



# Getting to the heart of smart

Road user experiences of smart motorways

September 2017



# Foreword

'Smart motorways' are a key part of Highways England's plans to deliver extra road capacity and more reliable journeys. Knowing what road users like and don't like about them is therefore important.

I am very pleased that Transport Focus is contributing this insight into road users' experiences of and aspirations for the development of smart motorways.

The voice of the road user has often been absent in recent headlines, debates and inquiries (mostly around safety on smart motorways with no hard shoulder, 'all-lane running' as it is known). This research looks to fill that gap, providing the views and experiences of those who use these roads.

Although questions emerged about all-lane running, our research shows that safety is not at the forefront of road users' minds, with it tending to emerge only when the subject was specifically explored. While many intuitively felt that having a hard shoulder would be safer than not, the increased journey reliability resulting from the extra lane tended to outweigh this consideration. Road users tend to trust that 'the authorities' would not allow all-lane running if it was unsafe. Highways England must remain vigilant that their trust is not misplaced.

Road users say that a number of things would improve their experiences, including Highways England taking steps to:

- deepen users' understanding of the concept of a smart motorway, what it is seeking to achieve and how the different elements all work together to benefit road users
- make sure reduced speeds are justified on every occasion, tackling the perception that on smart motorways traffic is often slowed unnecessarily and that nobody is really monitoring what is going on in 'real-time'
- increase knowledge among road users about specific aspects of smart motorways, particularly around the rules (for example, clarity about whether speed limits are the law or for guidance).

Overall, road users do not find smart motorways difficult to use and most learn how they work through using them. Frequent smart motorway users were more confident and supportive of the concept than infrequent users. Nevertheless, Highways England should continually strive to make smart motorways as intuitive as possible to use.

Our other key findings related to those smart motorways permanently converted to all-lane running. They generated questions about safety if you break down or there is an accident. Apart from among frequent users, few people had noticed the emergency refuge areas provided on all-lane running sections.

Road users want reassurance in the following areas:

- about what to do if you break down in an all-lane running section
- that if you have to stop in an all-lane running section you will be spotted quickly and protected by a red X and speed limits to slow approaching traffic
- that the emergency refuge areas are not too far apart
- that emergency services will still get to the scene of an accident quickly.

Transport Focus has made a number of recommendations in light of this research, which we will use to press for road users' views to be at the heart of how smart motorways are developed.

A handwritten signature in black ink that reads "Jeff Halliwell".

**Jeff Halliwell**

Chair, Transport Focus

# What is a smart motorway?

The smart motorway concept first appeared on England's motorways in 2006, although variable speed limits have been in use since the 1990s. The M42 near Birmingham airport saw the first section of 'active traffic management', where technology was used to open and close the 'dynamic hard shoulder' and change speed limits to improve traffic flow.

Since then a number of other sections of smart motorway have been completed, some are currently under construction and others planned for the future. Over time the specification for smart motorways has evolved, including around signage, overhead gantries and emergency refuge areas, as well as with the introduction of all-lane running. There are now essentially three types of smart motorway, all involving use of variable speed limits:

- **Dynamic hard shoulder**

The original concept where traffic can use the hard shoulder at times of congestion, but at other times it reverts to being a hard shoulder

- **Controlled motorway**

Essentially a conventional motorway with a permanent hard shoulder, but with technology to smooth the flow of traffic

- **All-lane running**

Where all of the road space is used by traffic and there is no hard shoulder, but with emergency refuges installed if a vehicle breaks down.

Many journeys will involve using more than one type of smart motorway, sometimes all three. For example, the M62 in Yorkshire contains dynamic hard shoulder, all-lane running and controlled motorway.

