Design Manual for Roads and Bridges

General Principles and Scheme Governance
General information

GG 104
Requirements for safety risk assessment

(formerly GD04/12 and IAN 191/16)

Revision 0

Summary
This document sets out the approach for safety risk assessment to be applied when undertaking any activity that does or can have an impact on safety on Highways England's motorway and all-purpose trunk roads, either directly or indirectly. It provides a framework for identifying hazards, assessing, evaluating and managing safety risks and assuring safety risk governance. This document only applies to Highways England.

Application by Overseeing Organisations
Any specific requirements for Overseeing Organisations alternative or supplementary to those given in this document are given in National Application Annexes to this document.

Feedback and Enquiries
Users of this document are encouraged to raise any enquiries and/or provide feedback on the content and usage of this document to the dedicated Highways England team. The email address for all enquiries and feedback is: Standards_Enquiries@highwaysengland.co.uk

This is a controlled document.

Contents

Release notes

Version	Date	Details of amendments
0	Jun 2018	GG 104 replaces GD 04/12 and IAN 191/16. The full document has been re-written to make it compliant with the new Highways England drafting rules.

Foreword

Publishing information

This document is published by Highways England.

This document supersedes GD04/12 and IAN 191/16, which are withdrawn.

Contractual and legal considerations

This document forms part of the works specification. It does not purport to include all the necessary provisions of a contract. Users are responsible for applying all appropriate documents applicable to their contract.

Introduction

Background

Safety is one of Highways England's values and our primary business imperative. The role of safety risk assessment in Highways England's activities has been described in the Health and Safety 5 year plan [Ref 1.I], by Jim O'Sullivan, CEO:

"We can't eliminate all of the risk on our road network or in the things that we do. However, we can recognise it, assess it correctly and ensure that people are protected from it".

This document sets out the framework and approach for safety risk assessment to be applied when undertaking any activity that does or can have an impact on safety on Highways England's motorway and all-purpose trunk roads, either directly or indirectly.

Activities that do or can have an impact on safety risk for any of the populations on the motorway and all-purpose trunk roads include:

1) planning, preparing, designing, constructing, operating, maintaining, modifying and disposing of assets (examples of direct influences on safety risk);
2) revising Highways England requirements and directions and all procedures, policies and strategies (examples of indirect influences on safety risk).

The framework presented in this document requires that the safety of all road populations is taken into consideration in safety risk assessments, in order to achieve the optimal safety outcome for everyone. It acknowledges that this may lead to having to balance competing safety risks for different motorway and all-purpose trunk roads populations.

These populations include:

1) everyone who works for Highways England on our road network;
2) everyone travelling on our road network, including people who work for someone else; and
3) people who are neither working on nor using it but are affected by it, such as those who live adjacent to the road network.

Compliance with this document will provide the means to demonstrate proactive, transparent decision making that will show rigour and withstand scrutiny if challenged to protect the business.

By providing a framework safety risk assessment process rather than a rigid process, the requirements provide flexibility for safety risk assessments to be as simple or as complex as the activity being risk assessed requires and can be applied appropriately for the many and varied activities undertaken across the business.

Safety risk assessments support decision making. Safety risk decisions on the viability of activities to be undertaken, including decisions to 'do nothing', need to be supported by a safety risk assessment. The presumption that to do something is always necessary does not guarantee the optimal safety outcome for everyone.

When an activity is initiated through problem identification, a safety risk assessment will help determine the nature and extent of any safety risk and the most effective way to proceed to reach the optimal safety outcome for everyone.

With regard to road projects, the requirements support safety risk assessments throughout the entire project life-cycle including option selection, the design and departure processes, all aspects for which the application of the Construction (Design and Management) Regulations 2015 [Ref 4.I] is required, the handover into operations, and maintenance and for the continuing safe operation of completed schemes.

The requirements are clear on the need to document the scope of the safety risk assessment and any evidence used in it. This is to ensure that a thorough audit trail is provided and there is no ambiguity around the decisions made.

The application of these requirements will ensure that safety risk decisions are aligned with Highways England objectives, policies, duties and responsibilities, are demonstrably evidence led, transparent, and deliver value for money.

The framework contained in these requirements sets out existing process, requirements and best practice that Highways England and any of its suppliers should already be following.

Assumptions made in the preparation of the document

The assumptions made in GG 101 [Ref 4.N] apply to this document.

The requirements and advice given in this document are provided on the basis that an appropriate governance process is in place and the outputs of the safety risk assessment process and decisions are used to assure it.

In this document the term as low as is reasonably practicable (ALARP) is used in preference to the term so far as is reasonably practicable (SFAIRP), which is used in the Health and Safety at Work etc. Act [Ref 2.N]. ALARP is the normal parlance of health and safety, and risk specialists, and duty-holders are more likely to know it. In the view of the Health and Safety Executive, the two terms are interchangeable except when drafting formal legal documents when the correct legal phrase is to be used.

Abbreviations and Symbols

Abbreviations

Abbreviation	Definition
ALARP	As low as is reasonably practicable
BCR	Benefits and costs ratio
ERIC	Eliminate, reduce, isolate, control
ETM	Emergency traffic management
FWI	Fatalities and weighted injuries
HASAWA	Health and Safety at Work etc. Act 1974 [Ref 2.N]
HSE	Health and Safety Executive
NSCRG	National Safety Control Review Group
SCRG	Safety control review group
SFAIRP	So far as is reasonably practicable

Terms and Definitions

Term	Definition
Activity/activities	The function(s) carried out by individuals or groups in meeting the Highways England obligations as a strategic highways company appointed by the Secretary of State under section 1 of the Infrastructure Act 2015 [Ref 5.I].
Governance	The processes for making, recording and implementing decisions.
Hazard	A source of potential harm, loss or failure.
Rigour	The quality of being extremely thorough and careful.
Safety baseline	Level of safety against which the safety objectives are set and measured.
Safety objective	A statement describing what, if any, contribution an activity will deliver from a safety perspective.
Safety risk	The expected consequence of a specified hazard being realised with the combination of the likelihood and expected severity of the outcome. NOTE: Safety risk is a measure of harm or loss associated with an activity.
Safety risk assessment	Identification, analysis and evaluation of safety risk.
Safety risk assessment process	Overarching process surrounding safety risk assessment that includes planning and preparation through to monitoring and review.
Sub-population	A part, identifiable fraction or subdivision of a larger population.
Motorway and all-purpose trunk roads	Collective term to indicate those parts of the highway and road network for which Highways England is highway or road authority.

