

M80 NOISE MODELLING REPORT

Bilfinger RE Asset Management Ltd

3513048C

Issue 3

M80 Noise Modelling Report

3513048C

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CONTENTS

	Page
Executive Summary	9
1 Introduction	11
1.1 Context	11
1.2 Study Area	11
2 Legislation and Contract Documents	12
2.1 Calculation of Road Traffic Noise (CRTN), 1988	12
2.2 Contract Requirements	12
3 Methodology	13
3.1 Liaison	13
3.2 Noise Survey	13
3.3 Noise Modelling	14
4 Results	16
4.1 Noise Survey	16
4.2 Noise Modelling	16
5 Investigation of Non-Compliant properties	18
6 Conclusions	19
6.1 Summary	19
Appendix A – Glossary of Terms	20
Appendix B – Noise Survey report	22
Appendix C – Noise Modelling Assumptions & Traffic Data	23
Appendix D – ES Noise Sensitive Receptors	24

EXECUTIVE SUMMARY

Parsons Brinckerhoff (PB) has been instructed by Bilfinger RE Asset Management Ltd on behalf of Highway Management (Scotland) Limited to undertake a noise assessment for the M80 motorway between Stepps and Haggs. The purpose of the assessment is to assist Highway Management (Scotland) Limited in discharging the following obligations as part of the O&M phase:

- Schedule 2 of the New Work Requirements.

The above schedules relate to the assessment of post-construction noise levels at properties defined in the Environmental Statement (ES).

A noise survey was undertaken in August 2014 at representative locations along the scheme. A computer noise model using CadnaA was prepared for the pre-construction and post-construction scenarios of the scheme. Noise predictions were undertaken in accordance with the methodology described in the memorandum 'Calculation of Road Traffic Noise' (CRTN).

Pre-construction and post-construction noise levels are reported for 121 representative receptors. Noise levels predicted for the post-construction scenario have been compared against the pre-construction (2008) and the ES 2010 with scheme and mitigation results.

Results of the assessment indicate that 117 locations are compliant with the contractual requirements. Of the 4 locations that are not compliant, the differences are explained by factors unrelated to the physical works on the M80 for three locations, and due to a noise barrier that was not included in the final scheme for the other location.

1 INTRODUCTION**1.1 Context**

1.1.1 Parsons Brinckerhoff (PB) has been instructed by Bilfinger RE Asset Management Ltd on behalf of Highway Management (Scotland) Limited to undertake a noise assessment for the M80 motorway between Stepps and Haggs to assist with discharging the obligations on the Design, Build, Finance and Operate (DBFO) Contract - O&M phase. These are defined in Schedule 2 of the New Work Requirements on the scheme.

1.1.2 This report details the outcome of the following agreed scope of work:

- Prepare a noise model using CadnaA and CRTN for pre-construction (2008) and post-construction (2012) scenarios of the scheme;
- Undertake a noise survey at various locations for validation of the noise model;
- Report the post-construction ambient noise levels (noise model) for the 121 representative noise sensitive locations given in the Environmental Statement (ES);

1.1.3 **Appendix A** presents a glossary of acoustic terminology.

1.2 Study Area

1.2.1 The study area for the noise model consists of a calculation area which is 300m either side of the new and existing roads surrounding the M80 scheme. This is the extent of validation for the CRTN prediction methodology.

1.2.2 It should be noted that the majority of these buildings are single dwellings comprising of two floor levels. A limited number of properties correspond to multi-storey buildings; receptors have also been included at higher floors, where applicable. The 121 noise sensitive properties assessed in the ES have been reported.

2 LEGISLATION AND CONTRACT DOCUMENTS**2.1 Calculation of Road Traffic Noise (CRTN), 1988**

2.1.1 This memorandum describes the methodology to calculate the road traffic noise at a given distance from the highway.

2.1.2 The methodology takes into account the intervening ground cover, road configuration and road layout. The calculation assumes a typical traffic and noise propagation conditions. Noise levels are presented in terms of the noise descriptor $L_{A10,18h}$ which is the arithmetic average of the noise level exceeded for 10% of the time between 06:00 and 24:00 hours.

2.1.3 The variables used in the calculation of the traffic noise level are:

- The annual average week day traffic flow (AAWT) for the 18-hour period from 06:00 to 24:00 hours;
- Mean traffic speed;
- Percentage of heavy vehicles;
- Road gradient;
- Type of road surface;
- Distance of the receptor from the road;
- Nature of the ground cover between the road and the receptor;
- Screening and reflection effects.

2.1.4 It has been agreed with Bilfinger that the CRTN method would be used for the purposes of the modelling.

2.2 Contract Requirements***Schedule 2***

2.2.1 The DBFO contract includes a number of clauses relating to potential noise impacts under Schedule 2. Clause 4.8 sets out the requirements for Traffic Noise and Vibration.

2.2.2 Paragraph 4.8.2 (i) sets out criteria to be met for noise levels due to traffic movements which upon completion of the New Works are to be no greater than those recorded in pre-construction noise survey (as per App 1/9 to Part 3 of the New Works Requirement for those parts of the scheme that are adjacent to the on-line section. For receptors adjacent to the off-line section, the ES 2010 with mitigation levels should be taken as a maximum level not to be exceeded.

2.2.3 Paragraph 4.8.2 (iii) requires a post-construction ambient noise assessment to be carried out to demonstrate that the Design complies with the requirements of 4.8.2. This report is presented in full compliance with this requirement.

3 METHODOLOGY

3.1 Liaison

3.1.1 A meeting was held on 25th February 2014 to agree on the noise survey, modelling and assessment methodologies. The following bullet points summarise the agreement:

- The noise survey will be undertaken in accordance with the shortened measurement procedure in CRTN for the purposes of validating the CRTN noise model;
- Four CRTN monitoring locations will be undertaken during a typical working day, as suitable weather conditions allows. Measurements will record the noise parameters L_{Aeq} , L_{A90} , L_{A10} , L_{Amax} and L_{Amin} for 3 x 1 hour periods;
- A noise model will be produced for the scheme. The model will be prepared using CadnaA and two scenarios will be created: pre-construction (2008) and post-construction (2012). The model will be based on existing noise models. Traffic data will be provided.

3.1.2 After the meeting, further liaison was made with the project team to discuss the information received and assumptions in the model. These are further detailed later in this report (Methodology – Modelling).

3.2 Noise Survey

3.2.1 A survey was conducted between 19th and 20th August in accordance with the shortened measurement method (Paragraph 43) from CRTN. The results of the CRTN survey have been used to validate the road traffic noise model. The guidance and reporting requirements set out in BS7445-2:1991 '*Description and measurement of environmental noise. Guide to the acquisition of data pertinent to land use*' have also been followed. **Appendix B** presents the noise survey report detailing the methodology results and calibration certificates of the equipment used in the survey.

3.2.2 Short-term CRTN noise measurements were undertaken at 4 locations along the scheme, as illustrated in **Figure 1** (overleaf). One series of 3 x 1-hour measurements were conducted at each of these locations at 1.5m above ground level.

3.2.3 The following parameters were recorded: L_{Aeq} , L_{A90} , L_{A10} , L_{Amax} and L_{Amin} using fast time weighting and A-weighted frequency network. Measurements were made in the absence of precipitation and the wind from source to receiver was recorded as less than 3m/s as identified in **Appendix B**.

Figure 1: Noise Survey Locations



3.3 Noise Modelling

3.3.1 A road traffic noise model for the scheme was prepared using CadnaA. Noise predictions were undertaken following the methodology described in CRTN.

3.3.2 The following bullet points summarise the sources of information and assumptions used in the model. A table with a list of modelling assumptions is presented in **Appendix C** along with details of the traffic data provided by HMG for use in the assessment, and the rationale for the post processing of traffic data undertaken.

- Building height information in the existing models was verified with satellite images and observation during the noise survey. The topographical data for the post construction (2012) model was extracted from the models produced previously, which is assumed to be based on a detailed topographical survey as part of the project. Vertical alignment data provided was used for the pre-construction (2008) model for the entire M80 scheme except for Auchenkilns junction which was taken from the relevant model.
- For high rise buildings, the assessment assumed that there is one dwelling per floor.
- Buildings are included in the model to account for screening effects, but the levels are calculated as free field levels, and thus a correction of 2.5 dB has been added to the modelling results at each of the receptors to convert it to a façade noise level; Some locations relate to car parks and open areas, and these are reported as free field levels.

- Where the receptor locations are near buildings they are set 1m away from facades.
- The road surface type was known to be HRA with a texture depth of 1.5mm in 2008. In 2012 the road surface of the M80 was a new low noise surface (-3.5dB). In both years the Auchenkilns Junction had a low noise surface (-2.5 dB). On all minor roads with speeds <75 km/hr a correction of -1 dB is used for both years.
- Noise barriers were included in the model as appropriate. Through liaisons with HMG, PB understands that barriers were in place at the Auchenkilns Junction in 2008, with the remainder in place by 2012;
- Traffic data for the M80 and surrounding road network was provided by HMG from actual traffic counts, and supplemented with data reported in the M80 Environmental Statement. Minor processing was made to convert the sets of data received in hourly format into Annual Average Weekly Traffic (AAWT) 18 hours format as required by CRTN. Some data has also been extrapolated to ensure a sufficient dataset was available. **Appendix C** lists the complete dataset (Road Traffic Data Table) used for the purposes of the noise modelling, and the rationale for the post processing of data. A traffic data schematic (**Figure C**) is also included for clarity.

3.3.3 The post-construction scenario has been validated against the results of the noise survey. Receptors have been implemented in the noise model at the same locations and height as measured during the survey. Results are presented in the next section.

4 RESULTS

4.1 Noise Survey

4.1.1 Table 1 presents the results of the noise survey in terms of the noise descriptor $L_{A10,3h}$ dB. In addition, the equivalent $L_{A10,18h}$ value has been calculated by subtracting 1dB from the 3 x 1 hour readings. The table also shows the distance from the main road to the measurement location.

Table 1: Noise Survey Result Summary

Measurement Location (ML)	Distance from road (Metres)	Measured $L_{A10,3h}$ dB	Equivalent $L_{A10,18h}$ dB (06:00 – 24:00)
ML2 – M73 Off slip	3	73.4	72.4
ML9 - Glenview Avenue	7	73.1	72.1
ML13 – Carrick Road	6	78.8	77.8
ML15 – Castlecary Road	10	80.0	79.0

4.2 Noise Modelling

Noise Modelling Validation

4.2.1 Validation of the post-construction modelling scenario for 2012 has been undertaken against the survey results from August 2014. Traffic counts and HGV percentages were obtained during the surveys to enable a correction to be applied between 2014 and 2012 to reflect the difference in traffic flows. Traffic flows on the days of the surveys (2014) were compared for each survey location with the traffic flow data in our 2012 noise model. Noise predictions were then made with the traffic data on the day of the survey as input to the model at each survey location.

4.2.2 The changes at each measurement location between 2014 and 2012 were:

- ML2 – M73 Offslip the 2014 flows were 11% greater than the 2012 flows but a 1% decrease in HGVs which would result in a relative change of 0.1 dB at that survey location.
- ML9 – Glenview Avenue the 2014 flows were 2% lower than the 2012 flows but a 6% increase in HGVs which would result in a relative change of 0.2 dB.
- ML13 – Carrick Road the 2014 flows were 4% greater than the 2012 flows and a 10% increase in HGVs which would result in a relative change of 0.9 dB.
- ML15 – Castlecary Road the 2014 flows were 8% greater than the 2012 flows and 4% increase in HGVs which would result in a relative change of 0.6 dB.

4.2.3 Table 2 presents a comparison of the measured data, the 2014/2012 correction and the predicted model data at each location. Positive values mean that the modelling results are higher.

Table 2: Noise Survey vs. Noise Modelling (2012) Results

Measurement Location (ML)	Noise Modelling Results L _{A10,18h} dB	Noise Survey Results L _{A10,18h} dB	Correction due to traffic flow difference between 2014 & 2012,dB	Difference (Model – Survey) dB
ML2 – M73 Off slip	73.2	72.4	0.1	0.9
ML9 - Glenview Avenue	73.2	72.1	0.2	1.3
ML13 – Carrick Road	77.8	77.8	0.9	0.9
ML15 – Castlecary Road	76.7	79.0	0.6	-1.7

4.2.4 It can be seen from Table 2 that the differences between the noise survey and the modelling results are within 1.7 dB for all locations. This is an acceptable tolerance for the purposes of the noise modelling exercise.

ES Noise Sensitive Receptors

4.2.5 Post-construction noise levels have been predicted at 121 sensitive receptors as identified in the ES to fulfil the obligations in Paragraph 4.8.2, Schedule 2 of the DBFO Contract. The location and name of these properties have been obtained from the ‘M80 Steps to Higgs Environmental Statement’ Figure 15.1.1 to Figure 15.1.19 and Tables 15.8, 15.9 and 15.10.

4.2.6 **Appendix D** presents Figure D1 to D4 showing the location of the 121 receptors. A table is presented in the appendix showing the façade noise levels at all the receptors during the post-construction phase of the scheme.

4.2.7 Pre-construction noise levels have been also predicted at the 121 ES sensitive receptors. A table with the results is presented in **Appendix D**. The table is split into two sections listing receptors adjacent to the off-line and on-line sections respectively.

4.2.8 For the off-line section (Table D1 i), PB’s 2012 post construction levels in the fifth column have been compared against the ES 2010 with mitigation levels in the fourth column, with the difference reported in the last column. Non-Compliant Data is highlighted in the last column in a dark red text with a light red background.

4.2.9 For the on-line section (Table D1 ii), the PB 2012 post construction levels in the fifth column have been compared with the 2008 (pre-construction) levels in the third column, with the difference reported in the sixth column. Non-Compliant Data is highlighted in the sixth column in a dark red text with a light red background.

4.2.10 Results of the assessment indicate that 117 locations are compliant with the contractual requirements. All 4 of the locations that are not complaint are on the offline section. Table 3 presents the locations that are not compliant with the contractual requirements.

