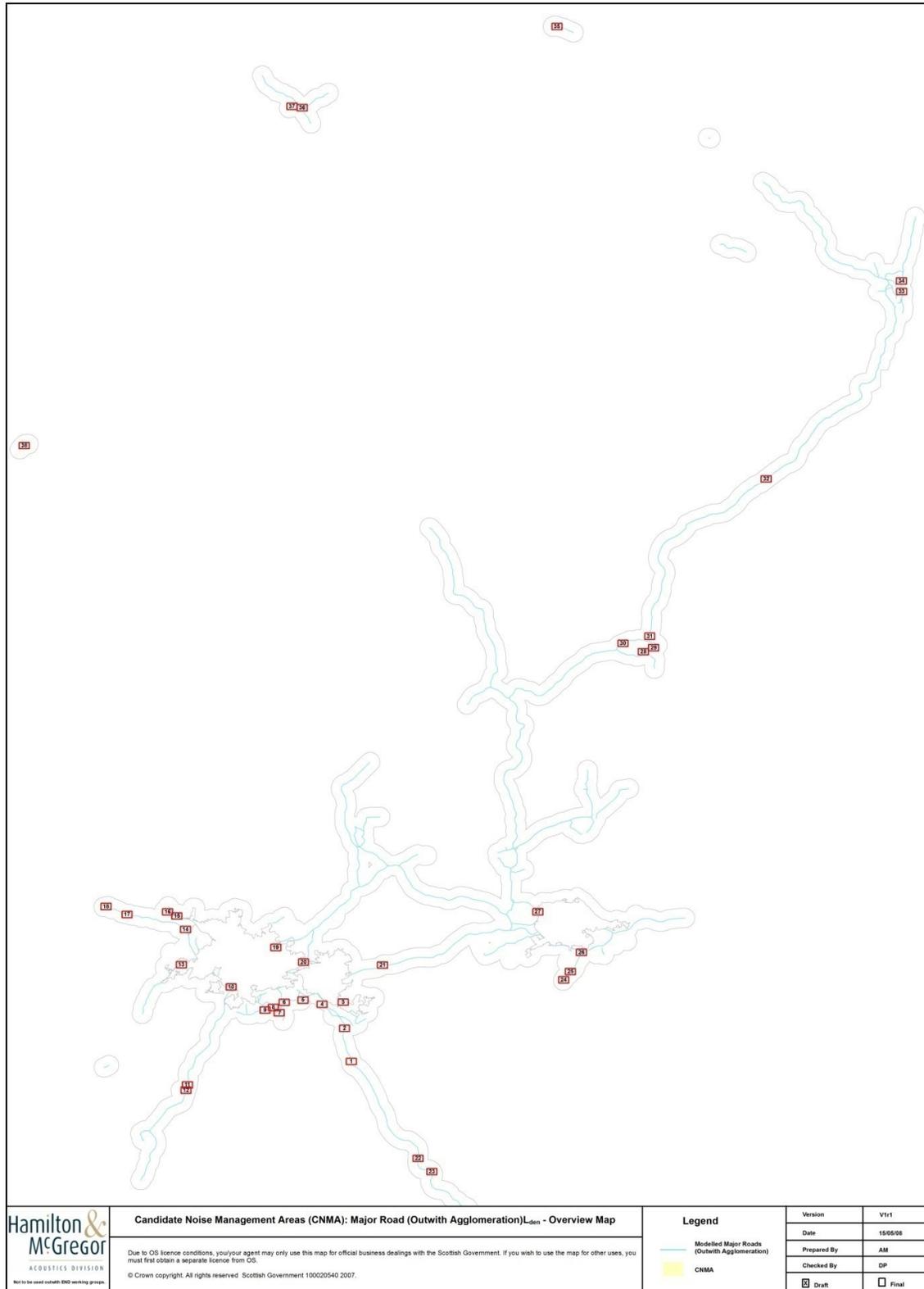
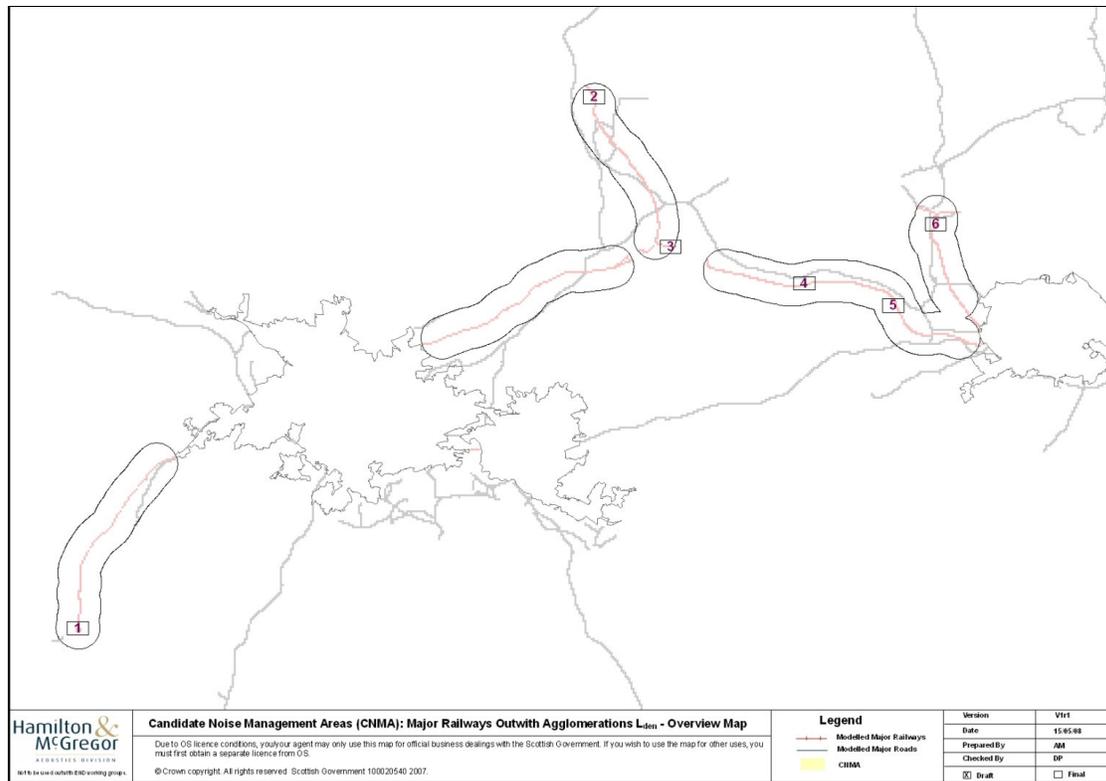