## Smart motorways network



### Dynamic hard shoulder running

01	M62 J25-30	04	M1 J10-13
02	M6 J5-8	05	M42 J3a-7
03	M4 J19-20 and M5 J15-17	06	M6 J4-5
		07	M6 J8-10a

### All-lane running

08	M25 J5-6/7	26	M20 J3-5
09	M25 J23-27	27	M6 J21a-26
10	M1 J32-35a	28	M5 J4a-6
11	M1 J28-31	29	M60 J24-27
12	M62 J18-20 (Part of Manchester smart motorways)	30	M60 J1-4
13	M1 J39-42	31	M56 J6-8
14	M6 J10a-13	32	M62 J25-26 (part of M62 J25-30)
15	M3 J2-4a	33	M62 J20-25
16	M4 J3-12	34	M53 J5-11
17	M6 J16-19	35	M40-M42 Interchange
18	M1 J24-25	36	A1 (M) J6-8
19	M1 J19-16	37	M1 J35a-39
19a	M1 J16-13	38	M1 J19-23a
20	M23 J8-10	39	M5/M42 Birmingham Box 4
21	M62 J10-12	41	M1 J23a-24
22	M6 J13-15	42	M25 J10-16
23	M6 J2-4		
24	M3 J9-14		
25	M27 J4-11		

### Controlled motorways – 4 lanes

43	M25 J16-23	47	M1 J25-28
44	M25 J27-30	48	M1 J6a-10
45	M60 J8-18 (part of Manchester smart motorways)	49	M25 J2-3
46	M62 J28-29 (part of M62 J25-30)	50	M25 J10-16
		51	M20 J5-7
		52	M25 J7-10
		53	M1 J31-32
		54	M42 J7-9