Table 3: Non-Compliant Properties

ES Noise Sensitive Receptor locations	Contractual requirement			
	Floor	PB 2012 L _{A10,18h} dB	ES2010 with mitigation L _{A10,18h} dB	Difference (dB)
Off-line Section properties	Ground floor	72.4	66.4	6.0
	1 st floor	73.5	68.7	4.8
Crow Wood House, Cumbernauld Road Muirhead, Glasgow, Strathclyde G69 9BS	Ground floor	75.1	64.0	11.1
	1 st floor	76.3	66.0	10.3
12 Church Road, Muirhead, Glasgow, Lanarkshire G69 9EB	Ground floor	69.1	60.1	9.0
	1 st floor	70.3	62.0	8.3
13 Dunellan Avenue, Moodiesburn, Glasgow, Lanarkshire G69 0GD,	Ground floor	63.0	61.0	2.0
	1 st floor	63.8	63.1	0.7
24 Stoneyetts Cottages, Muckcroft Road Glasgow, Lanarkshire G69 0JH	Ground floor			
	1 st floor			

5

INVESTIGATION OF NON-COMPLIANT PROPERTIES

Off-Line Section

- 5.1.1 There are 19 off-line locations assessed in the ES. Comparison of the 2012 results with the ES 2010 predictions reveals that 4 of the 19 locations do not, at face value, achieve compliance with the contractual requirement.
- 5.1.2 The first 3 (Crow Wood House, 12 Church Road & 13 Dunellan Avenue) are properties which are adjacent to the A80, which does not form part of the M80 scheme. A reason for the discrepancy appears to be from the ES's traffic flow predictions. The ES predicts a decrease of roughly 80% in that area, while the traffic data collected reveals a decrease of roughly 40%. This accounts for the difference in levels. Therefore the difference at these properties is outside the control of the scheme.
- 5.1.3 The other off-line location, 24 Stoneyetts Cottages is situated to the north of the off-line section which has an increase of 2.0 dB. PB has noticed that previous models included a noise barrier design to protect this property which was not confirmed as being installed as part of the scheme. The barrier would have provided a similar level of attenuation to the level of increase, and therefore we do not consider this property to be non-compliant.

On-Line Section

- 5.1.4 There are 102 on-line locations assessed in the ES. Comparison of the 2012 results with the pre-construction year reveals that all 102 locations achieve compliance with the contractual requirement.

6 CONCLUSIONS**6.1 Summary**

- 6.1.1 A noise assessment has been undertaken at the M80 between Stepps and Haggs to determine the post-construction noise levels at 121 noise-sensitive locations defined during the Environmental Statement (ES).
- 6.1.2 Results of the assessment indicate that 117 locations are compliant with the contractual requirements. Of the 4 locations that are not compliant, the differences are explained by factors unrelated to the physical works on the M80 for three locations, and due to a noise barrier that was not included in the final scheme for the other location.

APPENDIX A – GLOSSARY OF TERMS

Ambient Noise	The total sound in a given situation at a given time, usually composed of sound from many sources near and far.
A – Weighting	A-weighting has been found to give the best correlation between perceived and actual loudness. Measurement to which this weighting has been applied includes an A in their descriptor.
Background Noise Level, $L_{A90,T}$	The level exceeded for 90% of a given time interval, T.
Decibel (dB)	A logarithmic unit for measuring the relative loudness of noise, i.e. the sound level.
Environmental Noise	Noise governed by environmental legislation, and usually enforced by local authorities. Also termed “nuisance”.
Facade Effect	The phenomenon of sound energy (noise) being reflected from the hard rigid, external surface of a building or structure. Where a facade is present, this effect adds approximately 2.5 or 3 dB to the free field noise level (at a distance of 1 metre from the facade).
Free Field Noise Level	The noise level measured away from any reflecting surfaces.
Hertz (Hz)	Unit of frequency, equal to one cycle per second. Frequency is related to the pitch of the sound.
$L_{Aeq,T}$	The equivalent continuous sound level. It provides an “average” sound level over a defined period of time (T).
$L_{A10,3h}$	The L_{A10} is the sound level exceeded 10 per cent of the time and it is used to define road traffic noise. The L_{A10} (3 hour) dB is the arithmetic average of the values of L_{A10} hourly dB for three one-hour periods between 1000 and 1700 hours. It is used as a way of calculating the $L_{A10,18h}$ using the equation: $L_{A10,18h} = L_{A10,3h} - 1$.
$L_{A10,18h}$	The L_{A10} is the sound level exceeded 10 per cent of the time and it is used to define road traffic noise. The L_{A10} (18 hour) dB is the arithmetic average of the values of L_{A10} hourly dB for each of the eighteen one-hour periods between 0600 and 2400 hours.
L_{Amax}	The maximum sound level measured.

APPENDIX B – NOISE SURVEY REPORT

NOISE SURVEY REPORT

Bilfinger RE Asset Management Ltd

3513048C

Issue 2

M80 Noise Survey Report

3513048C

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CONTENTS

		Page
1	Introduction	7
2	Guidance	8
3	Methodology	8
4	Results	9
5	References	9
	 Annexes	
	A - Survey Measurement Locations	10
	B - Noise Survey Forms	14
	C - Calibration Certificates	19

1 INTRODUCTION**1.1 Background**

1.1.1 Parsons Brinckerhoff (PB) has been commissioned by Bilfinger RE Asset Management Ltd to undertake a noise survey at the M80 between Stepps and Haggs, Glasgow.

1.1.2 The purpose of this report is to inform the noise climate at a number of receptors along the M80. In addition, the results of these noise measurements will be used to validate a noise model.

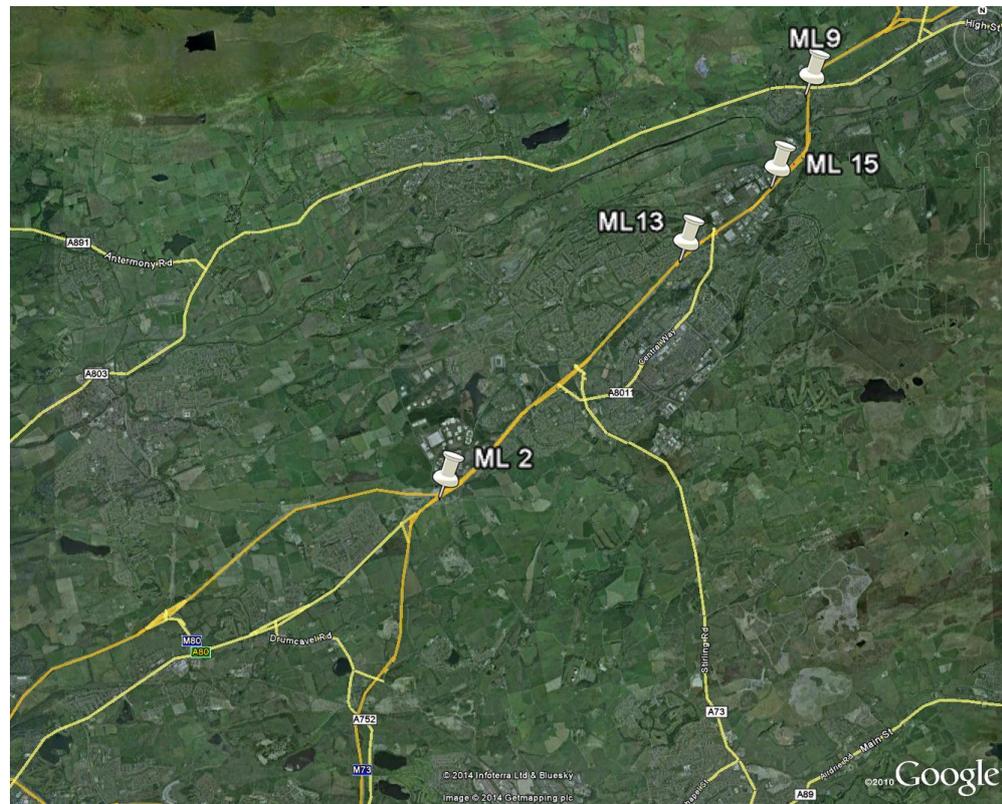
1.1.3 A noise survey was undertaken on the 19th and 20th of August 2014 in accordance with the shortened methodology advised in 'Calculation of Road Traffic Noise' (CRTN)[1] and BS7445 [2],[3].

1.2 Site Description

1.2.1 The noise survey was undertaken at 4 locations along the section of the M80 that runs between the town of Stepps and village of Haggs. The land use in the surrounding areas is predominantly rural, interspersed with small towns, business parks and residential areas.

1.2.2 **Figure A** presents the 4 measurement locations used in the survey. More detailed Figures (**B-F**) showing each location can be found in **Annex A**.

Figure A



2 GUIDANCE

2.1 Calculation of Road Traffic Noise (CRTN)

2.1.1 The shortened measurement procedure given within Calculation of Road Traffic Noise (CRTN) has been adhered to for the measurements.

3 METHODOLOGY

3.1 Noise Surveys

3.1.1 All 4 measurements were attended with 1 engineer from PB mobilised to site and the measurement period was 3 hours at each location, except for measurement location ML13 where a battery failure meant that the measurement was only 2 hours and 50 minutes long. In this instance the L_{A10} was noted down for the last 50 minute period.

3.1.2 From discussions with Bilfinger it was agreed that free field measurements on publically accessible land would be suitable. All measurements were made using Class 1 Integrating-Averaging Sound Level Meters (SLM) as defined in International Electrotechnical Commission (IEC) 61672:2003[4].

3.1.3 For each measurement, the following noise parameters were recorded: L_{eq} , L_{90} , L_{10} , L_{max} and L_{min} , in 1/3 octave bands. Fast time weighting and A-weighted frequency network were used.

- 3.1.4 Calibration certificates for the instrumentation used in the survey are presented in **Annex C**.
- 3.1.5 It should be noted that for the purpose of this report, emphasis is given to the results for the noise parameter L_{A10} dB, in line with Calculation of Road Traffic Noise (CRTN).
- 3.1.6 Measurement results for the CRTN shortened procedure have been given as $L_{A10,3h}$, which is the arithmetic average of the 3 measured $L_{A10,1h}$ values in decibels, at each measurement location. CRTN provides an equation which converts $L_{A10,3h}$ into $L_{A10,18h}$.
- 3.1.7 Measurements were made in the absence of precipitation. The wind direction from source to receiver was less than 3 m/s. A windshield was used to minimise the effects of wind-induced noise at the microphone.

4 RESULTS

- 4.1.1 **Table A** presents a summary of the noise survey results at the 4 locations. A more detailed version of the results is presented in the noise survey forms (See **Annex B**).
- 4.1.2 The equivalent $L_{A10,18h}$ was calculated by subtracting 1 dB from the measured $L_{A10,3h}$. The distance of the microphone from the edge of the nearest main road is also presented in **Table A**.
- 4.1.3 The dominant noise source at all of the locations was that of road traffic noise from the M80 scheme. Further subjective comments on the noise climate can be found in the noise monitoring forms (See **Annex B**).

Table A: Survey Data

Measurement Location (ML)	Distance from road (Metres)	Measured $L_{A10,3h}$ dB(A)	Calculated $L_{10,18h}$ dB(A) (06:00 – 24:00)
ML2(August)- M73 Off slip	3	73.4	72.4
ML9(August)- Glenview Avenue	7	73.1	72.1
ML13(August) – Carrick Road	6	78.8	77.8
ML 15(August) – Castlecary Road	10	80.0	79.0

5 REFERENCES

1. Calculation of Road Traffic Noise' (CRTN) – 1988 Department of Transport, HMSO
2. BS 7445-1: 2003 "Description and Measurement of Environmental Noise: Guide to quantities and procedures", BSI
3. BS 7445-3: 1991 "Description and Measurement of Environmental Noise: Guide to application to noise limits ", BSI
4. IEC 61672:2003 "Electroacoustics - sound level meters", BSI

ANNEX A

SURVEY MEASUREMENT LOCATIONS

Figure B

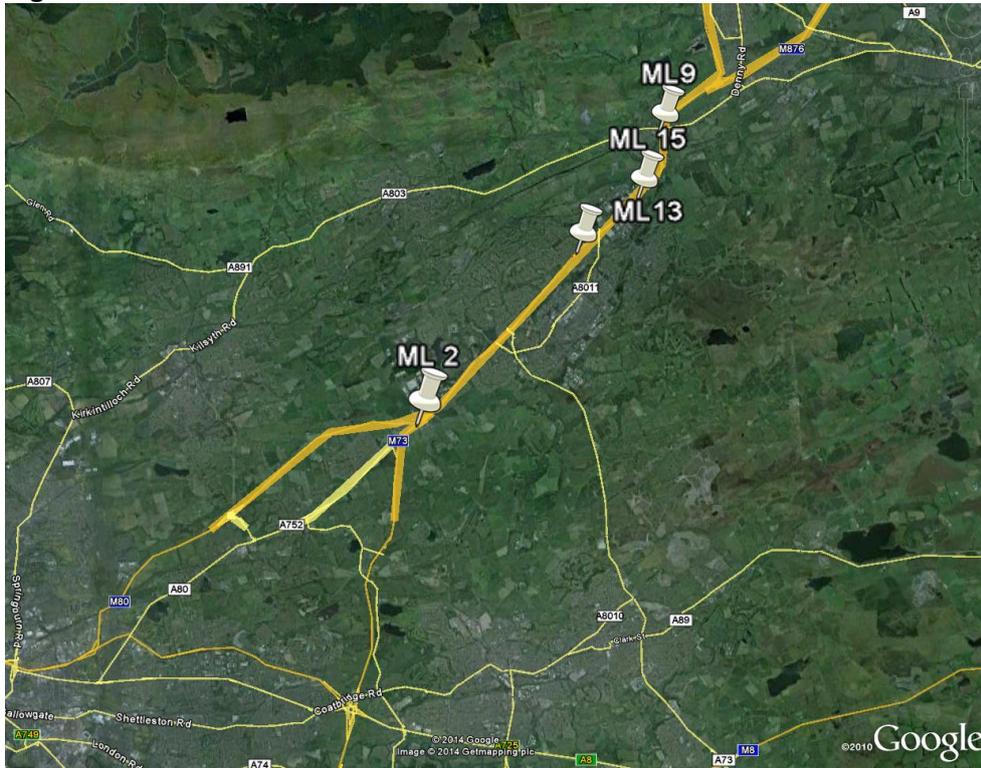


Figure C



Figure D



Figure E



Figure F



Measurement Location (ML)
ML 2 – M73 Off slip
ML 9 - Glenview Avenue
ML 13 – Carrick Road
ML 15 (August)- Castlecary Road

ANNEX B

NOISE SURVEY FORMS

Noise Monitoring Form											PARSONS BRINCKERHOFF
Project: M80 (part C)					Job Number: 3513048C						
Location: ML2 (August)											
Equipment: NA-28					Engineer: Adam Price						
Pre-Calibration Level: 94.0 dB					General Weather Description: Mix of clear skies and then overcast						
Post-Calibration Level: 93.9 dB					Date: 19/08/2014						
Measurement Period			Weather			Statistical Noise Levels / dB					Description of Audible Noise
Date	Start Time	Elapsed Minutes	Wind Speed (m/s)	Wind Direction (from)	Temperature (°C)	L _{Aeq}	L _{Amax}	L _{Amin}	L _{A10}	L _{A90}	
19/08/2014	10:00	60	0-1	SW	12	72.7	86.4	53.8	76.5	62.4	(dominant) Road traffic noise,birdsong
19/08/2014	11:00	60	0-1	SW	12	72.7	86.9	58.5	76.3	63.2	
19/08/2014	12:00	60	0-1	SW	12	73.0	87.2	57.2	76.8	62.7	





