

## **APPENDIX A: IMPACT ASSESSMENT**

## Summary: Intervention & Options

Department /Agency:  
Highways Agency

Title:  
Impact Assessment M25 Junctions 2 to 3 Controlled  
Motorway

Stage: Final Proposal

Version: DRAFT

Date: 05<sup>th</sup> May 2009

Related Publications: Consultation documents

### Available to view or download at:

<http://www.highways.gov.uk/business/133.aspx>

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### What is the problem under consideration? Why is government intervention necessary?

Secondary legislation is required to implement variable mandatory speed limits on the M25 Motorway between junctions 2 and 3 (both directions). The variable mandatory speed limits will be enforced by the police.

### What are the policy objectives and the intended effects?

The implementation of variable mandatory speed limits on the M25 junctions 2 to 3 will improve traffic flow, reduce accidents and reduce carbon emissions.

### What policy options have been considered? Please justify any preferred option.

Option 1: (Baseline) Do nothing. To do nothing will retain the status quo for existing daily congestion, accident and pollution levels increasing pro-rata year on year.

Option 2: (Preferred) Secondary legislation in the form of regulations made under section 17 of the Road Traffic Regulation Act 1984 will be required. This policy is expected to:

- Reduce congestion
- Reduce the frequency of accidents
- Reduce driver stress
- Provide more reliable journey times
- Reducing carbon emissions

When will the policy be reviewed to establish the actual costs and benefits and the achievement of the desired effects? A period of monitoring and assessment will begin prior to commissioning and will continue for six months thereafter. The assessment will optimise the system to ensure that full benefits are achieved.

### **Ministerial Sign-off** For SELECT STAGE Impact Assessments:

*I have read the Impact Assessment and I am satisfied that, given the available evidence, it represents a reasonable view of the likely costs, benefits and impact of the leading options.*

Signed by the responsible Minister:

To be signed once Statutory Instrument is available for signature

..... Date:

## Summary: Analysis & Evidence

Policy Option: 2

Description: To make regulations to introduce Variable Mandatory Speed Limit on the M25 between junctions 2 to 3

<b>COSTS</b>	<b>ANNUAL COSTS</b>		Description and scale of <b>key monetised costs</b> by 'main affected groups'	
	<b>One-off</b> (Transition)	<b>Yrs</b>		
	<b>£ 6,080,000</b>	1	Installation =	£6,080,000
	<b>Average Annual Cost</b> (excluding one-off)		Journey Time =	£2,150,794
<b>£ 117,220.4</b>	30	Maintenance =	£65,427	
		Enforcement =	£643,722	
		<b>Total Cost (PV)</b>	<b>£ 9,596,613</b>	
Other <b>key non-monetised costs</b> by 'main affected groups'				

<b>BENEFITS</b>	<b>ANNUAL BENEFITS</b>		Description and scale of <b>key monetised benefits</b> by 'main affected groups'	
	<b>One-off</b>	<b>Yrs</b>		
	<b>£ NA</b>		Accident Saving =	£23,191,062
	<b>Average Annual Benefit</b> (excluding one-off)		Journey Time Reliability =	£7,847,087
<b>£ 1,047,189</b>	30	Emissions =	£377,523	
		<b>Total Benefit (PV)</b>	<b>£ 31,415,672</b>	
Other <b>key non-monetised benefits</b> by 'main affected groups'				
Increased driver information, reduced driver stress, reduced fuel usage, reduced noise pollution.				

### Key Assumptions/Sensitivities/Risks

The effects of a Controlled Motorway scheme on the newly widened 4-lane dual motorway between M25 junctions 2 to 3 have been assumed to be similar as for the M25 junctions 10 to 16, which has had Controlled Motorways in operation since 2002.

Price Base Year 2008	Time Period Years 30	<b>Net Benefit Range (NPV)</b> <b>£ NA</b>	<b>NET BENEFIT (NPV Best estimate)</b> <b>£ 21,819,059</b>
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What is the geographic coverage of the policy/option?		M25 J2 to 3	
On what date will the policy be implemented?		August 2009	
Which organisation(s) will enforce the policy?		Police	
What is the total annual cost of enforcement for these organisations?		£ TBA	
Does enforcement comply with Hampton principles?		Yes	
Will implementation go beyond minimum EU requirements?		N/A	
What is the value of the proposed offsetting measure per year?		£ NA	
What is the value of changes in greenhouse gas emissions?		£ NA	
Will the proposal have a significant impact on competition?		No	
Annual cost (£-£) per organisation (excluding one-off)	Micro	Small	Medium
Are any of these organisations exempt?	No	No	N/A
			Large