1. Scope

Aspects covered

1.1 The approach set out in this document shall be applied to determine the level of complexity of any activity that does or can have an impact on safety risk, either directly or indirectly, for any of the populations on the motorway and all-purpose trunk roads.

NOTE 1 *Activities that do or can have an impact on safety risk for any of the populations on the motorway and all-purpose trunk roads include:*

1) planning, preparing, designing, constructing, operating, maintaining and disposing of assets (examples of direct, with nothing or no one in between influences on safety risk);

2) revising Highways England requirements and advice documents and all procedures, policies and strategies (examples of indirect influences on safety risk).

NOTE 2 *The approach set out in this document can be applied to carry out safety risk assessments to support departure applications.*

1.2 The approach set out in this document shall be applied to establish the relative rigour of the safety risk assessment.

NOTE *The degree of rigour required for a safety risk assessment is proportionate to how simple or complex the activity being risk assessed is.*

1.3 Populations on the motorway and all-purpose trunk roads shall be classified as shown in Table 1.3.

Table 1.3 Populations on the motorway and all-purpose trunk roads

Population	Classification
People directly employed by Highways England and who work on the motorway and all-purpose trunk roads either permanently e.g. traffic officers, or periodically e.g. those undertaking site visits; AND People in a contractual relationship with Highways England, including our national vehicle recovery contract operatives, all workers engaged in traffic management activities and incident support services, and any other activities where traffic is present, such as persons carrying out survey and inspection work.	Workers
All road users, including the police and emergency services, equestrians, cyclists and pedestrians, as well as those others, who are at work but are not in a contractual relationship with Highways England such as privately contracted vehicle recovery and vehicle repair providers.	Users
Other parties includes any person or persons who could be affected by the Highways England motorway and all-purpose trunk roads, but who are neither using it, nor working on it i.e. living or working adjacent to the motorway and all-purpose trunk roads, using other transport networks that intersect with the motorway and all-purpose trunk roads.	Other parties

1.4 This document shall be applicable throughout an activity and to all potential options for undertaking an activity.

Implementation

1.5 This document shall be implemented forthwith on all activities that do or can have an impact on safety risk, either directly or indirectly, for all populations on the motorway and all-purpose trunk roads according to the implementation requirements of GG 101 [Ref 4.N].

NOTE 1 *Throughout this document the framework for the safety risk assessment process has been illustrated by a series of flowcharts which provide a visual representation of the requirements. The full flowchart can be found in Appendix A.*

NOTE 2 *Explanation of the tasks required to undertake a safety risk assessment is provided in Appendix B.*

NOTE 3 *Explanation of safety risk assessment ownership, approval and acceptance arrangements is provided in Appendix C.*

Equality, diversity and inclusion

1.6 An equality impact assessment (EqIA) screening shall be carried out to determine the applicability of a full EqIA.

1.7 Where the EqIA screening indicates that a full EqIA is needed, an EqIA shall be carried out.

1.8 Where the EqIA indicates that people with protected characteristics can be disadvantaged or put at additional risk, solutions to mitigate that risk shall be proposed.

1.8.1 Consultation and engagement with affected people and groups should be carried out to identify solutions or mitigation.

2. Safety risk assessment process

2.1 The framework safety risk assessment process presented in Appendix A of this document shall be followed throughout the safety risk assessment process.

NOTE *The initial planning and preparation prior to undertaking the risk assessment is summarised in Figure 2.1N.*

Figure 2.1N Safety risk assessment planning process

Safety risk assessment planning

2.2 The tasks required to carry out the safety risk assessment using the framework safety risk assessment process presented in Appendix A shall be defined before beginning a safety risk assessment.

2.3 The tasks required to carry out the safety risk assessment shall be documented in accordance with the governance arrangements for the business area in which the activity is undertaken.

2.4 A safety risk assessment shall start by clearly defining and recording the question(s) that it is seeking to address.

2.5 Where there are a number of alternative approaches to undertaking an activity, each of these approaches, known as options, shall be the subject of a safety risk assessment.

2.5.1 Option selection should be made based on the outputs of the safety risk assessments.

NOTE *Option preferences formed ahead of the safety risk assessment process evaluation stage can lead to unconscious bias influencing the outcome of the safety risk assessment process.*

Categorisation of the activity type

2.6 The scope and complexity of the safety risk assessment shall be determined by categorisation of the activity type in category A, B or C in accordance with table 2.6.

Table 2.6 Categorisation of activity type

Feature	Selection criteria	
	Type	**Indicator**
Extent of prior experience of activity. The degree of knowledge available from undertaking the activity previously or the degree to which knowledge is available from the activity being undertaken by other industries or organisations.	A	Activities for which there is significant experience within Highways England. Previous safety studies and data are available, and some activity features are codified in a standard or formal procedure.
	B	Activities for which there is limited experience within Highways England but there is transferable experience elsewhere in the UK or internationally. Activities for which there is limited experience in Highways England but there is experience elsewhere in the UK or internationally, including in different industries, which is deemed sufficiently similar to the activity in question to be deemed relevant. Activities for which there is experience within Highways England but that experience is in a different application of the activity and some adaptation will be required. There might also be local and site specific issues to take into account that can affect the relevance of the available experience.
	C	Activities for which there is no previous applicable experience from either Highways England or other industries.