### Controlled motorways – 3 lanes

55	M20 J4-5
56	M6 J10a-11a (part of M6 10a-13)

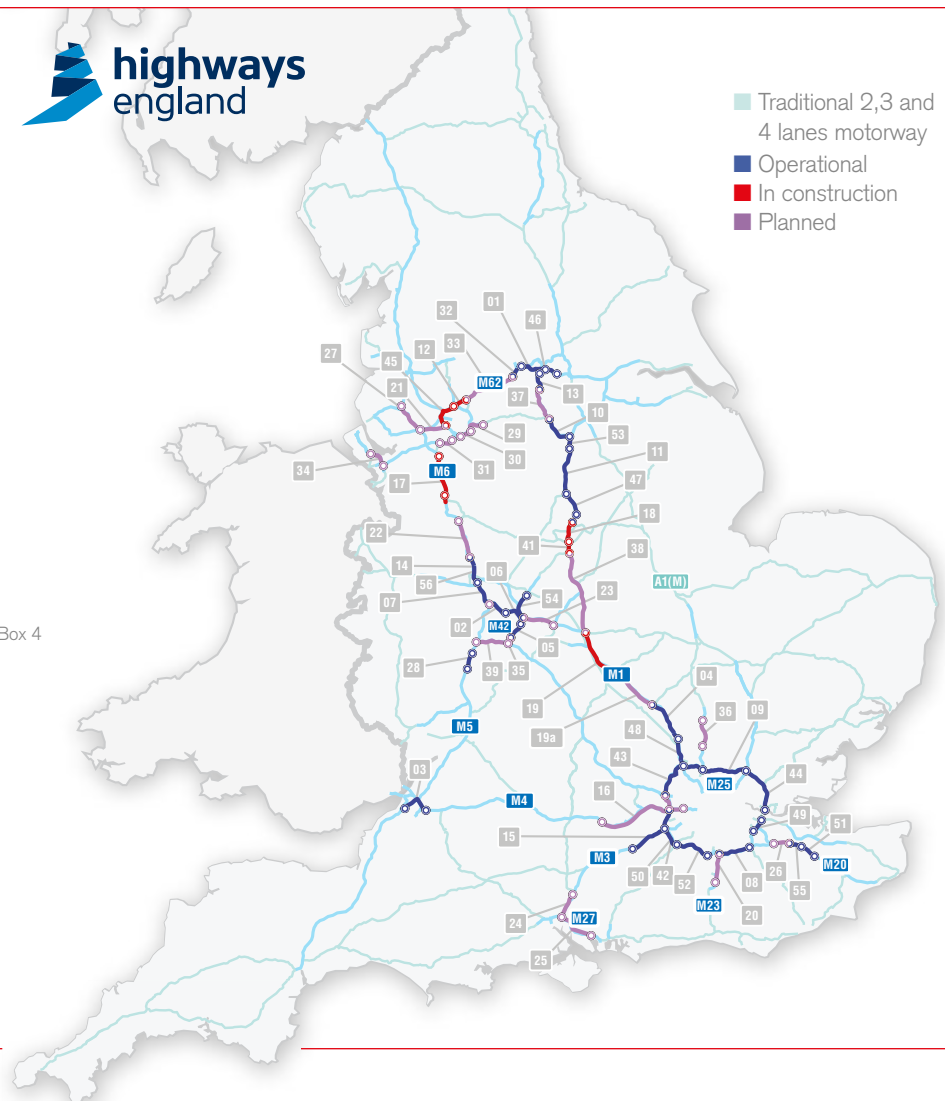


Image courtesy of Highways England Crown copyright and database rights 2017 Ordnance Survey 100030649  
Details correct as of September 2017. Creative Services, Birmingham BHM17\_0054\_MGW

# Key findings

## Awareness of smart motorways

The term smart motorway does not resonate strongly with road users. Awareness of it was higher among those who use strategic roads frequently, for example lorry drivers. But even among those familiar with the words 'smart motorway', the term does not really help them to understand the concept and how it works.

"It kind of rings a bell but I don't know why... I don't know what it is though... I think I've seen an advert or a poster or something but I don't know what it is... Isn't it what the M42 is?"

Birmingham, infrequent leisure user

"The smart motorway network is good for me because I'm used to it. I feel confident driving [on them]."

Birmingham, HGV driver

Most believe they are on a smart motorway when there are gantries with variable speed limits. Therefore while many of the findings in this research are applicable to all variants of smart motorway, we specifically draw out those relevant to sections with a 'dynamic hard shoulder' or which are all-lane running roads.

Drivers told us they learnt how to use smart motorways by experience. Professional drivers using them on a near-daily basis inevitably knew more than occasional users and recognised the benefits, such as increased journey reliability. Road users felt that smart motorways are generally self-explanatory, but they would like more information about them and their features so that they are clear what to do when driving on them.

"I'd still rather ease the congestion if you're stuck in the motorway. You've got to think that the probability of the congestion is every day. The probability of you breaking down is minute compared to the fact that there is going to be congestion all the time on that section of motorway."

Birmingham, infrequent leisure user

Notwithstanding Highways England's efforts in this area already, those taking part in the research felt that more needed to be done to engage with users about smart motorways, rather than relying simply on drivers learning by experience. They want various methods to be considered to increase their knowledge. There will be many other ways this could be done, but suggestions included:

- information provided through road tax, vehicle insurance, driving licence forms or other official communication from government agencies and insurance companies
- theory and practical driving test training for new drivers
- inclusion in the Highway Code.

"I can envisage that for new drivers all this will be part of the theory test. You shouldn't be allowed on a smart motorway until you have learnt about it in your test."

Leeds, frequent business user



## Driver understanding

The research shows that where users have little or no spontaneous understanding of smart motorways, when prompted they recall seeing features of them such as overhead gantries with variable speed limits. However many drivers do not fully understand how all these features work, how they interrelate to each other and how they benefit road users. For example, there is little knowledge of how traffic loops in the road detect slow-moving traffic and adjust speed limits to keep traffic flowing. There is an assumption that 'someone' is in charge of the system and is monitoring traffic conditions via CCTV, although knowledge is not widespread.

*"They're trying to make it safer and they're trying to make it less congested. So that's a massive positive but if people don't know what it is and don't know how to use it, it can have an adverse effect and it can cause you more congestion, cause you more problems."*

Birmingham, HGV driver

Smart motorways create a new layer of issues for drivers to deal with. They want to understand more about:

- speed limits. Are they advisory or mandatory?
- when can/can't I use the hard shoulder?
- what should I do if I break down without a hard shoulder?
- when can I go back into a lane after seeing a red X?
- what should I do when the gantry signs are switched off?