<b>Impact on Admin Burdens Baseline</b> (2005 Prices)		(Increase - Decrease)	
Increase of	£ NA	Decrease of	£ NA
		<b>Net Impact</b>	<b>£ NA</b>

Key: Annual costs and benefits: Constant Prices (Net) Present Value

## Evidence Base (for summary sheets)

**Note: This proposal has been assessed against the guidance that DfT uses to assess proposals and is based on the same principles as other Impact Assessments but some presentational aspects may differ.**

### **Background**

The Highways Agency is proposing to implement regulations to introduce variable mandatory speed limits on the M25 between junctions 2 and 3 (“the Controlled Motorway Scheme”). The Controlled Motorway Scheme together with the ability to enforce the variable mandatory speed limits will deliver a number of positive benefits with regard to, safer roads and a reduction in journey times without the need for more road construction. These are:

- Making best use of the existing infrastructure
- Reducing congestion, increasing the throughput of traffic and improving the journey time reliability
- Reduced traffic flow breakdown
- Reduced accidents; and
- Reduced carbon dioxide emissions

Since 1995, a Controlled Motorway has been operational on the western quadrant of the M25 between Junction 10 (A3) and Junction 15 (M4). In 2002, the scheme was extended to cover junctions 15 (M4) to 16 (M40) of the M25.

Controlled Motorways schemes have the following key features:

- Mandatory speed control, using variable speed limits displayed on special Advanced Motorway Indicators (AMI's) equipped with ‘Red Rings’, mounted above each lane on standard gantries;
- Automatic signal setting in response to traffic conditions, driven by the Motorway Incident Detection and Automatic Signalling (MIDAS) system, with additional driver information on Enhanced Message Signs (EMS);
- Provision of speed enforcement using the Highways Agency Digital Enforcement Camera System 2 (HADECS 2) which will be mounted on the gantries.

The variable mandatory speed limits signals will be displayed on gantries. The signals mounted on overhead gantries are capable of automatically displaying one of three mandatory settings, 40 mph, 50 mph or 60 mph. All the lanes above the main carriageway will automatically display the mandatory speed limit as appropriate to the road conditions. In addition, 40mph signals are set to protect backs of queuing traffic. Lower speed limits such as 20mph or 30mph can be manually set by operators when considered necessary for the safety of the travelling public or those working within the carriageway.

A detailed “before and after” study was carried out when the Controlled Motorway was implemented on the M25 between junctions 15 and 16. The study team included recognised experts in traffic behaviour, air quality, noise pollution, accident analysis, statistics and economic appraisal. The project team was accountable to a specially created Project Steering Group, comprising suitably qualified representatives from the Department for Transport and the Highways Agency. Methodology and results were reviewed on at least a quarterly basis, with interim meetings focusing on more technical detail as required.

In determining the methodology for guiding the business case work, the Project Steering Group recommended that the New Approach to Traffic Appraisal be adopted. The Business Case itself was established using a “before and after” comparison of key variables such as journey time, safety and capacity. The “before” scenario was the conventional gantry-mounted lane-signalling and cantilever mounted carriageway signals, with manually set signals and automatic queue protection using advisory speed limits. The “after” scenario (after implementation, i.e. with the Controlled Motorway operational) was Controlled Motorways with variable mandatory speed limits, speed enforcement and congestion algorithms.

The project team conducted a comprehensive data analysis as part of developing the business case methodology. There were several sources used to collect this data:

- Carriageway loop detectors provided minute-by-minute data on flows, speeds, vehicle type and vehicle spacing;
- Specific journey data from instrumented vehicles provided information about stop-start behaviour and verified journey time measurements;
- Automatic Number Plate Recognition data provided a larger volume of information on actual journey times between junctions 15 and 16;
- Noise surveys assessed the impact of the scheme on noise levels close to the road;
- Typical driving profiles (from the instrumented vehicles) and a large database for vehicle emission values were used to measure and model exhaust emissions; and
- STATS19 injury accident records provided extensive accident data.

The studies showed that there were impacts from introducing Controlled Motorways on the M25. The effects are described in the M25 Controlled Motorways Summary Report (HA159/04). Table 1 summarises the key outcomes.