Table 2.6 Categorisation of activity type (continued)

Feature	Selection criteria	
	Type	**Indicator**
Statutory and formal processes and procedures (including standards and legislation). Consideration of the applicability of current standards, formal processes or procedures, guidance and legislation.	A	The activity is substantially or entirely within the scope of existing standards, guidance, formal processes or procedures and applicable legislation. The activity requires minimal or no safety related departures from standard or safety related changes to formal processes or procedures (including any legislation).
	B	The activity is largely within the scope of existing standards, guidance, formal processes or procedures. There can be some safety related departures from standards needed and/or safety related changes to formal processes or procedures. The activity can need minor changes to existing legislation.
	C	Activities that are not within the scope of existing standards, formal processes or procedures and require new ones to be developed. Activities for which significant departures from standards, formal processes or procedures are required. Activities which require significant changes to existing legislation or new legislation to be written. Whilst the number of safety departures from standards, formal processes or procedures can affect the categorisation, the most important element in determining this is the nature and type of the departures. For example, a large number of safety departures that can be addressed straightforwardly will have less impact on feature type than a single safety departure that cannot and requires a detailed risk assessment to support it.

Table 2.6 Categorisation of activity type (continued)

Feature	Selection criteria	
	Type	Indicator
Impact on the organisation. The effect that the activity will have on current Highways England processes, procedures, structure, roles and responsibilities, competencies, policies and strategy, in addition to contractual and workforce arrangements.	A	The activity has no impact on Highways England. The activity has a minor impact on any of these for a finite period of time. Length of time Highways England is affected by decision to undertake the activity is short term.
	B	The activity can lead to permanent minor changes to any of these. These minor changes can introduce new roles and responsibilities, policies, contractual and workforce arrangements. The activity can require a change to organisational arrangements. Length of time Highways England is affected by decision to undertake the activity is medium term.
	C	The activity has significant impact on any of these. The activity can change core safety roles and responsibilities. Length of time Highways England is affected by decision to undertake the activity is long term.
Activity scale. Consideration of the size and/or scale of the activity. Does or can the activity have an impact on the motorway and all-purpose trunk roads, either directly or indirectly.	A	The impact of the activity is limited in nature or scale.
	B	The impact of the activity is significant in nature or scale.
	C	The impact of the activity is wide ranging across the network, and/or significantly impacts infrastructure, interventions or workforce.
Technical. Measure of technical and/or technological novelty and/or innovation the activity involves.	A	An activity where any processes, techniques, methodologies and/or technologies involved are currently in widespread use and re-examination is unlikely to be needed.
	B	There can be some experience of the processes, techniques, methodologies and/or technologies. The experience can be from use in either another application, or by another road authority, supplier, industry or perhaps from overseas in which case some additional work can be required to adapt them and/or to demonstrate that safety can be assured for the intended application.
	C	Activities that use new processes, techniques, methodologies and/or technologies for which there is no previous experience in the UK or elsewhere.

Table 2.6 Categorisation of activity type (continued)

Feature	Selection criteria	
	Type	**Indicator**
Stakeholder impact and interest. The quantity and/or impact of stakeholders, their interest in and resulting ability to influence or/impact on the activity. The degree to which the safety issues, as perceived, are capable of being understood and fully addressed.	A	Activities for which the quantity and/or impact of stakeholders, their interest in and resulting ability to influence or impact the activity is low.
	B	Activities that have only a single or a few stakeholders but their impact, in terms of their attitude towards, or ability to influence, and/or interest in the successful achievement of the activities aim can be significant. Alternatively it will represent an activity that has several stakeholders but the amount, or type, of safety issues involved are limited.
	C	Activities for which there are a large number of stakeholders and their impact in terms of their attitude towards, or ability to influence can be significant. Stakeholders with a strong interest in the potential safety impact of the activity on themselves. Activities where there are conflicting needs arising from different stakeholders or stakeholder groups.

2.7 The process for assigning a category to an activity shall follow the steps set out below:

1) Review the features of the activity and assign each feature a category in line with table 2.6.
2) Once the activity features have been identified and a category assigned to each of them, an overall category type for the activity is determined.

NOTE *Table 2.7N shows how to determine which category type is assigned.*

Table 2.7N Determining the activity category

Feature classifications	Type	Comments
All type A.	A	Where all activity features are categorised as type A then the entire activity is type A.
All type B.	B	Where all activity features are categorised as type B then the entire activity is type B.
All type C.	C	Where all activity features are categorised as type C then the entire activity is type C.
Three or more features categorised as Type A.	A	Where three or more features are categorised as type A but the remaining features are categorised as a combination of type B or C, the activity is categorised as type A but the features categorised as B or C require a greater rigour of analysis, assessment and evaluation.
Three or more features categorised as Type B.	B	Where three or more features are categorised as type B but the remaining features are categorised as a combination of type A or C, the activity is categorised as type B but the features categorised as C require a greater rigour of analysis, assessment and evaluation.
Three or more features categorised as Type C.	C	Where three or more features are categorised as type C then the entire activity is of type C.
Equal distribution of categories across features (no majority).	A/B/-C	Where the categorisation of activity features results in an equal distribution between two or more category types the decision on the overall activity categorisation is governed by the importance of each feature relative to the activity. If this results in a decision to select the overall activity categorisation as the lower category type, the features that were identified with the higher category type require a greater rigour of analysis, assessment and evaluation.

2.8 The results of the categorisation process, and the rationale for determining the individual activity features and overall category, shall be documented and supporting evidence recorded, in accordance with the governance procedures for the business area in which the activity is undertaken.

2.9 The results of the categorisation process shall be used to determine if a safety control review group is to be established to approve the category type and endorse the safety risk assessment process.

2.10 Activities categorised as type B or C shall establish a safety control review group.

NOTE *Appendix C Safety risk governance provides guidance on establishing a safety control review group, the purpose of the group, roles, responsibilities and escalation routes to the National Safety Control Review Group.*

2.11 For activities categorised as type A, the categorisation shall be approved by the person responsible for managing the activity.

Identification of affected populations

2.12 A safety risk assessment shall clearly identify all populations, described in Table 1.3, and record how each is or can be affected by the activity.

NOTE *Sub-populations identified within an overall population as described in Table 1.3 can be affected in different ways because of their inherently different characteristics.*

2.12.1 Where sub-populations to the populations described in Table 1.3 with differing characteristics exist, these should be assessed separately.

2.13 The identification of all affected populations shall be documented and supporting evidence recorded, in accordance with the governance procedures for the business area in which the activity is undertaken.