Noise Monitoring Form		PARSONS BRINCKERHOFF	
Project: M80 (part C)	Job Number: 3513048C		
Location: ML13 (August)			
Equipment: NA-28	Engineer: Adam Price		
Pre-Calibration Level: 94.0 dB	General Weather Description: Mix of clear skies and then overcast		
Post-Calibration Level: 94.0 dB	Date: 19/08/2014		

Measurement Period			Weather			Statistical Noise Levels / dB					Description of Audible Noise
Date	Start Time	Elapsed Minutes	Wind Speed (m/s)	Wind Direction (from)	Temperature (°C)	L _{Aeq}	L _{Amax}	L _{Amin}	L _{A10}	L _{A90}	
19/08/2014	14:00	60	0-1	SW	12	77.8	86.4	53.7	80.5	72.4	(dominant) Road traffic noise, birdsong
19/08/2014	15:00	60	0-1	SW	12	78.0	87.9	63.5	80.4	73.7	
19/08/2014	16:00	60	0-1	SW	12	N/A	N/A	N/A	80*	N/A	



Noise Monitoring Form		PARSONS BRINCKERHOFF	
Project: M80 (part C)	Job Number: 3513048C		
Location: ML9 (August)			
Equipment: NA-28	Engineer: Adam Price		
Pre-Calibration Level: 94.0 dB	General Weather Description: Mix of clear skies and then overcast		
Post-Calibration Level: 93.9 dB	Date: 20/08/2014		

Measurement Period			Weather			Statistical Noise Levels / dB					Description of Audible Noise
Date	Start Time	Elapsed Minutes	Wind Speed (m/s)	Wind Direction (from)	Temperature (°C)	L _{Aeq}	L _{Amax}	L _{Amin}	L _{A10}	L _{A90}	
20/08/2014	11:00	60	0-1	SW	12	70.8	86.8	57.8	73.5	66.1	(dominant) Road traffic noise, birdsong
20/08/2014	12:00	60	0-1	SW	12	70.5	82.3	52.4	73.4	65.5	
20/08/2014	13:00	60	0-1	SW	12	70.8	87.5	56.9	73.4	66.1	



Noise Monitoring Form											PARSONS BRINCKERHOFF
Project: M80 (part C)					Job Number: 3513048C						
Location: ML 15 (August)											
Equipment: NA-28					Engineer: Adam Price						
Pre-Calibration Level: 94.0 dB					General Weather Description: Mix of clear skies and overcast						
Post-Calibration Level: 93.9 dB					Date: 20/08/2014						
Measurement Period			Weather			Statistical Noise Levels / dB					Description of Audible Noise
Date	Start Time	Elapsed Minutes	Wind Speed (m/s)	Wind Direction (from)	Temperature (°C)	L _{Aeq}	L _{Amax}	L _{Amin}	L _{A10}	L _{A90}	
19/08/2014	14:00	60	0-1	SW	12	77.0	86.9	62.1	80.0	69.9	(dominant) Road traffic noise, birdsong
19/08/2014	15:00	60	0-1	SW	12	77.4	87.3	61.6	79.9	71.2	
19/08/2014	16:00	60	0-1	SW	12	77.8	86.3	63.6	80.0	74.2	



ANNEX C

CALIBRATION CERTIFICATES



CERTIFICATE OF CALIBRATION

Date of Issue: 18 June 2014

Certificate Number: TCRT14/1201

Issued by:
ANV Measurement Systems
Beaufort Court
17 Roebuck Way
Milton Keynes MK5 8HL
Telephone 01908 642846 Fax 01908 642814
E-Mail: info@noise-and-vibration.co.uk
Web: www.noise-and-vibration.co.uk

Page 1 of 2 Pages
Approved Signatory

M. Breslin [] K. Mistry [✓]

Acoustics Noise and Vibration Ltd trading as ANV Measurement Systems

Customer Parsons Brinckerhoff Ltd
Amber Court
William Armstrong Drive
Newcastle Business Park
Newcastle upon Tyne
NE4 7YQ

Order No. 83672

Description Identification	Manufacturer	Instrument	Type	Serial No. / Version
	Rion	Sound Level Meter	NA-28	00380778
	Rion	Firmware		1.8
	Rion	Pre Amplifier	NH-23	70703
	Rion	Microphone	UC-59	00940
	Rion	Calibrator	NC-74	35173440
		Calibrator adaptor type if applicable		NC-74-002

Performance Class 1

Test Procedure TP 2.SLM 61672-3 TPS-49
Procedures from IEC 61672-3:2006 were used to perform the periodic tests.

Type Approved to IEC 61672-1:2002 Yes Approval Number 21.21/07.01
If YES above there is public evidence that the SLM has successfully completed the applicable pattern evaluation tests of IEC 61672-2:2003

Date Received 13 June 2014 ANV Job No. TRAC14/06106

Date Calibrated 18 June 2014

The sound level meter submitted for testing has successfully completed the class 1 periodic tests of IEC 61672-3:2006, for the environmental conditions under which the tests were performed. As public evidence was available, from an independent testing organisation responsible for approving the results of pattern evaluation tests performed in accordance with IEC 61672-2:2003, to demonstrate that the model of sound level meter fully conformed to the requirements in IEC 61672-1:2002, the sound level meter submitted for testing conforms to the class 1 requirements of IEC 61672-1:2002.

Previous Certificate	Dated	Certificate No.	Laboratory
	19 June 2012	TCRT12/1069	ANV Measurement Systems

This certificate provides traceability of measurement to recognised national standards, and to units of measurement realised at the National Physical Laboratory or other recognised national standards laboratories. This certificate may not be reproduced other than in full, except with the prior written approval of the issuing laboratory.



CERTIFICATE OF CALIBRATION

Date of Issue: 17 June 2014

Certificate Number: TCRT14/1198

Issued by:
ANV Measurement Systems
Beaufort Court
17 Roebuck Way
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Page 1 of 2 Pages
Approved Signatory

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Acoustics Noise and Vibration Ltd trading as ANV Measurement Systems

Customer Parsons Brinckerhoff Ltd
Amber Court
William Armstrong Drive
Newcastle Business Park
Newcastle upon Tyne
NE4 7YQ

Order No. 83672

Test Procedure Procedure TP 1 Calibration of Sound Calibrators

Description Acoustic Calibrator

Identification	Manufacturer	Instrument	Model	Serial No.
	Rion	Calibrator	NC-74	35173440

The calibrator has been tested as specified in Annex B of IEC 60942:2003. As public evidence was available from a testing organisation (PTB) responsible for approving the results of pattern evaluation tests, to demonstrate that the model of sound calibrator fully conformed to the requirements for pattern evaluation described in Annex A of IEC 60942:2003, the sound calibrator tested is considered to conform to all the class 1 requirements of IEC 60942:2003.

ANV Job No. TRAC14/06106

Date Received 13 June 2014

Date Calibrated 17 June 2014

Previous Certificate
Dated 12 June 2013
Certificate No. TCRT13/1218
Laboratory ANV Measurement Systems

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**APPENDIX C – NOISE MODELLING ASSUMPTIONS & TRAFFIC
DATA**

M80 DBFO STEPPS to HAGGS Check list followed by the Cadna A Modelling Assumptions Table and Traffic Estimation Methodology

<u>M80 DBFO STEPPS to HAGGS Checklist</u>	
Which noise modelling software was used, including version?	Cadna A, Version 4.4.145
What prediction methodology was used?	CRTN
What deviations from the prediction methodology were adopted?	None, however see free field or façade note below.
What search radius was used?	2000m
What number of reflections was used?	Cadna A has been set up to apply 'Reflection via Correction', and therefore compliant with CRTN. Not reflections via mirrored sources.
Has low flow correction been used?	Yes (Low-Traffic-Correction from Chart 12 in CRTN)
How is ground absorption included in the model?	A ground absorption of 0.5 had been set. This describes the variation in soft ground (rural areas) and hard ground (urban areas) in the model.
If a default ground absorption has been used what value was used?	0.5 (globally)
If default heights for buildings were adopted, what heights were used?	Exact heights for buildings beyond (North of) Auchenkilns junction were used. South of Auchenkilns junction the same default value of 8m was used. Google Earth was used to spot check heights of buildings. New buildings not included in the previous models (5 in total) were manually inputted and heights were estimated using Google street view images. 2.5m added to height for each additional storey.
If used, what absorption coefficients were used?	Cadna A has been set up to apply Reflection via Correction. Not reflections via mirrored sources.
What source height and location was adopted?	Following CRTN. 0.5m above the carriageway and 3.5m within the outside edge of the carriageway.
Are noise levels free field or façade?	Free field, (façade correction applied in analysis)
If noise contour grids have been produced, what grid spacing has been used and what height?	10m by 10m grid spacing has been used at a height of 4m
If receptor points have been located at buildings, what distance from the building are they? And how have their locations around buildings been determined.	Set 1m from façade of building, using a Cadna tool.

M80 DBFO STEPPS to HAGGS Check list followed by the Cadna A Modelling Assumptions Table and Traffic Estimation Methodology

If acoustic barriers included in the model, what reflectivity/absorption was used?	Cadna A has been set up to apply 'Reflection via Correction', and therefore compliant with CRTN. Not reflections via mirrored sources.
How have modelling attributes/values that lie out with the range of validity of the prediction method been dealt with?	CRTN has been validated to 600m and all calculations were within 600m.
State all model simplifications or assumptions made.	See attached assumptions table from previous report with updates where necessary.
What data sources have been used to create the ground models (include supplier, file name and version)?	<p>Previous models provided the topography/mapping for 2012.</p> <p>For 2008 a detailed digital terrain model provided was used file name: 'Survey_Nat_3D' (06/08/14) for mapping and all of the vertical alignment except for the Auchenkilns Junction section which was taken from the previous model (the same alignment as 2012).</p> <p>For 2003 topo data provided was used in conjunction with 2012 data.</p>
What data sources have been used for the source input data (include supplier, file name and version)?	Road traffic data for 2012 was acquired from HMG. 2008 and 2003 from other sources. See traffic assessment below.
What digital mapping data has been used (e.g OS MasterMap), and where and when was it sourced?	See ground models section.
What data was used to identify addresses?	Address point database from HMG.
If acoustic barrier information supplied, what was the source and what version was included in the model?	Acoustic barrier information for 2012 and 2008 was provided by the project team. The info was also verified using Google Earth.
If proprietary mapping data was used (e.g. OS Mastermap, please provide licensing information)?	OS mapping provided by the project team.
What other datasets were used to create the noise models, provide details of the source of data, and what it was used for?	N/A

Cadna Modelling assumptions

No	Data concerned	Sub category of data	description	date
1	Building Height Data		Building heights from previous model (northern section), used for overlap section Auchenkilns junction. All building height data for previous model (Southern Section) set to 8m. <u>Action:</u> used satellite images as well as google street view to verify heights in both North section and South section.	17-Apr
2	Topography		Topographic data from the previous models was used for the 2012 model, the vertical alignment of the roads for the 2003 model was provided seperately. <u>Action:</u> The 2003 model, used the vertical alignment of the road provided and then used 2012 topographic data for the surroundings. It was deemed no significant changes in topography had occurred in these surrounding areas. <u>update Action 01/09/14:</u> The 2008 model topographic data has been provided by HMG. This was subsequently found to be 2003 vertical alignment and so a 2008 topo dataset was constructed by combining the 2003 alignment with the Auchenkilns Junction section from the 2012 model	Apr Aug May
3	Road Widths		Road widths are missing in Northern section of the model (2012). and all sections in 2003. <u>Action:</u> for consistency we used the same widths as used in southern section model (RQ15.5-motorway(3lane), RQ 14 (2lane) and RQ10 for slip & minor roads) and verified with google earth. <u>update Action 01/09/14:</u> The same action but applied to 2008 model.	
4	Noise Barriers 2003 & 2008		We understand from HMG, that it is not possible to confirm the location or existence of any noise barriers implement in the year 2003. <u>Action:</u> No barriers were implemented in our 2003 model including the central reservation barrier. <u>update Action 01/09/14:</u> New information on the 2008 model barrier locations provided by HMG. They detailed barrier locations around the Auchenkilns junction, no barrier locations were detailed for the rest of the scheme and so no other barriers were implemented into 2008 model.	28-May
5	Noise Barriers 2012		Acoustic barrier information for 2012 was provided by HMG. <u>Action</u> noise barriers for our 2012 model were verified using satellite images and as part of the noise survey.	
6	Road Surface		<u>September 2014 Action:</u> advice followed: Where traffic speed is < 75 km/h surface correction is -1.0 dB(A) for all roads and all scenarios. Where traffic speed is >= 75km/h: Pre-Construction scenarios (2003&2008): surface correction is 0 dB(A) unless there are any roads identified as low noise surfaces in which case the surface correction is -2.5 dB(A). Post-construction scenarios: surface correction is 0 dBA except for road surfaces identified as low noise surfaces: For new low noise surfaces at the time of opening (2008 for Auchenkilns section, 2012 for the rest of the M80): surface correct -3.5 dB(A) *(see update); For low noise surfaceing in future scenarios (2012 for Auchenkilns section): surface correction is -2.5 dB(A). location of low noise surfaces provided on as Built drawings. * <u>update Action10/14:</u> From draft report comments PB has been advised that the 2008 Auchenkilns section should be given a surface correction of -2.5dB(A)	Sep
7	Traffic data			
		Road speeds	Speed data not provided for 2012 (unable to extract from data, there are significant gaps). <u>Action:</u> Use CRTN road classification in chart 4 section 14.2 for all years.	Aug
		Traffic flows	Section of Roads absent in 2012 or 2003, for example the A80 section Hornshill roundabout to Crow wood roundabout. <u>Action:</u> unless the section of road appears in both years (2012&2003) it was left out of both. <u>update Action 01/09/14:</u> Roads were extrapolated from (2003/2008/2012) to provide the most complete model possible	Aug
8	Presentation of Results			
		Receptor heights	Bungalows (1 floor dwellings) were not easily identifiable. <u>Action:</u> In the assessment the worst case scenario of every property having at least 1 storey (a 1st floor) was taken. For all high rise buildings a calculation was done for each floor. All elligible properties were manually checked using google earth street view and if there were bungalows the first floor receptor was removed.	12th Sep

Project Name: **M80 DBFO Noise Modelling**

Project Number: **3513048B**

Technical Note Number: **01**

Technical Note Title: **Traffic Estimation Methodology**

Status / Issue Number: **Issue 1** Date Issued: **22 August 2014**

Prepared By: **MSR** Checked by: **FR** Issued by: **RP**

1. INTRODUCTION

1.1. Study Outline

- 1.1.1. Parsons Brinckerhoff has been commissioned by Bilfinger RE Asset Management Ltd to undertake acoustic analysis along the M80 corridor near Cumbernauld. Part of the study required the assessment of conditions in 2008 prior to construction of the central Stepps to Hags section of the motorway.
- 1.1.2. Traffic counts from 2008 were not available for all the sections of highway covered by this assessment and therefore some estimation of likely traffic levels was necessary.

