55MPH THROUGH ROADWORKS

Safety risk assessment

28 February 2018

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Executive Summary

The objective of this safety risk assessment is to determine the safety risk for all relevant populations of implementing 55mph speed limit within roadworks. The original programme level safety risk assessment for 55 and 60mph speed limits in roadworks was published in November 2016. The original assessment demonstrated that is was acceptably safe to proceed with the trials. The safety risk assessment has since been updated to incorporate the results of the trials and is presented as two separate documents, namely:

- 60mph through roadworks trial – safety risk assessment (May 2017)
- 55mph through roadworks trial – safety risk assessment (this document)

This document aims to answer the following questions:

1. ***"Was it acceptably safe to use a 55mph speed limit within the M3 and M1 trial scenarios?"***
2. ***"Is it acceptably safe to roll out a 55mph speed limit within similar scenarios?"***
3. ***"What conclusions can be drawn about the safety of using a 55mph speed limit more widely within roadworks?"***

Several 60mph speed limit through roadworks trials have been carried out. The results from the 60mph programme level risk assessment suggest that there are demonstrable safety benefits of raising the speed limit, and improvements in road user behaviour and customer satisfaction.

Based on evidence from these 60mph limit through roadworks trials it was anticipated that the use of a 55mph speed limit through roadworks may deliver similar benefits. Highways England was keen to trial 55mph as there may be situations where it is not possible to increase the speed limit to 60mph but there may be some benefit in increasing it to 55mph.

Details of the 55mph trials on the M3 and M1 are outlined in Table 1-1.

Table 1-1: 55mph trial details

Trial name	Trial date	Monitoring report reference	Scenario covered
M3 J2 – 4a Smart Motorway	22/6/17 to 28/6/17	Interim report for the on-road trials of 55mph on the M3 J2-4a scheme (August 2017) Customer experience of changes of speed limits within roadworks (October 2017)	Scenario 2
M1 Jct 45	9/12/17 to	Interim report for the on-road trials of 55mph	n/a

improvement scheme	20/6/17	on the M1 J45 scheme (January 2018) M1 J45 55mph trial - road user survey findings (January 2018)	

The safety risk decision has been categorised as 'Type B with a type B/C feature' as defined in General Direction 04 (GD04) [5]. The type B/C feature relates to stakeholder interest and specifically the police's interest in how a 55mph speed limit can be enforced.

This safety risk assessment is based on:

- A semi-quantitative assessment of the risk to road users, which considers the increase in incidents which would be required in order to make the risk unacceptable
- A qualitative assessment of the change in risk to all affected populations. This has been updated to incorporate the findings from the trial.

The semi-quantitative assessment found that the risk to road users generally increases with speed. However it is likely to remain acceptable as it will be offset by safety benefits arising from improved compliance. In order for the risk to change from 'tolerable' to 'unacceptable' (as defined by GD04 [5]) the number of fatal incidents within the roadworks would need to increase by a factor of 32. Increasing the speed limit from 50mph to 55mph is extremely unlikely to lead to this level of increase in fatal incidents. Therefore the risk to road users is likely to remain 'tolerable'.

The outcome of the qualitative assessment is shown in Table 1-2.

Table 1-2: Summary of acceptability of risk

Population	Risk acceptability
Driver	Acceptable
Emergency services	Acceptable
Construction supplier	Acceptable
TOS (Traffic Officer Service)	Acceptable
Free recovery service	Site specific

It is concluded that:

C1 – It was acceptably safe to trial the 55mph speed limit on the M3 where system reliability testing was being carried out after installing new technology, and on the M1 where speeds were being reduced in advance of junction improvement works.

C2 – Based on the findings of the M3 trial, it is acceptably safe to roll out a 55mph speed limit in similar scenarios (system reliability testing). However, works that are not part of Stage D of IAN182 [2] should be completed prior to any increase in speed limit.

C3 – As ever, a site specific safety risk assessment will always be required to confirm that the proposed TTM arrangements and speed restrictions are appropriate for that site.

C4 – The perception of enforcement must be maintained in order to achieve speed compliance at the increased speed limit.

C5 - The trials on the M3 J2-4a smart motorway and M1 J45 improvement scheme minimised risk to populations by only increasing the speed limit where there was no significant construction activity taking place in the closed lanes. The trials demonstrated that a 55mph speed limit can be used without significantly increasing the risk to any population. This evidence means that it is likely to be acceptably safe to trial a 55mph speed limit in a location where construction activities are taking place, subject to the outcome of a site specific safety risk assessment. Monitoring will be required in the same way as previous trials (both traffic and focus groups). The results of this next trial are required before any decision can be made regarding wider roll out of 55mph within roadworks where construction activities are taking place.

C6 – Prior to the trial it was anticipated that the use of a 55mph speed limit through roadworks may deliver benefits in the following areas:

- Customer satisfaction
- Journey time benefits
- Improved speed compliance
- Improved Heavy Goods Vehicle (HGV) driver behaviour

The results from the two 55mph trials are shown below.

	M3 J2-4a	M1 J45
Customer satisfaction	46% of those surveyed agreed that the increased speed limit had increased their satisfaction with their journey, whilst a further 46% were neutral.	72% of drivers approved of the 55mph speed limit in roadworks, 13% were neutral and only 16% disapproved.
Journey time benefits	Average saving of 20 seconds per vehicle	Average speeds increased by around 3mph, resulting in average journey time savings of 5 seconds per vehicle
Improved speed compliance	The proportion of vehicles complying with the speed limit was 73% in the trial period (55mph speed limit) compared with 56% in the baseline period (50mph speed limit). However, given the short duration of the trial, there is evidence that some drivers may not have noticed the increased speed limit and that this contributed to improved compliance. Results from a survey of 221 participants found that 35% of regular drivers and 22% of occasional drivers did not notice that there was a different speed limit in place.	The proportion of vehicles complying with the speed limit was 73% in the trial period (55mph speed limit) compared with 56% in the baseline period (50mph speed limit). Unlike the M3 trial, the majority (84%) of those surveyed had noticed the increased speed limit, although this may be skewed by the small sample size (32 participants).
Improved HGV driver behaviour	The M3 trial did not identify any reduction in close following by HGVs or in overtaking and lane changing.	Not monitored

C7 – It is concluded that the first two benefits are likely to be achieved at a 55mph speed limit. There is also evidence of improved speed compliance, although this may in part be due to drivers not noticing the increased speed limit. The improved compliance is less than is achieved at 60mph where improvements of around 30% were observed. There is no evidence of improved HGV driver behaviour; the 55mph speed limit is less than the HGV's speed limiter setting of 56mph. Therefore increasing the speed limit to 55mph does not reduce close following by those HGV drivers who are driving to their limiters. Similarly there is no evidence to show that increasing the speed limit to 55mph has any impact on the amount of overtaking and lane changing.

It should be noted that the 60mph trials concluded that all four of these benefits are likely to be achieved at the higher 60mph speed limit.

C8 – Increasing the speed limit from 50mph to 55mph is likely to generate benefits, however these will be lower than those achieved at 60mph.

1 Introduction

1.1 Background

With greater government investment in roads, the amount of roadworks taking place on the network has increased. As the amount of roadworks has increased, road user satisfaction with roadworks management has decreased. Highways England's National Road User Satisfaction Survey (NRUSS) [1] shows that satisfaction with roadworks management on the motorways has fallen from 70% to 67% over the last 4 years.

Figure 1-1 shows the latest NRUSS (2014/15) scores for Highways England's 5 key aspects, against a target of 90%.

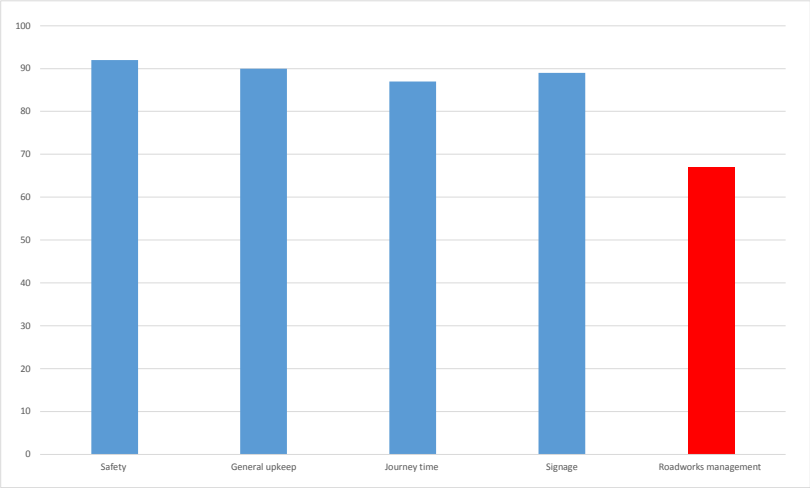

Figure 1-1: Customer satisfaction scores (2014/15)

Highways England failed to reach its target of 90% and, as shown in figure 1a, roadworks management scored considerably lower than the other aspects. The NRUSS found that the second highest priority for road users was for improvements to be made to minimise delays through roadworks.

In response to this, in March 2016 it was announced via a Department for Transport (DfT) press release that Highways England will begin trialling the use of 55 and 60mph speed limits through roadworks. Several trials of 55mph and 60mph have been carried out. The aim of the trials has been to assess the safety and benefits of raising the speed limit, assess the impact on driver behaviour and understand whether there is any effect on customer satisfaction.