Safety risk assessment scope

2.14 The purpose of the activity and how this will be undertaken shall be clearly defined within the scope of the safety risk assessment.

2.15 What is included and what is excluded and all the populations affected by the activity and how it will be undertaken shall be defined and recorded.

NOTE 1 *The point of defining the scope of the safety risk assessment is to understand how the individual and composite features of the activity work together to achieve the overall activity outcome.*

NOTE 2 *Defining the scope of the safety risk assessment supports subsequent safety risk assessment actions by enabling those responsible for undertaking them, to understand how individual features contribute to the achievement of the activity.*

2.16 The scope of the safety risk assessment shall be documented and supporting evidence recorded, in accordance with the governance procedures for the business area in which the activity is undertaken.

Safety baseline and safety objective

2.17 A safety baseline and safety objective relevant to the activity shall be defined, documented and evidenced, in accordance with the governance procedures for the business area in which the activity is undertaken.

2.18 Safety baselines and safety objectives shall include all populations.

2.19 Safety objectives for road workers shall always be to manage risk as low as is reasonably practicable.

2.20 The safety baseline shall be established from the current or recent historic safety performance of the activity.

2.20.1 The information sources or metrics used to establish the safety baseline and safety objective should be the best available.

NOTE 1 *There are a variety of information sources or metrics that can be used to establish the safety baseline and safety objective depending on what the activity is.*

NOTE 2 *It is important to use the best available information sources or metrics and to understand any limitations there are on what is chosen.*

NOTE 3 *If the activity is new, the information used to establish any safety baseline and safety objective can be sourced from expert opinion.*

2.21 When a safety improvement is not the primary purpose of the activity a safety objective shall still be set for the populations affected.

2.21.1 Safety objectives may be set using individual or collective risk metrics.

2.22 Safety objectives shall be expressed in the same metric that is used to define the baseline.

NOTE 1 *The metrics used do not have to be the same for every population in the safety risk assessment.*

NOTE 2 *The metric used does have to be the same for a population when evaluating any change from the baseline as a result of the activity.*

NOTE 3 *Individual risk is calculated on the safety risk to a single person and is used to represent the statistical risk of any individuals exposed to the risk.*

NOTE 4 *In terms of individual risk the commonest metric is the probability of a typical worker being killed or injured during a year whilst undertaking their work.*

NOTE 5 *Collective risk is used to represent the statistical risk to a group of people, or a population, associated with a particular activity.*

NOTE 6 *In terms of collective risk the commonest metric is the average number of fatalities per year that would be expected to occur for a given activity.*

3. Safety risk assessment

3.1 The safety risk assessment process presented in Appendix A of this document and summarised in Figure 3.1N shall be followed throughout the safety risk assessment process.

NOTE *The safety risk assessment is summarised in Figure 3.1N.*

Figure 3.1N Safety risk assessment

Hazard identification

3.2 All reasonably foreseeable hazards associated with an activity shall be identified.

NOTE *The identification of all reasonably foreseeable hazards includes understanding;*

1) who – might be affected by the hazard, which population(s);
2) what – is the hazard;
3) where – is the hazard limited to specific surroundings or conditions;
4) when – is the hazard limited to specific times;
5) why – what is it about the population that means it is a hazard for them;
6) how – does the hazard have potential to cause harm, loss or failure.

3.3 All steps of hazard identification shall be documented and supporting evidence recorded in accordance with the governance procedures for the business areas.

Hazard analysis

3.4 The identified hazards shall be analysed to understand the resulting safety risks and all reasonably foreseeable consequences if those risks are realised.

NOTE *A simple test of effective hazard, risk and consequence identification is if they can be described in this way: "because of <insert hazard here> <the risk> might occur which would lead to <insert possible events here>".*

Analysis of safety risk

3.5 The level of detail for any safety risk analyses shall be proportionate to the safety risks being assessed and the activity type categorisation.

3.5.1 The analysis of the safety risks for each population should include an assessment of the likelihood of the risk being realised and the most common potential severity of the consequences.

3.5.2 The analysis of the safety risks for each population may use a range of evidence sources, including:

1) Quantitative data.
2) Qualitative data including:
   a) Previous experience
   b) Expert opinion
   c) Research
3) Combination of quantitative and qualitative data.

3.5.3 Values for likelihood and severity of outcomes may be assigned to qualitative data for the purposes of assessment (Appendix D).

Evaluation of safety risks

3.6 Outputs from safety risk analyses shall show the level of the safety risk associated with the activity.

3.7 Outputs from safety risk analyses shall be compared to the safety baseline and safety objectives set for the activity.

3.8 In addition to evaluating the safety risk against the safety baseline and safety objective, for worker populations and any 'other parties' population affected by the activity, the safety risk must be evaluated against the reasonably practicable principle in HASAWA [Ref 3.N].

3.9 During the normal operation of the motorway and all-purpose trunk roads, in addition to evaluating the safety risk against the safety baseline and safety objective, the safety risk to road user populations for any activity shall be evaluated so that a decision can be made on the basis of what is reasonably required.

NOTE 1 *To demonstrate that something is reasonably required all suitable potential mitigations to reduce safety risks are assessed. Where the cost of a measure identified in the assessment is, in the reasonable opinion of those carrying out the assessment, proportionate to the benefit derived, that measure can be deemed as reasonably required.*

NOTE 2 *The term normal operation is used to describe when the use of the road is not constrained by Highways England implementing planned roadworks and includes instances when emergency traffic management is deployed.*

Table 3.9N2 Safety risk decision criteria for normal operations

Population	Safety risk decision criteria for normal operation including ETM
Workers	ALARP
Users	Reasonably required
Other parties	ALARP

3.10 Outside of the normal operation, of the motorway and all-purpose trunk roads, in addition to evaluating the safety risk for any activity against the safety baseline and safety objective, the safety risk to road user populations and any 'other parties' populations affected by the activity, must be evaluated against the reasonably practicable principle in HASAWA [Ref 1.N].