**Table 1 - Impacts of Controlled Motorways on M25**

Impact Area	Indicators of Impacts	Overall Improvement (Y/N)
Safety	Safety benefits arose as a result of a culmination of impacts on the driving environment and on driver behaviour. Injury accidents were reduced by 10%, and there was a 20% drop in the ratio of injury to damage only accidents.	Y
Journey times	There was an increase in peak-time journey times on the clockwise carriageway and a decrease on the anticlockwise carriageway. Combining the two carriageways made the peak-time effect of Controlled Motorways neutral. Off-peak, there were small increases in journey times on both carriageways.	N
Journey time reliability	There was a small improvement in overall journey time reliability, indicating a smoother journey.	Y
Emissions	Emissions decreased overall by between 2% and 8%. The smoothing effect of the system reduced fuel consumption, with a commensurate impact on emissions.	Y
Noise	Weekday traffic noise adjacent to the scheme was reduced by 0.7 decibels.	Y
Throughput	There was no increase in the peak 1-hour throughput.	N
Speed limit compliance	There was a reduction of 5% in the proportion of drivers exceeding the 40mph speed limit, which is now displayed as a mandatory limit.	Y
User reaction	The controlled motorway scheme was well accepted and there was a perception of key benefits.	Y

Subsequent to these studies, additional work has been carried out to determine the effect of Controlled Motorways on safety, using additional data (up to the end of 2006). This analysis has shown that the best estimate of the effect of Controlled Motorways on injury accidents is a reduction of 15%.

### M25 CONTROLLED MOTORWAY SCHEME JUNCTIONS 2 TO J3

As part of the work to tackle congestion on the motorway and trunk road network, the Highways Agency is planning to introduce variable mandatory speed limits on the M25 between junctions 2 to 3 (“the Controlled Motorway Scheme”). Variable Mandatory Speed Limits will be used to smooth traffic flow and prevent stop-start conditions. A map for the Controlled Motorway Scheme is shown below at Figure A.