Two 55mph speed limit through roadworks trials have been carried out. Details of the 55mph trials are outlined in Table 1-1. The trials were undertaken using existing standards.

Comment [ED(1]: There is no 55mph 'standard' so should we say GD04s were based on 60mph even though we only used 55mph?

Table 1-1: 55mph trial details

Trial name	Trial date	Report date	Scenario covered
M3 J2 – 4a Smart Motorway Trial of 55/60mph Speed Limit Through Roadworks	22nd June – 28th June 2017	August 2017 (Interim report)	Scenario 2
On-road pilot of 55mph on the M1 Jct 45 improvement scheme	9th December – 20th December 2017	January 2018 (Interim report)	

1.2 Anticipated benefits

Prior to the trial it was anticipated that the use of a 55mph speed limit through roadworks may deliver benefits in the following areas:

- Customer satisfaction
- Improved Heavy Goods Vehicle (HGV) driver behaviour
- Journey time benefits
- Improved speed compliance

The anticipated benefits are discussed below and comments have been added as to whether or not the trial found that the benefit was realised.

1.2.1 Customer satisfaction

As discussed above the NRUSS [1] has found that customer satisfaction with roadworks management is considerably lower than for the other aspects of Highways England's activities.

In order to gain further insight into this, in September 2016, Highways England carried out a separate Customer Panel survey [3] into roadwork speed restrictions which sought to investigate road users' attitudes to speed limits through roadworks. The survey consulted 471 panellists and the research highlighted the following:

- Only 50% of panellists are satisfied with how Highways England manages roadworks so as to minimise disruption to users of the network.

- However, 72% of panellists believe that the current speed limit is about right and 92% say that they obey restricted speed limits when driving through roadworks.
- 91% of panellists believe that speed restrictions through roadworks are important, with safety being a factor.
- 79% of panellists would support speed limits being tailored to the circumstances of the road works rather than a set speed limit nationwide.

Whilst a majority (72%) state that the current speed limit is about right, a slightly larger majority (79%) support the introduction of speed limits tailored to the conditions at each roadworks site. This indicates that there may be scope to increase customer satisfaction by increasing the speed limit where appropriate.

Survey results from the M3 J2-4a trial suggest that customer satisfaction was improved, with 46% of respondents being satisfied with the higher speed limit, 46% being neutral and only 8% being 'much' or 'a little' less satisfied. However, some people thought that an increase of 5mph was not sufficient to benefit them or to make a noticeable difference, suggesting that the speed limit should be 60mph or higher.

Further customer research was carried out using 36 drivers who drove through both the 50 and 55mph speed limits. All participants were provided with dash cams and Garmin devices (watches incorporating heart rate monitors and GPS trackers), to capture visual and physiological responses through each journey. The majority of the participants indicated that they prefer the higher speed limit. Participants reported that they could overtake HGVs at the higher speed and there was a general perception that journeys felt smoother. A small minority of the participants mentioned that a 5 mph increase in speed to 55mph was not enough of a change to make a difference to their experience. A small minority across the sample of 36 participants preferred the 50mph speed limit with the reason being familiarity and perception of safety from a qualitative perspective.

Monitoring of participant heart rate, as they drove through the roadworks, found that 56% of participants presented a decrease in average heart rate in the 55mph journey compared to the 50mph journey. These findings indicate that there is no increase in stress/heart rate with an increased speed limit.

Results from the surveys and interviews conducted with drivers on the M1 J45 55mph trial suggested that drivers were more satisfied with 55 mph speed limits through roadworks than 50mph limits. The results highlighted the following:

- 59% of drivers perceived the 55mph speed limit appropriate. Twenty-eight percent of drivers considered the 55mph speed limit to be too low while 13% of drivers claimed it was too fast.
- The reported effect of the speed limit change on satisfaction was positive (47%) or neutral (41%) for most of the sample. Only 12% reported being 'much' or 'a little' less satisfied compared with before the speed limit changed.

- The proportion of drivers who approve of the use of 55mph as a speed limit in roadworks is considerably higher than the percentage of drivers who disapprove (72% and 16%, respectively); 13% of the respondents expressed a neutral opinion.

1.2.2 HGV behaviour

There is anecdotal evidence of tailgating and weaving by HGVs within roadworks due to a speed differential between HGVs and other vehicles. Under the current 50mph speed limit, there is speculation that drivers of HGVs still regularly drive to the maximum of their speed limiter, which is 56mph. This may increase risk exposure on the network as cars driving at 50mph often find themselves being overtaken or tailgated by HGVs, particularly because car speedometers can under-read by up to 10%.

Trials of 60mph found that close following by HGVs was reduced at the higher speed limit as cars were able to move away from them. The M5 trial of 60mph found a substantial reduction in close following by HGVs compared with a 50mph speed limit.

However, the trial of 55mph on the M3 did not find any difference in close following between 50 and 55mph. HGVs travelling on the limiter will be travelling at a very similar speed to other vehicles complying with the 55mph speed limit. This suggests that a 60mph speed limit may be more effective than 55mph for reducing HGV close following. HGV close following was not monitored on the M1 J45 trial.

1.2.3 Journey time

Reducing the speed limit from 70mph to 50mph increases free flow journey times by 21 seconds per mile. Highways England Traffic Appraisal, Modelling and Economics (TAME) identified that this equates to a journey time delay cost of £12,165 per mile per day [15].

TAME identified that, increasing the speed limit to 60mph, results in potential savings in journey time delay costs of £7,096 per mile per day. Increasing the speed limit to 55mph results in 50% of these benefits.

Results from the M3 trial suggest that, increasing the speed limit from 50 to 55mph, reduced journey times by around 20 seconds. Results from the M1 J45 trial suggest that, increasing the speed limit from 50 to 55mph, reduced journey times for each user by an averages of 5 seconds.

1.2.4 Speed compliance

Average speed cameras are generally installed at motorway roadworks and give the perception of enforcement, encouraging good speed compliance. Evidence from the M1 J32-35a scheme shows that the police are satisfied with the level of speed compliance being achieved. [5]

This is backed by the results of the customer panel survey [3], discussed in 1.2.1, which suggest that a majority of road users find a speed of 50mph acceptable and therefore likely to comply with speed limits. Indeed, 92% of panellists said that they obey restricted speed limits when driving through roadworks.

However, road users are known to object to speed restrictions where no visible work is taking place and this can be a particular problem for those schemes where most of the work takes place at night. The NRUSS for 2014-15 [1] found that, of those surveyed, only 44% of those driving through roadworks had seen work in progress. Where there is no visible work taking place, the credibility of the speed limit may be eroded resulting in reduced levels of compliance. Increasing the speed limit to 60mph may appear more credible at locations where no visible work is taking place.

On the M3 trial speed compliance was better with the 55mph speed limit than the 50mph speed limit. The proportion of vehicles complying with the speed limit was 73% in the trial period (55mph speed limit) compared with 56% in the baseline period (50mph speed limit). However there is evidence that a proportion of drivers did not notice that the speed limit had increased and this may have contributed to the improved compliance.

On the M1 trial speed compliance was better with the 55mph speed limit than the 50mph speed limit. The proportion of vehicles complying with the speed limit was 73% in the trial period (55mph speed limit) compared with 56% in the baseline period (50mph speed limit). There is evidence that a significant amount of drivers (84%) did notice that the speed limit had increased. In addition, the southbound had a 5% reduction of cars and vans/LGVs exceeding the enforcement threshold of 62mph.

1.3 Contents of this report

The contents of this report are set out below:

Section 2 – Objective, scope and categorisation (stage 1)
Section 3 – Hazards and populations affected (stage 2)
Section 4 – Relevant criteria for populations (stage 3)
Section 5 – Existing risk exposure – Baseline 1 (stage 4)
Section 6 – Risk analysis assessment and evaluation (stage 5)
Section 7 – Risk control decisions (stage 6)
Section 8 – Maintaining the safety risk assessment (stage 7 – 10)
Section 9 – Conclusions and recommendations

2 Determine the scope (stage 1)

2.1 Objective of this safety risk assessment

The objective of this safety risk assessment is to determine the safety risk for all relevant populations of implementing 55mph speed limit within roadworks, taking account of the trials carried out on the M3 J2-4a smart motorway scheme in June 2017 and the M1 J45 junction improvement scheme in December 2017.

It aims to answer the following questions:

1. ***"Was it acceptably safe to use a 55mph speed limit within the M3 and M1 trial scenarios?"***
2. ***"Is it acceptably safe to roll out a 55mph speed limit within similar scenarios?"***
3. ***"What conclusions can be drawn about the safety of using a 55mph speed limit more widely within roadworks?"***

2.2 Scope of this safety risk assessment

This is a safety assessment. Non-safety benefits are noted; however this assessment does not consider whether or not they outweigh any potential increase in safety risk to any populations due to the increase in speed limit to 55mph, and hence whether or not the rollout should go ahead. It does however comment on whether or not the potential benefits were observed during the trial (contained in Section 1).

The safety risk assessment uses the results from the 55mph through motorway roadworks trial which took place between the 22nd and the 28th of June 2017 for phase 1 of the trial[1] and the M1 J45 junction improvement scheme which took place between the 9th and the 20th of December 2017. It uses these results to consider whether or not the safety risk associated with raising the speed limit through roadworks to 55mph is acceptable for the scenarios that have been trialled and for wider roll out.