NOTE *The term outside of normal operation is used to describe when the use of the road is constrained by Highways England implementing roadworks. Only in this instance is the road not in normal operation and Highways England's responsibility under health and safety legislation changes and during the period of road work activity the safety risk exposure of road user populations is managed differently.*

Table 3.10N Safety risk decision criteria outside of normal operations

Population	Safety risk decision criteria outside of normal operation
Workers	ALARP
Users	ALARP
Other parties	ALARP

3.11 The evaluation of the safety risk analyses and any decisions on whether a measure is reasonably required shall be documented and supporting evidence recorded, in accordance with the governance procedures for the business area in which the activity is undertaken.

Safety risk mitigations

3.12 Where the outcome of the safety risk assessment evaluation for an option being safety risk assessed, is within the list below, safety risk mitigations shall be explored.

1) Shows a safety risk dis-benefit from the safety baseline.
2) It does not meet the safety objective.
3) Does not accord with ALARP.
4) Is less than what is deemed reasonably required.

NOTE 1 *Safety risk mitigations are measures implemented to reduce the likelihood of a risk being realised or lessen the severity of the potential outcome. Safety risk mitigations are also be known as control measures.*

NOTE 2 *Highways England can exercise discretion in deciding to provide or omit safety risk mitigations.*

3.13 Safety risk mitigation measures shall follow the ERIC hierarchy - Eliminate, Reduce, Isolate and Control for each safety risk.

NOTE 1 *The ideal option for a safety risk mitigation measure is to eliminate the safety risk.*

NOTE 2 *Where the elimination of safety risks cannot be achieved or the costs to do so are disproportionate, reducing, isolating or controlling risks are assessed in turn.*

NOTE 3 *A benefit cost ratio (BCR) for a safety risk mitigation that is > 2 shows a good return on investment for what it costs and can be promoted on safety grounds.*

NOTE 4 *A BCR for a safety risk mitigation that is < 1 does not show a good return on investment for what it costs and cannot be promoted on safety grounds.*

3.13.1 Any safety risk mitigations with BCRs between the range >2 and <1 can be considered alongside all the other options and where a greater benefit can reasonably be achieved by allocation of the cost of that safety risk mitigation elsewhere within the scheme or a wider programme of works, this should be taken into account in deciding which safety risk mitigation is selected.

NOTE *The benefits in a BCR will generally be measured against a monetised value for a risk of death i.e. Value of Preventing a fatality (VPF) [Ref 7.I]; depending on the data available other metrics such as Fatalities and Weighted Injuries (FWIs), Killed and Seriously Injured (KSIs), Personal Injury Accidents (PIAs) [Ref 6.I]or incidents can also be used.*

3.13.2 A decision to do nothing may be a valid one if it is the proper conclusion of the assessment process outlined in this document.

3.13.3 The residual safety risk should be assessed for comparison to the safety baseline and the safety objective for each safety risk mitigation considered.

3.14 Safety risks for the activity shall be managed to optimise the safety risk benefits and deliver that which is reasonably required.

3.14.1 In maximising the safety risk benefit of the activity, the HSE approved concept of trade-off may be applied (in accordance with the HSE document 'R2P2 Reducing Risks and Protecting People [Ref 3.I].

3.14.2 In applying a trade-off, any safety risk dis-benefit to a single population should be out-weighed by a safety risk benefit to one or all of the other populations.

3.15 Where a safety risk dis-benefit occurs to one population to enable a decrease in risk exposure for another population, the residual risk for the sacrificing population shall remain with that which is tolerable.

NOTE 1 *Tolerability of risk is based on the understanding that it is not possible to fully eradicate all risk associated with every activity, and it acknowledges the relationship between the willingness to accept risks to secure benefits.*

NOTE 2 *The concept of tolerability contains boundaries that describe risks as unacceptable, tolerable and broadly acceptable; unacceptable because the benefits secured do not warrant the risk being taken and broadly acceptable because the risk is so low that there is no discernible benefit from reducing it further.*

4. Document and maintain the safety risk assessment

4.1 The safety risk assessment process presented in Appendix A of this document shall be followed throughout the safety risk assessment process.

NOTE *The process for documenting the safety risk assessment process and maintaining that documentation is summarised in Figure 4.1N.*

Figure 4.1N Document and maintain safety risk assessment process

4.2 All steps of the safety risk assessment shall be documented.

4.3 All steps of the safety risk assessment shall have the supporting evidence recorded to demonstrate that an appropriate level of rigour has been applied to assess the expected safety performance and to demonstrate how the design and implementation of the activity can satisfy the safety objective.

4.4 The format and extent of the safety risk assessment documentation shall be defined in accordance with the governance arrangements for the business area in which the activity is undertaken.

Update the safety risk assessment

4.5 Safety risk assessments are live documents which shall be reviewed and updated throughout the life of the activity.

NOTE *If anything changes that affects the activity or component part(s) of it, a review to check that whatever has changed does not invalidate the safety risk assessment is necessary.*

Assumption validation and monitoring

4.6 The scope of and timescales for a review of the safety risk assessment shall be defined and documented, in accordance with the governance procedures for the business area in which the activity is undertaken.

4.7 Where any assumptions were made in relation to the safety risk assessment, these shall be validated as part of the review.

4.8 The detail of any residual risks that require active monitoring shall be recorded and an owner assigned.

4.9 Monitoring and review arrangements shall be defined in accordance with the governance procedures for the business area in which the activity is undertaken.

NOTE *For type A activities (Categorisation of the activity type) it is acceptable for monitoring to be a part of routine performance measurement.*

4.10 The monitoring and review arrangements shall be documented and supporting justification recorded, in accordance with the governance procedures for the business area in which the activity is undertaken.

5. Normative References

The following documents, in whole or in part, are normative references for this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

Ref 1.N	'Health and Safety at Work etc. 1974 Section 3.1'
Ref 2.N	'Health and Safety at Work etc. Act 1974'
Ref 3.N	'Health and Safety at Work etc. Act 1974 Section 2 and section 3.1'
Ref 4.N	Highways England. GG 101, 'Introduction to the Design Manual for Roads and Bridges'

6. Informative References

The following documents are informative references for this document and provide supporting information.