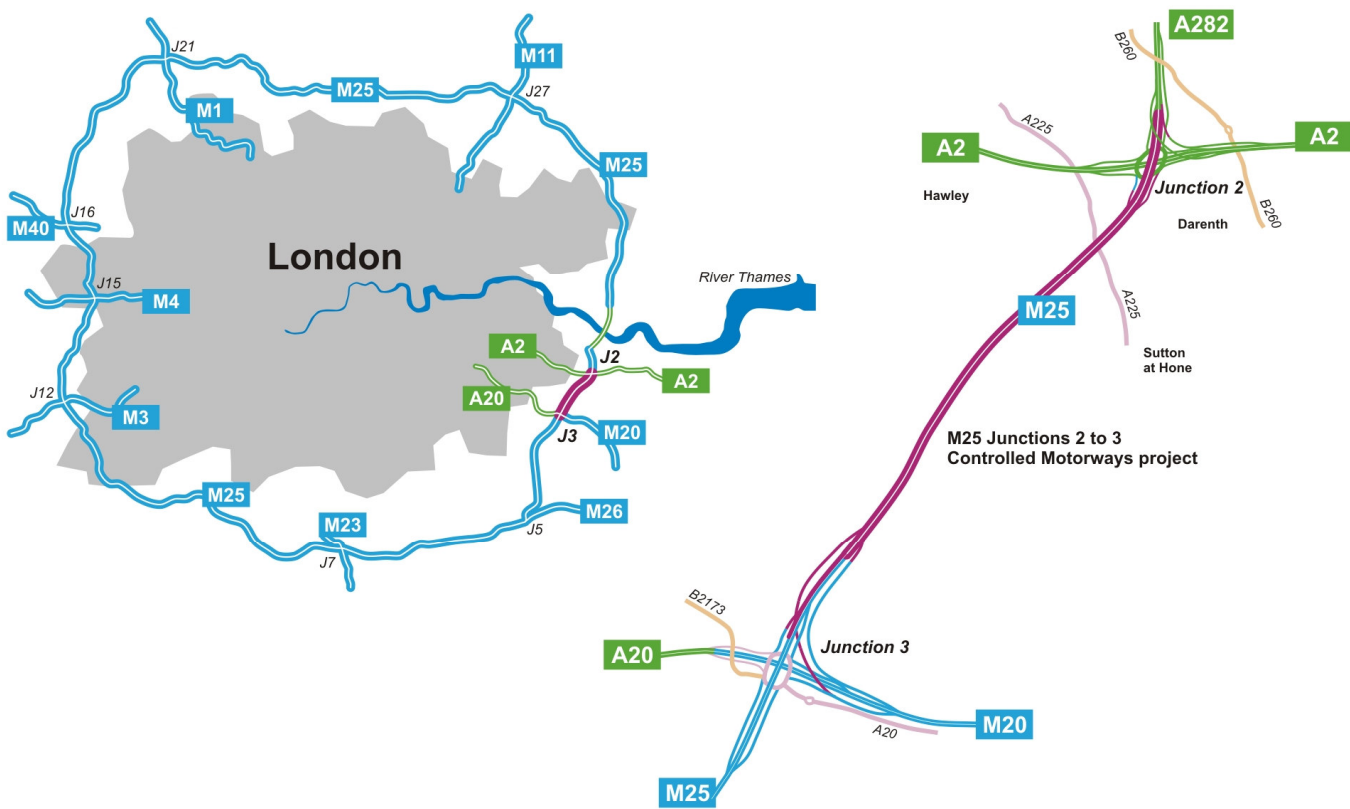


Figure A: Scheme Map

### THE EFFECT OF INTRODUCING THE CONTROLLED MOTORWAY SCHEME

The benefits of introducing the Controlled Motorway Scheme on to the M25 junctions 2 to 3 have been modelled against those observed on the M25 between junctions 10 and 12

The impact of the introduction of Controlled Motorways is proportional to the flow levels and to the distance over which the scheme is implemented. The impacts are expressed as per vehicle or per vehicle km; these have been factored according to the measured flow levels on the M25 and the distance over which the scheme is to be applied.

The economic values in the Summary Information have been expressed in 2008 prices. The Appraisal Period has been set at 30 years because this is a technology project, and the entire infrastructure would need to be replaced after 30 years.

The costs and benefits of the scheme over the 30-year Appraisal Period have been calculated in accordance with the Department for Transport’s Cost Benefit Analysis Guidance<sup>1</sup>. Changes in the value of time and vehicle occupancies have been obtained from the Values of Time and Operating Costs guidance<sup>2</sup>.

The anticipated effects of the scheme in future years have been estimated by applying a flow growth to the current measured flow profile. A medium growth rate has been applied to provide the NPV Best Estimate. Low and high flow growth rates have been applied to provide estimates of the sensitivity of the impacts; these have been used to provide the Net Benefit Range. The traffic growth for the M25 used in the calculations was:

**Table 2 - Estimated traffic growth for the M25 J2 to 3**

Year	Traffic Growth (per annum)
2009-2013	2.5%
2014-2018	2%
2019-2023	1.5%
2024-2028	1%
2029-2038	0.5%
2039 onwards	0%

<sup>1</sup> TAG UNIT 3.5.4: [http://www.dft.gov.uk/webtag/webdocument/3\\_Expert/5\\_Economy\\_Objective/3.5.4.htm](http://www.dft.gov.uk/webtag/webdocument/3_Expert/5_Economy_Objective/3.5.4.htm)

<sup>2</sup> TAG UNIT 3.5.6: [http://www.dft.gov.uk/webtag/webdocument/3\\_Expert/5\\_Economy\\_Objective/3.5.6.htm](http://www.dft.gov.uk/webtag/webdocument/3_Expert/5_Economy_Objective/3.5.6.htm)

## Benefits

The benefits of Controlled Motorways that can be expressed as economic values come from:

- a reduction in accidents
- a reduction in carbon emissions
- an improvement in journey time reliability

The current accident rate of 18.2 PIAs/100m veh km has been obtained from the HA’s Stats19 database. The national average is 9.8 PIAs/100m veh km, so there are nearly twice as many accidents on this section as on a typical motorway. An accident saving of 15% on the current accident rate is predicted with a 30-year monetary saving of £23.1m.

On the M25 J10 – 16, CO2 emissions were reduced by 1,184 tonnes in the first year. It has been assumed that it is possible to factor this by the relative flows and the lengths of the two schemes to apply this to M25 J2 to 3. The tonnes of CO2 emitted are then converted to a carbon value, followed by an economic value as described in the Greenhouse Gases Sub-Objective guidance<sup>3</sup>. The benefits in future years have been calculated using the flow growth rates in Table 2, plus the predicted changes in individual vehicle emissions contained in the WebTAG guidance. An emissions saving of £377,523 is predicted over the 30-year period.

Based on results from the M25 J10 to 16 scheme, journey times will be improved due to the reduction in stop-start driving. The savings from improved journey time reliability over the 30-year period are estimated to be £7.84m.