The baseline of the trial is 50mph running with one lane closed with cones.

2.3 Characterisation

The decision for rolling out a 55mph speed limit during roadworks has been assessed in accordance with General Direction (GD) 04/12 Standard for Safety Risk Assessment on the Strategic Road Network [6]. The results of the characterisation of the decision features are:

[1] Phase 1 operated with Lane 1 coned off for roadworks with Lanes 2, 3 and 4 open to traffic, at 55mph

- One feature categorised as a type B/C (stakeholder interest)
- Two features categorised as a type A/B feature (lifetime of decision, safety risk)
- One feature categorised as type B (size of decision)
- One feature categorised as type A (cost implications)

The decision has been categorised as a **'type B with a type B/C feature'** decision. Details of this categorisation are provided in Appendix C. In essence, this means a good level of evidence is required to support the decision.

3 Identify the hazards and populations affected (Stage 2)

The populations affected have been identified as:

- Road users (drivers and emergency services)
- Road workers (construction workers, traffic officer service (TOS) and the recovery operators providing free recovery during roadworks)

During major roadworks, maintenance activities are carried out by the scheme construction supplier, therefore the Asset Support Contractors (ASC) are not expected to be affected by the implementation of a 55mph speed limit through roadworks.

Hazards have been identified through:

- A review of the hard shoulder running (HSR) hazard log, which was used to assess the hazards associated with increasing the speed limit for HSR from 50 to 55mph (see Appendix D for more details). This was selected as it provides a good overview of the general hazards that populations are exposed to that are sensitive to a change in speed limit.
- Discussions with staff experienced in motorway operations and road safety auditing to identify the hazards that would apply to the trial scenario.

Table 3-1 below identifies the hazards associated with each population.

Table 3-1: Hazards and populations affected

Population		Hazard	Baseline - 50mph running with a lane closed with cones
Road users	Drivers	General hazards affected by speed	Yes, detailed assessment contained in Appendix D
		Road user vehicle not complying with speed limits through roadworks.	Yes. A speed limit will be in operation
		Road user vehicles striking TTM	Yes. TTM will be in place but only minimal construction activities will be undertaken by construction workers from the closed off lane
		Vehicles tailgating	Yes. Vehicles will be using the sites
		Vehicles changing lanes	Yes. Vehicles will be using the sites
	Emergency Services	Exposure to traffic when responding to incidents in live lanes.	Yes. Attending accidents in live lanes.
		Exposure to construction activities when responding to incidents within the work site.	Yes. Although minimal activities should be taking place.
Road workers	Recovery Operators	Exposure to traffic when responding to incidents in live lanes.	Yes. Attending accidents in live lanes.
		Exposure to construction activities when responding to incidents within the work	Yes. Although minimal activities should be taking place.

Population		Hazard	Baseline - 50mph running with a lane closed with cones
		site.	
	Construction workers	Exposure to traffic when setting up TTM	Yes. Exposed to traffic when TTM is set up.
		Exposure to traffic when working in closed lane.	Yes. But, only minimal construction activities will be undertaken by construction workers from the closed lane.
		Exposure attending and relocating cones that have been struck by traffic	Yes. Cones will be in place.
		Construction vehicles entering and leaving the work site from the main carriageway.	Yes. Construction workers entering and exiting the work site.
	Traffic officers	Traffic officers implementing a rolling road block (RRB)	Yes. Traffic officers will use RRB to attend incidents
		Traffic officers on foot when a RRB is in place	Yes. Traffic officers will use RRB to attend incidents
		Traffic officers attending live lane incidents (breakdowns and road traffic collisions (RTCs)).	Yes. Traffic officers will attend some live lane incidents

4 Identify the relevant criteria for the populations (Stage 3)

There is currently no specific safety objective for road users during roadworks. Highways England's vision, set out in their Strategic Business Plan for 2015-2020 [7], is that no one should be harmed when travelling or working on the Strategic Road Network.

The Tolerability of Risk Triangle from GD04 [6], shown in Figure 4-1, sets out the levels of individual risk which are considered unacceptable, tolerable with mitigation and broadly acceptable. The limits are set out below.

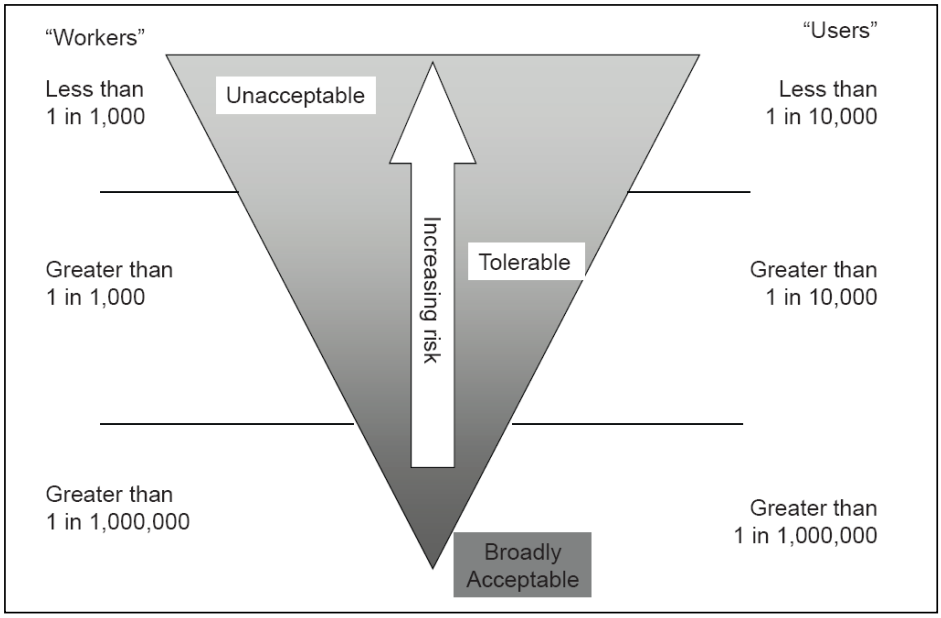

Figure 4-1: GD04 Tolerability of Risk triangle (ToR)

The road worker safety risk within this assessment will be managed so far as is reasonably practicable (SFAIRP), in line with the legal requirement. Highways England's 5 Year Health and Safety Plan [16] introduces specific initiatives for road worker safety including reducing the number of near misses related to TTM, embedding the zero carriageway crossings initiative and reducing the number of incursions at roadworks.

5 Consider existing risk exposure for each population

This section considers the existing risk exposure for each population driving through roadworks at 50mph with one lane closed with TTM.

5.1 Road users

5.1.1 Road traffic collisions through roadworks

A number of different sources have been used to assess the current level of road traffic collisions within motorway roadworks including:

- GD04 [6] – individual risk
- Highway England's Safety Risk Model (based on STATS 19 data) [18]
- Detailed STATS19 data for Area 3

The findings are summarised at the end of 5.1.1.

GD04 – Individual Risk

The most extensive piece of research identified into the risks associated with roadworks is Transport Research Laboratory's report "Safety Performance of Traffic Management at Major Motorway Roadworks" (2004) [8]. This looked at 29 major motorway roadworks sites and concluded that, "… the risk (in terms of PIAs) when roadworks are present is similar to the risk when no roadworks are present."

GD04 [6] Annex B gives the average annual risk of fatality when driving on a motorway as 1 in 320,000. On the basis of GD04 it would seem reasonable to assume that the current risk of driving in roadworks will be of a similar order of magnitude. If so, this is well within the 'tolerable' range as defined by GD04.

Evidence from Safety Risk Model

Evidence from the Safety Risk Model [18] (based on STATS19 data) was used to assess the existing risk exposure for road users. The results are presented in Table 5-1 and Table 5-2 below:

Table 5-1: Casualties within roadworks on motorways

Year	Fatalities	Serious	Slight	FWI
2011	3	15	402	8.52
2012	5	14	323	9.63
2013	2	23	338	7.68
2014	3	18	405	8.85
2015	5	29	400	11.90

Table 5a shows that the FWI does not vary greatly from year to year. It is higher in 2015 which could be attributable to the increased quantity of roadworks on the motorway network. This would seem to be a reasonable assumption, but without looking into the detail of the incidents, it is not possible to rule out that the FWI for 2015 has been skewed by a small number of significant incidents within roadworks (for example the incident involving a bus/coach which is discussed below).

Table 5-2: FWI per billion vehicle miles of the specified vehicle class

Year	Car	HGV	LGV	Bus/coach	PTW
2011	0.12	0.22	0.17	0.09	1.16
2012	0.14	0.36	0.21	0.00	1.67
2013	0.12	0.22	0.06	0.05	1.47
2014	0.13	0.38	0.07	0.05	1.64
2015	0.19	0.11	0.30	3.16	0.51

HGV refers to Heavy Goods Vehicles over 7.5 tonnes, LGV refers to Light Goods Vehicles under 7.5 tonnes and PTW refers to motorcycles.

Table 5b shows that the risk to HGV occupants is generally higher than for car or LGV occupants. This may corroborate the suggestion that there is an issue with HGV behaviour within roadworks and is investigated further in section 5.1.2

The FWI for motorcycles is considerably higher than for other vehicle types – this is in line with what would be expected elsewhere on the network for these vulnerable users and does not appear to be linked to the presence of roadworks. The 2015 FWI figure for buses/coaches is considerably higher than for other years. This is due to a single incident which resulted in 16 casualties, where driver error was given as a contributory factor. The incident occurred within roadworks but these were not given as a contributory factor and the 2015 figure is not thought to be indicative of any longer term trend.