Ref 1.I	Highways England. 'Health and Safety 5 year Action Plan, May 2017'
Ref 2.I	Standards for Highways. 'NSCRG and PSCRG Remit for Organisation and Governance document'
Ref 3.I	Health and Safety Executive Report. 'Reducing Risks, Protecting People.'
Ref 4.I	'The Construction (Design and Management) Regulations 2015'
Ref 5.I	'The Infrastructure Act 2015'
Ref 6.I	'Transport Appraisal Guidance Unit A 4.1 Social Impact Appraisal, section 2.1.5'
Ref 7.I	'Transport Appraisal Guidance Unit A 4.1 Social Impact Appraisal, section 2.2.4'

Appendix A. Safety risk assessment process

Figure A.1 Framework for safety risk assessment

Figure A.2 Safety risk assessment process

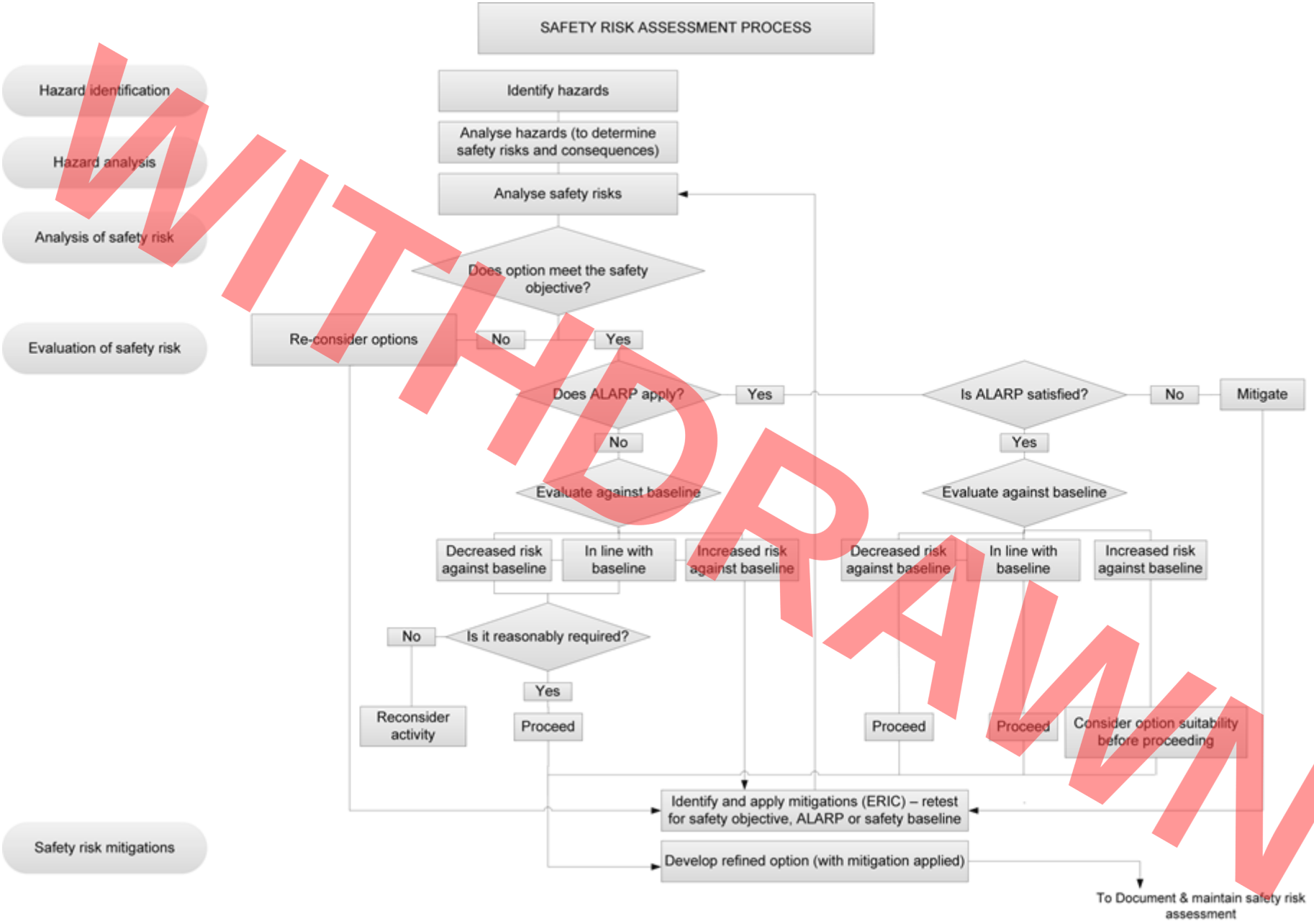
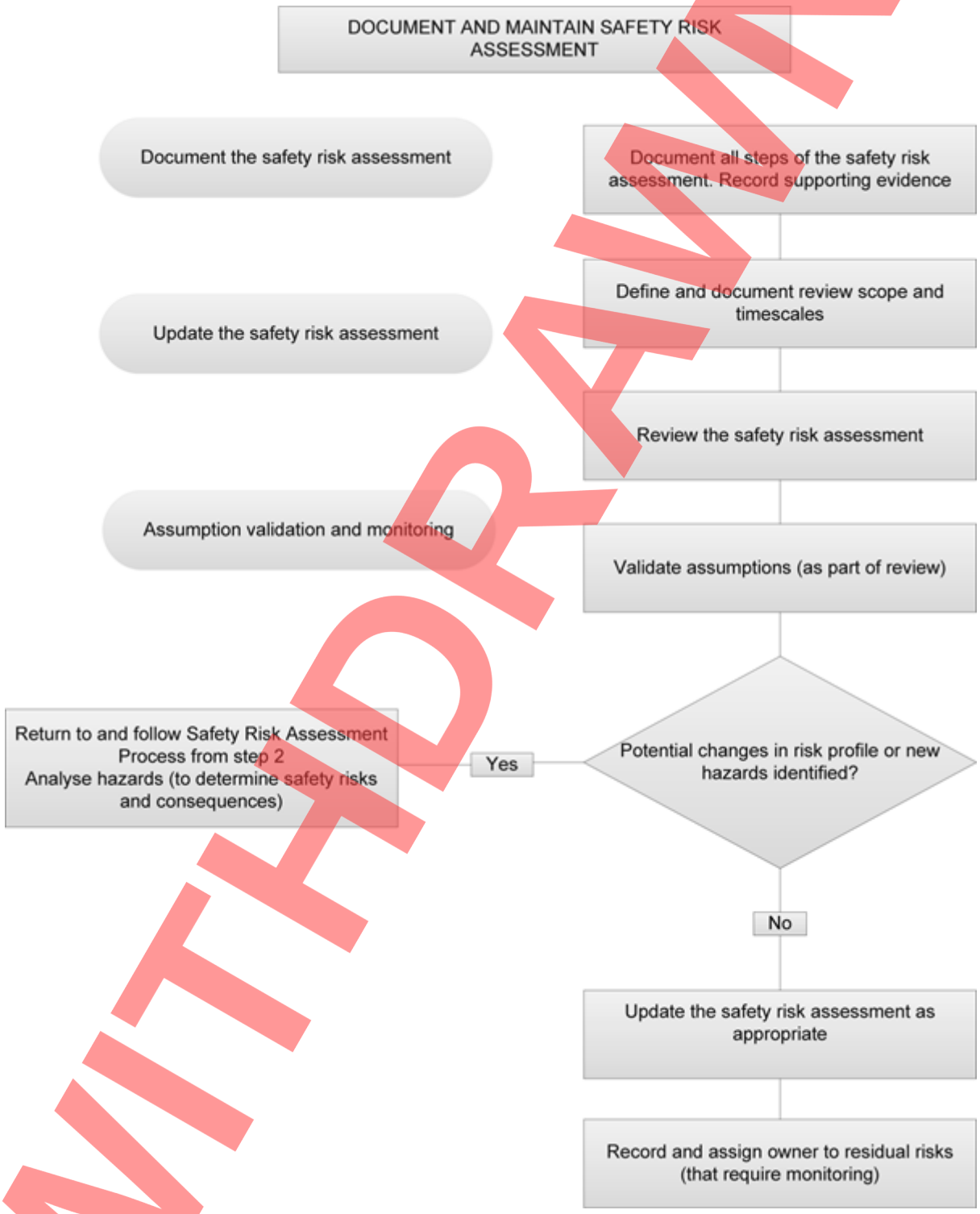