1.2. Document Structure

- 1.2.1. This note details the data sources and methodology employed in the calculation of these traffic estimates and is structured as follows:
- Section 2 – Traffic Estimation Methodology;
 - Section 3 – Summary.

2. TRAFFIC ESTIMATION METHODOLOGY

2.1. Preamble

- 2.1.1. This section details the supporting data and assumptions used in the estimation of the likely traffic levels in the Cumbernauld area in 2008.

2.2. Available Data Sources

- 2.2.1. Traffic data for the study area, provided by Transport Scotland, gave the volume of vehicles recorded on various sections of the Cumbernauld area highway network in 2003, 2008 and 2012. The traffic data had been collected and was presented in a variety of ways and levels of detail, ranging from classified hourly counts to daily average flow volumes.
- 2.2.2. The traffic estimates required for the acoustic analysis were 18hr Annual Average Weekday Traffic (AAWT) flows along with the corresponding proportion of heavy goods vehicles (HGVs) for each section of highway in the study area. Where the 18hr AAWT for 2008 had been surveyed and recorded, this was used.

2.3. Estimation Methodology

- 2.3.1. As data for 2008 was not available for all sites, a hierarchy of potential alternatives was defined to ensure that the source with the highest confidence level was used in each case.
- 2.3.2. The available data was employed for the estimation process in the following order:
- 2008 – Original target year;
 - 2003 – Same network as the target year;
 - 2012 – Different network following completion of construction work.
- 2.3.3. In the cases where data from an alternative year was used, the recorded volume has been factored to estimate the likely volume in 2008. The scaling factor for each of the links missing from the 2008 data set has been calculated from the recorded flows on adjacent links. In some cases, this factoring method was also used to convert flows presented as 24hr AAWT or Annual Average Daily Traffic (AADT) flows into the required form.
- 2.3.4. Some M80 slip-roads where adjacent surveys were not available have been estimated using the flow on the slip road carrying the opposing movement to the same location, for example the traffic volume leaving the motorway to access an industrial estate is assumed to be the same volume leaving the estate and re-joining the motorway.
- 2.3.5. The proportion of HGVs on the missing links was also estimated by combining the observed value from the selected alternative year with the change in HGV proportion between the alternative and target years at an adjacent count site with data covering both years.
- 2.3.6. For a smaller number of sites there was also no data available for 2012 or 2003, the same estimation process was followed as above for these sites.

2.4. Highway Network Coverage

- 2.4.1. The highway network extending into the area surrounding the M80 corridor has been assumed to carry traffic volumes observed at count sites adjacent to the motorway.

2.5. Limitations

- 2.5.1. As the wider highway network extends past junctions away from the survey location, the estimates become subject to progressively higher margins of error.
- 2.5.2. Estimating traffic flows from volumes recorded in other years is dependent on the assumption that travel patterns are broadly similar across the intervening period, with any changes in traffic volumes occurring uniformly across the study area. As the time difference between the observed and estimated traffic volume increases, the probability of changing travel patterns causing a significant change in traffic flow volume steadily rises.

2.6. Data presentation

- 2.6.1. All traffic data used in this study has been presented in the traffic data table. Traffic data estimates are highlighted in orange. The main links of the M80 scheme have also been presented in a traffic data figure.

3. SUMMARY

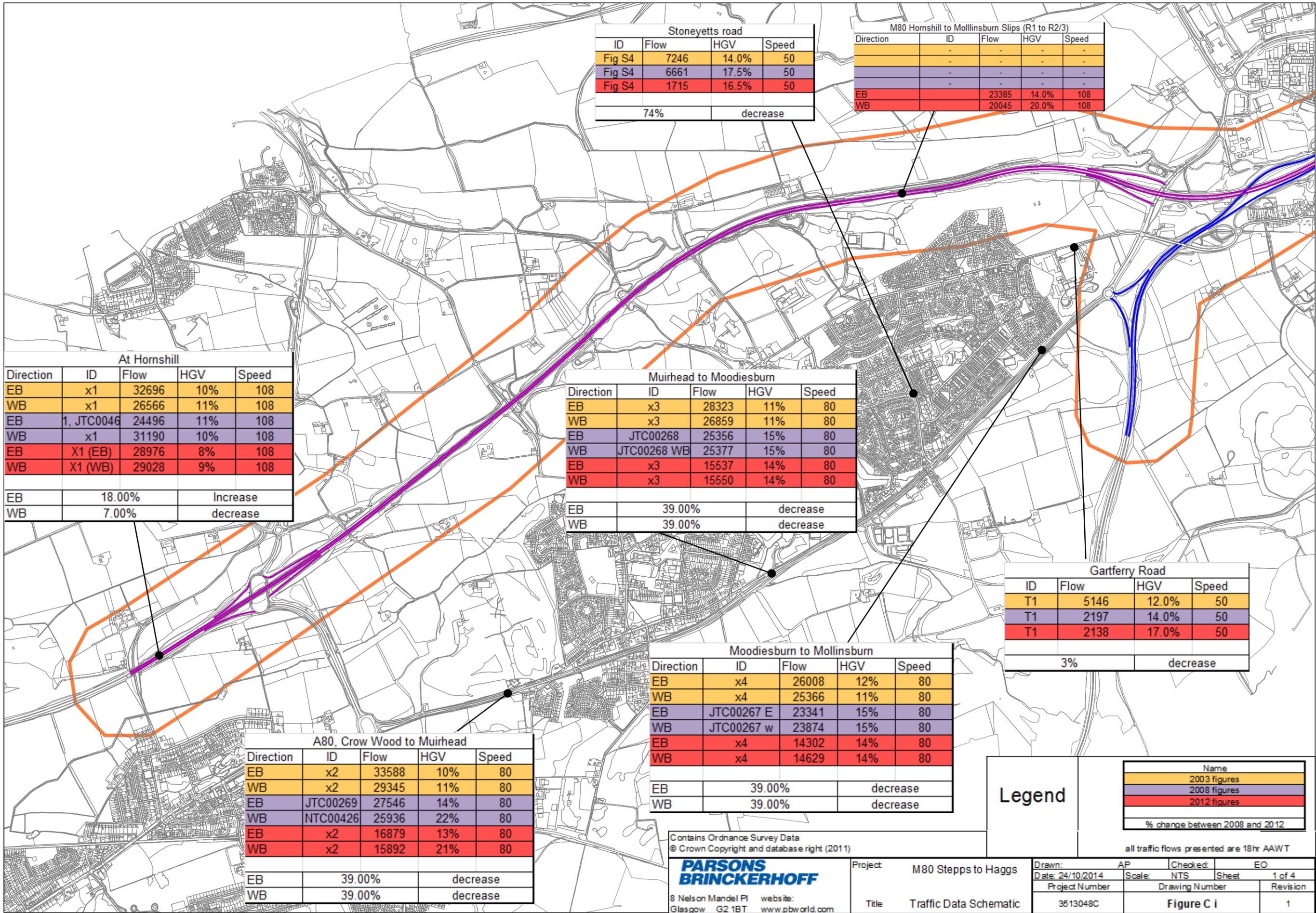
- 3.1.1. This note summarises the methodology employed in estimating the 2003, 2008 and 2012 traffic levels along the M80 corridor for use in acoustic analysis.