The data has been used to provide a crude estimate the individual risk of fatality for road users driving through roadworks. The calculation of individual risk depends on the proportion of the motorway network occupied by roadworks. Highways England's Operational Metrics Manual [17] gives a target for lane availability of 97%. Only those lanes closed by TTM are classed as 'unavailable'; lanes carrying traffic through roadworks (including narrow lanes) are classed as 'available'. Table 5-2 gives the lane availability for 2013 to 2015.

Table 5-3: Lane availability on the motorway network

	2013	2014	2015
Lane availability	98.82%	98.60%	98.38%

The figure has dropped slightly as the amount of roadworks on the network has increased.

If the average lane availability is 98.5%, then 1.5% of lanes are closed for roadworks. Table 5-4 shows the individual risk of fatality when driving through roadworks.

Table 5-4: Individual risk of fatality (average for 2011 to 2015)

	Whole motorway network	Roadworks (98.5% network availability)
Average million vehicle miles per year	53,987	1,619 *
Average number of fatalities per year	135	3.6
Average million vehicle miles per fatality (a)	395	449
1 in x risk of fatality (b)	**1 in 320,000**	**1 in 364,447 ****

* Assuming that an average of 2 lanes of traffic are passing each closed lane (i.e. 3% of the total network)

** It is assumed that the ratio of values for the 1 in x risk of fatality (b) is the same as the ratio of values for (a).

This shows that, at 98.5% network availability, the individual risk of fatality is slightly lower within roadworks than on the motorway network as a whole and is within the 'tolerable' range set out in GD04.

Area 3 STATS19 data

A further analysis of STATS19 data for Area 3 showed that only 0.6% of incidents on motorways in that region occur in roadworks. Data from 'Reported road casualties Great Britain: annual report 2015' [9] found the figure to be around 1%. Experience suggests that there is likely to be some under-reporting as the STATS19 figures are dependent on how incidents are categorised by police forces. If the police force does not assign roadworks as a contributing factor then that incident will not be picked up with the roadworks statistics. However, given that network availability tends to be between 97 and 99%, these accident rates do not suggest that a disproportionate amount of incidents occur within roadworks. This supports the findings of 'Reported Road Casualties Great Britain: Annual Report 2014' [9].

Within this limited sample:

- 57% of incidents in roadworks were rear end shunts
- 31% of incidents in roadworks were associated with vehicles changing lane

In order to put this into context with normal motorways, figures were obtained from the SRN Casualty Report 2014 [14]; this showed that 51% of casualties arose from rear end shunts and 9% of casualties were due to overtaking manoeuvres.

Whilst there is not a direct correspondence between numbers of incidents and number of casualties, these figures do allow us to consider whether the types of incidents occurring at roadworks appear to be different to those on normal motorways.

This limited data suggests that incident rates within roadworks are not significantly higher than elsewhere on the motorway network. However the breakdown of accident type shows that a greater proportion of incidents are rear end shunts or due to lane changing. This supports the anecdotal evidence that incidents within roadworks are often due to tailgating and weaving by vehicles.

Summary

The risk associated with driving in roadworks does not appear to be significantly different to the risk of driving elsewhere on the motorway network. Assuming 97% network availability, the individual risk of fatality is slightly lower within roadworks than on the motorway network as a whole. Even at 99% network availability, the individual risk of fatality is within the 'tolerable' range set out in GD04.

The FWI per billion vehicle miles is fairly constant over time. There is a slight rise in 2015 could be attributed to the greater length of roadworks on the motorway network.

The breakdown of incidents by incident type supports the anecdotal evidence that incidents within roadworks are often due to tailgating and weaving by vehicles. It appears that the risk to HGV occupants is higher than that to car or LGV occupants. This is investigated further in section 5.1.2 below.

5.1.2 HGV related RTCs

A study by David Solomon entitled "Accidents on main rural highways related to speed, driver, & Vehicle" (1964) [10] demonstrated the link between speed differential and accident rates. Vehicles travelling faster or slower than the mean traffic speed were more likely to be involved in incidents. Whilst this study is rather old, the principle remains that incidents are more likely when there is a greater speed differential.

At 50mph, there is anecdotal evidence that there can be a significant speed differential between HGVs, who often drive to their speed limiter at 56mph, and cars, who often comply with the 50mph speed limit. Table 5-5 (based on RCC Command and Control logs) shows the proportion of incidents in roadworks that involve an HGV. It shows that between 11 and 19% of incidents involve an HGV. The Department for Transport's report, "Road Traffic Estimates in Great Britain: 2014" [11] reports that, in 2014, HGVs formed 11% of the proportion of traffic on motorways by vehicle type. Therefore HGVs appear to be involved in a disproportionate number of incidents. In addition, the proportion of incidents involving an HGV appears to be increasing over the 5 year period.

Table 5-5: Percentage of incidents in roadworks involving an HGV

Percentage of Incidents in Roadworks involving a HGV					
	2010	2011	2012	2013	2014
Jan	14%	14%	13%	18%	18%
Feb	15%	13%	15%	15%	17%
Mar	15%	13%	15%	14%	17%
Apr	14%	12%	14%	15%	18%
May	13%	12%	14%	16%	16%
June	13%	12%	14%	18%	16%
July	14%	11%	12%	17%	19%
Aug	12%	12%	13%	14%	15%
Sept	12%	11%	13%	18%	19%
Oct	12%	13%	13%	17%	
Nov	14%	12%	14%	17%	
Dec	16%	12%	17%	14%	

Road Traffic Estimates in Great Britain: 2014 [11] also comments on headways between HGVs and other vehicles. It reports that headways between HGVs have reduced slightly over the period from 2009 to 2014, with only 57% leaving the recommended 4 second gap. This is further evidence of tailgating by HGVs.

There is no quantitative data available to determine current levels of speed compliance by HGVs at 50mph. However, the National Enforcement Co-ordinator for Highways England provided the following quote:
"I can confirm that I've seen a number of Highways Agency Information Lines (HAILS) relating to close following HGVs and also have personal experience of this. We know HGVs are limited to 56mph and so will not be detected speeding as the National Police Chiefs' Council (NPCC) guidance for enforcement is 10% +2mph so in a 50mph limit this would be 57mph. We also know average vehicle speeds in enforced roadworks is about 48mph and this leads to conflict with HGVs and a percentage of them moving into Lane 2."

It is noted that speed differential is not the only reason for HGV collisions; they are also likely to be caused by other factors such as a lack of concentration, for example due to mobile phone use or other distractions. Data from the Safety Risk Model [18] indicates, across all vehicles, lack of concentration is a greater cause of collisions than aggressive driving or inappropriate speed. Unfortunately, it has not been possible to disaggregate the data for HGVs so no conclusion can be drawn as to the reasons behind HGV collisions.

5.1.3 Speed compliance

The NRUSS 2014-15 [1] shows that road users are frustrated by speed limits at roadworks, particularly when no work is taking place. This frustration could reasonably be expected to translate into poor levels of speed compliance.

However, the Highways England Customer Panel Survey [3] showed that 92% of panellists state that they obey restricted speed limits when driving through roadworks on the network.

This is backed by average speed camera data from the M1 J32 to 35a scheme [5] where a 50mph speed limit is in place for roadworks, and the police have stated that they are satisfied with the level of compliance.

There is no quantitative evidence available to demonstrate whether or not speed compliance by HGVs is worse than with other groups of users.

5.2 Road workers

5.2.1 Construction workers

The Safety Risk Model has been used to obtain evidence of the current level of risk to construction workers. The type of work being carried out on the road during the trials was similar in nature to maintenance works; i.e. works largely on the verge, without the need for specialist plant. However, the Safety Risk Model does not separate incidents involving construction workers from those involving maintenance workers. Therefore, both are included for the purposes of this report. The output from the Safety Risk Model is not separated into those incidents occurring within roadworks and those occurring elsewhere on the motorway network. Table 5-6 shows the number of injury accidents affecting members of the supply chain (including construction and maintenance workers but excluding traffic officers) on the motorway network as a whole.

Table 5-6: Incidents involving the supply chain on the motorway network

	3 year period				
	2013-15	2012-14	2011-13	2010-12	2009-11
Fatal	0	1	1	4	4
Serious	11	8	7	20	28
Slight	91	96	108	172	198
FWI	0.20	1.90	2.78	7.72	8.78
% FWI attributed to road users	4%	4%	4%	23%	26%

Overall, it appears that the number and severity of incidents has decreased over time.

Since 2011, the proportion of incidents where road users are a contributory factor has remained stable at around 4%.

For all scenarios, it is assumed that minimal construction activity will be taking place within the closed lanes. During technology commissioning, workers will generally be behind permanent safety fencing apart from when entering and exiting their vehicles, which will parked within the coned off lane. This is similar to the way technology maintenance activities are carried out on normal motorways where vehicles are parked for short stops on the hard shoulder. If anything the presence of cones reduces the risk to workers. However with

rollout, the level of risk will need to be determined by site specific risk assessment, taking account of the actual activities being carried out within the site.