<sup>3</sup> TAG UNIT 3.3.5: [http://www.dft.gov.uk/webtag/webdocument/3\\_Expert/5\\_Economy\\_Objective/3.3.5.htm](http://www.dft.gov.uk/webtag/webdocument/3_Expert/5_Economy_Objective/3.3.5.htm)

## Costs

The monetised costs of Controlled Motorways come from:

- installation costs;
- maintenance costs (including renewal after 15 years);
- enforcement costs; and
- an increase in overall journey times.

The installation cost for the Controlled Motorways Scheme on the M25 J2 to 3 is £6m. This covers all the required infrastructure (gantries, Controlled Motorways Indicators, EMS, enforcement and CCTV cameras, MIDAS), plus management costs.

The maintenance and renewal costs of the system have been based on the generic values developed from the M25 J10 to 16. The total spent on maintenance and renewal over the 30-year period is estimated at £656,670.

The Police will enforce the speed limits on the Controlled Motorway Scheme. The Highways Agency will pay an estimated annual administration charge of £70,000 to a Police authority, in this case Kent. There are two proposed controlled motorways schemes in the Kent region (the other is on the M20), so the estimated annual cost of enforcement for each of these schemes is £83,000.

On the M25 J10 to 16 the peak-time effect of Controlled Motorways on journey times was neutral (see Table 1). Off-peak, there were small increases in journey times (the signals slow down the traffic, but flow breakdown was unlikely to occur). Overall, this meant that there was a small disbenefit in journey times from the introduction of Controlled Motorways.

To estimate the effect on journey times for a generic motorway, Faber Maunsell and TRL developed a complex spreadsheet that models the effect of Controlled Motorways at various flow levels. Controlled Motorways show a journey time benefit at certain flow levels, a disbenefit at others, and are neutral at other times. Over the 30-year period there is estimated to be a slight reduction in overall journey times to a cost of £2.1m.

## Breakdown of Net Benefits of the Controlled Motorway Scheme

The following table details the costs and benefits that contribute to the Net Benefit in the Summary Information on Page 2. All costs and benefits are over a 30-year period and are expressed as Present Value (PV) prices. (i.e. the value today of amounts of money in the future).

**Table 3 - 30-year BCR for the Controlled Motorway Scheme**  
(2008 prices)

	Anti-clockwise	Clockwise	Overall
Journey Time	-£872,064	-£1,278,729	-£2,150,794
Accident Savings	£12,267,345	£10,923,718	£23,191,062
Journey Time Reliability	£3,603,730	£4,243,357	£7,847,087
Emissions	£184,680	£192,842	£377,523
Installation	-£3,040,000	-£3,040,000	-£6,080,000
Renewal	-£328,335	-£328,335	-£656,670
Maintenance	-£32,714	-£32,714	-£65,427
Enforcement	-£321,861	-£321,861	-£643,722
Total	£11,460,781	£10,358,278	£21,819,059
<b>BCR</b>	<b>4.08</b>	<b>3.78</b>	<b>3.93</b>

Note: Enforcement costs may vary according to operational requirements

The Controlled Motorways Scheme would be tuned to optimise the benefits of the scheme. This would likely be to result in an improvement in the BCR for the scheme.

### **Air Quality**

In addition to the Controlled Motorway Scheme, weather stations and air quality stations have been installed to measure pollution levels, with evaluations to be conducted over a period prior to and after the go live date of the scheme.

### **Enforcement and Sanctions**

The legislation does not introduce any new offences or sanctions. Variable mandatory speed limits will be enforced using HADECS 2.

### **Monitoring and Review**

The operation of the variable speed limit scheme will be monitored and assessed to establish the effectiveness of the system on traffic flows, accidents and environmental factors.

### **Consultation**

A consultation will take place with affected stakeholder groups and interested parties. Consultation packs will be issued. Following completion of the consultation stakeholder feedback will be assessed and results from the consultation will be published.

## **Summary and Recommendations**

The Highways Agency recommends Option 2, outlined at the beginning of this document. The Controlled Motorway Scheme has the potential to produce considerable benefits by aiming to reduce congestion, improve journey time reliability, reduce accidents, driver stress and pollution levels.

Business case benefits have already been assessed on a similar scheme operating on the M25 between junctions 10 and 15 since 1995, and this was extended to junction 16 in 2002. The following benefits have been demonstrated as part of this scheme:

- A reduction in emissions;
- A reduction in noise levels;
- A reduction in vehicle operating costs;
- Improved driver behaviour; and
- A reduction in driver stress.