Table A3.2: List of Rail Candidate Noise Management Areas illustrated in Figure A3.2 below

RailCNMA: Top 1% Red Areas			
Map	Rail	Area	Approximate Location (see maps)
1	Glasgow -Ayr	South West Glasgow	Near Pennyburn Road, Kilwinning,
2	Glasgow - Edinburgh-Perth	Stirling	Near Cornton Road, Causewayhead
3	Edinburgh-Glasgow	Camelon	Near Nailor Road,
4	Edinburgh-Glasgow	Linlithgow	Near Union Road and Edinburgh Road (A803)
5	Edinburgh-Glasgow	West Edinburgh	Near Craigton Place, Station Road, Winchburgh
6	Edinburgh-Aberdeen	Inverkeithing	Near Cleveland Drive and Church Street

Figure A3.2 - Map of Rail Candidate Noise Management Areas



Appendix 4 – Action Plan Core Elements and Supporting Measures

Core Elements

The Core Elements of the Action Plan are as follows.

- 1 Assessment of Candidate Noise Management Areas (CNMA) and Identification of Noise Management Areas (NMA).
- 2 Develop cost benefit analysis tools.
- 3 Application of cost benefit analysis tools and evaluation of potential mitigation measures.

Supporting Measures

In addition to the Core Elements noted above and as described earlier in Section 4.6 of this document, a range of supporting measures would help ensure that the Core Elements are delivered in a broad cross cutting manner which aligns with planned investments on the transport networks and which takes account of innovation in noise assessment and planning.

An important aspect of delivering the Transportation Noise Action Plan will involve education and sharing of knowledge across the various organisations and professions involved in the process. This could include sharing knowledge, capturing good practice, and seeking specific stakeholder involvement in the various stages of the Action Planning process. It may also involve, for example, raising awareness of the cost and effectiveness of the range of noise reducing solutions available, engaging with others to inform the cost benefit analysis approach, and capturing examples of noise reduction where they occur.