5.2.2 Traffic officers

There is limited evidence available on the risk to traffic officers of operating within roadworks. An assessment was carried out on the M1 northbound between Junction 34 to 35a, from May 2015 to August 2016, when roadworks were in place. The results from the assessment of traffic officer attended incidents are as follows:

- A total of 560 incidents were recorded during this time period
- Traffic officers attended 55 of the incidents
- 8 incidents attended by traffic officers ended up in the roadworks site

The analysis of the current risk exposure of traffic officers concludes that traffic officers will be exposed to some risk from attending incidents within roadworks. However, traffic officers are able to mitigate this risk, in line with their work procedures, by managing traffic; this includes implementing rolling road blocks (RRB).

5.2.3 Recovery operators

With regard to the recovery of vehicles, M1 recovery data from junction 32 to 35a between 13/05/2015 and 27/08/2016 when roadworks were in place [12] shows that there were 2813 recoveries. On average this represents about 6 incidents per day. Of this around 34% of recoveries (961 recoveries) involved vehicles which were recovered from the lanes closed for works.

Free recovery operators each have their own method statements. The method statement for the M1 J32-35a [5] notes that recovery operatives will not carry out recoveries in live lanes unless the work area is deemed safe. This is achieved by creating a safe working environment with one or more impact protection vehicles (IPV), a Highways England traffic officer vehicle, or a Police vehicle.

For the majority of recoveries, the loss of one or more lanes caused by the breakdown will slow traffic significantly, mitigating the risk of the recovery operatives being in a live lane. It is only with low traffic flows, such as those encountered in the early hours of the morning, that traffic may be free flowing past the vehicle that is being recovered. Fortunately, breakdowns correlate with traffic flow, therefore, the percentage of recoveries will be low in this period.

The existing level of risk is dependent on the free recovery operator's method statement and will need to be examined as part of the site specific safety risk assessment.

6 Risk analysis assessment and evaluation (Stage 5)

This section considers how the risk to each population is likely to be affected by an increase in speed limit to 55mph. It takes two different approaches to the evaluation:

- A semi-quantitative assessment of the risk to road users, which considers the increase in incidents which would be required in order to make the risk unacceptable
- A qualitative assessment of the change in risk to all affected populations, which takes account of the findings from the trials

6.1 Semi-quantitative Assessment

As discussed in Section 5.1, the current level of risk to road users is likely to be similar to that experienced on a normal motorway. GD04 Annex B [6] gives an average annual risk of fatality when driving on a motorway as 1 in 320,000, which is within the tolerable range. In order for the risk to fall into the unacceptable range, the number of fatal incidents would need to increase by a factor of 32.

The proposed increase in speed is extremely unlikely to lead to this level of increase in fatal incidents. Therefore the risk to road users is likely to remain 'tolerable'.

6.2 Qualitative Assessment

This section assesses the potential impact of increasing the speed limit within roadworks from 50mph to a 55mph on each of the relevant populations. It incorporates the outcome of the M3 and M1 trials and then looks at what conclusions can be drawn with regard to wider use of 55mph speed limits within roadworks.

Table 6-1 provides a summary of acceptability of risk for each population; the reasons are explained in the sections that follow. The full results of these assessments are included in Appendix E.

In summary, the findings from the trials confirm that it was acceptably safe to trial the 55mph speed limit within the M3 and M1 scenarios. Further, the evidence from the trials suggests that it is likely to be acceptably safe to roll out a 55mph speed limit within similar scenarios so long as no significant construction activity is taking place.

The M3 and M1 trials minimised risk to populations by only increasing the speed limit where there was no significant construction activity taking place in the closed lanes. The trials demonstrated that a 55mph speed limit can be used without significantly increasing the risk to any population. This evidence means that it is likely to be acceptably safe to trial a 55mph speed limit in a location where construction activities are taking place, subject to the outcome of a site specific safety risk assessment. The results of that trial are required

before any decision can be made regarding wider roll out of 55mph within roadworks where significant construction activity is taking place.

The Interim reports for the on-road trials of 55mph on the M3 Junction 2 to 4a scheme [20] and the M1 J45 improvement scheme [21] point out that there were very few breakdowns or collisions during the trial period; therefore no robust conclusions could be drawn about the impact of the increased speed limit on incidents.

Table 6-1: Summary of acceptability of risk

Population	Risk acceptability
Driver	Acceptable
Emergency services	Acceptable
Construction supplier	Acceptable
TOS (Traffic Officer Service)	Acceptable
Free recovery service	Site specific

6.2.1 Road users

The results of the qualitative assessment conclude that for road users there is likely to be an increase in risk associated with general speed related hazards if speed is increased from 50mph to 55mph. Stopping distances increase significantly with speed, increasing the likelihood of collisions. Higher speeds also lead to greater momentum which is likely to increase the severity of collisions. However, drivers would typically accept this risk when driving on a D3M at 70mph. Further, both the M3 and M1 trials found no evidence to suggest that any of the speed related hazards were significantly affected.

There is likely to be some improvement in speed compliance which will reduce the number of incidents that are caused by excessive speed; however this is reliant on the perception of enforcement being maintained.

- The M3 trial found some improvement in speed compliance; however there is evidence that some drivers may not have noticed the increased speed limit and that this contributed to improved compliance (results from a survey of 221 participants found that 35% of regular drivers and 22% of occasional drivers did not notice that there was a different speed limit in place).
- The M1 J45 trial also found some improvement in speed compliance. On the northbound section the scheme reported a 6% improvement in compliance with posted speed limit while on the southbound section the compliance in posted average speed improved by 19% on average. In addition, results from a survey showed that 84% of drivers immediately noticed the change in speed limit. However, only 32 people completed the online questionnaire and therefore caution should be

taken when interpreting the results since they are based on a small number of participants.

- The evidence relating to HGV speed compliance is inconclusive. The M3 trial did not identify any change in speed compliance by HGVs. However the M1 trial showed an 18% in improvement in speed compliance by HGVs. No explanation is given for this difference. It should be noted that the 60mph trials showed clear evidence of improved compliance by HGVs. The 60mph speed limit is higher than the HGV speed limiter setting of 56mph; therefore all HGVs fitted with a speed limiter will be compliant with the 60mph speed limit.

There is no evidence that increasing the speed limit to 55mph has any impact on close following by HGVs, whereas a 60mph speed limit does appear to reduce this hazard.

- The M3 trial found that increasing the speed limit to 55mph had no impact on close following by HGVs (whereas a 60mph speed limit does appear to reduce this hazard). The M1 trial did not measure the impact of close on close following by HGVs.

Similarly there is no evidence to show whether increasing the speed limit to 55mph has any impact on the amount of overtaking and lane changing, whereas a 60mph speed limit was shown to reduce these activities.

The findings from the trials confirm that it was acceptably safe to trial the 55mph speed limit within these scenarios. Further, the evidence from the trials suggests that it is likely to be acceptably safe to increase speed limits from 50 to 55mph within similar scenarios where no significant construction activity is taking place.

6.2.2 Road workers

The results of the original safety risk assessment concluded that there will be a small increase in risk for construction workers. This risk is likely to be acceptable so long as minimal work takes place in the closed sections of carriageway. Monitoring was put in place during the trial to ensure that the risks associated with replacing TTM following strikes and access/egress from the work site remain acceptable. Evidence from the trial did not show any increase in risk to construction workers.

The risk to free recovery operators is dependent on their specific method statement. Where protection is required, prior to removing vehicles from the carriageway, the risk is likely to be acceptable.

The risk to the TOS is unlikely to change significantly with the increase in speed. This was reflected in the findings of the M3 trial.

On the M1 J45 trial two interviews were undertaken to obtain feedback from key stakeholders involved with the on-road trial of 55mph out; one with a construction site agent

and one with a traffic safety control officer (TSCO). The results from the interviews suggest that stakeholders did not make any substantial changes to the way they worked during the trial. No near misses or incidents were attributed to the 55mph speed limit by the interviewees and some improvements to driver compliance were noted; however, these were felt to be due to the introduction of speed cameras rather than the 55mph speed limit. No safety concerns were raised in relation to the higher speed limit or reduced working space behind the safety barriers.

The findings from the trials confirm that it was acceptably safe to trial the 55mph speed limit within this scenario. Further, the evidence from the trials suggests that it is likely to be acceptably safe to increase speed limits from 50 to 55mph within similar scenarios where no significant construction activity is taking place.

7 Risk control decisions (Stage 6)

The following risk controls should be implemented to minimise the risk increase to road users and workers:

- Maintain the perception of enforcement.
- Minimise the work being carried out in closed lanes. Any works that are not part of Stage D of IAN182 [2] should be completed prior to any increase in speed limit.

8 Maintaining the safety risk assessment

8.1 Document the safety risk decision in the safety risk report (Stage 7)

This report documents the programme level safety risk assessment for rolling out a 55mph speed limit through roadworks.

8.2 Handover of safety risk report to operators (Stage 8)

The safety risk assessment report will be handed over to Highways England (Roadworks & Asset Investment Division) RAID team, who will use it as part of the evidence for decisions relating to further roll out of 55mph speed limits through roadworks.

8.3 Update and refresh the safety risk report when change proposed (Stage 9)

Highways England will need to review, and if necessary update, this report should there be any further trials of a 55mph speed limit or if it is proposed to adopt it in any additional scenarios.

If the proposals are extended to include All Purpose Trunk Roads (APTR) as well as motorways, then the scope of the safety risk assessment will need to be extended accordingly.