Road Traffic Data Table

2003 road name	ID	AAWT 18hr flow	HGV percentage	Speed KPH	2008 road name	ID	AAWT 18hr flow	HGV percentage	Speed KPH	2012 road name	ID	AAWT 18hr flow	HGV percentage	Speed KPH	Percentage change with 2012& 2008	Comments
At Hornhill E	x1	32696	10%	108	M80 Between A80 and Jct 3 S or E	x1, JTC00468	24496	11%	108	M80 0458N M 11/2 mile N,R1 to R2	X1 (EB)	28976	8%	108	18	
At Hornhill W	x1	26566	11%	108	At Hornhill W	x1	31190	10%	108	M80 0458S M 11/4 mile N,R1 to R3 (west) 1	X1 (WB)	29028	9%	108	-7	
A80, M80 Crow Wood to Hornhill	A80, M8000024	19929	13%	108	M80 Between A80 and Jct 3 N or W	JTC00468	24198	11%	108	M80 Between A80 and Jct,S3 to S4 + S4 to S3	A80, M8000024	10731	6%	108	-56	Link to Crow Wood Roundabout changes to off ramp in 2012
West of Dalshannon EB	x5b	42327	12%	108	(M80) A80 East of M73 Junction	x5b, JTC00266	39984	19%	108	M80 W of J5 Auchenkilns,R1 to R2	X5b (EB)	38913	22%	108	-3	
West of Dalshannon WB	x5b	36556	13%	108	(M80) A80 East of M73 Junction	x5b, JTC00266	38099	20%	108	M80 1425S M W of J5 Au,R1 to R3 (west) 7	X5b (WB)	39570	22%	108	4	
Low wood Slip to Auchenkilns WB	x6	27098	16%	108	(M80) Low wood slip to Auchenkilns WB	x6	26229	20%	108	M80 1473S M J5 Auchenk,R1 to R3 (west) 7	x6 WB	33294	26%	108	27	
Low wood slip to Auchenkilns EB	x6	27521	15%	108	Low wood slip to Auchenkilns EB	x6	29240	22%	108	M80 1473N M J5 Auchenk,R4 to R66	x6	29637	32%	108	1	
Auchenkilns to Old Inns EB	X7	28557	10%	108	(M80) A80 East of Auchenkilns Rbt EB	X7	33705	24%	108	M80 E of J5 Auchenkilns,M80 Eastbound	X7	34787	22%	108	0	
Auchenkilns to Old Inns WB	X7	32210	17%	108	A80 East of Auchenkilns Rbt WB	X7	27841	17%	108	M80 1833S M W of J6 Ol,M80 Westbound	X7	33812	22%	108	25	
between old inns slips WB	x8 WB	32809	17%	108	(M80) between old inns slips wb	x8 WB (2008)	31462	22%	108	M80 1883S M J6 Old Inn,M80 Westbound	X8	29534	26%	108	-6	
between old inns slips EB	X8	32164	12%	108	between old inns slips EB	X8	35759	20%	108	M80 1892N M J6 Old Inn,M80 Eastbound	X8	28780	26%	108	-20	
Old Inns to Castley slips wb	x9a	36039	15%	108	(M80) A80 Cumbernauld to Castley (WB)	x9a wb	33897	23%	108	M80 2138S M W of J6a C,M80 Westbound	x9a	35509	20%	108	6	
Old Inns to Castle any slips eb	x9a	32174	12%	108	A80 Cumbernauld to Castley (EB)	x9a eb	33564	21%	108	M80 W of J6a Castley,M80 Eastbound	x9a (EB)	36231	24%	108	-1	
between Castley and Hags slip roads EB	x9b	36895	14%	108	(M80) A80 South of M80 Junction 4	x9b (JTC00263)	36609	22%	108	M80 2187N M J6a Castle,M80 Eastbound	x9b	35428	26%	108	-3	
between Castley and Hags slip roads WB	x9b	35626	15%	108	A80 South of M80 Junction 4	x9b JTC00263 (W)	36289	25%	108	M80 2187S M J6a Castle,M80 Westbound	x9b	35467	22%	108	-2	
between Hags Slips WB	x10	34750	14%	108	(M80) Between Hags Slips EB	x10	40549	21%	108	M80 2297N M J7 Hags,M80 Eastbound	x10	32490	28%	108	-19	
between Hags Slips EB	x10	34445	14%	108	between Hags Slips WB	x10	36373	26%	108	M80 2297S M J7 Hags,M80 Westbound	x10	32866	22%	108	-11	
Hags slip road (E) to tie-in EB	x11	39112	14%	108	(M80) Hags slip road (E) to tie-in EB	x11	40191	21%	108	M80 E of J7 Hags,M80 Eastbound	X11	38236	22%	108	-5	
Hags slip road (E) to tie-in WB	x11	39018	14%	108	Hags slip road (E) to tie-in WB	x11	38377	26%	108	M80 Hags Westbound	X11	36076	7%	108	-6	
A73 to roundabout Nth bound	S33	4601	23%	60	A73 to roundabout Nth bound	S33	4671	28%	60	A73 to roundabout Nth bound	S33	5251	32%	60	12	
A73 to roundabout SB	S33	5268	21%	60	A73 to roundabout SB	S33	5348	26%	60	A73 to roundabout SB	S33	6012	30%	60	12	
Low wood off slip	S25	14453	5%	80	Low wood off slip	S25	13989	9%	80	M80 1428NO O Off slip,R18 to 19	S25	7819	2%	80	-44	
Low wood On Slip	S26	7711	5%	80	Low wood On Slip	S26	8192	12%	80	M80 1473SI I On slip a,R20 to R21	S26	7370	14%	80	-10	
Old Inns E/B Diverge slip	S34	3336	29%	80	Old Inns E/B Diverge slip	S34	3708	38%	80	M80 1892NO O Off slip ,Old Inns Eastbound Off S	S34	4135	28%	80	12	
Old Inns E/B merge slip	S35	6980	0%	80	Old Inns E/B merge slip	S35	7760	9%	80	M80 1903NI I On slip a,Old Inns Eastbound On Sl	S35	6005	20%	80	-23	
Hags E/B diverge slip	S43	876	50%	80	Hags E/B diverge slip	S43	900	58%	80	M80 2297NO O Off slip ,Hags Eastbound Off Slip	S43	3617	40%	80	302	attributed to growth in Hags
M80 2297NI I On slip a,Hags Eastbound On Slip	S44	4357	18%	80	Hags E/B merge slip	s44	4477	26%	80	M80 2297NI I On slip a,Hags Eastbound On Slip	S44	3171	28%	80	-29	
Hags Westbound On Slip	S45	4574	14%	80	Hags w/b merge slip	s45	4499	23%	80	Hags Westbound On Slip	S45	3826	26%	80	-15	
M80 2297SO O Off slip ,Hags Westbound Off Slip	S46	2450	15%	80	Hags W/B Diverge slip	s46	2410	25%	80	M80 2297SO O Off slip ,Hags Westbound Off Slip	S46	3210	34%	80	33	
North road T17, T18	T17,T18	4682	10%	50	North road T17, T18	T17,T18	3693	3%	50	North Road S19 to S20 + S30 to S19	T17, T18	1146	7%	50	-69	
Mollisburn to Dalshannon E and W	T11,T12	6480	7%	50	UCL MAIN ROAD CONDORRAT Main Road West	atctn004	5097	0%	50	UCL MAIN ROAD CONDORRAT Main Road West	T11, T12	1869	0%	50	-63	
Dalshannon to Condorrat E and W	T13,T14	7242	6%	50	Dalshannon to Condorrat E and W (2008)	T13,T14	5697	0%	50	Dalshannon to Condorrat E and W (2008)	T13,T14	2033	0%	50	-64	
Main road condorrat	use T17,18 &ratio 2012	2954	10%	50	Main road condorrat	use T17,18 &ratio 2012	2323	3%	50	Main Road East	T17a and 18a	723	7%	50	-69	
Mollisburn WB Merge	C	13558	6%	80	Mollisburn WB Merge	C	13644	12%	80	M73 2062SI I On slip a,R62 to R63	C	2259	0%	80	-83	
Mollisburn WB diverge	c	713	5%	80	Mollisburn WB diverge	c	718	11%	80	M73 2062SO O Off slip,R64 to R65	c	2798	42%	80	290	Layout and changes in road network
M73 Mainline NB	L	24289	10%	108	M73 Mainline SB	L	24443	16%	108	M73 1962(N) M W of J3,R52 to R53 +R53 to R52	L	21052	24%	108	-14	
M73 Mainline SB	L	22938	12%	108	M73 Mainline NB	L	21127	17%	108	M73 1962(S) M W of J3,R52 to R53 +R53 to R52	L	23262	24%	108	10	
B8048 to roundabout EB and WB	S28	6857	10%	50	B8048 to roundabout EB and WB	S28 (2008)	6962	15%	50	B8048 EBWB	S28	6482	17%	50	-7	
Westfield road West	Ts6	12382	6%	50	Westfield road West	Ts6	5295	8%	50	Westfield road West	Ts6	5143	11%	50	-6	
Westfield road East	T7/8	14827	7%	50	Westfield road East	T7/8	6329	9%	50	Westfield road East	T7/8	6815	24%	50	8	
Mollins road	Fig S2	19195	7%	50	Mollins road	Fig S2	17646	11%	50	Mollins road	Fig S2	10813	9%	50	-39	
A80, Crow Wood to Muirhead EB	x2	33588	10%	80	A80 West of Muirhead	JTC00269	27546	14%	80	A80 West of Muirhead	x2	16879	13%	80	-39	
A80, Crow Wood to Muirhead WB	x2	29345	11%	80	A80 25W M at J3 Crowwood Rbt	NTC00426	25936	22%	80	A80 25W M at J3 Crowwood Rbt	x2	15892	21%	80	-39	
Muirhead to Muirhead EB	x2a	27864	11%	80	A80 West of Muirhead	JTC00269	27145	15%	80	A80 West of Muirhead	x2a	16633	14%	80	-39	
Muirhead to Muirhead WB	x2a	26763	10%	80	A80 MUIRHEAD WB	JTC00150 WB	27026	15%	80	A80 MUIRHEAD WB	x2a	16560	14%	80	-39	
Muirhead to Moodiesburn EB	x3	28323	11%	80	A80 Muirhead to Moodiesburn	JTC00268	25356	15%	80	A80 Muirhead to Moodiesburn	x3	15537	14%	80	-39	
Muirhead to Moodiesburn WB	x3	26859	11%	80	A80 Muirhead to Moodiesburn WB	JTC00268 WB	25377	15%	80	A80 Muirhead to Moodiesburn WB	x3	15550	14%	80	-39	
Moodiesburn to Mollisburn EB	x4	26008	12%	80	A80 West of M73 Junction	JTC00267 E	23341	19%	80	A80 West of M73 Junction	x4	14302	14%	80	-39	
Moodiesburn to Mollisburn WB	x4	25366	11%	80	A80 West of M73 Junction	JTC00267 w	23874	15%	80	A80 West of M73 Junction	x4	14629	14%	80	-39	
Gartferry road	T1	5146	12%	50	Gartferry road	T1	2197	14%	50	Gartferry road	T1	2138	17%	50	-3	
Stoneyetts road	Fig S4	7246	14%	50	Stoneyetts road	Fig S4	6661	18%	50	Stoneyetts road	Fig S4	1715	17%	50	-74	data taken from ES figure, as no other data provided
Lindsaybeg Road	S8	4661	10%	50	Lindsaybeg Road	S8	4285	14%	50	Lindsaybeg Road	S8	1103	13%	50	-74	
Mollisburn	T9,T10	7095	11%	50	Mollisburn	T9,T10	5581	4%	50	Mollisburn	T9,T10	2046	0%	50	-63	
Cumbernauld Town Centre E	T19	5223	6%	50	Cumbernauld Town Centre E	T19	10923	0%	50	Cumbernauld Town Centre E	T19	12270	2%	50	12	
Cumbernauld Town Centre W	T20	7625	7%	50	Cumbernauld Town Centre W	T20	9543	10%	50	Cumbernauld Town Centre W	T20	10720	12%	50	12	
Castley West	T23/24	19055	13%	50	Castley West	T21/22	18901	22%	50	Castley West	T21/22	17851	22%	50	-6	
Castley east	T23/24	8150	15%	50	Castley east E	T23/24	8194	25%	50	Castley east E	T23/4	2237	0%	50	-73	
Castley S25/26	Transport Scot	4001	26%	50	Castley S25/26	S25/26	8034	33%	50	B816 CASTLEARY ROAD,S25 to S26 New Castley	S25/26	3037	4%	50	-62	
Eastfield road	TS2	11773	10%	50	Eastfield road	TS2	12230	10%	50	Eastfield road	TS2	13738	12%	50	12	
Seabegs road	z	7202	19%	50	Seabegs Overbridge	z	9492	42%	50	Seabegs Overbridge	z	7673	39%	50	-19	
A803 Banknock	K5	8948	11%	50	A803 Banknock	K5	9195	19%	50	A803 Banknock	K5	8898	22%	50	-3	
A803 Mainline	K6	9073	12%	50	A803 Mainline	K6	9124	22%	50	A803 Mainline	K6	8872	21%	50	-3	
A803 Hags	K7	5893	13%	50	A803 Hags	K7	5796	24%	50	A803 Hags	K7	5665	21%	50	-2	
Castley E/B or N/B merge slip	S40	3427	43%	80	Castley junction NB	S40	3488	51%	80	M80 2187NI I On slip a,Castley Eastbound On	S40	952	22%	80	-73	
Offslip/diverge Castley W/B or S/B	S42	3576	8%	80	Offslip Castley SB	S42	3505	18%	80	M80 2187SO O Off slip ,Castley Westbound Off	S42	978	24%	80	-72	
Auchengeich road	S21/22	2608	12%	50	Auchengeich road	S21/22	2398	16%	50	Auchengeich road	S21/22	874	23%	50	-64	

note: positive means an increase in flows

roads/sections not comparable in all years	ID	AAWT 18hr flow	HGV percentage	Speed KPH	roads/sections not comparable in all years	ID	AAWT 18hr flow	HGV percentage	Speed KPH	roads/sections not comparable in all years	ID	AAWT 18hr flow	HGV percentage	Speed KPH	Percentage change with 2012& 2008	Comments
West of Lowwood EB	x5c	42327	12%	108	(M80) West of Lowwood EB	x5c	38985	17%	108	R52 to R53 +R53 to R52 (M73 between slips)	between slips	38923	32%	108	N/A	
West of Lowwood WB	x5c	34798	14%	108	West of Lowwood WB	x5c	35019	20%	108	R52 to R53 +R53 to R52 (M73 between junc)	between junc	38462	30%	108	N/A	Not comparable sections of road, due to road layout changes
(M80) East of Mollisburn EB	x5a	42329	12%	108	East of Mollisburn EB (M80)	x5a	38987	17%	108	M73 2062S						



Stoneyetts road				
ID	Flow	HGV	Speed	
Fig S4	7246	14.0%	50	
Fig S4	6661	17.5%	50	
Fig S4	1715	16.5%	50	
74%		decrease		

M80 Hornhill to Mollinsburn Slips (R1 to R2/3)				
Direction	ID	Flow	HGV	Speed
	-	-	-	-
	-	-	-	-
	-	-	-	-
EB		23385	14.0%	108
WB		20045	20.0%	108

At Hornhill				
Direction	ID	Flow	HGV	Speed
EB	x1	32696	10%	108
WB	x1	26566	11%	108
EB	1, JTC0046	24496	11%	108
WB	x1	31190	10%	108
EB	X1 (EB)	28976	8%	108
WB	X1 (WB)	29028	9%	108
EB	18.00%		Increase	
WB	7.00%		decrease	

Muirhead to Moodiesburn				
Direction	ID	Flow	HGV	Speed
EB	x3	28323	11%	80
WB	x3	26859	11%	80
EB	JTC00268	25356	15%	80
WB	JTC00268 WB	25377	15%	80
EB	x3	15537	14%	80
WB	x3	15550	14%	80
EB	39.00%		decrease	
WB	39.00%		decrease	

Gartferry Road			
ID	Flow	HGV	Speed
T1	5146	12.0%	50
T1	2197	14.0%	50
T1	2138	17.0%	50
3%		decrease	

Moodiesburn to Mollinsburn				
Direction	ID	Flow	HGV	Speed
EB	x4	26008	12%	80
WB	x4	25366	11%	80
EB	JTC00267 E	23341	15%	80
WB	JTC00267 w	23874	15%	80
EB	x4	14302	14%	80
WB	x4	14629	14%	80
EB	39.00%		decrease	
WB	39.00%		decrease	

A80, Crow Wood to Muirhead				
Direction	ID	Flow	HGV	Speed
EB	x2	33588	10%	80
WB	x2	29345	11%	80
EB	JTC00269	27546	14%	80
WB	NTC00426	25936	22%	80
EB	x2	16879	13%	80
WB	x2	15892	21%	80
EB	39.00%		decrease	
WB	39.00%		decrease	

Legend

Name
2003 figures
2008 figures
2012 figures
% change between 2008 and 2012

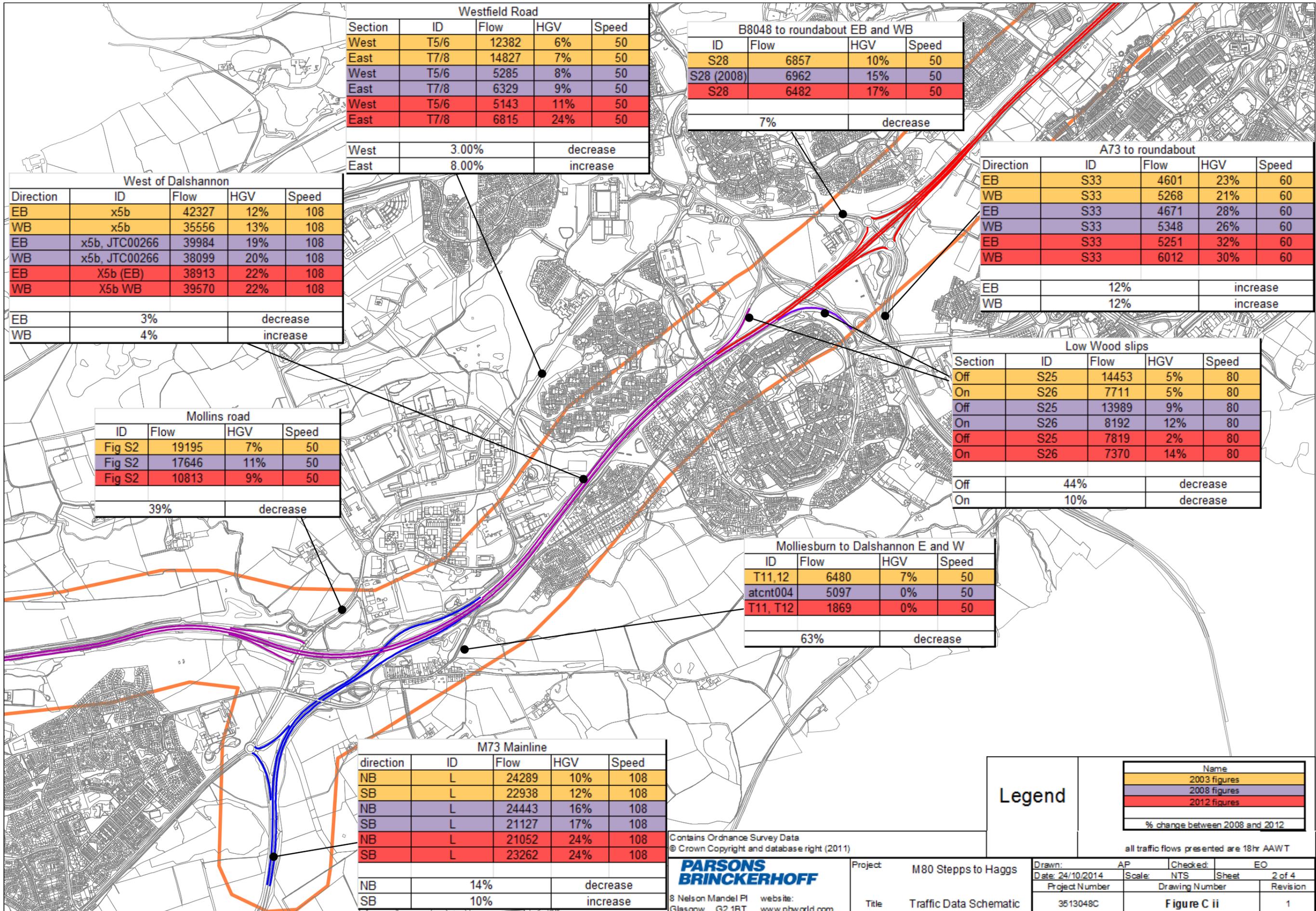
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Project M80 Steps to Haggs
Title Traffic Data Schematic