Research will have a significant role to play in achieving the objectives of this Action Plan. The gathering of existing relevant research, and commissioning new research where appropriate, will ensure future actions are rooted in a robust evidence base. It will be important to identify, appraise, and add to where effective, sources of relevant and peer reviewed, publicly available information on noise related issues. For example, this may include reviewing the impact of modal shift on noise, collating information on the effectiveness of mitigation measures, such as barrier and surface type, and identifying the way forward for quieter forms of transport.

Over the life of the plan, it is likely that data used in the noise model will be refined as progress is made towards the development of the second round mapping required by the Environmental Noise Directive. This may involve auditing the input data streams, working with others to improve the flow of data to and from the noise model, and developing with traffic modellers a consistent method of setting out the data to maximise its value to the process.

These processes will help identify and appraise technical and design related measures, to reduce noise on transport networks, which could be considered and deployed in the future. These developments would be appraised, in terms of their cost-benefit, as part of the core noise planning process described above. Where a clear case can be demonstrated for new technologies then the various agencies involved in the delivery of transportation will be better informed in any decisions to bring forward such measures as part of programmed network investments (for example, as part of planned maintenance).

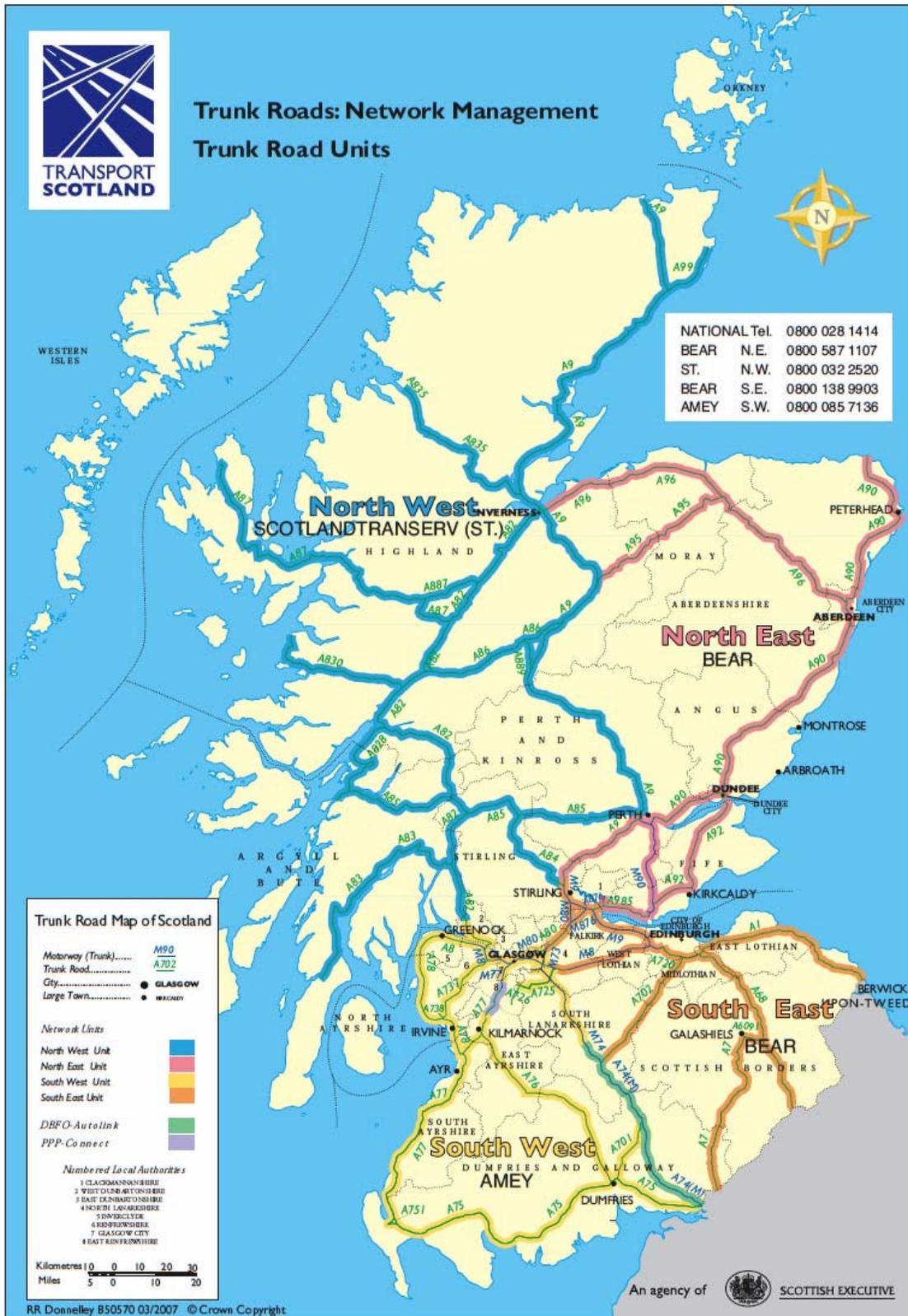
The format for the delivery of these supporting activities could include specific events such as seminars, combined with ongoing engagement with industry and non-governmental organisations, as opportunities arise, throughout the five years of the Action Plan.