## Recommendation 1

**Highways England should seek to further increase road user knowledge and understanding about:**

- what smart motorways are designed to achieve and how their various features work for the benefit of road users
- what, precisely, individual instructions encountered on smart motorways require drivers to do (for example, in respect of the red X)
- what to do if you break down on a smart motorway, including one with no hard shoulder.

## Communicating with road users



Image courtesy of Highways England

Road users like variable message signs because they help you feel in control and able to make informed decisions.

However, and while these issues are not confined to smart motorways, the research shows that road users are often sceptical about the accuracy and timeliness of information on variable message signs, undermining trust in the information. Road users told us that there are many occasions where they believe that variable message signs are not accurate, where signs show 'incident ahead' or 'debris in road' that they never see.

*"The same sign was left up 24 hours later, but it's meant to be giving you live information."*

Leeds, frequent business user

They told us that they wonder if signs are left on for too long, maybe from an earlier incident that has been cleared away. This can affect confidence in those operating the signs; causes doubt that they are managed in 'real-time' at all; and leads some not to trust any variable signs, with potential risks to safety.

The research shows that road users need to link the information they are given with something they experience – only then do they trust that it was correct. Of course, each incident will be unique in location, severity and whether there is a variable message sign in a location to help. That means road users will *not* always be able to link the message with their experience – even if the information was accurate.

This raises several questions that Highways England should consider, some of which the company is already considering:

- Could different words and style of language help road users better understand what is going on? For example, minor changes such as 'ambulance at scene' may help road users gauge the severity or stage an incident is at.
- Does more need to be done to test what messages road users prefer and would find helpful?
- Does Highways England have enough variable message signs, and are they capable of showing the information users want?
- Are messages 'sense checked' at the time of an incident to ensure they are relevant and useful to road users?
- What can Highways England do, post-incident, to analyse what messages were used and determine how accurate and helpful they were for road users?
- What more can Highways England do to help road users have confidence that signs are accurate and can be trusted?
- Does there need to be post-incident messaging, for example 'incident cleared – thank you'?

*"You could probably do with a few more of them actually. I don't think there's enough of them message boards."*

Birmingham, infrequent leisure user

## Variable speed limits

Variable speed limits are a key part of smart motorways. They enable traffic speed to be reduced to make best use of road capacity. However, similar to the lack of trust in variable message sign accuracy, the research shows that road users do not think variable speed limits are always set correctly. A common complaint is that there didn't seem to be any need to reduce traffic speed – leading to a perception that the speed limit caused congestion and delays to journeys that wouldn't otherwise have occurred.



*"The overhead gantries say 60 miles per hour. Then suddenly you get to one that says 40 miles an hour. So you literally go from 60 to 40 and there's nothing explaining – no reason, justification, why you need to drop down."*

Leeds, frequent business user

A small number of drivers were concerned that variable speed limits with speed cameras are designed to raise revenue.

Many taking part in the research regularly used the same smart motorway. They told us that some signs always show the same speed limit regardless of traffic conditions. This leads to frustration, undermines trust and causes people to doubt that the roads are being managed properly in 'real-time'.

## Recommendation 2

Highways England should ensure that speed limits are regarded by road users as appropriate to the traffic conditions, in particular guarding against reducing speed unnecessarily and minimising the perception that speed limits are causing congestion rather than reducing it.

## Red X

Among road users taking part in this research the red X was understood in principle – and they said they generally adhered to it. However some were not clear:

- whether a X is advisory or mandatory
- how soon after passing a red X the lane can be used if there is nothing blocking it
- what you should do if the sign changes as you pass underneath it?

*"I didn't know that you could get penalised for being in a red X, even though it is self-explanatory and wouldn't be doing it."*

Leeds, frequent leisure user

Some people felt that firmer action should be taken against those who ignore the red X, particularly because of the safety implications for those who break down. There was some frustration that a red X sometimes shows when there is no apparent need for it.