8.4 Monitor and review safety risk report assumptions (Stage 10)

A monitoring contract was in place for the trial. This monitored a range of indicators including vehicle speeds, headways, incidents and journey times. It also looked at the impact of the increased speed on customer satisfaction. The outcomes of the monitoring contract have been used to inform this safety risk assessment.

Monitoring will need to be in place for any further 55mph trials that test additional scenarios not previously tested, e.g. trial a 55mph speed limit for an operations scheme.

9 Conclusions

The objective of this safety risk assessment is to answer the following questions:

1. ***"Was it acceptably safe to use a 55mph speed limit within the trial scenarios?"***
2. ***"Is it acceptably safe to roll out a 55mph speed limit within those scenarios?"***
3. ***"What conclusions can be drawn about the safety of using a 55mph speed limit more widely within roadworks?"***

Table 9-1 provides a summary of the qualitative assessment of the impact of the 55mph speed limit on safety risk and goes towards answering the questions posed above.

Table 9-1: Summary of the qualitative assessment

Population	Risk acceptability
Driver	Acceptable
Emergency services	Acceptable
Construction supplier	Acceptable
TOS	Acceptable
Free recovery service	Site specific

The general conclusions of this safety risk assessment are as follows:

C1 – It was acceptably safe to trial the 55mph speed limit on the M3 where system reliability testing was being carried out after installing new technology, and on the M1 where speeds were being reduced in advance of junction improvement works.

C2 – Based on the findings of the M3 trial, it is acceptably safe to roll out a 55mph speed limit in similar scenarios (system reliability testing). However, works that are not part of Stage D of IAN182 [2] should be completed prior to any increase in speed limit.

C3 – As ever, a site specific safety risk assessment will always be required to confirm that the proposed TTM arrangements and speed restrictions are appropriate for that site.

C4 – The perception of enforcement must be maintained in order to achieve speed compliance at the increased speed limit.

C5 - The trials on the M3 J2-4a smart motorway and M1 J45 improvement scheme minimised risk to populations by only increasing the speed limit where there was no

significant construction activity taking place in the closed lanes. The trials demonstrated that a 55mph speed limit can be used without significantly increasing the risk to any population. This evidence means that it is likely to be acceptably safe to trial a 55mph speed limit in a location where construction activities are taking place, subject to the outcome of a site specific safety risk assessment. Monitoring will be required in the same way as previous trials (both traffic and focus groups). The results of this next trial are required before any decision can be made regarding wider roll out of 55mph within roadworks where construction activities are taking place.

C6 – Prior to the trial it was anticipated that the use of a 55mph speed limit through roadworks may deliver benefits in the following areas:

- Customer satisfaction
- Journey time benefits
- Improved speed compliance
- Improved Heavy Goods Vehicle (HGV) driver behaviour

The results from the two 55mph trials are shown below.

	M3 J2-4a	**M1 J45**
Customer satisfaction	46% of those surveyed agreed that the increased speed limit had increased their satisfaction with their journey, whilst a further 46% were neutral.	72% of drivers approved of the 55mph speed limit in roadworks, 13% were neutral and only 16% disapproved.
Journey time benefits	Average saving of 20 seconds per vehicle	Average speeds increased by around 3mph, resulting in average journey time savings of 5 seconds per vehicle
Improved speed compliance	The M3 trial found that speed compliance improved; however, given the short duration of the trial, there is evidence that some drivers may not have noticed the increased speed limit and that this contributed to improved compliance. Results from a survey of 221 participants found that 35% of regular drivers and 22% of occasional drivers did not notice that there was a different speed limit in place.	The proportion of vehicles complying with the speed limit was 73% in the trial period (55mph speed limit) compared with 56% in the baseline period (50mph speed limit). Unlike the M3 trial, the majority (84%) of those surveyed had noticed the increased speed limit, although this may be skewed by the small sample size (32 participants).
Improved HGV driver behaviour	The M3 trial did not identify any reduction in close following by HGVs.	Not monitored

C7 – It is concluded that the first two benefits are likely to be achieved at a 55mph speed limit. There is also some indication that speed compliance improves, although this may in part be due to drivers not noticing the increased speed limit. The improved compliance is less that is achieved at 60mph where improvements of around 30% were observed. There is no evidence of improved HGV driver behaviour; the 55mph speed limit is less than the HGV's speed limiter setting of 56mph. Therefore increasing the speed limit to 55mph does not reduce close following by those HGV drivers who are driving to their limiters. Similarly there is no evidence to show that increasing the speed limit to 55mph has any impact on the amount of overtaking and lane changing.

It should be noted that the 60mph trials concluded that all four of these benefits are likely to be achieved at the higher 60mph speed limit.

C8 – Increasing the speed limit from 50mph to 55mph is likely to generate benefits, however these will be lower than those achieved at 60mph.

Appendix A - References

1	Highways England National Road User Satisfaction Survey (NRUSS)
2	INTERIM ADVICE NOTE (IAN) 182/14 Major Schemes: Enabling Handover into Operation and Maintenance (April 2014)
3	Highways England Customer Panel Survey Report "Roadwork Speed Restrictions" (September 2016)
4	Managing Speed in Roadworks - End of Task Report (ARUP/URS) (04/11/2014)
5	GD04 Risk Assessment of Trialling a 60mph Speed Limit during roadworks on M1 J34 to 35a northbound (04/11/2016)
6	General Direction (GD) 04/12 Standard for Safety Risk Assessment on the Strategic Road Network (November 2012)
7	Highways England Strategic Business Plan Overview 2015 – 2020
8	Safety Performance of Traffic Management at Major Roadworks, Transport Research Laboratory (2004)
9	Reported Road Casualties Great Britain: Annual Report 2015 (Department for Transport)
10	M1 J32-35a Smart Motorway Recovery Data, June 2016
11	Accidents on main rural highways related to speed, driver, & Vehicle (1964) (US Department of Commerce / Bureau of Public Roads)
12	Road Traffic Estimates in Great Britain: 2014 (Department for Transport)
13	The Highway Code (last updated 31 October 2016)
14	Reported Road Casualties on the Strategic Network 2014 (Highways England)
15	TAME Calculations of disbenefits associated with speed restrictions (email 7/10/16)
16	Highways England 5 Year Health and Safety Plan
17	Highways England Operational Metrics Manual (June 2016)
18	Highways England Safety Risk Model
19	60mph Through Roadworks Safety Risk Assessment General Direction 04 (GD04) report
20	Interim report for the on-road trials of 55mph on the M3 Junction 2 to 4a scheme
21	Interim report for the on-road trials of 55mph on the M1 Junction 45 scheme
22	Interim report for the on-road trials of 55mph on the M1 J45 scheme - customer survey and stakeholder engagement

Appendix B – Glossary

ALR	All lane running
APTR	All Purpose Trunk Road
ASC	Asset support contract
D3M	Dual 3-lane Motorway
DfT	Department for Transport
HAIL	Highways Agency Information Line
HGV	Heavy Goods Vehicle
IAN	Interim Advice Note
LGV	Light Goods Vehicle
MIDAS	Motorway incident detection and automatic signalling
NPCC	National Police Chiefs' Council
NRUSS	National Road User Satisfaction Survey
PTW	Powered Two Wheeler
RAID	Roadworks & Asset Investment Division
RCC	Regional Control Centre
RRB	Rolling road block
RTC	Road traffic collisions
SFAIRP	So Far As Is reasonably Practicable
TAME	Traffic Appraisal, Modelling and Economics
TOS	Traffic Officer Service
TTM	Temporary traffic management
VMS	Variable message signs

Appendix C – Classification

Feature	Type A Specialist Technical/ Coordinator Roles	Type B Professional Safety Advisors	Type C Professional Roles
1. What is the size of the decision impact?	Local, low density	Local, high density or national, low density	National, high density
2. What are the cost implications of the decision for Highways England?	Low	Medium	High
3. What is the lifetime of the decision? (how long will Highways England be affected by the decision)	Rest of the day	Months to a few years	Decades
4. What is the level of safety risk or uncertainty associated with the decision?	Low	Medium	High
5. What is the policy or stakeholder interest level? (how sensitive is it?)	Low	Medium	High

Feature	Current classification	Justification
1. What is the size of the decision impact?	Type B	The decision will be limited to the scenarios covered by the trials and a possible future trial of 55mph where construction activities are taking place.
2. What are the cost implications of the decision for Highways England?	Type A	There may potentially be a minor cost associated with introduction of 55mph plate signs.
3. What is the lifetime of the decision? (how long will Highways England be affected by the decision)	Type A/B	The decision is likely to have implications for a number of years.

Feature	Current classification	Justification
4. What is the level of safety risk or uncertainty associated with the decision?	Type A/B	The trials have provided evidence of the impact of increased speed limits on a number of indicators including safety. For road workers this is classed as Type A. 55mph speed limits will only be used where the TTM is designed to the higher speed limit. Minimal works will take place in the closed lane. Commissioning works will take place on the verge behind permanent safety fence. There are some potential increases in risk associated with setting out signs to change the speed limit and replacing cones following impact by vehicles. For road users this is classed as Type A – again the trials will only take place where the TTM is designed to the higher speed limit. It will not include narrow lanes. There are possible benefits arising from reduced speed differential resulting in less tail gating and weaving. Compliance may also be improved.
5. What is the policy or stakeholder interest level? (how sensitive is it?)	Type B/C	Desire for increased speed limits from DfT and Highways England to address customer dissatisfaction regarding roadworks management. Likely to be some interest from the public and media following the press release earlier this year. Police likely to have significant interest, particularly around enforcement. At present a 55mph speed limit cannot be enforced as there is no offence code for this speed limit. However the perception of enforcement must be maintained. Contractors will be interested in the potential impact on their workers. TOS and recovery operators may have some interest as incident management and recovery of vehicles will be taking place at a higher speed, although this is not dissimilar to normal motorway conditions.