Appendix 5 – Scotland’s Strategic Transport Infrastructure

Figure A5.1 - Scotland’s Key Infrastructure



Figure A5.2: Trunk Roads: Network Management Trunk Road Units



Appendix 6 - Strategic Environmental Assessment

A Strategic Environmental Assessment (SEA) is a systematic process for identifying, predicting, and where possible avoiding, significant adverse environmental impacts when 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](#) ⁽⁵⁰⁾ ('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 the scoping report is to identify the environmental issues to be taken into consideration during decision-making. The scope of the SEA depends on the following:

- 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 preparation of an 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 A6.1 below explains what has been scoped in/out and provides 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 Internet site](#) ⁽¹⁹⁾. 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 A6.1: Table of Environmental Characteristic and Justification for Scoping.

Environmental Characteristic	Key Potential Environmental Effect of NAP	Scoped In/Scoped Out	Justification
Population and Human Health	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
Biodiversity, Flora, Fauna	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

Environmental Characteristic	Key Potential Environmental Effect of NAP	Scoped In/Scoped Out	Justification
Soil	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
Water	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
Air, Climatic Factors	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
Cultural Heritage, Material Assets	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
Landscape	Changes to landscape character; landscape quality; landscape features; Regional Scenic Area.	In	Designation of Quiet Areas may enhance landscape quality

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Appendix 8

**TRANSPORTATION NOISE ACTION
PLAN UPDATE : NOISE
MANAGEMENT AREAS**

November 2010

The Environmental Noise Directive (END) was published in the official Journal of the European Union in July 2002. The Scottish Government in recognition of their devolved responsibility to deliver the requirements of the END legislation published The Environmental Noise (Scotland) regulations 2006 on 05 October 2006.

The END requires that strategic mapping of certain sources (major roads, rail and airports) and areas (large cities) of the EU be carried out to ascertain those areas where environmental noise might need to be managed. The areas mapped are then detailed in follow up Noise Action Plans.

In Scotland this has included six Noise Action Plans, one each for the Glasgow and Edinburgh agglomerations, one for Transport out with Glasgow and Edinburgh and three plans for Edinburgh, Glasgow and Aberdeen airports. The first three plans included areas where the strategic noise mapping had identified where environmental noise might need to be managed. Under the approach taken in Scotland these areas are called Candidate Noise Management Areas (CNMAs). The next stage in the process was to check in more detail if such areas should actually become Noise Management Areas (NMAs.)

Transport Scotland, working with appropriate Local Authorities, produced the Transportation Noise Action Plan (TNAP), which was published on 25 May 2008 by the Scottish Government. This identified 45 Trunk Road and 11 Railway Candidate Noise Management Areas (CNMA) requiring further investigation.

Transport Scotland have been taking forward the more detailed assessment work of the CNMAs in the Transport Action Plan and have concluded that there should be 10 NMAs, all linked to road noise sources.

The following table lists the Noise Management Areas (NMAs). Each is described by reference to a Map, Candidate Noise Management area and indicated the nearest community to the area. The form of this information is common to all the Noise Management Areas.

Map	CNMA	Road	Nearest Community	Area
2	5	M74	Larkhall	Larkhall
5	9	A725	High Blantyre	Lanark
11	20	A77	New Farm Loch	Kilmarnock
11	21	A77	New Farm Loch	Kilmarnock
18	29	A78	Greenock West	Greenock
21	33	M8	Kirk O' Shotts	Salsburgh
30	46	A90	Menzieshill	Dundee
30	47	A90	Menzieshill	Dundee
30	48	A90	Menzieshill	Dundee
36	58	A9	Raigmore	Inverness

The next stage in the process is for Transport Scotland to consider appropriate mitigation measures for the NMAs.