Figure A.3 Document and maintain safety risk assessment



Appendix B. Safety risk assessment tasks

Table B.1 (overleaf) lists the tasks for safety risk assessment

Table B.1 Safety risk assessment tasks

Framework safety risk assessment process steps	Task	Description of activity	Reason for carrying out the activity
Safety risk assessment planning (Aspects covered:- Safety risk assessment process; Safety risk assessment planning; Categorisation of the activity; Identification of affected populations).	Develop a plan for safety.	Document a clear plan of how safety risk will be managed for all populations throughout the life cycle of the activity. Define the specific safety risk activities that will be undertaken for the activity. In activities categorised as Type B or C establish a safety control review group to endorse the categorisation.	Supports the planning of safety activities and demonstrates that a defined safety risk management approach is being used. Establish roles and responsibilities. Provides a means of communicating to and educating stakeholders as to how the project will achieve its safety objectives.
Safety baseline and objectives.	Define and document the safety baseline and safety objective.	Document a suitable baseline for the activity. Document objectives to cover relevant populations and align with wider Highways England safety and risk objectives.	Allow the effect of the activity to be measured. A safety baseline is required to measure the achievement of the safety objective. Have a clear understanding of the rationale to be pursued for managing safety for the different populations affected by the activity.

Table B.1 Safety risk assessment tasks (continued)

Framework safety risk assessment process steps	Task	Description of activity	Reason for carrying out the activity
Hazard identification and analysis. Analysis and evaluation of safety risk. Safety risk mitigations.	Type A project -Risk assessment.	Identify and document reasonably foreseeable hazards associated with the activity for all populations. Conduct safety risk assessment. Record details of any residual risks, and provide clear guidance on how these will be managed / monitored into the future.	Supports the identification and documentation of the hazards that will affect the activity; enabling them to be appropriately safety risk assessed and subsequently mitigated. To ensure any residual risks are handed over to the appropriate owner within Highways England for ongoing management.
	Type B project -Risk assessment.	As above, and conduct additional, appropriate safety risk assessments. Consider use of sensitivity analysis to support safety risk assessments.	As above. Provides additional detail and rigour to the safety risk assessments and ensures that options are informed by risk assessment. Sensitivity analysis on risk scores will help focus resources on areas where significant safety improvements are required.
	Type C project -Risk assessment.	As above, and conduct additional hazard analysis and appropriate safety risk assessment for all populations which may include: Preliminary hazard analysis (PHA); System hazard analysis (SHA); Sub-system hazard analysis (SSHA); Interface hazard analysis (IHA); Operation and support hazard analysis (OSHA).	Supports the identification of hazards arising from various sources and interfaces, enabling the activity to be thoroughly risk assessed and subsequent mitigations proposed. The management of these hazards will be consolidated in a log of hazards.
Document the safety risk assessment.		Document all safety risk assessment tasks undertaken. Include evidence showing that appropriate safety objectives have been developed and demonstrate how these objectives have been achieved.	To demonstrate that the appropriate level of safety management has been undertaken to assess the expected safety performance.

Table B.1 Safety risk assessment tasks (continued)

Framework safety risk assessment process steps	Task	Description of activity	Reason for carrying out the activity
Update the safety risk assessment.	Updating safety documentation.	Safety risk assessments are live documents which are to be reviewed and updated throughout the life of the activity. If anything changes that affects the activity or component part(s) of it, a review to check that whatever has changed does not invalidate the safety risk assessment will be necessary.	Maintain documentation as a record of status of the safety risk assessment and records ongoing achievement of safety objectives. This activity demonstrates that the activity still meets all of the necessary safety requirements and that appropriate safety risk management is continuing.
Assumption validation and monitoring.	Define and document review scope and timescales.	Verify that the activity has implemented any identified safety requirements and ensure that all planned safety activities have been adequately undertaken. Validate assumptions and meeting safety objectives. This will require post operational monitoring. If any activities have not been completed, or have been completed but not in accordance with the safety plan, then this will be reported to the Highways England Project Manager. Safety risk mitigations will be developed, implemented and recorded.	To demonstrate that the safety requirements have been actioned. Validate that the activity design satisfies its safety objectives. It is important to make it clear what has been done to mitigate issues where activities have not been completed as planned, or outcomes are not as expected.