Image courtesy of Highways England

## Dynamic hard shoulder

On the original section of 'active traffic management' on the M42, the hard shoulder is used at various times as a running lane. At other times it reverts to a hard shoulder. This concept – known as a dynamic hard shoulder – has been repeated in a number of other places since.

Those taking part in our study felt that this type of smart motorway can cause confusion about when you can drive on the hard shoulder and when you cannot, particularly where the hard shoulder should not be used but no red X appears above the lane. Road users told us that in these situations they would prefer to have a positive sign, for example a green arrow to signify that a lane can be used. This 'red X, green arrow' approach is used already on a number of tidal flow roads.

*"I was sort of wary of do I go in [to the hard shoulder]? There's no sign to give me a nudge that it's now usable. Maybe I missed something? I'm aware I shouldn't be in that lane. I suppose, the strong white line rather than the dotted ones? Yes, that would be my assumption. It's a long time ago since I took my Highway Code."*

Birmingham, infrequent leisure user

## Recommendation 3

Highways England should make it clearer to road users when the hard shoulder should and should not be used, with consideration given to using a green arrow as well as a red X.

## All-lane running

Although it tended to emerge only when specifically introduced to the discussion, not having a hard shoulder at any time has created concerns among some road users – particularly about what happens if you break down. The hard shoulder is seen as a place of relative safety if this happens – rightly or wrongly.

*"I've never thought about it, but now I do, [smart motorways are] very dangerous. Touch wood, I've never broken down on a motorway. If I did break down, yes, I can see there being some risk of someone coming into the back of you."*

Birmingham, infrequent leisure user

Experienced road users and stakeholders say that all-lane running smart motorways work well by providing additional capacity that might not otherwise exist, so increasing journey reliability. And all-lane running by definition removes confusion associated with when the hard shoulder should and shouldn't be used.

However many had a gut feeling that it must be more dangerous not to have a hard shoulder in the event of a breakdown. Few of those taking part in the research knew with certainty what you should do if you broke down on an all-lane running motorway, and there were doubts about how quickly a broken down vehicle would be spotted and protected by a red X. There were heightened concerns among disabled road users. Some expressed concern about the emergency services getting to the scene of a crash if there is no hard shoulder, while those in the breakdown recovery sector were concerned about increased risk to their staff. Among some, using the far left-hand lane simply 'felt wrong' given their familiarity with conventional motorways.

*"If you're on the motorway and you break down and there's no hard shoulder, I would feel very vulnerable... If I'm stuck I can't get out of my car and walk across three lanes."*

Leeds, disabled driver



## Emergency refuge areas

Smart motorways have emergency refuge areas (ERAs) for road users to stop if they break down. Our research shows that they are the least recognised and least understood aspect of smart motorways. As with other elements of smart motorways, more frequent users recall seeing ERAs but others generally haven't noticed them.

ERAs are seen as a safe space if you break down. They feel safer than a hard shoulder because vehicles are better protected from approaching traffic. Current ERA signage is clear for those who notice it in the first place.

Road users and key stakeholders say that having ERAs as far as 2.5 kilometres apart causes them concern. When people pause to think about it they wonder whether they would make it to the next one if something went wrong with their vehicle, and that they might therefore end up stranded on the motorway. Although not entirely comfortable, most assumed that the spacing of ERAs has been determined with safety factored in, so it 'must be OK'. Some wondered what would happen if the one they needed was already full. There was also doubt about how closely the ERA cameras are monitored and so how quickly help would be summoned.





*"I would rather have a hard shoulder. I honestly think that 2.5km is pretty far and it's dangerous to break down."*

Leeds, frequent business user

We tested a number of proposed changes to ERAs in conjunction with Highways England. Participants were shown a mock-up of an ERA painted orange, designed to highlight the area and signify that it should be used only in an emergency. We also asked road users to compare the proposed ERA signage with that used now.