Appendix D – General hazards affected by speed

The assessment considers qualitatively the change in risk for each of the general hazards affected by speed.

Decrease in risk	No Change	Increase in risk

Hazard ID	Description	Difference between 50mph to 55/60mph
H13	Driver loses control of vehicle	The likelihood and severity is likely to increase as the speed increases to 55mph. However the hazard is unlikely to be higher than on a normal motorway at 70mph.
H54	Motorcycle filters through traffic	Increasing the maximum speed through roadworks from 50mph to 55mph is expected to reduce congestion. This is expected to decrease the frequency of the hazard as it has been shown that motorcycle weaving decreases as traffic becomes free flowing, i.e. less congested. The severity of an incident increases marginally with the higher speed limits of 55mph. Overall the hazard is kept as “neutral”.
H67	Pedestrian on live carriageway (lanes 1, 2 or 3) during 3-lane running	There could be a small increase in likelihood and severity due to the increased speeds. However the overall risk is unlikely to be greater than on a normal motorway at 70mph.

Hazard ID	Description	Difference between 50mph to 55/60mph
H37	Individual vehicle drives too fast	There will still be instances where driver deliberately exceeds speed limits and this will be no different at 55mph speed limits. However, some drivers exceed the speed limit because they believe the speed limits are unnecessarily restrictive – this is supported by Highways Agency Information Line enquiries. Hence, more credible speed limits should encourage better speed compliance. The perception of enforcement will go some way towards mitigating this risk.
H36	Incidents or congestion caused in other lanes or carriageway due to rubber-necking	Whilst the severity of this hazard does increase with speed the overall risk is not anticipated to increase significantly. The overall risk is unlikely to be greater than on a normal motorway at 70mph.
H91	Tail gating (driving too close to the vehicle in front)	Evidence from the 60mph trials shows that the increased speed limit reduces close following by HGVs. However the 55mph speed limit is less that HGV speed limiters (set at 56mph) so is unlikely to have the same effect. Therefore it is anticipated that the impact will be neutral.
H137	Debris in running lane (including h/s while open, but not while opening)	There could be a small increase in likelihood and severity due to the increased speeds. However the overall risk is unlikely to be greater than on a normal motorway at 70mph.
H135	Vehicle stops in running lane	There could be a small increase in likelihood and severity due to the increase speeds. However the overall risk is unlikely to be greater than on a normal motorway at 70mph.
H122	Vehicle reversing back to exit slip	There could be a small increase in likelihood and severity due to the increase speeds. However the overall risk is unlikely to be greater than on a normal motorway at 70mph. The frequency is likely to be very low so the overall risk is not expected to change significantly.
H95	On-road resource crosses running lane	This hazard is not applicable as there will be no crossing of a live carriageway.

Hazard ID	Description	Difference between 50mph to 55/60mph
H112	Vehicle enters main carriageway unsafely	At 55mph all of the lorries will be travelling at the constant speed in lanes 1 and 2 wheareas at 50mph some lorries will be overtaking in lane 2. This can have an effect of creating a wall of lorries in lane 1 making it be difficult for the vehicles to join the motorway. However, this is no different to a normal motorway at 70 mph.
H76	Rapid change of general vehicle speed	Initial breaking on entering roadworks may be smoother from 70mph to 55mph rather than from 70 to 50mph. May even out. In roadworks, higher speed means more likelihood of collision.
H113	Vehicle exits hard shoulder (including an ERA) hazardously during 3-lane running	This hazard is not applicable as there is no hard shoulder.
H0099	Vehicle drifts off carriageway	At higher speeds there is less time to correct errors caused by lapses in concentration and any resulting impact is likely to greater.
H0207	Vehicle reversing along exit slip	Whilst the severity of this hazard does increase with speed it is a low frequency event which therefore the overall risk is not anticipated to increase significantly.

Appendix E - Risk analysis assessment and evaluation

The assessment considers qualitatively the change in risk for each of the populations using the following key:

Small benefit (-) Larger benefit (- -)	Neutral impact (=)	Small disbenefit (+) Larger disbenefit (++)

Road users

Population	Hazard	Risk assessment for trialling 55mph through roadworks	Is risk acceptable?
Road user - Drivers	**General speed related hazards**	(+) There is likely to be an increase in risk for the speed related hazards noted in Appendix D. However, this risk is unlikely to exceed that experienced on a D3M at the national speed limit of 70mph. The level of risk is acceptable since road users would typically accept the higher risks associated with driving on a D3M at the national speed limit (70mph). Additionally roadworks are generally covered by average speed enforcement and this helps to improve compliance within roadworks. Although average speeds increased on the M3 and M1 on-road trials, they were generally compliant and there is no evidence to suggest that any of the speed related hazards were significantly affected. The perception of enforcement was maintained throughout. The Highways England qualitative research on the M3 trial found that more people showed a decrease in average heart rate as they experienced travelling in a 55mph zone rather than 50mph, suggesting that drivers are calmer at 55mph. (Note – this effect was greater at 60mph than at 55mph)	Yes
	Road user vehicle not complying with speed limits through roadworks.	(-) Increasing speed limits may lead to increased credibility and hence better speed compliance. Credibility is thought to be a particular problem where there is no visible construction activity taking place, such as those scenarios targeted by the trials. There is little evidence of poor speed compliance within roadworks and [3] found that 92% of those questioned stated that they comply with speed limits within roadworks. The one area of concern is around HGV speed compliance. Increasing the speed limit to 60mph would result in 100% compliance of HGV vehicles as they will be limited to 56mph. However, this would not be the case with a 55mph speed limit. It should be noted that there is currently no offence code for 55mph leading to difficulties in enforcement. However the perception of enforcement can and should be maintained. Any perception of reduced enforcement is likely to reduce compliance. The 60mph on-road trial on the M5 J4a-6 scheme found that average speeds increased to around 55-57mph, so compliance was generally good. HGV driver compliance was better than that observed for car drivers (probably due to the speed limiter devices in HGVs). In this scenario, only 18% of drivers were travelling above the speed limit, compared to 54% in the 50mph baseline. The 55mph trial on the M3 found that speed compliance was better with the 55mph speed limit than the 50mph speed limit but that the rate of close following was not impacted.	Yes

Population	Hazard	Risk assessment for trialling 55mph through roadworks	Is risk acceptable?
		The 55mph trial on the M1 J45 scheme found that speed limit compliance improved during the trial phase. On the northbound the compliance in posted speeds improved by 6% while on the southbound compliance in posted speed improved by 19% on average. In addition, the enforcement threshold of 62mph, on the southbound section, reduced by 5% for cars, 5% for vans/LGVs and 3% for HGVs. Based on these findings, compliance is likely to improve with rollout of the 55mph speed limit through roadworks so long as the perception of enforcement is maintained. However, there may be no impact on close following by HGVs.	
	Road user vehicles striking road workers' equipment including TTM	(=) At higher speeds drivers have less reaction time. An increase in speed from 50 to 60mph increases thinking and breaking time by approximately 38% (53m to 73m). [13] This is likely to result in an increase in the number of TTM strikes. However, this is likely to be acceptable as road users will be getting a benefit from the speed increase. There were two incursions on the M5 J4a-6 scheme on-road trial in total throughout both the baseline and 60mph periods, where neither were identified by the scheme as having resulted due to the change in speed limit. The number of incursions on the M1 J32-35a scheme remained fairly stable across the monitoring period. During the M3 trial there was one incident where a car collided with at least one of the cones used to delineate the traffic away from Lane 1, eventually coming to a stop in the closed lane. No conclusions can be drawn as to whether the increased speed limit contributed to the collision during the 55mph speed limit. The overall number of incidents was the same during the 50mph baseline period and the 55mph trial. Based on these findings, road workers' equipment strikes (including TTM) are likely to remain the same as at 50mph with rollout of the 55mph speed limit through roadworks.	Yes
	Vehicles tailgating	(-) Tailgating, in particular that amongst HGV drivers that regularly drive to the maximum of their 56mph speed limit during 50mph speed restrictions, would be expected to remain unchanged with speed limits increased to 55mph. Whilst the 60mph trials found a significant reduction in close following by HGVs, the M3 trial of 55mph did not identify any change. This is probably due to the speed limit remaining below the 56mph limit set by HGV speed limiters. However the Highways England qualitative research on the M3 trial did find that participants felt safer at 55mph compared to 50mph. Based on these findings, instances of tailgating are unlikely to change significantly with the rollout of the 55mph speed limit through roadworks.	Yes
	Vehicles changing lanes	Evidence from the 60mph trials suggests that with a rollout of the 60mph speed limit through roadworks, there will likely be less overtaking and lane changing. However, due to potential inaccuracies with the lane distribution recorded by the radar, the M3 trial of 55mph was unable to draw conclusions about the impact of the speed limit change on lane choice or the distribution of vehicles types within each lane. Therefore, at this stage, there is no evidence that increasing the speed limit to 55mph will have any impact on	Yes