Appendix C. Safety risk governance

C1 Ownership, approval and acceptance arrangements

Throughout the life cycle of an activity, ownership and accountabilities in relation to the safety risk assessment process should be clearly identified and documented, in accordance with the governance procedures for the business area in which the activity is undertaken.

Ownership can transfer during the whole life cycle of an activity. When this occurs, responsibility for continuing to apply the appropriate approach to the safety risk assessment process also transfers to the new owner.

Safety risk assessment process outputs and decisions for type B and C activities require consultation before acceptance and approval can take place. This is required to gain a whole life understanding of how the activity affects Highways England and to gain agreement from across Highways England that it can be implemented safely. This will be activity specific consideration.

1) All activities define the roles that are consulted to support the acceptance and approval process.
2) Acceptance and approval is undertaken by competent persons.
3) Acceptance and approval is recorded, in accordance with the governance procedures for the business area in which the activity is undertaken.
4) The acceptance and approval process applies to any changes introduced to the activity and the safety documentation after implementation and is recorded, in accordance with the governance procedures for the business area in which the activity is undertaken.

Type A activities

The activity type categorisation and the safety risk assessment process is reviewed and agreed by the activity manager. The activity manager's agreement is documented in accordance with the governance procedures for the business area in which the activity is undertaken.

Type B activities

The activity type categorisation and the safety risk assessment process are referred to a safety control review group (SCRG).

Type C activities

The activity type categorisation and the safety risk assessment process are referred to the National Safety Control Review Group (NSCRG).

C1.1 SCRG

An SCRG is formed by the activity manager of any activity categorised as type B or C. The SCRG is formed of representatives of those business areas who are involved in undertaking, or affected by the activity at any stage in the development, implementation and adoption of the activity.

An SCRG is formed for the purpose of consultation on and reviewing, and endorsing of the activity categorisation.

For activities with a categorisation endorsed as type B the SCRG is consulted on, reviews and endorses the safety risk assessment process. The SCRG agrees the outputs of the safety risk assessment process and any decisions made within it.

For activities with a categorisation endorsed as a type C, the SCRG will review the categorisation and submit it to the NSCRG to endorse. If the NSCRG agrees the type C categorisation, the SCRG will undertake the same role for consultation, review and agreement of safety risk assessment process outputs and decisions made within it but it will submit all of these to the NSCRG for their approval.

C1.2 NSCRG

NSCRG is a standing committee with membership as defined in the NSCRG and PSCRG Remit for Organisation and Governance document [Ref 2.I]. The key objectives of the NSCRG are to:

1) Ensure alignment of safety objectives with Highways England objectives and targets;
2) Act as a specialist advisory group providing support to the Chief Highway Engineer;
3) Review and advise on complex, unique or contentious safety issues arising on activities;
4) Review and advise on safety issues that have a National impact or have not arisen before; and
5) Ensure consistency of approach to managing safety across activities.

The NSCRG will make a determination of the acceptability of any proposed solutions on type C referrals made by SCRGs and either:

1) Endorse the proposed activity;
2) Refer back to the project team for further consideration; or
3) Escalate the activity to the Chief Highways Engineer should the NSCRG feel that the issue has implications beyond its authority.

C1.3 Approvals

Type A activities require no more than a business as usual approach, consequently type A approvals will not require any additional effort beyond those required by the governance process of the business area.

Type B activities

The SCRG decides whether or not to approve safety risk assessment outputs and decisions or will comment on the safety implications. This will be documented in the minutes of the SCRG.

The SCRG will have the authority of the senior managers who ultimately sign off the safety risk assessment process outputs.

Type C activities

The NSCRG decides whether or not to approve safety risk assessment outputs and decisions or will comment on the safety implications. This will be documented in the minutes of the NSCRG.

Appendix D. Example risk matrix

Table D.1 gives values for likelihood and severity of outcomes that may be assigned to qualitative data for the purposes of assessment.

Table D.2 provides an example method of recording hazard identification and analysis of safety risk, risk values and safety risk mitigations. The values for L, S and R may be taken from Table D.1.

Table D.1 Risk value, likelihood and severity of outcomes that may be assigned to qualitative data for the purposes of assessment

Likelihood (L) x Severity (S) = Risk value (R)		**Severity (S)**				
		Minor harm; Minor damage or loss no injury	**Moderate harm; Slight injury or illness, moderate damage or loss**	**Serious harm; Serious injury or ill-ness, substantial damage or loss**	**Major harm; Fatal injury, major damage or loss**	**Extreme harm; Multiple fatalities, extreme loss or damage**
Likelihood (L)	Very unlikely; Highly improbable, not known to occur	1	2	3	4	5
	Unlikely; Less than 1 per 10 years	2	4	6	8	10
	May happen; Once every 5-10 years	3	6	9	12	15
	Likely; Once every 1-4 years	4	8	12	16	20
	Almost certain; Once a year or more	5	10	15	20	25

Risk Value (R)	**Required action**
Low (1-9)	Ensure assumed control measures are maintained and reviewed as necessary.
Medium (10-19)	Additional control measures needed to reduce risk rating to a level which is equivalent to a test of ”reasonably required” for the population concerned.
High (20-25)	Activity not permitted. Hazard to be avoided or risk to be reduced to tolerable.

Table D.2 Example method of recording hazard identification and analysis of safety risk, risk values and safety risk mitigations

Activity/ Decision									Date
Decision Maker/ Assessor									Contact Details
Ref	**Hazard/ Risk Description**	**L**	**S**	**R**	**Response/ Control Measure**	**L**	**S**	**R**	**Details/assumptions/ monitoring**
1									
2									
3									
4									
5									
6									