Drawn: AP	Checked: EO
Date: 24/10/2014	Scale: NTS
Project Number 3513048C	Drawing Number Figure C i
Sheet 1 of 4	Revision 1

all traffic flows presented are 18hr AAWT



Westfield Road				
Section	ID	Flow	HGV	Speed
West	T5/6	12382	6%	50
East	T7/8	14827	7%	50
West	T5/6	5285	8%	50
East	T7/8	6329	9%	50
West	T5/6	5143	11%	50
East	T7/8	6815	24%	50
West	3.00%		decrease	
East	8.00%		increase	

B8048 to roundabout EB and WB			
ID	Flow	HGV	Speed
S28	6857	10%	50
S28 (2008)	6962	15%	50
S28	6482	17%	50
7%		decrease	

A73 to roundabout				
Direction	ID	Flow	HGV	Speed
EB	S33	4601	23%	60
WB	S33	5268	21%	60
EB	S33	4671	28%	60
WB	S33	5348	26%	60
EB	S33	5251	32%	60
WB	S33	6012	30%	60
EB	12%		increase	
WB	12%		increase	

West of Dalshannon				
Direction	ID	Flow	HGV	Speed
EB	x5b	42327	12%	108
WB	x5b	35556	13%	108
EB	x5b, JTC00266	39984	19%	108
WB	x5b, JTC00266	38099	20%	108
EB	X5b (EB)	38913	22%	108
WB	X5b WB	39570	22%	108
EB	3%		decrease	
WB	4%		increase	

Low Wood slips				
Section	ID	Flow	HGV	Speed
Off	S25	14453	5%	80
On	S26	7711	5%	80
Off	S25	13989	9%	80
On	S26	8192	12%	80
Off	S25	7819	2%	80
On	S26	7370	14%	80
Off	44%		decrease	
On	10%		decrease	

Mollins road			
ID	Flow	HGV	Speed
Fig S2	19195	7%	50
Fig S2	17646	11%	50
Fig S2	10813	9%	50
39%		decrease	

Molliesburn to Dalshannon E and W			
ID	Flow	HGV	Speed
T11,12	6480	7%	50
atcnt004	5097	0%	50
T11, T12	1869	0%	50
63%		decrease	

M73 Mainline				
direction	ID	Flow	HGV	Speed
NB	L	24289	10%	108
SB	L	22938	12%	108
NB	L	24443	16%	108
SB	L	21127	17%	108
NB	L	21052	24%	108
SB	L	23262	24%	108
NB	14%		decrease	
SB	10%		increase	

Legend

	Name
	2003 figures
	2008 figures
	2012 figures
	% change between 2008 and 2012

Castlecreary West and East sections				
Section	ID	Flow	HGV	Speed
West	T23/24	19055	13%	50
East	T23/24	8150	15%	50
West	T21/22	18901	22%	50
East	T23/24	8194	25%	50
West	T21/22	17851	22%	50
East	T23/4	2237	0%	50
West	6.00%		decrease	
East	73.00%		decrease	

Eastfield road			
ID	Flow	HGV	Speed
TS2	11773	10%	50
TS2	12230	10%	50
TS2	13738	12%	50
12%		decrease	

Auchenkilns to Old Inns				
Direction	ID	Flow	HGV	Speed
EB	X7	28557	17%	108
WB	X7	32210	17%	108
EB	X7	33705	24%	108
WB	X7	27841	17%	108
EB	X7	34787	22%	108
WB	X7	33812	22%	108
EB	0%		decrease	
WB	25%		increase	

Old Inns to Castlecreary slips				
Direction	ID	Flow	HGV	Speed
WB	x9a	36039	15%	108
EB	x9a	32174	12%	108
WB	x9a wb	33897	23%	108
EB	x9a eb	33564	21%	108
WB	x9a	35509	20%	108
EB	x9a (EB)	36231	24%	108
WB	6%		increase	
EB	8%		increase	

Cumbernauld Town Centre				
Section	ID	Flow	HGV	Speed
East	T19	5223	6%	50
West	T20	7625	7%	50
East	T19	10923	0%	50
West	T20	9543	10%	50
East	T19	12270	2%	50
West	T20	10720	12%	50
East	12%		increase	
West	12%		increase	

Legend

Name
2003 figures
2008 figures
2012 figures
% change between 2008 and 2012

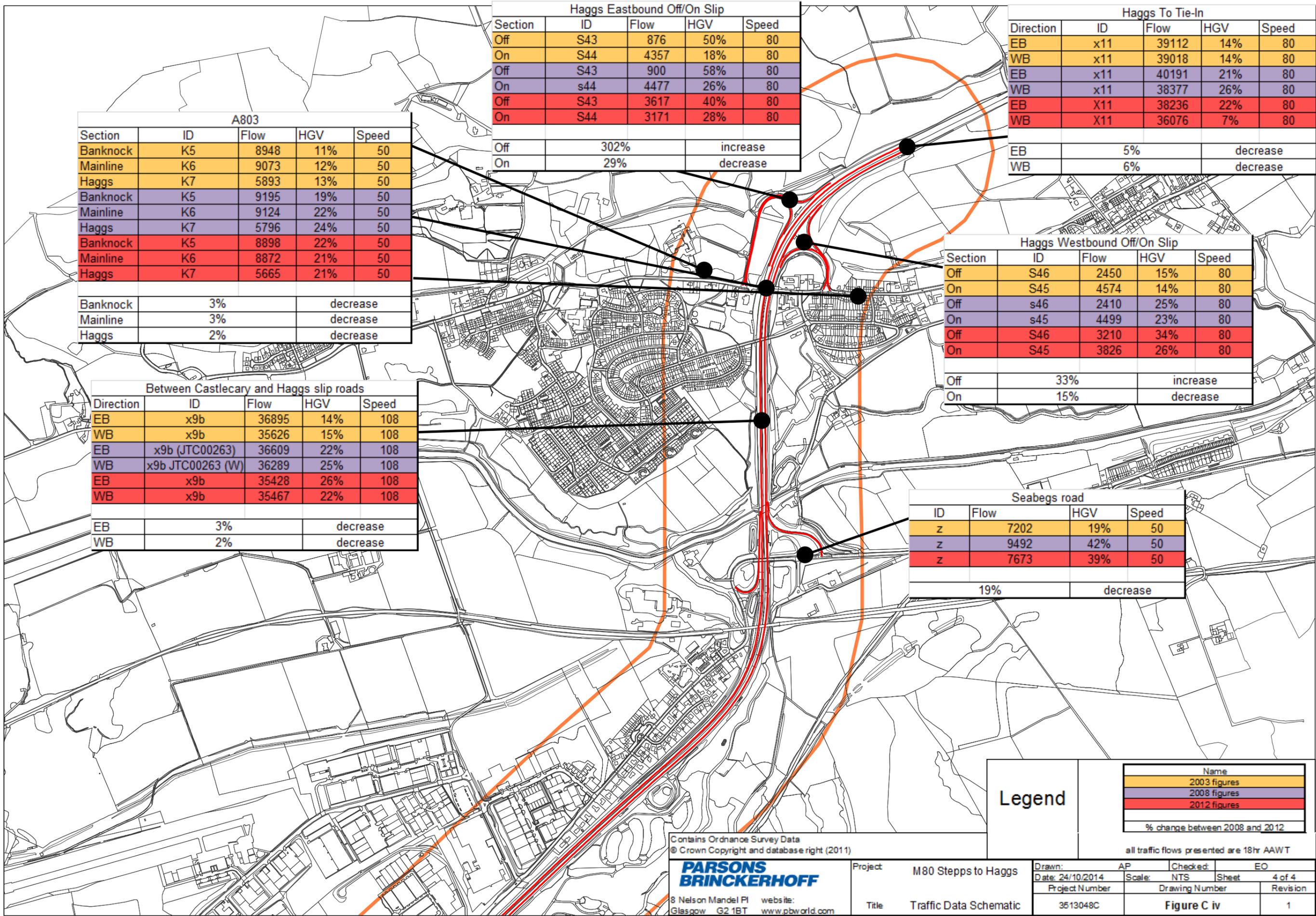
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Project M80 Steps to Haggs
Title Traffic Data Schematic

Drawn: AP	Checked: EO
Date: 24/10/2014	Scale: NTS
Project Number: 3513048C	Drawing Number: Figure C iii
Sheet: 3 of 4	Revision: 1

all traffic flows presented are 18hr AAWT



A803				
Section	ID	Flow	HGV	Speed
Banknock	K5	8948	11%	50
Mainline	K6	9073	12%	50
Haggs	K7	5893	13%	50
Banknock	K5	9195	19%	50
Mainline	K6	9124	22%	50
Haggs	K7	5796	24%	50
Banknock	K5	8898	22%	50
Mainline	K6	8872	21%	50
Haggs	K7	5665	21%	50
Banknock		3%		decrease
Mainline		3%		decrease
Haggs		2%		decrease

Haggs Eastbound Off/On Slip				
Section	ID	Flow	HGV	Speed
Off	S43	876	50%	80
On	S44	4357	18%	80
Off	S43	900	58%	80
On	s44	4477	26%	80
Off	S43	3617	40%	80
On	S44	3171	28%	80
Off		302%		increase
On		29%		decrease

Haggs To Tie-In				
Direction	ID	Flow	HGV	Speed
EB	x11	39112	14%	80
WB	x11	39018	14%	80
EB	x11	40191	21%	80
WB	x11	38377	26%	80
EB	X11	38236	22%	80
WB	X11	36076	7%	80
EB		5%		decrease
WB		6%		decrease

Haggs Westbound Off/On Slip				
Section	ID	Flow	HGV	Speed
Off	S46	2450	15%	80
On	S45	4574	14%	80
Off	s46	2410	25%	80
On	s45	4499	23%	80
Off	S46	3210	34%	80
On	S45	3826	26%	80
Off		33%		increase
On		15%		decrease

Between Castlecary and Haggs slip roads				
Direction	ID	Flow	HGV	Speed
EB	x9b	36895	14%	108
WB	x9b	35626	15%	108
EB	x9b (JTC00263)	36609	22%	108
WB	x9b JTC00263 (W)	36289	25%	108
EB	x9b	35428	26%	108
WB	x9b	35467	22%	108
EB		3%		decrease
WB		2%		decrease

Seabegs road			
ID	Flow	HGV	Speed
z	7202	19%	50
z	9492	42%	50
z	7673	39%	50
		19%	
			decrease

Legend			
Name			
2003 figures			
2008 figures			
2012 figures			
% change between 2008 and 2012			

APPENDIX D – ES NOISE SENSITIVE RECEPTORS

Table D1 i		OFFLINE Property Noise Levels between Stepps and Mollinsburn, comparison of ES and noise model levels.				
Property		Pre-construction year 2008 (dB)	ES, 2010 Scheme with mitigation (dB)	PB 2012 Post construction levels (dB)	(PB 2012 - PB 2008) difference (dB)	(PB 2012 Model - ES 2010 with mit) difference (dB)
Hornshill	G	67.0	63.3	60.5	-6.5	-2.8
	1st	68.5	64.0	61.7	-6.8	-2.3
South Broomknowes	G	53.8	54.5	54.0	0.2	-0.5
	1st	54.6	54.8	54.8	0.2	0.0
Drumsack Farm	G	57.8	62.6	58.4	0.6	-4.2
	1st	58.2	63.5	60.2	2.0	-3.3
Peathill Farm	G	46.7	58.6	58.4	11.7	-0.2
	1st	48.4	60.1	59.5	11.1	-0.6
Greenlea Cottage North	G	63.6	63.9	59.6	-4.0	-4.3
Davidston Mains Farm	G	51.6	62.7	62.2	10.6	-0.5
	1st	52.2	64.9	62.7	10.5	-2.2
Crow Wood House	G	74.8	66.4	72.4	-2.4	6.0
	1st	75.8	68.7	73.5	-2.3	4.8
12 Church Road	G	78.0	64.0	75.1	-2.9	11.1
	1 st	79.2	66.0	76.3	-2.9	10.3
13 Dunellan Avenue	G	71.4	60.1	69.1	-2.3	9.0
	1st	72.6	62.0	70.3	-2.3	8.3
Braeside Farm	G	51.0	64.0	59.3	8.3	-4.7
	1st	52.6	65.1	61.0	8.4	-4.1
24 Stoneyetts Cottages	G	51.5	61.0	63.0	11.5	2.0
	1st	51.8	63.1	63.8	12.0	0.7
Bowling Green, Stoneyetts (FF)	G	49.2	58.5	56.1	6.9	-2.4
5 The Cuillins	G	44.5	62.5	59.0	14.5	-3.5
	1st	47.6	63.8	60.7	13.1	-3.1
15 The Larches	G	42.2	61.3	59.0	16.8	-2.3
	1st	45.1	63.8	62.5	17.4	-1.3
15 Croftmoraig Avenue	G	45.4	58.1	56.6	11.2	-1.5
	1st	48.5	60.1	58.2	9.7	-1.9
Deerdykes Cottage	G	70.7	73.5	68.8	-1.9	-4.7
1 Cumbernauld Road	G	71.6	64.8	64.0	-7.6	-0.8
	1st	73.0	69.0	67.7	-5.3	-1.3
Mollinsburn Rec Area (FF)	G	68.0	67.7	64.4	-3.6	-3.3
Rosebank	G	71.5	67.6	63.4	-8.1	-4.2
	1st	72.2	68.5	64.5	-7.7	-4.0
*(FF) -Free Field						