When the orange surface and the new signs were considered together, road users were confident that the changes would help highlight ERAs and emphasise the circumstances in which they should and shouldn't be used. We are therefore pleased to see orange surface and accompanying new signs trials being carried out on the M3 and M25.

*"I think that's fairly obvious though, isn't it? Especially with painting the road orange."*

Birmingham, HGV driver

## Recommendation 4

Highways England should reassure road users that all-lane running motorways are safe, even if you break down, and that any risks associated with not having a hard shoulder will continue to be mitigated.

## Recommendation 5

Subject to results of the pilots, Highways England should roll out the orange surface and new signage to emergency refuge areas as quickly as possible, so as to increase road users' awareness of them and their purpose.

## Summary and conclusion

Most road users assume – as distinct from really know – that smart motorways have been implemented to improve traffic flow. Many think they are succeeding in that objective, in particular frequent users like lorry drivers. Road users tend to assume that safety issues have been well thought out and the risks mitigated. Nevertheless, there are areas where road users say things would help improve their experience using smart motorways. They would like Highways England to take steps which:

- deepen users' understanding of the concept of a smart motorway, including their objectives and explaining how the different elements all work together to deliver better journeys
- make sure reduced speed limits are justified on every occasion, tackling the perception that smart motorways often slow down traffic unnecessarily – causing people to question whether anybody is really monitoring what is going on in 'real-time'
- increase knowledge among road users about specific aspects of a smart motorway, particularly around what the rules are (for example, clarity about whether speed limits or the red X are the law or for guidance).

When all-lane running was specifically explored in the research it led to questions about safety if you break down or there is an accident. Road users want reassurance in these areas:

- about what they should do if they break down in an all-lane running section
- that if they stop in an all-lane running section they will be spotted quickly and protected by a red X
- that the emergency refuge areas are not too far apart
- that the emergency services will still get to the scene of an accident quickly, despite there not being a hard shoulder.

Despite these questions, the safety of all-lane running motorways was not at the forefront of road users' minds. While many intuitively felt that having a hard shoulder would be safer than not, the increased journey reliability resulting from the extra lane tended to outweigh this consideration. Road users generally trust that 'the authorities' would not allow all-lane running if it was unsafe. Highways England must ensure that this trust is maintained in relation to existing all-lane running motorways and future conversions.





## How we did it

### Focus groups and in-depth interviews

Six focus groups and 10 in-depth interviews were conducted with road users in Birmingham, Leeds and London. They involved people using motorways for leisure and business trips, professional drivers, lorry drivers, motorcyclists and disabled drivers and passengers. The locations were selected to capture experiences of the different types of smart motorway.

### Recorded journeys on smart motorways

A mix of leisure users, business users, professional drivers, lorry drivers, motorcyclists and disabled drivers and passengers were asked to record video diaries, make observations or note details of their journeys using smart motorways. Shortly afterwards they attended one of six focus groups and 10 in-depth interviews, again in Birmingham, Leeds and London.

### Stakeholder interviews

Six interviews were conducted with stakeholders who have an interest in motorways. We involved a broad range of organisations, including the National Police Chiefs' Council, the AA, the RAC, the Freight Transport Association, the Camping and Caravanning Club, FMG recovery services and logistics company DPD.

### Contact Transport Focus

Any enquiries about this research should be addressed to:

Guy Dangerfield

Head of Strategy

**e** [guy.dangerfield@transportfocus.org.uk](mailto:guy.dangerfield@transportfocus.org.uk)

**w** [www.transportfocus.org.uk](http://www.transportfocus.org.uk)

Fleetbank House

2-6 Salisbury Square

London

EC4Y 8JX

Transport Focus is the operating name of the Passengers' Council

**Transport Focus is the independent consumer organisation representing the interests of:**

- all users of England's motorways and major 'A' roads (the Strategic Road Network)
- rail passengers in Great Britain
- bus, coach and tram users across England outside London.

**We work to make a difference for all transport users**