Population	Hazard	Risk assessment for trialling 55mph through roadworks	Is risk acceptable?
		overtaking and lane changing.	
Road User - Emergency Services	General speed related hazards	(+) There is likely to be an increase in risk for the speed related hazards noted in Appendix D. However, this risk is unlikely to exceed that experienced on a D3M at the national speed limit of 70mph. The level of risk is acceptable since emergency services would typically accept the higher risks associated with driving on a D3M at the national speed limit (70mph). Although average speeds increased on the M3 trial they were generally compliant and there is no evidence to suggest that any of the speed related hazards were significantly affected. On the M1 J45 trial free-flow average speeds increased significantly, suggesting that some drivers noticed and responded to the change in speed. However, speed compliance improved and there is no evidence to suggest that any of the speed related hazards were significantly affected. If the 55mph speed limit is rolled out within roadworks, it is likely that speeds will be compliant. The risk is likely to increase for the speed related hazards, but this is unlikely to exceed that experienced on a D3M at 70mph, reflecting the findings of the trials. This risk is therefore acceptable.	Yes
	Road user vehicle not complying with speed limits through roadworks.	(-) With improved compliance there may be fewer incidents that require the emergency services to attend. Improved compliance also reduces the risk to emergency services attending incidents on the road. Speed compliance on the M3 trial was better at 55mph than at 50mph – the perception of enforcement was maintained throughout. There was one incident during the baseline period and one during the 55mph trial. There was no evidence that speed was a factor in either of these incidents. On the M1 J45 scheme there were two incidents reported in the baseline period and one broken down vehicle during the 55mph trial period. An independent assessment carried out by TRL concluded that these incidents did not pose a risk to the pilot. These findings suggest that there may be fewer incidents that require the emergency services to attend with the rollout of 55mph through roadworks so long as the perception of enforcement is maintained.	Yes
	Vehicles tailgating	(-) There may be fewer incidents to attend due to fewer instances of tailgating. Whilst the 60mph trials found a significant reduction in close following by HGVs, the M3 trial of 55mph did not identify any change. This is probably due to the speed limit remaining below the 56mph limit set by HGV speed limiters. However the Highways England qualitative research on the M3 trial did find that participants felt safer at 55mph compared to 50mph. Based on these findings, there is unlikely to be any significant change in the number of incidents arising due to tailgating that require the emergency services attendance.	Yes
	Vehicles changing lanes	(-) Evidence from the 60mph trials suggests that with a rollout of the 60mph speed limit through roadworks, there will likely be less overtaking and lane changing.	Yes

Population	Hazard	Risk assessment for trialling 55mph through roadworks	Is risk acceptable?
		However, due to potential inaccuracies with the lane distribution recorded by the radar, the M3 trial of 55mph was unable to draw conclusions about the impact of the speed limit change on lane choice or the distribution of vehicles types within each lane. Therefore, at this stage, there is no evidence that increasing the speed limit to 55mph will have any impact on overtaking and lane changing.	
	Exposure to traffic when responding to incidents in live lanes.	(=) Emergency Services exposed to higher speed traffic when responding to incidents in live lanes. However, at high flows, the loss of a lane is likely to slow the traffic in adjacent lanes so the risk is unlikely to be greater than in the baseline. At low flows (e.g. at night) the risk is increased but is unlikely to be higher than on a normal motorway at 70mph. There was no evidence found during the M3 trial to suggest that the risk to emergency services increased. On the M1 J45 55mph trial there was no evidence found to suggest that the risk to emergency services attending the incident through roadworks during the trial had increased	Yes
	Exposure to construction activities when responding to incidents within the work site.	(=) Minimal construction work will be taking place within the site.	Yes

The results of the qualitative assessment conclude that for road users there is likely to be an increase in risk associated with general speed related hazards if speed is increased from 50mph to 55mph. However, drivers would typically accept this risk when driving on a D3M at 70mph. There is some improvement in speed compliance which is likely to reduce the number of incidents that are caused by excessive speed; however this is reliant on the perception of enforcement being maintained.

There is no evidence that increasing the speed limit to 55mph has any impact on close following by HGVs, whereas a 60mph speed limit does appear to reduce this hazard. Similarly there is no evidence to show whether increasing the speed limit to 55mph has any impact on the amount of overtaking and lane changing, whereas a 60mph speed limit was shown to reduce these activities.

Road workers

Population	Hazard	Risk assessment for Scenario 2a – Technology commissioning with TTM in place	Is risk acceptable?
Road workers - construction workers	Construction workers' exposure to traffic when setting up TTM	(=) Construction workers will have to carry out an additional activity of changing the speed limit signs from 50mph to 55mph. The risk is likely to be acceptable so long as a safe method of working is adopted. For example on the M3 trial, signs were changed during an overnight closure. None of the participants in the focus groups for the on-road trials reported any events or experiences that diminished their safety during the trial. If the 55mph speed limit is rolled out through roadworks, the risk is likely to remain acceptable so long as a safe method of working is adopted.	Yes, with a safe method of working
	Construction workers' exposure to traffic when working in closed lane.	(=) Increased speed increases the risk of vehicles colliding with the TTM and encroaching on the work site. However, it is assumed that there will be minimal work taking place in the closed lane. Therefore, so long as this assumption is valid, the risk to construction workers is unchanged. None of the participants in the focus groups for the on-road trials reported any events or experiences that diminished their safety during the trial. The number of incursions remained fairly stable across the monitoring period. During the 55mph trial on the M3 there was one incident where a car collided with at least one of the cones used to delineate the traffic away from Lane 1, eventually coming to a stop in the closed lane. There was no evidence that the increased speed limit contributed to the collision. The overall number of incidents was the same during the 50mph baseline period and the 55mph trial. This evidence suggests that if the 55mph speed limit is rolled out through roadworks, risks associated with vehicles colliding with the TTM and encroaching on the work site will remain acceptable. There was minimal work taking place on the site, so this would need to be taken into account with rollout.	Yes, so long as minimal work takes place in closed lane
	Construction workers' exposure attending and relocating cones that have been struck by traffic	(+) Road user vehicles travelling at higher speeds have less time to react to road environment or take evasive action, therefore potentially increasing the likelihood of collisions with road workers who are replacing struck cones. However, there does not appear to be a history of near misses for this activity. It is possible that vehicles travelling at higher speed (55mph) will increase the frequency of cone strikes. This was monitored during the trials to ensure the risk remained acceptable. There were no reports of increased TTM strikes on any of the on-road trials. None of the participants in the focus groups for the on-road trials reported any events or experiences that diminished their safety during the trial.	Yes
	Construction vehicles entering and leaving the work site from the main	(=) Access to and exit from the work site will be more difficult and hazardous at higher speed. This needs to be monitored to ensure the risk remains acceptable. None of the participants in the focus groups for the on-road trials reported any events or experiences that diminished their safety during the trial. This evidence suggests that if the 55mph speed limit is rolled out through roadworks, risks associated with roadworkers entering and leaving the roadworks site are likely to remain acceptable.	Yes

Population	Hazard	Risk assessment for Scenario 2a – Technology commissioning with TTM in place	Is risk acceptable?
	carriageway.		
Road workers – Traffic Officer Service	**Traffic officers implementing a RRB**	(=) The risks associated with implementing a RRB will increase slightly with speed. However the risk will be lower than on a normal motorway at 70mph. Therefore the risk is likely to be acceptable. There was no evidence found during the on-road trials to suggest that the risk to Traffic Officers increased when implementing an RRB.	Yes
	Traffic officers on foot when a RRB is in place	(=) Once the RRB is in place, vehicles should not be in proximity to the location of the traffic officer on foot. Overall the risk is likely to be acceptable. There was no evidence found during the on-road trials to suggest that the risk to Traffic Officers increased when on foot when an RRB is in place.	Yes
	Traffic officers attending live lane incidents	(=) In most cases congestion caused by the incident will reduce speeds. However at low flows, vehicles will be able to travel past the incident at higher speeds. In most cases, traffic officers will be working under the protection of a RRB or lane closure, in line with their procedures. Overall the risk is likely to be acceptable. There was no evidence found during the on-road trials to suggest that the risk to Traffic Officers increased when attending live lane incidents.	Yes
Road workers - Free recovery operator	**Recovery Operators will be exposed to traffic when responding to incidents in live lanes.**	(=) Recovery operators will be exposed to higher speed traffic. However the recovery operator's method statement may include appropriate means of working (such as only recovering vehicles when protection is provided by an Impact Protection Vehicle, TOS or police). A review of local arrangements will be required to determine whether the risk to recovery operators is acceptable. There was no evidence found during the on-road trials to suggest that the risk to free recovery operators increased.	Depends on local method statement
	Recovery Operators being exposed to construction activities when responding to incidents within the work site.	(=) Minimal construction work will be taking place within the site. Therefore the risk is likely to be acceptable. There was no evidence found during the on-road trials to suggest that the risk to free recovery operators increased.	Yes

The results of the qualitative assessment conclude that the risk for construction workers is unlikely to change significantly so long as minimal work takes place in the closed sections of carriageway and a safe method of working is adopted.

The risk to free recovery operators is dependent on their specific method statement. Where protection is required, prior to removing vehicles from the carriageway, the risk is likely to be acceptable.

The risk to the TOS is unlikely to change significantly with the small increase in speed.