Table D1 ii		ONLINE Property Noise Levels between Mollinsburn and Hags, comparison of ES and noise model levels.				
Property		Pre-construction year 2008 (dB)	ES, 2010 Scheme with mitigation (dB)	PB 2012 Post construction levels (dB)	(PB 2012 - PB 2008) difference (dB)	(PB 2012 Model - ES 2010 with mit) difference (dB)
Badenheath Park, Mollinsburn	G	72.6	72.9	64.0	-8.6	-8.9
1 Craigend Road	G	77.8	72.1	66.3	-11.5	-5.8
	1 st	79.6	72.5	68.6	-11.0	-3.9
67 Craigend Road	G	65.0	63.7	57.2	-7.8	-6.5
	1 st	66.4	64.3	58.7	-7.7	-5.6
Deerdykes Car Park (FF)	G	68.3	70.9	65.2	-3.1	-5.7
116 Main Road, Dalshannon	G	78.3	67.0	65.8	-12.5	-1.2
	1 st	80.6	71.0	68.4	-12.2	-2.6
14 Gainburn Gardens	G	67.1	70.7	60.3	-6.8	-10.4
	1 st	68.4	70.8	61.4	-7.0	-9.4
4 Woodmill Gardens	G	73.7	65.5	63.6	-10.1	-1.9
	1st	76.8	69.2	66.1	-10.7	-3.1
Westfield Industrial Area	G	73.1	80.4	70.7	-2.4	-9.7
3 Main Road	G	63.2	68.3	59.2	-4.0	-9.1
	1st	64.5	69.6	60.6	-3.9	-9.0
5 Craigelvan Court	G	79.1	66.0	65.0	-14.1	-1.0
	1st	79.9	67.6	66.5	-13.4	-1.1
16 Leckethill Court	G	67.9	62.3	63.2	-4.7	0.9
	1st	68.4	63.3	63.7	-4.7	0.4
7 Craigelvan View	G	75.3	64.2	63.9	-11.4	-0.3
	1st	76.0	65.3	65.0	-11.0	-0.3
28 Leckethill Avenue	G	66.2	63.3	62.8	-3.4	-0.5
	1st	67.0	64.2	63.6	-3.4	-0.6
14 Leckethill View	G	58.9	60.5	56.7	-2.2	-3.8
	1st	61.2	62.2	58.9	-2.3	-3.3
1 Summerfield Road	G	66.5	69.2	60.2	-6.3	-9.0
	1 st	67.3	69.3	61.1	-6.2	-8.2
Playground at Westfield (FF)	G	66.9	63.5	64.0	-2.9	0.5
26 Kirkview	G	63.6	65.6	57.8	-5.8	-7.8
	1 st	65.4	65.7	58.6	-6.8	-7.1
19 Craigside Place	G	56.2	59.4	53.8	-2.4	-5.6
17 Inchwood Court	G	68.8	63.4	62.3	-6.5	-1.1
	1st	71.9	64.9	64.3	-7.6	-0.6
20 Inchwood Road	G	69.1	63.8	65.5	-3.6	1.7
	1st	73.9	69.6	71.6	-2.3	2.0
48 Inchwood Road	G	70.4	64.5	64.9	-5.5	0.4
	1st	71.5	65.9	66.4	-5.1	0.5
St Francis of Assisi School	G	64.7	59.2	59.9	-4.8	0.7
27 Kirk Place	G	77.9	66.7	67.8	-10.1	1.1
	1 st	79.6	69.5	70.1	-9.5	0.6
39 Main Road	G	69.0	70.9	63.0	-6.0	-7.9
	1 st	69.5	71.5	64.2	-5.3	-7.3
Library, Condorrat	G	68.5	62.9	62.8	-5.7	-0.1
15 Rosehill Drive	G	74.2	66.3	63.5	-10.7	-2.8
	1st	74.9	68.2	64.6	-10.3	-3.6

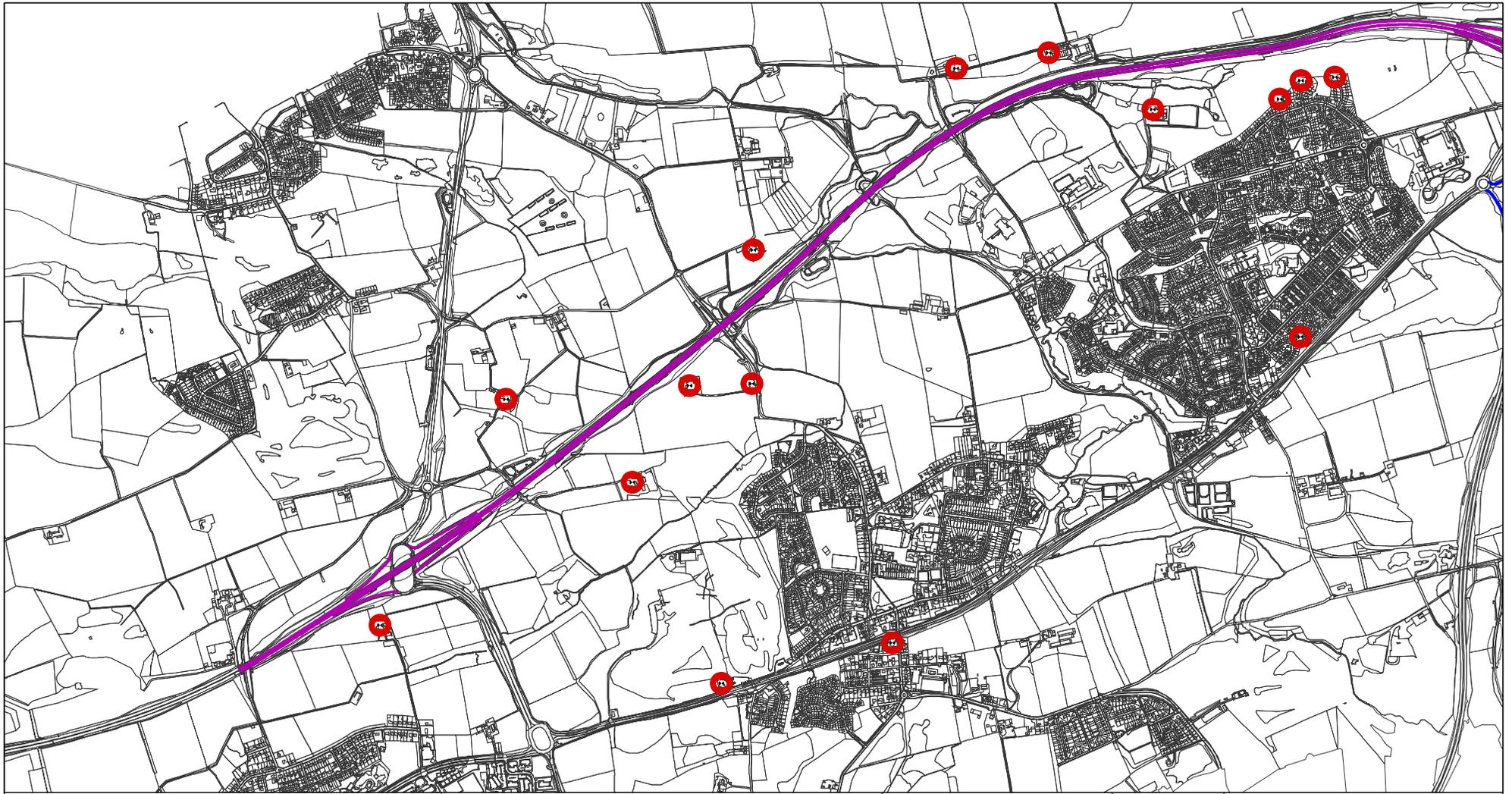
*(FF) -Free Field

Property		Pre-construction year 2008 (dB)	ES, 2010 Scheme with mitigation (dB)	PB 2012 Post construction levels (dB)	(PB 2012 - PB 2008) difference (dB)	(PB 2012 Model - ES 2010 with mit) difference (dB)
21 Rosehill Drive	G	73.1	67.5	64.8	-8.3	-2.7
	1st	74.8	70.2	66.5	-8.3	-3.7
Wayside Cottage	G	67.9	64.9	66.6	-1.3	1.7
	1st	76.8	76.7	75.9	-0.9	-0.8
St Maurices High School	G	60.1	55.0	59.5	-0.6	4.5
20 Maree Drive	G	61.8	69.3	60.7	-1.1	-8.6
	1st	63.0	69.8	62.0	-1.0	-7.8
76 Maree Drive	G	55.2	60.8	55.2	0.0	-5.6
	1st	57.3	62.4	57.3	0.0	-5.1
2a Main Road	G	62.5	65.5	59.6	-2.9	-5.9
99 Maree Drive	G	64.6	63.7	64.4	-0.2	0.7
	1st	65.9	65.4	65.9	0.0	0.5
8 Morar Court	G	64.8	63.6	63.3	-1.5	-0.3
	1 st	66.6	65.7	65.3	-1.3	-0.4
31 Auchenkilns Holdings	G	65.0	63.3	64.4	-0.6	1.1
	1st	66.3	65.2	65.6	-0.7	0.4
89 Grangeneuk Gardens	G	61.2	60.0	61.2	0.0	1.2
	1st	61.8	60.5	61.7	-0.1	1.2
83-85 Southfield Road	G	63.3	62.6	63.1	-0.2	0.5
	1st	64.0	63.1	63.8	-0.2	0.7
75 Southfield Road	G	64.5	66.1	64.4	-0.1	-1.7
	1st	65.3	66.6	65.0	-0.3	-1.6
41a Southfield Road	G	68.3	67.4	67.8	-0.5	0.4
	1st	69.0	68.4	68.4	-0.6	0.0
17/19 Southfields	G	68.9	66.3	67.9	-1.0	1.6
	1st	72.6	69.0	72.0	-0.6	3.0
Bowling Green, Ravenswood (FF)	G	65.3	66.5	64.5	-0.8	-2.0
12 Langdales Avenue	G	65.7	61.4	62.0	-3.7	0.6
	1st	66.8	62.4	62.7	-4.1	0.3
70 Berryhill Road	G	66.8	66.1	66.6	-0.2	0.5
	1 st	67.9	66.7	67.7	-0.2	1.0
211 Binniehill Road	G	69.8	65.2	66.4	-3.4	1.2
	1 st	70.5	66.3	67.3	-3.2	1.0
48 Binniehill Road	G	63.3	60.1	61.4	-1.9	1.3
	1 st	66.3	61.7	63.9	-2.4	2.2
62 Binniehill Road	G	61.0	57.7	58.0	-3.0	0.3
	1 st	64.3	59.3	60.7	-3.6	1.4
80 Binniehill Road	G	60.2	58.1	57.2	-3.0	-0.9
	1 st	63.2	59.2	59.8	-3.4	0.6
21d Braeface Road	G	68.9	65.8	67.4	-1.5	1.6
	1 st	69.6	67.1	67.9	-1.7	0.8
49 Binniehill Road	G	63.7	62.3	61.2	-2.5	-1.1
	1 st	64.8	63.4	62.3	-2.5	-1.1
103 Craighalbert Rd	G	70.2	62.4	66.4	-3.8	4.0
	1 st	71.2	63.6	67.5	-3.7	3.9
*(FF) -Free Field						

Property		Pre-construction year 2008 (dB)	ES, 2010 Scheme with mitigation (dB)	PB 2012 Post construction levels (dB)	(PB 2012 - PB 2008) difference (dB)	(PB 2012 Model - ES 2010 with mit) difference (dB)
Zoar Cottage	G	76.4	67.5	71.1	-5.3	3.6
	1 st	77.1	69.3	73.0	-4.1	3.7
49h Braeface Road	G	65.9	61.5	62.7	-3.2	1.2
	1 st	66.7	62.8	63.5	-3.2	0.7
Seafar	G	77.7	70.0	71.3	-6.4	1.3
	1 st	78.4	70.7	72.3	-6.1	1.6
89 Allanfauld Road	G	66.9	63.3	63.6	-3.3	0.3
	1 st	69.0	64.5	65.5	-3.5	1.0
53 Hayston Road	G	68.2	64.5	65.7	-2.5	1.2
	1 st	68.4	64.9	66.0	-2.4	1.1
12 Callander Court	G	68.6	64.1	66.3	-2.3	2.2
	1 st	68.9	65.2	66.6	-2.3	1.4
39 Lansdowne Drive	G	67.8	61.2	64.5	-3.3	3.3
	1 st	69.2	62.9	65.8	-3.4	2.9
88 - 118 The Auld Road	G	66.7	61.9	62.8	-3.9	0.9
	1 st	68.9	63.7	64.4	-4.5	0.7
	2 nd	71.0	65.1	65.7	-5.3	0.6
	3 rd	72.9	66.9	67.0	-5.9	0.1
55 The Auld Road	G	77.8	68.3	72.3	-5.5	4.0
	1 st	81.4	74.4	75.4	-6.0	1.0
7 Lansdowne Drive	G	69.8	62.4	64.9	-4.9	2.5
	1 st	72.9	64.1	67.6	-5.3	3.5
11 Letham Grange	G	62.3	56.2	58.8	-3.5	2.6
	1 st	64.6	57.7	60.5	-4.1	2.8
14 Letham Grange	G	60.9	55.8	57.3	-3.6	1.5
	1 st	63.2	56.6	59.1	-4.1	2.5
7 Nairn Way	G	58.0	56.0	55.8	-2.2	-0.2
	1 st	60.1	55.7	57.5	-2.6	1.8
11 Carrick Road	G	74.2	64.9	66.8	-7.4	1.9
	1 st	78.2	67.7	69.7	-8.5	2.0
Cumbernauld Old Parish Church	G	66.2	57.6	60.1	-6.1	2.5
	1 st	67.7	58.9	61.4	-6.3	2.5
Recreation Area & Car Park (FF)	G	72.0	58.6	63.0	-9.0	4.4
136 Roadside Cumbernauld	G	74.6	60.6	64.2	-10.4	3.6
	1 st	79.1	62.5	66.6	-12.5	4.1
126 Roadside, Cumbernauld	G	69.2	58.7	61.8	-7.4	3.1
	1 st	72.1	60.6	64.4	-7.7	3.8
13 Dornoch Way	G	71.9	64.4	68.3	-3.6	3.9
	1 st	73.7	65.7	70.0	-3.7	4.3
64 Muirfield Road	G	67.6	71.1	63.5	-4.1	-7.6
	1 st	69.6	72.8	64.7	-4.9	-8.1
49 Roadside, Cumbernauld	G	71.1	69.2	64.3	-6.8	-4.9
	1 st	72.1	69.9	65.3	-6.8	-4.6
25 Smithyends	G	59.0	56.9	56.4	-2.6	-0.5
	1 st	62.1	59.8	59.2	-2.9	-0.6
43 Muirfield Road	G	70.0	64.4	65.0	-5.0	0.6
	1 st	70.7	65.2	65.7	-5.0	0.5