## **Specific Impact Tests**

### ***Competition Assessment***

The Office of Fair Trading (OFT) guidelines have been followed in order to assess the impact of the Controlled Motorway Scheme upon market competition.

It has been concluded that there will not be any adverse effects upon competition in the marketplace. The introduction of the variable mandatory speed limits will reduce travel times and improve journey reliability which will contribute positively to competition in the marketplace. There will be agglomeration and competition benefits resulting from employment density change, due to improved journey times and productivity working.

### ***Small Firms Impact Test***

The Department for Business Enterprise and Regulatory Reform guidelines have been followed in order to assess the impact of the Controlled Motorway Scheme upon small firms. The Controlled Motorway Scheme will not have an adverse effect upon small firms. The proposals do not impose any new or increased burden. Small businesses have not been consulted separately. However, the Highways Agency and their partners will be sending targeted information on the scheme to numerous organisations within the area.

### ***Legal Aid***

The Department for Constitutional Affairs guidelines have been followed in order to assess the impact of the Controlled Motorway Scheme upon Legal Aid.

There are no new criminal sanctions or civil penalties that will be introduced as part of the Controlled Motorway Scheme. Therefore, a full Legal Aid impact test is not required.

### ***Sustainable Development***

The Government's Sustainable Development Strategy guidelines have been followed in order to assess the impact of the Controlled Motorway Scheme upon sustainable development.

The Controlled Motorway Scheme will not have an adverse effect upon sustainable development.

### ***Carbon Assessment***

The Governments carbon assessment guidelines have been followed in order to assess the impact of the Controlled Motorway Scheme upon carbon emissions.

The Controlled Motorways Scheme will provide a reduction in the emission of harmful gases and noise pollutants. The Controlled Motorway Scheme will not have an adverse effect upon carbon emissions.

### ***Other Environmental***

Full environmental assessments have been carried out in accordance with the Highways Agency (HA) national and local environmental strategies and policies including:

- Towards a Balance with Nature: The Highways Agency Environment Strategic Plan; and
- Living with Roads: An Environmental Strategy for England's Main Roads.

### ***Health Impact Assessment***

The Department of Health guidelines have been followed in order to assess the impact of the proposed scheme upon public health.

A full health impact assessment will not be necessary as the Controlled Motorways Scheme will not have a significant impact upon public health.

### ***Race Equality***

The Commission for Race Equality guidelines have been followed in order to assess the impact of the Controlled Motorways Scheme upon race equality.

The Controlled Motorways Scheme aims to establish a sustainable balance between wider economic growth, social inclusion and environmental objectives. It is therefore not expected that the Controlled Motorways Scheme will impact upon race equality.

### ***Disability Equality***

The Disability Rights Commission guidelines have been followed in order to assess the impact of the Controlled Motorways Scheme upon the disabled.

A full disability impact assessment will not be necessary as the Controlled Motorways Scheme will not have an adverse impact upon the disabled.

### ***Gender Equality***

The Government Equalities Office guidelines have been followed in order to assess the impact of the Controlled Motorways Scheme upon gender equality.

A full gender equality assessment will not be necessary as the Controlled Motorways Scheme does not discriminate between genders.

### ***Human Rights***

The Ministry of Justice guidelines have been followed in order to assess the impact of the Controlled Motorways Scheme upon human rights.

The Controlled Motorways Scheme will not have an adverse affect upon human rights.

***Rural Proofing***

The Commission for Rural Communities guidelines have been followed in order to assess the impact of the Controlled Motorways Scheme upon rural circumstances and needs.

The Controlled Motorways Scheme will not have an adverse affect upon rural circumstances and needs.

## Specific Impact Tests: Checklist

Use the table below to demonstrate how broadly you have considered the potential impacts of your policy options.

**Ensure that the results of any tests that impact on the cost-benefit analysis are contained within the main evidence base; other results may be annexed.**

Type of testing undertaken	<i>Results in Evidence Base?</i>	<i>Results annexed?</i>
Competition Assessment	Yes	No
Small Firms Impact Test	Yes	No
Legal Aid	Yes	No
Sustainable Development	Yes	No
Carbon Assessment	Yes	No
Other Environment	Yes	No
Health Impact Assessment	Yes	No
Race Equality	Yes	No
Disability Equality	Yes	No
Gender Equality	Yes	No
Human Rights	Yes	No
Rural Proofing	Yes	No

## Annexes

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