*(FF) -Free Field

Property		Pre-construction year 2008 (dB)	ES, 2010 Scheme with mitigation (dB)	PB 2012 Post construction levels (dB)	(PB 2012 - PB 2008) difference (dB)	(PB 2012 Model - ES 2010 with mit) difference (dB)
1 Westerwood Rise	G	69.4	68.7	64.0	-5.4	-4.7
	1 st	70.7	69.9	65.5	-5.2	-4.4
22/24 Rigghead Avenue	G	72.3	71.0	63.3	-9.0	-7.7
	1 st	74.5	73.4	65.2	-9.3	-8.2
Dobbies Garden Centre	G	75.1	72.2	70.8	-4.3	-1.4
2 Roadside, Cumbernauld	G	68.9	71.5	63.8	-5.1	-7.7
	1 st	71.2	71.8	65.0	-6.2	-6.8
Ward Park North Industrial Estate	G	73.3	75.8	70.5	-2.8	-5.3
Filling Station, Old Inns	G	77.2	79.5	73.9	-3.3	-5.6
Ward Park South Industrial Area	G	77.0	76.8	72.9	-4.1	-3.9
Ward Park Ind Area 2	G	71.2	67.5	67.0	-4.2	-0.5
Ward Park Ind Area 3	G	76.8	80.4	72.2	-4.6	-8.2
Ward Park Ind Area 4	G	81.4	68.2	77.7	-3.7	9.5
2a Castlecary Road	G	80.5	72.2	71.7	-8.8	-0.5
	1 st	81.8	78.0	75.6	-6.2	-2.4
8a Castlecary Road	G	79.2	70.0	72.1	-7.1	2.1
	1 st	80.3	73.9	75.1	-5.2	1.2
Castlecary Castle	G	68.7	66.0	64.5	-4.2	-1.5
	1 st	69.2	66.4	64.8	-4.4	-1.6
6 Castle Court	G	77.5	68.6	68.2	-9.3	-0.4
	1 st	79.4	72.0	71.0	-8.4	-1.0
28 Castle Court	G	79.2	72.4	71.2	-8.0	-1.2
	1 st	80.5	76.6	73.9	-6.6	-2.7
Glenside Cottage	G	78.1	70.3	69.6	-8.5	-0.7
Castra, Walton Road	G	70.8	63.1	66.2	-4.6	3.1
Woodneuk Cottage	G	67.6	56.3	61.6	-6.0	5.3
	1 st	68.6	57.7	62.4	-6.2	4.7
Bridge Keepers Cottage	G	71.6	72.0	66.4	-5.2	-5.6
	1 st	76.2	73.0	71.0	-5.2	-2.0
114 Holy Grove	G	71.6	63.3	66.4	-5.2	3.1
	1 st	72.0	64.7	66.8	-5.2	2.1
1 Cumbernauld Road, Haggs	G	61.0	63.6	58.6	-2.4	-5.0
	1 st	64.0	64.4	63.7	-0.3	-0.7
8 Auchinloch Drive	G	67.3	61.5	62.5	-4.8	1.0
	1 st	67.7	62.2	63.1	-4.6	0.9
50 Auchinloch Drive	G	70.2	66.3	65.9	-4.3	-0.4
	1 st	72.8	68.0	69.0	-3.8	1.0
2 Margaret Avenue	G	67.6	69.5	63.1	-4.5	-6.4
	1 st	68.2	70.5	63.7	-4.5	-6.8
36 Hollandbush Crescent	G	58.7	57.5	55.9	-2.8	-1.6
	1 st	60.0	58.6	57.2	-2.8	-1.4
St Lukes Church	G	67.1	58.1	62.7	-4.4	4.6
74 Auchincloch Drive	G	73.0	69.9	69.2	-3.8	-0.7
	1 st	75.7	70.8	71.4	-4.3	0.6
9 Garncrew Road	G	66.3	70.4	63.0	-3.3	-7.4
	1 st	67.3	71.6	64.3	-3.0	-7.3
Bankview Nursing Home	G	59.7	53.4	57.6	-2.1	4.2
	1 st	62.2	56.1	60.2	-2.0	4.1



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M80 Steps to Hags

Title:

ES Representative Properties

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EO

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A4

Sheet: 1 of 4

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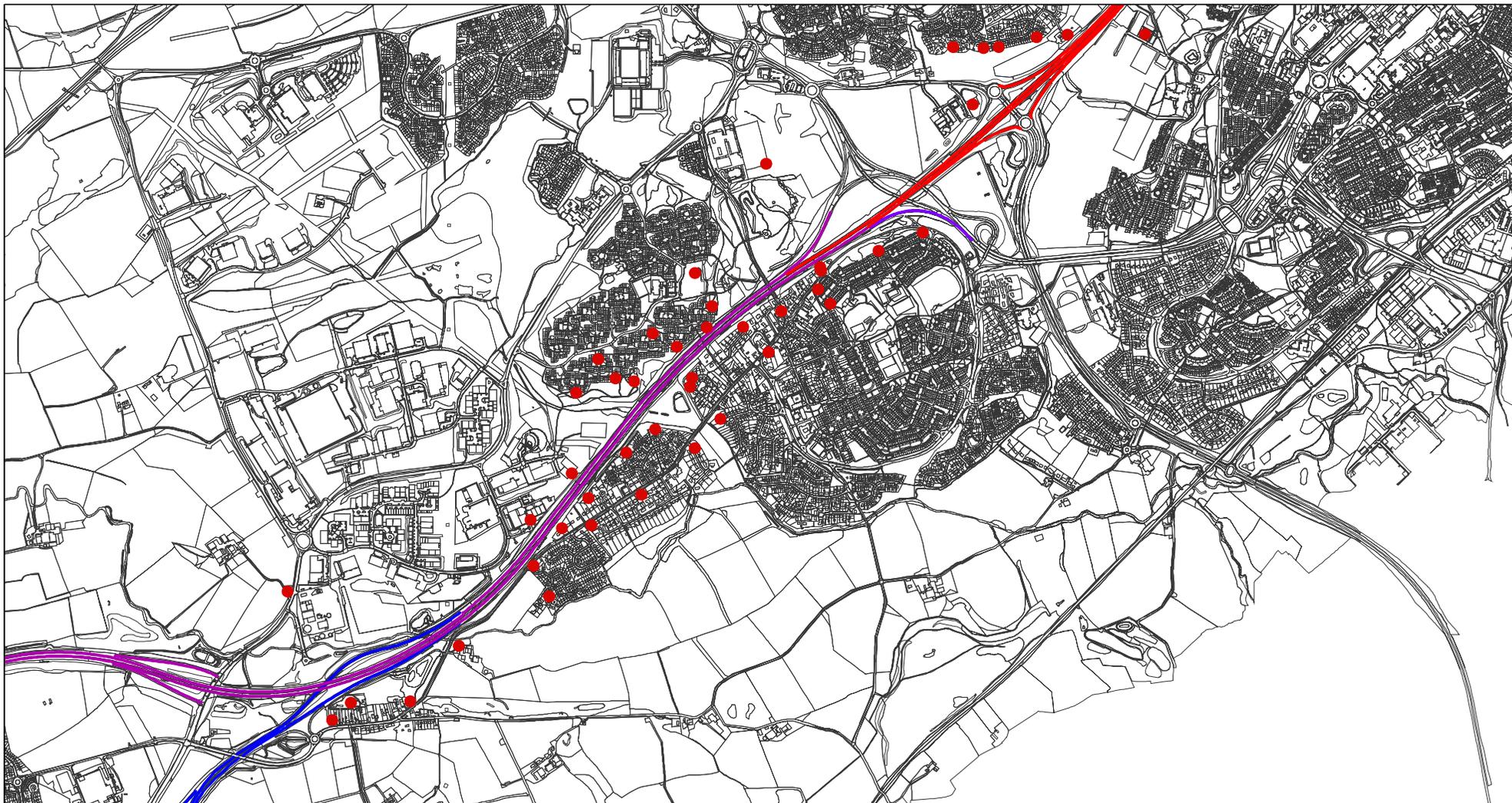
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Figure D1

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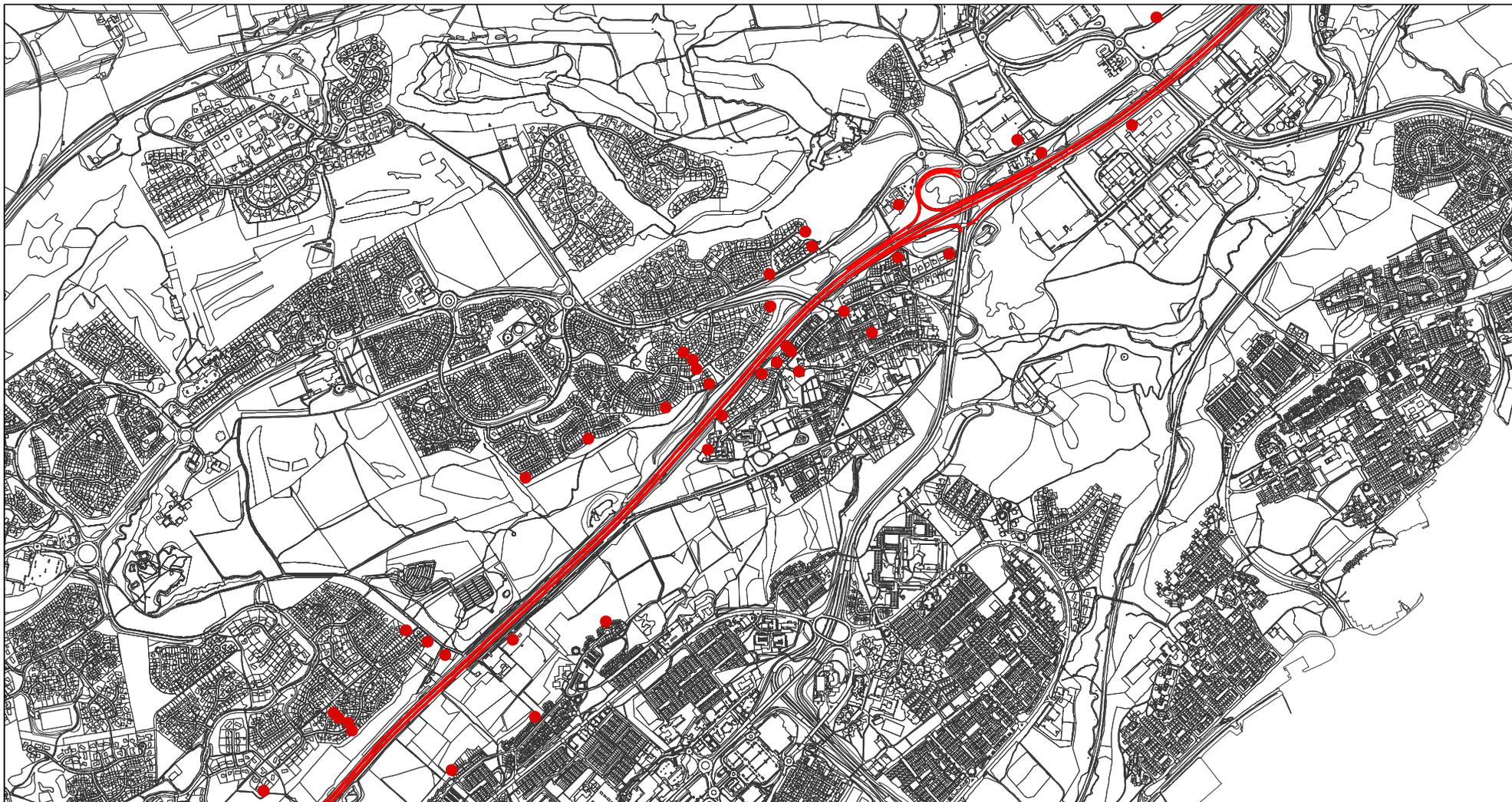
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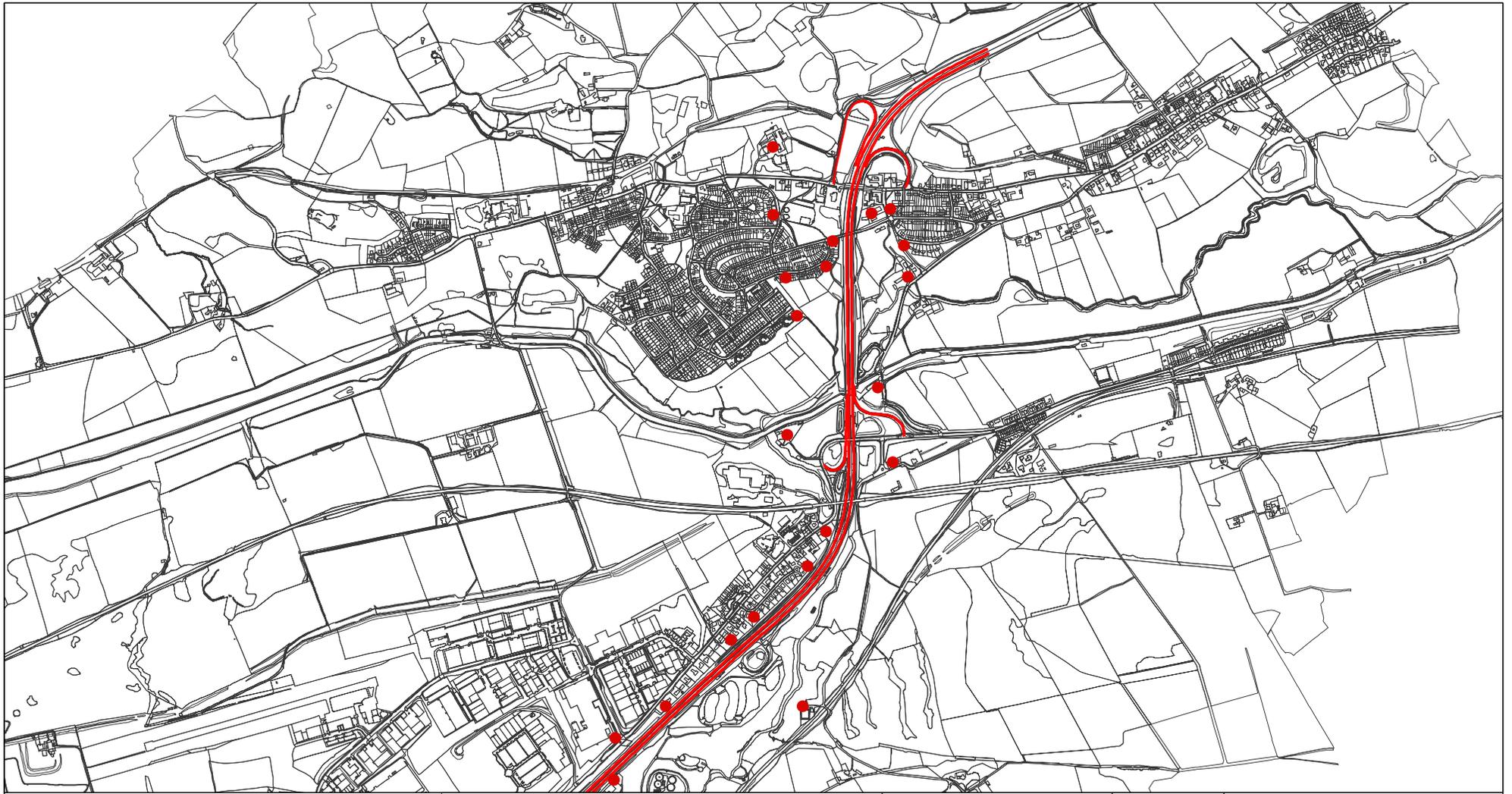
Figure D2

1

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Figure D4

1

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